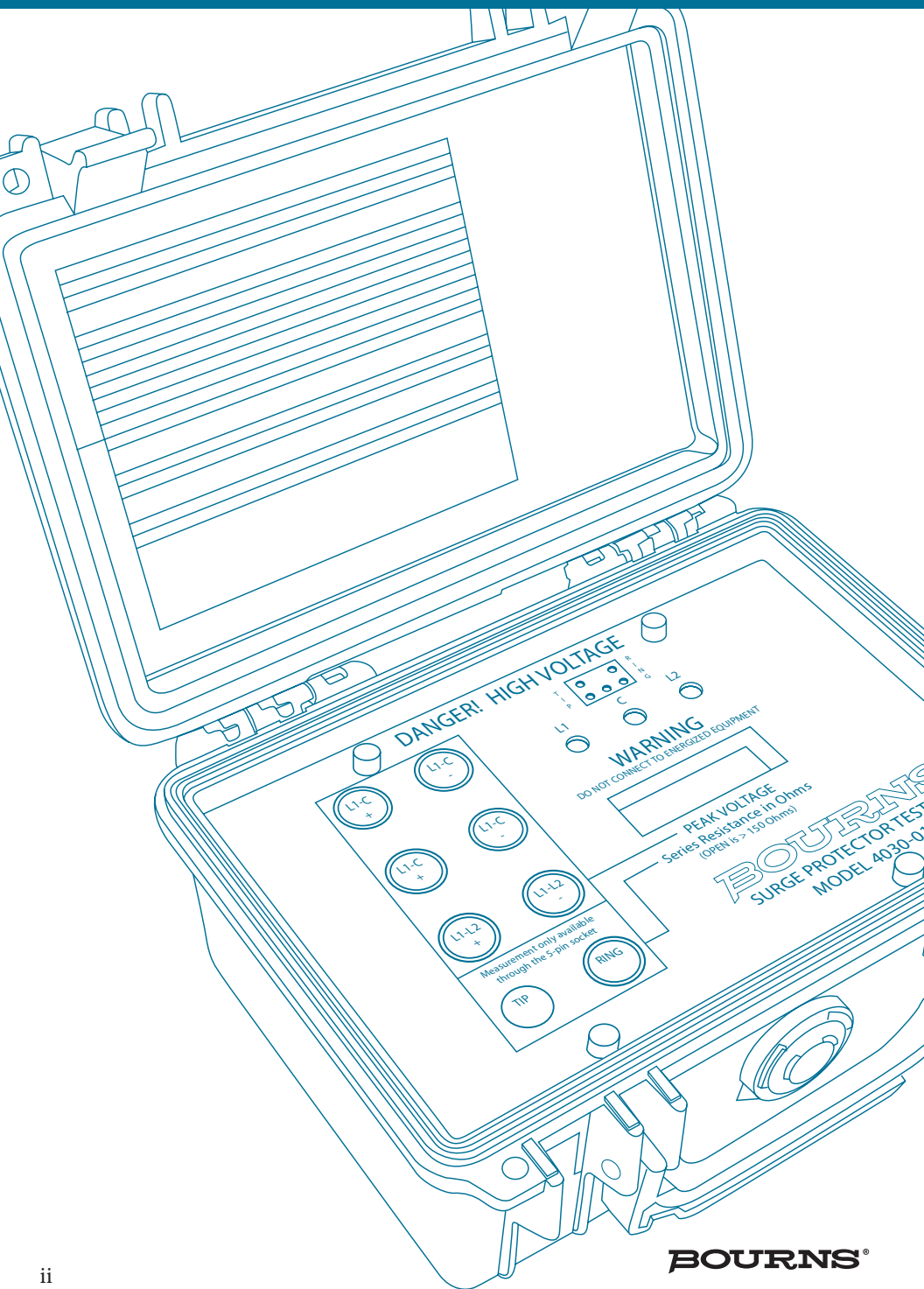


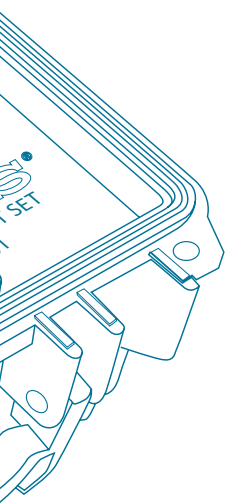


# Bourns® Model 4030 Surge Protector Test Set



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# Bourns® Model 4030 Surge Protector Test Set

## Safety

This tester produces a high voltage. The user should exercise care to keep hands away from the unit under test, and away from any open wires or exposed connections in the test circuit while the TEST button is depressed.

As soon as the tester senses 1 mA of current flow, the high voltage power supply is turned off. The meter will retain the reading until the button is released. High voltage conditions should be considered to exist at all times while the TEST button is depressed.

When testing arresters installed in ac power systems, ensure that the power system has been de-energized or the arrester is properly isolated from the power circuit. (Aside from technician safety considerations, the tester can be damaged if connected to any external voltage source.)

## Sécurité

*Cet appareil d'essai produit un courant haute tension. L'utilisateur doit faire preuve de prudence et garder ses mains à l'écart de l'unité mise à l'essai et de tout fil nu ou de toute connexion exposée du circuit d'essai tant que le bouton TEST est enfoncé.*

*L'alimentation à haute tension est désactivée dès que l'appareil d'essai détecte un flux électrique de 1 mA. Le compteur conserve le relevé jusqu'à ce que le bouton soit relâché. En toutes circonstances, les conditions de haute tension doivent être considérées comme existantes tant que le bouton TEST est enfoncé.*

*Lors de tests portant sur des dispositifs d'arrêt de systèmes d'alimentation en courant alternatif, vérifiez que le système d'alimentation est hors tension ou que le dispositif d'arrêt est bien isolé du circuit d'alimentation. (Outre les critères relatifs à la sécurité du technicien, l'appareil d'essai risque d'être endommagé s'il est branché à une source externe de tension quelconque.)*

## Description

The Bourns® Model 4030 Surge Protector Test Set is a portable, battery-operated, handheld tester designed to measure protection components and protection devices. Its unique design will measure all types of protectors repeatedly and accurately.

The Model 4030 is equipped with three output jacks used to test the voltage breakdown of 3-pole balanced or unbalanced protection components and devices, a 5-pin socket for testing 5-pin modules and an individual button that allows complete flexibility for testing any terminal combination and polarity. Testing 5-Pin modules through the 5-Pin socket enables the testing of shunt devices as well as series elements (Sneak Current Devices). Two-pole overvoltage protection can be tested by any pair of jacks (e.g., L1-C, L2-C or L1-L2) with the appropriate selection of a test button. Positive (+ setting) applies directional voltage L1 or L2 towards C. Negative (- setting) applies directional voltage C towards L1 or L2. Test cables and test adapter mounts for other common protection components are available from Bourns.

**Note:** L1 and Tip are the same connection and L2 and Ring are the same connection.

# Bourns® Model 4030 Surge Protector Test Set

## Theory of Operation

The tester employs a linear voltage ramp generator, a low energy capacitive discharge and a current limiting element, a precise 1 mA current detection and control circuit, and a peak-hold reading metering system. When 1 mA is conducted, the control circuit de-energizes the power supply but maintains the clamping/breakdown voltage reading on the meter as long as the test button is depressed.

When testing solid-state devices such as metal oxide varistors (MOVs), silicon avalanche diodes, Zener diodes and thyristor devices, the ramp voltage will increase until an exact 1 mA current is conducted through the device under test. At this 1 mA current, the detector immediately activates the control circuits which removes the voltage source in less than 50  $\mu$ s, latches the voltage peak-reading circuit, and displays the peak voltage on the meter. (After the tester has latched, it is normal for the reading to fluctuate  $\pm 1$  V.)

It should be noted that the current available from the tester is generally not enough to fully transition GDT and thyristor components and devices into the low voltage state. GDT based devices will show the DC Breakdown Voltage (DCBD) and for P-type thyristors, the breakover voltage  $V_{BO}$  (the highest voltage occurring across the thyristor) occurs at the device's Zener voltage  $V_Z$ . Therefore, the tester will measure actual  $V_{BO}$  of P-type protectors. For N-type thyristor devices,  $V_{BO}$  is higher than  $V_Z$ . Therefore, the tester will produce only  $V_Z$  measurements.

The tester senses current flow through the test device and at 1 mA, the control circuits are activated as described above. Two different voltage ramps can be selected by the user: 200 V/s or 1000 V/s. The selector jumper for this function is located within the tester enclosure. For laboratory testing, QA approvals and precise measurements of Gas Discharge Tubes (GDTs), the 200 V/s should be used. (GDTs can be sensitive to 1000 V/s  $dv/dt$  after surge duty with low voltage GDTs.) For high-speed bulk testing, sorting and incoming goods inspection, the 1000 V/s setting is practical. The tester has been factory set to 200 V/s.

## Testing of AC Surge Protectors

### ■ CAUTION

**AC Surge protectors must be tested with the power off. If you chose to disregard this warning and test with the power on and the fuses removed, please be aware that hazardous voltages will be present at the line terminals.**

The protector module's varistor voltage may be tested as follows:

- Disconnect power.
- Remove fuse(s) as well as relay(s) and indicator lights, if installed.
- Connect the positive test lead to the neutral terminal and the negative test lead to the line terminal of the module.
- Press and hold the test button until the reading stabilizes. Read the displayed value. This is the varistor voltage at 1 mA. Release the test button.

**Note:** Directional voltage testing is important as some AC Surge arrestors will only test properly in one direction. Care should be taken to ensure that testing is done in both + and - direction to verify accuracy of the test.

# Bourns® Model 4030 Surge Protector Test Set

## Calibration

### ■ To verify 1 mA detector sensitivity:

Connect a 100 K $\Omega$ , ¼ W (or higher wattage), 1 % or less tolerance resistor to the tester output. Press the appropriate TEST button and observe the clamping voltage. The metered voltage should be 90-110 V. To determine the acceptable limits when using a resistor with a value that is not 100 K $\Omega$ , use this formula:  $E = 10^{-3} \times R \pm 10 \%$ .

### ■ To verify meter accuracy:

Connect the output of the tester to a voltmeter standard (ideally with a known accuracy of +0.25 % or better and a 1 M $\Omega$  or greater input impedance). Press and hold the TEST button. When the readings on the tester and the standard stabilize, compare the two values and note any significant difference. The tester has no internal calibration adjustment. If the tester is off by an amount greater than 1 % and it is not desirable to employ a correction factor, return it to the factory for adjustment.

**Note:** Because of the “loading effect” of the standard’s impedance, the monitored voltage on both the standard and the tester may be lower than the open circuit voltage of the tester alone. With battery power, voltage on the voltmeter will begin to drop after reaching the peak.



## Specifications

Open circuit voltage rate of rise	200 V/s, 1000 V/s
Maximum output voltage <sup>1</sup>	1100 V
Usable measuring range <sup>2</sup>	5-1000 V
Sensing current	1 mA $\pm$ 10 %
Measurement accuracy <sup>3</sup>	1 % $\pm$ 1 count
In-line resistance measurement (Feature only available through the 5-pin socket.)	0 – 150 $\Omega$ (OPEN is > 150 $\Omega$ )
Resistance measurement accuracy	$\pm$ 10 %
Operating temperature	0 °C to +50 °C
Storage temperature	+10 °C to +60 °C
Batteries, 2 each (9 V)	Alkaline (Shorter battery life) Lithium (Longer battery life)
Battery Life (Lithium 1604LC)	up to 3,000 tests
Battery Life (Alkaline 1604A)	up to 1,500 tests
Warranty (except batteries)	2 years; any modification voids warranty

**NOTE:** Due to regulations, if the lithium battery option is ordered, the batteries are not installed but shipped separately. See battery installation on page 10.

**Read battery installation instructions on page 10 prior to first use.**

<sup>1</sup> Open circuit output voltage will vary depending on the battery status.

<sup>2</sup> Usable measuring range is about 90 % of the maximum open circuit voltage.

Measurement below 50 V is only applicable to components not sensitive to dv/dt.

<sup>3</sup> Measurement accuracy for low voltage reading is determined by the  $\pm$ 1 V count accuracy of the digital readout. Defined rate of rise starts at 50 V.

# Bourns® Model 4030 Surge Protector Test Set

## Battery Testing, Installation and Replacement

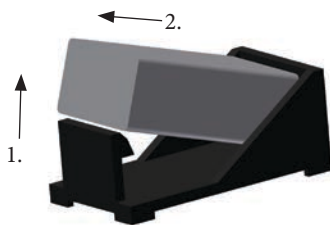
The tester is powered by two alkaline batteries (factory installed) and typically exhibits a life of 1,500 tests. For longer life, the user may install commercially available lithium 9 V batteries. Lithium batteries usually have a life of 3,000 tests depending on mAh type. As the batteries reach the end of useful life, the peak output voltage of the tester will start to drop and may affect the usable range. With no test device connected to the tester, and pressing one of the TEST buttons (i.e., L1—C +), the meter should read above 1000 V with fresh batteries. When the tester output meter is no more than 800 V with no test device connected to the tester, batteries should be replaced.

To replace batteries, remove the four thumb screws on the top of the panel. Batteries can only fit in their receptacles one way, but observe how they were oriented before removing and replacing.

## AC Power Option

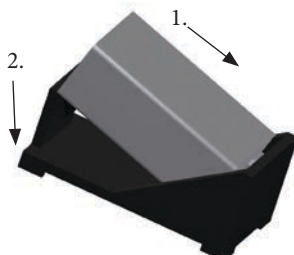
The Model 4030 has a receptacle in the back that accepts the plug of the 18 V<sub>dc</sub> power supply (P/N 50502-01). While the power supply is engaged, the tester will not draw battery power.

## Removal 9 V Battery



1. Lift the battery from the base.
2. Pull away from the holder.

## Installation of 9 V Battery



1. Observe the polarity of the battery.
2. Coming in at an angle, push the battery until the mating fully connects.
3. Push the battery down to the flush position.

## Battery Disposal

Please recycle used batteries.

In the United States, there are a large number of recycling centers available throughout the country.

To locate a center near you, you can call 1-800-8-BATTERY or 1-877-2-RECYCLE.

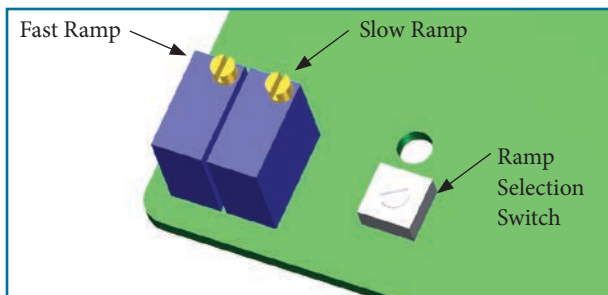
We suggest you visit Environment, Health and Safety Online (<http://www.ehso.com/battery.php>) for up-to-date details on battery disposal.

### DO NOT:

Recharge, disassemble, heat above 100 °C, or incinerate the lithium ion or alkaline battery in this unit. If a lithium ion or alkaline battery is subjected to high temperatures, it may explode.

# Bourns® Model 4030 Surge Protector Test Set

## Ramp (DVDT) Setting

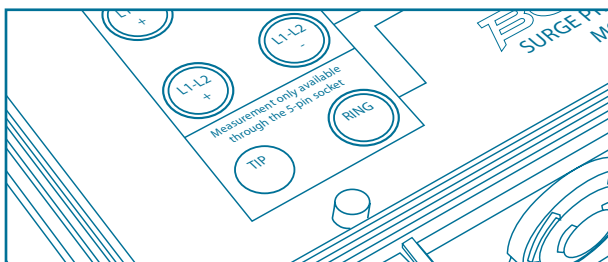


To access the internal ramp selection, open up the case (see **Battery Replacement**). Locate the Ramp Selection Switch and turn it either clockwise (slow ramp) or counter-clockwise (fast ramp) until it stops. The factory default setting is slow ramp (200 V/s). For accuracy of the Breakdown voltage it is recommended to use the 200 V/s setting. If faster testing speed is desired, the device can be set to 2000 V/s for both, AC and DC measurements. In certain cases there may be a slight increase in the Breakdown voltage at the faster rate of rise. This increase has no influence on the protection performance of the protector component or device under test.

## To Test DCBD (DC Breakdown)

Use the appropriate test accessory to make electrical contact with the test device. Select the terminals to be tested and the test polarity to be applied using the appropriate button on the face of the tester. Press the correct button for the desired test and hold until a reading is obtained. Repeat as necessary for the required number of tests.

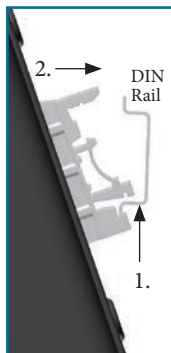
## To Test 5-pin In-line Resistance (feature only available through the 5-pin socket)



Plug in the 5-pin module to the 5-pin socket. Press and hold either the TIP  $\Omega$  or RING  $\Omega$  button. Readings are in Ohms. If the resistance reading is above 150  $\Omega$ , then the unit is considered an OPEN circuit.

## Tester Configuration Options

## Mounting Configurations - Wall Mount/Frame Mount Option



Although the 1000 V model (4030-01) can measure a low voltage device, when your application requires a precise measurement with a slow rise below 50 V, the 250 V model (4030-02) is recommended. With the 1000 V model, the startup may be as high as 50 V almost instantaneously; therefore, a  $dv/dt$  may no longer be within the desired limit.

**NOTE:** *The Wall Mount/Frame Mount option must be specified when ordering or returning to the factory for case modification.*

The Wall Mount/Frame Mount option is based on DIN 3 Rail hardware. An 8.7 inch DIN Rail is included with this option.

### Installing the DIN Rail to the wall securely before installing the Model 4030-01.

1. Using an appropriate fastener (not included); mount the DIN Rail to the wall.
2. Go in at an angle from the bottom (see arrow 1) and then push the top portion (see arrow 2) until a click is heard.

### Installing the DIN Rail to the frame:

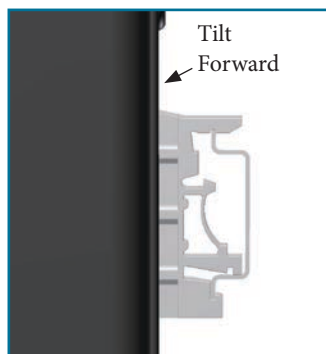
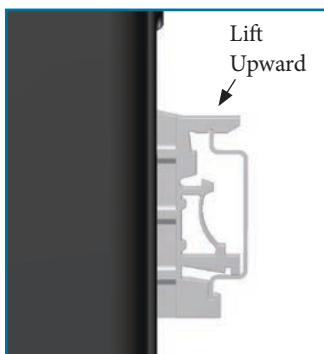
3. Locate the tester away from other operating switches or buttons.
4. Secure the DIN Rail to the frame using a 10/32 screw and/or nut (not included) or standard screw for your specific frame or cabinet.
5. Go in at an angle from the bottom (see arrow 1) and then push the top portion (see arrow 2) until a click is heard.

In the Wall Mount/Frame Mount configuration, the lid is open and in the down position.



# Bourns® Model 4030 Surge Protector Test Set

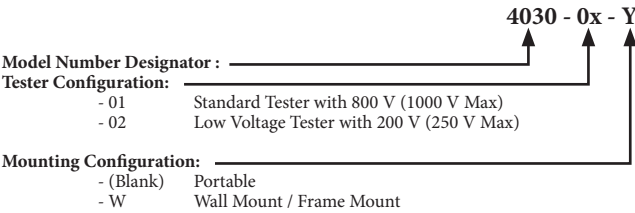
## Removal from the DIN Rail



1. With a small screwdriver, lift up the top portion of the DIN Rail adapter on both sides.
2. Tilt in a forward / downward direction and remove.
3. WARNING: Do not force removal as the DIN Rail adapter may break or the screw holding the adapter may be stripped.



Ordering Information



Test Accessories

Test Cables, with insulated alligator clips able to grasp 3/8 inch terminals  
- recommended for testing AC Arresters or Station Protectors:

- P/N 30503-01 Test Cable w/ Alligator clip - 48-inch Red
- P/N 30503-02 Test Cable w/ Alligator clip - 48-inch Black
- P/N 30503-03 Test Cable w/ Alligator clip - 24-inch Red
- P/N 30503-04 Test Cable w/ Alligator clip - 24-inch Black



P/N 72288  
2-Pole Adapter, for button type with and without leads



P/N 72289  
3-Pole GDT Adapter, for protection components with leads on 4.4, 4.7 and 6.4 mm centers



P/N 72292  
Adapter for 1-pin to 5-pin module



P/N 72293  
Adapter for 4-pin to 5-pin module



P/N 50502-01  
120 VAC to 18 VDC Adapter

4030 Surge  
Protector  
Test Set  
Worksheet

Test Equipment			Calibration Due Date
Oscilloscope			
Digital Multimeter			
4010 Standard Calibration Box			

Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

SN: \_\_\_\_\_

Tested By: \_\_\_\_\_

Visual Inspection:        \_\_\_\_ Done

Fresh Batteries Installed:        \_\_\_\_ Done

Open Circuit Voltage Test: DVM = \_\_\_\_ V

LCD=    \_\_\_\_ V

Polarity Comparison Test: P / F

200 V/s Ramp Test:        (S/B < 50 V for 200 P.S.) START UP \_\_\_\_ V

(S/B < 100 V for 800 V P.S.) START UP \_\_\_\_ V

(180—220 V/S) dv/dt \_\_\_\_ V/SEC

1000 V/s Ramp Test:        (S/B < 50 V for 200 V P.S.) START UP \_\_\_\_ VOLT

(S/B < 100 V for 800 V P.S.) START UP \_\_\_\_ VOLT

(800—1200 V/S) dv/dt \_\_\_\_ V/SEC

1 mA Shut Off Test:        (198 - 202 V)        \_\_\_\_ VOLT

Diode Verification Test: Cal Box Value A        \_\_\_\_ V

Cal Box Value B        \_\_\_\_ V

Cal Box Value C        \_\_\_\_ V

Cal Box Value D        \_\_\_\_ V

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