



## Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

### 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 screws** holding the machine tight in the crating box then identify the other components and assembly hardware.
3. Connect the main air supply to the rear air plug (refer to section 2.5.1 in the manual for specifications).
4. Attach the provided CE marked power supply to the rear of the system.
5. Run unit in manual cycle *first* to check component operation and alignment *before* running automatic cycle.





# **Quality Assurance Instrumentation Precision Assembly Automation**

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

---

## **Corporate Overview**

Sure Torque (ST) began the 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 ST; after all, we developed this advanced technology in response to the needs of our customers. ST 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 ST, 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.

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

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

Dan Delzer  
President  
Sure Torque  
2532-34 Trailmate Drive  
Sarasota, Florida 34243  
Office: (941) 753-1095  
Fax: (941) 756-8425  
<http://www.suretorque.com>



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## Preface

Thank you for the confidence you have shown in Sure Torque, Incorporated (ST) 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 (section 5) to aid in prolonging maximum machine productivity and packaging line "up-time." We at ST take great pride in you, our customer, and dedicate this manual to support your goal of prolonged system productivity throughout the years.

ST 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" (optional) 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 ST 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 Sarasota, Florida (941) 753-1095.

Your ST representative is eager to help you get the most production possible out of your torque tester. Our staff can ensure that you receive any 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 ST customer.

Sincerely,

Dan Delzer  
President



# **Quality Assurance Instrumentation Precision Assembly Automation**

---

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425





# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## Safety Comes First With ST

Throughout this manual, ST will emphasize safety precautions that should be adhered to by all personnel setting up, operating, maintaining and repairing all ST 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** *Worldwide Torque Testing Equipment Specialists!*



# **Quality Assurance Instrumentation Precision Assembly Automation**

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## **Electronic Torque Tester: Model ST-120**

### **Operation and Maintenance Manual**

With Appendix A containing:

- Machine Tuning Sheet
- Certification Records
- Closure Records
- Top Load Setup Procedure – Optional
- Sure Torque DAQ Software – Optional
- Sure Torque DAQ Plugin Torque-Time/Angle Analysis – Optional
- Instructions for Optional Sure Torque Test Methods – Optional
- Instructions for Decay, Alarm, four level Password Protection, Adaptive Torque application features – Optional



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. Acceptance and use of this manual constitutes acceptance of these terms and conditions.

PREPARED BY:  
**SURE TORQUE**  
2532-34 Trailmate Drive  
Sarasota, Florida 34243  
Tel: (941) 753-1095 Fax: (941) 756-8425

**SURE TORQUE** *Worldwide Torque Testing Equipment Specialists!*



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## Table of Contents

Read This First! .....	1-1
Preface .....	1-3
Safety Comes First With ST.....	1-5
Electronic Torque Tester: Model ST-120 .....	1-6
1. General Information .....	1-10
1.1. System Overview .....	1-10
1.1.1. Control Interface.....	1-10
1.1.2. Mechanical Assembly .....	1-10
1.1.2.1. Stand Assembly .....	1-12
1.1.2.2. Chuck Assembly.....	1-12
1.1.2.3. Change-Parts .....	1-12
1.1.2.4. Pneumatic Assembly .....	1-12
1.1.3. Electronic Assembly.....	1-14
1.1.3.1. Transducer .....	1-14
1.1.3.2. Programmable Logic Controller.....	1-14
1.2. Operational Sequence of the Test Cycle Functions.....	1-14
1.2.1. Clamping Sequence .....	1-14
1.2.2. Table Lifting Sequence .....	1-14
1.2.3. Chuck Actuation Sequence .....	1-14
1.2.4. Torque-Test Sequence .....	1-14
2. Installation Instructions .....	2-15
2.1. Receiving the Unit.....	2-15
2.1.1. Inspecting .....	2-15
2.1.2. Unpacking .....	2-15
2.2. Positioning the Unit.....	2-16
2.3. Pre-Run, <i>Sure Torque</i> Check-out .....	2-16
2.4. Electrical Installation.....	2-16
2.4.1. Precautions .....	2-17
2.4.2. Connections .....	2-17
2.5. Pneumatic Installation .....	2-17
2.5.1. Air Supply .....	2-17
2.5.2. Plumbing .....	2-17
2.5.3. Air Pressure Settings .....	2-17
2.6. Machine Tuning Sheet.....	2-17
3. Operating Instructions .....	3-18
3.1. Controls and Indicators .....	3-18
3.2. Machine Setup.....	3-19
3.2.1. Mechanical Setup .....	3-19
3.2.2. Electronic Setup .....	3-20
3.2.2.1. Timer configuration.....	3-21
3.2.2.2. Speed Settings .....	3-22
3.2.2.3. Miscellaneous.....	3-23



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

---

3.2.2.4.	Load/Save Presets.....	3-24
3.2.2.5.	Serial communication, Data table setup.....	3-25
3.2.2.6.	Unlocking operation modes, optional features.....	3-26
3.2.2.7.	Alarm settings.....	3-27
3.2.2.8.	Calibration.....	3-28
3.3.	Displayed messages, options and instructions. ....	3-30
3.3.1.	Display.....	3-30
3.3.2.	Power On.....	3-30
3.3.3.	The Mode Screens.....	3-31
3.3.3.1.	Manual Mode.....	3-31
3.3.3.2.	Applied Mode.....	3-33
3.3.3.3.	Release Mode.....	3-34
3.3.3.4.	Multiple Applied Mode.....	3-34
3.3.3.5.	Applied then Release Mode.....	3-35
3.3.3.6.	Multiple Release Mode.....	3-35
3.3.3.7.	Release and Applied Mode.....	3-35
3.3.3.8.	Reverse Ratchet Mode.....	3-35
3.3.3.9.	Shelling Mode.....	3-35
3.3.3.10.	Strip Test.....	3-35
3.3.3.11.	Nondestructive Release Mode.....	3-35
3.3.3.12.	Various Dispenser Pump Head Tests.....	3-35
3.3.3.13.	Sealed closure torque testing methods.....	3-36
3.3.3.14.	Precision Applied and Release tests.....	3-36
3.3.3.15.	Topload measurements.....	3-36
3.3.4.	Historical Data Screens.....	3-36
3.3.5.	Serial Communication.....	3-37
3.3.5.1.	Sure Torque Data Acquisition.....	3-37
3.3.5.2.	Customisation of the communication string.....	3-37
4.	Maintenance.....	4-38
4.1.	Cleaning.....	4-38
4.2.	Preventive Maintenance.....	4-38
4.3.	Pneumatic Maintenance.....	4-39
4.3.1.	Air Leaks.....	4-39
4.3.2.	Air Filter.....	4-40
4.3.3.	Solenoid Valves.....	4-40
5.	Troubleshooting Guide.....	5-41
6.	Sure Torque Warranty, Limitation of Liability and Service Information.....	6-43
7.	Sure Torque Options List.....	7-44
7.1.	Software Mode List.....	7-44
7.1.1.	Release Mode.....	7-44
7.1.2.	Applied Torque Mode.....	7-44
7.1.3.	Multiple Applied Mode.....	7-44
7.1.4.	Applied then Release Torque Mode.....	7-44
7.1.5.	Release then Re-Apply Mode.....	7-44
7.1.6.	Non-Destructive Release Mode.....	7-44



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

---

7.1.7.	Non-Destructive Release and Re-Apply Mode .....	7-45
7.1.8.	Repetitive Applied then Release (Fatigue) Mode .....	7-45
7.1.9.	Multiple Peak Mode .....	7-45
7.1.10.	Reverse Ratchet Mode.....	7-45
7.1.11.	Shelling Fixture Mode.....	7-45
7.1.12.	Strip Test .....	7-45
7.1.13.	Various Dispenser Pump Head Tests .....	7-45
7.1.14.	Sealed closure torque testing methods .....	7-45
7.1.15.	Precision Applied and Release tests.....	7-45
7.1.16.	Topload measurements.....	7-46
7.2.	Other Options list .....	7-46
7.2.1.	360°/720° Degree Test Mechanism.....	7-46
7.2.2.	Metric/US Measurement .....	7-46
7.2.3.	RS-232 Interface.....	7-46
7.2.4.	Real Time Clock (RS-232 serial port required) .....	7-46
7.2.5.	Verification Kits .....	7-47
7.2.6.	STDA Software .....	7-47
7.2.7.	Password Protection Feature .....	7-47
7.2.8.	Time Decay Feature .....	7-47
7.2.9.	Historical Data Option.....	7-47
8.	Glossary.....	8-48
9.	Data Acquisition Program for the ST-120 Bench Top Torque Tester .....	9-51
9.1.	General .....	9-51
9.2.	System Requirements.....	9-51
9.3.	Installation.....	9-51
9.3.1.	Hardware Installation .....	9-51
9.3.2.	Software Installation.....	9-51
9.4.	Operation.....	9-51



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## 1. General Information

*Sure Torque* 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* 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-120, *Sure Torque* Electronic Torque Tester System.

Major components and assemblies are called out on Figure 1-1, ST-120 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 Changeover specifications are listed on the Machine Tuning Sheet for the particular closure and container being tested.

Your ST-120, "*Sure Torque*" Electronic Torque Tester, is a fully automated precision instrument designed for a wide array of container closure test functions. The ST-120 electronically measures the forces required to apply or remove threaded screw caps from the containers. Your ST-120, 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-120 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.

ST offers an optional 360° degree test mechanism (refer to section 7.2.1 in this manual) for our ST-120 unit. This option measures the largest release torque sensed during a full 360° degree turn of a closure.

### 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-120, *Sure Torque* functions. Major components and assemblies are called out on Figure 1-1, ST-120 Torque Tester General Arrangement.

The basic ST-120 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:

#### 1.1.1. Control Interface

The operator's interface with the *Sure Torque* unit is controlled through the PLC mounted in the head of the ST-120 that regulates the operational cycles, processes the input/output data, and acts as the overall communications link with the line operator or test engineer. This PLC can easily interface with an on-line or remotely operated host computer for data collection. *Sure Torque* will gladly integrate this host computer interface controller PC in your system.

#### 1.1.2. Mechanical Assembly

The Mechanical System consists of a Base, Chuck and Change Part Components. Please refer to Figure 1-2, ST-120 Torque Tester Mechanical Components (Chuck Assembly).



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## ST-120 MECHANICAL COMPONENTS

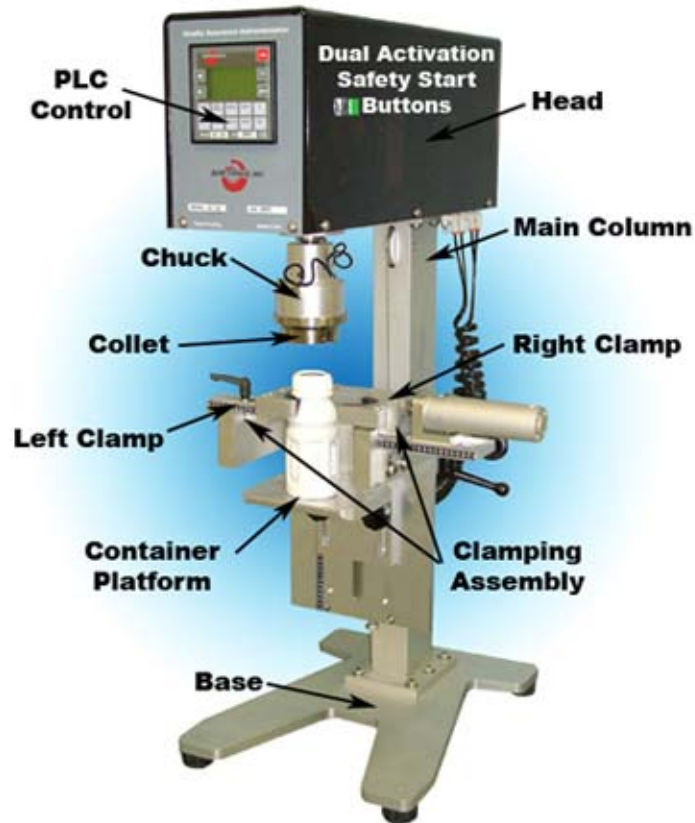


Figure 1-1, ST-120 Torque Tester General Arrangement.

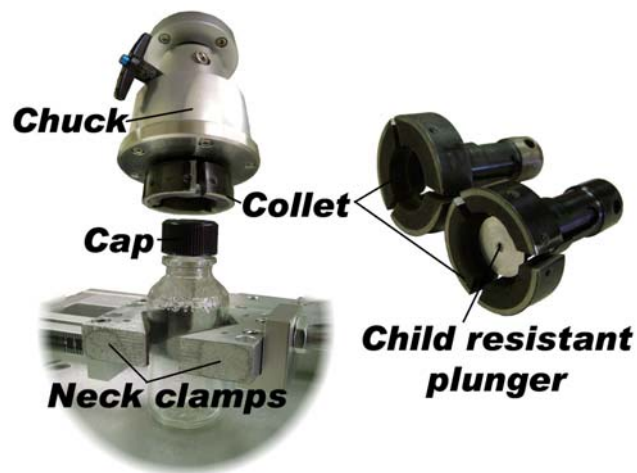


Figure 1-2, ST-120 Torque Tester Mechanical Components (Chuck Assembly).



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## 1.1.2.1. Stand Assembly

The Base is an aluminum fixture which supports the Container Platform, Clamp, Chuck, and ST-120 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 neck clamps and the chuck platform is attached. The neck clamps 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 (slide or support post) is the ST-120's Main Head Assembly, which contains all of the main pneumatic 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 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-120 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.

## 1.1.2.4. Pneumatic Assembly

Understanding the Pneumatic Assembly and its components is the key to understanding your ST-120 *Sure Torque* system and receiving optimum production and maintenance free operation from your unit. Please refer to Figure 1-3, ST-120 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-120 through a panel-mounted regulator. ST 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.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

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

Adjusting the "Release/Applied Impulse Time" in the set-up menu regulates the rate of increasing the air pressure. This number is expressed as 00:00:00 (minutes:seconds:milliseconds) and usually it is in the milliseconds range. Faster/less accurate or slower/more accurate torque application may be configured with this timer. It directly controls the rate of the impulses on the PLC output, and this rate is proportional to the torque applied by the chuck. The rate is programmable in 2 modes. In the first mode the rate is automatically adjusted by the PLC, and this method is based on special considerations to low torque application (syringes) and high torque applications as well (1 gallon container for chemicals). This mode is optional and does not come with the default configuration. In the other modes, the operator can change the rate to a static value. The faster the torque application rate is, the worse the accuracy of the measurement and the shorter the cycle time. A slower rate minimizes the effects of acceleration on the final torque reading.

It is important to understand that the decreasing this timer will make the torque application faster, while increasing this timer will make the application slower, because the torque is proportional to the number of the control impulses, and this timer changes the frequency of these control impulses.

The overall speed/accuracy performance is highly affected by the starting PWM rate as well. This number controls the zero offset of the torque application. By default we configure the testers with 0 lbf in zero offset, but in many cases it is advisable to evaluate the best starting rate for the specific torque application.

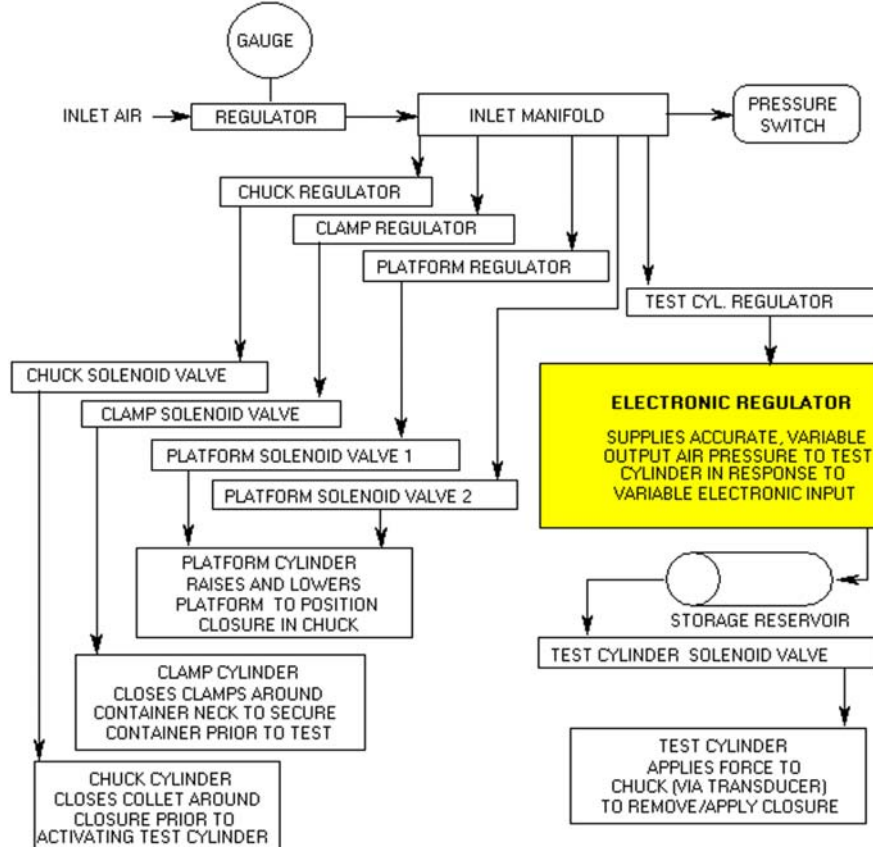


Figure 1-3, Standard ST-120 Torque Tester Pneumatic Diagram.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## 1.1.3. Electronic Assembly

A basic knowledge of the Electronic Assembly and related components will aid greatly in the understanding of the function of your ST-120 Torque Tester.

The main electronic components of the ST-120 are as follows:

1. The Transducer and the signal conditioning/PLC interface circuit.
2. The PLC.

### 1.1.3.1. 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-120 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 PLC, which monitors the torque, and controls the operating functions of the ST-120 *Sure Torque* system.

### 1.1.3.2. Programmable Logic Controller

The PLC 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 screen of the PLC, and can also be output to a variety of data collection/analization devices.

The PLC also controls the operating cycle of the *Sure Torque* system. Additionally, the PLC 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-120 *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. Table Lifting Sequence

The *second* step in the operational cycle is to pneumatically lift the table on which the container has been placed. The table lifts up 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/adaptively increased. The peak torque applied to the closure is measured by the Transducer. The measurement is displayed on the digital display of the PLC and is available for other optional functions, (eg: data collection and reporting, statistical analysis, graphic printout, automated capper torque control, etc.).

The factory default operational test mode of the ST-120 is the release mode, but it may be programmed to some of the other available operational mode screens as well in the Miscellaneous Setup screen.



## Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## 2. Installation Instructions

The following paragraphs explain the required information and procedures to properly install your ST-120 *Sure Torque* Electronic Torque Tester.

### CAUTION

Read this section completely before installing your new unit.

### 2.1. Receiving the Unit

Your ST-120 *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* **immediately**.

#### CONTACT:

SURE TORQUE  
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: Screwdriver, Allen wrench set.



## Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

1. Carefully remove the crating box cover to expose the machine, which is mounted on the crate's base. Then using a screwdriver, unscrew the screws.
2. Next, **unscrew the screws** holding the machine tight in the crating box then identify the other components and assembly hardware.
3. Connect the main air supply to the rear of the machine (refer to section 2.5.1 in the manual for specifications).
4. Attach the provided power supply to the rear of the unit.
5. Turn on the unit by pushing the switch on the rear of the machine.
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. 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

### NOTE:

The following **six** operators functions *Must* be performed prior to the running and/or operation of the ST-120 *Sure Torque* System.

1. Be sure the power on switch is off. Check that **all** electrical connections are installed as per the wiring diagram and that no loose or unfastened wires are evident.
2. Connect the Power Supply to the unit. (Input: AC 100-250V, 50-60Hz, 1.3A, Output: DC +24V, 2.0A)
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. Check 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. Set the Regulator at the Rear Panel to 80 psi on the Pressure Gage.
5. Visually inspect the **entire** unit for any loose brackets, bolts, etc. Check to see that there are no loose items on or around any of the moving parts.
6. 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).

+1. Optional: Connect the communication cable (RS-232/RJ11) to the PLC's COM port 2 (the bottom one, on the back plate of the unit).

## 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.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## 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-120 *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 ST (refer to Figure 1-3, ST-120 Torque Tester Pneumatic Diagram). Filtering systems for air supplies are the **machine owner's** 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 a 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-120 *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* 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.**



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## 3. Operating Instructions

### 3.1. Controls and Indicators

The ST-120 Torque Tester Control Unit has operator controls and indicators necessary for torque testing functions. Refer to Figure 3-1, ST-120 Controls and Indicators, for a drawing of all operator's controls and indicators, listing their types and functions.

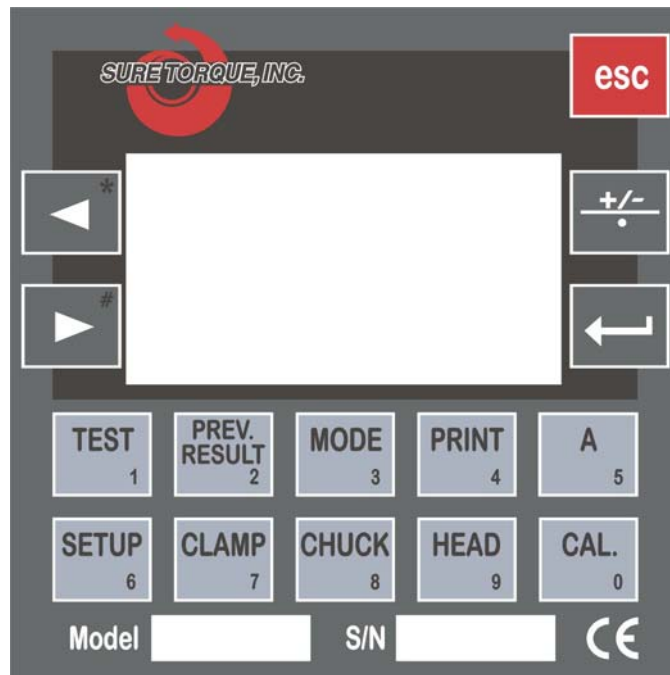


Figure 3-1, ST-120 Controls and Indicators.

There are 15 push-button switches available to the user to operate the ST-120 *Sure Torque* Control Unit. They are used as "Soft Keys"; that is to say, their functions depend on the operational test mode in use.



- This button is used to go back to the previous screen (on screens without edit fields), go forward to the next screen (on screens with edit fields), or stop the machine and go back to the mode screen in which the operator actuated the last test (while measurement is in progress).



- This button is used to navigate within edit fields/menu points and mode screens. In Manual Mode it is used to decrease the torque, and on the historical screens it may be used to navigate between the records.



- This button is used to navigate within edit fields/menu points and mode screens. In Manual Mode it is used to increase the torque, and on the historical screens it may be used to navigate between the records.



- Toggles the topload application switch in Manual Mode, when the tester is equipped with the topload option.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425



- This button is called "ENTER" (based on PC terminology), and used to get in submenus. Toggles the torque application switch in Manual Mode.

TEST

1 - This button is used in Manual mode, to toggle the test output.

PREV.  
RESULT

2 - This button is used to get in the historical screen.

MODE

3 - This button is used to select the operation mode.

PRINT

4 - This button is used to send out historical data on communication port #2, when purchased.

A

5 - This button is used in Manual mode.

SETUP

6 - This button is used in Manual mode.

CLAMP

7 - This button is used to toggle the clamp in manual mode.

CHUCK

8 - This button is used to toggle the chuck in manual mode.

HEAD

9 - This button is used to toggle the table in manual mode.

CAL.

0 - This button is used to check the device calibration and to start the calibration process.

## 3.2. Machine Setup

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-120 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-120 *Sure Torque* System.

### 3.2.1. Mechanical Setup

Follow these procedures to assure proper ST-120 *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.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

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 rear of the head).
3. Go to Manual Mode/Control

Container Platform Adjustment:

4. Obtain a container to be tested, with its closure **on** and insert it to the collet. If it is CR collet and it is a Child-Resistant closure, then make sure that the plunger has a fair spring load on the cap. Activate the “Chuck” by pushing the “CHUCK” button on the keypad.
5. Press the “HEAD” and then the “CAL” pushbuttons, energizing the vertical actuators to the measurement position.
6. Set the height of the Table, and the Clamp block with the container/closure to be tested in the chuck. Manually set the height of the Table platform so the container will fit firmly in the chuck and tighten the locking handle. Adjust the height of the clamp block, so the clamps will have a strong grip on the container and lock the clamp block securely.

Adjusting the table’s regulator valve - on the back panel - 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-120 tuning sheet. Next, feel the upward travel allowed in release mode by pulling up the head when only the low pressure valve is active. 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 “CLAMP” pushbutton, opening the Clamp.
11. Press “ESC” pushbutton to return to main menu, the tester is setup for your container.

Confirm your settings by running an automatic cycle:

13. Press “ENTER” on any mode screen to configure the desired torque and cycle settings (Password may be required) then hit “ESC” to go back to the mode screen. Push the “MODE/Navigation Arrows” button(s) until you reach the desired one, and hit the Start button to start the test.
14. Place the container/closure to be tested, onto the Container Platform *snugly* against the Stationary Clamp.
15. Press the Start buttons on the two sides of the head.
16. Read the “Applied”, or “Release” Torque finding for this particular test on the PLC screen at the end of the test cycle.

## 3.2.2. Electronic Setup

The ST-120 Setup Mode provides several options to set-up and alter electronic or pre-programmed software settings. Select the Setup Mode using the arrow buttons on the main navigation screen, then hit ENTER. Depending on the purchased configuration, the PLC will inquire you for your password on the next screen (the default password to get in the setup is 1111). After entering the last digit of the password the “Password accepted” screen appears. If the password is not accepted then the user may reenter the correct password or hit the ESC to cancel the password



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

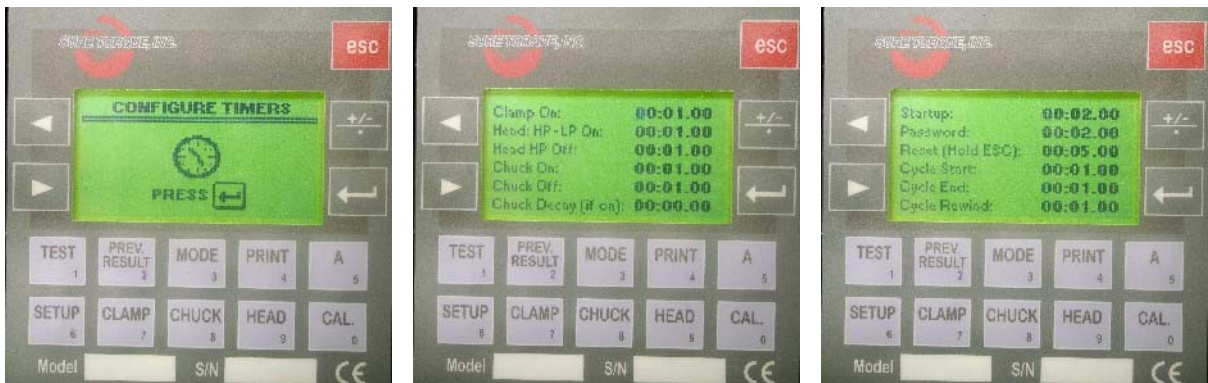
entry attempt. When the password protection feature is not purchased, the setup, calibration, manual and parameter change screens will be automatically enabled without password protection.



Whenever your password is accepted you will see a splash screen for a few seconds (this delay may be changed in the setup) and you will be redirected to the Setup submenus.

### 3.2.2.1. Timer configuration

There are seven submenus in the setup menu. The first submenu is the timer configuration.



This menu may be used to modify the default value of the built-in delays. Navigation is possible with the ENTER, ESC and ARROW buttons. ENTER is used to get in the parameter change screen, then it is used to accept the modified values. The numeric buttons may be used for editing the various values and the ARROW buttons may be used to navigate between the values on a screen. The ESC button is used to jump from one screen to the next.

Description of the values can be changed in the timer submenu:

**Clamp-On:** After the chuck is rewinded to the start position, this timer may be configured to delay the clamping sequence.

**Head-HP-LP On:** After the clamp is activated this timer will determine the delay before the table goes up.

**Head HP-Off:** In certain test modes it is required to eliminate, the topload force on the closure created by the table pushed up against the head. It is done by turning off the high-pressure mode while the low-pressure mode is on. This timer configures the delay before the PLC turns off the high-pressure actuator.

**Chuck On:** This value is used to configure the delay between the table lifting cycle and actuating the chuck.

**Chuck Off:** This value will determine the delay between the chuck releases the cap and the table platform raises to its upper position.

**Chuck decay:** In application modes you have the option to set the torque tester not to release the cap immediately



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

after applying the torque, but to wait for a certain amount of time. By setting this timer you can program the unit how many seconds to wait before conducting the next test in the cycled modes, or releasing the cap at the end of a single test.

**Startup:** After the equipment is turned on this delay is used before the PLC automatically redirects to the default operational mode.

**Password:** The delay to get into a password protected screen after a successful password entry.

**Reset:** On our newer models, it is possible to restart the equipment using the keypad. This timer is used to configure for how much time the operator has to press the ESC button before the PLC restart. If you feel it is necessary, change this value very carefully; this delay should not be less than 1 second.

**Cycle Start:** In cyclic operation modes it is possible to configure delays before, between and after cycles. This is the delay between the chuck is actuated and the torque test starts.

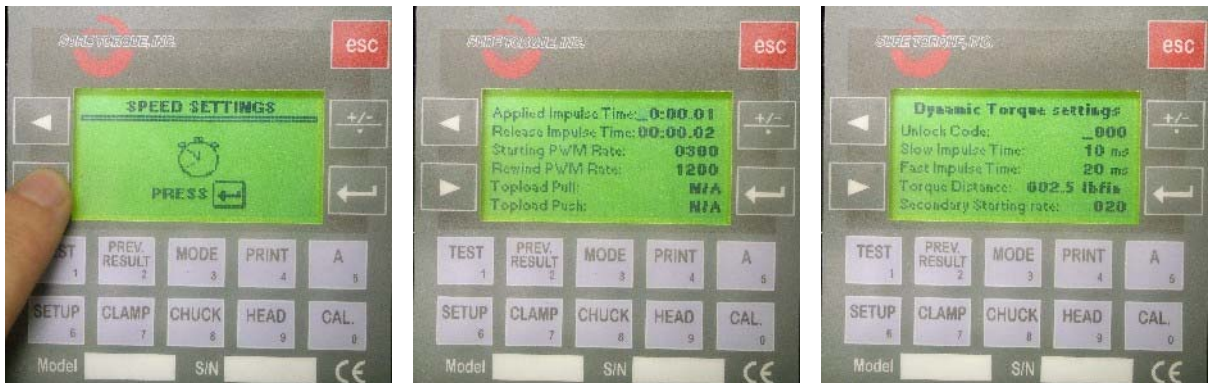
**Cycle End:** This is the delay at the end of a cycle, between the test is finished and the chuck rewinds to the start position in the next cycle.

**Cycle Rewind:** This is the delay at the end of a rotation in an unsuccessful applied cycle, before the chuck rewinds to the start position to reapply the pre-defined torque.

**Note:** Timing values are normally not changed unless a major size change is made to the test containers and closures. The delay values are increased if more time is required between cycle steps.

## 3.2.2.2. Speed Settings

The second submenu may be used to configure variables affecting the speed and accuracy of the torque testing.



Navigation is possible with the ENTER, ESC and ARROW buttons. ENTER is used to get in the parameter change screen, then it is used to accept the modified values. The numeric buttons may be used for editing the various values and the ARROW buttons may be used to navigate between the values on a screen. The ESC button is used to jump from one screen to the next.

Description of the values in the speed submenu:

**Applied Impulse Time:** When the automatic/dynamic torque control option is not purchased, this timer is used to configure the time interval between control impulses on the PLC output. The number of control impulses per second is proportional to the speed of the torque change in a cycle. Setting this timer to a low value will decrease the time required to reach the torque setpoint, but the control will overshoot the setpoint value. Increasing the time interval will slow down the speed of the torque application, while increasing the accuracy, and decreasing the error of the control. There are several factors affecting the accuracy and speed of the torque control. One of them is the Impulse time interval. The PLC controls the torque applied by the rotary actuator, through its frequency output. The frequency signal then is converted to an analog signal where the signal level is proportional to the frequency of the input signal. This analog signal directly controls the rotary actuator. When the dynamic torque control option is purchased the torque tester will automatically optimize the torque speed (applied impulse time) so this value is dynamically overwritten by the PLC to optimize the speed/accuracy of the torque tester.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

**Release Impulse Time:** Similar to the Applied Impulse time, this timer may be used to configure the time delay between the control impulses on the output of the PLC. As it was described above, this way the operator may change the accuracy of the readout or the speed of the torque application.

**Starting PWM rate:** The starting PWM rate is the frequency offset of the frequency signal, the PLC outputs at the very beginning of the torque test. This also means that the rotary actuator may be controlled to apply a pre-defined torque at the beginning of the test. Increasing this value will cause the torque tester to start the torque application from a higher torque value (not from 0), while decreasing it will decrease the torque of the rotary actuator when the test starts. Configuring the torque tester for a specific container/closure is basically the procedure to find the optimal starting rate and application impulse time for that torque application. For small containers/low torque ranges (syringes, vials, small pharmaceutical containers) with tight torque specifications, the starting rate/torque offset should be close to zero torque (around 300 Hz in PLC native unit) and the impulse time should be a higher value, for example 20-30 ms. For larger containers where both the applied torque setpoint and the expected initial release torque is at a higher torque level (above 10 lbf<sub>in</sub>) it is advisable to set the starting rate up to a native unit which equals 80-90 percent of the setpoint torque, and depending on the accuracy requirements change the impulse time to an optimal value. To find out the native unit equals to a certain amount of torque the operator has to go into manual mode, and evaluate the rate for that specific torque using the manual control options.

**Rewind PWM Rate:** The torque in native units used to rewind the chuck to the start position in the beginning of a test, and between cyclic tests. Default value is 1200.

**Topload Pull/Topload Push:** Not applicable where the topload option is not available.

## Dynamic Torque Settings

**Unlock code:** The dynamic torque control in applied mode is an optional feature and may be purchased at the time of purchasing the tester and it may be unlocked later on as well. Unlocking this feature requires a 1-4 digit code, which may be obtained from Sure Torque. Entering this code will automatically enable the dynamic torque control feature.

In the dynamic control mode, the torque tester will apply the torque in two phases. In the first phase it will change the torque fast, and in the second phase, where the error between the setpoint and the current torque value is below a predefined limit, it changes the torque application slower but more accurate.

**Slow Impulse Time:** The time interval between impulses in the more accurate/slow application phase.

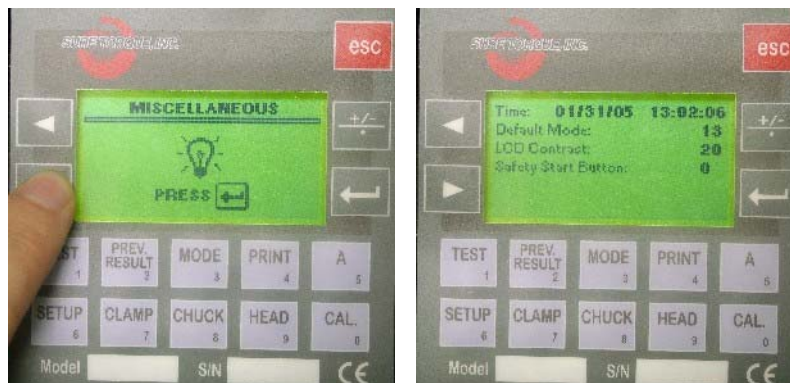
**Fast Impulse Time:** The time interval between impulses in the fast application phase.

**Torque Distance:** The value here will be used to check how close is the currently applied torque to the predefined setpoint. When the torque is within the range defined by the torque distance, the PLC will automatically decrease the torque and slow down the speed of the torque application.

**Secondary Starting Rate:** This is the amount in PLC native unit, that the control will decrease the actual rate with, when the current torque readout is within the Torque Distance range. It is necessary to be able to decrease the torque when the control automatically changes the speed, so the operator may optimize the operation for the best accuracy/speed in any torque range (from syringes to big chemical containers).

### 3.2.2.3. Miscellaneous

The third submenu may be used to configure miscellaneous settings, like the time and date, LCD contrast, default operation mode screen, etc.





# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

Navigation is possible with the ENTER, ESC and ARROW buttons. ENTER is used to get in the parameter change screen, then it is used to accept the modified values. The numeric buttons may be used for editing the various values and the ARROW buttons may be used to navigate between the values on a screen. The ESC button is used to jump from one screen to the next.

Description of the values in the miscellaneous submenu:

**Time:** The internal date and time of the PLC. This date and time will be used as a timestamp on the RS232 data output and in the internal historical data table as well. Format: MM/DD/YYYY HH:MM:SS

**Default Mode:** In many cases the default mode will be the release mode. Each mode has an 1-2 digit code assigned to it. Certainly if an operation mode is locked, it will be unavailable until the customer purchases that operation mode. Some of the operation modes need special hardware and labor, and the tester may have to be sent back to Sure Torque for modifications. Here is the list of the latest default mode codes.

- 0 Application
- 1 Application then Release
- 2 Multiple Application
- 3 Multiple Release
- 4 Optional 2
- 5 Optional 3
- 6 Optional 4
- 7 Precision Application
- 8 Precision Release
- 9 Pump Closure Release
- 10 Pump Head Release
- 11 Pump Head Topload
- 12 Pump Seal Release
- 13 Release
- 14 Release then Application
- 15 Reverse Ratchet
- 16 Shelling
- 17 Strip
- 18 Topload Pull
- 19 Topload Push

**LCD Contrast:** In the newer models the contrast of the LCD screen may be adjusted manually from the setup menu. The recommended value of this variable is 10.

**Safety Start Button:** This value may be set to 0 or 1. When the torque tester is equipped with the dual activation safety start buttons, and this variable is set to 1 the program requires both hands to be held on the start buttons until all the moving parts are closed and the test begins. This way the pinch points are eliminated for one operator. When this value is 0 and there are two buttons, both start buttons have to be pressed, but may be released right after that. If there is only one button it does not make any sense to change the value to 1.

### 3.2.2.4. Load/Save Presets

The fourth submenu is used to load/save presets - application specific variables.

Navigation is possible with the ENTER, ESC and ARROW buttons. ENTER is used to get in the parameter change screen, then it is used to accept the modified values. The numeric buttons may be used for editing the various values and the ARROW buttons may be used to navigate between the values on a screen. The ESC button is used to jump from one screen to the next.

Description of the values in the load/save presets submenu:

This setup feature has not been implemented, yet.



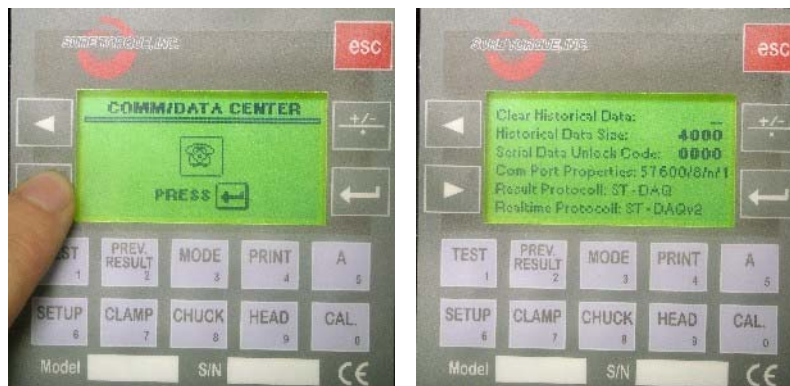
# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425



### 3.2.2.5. Serial communication, Data table setup

The fifth submenu may be used to define historical settings and check the communication parameters.



Navigation is possible with the ENTER, ESC and ARROW buttons. ENTER is used to get in the parameter change screen, then it is used to accept the modified values. The numeric buttons may be used for editing the various values and the ARROW buttons may be used to navigate between the values on a screen. The ESC button is used to jump from one screen to the next.

Description of the values in the miscellaneous submenu:

**Clear Historical Data:** When you want to delete the historical records in the PLC, set this variable to 1, then hit ENTER. This will erase all the records from the data table and set the data write pointer to 1.

**Historical Data Size:** To configure the data table size/the number of records may be stored in the data table, use this variable. By default the data table size is set to 4000, which means that the tester will hold up to 4000 measurement records in its memory. Then it uses the FIFO memory management strategy to refill the data table with the new records.

**Serial Data Unlock Code:** When it is purchased, the serial data unlock code may be used to unlock the data communication feature. This will enable both the real-time and the result string to be transferred to a printer, a data acquisition software on a host PC or any serial communication device capable of receiving ASCII codes.

The other parameters on this screen are informational. The Serial port settings are:

Speed: 57600 BP S  
Data bits: 8  
Stop bits: 1  
Parity: none  
ASCII strings:  
Real-time: "111.1-2222CRLF"



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

Result: " Applied Torque= 111.1/222.2 333333 Time: 44/44/44 55555555 66CRLF  
Result: " Release Torque= 111.1/222.2 333333 Time: 44/44/44 55555555 66CRLF  
Result: " Strip Torque= 111.1/222.2 333333 Time: 44/44/44 55555555 66CRLF  
Etc...

### 3.2.2.6. Unlocking operation modes, optional features

The sixth submenu may be used to unlock various operation modes, optional features and configure passwords, when the password protection feature is enabled.

Like on any other screen, navigation is possible with the ENTER, ESC and ARROW buttons. The ENTER button is used to get in the parameter change screen, and then it is used to accept the modified values. The numeric buttons may be used for editing the various fields and the ARROW buttons may be used to navigate between the values on a screen. The ESC button is used to jump from one screen to another.

All of our new models come with a 160 hours evaluation period. Within this period the customer may explore the most common optional features of the torque tester. In the evaluation period the unlock submenu will not function, because all of the features are allowed during this period. Trying to enter in the unlock submenu will show the remaining time from the evaluation period.



When the evaluation period is expired the torque tester will notify the operator the next time he/she restarts the PLC, and it will ask for a reset. Follow the instructions and reset the tester or turn it on and off. After that the PLC will be limited in operational modes and in functionality, although for most torque application that is still perfect.



When the customer decides to buy an operational mode or a built-in, but locked feature Sure Torque will provide the code to unlock that mode/feature. These codes may be entered on the following screens shown above. The first two screens are used to unlock operational modes, and on the third screen it is possible to unlock various features like the password protection, the out of limit alarm, the decay option, the automatic torque speed feature, the serial communication and the historical screens.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425



The last, password screen may be used to change the default passwords to any 4-digit number. The optional password protection feature allows the customer to prevent any unauthorized person to make any changes in the setup setting. The operator has to enter a four-digit password to have access to the critical modes. If your machine is equipped with the password protection feature, you are only able to change the setup settings if you enter the four-digit password.

## WARNING

Once you have changed the password, it is advisable to write down any passwords and keep them in a safe place as a backup. Be very careful with this option, because if you forget the password, you have to send your control unit back to the factory for password reset!

### 3.2.2.7. Alarm settings

The seventh submenu may be used to configure the alarm settings, when the alarm option is unlocked.



Navigation is possible with the ENTER, ESC and ARROW buttons. ENTER is used to get in the parameter change screen, then it is used to accept the modified values. The numeric buttons may be used for editing the various values and the ARROW buttons may be used to navigate between the values on a screen. The ESC button is used to jump from one screen to the next.

Description of the values in the alarm submenu:

**Alarm Unlock Code:** If the customer purchased this option, Sure Torque will provide a 1-4 digit code, may be used to unlock the alarm option in the torque tester. Enter that code here, then press the ENTER button. The alarm option is



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

used to define an acceptable torque range for an application

**Enable/Disable Alarm:** This is a convenient way to get rid of the alarm messaging when the customer purchased this option and fine-tune the tester for a specific application. Setting it 0 or 1 will disable or enable the alarm screen.

**On-Torque Low:** This variable is used to setup the low torque limit in “on-torque” applications (application, precision application, strip, etc modes)

**On-Torque High:** This variable is used to setup the high torque limit in “on-torque” applications (application, precision application, strip, etc modes)

**Off-Torque Low:** This variable is used to change the low torque limit in “off-torque” applications (release, precision release, multiple release, etc modes)

**Off-Torque High:** This variable is used to configure the highest acceptable torque value in “off-torque” applications (release, precision release, multiple release, etc modes)

### 3.2.2.8. Calibration

Select the Calibration using the arrow buttons on the main navigation screen, then hit ENTER. The following screen will appear:



Make sure the reading is 000.x if there is no torque applied to the chuck. If the reading is not 000.x, (where x is based on qualification requirements), it is probably a good idea to recalibrate the torque tester. Recalibration is done preferably with a dead weight calibration kit. The frequency of the recalibrations should be based on company recalibration specifications. When the torque tester is used properly, it is the best to re-calibrate it in every six months. Through the calibration screen the zero offset drift may be zeroed out, and with the calibration procedure the gain can be readjusted. Of course when the required accuracy is in the 1-5 lbf in range you probably do not need to recalibrate the torque tester for years. If the reading is other than it is required by your specifications, follow the procedure below - steps 1 through 10- to make sure that the calibration gain has not changed. (x is the smaller the torque tester is the more accurate).

A password is required to recalibrate the torque tester when the password protection is enabled. The default password is: 1113)

In the calibration mode the signal of the transducer is directly connected to the display for continuous observation and calibration of the ST-120 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. Adjust the container clamps.
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 – if there is one.
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



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

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, press the “ENTER” button to enter the recalibration mode. You will get the following display:



Calibration specific settings may be configured on this screen. The unit system of the torque tester is selectable, on customer request we also provide other settings than the one has been already implemented. The list of measurement units:

- 0: ozfin
- 1: lbfin
- 2: lbfft
- 3: kgfcm
- 4: kgfm
- 5: Ncm
- 6: dNm
- 7: Nm

The units best fit for most of the applications are the lbfin in imperial/US unit system, and dNm in SI unit system. Change or keep the configuration of the pulley radius and the weight by the numeric keypad, change or leave your preferred unit system and the “ENTER” key. When the cursor is not blinking anymore (you entered all the necessary variables. You may start the calibration procedure.

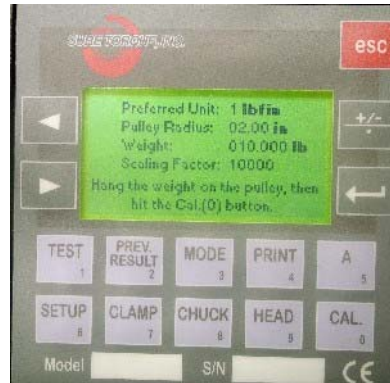


Take the weight off and make sure there is no torque applied to the chuck, then Press “CAL”.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425



The display will read:

“Hang The Weight On the Pulley”  
“Then hit the CAL button”

Install the largest pulley from your calibration kit into the chuck. Hang all the weights (or the weight that will have a comparable torque on the chuck (with the pulley) to the expected maximum of the release/application torque on the end of the wire on the right side of the pulley. Wait until the weights stop swinging. Press “CAL”.

At this point the zero offset and the gain are determined, everything is set to get back to the previous screen and check the calibration of the unit. Hit CAL the last time.

The display will then read the calibrated actual torque value.

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 main navigation screen.

## 3.3. Displayed messages, options and instructions.

### 3.3.1. Display

All operator controls and messages are conducted via the PLC’s integrated screen and keyboard.

The modes and messages are programmed into the PLC’s memory. Depending on the options the customer selected at the time of purchase, these modes may or may not be installed in the equipment.

### 3.3.2. Power On

At Power On, the Startup display appears on the screen:

To make the torque tester operator friendly, the PLC is configured to be ready to run the most often used test method right after the startup screen automatically disappears. The default mode screen may be selected on the miscellaneous setup screen. There is a few seconds which is used to delay the automatic default screen redirection from the startup screen (information about the owner, company, model and serial number) and this delay may be decreased or increased, as it is necessary in the timer configuration menu. If you are lost in screens you may always go back to the startup screen. When you hit the ESC button on the startup screen, the main navigation screen appears. From this screen you may navigate to the setup, calibration manual and test mode screens.



# Quality Assurance Instrumentation Precision Assembly Automation

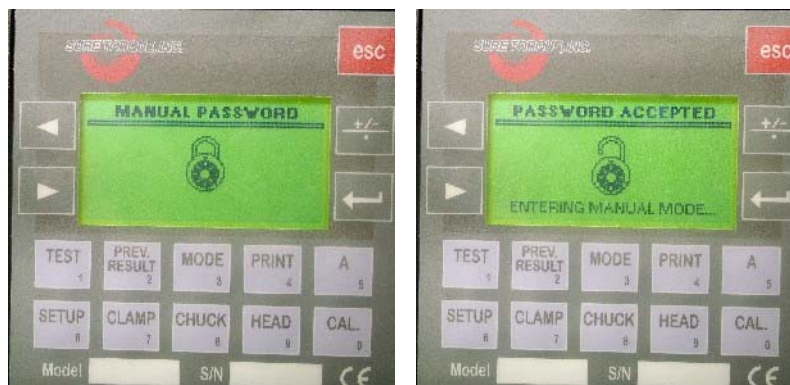
2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425



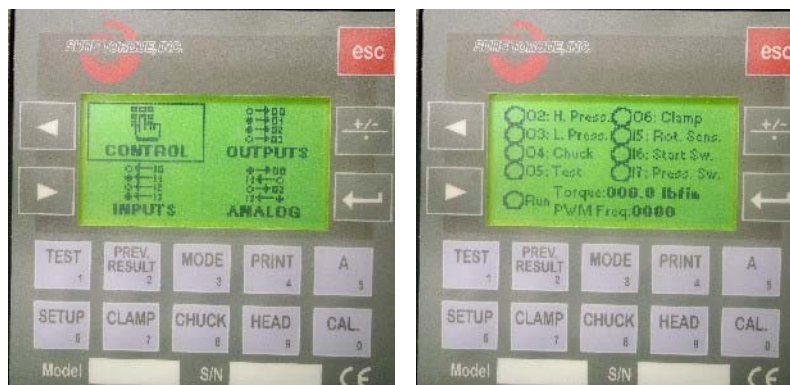
## 3.3.3. The Mode Screens

### 3.3.3.1. Manual Mode

Select the Manual Mode using the arrow buttons on the main navigation screen, then hit ENTER.



Before entering the authentication screen appears (when the password protection feature is enabled). Type in the password (default password is 1114). Entering the correct password's last digit will automatically redirect to the main manual screen. When the password protection is not enabled the operator will be able to enter in the manual mode without typing in passwords.



The most often used option in the manual mode is the control. Select the control item with the ARROW buttons and hit



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

ENTER. In this screen and on the other manual screens as well, there are special functions associated with the different keys. These are:

Esc:	This key is used to leave a screen and reset the tester and stop any motions.
Left Arrow:	Press or hold down this key to decrease the torque applied by the rotary actuator.
Right Arrow:	Pressing or holding down the key will increase the torque applied by rotary actuator.
+/-:	This key is used only on topload models, to turn on/off the topload application
Enter:	Use this button to turn on/off the torque application
1/Test:	This key is used to toggle the test cylinder. It affects the direction of the rotation.
2/Prev. Results:	It turns the Ratchet cylinder on/off when it is built-in the tester.
3/Mode:	Toggles the Alarm output.
4/Print:	Toggles O9. Not used.
5/A:	Toggles O10. Not used.
6/Setup:	Toggles O11. Not used.
7/Clamp:	Toggles the clamp cylinder.
8/Chuck:	This button turns on/off the chuck cylinder.
9/Head:	Toggles the high pressure cylinder.
0/Cal:	Press this key to turn on/off the low pressure cylinder.

The Manual/Control screen is used to manually evaluate the torque application. The operator may control the frequency output's rate and evaluate the corresponding torque value. For example, the customer wants to use the tester in application mode and the applied setpoint is 15 lbf/in. It is advisable to start the torque application at 10-13 lbf/in to save time. But how is it possible to find out what starting PWM rate equals to 10-13 lbf/in? Here is the procedure to follow: Hold the chuck in one hand and activate the torque application with the other. Then use the ARROW buttons, and the TEST button to change the frequency of the output and the direction of the rotation if necessary. Hold the chuck against the direction of the rotation. The torque generated this way will be shown on the screen and the corresponding output rate as well. Now you can go to the parameter change screen and enter the output rate which equals to your starting torque requirements. You can also manually run a torque test and even read out the real-time measurement data through the COM2 serial port and Hyperterminal or other terminal emulation software, or serial port monitoring application. This method may be used for special test purposes where the built-in methods are not acceptable.

## Operational Modes

These mode screens can be used to initiate a torque test, check the historical results or to change the parameters of a torque test.



Navigation between the different modes is possible by the "ARROW" buttons. The operator may alter the default/current parameters of a torque testing cycle with the following steps:

1. Hit the "ENTER" button on the current mode screen.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

2. Type in the Password if the password protection feature is enabled (default password is 1112), then modify the required values using the numeric keypad
3. Hit "ENTER" after you changed a variable.
4. Hit "ESC" if all the changes are made on the current screen, this will redirect to the next screen.



Change any values you wish and check the effect of that parameter change by running a test. There are some values on these screens which was not discussed previously:

**Applied Setpoint:** This is the pre-define torque limit in application/on-torque modes. When the transducer senses the Setpoint value in an application torque test, it will automatically turn off the torque, and then the completed screen appears showing the torque actually applied on the container/closure.

**Applied fallback:** The applied fallback value is used to determine the end of the measurement cycle after reaching a peak torque. If the torque decreases by the fallback value from the peak torque, the torque tester will finish the actual test and show the torque value where the fallback was sensed on the completed screen. The fallback directly affects the sensitivity of the measurement. The applied fallback value is only used in strip mode to determine the strip torque.

**Release Torque Limit:** This is the pre-define torque limit in release/off-torque modes. When the transducer senses the Torque limit value in a release torque test, it will automatically turn off the torque application, showing a message that the release torque was not sensed in the pre-define torque limit. It is the best to set this number 2 times of the expected release torque, or to 999.9 when the expected release torque is not known. Lowering this value may be used for undestructive release torque testing. This method is used to test if there is a release torque up to the release torque limit. This mode may be used for closure quality testing. For example, when a capper is known to undershoot the torque Setpoint, this method may be used for fast quality control, to see whether or not a closure was satisfying only the low limit requirement.

**Release fallback:** The release fallback value is used to determine the end of the measurement cycle after reaching a peak torque. If the torque decreases by the fallback value from the peak torque, the torque tester will finish the actual test and show the torque value where the fallback was sensed on the completed screen. The fallback directly affects the sensitivity of the measurement. The release fallback value is used in all the off torque modes to determine the initial, the highest or the local release torque values.

**Note:** On any mode screens or completed screens the same test may be initiated by pushing the START button(s). The Prev. Result button may be used to get in to the historical screens, when this feature is unlocked. The ESC button may be used to go to the main navigation screen, or while a test is running it will reset the torque tester.

### 3.3.3.2. Applied Mode

This is the test method used to tighten a closure precisely on a container. The mode screen displays the torque that the torque tester will apply, this torque value called the applied setpoint. The applied impulse time, the decay time (effective only when the decay feature is enabled) and other variables affecting the test are shown on this screen. Set the desired applied torque value by entering it in the "Parameter change" menu (Press "ENTER" (type in the password- if this feature is enabled) and then use the numeric keypad to configure the desired values). Each time you change a value you have to hit the "ENTER" button to accept the changes. If all the values are configured on the

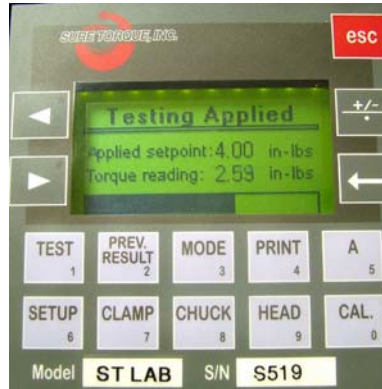


# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

parameter change screen, hit the “ESC” button to go to the next screen. When you modified all the required values, you have to hit the ESC button until you get back to the operational mode screen.

On the mode screen just press and hold down the start button(s) until the chuck closes, and it will initiate the test cycle. It is not necessary to hold down the start button when the safety feature is not enabled, or the tester is not equipped with the dual activation safety start button(s) option. When the test is running there are a real-time digital torque readout and a progress bar showing the applied torque throughout the test.



At the end of the test cycle, the “completed” screen will appear holding the applied torque until you press “ESC”, which takes you back to the operation mode screen, where the test was initiated. Pushing the start button(s) on either the completed screen or the mode screen will run the same test again.

### 3.3.3.3. Release Mode

This test method is used to determine the initial release torque of a closure. The sensitivity of the release torque measurement depends on the release fallback value. The release fallback value is used to determine the end of the measurement cycle after reaching a peak torque. If the torque decreases by the fallback value from the peak torque, the torque tester will finish the actual test and show the torque value where the fallback was sensed on the completed screen. As it was stated previously the fallback value directly affects the sensitivity of the measurement. The release fallback value is used in all the off-torque modes to determine the initial, the highest or the local release torque values.

In the standard release torque mode upon reaching the immediate release torque, the chuck stops rotating, then opens, then the container is unclamped for operator removal.

In the optional special release torque mode - where the torque tester measures the initial opening torque on special CR closures, upon reaching the first drop in the release torque, the tester will continue the rotation and look for a next drop in the torque to validate the previously measured release torque as the real initial release torque. If there is another drop in the release torque, the previous drop was generated by the engagement of the CR cap outer and inner caps, and determined to be a false readout. When there is no other drop throughout the release cycle, the first drop is validated as the real initial release torque and at the end of the rotation the chuck opens, then the container is unclamped for operator removal.

## Optional Modes

The base ST-120 comes with the standard application and release modes. All other measurement methods are optional, some of them may be unlocked after purchasing the unlock code, others need hardware modifications as well. Optional hardware modules may be required for example the 8000 cpr rotation encoder or the topload transducer for topload measurement and torque-angle monitoring/controlling.

### 3.3.3.4. Multiple Applied Mode

The only difference compared to the “Applied Mode” is that the torque tester applies the set point torque as many times as it is set in the “number of cycles” variable. This method may be used to test how does the multiple reapplication affect the removal torque.



## **Quality Assurance Instrumentation Precision Assembly Automation**

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

### **3.3.3.5. Applied then Release Mode**

This method may be used for fatigue testing. After applying the torque, the unit will automatically measure the release torque value. This method may be particularly useful when someone runs studies on how does a thread/material wears out in the function time/cycles. The applied then release mode runs as many times as it is configured in the cycle number variable.

### **3.3.3.6. Multiple Release Mode**

After measuring the immediate release torque the unit will try to measure a second peak torque value. The release fallback for the second peak torque may be different than the first fallback. At the end of the test cycle the display will hold the first and the second peak torque until you press "ESC", which takes you back to the mode screen, where the test was started. This mode may be useful to test the initial release torque of closure with a tamper evident band. The first release fallback variable may be set to a low amount of torque to keep the sensitivity of the initial torque test, and then the second fallback value may be set to a higher number to monitor the highest torque value breaking the tamper evident band.

### **3.3.3.7. Release and Applied Mode**

This is a cyclic mode again; the same as "Applied to Release" but this mode starts with releasing and finishes with applying the cap. Mostly used on production lines for fast and accurate automated removal torque testing. The containers are manually sampled regarding to quality assurance protocols, (based on rules like sampling every n-th container, or sampling in every 10 minutes, etc) then the initial release torque is measured followed by torque re-application. This way there is no product loss related to quality assurance processes.

### **3.3.3.8. Reverse Ratchet Mode**

This is a special mode for testing child resistant caps in compliance to the ASTM recommendation D3472-97(2002) Standard Test Method for Reverse-Ratchet Torque of Type IA Child-Resistant Closures.

### **3.3.3.9. Shelling Mode**

This mode is for special cap testing and allows for shelling test up to 30 degrees. Ref: D3481-97(2002) Standard Test Method for Shelling Two-Piece Child-Resistant Closures That Are Activated by Two Simultaneous Dissimilar Motions.

### **3.3.3.10. Strip Test**

The strip test mode measures the peak torque value, where threads break/deform in an on-torque/application cycle. This way you are able to measure the maximal amount of torque can be applied on a closure/container, without permanent damage of the closure/container threads. It is an important information for the Production people, so they can make sure that their cappers will never apply this amount of torque on the closures.

### **3.3.3.11. Nondestructive Release Mode**

Standard quality test. The tester will apply a certain amount of torque in off-torque direction to open the closure. If it can open the closure, your container failed the test, and when the container remains close, the closure passed the test. This way you may adjust your cappers until the tightened closure torque satisfies your low torque expectations. This test may be used for quality assurance, and it also makes an acceptable/not-acceptable rule based quality assurance process faster, because it is looking for the release fallback value only up to your acceptable lowest torque value.

### **3.3.3.12. Various Dispenser Pump Head Tests**

With different optional hardware modules, we can run dispenser pump tests, too. The following special measurement methods are available:

- Periodic topload application and spring load sensing/fatigue testing of dispenser pump heads.
- Pump closure release torque measurement
- Pump head release torque measurement.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

### 3.3.3.13. Sealed closure torque testing methods

After analyzing your closure we can write the best torque testing algorithm for you to test special sealed closures.

### 3.3.3.14. Precision Applied and Release tests

Special tests have been developed by Sure Torque to test or precisely apply torque on syringes, vials and these tests may be used in other low torque range applications, as well. The precision release test may be also used on CR caps, too. In the optional special release torque mode – it mainly used to test the initial opening torque on special CR closures, upon reaching the first drop in the release torque, the tester will continue the rotation and look for a next drop in the torque to validate the previously measured release torque as the real initial release torque. If there is another drop in the release torque, the previous drop was generated by the engagement of the CR cap's outer and inner caps, and determined to be a false readout. When there is no other drop throughout the release cycle, the first drop is validated as the initial release torque and at the end of the rotation the chuck opens, then the container is unclamped for operator removal.

### 3.3.3.15. Topload measurements

One of the most forgotten questions regarding to torque testing is the effect of the topload force on the cap. There are thread/closure designs where the removal/applied torque is highly affected by the force pushing down on the cap. We can upgrade the ST-120 with the topload option, and let you run torque measurements where the topload force is kept on the same level, providing accurate topload independent readouts. We can also sell you measurement methods, checking the thread friction torque at different topload force levels. Although these tests are mainly useful for closure designers, it is also a good idea to check a cap design with a topload equipped torque tester before buying thousands/millions of them. The topload option is also a must to properly test child resistant caps, for example the Reverse Ratchet torque, and the shelling force. It is also useful to determine the “pull-apart” force, or the maximal topload force of a container.

## 3.3.4. Historical Data Screens

Press the PREV. RESULT button on any of the operational mode screens. It will forward you to the statistical screens when the historical feature is enabled. On these screens you may navigate between historical measurement records. In release modes the tested and found to be loose caps are registered with 000.0 lbf in torque value, while the caps where the release fallback was not sensed below the pre-defined torque limit will be registered with 999.9 lbf in. On the first historical screen, the ARROWS may be used to navigate between records, but on the second screen the same button is used to see the statistics of the different measurement modes. It calculates the Minimum, Maximum, Average and Standard Deviation values of the captured measurement data. ESC is used to jump forward to the next screen. The third screen is reserved for customer specific statistics.





# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

### 3.3.5. Serial Communication

When this feature is unlocked the torque tester sends out measurement data at the end of each torque test. When a monitoring program use a handshaking (ASCII x) signal to receive data from the torque tester it also sends out the measured torque and angle data real-time.

Make sure that your host computer is connected to the PLC, and running the Sure Torque data acquisition software or a terminal emulation software. You also have to check the following settings in the configuration of the host computer's serial port: The data is in ASCII format with CR, LF Delimiter. Protocol: 56700 Baud, 8 Data bits, 1 stops, no parity (see Figure 3-2, RS-232 Cable and Communication Parameters). Cable to PC Serial Port is optional.

#### DEFAULT COMMUNICATION PARAMETERS

1. BAUD RATE: 56700
2. PARITY: NO
3. DATA LENGTH: 8 BITS
4. STOP BITS: 1

Figure 3-2, RS-232 Cable and Communication Parameters.

ASCII communication strings:

```

Real-time: "111.1-2222CRLF"
Result: "    Applied Torque= 111.1/222.2 333333 Time: 44/44/44 55555555 66CRLF
Result: "    Release Torque= 111.1/222.2 333333 Time: 44/44/44 55555555 66CRLF
Result: "    Strip Torque= 111.1/222.2 333333 Time: 44/44/44 55555555 66CRLF
Etc...
```

The tester may be directly connected to a serial printer or using a serial to parallel adapter it is possible to connect a parallel port printer, too. On customer request we also modify the communication protocol, to satisfy the specifications required by the customer's existing SPC software.

Today's laptop computers are usually not equipped with serial ports. When you want to capture the measurement data into a laptop, you can use almost any USB-Serial adapters. Our favorite is the ATEN-UC232A model.

#### 3.3.5.1. Sure Torque Data Acquisition

Optional Microsoft Windows compatible software package for data collection from ST-120 through the industry standard RS-232 Port. (Port 2 RJ11 connector) If you have purchased this option, refer to the Appendix A in this manual for details.



If your *Sure Torque* ST-120 Electronic Torque Tester is not running smoothly, or there is **any** doubt as to its operational proficiency or proper production cycle, contact ST Customer Service at once:

#### 3.3.5.2. Customization of the communication string

Data string customisation and communication protocol setup is only available at Sure Torque Please make sure that the data communication string and the serial port configuration is compatible with your system requirements.

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



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## 4. Maintenance

Proper and regular, routine maintenance schedules should be followed at all times with the SURE TORQUE 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 the 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 ST-120 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.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

Turn off the power with the **power** button before performing **any** cleaning or maintenance functions. ST 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: .....	<ul style="list-style-type: none"> <li>a. Check overall machine for any leaks and required cleaning.</li> <li>b. Apply light machine oil to shafts of Air Cylinder shafts.</li> <li>c. Check <b>all</b> pneumatic hose connections for any leaks.</li> <li>d. Check <b>all</b> Air Cylinders for full stroke.</li> <li>e. Completely clean all machine parts and inspect operational functions, cycles, and adjustments.</li> </ul>

### NOTE:

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

## 4.3. Pneumatic 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-120 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



## Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

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-120 *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-120 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.



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

## 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-120 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 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. <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 power connections</li> <li>b. Replace fuses</li> <li>c. Turn disconnect to "on" position.</li> <li>d. Replace push-button</li> </ol>
2. Sure Torque will not Start:	<ol 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> </ol>	<ol style="list-style-type: none"> <li>a. Check connections and disconnect.</li> <li>b. Replace fuses</li> <li>c. Install isolation X-former</li> </ol>



# Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

TABLE 5-3, Pneumatic Troubleshooting Guide.

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
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>



## Quality Assurance Instrumentation Precision Assembly Automation

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

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

All Sure Torque, Incorporated (ST) 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, represent 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 (ST'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 (ST).
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 (ST'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 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, 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** 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 (ST) 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 (ST) 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 (ST). 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, ST.



# **Quality Assurance Instrumentation Precision Assembly Automation**

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

---

## **7. Sure Torque Options List**

### **7.1. Software Mode List**

#### **7.1.1. Release Mode**

This mode tests the release torque of a previously applied closure. In this way the Sure Torque ST-120 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-120 applies increasing removal torque consistently to a closure until it reaches the release torque value or shows a lesser torque measurement/000.0 during operation on a loose closure. (result on loose cap should be specified by the customer)

#### **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-120 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-120 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 then Release Torque Mode**

This mode applies closures in the Multiple Applied Mode and 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 then 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-120 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-120 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 safe transfer of samples 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-120 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.



## **Quality Assurance Instrumentation Precision Assembly Automation**

---

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

---

### **7.1.7. Non-Destructive Release and Re-Apply 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 then 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. Multiple 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. Reverse Ratchet Mode**

This option is based on the “D3472-97(2002) Standard Test Method for Reverse-Ratchet Torque of Type IA Child-Resistant” ASTM specification.

### **7.1.11. Shelling Fixture Mode**

This option is suited to comply with the ASTM recommendation: D3481-97(2002) Standard Test Method for Shelling Two-Piece Child-Resistant Closures That Are Activated by Two Simultaneous Dissimilar Motions.

### **7.1.12. Strip Test**

The strip test mode measures the peak torque value, where threads break/deform in an on-torque/application cycle. This way you are able to measure the maximal amount of torque can be applied on a closure/container, without permanent damage of the closure/container threads. It is an important information for the Production people, so they can make sure that their cappers will never apply this amount of torque on the closures.

### **7.1.13. Various Dispenser Pump Head Tests**

With different optional hardware modules, we can run dispenser pump tests, too. The following special measurement methods are available:

- Periodic topload application and spring load sensing/fatigue testing of dispenser pump heads.
- Pump closure release torque measurement
- Pump head release torque measurement.

### **7.1.14. Sealed closure torque testing methods**

After analyzing your closure we can write the best torque testing algorithm for you to test special sealed closures.

### **7.1.15. Precision Applied and Release tests**

Special tests have been developed by Sure Torque to test or precisely apply torque on syringes, vials and these tests may be used in other low torque range applications, as well. The precision release test may be also used on CR caps, too. In the optional special release torque mode – it mainly used to test the initial opening torque on special CR closures, upon reaching the first drop in the release torque, the tester will continue the rotation and look for a next drop in the torque to validate the previously measured release torque as the real initial release torque. If there is another drop in the release torque, the previous drop was generated by the engagement of the CR cap’s outer and inner caps, and determined to be a false readout. When there is no other drop throughout the release cycle, the first drop is



# **Quality Assurance Instrumentation Precision Assembly Automation**

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

validated as the initial release torque and at the end of the rotation the chuck opens, then the container is unclamped for operator removal.

## **7.1.16. Topload measurements**

One of the most forgotten questions regarding to torque testing is the effect of the topload force on the cap. There are thread/closure designs where the removal/applied torque is highly affected by the force pushing down on the cap. We can upgrade the ST-120 with the topload option, and let you run torque measurements where the topload force is kept on the same level, providing accurate topload independent readouts. We can also sell you measurement methods, checking the thread friction torque at different topload force levels. Although these tests are mainly useful for closure designers, it is also a good idea to check a cap design with a topload equipped torque tester before buying thousands/millions of them. The topload option is also a must to properly test child resistant caps, for example the Reverse Ratchet torque, and the shelling force. It is also useful to determine the "pull-apart" force, or the maximal topload force of a container.

## **7.2. Other Options list**

### **7.2.1. 360°/720° 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.

### **7.2.2. Metric/US Measurement**

This arrangement provides the option of displaying all torque measurements in metric Newton-Meters, in place of inch-pound units or other units. If chosen, this option will be a selection in the calibration menu. The unit system of the torque tester is selectable, on customer request we also provide other settings than the one has been already implemented. The list of measurement units:

- 0: ozfin
- 1: lbfin
- 2: lbfft
- 3: kgfcm
- 4: kgfm
- 5: Ncm
- 6: dNm
- 7: Nm

### **7.2.3. RS-232 Interface**

This option provides a cable and RS232 serial port (with RJ-11 connector) on the back of the Sure Torque ST-120 control box, to interface to a serial port on a customer's host computer or printer. All test data generated on the Sure Torque ST-120 are available for output to a customer's printer or PC. This feature available with the Sure Torque Data acquisition package (with real-time torque monitoring), and it feeds all collected torque values into the customer's PC for storage, later analysis or printout.

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

A data collection aid to provide 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-120 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.



## **Quality Assurance Instrumentation Precision Assembly Automation**

---

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

---

### **7.2.5. 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.

### **7.2.6. STDA Software**

The Sure Torque STDA software package, downloaded to customer's (hard drive/USB Pin drive, local or network storage devices) automatically collects and displays torque test data from the ST-120 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. Host computer and RS-232 serial port option required. If you have purchased this option refer to the Appendix A in this manual for details.

### **7.2.7. Password Protection 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-digit password to have access to the setup, parameter change, calibration and manual mode.

### **7.2.8. Time Decay Feature**

In application 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 the decay timer you can program the unit how many seconds to wait before conducting the next test in the cycled modes, or releasing the cap at the end of a single test.

### **7.2.9. Historical Data Option**

Fast and convenient way to check previously measured data. Based on the FIFO data storage strategy, the built-in data table stores up to 4000 records of measurement. The table size may be setup to anything from 2 to 4000. This way you may be able to store only the measurement result for the actual batch of containers.



## **Quality Assurance Instrumentation Precision Assembly Automation**

---

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

---

### **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 conform 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.



## **Quality Assurance Instrumentation Precision Assembly Automation**

---

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

---

**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.

---



## **Quality Assurance Instrumentation Precision Assembly Automation**

---

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

---

**TE (closure):** Tamper Evident

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

**top load:** 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.



## **Quality Assurance Instrumentation Precision Assembly Automation**

2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

---

## **9. Data Acquisition Program for the ST-120 Bench Top Torque Tester**

### **9.1. General**

The STDA (Sure Torque Data Acquisition) is a utility program that together with the ST-120 instrument facilitates computerized real-time torque monitoring, data collection and storage. It is specifically designed to work together with the latest Torque Testers.

The STDA program acquires measured data from the ST-120 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 or available to download from the company http or ftp server. For download information please contact the customer service department. The application will run on any host computer compatible with Microsoft Operating Systems.

### **9.2. System Requirements**

- Any portable or desktop computer with Microsoft Operating Systems.
- <=200MHz CPU
- 128M memory
- Floppy/CD/USB Drive and hard disk drive
- At least one RS-232 port
- Interface cable (supplied with the ST-120 instrument)

### **9.3. Installation**

#### **9.3.1. Hardware Installation**

Locate the Interface cable (supplied with ST-120 instrument). This is a 6 ft. long cable with a 9 pin "D" type FEMALE connector on the PC end and RJ11 Type connector on the machine end.

Install the connector of into the matching "PORT 2" plug at the back of the head. Install the connector on the other end of the cable into the RS232 port on your PC (COM1 or COM2).

**On special request we can also provide multimedia card, USB, parallel port, wired/wireless ethernet accesses, to the torque tester**

#### **9.3.2. Software Installation**

Latest software always downloadable from the <http://www.suretorque.com/download/> url.

Hard disk installation

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

### **9.4. Operation**

The data collection from the ST-120 instrument is fully automatic and there are two options to capture data from the Torque Tester. The first method requires a dedicated PC connected to the torque tester, for real-time



# Quality Assurance Instrumentation Precision Assembly Automation

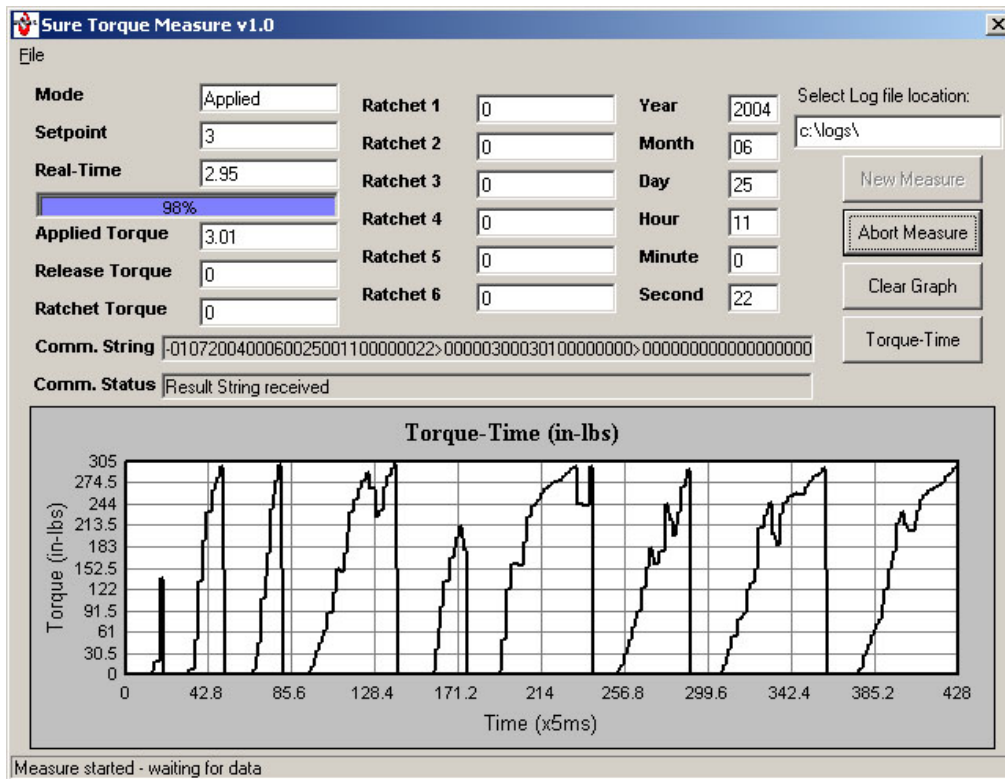
2532-34 Trailmate Drive, Sarasota, Florida 34243  
Tel: +1-941-753-1095, Fax: +1-941-756-8425

torque monitoring and data processing. After every measurement the information is transferred to the PC via the RS-232 link logged and inputted into the STDA system.

The second method does not need a dedicated PC but does not have the ability to monitor the real-time torque either. The ST-120 itself is able to hold at least 4000 measurement records in its memory providing an alternative way for data collection.

Data logs generated automatically by the application each day the device is turned on and communicating with the PC. The generated file is a ".csv" file which is very flexible and easily importable to database servers on any widely used operating system today.

For professional real-time and historical data management, we will be glad to customize the machine to work with your preferred SPC/Test/Data Acquisition software.



Screenshot of Sure Torque Data Acquisition Software - Realtime Torque monitoring\*  
\*Current Software screen may differ from the one above.