SureTorque by Mesa Labs

Operator’s Manual
Torqo II+ 1600 Torque Tester
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**Warning:**
The Torqo II+ Model 1600 is not suitable for use in a potentially explosive environment.

**Torqo II+ Model 1600 Materials List:**
aluminum, steel, copper, plastic (PE, PC, PVC), silicon, tin, iron ferrite, ceramic, brass, gold, glass, liquid crystal.
Contains no latex.
Conventions

The following conventions are used in this guide.

**Note:**

Provides additional information related to the current topic.

**Warning:**

Alerts you to a danger that might result from doing or not doing a specific action.

**Caution:**

Suggests precautionary measures to avoid problems.

**Important:**

Reminds you to take specific action relevant to the procedure at hand.

**Tip:**

Tells how to accomplish a procedure with the minimum number of steps.
Chapter 1: Overview

Introduction

Mesa Laboratories, Inc. is an industry leader in the manufacturing of precision torque measuring equipment. Over forty years of experience in the torque-testing field is reflected in every automated system.

Mesa’s commitment to supplying state of the art products has resulted in the development of the Torqo II+ and its patented measuring system.

The Model 1600 Torqo II+ with minimal maintenance will provide the user with years of trouble free service.

What’s Inside

This manual is designed to provide the user with a step-by-step procedure from receipt of the system through operation, maintenance and calibration.
Chapter 2: Torqo Specifications

What’s Inside

This chapter is a list of pertinent specifications for the Model 1600 Torqo II+.

Technical Specifications

<table>
<thead>
<tr>
<th>Testing</th>
<th>Removal, Removal and Incremental, Removal and Bridge, Reverse Ratchet, Close, Strip, ROPP (Roll on Pilfer Proof)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque Modes</td>
<td></td>
</tr>
<tr>
<td>Torque Range</td>
<td>0-200 lbf•in</td>
</tr>
<tr>
<td>Torque Transducer</td>
<td>Strain gauge</td>
</tr>
<tr>
<td>Accuracy</td>
<td>+/- 0.125% FS on 5-20 in-lbs models, +/- 0.5% FS on 30-200 in-lbs models</td>
</tr>
<tr>
<td>Repeatability</td>
<td>+/- 0.2 lbf•in for one set up</td>
</tr>
<tr>
<td>Resolution</td>
<td>Min 0.01 lbf•in</td>
</tr>
<tr>
<td>Maximum Overload</td>
<td>150%</td>
</tr>
<tr>
<td>Speed</td>
<td>1 RPM, CW and CCW (1-8 RPM Multi-Speed Option)</td>
</tr>
<tr>
<td>Modes</td>
<td>Run, Program</td>
</tr>
<tr>
<td>Torque Units</td>
<td>d•Nm, N•m, kg•cm, kg•m, oz•in, lbf•in</td>
</tr>
<tr>
<td>Calibration</td>
<td>Certifiable (NIST)</td>
</tr>
<tr>
<td>Standards</td>
<td>Meets or exceeds NIST, ASTM, FDA, GMP</td>
</tr>
</tbody>
</table>

Electrical

| Control          | Aaeon Touchscreen with Windows 7 Embedded                                                                   |
| Analog Signal    | 16bit/12.5ms conversion                                                                                     |
| Response Time (avg) | <12.5ms                                                                                                       |
| Display          | 8.4” SVGA HMI Touch Panel Computer                                                                           |
| Communication    | RS-232 Cable, USB, Ethernet                                                                                 |
| Real-Time Clock  | 7-year typical battery backup                                                                               |

Utilities

| Air Source       | 80-125 PSI, 5 SCFM (Child Resistant Option)                                                                   |
| Power Source     | 100-240VAC, 2.0A Max, 50-60 Hz                                                                               |
### Environment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Range</td>
<td>32-100°F (0-40°C)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% (non-condensing)</td>
</tr>
<tr>
<td>Mounting</td>
<td>Flat surface or desktop</td>
</tr>
</tbody>
</table>

### Container Sizes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height Range</td>
<td>0.5” to 14.00” (16.00” Max with Tower Riser)</td>
</tr>
<tr>
<td>Diameter Range</td>
<td>0.25” to 6.00”</td>
</tr>
</tbody>
</table>

### Dimensions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>32” x 13.8” x 18” (HxWxD)</td>
</tr>
<tr>
<td>Weight</td>
<td>160 lbs.</td>
</tr>
</tbody>
</table>

### Materials of Construction

<table>
<thead>
<tr>
<th>Component</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tester</td>
<td>aluminum, steel, copper, plastic (PE, PC, PVC), silicon, tin, iron ferrite, ceramic, brass, gold, glass, liquid crystal.</td>
</tr>
<tr>
<td>Tooling</td>
<td>Anodized Aluminum, Nickle Plated Steel, Polyurethane, Acrylic, HDPE, UHMW</td>
</tr>
</tbody>
</table>

### Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Printer</td>
<td>For all torque tester models. Interface: RS-232. Paper dimensions: 57.5, 69.5, or 76.0 mm (W) x 83.0 mm dia. Reliability: MTBF-180,000 hour</td>
</tr>
<tr>
<td>Calibration Kit</td>
<td>ASTM Calibration kit in protective case with weights and pulleys</td>
</tr>
<tr>
<td>Gold Bottle</td>
<td>For daily “Quick Check” of calibration, 0-20 lbf•in range.</td>
</tr>
<tr>
<td>Moisture Resistant Cover</td>
<td>Plastic cover to protect against moisture during washdown</td>
</tr>
<tr>
<td>Torqo Graph-It</td>
<td>Reporting features, test reports, torqo graph-it, history, and program features</td>
</tr>
</tbody>
</table>
Chapter 3: Unpacking and Inspection

What’s Inside

This chapter provides the user with a guide to ensure that the Torqo is received in proper condition and that all necessary components have been located.

Unpacking and Inspection

Your Torque meter was carefully inspected, both electrically and mechanically before shipment. Upon receiving this system, carefully unpack all items from the shipping container and check for any signs of damage that may have occurred during shipment.

Immediately report any shipping damage to the shipping agent.

Retain and use the original packing materials in case reshipment is necessary.
Checklist for Items supplied with the system

The following items are shipped with all Torqo’s.

- **Input power cable**

- **External Universal Power Supply**

- **Program / Run keys**

- **Operator’s manual**

When calibration equipment is purchased with the system, the certificates of calibration for the beam and weights are included behind the front cover of the manual.

A Certificate of Calibration for your new Torqo II+ is included behind the front cover of the manual.
Chapter 4: System Power Up

What’s Inside

This chapter contains the required information for powering up the Model 1600 Torqo II+.

Powering the Torqo II+

The system is energized by first inserting the external power supply into the receptacle marked DC INPUT, on the rear panel of the tower and then plugging the input power cable into an AC OUTLET.

Now by actuating the power switch located on the side of the system’s touch panel, the system will be energized and ready for use.

The Torqo II+ is supplied for use with 100 - 240 VAC 50 - 60 HZ. Consult factory or your local sales representative for operation with other voltages.

The use of a surge protector with the Torqo is recommended as a protective measure against electrical noise.
Initial Display After Power-up

The following **Main** menu will appear on the touch screen display whenever the system is turned on.

**Main Menu**

![Main Menu Image]

**LCD Back Light Saving Mode**

The Touch Screen Display will shut down automatically after 30 minutes of inactivity. Just touch the screen to refresh the display.
Powering the Optional Printer

The printer should be powered up in accordance with the manual that is supplied with the printer.

All Mesa supplied printers have been pre-tested with a Torqo for functionality.

A USB interface cable for connecting the printer to the Torqo is supplied when this option is purchased.

This cable should be attached to the printer and then plugged into the connector marked USB on the rear panel of the tower.

**Printer Cable Information**

Printer Cable: USB Connection
Chapter 5: Control Panel Features

What’s Inside

This chapter contains a description of the **Control Panel**, **Key Lock Switch** and **EMS Switch**.

Control Panel Items

The titles that are shown on the picture below will be used throughout this manual.

TOUCH SCREEN DISPLAY

![Control Panel Diagram]

KEY LOCK

EMS SWITCH
**Touch Screen Display**

The Touch Screen Display is the primary communication link between the user and the system. Just touch an on-screen button and the selection is made.

**Key Lock**

The key-lock feature provides for two modes of operation.

The Run mode prevents the operator from making any un-authorized changes to the Test Profiles.

The Program mode enables the user to create Test Profiles and perform system calibrations.

All of these features will be described in the following chapters of this manual.

**Emergency Motor Stop Switch**

The Emergency Motor Stop Switch will turn the drive motor off when depressed.

It does not turn the power to the system off. Release it with 1/4 turn clockwise.
Chapter 6: Bottle and Cap Tooling

What’s Inside

This chapter contains the required information for installing and adjusting the tooling that will be used for holding the bottle, gripping the cap and positioning the chuck.

The tooling pictured here may not necessarily be the tooling shipped with your system however the descriptions for installing this tooling are still applicable for most other tooling packages.

Installing Tooling for Holding the Bottle

All Mesa supplied tooling packages are designed to be mounted on top of the Spindle Cap shown in this picture.

Screws are provided for holding the tooling in place.

Qty 2 x .250-20 x 1” Skt Hd Cap Screws
Wrench size 3/16” Hex.

The Model 1506 Beverage Bottle clamp is secured to the Torqo by carefully centering it on the shaft that protrudes through the spindle cap and then installing and tightening the Cap Screws that are supplied with the clamp.
Model 1624 Quick Clamp Vise is secured to the Torqo by carefully centering it on the shaft that protrudes through the spindle cap and then installing and tightening the Cap Screws that are supplied with the vise.

**Installing Tooling for Gripping the Cap**

All Mesa supplied cap chucks are mounted on the drive shaft by tightening a clamp collar on the top of the chuck.

*Wrench size 5/32” Hex.*

---

**Standard EDM**

**Universal EDM (26mm – 32mm)**

**Yoke Chuck**

**Slide Chuck**

**Universal 4 Post**
About the 1506 Beverage Bottle Clamp

The Model 1506 was designed as a quick acting universal holding device that can be easily adjusted to accommodate many different size bottles. Petaloid bases required are dependent on customer bottle samples.

Specifications

- Max Bottle Diameter: 6.5 inches
- Max Bottle Height: 11.0 inches
- Minimum Bottle Height: 4.0 inches

1506 Beverage Bottle Clamp Nomenclature
Adjusting the 1506 Beverage Bottle Clamp

This clamp is easily adjusted for specific bottle size by following the procedure described below.

**Step 1:**

Loosen the Height Adjusting Knobs and raise the Ring Support to a position greater than the height of the bottle to be tested and slightly tighten one knob. Now place the test sample on the base of the fixture.

**Step 2:**

Now loosen the knob, lower the Ring Support Plate to a position slightly above the sample and slightly tighten to one knob again. Now engage the cap chuck to aid in centering the bottle.
Step 3:

Now with both height adjusting knobs loose, lower the Ring Support Plate until the Rubber Clamp Ring is resting on the bottle. Raise the 2 Clamp Handles so that they are at an angle of approximately 15° off horizontal and then tighten both Knobs.

Step 4:

Push Clamp Handle down to secure a bottle and then raise, to the latched position, for loading the next sample.

The clamping action should not distort the shape of the bottle. If this occurs, loosen the Height Adjusting Knobs and reduce the 15° angle.
About the 1624 Quick Clamp Vise

The Model 1624 Quick Clamp Vise was designed as a universal holding device that can be easily adjusted to accommodate both round and square bottles.

Specifications

- Min Bottle Diameter: .62 inches
- Max Bottle Diameter: 6.0 inches

Pin Positioning Chart

The chart below shows the diameter range for each pin position.

<table>
<thead>
<tr>
<th>Position</th>
<th>Min. Diameter</th>
<th>Max. Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.62”</td>
<td>1.12”</td>
</tr>
<tr>
<td>2</td>
<td>1.12”</td>
<td>2.00”</td>
</tr>
<tr>
<td>3</td>
<td>2.00”</td>
<td>3.00”</td>
</tr>
<tr>
<td>4</td>
<td>3.00”</td>
<td>4.00”</td>
</tr>
<tr>
<td>5</td>
<td>4.00”</td>
<td>5.00”</td>
</tr>
<tr>
<td>6</td>
<td>5.00”</td>
<td>6.00”</td>
</tr>
</tbody>
</table>
Adjusting the 1624 Quick Clamp Vise

When pins are used for clamping the test sample, the vise should be tightened just enough to hold the bottle but not so tight as to distort the shape of the bottle.

By noting the position of the handle crank and returning to this position when changing samples, the user can rapidly load and unload the vise.

About the Chuck Height Adjuster

The **Height Adjuster** was designed to position the cap chuck at a convenient height for loading and unloading test samples while providing for the minimum amount of vertical chuck motion for the operator.
Positioning the Chuck with the Height Adjuster

Loosen the Height Adjuster Thumb Screw and position the cap chuck approximately 1” above the bottle cap when using the 1506 beverage clamp or 1” above the position that allows the test bottle to be loaded into the 1624 vise or other tooling systems.

See picture below:

Now between tests just lift the cap chuck and the magnetic height adjuster will hold it in position.
Chapter 7: Quick Start

What’s Inside

This chapter contains a step-by-step procedure to help the user become familiar with the basic operation of the Torqo II+ when the key is in Run Mode.

Selecting a Test Profile

From the Main Menu press the button labeled Select Test Profile.

On the Select Test to Run menu select Mesa Removal to highlight that test name. Press the Select button at the bottom center to select the test.

Select Test Profile Menu

The software will then advance to the Operation Screen.
Operation and Graphic Display Screen

Observe the Torque display in the center of the screen.

It must read Zero before commencing a test.

Operations Screen

Zeroing the Display

If the display does not read zero, press the Zero Key before proceeding with the sample test sequence.

The display must never be zeroed when the cap chuck is connected to a bottle in the holding fixture. This action can result in an offset that will affect the measurements.
Performing a Test

Now load the bottle to be tested into the holding fixture and clamp the bottle in accordance with the procedure described in the Bottle and Cap Tooling section of this manual.

Encage the cap chuck by gently pressing the drive extension rod down until the chuck engages the cap.

Press the **Open Key** to commence the testing process.

Live Display

This screen provides a live display of torque during the test.

During the test, the Stop key can be pressed at any time to immediately halt the test.
Observe the graph. The torque will increase until the system detects that the cap has released and then the drive will reverse and re-apply the cap to a preset torque value.

The re-application is normally set by the user and the procedure for setting it is described in the section of this manual titled Setting the Re-application Torque.

The Re-application Torque used in this Test Profile (MESA REMOVAL TEST) is set by default.

The chart below shows the default values for the different size Torqo’s.

<table>
<thead>
<tr>
<th>Model #</th>
<th>Max Torque (in-lbs)</th>
<th>Application Torque (25%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600-05</td>
<td>5</td>
<td>1.25</td>
</tr>
<tr>
<td>1600-10</td>
<td>10</td>
<td>2.50</td>
</tr>
<tr>
<td>1600-20</td>
<td>20</td>
<td>5.00</td>
</tr>
<tr>
<td>1600-30</td>
<td>30</td>
<td>7.50</td>
</tr>
<tr>
<td>1600-40</td>
<td>40</td>
<td>10.00</td>
</tr>
<tr>
<td>1600-50</td>
<td>50</td>
<td>12.50</td>
</tr>
<tr>
<td>1600-100</td>
<td>100</td>
<td>25.00</td>
</tr>
<tr>
<td>1600-200</td>
<td>200</td>
<td>50.00</td>
</tr>
</tbody>
</table>

After the cap has been re-applied and the drive has relaxed to zero, both the removal torque and the re-application torque will be displayed in the Testing Complete Screen.
End of Test Display

This screen displays the test results at the end of a test sequence with Auto Save disabled. Please note this screen will complete and save the data automatically with Auto Save enabled in the System Options menu.

Testing - Complete Screen

![Image of test screen with SAVE and CLEAR buttons, and data readings]

Before another test can be started with Auto-Save disabled, the results of the last test must either be marked as discarded by pressing **Clear** or saved in as a valid test by pressing **Save**.

**SAVE**

For this Quick Start example press **Save** and this will save the data in memory for Viewing or Printing in the next step.
The software will now return to the Operations Screen. A graph of the torque measured during the test as well as the precise removal and re-application values will be displayed.

**Operations Screen**

Now press **View / Print** this will produce a menu for displaying and outputting the data that is stored in memory.

**View Print Options Screen**

A typical end of test report is shown.

The options that are available on this menu will be described in the section of this manual titled **Viewing and Printing Test Results**.
Just like 1, 2, 3, the Torqo II+ has performed the selected test and the results have been saved.

1. A Test Profile was selected
   (The **Mesa Removal Test** was pressed.)

2. A test was performed.
   (The **Open** key was pressed.)

3. The test results were displayed and saved.
   (The **Save** key was pressed.)
Chapter 8: Understanding the Run Mode

What’s Inside

This chapter contains a description of the menus and features that are available in the Run Mode.

Run Mode

The purpose of the Run Mode is to prevent the operator from making changes to the Test Profiles that have been created by an authorized person.

The Key on the control panel selects this mode.

Now from the Select Test Profile screen shown below, the user may select a test or go to the main menu.

Select Test Profile Screen

In the Quick Start chapter of this manual, a Test profile is selected, and a test is performed.

Here we will select Main Menu and detail the features that are provided by the Torqo II+ in this mode.
Main Menu - Run Mode

Select Main Menu on the Select Test Profile Screen to advance to the Main Menu Screen.

Those features that can only be accessed in the Program Mode will appear on this screen in a grayed-out state.

Main Menu - Run Mode

In the Run Mode, the user can choose to Select a Test Profile, obtain the Torqo System Information, or advance to the Calibration Menu.
Calibration in the Run Mode

When Calibration is selected the software will advance to the following menu.

**Main Calibration Screen**

At the top of each calibration feature, the date that it was last performed is displayed. The system keeps a log of all calibration activities including the date the action was done, the user name and what kind of calibration action happened. Press the View Calibration Log button to see the calibration log.

Use the horizontal and vertical scroll bars to view all the columns and entries in the calibration log.

The calibration log data may be exported by pressing the Export Data button. The export will take place using the settings in the Export Format and Export Options button in the System Options menu.

The calibration log may not be printed because it is too wide for the Torqo printer.
In the run mode, User Calibration can be protected from unauthorized entry by a password. This feature is enabled and disabled in the Systems Options Menu.

When enabled, selecting User Calibration will display the Password Input Screen.

**Password Input Screen**

The password must be entered precisely as it was first entered in the System Options Password entry.

When entering a password, the case of the text is not ignored.

All three of the Calibration Features shown on the Main Calibration Screen have their own section in this manual.
Chapter 9: Understanding the Program Mode

What’s Inside

This chapter contains a description of the menus and features that are available in the Program Mode.

Program Mode

The Program Mode enables the user to Create Test Profiles that will test in accordance with the requirements of any given application.

The Keylock switch on the Control Panel selects this mode. Set it to the Program setting.

Now from the Select Test Profile screen shown below, the user may select a test or go to the main menu.

Select Test Profile Screen
Main Menu - Program Mode

Select Main Menu on the Select Test Profile Screen to advance to the Main Menu Screen.

The features that were grayed out before, in the Run Mode, will now be accessible.

Main Menu Screen

![Main Menu Screen Image]

System Information

This is an information screen that provides the user with all the pertinent facts about the system.
System Information Screen

This information may be required when ordering accessories and other spare parts.

System Options

The system options are all the program features that control the details of the Torqo operation. They will normally be selected once, when the system is installed, and seldom changed again.

System Options Screen - Page 1
Some of the system option keys will just toggle from one selection to another while other keys will display a menu.

Pressing the Units key will toggle the selection from lb-in to Kgcm to Nm. The default selection is lb-in.

Pressing the Decimal place key will display the following menu. This controls the appearance of test results on-screen and in the results printouts.

**Enter Number of Decimal Places**

Pressing the Standard Deviation key will toggle the selection from N-1 to N for the calculation (\(\bar{X}\)). The default selection is N-1.
Standard Deviation Formula

The formula contains the mean value ($\mu$) and the standard deviation (of the measured values ($x_i$) for $n$ points.

$$
\sigma_x = \sqrt{\frac{1}{n} \sum_{i=0}^{n-1} (x_i - \mu)^2}
$$

where $\mu = \frac{1}{n} \sum_{i=0}^{n-1} x_i$, and $n$ is the number of elements in X.

**Auto-Save Data**

Pressing the Auto-Save Key will toggle the selection from Disabled to Enabled. The default selection is Disabled.

**Auto Transmit to PC**

Pressing the Auto Transmit Key will display the Data Output to PC menu shown below.

This feature is provided for outputting results to other PC programs for processing data. For more information on this topic see the chapter in this manual titled *Transmitting Data to a PC* and the chapter labelled *Torqo Connectivity*.

**View/Print Defaults**

Pressing the Auto Print Key will toggle the selection from Disabled to Enabled. The default selection is Disabled.

Enabling this prints results for a single test at the end of each test.

Pressing the View/Print Defaults Key will display the Select View / Print Options Menu shown in the chapter titled
Pressing the User Cal Weights button will bring up the menu which allows user calibration points to be selected. Please refer to the Calibration section below for details.

Pressing the Calibration Selection key will toggle the selection between factory and user calibration.

Pressing the Calibration Due Date Options button will bring up the Calibration Due Date menu and allow calibration due dates to be set along with the action to take when calibration is overdue.

Pressing the Password button will cause the Password Input Screen to be displayed. This sets the User Calibration password to whatever phrase is entered. Upper and lower case are used. Set password to blank to disable password use.
Pressing the Delete Data Run Mode button will toggle the selection between Enable and Disable. This controls whether users may delete data with the key switch set to Run.

The Delete Date Options button brings up a menu which allows control of the sample delete and replace options allowed when the key switch is set to Run. See the **Deleting and Replacing Data** section for details.

**System Option Screen - Page 3**

![System Option Screen](image)

The Multi-Test button enables the user to run multiple removal tests on one cap & container without operator intervention. It can be used for life testing a threaded closure.

The Multi-Test Delay button sets the delay in seconds between removal tests when Multi-Test is enabled.
The Location button allows storing a note about this machine’s location within the plant with the test results data.

The Test Record Options button brings up a menu which allows the user to require a lot number or an operator ID for each set of tests.

**Test Record Options Menu**

The Export Format button toggles between the supported export data file formats as described below. These export options are used for all export functions: test data export, historical test data export, and calibration log export.
Supported Export Formats

Data may be exported in one of these formats:

**Excel** - data is exported as tab-separated values, arranged to fit nicely in an Excel spreadsheet. The file extension is .xls and these files may be opened in Microsoft Excel.

**CSV** - data is exported as comma-separated values. This is a text file with commas separating each entry in a line and carriage returns separating each line. The file extension is .csv. These files may be opened with Microsoft Excel and imported into other user-supplied database programs.

**Text** - data is exported as a text file which should appear the same as the short format report shown on the Torqo screen. The file extension is .txt and the files may be opened with Notepad or Word or any text editor.

**XML** - data is exported as an XML database. This is the Torqo native data format and contains the most complete set of data values possible. Users must create their own applications to read, format and report the XML data. The file extension is .xml and the files may be viewed with XML Notepad or Internet Explorer.

The Export Options button opens the Export Options menu which allows the user to configure the file export destination and other options.

See the chapter in this manual titled **Transmitting Data to a PC** and the chapter labeled **Torqo Connectivity** for full information on the Export settings.
The Use Custom Print Logo button enables printing the Mesa logo or a user’s custom monochrome bitmap logo (.bmp format) in the print header of a report printed to the Torqo printer. The disable setting does not print a logo.

The Custom Print Logo File button allows the user to browse to a monochrome bitmap (.bmp format) file which will be printed in the header of reports on the Torqo printer.

The process to add your company’s logo to the Torqo is described briefly here. This process assumes some familiarity with the Windows operating system.

1. Create a monochrome (black and white) bitmap or convert your company’s bitmap to black and white. The size is variable but should be about 64 x 64 pixels or perhaps 96 x 96 pixels maximum. The format is Windows bitmap (.bmp extension).

2. Place the .bmp file on a USB flash drive and plug it into the Torqo.

3. Exit from the Torqo application; from the main menu press the Exit to Windows button (with key switch in Prog) and then OK.
4. Using a pencil eraser or a USB mouse plugged into the Torqo open the Windows Explorer by holding the Start button down in the lower left of the screen, then select Explore.

5. Open the E: drive and copy the bitmap file. This can be done by pressing and holding the screen over the name of the file, when the menu appears select copy.

6. Paste the bitmap file in the folder D:\Torqo\System.

7. Close the Explorer window by clicking the upper right corner red “X”.

8. Start the Torqo application by double clicking the Torqo icon on the desktop.

9. In System Options page 4 click the Custom Print Logo file button and browse to select the bitmap file you just copied into the D:\Torqo\System folder.

   The System Backup button will copy critical Torqo system files to a USB flash drive. Plug in the USB flash drive and click the System Backup button.

   The Autoscale Graph Y Axis button enables an automatic Y axis scaling on the torque graph display when a test is run and on the main results torque graph on the Operations Display after the test completes. When autoscaling is disabled all graphs scale to the maximum range of the unit.

   The Autoscale Graph Y Axis Sensitivity button selects how frequently the Y axis scale changes when Autoscaling is enabled. The setting 5 means the graph Y axis will rescale 5 times from 0 torque to full scale torque.
The Printer Output button does not change the printer settings. It is used mainly to remind users the printer is expected to be USB connected. Serial printing may be configured manually if required but this is not recommended for the Model 1600. Contact Mesa Labs Support if you need serial printing.

**System Option Screen - Page 5**

Capper Head Tracking enabled allows the user to record which capper head a sample is associated with during a Removal test.

Max Capper Heads sets the number of capper heads on the capper which is being tested. This sets the limits on the Prev Head and Next Head buttons.
Capper Head Tracking Mode

A set of controls on the Operations screen shows the current head number and allows the user to select the correct capper head before starting the removal test. The test type must be Removal to use this mode. The capper head will be shown in the Head column in the printed report when the capper head tracking mode is Enabled. The head will be sent as part of the End of Test data when this mode is Enabled.

Operations Screen - Capper Head Mode Enabled

The Auto Backup Test Data button allows the user to disable storing a date and time-stamped backup copy of historical test data whenever the Delete All function is performed. It is recommended to leave this Enabled unless there is a concern about keeping historical test records.

The historical data is automatically backed up to the folder D:\Torqo\BACKUP. A date and time is appended to the name of the profile and used as the file name. The file extension is .xml. An example of a backed-up file name is: D:\Torqo\BACKUP\Mesa Solution Removal_23-Aug-13_16_34_49.xml

Please note the file name data and time formats are not selectable. Dates used are DD-MMM-YY and time is HH_MM_SS.
It is recommended to periodically back up your historical test data to a USB or network drive which is separate from the Torqo touch panel for a long-term archive. See the Test History menu for the Backup Test Data menu.

**Print the System Options**

The print key at the bottom of the System Options Screen enables the user to produce a hard copy of the settings on the Torqo printer.

It is always a good idea to produce a hard copy of the System Option setting and the Test Profile settings.

**Profile Manager**

The Profile Manager portion of the Torqo II+ software is used to create the Test Profiles.

When Profile Manager is selected, a screen similar to the one shown below will be displayed.

In the gray area of the screen, the name and the test parameters for the last selected test profile, will be displayed.
The Profile Manager screen for all Test Types will contain the Action Buttons pictured below.

**Action Buttons - Profile Manager**

![Action Buttons](image)

The profile manager for the removal test has been selected for the following explanations in this manual.

**Profile Manager - Removal Test**

![Profile Manager - Removal Test](image)

**Select Key - Profile Manager**

This key will return the user to the Test Profile selection menu.

**Edit Key - Profile Manager**

This key will enable the user to edit the currently selected Test Profile.
The Two Edit Screens for a Removal Test are shown below.

**Removal Test Setup Screen (Basic View)**

![Removal Test Setup Screen (Basic View)](image_url)

**Removal Test Setup Screen (Advanced View)**

![Removal Test Setup Screen (Advanced View)](image_url)

When a Blue Button is touched, on a Test Setup Screen, the Edit Screen for that feature will be displayed.

The text on an advance screen button will be yellow.

Press the Name key to commence the editing process.
Edit Name Screen

This screen is used to edit the name of the currently selected Test Profile. Test Profiles cannot be saved without a name so if no name is entered the OK button will be disabled.

Press the Low Limit key to commence the editing process.

Edit Low Limit Screen

This screen enables the user to program a Low pass/fail limit.

Press the High Limit key to commence the editing process.

Edit High Limit Screen

This screen enables the user to program a High pass/fail limit.
**Application Torque**

Press the Application key to commence the editing process.

**Edit Application Torque Screen**

This screen enables the user to input a torque value for reapplying the cap at the end of a test.

See section titled **Setting the Re-application Torque**.

**Header / Comment**

Press the Header key to commence the editing process.

**Edit Header / Comment Screen**

This screen enables the user to program Header and a Comment that will appear on the printout of the test results.

**Speed**

Press the Speed key to commence the editing process.

**Edit Speed**

This feature is provided for selecting a test speed when the Multi-Speed Option is purchased.
Press the Peak Detect key to commence the editing process.

**Edit Peak Detect**

This is the distance in degrees that the Torqo will drive after detecting a peak torque value in search of a higher peak.

Press the Min Torque key to commence the editing process.

**Edit Minimum Torque**

This screen enables the user to enter a minimum torque value that must be exceeded for a test to be legitimate.

Press the Extra Travel key to commence the editing process.

**Edit Extra Travel**

This feature enables the user to enter a distance to drive the cap after the removal measurement has been made. This will leave the cap loose for easy removal.
New Key - Profile Manager

This key will enable the user to create a new Test Profile.

The following menu will be displayed when New is selected.

**Select Test Type Menu**

The first step in creating a new Test Profile is to select the Test Type. Once this is done the software will advance to the following screen.

**Enter Profile Name Screen**

Here the user must enter a name and then select OK to advance.

The software will then return to the Profile Manager Screen with the newly entered information and test type displayed.
Delete Key - Profile Manager

The delete key will remove the current Profile and the Data that has been saved.

The following screen will be displayed to confirm this selection before execution.

Delete Profile Screen

![Delete Profile Screen]

When a Test Profile is deleted all data stored with that profile will be deleted.

For more information on deleting data see the chapter in this manual titled **Deleting and Replacing Data**.

Print Key - Profile Manager

Print Key

Set Defaults Button

Set Defaults

The print feature here is used to provide Hard Copy of a Test Profile.

This button can be found in the lower right-hand corner of the Test Profile Manager Screen. When pressed, the software will reset to the factory defaults.
Test Data Viewer

Current and historic test data may be viewed using the Test Data Viewer.

From the Main Menu select the Test Data Viewer button to open the Test History menu.

The Test History menu allows users to review, print, or export current and historical test data by displaying the Torqo XML data in a usable format. Backing up the historical test data to a network PC or a USB flash drive is supported. Deleting all or a percentage of the oldest historical test data is supported with the keyswitch in Prog mode.

Test History Menu

The View Test Data button opens the View/Print Test History menu which allows viewing, exporting or printing current and historic test data. Test data may not be edited.
The Select Data File button opens a browser to allow selecting the current or historical test data XML file to view.

The current test data XML files are stored in the folder D:\Torqo\DATA.

The historical test data XML files are stored in the folder D:\Torqo\BACKUP.

If Auto-Backup is disabled or Delete All Tests was never done, there may not be any files in the BACKUP folder. Enable Auto-Backup in the System Options page 5 to create historical test data whenever Delete All Tests is completed in the View/Print button.

It may be useful to use a pencil eraser or USB mouse to help browse to the desired location using the touch panel PC.

The Data Filter button selects which tests to view in the report.
**Selections are:**

**View Active Records** which shows only completed tests.

**View Active & Replaced** which shows completed tests and tests whose results were later replaced by later tests using the Replace Sample function in the View/Print button.

**View All Records** which shows completed tests, replaced tests, stopped tests, tests with errors, and deleted test records.

This button toggles between Short and Long reports. The Long report may be viewed using the horizontal scroll bar. Only the Short report may be printed on the Torqo printer.

The Export Data button uses the settings in the System Options menu for Export Format and Export Options to export the test data being viewed. A message will be shown giving the export status once the export is completed. Note the location of the exported file from the message for later retrieval of the exported data.

**Export Data Results Message Example**

![Export Data Results Example](image)

Please note the date and time of the export was appended to the profile name to form the exported data file name. In this example the profile name was Mesa Solution Removal and the export data was 26-Nov-2013 and the export time was 16:12:37.
Chapter 10: Test Types and Their Menus

What’s Inside

This chapter contains a description of the Torqo II+ test types and the menus that are used to select and program them.

Test Types

The Torqo II+ was designed to perform 7 basic tests as shown below in the Select Test Type Menu.

Select Test Type Menu

- Removal
- Reverse Ratchet
- Removal and Incremental
- Close
- Removal and Bridge
- Strip
- ROPP (Roll On Piller Proof)
- Copy Profile
- Cancel
Removal Test

This Test is used to measure the Removal Torque on conventional threaded bottles and caps.

Rotating the cap in the counter-clockwise direction until the cap releases performs the test.

Removal and Incremental

This Test is used to measure the removal torque as well as the Incremental Torque in a single test cycle.

Rotating the cap in the counter-clockwise direction until the cap releases and then re-applying the cap to a position that is 6 degrees past the initial starting position performs this test.

Removal and Bridge

This Test is used to measure the removal torque as well as the Bridge Torque in a single test cycle.

Rotating the cap in the counter-clockwise direction until the cap releases and then continuing to drive until the Bridges on the tamper evident bands break performs this test.

Reverse Ratchet

This Test is used to measure the torque required to rotate a child resistant closure in the free running state. (i.e. No vertical down force)

This test is performed by rotating a child resistant cap in the counter-clockwise direction for 1 complete revolution while looking for and storing the highest measured torque value.
**Close**

This Selection enables the system to be used as a capping device. When used in this mode the actual closing value can be saved and outputted.

**Strip**

This Test is designed to measure the torque required to strip the threads.

Rotating the cap in the clockwise direction until the threads yield performs the test.

**Copy Profile**

This feature is provided on the select test screen as a method of duplicating a test that has features that are close to the desired features for a new test.

**ROPP (Roll on Pilfer Proof)**

The ROPP test is designed to measure the following attributes:

1. Performs a removal test (1st Peak Torque)
2. Once the removal is performed the unit will drive the cap until the bands break (2nd Peak Torque)
3. Finally, the unit will drive the cap until it completely strips (3rd Peak Torque)
Removal Test Menus

After selecting Removal Test and inputting a name, the following menu will be displayed.

Removal Test Menu

The default settings for a Removal Test will be displayed.

Selecting Edit will enable the user to change the default settings to meet the requirements of the application.

Removal Edit Menu
Removal and Incremental Test Menus

After selecting Removal and Incremental Test and inputting a name, the following menu will be displayed.

**Removal and Incremental Test Menu**

The default settings for a Removal and Incremental Test will be displayed.

Selecting Edit will enable the user to change the default settings to meet the requirements of the application.

**Removal and Incremental Edit Menu**

The default settings for a Removal and Incremental Test will be displayed.
Removal and Bridge Test Menus

After selecting Removal and Bridge Test and inputting a name, the following menu will be displayed.

**Removal and Bridge Test Menu**

```
Removal and Bridge Test

Test Type: Removal & Bridge Test

REMOVAL OPTIONS
- Low Limit: 0.00 lb-in
- High Limit: 10.00 lb-in
- Speed: 1.0 RPM
- Peak Detect: 5 deg
- Minimum Torque: 2.0%

BRIDGE OPTIONS
- Low Limit: 0.00 lb-in
- High Limit: 10.00 lb-in
- Distance: 0.00 deg
- Header:
```

The default settings for a Removal and Bridge Test will be displayed.

Selecting Edit will enable the user to change the default settings to meet the requirements of the application.

**Removal and Bridge Edit Menu**

```
Removal and Bridge Test (Advanced)

Name: Removal and Bridge Test

Removal Options
- Low Limit: 0.00 lb-in
- High Limit: 10.00 lb-in
- Speed: 1.0 rpm
- Peak Detect: 5.0 deg
- Minimum Torque: 2.0%

Bridge Options
- Low Limit: 0.00 lb-in
- High Limit: 10.00 lb-in
- Distance: 1.0 deg
- Header / Comment:
```

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Reverse Ratchet Test Menus

After selecting Reverse Ratchet Bridge Test and inputting a name, the following menu will be displayed.

**Reverse Ratchet Test Menu**

![Reverse Ratchet Test Menu](image)

The default settings for a Reverse Ratchet Test will be displayed.

Selecting Edit will enable the user to change the default settings to meet the requirements of the application.

**Reverse Ratchet Edit Menu**

![Reverse Ratchet Edit Menu](image)
Close TestMenus

After selecting Close Test and inputting a name, the following menu will be displayed.

Close Test Menu

The default settings for a Close Test will be displayed.

Selecting Edit will enable the user to change the default settings to meet the requirements of the application.

Close Edit Menu
The operations screen for a Close test and a Strip test is different than the operations screen for all of the removal type tests.

On the Close Operation Screen shown below the Open feature has been removed to prevent the operator from accidentally selecting the wrong direction of rotation.

![Close Operations Screen](image-url)
Strip Test Menus

After selecting Strip Test and inputting a name, the following menu will be displayed.

Strip Test Menu

The default settings for a Strip Test will be displayed.

Selecting Edit will enable the user to change the default settings to meet the requirements of the application.

Strip Edit Menu
Roll on Pilfer Proof (ROPP) Test Menus

After selecting ROPP Test and inputting a name, the following menu will be displayed.

The default settings for a ROPP Test will be displayed.

Selecting Edit will enable the user to change the default settings to meet the requirements of the application.
Roll on Pilfer Proof (ROPP) Edit Menus

ROPP TEST SETUP

Removal Options
- Low Limit: 0.00 Ncm
- High Limit: 451.9 Ncm
- Minimum Torque: 2.0 %
- Peak Detect: 10 deg
- Speed: 1.0 RPM

Bridge Options
- Low Limit: 0.00 Ncm
- High Limit: 451.9 Ncm
- Distance: 270 deg
- Initial Speed: 1.0 RPM
- Change Speed @: 50 %
- Break Speed: 1.0 RPM

ROPP TEST SETUP

Strip Options
- Low Limit: 0.00 Ncm
- High Limit: 451.9 Ncm
- Peak Detect: 20 deg
- Cutoff Torque: 451.9 Ncm
- Speed: 1.0 RPM
- Slow Down @: 75 %

Close Options
- Application Torque: 112.9 Ncm
- Speed: 1.0 RPM
- Slow Down @: 100 %
Chapter 11: Application Torque Test

What’s Inside

This chapter describes in detail the Application Torque Test.

Test Description

This test is designed to measure the torque that a cap was applied to.

To make this measurement the system will rotate the cap in the clockwise (closing) direction until the cap begins to rotate. The point at which the cap begins to rotate will be considered the application torque and will be displayed on the screen.

Test Theory

In order to determine the point at which the cap begins to rotate, the software continuously computes the slope of the torque vs. position data and when this slope changes the software stores the torque value as the application torque.

See following data.

The above graph can be produced with the Torqo Graph-It software program and a PC.
Chapter 12: Programming an Application Test

What’s Inside

This chapter contains a step-by-step procedure for selecting and programming an Application Test.

Selecting The Test

The Select Test to Run screen is displayed on power up and when a program has been created for measuring the application torque it can be selected here and then run.

When a program does not exist select Main Menu button.

Programming the Test

On the Main Menu Screen select Profile Manager.
On the Test Profile Manager Screen select New.

On the Select Test Type Menu select Close.

On the keyboard enter a Name for the new test. Then press OK. This will advance the program to the Close Test Setup menu.

On the Close Test Setup screen, select the mode key. This will advance the software to the following screen for programming the test features.
Close Test Setup Screen for the Application Test

This screen is used to select and program the features of the test.

This key function like an alternate action switch.

When the Mode key was selected, the test type changed from Close to Measure.

**Cutoff Torque**

Is the maximum torque that will be applied when searching for the application torque.

This value must be greater than the high pass/fail limit.

This button will display the Cutoff Torque input screen.
Observe the minimum and maximum values.

To input a value, **Press Clear Entry** first, and then key in the desired value.

Then press OK to save the new value.

**Measure Sensitivity**

This key function like a three-way switch.

The Measure Sensitivity Button will step through the possible settings.

The sensitivity level enables the software to detect the application torque with varying degrees of slope due to the friction of the materials in the test sample.

The default Sensitivity setting is Medium, and this will work in most cases.
Inputting Pass / Fail Limits

Pass-fail limits can be inputted for all torque values that are measured and displayed at the conclusion of a test.

**Low Limit**

The Low Limit Button will display the input screen for the low pass / fail torque value.

**Observe the minimum and maximum values.**

To input a value, **Press Clear Entry** first, and then key in the desired value.

Then press OK to save the new value.

**High Limit**

The High Limit Button will display the input screen for the low pass / fail torque value.

**Observe the minimum and maximum values.**

To input a value, **Press Clear Entry** first, and then key in the desired value.

Then press OK to save the new value.
Inputting Header and Comment Information

The header that appears at the top of the print test results report can be customized for each test profile.

A customized comment for each test profile can also be included in the printed results.

The Header / Comment Button will display the Edit Profile Header and Comment Menu.

When either the Header or Comment Button is selected the appropriate Keyboard will be displayed.
Chapter 13: Performing an Application Test

What’s Inside

This chapter contains a step-by-step procedure for performing an Application Test.

Selecting The Test

The Select Test to Run screen is displayed on power up and when the Select Test Profile button on the Profile Manager screen is selected.

Now select the desired test and the software will advance to the Main Run Screen.

Observe the live Torque Display in the top center of the touch panel.

This display should read zero when the chuck is not engaged with the cap.
If the display does not read zero press the Zero Button.

When the Zero Button is pressed the following warning, screen will be displayed.

This precaution is emphasized to prevent the user from putting a torque offset in the system that will affect all subsequent readings.

If the chuck is not engaged press Zero to continue.

Now install the sample to be tested into the tooling, engage the chuck and press the Close button on the screen.

When the Close button is pressed the software will commence the testing process and the following screen will be displayed.

**Test in Process Screen**

During the test, the torque will be displayed graphically and at the conclusion of the test the application torque will be displayed, and a pass / fail indication will appear.
Chapter 14: Understanding the Operation Screen

What’s Inside

This chapter contains a description of the features that are available on the Operation Screen.

Operation Screen Features

The operation screen will be displayed after a test profile has been selected and after a test has been performed.

Operations Screen

At the top of the screen, the name of the currently selected test profile will be displayed.
Beneath the title block, the start test button for Open and Close can be found on either side of the live torque display.

![Start Test Button](image)

The next row of features contains the end of test removal torque display, a Pass/Fail Indicator and the re-application torque display.

![End Test Removal and Re-Application](image)

The bottom left portion of the screen contains a graphic display of the actual test.

![Graphic Display](image)

The remaining features can be found to the right of the graphic display.
This key is used to zero the display before testing.

This key is used to view the test results in memory before printing.

This key will return the software to the Test Profile Menu.

This indicator displays the number of samples in memory.
Chapter 15: Creating a New Test Profile

What’s Inside

This chapter contains a step-by-step procedure for creating a new test profile.

Creating a New Profile for a Removal Test

The Control Panel Key must be in the Program position to perform the following steps.

On the Main Menu Screen select Profile Manager.

The Tests Profile Manager screen will now display the last selected test type.

Now on this screen select New.
On the Select Test Type screen select Removal.

On the Enter Profile Name screen type the desired name and then select OK.

The Tests Profile Manager screen will now display the selected test type.

Now review the selected test features and edit if required.

A new test profile, with a new name, has been created.
Chapter 16: Setting the Re-application Torque

What’s Inside

This chapter contains a description of the procedure for programming a re-application Torque.

Entering a Torque

The following procedure will enable the user to enter a re-application torque. The Re-application feature is only used in a Removal Test Type.

In the Select Test Profile Menu select Main Menu.

The software will then advance to the Main Menu.

On the Main Menu Screen select Profile Manager.
In the Main Menu select Profile Manager.

The software will then advance and display the Test Menu for the currently selected Test Profile.

If the test type in this Test Profile is not a removal test, select another Profile or create a new Profile with a removal test in it. Now select edit.

The software will then advance to the Removal Test Edit menu.

Now select Application Torque.

The software will then advance to the edit application menu.

Key in the desired value and select OK.

The procedure for setting the re-application torque is now complete.
Chapter 17: Viewing and Printing Test Results

What’s Inside

This chapter contains a description of the procedure for customizing the report that can be viewed and printed at the end of a test session.

Customizing the End of Test Report

The defaults for viewing and printing test results are defined in the System Options menu.

The Select View/Print Options screen is reached from the System Options menu by pressing the View/Print Defaults button.
These selections control whether these elements are printed on the test report.

- **Signature**: controls printing approval signature lines.
- **Data**: controls printing test result data.
- **Profile**: controls printing the test profile details.
- **Summary**: controls printing the statistics for the report data.
- **Pass/Fail Text**: controls printing the test result for each test based on the limits set in the test profile.
These selections control the printed date format and time format.

**Date Format**

Date formats will appear as shown in the example on the screen.

**Time Format**

Time formats are 12-hour and 24-hour as shown in the example on the screen.

**Header**

The user may enter the default header and comment printed at the top of the test report using these buttons. Your company name is a good choice for the default header.
These selections control whether the Operator ID, Lot Number, and Calibration Due date are printed at the top of the test report.

Operator ID and Lot Number may be entered by the user using the View/Print button on the Operations screen.
Viewing and Printing the Test Report

On the Operations Screen (shown below) press the View/Print button. The software will now display the View/Print Report Screen.

**Operations Screen**

![Operations Screen](image)

**View / Print Report Screen**

![View / Print Report Screen](image)

The option keys shown to the right of the report enable the user to customize the report prior to printing and export test data to a USB flash drive or a Network folder.
The Print button allows the report to be printed as shown in the preview on the left side of the screen.

The Export Data button will export the data to a USB flash drive plugged into the Torqo or to a file on a Network folder. The export format and destination are set in the System Options page 3 using the Export Format button and Export Options menu.

Once a Lot Number or Operator ID has been entered, it will remain with the test profile until changed or deleted.

Please note that the new Lot Number or Operator ID will apply to all tests in the report regardless of whether they had a previous Lot Number or Operator ID. The firmware assumes all tests in a report are from the same lot and had the same operator. If you wish to start a new lot or use a new operator, print or export the current tests, delete all test data, and start a new test, then enter the new lot number or new operator ID.
The changes made using the Modify Report button, prior to printing, are not stored in memory. They will only be applied to the current printout.

It is recommended to use the System Options settings rather than the Modify Report button at this time.

If enabled in the System Options, the Delete Data button allows the user to delete a single sample, replace a bad sample, or delete all current test data and start a new set of tests.

If none of the Delete Data options are allowed in the System Options, a message will show on the screen when this button is pressed.

For more information on deleting data see the next chapter in this manual titled Deleting and Replacing Data.
Chapter 18: Deleting and Replacing Data

What’s Inside

This chapter contains a description of the procedure for deleting and replacing data that has been saved.

Deleting and replacing data

The allowed Delete and Replace actions are set in the System Options page 2.

Press the Delete Data Options button to bring up the Delete Data Options menu.

Delete Data Options Menu

Delete Sample enabled allows the user to delete a single sample from a test.
Deleted samples are marked as deleted with the time and date of deletion in the test data XML file. Deleted samples are not shown on the printed report. Deleted samples are included in exported data and may be viewed in the Test History Data viewer using the Long report and View All Records filter.

Replace Sample allows the user to replace a single sample from a test with the next new sample from the next test that is run. It is assumed the next test is run immediately, if any other action occurs the sample is not replaced and will remain in the test data.

Delete All enabled allows the user to complete a set of tests, print or export the test results, delete all the samples and start a new test batch using the same test profile.

If Auto-Backup is enabled in System Options, the test data is backed up to the D:\Torqo\BACKUP folder with a date and time-stamp before it is deleted.

If Auto Delete After Print is selected and Delete All is enabled the system will ask the user for confirmation that the print was successful, then if the user clicks OK the system will perform a Delete All including the backup step, if enabled.

Enabling Auto Delete saves keystrokes for the user in normal operation where data is deleted after printing to get the system ready for a new set of test data using the same profile. It is recommended to enable Auto Backup when Auto Delete After Print is used.
Starting the Deletion Process

This process begins by first selecting View / Print on the Operation Screen. The software will then display the report for the data stored in memory for the current test profile.

View / Print Report Screen

On the View / Print Report screen press Delete Data. The software will then advance to the Delete Data Menu.

Buttons on the Delete Data Menu which are greyed out have been disabled in the System Options menu under the Delete Data Options settings.
Delete Data Menu

In the Sample # window, the number of the last saved sample will be displayed.

Pressing Delete Sample now will cause the software to display the following confirmation screen.

Delete Sample # Confirmation Screen

The deletion of the selected sample can be aborted here by selecting Cancel. If OK is selected, Sample #7 will be deleted, and the file will now contain 6 samples.

After a sample is deleted, the software will return the user to the View/Print Report Screen to show the updated report.
Delete a Specific Sample #

The following procedure enables the user to delete a specific sample #.

Press the Sample # key and the Sample Number input screen will be displayed.

Press the Clear Entry key and then enter the number of the sample you wish to delete. Then press OK and once again the confirmation screen will be displayed.

The deletion of the selected sample can be aborted here by selecting Cancel. If OK is selected, Sample #7 will be deleted, and the file will now contain 6 samples.

Once again, the software will return to the View / Print Report screen to show the updated report.
Replacing a Sample

The following procedure enables the user to replace a specific sample #.

Press the Replace Sample # key and then enter the number of the sample you wish to replace. Then press OK and once again, the confirmation screen will be displayed.

The replacement process can be aborted here by selecting Cancel. If OK is selected, the displayed Sample #(7) will be deleted and the software will return to the Operations Screen where a test must be performed in order to complete the replacement process.

If a test is not performed, the replacement process will be canceled.
Deleting All Data

The following procedure will delete all saved data for the current test profile.

Press Delete All and the software will once again display a confirmation screen.

The deletion of all the samples can be aborted here by selecting Cancel.

If OK is selected, all the samples for the current test profile will be deleted.

Once again, the software will return to the View / Print Report screen to show the updated report. This time the report will have no samples as shown since they were just deleted.

Note most buttons are disabled since no data exists to view, print or export. The user may enter the Lot number and Operator ID for the next tests.

View / Print Report with No Samples
Chapter 19: Performing a Life Test

What’s Inside

This chapter contains a description of the procedure for performing a life test on a closure system by removing and re-applying the cap a programmable number of times.

Programming the Test

In the Main Menu select System Option and then press the Multi-Test key to enable this feature.

Now when Open is pressed to start a test, the following screen will appear for inputting the number of repetitions.

After inputting the number of repetitions, the test will commence when OK is pressed.

The time between tests may be set using the Multi-Test Delay (sec) button.
Chapter 20: Gold Bottle Verification

What’s Inside

This chapter describes the Gold Bottle and the procedure for using it to verify the calibration of the Torqo II+.

Gold Bottle Description

The Model 1612 Gold Bottle is used to quickly verify the calibration and operational repeatability of the Model 1600 series Torqo. This bottle is pre-set at the factory to a customer specified torque value.

Each Gold Bottle is labeled with its exact torque rating.

Since the cap torque of this bottle is the torque produced by a permanent magnet assembly, the value will always be the same. Therefore, when tested on the Torqo, the measured value should always repeat unless something has been damaged.

The bottle is normally supplied with the customer’s cap so that the customer’s Torqo Cap Chuck can be used in the testing process.

These Gold Bottles are readily available and their torque can be certified on an annual basis.
Using the Gold Bottle

The following step-by-step procedure will guide the user through the **Gold Bottle Verification** process.

Selecting the Test

On the Main Menu select Calibration.

**Main Menu Screen**

The software will then advance to the main Calibration Menu.

On the Calibration Menu select **Verification with Gold Bottle**.

The software will then advance to the Gold Bottle program screen.
Before running a verification, the user should input the serial number of the Gold Bottle to be tested.

Mesa recommends that a minimum of 5 repetitions be entered when performing a verification.

The default test direction is ccw. (Removal direction)

When Next is selected, the software will advance to the Gold Bottle Zero torque screen.
Now by following the directions on the screen the software will advance to the test screen.

The verification report will automatically be displayed.

**Gold Bottle Verification Report**

<table>
<thead>
<tr>
<th>TORQO</th>
<th>Serial #: 07-9001</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GOLD BOTTLE VERIFICATION</td>
</tr>
<tr>
<td>8.01</td>
<td>1b-in</td>
</tr>
<tr>
<td>8.01</td>
<td>1b-in</td>
</tr>
<tr>
<td>8.01</td>
<td>1b-in</td>
</tr>
<tr>
<td>8.01</td>
<td>1b-in</td>
</tr>
<tr>
<td>8.01</td>
<td>1b-in</td>
</tr>
<tr>
<td>8.01</td>
<td>1b-in</td>
</tr>
<tr>
<td>8.01</td>
<td>1b-in</td>
</tr>
<tr>
<td>8.01</td>
<td>1b-in</td>
</tr>
</tbody>
</table>

The torque reading on the display should now match the value printed on the Gold Bottle Label.

The allowable variation is computed by adding together the tolerance on the bottle and the full-scale tolerance of the Torqo unit.

Selecting View Gold Bottle Verification on the Main Calibration Screen can recall these results.
Chapter 21: System Calibration

What’s Inside

This chapter is intended to acquaint the user with the required Calibration Equipment, the Calibration Verification process, the process for performing a User Calibration and the procedure for Selecting the Calibration to be used.

General Calibration Information

The Torqo is supplied with a factory Calibration that is stored on the disk drive. This is done so that the user will always have a backup calibration when an incorrect user calibration is performed.

Calibration Frequency

Checking the calibration of the Torqo at least twice a year is recommended when the system is used frequently.

Required Calibration Equipment

The following list of equipment is required to perform a Torqo Calibration. When ordering this equipment please provide the Model Number and Serial Number of the machine that the equipment will be used on.

1. Calibration Disc
2. Calibration Fixture
3. Calibration Weight Set
**Calibration Beam**

The calibration beam is a disc with a diameter of precisely 8.000 inches. Each disc is serialized, and the actual diameter is stamped on the bottom. The beam is supplied as an assembly of the following parts.

1. Calibration Disc
2. Calibration Cables

**Calibration Fixture**

The calibration fixture is supplied as an assembly of the following parts.

1. Calibration Bracket
2. Cable Pulleys
3. Retain Rings

**Calibration Weight Set**

The calibration weight set consists of three weights that are selected to provide a torque of 25%, 50% and 75% of the fullscale torque of the Torqo.

See chart below.
Calibration Weight Chart

The required weight in lbs for producing a specific torque can be computed by dividing the desired torque value by 4, since 4 inches is the Radius of the calibration beam.

This chart shows the weights that Mesa Supplies when a calibration kit is purchased. The 100% value is obtained by combining the 25% and 75% weights.

<table>
<thead>
<tr>
<th>Torque Capacity</th>
<th>Calibration Weights (lbs)</th>
<th>5 in-lb</th>
<th>10 in-lb</th>
<th>20 in-lb</th>
<th>30 in-lb</th>
<th>40 in-lb</th>
<th>50 in-lb</th>
<th>100 in-lb</th>
<th>200 in-lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td></td>
<td>.3125</td>
<td>.625</td>
<td>1.250</td>
<td>1.875</td>
<td>2.500</td>
<td>3.125</td>
<td>6.250</td>
<td>12.500</td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td>.6250</td>
<td>1.250</td>
<td>2.500</td>
<td>3.750</td>
<td>5.000</td>
<td>6.250</td>
<td>12.500</td>
<td>25.000</td>
</tr>
<tr>
<td>75%</td>
<td></td>
<td>.9375</td>
<td>1.875</td>
<td>3.750</td>
<td>5.625</td>
<td>7.500</td>
<td>9.375</td>
<td>18.750</td>
<td>37.500</td>
</tr>
<tr>
<td>100%</td>
<td></td>
<td>1.250</td>
<td>2.500</td>
<td>5.000</td>
<td>7.500</td>
<td>10.000</td>
<td>12.500</td>
<td>25.000</td>
<td>50.000</td>
</tr>
</tbody>
</table>

Selecting a Calibration to be Used

When a Torqo is shipped, the factory calibration is Enabled in the System Options Menu.

When a User Calibration is performed, this selection will automatically change from Factory Enabled to User Enabled.
Performing a Calibration Verification

This procedure is used to verify that the Torqo is in calibration and to produce a hard copy of the measured values when a Torqo Printer is connected to the system.

The first step in this procedure is to install the Calibration Fixture on the Torqo.

Installing the Calibration Fixture

The calibration fixture mounts underneath the base of the unit.

To install the fixture, loosen the two 5/16” Socket Head Cap Screws that can be accessed from under the base plate and then insert the fixture under the base plate. Now re-tighten the bolts.

(Wrench Size 1/4” Hex)

Installing the Calibration Beam

The beam is installed by first removing any bottle holding tooling and then carefully placing the beam on top of the spindle cap. Screws are provided for holding the beam in place.

(Qty 2 x .250-20 x 1” Skt Hd Cap Screws) (Wrench size 3/16” Hex)
Starting the Verification Test

On the Main Menu press Calibration

Main Menu Screen

The software will now advance to the main Calibration Screen.

Main Calibration Screen

Select User Verification and the program will advance to the first of Verification Screens.
Now follow the directions as displayed on the screen.

**Verification - Zero Screen**

After the display has been zeroed, the continue key will advance the program to the screen shown below.

**User Verification Test Screen**

The directions on the screen will guide the user through the process of hanging the weights and capturing the readings.
The process begins by hanging a 25% weight on the CW side and ends with a 100% weight on the CCW side.

Upon completion of this procedure, a calibration chart similar to the one pictured below can be printed.

**Calibration Verification Chart**

Now compare the values in the above chart with the theoretical values that can be found in the tables below.

**Calibration Specification Charts**

<table>
<thead>
<tr>
<th>Model 1600-5</th>
<th>(Torque Capacity 5 lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Torque in % Capacity</strong></td>
<td><strong>Torque in lb-in</strong></td>
</tr>
<tr>
<td>25</td>
<td>1.250</td>
</tr>
<tr>
<td>50</td>
<td>2.500</td>
</tr>
<tr>
<td>75</td>
<td>3.750</td>
</tr>
<tr>
<td>100</td>
<td>5.000</td>
</tr>
</tbody>
</table>
### Model 1600-10
(Torque Capacity 10 lb-in)

<table>
<thead>
<tr>
<th>Torque in % Capacity</th>
<th>Torque in lb-in</th>
<th>Accuracy in +/-% FS</th>
<th>Accuracy +/-lb-in</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>2.50</td>
<td>1.25%</td>
<td>.125</td>
</tr>
<tr>
<td>50</td>
<td>5.00</td>
<td>1.25%</td>
<td>.125</td>
</tr>
<tr>
<td>75</td>
<td>7.50</td>
<td>1.25%</td>
<td>.125</td>
</tr>
<tr>
<td>100</td>
<td>10.00</td>
<td>1.25%</td>
<td>.125</td>
</tr>
</tbody>
</table>

### Model 1600-20
(Torque Capacity 20 lb-in)

<table>
<thead>
<tr>
<th>Torque in % Capacity</th>
<th>Torque in lb-in</th>
<th>Accuracy in +/-% FS</th>
<th>Accuracy +/-lb-in</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>5.000</td>
<td>.625%</td>
<td>.125</td>
</tr>
<tr>
<td>50</td>
<td>10.00</td>
<td>.625%</td>
<td>.125</td>
</tr>
<tr>
<td>75</td>
<td>15.00</td>
<td>.625%</td>
<td>.125</td>
</tr>
<tr>
<td>100</td>
<td>20.00</td>
<td>.625%</td>
<td>.125</td>
</tr>
</tbody>
</table>

### Model 1600-30
(Torque Capacity 30 lb-in)

<table>
<thead>
<tr>
<th>Torque in % Capacity</th>
<th>Torque in lb-in</th>
<th>Accuracy in +/-% FS</th>
<th>Accuracy +/-lb-in</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>7.500</td>
<td>.5</td>
<td>.15</td>
</tr>
<tr>
<td>50</td>
<td>15.00</td>
<td>.5</td>
<td>.15</td>
</tr>
<tr>
<td>75</td>
<td>22.50</td>
<td>.5</td>
<td>.15</td>
</tr>
<tr>
<td>100</td>
<td>30.00</td>
<td>.5</td>
<td>.15</td>
</tr>
</tbody>
</table>

### Model 1600-40
(Torque Capacity 40 lb-in)

<table>
<thead>
<tr>
<th>Torque in % Capacity</th>
<th>Torque in lb-in</th>
<th>Accuracy in +/-% FS</th>
<th>Accuracy +/-lb-in</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>10.00</td>
<td>.5</td>
<td>.20</td>
</tr>
<tr>
<td>50</td>
<td>20.00</td>
<td>.5</td>
<td>.20</td>
</tr>
<tr>
<td>75</td>
<td>30.00</td>
<td>.5</td>
<td>.20</td>
</tr>
<tr>
<td>100</td>
<td>40.00</td>
<td>.5</td>
<td>.20</td>
</tr>
</tbody>
</table>
### Model 1600-50
(Torque Capacity 50 lb-in)

<table>
<thead>
<tr>
<th>Torque in % Capacity</th>
<th>Torque in lb-in</th>
<th>Accuracy in +/-% FS</th>
<th>Accuracy +/-lb-in</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>12.50</td>
<td>.5</td>
<td>.25</td>
</tr>
<tr>
<td>50</td>
<td>25.00</td>
<td>.5</td>
<td>.25</td>
</tr>
<tr>
<td>75</td>
<td>37.50</td>
<td>.5</td>
<td>.25</td>
</tr>
<tr>
<td>100</td>
<td>50.00</td>
<td>.5</td>
<td>.25</td>
</tr>
</tbody>
</table>

### Model 1600-100
(Torque Capacity 100 lb-in)

<table>
<thead>
<tr>
<th>Torque in % Capacity</th>
<th>Torque in lb-in</th>
<th>Accuracy in +/-% FS</th>
<th>Accuracy +/-lb-in</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>25.0</td>
<td>.5</td>
<td>.5</td>
</tr>
<tr>
<td>50</td>
<td>50.0</td>
<td>.5</td>
<td>.5</td>
</tr>
<tr>
<td>75</td>
<td>75.0</td>
<td>.5</td>
<td>.5</td>
</tr>
<tr>
<td>100</td>
<td>100.0</td>
<td>.5</td>
<td>.5</td>
</tr>
</tbody>
</table>

### Model 1600-200
(Torque Capacity 200 lb-in)

<table>
<thead>
<tr>
<th>Torque in % Capacity</th>
<th>Torque in lb-in</th>
<th>Accuracy in +/-% FS</th>
<th>Accuracy +/-lb-in</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>50.0</td>
<td>.5</td>
<td>1.0</td>
</tr>
<tr>
<td>50</td>
<td>100.0</td>
<td>.5</td>
<td>1.0</td>
</tr>
<tr>
<td>75</td>
<td>150.0</td>
<td>.5</td>
<td>1.0</td>
</tr>
<tr>
<td>100</td>
<td>200.0</td>
<td>.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>

All readings should be within the specified Accuracy Range.

If the readings are not within the Accuracy Range, a User Calibration should be performed.
Performing a Calibration

Press calibration on the Main Menu to display the Main Calibration Screen.

Main Calibration Screen

Now follow the directions as displayed on the screen.

Calibration - Zero Screen
The directions on the screen will guide the user through the process of hanging the weights and capturing the readings.

This procedure must be followed carefully to insure the accuracy of the system.

The process begins by hanging a 25% weight on the CW side and ends with a 100% weight on the CCW side.

If a weight is hung on the wrong side during the procedure, the following display will appear.
If when a weight is applied, the measured value is between 5% and 7.5% away from the expected value, a warning screen will be displayed.

This message indicates that there may be a problem with the system and the Calibration should be checked frequently.

If the measured value is more than 7.5% away from the expected value, the software will prevent the user from continuing.

When this procedure is complete, the software will advance to the following screen.

![Image of calibration verification screen]

When OK is selected, the calibration verification process will be initiated. Once the verification is complete, the Torqo II+ will be ready for use.
Setting the Calibration Due Date

A calibration due date interval may be defined for the Torqo and the actions to take after the calibration becomes overdue may be set. In the System Options menu page 2 press the Calibration Due Date Options button to bring up the Calibration Due Date Options menu.

**Calibration Due Date Options Menu**

The Calibration Interval may be set quickly using the 1 Year and 2 Years buttons or the interval in days may be entered by pressing the Select Calibration Interval button and typing in the duration in days for which calibration is valid.

The Calibration Due Date feature may be disabled using the Disabled button or setting the calibration interval to 0 days.

The action to take when calibration expires may be set by toggling the Out of Calibration Action button. Selections Are Disabled which does nothing and disables the feature, warn which warns the user on the screen at power-up and before any test is run, and Lock Out which will not allow a test to be run once the calibration has expired.

The calibration due date may be added to the test results printout. Using the System Options menu press the View / Print Defaults button. Go to page 2 of the View / Print Defaults and select Cal Due Enabled to add the calibration due date to the report.
Chapter 22: Child Resistant Cap Option

What’s Inside

This section is intended to acquaint the user with the features and use of this option.

About the Child Resistant Option

This option enables the Torqo to provide a pre-settable down force for push and turn caps.

An air supply with the ability to provide a minimum of 30 PSI is required.

Once connected to the air, the down force can be set to the required force for a given application.

Connecting the Air Supply

The air supply connects to the air filter on the rear of the tower.

This connection is a 1/8 NPT thread.

Both the air filter and regulator are designed for a maximum of 100 PSI however the Force Gauge is limited to 30 PSI.
Adjusting the Down Force

Once connected, the Air Control Knob should be adjusted to provide the required amount of down force.

Observe the down force gauge on the front of the tower cover while adjusting the knob.

In most cases, a down force of 15 to 20 lbs will open a child resistant closure.
**Down Force Mechanism Nomenclature**

The names in the callouts below will be used when describing the setup and adjustment of the Child Resistant Down Force Mechanism.

- Foot Support Shaft
- Foot Shaft Position Clamp
- Down Support Foot
- Drive Shaft Bearing & Collar Clamp
- Drive Shaft
- Cap Chuck

**Adjusting the Down Force Foot**

The Down Force Foot applies the force on the cap by pressing down on the Drive Shaft Bearing when the Down Force Switch is actuated.
To adjust the foot, put the Down Force wench in the up position and then place the sample to be tested in the bottle holding fixture.

Now position the Cap Chuck on the cap by lowering the drive shaft.

Pivot the Down Force Foot over the top of the Drive Shaft Bearing and adjust for approximately 1/16 of an inch of clearance (i.e. the thickness of a quarter).

Loosening the Foot Position Shaft Clamp and sliding the Foot Support Shaft up or down and then retightening the clamp makes this adjustment.

**Operating the Child Resistant Mechanism**

Once the mechanism has been adjusted, a sample is tested by pivoting the foot into position and actuating the Down Force Switch.

At the conclusion of the test cycle, move the switch to the up position and pivot the foot to the rear.

Repeat this procedure for the next sample.
Chapter 23: Using Windows Embedded OS

What’s Inside

This chapter contains a description of the Windows Embedded OS feature and its use in the Torqo II+.

Windows Embedded OS

Windows Embedded OS is the operating system for the touch screen display and the platform for the Torqo II+ software.

Main Menu Screen

By selecting Exit to Windows on the screen above, the software will display the Windows Embedded OS desktop.
The System Settings for the Torqo II+ are set by Mesa personnel prior to shipment and should not require any field adjustment with one exception; the clock.

On the Desktop double click on My Device. Then double click on Control Panel. Then double click on Date/Time.

Now make sure the time zone is correct and then adjust the clock and select Apply.
Chapter 24: Transmitting Connectivity

What’s Inside

This chapter describes the options for data output for Torqo.

Connectivity Options

The Mesa Labs Torqo Model 1600 has several connectivity options to allow data to be sent to a remote computer or network folder.

Data can be output from the Torqo Model 1600 using:

- Serial port
- USB Flash memory stick plugged into the Torqo USB port
- Ethernet file transfer
- Ethernet network shared variables
- Ethernet OPC published variables
- Ethernet link using Torqo Graph-it application

Some control over the amount and type of data which is sent to the remote computer can be configured in the Torqo System Options menu.

The Ethernet shared variable and OPC methods are configured so the remote PC or server computer pulls the data from the Torqo machine. In these cases, the data which is archived is selected by the remote computer application which must choose which data items are important and pull them into the archived storage.

Implementation of some of these connectivity options requires Torqo Model 1600 operating firmware to be installed with version 6.0 or later.
Serial Port

The Model 1600 Serial Port can be used to output results data from each test. The Serial Port is a DB-9 male connector and can be found on the rear panel of the Model 1600 Tower. The port is labeled “PC OUT” and can be seen in the photograph below.

The serial port is set to the following settings by default in normal ASCII format:

- **Baud Rate:** 115200
- **Data Bits:** 8
- **Stop Bits:** 1
- **Parity:** No
- **Xon / Xoff:** Yes

The cable that connects the Torqo II+ to the PC should be an RS-232 cable with the description: Serial Type, Null Modem, 9 Sub-D female to 9 Sub-D female. Mesa Part Number 51.004470

Pin connections are as shown below (RS232 Standard, RS422/485 not used).
Configuring the Torqo to send results data out the Serial Port

From the Main Menu, select the System Options button. You will see page 1 as shown below. Press the Auto Transmit to PC button to bring up the Auto Transmit to PC screen.

Auto Transmit to PC Menu

The Auto Transmit to PC screen allows the user to configure the Torqo Model 1600 to output results data to the Serial Port in ASCII text format at the successful end of each test. This is enabled as shown in the image below. Please note that if Graphit output is enabled the Single Line - End of Test output is disabled automatically. Only one of these output modes may be selected at a time.

Once the Single Line - End of Test Data mode is enabled, the Configure End of Test Data button becomes visible.
Configure End of Test Data Menu

The Configure End of Test Data menu allows certain output data to be suppressed from the ASCII data stream if it is not desired. Please note the Units Name and Main Results data are always output at the end of each test in this mode and these cannot be disabled. They are shown greyed out and enabled as a reminder that they will always be output.

Interpreting Single Line End of Test Data from the Serial Port
When transmitting Single Line End of Test results the following data strings are used for the different Test Profile Types. These examples are shown with Configure End of Test Data settings to enable all outputs. If a specific output is disabled, for example Date and Time String the affected ASCII data will not be sent. Please note the <CR><LF> text below are nonprintable ASCII end of line characters. Please note the _ characters represent spaces.

Removal Torque Data String
Date_Time_Units_Removal Torque_Test Type_Re-Application Torque<CR><LF>
Example:
01/01/00 09:00 lb-in 10.80 removal 12.00<CR><LF>
Example without re-application torque or test name:
01/01/00 09:00 lb-in 10.80<CR><LF>

Incremental Torque Data String
Date_Time_Units_Removal Torque_Test Type_Incremental Torque<CR><LF>
Example: 01/01/00 09:00 lb-in 10.80 inc 12.00<CR><LF>
Bridge Torque Data String  
Date_Time_Units_Removal Torque_Test Type_Bridge Torque<CR><LF> Example: 01/01/00 09:00 lb-in 10.80 rrt <CR><LF>

Reverse Ratchet Torque Data String  
Date_Time_Units_Torque_Test Type_<CR><LF> Example: 01/01/00 09:00 lb-in 10.80 rrt<CR><LF>

Close Torque Data String  
Date_Time_Units_Close Torque_Test Type_<CR><LF> Example: 01/01/00 09:00 lb-in 10.80 close<CR><LF>

Strip Torque Data String  
Date_Time_Units_Strip Torque_Test Type_<CR><LF> Example: 01/01/00 09:00 lb-in 10.80 close<CR><LF>

Testing Single Line End of Test Data from the Serial Port

Configure the Torqo Model 1600 as described above. Connect the Serial Cable to the PC on which you will run the test. If your PC does not have a serial port, obtain a USB to Serial adapter similar to the Key span USB to Serial Adapter (Mesa PN 300355-001) and connect the serial cable to the 9-pin serial port on the PC and the 9-pin PC OUT port on the Torqo.

Run the HyperTerminal serial port emulator application (which can be downloaded from Hilgraeve) or a similar serial port terminal emulator. Select the Port number of the serial port to which the cable is connected. Select 115200 baud, 8 bits, 1 stop, no parity, XON/XOFF. This should connect the HyperTerminal to the serial port and it will be waiting for data from the Torqo.

On the Torqo insert a bottle into the clamp and press Open. When the test finishes you should be able to observe the result data you have selected on the HyperTerminal screen.
Troubleshooting the Serial Port

If HyperTerminal is not displaying anything, confirm the COM port number: One way to do this is to bring up the Device Manager; on Windows 7 click Start, right click Computer and click Manage then choose Device Manager and expand the Ports (COM and LPT) selection. While viewing the list of COM ports, unplug the USB to Serial adapter and plug it back in. The COM port for that adapter will be removed from the list and replaced in the list when it is plugged back in. In the image below there are 3 Key span USB serial ports (COM1, COM3, and COM4) so unplugging and re-plugging one will identify it because it will disappear from the list and then reappear.

Confirm the type of the serial cable:

Using an ohmmeter, verify pin 2 on one end of the cable connects to pin 3 on the other end of the cable.

Confirm the serial cable is connected to the PC OUT port on the Torqo and confirm Single Line End of Test Data is Enabled on the Torqo.

If it displays garbled characters check the baud rate; the baud rate is 115,200 by default on the Model 1600. The baud rate is 9600 by default on the Model 1590. Confirm the Handshaking setting is Xon/Xoff or None.
USB Flash Memory Stick

Data may be exported to a file on a USB Flash drive plugged into the USB connector on the Torqo touch panel – the connector is under the bottom of the touch panel enclosure and it has a threaded watertight cover on it. Unscrew the cover and plug in the USB Flash Drive. Wait about 30-40 seconds for the Windows Embedded operating system to recognize the Flash drive has been added.

Configure the Torqo to send data to the USB Flash drive by selecting System Options from the Main Menu and pressing Next Page until Page 3 is reached. You will see the Export Format button and the Export Options button as shown below.

![Export Options Screen](image)

The Export Options button brings up the following Export Options screen where the destination of the Export is selected to be the USB Flash drive or a network shared folder. For USB data export select Export Destination to be USB Flash Drive as shown.
Supported Export Formats

The Export Format is selected on page 3 of the System Options menu using the Export Format button.

Data may be exported in one of these formats:

**Excel** - data is exported as tab-separated values, arranged to fit nicely in an Excel spreadsheet. The file extension is .xls and these files may be opened in Microsoft Excel.

**CSV** - data is exported as comma-separated values. This is a text file with commas separating each entry in a line and carriage returns separating each line. The file extension is .csv. These files may be opened with Microsoft Excel and imported into other user-supplied database programs.

**Text** - data is exported as a text file which should appear the same as the short format report shown on the Torqo screen. The file extension is .txt and the files may be opened with Notepad or Word or any text editor.

**XML** - data is exported as an XML database. This is the Torqo native data format and contains the most complete set of data values possible. Users must create their own applications to read, format and report the XML data. The file extension is .xml and the files may be viewed with XML Notepad or Internet Explorer.

Export Waveform Data is disabled and greyed out, this is a future feature. Export All Details can be enabled or disabled. Export All Details disabled will export the test results. Export All Details Enabled will also export pass fail conditions of the test.
**Exporting Data from a test run:**
Once you have opened a set of bottles, press the View/Print button to review the results data.

The View/Print Report screen is shown, an example is below. If data has been collected the Export button is enabled. Pressing the Export button will export the data to the USB memory stick in the selected format.

The filename is the name of the profile with a date and time stamp appended to the name. A screen will appear confirming the file transfer was completed and giving the new filename on the USB stick. If the file transfer could not be completed – the USB stick was not plugged in or could not be written to or was full – an error will be displayed.
Troubleshooting the Flash Drive

Confirm that the Flash Drive is plugged into the Torqo USB socket:
There are two USB sockets, one underneath the touch panel enclosure, typically
used for the Flash Drive, and one on the rear of the unit, typically used for the USB
printer option. The USB ports are identical and either one may be used for the Flash
Drive.

Confirm that the Flash Drive works and has free space available on it:
Plug the Flash Drive into a Windows PC and verify it can be read and is not full.

Wait for 30-40 seconds after plugging the Flash Drive into the Torqo:
The Windows operating system takes a short time to recognize the Flash Drive is
plugged in and to make it available to the Torqo application.

Confirm that the Export Options are set to USB Flash Drive. Confirm that the
Export Format is set to the desired file format.
Confirm that there are data samples visible in View/Print. The Export Data button is
disabled and greyed out if there are no samples.
Ethernet File Transfer

Exporting data to a file located on an Ethernet connected drive is similar to the USB file export; please refer to that section for more details. The Export Destination in the Export Options menu in System Options Page 3 is set to Network Folder as shown below.

When the Select Export Folder button is clicked, a folder browser appears to allow you to browse the network to locate the desired designation folder.

Select Network on the left side then select the network location and the folder and then click Current Folder.
There are a few requirements to being able to select a network folder for export; your local IT department can help satisfy these requirements:

- The network drive, target computer, and folder must be able to be seen in the file browser.
- The selected network folder is tested to make sure the Torqo can write to the folder – the Torqo touch panel PC must have write permissions to the selected folder.
- It is possible that network permissions will need to be created by creating a user on the Torqo touch panel and having users log in to the Torqo touch panel at the start of their shift; this will depend on your local IT requirements for the plant and network. See the Network Security section below or contact Mesa Labs for more information if this is required.

When a network folder location is selected, the Torqo attempts to create and then delete a test file in the selected network folder. If the network folder cannot be written to, an error message will appear telling you that the location may not be used.
Ethernet Link to Torqo Graph-It Application

When the Torqo is used in a laboratory setting or detailed torque studies are desired to be run using the machine, the torque waveform data as well as the torque results may be sent to a PC in another location using an Ethernet link. The target PC will run the Torqo Graph-It Windows application which will harvest the waveform and results data and store them to an Excel file.

There are three steps to setting this up: Connect the Torqo instrument to the Ethernet; Set up the Torqo instrument to output data to Graph-It over the Ethernet; Set up the PC to run the Torqo Graph-It Windows application to harvest the data.

**Step 1: Connect the Torqo instrument to the Ethernet.**

Using an Ethernet cable, connect the LAN connector on the rear of the Torqo tower to an Ethernet connection in the plant. The LAN connector has a watertight cover that must be removed before a connection is made.

- The Ethernet connection can be any Ethernet local area network, network router, network switch, network hub or a PC running, for example, Windows 7.

- The network connection must run DHCP and must issue a network address to the Torqo instrument touch panel PC when it is connected.

- Your local IT support must be able to grant network access to the Torqo touch panel PC. See the Network Security section below for more details.

- The Torqo instrument’s touch panel PC must be routable from the PC running the Torqo Graph-It Application. That means there is not a firewall, subnetwork or other security measures which keep the PC from ‘seeing’ the Torqo instrument. If the PC can ‘ping’ the Torqo instrument successfully or see it on a list of named computers on the network, then it is routable.
Step 2: Set up the Torqo instrument to output data to Graph-It over the Ethernet.

From the Main Menu select System Options. On Page 1 of System Options as shown below, press the Auto Transmit to PC button to get the Auto Transmit to PC Menu.

![System Options Menu]

In the Auto Transmit to PC menu set the Graphit button to Enabled. Note this will disable Single Line – End of Test data. Select the Graphit Interface to be Ethernet. The current IP Address of the Torqo instrument will be displayed as My IP Address. Note you may need to press OK then go back into the Auto Transmit to PC menu after selecting Ethernet mode to refresh My IP Address in the display.

![Data Output to PC Menu]
Step 3: Run the Torqo Graph-It application to harvest the data from the Torqo instrument.

On the PC also connected to the Ethernet and routable to the Torqo instrument, run the Torqo Graphit application. Select Options, Com Ports as shown below.

![Image of Torqo Graph-It application]

Select the Ethernet radio button.
You can then type in the My IP Address that was shown on the Torqo Instrument in the Auto Transmit to PC menu. Make sure you type in the numbers exactly.

Alternately you can Search for Torqo machines on the network. Torqo machines are recognized by having computer names TORQO2M-YY-XXXX where YY-XXXX is the serial number of the individual machines.

![Image of Torqo Graph-It application for selecting Ethernet interface]
Please note some IT departments will require the default factory Torqo Instrument computer names to be changed for security. If there is a specific name or base naming convention used at your plant, these can be used in the Search for Torqo function, but they may no longer conform to the Mesa naming convention TORQO2M-YY-XXXX.

If you want to ‘Ping’ the Torqo instrument from the PC to see if the network address is routable, note My IP Address from the Torqo instrument. Our example is 192.168.254.203.

Open a Command window on the PC which will run Torqo Graphit.

Type the command ‘ping’ followed by the My IP Address with dot separators: Ping 192.168.254.203

The command will attempt to ping to the Torqo instrument and will either succeed or fail with some failure diagnostic text.

Make sure you typed the IP address correctly as it’s easy to make a mistake here. You might try to recheck the My IP Address on the instrument to make sure the whole setup was plugged in and running when the IP address was issued.
Network Security

The Torqo touch panel runs the Windows Embedded operating system. The Torqo is factory configured to automatically log-on to Windows with a username of mesa and no password is required.

The factory configuration is to use a Windows workgroup called WORKGROUP. Some factory networks may require the Torqo touch panel Windows operating system to be joined to a Domain and to have a user name and password provided by the Torqo operator after power is turned on for the Torqo machine. These settings must be changed on the Torqo touch panel by your factory’s IT support personnel prior to connecting the Torqo to your factory network.

If you do not use a domain server at your location, you will not need to make these changes.

Please note these instructions assume some familiarity with Windows Embedded operating system use and some familiarity with network terms. If you do not feel you are able to complete these steps please contact Mesa support.

One way to tell if you need to reconfigure the Torqo touch panel Windows network settings is to plug the Torqo in to your network using a network cable and see if you can see the Torqo machine name appear on your network after some time delay (5-15 minutes). If you can see the machine name, then it may not need network settings changes.

The Torqo machine will appear on the network using the default name TORQO2M-yy-xxxx where yy-xxxx is the serial number of the Torqo machine.

You or your IT support people can change the machine name to conform to your plant’s naming conventions, details on that are given below.

It is not recommended to change the machine name unless it is a requirement of the network administrator.
Chapter 25: Printer Connectivity
Troubleshooting Procedure

Procedure

1. Check to see if the printer is turned on

2. Ensure the USB cable is connected to both the printer and the Torqo

3. Printer is available and its status reads ready
   a. Navigate to the Windows Control Panel
   b. Select Devices and Printers
   c. Confirm appropriate printer is present and status reads ready

4. Replace printerconfig.txt file in the D:\Torqo\system folder
   a. Download the printerconfig.txt file onto a flash drive
   b. Plug in the flash drive and mouse to the USB ports on the Torqo
   c. Navigate to the D drive and locate D:\Torqo\system folder
   d. Delete the old file txt file from the system folder
   e. Drag and drop new file into the specified location

Printer Name may be different if utilizing non-Epson printer. Printer Name in printerconfig.txt file should match printer name in Windows control panel
Chapter 26: Maintenance and Cleaning

What’s Inside

This chapter describes the recommended maintenance and cleaning procedures for a Torqo and its tooling.

General Information

The Torqo is designed to operate for many years with a minimum amount of maintenance.

However, the Torqo, like any precision measuring tool, should be periodically checked for accuracy. (See System Calibration)

The calibration of the Torqo should be checked at least twice a year.

A protective cover can be supplied for those applications where wash downs are frequently performed.

Disconnect the power to the system when cleaning.
Maintenance Schedule

At every startup:  Check for leaks
Optional: Verify the accuracy of the measurement system using the Gold Bottle Verification, see chapter 20

Weekly:  Check condition of tooling (asymmetric wear may indicate setup/concentricity issues). All bottle tooling should move smoothly and easily. Chucks should slip onto caps with the minimal amount of force.

Monthly:  Clean enclosure.
Clean all other parts with clean, soft cloth and Formula 409 Glass and surface cleaner or similar.
Check the air filter assembly (CR Models) for fluid/debris trapped inside the bowl, replace cartridge and clean bowl if necessary.
Check for worn/chafed/broken air hoses and electrical power supply cords and replace if necessary.

Annual:  Check calibration

Cleaning the Tooling

1506 Beverage Bottle Clamp

This tool is made from corrosion resisting materials and therefore it can be fully submerged in hot soapy water for cleaning.

Remove the fixture by unscrewing the 2 mounting screws and lifting straight up. Make sure the center hole is clean before re-installing the fixture.

1624 Quick Clamp Vise

This tool can also be submerged in hot soapy water, but care should be taken to thoroughly dry the lead screw and then it should be lubricated with light oil.
Appendix 1: Torqo II+ 1600 Common Spare Parts

What’s Inside

This addition is to show the operator common spare parts associated with the Torqo II+ 1600. All parts can be found in the Spare Parts Kit, 53.500300.

Common Spare Parts

51.000620 Assembly, Thumb Screw, Height Adjuster

51.000050 Encoder, Danaher

51.000680 Belt, Twin Core (Torqo-Single Speed) Current

51.004421 E Stop Switch
51.004681 Motor, 500 Gearbox

51.001084 CMOS Battery for Aaeon Touchpanel

51.001170 Key for Keylock Switch

51.008000 Interlock Switch
Appendix 2: Variables in Torque Testing

What’s Inside
This addition is to inform about the many variables that can affect torque readings

Applied Torque
In most cases, the higher the applied torque, the higher the thread break torque. This is true up to the strip torque where the threads break/deform irreversibly in a cap tightening cycle. Without the cap/container manufacturer’s guidance, it is recommended to start with an application torque that equals to the cap outer diameter in mm divided by two (in inch-pounds [in-lbs., lbf-in]). The release torque/applied torque quotient depends on the specific cap design. It is usually in the 0.6-0.9 range and higher for glass and lower for plastic bottles. It is not uncommon to see values out of this range and dwell time usually decreases the quotient over time.

Sensitivity of Automatic Thread Break torque measurement
In the automatic detection of the thread break torque, two methods may be used to validate the result.

A. Fallback based peak torque validation: this is the fastest and most cost effective way to measure thread break torque on a cap. In CR cap applications, special attention must be made when fine tuning the fallback value to avoid validating the shell engagement as the thread break torque.

B. Rotation based peak torque validation: to overcome the problem introduced by the torque drop during the CR engagement an additional encoder can be used to validate the thread break torque. The rotation limit must be set according to the worst-case scenario of the shell engagement.
C. If fallback based validation is used during a measurement and the fallback is set at <1.5lbfin, the tester will stop in <25 degrees and display the engagement torque. To avoid the false readout, either the fallback must be increased above 1.5lbfin (the recommended fallback for CR caps is 2.5lbfin), or rotation based validation must be used and the rotation limit set at ~40 degrees.

D. See the top load vs. rotation and torque vs. rotation trends below to understand the variations during a CR cap removal cycle. The vertical axis represents both torque (lbfin) and top load (lbf) while the horizontal axis is the rotation in degrees.
Cap and container squeezing pressure, top load

The variation in cap/container squeezing pressure and the top load on the cap may also affect the torque reading. The pressure variation is caused by either force or contact area variation. The larger the contact area and/or the higher the force compressing the cap and the container threads, the higher the torque readout will be. Thus, in some applications it is important to monitor the container and/or cap squeezing pressures and the top load force.

Optimal chuck pressure:
The contact area is “minimal” and the torque readout is not affected.

High chuck pressure and/or excessive top load: The contact area is increased resulting in higher torque readouts.

Speed of torque ramp, update rate of torque digitization

There are two phenomenon a package engineer must be aware of when setting a torque ramp setting:

A. When the torque ramp up is fast compared to the conversion time of the digitizing device, the removal torque readout on the digital machine can be considerably lower than the real peak due to the slow analog to digital conversion speed. The error originating from the low sampling speed is not to be confused with the quantization error. To understand the error originating from inappropriate digitization, look at the graphs below and/or find more information on the internet about the Nyquist-Shannon sampling theorem and resolution/quantization noise.
B. When the torque ramp up time is slower, the removal torque tends to be lower because the gradually increasing fatigue lowers the peak force required to finally break the threads. If the torque ramp is faster, the thread break torque is usually higher.

Even if a manual torque tester had fast digitizer circuit, the lack of torque ramp control may still cause considerable variation from one operator to another, and even for one operator depending on how fast he/she manually applied torque on a specific package.
Dwell Time

In various experiments, it has been established that release torque levels are highest immediately after application and then gradually decrease to a stable level over a period of time (days/weeks). The rate of the release torque decay is greatest in the first couple of hours/days and then reduces at a decreasing rate before reaching its stable level. Production processes such as hot filling or those using heat activated glue cap systems can produce a big difference in the release torque readout when compared with results measured in a laboratory environment.

Product Variations

Minor changes in mold, material and liner can be also major contributing factors in torque variations. See an example of different liner alignments and how it relates to the contact surface area and the release torque.
Appendix 3: Torque Testing Standards

What’s Inside

This addition is a quick reference for the various standards including the ones developed by ASTM and ISBT

ASTM

Developed by D10.31:

- D3475-07 Standard Classification of Child-Resistant Packages
- D3481-06 Standard Test Method for Manual Shelling Two-Piece Child-Resistant Closures That Are Activated by Two Simultaneous Dissimilar Motions
- D7257-06 Standard Test Method for Automated Shelling Two-Piece Child-Resistant Closures That Are Activated by Two Simultaneous Dissimilar Motions
- D5094-90 Standard Test Methods for Gross Leakage of Liquids from Containers with Threaded or Lug-Style Closures
• D5419-95 Standard Test Method for Environmental Stress Crack Resistance (ESCR) of Threaded Plastic Closures

**ISBT**

Voluntary Standard Test Methods for Plastic Flat Top Closures

• Top Closures
• Back-off
• Ball Impact
• Drop Impact
• Elevated Temperature Cycle
• Opening Performance
• Pressure Retention: Zahm Nagel
• Pull Up
• Removal Torque
• Secure Seal Test
• Security
• Strip Torque
• Top Load Vent
• Vacuum Retention

**International Test Standards**

• DIN EN 12377:1998 Packaging - Flexible tubes - Test method for the tightness of closures
• DIN EN 14401:2004 Rigid plastics containers - Methods to test the effectiveness of closures
• SS-EN 12377 Packaging - Flexible tubes - Test method for the air tightness of closures

**USPC Test Methods**

• CHAPTER 671: Containers – Permeation