



## B-Series Spark Tester

### Short-Form Instructions and Equipment Warranty

Full instruction manuals for specific models are available.

Download them on our website: [www.clintoninstrument.com](http://www.clintoninstrument.com)

Or contact [support@clintoninstrument.com](mailto:support@clintoninstrument.com)



HF-15B/BD-12S shown with optional X3B Horn/Light Tower

**The Clinton Instrument Company**

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## Safety Instructions

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### Environmental Conditions

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The spark tester is designed for safe operation 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. The calibrations of the equipment are 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. For customer service or technical assistance with this equipment, please contact:

The Clinton Instrument Company  
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### Avoid the Risk of Fire!

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Each time the wire line stops, be sure that the high voltage (HV) in the electrode is removed. If the HV remains ON while the wire line is stationary, the wire insulation within the electrode will heat and there is a danger of combustion. Refer to the table in the "Installation" section labelled "Terminal Block connections," under HV Enable on how to safely install your spark tester.

### Caution: Pacemaker Warning

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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 the center conductors of the product under test are not connected to ground. While Clinton cautions its customers to ground the test product for reasons of both safety and efficacy of test, 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.

## Caution: Ozone Production

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Ozone is a naturally occurring gas (O<sub>3</sub>) and is produced when there is an electrical discharge through Oxygen (O<sub>2</sub>). Any equipment that generates arcing will produce Ozone (electric motors and office photocopiers for example). Ozone is a powerful oxidizer and is a nasal and lung irritant.

AC spark testers, both power mains frequency as well as high frequency, produce ozone because the test voltage generates a corona field, ionizing the air surrounding the cable within the electrode during testing. Ozone is produced in proportion to the surface area of this corona field, which varies in size primarily due to the capacitance of the specific cable under test. Other factors include the length and condition of the spark tester electrode, and test voltage level.

When Ozone is noticeable and problematic, ventilation should be added to the workstation to exhaust the air and to provide fresh air. To gauge exposure levels in a given setting, operators can wear Ozone sensitive badges during a working day. Thus total exposure can be assessed and appropriate actions taken.

## Electrical Shock Hazard from Production Line Spark Testers

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By Henry H. Clinton

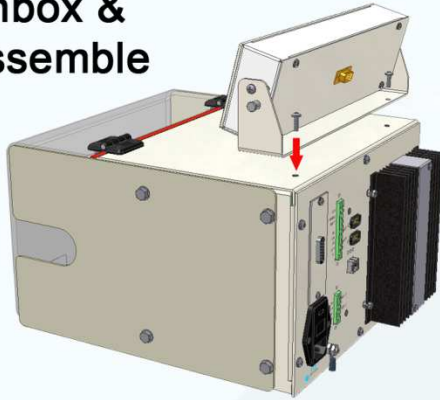
The commonly accepted maximum values of 60Hz. current passing through the human adult body which permit a subject to let go of electrodes are nine milliamperes for males and six milliamperes for females. At 3000 Hz. this value increases to about 22 milliamperes for men and 15 milliamperes for women, 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 3 kHz 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 6 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.

# Installation

## 1 Unbox & Assemble



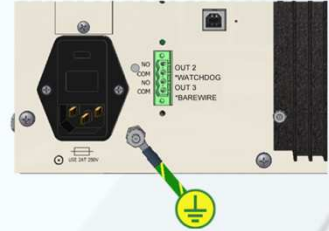
Mount Permanently

## 2

Connect RC (if used)



Ground Equipment

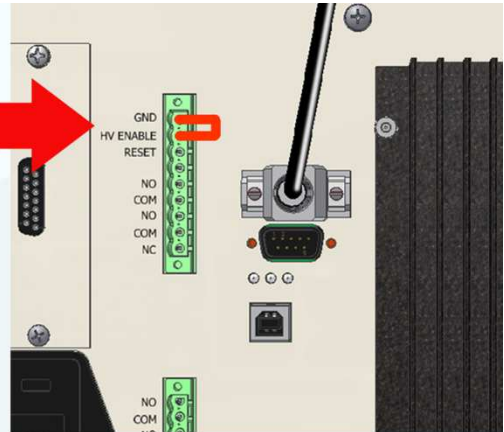


## 3 Connect to Mains Power



100/240 VAC 50/60 Hz

## 4



Connect HV Enable and GND

## 5 Turn Power "ON"



Verify Operation  
(if no high voltage see next)

## 6 Notifications

E.C.V.O

Electrode  
Cover is Open

E.EX.I

External Interlock  
Not Installed

E.R.V.F

Voltage Removed  
During Fault

E.COM

Communication  
with Test Module  
Has been Lost

E.R.V.C

Voltage Removed by  
Comm Source



## Provide for Ventilation of the Spark Tester



Note: Please see the *Caution Ozone Production* section above in the Spark Tester Safety section of this manual. If Ozone production is problematic an external air extraction system is recommended and should operate whenever the spark tester is in use. The exhaust of the external air extraction system should be discharged either outdoors or into some area well away from workers.

Ozone is produced by AC spark testers, both main frequency and high frequency. Ozone will revert to Oxygen within hours.

## Power Wiring



### Install an External Disconnecting Device

Install an external switch or circuit breaker in close proximity to the spark tester and within easy reach of the operator. The switch or circuit breaker must meet the relevant requirements of IEC 947-1 and IEC 947-3 and should be marked as the disconnecting device for the equipment. The rating of the circuit breaker or fuse should be no greater than 5 amperes.

**Caution:** Be sure the external disconnecting device is OFF and locked out before continuing.

### Terminal Block Wiring

Refer to the following table for information on pin functions. Locate the green terminal blocks on the back of the spark tester and its companion green terminal block connectors supplied with the unit.

Conductors connecting auxiliary equipment, relays and switches should be shielded 22 gauge or larger and should be stripped back ¼" (6mm) and fed into the green terminal block connector at the proper pin number. Shields from conductors connecting auxiliary equipment should be grounded to the safety ground terminal.



9 - Pin Terminal Block Connections	Pin No.	Designation	Conductor
<p><b>HV Enable (IN0):</b>  <b>CAUTION:</b> For HV on the electrode, install a normally closed switch or relay contact** between pins 1&amp;2. This switch or relay should open automatically when the wireline stop switch is activated or be opened manually by the system operator when the line stops. <b>FAILURE TO DO SO COULD RESULT IN A FIRE HAZARD</b> If the HV remains ON in the electrode when your line is stationary, the wire insulation in the electrode will heat and there is a danger of combustion.</p> <p><b>External Reset (IN1):</b>                      To reset the spark tester fault relay with an external switch, wire a momentary switch** between pins 1&amp;3. When these contacts close, the fault relay will return to a normal state. The interval that the contacts are closed must exceed 50 ms.</p>	1	GND	(3) 22 ga. stranded conductors rated 250V, less than 10 meters in length, contained in a common insulating sheath
	2	HV ENABLE	
	3	RESET	
	4	not used	
<p><b>HV ON Indication (OUT1):</b>                      Dry relay contact pins 5&amp;6 will close when the test voltage exceeds 500v. For an indication that HV is ON in the electrode, wire a lamp or auxiliary device* here.</p>	5	NO	(3) 22 ga. stranded conductors rated 250V, less than 10 meters in length, contained in a common insulating sheath
	6	COM	
<p><b>Process Control (OUT0):</b>                      To activate external lights, alarms or relays* when a fault occurs, wire them between dry relay contact pins 9,8 &amp; 7. If the output function is set to LCH or RVF the dry relay contacts will remain closed until the RESET button is pressed or when pins 1&amp;3 are closed by remote switch or relay. If the output function is set to NLC, the dry relay contacts will return to normal state after the interval known as the AMFS (Any Fault Alarm Time) has elapsed.</p>	7	NO	
	8	COM	
	9	NC	
<p>* When connecting auxiliary equipment to dry relay contact pins 5, 6, 7, 8 or 9, observe maximum ratings of 120VAC at 2 amps, 240VAC at 1 amp.</p>			
<p>**Switches and relays connected to pins 1,2, &amp; 3 should be suitable for 24V low current applications.</p>			
4 - Pin Terminal Block Connections	Pin No.	Designation	Conductor
<p><b>Watch Dog (OUT2):</b>                      Dry relay contact pins 1&amp;2 will close when the test voltage is between the VVDL (Voltage Watchdog Low Threshold) and the VVDH (Voltage Watchdog High Threshold) values.</p>	1	NO	(3) 22 ga. stranded conductors rated 250V, less than 10 meters in length, contained in a common insulating sheath
	2	COM	
<p><b>Bare Wire (OUT3):</b>                      To activate external lights, alarms or relays* when a Bare Wire type fault occurs, wire them between dry relay contact pins 3 &amp; 4. If the output function is set LCH or RVF, the dry relay contacts will remain closed until the RESET button is pressed or when pins 1&amp;3 are closed by remote switch or relay output function is set to NLC, the dry relay contacts will return to normal state after the interval known as the ABMS (Any Bare Wire Alarm Time) has elapsed.</p>	3	NO	
	4	COM	
<p>*When connecting auxiliary equipment to dry relay contact pins 1, 2, 3, or 4, observe maximum ratings of 120VAC at 2 amps, 240VAC at 1 amp.</p>			

## B-Series Spark Tester New Features

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**Display:** B-Series spark testers are available with bright, detachable displays, (Model RC). This display connects to the test module with a short serial cable and eliminates the need for a separate remote display. The RC display can be mounted up to 60 meters (200 feet) away with a longer, shielded, serial cable. For applications where it is desirable to mount the RC controller in an instrument panel, a rack mount adaptor is available, (CIC Part No. 92244).

**Front Panel Security:** B-Series spark testers offer customizable password protect as an option that can be enabled, if desired, to prevent operators from changing settings or accessing information. There are four levels of password protection that allow supervisors to choose exactly what the operators can control.

**BD-12S Design (Patent Pending):** The new split-electrode design provides an easy way to string up a cable through the bead chain electrode, guaranteeing precise center placement for the most effective and reliable test. The bead chains are arranged to eliminate gaps between hanging beads, which provides coverage around the product at all times.

**Communication Modules:** An optional circuit board (PCB) may be added to the B-Series spark testers for easy communication to PLCs. This PCB can be factory installed or added later. Analog, DeviceNET, Ethernet/IP Profibus, Profinet, Modbus RTU, and Modbus TCP protocols are all available options. Communication protocols can easily be changed at any time with the purchase of an upgrade kit or a new plug-in module.

**Voltage Watchdog:** Test voltage parameters can be set by users to ensure adequate test voltages are always being used to test product. For example, if the spark tester should be continuously testing at 4kV, users can set the system to alarm if the spark tester voltage were to fall below 3kV or rise above 5kV. Preset upper and lower voltage limits may be set remotely by PLC or through the front panel.

**Redundant Voltage Monitoring:** In addition to standard voltage monitoring, the HF-15B monitors the voltage at the electrode to verify correct voltages are being maintained.

**Storing Configuration Information:** When customers have multiple units that must be configured identically, one unit can be configured as required, and then the configuration information can be copied and transferred to additional units. This is accomplished via computer or by using Clinton's Calibration System STCAL. The required software for this feature, when using the customer's computer or laptop, will be available free from Clinton's website: [www.clintoninstrument.com](http://www.clintoninstrument.com)

**Four Output Relays:** One set of form C and three sets of form A relay contacts are located on the back of the HF-15B for easy connection to external alarms, lights, or machinery that will be controlled by the spark tester. Relay functions can be selected from options including: High Voltage ON indication, Fault Alarm, All Bare Wire Alarm (this includes both Direct metal contact and gross bare wire conditions), and Voltage Watchdog.

**Fault Typing (Patent Pending):** Detecting the flow of current during spark testing has always been the standard in spark testing. B-Series spark testers revolutionize the concept of fault detection by the use of Digital Signal Processor-Based Fault Typing. We can now differentiate 4 types of fault conditions: Pinhole, direct metal contact, multi-pinhole, and gross bare wire.

### Definitions of fault conditions:

- **Pinhole-** A pinhole is defined as a short-duration fault where no direct metal contact between the wire conductor and the electrode is made.

- **Multi-Pinhole-** A Multi-Pinhole is defined as two or more pinhole faults closely spaced. It can also be a single fault of longer duration where no metal contact was made between the wire conductor and the electrode.
- **Metal Contact-** Sometimes referred to as BARE WIRE. A Metal Contact fault is defined as a defect or bare patch in the insulation that allows the electrode to come into momentary direct contact with the center conductor or shield. In order for a fault to be typed as a metal contact, the bead chain electrode must make physical contact with the center conductor or shield under test.
- **Gross Barewire-** Gross Barewire is defined as a fault where the wire conductor is exposed, allowing metal contact to be made with the electrode for a period of time equal to two and one half times the electrode length.

**Backwards Compatible:** B-Series Spark Testers are compatible with A-Series Spark Testers. For example, All that is needed for a customer to upgrade from the HF-15A series to the HF-15B series is to unplug the power cord and the 9-pin green terminal strip from the back panel on the HF-15A and to plug it into the HF-15B. The HF-15B will function identically to the HF-15A (if the user does not wish to use any of the HF-15B's advanced features. The bolt patterns on the bottom of the HF-15B are the same as the HF-15A for easy physical replacement.

**Automatic Calibration with STCAL System:** When calibrating with Clinton Model ST-CAL, there is no need to open the equipment, or to make any physical adjustments during the process. The HF-15B will communicate with a Tablet and Voltmeter to make all necessary adjustments. Calibration results, Serial information, and other optional information is provided on a Calibration Certificate which can either be printed to a network printer or exported to a USB stick to keep for future records.

**Universal Power Supply:** B-Series Spark Testers will work on 100/120, 200/240 input voltage without internal rewiring.

**Percent Load Meter:** By toggling the A button on the control panel the voltage will change from test voltage to a percentage of current output required to produce test voltage in real time.

## Equipment Warranty

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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.