

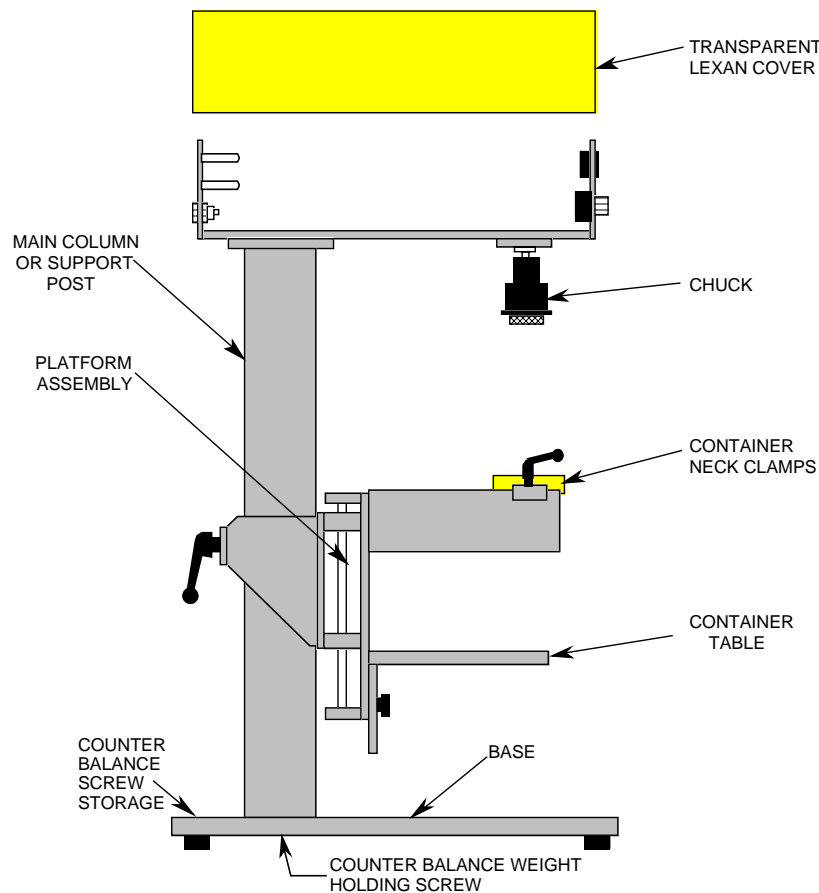


## IMPORTANT! READ THIS FIRST!

TO UNPACK AND SET UP YOUR *SURE TORQUE* BENCHTOP TORQUE TESTER, PLEASE PERFORM THE FOLLOWING STEPS:

**Tools needed:** Screwdriver, Allen wrench set.

1. Carefully remove the crating box cover to expose the machine, which is mounted on the crate's base. Then using an Allen wrench set, unscrew four screws in the machine's base.
2. Next, unscrew the one screw under the base plate holding the counter balance weight and thread into open hole behind the column, then identify the other components and assembly hardware.
3. Connect the main air supply to the rear of the head (refer to section 2.5.1 in the manual for specifications).
4. Attach 115 V, 60 Hz power cord (provided) to the rear of the control console.
5. Attach one end of the 37 pin cable to the connector on the back of the ST-94 electronic box labeled "Process control", the other end to the matching connector on the rear panel of the pneumatic head. Then connect one end of the 15 pin cable to the connector on the back of the ST-94 electronic box labeled "Transducers", the other end to the matching connector on the rear panel of the pneumatic head.
6. Run unit in manual cycle *first* to check component operation and alignment *before* running automatic cycle.



# Corporate Overview

Sure Torque, Inc. (STI) began development of the first electronic torque tester in 1985 in response to the needs of manufacturing and quality control engineering departments for precision torque testing instrumentation, capable of accurate, NIST certifiable torque measurement. Our equipment line offers rigorous testing of closure integrity, and is a necessary requirement to meet today's stringent specifications for quality control and data collection.

Our torque testers are currently an invaluable part of the production and quality control departments for major corporations such as Abbott, Eli Lilly, Schering, Upjohn, Procter & Gamble, Coca Cola, S.C.Johnson, Gerber, Seagram, Hershey, Warner Lambert, and Kraft General Foods, to name a few.

Container cap torque is important, not only for package appearance and product integrity, but mainly for customer satisfaction and consumer safety. We fully support a total commitment to quality control at STI, after all, we developed this advanced technology in response to the needs of our customers. STI continues to respond to our customers' needs by developing and manufacturing the most sophisticated, up to date electronic torque testers available in the world today.

We know today's consumers judge product quality based on many criteria, which include packaging, appearance and overall effectiveness of the product. Cap torque not only impacts the package's appearance, but more importantly, the customer's perception of the manufacturers' level of quality and concern.

In today's competitive market, the consumer avoids buying products if there is detectable evidence of product leakage, product tampering or something as simple as a difficult to remove closure.

Quality control of the filling operation is concerned with possible product loss due to loose caps on liquid products and the stability of both liquid and dry products. Stability is of particular concern with moisture sensitive products, which require that the integrity of the container cap and the internal seal be maintained. Stability considerations are critical since product loss due to evaporation or moisture absorption can cause significant changes in potency and thereby the efficacy of the product.

Container closure application can significantly affect the success of a product and closure application defects are detectable with the correct torque testing protocols in place, thus assuring closures meet certain specifications, thereby assuring product integrity.

To achieve the desired level of product quality, manufacturers set certain specifications for acceptable torque values, based upon container closure testing conducted on each container type.

At STI, our line of torque testing equipment is designed to not only conduct precise closure torque testing, but to also provide data necessary for evaluation of a closure system's compatibility to a container, efficiency of tamper evident bands and closure or liner durability. This data will help determine a closure's conformance to performance specifications, and evaluate a capper's capability.

Our customer service and parts departments are always willing to help you with ordering the proper parts, and will answer any questions you may have about operation and maintenance of your machine.

STI invites you to attend a guided tour of our manufacturing facility including demonstrations of our laboratory torque testing equipment. Please feel free to contact STI for information, brochures and specification literature for our quality, state of the art, precision instrumentation.

Thank you for your interest in Sure Torque, Inc.  
We look forward to supporting your closure testing requirements.

Ilona Bankuty  
President  
Sure Torque, Inc.  
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USA • France • Hungary

## Preface

Thank you for the confidence you have shown in Sure Torque, Incorporated (STI) as demonstrated by your purchase of our equipment.

Although many machine concepts and subsystem operations may be common to several different Sure Torque machine models, this Operation and Maintenance Manual (O&M) applies to your specific packaging system.

This manual is intended to provide a comprehensive description of your system's machine concepts, safety precautions, operation, basic maintenance, and adjustments necessary to assure optimum performance. A troubleshooting and replaceable parts section are included to aid in prolonging maximum machine productivity and packaging line "up-time." We at STI take great pride in you, our customer, and dedicate this manual to support your goal of prolonged system productivity throughout the years.

STI machines normally require little special attention other than routine lubrication and cleaning. Routine preventative maintenance procedures, however, should always be followed, especially those recommended in this manual. In particular, component contact areas should be inspected regularly for proper alignments and for possible wear or damage. The handy "Replaceable and Spare Parts List" will aid in rapid replacement of worn, or damaged parts, and will help return your machine to on-line productivity in the shortest possible time.

It is also extremely important to observe good shop safety practices in all aspects of installation, lubrication, operation, maintenance, and adjustments of all STI packaging equipment. Safety instructions given in this manual should be followed **strictly**, without exception under all circumstances.

If this manual does not answer a particular question, or leaves doubts in the proper operation of your machine, do not hesitate to contact our Customer Service department in Bradenton, Florida (941) 753-1095.

Your STI representative is eager to help you get the most production possible out of your packaging machines. Our reps can ensure that you receive additional information you may need. We will work with you in solving interfacing or mechanical problems, and will guide you in ordering the proper equipment, or replacement parts.

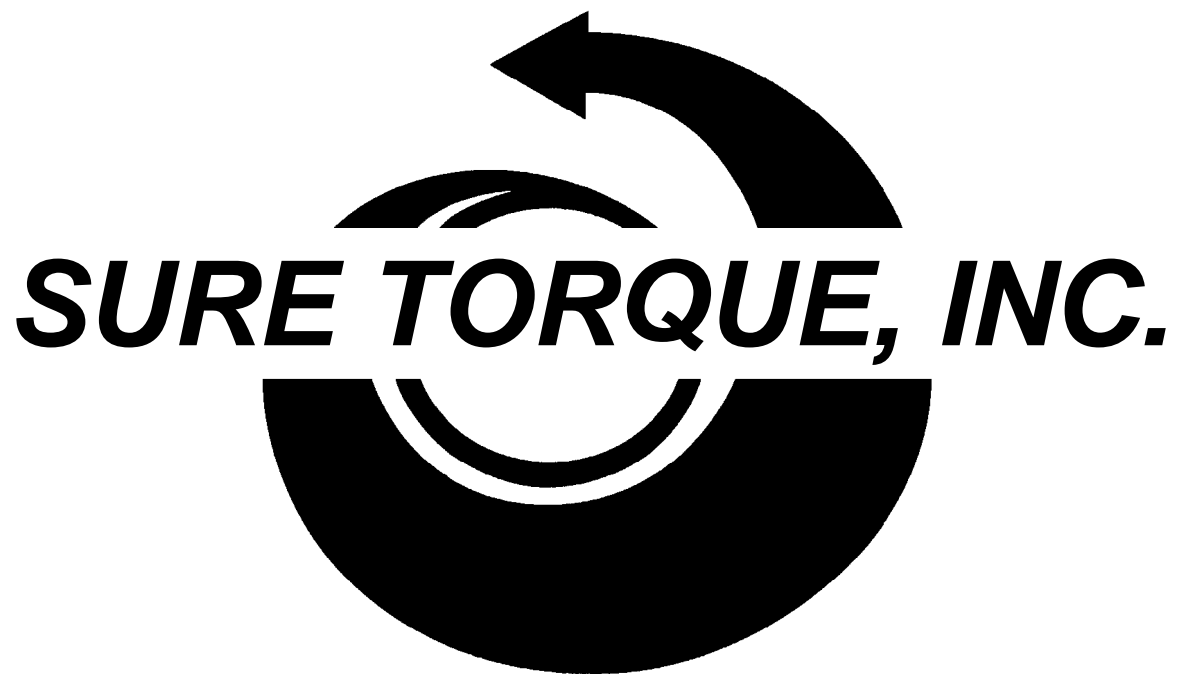
Again, thank you for becoming another loyal STI customer.

Sincerely,

Ilona R. Bankuty  
President

**SURE TORQUE, INC.**

*The Finest In Quality Closure Testing Equipment!*



***SURE TORQUE, INC.***

# Safety Comes First With STI

Throughout this manual, STI will emphasize safety precautions that should be adhered to by all personnel setting up, operating, maintaining and repairing all STI equipment. Machine and personal safety depends on adherence to **ALL CAUTIONS** and **WARNINGS**. Since actual working environments vary greatly, it is impossible to mention **ALL** precautions that should be taken in any particular situation. It is your responsibility to **be alert** while working with any machinery. Failure to do so will cause **personal injury** or equipment damage.

**All** precautions and warnings should be discussed with **ALL** personnel operating, working on, or near any packaging equipment or production lines.

## Follow All Safety Precautions In This Manual

### NOTE:

Generally, CAUTION conditions refer to equipment damage, whereas WARNING conditions alert personnel to the possibility of **bodily injury**. One hazardous condition, however, could easily cause the other.

### WARNING

### Personal Injury Or Equipment Damage May Result If The Following 10 Safety Precautions Are Not Observed At All Times.

1. **DO NOT** operate any machine until you have completely read the manual.
2. **DO NOT** operate machine without safety guards in place. Stop the machine if guards are opened.
3. **STAY CLEAR** of all moving parts, **AND NEVER** wear baggy clothes around machines. Protect long hair with a hair net.
4. **STOP** the machine before clearing container jams.
5. **STOP** the machine before cleaning.
6. **STOP** the machine before performing maintenance or lubrication procedures.
7. Disconnect power **BEFORE** **changeovers** or adjustments.
8. **ENSURE** machine is properly grounded.
9. Permit **ONLY** qualified personnel to open the electrical enclosure.
10. Ensure that All personnel **are clear** of the machine **BEFORE** starting.

### REMEMBER!

**ADHERE TO ALL SAFETY PRECAUTIONS LISTED ABOVE  
AND THROUGHOUT THIS MANUAL**

**SURE TORQUE, INC.** *World-Wide Torque Testing Equipment Specialists!*



USA • France • Hungary

## *Quality Assurance Instrumentation*

---

### **ELECTRONIC TORQUE TESTER MODEL: ST-94**

# **Operation and Maintenance Manual**

#### **With Appendix A Containing:**

- Machine Tuning Sheet
- Certification Records
- Closure Records
- Top Load Setup Procedure  
- Optional
- Sure Torque Data Acquisition  
(STDA - when applicable)
- Sure Torque Control Software  
Torque vs. Angle - Optional
- Sure Torque Strip Test Mode -  
Optional



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***SURE TORQUE, INC. World-Wide Torque Testing Equipment Specialists!***

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**SURE TORQUE, INC.**     *World-Wide Torque Testing Equipment Specialists!*

# Section 1, General Information

*Sure Torque, Inc.* recommends that *all* operators and service personnel scan the Table of Contents to familiarize themselves with the contents and layout of this technical manual. Since certain modifications have been made, or requested by our customers, this is a general guide and all of the technical information in this manual may not pertain to your specific machine. Changes in machine design or specifications are a result of continual machine improvement and *Sure Torque, Inc.* reserves the right to change specifications without prior notice.

The following chapter gives a brief description of the operational philosophy of your fully automated ST-94, *Sure Torque* Electronic Torque Tester System.

Major components and assemblies are called out on Figure 1-1, ST-94 Torque Tester General Arrangement, and referred to in this chapter, and throughout this manual as well. Any optional equipment included with your machine is listed on the Owners Fact Sheet. Any Change-over specifications are listed on the Machine Tuning Sheet for the particular closure and container being tested.

Your ST-94, "*Sure Torque*" Electronic Torque Tester, is a fully automated precision instrument designed for a wide array of container closure test functions. The ST-94 electronically measures the forces required to apply or remove threaded screw caps from the containers. Your ST-94, with available options, will also apply downward forces to a *childproof* closure for the required protocol tests under the Poison Prevention and Packaging Act. The ST-94 can also be used for *any* other test that requires the measurement of an increasing rotary, or linear force to a peak point, closure container compatibility or failure analysis.

The *Sure Torque's* modular design assures minimum maintenance, ease of operation in a minimum of space, and wide-range of container acceptance capabilities.

STI offers an optional 360° degree test mechanism (refer to section **7.1.10** in this manual) for our ST-94 unit. This option measures the highest release torque sensed during a full 360° degree turn of a closure.

SURE TORQUE, INC. also offers an "On-Line" Torque Tester System that can be integrated into your existing packaging line operation. When line integrated, the "On-Line" unit can gather random containers from the conveyor at a controlled rate, and perform required closure tests, right on your production line.

## 1.1 SYSTEM OVERVIEW

The following paragraphs are intended to give an outline of the major components and operational sequences required to perform the ST-94, *Sure Torque* functions. Major components and assemblies are called out on Figure 1-1, ST-94 Torque Tester General Arrangement.

The basic ST-94 Torque Tester System consists of:

1. Control Enclosure.
2. Sturdy mechanical assembly.
3. Integrated pneumatic systems.
4. Electronic components and assemblies required to perform various operational test

functions.

The following four sections give a detailed description of each of these assemblies:

**ST-94  
MECHANICAL COMPONENTS**

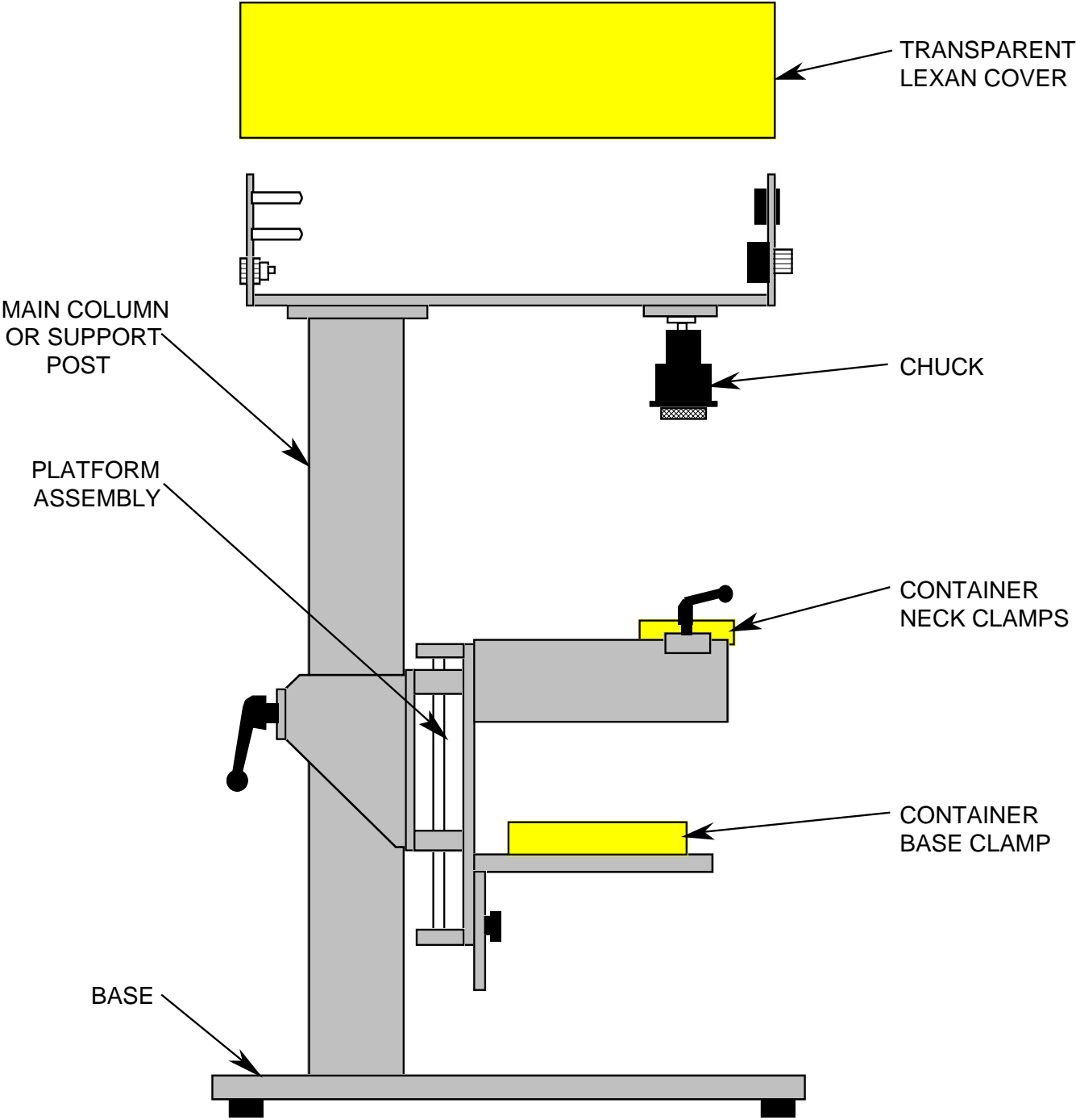


Figure 1-1, ST-94 Torque Tester General Arrangement.

### 1.1.1 Control Enclosure

The operator's interface with the *Sure Torque* unit is controlled through the remotely located and mounted Control Enclosure, a separate bench top mounted box, which houses the computer that regulates the ST-94's operational cycles, processes the input/output data, and acts as the overall communications link with the line operator or test engineer. This Control Enclosure can easily interface with an on-line or remotely operated IBM PC for data collection. Sure Torque, Inc. will gladly integrate this IBM interface controller PC in your system.

### 1.1.2 Mechanical Assembly

The Mechanical System consists of a Stand assembly, Chuck and Change Part Components. Please refer to Figure 1-2, ST-94 Torque Tester Mechanical Components (Chuck Assembly).

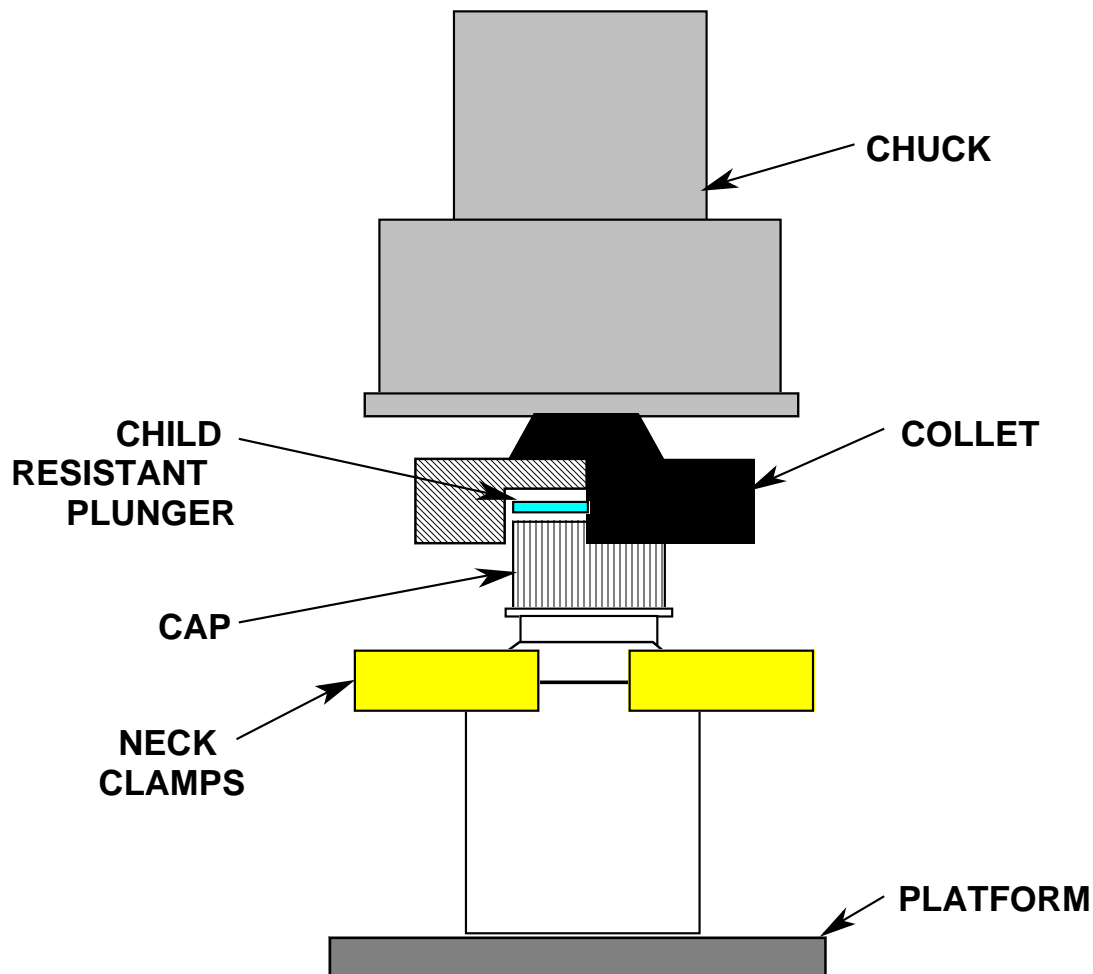


Figure 1-2, ST-94 Torque Tester Mechanical Components (Chuck Assembly).

### 1.1.2.1 Stand Assembly

The Stand Assembly is an aluminum fixture which supports the Container Platform, Clamp, Chuck, and ST-94 Control Head Assembly. The stand has a wide stable base to minimize motion during the test cycle, and a rugged main support post on which the container platform is attached. The container platform is manually raised or lowered to accommodate the different container / bottle heights and locked into position by a “quick-release” half-turn locking handle.

On top of the stand’s Main Column or support post is the ST-94’s Main Head Assembly, which contains all of the main pneumatic, electronic, and force sensing components required for the actual torque testing function operations. The base of the control head assembly is a solid aluminum plate, which acts as a sturdy mounting surface for all these components. The cover of the control head, made of attractive and durable smoked Lexan, is removable for component cleaning, servicing and calibrating.

### 1.1.2.2 Chuck Assembly

The Chuck is the mechanical component, which holds the Collet that “grasps” the various closure devices, and transmits the force to actually remove the closures. Both the “grasping” and the “turning” forces of the Chuck are applied pneumatically, via electronic control. The Chuck rotates on a shaft, actuated by the pneumatic Test Cylinder located in the Main Head Assembly. This Test Cylinder applies the required force to perform all torque-test functions.

### 1.1.2.3 Change-Parts

Each different container and closure “combination” requires a different set of change-parts, (please refer to the Machine Tuning Sheet for the required change-parts for the particular container/closure combination being tested).

The change-parts, (or tooling package), for the basic ST-94 consists of:

- a. Container Base Clamp (when applicable) holds the container’s base.
- b. Container Neck Clamps which hold the container’s neck as close to the closure as possible.
- c. Closure Collet, which actually “grasps” the closure during the test cycle.

### 1.1.3 Pneumatic Assembly

Understanding the Pneumatic Assembly and its components is the key to understanding your ST-94 *Sure Torque* system and receiving optimum production and maintenance free operation from your unit. Please refer to Figure 1-3, ST-94 Pneumatic Diagram.

The pneumatic components control these 4 major *Sure Torque* functions:

1. Holding the container, (the Clamp function).
2. “Grasping” the closure, (the Chuck function).
3. Raising and lowering the Platform.
4. Activating the Test Cylinder to apply or remove the closure.

The Pneumatics Operational Philosophy is as follows:

Air pressure is applied to the ST-94 through a panel mounted regulator. STI offers an optional filter package for those locations, which do not have a clean air supply.

The central air supply is then distributed via an inlet manifold to four regulators, which individually control the air supply to the four main operation functions listed above. The manifold air supply is also monitored by a pressure switch that will warn the *Sure Torque* operator if incoming air supply falls below a preset value. The air pressure is sent directly to the Platform, Clamp, and Chuck air valves which control the air cylinders that activate these components.

The air pressure to the Test Cylinder, however, is first routed to a special electronic regulator, and a small cylindrical storage reservoir. The electrical regulator is an electrically operated, pneumatic control device that utilizes a variable electronic input signal to control a pneumatic output pressure. The input voltage to the electronic regulator is steadily increased, producing an increase in the output pressure to the Test Cylinder, thus increasing the Chuck torque for both the applying *and* releasing of closures. This output pressure is not affected by changes in input pressures that may occur from normal plant air variations.

The small Air Storage Reservoir, located between the electronic regulator and the Test Cylinder, provides a smooth, pulse-free and constant pressure air flow to the Test Cylinder, smoothing out the rates of change in the pressure being fed to the cylinder. This air flow of constantly increasing pressure, produces a pulse-free and smoothly increasing “force” that allows *very* accurate readings of peak torque values. Clean air flow to the Test Cylinder is critical for proper operation of this component, and that of the overall machine as well.

The rate of increasing the air pressure is regulated by adjusting the “Release Rate” in the set-up menu of the control box. The Release Rate is programmable from 1 to 250 seconds. A shorter release rate minimizes cycle time. A longer release rate minimizes the effects of acceleration on the final torque reading. See Section **3.5.2** for more details.

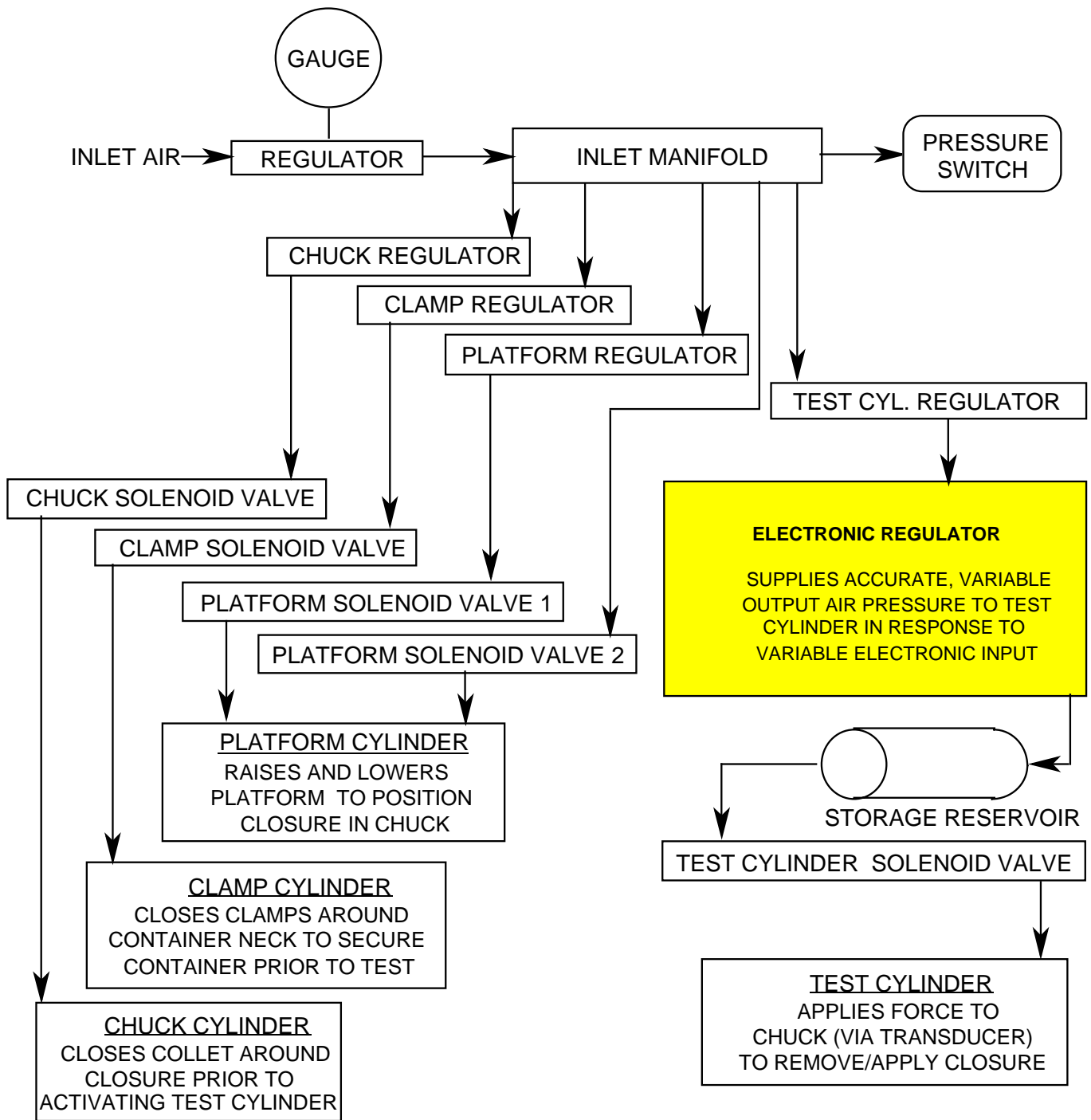


Figure 1-3, ST-94 Torque Tester Pneumatic Diagram.

### 1.1.4 ELECTRONIC ASSEMBLY

A basic knowledge of the Electronic Assembly and related components will aid greatly in the understanding of the function of your ST-94 Torque Tester.

The main electronic components of the ST-94 are as follows:

1. The Transducer.
2. The Microprocessor.

#### 1.1.4.1 Transducer

The force applied to the Chuck by the Test Cylinder (the application *or* removal torque), is measured by an electronic Strain Gauge Transducer. A strain gauge operates by measuring minute changes in a solid-state electrical conductor as it is flexed or strained. The changes show up as measurable increases or decreases in electrical resistance to a current flow through the conductor caused by the variation in the cross-section of the conductor.

The Transducer in the ST-94 is designed to compensate for temperature, vibration and other possible causes of resistance variation, and to convert the change in electrical resistance into a linear electrical signal, which is proportional to the force applied to the closure device. In this way, the mechanical force (torque) applied to the closure device is converted into an electrical signal. This signal is then sent to the microprocessor, which monitors the torque, and controls the operating functions of the ST-94 *Sure Torque* system.

#### 1.1.4.2 Microprocessor

The Microprocessor monitors the torque signal and records the *peak signal* as the actual application *or* removal torque. This signal is displayed on the digital display on the front of the Main Control Box, and can also be output to a variety of data collection/analization devices.

The Microprocessor also controls the operating cycle of the *Sure Torque* system. Additionally the Microprocessor can display diagnostic and error messages and allows the operator to program various parameters of the test cycle to achieve optimum performance and accuracy.

### 1.2 OPERATIONAL SEQUENCE of the TEST CYCLE FUNCTIONS

The *basic* operational sequence of your ST-94 *Sure Torque* system is as follows:

#### 1.2.1 Clamping Sequence

In the *first* step of the *Sure Torque's* operational cycle, the Clamp air cylinder is activated and closes the Clamps around the neck of the container being tested. Since each set of Clamps has been made to fit a particular container, the container is *firmly* held in place, preventing it from bending, twisting or slightly rotating, thus affecting the closure test results.

#### 1.2.2 Platform Raising Sequence

The *second* step in the operational cycle is to pneumatically raise the Platform on which the container has been placed. The Platform raises to a height at which the container closure is securely inserted into the Chuck mechanism.

#### 1.2.3 Chuck Actuation Sequence

In the *third* step in the operational cycle, the Collet closes around the closure being tested, and securely "grasps" the closure prior to the Chuck rotating it either on, or off the container.

#### **1.2.4 Torque-Test Sequence**

In the *fourth* and final step of the operational cycle, The Test Cylinder is activated, and the torque applied to the closure being tested is linearly increased. The peak torque applied to the closure is measured by the Transducer. The measurement is displayed on the digital display of the Microprocessor and is available for other optional functions, (eg: data collection and reporting, statistical analysis, graphic printout, automated capper torque control, etc.).

The standard operational test mode of the ST-94 is the removal torque mode in which a container/closure is tested to determine the actual torque at which the closure “breaks loose” from the container, (the point at which the “seal” of the container is “breached”. Because the seal is breached in this test, it is considered a “destructive” test.

## Section 2, Installation Instructions

The following paragraphs explain the required information and procedures to properly install your ST-94 *Sure Torque* Electronic Torque Tester.

### CAUTION

Read this section completely before installing your new unit.

### 2.1 RECEIVING THE UNIT

Your ST-94 *Sure Torque* System is shipped with the mechanical component already assembled. It has to be hooked up with the electronic control unit, the air supply and the optional printer and/or computer.

#### 2.1.1 Inspecting

*Sure Torque* urges you to give your machine a complete inspection as soon as it is received. Any machine damage and/or missing parts should be reported to *Sure Torque, Inc. immediately*.

#### CONTACT:

**SURE TORQUE, INC.**  
2532-34 Trailmate Drive  
Sarasota, Florida 34243  
Phone: (941) 753-1095 Fax: (941) 756-8425

### IMPORTANT

Please Follow These Simple Inspection Steps:

1. Check the packing list that accompanies the equipment to ensure that ALL loose parts have been included.
2. Check the unit completely for possible shipping damage.
3. Check the unit completely for any screws, bolts, belts, wheels, or other parts that may have loosened during shipment. These parts should be tightened and/or properly adjusted **before** operating the equipment.
4. Assemble the unit according to the following Unpacking instructions.

## 2.1.2 Unpacking

Remove all packing, shipping wire, and/or other materials that might interfere with machine operation or safety and proceed with the following unpacking and set-up procedures.

### IMPORTANT

To unpack and set up your new *Sure Torque* Electronic Torque Tester, follow the steps below:

#### NOTE:

Tools needed: Screw driver, Allen wrench set.

1. Carefully remove the crating box cover to expose the machine, which is mounted on the crate's base. Then using a screw driver, unscrew four screws in the machine's base.
2. Next, **unscrew the one screw under the base plate** holding the counter balance weight, then identify the other components and assembly hardware, including the four foot pads to be screwed back into the base plate holes.
3. Connect the main air supply to the rear of the head (refer to section 2.5.1 in the manual for specifications).
4. Attach 115 V, 60 Hz power cord (provided) to the rear of the control console.
5. Attach one end of the 37 pin cable to the connector on the back of the ST-94 electronic box labeled "Process control", the other end to the matching connector on the rear panel of the pneumatic head. Then connect one end of the 15 pin cable to the connector on the back of the ST-94 electronic box labeled "Transducers", the other end to the matching connector on the rear panel of the pneumatic head.
6. Run unit in manual cycle *first* to check component operation and alignment *before* running automatic cycle.

### IMPORTANT

See "Section 3, Operating Instructions" for complete instructions.

## 2.2 POSITIONING THE UNIT

Simply place the *Sure Torque* unit on a large table or flat platform allowing plenty of *side room* to perform proper torque testing in an uncluttered area.

### WARNING

Only **qualified personnel** should move or install this equipment. Failure to comply may cause equipment damage and/or personal injury.

## 2.3 PRE-RUN, *Sure Torque* Check-out

Two fuses are used to protect the System's electronic components. Assure that they are installed, and in good working order.

- The fuses are located on the power supply module inside the control unit.

### NOTE:

The following **five** operators functions *Must* be performed prior to the running and/or operation of the ST-94 *Sure Torque* System.

1. Be sure the power on switch to the unit is off.
2. Connect the Power Cord to 120 V, AC receptacle.
3. Hook-up a clean, dry, filtered air supply of 80 psi at 4 cfm. Connect the air line to the 1/8" NPT fitting at rear panel of the Test Head. (If optional filter is installed, connect the air line to the 1/8" NPT filter inlet.)
4. Set the Regulator at the Front Panel to 80 psi on the Pressure Gage.
5. Connect the Adapter Cable to the Console, then the 25 pin Cable Connector from Adapter Cable to the Test Head.

## 2.4 ELECTRICAL INSTALLATION

### CAUTION

Damage to electrical components can result if improper electrical connections are made. Be sure to check **all** connections **before** applying power.

### WARNING

1. **Only** qualified personnel should perform electrical installation of this equipment.
2. To avoid electrical shock, **do not** install this machine with **any** power active.  
***Failure to comply with these Warnings, may cause extensive equipment damage and severe personal injury.***

### 2.4.1 Precautions

The electrical supply requirements of your ST-94 *Sure Torque*, are designed to meet your individual specifications. Therefore, the Owners Fact Sheet in this manual should be checked **before** any electrical connections are installed, **or**, power is put to the unit.

## 2.4.2 Connections

All electrical connections should be made by a **qualified electrician** and in accordance with the local electrical codes.

## 2.5 PNEUMATIC INSTALLATION

Individual regulators have been provided by STI (refer to Figure 1-3, ST-94 Torque Tester Pneumatic Diagram).

### CAUTION

Filtering systems for air supplies are the **machine owner** responsibility. Contaminated air **will** cause excessive wear, erratic operation, and eventual failure of pneumatic components.

### 2.5.1 Air Supply

A clean and moisture-free air supply of 80 psi should be available to mate with the existing air connection on your machine. *Sure Torque* recommends the use of 5 $\mu$  filtration.

### 2.5.2 Plumbing

Customers piping for the air supply can run to the rear of the machine from any convenient point.

### 2.5.3 Air Pressure Settings

Normal pressure setting for operation is 80 PSI. The automatic pressure switch will shut down machine if inlet pressure falls below 65 PSI.

## 2.6 MACHINE TUNING SHEET

(Refer to the Machine Tuning Sheet in the Appendix-A, accompanying this manual). The Machine Tuning Sheet shows the recommended mechanical adjustments for the different change parts ordered with your machine. The Tuning Sheet is a valuable tool for all those operating the ST-94 *Sure Torque* Unit. It is recommended that this tuning sheet be reviewed by **All** personnel involved in machine operation and change-over procedures, before initiating machine start-up. *Sure Torque, Inc.* should be contacted immediately if there are any questions or problems pertaining to any specific Tuning Sheet data, its understanding, or application. The final run and fine tune settings for your machine, may be slightly different from the ones on the Tuning Sheet, thus, the customer's set-up and change-over personnel should note these changes, for future reference, on the Tuning Sheet.

## Section 3, Operating Instructions

### 3.1 CONTROLS AND INDICATORS

The ST-94 Torque Tester Control Unit has operator controls and indicators necessary for torque testing functions. Refer to Figure 3-1, ST-94 Controls and Indicators, for a drawing of all operator's controls and indicators, listing their types and functions.

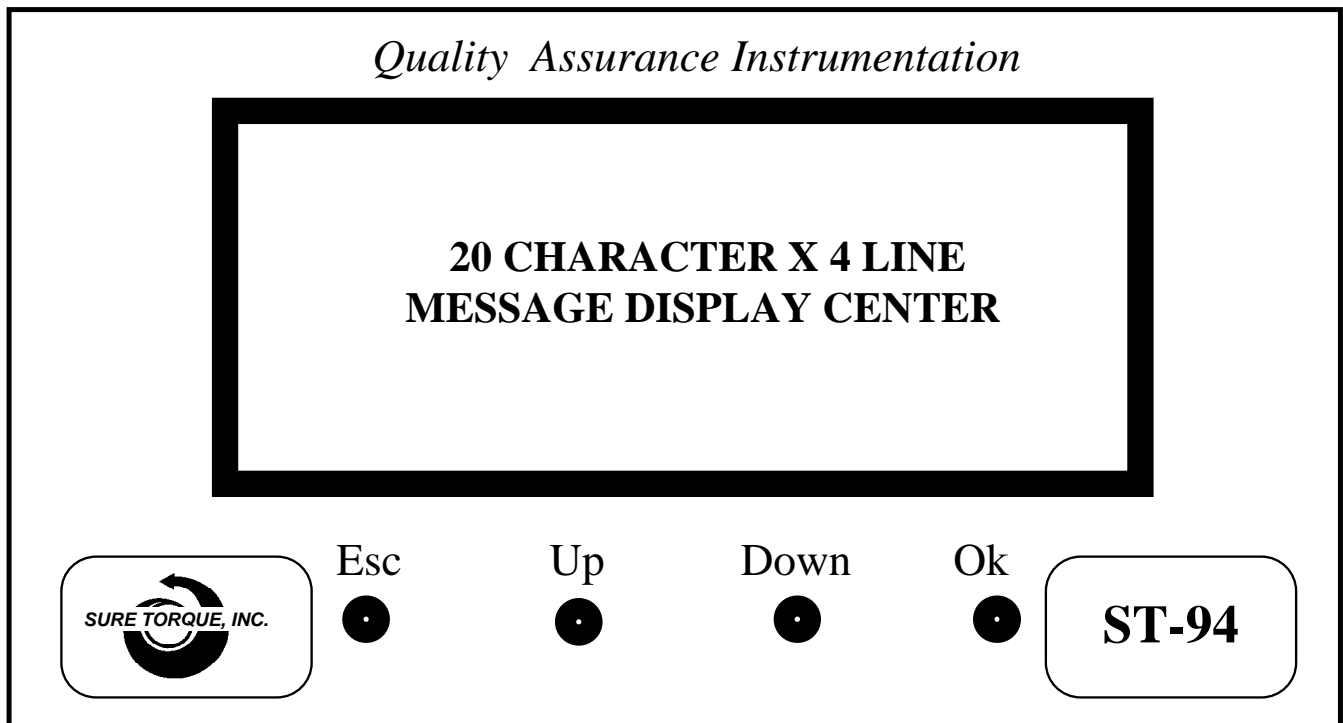


Figure 3-1, ST-94 Controls and Indicators.

### 3.2 OPERATOR CONTROL FUNCTIONS

There are 4 push-button switches available to the user to operate the ST-94 *Sure Torque Control* Unit. They are used as "Soft Keys"; that is to say, their functions depend on the operational test mode in use.

#### 3.2.1 Escape Button

This button is used to escape to the next higher-level item in the menu.

#### 3.2.2 Down Button

This button is used to *reduce* a numerical value. *EXAMPLE:* Set applied torque value. By pressing this button, the value Displayed is *reduced*.

### 3.2.3 Up Button

This button is used to *increase* a numerical Value, by pressing this button; the value displayed is *Increased* (used just the opposite as the “Down” button).

### 3.2.4 Ok Button

This button functions as an “acknowledgment of operation”, or to “go forward” with the operational cycles of the testing process. It is also the main button to “Start” an actual test.

### 3.2.5 Manual Mode

After powering the control unit on press the “Ok” button to enter the Main Menu, then with the “Down” or “Up” button move the cursor until “Manual Mode” appears on the display next to the asterisk. Push the “Ok” button to enter the Manual Mode. In this mode the Clamp, Container Platform, and Chuck assemblies have individual on/off push-button switches that either activate, or deactivate their respective operational test functions. This mode is the mode that is most frequently used for machine set-up or trouble-shooting.

### 3.2.6 Set-up Mode

Select “Setup” from the Main Menu with the “Down” or “Up” buttons. Pressing the “Ok” button places the system into the set-up mode, in which different set-up parameters can be programmed.

## 3.3 MACHINE SET UP

Prior to initial and/or routine machine startup, it is essential to perform a detailed and accurate inspection to the overall system. As well, a proper “Set-up” procedure is necessary to assure the accuracy, and optimum trouble-free operation of your ST-94 Torque Tester.

### IMPORTANT

Refer to Section 2, Installation Instructions, Section 2-3, Pre-run, *Sure Torque* Check-out **Before** attempting to start **or** operate your ST-94 *Sure Torque* System.

#### 3.3.1 Pre-run Inspection

Prior to any initial **and/or** routine set-up, the following inspections **must** be performed:

1. Check to see that **all** electrical connections are installed as per the wiring diagram and that no loose or unfastened wires are evident.
2. Check to see that **all pneumatic** connections are installed properly, and that no loose or unfastened hoses or lines are evident. With air pressure on, listen for any air leaks throughout the system, and correct.
3. Visually inspect the **entire** unit for any loose brackets, bolts, etc.
4. Check to see that there are no loose items on or around any of the moving parts.
5. Check to see that the Tuning Sheet adjustments are appropriate for the container size to be run. (Please refer to the Machine Tuning Sheet in Appendix-A).

### 3.4 MECHANICAL SET-UP

Follow these procedures to assure proper ST-94 *Sure Torque* set-up, and operation.

## IMPORTANT

These steps must be performed whenever the size of the closure and/or container to be tested, is changed.

To set-up your Sure Torque Unit, proceed as follows:

1. Install the proper Collet, for the “closure” being tested, into the Chuck Housing utilizing the Lock Pin (Press Lock Pin handle button during installation and removal).
2. Push the “POWER” button **On** (located on the back panel of the control unit).
3. Go to Manual Mode (Refer to section 3.2.5)

Container Platform Adjustment:

4. Obtain a container to be tested, with its closure **on**.
5. Press the “TABLE” pushbutton, energizing the Table to full “Up” position.
6. Set the height of the Container platform with the container/closure to be tested, in position. Manually set the height of the Container Platform, via the locking handle on rear of Platform. Adjust the Container Platform so that there is 1/8” clearance between the *Top of* the closure, and the base of the Collet relief, and lock Container Platform securely. On a “CT” type closure feel the downward travel allowed on the pneumatic table by pushing down on the platform table. Adjusting the table’s regulator valve compensates for the additional vertical force created by the closure’s thread travel and any unnecessary pressure is reduced accordingly. On the “CR” type closure, while setting up to engage the closure’s ratchets prior to obtaining thread engagement, the proper table height is first set (static) conforming to the parameters described in your Sure Torque ST-94 tuning sheet. Next, feel the downward travel allowed on the pneumatic table by pushing down on the platform table. By adjusting the table’s regulator valve to obtain a constant vertical load on the component and closure, this assures a dynamic engagement of the closure’s ratchet feature.

Clamp Adjustment:

7. Set the Left Hand, Stationary Clamp in a position that will ensure a centralized position of the container on the Platform.
8. Press the “CLAMP” pushbutton, energizing the Air Clamp.
9. Adjust the Air Clamp in or out until both stationary, and moveable Clamp sections, perfectly align the container, (and closure), in the Collet.
10. Press the “TABLE” pushbutton, lowering the Container platform.
11. Press the “CLAMP” pushbutton, opening the Clamp.
12. Press “Esc” pushbutton to return to main menu.

Confirm your settings by running an automatic cycle:

13. From the Main Menu select “Measurement”, then select either an “Applied” or “Release” Torque, testing requirement by using the “Up” and “Down” pushbuttons to choose the desired mode & then the “Ok” pushbutton to select that mode.

If “Applied” is selected, set the desired torque setting, using the “Up” and “Down” buttons while viewing the Display Screen.

14. Place the container/closure to be tested, onto the Container Platform *snugly* against the Stationary Clamp.

15. Press the “Ok” pushbutton.

16. Read the “Applied”, or “Release” Torque finding for this particular test, on the Control Unit’s display, at the end of the test cycle.

### 3.5 ELECTRONIC SET-UP

The Sure-Torque set-up Mode provides several options to set-up and alter electronic or pre-programmed software settings. Select the set-up Mode from the Main Menu with the “Up” and “Down” buttons. Press “Ok”. There are four sub-menus in the set-up menu: Measurement Setup, Calibration, Setup Delay and Setup Features.

Selecting one of the sub-menus is accomplished by pressing the “Up” and “Down” buttons to move the cursor to the desired function then pressing the “Ok” button confirms the selection. Pressing the “Esc” button leads back to the previous menu mode. Details on the set-up menus are as follows:

#### 3.5.1 Measurement Setup (sub-menu)

Enter the Measurement Setup sub-menu by placing cursor on "Set up", then by pressing “Ok”. Then place cursor on “Measurement Setup” and press "Ok" again. The display then will read:

“Closure Type”

“Type = X”

Set this number to identify the closure you are going to test by the “Up” and “Down” buttons, then press “Ok” when you are done. The display then will read:

“Group Identifier”

“Group = X”

Set this number to identify the group of containers you are going to test by the “Up” and “Down” buttons, then press “Ok” when you are done. The display then will read:

“\*\*\* Data Storage \*\*\*”

“\*Enabled”

“ Disabled”

Move the cursor with the “Up” and “Down” pushbuttons to “Enabled” if you want the control unit to store all the measured data in its memory, and to “Disabled” if you don’t. Press “Ok” when you’re done.

### 3.5.2 Calibration (sub-menu) (see figure 3-2)

Enter the Calibration sub-menu by pressing "Ok" when the cursor is at "Calibration" in the Setup Menu. The display then will read:

"\* Calibration Menu \*"

"\*Torque"

Press "Ok" if you wish to check the calibration of the unit. The display will read:

"Measuring current"

" Torque "

" X.X in-lb "

"Esc Recal "

Make sure the reading is 0.0 if there is no torque applied to the chuck. If the reading is not 0.0, you have to recalibrate your torque tester. (See the procedure below.) If the reading is 0.0, follow the procedure below, steps 1 through 10, to make sure calibration has not drifted.

In this mode the transducer is directly connected to the display for continuous observation and calibration of the ST-94 instrument. The actual certified system calibration with accurate weights is done in this mode. If you have purchased the optional verification kit (strongly recommended), follow these steps to verify the unit's calibration:

1. Remove the platform
2. Using 5/16-18 hand knobs, install the weight roller assembly (roller side up), on the highest hole pattern on the vertical plate.
3. Remove the existing collet
4. Remove the left clamp assembly
5. Slide back the right clamp assembly all the way to the right
6. Install the desired test pulley into the chuck
7. Raise the roller assembly to align the test pulley with the roller assembly. The top of the rollers should be in level with the middle of the pulley
8. Attach the wire to the test pulley with the loop at the end of the wire set over the head of the socket screw in the middle of the pulley. Pull the pin on the pulley then. Wrap the wire around pulley at least 180 degrees and hang it over the appropriate roller; now put the pin back in. If you hang the wire over the right hand side roller, you test the machine for release; if over the left hand side roller, you test for applied.
9. Hang the desired weight on the end of the wire. Be sure not to drop the weight and shock the testing head.
10. If the reading on the display is within the  $\pm 1\%$  range of the torque (the radius of the pulley multiplied by the weight), the torque tester meets the calibration requirements.

Pressing the "Esc" button will terminate the calibration mode and return to the previous sub-menu.

If you need to recalibrate your machine, push the "Down" button to enter the recalibration mode. The display will read:

" Are You Sure You "

"Want To Recalibrate?"

"Esc Ok"

If you are not sure, press "Esc." Pressing "Ok" will take you to the next screen:

"Take The Weight Off"

"Now, Then Press Ok"

Take the weight off and make sure there is no torque applied to the chuck. Press "Ok". The display will read:

"Hang The Weight On"

"Now, Then Press Ok"

Install the largest pulley from your calibration kit into the chuck. Hang all the weights from the kit on the end of the wire. Wait until the weights stop swinging. Press "Ok". The display will then read:

"Enter The Calculated"

" Torque Value "

" XX.X in-lb "

Calculate the torque (the radius of the pulley multiplied by total weight) and using the "Up" and "Down" buttons set this number. Press "Ok" again. The display will then read:

"Measuring Current"

" Torque "

" XX.X in-lb "

"Esc Recal "

Now the transducer is directly connected to the display for continuous observation. You can use different weights and pulleys to test the unit for linearity.

Pressing the "Esc" button will take you back to the Calibration sub-menu, pressing the "Down" button will take you to the Recalibration sub-menu.

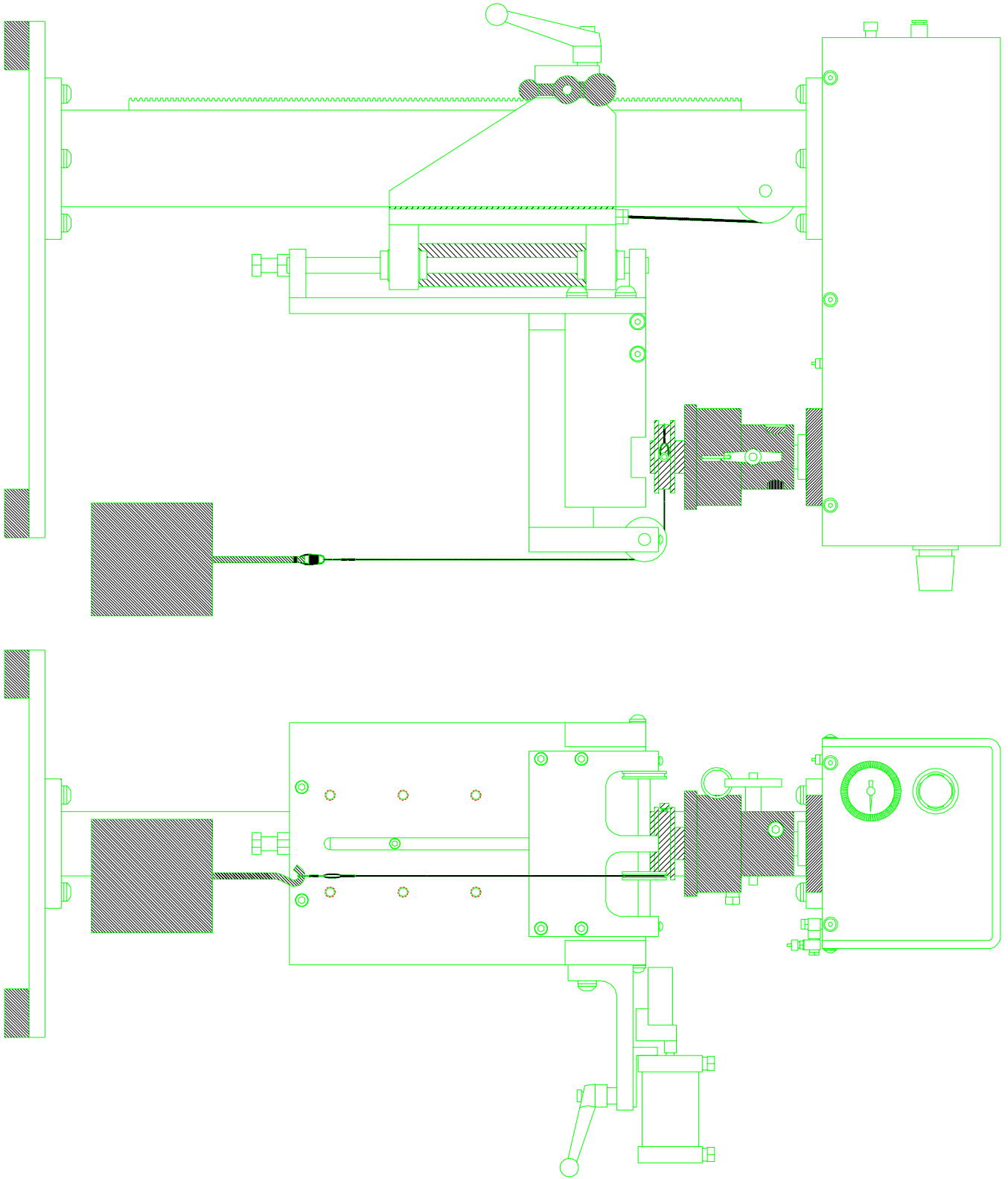


Figure 3-2, ST-94 Setup For Calibration

### 3.5.3 Set-up Delay (Sub-Menu)

Enter the Setup Delay sub-menu by pressing “Ok” when the cursor is at “Setup Delay” in the Setup Menu.

Timing of the measurement cycle is altered in this submenu. The order of cycle steps is pre-programmed. The items in this menu are arranged in the same order as they occur within the cycle: Clamp on, Table up, Chuck on, Chuck off, Table down, Clamp off.

The timing delays are measured as the time between the start of the displayed cycle step to the start of the next operating step. Example: “Table Up=1.5 s” means that the time from the beginning of the Table Up motion until the start of the Chuck On action is 1.5 seconds. All timing values are adjustable from 0.0 - 250.0 seconds in 0.1-second increments, except as noted. Select the timing constant you wish to change with the “Up” and “Down” keys, then press “Ok”. Values are set by the “Up” and “Down” buttons. “Ok” enters the value displayed, “Esc” returns to the previous sub-menu. Timing values are normally not changed unless a major size change is made to the test containers and closures. The delay value is increased if more time is required between cycle steps.

The rate at which *release* and *applied* torque or vertical force is applied is also adjustable in the set-up delay sub-menu. The rate of release torque is adjusted by altering the relative rate value in the set-up delay sub-menu. The rate is adjusted from 1 to 250 seconds in 1-second increments. The value entered, is the time from start of the torque application to the time at which the system reaches full (100%=100 Inch-Lbs) torque in a linear fashion. As the time value increases, the cycle time is lengthened. As the value is decreased, the cycle time is shortened. A release rate set too short can adversely affect the accuracy of torque readings.

The application rate or table rate is set in a similar manner and the settings and functions operate in the same fashion.

### 3.5.4 Set-up Features (Sub-Menu)

Enter the Calibration sub-menu by pressing “Ok” when the cursor is at “Calibration” in the Setup Menu. The “FEATURES” sub-menu contains standard and optional items, including time and date setting, the number of retries in the Multiple Applied Mode, and the Release and Applied Fallback values. Each Feature is reached by moving the cursor with the “Up” and “Down” buttons and pressing “Ok” when the desired menu point is at the cursor.

#### 3.5.4.1 Date, Time settings

For certified and validated measurement the Torque data reported from optional RS-232 port is tagged with actual time and date stamp. Also, if the unit is set up for data storage the time and date will be stored in the memory with the measured value indicating the time when the test was done. Time adjustment is required once a year. To set the time and date, use the “Ok” button to advance to the next digit, “UP” and “DOWN” to select the right value.

#### 3.5.4.2 Decay Time Delay Setting (Optional)

In the “Applied and Release” and the “Fatigue” modes you have the option to set the torque tester not to release the cap immediately after applying the torque, but to wait for a certain amount of time. By setting this number you can program your unit how many seconds to wait before conducting the release test in the above two modes. To set this value, use the “Up” and “Down” buttons to select the right value, then press “Ok” when you’re done. This number can be set between 0 and 3600 second. Set it to zero if you want an immediate release test.

### 3.5.4.3 Number of Retry (1 thru 5)

This value sets the number of retries that the system will automatically cycle through in the optional Multiple Applied Mode. In the Multiple Applied Mode, the system will continue to apply the closure until the applied torque value is reached or the number of retries reaches the number set in this menu. If the Number of Retries =1, There will be two applied torque cycle in the Multiple Applied Mode. If the Number of Retries = 5, it means 6 cycles in total can occur in the Multiple Applied Mode.

### 3.5.4.4 Release, Topload and Applied Fallback

Select a value by pressing “UP” or “DOWN”. Release fallback torque value means the torque amount drop after peak value that terminates the cycle and validates the peak value to be the true release torque. Select low value for low expected torque and higher for higher expected torque. Particularly useful for speedier cycle and child resistant cap applications. You can set different values for Release, Pull apart and Applied mode in 0.1 in-lb increments up to 100 in-lb.

### 3.5.4.5 Table Down Setting

For operations, which require the chuck to rewind (e.g. Multiple applied mode) you can enable or disable the table to go down while the chuck is rewinding. To enable the table to go down is useful when you are trying to tighten a very loose cap in the Multiple applied mode.

### 3.5.4.6 Unit of Measure Setting

This setting provides you selection between U.S. (inch-pounds) and SI (Newton-meters) units of the measurement.

### 3.5.4.7 Check Database

By selecting this feature the control unit tests the entire memory and displays the number of errors the number of errors should be zero. If the unit found errors, try to clear the Database (3.5.4.8), then check it again. If errors still exist, the unit needs to be repaired.

### 3.5.4.8 Clear Database

After selecting this feature the display will read:

“ All data in memory”  
“ will be lost ! “  
“Esc OK”

Press “Ok” if you want to erase all stored data from the memory, or press “Esc” if you don’t. Be careful with this feature, because the lost data cannot be recovered!

### 3.5.4.9 Set-up Lock Out Feature (Optional)

This feature allows you to prevent any unauthorized person to make any changes in the set-up setting. You have to enter a six-letter password to have access to the set-up mode.

If your machine is equipped with the set-up lock out feature, you are only able to change the setup settings if you enter the six-letter password. When you select “Setup” from the main menu, the following message will appear on the display:

“ User Password “  
“ — “

You can set the desired letter by pressing the “UP” or “DOWN” key. The letters will appear in alphabetical order. To select the next letter, press the “ESC” key. When you have set all the six letters, hit “ENTER”. If the password is correct, you are in set-up mode, but if not the message below appears on your display:

“Wrong Password”

Pressing any of the pushbuttons will take you back to the Main Menu. If you want to change the password, select “Set User Password” from the Setup Menu, and the display will read:

“Set User Password”  
" - "

Now you can set the desired password, as described above. When you are finished, press “ENTER”.

### 3.5.4.9.1 Password

The pre-set password from the factory is “AAAAAA”.

**WARNING**

Once you have changed the password, there is no way to read it back! Be very careful with this option, because if you forget the password, you have to send your control unit back to the factory for reinstallation!

## 3.6 DISPLAYED MESSAGES, OPTIONS AND INSTRUCTIONS

### 3.6.1 Display

All operator controls and messages are conducted via the 4 X 20 Character message center and the four (4) program keys under the display.

The modes and messages are programmed into a computer cartridge. Depending on the options the customer selected at the time of purchase, these modes may or may not be installed in the equipment.

### 3.6.2 Power On

At Power On the

“ \*\*\* ST-94 \*\*\* ”  
“Ver: 5.91 (C) 2001”  
“Sure Torque, Inc.”

message appears together with the actual time and date on the top of the display. By pressing the “Ok” key, the unit enters the main menu.

### 3.6.3 The Main Menu

The Main Menu contains the main features of the ST-94 torque tester. Selection of a mode is done by moving the cursor to the appropriate mode, then pressing "Ok". From the Main Menu the user may select **Measurement**, **Data Analysis**, **Setup** or **Manual Mode**. The Measurement sub-menu contains the modes of operation the ST-94 is programmed for.

### 3.6.4 Release Mode

(Selected from the Measurement Menu ).

"P:Release Mode "  
"Type: X Group: X "  
"Esc Storage OK"

message appears on the screen. The Type number identifies the closure you are testing. The Group number identifies the group of containers you are testing. If you wish to change these numbers, go to Measurement Setup (sect. 3.5.1). The bottom row of the display indicates if the results of the test will be stored in the memory or not. If not, upon starting the test cycle you will hear a warning beep. If you wish to enable or disable the data storage, go to Measurement Setup (sect. 3.5.1). Pressing "Esc" takes you back to the Procedure menu, pressing the safety buttons initiates the test cycle. "RelPeak: ..." and the actual release peak torque is displayed. At the end of the test cycle the display will hold the measured peak torque until you press "Ok" or "ESC", which takes you back to the previous screen.

### 3.6.5 Release Double

(Selected from the Measurement Menu ).

"P:Release Double "  
"Type: X Group: X "  
"Esc Storage OK"

message appears on the screen. The Type number identifies the closure you are testing. The Group number identifies the group of containers you are testing. If you wish to change these numbers, go to Measurement Setup (sect. 3.5.1). The bottom row of the display indicates if the results of the test will be stored in the memory or not. If not, upon starting the test cycle you will hear a warning beep. If you wish to enable or disable the data storage, go to Measurement Setup (sect. 3.5.1). Pressing "Esc" takes you back to the Procedure menu, pressing the safety buttons initiates the test cycle. "RelPeak: ..." and the release peak torque is displayed. After measuring the immediate release torque the unit will display the second peak torque value. At the end of the test cycle the display will hold the second peak torque and show the first peak torque at the same time until you press "Ok" or "ESC", which takes you back to the previous screen.

### 3.6.6 Applied

(Selected from the Measurement Menu).

"P:Applied "  
"Appl: XX.X in-lb "  
"Type: X Group: X "  
"Esc Storage OK"

message appears on the screen. The second row displays the torque that the torque tester will apply. Set the desired applied torque value by pressing the "Up" or "Down" button, then press "Ok". The Type number identifies the closure you are testing. The Group number identifies the group of containers you are testing. If you wish to change these numbers, go to Measurement

Setup (sect. 3.5.1). The bottom row of the display indicates if the results of the test will be stored in the memory or not. If not, upon starting the test cycle you will hear a warning beep. If you wish to enable or disable the data storage, go to Measurement Setup (sect. 3.5.1). Pressing “Esc” takes you back to the Procedure menu, pressing the safety buttons initiates the test cycle. “AppPeak: ...” and the applied peak torque is displayed. At the end of the test cycle the display will hold the applied torque until you press “Ok” or “ESC”, which takes you back to the previous screen.

### 3.6.7 Multiple Applied

(Selected from the Measurement Menu).

“P: Multiple Applied “  
“Appl: XX.X in-lb “  
“Type: X Group: X “  
“Esc Storage OK”

message appears on the screen. The second row displays the torque that the torque tester will apply. Set the desired applied torque value by pressing the “Up” or “Down” button, then press “Ok”. The Type number identifies the closure you are testing. The Group number identifies the group of containers you are testing. If you wish to change these numbers, go to Measurement Setup (sect. 3.5.1). The bottom row of the display indicates if the results of the test will be stored in the memory or not. If not, upon starting the test cycle you will hear a warning beep. If you wish to enable or disable the data storage, go to Measurement Setup (sect. 3.5.1). Pressing “Esc” takes you back to the Procedure menu, pressing the safety buttons initiates the test cycle. “AppPeak: ...” and the applied peak torque is displayed. At the end of the test cycle the display will hold the applied torque until you press “Ok” or “ESC”, which takes you back to the previous screen.

### 3.6.8 Release and Applied

(Selected from the Measurement Menu ).

“P:Release & Applied “  
“Appl: XX.X in-lb “  
“Type: X Group: X “  
“Esc Storage OK”

message appears on the screen. The second row displays the torque that the torque tester will apply after opening the cap. Set the desired applied torque value by pressing the “Up” or “Down” button, then press “Ok”. The Type number identifies the closure you are testing. The Group number identifies the group of containers you are testing. If you wish to change these numbers, go to Measurement Setup (sect. 3.5.1). The bottom row of the display indicates if the results of the test will be stored in the memory or not. If not, upon starting the test cycle you will hear a warning beep. If you wish to enable or disable the data storage, go to Measurement Setup (sect. 3.5.1). Pressing “Esc” takes you back to the Procedure menu, pressing the safety buttons initiates the test cycle. “RelPeak: ...” and the release peak torque is displayed. After measuring the release torque, the unit will display the applied torque value. At the end of the test cycle the display will hold the applied peak torque and show the release peak torque at the same time until you press “Ok” or “ESC”, which takes you back to the previous screen.

### 3.6.9 Applied & Release

(Selected from the Measurement Menu ).

“P:Applied & Release “

“Appl: XX.X in-lb “

“Type: X Group: X “

“Esc Storage OK”

message appears on the screen. The second row displays the torque that the torque tester will apply before opening the cap. Set the desired applied torque value by pressing the “Up” or “Down” button, then press “Ok”. The Type number identifies the closure you are testing. The Group number identifies the group of containers you are testing. If you wish to change these numbers, go to Measurement Setup (sect. 3.5.1). The bottom row of the display indicates if the results of the test will be stored in the memory or not. If not, upon starting the test cycle you will hear a warning beep. If you wish to enable or disable the data storage, go to Measurement Setup (sect. 3.5.1). Pressing “Esc” takes you back to the Procedure menu, pressing the safety buttons initiates the test cycle. “AppPeak: ...” and the applied peak torque is displayed. After applying the torque, the unit will measure the release torque value. At the end of the test cycle the display will hold the release peak torque and show the applied peak torque at the same time until you press “Ok” or “ESC”, which takes you back to the previous screen.

### 3.6.9 Fatigue Mode

(Selected from the Measurement Menu ).

“P:Fatigue Mode “

“Appl: XX.X Cycl: X “

“Type: X Group: X “

“Esc Storage OK”

message appears on the screen. The second row displays the torque that the torque tester will apply before opening the cap and the number of cycles what the machine will go through. Set the desired applied torque value by pressing the “Up” or “Down” button, then press “Ok”. You can change the number of cycles by pressing “Up” or “Down”. Push “Ok” when you’re done. The Type number identifies the closure you are testing. The Group number identifies the group of containers you are testing. If you wish to change these numbers, go to Measurement Setup (sect. 3.5.1). The bottom row of the display indicates if the results of the test will be stored in the memory or not. If not, upon starting the test cycle you will hear a warning beep. If you wish to enable or disable the data storage, go to Measurement Setup (sect. 3.5.1). Pressing “Esc” takes you back to the Procedure menu, pressing the safety buttons initiates the test cycle. “AppPeak: ...” and the applied peak torque is displayed. The bottom row indicates the current cycle and the number of the total cycles. After applying the torque, the unit will measure the release torque value. The machine keeps repeating this operation until it went through all the cycles. At the end of the operation the display will hold the last release peak torque and show the last applied peak torque at the same time until you press “Ok” or “ESC”, which takes you back to the previous screen.

### 3.6.10 Release, Non-Destructive

(Selected from the Measurement Menu).

```
"P:Release,Non-destr."  
"Ndr: XX.X in-lb "  
"Type: X Group: X "  
"Esc Storage OK
```

message appears on the screen. The second row displays the target value for the non-destructive test. Set the desired target value by pressing the "Up" or "Down" button. The Type number identifies the closure you are testing. The Group number identifies the group of containers you are testing. If you wish to change these numbers, go to Measurement Setup (sect. 3.5.1). The bottom row of the display indicates if the results of the test will be stored in the memory or not. If not, upon starting the test cycle you will hear a warning beep. If you wish to enable or disable the data storage, go to Measurement Setup (sect. 3.5.1). Pressing "Esc" takes you back to the Procedure menu, pressing the safety buttons initiates the test cycle. "RelPeak: ..." and the release peak torque is displayed. At the end of the test cycle the display will show either the pre-set target value for "passed" sample or the actual peak release torque for a "failed" sample. Pressing "Ok" or "ESC", will take you back to the previous screen.

### 3.6.11 Pull Apart Mode

(Selected from the Measurement Menu).

```
"P:Pull Apart Mode"  
  
"Type: X Group: X "  
"Esc Storage OK"
```

message appears on the screen. The Type number identifies the closure you are testing. The Group number identifies the group of containers you are testing. If you wish to change these numbers, go to Measurement Setup (sect. 3.5.1). The bottom row of the display indicates if the results of the test will be stored in the memory or not. If not, upon starting the test cycle you will hear a warning beep. If you wish to enable or disable the data storage, go to Measurement Setup (sect. 3.5.1). Pressing "Esc" takes you back to the Procedure menu, pressing the safety buttons initiates the test cycle. "Load: ..." and the vertical peak force is displayed. At the end of the test cycle the display will show the actual peak vertical force. Pressing "Ok" or "ESC", will take you back to the previous screen.

### 3.6.12 Data Analysis

(Selected from the Main Menu). After collecting the data, this menu item allows you to make your SPC analysis.

Specify the closure type first, then the mode of operation. Next, select the type of analysis you wish to perform. You can select one of the following types:

- List of data** (gives you the numeric values of the individual measurements)
- Min, Max, Average** (calculates the Minimum, Maximum and Average values of the collected data)
- Standard Deviation** (calculates the Standard Deviation of the collected data)
- Histogram** (gives you the Histogram of your measurements)
- Data on RS232** (downloads data to a PC through serial cable)

**-Check Sheet** (gives you the numeric values of the individual measurements in a customized format)

After selecting the mode, specify the first and the last group of samples you wish to analyze, then the start date and time and the end date and time of the measurements. Next, select the mode in which you want the results to appear. You can chose from one of the following:

- **Chart** (the data appears in a bar chart format on your printer)
- **Data on Printer** (the data appears in numeric values on your printer)
- **Data on Display** (the data appears in numeric values on the display of the electronic box)

If you select “Chart” or “Data on Printer”, there must be a printer hooked up to the printer port of the electronic box.

### 3.6.13 Manual Mode

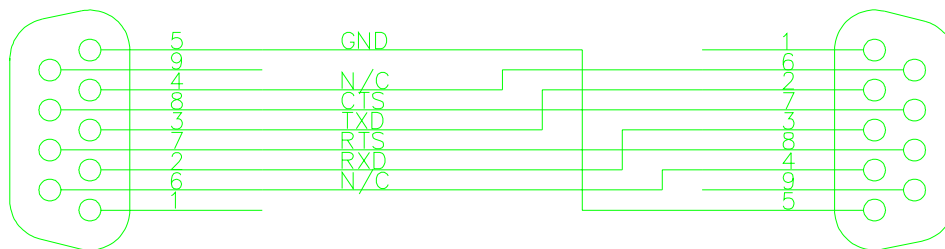
(Selected from the Main Menu) Useful for adjustment in the mechanisms, this mode allows you to independently operate the clamp, table and chuck movements. Press the appropriate button (one push turns the device on, another turns it off). By pressing the “ESC” button you may return to the main menu.

### 3.6.14 RS-232 Interface

Serial Port for data transmission to a remote computer or to a printer. Data is output after every measurement cycle. Data is in ASCII format with CR, LF Delimiter. Protocol: 1200 Baud, 8 Data bits, 2 stops, no parity (see Figure 3-2, RS-232 Cable and Communication Parameters). Cable to PC Serial Port is optional.

### 3.7 STDA (Sure Torque Data Acquisition - Optional)

MS-DOS compatible software package for data collection from ST-94 RS-232 Port. If you have purchased this option refer to the Appendix A in this manual for details.



CABLE LENGTH: 6'

### COMMUNICATION PARAMETERS

1. BAUD RATE: 1200
2. PARITY: NO
3. DATA LENGTH: 8 BITS
4. STOP BITS: 2

Figure 3-3, RS-232 Cable and Communication Parameters.

**WARNING**

If your *Sure Torque* ST-94 Electronic Torque Tester is not running smoothly, or there is **any** doubt as to its operational proficiency, or proper production cycle, contact STI Customer Service at once:

**Phone: (941) 753-1095      FAX: (941) 756-8425**

# Section 4, Maintenance

Proper and regular, routine maintenance schedules should be followed at all times with the SURE TORQUE, INC. instrument. This instrument is designed to give many years of trouble-free operation, so long as machine cleaning and maintenance are performed regularly. SURE TORQUE suggests you train all machine operators and maintenance personnel with a comprehensive program and maintenance schedule. The posting of this schedule in machines' electrical cabinet, or near machine, will aid personnel in conforming to the overall maintenance program, and not miss scheduled maintenance objectives.

## WARNING

Do not attempt to clean **any** part of this machine with the power on. Turn off the power with the **power** button before performing **any** cleaning or maintenance functions.

Be sure to follow **all** safety precautions in the Safety Instructions.

Failure to comply with the aforementioned Warnings **may** cause personal injury.

### 4.1 CLEANING

Frequent regular cleaning is one of the most important functions of any machinery maintenance program. Surrounding shop conditions such as dust, type of product, etc., will dictate the frequency of cleaning required. Simply... Inspect machine daily, and thoroughly clean as necessary.

Wipe or wash all rails, chains, guides, wheels, belts, gears, and any other "slip", "drive", or "container contact" surfaces, to remove contaminants as frequently as needed, which may be weekly, or even daily.

Various materials used for specific machine applications and the recommended cleaning solutions are listed below:

TABLE 4-1, Cleaning Materials.

MATERIAL (APPLICATION):	CLEANING SOLUTIONS:
a. High Density Polyethylene (Change Parts):	All purpose cleaner.
c. Anodized Aluminum (Structure):	All purpose cleaner.
d. Transparent Polycarbonate/acrylic* (Guarding):	Glass cleaner.
e. Mechanical Parts):	All purpose cleaner/degreaser.

- **Do not** use alcohol and chlorothene based cleaning products on these materials.

## 4.2 PREVENTIVE MAINTENANCE

A comprehensive Preventive Maintenance Program is recommended to keep your SURE TORQUE ST-94 Instrument in optimum operating condition, eliminating any unnecessary machine “down-time”. The following schedule is an outline as to achieving this goal. Any additions or changes to suite your own specific production operation should implemented into the overall Maintenance Program.

### WARNING

Do not attempt to clean **any** part of this machine with the power on.  
Turn off the power with the **power** button before performing **any** cleaning or maintenance functions. STI recommends unplugging the machine before **any** cleaning or maintenance functions.

Be sure to follow **all** safety precautions in the Safety Instructions.  
Failure to comply to the for mentioned Warnings **may** cause personal injury.

### CAUTION

As a **Minimum Maintenance Program**, follow the procedures scheduled below, **regularly**.  
Failure to comply with these minimum maintenance functions **may** cause machine damage.

TABLE 4-2, Maintenance Schedule.

INTERVAL	MAINTENANCE FUNCTION
Weekly: .....	a. Check overall machine for any leaks and required cleaning. b. Apply light machine oil to shafts of Air Cylinder shafts. c. Check <b>all</b> pneumatic hose connections for any leaks. d. Check <b>all</b> Air Cylinders for full stroke. e. Completely clean all machine parts and inspect operational functions, cycles, and adjustments.

#### NOTE:

Keep an adequate supply of SURE TORQUE spare parts on hand.  
Contact SURE TORQUE, INC. for a recommended low-cost “Spares” package for your particular machine.

## 4.3 PNEUMATIC SYSTEMS MAINTENANCE

The Pneumatic System actuates all the mechanical systems and components, and their relative test functions. A clean, steady supply of compressed air is essential for proper *Sure Torque* operation. As well, the proper adjustment of these pneumatic components is also essential to accurate torque testing data.

- *Regulator:*

Overall ST-94 System pressure is controlled by a master regulator located on the unit, assuring that no more than 80 psi. of air enters the *Sure Torque* unit.

- *Mini Regulators, (Cylinder Regulators).*

Proper air pressure settings for the Clamp, Container Platform, Chuck, and Test Cylinders, are individually adjustable. These Cylinder Regulators are factory set for optimum performance. Cylinder Regulator adjustment should be limited to one (1) turn, in either direction, for fine adjustments of the various cylinder actuated functions.

**NOTE:**

Clockwise turning of Cylinder Regulator, *Raises* actuation pressure.  
Counter-clockwise turning of Cylinder Regulator, *Lowers* actuation pressure.

### 4.3.1 Air Leaks

It is important to keep the Pneumatic System *Airtight*, and to correct small leaks, should they occur, before they become major problems. With pressure on the system, some leaks may be difficult to locate because the *Lost Air* is continuously being replaced. Small leaks may be located quickly by brushing the suspected part with a soap and water solution, and watching for bubbles, which will form and become "active", at the point where the air escapes. Pneumatic system circuits equipped with air pressure regulators can be isolated for air-leak troubleshooting.

**NOTE:**

Air leaks beyond the regulator will be indicated if the air gauge *does not* maintain constant pressure for a considerable period.

**IMPORTANT**

By providing periodic inspection and maintenance of the Pneumatic System, the operational proficiency your ST-94 *Sure Torque* is greatly enhanced.

### 4.3.2 Air Filter

#### IMPORTANT

If you did not purchase the optional SURE TORQUE Air Filter, then you *must* install your own Air Filter.

There is a drain cock located at the bottom of each filter bowl. This drain cock should be opened at least once a week to drain accumulated water and unused oil from the pneumatic system.

#### WARNING

Shutdown your *Sure Torque* unit, **and** the system air pressure, **before** opening Drain Cocks. Failure to comply may cause damage to equipment and/or personal injury.

### 4.3.3 Solenoid Valves

The Solenoid valves are air direction components that open *or* close in response to electrical impulse, and emit their air flow to air operated components. The Solenoid Air Valves are an *extremely* important part of the ST-94 Electronic Torque Tester System. These valves should *Always* be included in the regular, preventative maintenance program of the overall unit. Make sure that valve responses are immediate and snappy. Air supply to the valves should be clean and free from moisture.

# Section 5, Troubleshooting Guide

This troubleshooting guide is presented to assist in the recognition of any possible malfunctions, identification of their probable causes, and correcting the problem. Refer to the Machine Tuning Sheet in the Appendix-A, when making any adjustments to the machine. This is a general troubleshooting guide, therefore, some malfunction conditions and/or corrective applications may not apply to your particular ST-94 Electronic Torque Tester.

**WARNING**

1. **Only** qualified personnel should troubleshoot this machine.
2. **All** Personnel should stay clear of moving parts.
3. **All** guards and safety features must be replaced **before** the machine is returned to service.

Failure to comply to these warnings **may** cause personal injury !

TABLE 5-1, Mechanical Troubleshooting Guide.

MALFUNCTION	PROBABLE CAUSE
1. Unusually High Torque Reading:	Check clearance between the top, inside surface of the Collet's relief cut counter bore; and the top of the top of the container/closure. Assure that this clearance is <i>from .06" to .012"</i>
2. Unusually Low Torque Reading:	Check for rigidity of container clamps. <b>Container MUST NOT Rotate!</b>

TABLE 5-2, Electrical Troubleshooting Guide.

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Sure Torque will not Power-up:	<ol style="list-style-type: none"> <li>a. No AC power to main panel</li> <li>b. Main AC fuse missing/blown</li> <li>c. Main disconnect not in "on" position</li> <li>d. "Power On" push-button faulty</li> </ol>	<ol style="list-style-type: none"> <li>a. Check pwr. connections</li> <li>b. Replace fuses</li> <li>c. Turn disconnect to "on" position.</li> <li>d. Replace push-button</li> </ol>

TABLE 5-2, Electrical Troubleshooting Guide (Continued).

<b>MALFUNCTION</b>	<b>PROBABLE CAUSE</b>	<b>CORRECTIVE ACTION</b>
2. Sure Torque will not Start:	<ul style="list-style-type: none"> <li>a. No AC power</li> <li>b. Control or main fuse blown/missing</li> <li>c. Line voltage not within <math>\pm 10\%</math></li> </ul>	<ul style="list-style-type: none"> <li>a. Check connections and disconnect.</li> <li>b. Replace fuses</li> <li>c. Install isolation X-former</li> </ul>

TABLE 5-3, Pneumatic Troubleshooting Guide.

<b>MALFUNCTION</b>	<b>PROBABLE CAUSE</b>	<b>CORRECTIVE ACTION</b>
1. Cannot Get Proper Air Pressure:	<ul style="list-style-type: none"> <li>a. Air regulator defective</li> <li>b. Air gauge defective</li> <li>c. Leak in air system</li> <li>d. Insufficient air supply</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace air regulator</li> <li>b. Replace air gauge</li> <li>c. Locate leak and correct</li> <li>d. Check for restrictive kinks, or leaks in air hoses or connections.</li> </ul>
2. Discrete Air Components not Responding:	<ul style="list-style-type: none"> <li>a. Excessive moisture in system</li> <li>b. Component defective</li> <li>c. Defective rear panel fuse</li> <li>d. Low air pressure</li> </ul>	<ul style="list-style-type: none"> <li>a. Check filtering system</li> <li>b. Replace component</li> <li>c. Replace fuse</li> <li>d. Check air supply and that air pressure at the main regulator is 80 psi</li> </ul>
3. Water in Air Supply:	<ul style="list-style-type: none"> <li>a. Filter defective</li> <li>b. Filter dirty</li> </ul>	<ul style="list-style-type: none"> <li>a. Replace filter</li> <li>b. Clean or replace filter</li> </ul>
4. Discrete Air Components Malfunctioning:	<ul style="list-style-type: none"> <li>a. Excessive moisture in system</li> <li>b. Air supply dirty.</li> <li>c. Leak in component or hose connections.</li> </ul>	<ul style="list-style-type: none"> <li>a. Check filtering system</li> <li>b. Check filtering system</li> <li>c. Locate leak and correct.</li> </ul>

## Section 6, Sure Torque, Inc. Warranty, Limitation of Liability and Service Information

All Sure Torque, Incorporated (STI) equipment carries a warranty against defective parts, material and workmanship for one (1) year from the date of shipment. We guarantee the equipment to perform only the functions outlined in the purchase order when supplied with the correct electrical and compressed air supply. Purchased components carry the warranty of the original equipment manufacturers. Normal wear, abuse, misapplication or misuse, incorrect adjustments by the customer, failure that is not machine related and failure due to operating with samples that are different from those supplied and used during construction of the equipment is excluded from this warranty. We will not accept any charges for work performed by purchaser unless the work was authorized in writing by Sure Torque. Satisfaction of this warranty will be limited to the repair, replacement, modification or issuance of a credit for defective material or workmanship only after the return of the parts for evaluation in our plant. Any warranty service (consisting of time, travel and expenses) performed other than at our factory shall be at buyer's expense. In no event will Sure Torque, Incorporated be responsible for consequential, incidental or exemplary damages.

Sure Torque instruments whether patented, patentable or non-patentable represents a reduction to practice of Sure Torque's know-how and expertise. This know-how and expertise is the result of our considerable experience, research and development. To protect and to retain control over our know-how and expertise, the know-how and expertise executed in the machinery covered by an order to purchase shall be considered a one-time license. The purchaser by accepting delivery of the equipment agrees not to build or have built equipment, which substantially duplicates equipment in whole or in part.

### **This warranty does not apply to:**

1. Damage resulting from abuse, negligence, accident, or loss or damage in transit.
2. Damage caused by neglecting explicit Cautions and Warnings, contained within Seller's (STI's) Operations and Maintenance Manual, depicting specific safeguards and procedures that must be adhered to, and the related risks of equipment damage (and/or personal injury) by not doing so.
3. Damage caused by attempting repairs and/or alterations without prior written consent of Seller (STI).
4. Damage caused by improper connections to the equipment of other manufacturers, or improper connections of equipment of other manufacturers, to that of the Seller.
5. Damage caused by improper electrical connections.
6. Damage caused by improper mechanical installation or set-up.
7. Damage caused by failure to perform required maintenance as outlined in Seller's (STI's) Operations and Maintenance Manual.
8. Incidental items, such as miscellaneous consumables, hardware, fuses, light bulbs, springs, glass, acrylic, polycarbonate, or plastic components.

The Seller makes no other warranty, expressed or implied, and **disclaims any implied warranty of merchantability or fitness for a particular purpose.**

The Buyer and Sure Torque, Inc., agree that the sole and exclusive remedies for breach of any warranty concerning the goods shall be repair or replacement of defective parts upon the terms above described or, at Seller's option, refund of purchase price. The Seller **shall not** be liable for contingent or consequential damages to **persons, property, or loss of productivity** and its sole liability as above set forth in this document.

Any action by Buyer for any alleged breach of the warranty set forth herein shall be brought to the attention of Sure Torque, Inc., by Buyer within the warranty period, but not later than thirty (30) days after the alleged breach.

**This statement of warranty and limitation of liability is a complete and exclusive statement of all warranty and liability representations of Sure Torque, Inc.** It may not be varied, supplemented, qualified or interpreted by any prior dealings between the parties or by any usage of the trade or upon the face or reverse of any form to which this is attached or part of, nor may it be modified by any agent, employee, or representative of the Seller, unless such modification or representation is made in writing and signed by a duly authorized officer of the Seller.

Repairs and/or replacements under the terms of this warranty **shall not extend the warranty life of the original equipment supplied.**

Equipment, parts, or components returned to the factory (STI) should be accompanied by the following information: A Return of Materials Authorization (RMA) number, the reason for the return with a comprehensive description of the malfunction, shipping instructions, and the name and telephone number of a contact in the event of any problems.

In some cases, prior to Warranty repair and/or replacement authorization, Seller (STI) may require an on-site inspection of the Buyer's equipment. This inspection, if deemed necessary by Seller, is intended to verify malfunction and identify what repairs or expendable parts, if any, are required to bring the unit(s) up to a satisfactory operating condition as determined by Seller (STI). The cost of the necessary parts and labor to bring the machine to a satisfactory operating condition will be billed at retail prices and standard service rates, and shall be paid by the customer. Thank You, STI.

# Section 7, Sure Torque Options List

## 7.1 OPTIONS LIST

### 7.1.1 Release Mode

This mode tests the release torque of a previously applied closure. In this way the Sure Torque ST-94 acts to insure all containers tested reach the proper release value as it relates to the cappers applied torque. A digital display indicates the release torque at which the closure loosens. The model ST-94 applies increasing removal torque consistently to a closure until it reaches the release torque value or shows a lesser torque measurement during operation on a loose closure.

### 7.1.2 Applied Torque Mode

This mode applies closures accurately and consistently to a sample of containers, often in preparation for further testing or evaluation. In the Applied torque mode, the model Sure Torque ST-94 accurately applies closures to individual containers without operator intervention or influence.

### 7.1.3 Multiple Applied Mode

This mode applies closures consistently to containers that normally require multiple individual cycles due to the amount of thread travel required, degrees of rotation, resiliency of cap liner and other components or factors. This option saves cycle time and test time, while preventing operator fatigue and injury due to extensive testing. The Sure Torque ST-94 applies closures automatically to individual containers upon initiation of this cycle by running multiple cycles, if required, to reach target values.

### 7.1.4 Applied & Release Torque Mode

This mode applies closures in the Multiple Applied Mode, then conducts an immediate release torque test. Best suited to assist the Incoming Quality Control function in testing virgin bottles and closures before approving their release to Production. Research & Development and Package Development departments both use this feature to design new components and to determine component compatibility. This feature assists Production and/or Maintenance in the setting up of a capper. Production departments also use this feature to determine when "out of spec" components have reached their filling lines.

### 7.1.5 Release & Re-apply Mode

This mode provides a faster method for removing and applying closures in a single cycle without human intervention, providing a time saving mode for the technician and preventing operator injury and fatigue. The Sure Torque ST-94 will release the closure automatically, then apply the torque that you have pre-set for tightness, and displays both the removal and applied torque's value.

### **7.1.6 Non-Destructive Release Mode**

This mode confirms that the release torque of a previously applied closure, at least equals a predetermined value. In this way the Sure Torque ST-94 acts to pass or fails quality control test, insuring that all containers tested reach the selected release value. If the test proves successful, this mode allows samples safe transfer back into circulation, saving the cost of discarding product. A digital display indicates the release torque at which the closure loosened if a test fails.

The Sure Torque ST-94 applies increasing removal torque to a closure until it either reaches the pre-selected release torque value or shows a lesser torque measurement during operation on a pre-tightened closure. This indicates a loose closure. The display then shows either the pre-set target value for a "passed" sample or the actual peak release torque for a "failed" sample.

### **7.1.7 Non-Destructive Release and Reapply Mode**

Combines two other options, the "Non-Destructive Release" and the "Multiple Applied" torque modes into one option to save time, and prevent operator fatigue and injury. The test procedure is the same as the Non-Destructive Release Mode with the addition of the Multiple Applied Torque Mode. This automatic reapplied cycle insures the released closure's pre-set target value of the applied torque.

### **7.1.8 Repetitive Applied & Release (Fatigue) Mode**

This mode applies closure accurately and consistently to a sample container, then performs a release test, automatically repeating the procedure as many times as your test criterion requires. Providing a true fatigue test criterion of any quantity selected. Some uses are seal integrity detection; leak testing, premature thread ware, liner durability, and child resistant mechanical failure determination.

### **7.1.9 Release Double Peak Mode**

This option will measure the very first immediate release torque, then open the chuck, rewind, close and then begin again testing for the next peak. Best suited for tamper evident closures requiring the continued application of torque to break each of the tibs on the band.

### **7.1.10 360° Degree Test Mechanism**

This option measures the highest release torque sensed during a full 360 degree turn of the closure. In some types of "tamper evident" or "child resistant" closures, the immediate release torque is not always the highest torque reached in the complete closure removal process. If you have purchased this option refer to the Appendix A in this manual for the table adjustment procedure of your 360° Mechanism.

### **7.1.11 Metric Measurement**

This arrangement provides the option of displaying all torque measurements in metric Newton-Meters, in place of inch-pound units. If chosen, this option will be a selection in the set-up menu as a Metric or U.S. (avoirdupois) toggles function.

### **7.1.12 RS-232 Interface**

This option provides a cable and RS232 serial port, on the back of the Sure Torque ST-94 control box, to interface to a serial port on a customer's IBM compatible computer or printer. All test data generated on the Sure Torque ST-94 are available for output to a customer's printer or PC. This feature available with either the Sure Torque SPC software program or the Sure Torque NEMDA data acquisition package, which feeds all collected torque values into the customer's PC for storage, later analysis or printout.

#### **7.1.13 Real Time Clock (RS-232 serial port required)**

A data collection aid to provide a time and date readout on any torque test data downloaded to a customer's computer or printer. With this option installed, the Sure Torque ST-94 automatically feeds time and date signals to the customer's PC or printer, identifying the time and date of each test. With the possibility of a house computer shut down, this optional back up feature allows actual time and date transmitted with the generated test data.

#### **7.1.14 Verification Kits**

This feature allows an on-site verification of the Electronic Torque Tester's calibration by your technicians. The specially designed set of calibration weights and brackets, enclosed in self-contained storage boxes, are available in two sizes, portable and lab use with optional capacity for 50 Inch-LB calibration requirement. We strongly advise the addition of this option to your torque testing operation for purposes of continued validation of equipment and quality conforming to performance.

#### **7.1.15 STDA Software**

The Sure Torque STDA software package, downloaded to customer's hard drive or floppy disk, automatically collects and displays torque test data from the ST-94 Electronic Torque Tester in both release and applied torque modes, eliminating the task of manual data collection and the possibility of human error in reading or recording results. IBM compatible computer and RS-232 serial port option required. If you have purchased this option refer to the Appendix A in this manual for details.

#### **7.1.16 Set-up Lock Out Feature**

This feature allows you to prevent any unauthorized person to make any changes in the set-up setting. You have to enter a four letter password to have access to the set-up mode (refer to section **3.5.3.9** in this manual).

# Section 8

## Glossary

This list of terms and machine nomenclature is used throughout this publication. Understanding meanings and applications will be helpful in using the publication.

**applied torque:** The torque required to apply closures accurately and consistently to a sample of containers, including multiple and repetitive extensions of applied torque requirements, measured in units of inch-pounds (avoirdupois) or Newton-Meters.

**“A” diameter:** Diameter of bottle around which pilfer proof or tamper evident band is applied.

**bottle control:** Equipment parts used for supporting and indexing bottles through a machine.

**bottle finish:** Sealing surface, threads, neck, neck ring or support ring of bottle.

**bottle neck:** The throat area below and including the thread finish of the bottle.

**bridge torque:** Same as secondary Torque.

**calibration:** The test performed to verify that actual test measurements coincide with certifiable standards or conforms to specifications.

**cap feed:** Parts or units which relate to closure transfer or orientation.

**cap release:** Capper component which allows bottle pick up of closure.

**CR (closure):** Child Resistant

**CT (closure):** Continuous Thread.

**“E” diameter:** Diameter of vertical outside wall of bottle Finish.

**headset:** Parts making up the chuck and collet assembly.

**head space:** The unfilled volume between the top of the liquid and the top of the bottle.

**heel:** Bottle base or container foot.

**histogram:** The graphic presentation of a frequency distribution.

**horizontal score:** The score near the bottom of a metal closure forming the pilfer proof band.

**ID:** Measurement of inside diameter.

**initial torque:** The twisting force required to start closure movement on bottle finish.

**liner:** The sealing component of a closure system.

**Mil Standard 105-D:** Quality control information issued by Military Procurement for statistical sampling.

**minimum:** Low limit of dimensional tolerance.

**neck ring:** The formed ring (transfer bead) around the neck to secure Pilfer proof or tamper evident band.

**Newton Meters:** A metric unit (Nm) measurement comparable to converted US Inch-pound units.

**NIST:** National Institute of Standards and Testing.

**non-destructive:** The act of maintaining the integrity of the product unharmed and unspoiled.

**OD:** Measurement of outside diameter.

**perpendicularity:** Bottle specification around the vertical axis of base and neck.

**pneumatic head assembly:** Parts making up the Electronic and pneumatic components of the torque tester equipment.

**PP:** Pilfer proof.

**PSI:** Pounds per square inch (measure of pressure).

**QC:** Quality Control.

**R:** Range of values.

**range:** The difference between the highest and lowest measured value.

**real time:** Logging actual time and date of occurring data.

**release torque:** The torque required to disengage the threads of a previously applied closure, including extensions of non-destructive release, measured in units of inch-pounds (avoirdupois) or Newton-Meters (Nm).

**removal torque:** The rotational forces necessary to remove closure from the bottle.

**RO (roll-on):** The action of copying the threads of the bottle into the metal closure as the two are joined.

**RS-232 Interface:** A serial port connection from controller to interface a computer or printer.

**“S” diameter:** Vertical dimension from top of sealing surface to start of thread.

**sealing surface:** The uppermost portion of the bottle finish where the interface with the lining material of the closure creates a barrier to transmission.

**shoulder:** The area between the neck and container body.

**spotting lug:** The notch formed into the bottle to aid in bottle indexing purpose.

**standard deviation:** A measure of the variation of data from the average.

**SPC:** Statistical Process Control.

**STDA:** Proprietary data acquisition and process.

**short thread:** Closure threads of less than one full 360 degree turn of thread.

**“T” diameter:** Outside diameter of threads.

**TE (closure):** Tamper Evident.

**thread start:** The point at the top of bottle where the thread begins.

**topload:** The pressure (PSIG) applied by vertical force during closure application to achieve thread engagement of child proof (CR) closures or sealing bottle finish (surface) prior to roll on application.

**traceable:** A copy of a previously certified component.

**twist off:** Closure thread with lug design.

**vent:** Openings in side wall of closure to aid in rapid evacuation of headspace gases.

**vent slots:** The vertical interruptions of bottle threads.

**ware:** Glass bottle containers.



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## **ELECTRONIC TORQUE TESTER MODEL: ST-94**

### **Operation and Maintenance Manual**

#### **Appendix A**

- Machine Tuning Sheet
- Certification Records
- Closure Records
- Top Load Setup Procedure  
- Optional
- Sure Torque Data Acquisition  
(STDA - when applicable)
- Sure Torque Control Software  
Torque vs. Angle - Optional
- Sure Torque Strip Test Mode -  
Optional



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## *Quality Assurance Instrumentation*

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# **STDA**

### **DATA ACQUISITION PROGRAM FOR THE ST-94 BENCHTOP TORQUE TESTER**

#### **1. GENERAL**

The STDA (Sure Torque Data Acquisition) is a utility program that together with the ST-94 instrument facilitates computerized data collection and storage. It is specifically designed to work together with the Torque Tester.

The STDA program acquires measured data from the ST-94 instrument and saves the collected data points in a standard ASCII file. This ASCII file can be used for further data processing, such as statistical analysis.

This program is supplied on a CD. It will run on any IBM Personal Computer or compatible with MS-DOS or PC-DOS system.

#### **2. SYSTEM REQUIREMENTS**

- IBM or compatible PC, XT, AT, 386, 486 or portable computer
- MS-DOS or PC DOS operating system
- 640K memory
- Floppy disk drive or hard disk drive
- RS-232 port COM1 or COM2
- Interface cable (supplied with the ST-94 instrument)

#### **3. INSTALLATION**

##### **3.1. Hardware Installation**

Locate the Interface cable (supplied with ST-94 instrument). This is a 6 ft. long cable with a 9 pin "D" type FEMALE connector on both ends.

Install the connector of into the matching "RS232" plug at the back of the electronic box (**do not** use the connector labeled "RS485"). Install the connector on the other end of the cable into the RS232 port on your PC (COM1 or COM2).



## *Quality Assurance Instrumentation*

## 3.2. Software Installation

### 3.2.1. Hard disk installation

Make a subdirectory "STDA" and copy the STDA.EXE file from supplied diskette. Start the program by calling the STDA file.

For inexperienced users:

At the DOS prompt type:

MD STDA <ENTER>

CD STDA <ENTER>

insert diskette into drive A: or B:

COPY A:\*. \* <ENTER> (or COPY B:\*. \* <ENTER>)

STDA [filename] [2]

Any filename can be selected that conforms the DOS operating system.

Specify "2" after the filename if you are using the COM2 port.

### 3.2.2. Floppy disk installation

Format a blank diskette and copy the STDA.EXE file from the STDA distribution disk. This is your work disk. At the prompt of your work disk A: or B: call the program by typing:

STDA [filename] [2]

Any filename can be selected that conforms the DOS operating system.

Specify "2" after the filename if you are using the COM2 port.

## 4. OPERATION

The data collection from the ST-94 instrument is fully automatic. After every measurement the information is transferred to the PC via the RS-232 link and inputted into the STDA system.

The maximum number of data points is 1500. There is room for 21 data points on the display. The cursor keys (Up, Down, Page Up, Page Down, Home, End) can be used for displaying previous data. In case of new data arriving, the last 21 tests will be displayed.



**4.1. FILE SAVE                      F2 FUNCTION KEY**

By Pressing the F2 key you can save the collected data points.

**4.2. CLEAR DATA                      F4 FUNCTION KEY**

All collected data points are cleared by pressing F4.

**4.3. PRINT                              F6 FUNCTION KEY**

Standard ASCII print function to the DOS printer.

**4.4. CHANGE COM PORT                      F10 FUNCTION KEY**

Select the COM port, which your Torque Tester is hooked up to.

**4.5 DELETE LINE                      DELETE KEY**

If you want to erase a data point from the file, move the cursor to that line and push the Delete key.

**4.6. EXIT                              ESC KEY**

Use the ESC key to exit to DOS. Before exiting do not forget to save the file.



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## TOP LOAD FEATURE SET UP AND OPERATION

The object behind the top load feature is to allow the operator to control and document the downward pressure being applied to a cap when torque is being applied or checked. In order to do this, a second transducer is used to measure the force being transferred from the container cap to the collet. This is the measurement of the force being applied to the cap, and is displayed on the readout.

The force is applied by the upward motion of the table lifting cylinder which raises at the beginning of the test cycle to bring the cap in contact with the collet. This force can be adjusted by the operator.

Set up for the top load feature is as follows.

1. Go to Setup Mode
2. Select Topload Setup
3. If you are testing a closure that does not require any downward force, set the Topload Function to Disabled, then follow the setup procedure described in section **3.4**.
4. If you are testing a closure that requires certain downward force (e.g. Child-resistant closure), set the Topload Function to Enabled, then press "Ok".
5. Set the Downward Force to the required value, then press "Ok".
6. Go to Manual Mode
7. Obtain a container to be tested, with its closure **on**.
3. Press the "TABLE" push-button, energizing the Table to full "Up" position.
4. Set the height of the Container platform with the container/closure to be tested, in position. Raise the platform so that the closure goes all the way up inside the collet against the spring loaded disk to engage the closure's ratchets prior to obtaining thread engagement. Tighten the locking handle on the rear of Platform.
5. Follow the clamp adjustment procedure in section **3.4**.

In Measurement Mode before conducting the test, the ST-94 will adjust the downward force automatically to the preset value.

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*The Finest In Quality Closure Testing Equipment!*

## Topload Calibration

Enter the Calibration sub-menu by pressing "Ok" when the cursor is at "Calibration" in the Setup Menu. The display then will read:

```
“* Calibration Menu *”  
“*Torque”  
“ Force”
```

Select "Force" with the down button, then press "Ok. The display will read:

```
“Measuring current”  
“ Topload “  
“ X.X in-lb “  
“Esc Recal ”
```

Make sure there is collet inserted in the chuck, but nothing is touching it. The reading should be 0.0. If the reading is not 0.0 at this point, the topload has to be recalibrated, otherwise follow the procedure below, steps 1 through 3, to make sure calibration has not drifted.

In this mode the topload transducer is directly connected to the display for continuous observation and calibration of the ST-94 instrument. The actual certified system calibration with accurate weights is done in this mode. If you have purchased the optional verification kit (strongly recommended), follow these steps to verify the unit's calibration:

1. Release the black handle on the back of the machine and lower the table all the way down with the crank.
2. Hang the desired weight on the ring on the handle of the quick release pin that holds the collet in the chuck. Be sure not to drop the weight and shock the testing head.
3. If the reading on the display is within the  $\pm 1\%$  range of the applied weight, the torque tester meets the calibration requirements.

Pressing the "Esc" button will terminate the calibration mode and return to the previous sub-menu.

If you need to recalibrate your machine, push the "Down" button to enter the recalibration mode. The display will read:

```
“ Are You Sure You “  
“Want To Recalibrate?“  
“Esc Ok”
```

If you are not sure, press "Esc." Pressing "Ok" will take you to the next screen:

```
"Take The Weight Off"  
"Now, Then Press Ok"
```

Take the weight off with the collet still in the chuck and make sure there is nothing touching the chuck. Press "Ok". The display will read:

"Hang The Weight On"  
"Now, Then Press Ok"

Hang the desired weight on the ring on the handle of the quick release pin that holds the collet in the chuck. Press "Ok". The display will then read:

" Transducer 2 "  
"  
" Value = XX.X lb "

Using the "Up" and "Down" buttons enter the weight that you hung. Press "Ok" again. The display will then read:

"Measuring Current"  
" Topload "  
" XX.X lb "  
"Esc Recal "

Now the topload transducer is directly connected to the display for continuous observation. You can use different weights to test the unit for linearity.

Pressing the "Esc" button will take you back to the Calibration sub-menu, pressing the "Down" button will take you to the Recalibration sub-menu.