

# ROYCE INSTRUMENTS



## System 610 User's Guide

User's Guide 25781, R6



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## Safety Precautions

- Read and follow the instructions! All the safety and operating instructions must be read before the machine is operated.
- Use only the correct power source as marked on the machine - if you are not sure of the power supply consult your local power company. If the machine uses a wall plug-in transformer, use only the transformer supplied.
- Your wall outlet must accept a polarized, three-prong grounded plug. These plugs are designed for your safety, so do not attempt to defeat them. If you cannot insert the plug easily, an electrician should replace the outlet.
- Operators must be trained on the proper use of the machine and on handling pull hooks before performing any tests.
- Do not place hands or fingers at pinch points.
- Do not use liquids where they can be spilled into the enclosure through openings.
- Do not use machine if you suspect a gas leak. Report the leak immediately.
- Do not use the machine near water, or when you are wet. If the machine comes in contact with any liquids, unplug the power and line cords immediately. Do not plug the machine back in until it has been dried thoroughly.
- The machine must be serviced by qualified service personnel when:
  - The power supply cord or the plug has been damaged
  - Objects have fallen or liquid has been spilled into the machine
  - The machine has been exposed to rain
  - The machine does not appear to operate normally or exhibits a marked change in the performance
  - The machine has been dropped, or the enclosure is damaged
- Do not attempt to service the machine beyond the operating instructions. All other servicing should be referred to qualified service personnel. Opening the machine or reassembling it incorrectly may expose you to dangerous voltages or other risks.
- The Royce 610 system mainframe weighs 20 kg (45 lb.) with typical tooling installed. Two people are needed to move or lift the system mainframe safely.

## Get Help from Royce Instruments

Before you contact us, please record the following information.

**System serial number:** *(located on the back of the machine)*

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**Installed software revision number:** *(displayed upon start up)*

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### **Internet – [www.royceinstruments.com](http://www.royceinstruments.com)**

Check us out online for answers to frequently asked questions and product information.

### **Email – [customerservice@royceinstruments.com](mailto:customerservice@royceinstruments.com)**

For individual attention on a special issue, contact our knowledgeable technical support representatives.

### **Process Consumables**

Many consumable items are can be purchased directly from our website.

**[www.royceinstruments.com](http://www.royceinstruments.com)**

### **Extended Warranty**

Royce Instruments Extended Warranty is a cost-effective service and support program. For more information, visit the Royce Instruments website.

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## 1.1 MAINFRAME

The System 610 mainframe includes illumination, mouse, LCD, parallel printer port, and RS232 serial port. Standard features include pull hook rotation, conventional “semi auto” test mode, and collision sensing. The System 610 wire pull tester is capable of 100 gram testing force with a 0.1 gram resolution.

### System 610 Mainframe





## 1.2 OPTICS

The Olympus SZ61 zoom microscope is available with 20X eyepieces, focusing arm, 6.7x – 40x magnification.

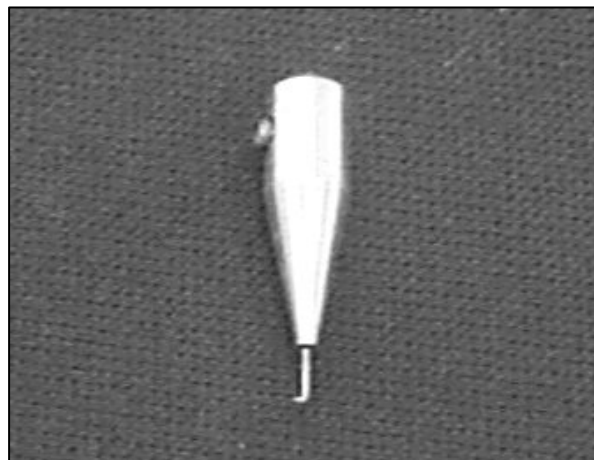
### Olympus SZ61 Microscope



## 1.3 WIRE PULL HOOKS

Standard wire pull hooks are available in diameters from 0.002" to 0.010". Generally, hook diameter should be at least 2X the diameter of the bonding wire. Custom hooks, built to user specified dimensions, are also available.

### Wire Pull Hook



## 1.4 SAMPLE HOLDERS

Sample holders (SH), manipulators (MPS), and test piece holders (TPS) are available to suit a wide range of sample types and sizes. The standard System 610 manipulator and sample holders are detailed on the following 2 pages. Custom sample holders, built to user specified dimensions, are also available. Please contact the factory for further information.

### MPS-12 Manipulator

The MP-12 manipulator connects to any Royce Instruments' test piece holder (TPS) to hold samples on the System 610.

Please contact the factory for information on standard or custom test piece holders.



### MPS-14 Manipulator

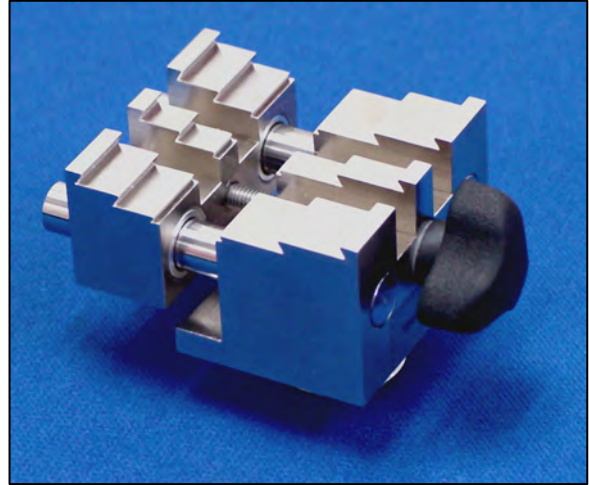
The MPS-14 Manipulator uses a 4:1 pantograph linkage to help the operator position parts very precisely.



### **TPS-55 Sample Holder**

The TPS-55 is a universal sample holder (test piece holder) that is suitable for many types of samples.

Clamping force of the stepped jawset is adjustable by precision leadscrew.



Please contact the factory for information on standard or custom test piece holders.

## 1.5 OPTIONS

Options include a keypad and a printer. Increased data entry functions are possible through the addition of the keypad. The 40 column thermal printer allows test results and statistical reports to be printed on paper tape.

### Keypad

The optional Keypad enables convenient entry of bond test grade codes, operator information etc.



### Printer

The optional thermal printer quickly prints test reports onto thermal paper. Clean room compatible thermal paper is available.



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## 2.1 UNPACKING THE SYSTEM

The System 610 is shipped in a wooden crate that has been specifically designed to prevent damage to the system. Re-use the shipping crate when transporting the system. Accessories and optional equipment are packed in a separate double-wall corrugated cardboard carton.

Be careful when unpacking the shipping containers, the System 610 is a precision instrument and may be affected by bumping, dropping, or excessive contact.



### **WARNING:**

Be careful when unpacking the shipping containers. The Royce 610 is a precision instrument and may be damaged by bumping, grabbing, lifting, or pressing on the test head. **Do not lift the machine by the Z-Arm Sensor; damage will occur!**



Additional separate boxes contain the Royce 610 system accessories. As you unpack the boxes, check the items against the packing list shipped with your system to ensure all parts were received. If any items are missing, contact Royce Customer Service immediately at (507) 345-0166 or email: [customerservice@royceinstruments.com](mailto:customerservice@royceinstruments.com).

## 2.2 SAFETY INFORMATION

The information in this document is subject to change in order to improve reliability, design, or function without prior notice and does not represent a commitment on the part of this company.

1. **Read Instructions** - All the safety and operating instructions must be read before the machine is operated.
2. **Follow Instructions** - All operating and user instructions must be followed.
3. **Heat** - The machine should be situated away from heat sources such as radiators, heat registers, ovens, or other machinery that produce heat.
4. **Power-Cord Protection** - Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
5. **Object and Liquid Entry** - Care must be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
6. **Do not use the machine near water, or when you are wet** - If the machine comes in contact with any liquids, unplug the power and line cords immediately. Do not plug the machine back in until it has been dried thoroughly.
7. **Damage Requiring Service** - The machine must be serviced by qualified service personnel when:
  - The power supply cord or the plug has been damaged; or
  - Objects have fallen or liquid has been spilled into the machine ; or
  - The machine has been exposed to rain; or
  - The machine does not appear to operate normally or exhibits a marked change in the performance; or
  - The machine has been dropped, or the enclosure is damaged.
8. **Servicing** - The user should not attempt to service the machine beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel. Opening the machine or reassembling it incorrectly may expose you to dangerous voltages or other risks.
9. **Install this machine securely on a stable surface** - Serious damage may result if the machine falls.
10. **During thunderstorms, avoid using machines connected to a phone line** - There may be a slight chance of electric shock from lightning.

11. **Do not use machine in the vicinity of a gas leak** - If you suspect a gas leak, report it immediately, but use a telephone away from the area where gas is leaking.
12. **Use only the correct power source as marked on the machine** - If you are not sure of the power supply; consult your local power company. If the machine uses a wall plug-in transformer, use only the transformer supplied.
13. **Your wall outlet must only accept a polarized, three-prong grounded-plug** - Such plugs are designed for your safety. Do not attempt to defeat this purpose. If you cannot insert the plug easily, your outlet should be replaced by an electrician.



**COVER PANELS:**

No user-serviceable parts are included within this enclosure. All service-related issues must be referred to qualified service personnel.



**MOVING OR LIFTING THE SYSTEM 610:**

The System 610 mainframe weighs 20.4 kg (45 lb.). The use of a helper is necessary when moving or lifting the system mainframe.



## 2.3 INSTALLING THE SYSTEM

Place the system on a flat, level, stable surface that positions the system at a comfortable height for the operator. Connect the power cord from the rear panel to a properly grounded power supply outlet.

### Rear Panel Connections



### 2.3.1 Supplies

**ELECTRICAL** 110-120VAC, 2A, 50-60 Hz, single phase

**FUSE** . 2A F

**NON- ACCESSABLE FUSES** (P/S within enclosure)

GPC40-A 2A F

GPC41-24 2A F

### 2.3.2 Environmental Requirements

The System 610 is intended to be installed in a facility meeting the following environmental requirements unless otherwise specified in a particular section.

- i. Indoor use
- ii. Altitude up to 2000 meters
- iii. 60 to 80 degrees Fahrenheit
- iv. Relative humidity of 10 to 90 percent, non-saturating.
- v. Main supply voltage fluctuations not to exceed  $\pm 10\%$  of nominal voltage.
- vi. Transient over-voltages according to installation categories:  
Overvoltage Categories II
- vii. Pollution Degree 2
- viii. Positioning: The System must be placed on a leveled surface (fluid level (sensitivity .035 in/ft) included).

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

### **2.3.3 Microscope**

Insert the microscope mount arm into the end of the microscope rod that extends from the front panel, and clamp firmly in place with the provided set screw. Install the microscope into the mount arm. The microscope can be used at any angle between 60 degrees and 36 degrees to the horizontal.

### **2.3.4 Z Arm**

Remove the (4) Phillips Screws which attach the metal Tip Guard to the Z Arm Sensor Cover. Carefully pull the Tip Guard down and away from the Z Arm, avoiding contact with the tip. Replace the screws in the Z Arm Sensor Cover. Store the Tip Guard with the crate for future shipping.

### **2.3.5 Sample Holder**

Place the sample holder (or manipulator/test piece holder combination) on the base plate. After inserting a sample, slide the sample holder into testing position by hand. The weight of the sample holder is enough to secure it to the base plate during testing.

### **2.3.6 Pull Hooks**

Carefully open the pull hook shipping tube by twisting the cap while pulling the cap and tube apart gently. Pull hooks are fragile and can easily be damaged by contact, handle the hook by the aluminum body ONLY. Loosen the set screw and remove the hook from the cap. Carefully slide the hook onto the pull rod and tighten the set screw.

### **2.3.7 Mouse**

Attach the mouse cable to the connector labeled "MOUSE" on the back panel. Place the mouse on a mouse pad. Keep the mouse pad clean to ensure proper functioning of the mouse.

### **2.3.8 Options**

Attach the optional keypad to the connector labeled "KEYPAD" on the back panel. The optional printer is attached to the connector labeled "PRINTER" on the back panel.

### **2.3.9 Initial Calibration**

Acclimatize the system to the installation environment by checking the system calibration and calibrating the system if necessary. Perform this procedure whenever the system is moved or the environmental conditions surrounding the system change.

## **2.4 USING THE CONTROLS**

The system is controlled by use of push buttons located on the front panel, a mouse, and an optional keypad.

### **2.4.1 Front Panel Control Buttons**

The front panel control buttons are located beneath the LCD display. Pressing a button will initiate an action by the system. Details of the actions initiated by each button are described below.

#### **2.4.1.1 The “NDT” Button**

Pressing the “NDT” button toggles the system between non-destruct and destruct testing mode. The current mode is indicated as “NDT” or “DES” in the lower left corner of the display.

#### **2.4.1.2 The “PRINT REPORT” Button**

Pressing the “PRINT REPORT” button sends report data to the printer port. If the printer is not connected or has not been switched ON the display shows:

<p style="text-align: center;"><b>PRINTER NOT ON OR NOT CONNECTED</b></p>
---

Switch the printer on and/or check the connection, then press “PRINT REPORT” again.

The printout format can be modified in the TEST SETUP menu.

#### **2.4.1.3 The “CLEAR DATA” Button**

Pressing the “CLEAR DATA” button deletes ALL test data from system memory. The system will prompt the operator for confirmation before deleting data.

#### **2.4.1.4 The “MENU” Button**

Pressing the “MENU” button toggles the display between the test screen and the main menu screen. It also returns the display to the main menu from any sub-menu.

## **2.4.2 Mouse**

A three-button mouse is used to control test functions, pull hook placement, menu functions, and limited fail code entry. Please refer to section 4.2.3 for information on fail code entry with the mouse.

Do NOT attempt to use any mouse except the factory supplied mouse. If replacement ever becomes necessary, please contact Royce Instruments.

### **2.4.2.1 Test Functions and Pull Hook Placement**

Test functions and hook placement are controlled by the mouse when the test screen is displayed on the LCD.

#### **Test Functions:**

Press the center mouse button to start a test. The system will complete the test. During a test, press any mouse button to end the test before completion.

#### **Pull Hook Placement:**

Vertical hook movement is controlled by user programmable mouse buttons. Press the left button to move the hook in one direction and the right button to move the hook in the other direction. Direction of each button is programmable in the TEST SETUP menu. Pressing the center button in addition to either the left or right button increases the movement speed. The slow movement controlled by the left and right buttons can be adjusted. The fast movement is set at 500 mils per second and cannot be adjusted.

Rotation of the pull hook is controlled by moving the mouse to the left or right. The sensitivity of hook movement to mouse movement can be adjusted in the TEST SETUP menu.

### **2.4.2.2 Menu Functions**

Menu functions are controlled by the mouse when the main menu or any of the sub-menus are displayed on the LCD.

#### **Viewing the menus**

To move through the menus, press the left or right button to scroll upward or downward. Direction of each button is programmable in the TEST SETUP menu. The longer a mouse button is held down, the faster the menu items scroll.

#### **Selecting a Menu Item**

1. Press the center button to select an item.

If the menu item provides more than 2 settings; press the left or right button to increment or decrement the value of the setting. Direction of each button is programmable in the TEST SETUP menu.

To accept the setting and exit to the menu, press the center button.

For menu items with alphanumeric data entry requirements, please refer to the keypad section for further instructions.

### **2.4.3 Keypad**

Alphanumeric data entry is accomplished through the use of an optional keypad. Within the sub-menus, the keys are used to enter and edit failure code and operator identification text. Immediately following each test, the keys can be used to enter failure codes or to void test results.

#### **2.4.3.1 Test Screen Keypad Functions**

Immediately following a test, the test may be assigned a failure code or the test results may be voided.

To assign a failure code to a test; press the number key (0 - 9) that corresponds to the observed failure. (The failure code text that is assigned to each code number may be edited with the keypad in the TEST SETUP menu.) To void a test press the star key (\*). Voided tests are removed from all statistical analysis.

#### **2.4.3.2 Sub-menu Keypad Functions**

Several sub-menu selections allow alphanumeric data entry through the use of the keypad. The keypad includes an overlay that illustrates the characters that may be entered with each key. When a key is pressed, it will display a character at the cursor location. To display an alternate character from the overlay, press the key again. Repeating this procedure will cycle the display through all characters that are available for that key. Pressing the number sign key (#) accepts a character entry and moves the cursor to the right. Pressing the star key (\*) accepts a character entry and moves the cursor to the left. Pressing the center mouse button will accept the entire selection and return the user to the sub-menu.



**3. SETTING UP THE SYSTEM**

**3.1 HOLDING THE SAMPLE 24**

**3.2 INSTALLING THE TEST HOOK 24**

**3.3 USING THE “TEST SETUP” MENU 24**

### **3.1 HOLDING THE SAMPLE**

In order to ensure accurate test results, determine the optimal sample holder, secure the sample in the holder, and position the sample holder on the base plate in an appropriate position for testing. Generally, choices should be made with test accuracy as the first criteria.

### **3.2 INSTALLING THE TEST HOOK**

Place the hook on the shaft extending from the bottom of the test head, then tighten the set screw on the hook body. Be careful when installing the test hook, the test head is sensitive and can be damaged by excessive contact.

Wire diameter is the main factor that influences hook choice, however wire spacing may also need to be considered. Generally, the diameter of the hook should be 2 times the diameter of the wire being tested.

### **3.3 USING THE “TEST SETUP” MENU**

The Test Setup menu contains a number of high level options which govern the operation of the system. Test parameters, printer output, time, date, operator identification, and sample identification settings are entered from this menu. Test Setup settings are stored in non-volatile memory and remain in effect until edited by an operator. A description of all Test Setup menu choices follows.

#### **NDT LIMIT**

This selection allows the operator to set the force limit for non-destruct testing. To set the limit, use the left and right mouse buttons to increase or decrease the limit value, then press the center mouse button to accept the value.

#### **PRINTER**

This selection allows the operator to switch the printer ON or OFF. When ON, the printer will print each test as it is completed. When OFF, test results appear only on the test screen, and only until the next test is run.

#### **NAME:**

This selection allows the operator to enter or select an operator identification name. Use the left and right mouse buttons to scroll through the default operator ID numbers, use the center mouse button to select a number of your choice. If the keypad is installed, the default ID designations may be edited. When the selection is completed, press the center mouse button to set selection.



## **PART**

This selection allows the operator to enter or select a part identification designation. Use the left and right mouse buttons to scroll through the default part ID numbers, use the center mouse button to select a number of your choice. If the keypad is installed, the default part ID designations may be edited. When the selection is completed, press the center mouse button to set selection.

## **GROUP NUMBER**

This selection allows the operator to enter a group identification number for the current sample group. Use the keypad to enter a group number designation.

## **LOWER HT**

This selection allows the operator to set the lower limit for test hook travel. To set the lower height, use the left or right mouse buttons to position the hook at the desired lower height position, then press the center button to accept the value.

## **SEARCH HT**

This selection allows the operator to set the test hook search height. To set the search height, use the mouse buttons to position the hook at the desired search height position, then press the center mouse button to accept the value.

## **RETURN TO**

This selection allows the operator to choose the height to which the hook returns upon completion of a test. The choices are "START HT" or "SEARCH HT".

## **ALARM**

This selection allows the operator to set an alarm based on the time of day. The alarm time is displayed as a 24 hour value and can be set to any time from 00:00 to 23:59. An audible "double beep" sounds at the alarm time.

## **SPEED**

This selection allows the operator to set the Z axis speed of the test hook as controlled by the system during testing. The speed can be adjusted from a minimum of 4 mils per second to a maximum of 240 mils per second with a default value of 100 mils per second. The default setting is edited by pressing the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

**NDT HOLD**

This selection allows the operator to enter a hold time for the non-destruct test pull. The default setting is edited by pressing the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

**SEMI AUTO**

This selection allows the operator to toggle the semi-automatic testing mode on or off. Press the center mouse button to toggle the setting.

**MUST FAIL CODE**

This selection allows the operator to set the system to prompt for a fail code and wait until the code is entered before resuming test mode. Press the center mouse button to toggle the setting.

**TEST STOPS AT**

This selection allows the operator to set the percentage of maximum test force below which the test is concluded. The default setting is edited by pressing the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

**HOOK Z SPEED**

This selection allows the operator to set the Z axis speed of the test hook as controlled by the left and right mouse buttons. The speed can be adjusted from a minimum of 1 (50 mils per second) to a maximum of 10 (500 mils per second) with a default value of 5 (250 mils per second). The default setting is edited by pressing the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

**HOOK  $\theta$  SPEED**

This selection allows the operator to set the rotational speed of the test hook as controlled by positional movement of the mouse. The default setting is edited by pressing the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

**CODE 1:**

This selection allows the operator use the keypad to edit the description of fail code #1.

**CODE 2:**

This selection allows the operator use the keypad to edit the description of fail code #2.

**CODE 3:**

This selection allows the operator use the keypad to edit the description of fail code #3.

**CODE 4:**

This selection allows the operator use the keypad to edit the description of fail code #4.

**CODE 5:**

This selection allows the operator use the keypad to edit the description of fail code #5.

**CODE 6:**

This selection allows the operator use the keypad to edit the description of fail code #6.

**CODE 7:**

This selection allows the operator use the keypad to edit the description of fail code #7.

**CODE 8:**

This selection allows the operator use the keypad to edit the description of fail code #8.

**CODE 9:**

This selection allows the operator use the keypad to edit the description of fail code #9.

**FORMAT**

This selection allows the operator to select the desired date format from the following options: MM/DD/YYYY, DD/MM/YYYY, or YYYY/MM/DD.

**DATE**

This selection allows the operator to set the system date, month, and year. The left and right mouse buttons change each digit. The center button sets the value and advances the cursor.

**TIME**

This selection allows the operator to enter the current time. The time is displayed in 24 hour format and can be set to any time from 00:00:00 to 23:59:59. The left and right mouse buttons change each digit. The center button sets the value and advances the cursor.

**PARK TIME**

This selection allows the operator to set the number of minutes that the system may remain idle before it returns to the reset position.

**COLLISION**

This selection allows the operator to select the force at which the test head stops moving after the hook makes contact.

**UNIT**

This selection allows test results and statistics to be displayed and printed in inches or millimeters. Press the center mouse button to toggle the setting.

**RS232 EA TEST**

This selection allows the operator to select whether or not each test will be sent to the RS232 port. Press the center mouse button to toggle the setting.

**PRINT HEADER**

This selection allows the operator to select whether or not the printout will include a header section. Press the center mouse button to toggle the setting.

**PRINT SUMMARY**

This selection allows the operator to select whether or not the printout will include a summary section. Press the center mouse button to toggle the setting.

**PRINT CODES**

This selection allows the operator to select whether or not the printout will include a section that groups test results by failure code. Press the center mouse button to toggle the setting.

**PRINT DATA**

This selection allows the operator to select whether or not the printout will include a test data section. Press the center mouse button to toggle the setting.

**PRINT STYLE**

A choice of two printout styles is available. Style "A" is brief, style "B" includes more in-depth data analysis. Press the center mouse button to toggle the setting.

**PRINT SPACING**

Printouts can be single or double spaced. Press the center mouse button to toggle the setting.

**UP: RIGHT DOWN: LEFT**

This selection allows the operator to define the test head positioning and menu scrolling functions of the left and right mouse buttons. Press the center mouse button to toggle the setting.

**MOUSE SCROLL**

This selection allows the operator to toggle the ability to scroll the menus by front/back movement of the mouse. Press the center mouse button to toggle the setting.



**4. OPERATING THE SYSTEM**

**4.1 READING THE DISPLAY 32**

**4.2 RUNNING TESTS 32**

**4.3 STOPPING A TEST 34**

#### 4.1 READING THE DISPLAY

An example of information provided by the LCD is shown below:

<b>3</b>	<b>0.0gf</b>
<b>13</b>	
<b>NDT78.0g AUT</b>	<b>PULLING</b>

The display provides information concerning the most recently completed test, or if a test is running, the current test.

The test number, the pull force (in grams), and the fail code number are shown across the top row of the display.

Destruct or non-destruct test mode is indicated in the lower left corner of the display (“DESTRUCT” or “NDT”). When the system is set to non-destruct mode, the user set NDT limit value is displayed next to “NDT”.

Manual or semi-automatic test mode is indicated in the lower middle of the display (“AUT” or “MAN”).

Test status is indicated in the lower right corner of the display (“READY” or “PULLING”). “READY” indicates that the system is ready to begin a test and “PULLING” indicates that a test is in progress.

#### 4.2 Running tests

The System 610 is capable of manual or semi-automatic pull testing.

##### 4.2.1 Manual Testing

After completion of setup procedures, testing may begin. Position the test hook and press the center mouse button to begin a test.

##### 4.2.2 Semi-Automatic Testing

The System 610 semi-automatic testing mode automates some steps of the testing procedure. Semi-automatic test mode enables the user to set up a test hook position (z axis and  $\theta$ ) that the system will “remember” and repeat. Once the semi auto setup is completed, the operator needs only to position the sample and start the test.



### **4.2.2.1 Semi Auto Setup Procedure**

- 4.2.2.1.1 Install the sample in the sample holder.
- 4.2.2.1.2 Position the sample holder on the base plate.
- 4.2.2.1.3 Adjust the sample holder position so that the pull hook is on the right side of wire to be tested.
- 4.2.2.1.4 Position the hook foot parallel to the sample wire with the foot pointing toward the operator.
- 4.2.2.1.5 Enter the "TEST SETUP" menu
- 4.2.2.1.6 Choose the "LOWER HEIGHT" item
- 4.2.2.1.7 Move the hook down until the foot is sufficiently below wire level to allow the hook to rotate 90° and not collide with the wire.
- 4.2.2.1.8 Press the center mouse button to set lower height.
- 4.2.2.1.9 Select "SEMI AUTO" in the "TEST SETUP" menu.

### **4.2.3 Failure Codes**

The System 610 provides the ability to assign failure codes to each test. Codes 1 thru 9 can be assigned by the operator after inspection of the failure. Codes 10 thru 13 are automatically assigned by the system.

Failure codes are assigned to a test with the optional keypad or the mouse. To assign a fail code with the keypad, press the numeric key that corresponds to the failure. The keypad is also required to edit the text that is assigned to fail codes 1 thru 9 or to void a completed test. The mouse can be used to enter five failure codes (1 thru 5). The left button selects code 1, the center button selects code 2, and the right button selects code 3, moving the mouse to the left selects code 4, and moving the mouse to the right selects code 5.

## List of Failure Codes and Text

CODE 1: NECK BREAK  
CODE 2: SPAN BREAK  
CODE 3: DIE INT BRK  
CODE 4: SUB INT BRK  
CODE 5: DIE MT LIFT  
CODE 6: SUB MT LIFT  
CODE 7: DIE FRACT  
CODE 8: SUB FRACT  
CODE 9: FAIL TEXT 9  
CODE 10: OPERATOR VOID  
CODE 11: TEST CANCELLED  
CODE 12: OVERTRAVEL  
CODE 13: NO CODE ASSIGNED

### 4.3 STOPPING A TEST

At any time during a test, the test may be stopped by the operator. Press the center mouse button to stop a test before completion. Aborted tests results are stored but are not used when the system calculates statistics.

**5. READING TEST RESULTS**

**5.1 READING LCD DATA 36**

**5.2 USING THE “STATISTICS” MENU 37**

**5.3 PRINTING TEST DATA 39**

**5.4 RS232 DATA OUTPUT 41**

## 5.1 READING LCD DATA

An example of information provided by the LCD is shown below:

<b>3</b>	<b>0.0gf</b>
<b>13</b>	
<b>NDT78.0g AUT</b>	<b>PULLING</b>

The display provides information concerning the most recently completed test, or if a test is running, the current test.

The test number, the pull force (in grams), and the fail code number are shown across the top row of the display.

Destruct or non-destruct test mode is indicated in the lower left corner of the display (“DESTRUCT” or “NDT”). When the system is set to non-destruct mode, the NDT limit value is displayed next to “NDT”.

Manual or semi-automatic test mode is indicated in the lower middle of the display (“AUT” or “MAN”).

Test status is indicated in the lower right corner of the display (“READY” or “PULLING”).

## 5.2 USING THE “STATISTICS” Menu

The “STATISTICS” menu contains statistical data and options that govern analysis of valid destruct test results. Upper and Lower spec limits may be entered and statistics may be viewed within this menu. A description of all “STATISTICS” menu choices follows.

### **MIN**

This selection displays the minimum failure force of all tests in the current group.

### **MAX**

This selection displays the maximum failure force of all tests in the current group.

### **$\bar{X}$ , MEAN**

This selection displays the mean failure force of all tests in the current group.

### **RANGE**

This selection displays the failure force range of all tests in the current group.

### **$\sigma$ , STD DEV**

This selection displays the standard deviation of all tests in the current group.

### **Cpk**

This selection displays the group Cpk value.

### **Cpl**

This selection displays the group Cpl value.

### **Cpu**

This selection displays the group Cpu value.

### **UPPER SPEC**

This selection allows the operator to enter the upper specification limit for test statistics. Press the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

**LOWER SPEC**

This selection allows the operator to enter the lower specification limit for test statistics. Press the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

 **$\bar{X} - 3 * \sigma$** 

This selection displays the value of the equation MEAN - 3 \* Standard Deviation for the current group.

**PRINT REPORT**

This selection allows the operator to print a report by pressing the center mouse button.

**REPORT TO RS232**

This selection allows the operator to send a report to the RS232 port by pressing the center mouse button.

**DATA ONLY TO RS232**

This selection allows the operator to send the test data to the RS232 port by pressing the center mouse button.

### **5.3 PRINTING TEST DATA**

An optional thermal printer may be connected to the system to provide printing capability.

#### **5.3.1 Printing Each Test**

Tests can be printed out as they are completed by selecting “PRINTER” from the TEST SETUP menu, then set printer to “ON”.

#### **5.3.2 Printing a Report**

A statistical report can be printed by pressing the “PRINT REPORT” button on the front panel of the system.

#### **5.3.3 Printing from the “STATISTICS” menu**

The “PRINT REPORT” selection allows the operator to print a report by pressing the center mouse button.

## Printout Example

```
-----  
° ROYCE INSTRUMENTS °  
° SYSTEM 610 WIRE-PULL TESTER °  
-----  
° WIRE PULL TEST MIL-STD-883D 2011. ___ °  
° WIRE PULL TEST MIL-STD-883D 2023. ___ °  
° SOFTWARE VERSION: 1.14 °  
°  
° DATE: 11-05-1998 TIME: 17:12:33 °  
° OPERATOR NAME : A. EINSTEIN °  
° PART NUMBER : DS1232 °  
° TEST SPEED: 0.100 in/s °  
° NDT LIMIT: 100.0 gf °  
° NDT HOLD TIME: 0.0 sec °  
° USER-SET LOWER SPEC LIMIT: 0.0 gf °  
° USER-SET UPPER SPEC LIMIT: 100.0 gf °  
-----  
° SYSTEM 610 DATA ANALYSIS °  
° °  
° °  
° DATE: 11-05-1998 TIME: 17:12:33 °  
° °  
° 0.304 Cpk °  
° 0.304 Cpl °  
° 0.428 Cpu °  
° 0.0 gf LOWER SPEC °  
° 100.0 gf UPPER SPEC °  
° 41.55 gf MEAN LOAD °  
° 45.95 gf STD DEV n-1 °  
° -94.92 gf MEAN - 3 * STD DEV °  
° 97.60 gf MAX LOAD °  
° 95.10 gf MIN LOAD °  
° 2.50 gf RANGE °  
° 22 DESTRUCT TESTS °  
° 0 TESTS > 100.0 gf °  
° 0 TESTS < 0.1 gf °  
° 22 WITHIN SPECS °  
° °  
° °  
° Test# Code Failure mode Force(gf) °  
-----  
° 1 13 ??? 95.10 °  
° 2 13 ??? 96.30 °  
° 3 13 ??? 97.60 °  
° 4 13 ??? 96.90 °  
-----
```

### HEADER SECTION

### SUMMARY SECTION

### DATA SECTION



## 5.4 RS232 DATA OUTPUT

Selections in the "STATISTICS" menu allow test data or a report to be sent to the RS232 port. A selection in the "TEST SETUP" menu allows each test result to be sent to the RS232 port as it is completed. The RS232 report format will contain the same elements as the selected printout format.

The following describes the RS-232 output format from System 610.

Baud : 9600  
Bit : 7  
Parity : Even  
Stop : 1  
Flow : none

```
          1          2          3          4
1234567890123456789012345678901234567890
=====
nnnnn,  fff.f    ,"ssssssssssssssssss",  ccCL
```

nnnn accumulative test number  
fff.f test force result in grams  
sss..sss failure mode description (in quotes)  
cc failure mode code  
C carriage return, ASCII code 13  
L line feed, ASCII code 10



**6. CALIBRATION**

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<b>6.2 USING THE “SERVICE” MENU</b>	<b>44</b>
<b>6.3 CHECKING CALIBRATION</b>	<b>45</b>
<b>6.4 CALIBRATING THE SYSTEM</b>	<b>45</b>

## **6.1 OVERVIEW**

Test result accuracy is verified and maintained through system calibration. Check calibration and, if necessary, perform calibration procedures on a monthly basis. Calibration functions are accessed through the “SERVICE” menu.

## **6.2 USING THE “SERVICE” MENU**

The “SERVICE” menu contains calibration and lighting control options. A description of all “SERVICE” menu choices follows.

### **CALIBRATE**

This selection allows the operator to calibrate the system. Press the center mouse button and follow the procedure indicated on the LCD.

### **CHECK CALIBRATION**

This selection allows the operator to confirm the calibration status of the system. Press the center mouse button and hang a weight of known value on test hook. Compare the displayed value to the known weight to determine calibration accuracy.

### **TEST ANALOG**

This selection displays the analog sensor value.

### **LIGHT ON/OFF**

Press the center mouse button to toggle the test illumination light ON or OFF.

### **6.3 Checking Calibration**

Install a calibration hook to the test head.

Access the "SERVICE" menu.

Select "CHECK CALIBRATION".

Check displayed weight value. (0.0 gm = accurate calibration)

1. Carefully, hang a 100 gm weight from the hook.

Stabilize weight to eliminate any movement.

Check displayed weight value. (100.0 gm = accurate calibration)

2. Carefully, remove 100 gm weight and hang a 50 gm weight.

Check displayed weight value. (50.0 gm = accurate calibration)

If any of the displayed weight values differ significantly from the actual value of the hanging weight, calibration is required.

### **6.4 Calibrating THE SYSTEM**

Install a calibration hook to the test head.

Access the "SERVICE" menu.

Select "CALIBRATE".

1. Follow the directions on the display. (Hang and stabilize weight carefully, as in calibration checking procedure.)

Check calibration.

If the system displays any error messages during calibration or accurate calibration cannot be completed, please call the factory for assistance.



**7. MENU STRUCTURE**

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## **7.1 OVERVIEW**

This section provides functional details of the System 610 menu structure. Descriptions are provided for each menu and menu item. Directions concerning parameters or entries are detailed for each menu item.

To enter the Main Menu from the Test Screen, press the MENU key on right side of front panel or press and hold the center mouse button for 3 seconds.

Use the mouse to scroll through the sub-menu choices: "TEST SETUP", "STATISTICS", or "SERVICE". The left and right mouse buttons move the cursor up and down, and the center mouse button selects the item next to the cursor. Left and right mouse buttons are programmable.



## 7.2 THE “TEST SETUP” MENU

The Test Setup menu contains a number of high level options which govern the operation of the system. Test parameters, printer output, time, date, operator identification, and sample identification settings are entered from this menu. Test Setup settings are stored in non-volatile memory and remain in effect until edited by an operator. A description of all Test Setup menu choices follows.

### **NDT LIMIT**

This selection allows the operator to set the force limit for non-destruct testing. To set the limit, use the left and right mouse buttons to increase or decrease the limit value, then press the center mouse button to accept the value.

### **PRINTER**

This selection allows the operator to switch the printer ON or OFF. When selected ON, the printer will print each test as it is completed. When OFF, test results appear only on the test screen, and only until the next test is run.

### **NAME:**

This selection allows the operator to enter or select an operator identification name. Use the left and right mouse buttons to scroll through the default operator ID numbers, use the center mouse button to select a number of your choice. If the keypad is installed, the default ID designations may be edited. When the selection is completed, press the center mouse button to set selection.

### **PART:**

This selection allows the operator to enter or select a part identification designation. Use the left and right mouse buttons to scroll through the default part ID numbers, use the center mouse button to select a number of your choice. If the keypad is installed, the default part ID designations may be edited. When the selection is completed, press the center mouse button to set selection.

### **GROUP NUMBER**

This selection allows the operator to enter a group identification number for the current sample group. Use the keypad to enter a group number designation.

### **LOWER HT**

This selection allows the operator to set the lower limit for test hook travel. To set the lower height, use the left or right mouse buttons to position the hook at the desired lower height position, then press the center button to accept the value.

### **SEARCH HT**

This selection allows the operator to set the test hook search height. To set the search height, use the mouse buttons to position the hook at the desired search height position, then press the center mouse button to accept the value.

**RETURN TO**

This selection allows the operator to choose the height to which the hook returns upon completion of a test. The choices are “START HT” or “SEARCH HT”.

**ALARM**

This selection allows the operator to set an alarm based on the time of day. The alarm time is displayed as a 24 hour value and can be set to any time from 00:00 to 23:59. An audible “double beep” sounds at the alarm time.

**SPEED**

This selection allows the operator to set the Z axis speed of the test hook as controlled by the system during testing. The speed can be adjusted from a minimum of 4 mils per second to a maximum of 240 mils per second with a default value of 100 mils per second. The default setting is edited by pressing the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

**NDT HOLD**

This selection allows the operator to enter a hold time for the non-destruct test pull. The default setting is edited by pressing the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

**SEMI AUTO**

This selection allows the operator to toggle the semi-automatic testing mode on or off. Press the center mouse button to toggle the setting.

**MUST FAIL CODE**

This selection allows the operator to set the system to prompt for a fail code and wait until the code is entered before resuming test mode. Press the center mouse button to toggle the setting.

**TEST STOPS AT**

This selection allows the operator to set the percentage of maximum test force below which the test is concluded. The default setting is edited by pressing the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

**HOOK Z SPEED**

This selection allows the operator to set the Z axis speed of the test hook as controlled by the left and right mouse buttons. The speed can be adjusted from a minimum of 1 (50 mils per second) to a maximum of 10 (500 mils per second) with a default value of 5 (250 mils per second). The default setting is edited by pressing the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

## **HOOK $\theta$ SPEED**

This selection allows the operator to set the rotational speed of the test hook as controlled by positional movement of the mouse. The default setting is edited by pressing the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

### **CODE 1:**

This selection allows the operator use the keypad to edit the description of fail code #1.

### **CODE 2:**

This selection allows the operator use the keypad to edit the description of fail code #2.

### **CODE 3:**

This selection allows the operator use the keypad to edit the description of fail code #3.

### **CODE 4:**

This selection allows the operator use the keypad to edit the description of fail code #4.

### **CODE 5:**

This selection allows the operator use the keypad to edit the description of fail code #5.

### **CODE 6:**

This selection allows the operator use the keypad to edit the description of fail code #6.

### **CODE 7:**

This selection allows the operator use the keypad to edit the description of fail code #7.

### **CODE 8:**

This selection allows the operator use the keypad to edit the description of fail code #8.

### **CODE 9:**

This selection allows the operator use the keypad to edit the description of fail code #9.

## **FORMAT**

This selection allows the operator to select the desired date format from the following options: MM/DD/YYYY, DD/MM/YYYY, or YYYY/MM/DD.

**DATE**

This selection allows the operator to set the system date, month, and year. The left and right mouse buttons change each digit. The center button sets the value and advances the cursor.

**TIME**

This selection allows the operator to enter the current time. The time is displayed in 24 hour format and can be set to any time from 00:00:00 to 23:59:59. The left and right mouse buttons change each digit. The center button sets the value and advances the cursor.

**PARK TIME**

This selection allows the operator to set the number of minutes that the system may remain idle before it returns to the reset position.

**COLLISION**

This selection allows the operator to select the force at which the test head stops moving after the hook makes contact.

**UNIT**

This selection allows test results and statistics to be displayed and printed in inches or millimeters. Press the center mouse button to toggle the setting.

**RS232 EA TEST**

This selection allows the operator to select whether or not each test will be sent to the RS232 port. Press the center mouse button to toggle the setting.

**PRINT HEADER**

This selection allows the operator to select whether or not the printout will include a header section. Press the center mouse button to toggle the setting.

**PRINT SUMMARY**

This selection allows the operator to select whether or not the printout will include a summary section. Press the center mouse button to toggle the setting.

**PRINT CODES**

This selection allows the operator to select whether or not the printout will include a section that groups test results by failure code. Press the center mouse button to toggle the setting.

**PRINT DATA**

This selection allows the operator to select whether or not the printout will include a test data section. Press the center mouse button to toggle the setting.

**PRINT STYLE**

A choice of two printout styles is available. Style "A" is brief, style "B" includes more in-depth data analysis. Press the center mouse button to toggle the setting.

**PRINT SPACING**

Printouts can be single or double spaced. Press the center mouse button to toggle the setting.

**UP: RIGHT DOWN: LEFT**

This selection allows the operator to define the test head positioning and menu scrolling functions of the left and right mouse buttons. Press the center mouse button to toggle the setting.

**MOUSE SCROLL**

This selection allows the operator to toggle the ability to scroll the menus by front/back movement of the mouse. Press the center mouse button to toggle the setting.

### 7.3 THE “STATISTICS” Menu

The “STATISTICS” menu contains statistical data and options that govern analysis of valid destruct test results (NDT not included in statistics). User defined Upper and Lower spec limits are entered and statistics may be viewed on the LCD display within this menu. A description of all “STATISTICS” menu choices follows.

#### **MIN**

This selection displays the minimum failure force of all tests in the current group.

#### **MAX**

This selection displays the maximum failure force of all tests in the current group.

#### **$\bar{X}$ , MEAN**

This selection displays the mean failure force of all tests in the current group.

#### **RANGE**

This selection displays the failure force range of all tests in the current group.

#### **$\sigma$ , STD DEV**

This selection displays the standard deviation of all tests in the current group.

#### **Cpk**

This selection displays the group Cpk value.

#### **Cpl**

This selection displays the group Cpl value.

#### **Cpu**

This selection displays the group Cpu value.

#### **UPPER SPEC**

This selection allows the operator to enter the upper specification limit for test statistics. Press the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

#### **LOWER SPEC**

This selection allows the operator to enter the lower specification limit for test statistics. Press the left or right mouse buttons to increase or decrease the value, then press the center mouse button to accept the value.

#### **$\bar{X} - 3 * \sigma$**

This selection displays the value of the equation MEAN - 3 \* Standard Deviation for the current group.

**PRINT REPORT**

This selection allows the operator to print a report by pressing the center mouse button.

**REPORT TO RS232**

This selection allows the operator to send a report to the RS232 port by pressing the center mouse button.

**DATA ONLY TO RS232**

This selection allows the operator to send the test data to the RS232 port by pressing the center mouse button.

## **7.4 THE “SERVICE” MENU**

The “SERVICE” menu contains calibration and lighting control options. A description of all “SERVICE” menu choices follows.

### **CALIBRATE**

This selection allows the operator to calibrate the system. Press the center mouse button and follow the procedure indicated on the LCD.

### **CHECK CALIBRATION**

This selection allows the operator to confirm the calibration status of the system. Press the center mouse button and hang a weight of known value on test hook. Compare the displayed value to the known weight to determine calibration accuracy.

### **TEST ANALOG**

This selection displays the analog sensor value.

### **LIGHT ON/OFF**

Press the center mouse button to toggle the test illumination light ON or OFF.



## 8. **TECHNICAL SPECIFICATIONS**

Size	12 in. W, 16 in. H, 20 in. D
Weight	45 lbs.
Range	100gm
Accuracy	$\pm 0.25\%$
Resolution	0.1%
Repeatability	$\pm 0.25\%$
Z Motion Range	2.0 in. (50mm)
Machine Throat Depth	12.5 in. (317mm)
Maximum Lead frame	12 in. (305mm)

## **9. LIMITED WARRANTY**

Royce Instruments warrants its products to be free from defects in material and workmanship upon leaving its factory.

Royce Instruments will repair (or at its option, replace) at no charge any defective equipment for one (1) year from date of shipment.

To make request or claim for service under this Limited Warranty, the original purchaser must return the Royce Instruments product, shipping prepaid, in the original shipping container or equivalent, to Royce Instruments and assume the risk or loss or damage in transit. A written receipt for the product, showing the date of purchase, must accompany any request or claim for work to be performed under this Limited Warranty.

This warranty does not apply to equipment which:

- (1) has been repaired or altered by anyone in any way so as, in Royce Instruments' judgment, to injure its stability or reliability.
- (2) has been subject to misuse, negligence or accident.
- (3) has been connected, installed, or adjusted in a manner other than in accordance with Royce Instruments' written instructions.

Royce Instruments does not represent or warrant that the equipment supplied hereunder complies with any local laws or ordinances and Buyer will assume complete responsibility for compliance with local laws and ordinances and obtain all permits, licenses, authorizations or certificates required by any regulatory body for the installation or use of the equipment.

Royce Instruments is not liable for any consequential or special damage, or for personal injury resulting directly or indirectly from the design, material, workmanship operation or installation of any of its products and neither assumes or authorizes any other person to assume for it any other liability in connection therewith.

**THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, WHETHER STATUTORY, EXPRESS OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF FITNESS FOR USE AND MERCHANTABILITY, EXCEPT AS TO TITLE.**

**10. PROBLEM REPORT FORM**

To assist Royce Instruments' personnel in the diagnosis of any problems that may occur with your System 610, please use this form to document the problem.

System 610 serial number: \_\_\_\_\_

Software revision number: \_\_\_\_\_

Description of Symptom(s): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Sequence of Events leading to the Problem: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What happened after the problem? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



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## Manufacturer's calibration requirements

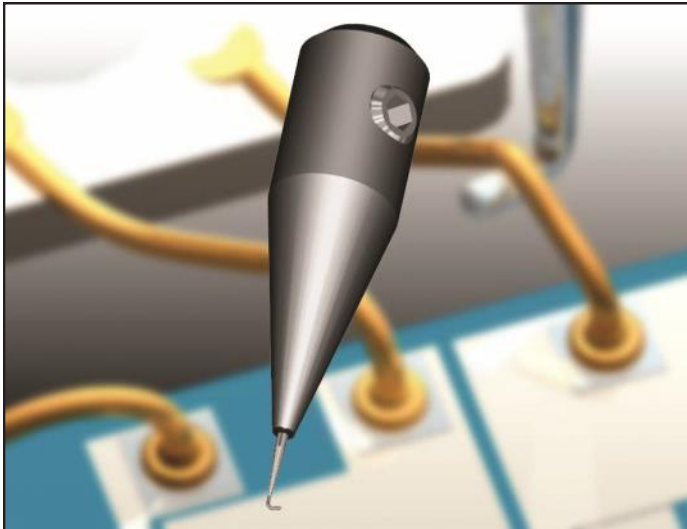
It is recommended that all Royce Instruments test systems and modules be calibrated **at a minimum of every six months.**

All calibration certificates being issued by Royce Instruments will have an expiration date of six months from the date of issue. Royce Instruments will not issue certificates that exceed the six month interval for calibration.

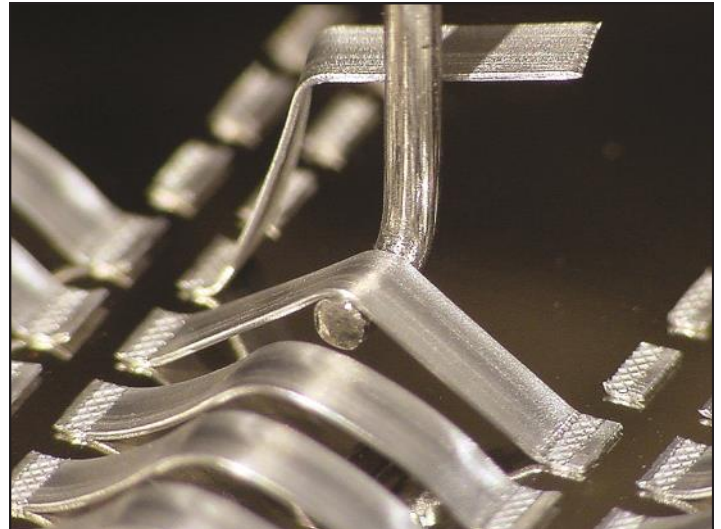
Customers who wish to have calibration intervals longer than the recommended 6 months, are required to provide their own calibration and certification services. These calibration services should meet manufacturer's specifications and procedures.

### Product Datasheet

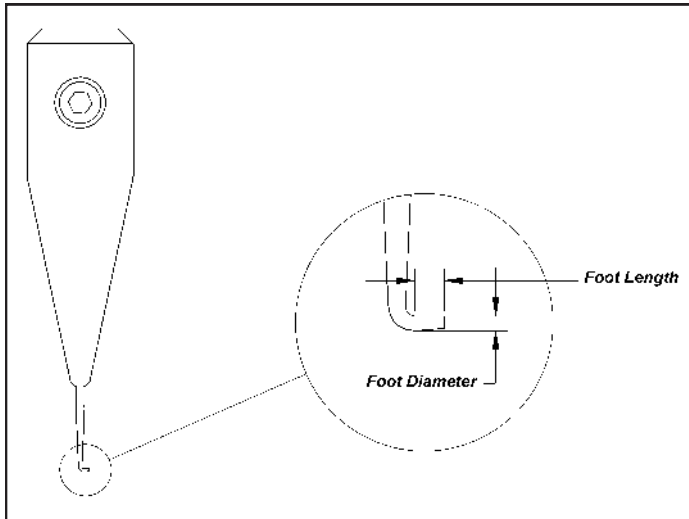
Royce Instruments pull test hooks are compatible with Royce Instruments System 550, 552, 580, 610, 620 and 650. The hook dimensions meet the requirements of MIL 883 Method 2011 and 2023. To permit ease of rotation, each hook is carefully adjusted so that it will rotate concentrically. Below are listed the standard hook dimensions. We can usually ship custom hooks to user specified dimensions within a few days.



High Precision wire pull test hooks are available in a wide range of standard and custom sizes.



Ribbon pull hook for testing high power ribbon bonds



Choose a foot diameter of at least twice the diameter of the wire to be tested

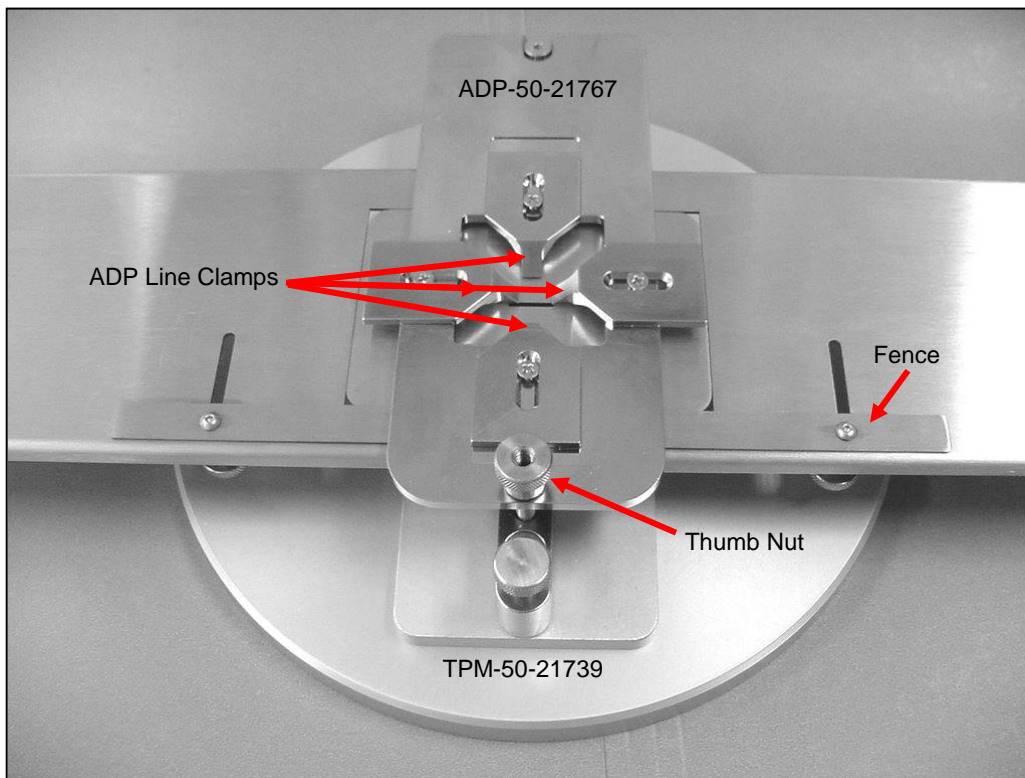
Part Number	Foot Diameter	Foot Length	Max force (g)
HT-001-04120	0.001 in, 25 $\mu$ m	0.005 in, 125 $\mu$ m	4
HT-002-04121	0.002 in, 50 $\mu$ m	0.005 in, 125 $\mu$ m	13
HT-003-04122	0.003 in, 75 $\mu$ m	0.006 in, 150 $\mu$ m	50
HT-004-04123	0.004 in, 100 $\mu$ m	0.008 in, 200 $\mu$ m	50
HT-005-04124	0.005 in, 125 $\mu$ m	0.010 in, 250 $\mu$ m	113
HT-006-04125	0.006 in, 150 $\mu$ m	0.012 in, 300 $\mu$ m	113
HT-010-04129	0.010 in, 255 $\mu$ m	0.020 in, 500 $\mu$ m	314
HT-015-04134	0.015 in, 380 $\mu$ m	0.030 in, 750 $\mu$ m	804
HT-020-04135	0.020 in, 505 $\mu$ m	0.030 in, 750 $\mu$ m	1257
HT-025-04136	0.025 in, 635 $\mu$ m	0.037 in, 940 $\mu$ m	2124
HT-032-04137	0.032 in, 810 $\mu$ m	0.048 in, 1200 $\mu$ m	3217
HT- <i>nnn-nnnn</i>	Customer Choice	Customer Choice	TBD



This procedure is applicable to wire pull testing up to 100 grams and shear testing up to 20 kilograms. The ADP-50-21767 and TPM-50-21739 are used in this procedure.

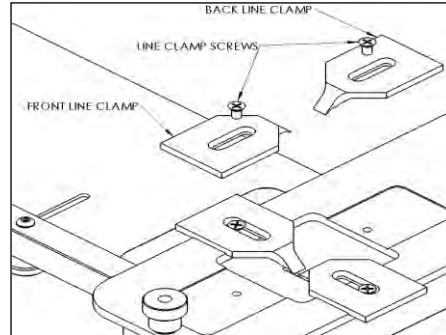
**CAUTION:** For shear forces higher than 1k gram, the shear stop tooling must be used.

**Note:** Use the Fence whenever possible during shear testing. The Line Clamps are sufficient to restrain the lead frame without using the Fence for up to 1 kg of shear force. However, tightening the Thumb Nut much beyond what is required for 1 kg of shear may damage the line clamps. It is not recommended to perform shear tests exceeding 1kg forces without using the shear stop tooling.



## Testing Without the Shear Stop

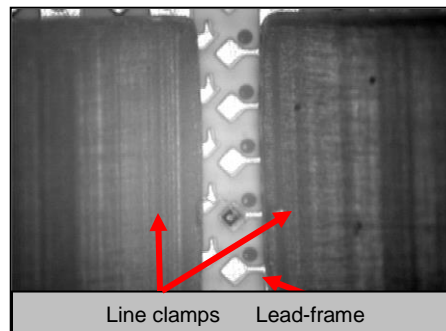
1. The Line Clamps on the ADP-50-21767 can be individually positioned by loosening the Line Clamp Screws. If spacing is a problem, the Front and Back Line Clamps can be removed.



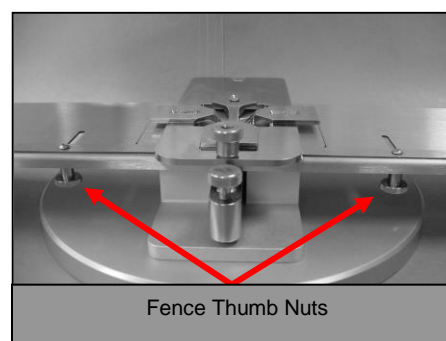
2. Turn the Thumb Nut counter-clockwise to raise the ADP enough to slide the lead frame under the Line Clamps.



3. Loosen the Line Clamp Screws. Adjust the Side Line Clamp spacing to suit the lead frame being tested. Tighten the Line Clamp Screws to secure the Line Clamps.



4. Adjust the Fence with the Fence Thumb Nuts. Position the lead frame so that the desired test site is between the jaws of Line Clamps.



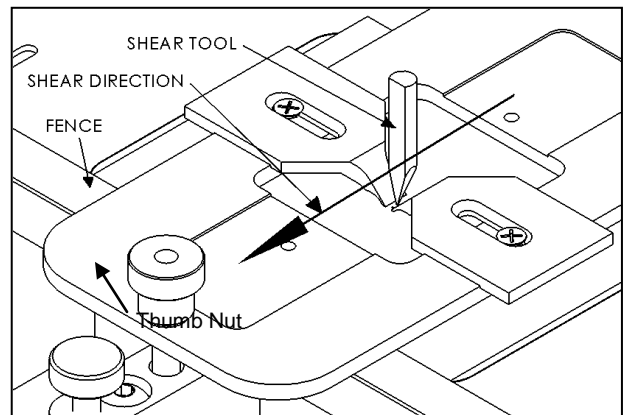
**Note:** It may be necessary to remove the Fence to reach some of the bond sites on the edges of the

lead frames. To remove the Fence, first remove the ADP by unscrewing the Thumb Nut. Then unscrew the Fence Thumb Nuts and remove the Fence. Put the ADP back in place.

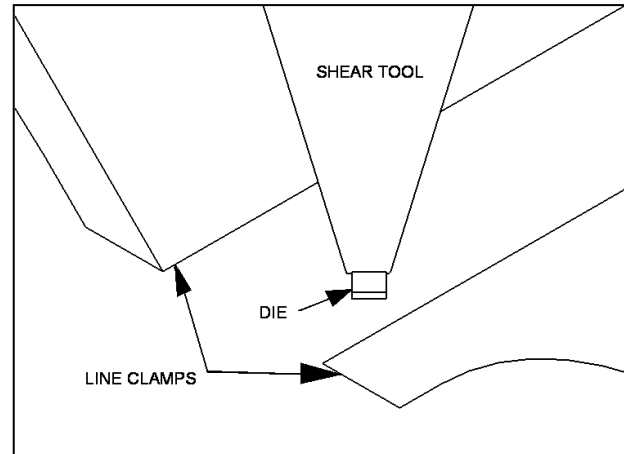
- Turn the Thumb Nut clock-wise to clamp the lead frame to the TPM.

**CAUTION:** Do not over tighten the Thumb Nut. Using excessive force will damage the Line Clamps.

- If performing shear tests, rotate the TPM so that the shear tool is shearing toward the Fence.



- The TPM may be turned up to 45° to align the Shear Tool with the die. The Line Clamp spacing may need to be adjusted to allow room for the Shear Tool.

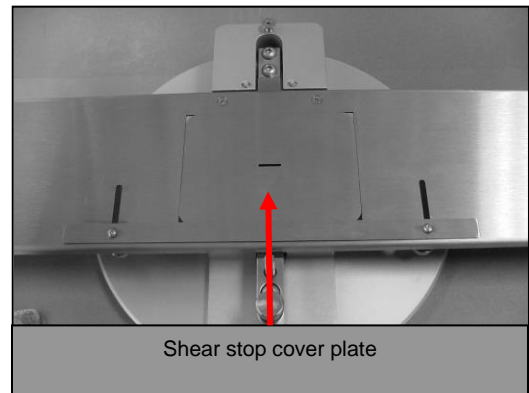
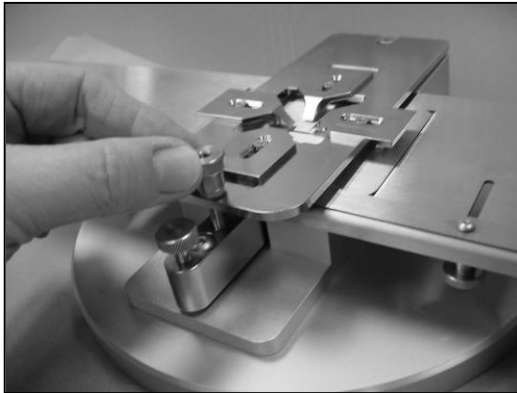


- Press the Lock Key to turn on the vacuum.
- Execute the test.
- Move the tool up to clear the TPM and the ADP.

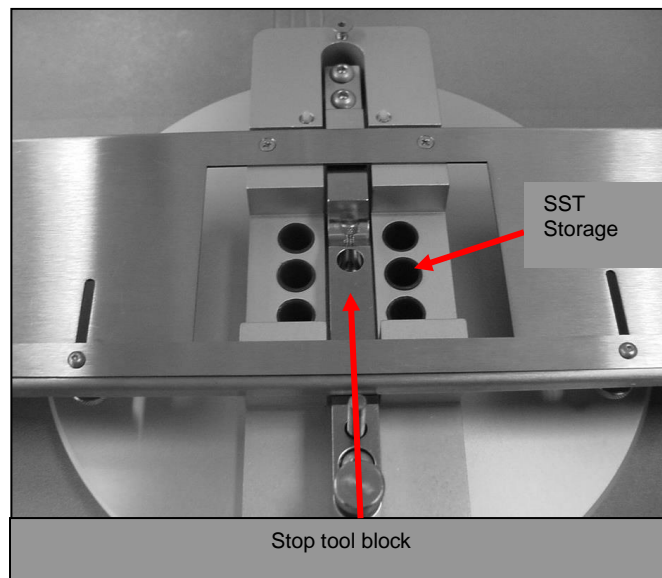
- Loosen the ADP by turning the Thumb Nut counter-clock-wise to reposition the lead frame.

## Using the Shear Stop

1. Remove the ADP by turning the Thumb Nut counter-clockwise. Take care not to lose the Teflon washer.

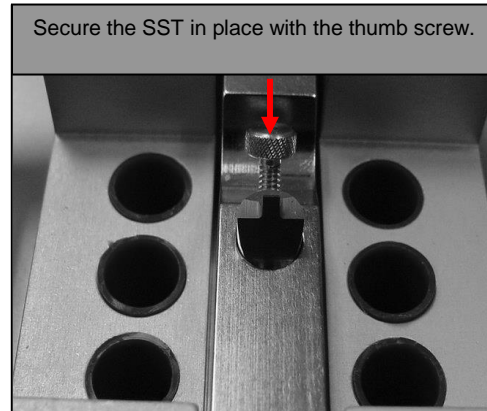
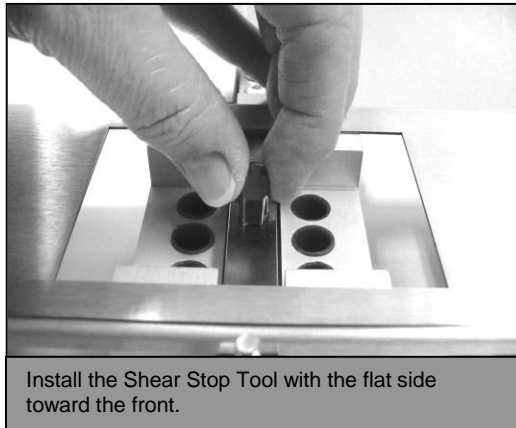


2. Remove the shear stop cover plate.

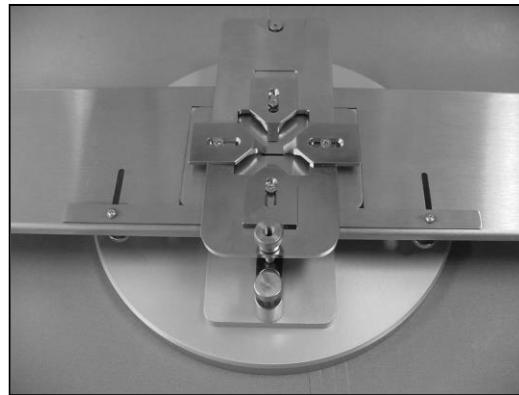
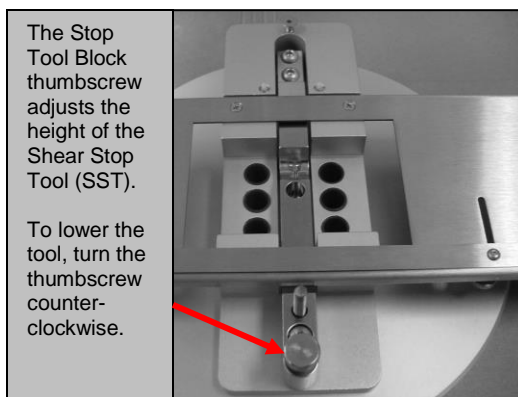


3. Insert the appropriate Shear Stop Tool (SST-XXXX) in the Stop Tool Block.

**Note:** The flat side of the tool goes towards the front.



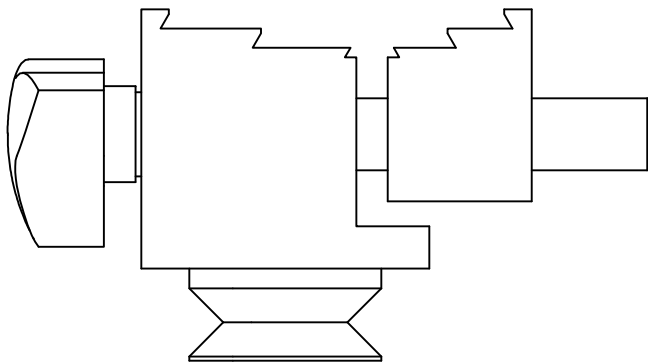
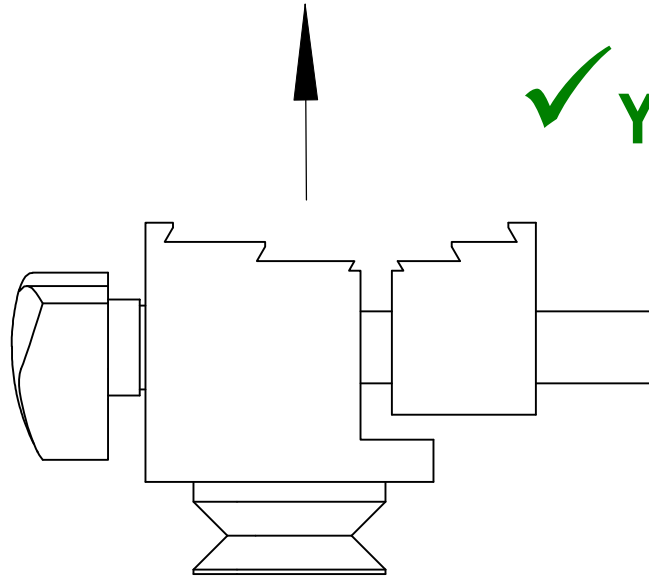
4. Secure the Shear Stop Tool (SST) in place with the thumb screw.
5. Lower the Shear Stop Tool (SST) using the Stop Tool Block thumbscrew prior to replacing the cover plate.



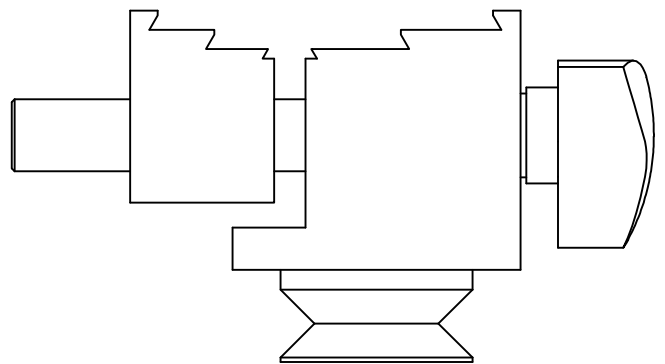
6. Carefully replace the shear stop cover plate.
7. Place the adapter back on top of the TPM-50-21739 and re-attach the nylon washer and Thumb Nut.
8. Install lead-frame and position the die to be tested up against the Shear Stop Tool.
9. Complete lead-frame and ADP Line Clamp alignment prior to testing.

# TP-55

✓ YES

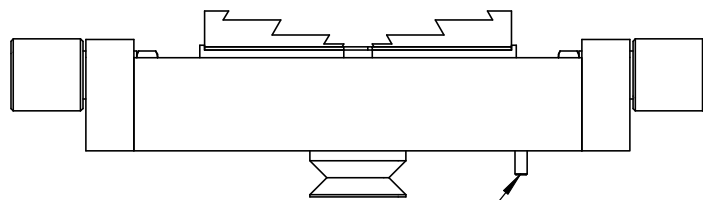
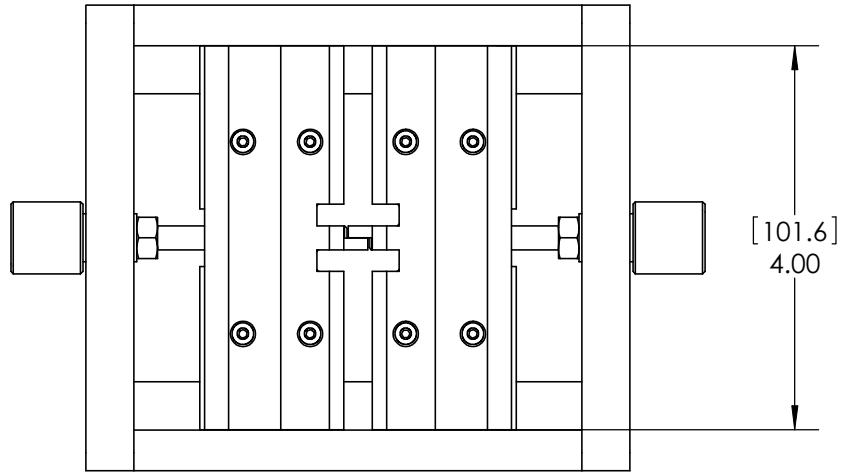


✓ YES

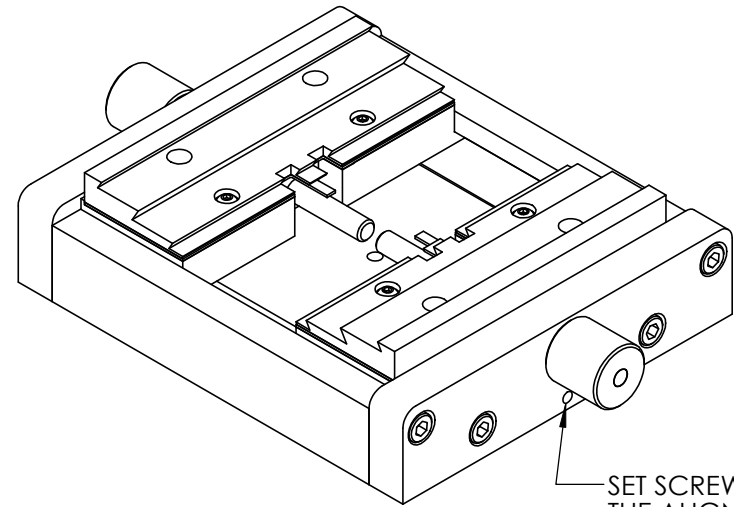


✗ NO

Do not shear against the moving jaws.



ALIGNMENT PIN



SET SCREW TO RETRACT THE ALIGNMENT PIN

TPS-200  
UNIVERSAL TEST PIECE MANIPULATOR  
200kg MAX TEST FORCE

CONFIDENTIAL -  
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DIMENSIONS IN  
INCHES AND  
[MILLIMETERS]

THIRD ANGLE  
PROJECTION:



DRAWN BY  
J. ROACH

DATE  
10/28/08

REV'D BY  
D. SCHOW

DATE  
06/13/14

TPS-200  
APPLICATION NOTE

SCALE	SHEET	OF	DWG. NO.	REV.
1:2	1	1	24393	1

# ROYCE

INSTRUMENTS



## System 610

### Bond Test Manager User's Guide

User's Guide 28133, Rev. 1

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# **Chapter 1:**

## **Bond Test Manager Software Overview**

# System Welcome Window

## Login

To protect your system against unauthorized modifications to test parameters, the Royce 610 requires users to enter a user name and password to access the operating software.

When shipped from Royce Instruments, Windows is set up to accept the following default user name and password. It is strongly recommended that your network administrator change this after installation.

### Windows Administrator Login:

User-name: ROYCE

Password: ROYCE

### Windows User Login

User-name: User

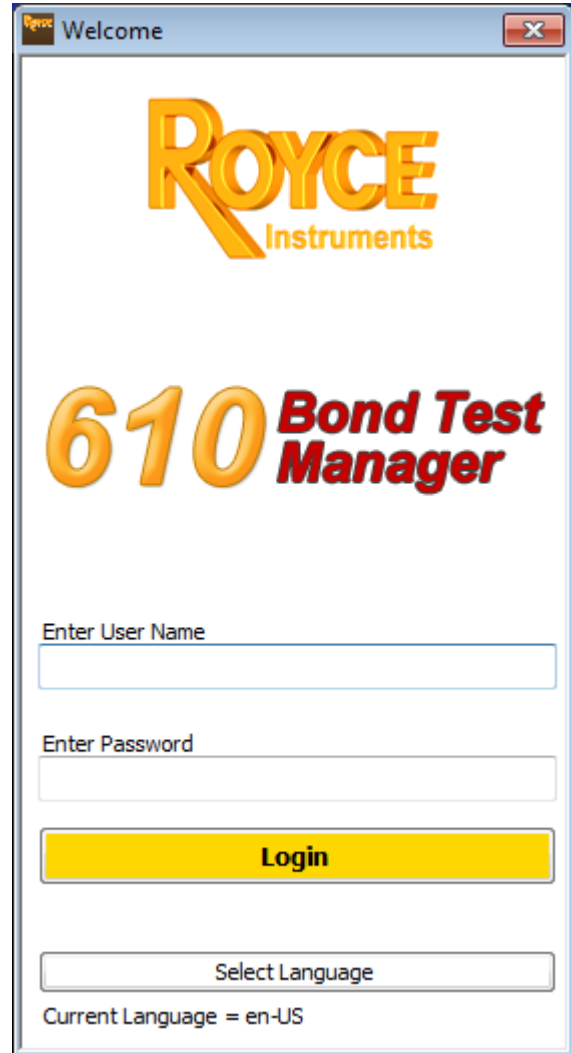
Password: User

A further login is required to use the Bond Test Manager program. The factory set default login will give the maximum level of access to all user parameters.

### Bond Test Manager Login

User-name: Administrator

Password: admin



ROYCE  
Instruments

**610 Bond Test  
Manager**

Enter User Name

Enter Password

**Login**

Select Language

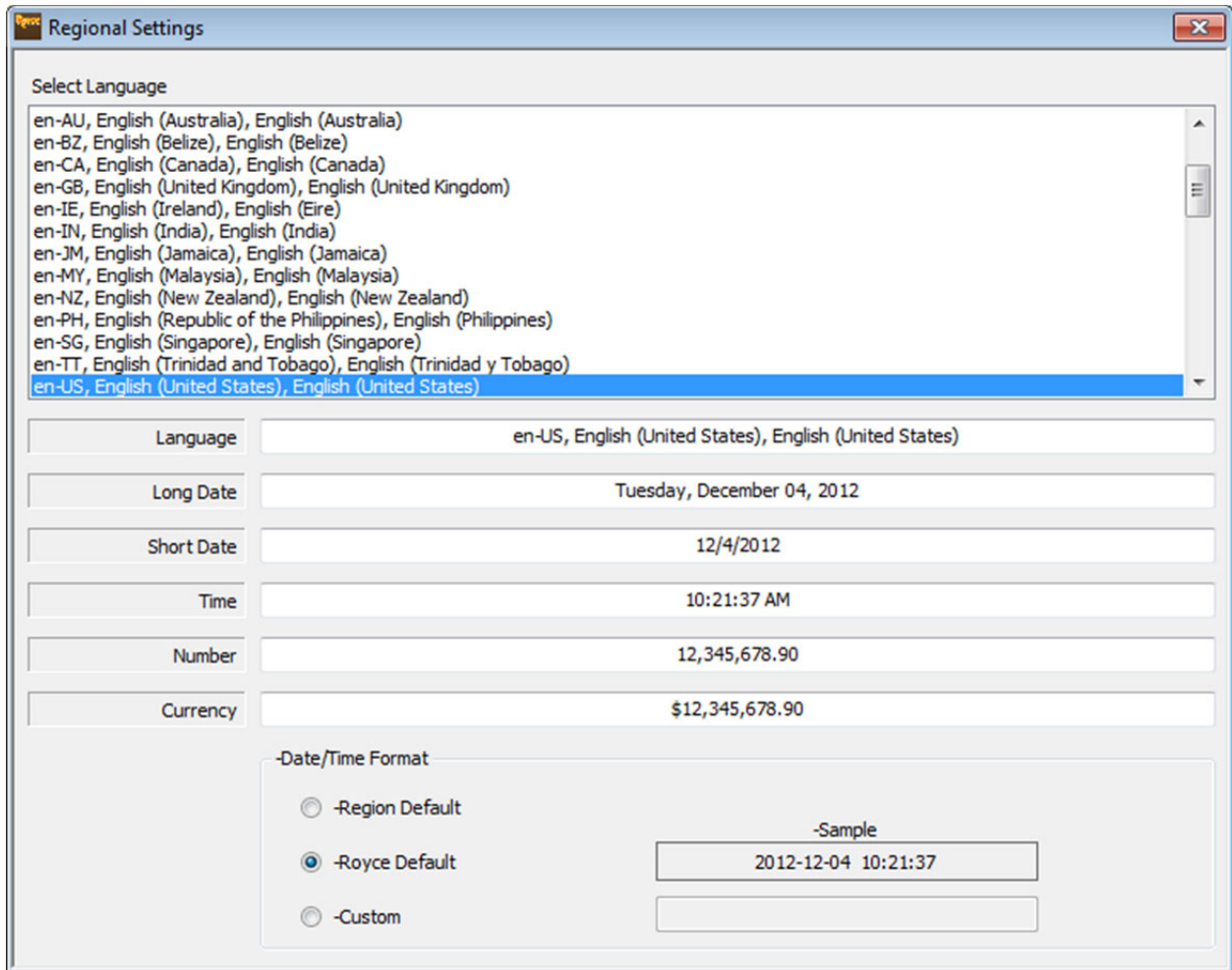
Current Language = en-US

**Note:** Please note that passwords are case sensitive, but user names are not case sensitive. Passwords and user names can be changed, see Page 18 for details.

## Select Language

The Royce System 610 BTM supports multiple languages: Chinese (simplified and traditional), English, French, German, Japanese, Korean, and Spanish. The default setting is English.

To change the language or date and time formats, in the *Preferences Menu* select **Regional Settings > Select Language**.



Several cultural choices are available for many languages. Select the desired culture of a particular language, the “mother” language will automatically also be selected.

# Main Screen

The screenshot shows the main interface of the Royce 610 BTM software. At the top, there is a menu bar with options: Test Setup, Reports/Charts, Preferences, Administrator, Help, and Switch Users. The main header displays the Royce Instruments logo and the text "EXPERIENCE · PRECISION · PERFORMANCE 610 Bond Test Manager".

On the right side, a status window displays "SYSTEM-610 SN 0" and a large weight reading of "19.9 gf" with a "100 gf" scale indicator. Below this are buttons for "Test Group", "Recipe Settings", and "Show Grade Code Reference".

The central area features a "Trend Chart (Samples)" showing a line graph with data points for samples 1 through 7. The y-axis ranges from 19.7 to 20.3. Control limits are shown as horizontal lines: USL at 20.2 gf and LSL at 19.8 gf. A callout box labeled "Trend Chart" points to the graph.

At the bottom left, a "Test Statistics" table is shown:

	Sample 7	Group
S	0.0	0.1
Min	19.9	19.9
Max	20.0	20.1
$\bar{X}$	20.0	20.0
R	0.1	0.2
$\bar{R}$		20.0
$\bar{R}$		0.1
$\bar{X} - 3S$	19.8	19.8
$\bar{X} + 3S$	20.1	20.2
Cpl		0.391
Cpu		0.368
Cpk		0.368
Cp		1.266

To the right of the statistics is a "Test Results" table:

Test No.	Sample Test No.	Test Force	Grade Code
65	7.5	19.9	0
64	7.4	20.0	0
63	7.3	20.0	0
62	7.2	20.0	0
61	7.1	20.0	0
60	6.10	20.0	0
59	6.9	20.0	0
58	6.8	20.1	0
57	6.7	20.1	0
56	6.6	20.1	0
55	6.5	20.1	0
54	6.4	20.0	0
53	6.3	19.9	0
52	6.2	20.1	0
51	6.1	20.0	0
50	5.10	20.0	0
49	5.9	20.0	0
48	5.8	20.1	0
47	5.7	19.9	0
46	5.6	20.0	0
45		20.0	0

At the bottom right, there are buttons for "Quick Report", "Clear Data", and a green "Start New Sample" button.

Callout boxes at the bottom of the screen identify: "Test Statistics" (pointing to the statistics table), "Test Results" (pointing to the test results table), and "User Data" (pointing to the bottom right area).

The Royce System 610 BTM Main screen is shown above.

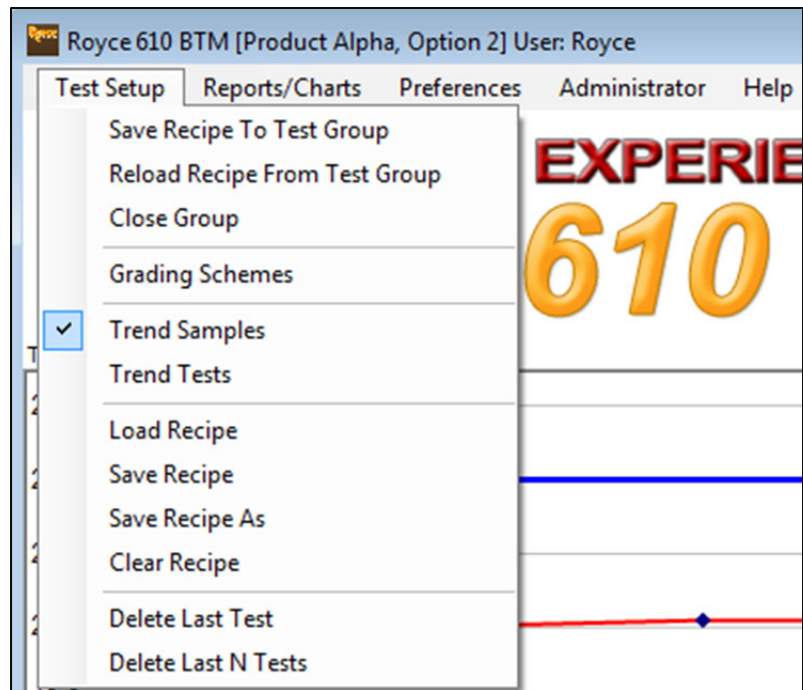
## Main Screen Overview

	<b>Description</b>	
<b>Test Group Indicator</b>	Name of currently selected test group	
<b>Menu Bar</b>	<b>Test Setup</b>	Provides test group and grading scheme maintenance, recipe import/export, data clearing, and selection of sample or test trending.
	<b>Reports/Charts</b>	User selectable chart and print options for current test results and data export.
	<b>Preferences</b>	Provides language selection and password changing.
	<b>Administrator</b>	Add/delete/modify users, add/delete security roles, edit permissions for each role.
	<b>Help</b>	Displays software version and user guide.
	<b>Switch User</b>	Enables changing users without closing BTM.
<b>Status Window</b>	Displays peak test force, in gram force.	
	Displays mainframe serial number.	
	Displays maximum test force capacity.	
<b>Button Panel</b>	<b>Clear Data</b>	Provides options to delete data.
	<b>Recipe Settings</b>	Displays a list of BTM settings which can be modified to suit the process. See "Recipe Settings" on page 24 for more detail.
	<b>Quick Report</b>	Opens the Quick Report window. Quick Reports can be printed or exported to Excel or Adobe Acrobat format.
<b>Trend Chart</b>	Displays test results summarized in a graph. Users can toggle between the average peak force for each sample (represents multiple tests per point) or the peak force for each test.	
<b>Test Results</b>	Displays the test results. Default information parameters include test number, sample number, and test force.	
<b>Test Statistics</b>	Displays the statistics for samples and group test results.	
<b>User Data</b>	Displays the last value entered for optional user defined fields.	

## Menus

### Test Setup Menu

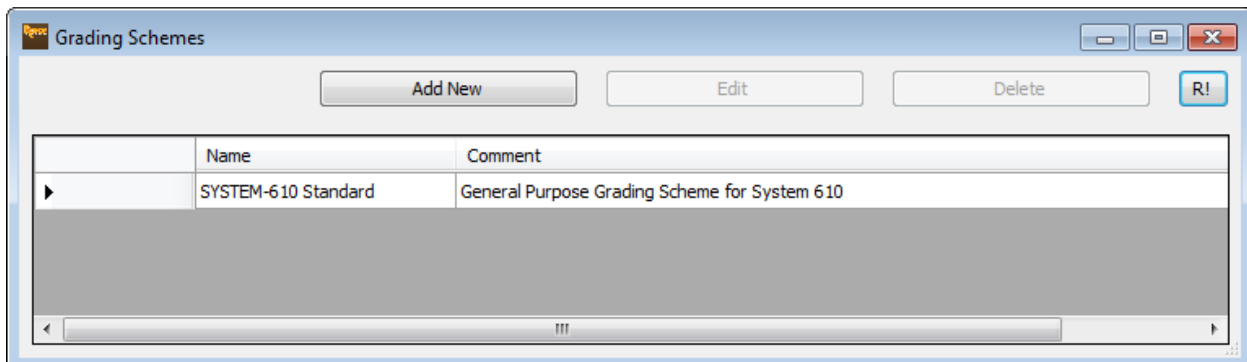
The *Test Setup* menu commands allow users to define the test recipe and test group parameters. Access to some of the Test Setup commands may be limited by permissions assigned to the login role of the user. (See Administrator Menu: Permissions, Page 20)



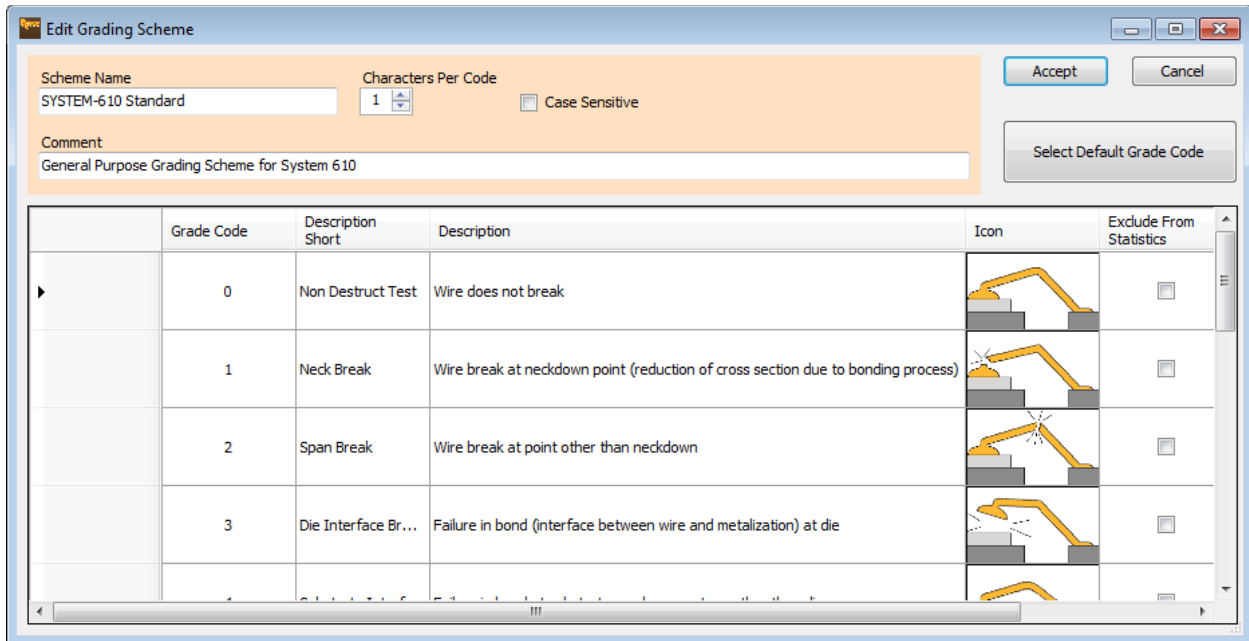
### Grading Schemes

This window defines the bond failure grading scheme for a particular test recipe. The grading scheme typically describes the location of the bond failure and the way it failed. Royce provides sets of default grade codes for common bond test failures.

Grading schemes can be edited from the **Test Setup > Grading Schemes** menu.



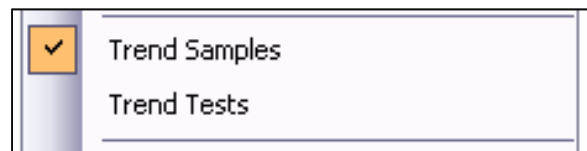
Click the **Grading Scheme**, then click **Edit**.



Edit Grading Scheme as desired, then click **Accept**.

### Trend Samples, Trend Tests

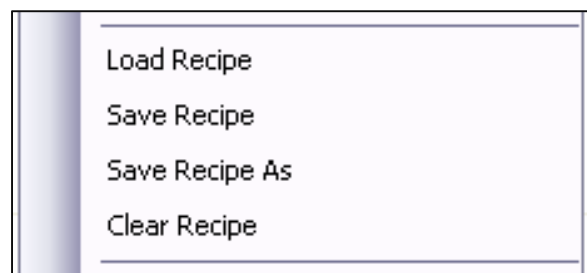
When *Trend Samples* is checked, each point on the graph represents the average of all test values in each sample.



When *Trend Tests* is checked, each point on the graph represents the test value for a single test.

### Load Recipe

Embed an existing recipe file into the currently selected group.



### Save Recipe

Ensure that current recipe parameters are embedded in the group. These will then be saved in the database.

### Save Recipe As

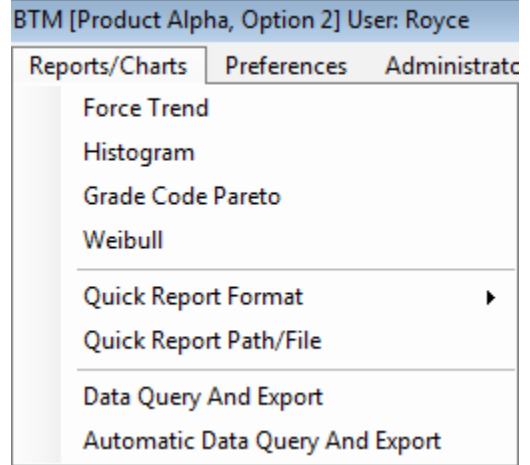
Extract the recipe information embedded in the currently selected group and save it as an external recipe file.

### Clear Recipe

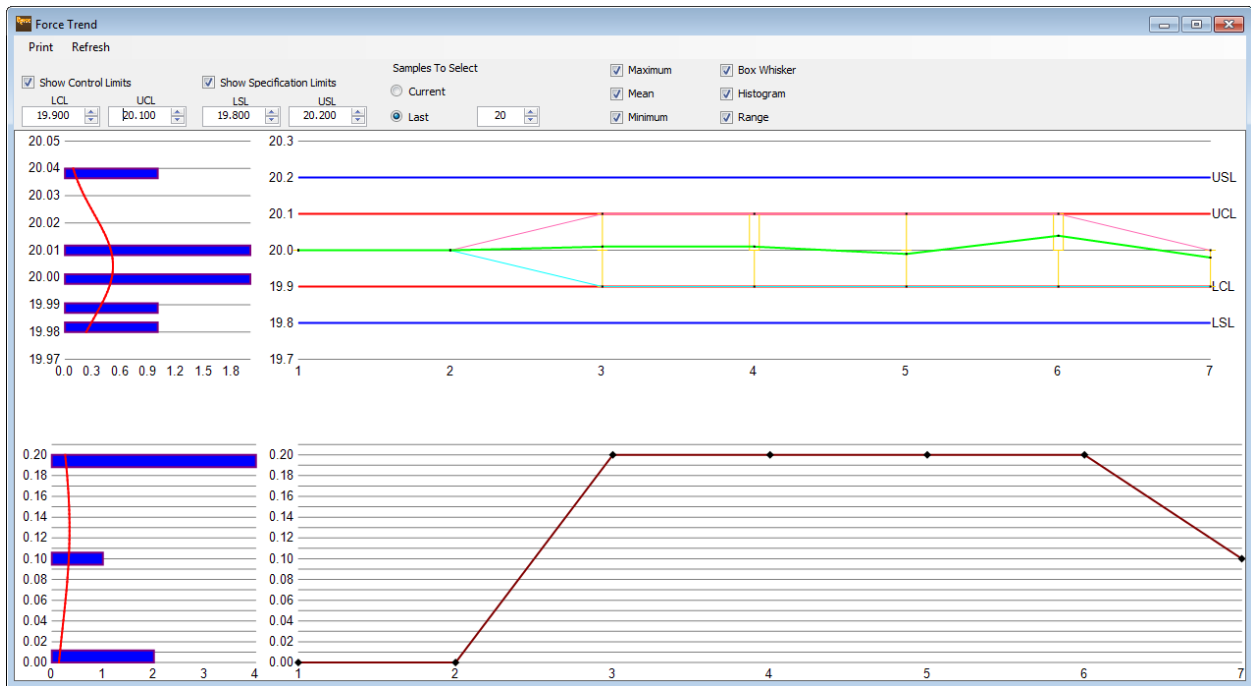
Clear Recipe deletes any changes and returns to the factory default recipe file.



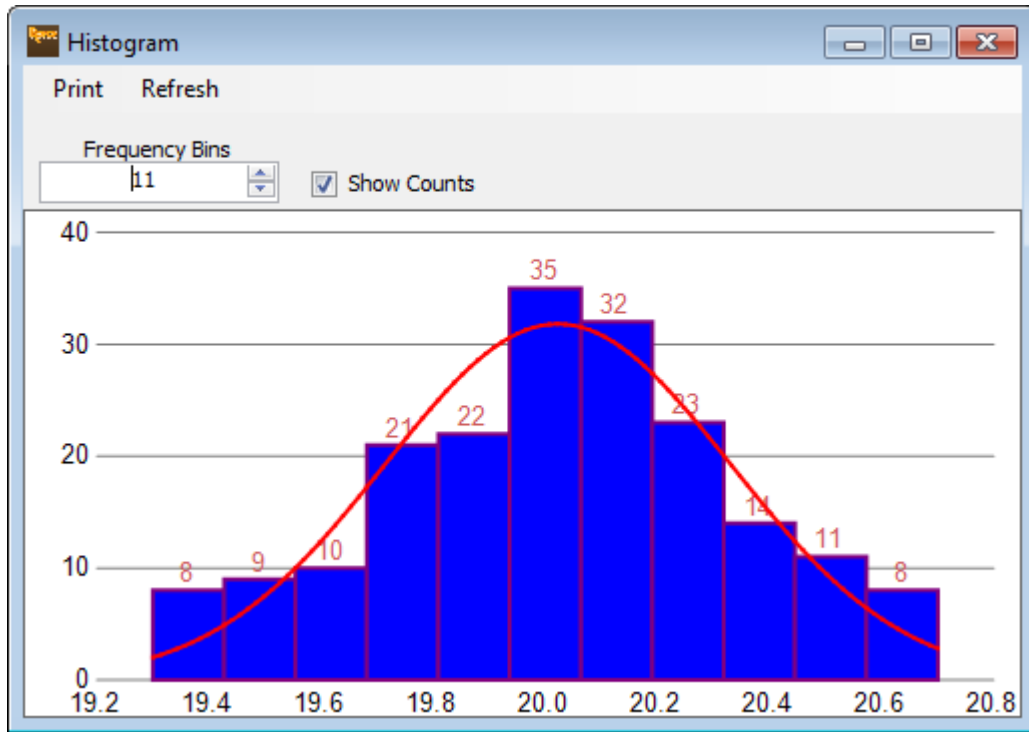
# Reports/Charts Menu



## Force Trend Chart

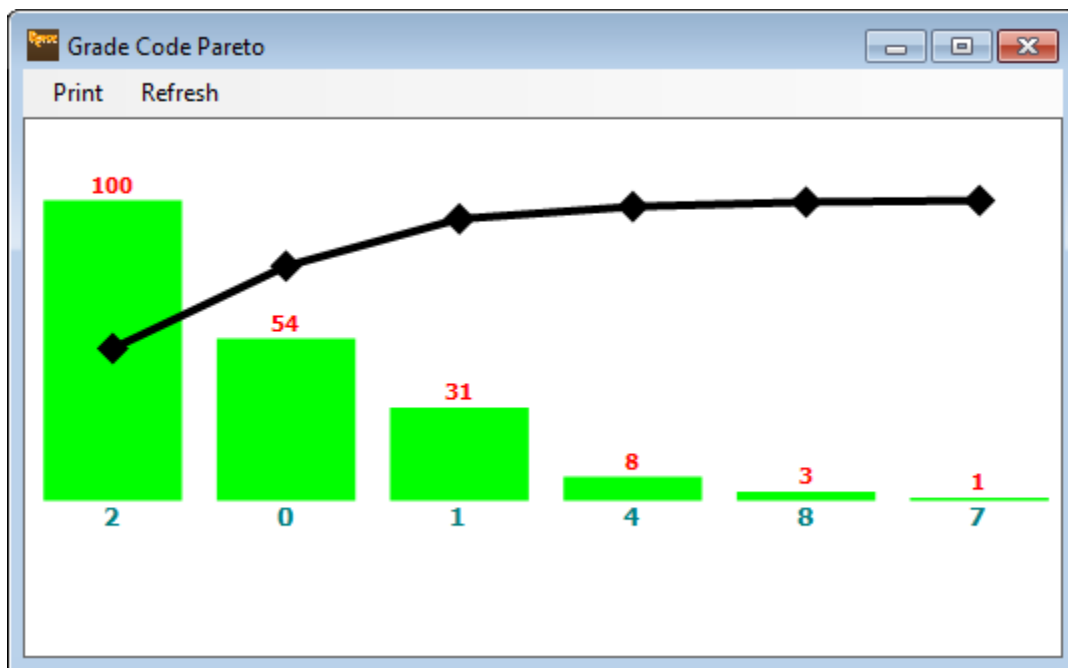


## Histogram Chart



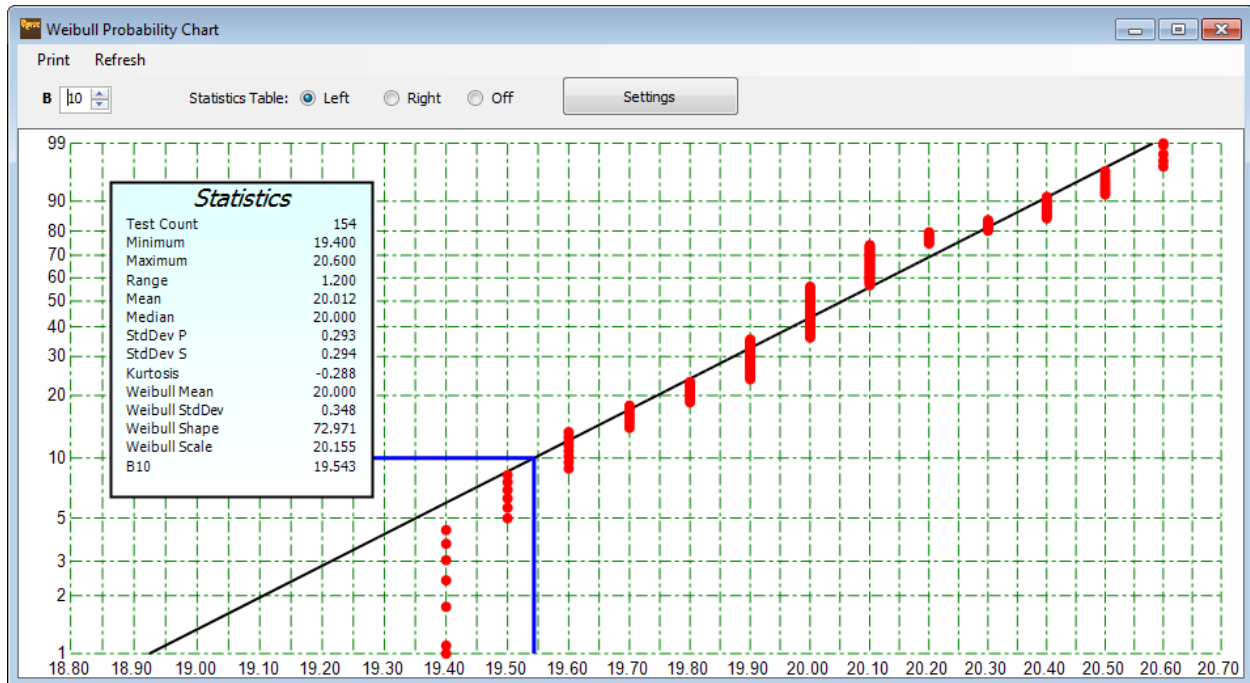
## Grade Code Pareto Chart

Grade Code Pareto Chart plots the frequency of grade codes and the cumulative total of all failure codes in the selected test group.



## Weibull Probability Chart

The Weibull Chart is used in reliability analysis.



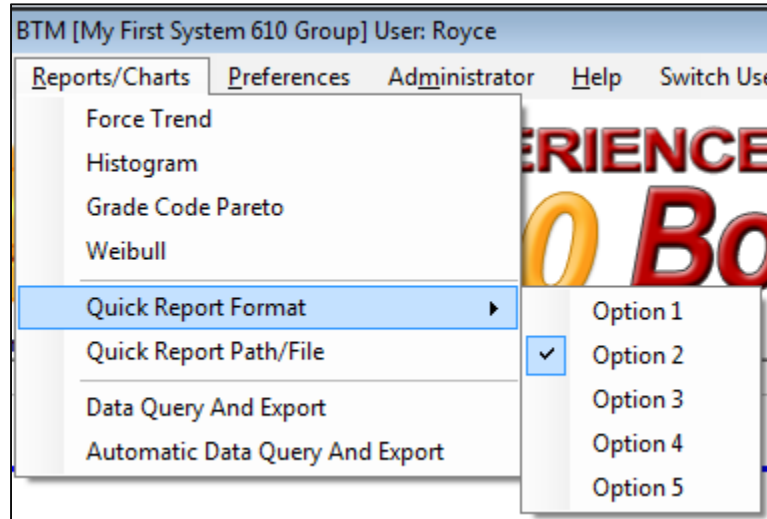
For further information on Weibull analysis, please refer to:

<http://www.weibull.com/basics/lifedata.htm>

The *Statistics Table* can be turned **OFF** or positioned to the left or to the right of the Probability Chart.

## Quick Report Format

The Quick Report is a formatted report of bond test results for the currently open group. Several different formatting options are available via this menu item. This setting is stored with the system configuration and is global to all users and data groups.

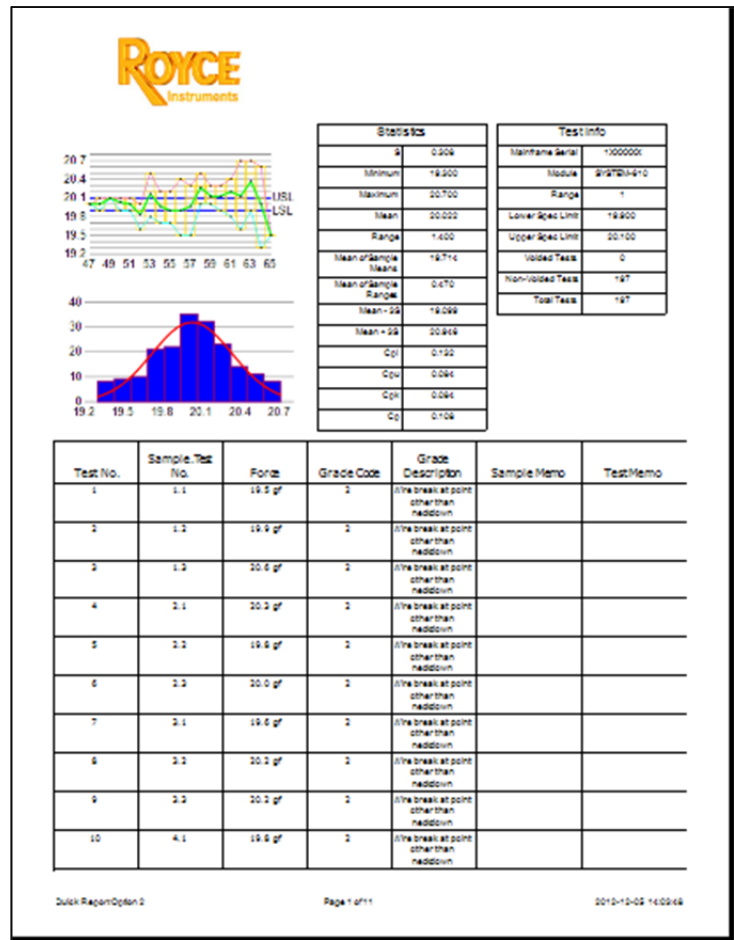


Quick Reports are launched from a button on the right side of the *Main Screen*.

The generated report can be viewed on-screen, sent to a printer, or saved in Adobe PDF or Microsoft Excel formats by using the toolbar controls at the top of the *Report Viewer Window*.

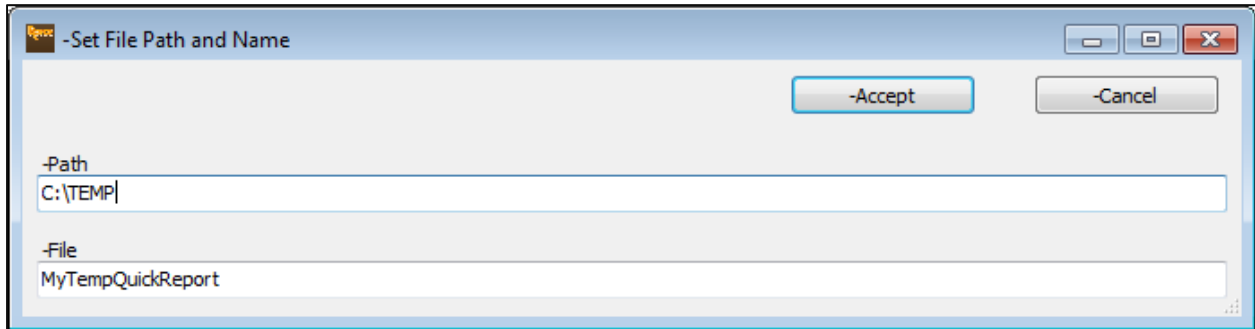
The logo that appears on all Quick Reports can be changed, if so desired, by substituting a new 300 x 100 pixel image in the following file:

**C:\Program Files\Royce Instruments\610\ CustomLogo.jpg**



## Quick Report Path/File

The destination file-name and path for saving quick reports can be set using this menu option.



Clicking on the Path text box will open a “Browse to folder” dialog. The File text box can be simply edited. This setting is stored with the system configuration and is global to all users and data groups.

## Data Query and Export

The *Data Query and Export* feature of Bond Test Manager provides a means to extract any or all test results from the Royce 610 database based on user-defined criteria, then format and output these data in a user configured export format.

The *Data Query and Export* feature can be used two ways:

1. On-demand: Data is exported when needed, according to the user designed report.

OR

2. After every test: Data is exported automatically to the report following every test or every test recall and re-grade.

Selecting either option will bring up the *Data Query and Export Screen* in which you can design the report format.

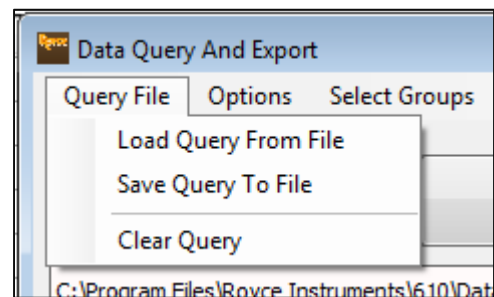
### Query File Menu

#### Load Query from File

All *Data Query and Export (DQAX)* settings are automatically saved into the database with the current group. This option provides a way for previously exported DQAX setups to be imported.

#### Save Query To File

All *Data Query and Export (DQAX)* settings are automatically saved with the current group. This option provides a way to export DQAX settings to a file.



## Clear Query

Clears a user created DQAX query.

## Options Menu

### Output To Excel

Output to Excel will save the data to a Microsoft Excel formatted spreadsheet.

Use *Set File Pathname* to change the location of the Excel file.

### Output To CSV

Sets output to be in CSV (Comma Separated Values) format. *Output to CSV* will output the data to a CSV file.

Use *Set File Path-name* to change the location of the CSV file.

Select the *Append* option to add data to the end of an existing CSV file every time an export is performed.

### Set File Pathname

This allows the user to set the destination folder for the report.

### Append

This appends data to existing CSV output file.

### Output To Network

This permits data to be output to a network file system.

### Network Settings

This sets the network IP address and port.

### Output To COM Port

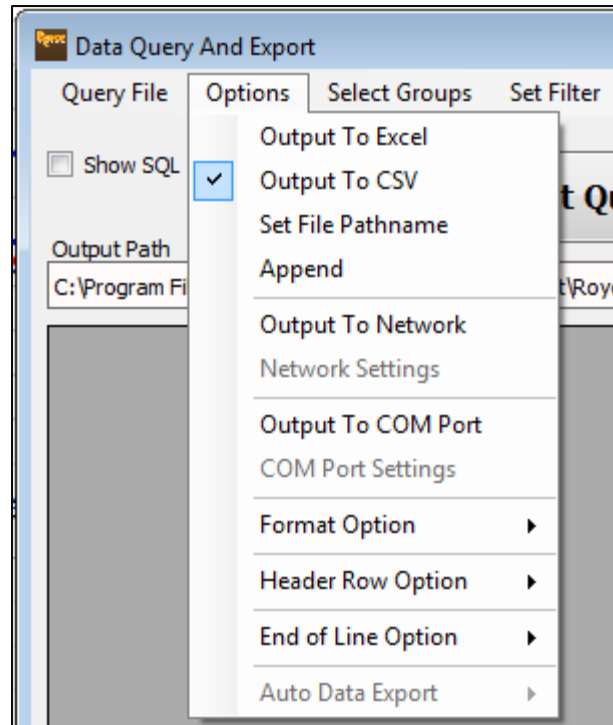
Selecting output to COM Port will send the data through the selected serial port.

### COM Port Settings

Selects the COM Port Settings for the serial communications.

### Format Option

This option sets the output format to either the Default format or to the Royce System 552 "Short" compatibility format.



### Header Row Option

This sets when to output a header line in the report.

### End of Line Option

This sets the end of line character permutations of:

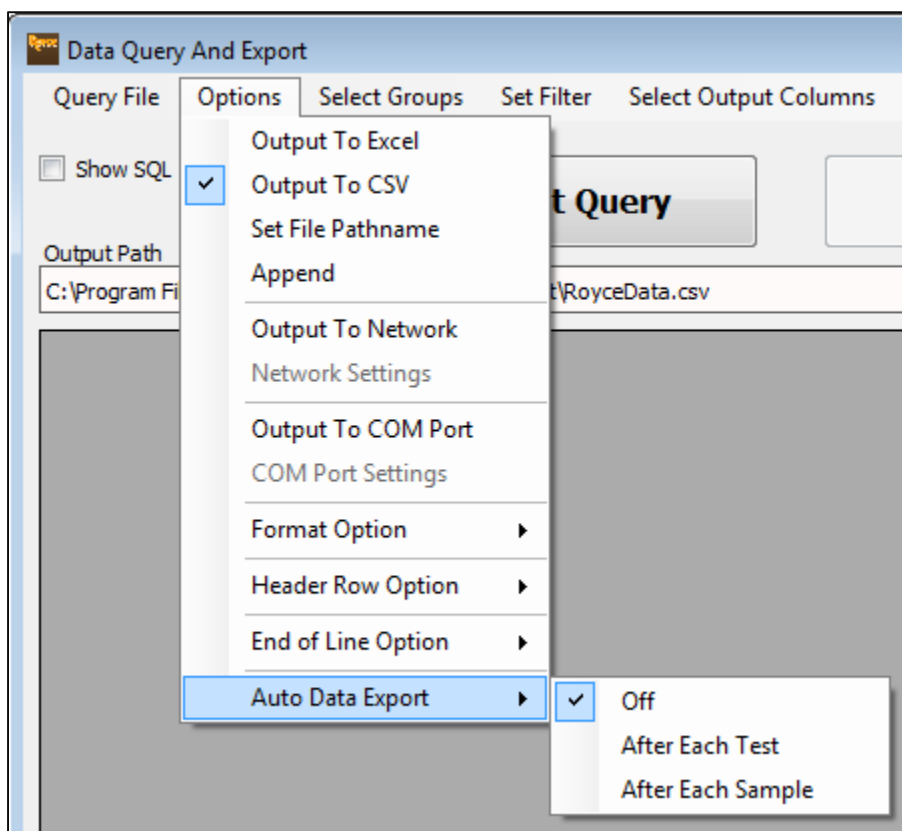
**CR** (Carriage return character)

**LF** (Line feed character).

### Auto Data Export

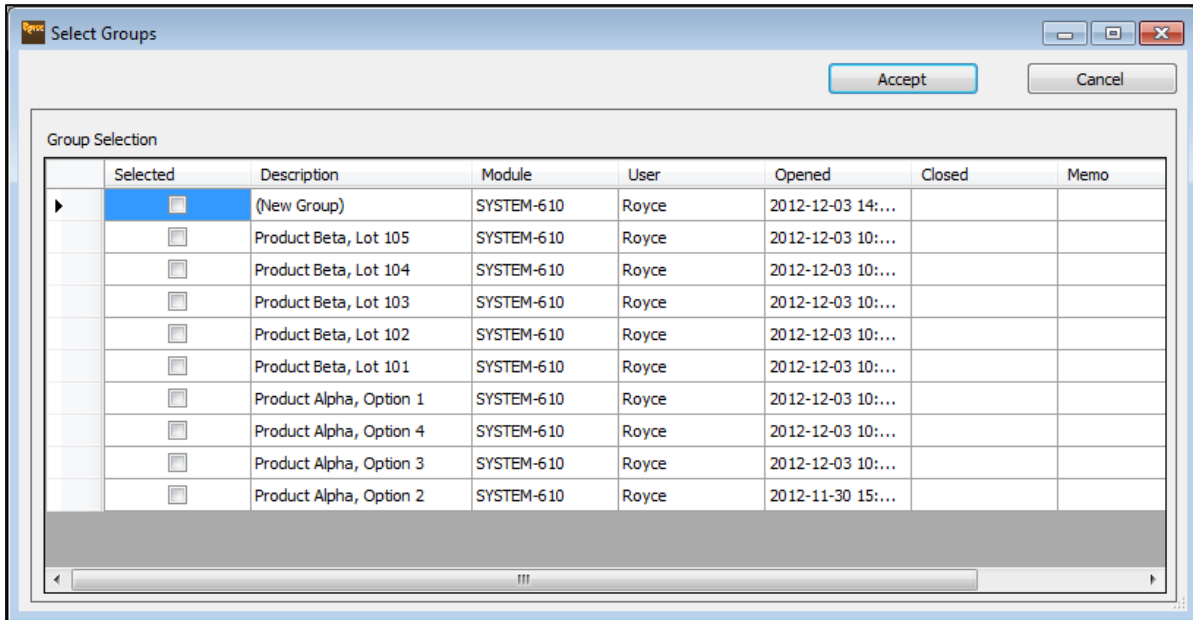
This sets the Data Query Report to be sent after each test.

Note that the report configuration must be appropriate for sending after each test.



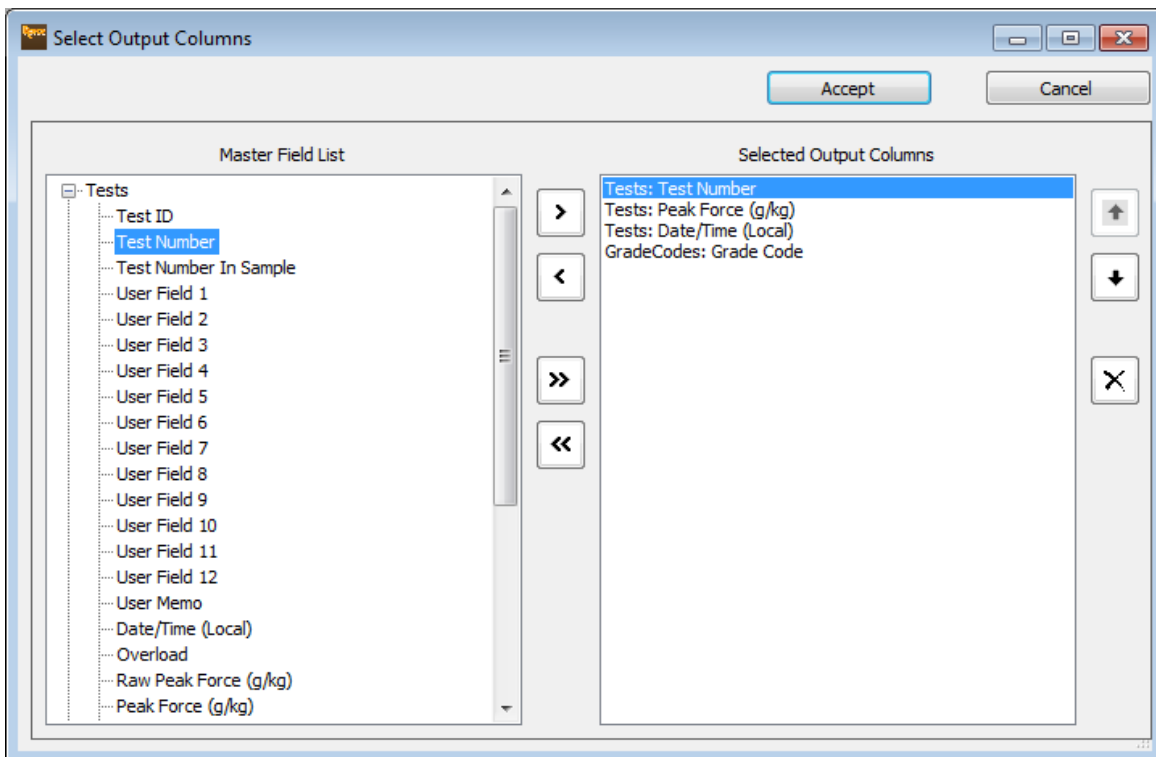
## Select Groups

Selecting this will immediately present a list of groups to choose from.



Check the boxes next to the groups you wish to include in your query. If none of the boxes are checked, then all of the groups will be included in your query. Groups can also be selected or restricted using Filtering.

## Select Output Columns Menu





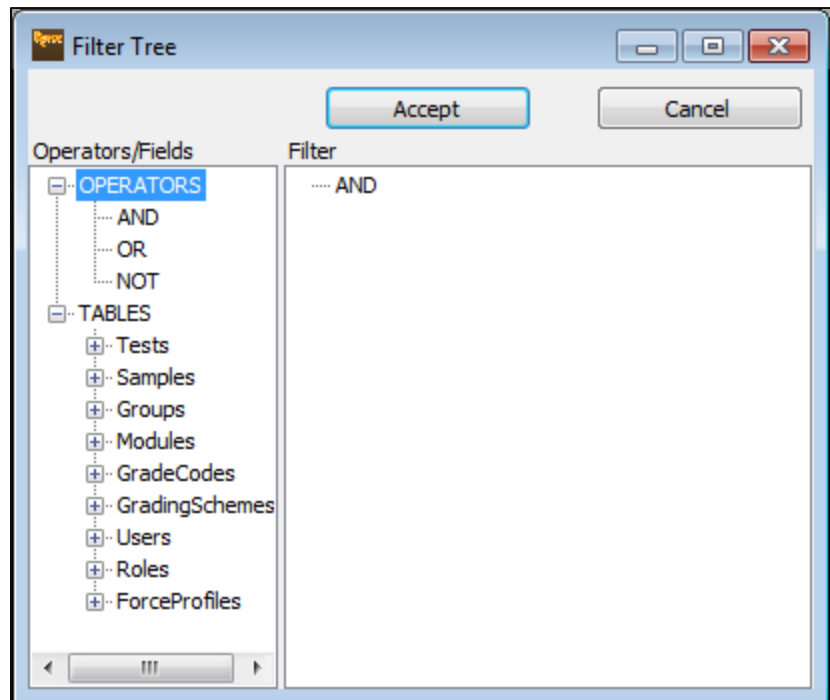
This menu launches a dialog box enabling you to define which data fields are returned by the query, and in which order they should appear.

1. In the *Master Field List* click the **+** button to expand the categories of fields.
2. Select a field to include in the export.
3. Click the **Right Arrow** button to add the selected field to the *Selected Output Columns List*.
4. Use the **Up** and **Down Arrow** buttons to change the order of the output columns.
5. Use the button or the button to remove a field from the Output Columns List.
6. Click the **Accept** button.
7. Use **Test Query** button to see the results of your selections.

### Set Filter Menu

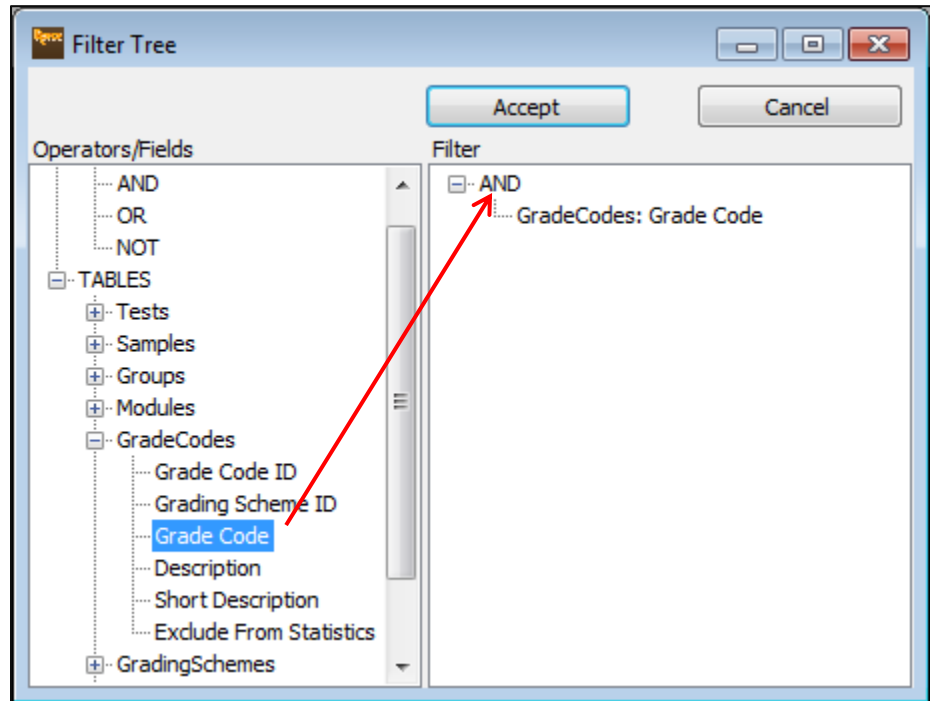
This menu launches a dialog box which allows you to construct a filter which restricts the data selected by the query.

1. Select the field to be filtered on, then click the **+** box to expand that section.

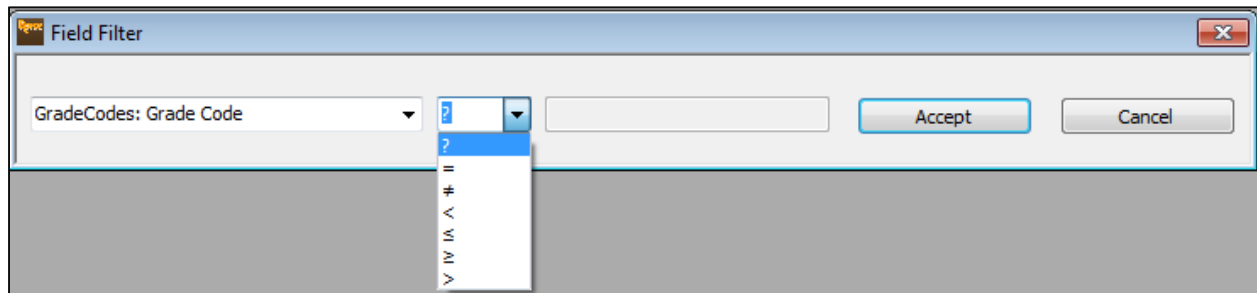


2. Select a field and drag it over to the base operator (**AND**) in the Filter pane.

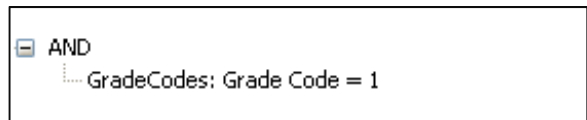
**Note:** You must drop the field exactly on the **AND**.



3. Select the filter type (=, <, >, etc.), enter the filter parameter, and click **Accept**.

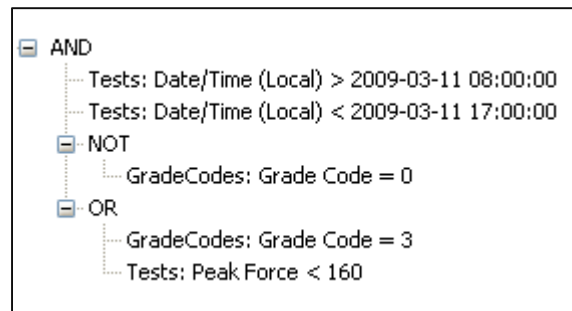


This example will limit the results to only those with a grade code equal to 1.



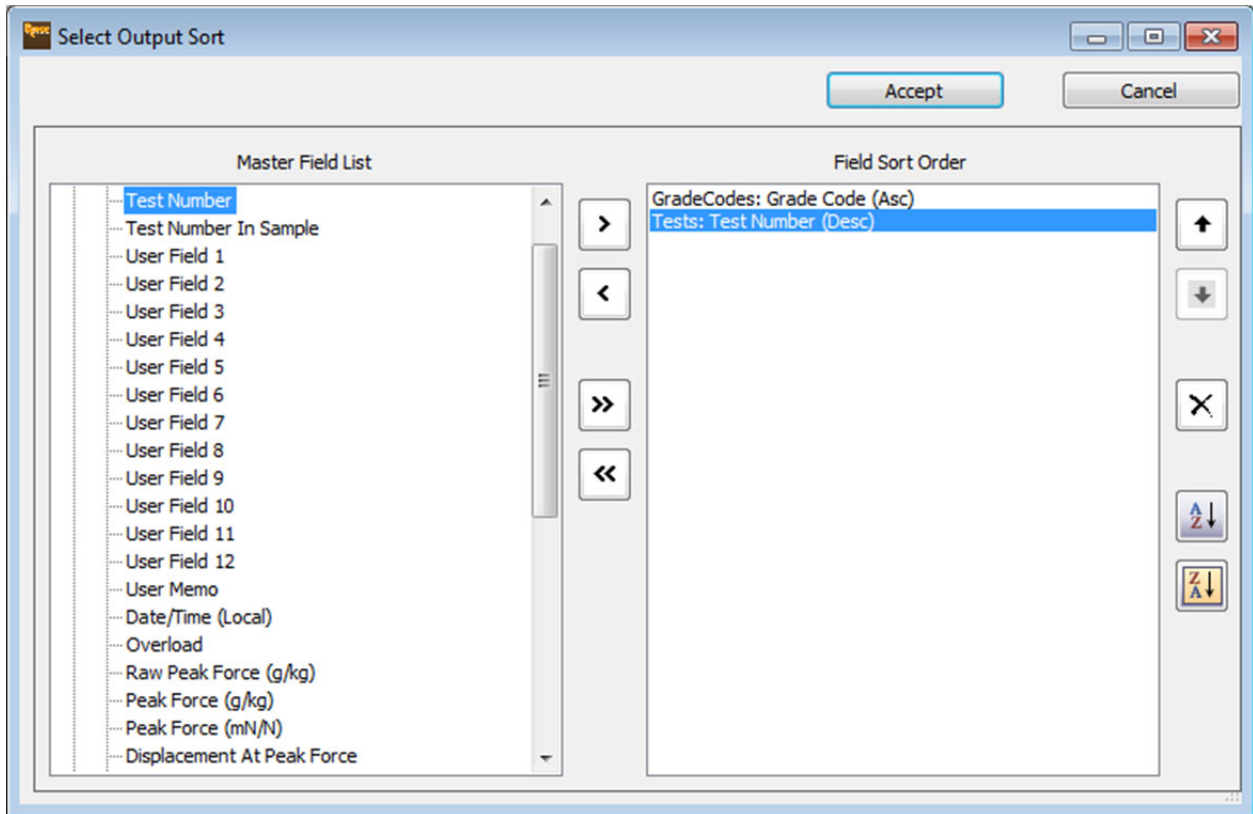
4. Click **Accept** to save the filter or continue to add more parameters to the current Filter Tree.

This example will include all tests from the selected test groups that occurred between 8:00 a.m. and 5:00 p.m. on March 3, 2009, whose grade code is equal to 3 or whose peak force was less than 160, and will exclude all tests whose grade code is equal to 0.



## Select Output Sort Menu

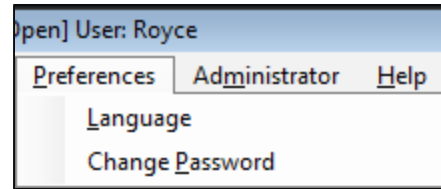
This menu launches a dialog box offering sorting options. In general, output data can be sorted by one or more data fields and in ascending or descending order.



1. In the *Master Field List* click the + button to expand the categories of fields.
2. Select the desired field to specify sort order.
3. Click the + button to add the selected field to the *Field Sort Order List*.
4. Use the **Up** and **Down Arrow** buttons to change the sort priority of the field. The fields toward the top of the list will have the highest sort priority.
5. Use the **X** button or the **Right Arrow** button to remove a field from the *Field Sort Order List*.
6. The **AZ↓** button selects ascending order for a field (asc), the **ZA↓** button selects descending order for the field (desc).
7. Click **Accept** to save.
8. Use **Test Query** button to see the results of the sort selections.

## Preferences Menu

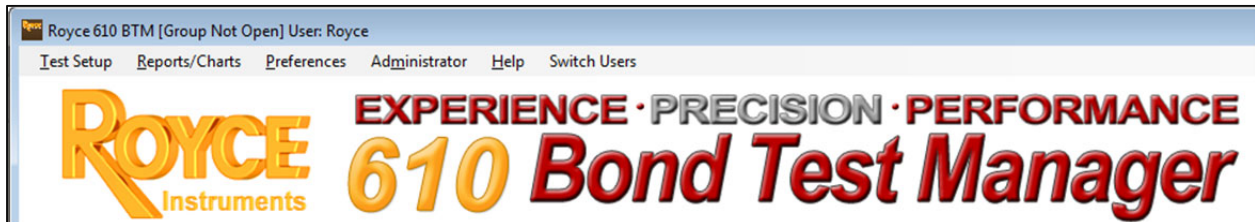
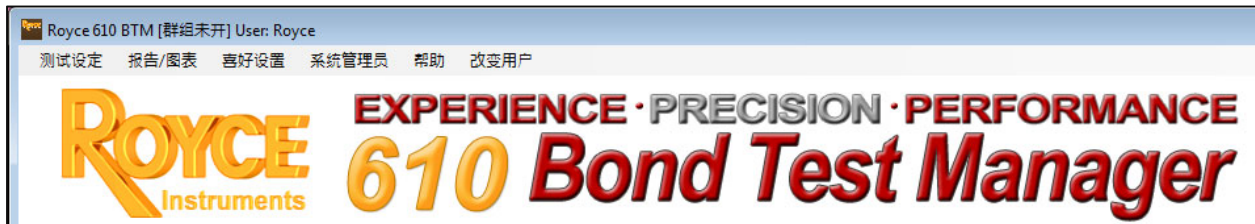
This menu offers options for changing the current user's password and for selecting the language BTM uses for displaying messages.



## Language

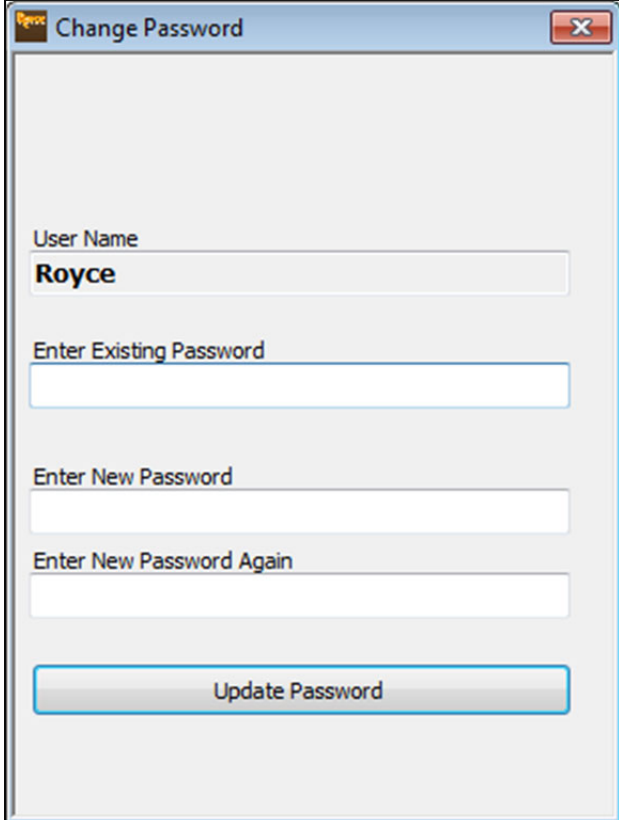
The user may choose from among any of the following languages for BTM text displays: Chinese (both Simplified and Traditional), English, French, German, Japanese, Korean, and Spanish. The specific language selection also affects the display of numbers, dates, and times according to regional custom. Language selection affects all BTM users.

**Note:** Click on the Royce banner on the *Main Screen* to temporarily toggle between the selected language and US English.



### Change Password

Use this option to change the currently logged-in user's password.



The image shows a 'Change Password' dialog box with a title bar containing a close button. The dialog contains four text input fields and one button. The first field is labeled 'User Name' and contains the text 'Royce'. The second field is labeled 'Enter Existing Password'. The third field is labeled 'Enter New Password'. The fourth field is labeled 'Enter New Password Again'. At the bottom of the dialog is a button labeled 'Update Password'.

Change Password

User Name  
Royce

Enter Existing Password

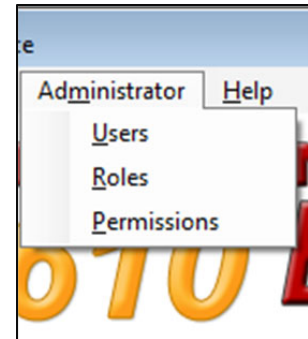
Enter New Password

Enter New Password Again

Update Password

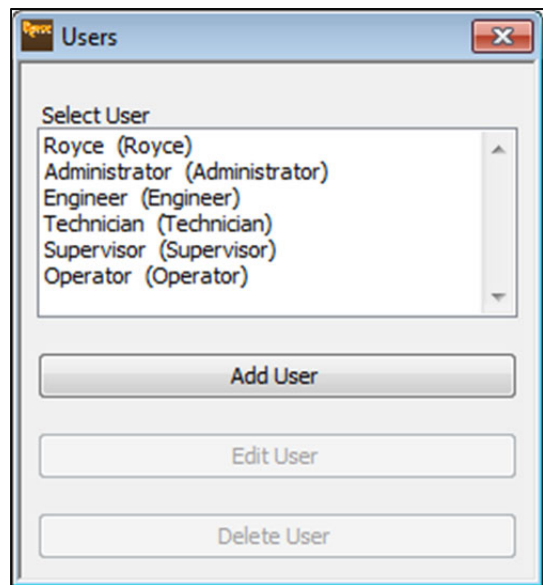
## Administrator Menu

The options in this menu allow a user with sufficient privileges to manage BTM security.



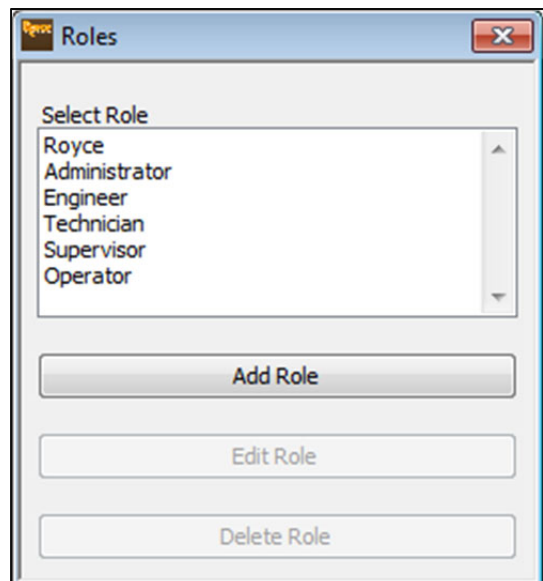
## Users

This window allows a user with sufficient privileges to add and delete users, and edit user information. The user's security role is shown in parenthesis. BTM is installed with six predefined users, which can be modified. There is no limit to the number of users that can be added to the system.



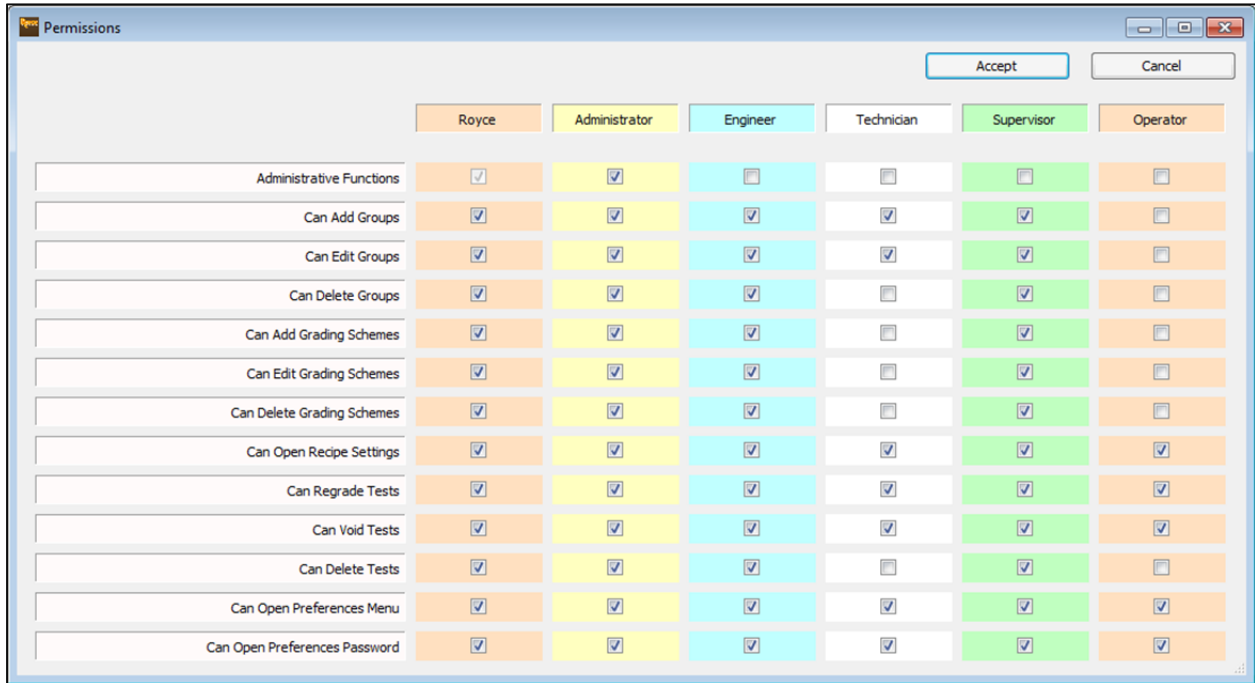
## Roles

Each security role grants a specific set of BTM permissions. A user may be assigned to only one role, but the permissions of each role can be tailored as desired. BTM is installed with six predefined roles, which can be modified. There is no limit to the number of roles that can be added to the system.



## Permissions

The Permissions Matrix displays available permission in rows, and each security role in columns. At the intersection of these rows and columns is a check-box. A tick in the check box indicates that the permission is granted to the role.



	Royce	Administrator	Engineer	Technician	Supervisor	Operator
Administrative Functions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can Add Groups	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Can Edit Groups	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Can Delete Groups	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Can Add Grading Schemes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Can Edit Grading Schemes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Can Delete Grading Schemes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Can Open Recipe Settings	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Can Regrade Tests	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Can Void Tests	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Can Delete Tests	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Can Open Preferences Menu	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Can Open Preferences Password	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

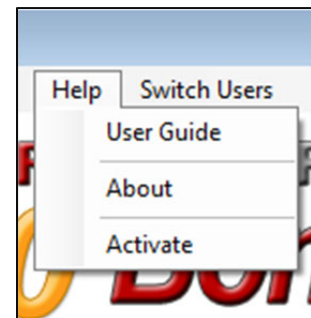
**Note:** The role of the currently logged in user cannot disable his/her own Administrative Functions permission.

## Help Menu

Use the Help menu to access the User Guide, or to see software version and system serial number information.

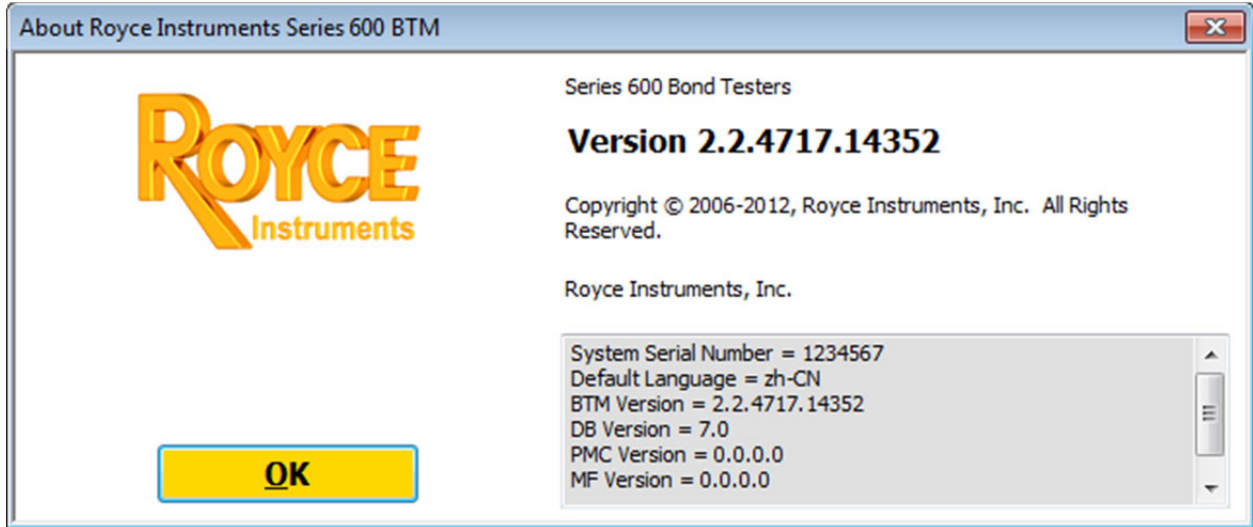
### User Guide

Selecting User Guide will open the electronic version of this document.



## About

The software version number of Royce Instruments *Bond Test Manager* is shown in bold. Additional relevant information is shown in the lower right text box. Customer Support inquiries should always include the version number or a screen shot of the **Help > About** box.



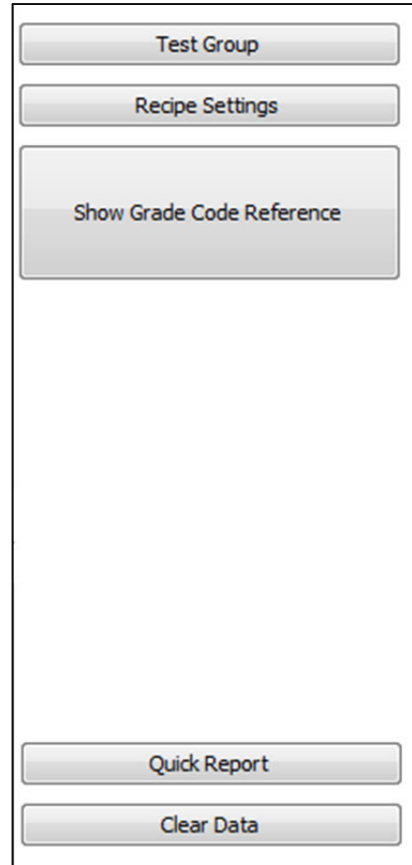
## Activate

System 610 BTM is normally installed and activated on a Royce SurePC prior to delivery to the customer. **Please contact Royce Customer Service should a hard drive or PC replacement be required or before re-installing Windows, as these situations will likely require re-activation of the software.**



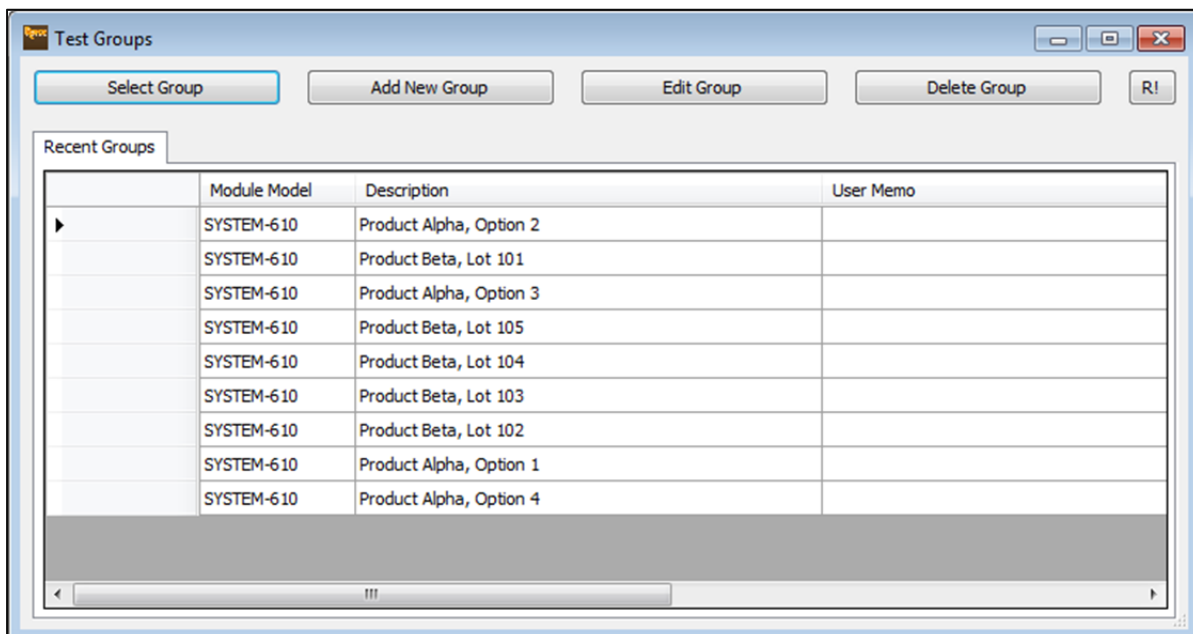
## Operation Buttons

Located along the right border of the *Main Screen*, these buttons provide quick access to BTM functions used most often.

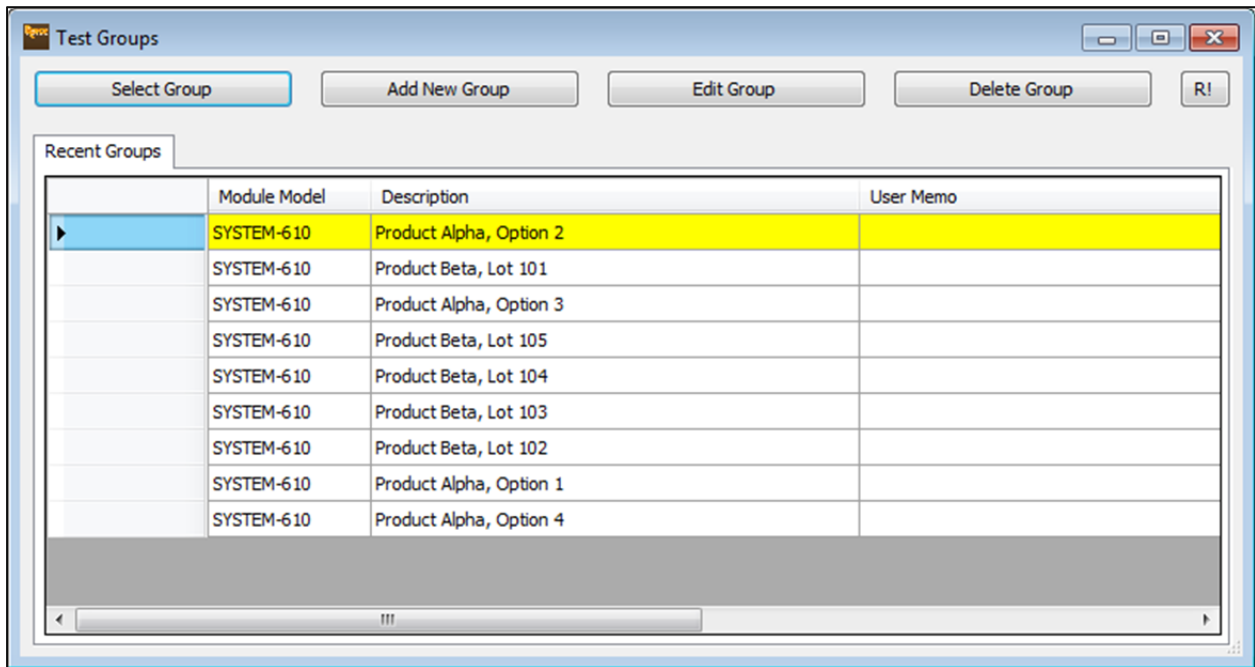


### Test Group Button

A test group is a collection of rest results with BTM recipe settings saved together. Clicking the **Test Group** button displays a list of existing test groups, most-recently-used first.

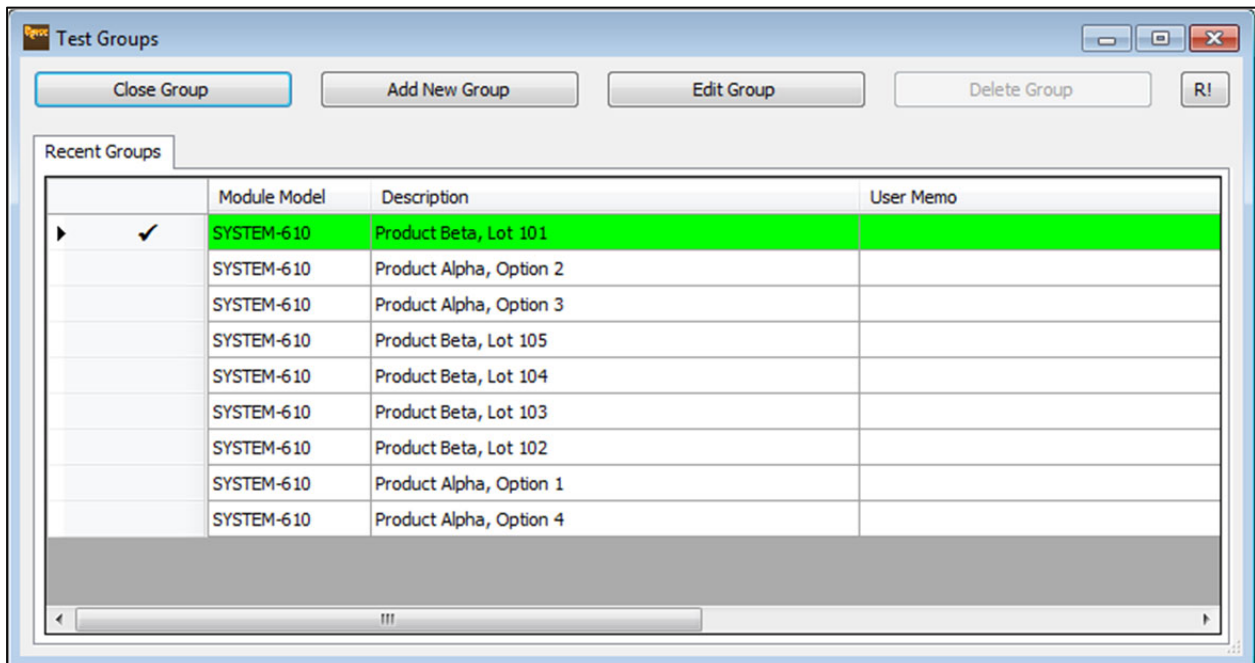


To resume testing using an existing test group, simply click on the row corresponding to the desired group. (This action will highlight the row in yellow.)



Click the **Select Group** button in the upper-left. The group will open and the *Test Groups* window will close.

Click the **Test Group** button again to show the currently open group in green. The currently open group is also flagged with a check-mark in the left column.



The currently selected group is indicated by a check-mark in the left column and green highlighting.

To create a new group, simply click **Add New Group**.

	Caption	Clear After Each Test	Clear After Each Sample	Clear When Group Data Cleared	Require After Each Test	Require After Each Sample	Require With New Group	Validate	Validator
▶	User Field 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	User Field 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	User Field 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	User Field 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

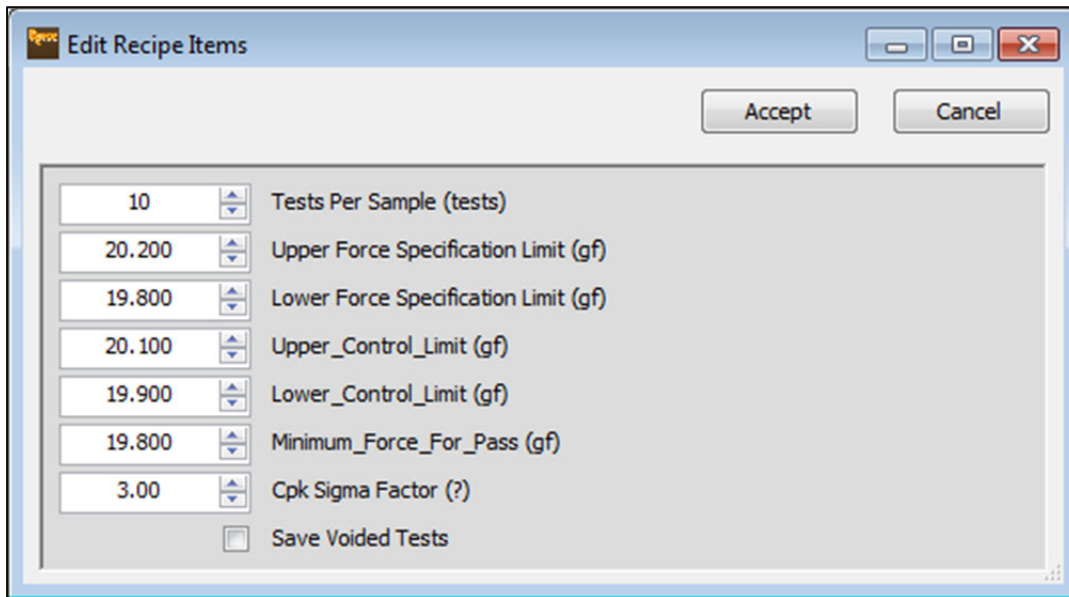
Set the group *Description* field appropriately, then click **Accept**. Grading scheme, User Fields Setup, and other settings will be discussed later.

After clicking **Accept**, the new group will appear at, or near the top of the *Test Groups* window. To open this new group, click on the desired test group, then click the **Select Group** button.

Test groups can be deleted from the *Test Groups* screen one at a time by clicking on the undesired test group, then clicking the **Delete** button. The **Delete** button will be disabled if the group is currently open.

## Recipe Settings Button

Clicking the **Recipe Settings** button launches the *Edit Recipe Items* dialog.



**Note:** Changes to individual recipe settings take effect immediately, but are not saved until **Accept** is clicked. To close the *Edit Recipe Items* dialog without making any changes, click **Cancel**.

### Tests Per Sample

This sets how many tests comprise a statistical sample for SPC purposes.

### Upper Force Specification Limit (USL)

This setting adjusts the height of the upper Specification Limit Line in the graphical display and affects the process capability statistical calculations.

### Lower Force Specification Limit (LSL)

This setting adjusts the height of the lower Specification Limit Line in the graphical display and affects the process capability statistical calculations.

### Upper Force Control Limit (UCL)

This setting adjusts the height of the upper Control Limit Line in the *Force Trend* graphical display under the *Reports/Charts Menu*.

### Lower Force Control Limit (LCL)

This setting adjusts the height of the lower Control Limit Line in the *Force Trend* graphical display under the *Reports/Charts Menu*.

### Cpk Sigma Factor

The process capability index Cpk (and the upper and lower precursor values Cpu and Cpl) use  $3\sigma$  as the divisor in the standard calculation. This recipe setting permits the changing of the coefficient 3 to any value in the range 0.01 to 10.0.

### Save Voided tests

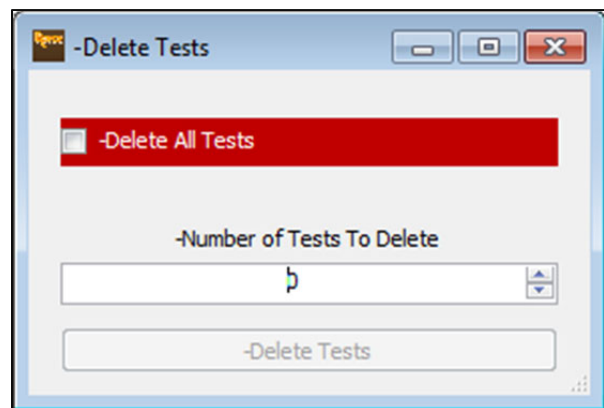
If this is set, then any test voided by the user will be saved in the database. Even though the voided tests are recorded, they are not included in any statistical calculations.

When finished changing recipe settings, click the **Accept** button so that settings are saved in the test group database.

### Clear Data Button

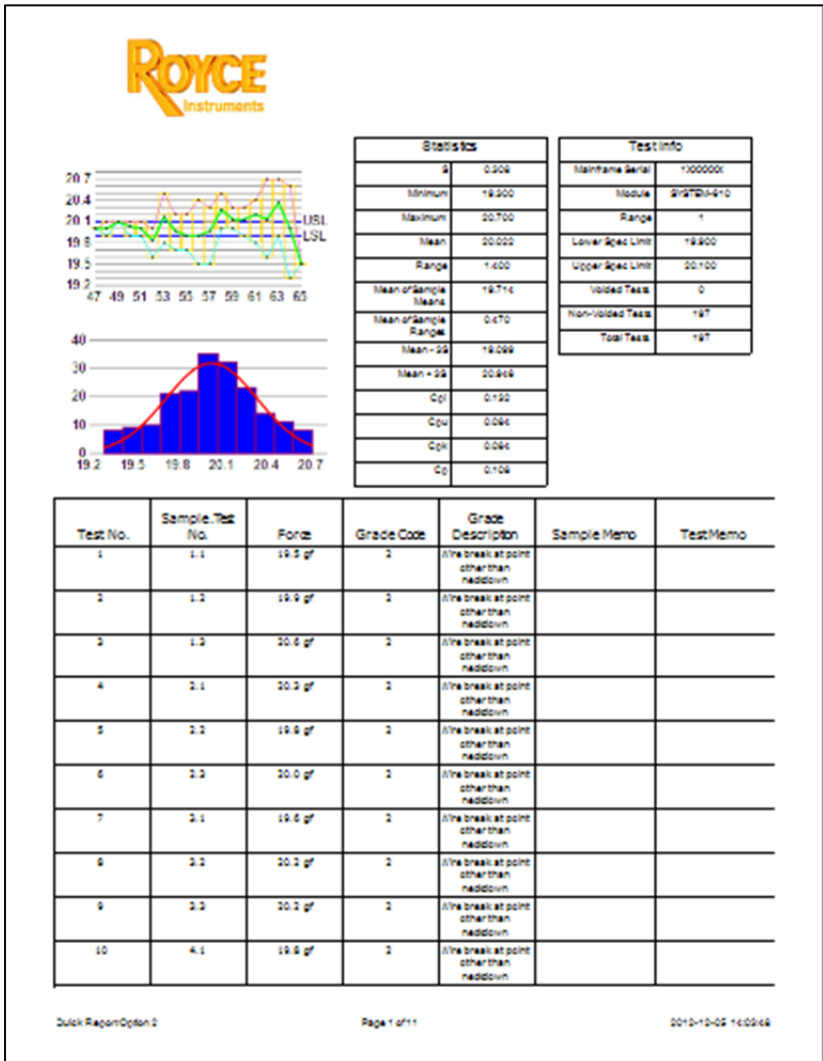
If the user has the appropriate permission, this button opens a window in which deletion options can be chosen.

Selecting **Delete All Tests** will remove all test data from the current test group. Recent tests can be deleted by selecting the number of tests to delete, which will be removed on a “last in, first out” basis.



## Quick Report Button

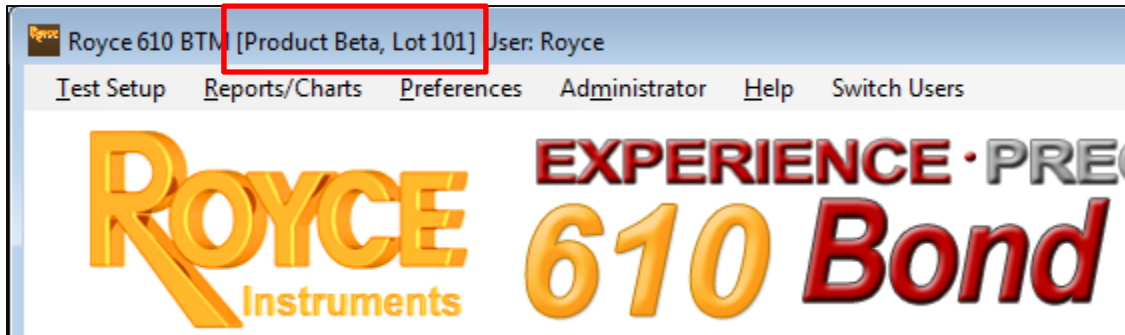
The **Quick Report** button offers a convenient way to generate a formatted report of bond test results for the currently open group.



## Display Fields

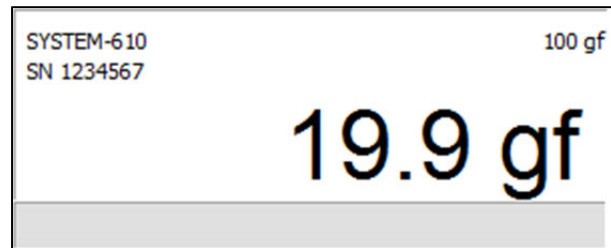
### Current Test Group

The description of the currently open test group is displayed within square brackets in the title bar of the main screen. This is followed by the currently logged-in user name.



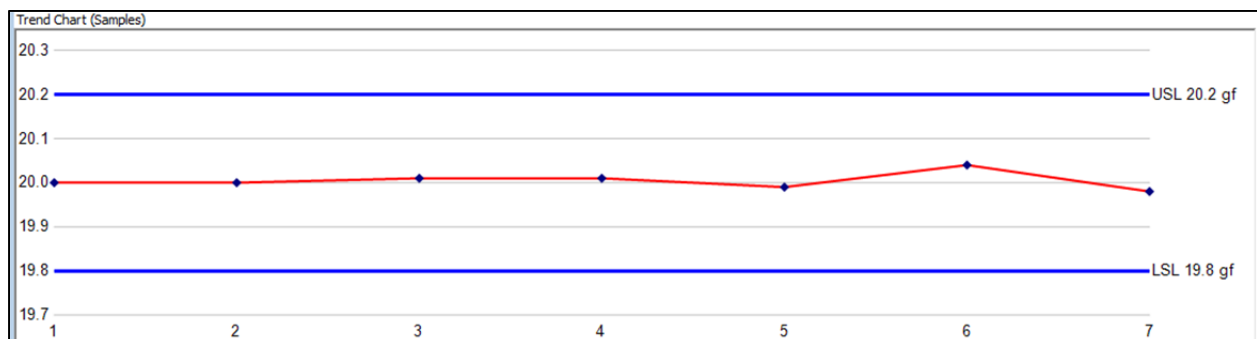
### Status Display

The latest test result is displayed in large numerals on the upper-right side of the *Main Screen*. The mainframe serial number is shown here, as well as maximum test capacity.



### Trend Chart

The *Trend Chart* graphically displays test results. The chart can be set to plot individual test data points or to plot completed test samples. Upper and Lower Specification Limits are plotted in blue.



The X axis represents the test or sample number, the Y axis represents peak force.

The position of the blue chart lines for **Upper Specification Limit (USL)** and **Lower Specification Limit (LSL)** are manually set by the user from the *Test Recipe Menu*.

When in *Trend Samples* mode, selecting a data point in the plot will illuminate the constituent test results in the *Test Results Table* (see Test Results below).

When in *Trend Tests* mode, selecting a data point in the plot will illuminate the individual test result in the *Test Results Table* (see below).

### Test Statistics/Test Results Table

The *Test Statistics Table* displays the current group and sample statistics.

Test Statistics			Test Results			
	Sample 7	Group	Test No.	Sample.Test No.	Test Force	Grade Code
S	0.0	0.1	65	7.5	19.9	0
Min	19.9	19.9	64	7.4	20.0	0
Max	20.0	20.1	63	7.3	20.0	0
$\bar{X}$	20.0	20.0	62	7.2	20.0	0
R	0.1	0.2	61	7.1	20.0	0
$\bar{X}$		20.0	60	6.10	20.0	0
$\bar{R}$		0.1	59	6.9	20.0	0
$\bar{X} - 3S$	19.8	19.8	58	6.8	20.1	0
$\bar{X} + 3S$	20.1	20.2	57	6.7	20.1	0
Cpl		0.391	56	6.6	20.1	0
Cpu		0.368	55	6.5	20.1	0
Cpk		0.368	54	6.4	20.0	0
Cp		1.266	53	6.3	19.9	0
			52	6.2	20.1	0
			51	6.1	20.0	0

The *Test Results Table* displays each test result, including Test Number, Sample Number &.Test Number Within Sample, Peak Force (in gf), Grade Code, and optional User Field data. User fields can be managed using **Edit Test Group**.



# Chapter 2:

## Quick Start

The bond testing overview information in this chapter was developed from Royce Instruments technical expertise and from online materials from:

[www.royceinstruments.com](http://www.royceinstruments.com)

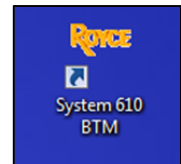
and

[www.SiliconFarEast.com](http://www.SiliconFarEast.com)

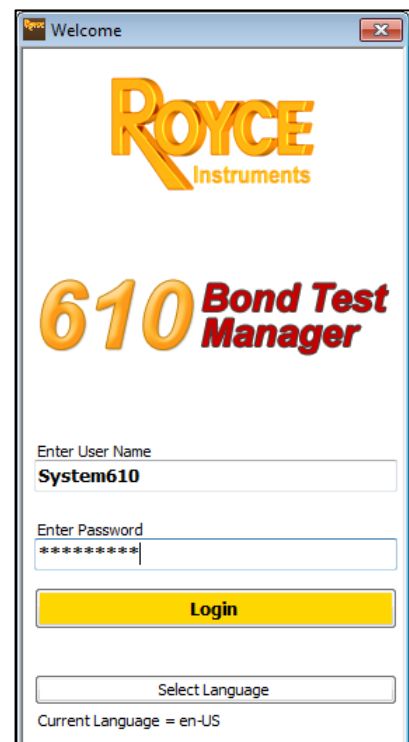
a comprehensive Web reference for the semiconductor manufacturing industry.

# Getting Started

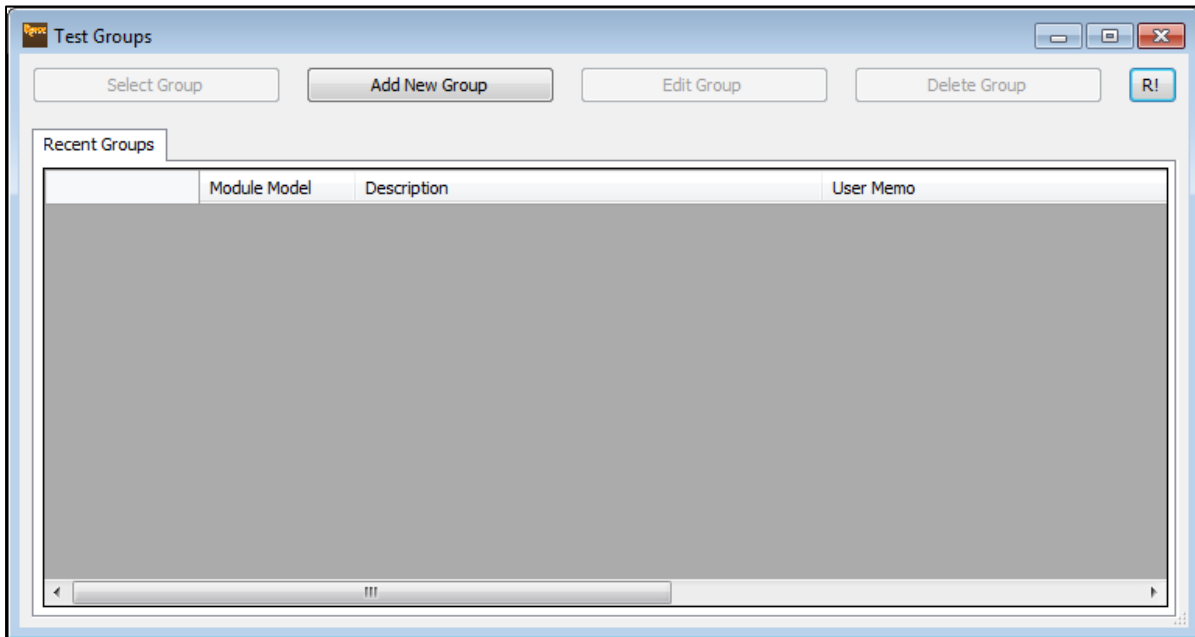
1. **First time only:** Ensure that the supplied RS-232 extension cable is connected between the **RS232** Port on the back of the Mainframe and the **COM1** Port on the back of the SurePC.
2. Power on the System 610 Mainframe and the Royce SurePC. While waiting for the PC to boot, the Mainframe will automatically perform power-up checks and home the Z axis.
3. **First time only:** Ensure that the Mainframe is configured to transmit test results after each test via RS-232. After the Mainframe has completed its power-up initialization, verify the following settings on the TEST SETUP menu:
  - **PRINTER = OFF**
  - **RS232 EA TEST = YES**
4. Log into Windows on the SurePC as user “User”, password “User”.
5. Start Bond Test Manager using the desktop icon.



6. Log into BTM using the default user name “System610” and default password “System610”.

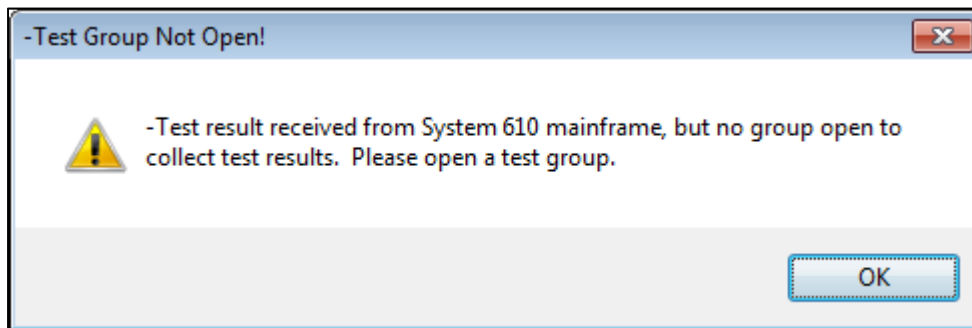


7. After successful log-in, the *Test Groups* window will automatically appear.

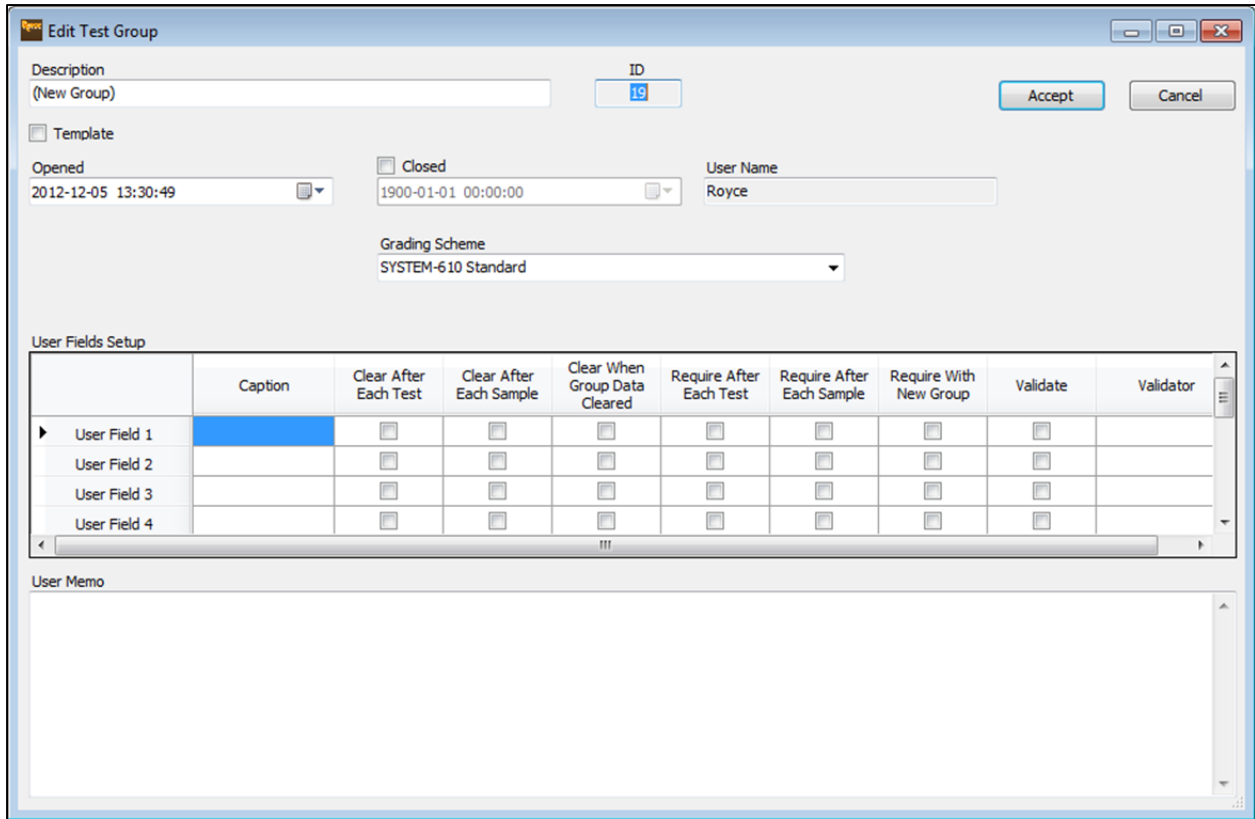


8. In order to collect test results from the System 610 mainframe, it is necessary to open an existing test group or create a new one. Create a new test group by clicking the button **Add New Group**.

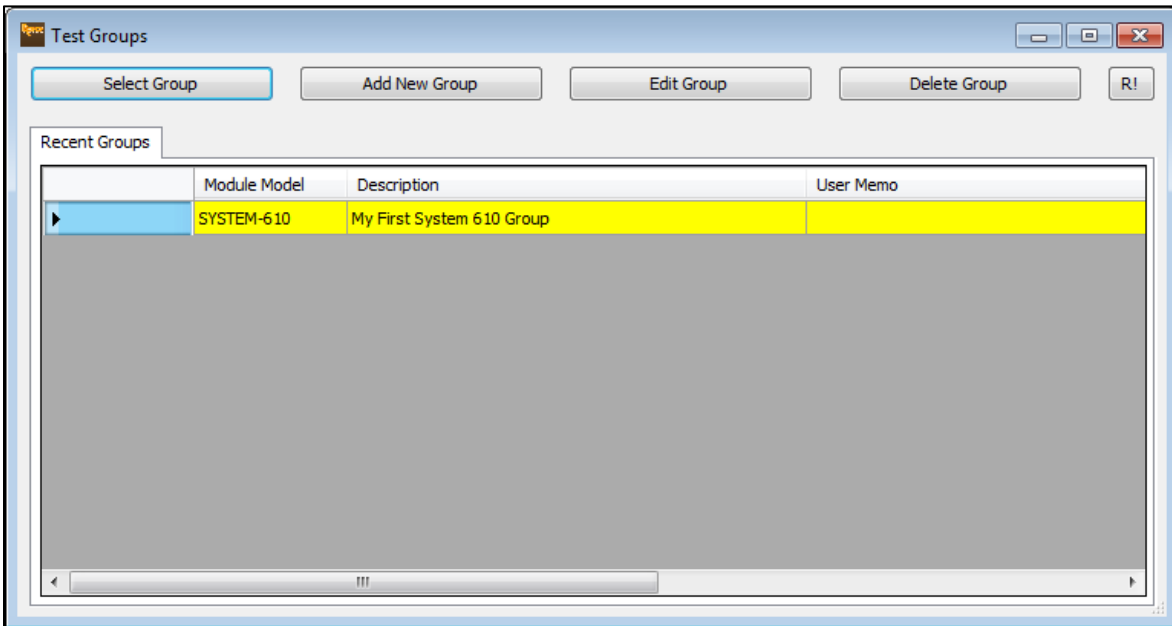
**Note:** If one or more tests are performed on the Mainframe but no test group is opened, the following error message will appear in BTM.



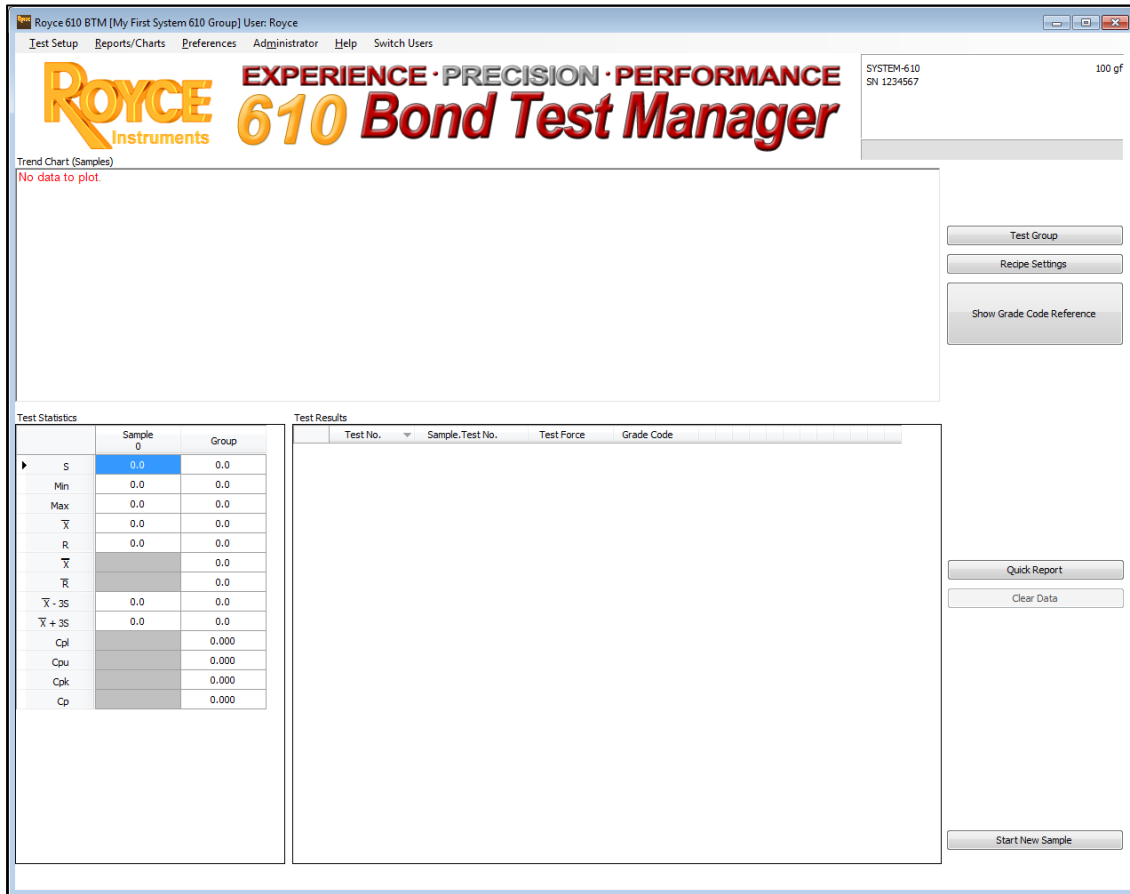
Clicking **Add New Group** will open the *Edit Test Group* screen.



9. In the *Description* field (upper left), enter an appropriate description for this new group, then click **Accept**. The Test Groups window with the new group will appear.
10. Click once on the new test group row (highlighting it in yellow), then click the **Select Group** button.

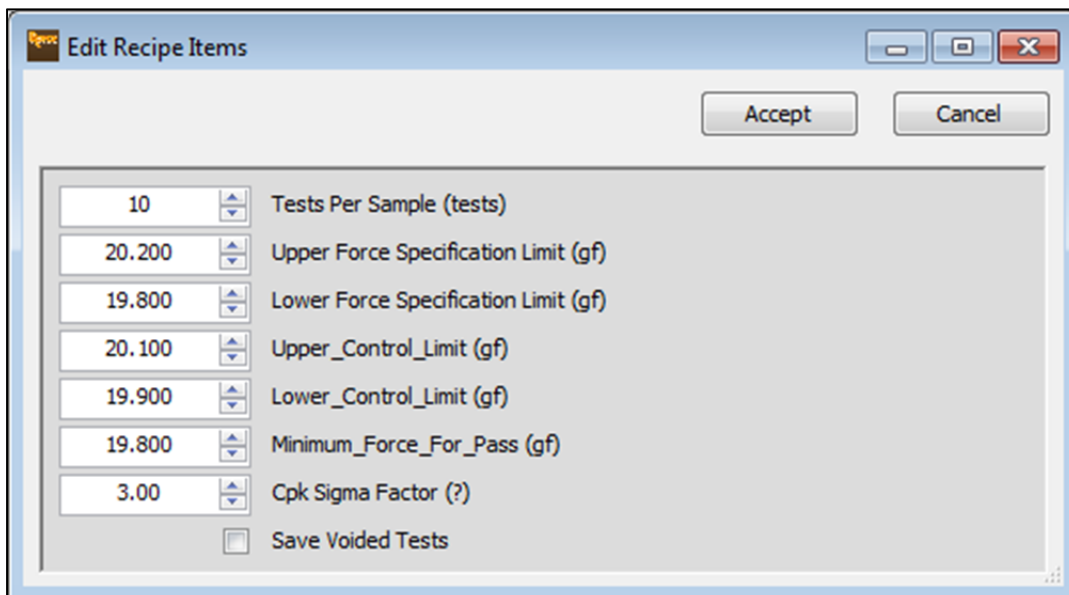


11. The *Test Groups* window will close, revealing the *Main Screen*.



**Note:** The *Test Groups* window can be recalled using the first button in the right column.

12. Click on the **Recipe Settings** button (second button in the right column).



13. Adjust the settings consistent with desired process. The first setting, *Tests Per Sample*, is the most critical as it affects how collected test results are organized into samples within the database. This setting can be changed at any time, but such changes will not be retroactive.

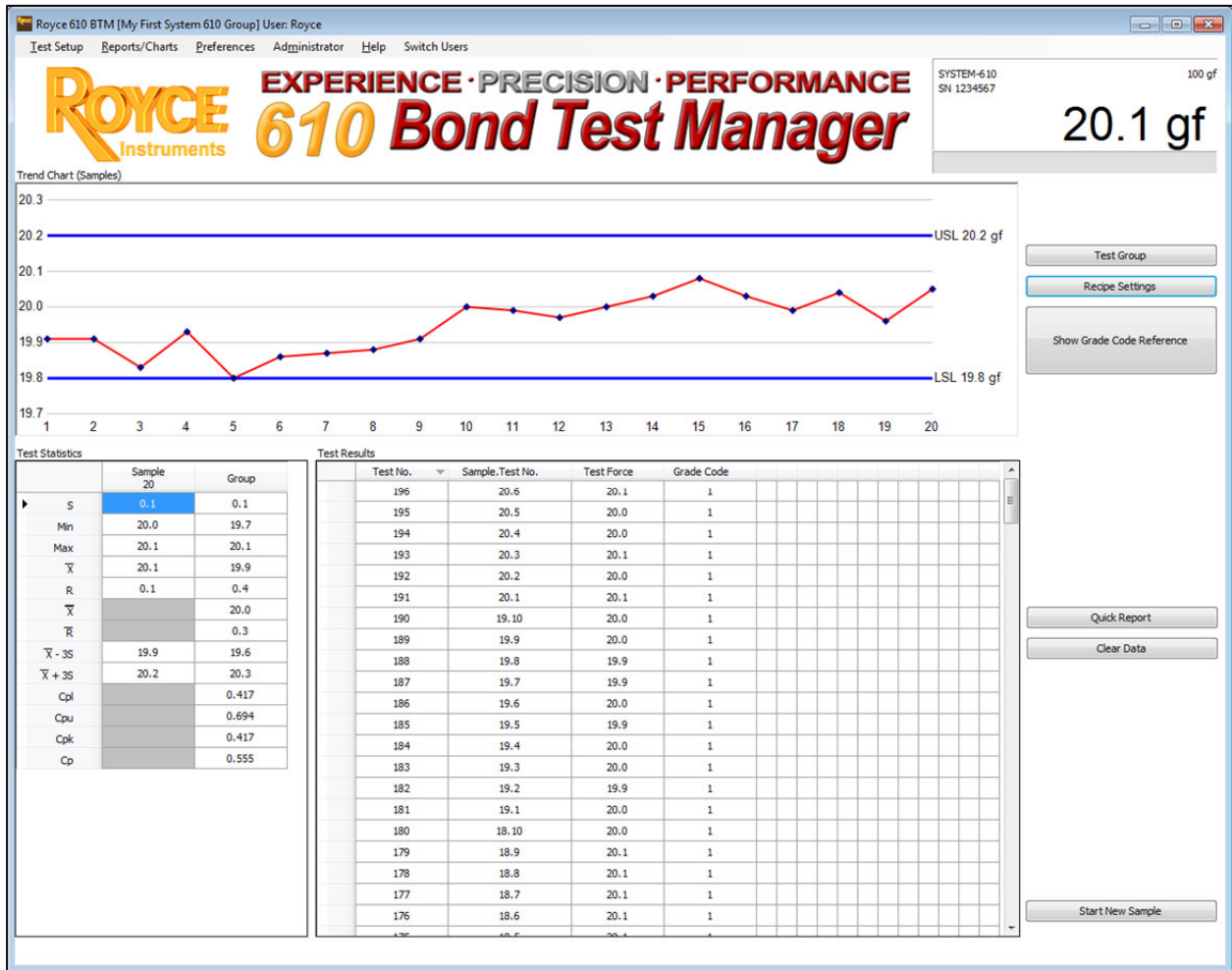
The remaining recipe parameters control statistical calculations and/or limit lines on charts. These settings may be adjusted at any time and will cause relevant statistics and charts to update immediately.

**Note:** Click **Accept** or **Cancel** to close the *Edit Recipe Items* window.

**Note:** BTM can be exited at any time – it is not necessary to explicitly close the group before closing BTM. Recipe data and group data are automatically saved.

# Operation with BTM

On the System 610 Mainframe, perform tests just as you would without Bond Test Manager. Test results are automatically captured to the BTM database, and the *Main Screen Statistics* and *Force Trend* are updated dynamically.



## Fail Codes

**Fail Codes** selected on the Mainframe will appear in the *Grade Code* column in BTM. Using the Mainframe keypad or mouse, the Fail Code of the most-recently-completed test can be revised, and any such revision will automatically update BTM displays as well.

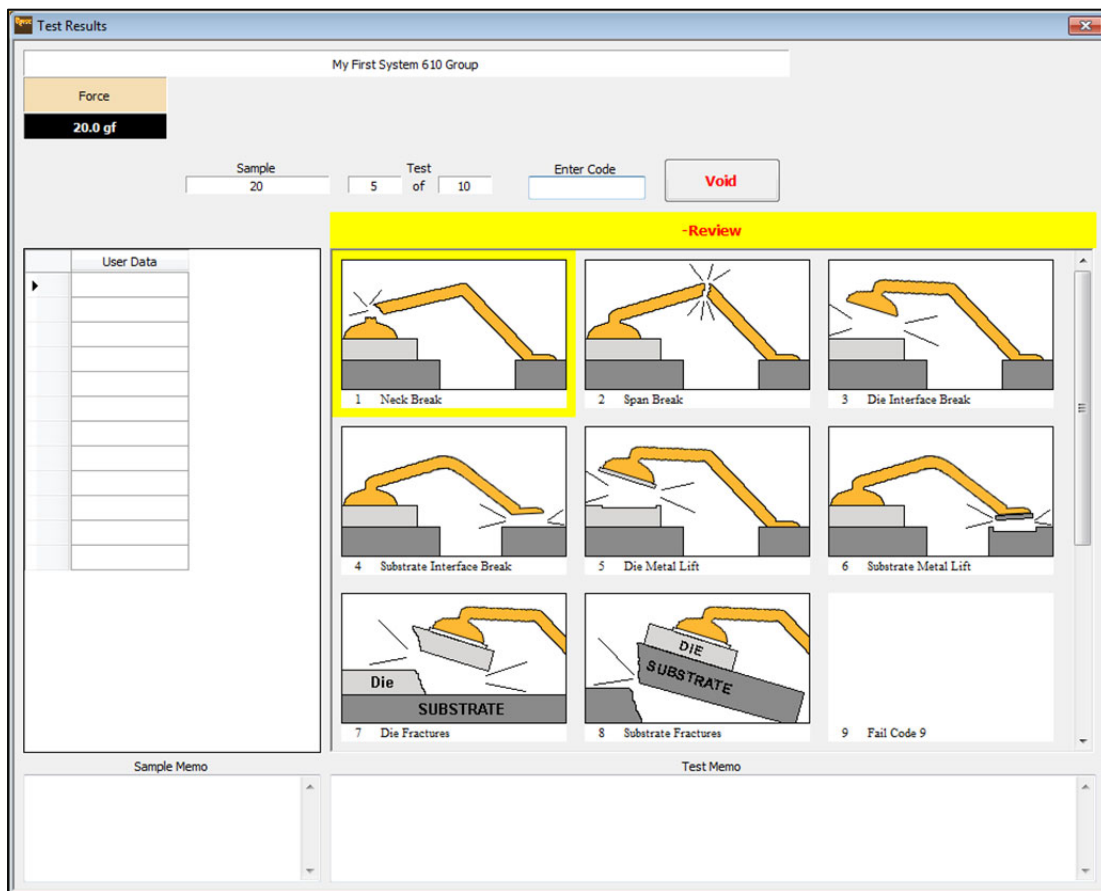
## Grade Codes

Within BTM, the **Grade Code** for any test can be changed at any time.

1. In the *Test Results Data Table*, click on the test row to revise (test 195 in this example).

Test No.	Sample Test No.	Test Force	Grade Code
196	20.6	20.1	1
195	20.5	20.0	1
194	20.4	20.0	1
193	20.3	20.1	1

2. Right-click and choose **Recall Test and Regrade** to launch the *Test Results* window.



3. Clicking a *Grade Code Icon* will close the window and set the corresponding grade code for the recalled test. Alternatively, the test can be voided using the button above the icon matrix.
4. Before choosing a *Grade Code* or *Void*, the **Sample Memo** and **Test Memo** text boxes may be edited to add relevant commentary, and the **User Data** fields may be filled-in.



## User Data

The **User Data** fields are used to capture and record product, bonder, sample, test site or other application-specific data in a consistent manner.

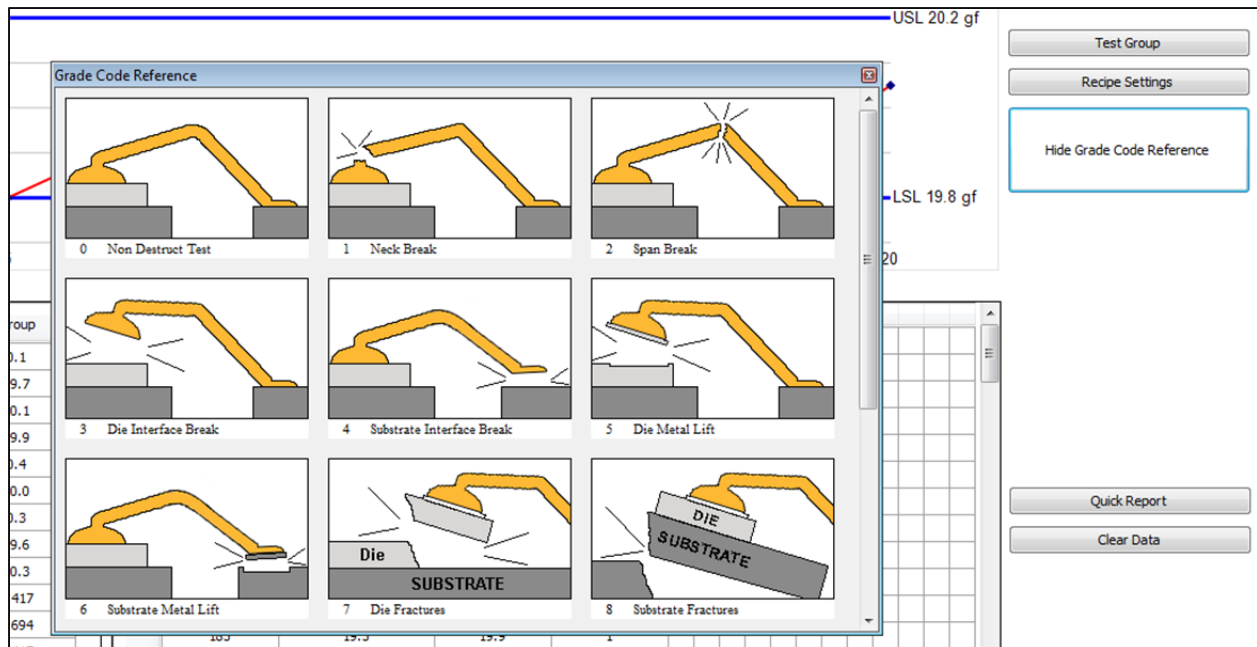
- a. Based on settings in the test group, the *Test Results* window can be forced to pop-up after every test or at the start of every sample and prompt the operator for required field data.
  - b. Field data can be validated to ensure that it matches a user-specified format, which helps to prevent keyboarding errors from being accepted.
  - c. The **Data Query And Export** tool (DQAX) as well as certain **Quick Reports** can be used to access or display test results based on user field data.
5. Clicking the **Die Metal Lift** icon will close the *Test Results* window and revised test 195 to Grade Code 5:

Test No.	Sample.Test No.	Test Force	Grade Code
196	20.6	20.1	1
195	20.5	20.0	5
194	20.4	20.0	1
193	20.3	20.1	1

## Show Grade Code Reference

Clicking the **Show Grade Code Reference** button will display a read-only matrix of the currently available grade codes. While performing and grading tests on the Mainframe, operators can refer to this screen whenever uncertain as to which code to use.

The *Grade Code Reference* screen is automatically hidden whenever the *Test Results* screen is displayed. The screen can be closed using either the Windows **Close** button in the upper-right corner or via the **Hide Grade Code Reference** button on the *Main Screen*.



The **Quick Report** button generates an on-screen report for the test results collected so far, in one of several available formats. In addition, several charts and the *Data Query and Export* tool are available from the *Reports/Charts Menu*.

The **Clear Data** button provides an easy way to delete some or all test results.

# Glossary

<b>Absolute value</b>	For bond test systems, the force applied by weights certified as traceable to NIST and used as standards for calibration.
<b>Accuracy</b>	Deviation from the true or accepted value, or the distance from point to the center of the target.
<b>Destructive test</b>	A bond test that destroys the bond.
<b>Error</b>	The difference between the measured force and the absolute value, for example, the difference between a perfect measurement and one actually made. Factors that can affect the degree of error include temperature, non-compliance, creep and vibration, electrical noise, and operator inconsistencies.
<b>Failure code</b>	An engineer-defined description of a type of bond failure. The code typically describes the location of the bond failure and the way it failed.
<b>Force profile</b>	A graphical representation of the force applied to the bond and the force at which the bond breaks.
<b>NDT</b>	Non-destructive test. A test that does not destroy the bond.
<b>Precision</b>	The degree of freedom from random error, or the degree of cluster in the data points. Also, the smallest increment of force that an instrument can detect and respond to.
<b>Recipe</b>	A set of test parameters defined by the process engineer, includes specifications such as maximum and minimum force applied, force profile, number of test samples, etc.
<b>Repeatability</b>	The degree to which the accuracy of a measurement can be duplicated from test to test.
<b>Resolution</b>	The smallest increment an instrument can display,
<b>Sample</b>	A number of individual bond tests, defined by the process engineer.
<b>Test piece holder</b>	Interchangeable modular tooling which secures samples for all types of bond testing.
<b>Test statistics</b>	A series of mathematical formulas applied to the test results to analyze the behavior of the data.
<b>Trend chart</b>	A graphical representation of the test results spread; it can depict the average peak force for each sample (multiple tests) or the peak force for each test
<b>Wire pull test</b>	Evaluates wire bond strength and quality. An upward force is applied by a pull hook under the wire, pulling the wire away from the die. The pulling force is applied perpendicular to the die surface. The peak force required to break the wire bond is then measured and recorded.



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## **EXPRESS WARRANTY, EXCLUSION AND DISCLAIMER OF UNSTATED WARRANTIES AND LIMITATION OF LIABILITY**

V-TEK Inc (V-TEK) manufactures equipment for the Royce Instruments and V-TEK International brands. The following warranty applies to both product lines.

1. V-TEK warrants for one year from date of receipt by end user that equipment manufactured by V-TEK will be free of defects in workmanship and materials.
2. All integrated products purchased by V-TEK and integrated on to V-TEK equipment shall be covered in accordance with the manufacturer's pass through warranty and limited in costs equal to the amount of the manufacturer's pass through warranty.
3. V-TEK's obligation under this warranty applies only to the original Customer and commences when V-TEK is notified of name, address of Customer, and date of receipt of equipment.
4. During the warranty period, V-TEK will replace any defective non-consumable parts returned for that purpose to the designated V-TEK Replacement Parts Center or at V-TEK's option, refund original cost of equipment.
5. Authorization to return Articles purchased from V-TEK must be obtained by Customer before return shipping commences.
6. Credit may be granted, less an appropriate restocking charge of 15 to 20% of invoice amount, depending on the reason for the return and condition of the Articles.
7. Returns should always be carefully packed in original shipping carton and sent via ground service. V-TEK does not assume any liability for damage incurred during shipment.
8. For the first 30 days that you own your V-TEK product, V-TEK will be responsible for ground shipments to and from V-TEK's facility in Mankato, MN, U.S.A. or its designate. For the remainder of your warranty V-TEK will pay freight for returning your product to you after its repair.
9. Customer shall bear all charges for customs duty fees or freight above the ground rate or for articles returned which are not defective.
10. Collect shipments will not be accepted.
11. Insurance coverage during shipping is the responsibility of the Customer. V-TEK does not assume any liability for damage incurred during shipment.
12. The warranty applies only to normal use of the equipment and shall be void if V-TEK determines that defects in or failures of the equipment were caused by the Customer's negligence including the lack of proper preventative maintenance, misuse or accident or by unauthorized repair, alteration or installation.
13. This Warranty does not extend to consumable items or mechanical parts subject to normal wear.
14. Customer's exclusive remedy for claims against V-TEK shall be the repair or replacement of defective equipment and parts.
15. Any modification to the standard configuration of this equipment as delivered will void the warranty, unless V-TEK personnel make the modification.

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PASS THROUGH WARRANTIES ARE AVAILABLE FROM THE RESPECTIVE MANUFACTURERS.

**SERIAL NUMBER:**

**MODEL:**

**DATE OF MANUFACTURE:**