

## Warranty

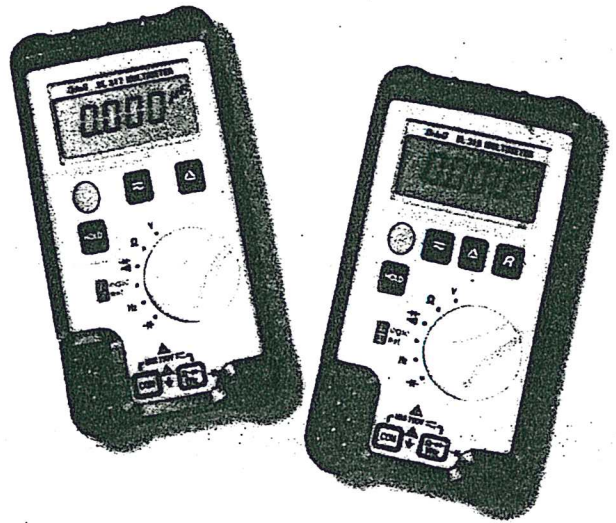
Your digital multimeter is warranted to be free from defects in materials and workmanship for a period of five years from the date of purchase. If, within the warranty period, your meter should become inoperative from such defects, the unit will be repaired or replaced at our option. This warranty covers normal use and does not cover damage which occurs in shipment or failure which results from alteration, tampering, accident, misuse, abuse, neglect, or improper maintenance. A purchase receipt or other proof of date of original purchase date will be required before warranty repairs will be rendered. Instruments out of warranty will be repaired for a service charge. Return the unit postage paid and insured to:

### UEI Service Department

8030 SW Nimbus • Beaverton, OR 97008  
(503) 644-8723 • Fax: (503) 643-6322

This warranty gives you specific legal rights. You may also have other rights which vary from state to state.

**DrloG<sup>®</sup>**



## **DL317 • DL319 DIGITAL MULTIMETERS**

## **USER'S MANUAL**

## Measurement Limits

DC Voltage:	0 to 750V.
AC Voltage:	0 to 750V
Resistance:	0 to 20M $\Omega$
Capacitance:	0.001 $\mu$ F to 9999 $\mu$ F
Frequency:	1 Hz to 200 KHz
Continuity Check:	Beep at Approx. <100 $\Omega$ in the 400 $\Omega$ range
Logic Probe Function:	-9.9V to 39.9V DC (up to 400KHz)



### **Warning!**

Read "Safety Considerations" before using this meter.

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# 1. Introduction

This meter is a hand held and battery operated instrument that is designed and tested according to IEC Publication 1010 (Overvoltage Category III) and other safety standards (see section 10. Technical Data and Specifications)











## Features of This Meter

- 3 3/4 digit, 4000 count LCD with 41 segment bar graph
- Auto Range or Manual Range Selection
- Standby Mode Indicator
- Data Hold
- Logic Probe Function
- Capacitance Measurement
- Frequency Measurement
- Fast Continuity Beeper
- Max/Min Recording Function (DL319 only)
- Diode Test
- Rubber Boot
- Auto Polarity
- Battery Replacement Indicator

## 2. Safety Considerations

Before using this meter, read the following safety information carefully. If the product is not used as described in this manual, the safety features may be severely impaired. In this manual, the word "Warning" is used for conditions and actions that pose hazard(s) to the user; the word "Caution" is used for conditions and actions that may damage this meter.

### International Symbols:

	Dangerous Voltage (risk of electric shock)
	Not Applicable to Identified Model
	Alternating Current (AC)
	Direct Current (DC)
	Either AC or DC
	Diode
	Capacitor
	Ground (allowable applied voltage range between the input terminal and earth)
	Caution! Refer to the user's manual before using this meter.
	Double Insulation (Protection Class III)

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### Warning!

Observe all safety precautions when measuring higher voltages. Turn off power to the circuit under test, set this meter to the desired function and range, and connect the test leads to this meter and then to the circuit under test. Reapply power. If an erroneous reading is observed, disconnect power immediately and recheck all settings and connections.

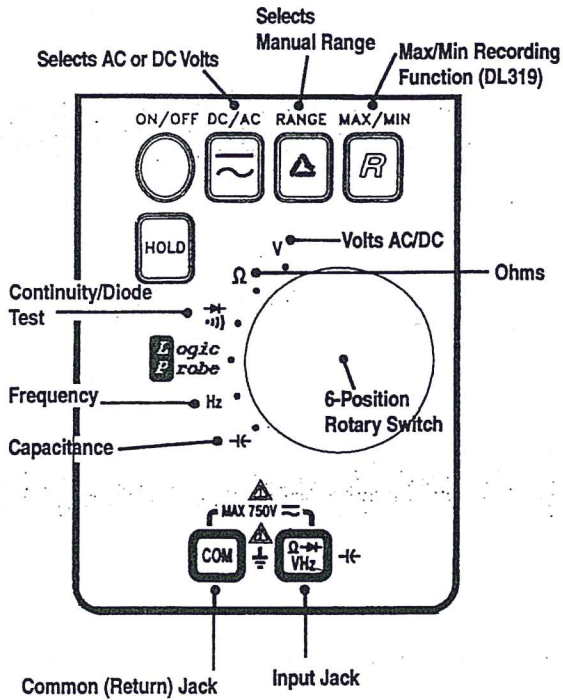
### Safety Tips

Exceeding the specified limits of this meter is dangerous and can expose the user to serious and possibly fatal injury. To ensure safe and appropriate use, please follow the safety guidelines below:

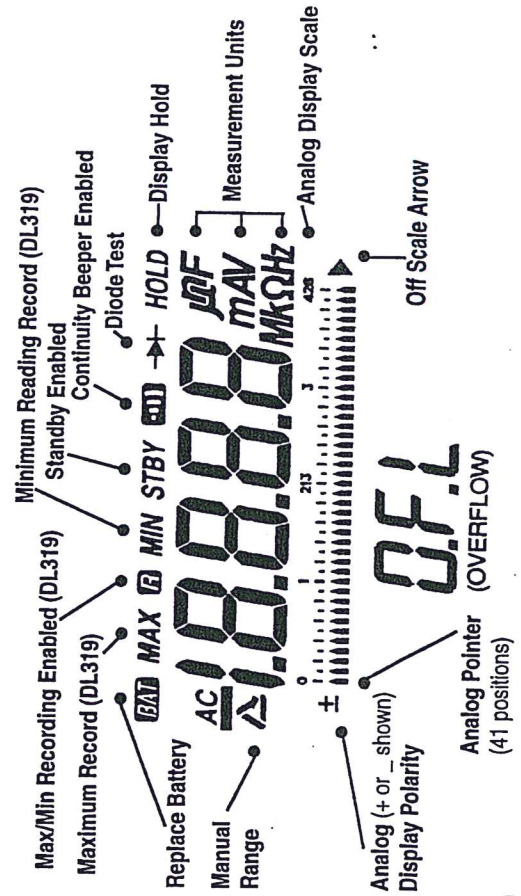
- Do not try to measure any voltage that exceeds 750DCV or 750ACV peak.
- Voltages above the 60VDC or 25VAC RMS may constitute a serious shock hazard.
- Do not attempt to use this meter if either the meter or the test leads have been damaged.
- Turn off power to the circuit under test before cutting, unsoldering, or breaking the circuit. Small amounts of current can be dangerous.
- Disconnect the live test lead before disconnecting the common test lead.
- When using the test leads, keep your fingers away from probe contacts. Always grip behind the finger guards on the probes.

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### 3. Explanation of Controls and Indicators



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### Holster and Stand

The meter comes with a snap-on holster that absorbs shocks and protects the meter from rough handling. The holster is equipped with a stand rest.

## 4. Standby Mode

If the meter is on and inactive for approximately 30 minutes, the meter will switch to Standby Mode. In this mode, the display will blink "STBY" and circuit power is reduced to save battery life. To resume operation, press any button or control. To disable the Standby Mode, press both the ON/OFF and HOLD buttons for two seconds.

Note: If the meter is in the Min/Max Mode, Standby is not activated.





## 5. Auto and Manual Ranging

### Autoranging

When first turned on, the meter always comes up in the Autorange Mode. In this mode, the meter will automatically select the appropriate range for best resolution.

### Manually Selecting a Range

To manually select a range:


1. Press  to select Manual Range function.
2. Press  to step through the ranges (indicated by position of the decimal point). The meter beeps whenever the range changes.
3. To return to Autorange, press  for two seconds or change to any other measurement function. "" is no longer displayed.

## 6. General Testing and Measuring

### 6.1 Measuring Volts

#### Warning!

To avoid the risk of electrical shock, instrument damage and/or equipment damage, input voltage must not exceed 750 volts DC or peak AC. Do not attempt to take any unknown voltage measurement that may be in excess of 750 volts DC or peak AC.

1. Insert the test leads in the jacks.
2. Set the rotary switch to the voltage function. To select either DC or AC, press .
3. Touch the probes to the test points and read the display. The meter will beep and display OFL (overload) if the voltage exceeds the limits of the meter.

### 6.2 Measuring Resistance


#### Caution!

Turn off power and discharge all capacitors on circuit to be tested before attempting in-circuit resistance


measurements. Failure to do so may end up in equipment and/or instrument damage.

1. Insert the test leads into the jacks.
2. Set rotary switch to the Ohms function.
3. Touch the probes to the test points and read the display.

### 6.3 Testing Continuity and Diodes

1. Insert the test leads in the jacks.
2. Set the rotary switch to the Continuity/Diode function.  


3. To check continuity, touch the probes to the test points. The beeper will sound continuously if continuity exists (resistance  $<100\Omega$ ).

To turn the beeper off in Continuity/Diode Test Mode, press . "di" is displayed only when the beeper is enabled.

4. To test diodes, touch the probes to the diode. A forward-voltage drop of about 0.6V (typical for a silicon diode) is displayed if the diode is good. Reverse the probes. If the diode is good, "OFL" is displayed. If the diode is shorted, you will hear 2 beeps in at least one direction. If the diode is open, "OFL" is displayed in both directions.

### 6.4 Measuring Frequency


1. Insert the test leads into the jacks.
2. Set the rotary switch to the Frequency function.
3. Touch the probes to the test points and read the display. IF the measured frequency is greater than 200 KHz, "OFL" (overload) is displayed.

In frequency, the meter is always autoranging and the MAX/MIN Recording function is disabled.

### 6.5 Measuring Capacitance



Discharge all capacitors before attempting to take measurements. Failure to do so can result in damages to the meter.

1. Insert the test leads into the jacks.
2. Set the rotary switch to the Capacitance function.
3. Touch the probes to the capacitor and read the display. When measuring polarized capacitors, connect the positive to the  terminal and the negative to the COM terminal. On larger capacitors, "di SC" will be displayed while the capacitor is discharging.



NOTE: Use manual range mode to get faster response of reading when measuring capacitance in the ranges of 1000 $\mu$ F or 10000 $\mu$ F.

In capacitance, the MAX/MIN Recording function is disabled (DL319 only).

## 7. Logic Probe Function

This function is ideal for analyzing digital logic levels at frequencies up to 400 KHz and detects pulses as narrow as 2.5 $\mu$ S for those high-speed logic circuits. When this function is selected, the display shows if the test point is at a logic level high or low, or is pulsing or not active.

1. Set the rotary switch to the Logic Probe function.
2. Connect the test leads to the test point.
3. If the high output is active and low output has been active for more than one second, this meter automatically measures the voltage and displays it in two right most digits along with an "H." If the high output is more than 39.9VDC, this meter displays an "H OL."



If the low output is active and the high output has been inactive for more than one second, this meter automatically measures the voltage and displays it in the two rightmost digits along with an "L", when a negative sign may be needed in the second digit. If the low output is less than -9.9VDC, this meter displays an "L OL."

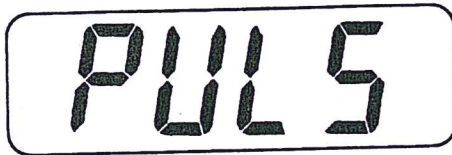


L - 3.5 v



L OL v

If both the low output and the high output have been active within the last second, this meter displays:



PULS

If neither output is active, this meter displays:



OPEN

## 8. Max/Min Recording Function (DL319 only)

This function allows you to record either the highest or lowest measurements taken. This function cannot be used when the meter is measuring frequency and capacitance or continuity/diode. In Max/Min Recording Mode, Standby, Logic Probe, and Autoranging functions are disabled.

1. Insert the test leads into the jacks.
2. Put the meter in the Voltage or Ohms function.
3. Connect the test leads to the circuit under test.
4. Press **(R)** to enter Max/Min Mode. When a new maximum or minimum is recorded, the meter beeps.
5. Press **(R)** to cycle through maximum, minimum and present readings. To exit Max/Min Recording, press **(R)** for two seconds or change the measurement function. The meter will return to Autorange Mode.

## 9. Maintenance

### Warning!

To avoid electrical shock or damage to the meter, do not get water inside the case. Remove the test leads and any input signals before opening the case.

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

### Battery Replacement

The meter uses a 9V battery (NEDA 1604 or IEC 6F22).

To replace the battery, remove the two screws of the battery compartment from the back of the meter and lift off the cover of the compartment. Replace the battery and reinstall the screws.

### Service and Parts

When servicing this meter, use only the replacement parts specified. This meter should be serviced by qualified personnel only.

## 10. Technical Data

This meter has been designed to comply with Part 15 of FCC Rules.

Max. Voltage Between Either Terminal and Earth Ground:	750V
Display:	Digital - 3 3/4 digits, 4000 count, Updates 5/sec. Updates 41 10/sec., segment bargraph.
Temperature Coefficient:	0.1 x (specified accuracy)/°C (<18°C or >28°C)
Operating Temperature:	0° to 40°C/32° to 104°F
Operating Humidity:	0 to 80% RH
Storage Temperature:	-20° to 60°C/-4° to 140°F
Battery Type:	9V, NEDA 1604 or IEC 6F22
Battery Life:	200 hours typical (alkaline)
Shock, Vibration:	Per Mil - T28800D for a Class 3 instrumentation
Dimensions (H x W x L) without Holster:	36 x 70 x 140mm
with Holster:	54 x 80 x 154mm

Weight without Holster:	252g (8.8oz.)
with Holster:	425g (14.9oz.)
Safety Standards:	Designed for Class II requirement to UL 1244, CSA C22.2 No. 231, ANSI/ISA-S82, and VDE 0411, and IEC 1010 Over-Voltage Category III.
EMI Regulations:	Complies with FCC Part 15, Class B, and VDE 0971B.
Standard Equipment:	Meter, Test-leads, Holster, User's Manual, and 9V Battery (installed)

### 10.1 Specifications

Accuracy is given as  $\pm$ [% of reading] + [number of least significant digits] at -18° to 30°C with relative humidity at 80%, for a period of one year after calibration. AC conversions are AC coupled, average responding and calibrated to RMS values.

### DC Volts

FUNCTION	RANGE	RESOLUTION	ACCURACY
V̄	400.0mV	0.1mV	±(0.9% + 2)
	4.000V	0.001V	
	40.00V	0.01V	
	400.0V	0.1V	
	750V	1V	

Maximum Input Voltage: 750V DC  
 Input Impedance (Nominal): >10MΩ <100pF  
 Common Mode Rejection Ratio: >90dB at DC, 50Hz or 60Hz (1KΩ unbalance)  
 Normal Mode Rejection Ratio: >30dB at 50Hz or 60Hz

### AC Volts (50Hz to 400Hz)

FUNCTION	RANGE	RESOLUTION	ACCURACY
Ṽ	4.000V *	0.001V	±(7% + 5)
	40.00V	0.01V	±(1.9% + 3)
	400.0V	0.1V	
	750V	1V	

Maximum Input Voltage: 750V AC Peak  
 Input Impedance (Nominal): >10MΩ <100pF (AC Coupled)  
 Common Mode Rejection Ratio: >60dB, DC to 60Hz

\*The accuracy in the 4V range is guaranteed for 50Hz to 200Hz only.

### Resistance

FUNCTION	RANGE	RESOLUTION	ACCURACY
Ω	400.0Ω	0.1Ω	DL317
	4.000KΩ	0.001KΩ	±(0.9% + 2)
	40.00KΩ	0.01KΩ	DL319
	400.0KΩ	0.1KΩ	±(0.75% + 2)
	4.000MΩ	0.001MΩ	±(1.5% + 3)
	20.00MΩ	0.01MΩ	

Overload Protection: 600V AC/DC Peak  
 Open Circuit Test Voltage: <3.5V DC  
 Full Scale Voltage to 4.0MΩ: <450mV DC  
 Full Scale Voltage at 20MΩ: <2.5V DC  
 Short Circuit Current: <1.5mA

### Diode Test

Overload Protection: 600V AC/DC Peak  
 Open Circuit Test Voltage: <3.5V DC  
 Full Scale Voltage: 1.000V DC  
 Short Circuit Current: <1.5mA

### Continuity Test

RANGE	CONTINUITY BEEPER
400Ω	Approx. <100Ω

### Capacitance

FUNCTION	RANGE	RESOLUTION	ACCURACY
⌚	1.000μF	0.001μF	±(1.7% + 5)*1
	10.00μF	0.01μF	
	100.0μF	0.1μF	
	1000μF	1μF	±(2.5% + 15)
	10000μF	1μF	±(10% + 90)*2

- \*1. The accuracy is for capacitors that have negligible dielectric absorption.
- \*2. Typical accuracy. Functionally, 1000μF is in the same range as 10,000μF.

Overload Protection: 250V DC/AC Peak

### Frequency

FUNCTION	RANGE	RESOLUTION	ACCURACY
Hz	20KHz	1Hz	±(0.2% + 2) (autoranging 20000 counts)
	200KHz	10Hz	

Overload Protection: 600V DC/AC Peak

### Logic Probe

Low Threshold: 1.2V  
 High Threshold: 1.6V  
 Input Impedance: 10MΩ  
 Frequency Response: 400KHz  
 Detects Pulses as Narrow as: 2.5μS  
 Max. Signal Input Protection: 600V DC/AC Peak for 15 sec.

### Max/Min Recording Accuracy and Response Time (DL319 only)

Specified accuracy of the measurement function ±20 digits for changes >200mS in duration (±60 digits in AC).  
 Typical 100mS response to 80%.