



Model STCAL Spark Test Calibration System Instruction Manual



Clinton Instrument Company

295 East Main Street
Clinton, CT 06413 USA
Telephone: 860.669.7548 Fax: 860.669.3825
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STCAL

Spark Test Calibration System

- >> Accurate calibration of AC, DC and high frequency spark testers
- >> Lightweight modular components
- >> Built-in spark tester profiles
- >> Calibration certificates with data can be printed or downloaded for storage
- >> Optional SM Sensitivity Module checks fault detection sensitivity to EN50356, IEC/CEI 62230 and NEMA specifications



STCAL Calibration System
with HF-15A Spark Tester

Clinton Instrument Company introduces a modular calibration system for AC mains, high frequency, and DC spark testers. The system includes separate high- and low-frequency voltmeters and a case containing a Windows-based touch-screen tablet and connecting cables.

The calibration procedure is a series of simple steps:

- >> Select the appropriate voltmeter and cables
- >> Connect the voltmeter to the spark tester and tablet
- >> Choose a spark tester profile from the touch screen menu
- >> Follow the on-screen directions for completing the calibration

The system generates a certificate of calibration suitable for download, printing and storage in the customer's computer. Data is traceable to NIST standards when the STCAL is incorporated into an effective quality assurance program.

STCAL components are light enough to be carried to the hard-to-reach locations where spark testers are sometimes situated.



Optional STCAL-SM Sensitivity Module

The system calibrates AC mains spark testers to 30kV, high frequency units to 15kV, and DC spark testers to 40kV.

The optional SM Sensitivity Module has a rotating spark gap that controls arc duration and gap distance. The operator simply selects the type of test to be performed; the SM displays the detection current and the required number of controlled faults the spark tester must identify to meet the norm. After the test, the operator compares the SM fault count to the faults counted by the spark tester to determine its conformity with the specification.

MODEL STCAL SPECIFICATIONS

High Frequency Calibrator

For voltage calibration of high frequency spark testers.

Components.....High Frequency Voltmeter (HFVM); Tablet and connecting cables in soft case.

Input Voltage Range.....500 volts to 15kV AC.

Input Frequency Range1 kHz to 5 kHz.

Output Voltage Reading Accuracy..... +/- .5%.

HFVM Weight.....8.9 lbs. (4.1 kg).

HFVM Dimensions5.9" H x 9.8" W x 10.2" D
(150mm H x 249mm W x 259mm).

Powerfrom tablet via USB.

Tablet10.1" Windows 8 with charger, 1.5 lbs.
(approx dimensions and weight).

Connecting Cables.....HV Cables 1.5' and 3'; USB Cable 6';
RS485 Cable 10'; Ground Cable.

Low Frequency Calibrator

For voltage calibration of DC spark testers to 40kV and 50/60 Hz AC spark testers to 30kV.

ComponentsLow Frequency Voltmeter (LFVM); Tablet and connecting cables in soft case.

Input Voltage Range.....100 volts to 40kV DC and 1kV to 30kV AC.

Input Frequency Range50-60 Hz.

Output Voltage Reading Accuracy..... +/- .5%.

LFVM Weight.....5.3 lbs. (2.4 kg.)

LFVM Dimensions5.9" H x 9.8" W x 10.2" D
(150mm H x 249mm W x 259mm).

Powerfrom tablet via USB.

Tablet10.1" Windows 8 with charger, 1.5 lbs.
(approx dimensions and weight).

Connecting Cables.....HV Cables 1.5' and 3'; USB Cable 6';
RS485 Cable 10'; Ground Cable.

Spark Testers that can be calibrated with the STCAL (partial list)

Model Number	Voltmeter Required	Calibration Available		
		AutoCal	Assisted	Manual
Clinton AC-30A & AC-30AS 50/60 Hz 30kV AC Spark Testers	LFVM	✓		
Clinton HF-15A High Frequency Spark Testers	HFVM		✓	
Clinton HF-15B High Frequency Spark Testers	HFVM	✓		
Clinton HF-20E, HF-20H, HF-20GA and HF-20GB High Frequency Spark Testers	HFVM			✓
Clinton FL-8A and FL-20A Cable Fault Locators	LFVM	✓		
Clinton DC-10A, DC-20A, and PDC-20A DC Spark Testers	LFVM		✓	
Clinton STB-10G, STB-20G and PDC-20 DC Spark Testers	LFVM			✓
Clinton STA-30A and STA-30GB 50/60 30kV AC Spark Testers	LFVM			✓
DC Spark Testers by other manufacturers, to 40kV	LFVM			✓
High Frequency Spark Testers by other manufacturers, to 15kV	HFVM			✓

Certificate of Calibration

Certificate No. HA1234@4/16/2014

Equipment Owner: Clinton Instrument Company
Name: Clinton Instrument Company
Address: 295 East Main Street
Clinton, CT 06413
USA

Calibration Service Provider: Clinton Instrument Company
Name: Clinton Instrument Company
Address: 295 East Main Street
Clinton, CT 06413
USA

Equipment Manufacturer: Clinton Instrument Company
Name: HF-15A
Model: 15kV High Frequency Spark Tester
Description: BD-12
Electrode Model: HA1234
Unit Serial Number: 80801
ID Number:

Calibration Performed at: Clinton Instrument Company
Name: Clinton Instrument Company
Address: 295 East Main Street
Clinton, CT 06413
USA

Date of Calibration: 4/16/2014 3:59:24 PM Temperature: 24.3 C Humidity: 32.1%

Calibration Data

As Found Readings			As Left Readings					
Displayed Voltage (kV)	Actual Voltage (kV)	Result	Nominal Voltage (kV)	On Range (kV)	Acceptable Max (kV)	Actual Voltage (kV)	Result	
1.0	0.983	PASS	1.0	15.0	0.980	1.020	1.002	PASS
3.0	2.998	PASS	3.0	15.0	2.940	3.060	3.006	PASS
5.0	5.013	PASS	5.0	15.0	4.900	5.100	5.011	PASS
8.0	8.022	PASS	8.0	15.0	7.840	8.160	8.020	PASS
10.0	10.034	PASS	10.0	15.0	9.800	10.200	10.031	PASS
12.0	12.021	PASS	12.0	15.0	11.780	12.240	12.022	PASS
15.0	14.997	PASS	15.0	15.0	14.700	15.300	15.003	PASS

Condition as Received:
In Calibration

Condition as Left:
In Calibration

Standards Used

Model No.	Serial No.	Calibration Date	Calibration Due Date	Traceability No.
HFVM	HFVM-5555	03/14/2013	03/14/2014	XXXXXXXXXX

The calibrations of the equipment identified have been checked against Measurement Standards (Reference) maintained by The Clinton Instrument Company. The accuracy of these standards is traceable to the national standards at the National Institute of Standards and Technology (NIST) or derived by ratio type measurements.

Calibration Technician: J Smith

Sample Calibration Certificate

Clinton
INSTRUMENT COMPANY

295 East Main St. • Clinton, CT 06413 USA • Tel: 860.669.7548 • Fax: 860.669.3825 • www.clintoninstrument.com

Specifications subject to change without notice. 10/14 EN

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Safety

Safety Symbols

The symbols depicted below are safety symbols placed on spark test equipment. It is important to understand the meaning of each.



Caution symbol. Caution- refer to the manual to protect against damage to the equipment or to avoid personal injury.



Risk of electric shock symbol.



Earth ground symbol.

Environmental Conditions

The spark tester is designed to be safe under the following conditions:

- Indoor use.
- Altitude to 2000m.
- Temperatures from 5°C to 40°C.
- Humidity to 80% R.H. at 31°C, decreasing linearly to 50% R.H. at 40°C

The Clinton Instrument Company certifies that this equipment met its published specifications at the time of shipment. Clinton further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology to the extent allowed by the Institute's calibration facility. For customer service or technical assistance with this equipment, please contact:

The Clinton Instrument Company
295 East Main Street, Clinton, CT 06413 USA
Telephone: 860-669-7548 Fax: 860-669-3825
Website: www.clintoninstrument.com
Email: support@clintoninstrument.com

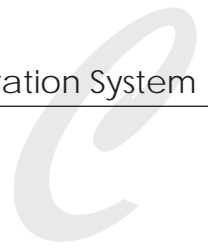
Caution: Pacemaker Warning



Clinton Instrument Company strongly advises any individual using a pacemaker or other such medical device to avoid operating or being in the vicinity of spark testers. Current studies indicate that such medical devices can malfunction in the presence of electrical and magnetic fields. When a fault occurs in the electrode of a Clinton spark tester, both high

and low frequency electromagnetic fields are generated. The strengths of these emissions are unknown, since they depend on test voltage and other variables. The danger is greater when a customer does not ground the inner conductors of a test product. While Clinton cautions its customers to ground the test product for safety reasons, many times this warning is ignored. In this situation, both the spark tester and the entire length of the wire line will radiate these emissions. There is also a serious risk of electrical shock if an individual comes into contact with an ungrounded test product.

email: support@clintoninstrument.com.



Electrical Shock Hazard From Production Line Spark Testers

by Henry H. Clinton

The commonly accepted maximum values of 60Hz. current passing through the human adult body which permit a subject to let go of electrodes are nine milliamperes for males and six milliamperes for females. At 3000 Hz. this value increases to about 22 milliamperes for men and 15 milliamperes for women, DC currents do not present the same let-go problems, but a subject can readily let go at a level of 60 milliamperes. A continuous 60 Hz. current above 18 milliamperes stops breathing for the duration of the shock only. Ventricular fibrillation may occur above a level of 67 milliamperes. The reaction current level of 60 Hz. is about .5 milliamperes. Above this level a muscular reaction can occur which can cause a secondary accident. The DC and 3kHz. levels are probably considerably higher. Capacitor discharge energy of 50 Joules (watt-seconds) is regarded as hazardous.

Clinton DC spark testers are current limited to 5 milliamperes or less. Three kiloHertz spark testers are limited to 4 milliamperes or less, and 60 Hz. types to 7 milliamperes. Impulse spark testers can deliver a maximum charge of about .2 Joules 248 times per second. All these spark testers have current outputs above the reaction level, but none above the let-go threshold level. Because of the possibility of secondary accidents caused by muscular reactions, operators should be protected against accidental shock. Electrodes are supplied with interlock switches, and these should not be disabled. The conductor under test should be grounded. If an operator must inspect the product by touching its surface while it is being spark tested, he should be electrically insulated from his environment, and any possible cause of a secondary accident caused by reaction should be eliminated.

For references, see: Dalziel, Ogden, Abbot, "Effect of Frequency on Let-Go Currents," Transactions of A.I.E.E., Volume 62, December 1943, and Dalziel, "Electric Shock Hazard," I.E.E.E., Spectrum, February 1972.

Unpacking

Remove the equipment from the carton. Retain the packing material in the event that the unit is returned for calibration or service at some future time.

STCAL System

- High Frequency Voltmeter Model HFVM
- Low Frequency Voltmeter Model LFVM
- 92039I Windows-based computer tablet with charger
- 92014 Accessory Kit: (1) 90933 ground lead, (1) 92011-1.5 ft HV cable, (1) 92011-3 ft HV cable, (1) 92012 6 ft USB cable, (1) 92060 6 ft USB cable, (1) 92061 6 ft USB cable, (1) RS485-10 ft cable, (2) 02259 alligator clips, and (2) 92013 brass rods, 4" long
- Instruction manual
- (2) STCAL Certificates of Calibration

STCAL-LF System

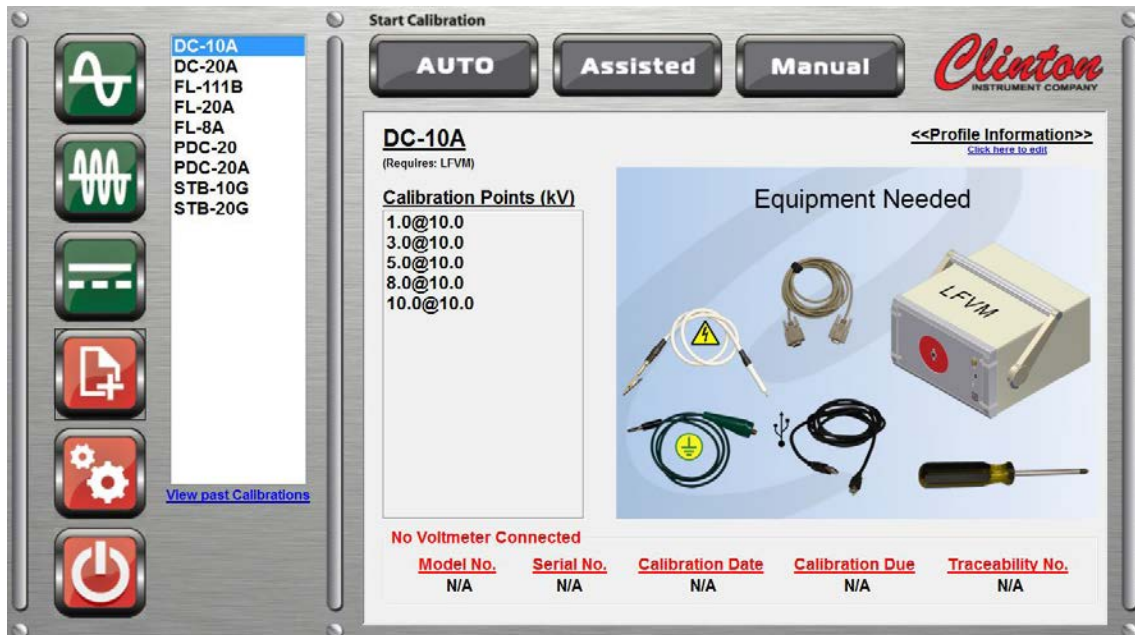
- Low Frequency Voltmeter Model LFVM
- 92039I Windows-based computer tablet with charger
- 92014 Accessory Kit: (1) 90933 ground lead, (1) 92011-1.5 ft HV cable, (1) 92011-3 ft HV cable, (1) 92012 6 ft USB cable, (1) 92060 6 ft USB cable, (1) 92061 6 ft USB cable, (1) RS485-10 ft cable, (2) 02259 alligator clips, and (2) 92013 brass rods, 4" long
- Instruction manual
- (1) STCAL Certificate of Calibration

STCAL-HF System

- High Frequency Voltmeter Model HFVM
- 92039I Windows-based computer tablet with charger
- 92014 Accessory Kit: (1) 90933 ground lead, (1) 92011-1.5 ft HV cable, (1) 92011-3 ft HV cable, (1) 92012 6 ft USB cable, (1) 92060 6 ft USB cable, (1) 92061 6 ft USB cable, (1) RS485-10 ft cable, (2) 02259 alligator clips, and (2) 92013 brass rods, 4" long
- Instruction manual
- (1) STCAL Certificate of Calibration

STCAL Main Screen

Turn ON the STCAL tablet. The main STCAL screen will appear.



Select Spark Tester Type



The three green buttons represent categories of spark testers:

- 50/60 Hz AC
- High Frequency AC
- DC

When a green button is selected, a list of generic, factory-installed spark tester profiles in that category will appear. A profile consists of a set of calibration points, the characteristics of the spark tester (i.e., manufacturer, manufacturer's stated accuracy of readings, serial number), calibration instructions, and photos. You will select the profile of the spark tester you wish to calibrate.

View past Calibrations

To search for previous calibrations, click the link, [View past Calibrations](#). The user may filter search results by type of voltmeter and profile.

New Profile



To add a new spark tester profile, select the top-most red button. You may enter information about a new spark tester or load a template from an existing profile, modify the calibration points or other information, and save as a

new profile. This feature allows operators to link a custom calibration to a particular wire line or spark tester ID. See the section entitled, “Adding a New Spark Tester Profile,” for detailed instructions.

Format Certificate of Calibration



To customize your company’s Certificate of Calibration, select the second red button on the STCAL main screen.

Certificate of Calibration
Certificate No. HA1234@4/16/2014

Equipment Owner:
Name: Clinton Instrument Company
Address: 295 East Main Street
Clinton, CT 06413
USA

Calibration Service Provider:
Name: Clinton Instrument Company
Address: 295 East Main Street
Clinton, CT 06413
USA

Equipment Manufacturer:
Name: Clinton Instrument Company
Model: HF-15A
Description: 15kV High Frequency Spark Tester
Electrode Model: BD-12
Unit Serial Number: HA1234
ID Number: 80801

Calibration Performed at:
Name: Clinton Instrument Company
Address: 295 East Main Street
Clinton, CT 06413
USA

Date of Calibration: 4/16/2014 3:59:24 PM

Temperature: 24.3 C

Humidity: 32.1%

Calibration Data

As Found Readings			Calibration Data				As Left Readings	
Displayed Voltage (kV)	Actual Voltage (kV)	Result	Nominal Voltage (kV)	On Range (kV)	Acceptable Min (kV)	Acceptable Max (kV)	Actual Voltage (kV)	Result
1.0	0.983	PASS	1.0	15.0	0.980	1.020	1.002	PASS
3.0	2.998	PASS	3.0	15.0	2.940	3.060	3.006	PASS
5.0	5.013	PASS	5.0	15.0	4.900	5.100	5.011	PASS
8.0	8.022	PASS	8.0	15.0	7.840	8.160	8.020	PASS
10.0	10.034	PASS	10.0	15.0	9.800	10.200	10.031	PASS
12.0	12.021	PASS	12.0	15.0	11.760	12.240	12.022	PASS
15.0	14.997	PASS	15.0	15.0	14.700	15.300	15.003	PASS

Condition as Received:
In Calibration

Condition as Left:
In Calibration

Standards Used

Model No.	Serial No.	Calibration Date	Calibration Due Date	Traceability No.
HFVM	HFVM-5555	03/14/2013	03/14/2014	XXXXXXXXXX

The calibrations of the equipment identified have been checked against Measurement Standards (Reference) maintained by The Clinton Instrument Company. The accuracy of these standards is traceable to the national standards at the National Institute of Standards and Technology (NIST) or derived by ratio type measurements.

Calibration Technician: J Smith

If the Equipment Owner displayed on the certificate is also the Calibration Service Provider, and the calibration is performed at that location, enter Owner Information on this screen and check the box, “Use owner information always.” This information will populate the 3 fields.

If the Equipment Owner, Calibration Service Provider and Calibration Location change, enter these addresses in the Address Book on this screen.

The user also may choose to include the following fields on his certificate:

- Humidity
- Temperature
- Unit ID (equipment ID is entered during calibration)
- Calibration Technician (enter these name in a list on this screen)
- Electrode Model

If you wish to change the way the model number and description is displayed on the certificate, you can add a new spark tester profile, load the generic template, and make the desired changes.

AUTO, Assisted, and Manual Calibrations



AUTO, Assisted, and Manual buttons in green indicate the calibration procedures available for the spark tester profile you have selected.

- *AUTO* calibration is the simplest procedure, available for the newest Clinton spark testers such as the AC-30A, the AC-30AS, and the FL-20A and FL-8A Cable Fault Locators. Simply connect the unit as directed and press start. The calibration will conclude without further operator intervention.

- *Assisted* calibration is available for Clinton spark testers that have RS-485 ports, such as the HF-15A. The operator adjusts spark tester voltage to cardinal points, and the STCAL will record true voltage at each point.
- *Manual* calibration is available for older Clinton spark testers and for most spark testers from other manufacturers. The operator sets the spark tester to cardinal voltage points and then must manually enter the voltage at each point.

At the conclusion of calibration, data is presented on screen in certificate form. It can then be stored or exported for printing.

Adding a New Spark Tester Profile

The profiles in the STCAL are generic. You may want to add custom profiles to more accurately reflect your calibration procedure or to associate them with certain lines.

General Information tab



1. At the main menu, press the New Profile button.
2. To create a new profile based on an existing one, press the Load Template button.

3. Enter a new Profile Name. **NOTE: Profile names cannot include the following symbols: / **
4. Select the correct voltage type for the spark tester you will calibrate: 50/60Hz AC, High Frequency (1000-5000 Hz), or DC.
5. Under Manufacturer Information, leave the default or enter the correct spark tester manufacturer. Enter the spark tester Model Number and Description. This information will print on a calibration certificate.

6. Enter the spark tester's voltage accuracy as specified by the manufacturer in the Tolerance field.
7. Select whether the accuracy is expressed in relation to the voltage reading or the voltage range.
8. Enter the Maximum Voltage at which you will calibrate. A spark tester may be designed to reach 20KV, but it may be used on a particular line at 3KV and 5KV only. Sometimes calibrations are done only at the points at which the spark tester is used.
9. Specify whether the voltage display on the spark tester is expressed with one or two decimal points. For example, an HF-15A Spark Tester displays 15.0 KV when reading 15,000 volts, while a DC-20A displays 15.00 KV. when reading 15,000 volts.
10. If you are calibrating an All-in-One spark tester, type the words, "Unit Serial Number" in the Serial Number Entry field so it will display in your calibration data and on your certificate. If your spark tester consists of separate con-

trol unit and high voltage test module, each with serial numbers, you may want add a second serial number field called, "Electrode Serial Number." Up to 4 serial numbers can be added to your calibration.

Calibration Setup tab

Some spark testers operate in more than one range. For example, the Clinton HF-20E has a range switch that allows the operator to switch between the 5KV and the 15KV range. You may enter calibration points specific to each range.

Profile Pictures tab

If you wish to attach instructions and photographs to a custom profile, save them in .jpg form and add them here. Instructions are divided into 4 sections: Setup, Pre-Calibration, Calibration, and Post-Calibration.

The screenshot shows the 'Calibration Setup' tab of the STCAL software. It features two main panels: 'Ranges (kV)' and 'Calibration Points (kV)'. The 'Ranges (kV)' panel lists '15.0' and '5.0' with a 'Remove' button. Below it is a 'New Range' section with 'Up', '15.00', 'Down', and 'Add' buttons. The 'Calibration Points (kV)' panel lists several points like '3.0@5.0', '5.0@5.0', etc., with a 'Remove' button. To the right is a 'New Calibration Point' section with 'Up', '20.0', 'Down', and 'Add' buttons. At the bottom are 'Cancel' and 'Load Template' buttons.

Calibrating an HF-15A Spark Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



1. Select the HF-15A spark tester profile from the list of High Frequency AC spark testers.
2. The STCAL tablet screen will indicate that the High Frequency Voltmeter (HFVM) is required for the calibration. Connect the tablet to the HFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:
 - HFVM High Frequency Voltmeter
 - STCAL tablet
 - USB cable
 - High voltage cable
 - Ground lead
 - Serial cable (needed if your spark tester is equipped with a serial port)
 - Small plastic slotted screwdriver
 - Phillips head screwdriver
4. Press the ASSISTED calibration button, which permits the exchange of calibration data between STCAL and spark tester through a serial cable. Press the MANUAL button to begin calibration if there is no serial port available on the spark tester.
5. Enter the spark tester's serial number.
6. **WARNING:** Turn OFF the spark tester before proceeding!
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown. Connect the serial cable only when an ASSISTED calibration is in process.

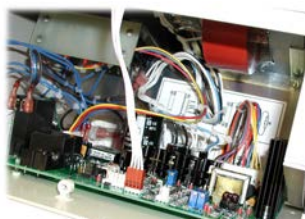


NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between tablet and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the HFVM or the spark tester end guards.

8. Turn ON the spark tester. Press the NEXT button on the STCAL screen.
9. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Precalibration Readings."
10. A grid showing actual voltage readings will display. Readings that are out of tolerance will be in red. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.
11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL.



Recalibration



1. On HF-15AC All-In-One units, remove the two screws holding the display panel to the back of the spark tester chassis. Slide the display unit off and rest on top of the spark tester chassis. Do not disconnect the cable on the display. On AR units, remove the top plate.
2. Look straight down into the back of the spark tester at the test module PC board. Locate the calibration jumper JMP1 which covers pins 2 & 3 of the three-pin terminal labelled CAL ENABLE.
3. Move JMP1 to the right so that it covers pins 1 & 2 of the three-pin terminal labelled CAL ENABLE.
4. Turn ON the spark tester. Adjust the spark tester Set Point (SP) to 10.0KV using the VOLTAGE ADJUST buttons, or choose 10KV from the list of calibration points on the STCAL tablet screen.
5. Locate the calibration potentiometer R8, which can be found in the center of the test module PC board. Adjust R8 with a small plastic slotted screw driver until the voltmeter reading on the STCAL reads 10.0KV or within the tolerance limits shown.

NOTE: By pressing any of the calibration points listed on the left side of the STCAL screen, you can verify whether the point is within tolerance.

6. Press the COUNTER RESET button twice. The spark tester voltmeter & counter will display the spark tester's Actual Voltage (AU).
7. Press a VOLTAGE ADJUST arrow button just once to adjust the voltage readout toward 10.0KV. Every time you press a VOLTAGE ADJUST button, you will see the FAULT light flash, and after a few seconds, the voltage readout will reflect the change.



Repeat this step until the AU (actual voltage) displayed on the spark tester matches the STCAL voltage reading of 10.0KV. Turn OFF the spark tester. Remove the JMP1 calibration jumper and return it to its original position on the PC board.

8. Turn ON the spark tester and press the NEXT button on the STCAL screen. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Calibration Readings."
9. A grid showing actual voltage readings will display. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved.
10. If any reading is out of tolerance, press RETRY to reenter Recalibration mode. **WARNING: turn OFF the spark tester power.** Repeat steps 3-9 above.

Calibrating an HF-20G Spark Tester

CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



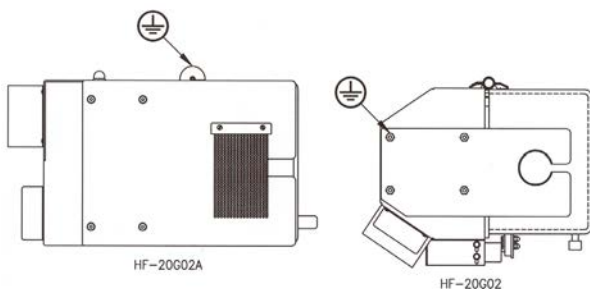
1. Select the HF-20G spark tester profile from the list of High Frequency AC spark testers.
2. Under the profile name on the center STCAL screen, the required voltmeter will be displayed (HFVM). Connect the tablet to the HFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:

- HFVM High Frequency Voltmeter
- STCAL tablet
- USB Cable
- High voltage cable
- Ground lead
- Small plastic slotted screwdriver
- Phillips screwdriver
- Digital Voltmeter (customer-supplied)

4. Press the MANUAL button to select a Manual calibration procedure.
5. Enter the spark tester's serial number, the test module serial number, and an ID number, such as a line ID, if desired.

6. **WARNING:** Turn OFF the spark tester before proceeding! Connect the HF-20G control unit to the High Voltage Test Module.

7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown. Attach the ground lead to a ground point on the High Voltage Test Module as shown on the left. If the Test Module has a plastic cam or no cam, use the cover hinge for the ground connection.



NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between tablet and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the HFVM or the spark tester end guards.

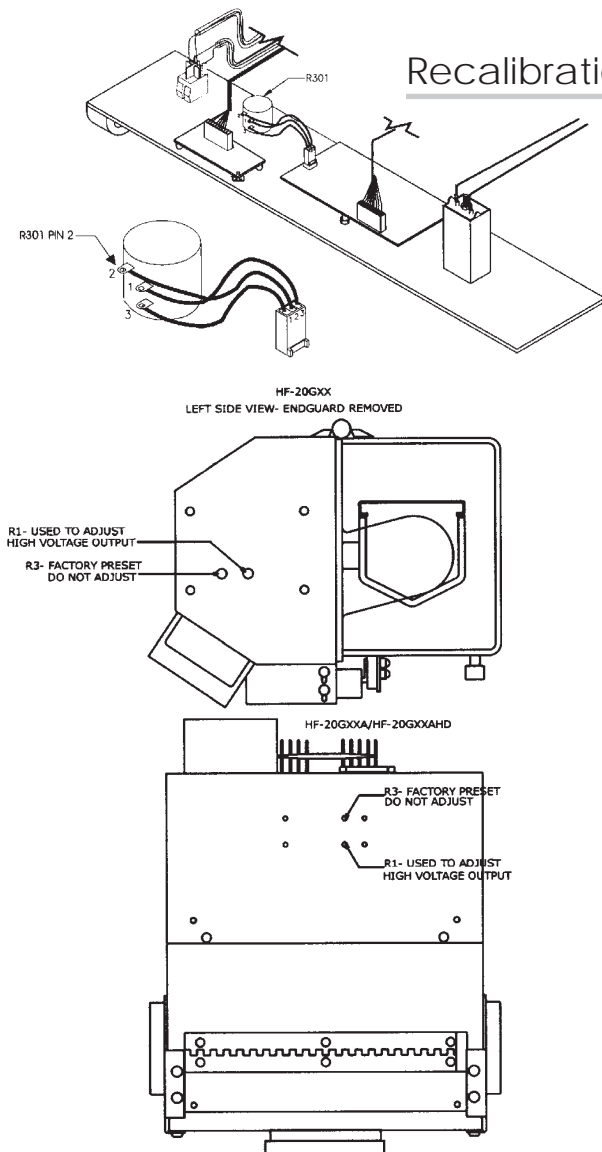
8. Turn ON the spark tester and press OK on the STCAL tablet.
9. When prompted, enter each voltage calibration point on the spark tester's display and again on the tablet.
10. A grid showing actual voltage readings will display on the STCAL tablet screen. Readings that are out of tolerance will be in red. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.
11. If any reading is out of tolerance, press NEXT to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL.

Recalibration

12. Remove the cover of the HF-20G control unit. Find the connections to the voltage adjust potentiometer R301, which is located on the front panel of the HF-20G control unit. Turn R301 fully counterclockwise.
13. Connect the positive lead of a Digital Voltmeter (DVM) to Pin 2 of R301. Connect the negative lead to chassis ground. Turn R301 fully counter-clockwise.
14. For HF-20Gxx Test Modules, remove the left safety guard to expose two ports, which give access to potentiometers R1 and R3.

For HF-20xxA and HF-20xxAHD Test Modules, remove the "Clinton" logo plate on the top to expose two ports, providing access to potentiometers R1 and R3.

15. Turn ON the spark tester. Adjust R301 so that the DVM reads 6.66 volts DC.
16. Locate R4, which is on the main PC board in the HF-20G control unit. With a plastic slotted screwdriver, adjust R4 until the HF-20G voltmeter reads 10.00 KV.
17. Using a plastic slotted screwdriver, adjust R1 on the High Voltage Test Module until the STCAL tablet voltage reading is 10.0KV. Do NOT adjust R3.
18. Adjust R301 so that the DVM reads 10.0 volts DC. The STCAL voltage reading should be 15.00KV or within tolerance limits shown.



19. Adjust R301 so that the DVM reads 3.33 volts DC. The STCAL voltage reading should be 5.00KV or within tolerance limits shown.
20. Turn the HF-20G voltage knob to 0. Turn OFF the spark tester and disconnect the DVM. Replace the spark tester covers.
21. Turn ON the spark tester. Press the NEXT button on the STCAL screen.
22. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Precalibration Readings."
23. A grid showing actual voltage readings will display. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.
24. If any reading is out of tolerance, press RETRY to reenter Recalibration mode. **WARNING: turn OFF the spark tester power.** Repeat steps 12-21 above.

Calibrating an HF-20E Spark Tester

CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

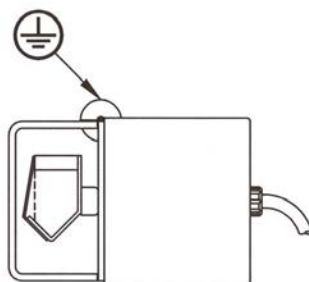
Calibration



1. Select the HF-20E spark tester profile from the list of High Frequency AC spark testers.
2. The STCAL tablet screen will indicate that the High Frequency Voltmeter (HFVM) is required for the calibration. Connect the tablet to the HFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:

- HFVM High Frequency Voltmeter
- STCAL tablet
- USB Cable
- High voltage cable
- Ground lead
- Small plastic slotted screwdriver
- Phillips screwdriver

4. Press the MANUAL button to select a Manual calibration procedure.
5. Enter the spark tester's serial number, the electrode serial number, and an ID, such as the line location, if desired.
6. **WARNING:** Turn OFF the spark tester before proceeding! Connect the HF-20E control unit to the electrode.
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown. Attach the ground lead to a ground point on the electrode as shown on the left.



HFEBD-12

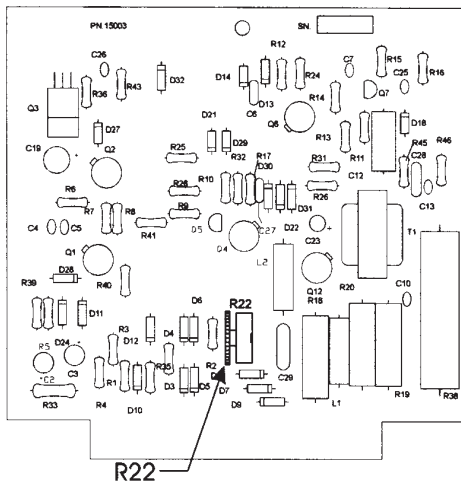


NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between tablet and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the HFVM or the spark tester end guards.

8. Turn ON the spark tester and press OK on the STCAL tablet.

9. When prompted, turn the voltage control knob on the spark tester to each voltage calibration point and enter it on the STCAL tablet. You will be prompted to change the voltage range. Press NEXT on the STCAL.
10. A grid showing actual voltage readings will display on the STCAL tablet screen. Readings that are out of tolerance will be in red. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.
11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL.

Recalibration



1. Remove the top cover of the HF-20E control unit.
2. The meter on the HF-20E has a mirrored area to assist in eliminating errors in reading. The correct way to read the meter is to move your eye until the reflection of the needle in the mirror is directly behind the mirror itself, and observe the needle position on the scale. This eliminates any parallax error that might result from viewing the meter at a slight angle. Set the HF-20E KV meter to zero by means of the screw-type zero adjustment at the bottom of the meter face.
3. Locate R22, a small adjustable trimpot on the PC Board, part number 15003.
4. Turn ON the spark tester, set the range switch to 15KV, and advance the spark tester voltage control until the STCAL reads 10.0 KV. Alternately, if the equipment is used most frequently at another voltage, adjust the voltage control to that setting.
5. If the HF-20E voltage reading differs from the STCAL reading, adjust R22 so that the HF-20E voltage reading is 10 KV.
6. When prompted, turn the voltage control knob on the spark tester to each additional voltage calibration point and enter it on the STCAL tablet. You will be prompted to change the voltage range. Press the NEXT button on the STCAL tablet.
7. A grid showing actual voltage readings will display on the STCAL. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved. Turn OFF the HF-20E and replace the cover.
8. If any reading is out of tolerance, press RETRY to reenter Recalibration mode. **WARNING: turn OFF the spark tester power.** Repeat steps 1-6.

Calibrating an AC-30A/AS Spark Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



1. Select the AC-30A spark tester profile from the list of 50/60 Hz AC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:
 - LFVM High Frequency Voltmeter
 - STCAL tablet
 - (2) USB Cables
 - High voltage cable
 - Ground lead
4. Press the AUTO button, which allows the entire calibration procedure to occur automatically through a USB cable.
5. Enter the spark tester's serial number.
6. **WARNING: Turn OFF the spark tester before proceeding!**
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown.



NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between tablet and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the HFVM or the spark tester end guards.

8. Follow the directions given on the STCAL tablet.
9. A grid showing actual voltage readings will display on the STCAL tablet screen. Readings that are out of tolerance will be in red. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved.



10. If any reading is out of tolerance, press NEXT to enter Recalibration mode. **WARNING:** turn OFF the spark tester power but do not disconnect the STCAL.

Recalibration

1. Follow the directions on the STCAL screen. The AC-30A will automatically recalibrate.
2. A grid showing actual voltage readings will display. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved.

Calibrating an STA-30GB Spark Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



1. Select the STA-30GB spark tester profile from the list of 50/60 Hz AC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:
 - LFVM High Frequency Voltmeter
 - STCAL tablet
 - USB Cable
 - High voltage cable
 - Ground lead
 - Digital Voltmeter
 - Small plastic slotted screwdriver
 - Phillips head screwdriver
4. Press the MANUAL button to select a Manual calibration procedure.
5. Enter the spark tester's serial number, the electrode serial number, and an ID, such as the line location, if desired.
6. **WARNING: Turn OFF the spark tester before proceeding!**
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown. Attach the ground lead to a ground point on the electrode. Attach the high voltage lead of the LFVM to the spark tester's bead chain electrode.



NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between tablet and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the LFVM or the spark tester end guards.



8. With no product in the electrode, turn ON the spark tester and press OK on the STCAL tablet.
9. When prompted, turn the voltage control knob on the spark tester to each voltage calibration point and enter it on the STCAL tablet. Press the NEXT button on the STCAL.
10. A grid showing actual voltage readings will display on the STCAL tablet screen. Readings that are out of tolerance will be in red.
11. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.
12. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: Turn OFF the spark tester power** but do not disconnect the STCAL.

Recalibration

1. Open the front access panel of the test station. Remove the cover of the STA-30G control unit. Pull the control unit forward.
2. Find the connections to the voltage adjust potentiometer, which is located on the front panel of the STA-30G control unit. Connect the positive lead of the DVM to pin 2 of the voltage adjust pot. Connect the negative lead to Test Point TP 314. Set the DVM to DC.
3. Confirm that the ground lead of the LFVM is connected to system ground and that the high voltage lead of the LFVM is connected to the spark tester's electrode bead chain.
4. Turn ON the spark tester and advance the spark tester voltage control until the DVM reads 6.66 volts. Alternately, if the equipment is used most frequently at another voltage, adjust the voltage control to that setting.
5. Locate R44, which is on the main PC board of the STA-30G control unit. Adjust until the Kilovolt meter on the front panel reads 20.00KV.
6. Locate potentiometer R20 on the High Voltage Control Module PCB. and adjust until the STCAL reads 20.00KV.
7. As directed on the STCAL screen, check four other LFVM voltage points.
8. Press the NEXT button on the STCAL screen. A grid showing actual voltage readings will display on the STCAL. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for



printing or saved.

9. Turn OFF the spark tester power.
10. If any reading is out of tolerance, press RETRY to reenter Recalibration mode. **WARNING: turn OFF the spark tester power.** Repeat steps 4-9.
11. Replace the covers when the calibration is complete.

Calibrating an STA-30A Spark Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



1. Select the STA-30A spark tester profile from the list of 50/60 Hz AC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:
 - LFVM High Frequency Voltmeter
 - STCAL tablet
 - USB Cable
 - High voltage cable
 - Ground lead
 - Small plastic slotted screwdriver
 - Phillips head screwdriver
 - 7/16" nut driver (customer supplied)
4. Press the MANUAL button to select a Manual calibration procedure.
5. Enter the spark tester's serial number, the electrode serial number, and an ID, such as the line location, if desired.
6. **WARNING:** Turn OFF the spark tester before proceeding!
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown. Attach the ground lead to a ground point on the electrode. Attach the high voltage lead of the LFVM to the spark tester's bead chain electrode.



NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between tablet and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the LFVM or the spark tester end guards.

8. With no product in the electrode, turn ON the spark tester and press OK on the STCAL tablet.
9. When prompted, turn the voltage control knob on the spark tester to each voltage calibration point and enter it on the STCAL tablet. Press the NEXT button on the STCAL.
10. A grid showing actual voltage readings will display on the STCAL tablet screen. Readings that are out of tolerance will be in red.
11. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.
12. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: Turn OFF the spark tester power** but do not disconnect the STCAL.

Recalibration

1. Remove the bottom front access panel from the test station. Remove the two bolts located under the control unit that secure it to the test station. Pull the control unit forward.
2. The meter on the STA-30A has a mirrored area to assist in eliminating errors in reading. The correct way to read the meter is to move your eye until the reflection of the needle in the mirror is directly behind the mirror itself, and observe the needle position on the scale. This eliminates any parallax error that might result from viewing the meter at a slight angle. Set the STA-30A KV meter to zero by means of the screw-type zero adjustment at the bottom of the meter face.
3. Confirm that the ground lead of the LFVM is connected to system ground and that the high voltage lead of the LFVM is connected to the spark tester's electrode bead chain.
4. Turn ON the spark tester and advance the spark tester voltage control until the STCAL reads 30.0 KV. Alternately, if the equipment is used most frequently at another voltage, adjust the voltage control to that setting.
5. If the STA-30A voltage reading differs from the STCAL reading, adjust the calibration potentiometer (labelled CAL), located next to the sensitivity pot, until the STA-30A front panel KV meter reads 30KV.
6. As directed on the STCAL screen, check four other LFVM voltage points. A calibration point other than 30KV may be chosen if the four additional readings deviate consistently from true voltage.

7. Press NEXT on the STCAL screen.
8. A grid showing actual voltage readings will display on the STCAL. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved.
9. Turn OFF the spark tester power.
10. If any reading is out of tolerance, press RETRY to reenter Recalibration mode. **WARNING: turn OFF the spark tester power.** Repeat steps 2-9.

Calibrating an FL-20A Cable Fault Locator



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment. **BE CERTAIN THAT THERE IS NO CHARGE ON THE TEST PRODUCT REMAINING FROM PREVIOUS OPERATIONS, SUCH AS A HI-POT TEST.**

Calibration



1. Select the FL-20A spark tester profile from the list of DC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment necessary to perform the calibration:

- LFVM Low Frequency Voltmeter
- STCAL tablet
- (2) USB cables
- High voltage cable
- (2) Ground leads with alligator clip and banana plug
- (2) Brass rod

4. Press the AUTO calibration button, which allows the entire calibration procedure to occur automatically through a USB cable.
5. Enter the FL-20A serial number.

6. **WARNING:** Turn OFF the FL-20A before proceeding!



NOTE: Do not place the tablet on top of the FL-20A-- high voltage will interfere with communication between tablet and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the LFVM or the end panels.

7. A connection diagram will appear on the tablet screen. Connect the FL-20A to the STCAL components as shown. Short the red and blue probes with a brass rod provided with the STCAL, and connect the rod to the LFVM with the white HV connecting cable.



8. Insert the second piece of brass rod into the green probe. Connect an STCAL ground lead between the brass rod and the LFVM. Connect the other STCAL ground lead between the ground stud on the rear of the FL-20A and the LFVM.
9. Turn ON the FL-20A, wait for power up, and press OK on the STCAL tablet, and the calibration will begin.
10. The red high voltage light on the X3A will illuminate, indicating that there is high voltage on the red and blue probes.

DANGER! Do not touch the red and blue probes for the remainder of the calibration procedure, because they are charged.

11. In AUTO mode, the STCAL will automatically check the selected calibration points as the screen displays, "Taking Pre-calibration Readings."
12. A grid showing actual voltage readings will display. Readings that are out of tolerance will be in red. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved.
13. If any reading is out of tolerance, press NEXT to enter Recalibration mode. **WARNING:** turn OFF the FL-20A power but do not disconnect the STCAL.

Recalibration

1. Follow the directions on the STCAL screen. The FL-20A will automatically recalibrate.
2. A grid showing actual voltage readings will display. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved.

Calibrating an FL-8A Cable Fault Locator



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment. **BE CERTAIN THAT THERE IS NO CHARGE ON THE TEST PRODUCT REMAINING FROM PREVIOUS OPERATIONS, SUCH AS A HI-POT TEST.**

Calibration



1. Select the FL-8A spark tester profile from the list of DC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment necessary to perform the calibration:
 - LFVM Low Frequency Voltmeter
 - STCAL tablet
 - (2) USB cables
 - High voltage cable
 - (2) Ground leads with alligator clip and banana plug
 - (2) Brass rod
4. Press the AUTO calibration button, which allows the entire calibration procedure to occur automatically through a USB cable.
5. Enter the FL-8A serial number.
6. **WARNING:** Turn OFF the FL-8A before proceeding!

NOTE: Do not place the tablet on top of the FL-8A-- high voltage will interfere with communication between tablet and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the LFVM.

7. A connection diagram will appear on the tablet screen. Connect the FL-8A to the STCAL components as shown. Short the red and blue probes with a brass rod provided with the STCAL, and connect the rod to the LFVM with the white HV connecting cable.

8. Insert the second piece of brass rod into the green probe. Connect an STCAL ground lead between the brass rod and the LFVM. Connect the other STCAL ground lead between the ground stud on the rear of the FL-8A and the LFVM.
9. Turn ON the FL-8A, wait for power ups, and press OK on the STCAL tablet, and the calibration will begin.
10. The red high voltage light on the FL-8A will illuminate, indicating that there is high voltage on the red and blue probes.



DANGER! Do not touch the red and blue probes for the remainder of the calibration procedure, because they are charged.

11. In AUTO mode, the STCAL will automatically check the selected calibration points as the screen displays, "Taking Precalibration Readings."
12. A grid showing actual voltage readings will display. Readings that are out of tolerance will be in red.
13. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved.
14. If any reading is out of tolerance, press NEXT to enter Recalibration mode. **WARNING:** turn OFF the FL-8A power but do not disconnect the STCAL.

Recalibration

1. Follow the directions on the STCAL screen. The FL-8A will automatically recalibrate.
2. A grid showing actual voltage readings will display. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved.

Calibrating a DC-1, -10 or -20AC or AR Spark Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



1. Select the DC-1AC&AR, DC-10AC&AR, or DC-20AC&AR spark tester profile from the list of DC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:
 - LFVM Low Frequency Voltmeter
 - STCAL tablet
 - USB cable
 - High voltage cable
 - Ground lead
 - Serial cable
4. Press the ASSISTED calibration button, which permits the exchange of calibration data between STCAL and spark tester through a serial cable.
5. Enter the spark tester's serial number.
6. **WARNING:** Turn OFF the spark tester before proceeding!
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown.

NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between table and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the LFVM or the spark tester end guards.

8. Turn ON the spark tester. Press the NEXT button.
9. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Precalibration Readings."
10. A grid showing actual voltage readings will display. Readings that are out of tolerance will be in red. If the readings are

within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.

11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL.

Recalibration



1. Press and hold the VOLTAGE ADJUST DOWN and COUNTER RESET buttons and turn ON the spark tester. The Voltmeter & Counter will indicate that the spark tester is in Set Point (SP) mode.



2. Using the VOLTAGE ADJUST arrow buttons, adjust the spark tester's voltage Set Point (SP) as follows:
Model DC-1AR or AC - adjust to 1KV
Model DC-10AR or AC - adjust to 10KV
Model DC-20AR or AC - adjust to 20KV.



3. Press the COUNTER RESET button to put the spark tester in Voltage Output (UO) mode.
4. Use the VOLTAGE ADJUST buttons on the spark tester to adjust the STCAL Voltmeter Reading until it is within the acceptable voltage range for this voltage point, as shown on the tablet.



5. Press the COUNTER RESET button to put the spark tester in Actual Voltage (AU) mode.
6. Press a VOLTAGE ADJUST arrow button just once to adjust the spark tester voltage readout toward the Set Point. Every time you press a VOLTAGE ADJUST button, you will see the FAULT light flash, and after a few seconds, the voltage readout will reflect the change. Repeat this step until the AU (actual voltage) displayed on the spark tester voltmeter matches the original SP (Set Point):
Model DC-1AR or AC - 1KV
Model DC-10AR or AC - 10KV
Model DC-20AR or AC - 20KV.

7. Press the COUNTER RESET button to put the spark tester in Set Point (SP) mode. Reduce voltage to 00.
8. Press the NEXT button on the STCAL screen. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Calibration Readings."

9. A grid showing actual voltage readings will display on the STCAL tablet. Readings that are out of tolerance will be in red.
10. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved. Turn OFF the spark tester.
11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL. Repeat steps 1-8 above.

Calibrating a DC-1A, -5A, -10A or -20A Spark Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



1. Select the DC-1A, DC-5A, DC-10A, or DC-20A spark tester profile from the list of DC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:
 - LFVM Low Frequency Voltmeter
 - STCAL tablet
 - USB cable
 - High voltage cable
 - Ground lead
 - Serial cable
4. Press the ASSISTED calibration button, which permits the exchange of calibration data between STCAL and spark tester through a serial cable.
5. Enter the spark tester's serial number.
6. **WARNING:** Turn OFF the spark tester before proceeding!
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown.



NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between table and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the LFVM or the spark tester end panels.

8. Turn ON the spark tester. Press the NEXT button on the STCAL screen.
9. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Precalibration Readings."
10. A grid showing actual voltage readings will display. Readings

that are out of tolerance will be in red. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.

11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL.

Recalibration



1. Press and hold the VOLTAGE ADJUST DOWN and COUNTER RESET buttons and turn ON the spark tester. The Voltmeter & Counter will indicate that the spark tester is in Set Point (SP) mode.



2. Using the VOLTAGE ADJUST arrow buttons, adjust the spark tester's voltage Set Point (SP) as follows:
Model DC-1A - adjust to 1KV
Model DC-5A - adjust to 5KV
Model DC-10A - adjust to 10KV
Model DC-20A - adjust to 20KV.



3. Press the COUNTER RESET button to put the spark tester in Voltage Output (UO) mode.
4. Use the VOLTAGE ADJUST buttons on the spark tester to adjust the STCAL Voltmeter Reading until it is within the acceptable voltage range for this voltage point, as shown on the tablet.
5. Press the COUNTER RESET button to put the spark tester in Actual Voltage (AU) mode.



6. Press a VOLTAGE ADJUST arrow button just once to adjust the spark tester voltage readout toward the Set Point. Every time you press a VOLTAGE ADJUST button, you will see the FAULT light flash, and after a few seconds, the voltage readout will reflect the change. Repeat this step until the AU (actual voltage) displayed on the spark tester voltmeter matches the original SP (Set Point):
Model DC-1A - 1KV
Model DC-5A - 5KV
Model DC-10A - 10KV
Model DC-20A - 20KV.
7. Press the COUNTER RESET button to put the spark tester in Set Point (SP) mode. Reduce voltage to 00.

8. Turn ON the spark tester and press the NEXT button on the STCAL screen. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Calibration Readings."
9. A grid showing actual voltage readings will display on the STCAL tablet. Readings that are out of tolerance will be in red.
10. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved. Turn OFF the spark tester.
11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL. Repeat steps 1-8 above.

Calibrating an STB-1G, -5G, -10G, or -20G Spark Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



1. Select the STB-1G, STB-5G, STB-10G, or STB-20G spark tester profile from the list of DC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:
 - LFVM Low Frequency Voltmeter
 - STCAL tablet
 - USB Cable
 - High voltage cable
 - Ground lead
 - Small plastic slotted screwdriver
 - Phillips head screwdriver
4. Press the MANUAL button to select a Manual calibration procedure.
5. Enter the spark tester's serial number and an ID, such as the line location, if desired.
6. **WARNING:** Turn OFF the spark tester before proceeding! Connect the spark tester control unit to the electrode.
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown.

NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between tablet and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the LFVM or the spark tester end guards.

8. Turn ON the spark tester and press OK on the STCAL tablet.
9. When prompted, turn the voltage control knob on the spark

tester to each voltage calibration point and enter it on the STCAL tablet.

10. A grid showing actual voltage readings will display on the STCAL tablet screen. Readings that are out of tolerance will be in red. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.
11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL.

Recalibration

1. Remove the top cover of the spark tester control unit.
2. Turn ON the spark tester, advance the spark tester voltage control until the STCAL reads the voltage shown below:
STB-1G: 1KV
STB-5G: 5KV
STB-10G: 10KV
STB-20G: 20KV
3. If the voltage displayed on the spark tester differs from the STCAL reading, locate R17, a potentiometer on the inside of the front panel. Adjust R17 so that the spark tester voltage reading is as follows:
STB-1G: 1KV
STB-5G: 5KV
STB-10G: 10KV
STB-20G: 20KV
4. When prompted, turn the voltage control knob on the spark tester to each voltage calibration point and enter it on the STCAL tablet.
5. Press the NEXT button on the STCAL screen.
6. A grid showing actual voltage readings will display on the STCAL. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved. Turn OFF the spark tester and replace the cover.
7. If any reading is out of tolerance, press RETRY to reenter Recalibration mode. **WARNING: turn OFF the spark tester power.** Repeat steps 2-6.

Calibrating a PDC-20AC or AR Spark Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



1. Select the PDC-20AC&AR spark tester profile from the list of DC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:
 - LFVM Low Frequency Voltmeter
 - STCAL tablet
 - USB cable
 - High voltage cable
 - Ground lead
 - Serial cable
4. Press the ASSISTED calibration button, which permits the exchange of calibration data between STCAL and spark tester through a serial cable.
5. Enter the spark tester's serial number.
6. **WARNING: Turn OFF the spark tester before proceeding!**
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown.

NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between table and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the LFVM or the spark tester end guards.

8. Turn ON the spark tester. Press the NEXT button.
9. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Precalibration Readings."
10. A grid showing actual voltage readings will display. Readings that are out of tolerance will be in red. If the readings are

within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.

11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING:** turn OFF the spark tester power but do not disconnect the STCAL.

Recalibration



1. Press and hold the VOLTAGE ADJUST DOWN and COUNTER RESET buttons and turn ON the spark tester. The Voltmeter & Counter will indicate that the spark tester is in Set Point (SP) mode.



2. Using the VOLTAGE ADJUST arrow buttons, adjust the spark tester's voltage Set Point (SP) to 20KV.

3. Press the COUNTER RESET button to put the spark tester in Voltage Output (UO) mode.

4. Use the VOLTAGE ADJUST buttons on the spark tester to adjust the STCAL Voltmeter Reading until it is within the acceptable voltage range for this voltage point, as shown on the tablet.



5. Press the COUNTER RESET button to put the spark tester in Actual Voltage (AU) mode.



6. Press a VOLTAGE ADJUST arrow button just once to adjust the spark tester voltage readout toward the Set Point voltage (20KV). Every time you press a VOLTAGE ADJUST button, you will see the FAULT light flash, and after a few seconds, the voltage readout will reflect the change. Repeat this step until the AU (actual voltage) displayed on the spark tester voltmeter matches the original SP (Set Point) of 20KV.

7. Press the COUNTER RESET button to put the spark tester in Set Point (SP) mode. Reduce voltage to 00.

8. Press the NEXT button on the STCAL screen. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Calibration Readings."

9. A grid showing actual voltage readings will display on the STCAL tablet. Readings that are out of tolerance will be in red.

10. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved. Turn OFF the spark tester.
11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL. Repeat steps 1-9 above.

Calibrating a PDC-20A or PDC-20HC Spark Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



1. Select the PDC-20A or PDC-20HC spark tester profile from the list of DC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:
 - LFVM Low Frequency Voltmeter
 - STCAL tablet
 - USB cable
 - High voltage cable
 - Ground lead
 - Serial cable
4. Press the ASSISTED calibration button, which permits the exchange of calibration data between STCAL and spark tester through a serial cable.
5. Enter the spark tester's serial number.
6. **WARNING:** Turn OFF the spark tester before proceeding!
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown.

NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between table and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the LFVM or the spark tester end panels.

8. Turn ON the spark tester. Press the NEXT button.
9. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Precalibration Readings."
10. A grid showing actual voltage readings will display. Readings that are out of tolerance will be in red. If the readings are

within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.

11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING:** turn OFF the spark tester power but do not disconnect the STCAL.

Recalibration



1. Press and hold the VOLTAGE ADJUST DOWN and COUNTER RESET buttons and turn ON the spark tester. The Voltmeter & Counter will indicate that the spark tester is in Set Point (SP) mode.
2. Using the VOLTAGE ADJUST arrow buttons, adjust the spark tester's voltage Set Point (SP) to 20KV.



3. Press the COUNTER RESET button to put the spark tester in Voltage Output (UO) mode.
4. Use the VOLTAGE ADJUST buttons on the spark tester to adjust the STCAL Voltmeter Reading until it is within the acceptable voltage range for this voltage point, as shown on the tablet.



5. Press the COUNTER RESET button to put the spark tester in Actual Voltage (AU) mode.
6. Press a VOLTAGE ADJUST arrow button just once to adjust the spark tester voltage readout toward the Set Point. Every time you press a VOLTAGE ADJUST button, you will see the FAULT light flash, and after a few seconds, the voltage readout will reflect the change. Repeat this step until the AU (actual voltage) displayed on the spark tester voltmeter matches the original SP (Set Point) of 20KV.



7. Press the COUNTER RESET button to put the spark tester in Set Point (SP) mode. Reduce voltage to 00.
8. Press the NEXT button on the STCAL screen. The STCAL will automatically check the selected calibration points as the screen displays, "Taking Calibration Readings."
9. A grid showing actual voltage readings will display on the STCAL tablet. Readings that are out of tolerance will be in red.

10. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved. Turn OFF the spark tester.
11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL. Repeat steps 1-9 above.

Calibrating a PDC-20 Spark Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

Calibration



1. Select the PDC-20 spark tester profile from the list of DC spark testers.
2. The STCAL tablet screen will indicate that the Low Frequency Voltmeter (LFVM) is required for the calibration. Connect the tablet to the LFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:
 - LFVM Low Frequency Voltmeter
 - STCAL tablet
 - USB cable
 - High voltage cable
 - Ground lead
 - Serial cable
 - Small plastic slotted screwdriver
 - Phillips head screwdriver
4. Press the MANUAL calibration button, which permits the exchange of calibration data between STCAL and spark tester through a serial cable.
5. Enter the spark tester's serial number and an ID, such as the line location, if desired.
6. **WARNING:** Turn OFF the spark tester before proceeding!
7. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown.

NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between table and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the LFVM or the spark tester end panels.

8. Turn ON the spark tester and press OK on the STCAL tablet.

9. When prompted, turn the voltage control knob on the spark tester to each voltage calibration point and enter it on the STCAL tablet. Press the NEXT button on the STCAL.
10. A grid showing actual voltage readings will display. Readings that are out of tolerance will be in red. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.
11. If any reading is out of tolerance, press OK to enter Recalibration mode. **WARNING: turn OFF the spark tester power** but do not disconnect the STCAL.

Recalibration

1. Remove the top cover of the spark tester control unit.
2. Turn ON the spark tester, advance the spark tester voltage control until the STCAL reads 20KV.
3. If the voltage displayed on the spark tester differs from the STCAL reading, locate R17, a potentiometer on the inside of the front panel. Adjust R17 so that the spark tester voltage reading is 20KV.
4. When prompted, turn the voltage control knob on the spark tester to each voltage calibration point and enter it on the STCAL tablet. Press the NEXT button on the STCAL.
5. A grid showing actual voltage readings will display on the STCAL. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved. Turn OFF the spark tester and replace the cover.
6. If any reading is out of tolerance, press RETRY to reenter Recalibration mode. **WARNING: turn OFF the spark tester power.** Repeat steps 2-5.

Calibrating a CT-15A Catheter Shaft Tester



CAUTION: The calibration procedures listed below are to be performed by qualified service personnel experienced in high voltage safety procedures only. Failure to follow these procedures may result in danger to personnel and equipment.

NOTE: This calibration requires a Calibration Electrode Block (CEB), which may be purchased from the factory.

Calibration



1. This calibration requires a Select the CT-15A spark tester profile from the list of High Frequency AC spark testers.
2. The STCAL tablet screen will indicate that the High Frequency Voltmeter (HFVM) is required for the calibration. Connect the tablet to the HFVM with the USB cable provided.
3. The tablet will display the equipment needed to perform the calibration:

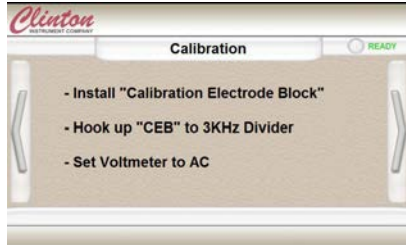
- HFVM High Frequency Voltmeter
- STCAL tablet
- USB cable
- High voltage cable
- Ground lead
- Serial cable



4. Press the MANUAL button to select a Manual calibration procedure.
5. Enter the spark tester's serial number and an ID, such as the line location, if desired.
6. **WARNING:** Turn OFF the spark tester before proceeding!
7. Replace the electrode block with the Calibration Electrode Block (CEB). Refer to the "Installation" section of the CT-15 Instruction Manual for details.
8. A connection diagram will appear on the tablet screen. Connect the spark tester to the STCAL components as shown.

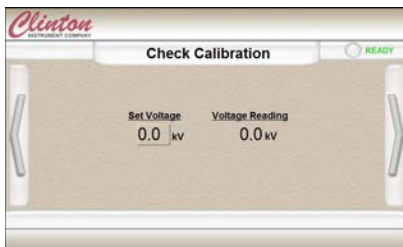


NOTE: Do not place the tablet on top of the spark tester-- high voltage will interfere with communication between tablet and voltmeter. Do not allow the white HV connecting cable to come into contact with any metal surface, including the side of the HFVM or the spark tester end guards.



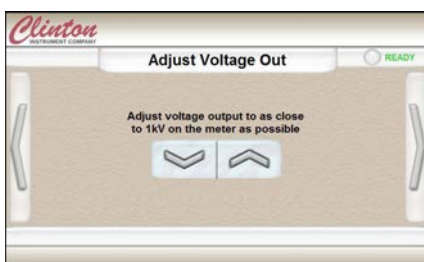
9. Turn ON the CT-15A. After a few moments, press the LOGIN button. Enter your password and press OK.
10. Press the Calibration button, located in the bottom left corner of the touchscreen. The Calibration screen will appear.
11. Press the NEXT arrow on the touchscreen. The Check Calibration screen will appear.

Check Calibration

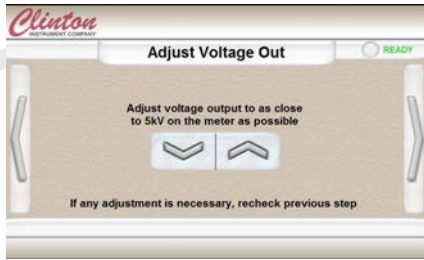


12. On the CT-15A touchscreen, press 0.0 under Set Point and enter the voltage prompted by the STCAL. Press OK. Enter the number displayed under Voltage Reading on the CT-15A screen on the STCAL screen.
13. Set the CT-15A voltage to 0 and press the NEXT arrow.
14. A grid showing actual voltage readings will display. Readings that are out of tolerance will be in red. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be printed or saved.
15. If the calibration is within specification, exit the calibration mode and Log Out of the CT-15A screen. If the calibration is not within specification, press the NEXT arrow on the right. The Adjust Voltage Out screen will appear.

Adjust Voltage Out

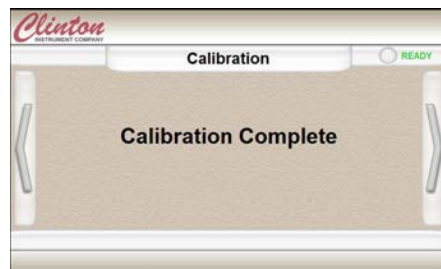
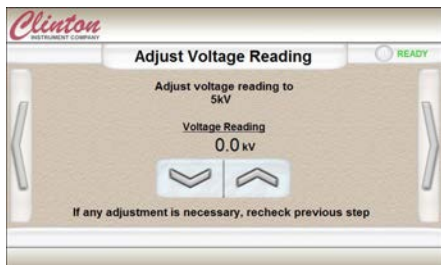
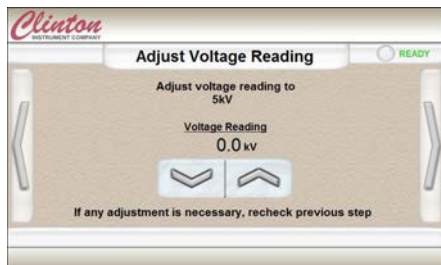


16. View the voltage output reading on the STCAL voltmeter. Use the up and down arrows on the touch screen so that the STCAL voltmeter displays 1.0 kV (within 2% or +/- 20 volts). Press NEXT.



17. A new screen will appear on the CT-15A. View the reading on the STCAL voltmeter. If necessary, use the up and down arrows on the touch screen until the STCAL voltmeter displays 5.0 kV (+/- 2% or 100 volts). Press the NEXT arrow. If adjustments were made, you will be returned to the Adjust Voltage Out 1kV screen.
18. Repeat steps 17 and 18 until the STCAL voltmeter reads 5.0 kV without further adjustment from the touch screen. Press the NEXT arrow. The Adjust Voltage Reading screen will appear.

Adjust Voltage Reading



19. As directed on the touch screen, use the up and down arrows so that the Voltage Reading on the touch screen displays 1.0 kV. Press the NEXT arrow to advance to the next screen.
20. If the Voltage Reading on the touch screen is not 5.0 kV, use the up and down arrows until the Voltage Reading on the touch screen is 5.0 kV. Press the NEXT arrow. If adjustments were made, you will be returned to the Adjust Voltage Reading 1.0kV screen.
21. Repeat steps 20 and 21 until the Voltage Readings on the touch screens read 1.0KV and 5.0 kV without further adjustment.
22. On the CT-15A touchscreen, press 0.0 under Set Point and enter the voltage prompted by the STCAL. Press OK. Enter the number displayed under Voltage Reading on the CT-15A screen on the STCAL screen.
23. Press NEXT. The calibration is complete.
24. A grid showing actual voltage readings will display. If the readings are within tolerance, press FINISH and a calibration certificate will appear on the screen. It can be exported for printing or saved. Press the right arrow on the CT-15A screen to exit Calibration.
25. If any reading is out of tolerance, press RETRY on the STCAL tablet to reenter Calibration mode. **WARNING: turn OFF the spark tester power.** Repeat steps 13-25 above.

Retrieving Calibration Results

From the main screen, click the link, [View past Calibrations](#), to search for previous calibrations. You may filter by profile.

STCAL-SM Sensitivity Module (Optional)

Introduction



The STCAL-SM Sensitivity Module allows calibration and repair technicians to conduct controlled spark tester sensitivity tests to common, published sensitivity standards or norms. The tests show that the spark tester's detection circuit will properly respond to a series of arcs with tightly controlled properties, which may include:

- arc length
- arc duration
- time between arcs
- detection current threshold
- impedance to ground

Supported standards are:

- IEC-62230. This is also referred to as EN 50356 and is derived from the BS 5099. The standard describes separate test protocols for High Frequency, Power Mains (AC) Frequency and DC units.
- NEMA WC-56. This is a test protocol for High Frequency units only.

The Sensitivity Module comprises a rotary spark gap which adjusts in speed to match the dwell time of each specified test as well as a series of network impedance values for each. Relevant test parameters are automatically set by the equipment when each test is selected by the operator.

Preparation

The STCAL-SM module is used alone for this test; no other parts of the STCAL system are required. The SM is supplied with the following items:

- Grounding cable
 - 2 high voltage lead cables (1.5' and 3' long)
 - 2 alligator clips
 - Power cord
 - 0.01" Feeler Gauge
1. The spark tester should be in current voltage calibration, clean, dry, and in good operating order.
 2. Set the spark tester fault count to 0 and the voltage to 0. Turn OFF the spark tester.
 3. Set the gap between the stylus and needle to 0.01" using the



enclosed feeler gauge (see the Maintenance section for complete instructions). **NOTE: Clean the stylus and replace the needle every 400 cycles.**

4. Choose the shortest high voltage lead possible. Plug the high voltage lead into an alligator clip. Connect the clip to the spark tester electrode. Make certain that the alligator clip makes good contact with some portion of the electrode that is charged during spark testing. If necessary, abrade or clean surfaces to ensure a good connection. Examples of good connection points include:
 - Direct connection to several bead strands of a bead chain electrode
 - Direct connection to metal electrode trough components
 - Direct connection to brush electrode elements, at the base of the bristles, or its mounting structure
5. Insert the high voltage lead probe into the high voltage input receptacle on the SM's front panel and press in until the connector fully seats.
6. Using the supplied grounding cable, make a direct connection to the grounding stud located on the back panel of the spark tester. If the spark tester doesn't have a grounding stud, connect to any point on the chassis that is grounded, such as a hinge barrel or panel screw. To verify that the chosen point is really grounded, use a multi-meter to check continuity from the ground point to the grounding pin on the spark tester's power cord or terminal block.
7. Connect the other end of the grounding cable to either of the ground receptacles located on the SM rear panel.
8. Plug the supplied power cord into the SM power entry port on the rear of the equipment and connect to mains power.
9. Turn ON the SM.
10. Press the MODE button on the SM front panel until the LED corresponding to the test you wish to perform is illuminated.

Begin the Test

IEC/HF Test Parameters	
Test Voltage	3.0kV RMS
Impedance Value	≈10pf (Capacitive)
Fault Current	600 microamperes
Arc Duration (dwell time)	1ms.
Needle Gap	0.010 inches
Arc Rate	1 per second

IEC/HF

The IEC-62230 test for high frequency spark testers.

1. Press DISPLAY MODE so the LED reads CURRENT.
2. Turn ON the spark tester. Set the spark tester voltage to **3.0kV**. **PLEASE NOTE: Any other test voltage may result in inaccurate test results and damage to the SM.**
3. Turn the CURRENT ADJUST dial until the display reads 0.60 milliamperes. (600 microamperes). Turn off spark tester. Press

DISPLAY MODE again so the LED reads FAULT COUNT.

4. Reset the spark tester FAULT COUNT to 0.
5. Turn on spark tester.
6. Press the START button. The rotating spark gap will advance the test needle past the fixed stylus at the correct speed to yield an arc dwell time of once per second for the required number of faults. The START button can also be used to pause the test.
7. The test is successful if the spark tester's front panel counter matches the FAULT COUNT of the STCAL-SM.

IEC/AC Test Parameters	
Test Voltage	3.0kV RMS
Impedance Value	≈550pf (Capacitive)
Fault Current	600 microamperes
Arc Duration (dwell time)	25 ms.
Needle Gap	0.010 inches
Arc Rate	1 per second

IEC/AC

The IEC-62230 test for power mains (AC) spark testers.

1. Press DISPLAY MODE so the LED reads CURRENT.
2. Turn ON the spark tester. Set the spark tester voltage to **3.0kV**. **PLEASE NOTE: Any other test voltage may result in inaccurate test results and damage to the SM.**
3. Turn the CURRENT ADJUST dial until the display reads between 0.59 and 0.60 milliamperes (600 microamperes). Turn off spark tester. Press DISPLAY MODE again so the LED reads FAULT COUNT.
4. Turn on spark tester.
5. Reset the spark tester FAULT COUNT to 0.
6. Press the START button. The rotating spark gap will advance the test needle past the fixed stylus at the correct speed to yield an arc dwell time of once per second for the required number of faults. The START button can also be used to pause the test.
7. The test is successful if the spark tester's front panel counter matches the FAULT COUNT of the STCAL-SM.

IEC/DC Test Parameters	
Test Voltage	5.0kV
Impedance Value	8.3 ohm (Resistive)
Fault Current	600 microamperes
Arc Duration (dwell time)	0.5 ms.
Needle Gap	0.010 inches
Arc Rate	1 per second

IEC/DC

The IEC-62230 test for DC spark testers.

1. Press DISPLAY MODE so the LED reads CURRENT.
2. Turn ON the spark tester. Set the spark tester voltage to **5.0kV**. **PLEASE NOTE: Any other test voltage may result in inaccurate test results and damage to the SM.**
3. The display should read below 0.60 milliamperes. (600 microamperes). Turn off spark tester. Press DISPLAY MODE again so the LED reads FAULT COUNT.

4. Reset the spark tester FAULT COUNT to 0.
5. Turn on spark tester.
6. Press the START button. The rotating spark gap will advance the test needle past the fixed stylus at the correct speed to yield an arc dwell time of once per second for the required number of faults. The START button can also be used to pause the test.
7. The test is successful if the spark tester's front panel counter matches the FAULT COUNT of the STCAL-SM.

NEMA/HF

The NEMA WC-56 test for high frequency spark testers.

1. Turn ON the spark tester. Set the spark tester voltage to **3.0kV**.
PLEASE NOTE: Any other test voltage may result in inaccurate test results and damage to the SM.
2. Press the START button. The rotating spark gap will advance the test needle past the fixed stylus at the correct speed to yield an arc dwell time of once per second for the required number of faults. The START button can also be used to pause the test.
3. The test is successful if the spark tester's front panel counter matches the FAULT COUNT of the STCAL-SM.

NEMA/HF Test Parameters	
Test Voltage	3.0kV RMS
Impedance Value	10k ohm (Resistive) and 50pf (Capacitive)
Fault Current	600 microamperes
Arc Duration (dwell time)	1ms.
Needle Gap	0.010 inches
Arc Rate	1 per second

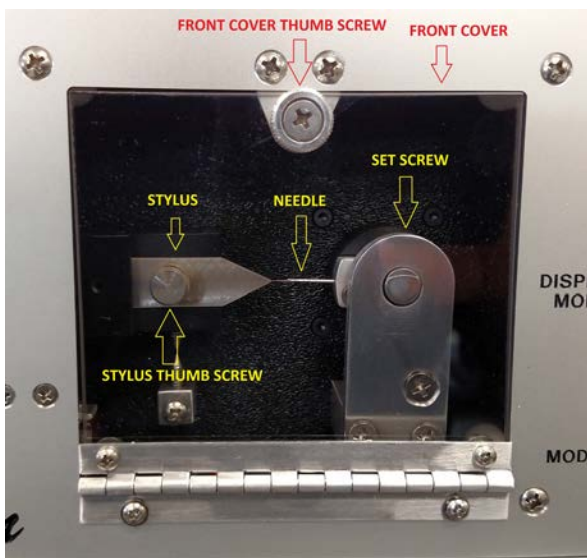
Maintenance

STCAL Voltmeters

The LFVM Low Frequency Voltmeter and the HFVM High Frequency Voltmeter must be returned to Clinton or to an authorized Clinton service center for calibration every year. The calibration due date and information for each voltmeter is stored in the voltmeter and prints on every certificate of calibration. The STCAL will remind you if your voltmeter calibration is out of date.

STCAL-SM Sensitivity Module

Adjusting the STCAL-SM Rotary Spark Gap



1. Disconnect the high voltage wire from the STCAL-SM.
2. To access the needle, loosen the thumb screw on the front cover and open the cover.
3. Use care in handling, as the needle is very sharp.
4. Rotate the needle to face the stylus.
5. Place a 0.01" feeler gauge against the needle vertically.
6. If the feeler gauge can be slid between the needle and stylus and there is some resistance, no adjustment is necessary. Close the front cover and tighten the front cover screw.
7. If adjustment is necessary, follow the steps below:
8. Loosen the thumb screw on the stylus. The stylus will push against the feeler gauge. Insure needle tip and stylus tip are aligned.
9. Make sure to keep the feeler gauge vertically aligned.
10. Tighten the screw on the stationary electrode.
11. Swing the needle past the stationary electrode and verify it can spin easily past the stationary electrode.
12. Close the front cover and tighten screw for front cover.

Replacing the Needle

1. Disconnect the high voltage wire from the STCAL-SM.
2. Open the front cover to access the needle.

3. Rotate the needle to face the stylus.
4. Loosen the set screw on the top of the needle assembly.
5. Rotate the needle away from the stylus and slide out the needle. (You may need pliers.)
6. Insert the new needle flat side up.
7. Tighten the set screw on the top of the needle assembly.
8. Follow the steps for cleaning the stylus (See below.)
9. Follow the instructions for adjusting the rotary spark gap. (See above.)

Cleaning the Stylus

1. Disconnect the high voltage wire from the STCAL-SM.
2. Open the front cover to access the stylus.
3. Using a fine grain sandpaper or emery cloth, gently sand the tip of the stylus.
4. Wipe the tip of the stylus with a clean cloth or paper.

Cleaning the Rotating Electrode Bearing

1. Disconnect the high voltage wire from the STCAL-SM.
2. Open the front cover to access the rotating electrode arm.
3. Remove the bottom two screws of the arm
4. Pull the arm straight out and clean both bearing and contact.
5. Place arm back in position.
6. Secure arm with screws.
7. Check gap on needle.

Troubleshooting

CAUTION: Troubleshooting is to be performed by qualified service personnel only. Failure to follow the procedures in this manual may result in danger to personnel and equipment damage.

My tablet disconnects or locks up during calibration.

The voltage from the spark tester may be interfering with the communication between the tablet and the voltmeter.

1. Unplug everything and wait for a minute or so.
2. Reboot the tablet using the Power button on the STCAL screen and restart the program.
3. Do not set the tablet on top of the spark tester.
4. Do not allow the white high voltage connecting cable to come into contact with any metal surface, including the side of the STCAL voltmeter or the spark tester end guards.

I want to run this program on my own computer.

1. The proprietary software is designed to work only on tablets supplied by Clinton.

Replacement Parts

Part Number	Description
HFVM*	High Frequency Voltmeter with Certificate of Calibration
LFVM*	Low Frequency Voltmeter with Certificate of Calibration
92039I	STCAL Tablet configured for STCAL firmware
90933	Ground Lead Cable
92011-1.5	HV Cable 1.5' long
92011-3	HV Cable 3' long
92012	USB Cable 6' male straight "A" to male up angle "B"
92060	USB Cable 6' mail down angle "A" to male straight "B"
92061	USB Cable "A" recept to "A" micro male
RS485-10	9-pin RS485 cable 10' long
02259	Alligator clip
92013	Brass rod .062" dia, 4" long

Warranty

The information contained in this document is subject to change without notice. The Clinton Instrument Company makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties or merchantability and fitness for a particular purpose.

The Clinton Instrument Company shall not be liable for errors contained herein or for incidental damages in connection with the furnishing, performance, or use of this material.

We warrant to the original purchaser that the equipment described herein is free from defects in materials and workmanship for a period of one year from the date of invoice, our obligation under this warranty being limited to repair or replacement of the defective parts. This warranty does not apply to fuses, lamps, or any normally expendable parts. Any part appearing to have defects in material or workmanship, upon our examination only and as determined by us, and providing the equipment has not been subject to abuse, misuse, or alteration, will be repaired or replaced at no charge for materials and labor, either upon receipt of the defective part or equipment, transportation charges prepaid, at our plant or at the equipment location, as selected by us. No parts or equipment shall be returned without our prior permission. Any parts replaced under this warranty shall be warranted until the expiration date of the original warranty.

The warranties herein are in lieu of all other warranties, expressed or implied, and of all other obligations or liabilities on our part concerning this equipment.