

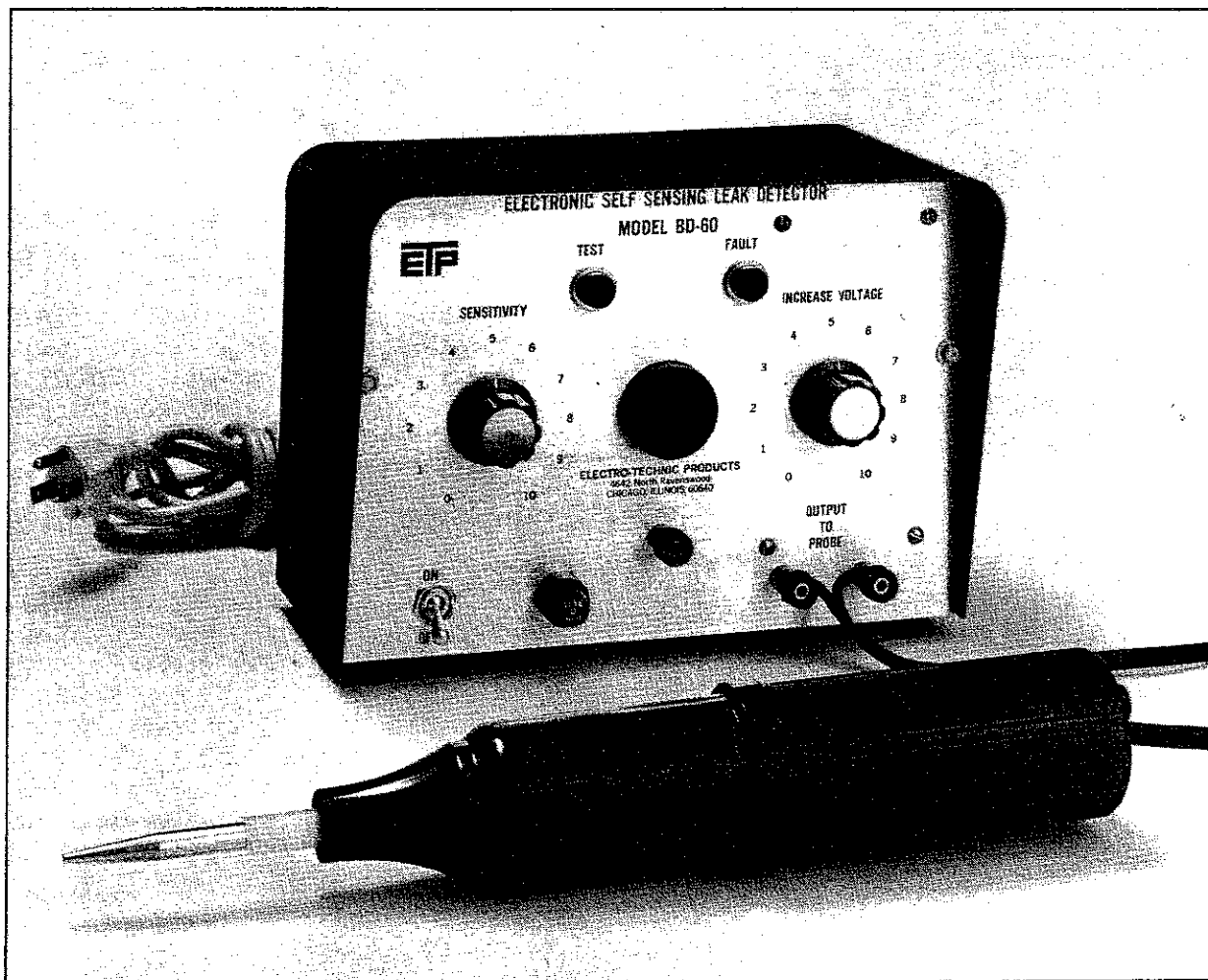


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OPERATING MANUAL

Automatic Sensing Insulation Leak Detector

Models BD-60, BD-60V, BD-60T, BD-60TV



OPERATING MANUAL

Automatic Sensing Insulation Leak Detector Models BD-60, BD-60V, BD-60T, and BD-60TV

SECTION 1--GENERAL INFORMATION

1.1 Description

- 1.1.1 This Automatic Sensing Insulation Leak Detector is an electronic, self-sensing instrument with a solid-state spark tester. Several model variations are available. All of them will detect small holes in:
- plastic, glass, or rubber linings of metal tanks
 - linings of metal pipes, valves and fittings
 - thin coatings or paint on metal or concrete surfaces
- 1.1.2 Once calibrated for the thickness of a coating or lining, and for the electrode used, an audible tone and a light will automatically indicate when the probe is swept over a spot where a pinhole, crack, or tear is located.
- 1.1.3 The electronics of the system are contained in a metal cabinet, with a sloped visor to increase the visibility of the indicator lamps if used in a well-lit area. It has an 8-ft. line cord, and the circuitry is fused. A hand-held generator is attached to the front panel via a 6 ft. cord. Each model is furnished with several electrodes. Refer to the Packing List in Section 1.3 for the type of electrodes furnished with the specific model ordered. A variety of accessory electrodes are also available.
- 1.1.4 The Model BD-60 is the standard model operating from 115 V. The Model BD-60V is identical to the Model BD-60 except that operation is from 230 volts. It is supplied with a line cord and plug polarized (per US Standards) for this voltage.
- 1.1.5 The Model BD-60T is intended for use for Cargo Tank Lining Testing. It is the same as the Model BD-60, except that it comes with accessory electrodes appropriate for tank lining testing. The Model BD-60TV is identical to the Model BD-60T except that operation is from 230 volts. It is supplied with a line cord and plug polarized (per US Standards) for this voltage.

1.2 Specifications

Tester Voltage Output - 2,000 to 35,000 volts

Voltage Waveform - pulsated DC signal

Equivalent Pulse Width Frequency - 400 to 500 kHz

Electrical Requirements - 50/60 Hz, single phase

Model BD-60, BD-60T: 115 volts

Model BD-60V, BD-60TV: 230 volts

Dimensions - Power Source: 9-1/4 x 4-3/4 x 7 in. high
(23.5 x 12.1 x 17.8 cm)

Probe Handle Dimensions: 2 x 10 in. without tip
(5.1 x 25.4 cm)

Weight: Net, 8.8 lbs (4 kg); Shipping, 10.9 lbs (4.9 kg)

1.3 Packing List

1.3.1 Carefully remove the instrument and accessories from the packing material. Check all parts against this Packing List. Notify your dealer or Electro-Technic Products, Inc. of any shortages immediately.

1.3.2 Packing List for Models BD-60 (Product No. 16001) or BD-60V (Product No. 16021):

Quantity	Product No.	Description
1	080-1506-3	BD-60 Power Supply, 115V
or		
1	080-1510-3	BD-60V Power Supply, 230V
1	011-0019-1	Handle Assembly
1	12101	Electrode Tip, Standard
1	12201	Electrode Tip, Spring
1	12461	Electrode Shorting Block
1	085-0044-3	Instruction Manual

1.3.2 Packing List for the Model BD-60T (Product No. 16031) or the Model BD-60TV (Product No. 16021):

Quantity	Product No.	Description
1 or 1	080-1506-3	BD-60 Power Supply, 115V
	080-1510-3	BD-60V Power Supply, 230V
1	011-0019-1	Handle Assembly
1	12101	Electrode Tip, Standard
1	12201	Electrode Tip, Spring
1	12131	Electrode, 12 in. T-Tip
1	12141	Electrode, Fan Tip
1	12461	Electrode Shorting Block
1	085-0044-3	Instruction Manual

1.4 Accessory Equipment

1.4.1 A standard blunt tip and spring tip electrode are supplied. The spring tip must be used when low voltage settings are required. Models for Cargo Tank Liner Testing include a brush tip electrode, suitable for testing in corners, curved surfaces, and around bulkheads; and a 12 in. long T-Tip electrode for testing large flat or slightly curved surfaces. It may be necessary to use the Electrode Shorting Block when operating at very low voltage settings.

1.4.2 The following is a list of additional electrodes for the Models BD-60 or BD-60V.

Product Number	Description
12121	Electrode, T Tip, 4-1/4 in. Wide
12131	Electrode, T Tip, 12 in. Wide
12141	Electrode, Fan Tip
12401	Electrode, Brush Tip, 4 in. Wide
12421	Electrode, Brush Tip, 8 in. Wide

- 1.4.3 New electrodes are being developed on a continuing basis. Also, special or custom-made electrodes can be designed to fit a specific application. Contact Electro-Technic Products, Inc. for more information.
- 1.4.4 The following are useful accessories for specific applications.

Product Number	Description
12701	Peak Voltage Calibrator
12191	Calibration Block for Rubber Tank Linings
085-0501-1	Video Tape, Tank Lining Testing VHS Format, NTSCI (US) System

1.5 Warranty Repair/Replacement Information

- 1.5.1 If the unit requires repair, forward it freight prepaid to your dealer or to Electro-Technic Products, Inc. along with a copy of the original invoice for warranty verification. The unit is date coded as to the date of manufacture.
- 1.5.2 Electro-Technic Products, Inc. reserves the right to repair or replace any unit sent in for warranty repair.
- 1.5.3 If found to be out of warranty, or damaged due to improper use, it will be repaired for a minimal labor and parts charge, unless directed to do otherwise. If it is determined that repair costs will exceed approximately half or more of the cost of a new unit, the customer will be so advised.
- 1.5.4 Parts for discontinued models will be made available whenever possible for at least five years after the date of model discontinuance.

SECTION 2--INSTALLATION

- 2.1.1 The unit can be placed on a table top, or hung on a wall. There are two mounting holes located at the rear of the chassis; hole centers are 7 in. apart, and have openings to accept mounting hardware with heads up to 3/8 in. in diameter. If mounting this way, however, allow adequate clearance for the line cord without crimping it.
- 2.1.2 Locate the Model BD-60 Power Supply within 6 feet of the surface to be leak checked.
- 2.1.3 The Generator Handle Cord is terminated with color-coded spade lugs. Attach each of the spade lugs to its matching color-coded binding post on the front panel. Partially unscrew the plastic binding post insulator and insert the spade lug at the base of the post. Tighten to make a good electrical contact.
- 2.1.4 With the Power Switch in the OFF position, insert the power line cord into its matching three wire grounded receptacle. This insures that the chassis is grounded. Operation in any other way will result in a potential shock hazard and may affect the performance of the instrument. Never use a two-prong plug adapter.
- 2.1.5 Insert the electrode into the tip end of the Generator Handle. To remove the electrode, firmly grasp the base of the electrode and gently rock back and forth while pulling it out.

SECTION 3--OPERATION

3.1 Front Panel Operating Controls

- 3.1.1 Power ON/OFF Switch. A toggle switch located at the lower left hand corner.
- 3.1.2 Sensitivity Adjust Knob. A control located at the middle left side. It adjusts or "tares" the sensitivity of the circuitry as it detects the induced current of the corona over a good surface relative to that which arcs through a hole to the metal subsurface. Turning it clockwise increases the sensitivity.
- 3.1.3 Increasing Voltage Adjust Knob. A control located at the middle right side. Sets the proper voltage applied to the electrode for the particular application. Turning it clockwise increases the voltage. This is an important setting when testing thin coatings.

3.2 Front Panel Status Indicators

- 3.2.1 Test Indicator Lamp. A lamp near the top, left center. It is lit when a test is in progress, but is off when a fault (leak) is encountered.
- 3.2.2 Fault Indicator Lamp. A lamp located near the top, right center. It works in conjunction with the Test Indicator Lamp. It lights when a fault (leak) is detected, and remains lit for about 3 or 4 seconds.
- 3.2.3 Fault Indicator Alarm. A horn located in the center. It emits an audible tone for about 3 or 4 seconds when a fault is detected.

3.3 Front Panel Terminal Connections

- 3.3.1 Output to Probe Terminals. Two binding posts, color-coded black and red, located at the lower right hand corner. These provide power to the Generator Handle and electrode.
- 3.3.2 Ground Terminal. A black binding post located at the lower center. This provides an electrical earth ground through the grounded power line cord. When testing the lining or coating of a small metal object, the metal may require connection to this terminal, or equivalent ground connection.

3.4 Calibration

- 3.4.1 The Model BD-60 circuitry is factory calibrated, but the voltage and sensitivity must be calibrated for the thickness of the coating or lining being tested, and for the electrode used. The calibration procedure for coatings and linings are different.
- 3.4.2 By definition, a coating is a nonconducting thin film generally between 10 to 20 thousandths of an inch. It has a breakdown voltage of approximately 200 to 400 V/mil. For a 10 mil coating, for example, the voltage setting should be between 2 to 4 kV, to compensate for coatings which may typically not be of uniform thickness, or for those with a pebbled-type surface.
 - 3.4.2.1 To calibrate for a coating leak detection application, select an area that represents the average thickness of the coating to be tested, and make certain that this test surface does not have any pinhole leaks.
 - 3.4.2.2 Turn the Sensitivity Adjust Knob completely counterclockwise. It is recommended that the Peak Voltage Calibrator be used to adjust the voltage for the thickness of the

coating. Follow the instructions supplied with the Calibrator to adjust the spark gap, using the Voltage Increase Knob to change the voltage until the spark jumps the gap.

3.4.2.3 Replace the Peak Voltage Calibrator with the electrode selected for the application. Use the spring tip electrode, or the Electrode Shorting Block with a Fan, T, or Brush Tip Electrode, if the voltage setting is about 5,000 volts or lower. Turn power ON and press the electrode firmly against the coating surface. If the voltage is set too high for very thin coatings, the corona discharge may puncture the coating.

3.4.2.4 Position the electrode over an area with a known pinhole and turn the Sensitivity Adjust Knob clockwise until the Fault Lamp is lit. Then reduce the Sensitivity Adjust somewhat. Run the electrode over the coating again, and over the area where the known pinhole exists. The Fault Lamp should only be lit when the electrode is swept over the pinhole.

3.4.3 By definition, a lining is a nonconducting sheet generally 3/32 in. or thicker. The breakdown voltages are considerably greater for this type of material than for thin coatings. If the lining is thinner than 3/32 (95 thousands), follow the calibration procedure for coatings in Section 3.4.2. If the lining is 3/32 or thicker, follow these calibration procedures:

3.4.3.1 To calibrate for a lining leak detection application, after the electrode is installed, select an area that represents the thickness of the lining to be tested, and make certain this test surface **does not have any cracks, seam tears, or pinholes**. If rubber linings of cargo tanks are being tested, it is recommended that the Model 12191 Tank Lining Calibration Block be used to permit calibration outside of the tank.

3.4.3.2 Turn the Sensitivity Adjust Knob completely counterclockwise, and the Increase Voltage Adjust Knob completely clockwise. The breakdown voltage of most linings will be greater than the 35,000 volt maximum output of the Model BD-60.

3.4.3.3 Turn the power ON and press the electrode firmly against the lining. Turn the Sensitivity Adjust Knob clockwise until the Fault Indicator Lamp is lit. Then reduce the Sensitivity somewhat. Sweep the electrode over the lining, and over an area where a known leak is located. The Fault Indicator Lamp should light only when the electrode passes over the imperfection in the lining.

- 3.4.3.4 It is important to note that some linings crack or tear at an angle rather than perpendicular to its surface. Increasing the voltage output is required to locate this type of defect.

NOTE

The calibration procedure must be repeated whenever:

- 1) The electrode is changed to a different type
- 2) The material, or thickness, of the coating or the lining changes

- 3.4.4 Small objects may have to be grounded prior to testing. Refer to Section 3.5.4 for more information about grounding.

3.5 Operation

- 3.5.1 When the Power Switch is toggled to the ON position, the circuitry will go into a self-test. The Fault Lamp will be lit initially, and the Horn may sound depending upon the position of the Sensitivity Adjust. After about 2 seconds the Test Indicator should light, and the Fault Indicator and Horn should be off.
- 3.5.2 Once the Model BD-60 is calibrated, sweep the electrode over the surface to be tested, touching the surface with the electrode. The corona generated at the tip of the electrode is what seeks out a minute pinhole or crack, and penetrates the defect to the metal surface below.
- 3.5.3 Understanding the nature of the typical defect encountered is important for proper operation. A very small pinhole of a diameter measured in microns will require a higher voltage than larger cracks or seam tears.
- 3.5.4 Grounding of the metal object whose coating or lining is being tested may be required for small objects weighing 1/2 lbs (225 g) or less. If grounding is required, it is recommended that the object be connected directly to the Ground Terminal on the front panel using as short a wire as possible.

- 3.5.5 Be careful not to set the Increase Voltage Adjust Knob too high when thin coatings are being tested, as a high voltage spark could puncture the coating. Recalibrate if in doubt.
- 3.5.6 At settings of the Increase Voltage Adjust Knob above 5, there may be a crackling sound at the probe tip. This is normal. If the operator accidentally touches the probe tip, the Fault Indicator Lamp will come on.
- 3.5.7 The unit is designed for continuous operation under normal conditions, but it is recommended that the power be turned off when not in use. If the unit is being used in an atmosphere where chlorinated products are present, or is used in a plating room, or other similar corrosive environments, it is advisable to remove this unit when not in use and store it away from these areas. Prolonged exposure can corrode the brass and other metal parts inside the instrument, shortening its service life.

3.6 Hazards

- 3.6.1 This instrument generates a pulse that acts like a high frequency, high voltage signal. Keep the electrode tip away from the body. A spark to the body will not cause harm, but will cause a slight discomfort, like the sensation felt when a spark jumps from the finger tip to a metal object after walking across a carpet on a dry day. The output of the instrument is at a very low current. Also, the skin of the body has a very high resistance to the high frequency current, causing any current to flow harmlessly over the skin.
- 3.6.2 Do not operate in or around flammable liquids or gases, as the spark might ignite them. Tanks which contain flammable liquids must be drained, cleaned, and completely dry before testing can begin. If used inside of a cargo tanker, someone located outside of the tank should always be observing the operator inside.
- 3.6.3 A small amount of ozone gas is generated around the tip of the electrode when oxygen in the air is ionized. The gas has a pungent odor, but is harmlessly dissipated in a normally ventilated area. Do not use in a confined area where high concentrations of ozone gas can develop.
- 3.6.4 The Model BD-60 generates an output that acts like a radio-frequency signal. Users who wear a pacemaker or other medical devices which might be affected by radio-frequency waves are advised to consult a physician before using this instrument.

SECTION 4--REPAIR

- 4.1.1 No user serviceable components are located in the Generator Handle. To remove the cover for servicing, disconnect the power line cord from its power source, and remove the two 1/4 in. hex-head screws located on either side of the front panel. Lay the unit down and carefully lift the front panel away from the chassis. Take care not to damage any of the wires, or their connections, while removing or reinstalling this panel.
- 4.1.2 Only personnel familiar with electronic circuitry should attempt repair. If it should become necessary to service while the front panel is removed, exercise caution as high voltage is present at various parts of the circuitry.

SECTION 5--REPLACEMENT PARTS

- 5.1.1 The following parts are replacement parts. They will cover most of the service-related repair which might be anticipated.

Part Number	Description
010-0003-1	Isolation Trans., 115 V
010-0007-3	Choke Coil
010-0012-1	Isolation Trans., 230 V
020-0032-1	Potentiometer, Sensitivity
020-0033-1	Potentiometer, Voltage
020-2001-3	Resistor, 250 Ω , Porcelain
021-0017-1	Capacitor, 10 μ F, 370 V
022-0009-1	SCR, High Voltage
024-0021-1	Power Supply-to-Generator Cord
025-2509-1	Printed Circuit Board Assembly
026-0022-3	Binding Post, Red
026-0023-3	Binding Post, Black

Part Number	Description
027-0001-1	Relay
027-0020-1	Signal Horn
028-0002-1	Pilot Light
029-0001-1	Switch, Toggle, SPST
029-0002-1	Fuse Holder
029-0023-1	Fuse, 1/2 A, 3AG
033-0015-1	Cabinet, w/o Front Panel
033-7019-1	Front Panel
044-0001-1	Adjusting Knob
045-0003-1	Electrode Socket
049-0001-1	Cabinet Handle Assembly
060-0001-1	Line Cord Set, 115 V
060-0003-1	Line Cord Set, 230 V