Safe-T Sim™ ST-1 and ST-1-IEC Electrical Safety Analyzer

Operator's Manual

This Operators Manual relates to ***Safe-T Sim*** Analyzers with SW 2.6 or higher.

This product is intended for testing purposes only and is not used in diagnostics, treatment or any other capacity where it would come in contact with a patient.

The device shall only be used with the AC power cord provided or with AA Alkaline or Lithium batteries.

Operate this product using only accessories provided by Pronk Technologies.

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

Service and calibration must be performed by Pronk Technologies or a designated service organization approved by Pronk Technologies. Verify proper service and calibration by reviewing certification document returned with the device.

To dispose this product, contact Pronk Technologies at support@pronktech.com. We will issue a RMA and pay for return shipment.

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Contact Information

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Website: www.pronktech.com

Warnings

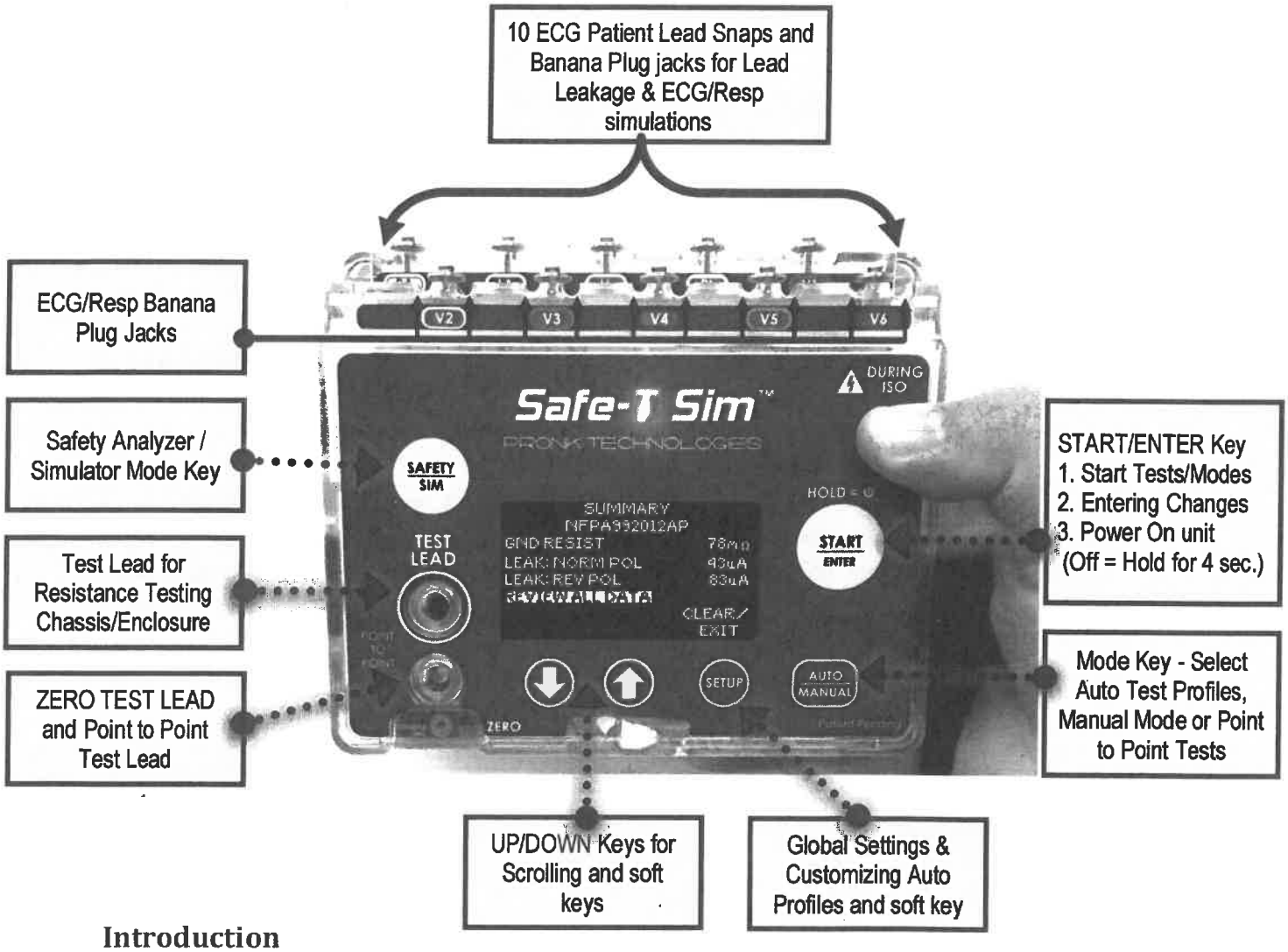
To avoid possible electrical shock or personal injury, follow these recommendations:

1. **When Lead Leak ISO testing is being performed with the Safe-T Sim Electrical Safety Analyzer, the ECG snaps will have line voltage applied to them. This voltage is current limited but users should not touch the ECG Snaps or Device Under Test (DUT) during these tests.**

2. **Do not touch metal parts of the DUT during testing. The DUT is a potential shock hazard when connected to Safe-T and conducting high voltage tests.**

3. **ONLY use the power cord provided by Pronk Technologies to ensure 15 to 20 amp operation does not cause a temperature issue with the power cord.**

Front Panel Keys and Connections



Introduction

The Safe-T Sim ST-1 Electrical Safety Analyzer is quick to set up, easy to use and ready to go where you need to be. ST-1 is designed to be used in either Automatic or Manual mode. With Automatic mode, the user can customize up to 5 unique test protocols or "profiles" enabling and disabling tests and adjusting pass/fail limits. Applied parts testing, ECG and Respiration simulations are integral in the standard product.

Accessories Included

- Carrying Case • Chassis Test Lead Red- 8 foot • 2 AA Alkaline Batteries
- 10 ft. USA NEMA 5-15, 14 Gauge power cord • Power Cord Secure Sleeve Fastener
- Operators Manual
- USB cable

Optional: • Mounting Clamp Assembly • Bluetooth Interface • 10 ECG Alligator Adapters • Chassis Test Lead Black – 8 foot

Quick Start: Automated Safety Testing

AUTO mode can substantially speed up Safety Testing. Five factory default automated Test Profiles are preloaded onto ST-1. These profiles are editable by users on the ST-1 directly or via a PC using the USB cable provided (see Cloning Profiles section).

1. **Power up ST-1** by plugging in the AC power cord provided and if needed, pressing the **START** key.
2. Attach Test Lead banana plug end to upper TEST LEAD jack, and Alligator clamp end of Test Lead to DUT chassis exposed metal / ground post.
3. Press **AUTO/MANUAL** key.
4. Highlight desired Auto Profile* and press **START** to select.
5. From AUTO: HOME screen, press **START** to begin automated test. *ZERO TEST LEAD cable, if prompted.***
6. Once the test sequence is completed, the Safe-T Sim will display a SUMMARY screen showing peak values measured by category.

Reviewing / Clearing Data

- To clear all data, exit testing and turn off power to DUT, press **CLEAR/EXIT**.
- To review all the data press **START** to enter REVIEW mode.
- In review mode, press **NEXT** (**START**) to move to next screen / category of tests or use arrow up or down within each screen of review, highlight a test and press **START** to retest an individual test.
- Press **EXIT REVIEW** from any review screen to return to SUMMARY screen.

*Example: ST-1 NFPA99 Factory Defaults

Profile Name	Ground Resistance	Earth	Chassis		Lead Leak: GND	
		N-POL	N-POL-GO	N-POL-GC	N-POL-GC	N-POL- GO
USERDEFINE1	Yes	Yes	Yes			
USERDEFINE2	Yes	Yes	Yes		Yes	Yes
USERDEFINE3		Yes	Yes			
NFPA992012	Yes		Yes	Yes		
NFPA992012AP	Yes		Yes	Yes	Yes	

**NFPA99-2012 calls for testing both with the DUT on and then repeating some tests with the DUT off. Both NFPA99 profiles have been default to "Leave DUT on at end" to comply. This feature can be configured by users in SETUP.*

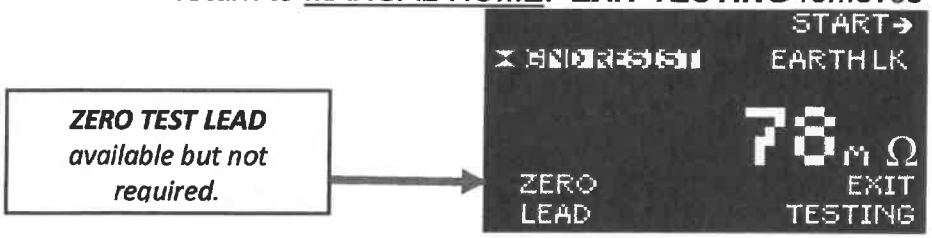
NFPA factory defaults include two profiles that comply with NFPA-99 2012 edition. Profile NFPA992012 is for testing devices with no Applied Parts (ISO tests) and NFPA992012AP is for testing devices that have Applied Parts ("AP"). These profiles can be edited, if desired.

****NOTE:** Zero Test Lead has factory default of once every 30 days. This value can be edited. (See section "Editing the PROFILES.CSV")*

Quick Start: Manual Safety Testing

1. Press **AUTO/MANUAL** key, highlight **MANUAL**, press **START**
2. MANUAL HOME: Ground Resistance and Leakage testing can be started. Scroll to desired test, press **START**

3. Manual Testing screen: Ground Resistance Testing shown. Press **START** again to accept measurement and advance Earth Leakage, or Select **EXIT TESTING** to return to MANUAL HOME. ***EXIT TESTING*** *removes DUT power.*



4. The active Leakage test is displayed on the left highlighted with an hour glass. ⧗ Fault conditions can be started by pressing up or down arrow keys. Pressing **START** changes the active Leakage test. ***EXIT TESTING*** *removes DUT power.*

5. Press **EXIT TESTING** once all tests required are completed. Summary results (peak values) are shown on MANUAL: HOME. To see detailed results, select **REVIEW ALL DATA,** then press **START** key to page through all results pages.

NOTE: *Tests can be repeated from SUMMARY screens. Highlight test using up down arrow keys, press* ***START*** *to begin. Press START again to end test.*

6. Press **CLEAR DATA from** MANUAL: HOME screen to delete all test results.

Quick Start: ECG/Respiration Simulation

1. Press **SAFETY/SIM** key
2. ECG Heart Rate is highlighted- press **START** to edit value (ECG HR flashes) **OR**
3. Down arrow to Resp Rate, press **START** to edit value (Resp Rate flashes) **OR**
4. Down arrow to AUTO SEQ, press **START** to change from Adult, Peds or Neo.

Detailed Operation: ST-1

ZERO TEST LEAD: Auto and Manual Mode

The **ZERO TEST LEAD** function calibrates out the resistance of the Test Lead cable. The resistance value from this function is stored in memory of the ST-1 and is automatically subtracted from resistance measurements for greater accuracy. ZERO TEST LEAD function reminders are defaulted to 30 days, but users may perform the zero function as often as they choose by scrolling to **ZERO TEST LEAD** from manual mode and pressing **START**. The Factory Default reminder can also be edited. *(See section "Editing the PROFILES.CSV")*

Performing ZERO TEST LEAD manually (Not Required):

1. Attach 90 degree banana end of Test Lead to upper jack.
2. Press alligator end of Test Lead into lower jack.
3. From MANUAL:HOME select **GND RESISTANCE**, then **ZERO LEAD** to perform ZERO TEST LEAD.

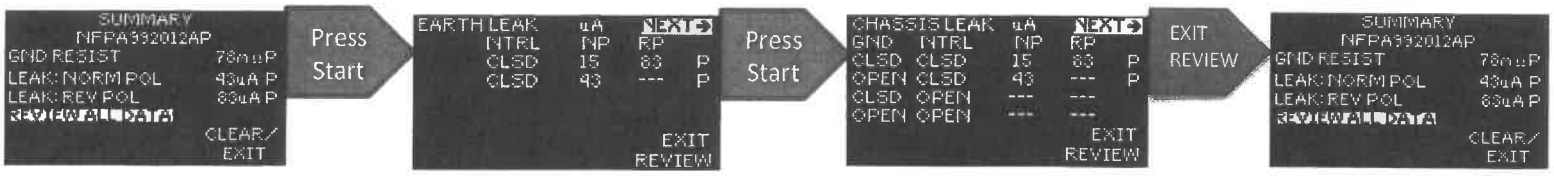
Press Alligator to lower Jack
(most accurate method)

Electrical Safety Testing: AUTO MODE

1. Insert the DUT power cord into the DUT outlet located on the left side of the ST-1. Connect the banana plug connector of Test Lead to upper test lead jack and the clamp side of test lead to the DUT chassis / enclosure ground lug or exposed metal, if available.
2. Press **AUTO/MANUAL** key to select desired Auto Profile. Highlight the profile, press **START**.
3. From the AUTO Mode Home Screen, press **START** to begin testing. (ZERO TEST LEAD cable, if prompted.) All of the tests that were configured "ON" will run without user interaction on the ST-1. Tests are automatically grouped and performed in the following order. 1st All Normal Polarity, 2nd All Reverse Polarity and 3rd All Open Neutral. A green or red flash will follow the completion of each test performed depending on pass/fail.

NOTE: *Zero Test Lead has factory default of once every 30 days. This value can be edited. (See section "Editing the PROFILES.CSV")*

4. Once all the tests that were "ON" have completed, the screen will display a SUMMARY of all results (peak values). "P" (Pass) or "F" (Fail) symbol will be posted to the right of each test category. Press **START** to REVIEW ALL DATA, or **CLEAR/ EXIT** to clear all data and start a new test (Turns off DUT Power). Measured value will be posted to the right of each test completed. Press **START** to advance to next page of results, **EXIT REVIEW** to return to SUMMARY Screen.

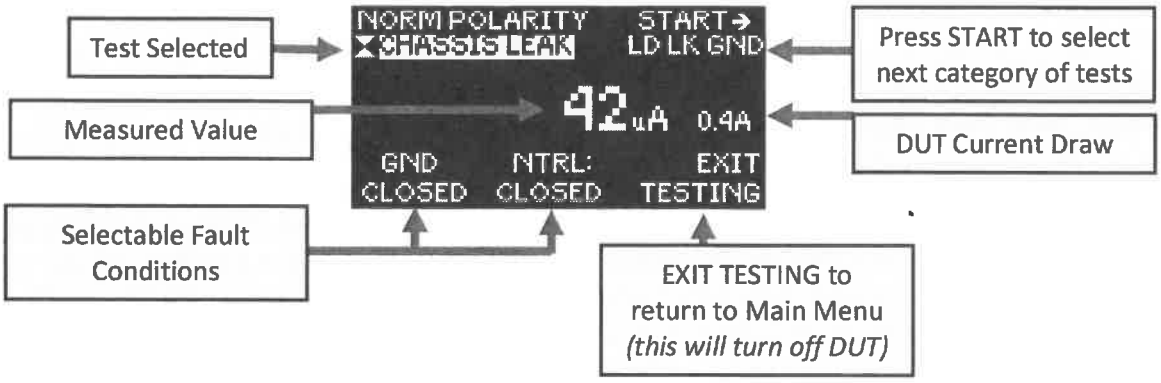


5. ***Retesting in Auto Review Screens:*** From REVIEW screens for any test completed, the result can be reviewed and repeated by scrolling to that line using up or down arrow keys and pressing **START** key. The test will repeat and the new test result will replace the prior. This can be done for any test turned on in the Auto Profile, but not for any test that was turned off in that profile.
6. From SUMMARY screen press CLEAR/EXIT to return to AUTO: HOME screen to start a new test / new DUT.

Electrical Safety Testing: MANUAL MODE

1. Insert the DUT power cord into the DUT outlet located on the left side of the ST-1. ZERO TEST LEAD cable, if prompted. Connect the banana plug connector of Test Lead upper test lead jack and the clamp side of test lead to the DUT chassis / enclosure ground lug or exposed metal, if available.

   NOTE: *Zero Test Lead has factory default of once every 30 days. This value can be edited. (See section "Editing the PROFILES.CSV")*
2. From the Manual Mode Home Screen, scroll using **UP** or **DOWN** arrow keys to highlight the desired test and press **START** key to begin testing.
3. Leakage test being performed is displayed, as shown below, along with available fault conditions that can be selected. Press **START** to select next category of tests.



4. Use **UP** or **DOWN** arrow keys to change fault conditions e.g. GND CLOSED to GND OPEN and NTRL CLOSED to NTRL OPEN.
5. Measured value is displayed along with DUT current draw.
6. Press **EXIT TESTING** once all tests are complete (DUT will power off). Select **REVIEW ALL DATA,** then press **START** key to page through all results.

   NOTE: *Tests can be repeated from REVIEW screens. Highlight test by using up and down arrow keys, press **START** to begin. Press START again to end test.*

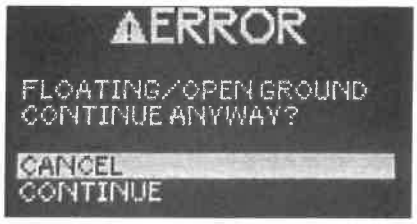
7. Press **CLEAR DATA** from HOME screen to delete test results.

Electrical Safety Testing: Alert Messages

Electrical Safety Home Screen: When power up sequence is complete, ST-1 will display the last testing mode used (MANUAL or AUTO: Profile [X]), indications of the line voltage (polarity, ground continuity). If no fault is detected, ST-1 is ready for use.

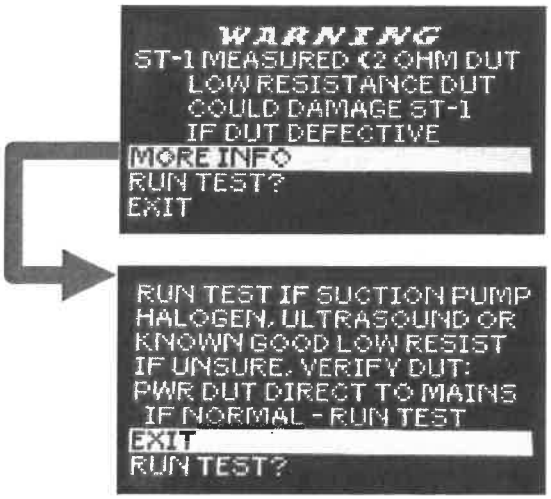
1. If **NO AC DETECTED** or **REVERSE POLARITY** message is displayed, safety testing will be halted until the line voltage fault is no longer present.

2. FLOATING GND: If very high resistance is detected between ST-1 and protective earth at Mains, a **FLOATING GND** message is displayed at the bottom of the screen. When the user presses START, the following warning message is displayed:



NOTE: *If you are using the ST-1 in an isolated power environment that is causing this message and are confident it will not affect accuracy of electrical safety measurements, select CONTINUE to begin testing.*

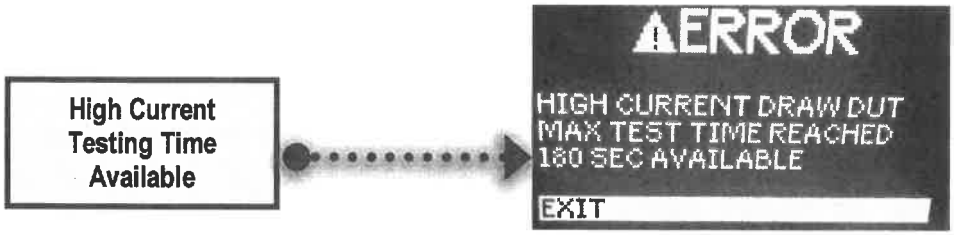
3. **ST-1 MEASURED <2 OHM DUT:** ST-1 will perform resistance test of the DUT input and if the resistance is less than 2.1 ohms, ST-1 will post warning messages, as shown below. User should verify the medical device is functional before proceeding.



High Current Testing

1. When testing devices that draw more than 15 amps, ST-1 will limit electrical safety testing to a maximum of 3 minutes continuous*. This applies anytime the ST-1 is providing AC power to the DUT including Sim and leakage testing modes, as well as, the DUT PWR AT END feature. The following timer message will be displayed in **Manual Mode** indicating high current draw and time left before safety testing is automatically stopped.

2. Once high current draw time limit is reached, the DUT power is removed and the following message will be displayed. ST-1 tracks the time of High Current testing and a timer will be displayed incrementing from zero seconds to show how much time is available for additional High Current tests. Users can EXIT this screen at any time, and resume high current testing for the duration of time last displayed on this screen or wait until the timer reaches the maximum of 180 seconds, then press EXIT to resume testing.



*Safe-T Sim is designed to continuously track the amount of time that high current is being drawn by the DUT in order to ensure to limit the time to a maximum of 180 seconds.
Example: If DUT current draw is 18 Amps for 120 seconds, then 1 Amp for 120 seconds, the available High Current Time after these two tests is 180 seconds.
Second example: If the DUT current draw is 18 Amps for 120 seconds and then 1 Amp for 60 seconds, the available High Current Time will be 120 seconds.
[(180 max. seconds avail. - 120 sec. high current used) + 60 seconds low current used = 120 seconds high current time available.]

NOTE: While very unlikely, it is feasible that if many devices that draw 15+ Amps were tested sequentially and the Safe-T Sim power was removed between each device tested, the timer would not be able to manage how much time was available for High Current testing. If this were to occur and less than 3 minutes expired between High Current devices tested, the Safe-T Sim display could go blank. This is not a failure of the Safe-T Sim and only requires the user to remove the DUT and the power cord from the Safe-T Sim for 3-5 minutes and restart testing.

Electrical Safety Tests Available

Name	Definition
Zero Test Lead	Function to zero out resistance from Test Lead Cable.
GND Resistance	Resistance measured from the DUT Protective Earth (PE) pin to line PE and/or from Test Lead connected to DUT enclosure to Line PE.
Earth Leak	Displays leakage current measured through DUT ground line under user selectable fault conditions.
Chassis Leak	Chassis Leakage shows leakage current measured under user selectable fault conditions. Measurements are from DUT chassis / enclosure via the Test Lead.
Lead Leak: GND	Leakage Current measurements from the applied parts to PE where the applied parts are connected to Ground.
Lead Leak: ISO	Leakage current measurements from the applied parts to PE where the line voltage is present on the applied parts (current limited).

GND RESISTANCE

The GND RESISTANCE performs a resistance test between the Test Lead Cable and PE (Protective Earth). This measurement is performed using the Test Lead connected to exposed metal surface on the DUT. This measurement result is the resistance of the enclosure / chassis and the DUT power cord itself. The limit for Pass/Fail can be customized for each Auto Profile. Once set, the software will use this value to make decisions such as Pass/Fail for Ground Resistance Test and whether or not to beep if Beep is turned on. It will also trigger beeps / tones based on the GND AUDIO setting.

EARTH LEAK TESTS

When initiated, a measurement is displayed of the leakage current in the ground wire to Protective Earth with a 1000 ohm load in series with the measurement. Test conditions are user configurable including programming test on/off and pass/fail limits as described below.

Neutral	Normal Polarity (NP)	Reverse Polarity (RP)	LIMIT
Closed	On/Off	On/Off	5-5000
Open	On/Off	On/Off	5-5000

CHASSIS LEAK TESTS

When initiated, a measurement is displayed of the leakage current between the DUT Chassis / enclosure via the test lead to Protective Earth with a 1000 ohm load in series with the measurement. Test conditions are user configurable including programming test on/off and pass/fail limits as described below.

Ground	Neutral	Normal Polarity (NP)	Reverse Polarity (RP)	LIMIT
Closed	Closed	On/Off	On/Off	5-5000
Open	Closed	On/Off	On/Off	5-5000
Closed	Open	On/Off	On/Off	5-5000
Open	Open	On/Off	On/Off	5-5000

LEAD LEAK- GND TESTS

When initiated, a measurement is displayed of the leakage current between the ECG leads and Protective Earth. A relay provides a current path from Protective Earth, through the 1000 Ohm AAMI / IEC Test load circuit. Test conditions are user configurable including programming test on/off and pass/fail limits as described below.

Ground	Neutral	Normal Polarity (NP)	Reverse Polarity (RP)	LIMIT
Closed	Closed	On/Off	On/Off	5-5000
Open	Closed	On/Off	On/Off	5-5000
Closed	Open	On/Off	On/Off	5-5000
Open	Open	On/Off	On/Off	5-5000

LEAD LEAK- ISO TESTS (MAP)

WARNING- SNAPS HOT! (High Voltage on ECG Snaps)

When initiated, a measurement is displayed of the leakage current by applying mains to the applied parts (MAP). A relay provides a current path from Protective Earth, through the 1000 Ohm AAMI / IEC Test load circuit. All 10 ECG snaps are electrically connected to mains voltage but are current limited for safety. Test conditions are user configurable including programming test on/off and pass/fail limits as described below.

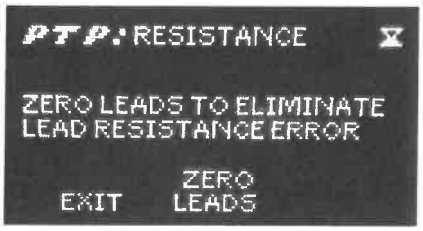
Neutral	NP (Normal Polarity)	RP (Reverse Polarity)	LIMIT
Closed	On/Off	On/Off	5-5000
Open	On/Off	On/Off	5-5000

Point to Point Testing (Hardwired Devices)

Allows Measurement of resistance or leakage between two points (PTP). Black Test Lead Cable required P#: 501-9924.

Press **AUTO/MANUAL** key, highlight POINT TO POINT TESTS, press **START**.

1. Point-Point Resistance Test
    a. First time you select PTP Resistance, it is recommended to use the ZERO LEADS function to null resistance of test leads before taking measurement.



    b. Connect Test Leads between the two points desired on DUT. Resistance measurement will be displayed. Press **EXIT** to stop test and return to prior screen.

2. Point-Point Leakage Test
    a. Connect Test Leads between the two points desired on DUT. Leakage measurement will be displayed. Press **EXIT** to stop test and return to prior screen.

Applied Parts- Lead to Lead and Lead to Ground Testing

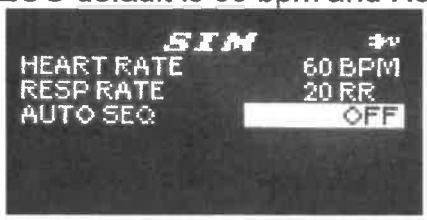
NFPA-99 2012 does not call for lead to lead or individual lead to ground testing, however, these tests can be performed using the ST-1, if required.

For lead to lead testing, connect a Test Lead to the upper jack of the TEST LEADS jacks. Connect a second Test Lead to the lower jack of the TEST LEADS jacks. Connect one test lead to one ECG lead wire snap, making sure it is making electrical contact and connect the other test lead to a different ECG lead wire, making sure it is making electrical contact. Using Manual Mode, scroll to CHASSIS LEAK: N-POL GC and press START. Repeat with different combinations of lead wires, if required. If required to introduce a Ground Open condition during lead to lead testing, CHASSIS LEAK: N-POL GO mode can be used with the same connections.

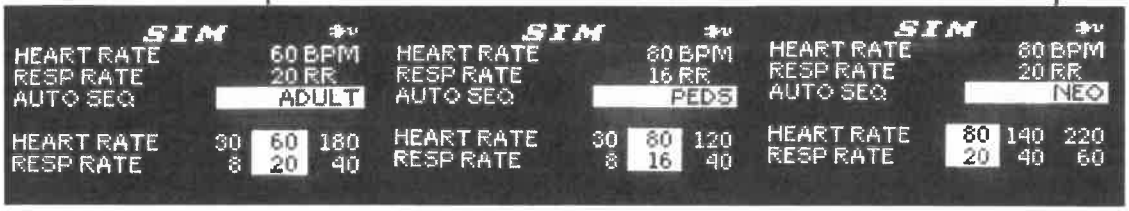
For individual lead to Ground testing, simply connect one individual Lead wire snap to the V2 Snap provided on the ST-1. Using Manual Mode, scroll to CHASSIS LEAK: N-POL GC and press START. Repeat with different lead wires, if required. If required to introduce a Ground Open condition during lead to Ground testing, CHASSIS LEAK: N-POL GO mode can be used with the same connections.

Simulation Mode

1. Press **SAFETY / SIM** key to toggle to Simulation Mode. Home screen will display SIM as shown below. ECG default is 60 bpm and Respiration is 20 rpm.



   a. To edit ECG or Respiration rate, use **UP** or **DOWN** arrow keys to highlight rate value to be edited, then press START. Rate value will begin flashing.
   b. Use **UP** or **DOWN** arrow keys to edit to desired value.
   c. Press start again to save changes.
2. ECG and Respiration Auto Sequence for ADULT, PEDS and NEO type patients automatically changes the values every 30 seconds, as listed in the diagrams below. Each sequence contains three rate simulations for ECG and Respiration.



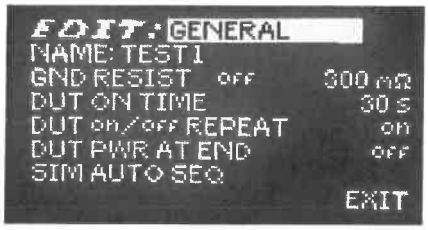
3. ST-1 will retain last used Auto Seq. after it is powered off unless an Auto Test profile is run that has been configured for a different simulation Auto Sequence.

Customizing Auto Profiles: Detailed

Users can configure ST-1 based on their testing requirements and preferences. All tests can be configured On or Off and limits can be customized.

Safe-T Sim AUTO mode Customization:

1. Press **SETUP** key, highlight **EDIT PROFILE**, then **START**.
2. Scroll to profile to be edited, press **START**.
3. General Edit Screen. Edit any value including profile Name as shown below. Press **START** to edit entry. When entry is flashing, use UP/DOWN arrow keys to change entry. Press start again to accept edited value.

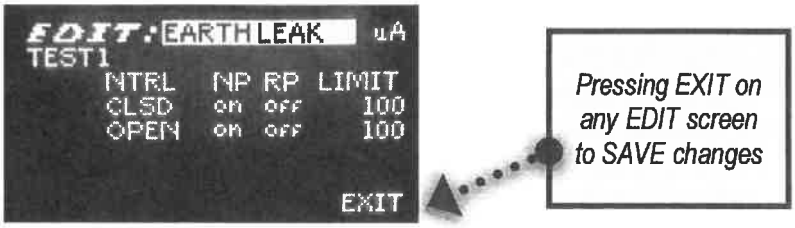


NOTE: *A password may be required to edit profiles, if someone within your organization has chosen to maintain consistency of all auto profiles. If you are asked for a password during EDIT mode contact your management.*

EDIT: General Terminology

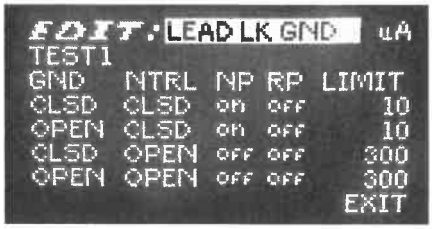
Feature	Definition
NAME	Profile names can be edited and will appear on home screens when selected.
GND RESIST	Ground resistance test. Turn On/Off and set Pass/Fail limit.
DUT ON TIME	User defined delay in seconds to provide sufficient time for a device to power up completely, if required. Default is 2 seconds.
DUT ON/OFF REPEAT	Configure ON/OFF. When ON, will prompt user at end of electrical safety tests performed to change state of DUT from on/off or vice versa, then ST-1 will repeat all leakage tests a second time.
DUT PWR AT END	Configure ON/OFF. When ON, at end of electrical safety tests performed, power at DUT outlet on the Safe-T Sim will be ON.
SIM AUTO SEQ	Configure for blank (off), Adult, Peds or NEO. When active, selected simulation sequence will be active at end of the safety test.

4. Press **START** to advance to **EDIT: EARTH LEAK** tests. Use UP/DOWN arrow keys to highlight value to be edited. Press **START** to edit value. When Limit value is flashing, use UP/DOWN arrow keys to change value. Press start again to accept edited value.



5. Press **START** to advance to **EDIT: CHASSIS LK** tests. Use UP/DOWN arrow keys to highlight value to be edited. Press **START** to edit value. When Limit value is flashing, use UP/DOWN arrow keys to change value. Press start again to accept edited value.

6. Press **START** to advance to **EDIT: LEAD LK GND** tests. Use UP/DOWN arrow keys to highlight value to be edited. Press **START** to edit value. When Limit value is flashing, use UP/DOWN arrow keys to change value. Press start again to accept edited value.



7. Press **START** to advance to **EDIT: LEAD LK ISO** tests. Use UP/DOWN arrow keys to highlight value to be edited. Press **START** to edit value. When Limit value is flashing, use UP/DOWN arrow keys to change value. Press start again to accept edited value.

8. Once edits are complete, press **EXIT**, then **SAVE**, to save changes.

NOTE: Profiles are saved even after power down / power on. Profiles can also be "cloned" using a PC and the USB cable provided. See section "Cloning PROFILES from one ST-1 to others"

Global Settings

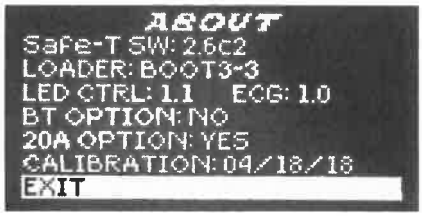
The following features are global settings, meaning they influence both Manual and Auto modes. They are found in the **SETUP** page.

Setup Menu

Name	Definition
EDIT PROFILE	Users can edit the (5) Auto Profiles. Customize tests ON/OFF, Pass / Fail Limits and other features within the Auto Profile.
AUTO AUDIO	Configure ON/OFF. When ON, the ST-1 will beep after automated testing is completed when one or more tests fail defined test limits. The ST-1 enclosure will also flash green (pass) or red (fail) after each automated test is complete, as well as glow green/red at the end of testing indicating pass/fail status of all test performed.
GND AUDIO	Configure ON/OFF. This feature is designed to make testing easier to confirm a good ground connection between DUT and the test lead. BEEP GND: Beeps when ground resistance is within programmed limits. BEEP OPEN: Beeps when ground resistance is not within limits.
ABOUT	Displays the software versions and options configured on the ST-1 and calibration date of ST-1.

Calibration Date of ST-1

In About page, the CALIBRATION date of the ST-1 will be displayed as shown below.



NOTE: The calibration date can only be modified by Pronk Authorized Service Centers.

When the expiration of the calibration is within 30 days, on power up, the ST-1 will display the quantity of days left before calibration (CAL) will expire. This message appears momentarily after each power up.

IMPORTANT: If the password feature is configured ON in the profiles.csv file and the calibration has expired on the unit, a message will be displayed for 5 seconds stating CALIBRATION EXPIRED and the unit will then power off. Unit should be sent in for calibration.

The Calibration Cycle (CalMonths) of the ST-1 is user programmable from 6-36 months. The user configurable setting is found in the Profiles.csv file. See "Editing the Profiles.csv" section below for details.

Cloning PROFILES from one ST-1 to others

Once Profiles are customized and saved to desired test requirements, follow the steps below to save all the test profiles to a PC and clone to other ST-1 units.

Storing Master File of Auto Profiles to PC/Mac:

1. Connect the ST-1 to AC power and to PC using USB cable provided.
2. Once the ST-1 has displayed a menu, press and hold the START key for 4-5 seconds to turn it off.
3. Next, while pressing and holding the **down arrow** key on the ST-1, momentarily press the START key, and then release both keys.
4. After 5-20 seconds, the ST-1 will appear as a "drive" or device on the PC within the file manager. If the new device **Safe-T Sim** does not appear on the File Explorer (or Finder) try unplugging the USB cable and reinserting.
5. From PC, open the volume / drive named **Safe-T Sim**.
6. Select the file named **PROFILES.CSV**, then copy and paste (or drag) that file onto your PC into a folder where it can be found later. Consider renaming the file as "MasterProfile.csv" or similar.
7. When finished, disconnect the USB Cable from both PC and the ST-1. Remove all power from the ST-1 and power up normally.

Editing the PROFILES.CSV (or "MasterProfile.csv")

Often times it is easier to edit the profiles data on your computer.

1. Make a copy of a PROFILES.CSV from a ST-1 using the above steps [1-7].
2. Using your preferred spread sheet application (i.e. Excel, Open Office Calc.) open the copied PROFILES.CSV stored on your computer. Make sure when importing the file that comma delimiters are turned on.
3. The first three rows displayed of the profile describe the following features:

Row 1	PROFILES of Safe-T Sim	51					
Row 2	Boot Up Name(userdefined)	NFPA99-2012v2.0					
Row 3	Global Settings:	ZeroLim(15-150)	35	ZeroDays(1-180)	30	Password(0000-9999)	'0000

Row 1 - Column 1: Describes name of file and can be customized. The line ***must*** start with the characters "PROFILES" to be valid and for the Safe-T Sim to accept and load.

Row 2 - Column 2: The "Boot Up Name" or profile version ID, which can be

customized. The first 29 characters are displayed on initial boot up of the ST-1. Use this for naming your own custom profiles (e.g. "General Hospital Profile 7-12-2017". "NFPA99-2012v2.0" (factory Default)
Row 3: Global Settings. Every pair of cells is used and its tag to the left specifies its meaning with ranges in parenthesis.
ZeroLim = Programmable maximum resistance allowed for Test Lead Cable when performing Zero Test Lead function. Range 15-150mOhms. Default is 35mOhms.

ZeroLim(15-150)	35

ZeroDays = Programmable frequency required to Zero Test Lead Cable. Range 1-180 days. Default is 30 days.

ZeroDays(1-180)	30

Password = 0000 will turn off password protection (factory default). Create password by choosing value between (0001-9999). When enabled, password will be required to edit Auto Profile settings.

Password(0000-9999)	'0000

CalMonths = Programmable ST-1 Calibration Cycle. Programmable from 6-36 months. Default is 12 months.

CalMonths(6-36)	12

IMPORTANT: *When password is other than default 0000 (off), ST-1 will display CALIBRATION EXPIRED message at power on for 5 seconds and then power off if calibration date has expired.*

4. Row 4 is a header for columns A through G as viewed in Microsoft Excel.

	Column A	Column B	Column C	Column D	Column E	Column F	Column G
Row 4	Profile Names:	(12CharMax-NoSpaces)	EditNameBelow:	EditNameBelow:	EditNameBelow:	EditNameBelow:	EditNameBelow:
Row 5	TestCategories(DoNotEdit)	FaultConditions (DoNotEdit)	USERDEFINE1	USERDEFINE2	USERDEFINE3	NFPA992012	NFPA992012AP
Row 6	GroundResistance	NormalConditions	300	300	0	500	500
Row 7	NormPol:EarthLeakage	NormalConditions	300	300	300	0	0
Row 8	NormPol:EarthLeakage	OpenNeutral	0	0	0	0	0
Row 9	NormPol:ChassisLeakage	NormalConditions	0	0	0	100	100
Row 10	NormPol:ChassisLeakage	OpenGround	300	300	300	500	500
Row 11	NormPol:ChassisLeakage	OpenNeutral	0	0	0	0	0
Row 12	NormPol:ChassisLeakage	OpenNeutralOpen Ground	0	0	0	0	0
Row 13	NormPol:LeadLeakageGND	NormalConditions	0	50	0	0	100
Row 14	NormPol:LeadLeakageGND	OpenGround	0	100	0	0	500
Row 15	NormPol:LeadLeakageGND	OpenNeutral	0	0	0	0	0

Row 16	NormPol:LeadLeakageGND	OpenNeutralOpen Ground	0	0	0	0	0
Row 17	NormPol:LeadLeakageISO	NormalConditions	0	100	0	0	0
Row 18	NormPol:LeadLeakageISO	OpenNeutral	0	0	0	0	0
Row 19	RevPol:EarthLeakage	NormalConditions	0	0	0	0	0
Row 20	RevPol:EarthLeakage	OpenNeutral	0	0	0	0	0
Row 21	RevPol:ChassisLeakage	NormalConditions	0	0	0	0	0
Row 22	RevPol:ChassisLeakage	OpenGround	0	0	0	0	0
Row 23	RevPol:ChassisLeakage	OpenNeutral	0	0	0	0	0
Row 24	RevPol:ChassisLeakage	OpenNeutralOpen Ground	0	0	0	0	0
Row 25	RevPol:LeadLeakageGND	NormalConditions	0	0	0	0	0
Row 26	RevPol:LeadLeakageGND	OpenGround	0	0	0	0	0
Row 27	RevPol:LeadLeakageGND	OpenNeutral	0	0	0	0	0
Row 28	RevPol:LeadLeakageGND	OpenNeutralOpen Ground	0	0	0	0	0
Row 29	RevPol:LeadLeakageISO	NormalConditions	0	0	0	0	0
Row 30	RevPol:LeadLeakageISO	OpenNeutral	0	0	0	0	0
Row 31	DoNotEditTestCategory Above	DoNotEditFault ConditionsAbove	Test/Limit(0=OFF ,5-5000=ON)	Test/Limit(0=OFF ,5-5000=ON)	Test/Limit(0=OFF ,5-5000=ON)	Test/Limit(0=OFF ,5-5000=ON)	Test/Limit(0=OFF ,5-5000=ON)

5. Row 5, column C through G contain the Auto Profiles names (i.e. USERDEFINE1). These names can be edited by users as needed. Use the column header on row 5 and the test range information on row 31 as a guide when modifying settings.
   NOTE: *Do NOT modify text found in Test Categories or Fault Conditions information in columns A and B.*
6. Column A, rows 6 to 30 contain name of each safety test.
7. Column B, rows 6 to 30 contain DUT AC line condition for each safety test.
8. The test limits for each safety test and each Auto Profile are listed as numerical value. 0 value =Test OFF, ON =values between 5-5000 are programmed leakage limit in uA.

NOTE: *If* NormPol:ChassisLeakage, NormalConditions has a limit setting of 100 then RevPol:ChassisLeakage, NormalConditions would also have to have a limit setting of either 0 (off) or 100. All standards (AAMI, NFPA and IEC) have the same limits for Normal and Reverse polarity regardless of what test is being performed..

9. Rows 33-36 are for setting miscellaneous (misc) features for each Auto Profile.

	Column A	Column B	Column C	Column D	Column E	Column F	Column G
32	Misc						
33	DUTonTime	(2-180sec)	2	2	2	2	2
34	DUTon/off/REPEAT	(0=Off/1=On)	0	0	0	1	1
35	DUTpwrAtEnd	(0=Off/1=On)	1	1	1	1	1
36	SimAutoSeq	(A/P/N/Blank)		A			A

DUTonTime: User defined delay in seconds to provide sufficient time for a device to power up completely, if required. Default is 2 seconds.

DUTon/off/Repeat: Configure ON/OFF. When ON, will prompt user at end of electrical safety tests performed to change state of DUT from on/off or vice versa, then ST-1 will repeat all leakage tests a second time.
DUTpwrAtEnd: Configure ON/OFF. When ON, at end of electrical safety tests performed, power at DUT outlet on the Safe-T Sim will be ON.
SimAutoSeq: Configure for off=no value (blank), Adult=A, PEDS=P, NEO=N. When active, selected simulation sequence will be active at end of the safety test.

10. When saving your changes to be loaded on a ST-1, make sure to use only DOS or ASCII character sets. Unicode or Macintosh style data will not work correctly. ***Only*** save the data as comma separated variable text format (CSV).

Clone Master File to Additional ST-1

To store Master PROFILE to another ST-1, follow these steps below.

1. Repeat steps 1-5 of "Storing Master File of Auto Profiles to PC/Mac" from above to access the **Safe-T Sim** volume / drive.
2. Select and copy the **PROFILES.CSV** (or custom name it was saved as i.e. MasterProfiles.csv) located on the PC to copy to other ST-1's using the copy/paste method. Alternatively, the "drag and drop" method can be used to copy the file onto the target ST-1.

NOTE: *A message may appear on the PC warning that the file exists and do you want to replace it. Select YES or OK to replace it.*

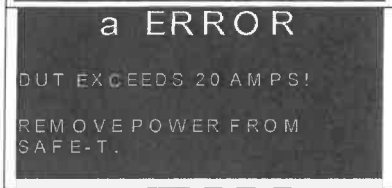
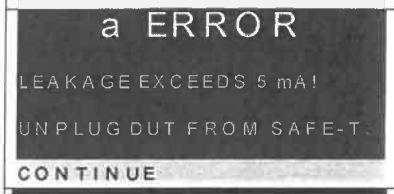
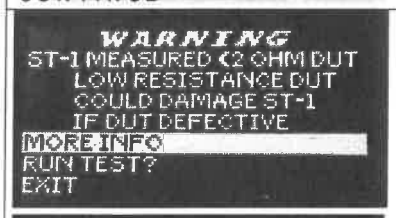
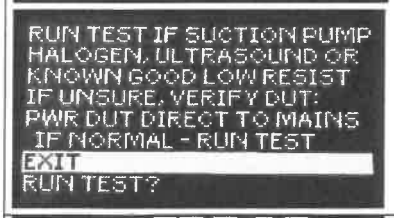
3. Once copied, the **Safe-T Sim** volume / drive will disappear from your PC and then reappear after a short time. Once the volume has reappeared, please notice that your file has now replaced the file **PROFILES.CSV** and the name has not changed even if your copied file was named differently.
8. Disconnect the USB Cable from both PC and the ST-1. Remove all power from the ST-1 and power up normally.

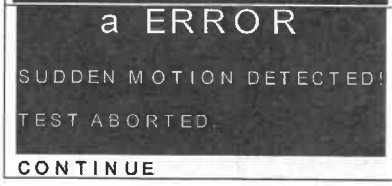
Note 2: *When the ST-1 starts, please notice at the bottom of the first screen, a message stating FOUND PROFILES.CSV, then UPDATING PROFILES will be displayed if no errors are found. Finally, the profiles revision stored on row 2 of the CSV is shown. This process should not take more than 10-20 seconds.*
If errors are found in the new PROFILES.CSV, the message PROFILES.CSV ERROR is displayed and the previous profiles settings are restored. Errors are generally due to fields out of normal range or file corruption. Please inspect your master file if errors occur.

Glossary of Terms

Name	Definition
SAFETY / SIM	Key to switch between electrical safety testing and simulation modes.
START / ENTER	Key to start individual test in manual mode or a series of tests in auto mode. Press and HOLD for 4+ seconds to turn off ST-1. Press again to turn back on.
SETUP	Key to configure the way ST-1 functions during testing, including beeps, flashing LED, ground resistance limit and more.
AUTO / MANUAL	Key to select either Manual mode, an Automated test sequence (Profile) or Point to Point Tests. Automated test sequences are user configurable.
Auto	Automatic testing based on user defined tests. ST-1 will automatically run user defined test, advance and automatically run the next test until all tests enabled are completed. 5 auto tests (Profiles) are available. Once edited, these profiles are available every time the ST-1 is powered on.
Manual	Manual testing with ST-1 requires the user to start each individual test. ST-1 will continue measurements in an individual test until the user presses START, up or down arrow keys returning ST-1 to the Manual List screen.
Test Ground	Perform ground resistance test and perform Zero Test Lead Cable function.
Leakage: Norm Polarity	All electrical safety tests can be performed manually with AC line in Normal polarity.
Leakage: Rev Polarity	All electrical safety tests can be performed manually with AC line in Reverse polarity.
Profile	Profiles are user defined automatic test sequences. Users can name each profile with a custom name. Up to 5 profiles can be programmed.
Review Summary	Review results for most recent tests performed in Manual or Auto Mode
Clear Summary	Delete most recent test results.
TEST LEAD	Connect the test lead to the top TEST LEAD jack and DUT enclosure/chassis for performing ground / chassis resistance and leakage testing. Connect test leads to both jacks to perform Point to Point Measurements.
PE	Protective Earth
GND	Ground
Chassis	Chassis (Enclosure) of the DUT
POL	Polarity- as it applies to Hot vs. Neutral
Earth Leak	Leakage Current between the Ground wire of the DUT power cord and Protective Earth.
ZERO TEST LEAD REQ	This message appears at interval programmed. Factory default is every 30 days. User must "ZERO TEST LEAD" by connecting Test Lead to the top TEST LEAD jack and opposite end to the lower TEST LEAD jack then press START.
OL	Over Limit
P	Pass
F	Fail
POINT to POINT TESTS	Perform measurements between two points when DUT cannot be plugged into ST-1. Resistance and Chassis Leakage tests available.

ST-1 Troubleshooting Tips

ERROR MESSAGE	CAUSE	WHEN CAN IT OCCUR	HOW TO FIX
	DUT CURRENT DRAW > 20 Amps	When a test is running.	1. Remove the DUT from the SAFE-T. 2. Click START to return to main screen.
	DUT CURRENT DRAW > 22+Amps. Circuit breaker trips to remove power from DUT.	When a test is running.	1. Remove power from SAFE-T. 2. Wait a moment. 3. Re-connect power to SAFE-T.
	Leakage current > 5mA.	When a leakage test is running.	3. Remove the DUT from the SAFE-T. 4. Click START. 5. Re-connect DUT after servicing.
 	ST-1 measured DUT resistance less than 2.1 ohms between hot and neutral.	At the start of leakage test.	1. Verify DUT operational and that there is no short on DUT. 2. Connect DUT to wall plug to verify functionality if needed. 3. Unit operational, reconnect to ST. If not, DUT requires service. 4. If normal for DUT to have low input resistance, select Run Test.
	DUT CURRENT DRAW exceeded 15+ Amps for more than 180 seconds (180s accumulative*)	Any mode where DUT is powered by the Safe-T Sim including: Sim mode, Leakage tests, DUT on At End feature and others.	1. Pressing Exit will return user to prior home screen (either manual or Auto mode). 2. IF ERROR screen showed 180 sec at time of exit, that is available time to run more 15+ amp testing.
	SAFE-T temperature measured > 60 degrees C internally.	When a test is running.	3. Wait for the SAFE-T to cool. 4. Click START.

	SAFE-T detected very high resistance on protective earth at mains.	When starting a safety test.	Two cases: 1. Isolated Environment a. Select CONTINUE. b. Continue testing as normal. 2. Non-Isolated Environment a. Select CANCEL. b. Follow user procedures for handling a wall outlet with protective earth open.
	If AC power is pulled, but batteries remain.	When a test is running.	1. Click START to close message. Plug in AC power to run electrical safety tests.
	TEST GND detected measured resistance lower than ZERO TEST LEAD resistance by 25 milliohms or more.	When TEST GND is started.	ZERO TEST LEAD function required to clear this message before Ground resistance testing can resume.
	Unit enters free fall.	When a test is running.	2. Click START to dismiss the screen.

Symptom	Solution
Unable to resolve problem	Contact Pronk Technologies Technical Support at: **800-541-9802**

ST-1 Limited Warranty

The ST-1 Electrical Safety Analyzer is warranted against defects in materials and workmanship for a period of forty eight (48) months from the date of shipment to the original purchaser. Warranty is valid only to the original buyer. Defective equipment should be returned freight prepaid to Pronk Technologies. Equipment returned with defective parts and assemblies shall be either repaired or replaced at the manufacturer's sole discretion. This warranty is not applicable if the unit has been opened, if repair has been attempted, if the unit has been damaged due to operation outside the environmental and power specifications for the product, or due to improper handling or use. If any fault develops, notify Pronk Technologies (see Returns and Repairs, below) giving full details of the difficulty, and include the model and serial number of the device. Upon receipt of shipping instructions, forward the device prepaid and repairs will be made at the factory.

The foregoing warranty is in lieu of all other warranties expressed or implied, including but not limited to any implied warranty or merchantability, fitness or adequacy for any particular purpose or use. Pronk Technologies shall be liable only for repair or replacement of the ST-1 Electrical Safety Analyzer and optional features. Pronk Technologies shall not be liable for any incidental or consequential damages.

Order Cancellation and Refund Policy
You may return your item within 14 days of delivery for a full refund. We are unable to exchange items (however, if you received a defective or incorrect item, we will be happy to make an exchange). Item(s) returned for refund must be in its original condition, undamaged and with no missing parts, packed in its original packaging, and include both the original receipt and an RMA number.

We will notify you via e-mail or fax of your refund once we have received and processed the returned item. You can expect a refund in the same form of payment originally used for purchase within 7 to 14 business days of our receiving your return.

Returns and Repairs
Please call Pronk Technologies' Service Department at 800-541-9802 to obtain a Return Merchandise Authorization (RMA) number and the shipping address. Returns should be packaged securely in the original packaging materials. The RMA number should be clearly marked on the packaging. If the return is for a new item and is a result of our error, we will make arrangements for payment of return shipping. Otherwise, items should be returned freight prepaid to Pronk Technologies.

Services
Calibration is recommended on an annual basis. The Pronk Safe-T Sim calibration procedure must be followed by an authorized calibration company using NIST traceable fixtures defined in the procedure to guarantee the device meets all specifications.

Standards Compliance
ST-1 and ST-1-IEC are designed to provide testing capabilities in accordance with NFPA-99 2012, AAMI ES1-1993 and IEC 60601, 62353 standards for test limits, resistance, earth, chassis and lead leakage measurements.

Test Load Circuit Diagrams

Safe-T Sim ST-1	Safe-T Sim ST-1-IEC
AAMI load circuit diagram	**IEC load circuit diagram**