

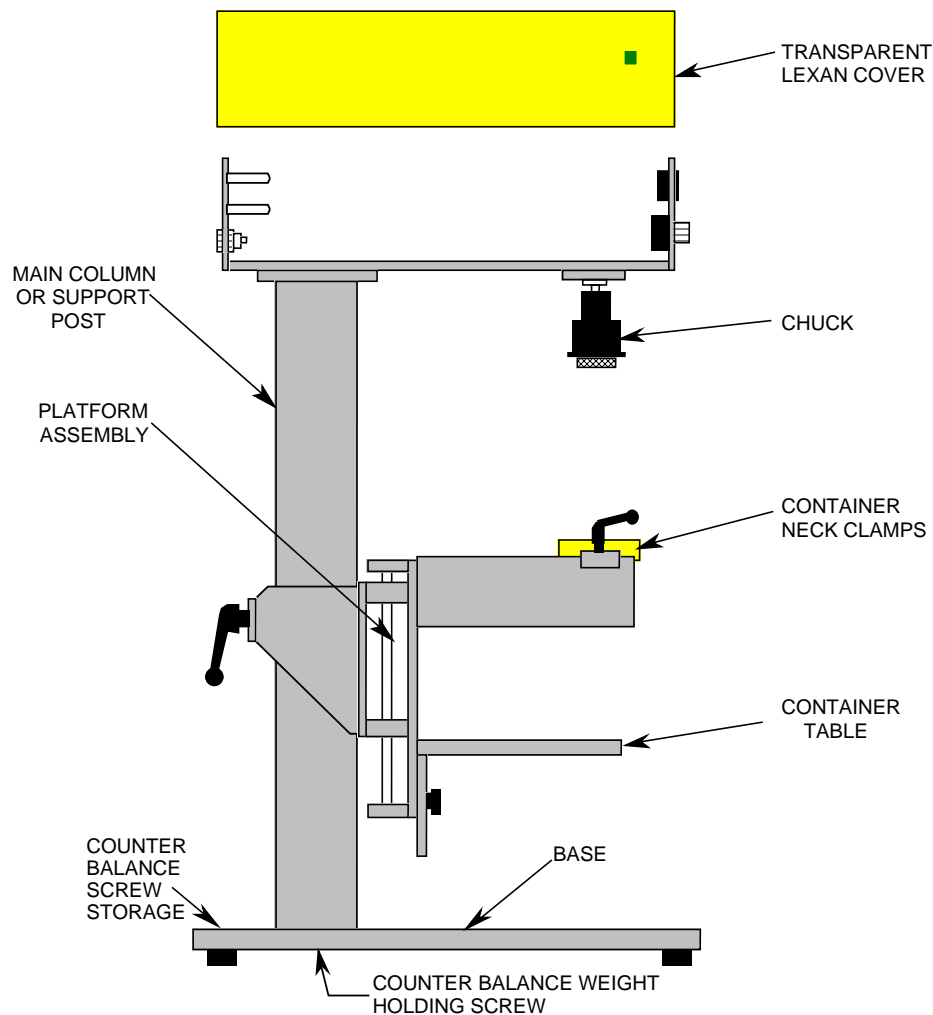


IMPORTANT! READ THIS FIRST!

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

Tools needed: Screwdriver, Allen wrench set.

1. Carefully remove the crating box cover to expose the machine. Remove all the accessories then using a Phillips head screwdriver, remove the wood screws holding the 2X4 cross bars. Remove the bars, and then lift the machine carefully out of the crate.
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 Main Head Assembly.
5. Run unit in manual cycle *first* to check component operation and alignment *before* running automatic cycle.





USA • France • Hungary

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.
2532-34 Trailmate Drive
Sarasota, FL 34243
Office: (941) 753-1095
Fax: (941) 756-8425
<http://www.suretorque.com>

SURE TORQUE, INC. *The Finest In Quality Closure Testing Equipment!*



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 is 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

SURE TORQUE, INC. The Finest In Quality Closure Testing Equipment!

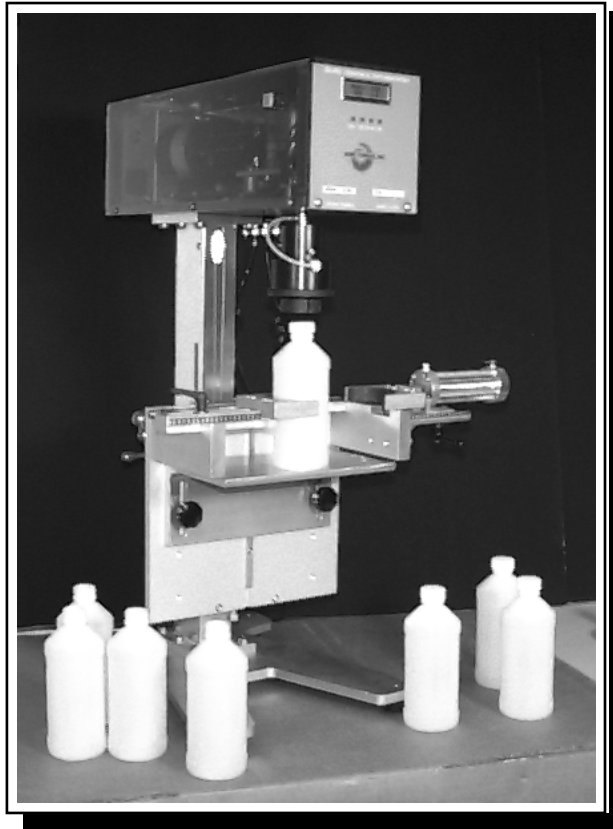


USA • France • Hungary

Quality Assurance Instrumentation

ELECTRONIC BENCHTOP CAPPER MODEL: BT-94

Operation and Maintenance Manual



Information provided in this document contains proprietary data on patented products and systems. This information is furnished for the exclusive use of the customer to install, maintain, repair, and operate the equipment covered in a specific purchase agreement. Disclosure of the data contained herein to any individual or organization not a party to the specific purchase agreement and all other uses, including reproduction by any means, is strictly prohibited without the express written consent of Sure Torque, Inc. Acceptance and use of this manual constitutes acceptance of these terms and conditions.

**PREPARED BY:
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Sarasota, FL 34243
Tel: (941) 753-1095 Fax: (941) 756-8425**

SURE TORQUE, INC. Worldwide Torque Testing Equipment Specialists!

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**

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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 BT-94, *Sure Torque* Electronic Bench top Capper System.

Major components and assemblies are called out on Figure 1-1, BT-94 Bench top Capper 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 Changeover specifications are listed on the Machine Tuning Sheet for the particular closure and container being capped.

Your BT-94, "*Sure Torque*" Electronic Bench top Capper, is a fully automated precision instrument designed for a wide array of container closure capping functions. The BT-94 electronically sets the forces required to apply or remove threaded screw caps from containers.

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

1.1 SYSTEM OVERVIEW

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

The basic BT-94 Bench top Capper System consists of:

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

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

BT-94
MECHANICAL COMPONENTS

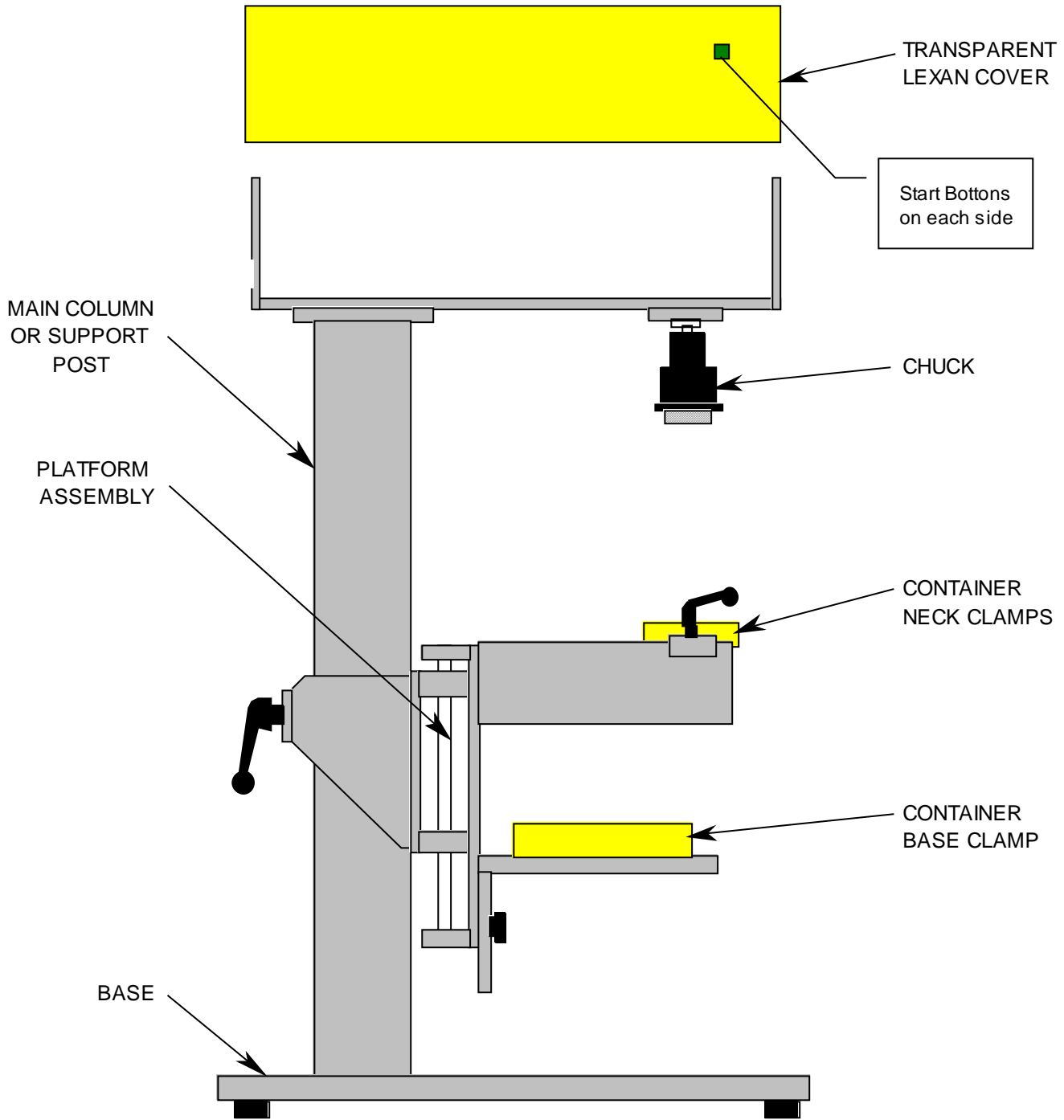


Figure 1-1, BT-94 Bench top Capper General Arrangement.

1.1.1 Electronic Control

The operator's interface with the *Sure Torque* unit is controlled through the integrated electronic control that includes the computer that regulates the BT-94's operational cycles and acts as the overall communications link with the line operator.

1.1.2 Mechanical Assembly

The Mechanical System consists of a Stand assembly, Chuck and Change Part Components. Please refer to Figure 1-2, BT-94 Bench top Capper Mechanical Components (Chuck Assembly).

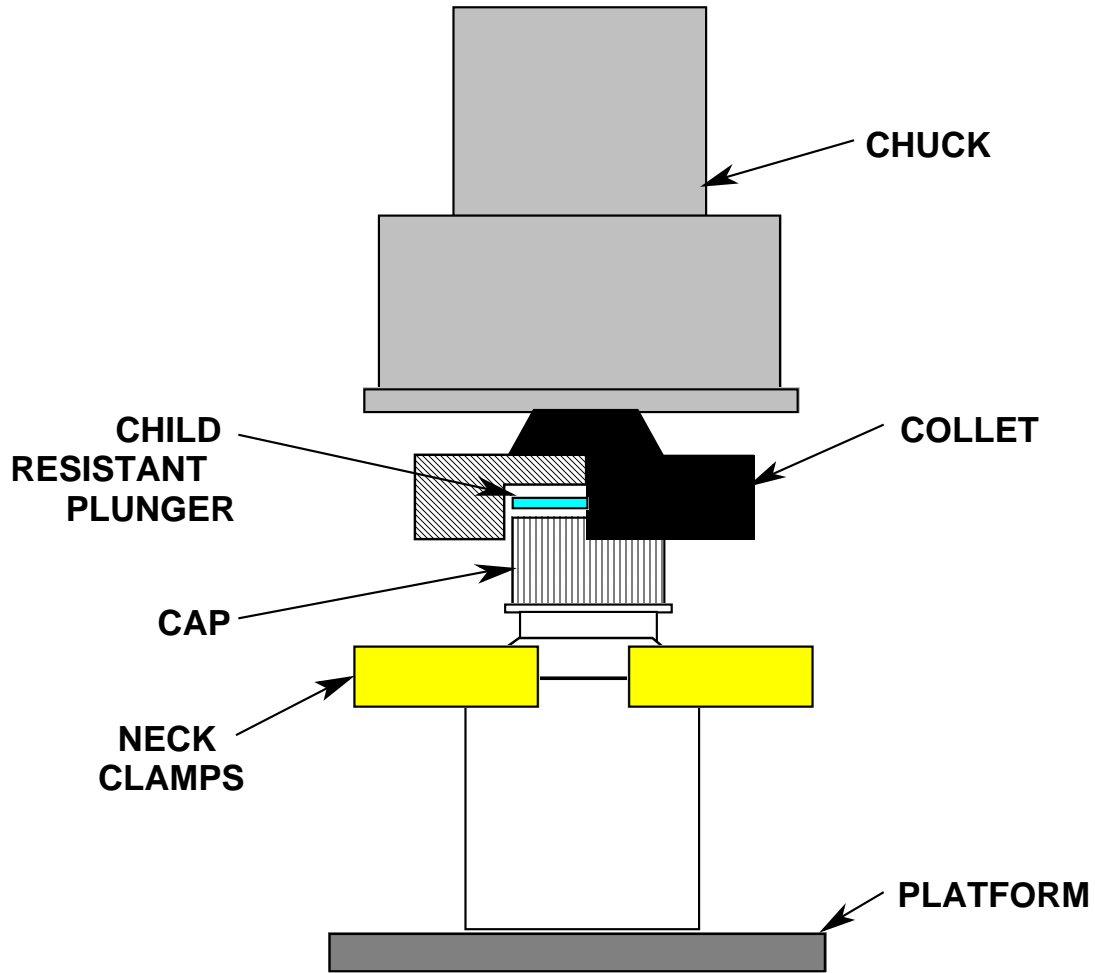


Figure 1-2, BT-94 Bench top Capper Mechanical Components (Chuck Assembly).

1.1.2.1 Stand Assembly

The Stand Assembly is an aluminum fixture which supports the Container Platform, Clamp, Chuck, and BT-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 BT-94's Main Head Assembly, which contains all the main pneumatic, electric, electronic, and force-controlling components required for the actual capping/uncapping 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. The "grasping" force of the Chuck is applied pneumatically, via electronic control. The Chuck rotates on a clutch shaft, actuated by an Electric Motor located in the Main Head Assembly. This Electric Motor applies the required force to perform all capping 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 BT-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 BT-94 *Sure Torque* system and receiving optimum production and maintenance free operation from your unit. Please refer to Figure 1-3, BT-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.

The Pneumatics Operational Philosophy is as follows:

Air pressure is applied to the BT-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 three regulators, which individually control the air supply to the three 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.

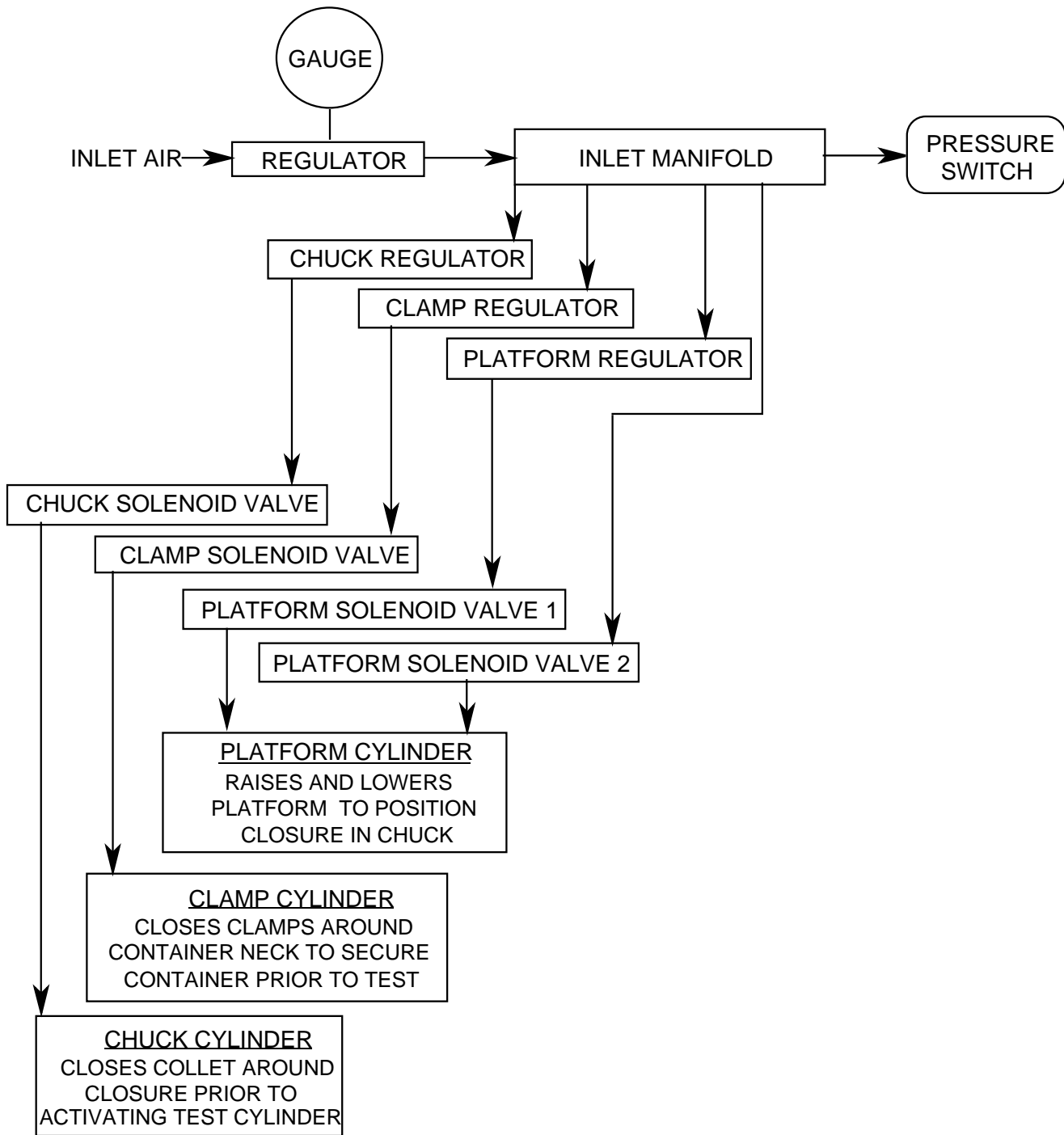


Figure 1-3, BT-94 Bench top Capper Pneumatic Diagram.

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 BT-94 Bench top Capper.

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

1. The Magnetic Particle Clutch.
2. The Microprocessor.

1.1.4.1 Magnetic Particle Clutch

The force applied to the chuck by the Electric Motor (for application *or* removal torque), is controlled by a Magnetic Particle Clutch. Magnetic particle clutches engage magnetically with no movement of mechanical parts, so operation is smooth, ultra-fast, reliable, and free of backlash.

The output disk/shaft assembly does not touch the housing. The gap in between is filled with a fine, dry stainless steel powder. The powder is free flowing, until a magnetic field is applied from the stationary coil. The powder particles form chains along the magnetic field lines, linking the disk to the housing. The torque is proportional to the magnetic field, and therefore, to the applied D.C. input current.

Varying the DC input current controls output Torque. The torque vs. current curve is essentially linear.

While the input torque is less than the output torque, the clutch won't slip, the input shaft will be coupled to the output shaft, with no slip. When the input torque is increased, the clutch will slip smoothly at the torque level set by the coil input current. Output torque is independent of slip RPM.

1.1.4.2 Microprocessor

The Microprocessor controls the input DC current to the clutch. This current is converted to inch-pounds and displayed on the digital display on the front of the Main Head Assembly.

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 BT-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 rises 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 Capping Sequence

In the *fourth* and final step of the operational cycle, the Electric Motor is activated. The Magnetic Particle Clutch controls the torque applied to the closure. The applied torque is displayed on the digital display of the Microprocessor. The standard operational test mode of the BT-94 is the Capping mode in which a closure is being torqued on a container.

Section 2, Installation Instructions

The following paragraphs explain the required information and procedures to properly install your BT-94 *Sure Torque* Electronic Bench top Capper.

CAUTION

Read this section completely before installing your new unit.

2.1 RECEIVING THE UNIT

Your BT-94 *Sure Torque* System is shipped with the mechanical components already assembled. It has to be hooked up with the electrical and air supply.

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, FL 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 Bench top Capper, follow the steps below:

NOTE:

Tools needed: Screwdriver, Allen wrench set.

1. Carefully remove the crating box cover to expose the machine. Remove all the accessories then using a Phillips head screwdriver, remove the wood screws holding the 2X4 cross bars. Remove the bars, and then lift the machine carefully out of the crate.
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. Attach bottle clamp assembly "Air Cylinder" w/ one black handle, to right side (facing front of machine) of the platform assembly with the two hex screws provided.
4. Connect the main air supply to the rear of the head (refer to section 2.5.1 in this manual for specifications).
5. Attach 115 V, 60 Hz power cord (provided) to the rear of the Main Head Assembly.
6. Run unit 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

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

- One fuse is located inside the power receptacle (5A)
- One fuse is located on the power supply module inside the Main Head Assembly (1A)

NOTE:

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

1. Turn on be sure the power on switch to the unit is off.
2. Connect the Power Cord to 120 V, AC receptacle at the rear panel of the Test Head.
3. Hook-up a clean, dry air supply of 80-100 psi at 4 cfm. Connect airline to the 1/4" NPT fitting at the rear panel of the Test Head. (If optional filter is installed, connect the airline to the 1/4" NPT filter inlet.)
4. Set the Regulator at the Rear Panel to 80 psi on the Pressure Gage.

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 BT-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, BT-94 Bench top Capper Pneumatic Diagram).

CAUTION

Filtering systems for air supplies are the *machine owners* 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 μ 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 BT-94 *Sure Torque* Unit. It is recommended that all personnel involved in machine operation and changeover procedures, before initiating machine start-up, review this tuning sheet. *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 BT-94 Bench top Capper has operator controls and indicators necessary for capping/uncapping functions. Refer to Figure 3-1, BT-94 Controls and Indicators, for a drawing of all operator's controls and indicators, listing their types and functions.

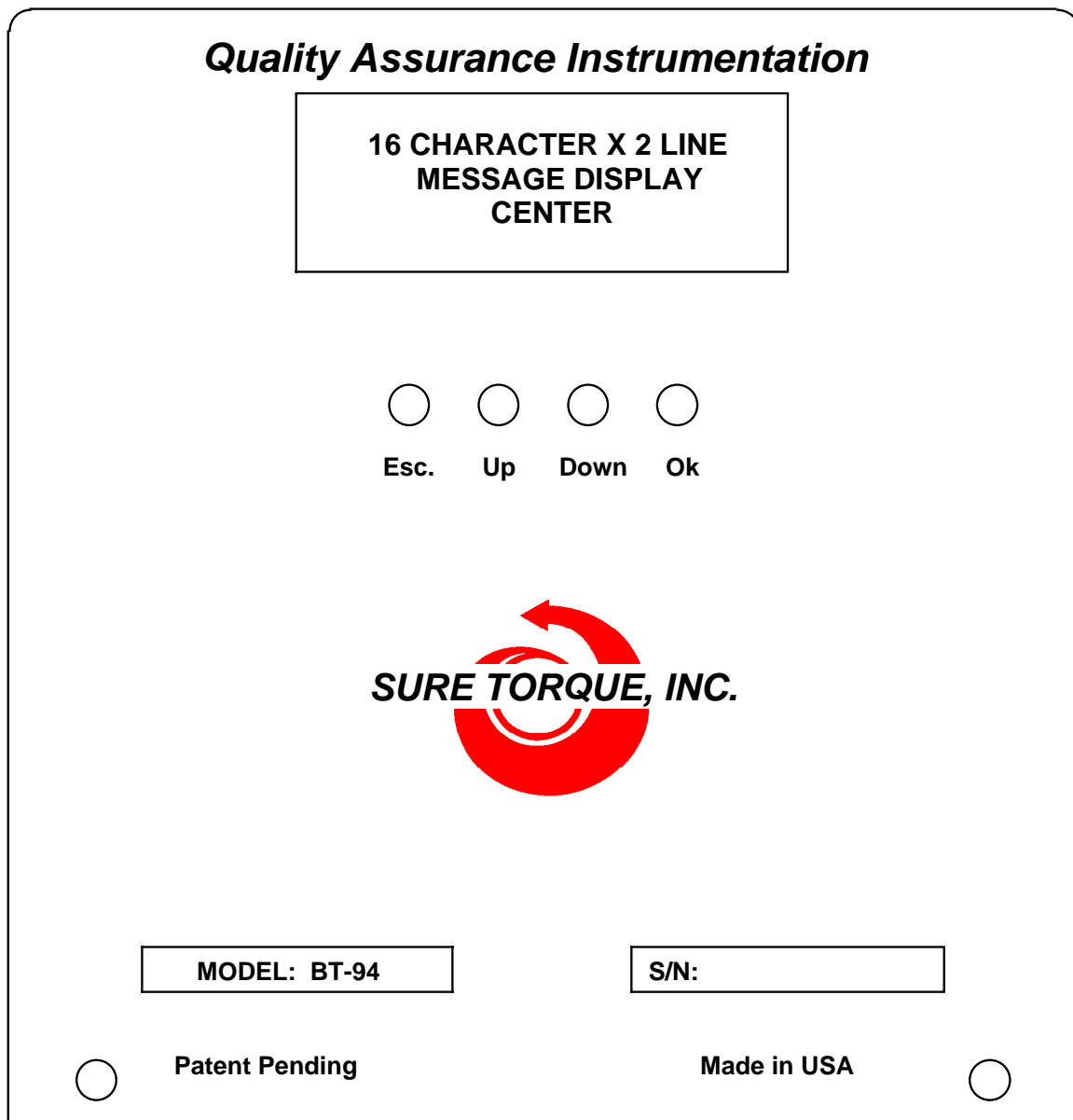


Figure 3-1, BT-94 Controls and Indicators.

3.2 OPERATOR CONTROL FUNCTIONS

There are four push-button switches available to the user to operate the BT-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. 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.

3.2.5 Manual Mode

Pressing the "Esc." and "Up" buttons *simultaneously* gains access to the *Sure Torque's* manual mode of operation. 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

Pressing the "Down" and "Ok" buttons simultaneously 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 BT-94 Bench top Capper.

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

3.4 MECHANICAL SET-UP

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

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 capped/uncapped, 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 back panel of control unit.)
3. Press the "Esc." & "Up" pushbuttons simultaneously while the display shows: "MODE: Capping", assuring the unit is in the "MANUAL" mode.

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 BT-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. Select either Capping or Uncapping by using the "Esc" pushbutton to choose the desired mode & then the "Ok" pushbutton to select that mode. If "Capping" is selected, set the desired torque setting, using the "Up" and "Down" buttons while viewing the Display.
14. Place the container/closure to be capped, onto the Container Platform *snugly* against the Stationary Clamp.
15. Press the two green pushbuttons on the two sides of the Lexan cover *Simultaneously*.
16. Remove the container from the platform at the end of the cycle.

3.5 ELECTRONIC SET-UP

The Setup Mode provides several options to set-up and alter electronic or pre-programmed software settings. Select the Setup Mode from the Main Menu by pressing the "Down" and "Ok" buttons simultaneously.

The Set-up Lock Out Feature 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.

You are only able to change the setup settings if you enter the four-letter password. When you select "Setup" from the main menu, the following message will appear on the display:

"PASSWORD: AAAA"

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 four letters, hit "Ok". 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 the password is correct, "MODE: SETUP" appears on the display. Pressing "Ok" again makes the setup submenu appear. There three sub-menus in the set-up menu: Calibrate Clutch, Change Password and Setup Delay.

Selecting one of the sub-menus is accomplished by pressing the "YES" or "NO" button as each option appears on the display. Pressing the "Esc." button (EXIT) leads back to the previous menu mode. Details on the set-up menus are as follows:

3.5.1 Calibrate Clutch (sub-menu)

The Calibration parameters are set here. The calibration of the machine has been done at the factory. If you need to check the calibration of the unit or need to recalibrate it, you must obtain an STH3 calibrating unit from Sure Torque, Inc. If you do not have this unit, you must not make any changes in this setup menu.

If you obtained the STH3 unit, please follow this procedure:

1. Move the platform assembly all the way down to make room for the sensor.
2. Place the collet in the chuck that matches the diameter of the cap ring on the end of the STH3's sensor.
3. Place the STH3's sensor with the cap ring inside the collet.
4. Press "YES" to calibrate the clutch. The collet will close grabbing the cap ring.
5. Release the sensor, so it is only held by the collet.
6. Raise the platform back, so that the handle of the STH3's sensor won't be able to rotate 360 degrees around but gets stopped by one of the parts of the platform at some point. Bring it to that point now, so it cannot turn clockwise.
7. Turn your STH3 unit on and make sure it is in Peak mode, and the torque reading is zero.
8. With the Up and Down buttons on the BT94 set the torque to the value at which you wish to check the calibration.
9. Press Ok. A second value will appear on the bottom line of the display. This value is the input of the digital to analog converter that controls the clutch's output.
10. Press the Ok button on the BT94. The motor will start trying to rotate the chuck, but the handle of the STH3 will stop the rotation, forcing the clutch to slip. While the motor is running, check the reading on the STH3. It should be within ± 0.5 in-lb. of the torque value that you set on the BT94.
11. If the reading met the above criteria, wait until the motor stops then hold the sensor with one hand, while pressing the Esc key with the other. The collet will open releasing the sensor.
12. If the motor is running for only a short period of time and you can't get a good reading, try to increase the CAP TIMING in the Setup Delay mode (see below).
13. If you find the reading was outside of the ± 0.5 in-lb. range, you need to readjust the BT94's calibration by changing the input of the digital to analog converter. Press Ok to move the cursor to the bottom line of the display. If your reading was higher, decrease this number, if it was lower, increase this number.
14. Repeat steps 11 through 14 until you get the correct reading.
15. You should check the calibration of the BT-94 at all the different torque levels the machine is used on. To do this, repeat the procedure from step 9 with the desired torque values.
16. After the BT94 has been successfully calibrated, hold the sensor with one hand, while pressing the Esc key with the other. The collet will open releasing the sensor.

3.5.2 Change Password (sub-menu)

If you want to change the password, select "CHANGE PASSWORD" from the Setup Menu, and the display will read:

```
"NEW PASSWORD"  
"    AAAA    "
```

Now you can set the desired password, as described above. When you are finished, press "Ok".
The pre-set password from the factory is "AAAA".

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!

3.5.3 Set-up Delay (Sub-Menu)

Enter the set-up delay sub-menu by pressing "YES" when the display reads: "SET UP DELAY" in the set-up menu. Timing of the measurement cycle is altered in this sub-menu. 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, Cap Timing, Unc Timing, Chuck off, Table down, Clamp off. Cap timing will be in effect while the machine is running a capping cycle; Unc timing while it is running an uncapping cycle.

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" 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 0.1 - 25.5 seconds in 0.1-second increments, except as noted. Values are set by the up and down buttons. "YES" enters the value displayed and steps to the next item in this sub-menu. "EXIT" returns to the previous set-up delay 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.

3.6 DISPLAYED MESSAGES, OPTIONS AND INSTRUCTIONS

3.6.1 Display

All operator controls and messages are conducted via the 2 X 16 Character message center and the four (4) program keys under the display.

3.6.2 Power On

At Power On the "MODEL: BT-94" message together with the actual software version appears. By pressing any key, the unit enters the main menu.

3.6.3 The Main Menu

The Main Menu contains the two modes of operation. Selection of a mode is done by pressing the "Ok" key at the appropriate mode. Selecting another main menu item is done by pressing the "Esc" key. From the main menu the user may select the **manual mode** by simultaneously pressing the left two buttons ("Esc" and "Up") or the **setup mode** by simultaneously pressing the right two buttons ("Down" and "Ok").

3.6.4 Capping Mode

(Selected from the Main Menu). "CAPPING, Set: XX.X in-lb" appears on the screen.. You are only able to change the torque setting if you enter the four-letter password. When you press the "Up" or "Down" button, the following message will appear on the display:

"PASSWORD: AAAA"

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 four letters, hit "Ok". If the password is correct, you can change the torque value, but if not the message below appears on your display:

"WRONG PASSWORD!"

If the password is correct, set the desired applied torque value by pressing the "Up" or "Down" button. After the desired torque is set, place a container on the platform with its cap on, then pressing the two green pushbuttons on the two sides of the Lexan cover simultaneously initiates the cycle. For safety purposes you must hold down the two buttons until the chuck is closed, otherwise the machine will abort the cycle. "Esc" gets back to the previous level. Pressing and holding the two pushbuttons again will start another cycle.

3.6.5 Uncapping Mode

(Selected from Main Menu by pressing "Ok"). "UNCAPPING" message appears on the screen. Pressing the two green pushbuttons on the two sides of the Lexan cover simultaneously initiates the test cycle. "Esc" gets back to the previous level. Pressing the two pushbuttons again will start another cycle.

3.6.6 Manual Mode

(Selected from the Main Menu by pressing the "Esc" and "Up" buttons simultaneously). Useful for adjustment in the mechanisms, this mode allows 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.

If your *Sure Torque* BT-94 Electronic Bench top Capper 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 contaminates 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 BT-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 be 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 with the aforementioned 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 <i>all</i> pneumatic hose connections for any leaks. d. Check <i>all</i> 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 BT-94 System pressure is controlled by a master regulator located on the unit, assuring that no more than 100 psi. of air enters the *Sure Torque* unit.

• *Mini Regulators, (Cylinder Regulators).*

Proper air pressure settings for the Clamp, Container Platform, and Chuck 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 STBC *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 STBC Electronic Bench top Copper 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, 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 BT-94 Electronic Bench top Capper.

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 with 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 container/closure. Assure that this clearance is <i>from .06" to .012"</i>
2. Unusually Low Torque Reading:	Check for rigidity of container clamps. <i>Container MUST NOT Rotate!</i>

TABLE 5-1, Electrical Troubleshooting Guide.

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
1. Sure Torque will not Power-up:	<ol style="list-style-type: none"> a. No AC power to main panel b. Main AC fuse missing/blown c. Main disconnect not in "on" position d. "Power On" push-button faulty 	<ol style="list-style-type: none"> a. Check power. connections b. Replace fuses c. Turn disconnect to "on" position. d. Replace push-button
2. Sure Torque will not start:	<ol style="list-style-type: none"> a. No AC power b. Control or main fuse blown/missing c. Line voltage not within $\pm 10\%$ 	<ol style="list-style-type: none"> a. Check connections and disconnect. b. Replace fuses c. Install isolation X-former

TABLE 5-2, Pneumatic Troubleshooting Guide.

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

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 Sure Torque authorized the work in writing. 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

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.

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.

“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.

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.

top load: The pressure 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 sidewall of closure to aid in rapid evacuation of headspace gases.

vent slots: The vertical interruptions of bottle threads.

ware: Glass bottle containers.