

# *Multimeter with Temperature*

## *Instruction Sheet*

### **Read First: Safety Information**

To ensure that the meter is used safely, follow these instructions:

- Do not use the meter if the meter or test leads appear damaged, or if you suspect that the meter is not operating properly.
- Disconnect the live test lead before disconnecting the common test lead.
- When using the probes, keep your fingers behind the finger guards on the probes.
- Do not use the V•Check mode to measure voltages in circuits that could be damaged by this mode's low input impedance ( $\cong 2 \text{ k}\Omega$ ).
- Turn off power to the circuit under test before cutting, desoldering, or breaking the circuit. Small amounts of current can be dangerous.
- Do not apply more than 600V rms between a meter terminal and earth ground.
- Use caution when working with voltages above 60V dc or 30V ac rms. Such voltages pose a shock hazard.

## Symbols



Press button.



Press button to switch between modes.



Double insulation.

MAN

Manual ranging mode.

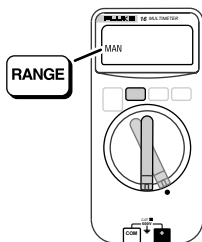
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## Automatic Range Selection

The meter defaults to autoranging when you turn it on. The 4000 mV range can be entered only with manual range selection.

## Manual Range Selection



To return to autoranging, press **RANGE** for 2 seconds, or change the measurement mode.

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## Battery Saver™

If the meter is ON but inactive and not connected to voltage for more than 45 minutes, the display goes blank to preserve battery life. To resume operation, press any button.

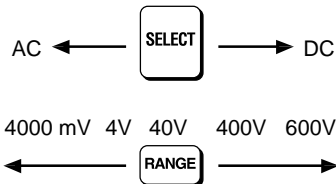
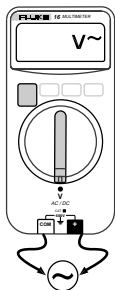
Battery Saver™ is disabled in MIN/MAX record mode.

# AC and DC Voltage

Also refer to V•Check.

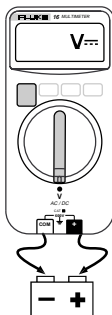
## Volts AC

Input Impedance  $\approx 5\text{ M}\Omega$   
50 Hz to 400 Hz



## Volts DC

Input Impedance  $\approx 10\text{ M}\Omega$

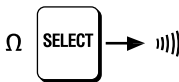
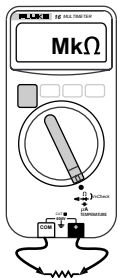


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# Resistance and Continuity $\Omega$ )))

Turn off circuit power before testing. Also refer to V•Check.

## Resistance

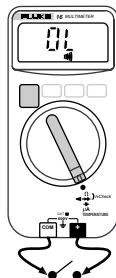
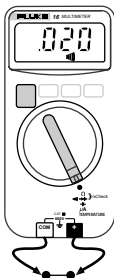


Low Impedance  
V•Check

400% 4 k% 40 k% 400 k% 4 m% 40 m%



## Continuity



Short  
<25Ω  $\mu$ )))  $\rightarrow$

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Detects shorts and opens  $\geq 250\ \mu\text{S}$ .

## **⚠ V•Check**

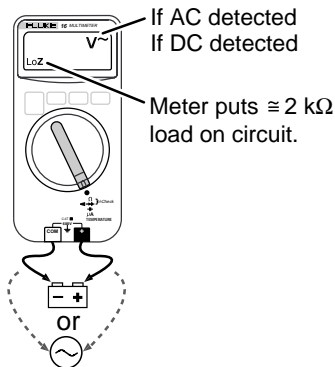
If a dc or ac voltage greater than about 4.5V is present across the inputs when the meter is set to  $\text{V}\sim$ ,  $\text{V}\rightarrow$ , or  $\Omega$ , the meter switches automatically to dc or ac voltage mode (V•Check mode).

### **⚠ Warning**

**Repetitive transients on a dc bus will cause V•Check to select ac volts, even though a hazardous dc voltage may be present. To avoid a misleading display and possible electric shock, manually select the proper volts function for measurements on these circuits.**

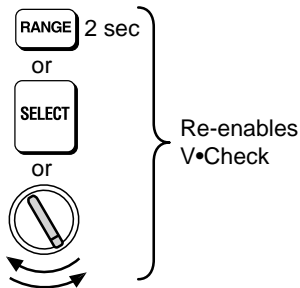
When V•Check is activated, the meter has low input impedance (LoZ)  $\approx 2\text{ k}\Omega$ . This load can alter the voltages in electronic control circuits. Do not use V•Check to measure voltage in circuits that could be damaged by a  $2\text{ k}\Omega$  load.

Hint: V•Check can be effectively used to eliminate “ghost” voltages.

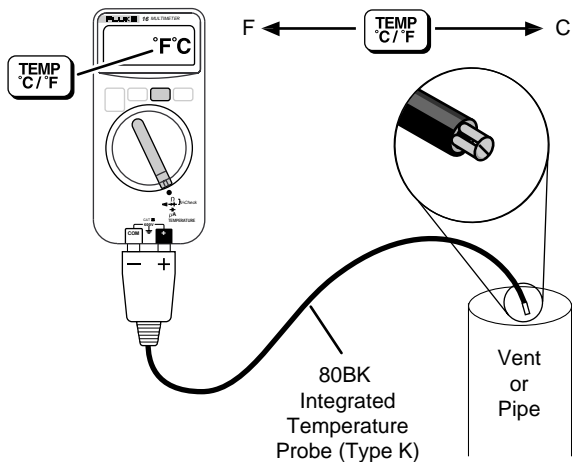


### **Disable and re-enable V•Check**

**RANGE** For  $\text{V}\sim$ ,  $\text{V}\rightarrow$  and  $\Omega$ ,  
Disables V•Check and  
locks meter in selected  
mode.



# Temperature



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Note correct connector polarity.

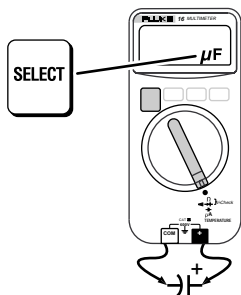
To meet stated accuracy, the 80BK temperature adapter must be at the same temperature as the meter.

## Warning

To avoid possible electric shock, **DO NOT** apply thermocouple tip to any conductor that is greater than 30V AC, 42.4V pk, or 60V DC to earth.

## Capacitance $\mu\text{F}$

Turn off circuit power; then disconnect and discharge the capacitor before measuring capacitance.



If the capacitor requires more discharging, **diSC** is displayed while the capacitor discharges.

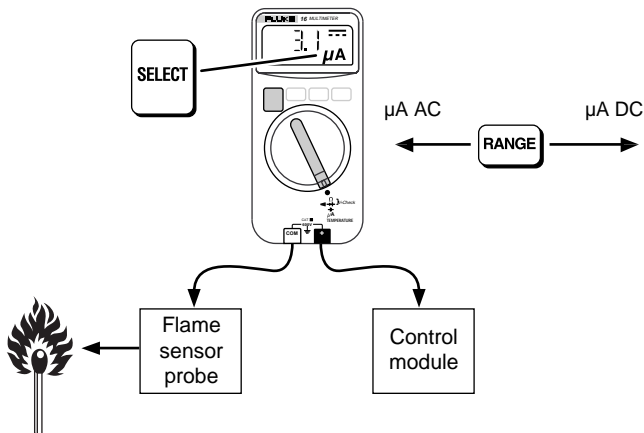


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Note correct probe polarity for polarized capacitors.

# Microamps $\mu\text{A}$

Range 0 to 200  $\mu\text{A}$



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Example: Flame rectification circuit.

To measure flame rectification circuits:

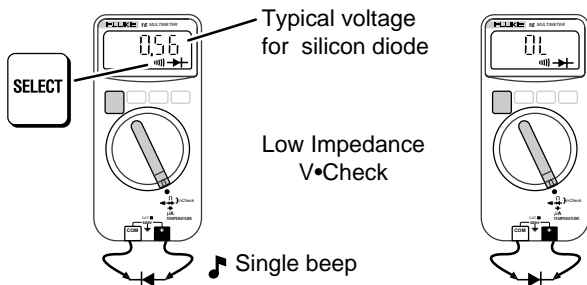
1. Turn function switch to far right position.
2. Push select button 3 times to select  $\mu\text{A}$ .
3. Connect meter between flame sensor probe and control module.
4. Turn heating unit on and record  $\mu\text{A}$  measurement.

## Diode Test $\rightarrow$

Turn off circuit power before testing. For best results diodes should be measured out of circuit.

Also refer to V•Check.

### Good Diode

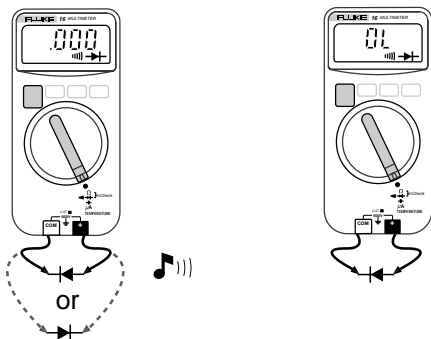


Forward Bias

Reverse Bias

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### Bad Diode



Shorted

Open

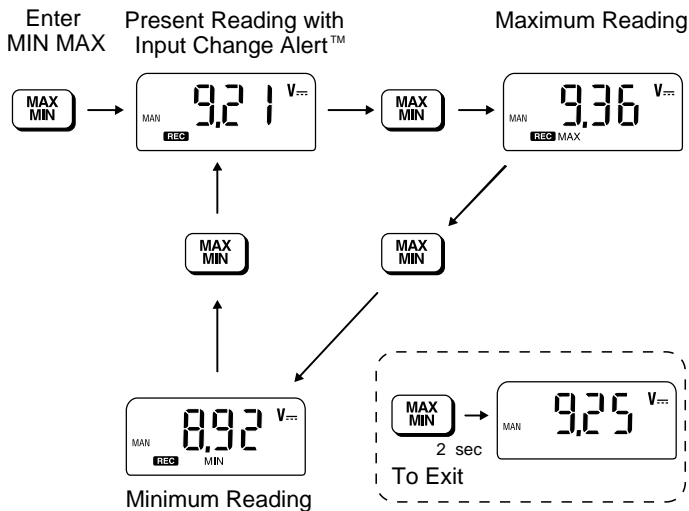
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# MIN MAX

**(Records the lowest and highest measurements)**

V•Check, autoranging, and Battery Saver™ are disabled. Put the meter in the proper range before entering MIN MAX.


When the reading changes more than about 50 digits, the meter gives a short beep. When a new minimum or maximum is recorded, the meter gives a long beep.

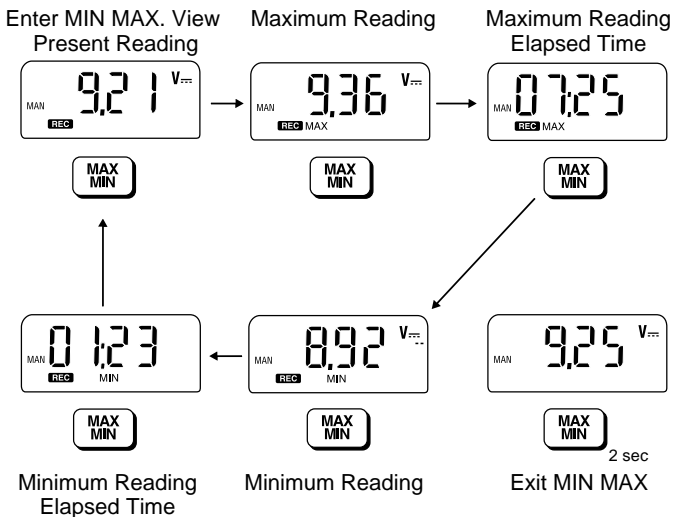


## MIN MAX with Elapsed Time



Records the hours and minutes between when MIN MAX was entered and the last high and low was recorded. OL is displayed for times longer than 99:59.

To enable the MIN MAX timer, hold down  while turning the rotary switch from OFF to either measurement mode.



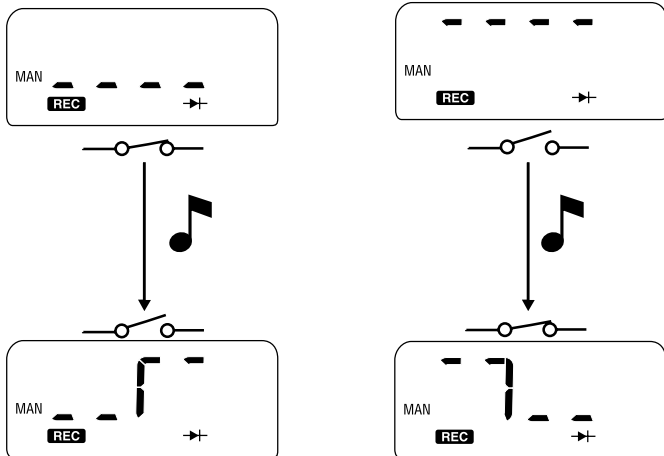
## Disabling the Beeper

To disable the beeper for all modes, hold down **RANGE** for 2 seconds while turning the meter on.

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## Continuity Capture™

To set up the meter to capture intermittent shorts and opens, turn the switch to **→+|||)**, connect the leads to the circuit; then press **MIN MAX**.



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Captures transitions longer than  $250 \mu\text{s}$  ( $1/4000^{\text{th}}$  of a second).

Transitions after the first transition cause the meter to beep, but the display does not change.

To reset the display to the current condition, press **MIN MAX**.

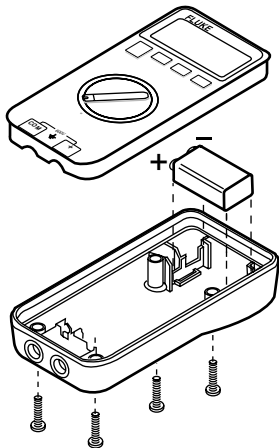
To exit, press **MIN MAX** for 2 seconds, or change the measurement mode.

## Maintenance

Clean the case with a damp cloth and detergent. Do not use abrasives or solvents.

## Battery Replacement

Remove the test leads before disassembling the case.



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## Replacement Parts

Fluke TL-75 (Double-insulated leads)  
80BK (Integrated Temperature Probe)

PN 855705  
PN 1273124

## Service and Parts

This meter should be serviced only by a qualified service technician. To locate an authorized service center, call:

USA: 1-888-99-FLUKE (1-888-993-5853)  
Canada: 1-800-36-FLUKE (1-800-363-5853)  
Europe: +31 402-675-200  
Japan: +81-3-3434-0181  
Singapore: +65-738-5655  
Anywhere in the world: +1-425-446-5500

Or, visit Fluke's Web site at [www.fluke.com](http://www.fluke.com).

## Specifications

Accuracy is specified for a period of one year after calibration, at 18°C to 28°C (64°F to 82°F) with relative humidity to 90%. AC conversions are ac-coupled, average responding, and calibrated to the rms value of a sine wave input. Accuracy specifications are given as follows:

$\pm$ ([% of reading] + [number of least significant digits])

| Function   | Range                           | Resolution        | Accuracy  |
|--|---------------------------------|-------------------|---|
| Temperature<br>(Type K Thermocouple)               | -10°C to 400°C<br>14°F to 752°F | 0.1°C or<br>0.2°F | $\pm(1.0\% + 0.8^\circ\text{C})$<br>typical<br>$\pm(1.0\% + 1.5^\circ\text{F})$ typical |
|  | -40°C to -10°C<br>-40°F to 14°F | 0.1°C or<br>0.2°F | $\pm(5.0\% + 1.5^\circ\text{C})$<br>typical<br>$\pm(5.0\% + 3.3^\circ\text{F})$ typical |
| Error does not include Type K Thermocouple errors. |                                 |                   |   |

| Function                        | Range                              | Resolution          | Accuracy  |
|---------------------------------|------------------------------------|---------------------|---|
| $V_{\sim}$<br>(50 to 400 Hz)    | 4000 mV <sup>1</sup>               | 1 mV                | $\pm(1.9\% + 3)$  |
|                                 | 4.000V                             | 0.001V              | $\pm(1.9\% + 3)$  |
|                                 | 40.00V                             | 00.01V              | $\pm(1.9\% + 3)$  |
|                                 | 400.0V                             | 000.1V              | $\pm(1.9\% + 3)$  |
|                                 | 600V                               | 1V                  | $\pm(1.9\% + 3)$  |
| $V_{\text{---}}$                | 4000 mV <sup>1</sup>               | 1 mV                | $\pm(0.9\% + 2)$  |
|                                 | 4.000V                             | 0.001V              | $\pm(0.9\% + 2)$  |
|                                 | 40.00V                             | 00.01V              | $\pm(0.9\% + 1)$  |
|                                 | 400.0V                             | 000.1V              | $\pm(0.9\% + 1)$  |
|                                 | 600V                               | 1V                  | $\pm(0.9\% + 1)$  |
| $\Omega$                        | 400.0 $\Omega$                     | 0.1 $\Omega$        | $\pm(0.9\% + 2)$  |
|                                 | 4.000 k $\Omega$                   | 0.001 k $\Omega$    | $\pm(0.9\% + 1)$  |
|                                 | 40.00 k $\Omega$                   | 0.01 k $\Omega$     | $\pm(0.9\% + 1)$  |
|                                 | 400.0 k $\Omega$                   | 0.1 k $\Omega$      | $\pm(0.9\% + 1)$  |
|                                 | 4.000 M $\Omega$                   | 0.001 M $\Omega$    | $\pm(0.9\% + 1)$  |
|                                 | 40.00 M $\Omega$                   | 0.01 M $\Omega$     | $\pm(1.5\% + 3)$  |
| $\text{---}\text{  }\text{---}$ | 1.000 $\mu\text{F}$                | 0.001 $\mu\text{F}$ | $\pm(1.9\% + 2)$  |
|                                 | 10.00 $\mu\text{F}$                | 0.01 $\mu\text{F}$  | $\pm(1.9\% + 2)$  |
|                                 | 100.0 $\mu\text{F}$                | 0.1 $\mu\text{F}$   | $\pm(1.9\% + 2)$  |
|                                 | 10000 $\mu\text{F}$                | 1 $\mu\text{F}$     | $\leq 1000 \mu\text{F} \pm(1.9\% + 2)$<br>$> 1000 \mu\text{F} \pm(10\% + 90)$ typical |
|                                 | 1) $\text{---}\text{  }\text{---}$ | 2.000V              | 0.001V  |

1. The 4000 mV range can be entered only in manual range mode. Use the 4000 mV range with accessories.
2. The beeper is guaranteed to come on at  $<25\Omega$  and turn off at  $>250\Omega$ . The meter detects opens or shorts  $\geq 250 \mu\text{s}$ .

| Function                                   | Range                  | Resolution        | Accuracy                      | Burden Voltage       |
|--|------------------------|-------------------|-------------------------------|----------------------|
| $\tilde{\mu\text{A}}$<br>(50 Hz to 400 Hz) | 0 to 200 $\mu\text{A}$ | 0.1 $\mu\text{A}$ | $\pm(2\% + 3 \text{ counts})$ | <5 mV/ $\mu\text{A}$ |
| $\overline{\mu\text{A}}$                   | 0 to 200 $\mu\text{A}$ | 0.1 $\mu\text{A}$ | $\pm(1\% + 2 \text{ counts})$ | <5 mV/ $\mu\text{A}$ |

| Function   | Overload Protection <sup>1</sup> | Input Impedance (Nominal)  |   |          |
|--|----------------------------------|--|---|----------|
| $V_{\sim}$   | 600V rms                         | >5 M $\Omega$ <100 pF<br>V•Check and LoZ = >2 k $\Omega$ <200 pF (ac coupled) <sup>2</sup> |   |          |
| $V_{\text{---}}$   | 600V rms                         | >10M $\Omega$ <100 pF<br>V•Check and LoZ = >2 k $\Omega$ <200 pF <sup>2</sup>              |   |          |
|  |                                  | Common Mode Rejection Ratio (1 k $\Omega$ Unbalanced)                                      | Normal Mode Rejection                                 |          |
| $V_{\sim}$   | 600V rms                         | >60 dB at dc 50 or 60 Hz   |   |          |
| $V_{\text{---}}$   | 600V rms                         | >100 dB at dc, 50 or 60 Hz   | >50 dB at 50 Hz or 60 Hz                              |          |
|  |                                  | Open Circuit Test Voltage  | Full Scale Voltage<br>To 4.0 M $\Omega$ 40 M $\Omega$ |          |
| $\Omega$   | 600V rms                         | <1.5V dc   | <450 mV dc  | <1.5V dc |
| $\rightarrow\text{+}$  | 600V rms                         | 2.4-3.0V dc  | 2.400V dc   |          |
|  |                                  | Short Circuit Current  |   |          |
| $\Omega$   | 600V rms                         | <500 $\mu\text{A}$   |   |          |
| $\rightarrow\text{+}$  | 600V rms                         | 0.95 mA (typical)  |   |          |
| <p>1. <math>3 \times 10^6</math> V Hz maximum</p> <p>2. <math>\cong 2</math> k<math>\Omega</math> input impedance up to 50V. Impedance increases with input voltage to &gt;300 k<math>\Omega</math> at 600V.</p> |                                  |  |   |          |

### MIN MAX Recording Accuracy and Response Time

Specified accuracy of the measurement function  $\pm 12$  digits in dc for changes >200 ms in duration ( $\pm 40$  digits in ac). Typical 100 ms response to 80%.

Example 1: This would mean  $\pm 1.2^\circ$  when recording temperature.

Example 2: This would mean  $\pm 12 \mu\text{A}$  when recording  $\mu\text{A}$  or  $\pm 12\text{A}$  if used with a dc amp probe (with a mV input).

## MIN MAX Recording with Elapsed Time

| Elapsed Time           | Resolution | Accuracy     |
|------------------------|------------|--------------|
| 0 to 100 hours (99:59) | 1 minute   | 0.3% typical |

**Maximum Voltage  
Between any Terminal  
and Earth Ground:**

600V rms

**Display:**

3 3/4-digits, 4000 counts, updates 4/sec

**Operating Temperature:**

-10°C to 50°C (14°F to 122°F)

**Storage Temperature:**

-30°C to 60°C (-22°F to 140°F)  
indefinitely (to -40°C (-40°F) for 100 hrs)

**Temperature  
Coefficient:**

(.1 x specified accuracy)/°C (<18°C or  
>28°C)

**Relative Humidity:**

0% to 90% (-10°C to 35°C; 14°F to 95°F)  
0% to 70% (35°C to 50°C; 95°F to 122°F)

**Battery Type:**

9V, NEDA 1604 or IEC 6F22

**Battery Life:**

650 continuous hours with alkaline  
450 continuous hours with carbon-zinc

**Shock, Vibration:**

3 meter drops.

**Size (H x W x L):**

3.46 cm x 7.05 cm x 14.23 cm  
(1.35 in x 2.75 in x 5.55 in)

**Weight:**

286g (10 oz)

**Safety:**

Designed to Protection Class II  
requirement of UL3111, ANSI/ISA-S82,  
CSA C22.2 No 231, and VDE 0411, and  
IEC 1010 overvoltage Category III (CAT  
III, 600 Volts).

**EMI Regulations:**

Complies with FCC Part 15, Class B, and  
VDE 0871B. Trademark of TÜV Product  
Services. Complies with EN 61010-1:  
1993.

**Certifications:**



TUV, UL and VDE

## LIMITED WARRANTY & LIMITATION OF LIABILITY

Each Fluke product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is three years and begins on the date of shipment. Parts, product repairs and services are warranted for 90 days. This warranty extends only to the original buyer or end-user customer of a Fluke authorized reseller, and does not apply to fuses, disposable batteries or to any product which, in Fluke's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation or handling. Fluke warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. Fluke does not warrant that software will be error free or operate without interruption.

Fluke authorized resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Fluke. Warranty support is available if product is purchased through a Fluke authorized sales outlet or Buyer has paid the applicable international price. Fluke reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country.

Fluke's warranty obligation is limited, at Fluke's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a Fluke authorized service center within the warranty period.

To obtain warranty service, contact your nearest Fluke authorized service center or send the product, with a description of the difficulty, postage and insurance prepaid (FOB Destination), to the nearest Fluke authorized service center. Fluke assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Fluke determines that the failure was caused by misuse, alteration, accident or abnormal condition of operation or handling, Fluke will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

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