

**DVM645BI**



**BENCH MULTIMETER**

**TAFELMULTIMETER**

**MULTIMETRE DE TABLE**

**BANCO MULTÍMETRO**

**TISCHMULTIMETER**



**User Manual**

**Gebruikershandleiding**

**Manuel d'utilisation**

**Gebrauchsanleitung**

# DVM645BI – BENCH MULTIMETER

## ***Introduction***

This manual contains instructions and warnings that must be observed to ensure safe operation and to keep the meter in a safe condition.

 **WARNING**  
**READ "SAFETY INFORMATION"**  
**BEFORE USING THE BENCH MULTIMETER**

This multimeter is a portable 4000-count instrument that is designed for use in the laboratory, the field, at home, and in other environments. This multimeter features a compact design with rounded corners for easy handling, with a rugged shock-resistant and fire-retardant case. It also has electronic overload protection for all functions and ranges.

## ***Unpacking and Inspection***

Upon removing your new Bench Multimeter from its packaging, you should have the following items:

1. Bench multimeter
2. Test lead set (one black, one red)
3. Carrying strap
4. Power lead
5. Instruction manual

If any of the above items are missing or are received in a damaged condition, please contact the distributor from whom you purchased the unit.

## ***Safety Precautions***

Injury or death can occur even with low voltage and low current. It is extremely important that you read this safety information before using your multimeter. Follow all safety practices and proper operating procedures for the equipment under test.

1. Exercise extreme caution when: measuring voltages above 20 volts, measuring currents greater than 10mA, measuring AC power lines with inductive loads, measuring AC power lines during electrical storms.
2. Always inspect your multimeter, test leads and accessories for signs of damage or abnormality before every use. If there are any abnormalities

- (i.e. broken or damaged test leads, cracked case, display not reading, etc.) do not attempt to do any measurements.
3. Never earth yourself when making electrical measurements. Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at earth potential. Keep your body insulated from earth by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.
  4. Never touch exposed wiring, connections, test probe tips, or any live circuit conductors when making measurements.
  5. Never replace the protective fuse inside the multimeter with a fuse other than the specified or approved type. Replace only with the same type of fuse. To avoid electric shock, disconnect the test leads and any input signals before replacing the fuse.
  6. Replace only with the same type of battery. To avoid electric shock, disconnect the power lead from the mains, and the test leads and any input signal before replacing the battery.
  7. Do not operate this multimeter in an explosive atmosphere (ie. in the presence of inflammable gases or fumes, vapour or dust).
  8. Measuring voltages that exceed the limits of the multimeter may damage the meter and expose the operator to a shock hazard. Always respect the meter voltage limits as stated on the front of the meter.
  9. Never apply more than 500V DC between the COM connector and earth.
  10. When testing for the presence of voltage or current, make sure the voltage or current ranges are functioning correctly. Take a reading of a known voltage or current before assuming a zero reading indicates no current or voltage.
  11. Do not attempt to calibrate or service the meter unless you are trained to do so and another person capable of rendering first aid and resuscitation is present.
  12. Remember: Think Safety, Act Safely



### **Safety Information**

The multimeter complies with Protection Class II, Overvoltage CAT II of IEC1010-1 (EN61010-1). Pollution degree 2 in accordance with IEC-664 indoor use. If the equipment is used in a non-compliant manner, the protection provided by the equipment may be insufficient.

This product complies with the requirements of the following European Community Directives: 89/336/EEC (EMC) and 73/23/EEC (LVD) as amended by 93/68/EEC (CE marking).

# Chapter 1

## A quick tour

### Explanation of Symbols



Attention ! Refer to the operating instructions



Dangerous voltage may be present at terminals



Ground (Earth Terminal)



AC - Alternating Current



DC - Direct Current



Audible Continuity



Equipment protected throughout by Double Insulation  
(Protection Class II)

# Instrument Layout

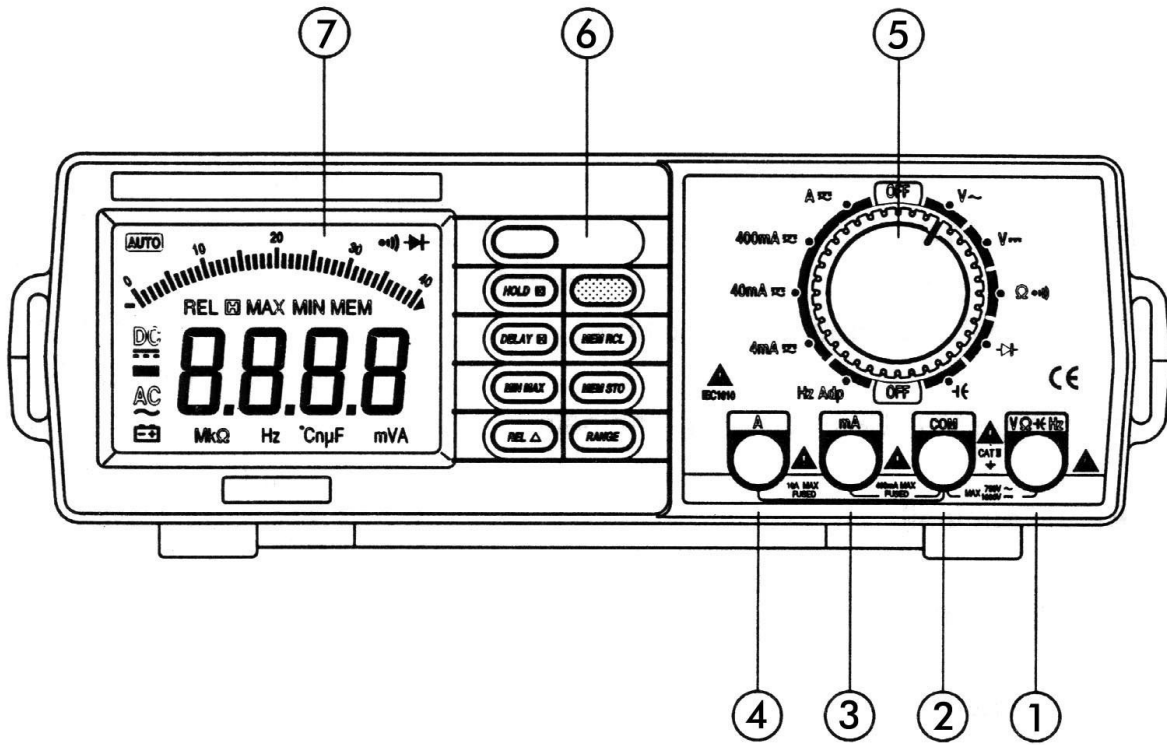


Figure 1-1. Bench Multimeter (Front)

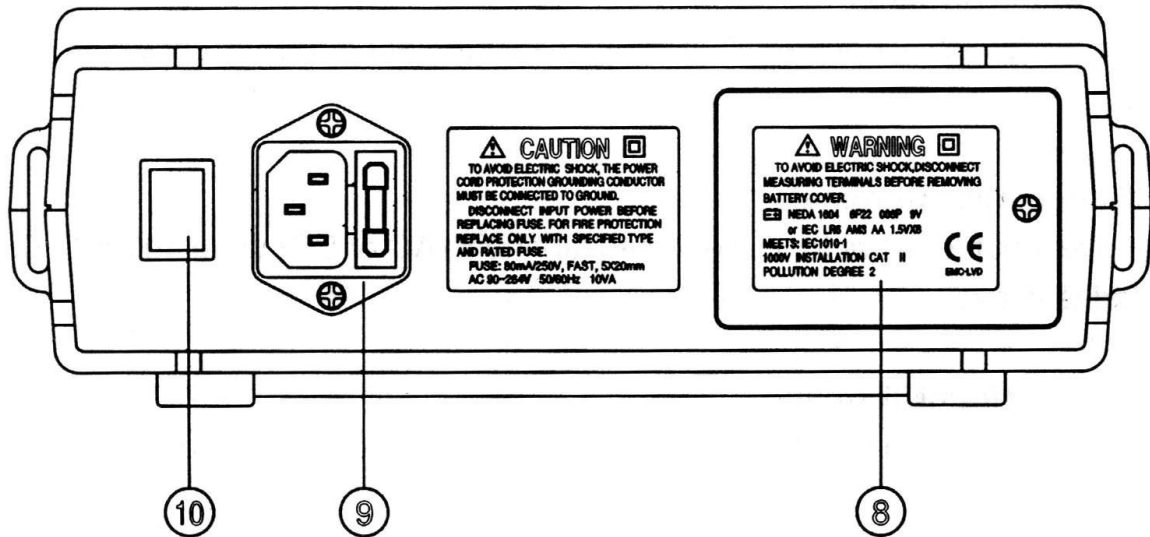


Figure 1-2. Bench Multimeter (Back)

**1.  $V\Omega\rightarrow Hz$  Volts, Ohms, Diode, and Frequency Input Terminal**

This is the positive input terminal for all functions except current measurement. The red test lead is connected to this.

**2. COM Common Terminal**

This is the negative (ground) input terminal for all measurement modes. The black test lead is connected to this.

**3. mA Milliamp Input Terminal**

This is the positive input terminal for current measurements (AC or DC) up to 400mA. The red test lead is connected to this.

**4. A 10 Amp Input Terminal**

This is the positive input terminal for current measurements (AC or DC) up to 10A. The red test lead is connected to this.

**5. Function / Range Selector Rotary Switch**

This rotary switch selects the function, and selects the desired range.

**6. Function / Range Selector Buttons**

This button selects the function, and selects the desired range.

**7. The LCD Display**

The LCD display indicates the measured value of a signal, the function mode, and indicators.

**8. The Battery Cover**

**9. Power Supply Input with Fuse**



**WARNING**

**To avoid user injury and multimeter damage, the multimeter must be set to the same AC voltage value as the mains before connecting the power lead to the mains and switching on.**

This switch is used to turn the AC Power on and off. When the AC Power is on, the DC Power is automatically switched off.

**10. The Power Switch**


## ***Using the Rotary Switch***

Turn the multimeter on by turning the rotary switch to any function.


## ***Using the Buttons***


The buttons are push type switches. The functions are as follows:


### 1. **BACK LIGHT Button**


You can turn the back light on or off by pressing the  button. When powered by the battery, the back light will automatically switch off again after a short period of time.

### 2. **FUNCTION SELECTOR Button**

In the resistance and continuity range, each press of the  button switches alternately between resistance and continuity.

In the frequency and adaptive test range, each press of the  button switches alternately between frequency and adaptive test.

In the DC and AC amps range, each press of the  button switches alternately between DC amps or AC amps.



In the DC and AC milliamps range, each press of the  button switches alternately between DC milliamps or AC milliamps.

### 3. Data Hold: **HOLD Button**

Press the  button to toggle in and out of the Data Hold mode, except if the multimeter is already in the Min/Max Recording Hold mode.


When in the Data Hold mode, the "H" indicator is displayed and the last reading is held on the display, the beeper emits a tone.

Pressing the  button when the multimeter is in the Data Hold mode will cause it to exit Data Hold and enter the Min/Max Recording Hold mode.


In the Min/Max Recording Hold mode, press the  button to stop recording the readings, press  again to resume recording.


However, the multimeter is still operating in Data Hold mode, therefore, the buzzer will still sound if the over range or continuity mode occurs. And the range will also change if it is in auto range.

### 4. Delay Data Hold: **DELAY HOLD Button**

Press the  button to toggle in and out of the Data Hold mode, and the "H" indicator turns on or off.


#### 5. Min/Max Recording Hold: **MIN/MAX Button**

Press the  button to enter the Min/Max Recording Hold mode. The minimum and maximum values are then reset to the current input, the readings are stored in memory, and the "H" indicator turns on. Push the button to cycle through the minimum (**MIN**), maximum (**MAX**), and current readings. The "**MIN**" or "**MAX**" indicator turns on to indicate what value is being displayed.

In the Min/Max Recording Hold mode, press the  button to stop recording the readings, press again to restart recording. If recording is stopped, the minimum, maximum, or current values and the analogue display are frozen. In the Min/Max Recording Hold mode, if a new minimum value exceeds the actual minimum readings, or a new maximum value is an overload value, the minimum or maximum value will be held on the display, but the analogue display will continue to be active.

If in auto range, the mode is held just before the range.


#### 6. Relative Display: **REL Button**

Press the  button to enter the Relative Display mode, the "**REL**" indicator turns on, the displayed reading is stored as a reference value, and the display is then set to zero.


In the Relative Display mode, the value shown on the LCD is always the difference between the stored reference value and the current reading. If the new reading is the same as the reference value, the display will indicate zero.


The bar graph displays absolute value, not relative value. And the over range also occurs according to the absolute value.


With auto-range, the range is held just before range.

Press and hold down the  button for more than one second to exit the relative mode.

#### 7. **RANGE Button**

Press the  button to select the Manual Range mode and turn off the "**AUTO**" indicator.

In the Manual Range mode, each time the  button is pressed, the range (and the input range indicator) increments and a new value is displayed.

To exit the Manual Range mode and return to auto range, press and hold down the  button for more than one second. The "**AUTO**" indicator turns back on.


The DC V, AC V, resistance and capacitance measurements are always first set to the auto range by default.

The frequency measurement is always set to the auto range.


The continuity, diode, ADP, DC A and AC A measurements are always set to the manual range.



When the power is turned on, the default range is selected.

### 8. Data Memory: **MEM STO Button**

Press the  button to enter the Data Memory mode and turn on the "MEM" indicator. All the display data is then stored in the memory. The stored data can be read out and displayed on the LCD, which then switches to the Data Recall Hold mode.




### 9. Data Recall Hold: **MEM RCL Button**

Press the  button to enter the Data Recall mode and turn on the "MEM" and "H" indicator. The stored data can be read out and displayed on the LCD, which then switches to the Data Recall Hold mode.


While storing data in the memory display, the "MEM" indicator flashes. The Data Recall Hold mode is exited by pressing the  button or the  button.

## **Buzzer Output**

A 2kHz buzzer sounds in the following cases:

1. When the key is operated.
2. When the over-range occurs, except for resistance ( $\Omega$ ), frequency (Hz), continuity () and diode () measurements.
3. When the continuity measurement results in less than 40 $\Omega$ .
4. When the relative mode is exited.
5. When the mode is changed from manual to auto range by operating the  button. Please refer to the timing chart for the timing.

## **Low Battery Indication**

The " " indicator is displayed when the battery voltage falls below the reliable operating level.

# ***Chapter 2***

## ***Measurements***

### ***Introduction***



#### **WARNING**

**To avoid user injury and multimeter damage, the multimeter must be set to the correct value of mains voltage before connecting the power lead to the mains and switching on.**

Before doing any measurements always examine the multimeter and accessories for any damage, contamination (excessive dirt, grease, etc.) and defects. Examine the test leads for cracked or frayed insulation and make sure the lead plugs fit snugly into the multimeter sockets. If there are any abnormalities, do not attempt to do any measurements.

## Measuring DC Volts

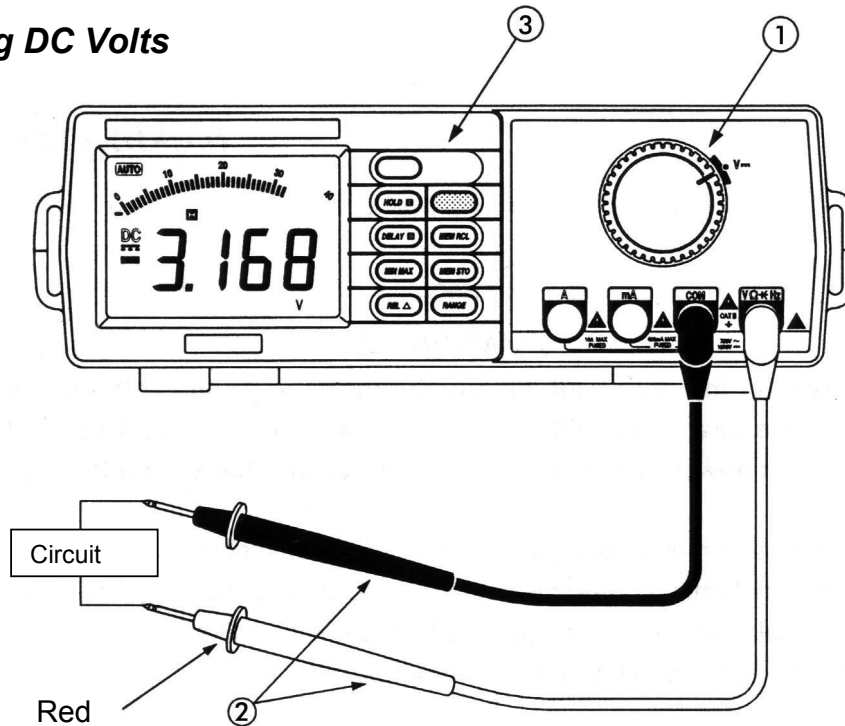



Figure 2-1. Measuring DC Volts



### WARNING

To avoid possible electric shock, multimeter damage and/or equipment damage, do not attempt to do any voltage measurements if the voltage is above 1000V DC / 750V AC RMS. 1000V DC / 750V AC RMS are the maximum voltages that this multimeter is designed to measure.

- ① Turn the Selector to Volts DC
- ② Connect the leads as shown
- ③  is not available in Volts DC, all other buttons can be used.

1. Insert the black and red test leads into the **COM** and **VΩ-Hz** input terminals respectively.
2. Select the desired DC voltage range, or set to auto range.
3. When the magnitude of the voltage to be measured is unknown, always start with the highest range.
4. Connect the test leads in parallel with the circuit to be measured. Be careful not to touch any live conductors with your hands. Note the reading.
5. For DC voltage readings, the red lead should be connected to the positive side of the circuit, the black lead to the negative side. A minus sign on the left-hand side of the LCD will appear if the leads are connected the other way around.
6. When all measurements have been completed, disconnect the test leads from the circuit under test. Remove the test leads from the multimeter.

## Measuring AC Volts

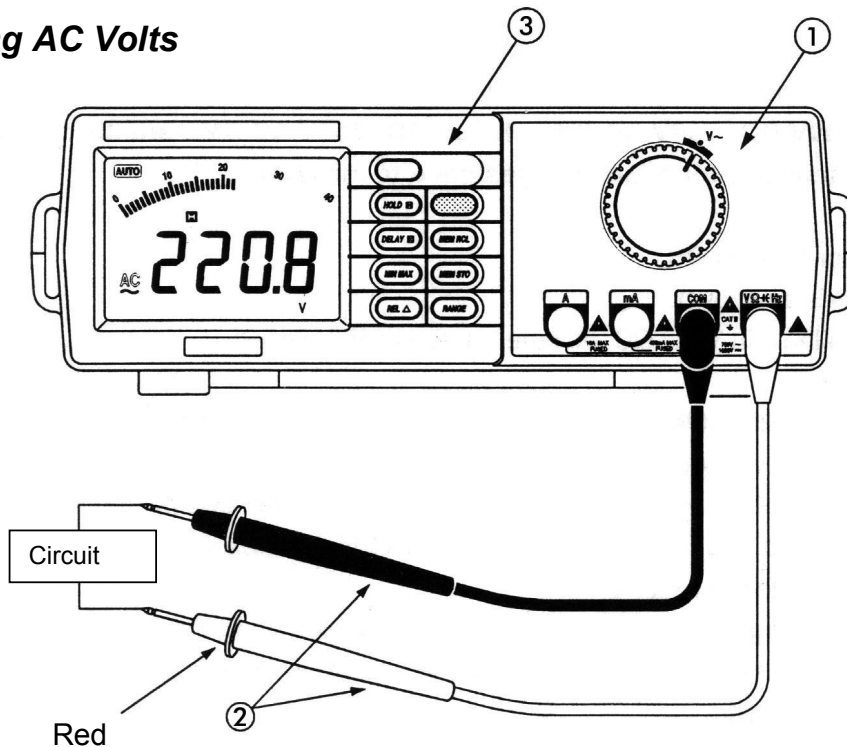



Figure 2-2. Measuring AC Volts



### WARNING

To avoid possible electric shock, multimeter damage and/or equipment damage, do not attempt to do any voltage measurements if the voltage is above 1000V DC / 750V AC RMS. 1000V DC / 750V AC RMS are the maximum voltages that this multimeter is designed to measure.

- ① Turn the Selector to Volts AC
- ② Connect the leads as shown
- ③  is not available in Volts AC, all other buttons can be used.

1. Insert the black and red test leads into the **COM** and **VΩ-Hz** input terminals respectively.
2. Select the desired AC voltage range, or set to auto range.
3. When the magnitude of the voltage to be measured is unknown, always start with the highest range.
4. Connect the test leads in parallel with the circuit to be measured. Be careful not to touch any live conductors with your hands. Note the reading.
5. When all measurements have been completed, disconnect the test leads from the circuit under test. Remove the test leads from the multimeter.

## Measuring DC and AC Amps

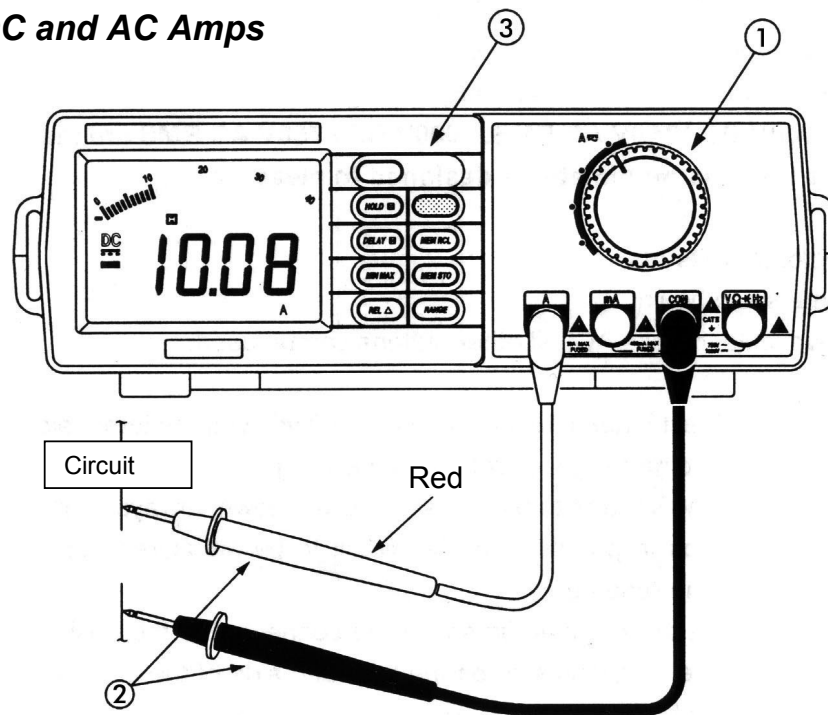




Figure 2-3. Measuring Amps



### WARNING

Do not attempt to measure high currents. Use a current clamp for measurements >10A. The 10A input terminal is protected by a F15A/250V fast blow ceramic fuse.

- ① Turn the selector to DC and AC Amps.
- ② Connect the leads as shown
- ③  is not available in DC and AC Amps, all other buttons can be used.

Each press of the button  switches alternately between DC and AC Amps.

1. Insert the black and red test leads into the **COM** and **A** input terminals respectively.
2. Turn off or disconnect the circuit to be measured from all power sources, connect the multimeter in series with the conductor where the current is to be measured.
3. Switch on the power to the circuit under test. Note the reading.
4. After completing the measurement, turn off the power to the circuit under test, disconnect the test leads from the multimeter.
5. The DC and AC Amps measurements are always fixed range.

## Measuring DC and AC Milliamps

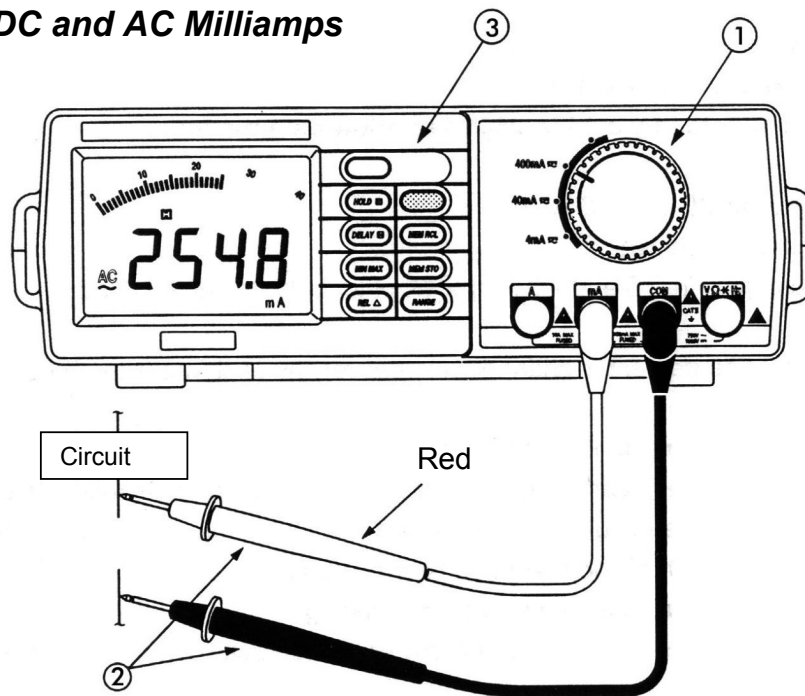




Figure 2-4. Measuring Milliamps



### WARNING

Do not attempt to measure high currents. The mA input terminal is protected by a F1A/250V fast blow ceramic fuse.

- ① Turn the selector to DC and AC Milliamps.
- ② Connect the leads as shown.
- ③  is not available in DC and AC Milliamps, all other buttons can be used.

Each press of the button  switches alternately between DC or AC Milliamps.

1. Insert the black and red test leads into the **COM** and **mA** input terminals respectively.
2. Select the desired DC current range or AC current range.
3. Turn off or disconnect the circuit to be measured from all power sources, connect the multimeter in series with the conductor where the current is to be measured.
4. Switch on the power to the circuit under test. Note the reading.
5. After completing the measurement, turn off the power to the circuit under test, disconnect the test leads from the multimeter.
6. The DC and AC Milliamps measurements are always fixed range.

## Measuring Frequency and Adaptive Measurement

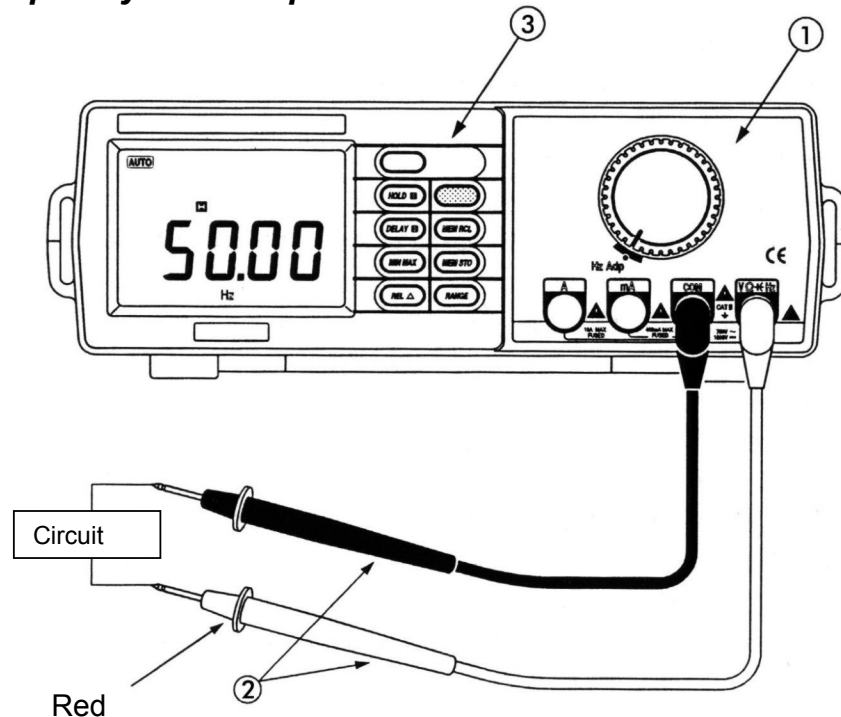




Figure 2-5. Measuring Frequency and Adaptive Measurement (ADP)

- ① Turn the selector to frequency and adaptive measurement.
- ② Connect the leads as shown
- ③  is not available in frequency and adaptive measurement, all other buttons can be used.

Each press the button  switches alternately between frequency and adaptive measurement.

1. Insert the black and red test leads into the **COM** and **VΩ-▶Hz** input terminals respectively.
2. In the frequency test, it is not necessary to know the range, as the multimeter will automatically range up or down to display the best resolution. Manual range is not available.
3. Ensure that the amplitude level of the signal to be measured is not greater than the input voltage limit (250V DC/AC rms). The signal amplitude must also be greater than the sensitivity level.
4. Attach the probe tips to the points across which the frequency is to be measured, and read the result directly from the display.
5. The frequency range is always set to auto range.

The Adaptive (ADP) Measurement is as follows:

1. Connect the ADP signal terminal (-) and (+) to the **COM** and **VΩ-▶Hz** input terminals respectively.
2. The ADP voltage is supplied to the multimeter directly. The result is displayed on a scale of 10 units per 1mV.
3. The ADP measurement is always fixed range. The full range is 400mV DC.

## Measuring Capacitance

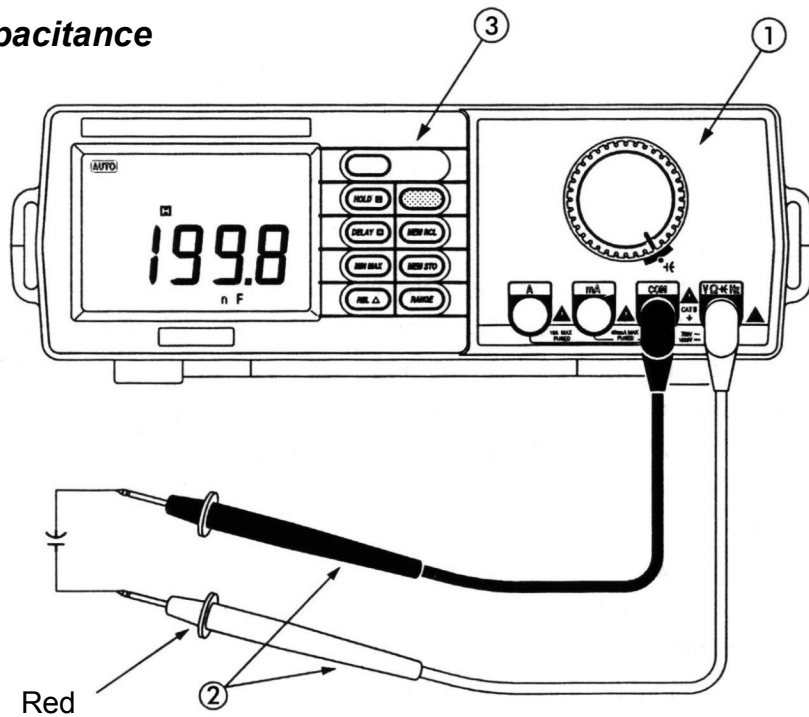




Figure 2-6. Measuring Capacitance



### WARNING

Turn off the power to the device under test and discharge all capacitors.

- ① Turn the selector to capacitance.
- ② Connect the leads as shown: insert the black and red test leads into the **COM** and **VΩ-|Hz** input terminals respectively.
- ③  is not available with capacitance, all other buttons can be used.

1. Turn off the power to the device under test and discharge all capacitors.
2. Completely discharge the capacitor before measuring its capacitance value.
3. Set to the capacitance range that gives the most accurate reading or select auto range.
4. Connect the crocodile clips to the capacitor leads or insert the capacitor leads into the multimeter measuring socket. Always observe the correct polarity when measuring electrolytic capacitors.
5. Read the capacitance value directly from the display. The accuracy of the capacitance measurement can be improved by first pressing the  button (Relative mode) in order to zero the display and automatically subtract the residual multimeter and test lead capacitance. The Relative mode also selects manual range.
6. Residual charge in the capacitor, or capacitors with poor insulation resistance or poor dielectric absorption may cause measurement errors.

**NOTE:** A safe way to discharge a capacitor is to connect a 100kΩ resistor across the two capacitor leads.

## Testing Diodes

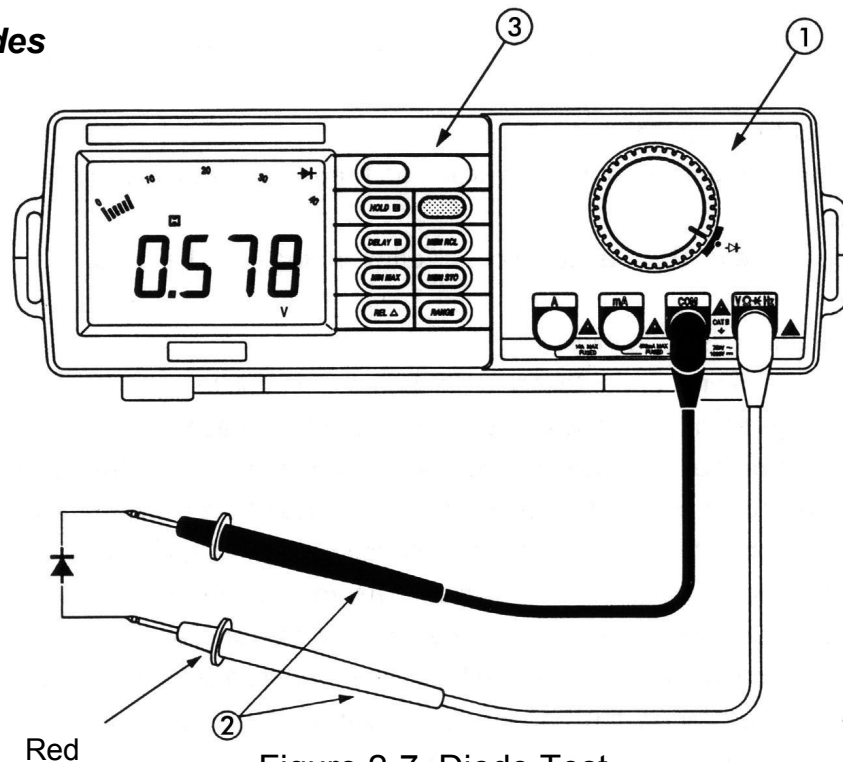





Figure 2-7. Diode Test



### WARNING

Measurements must always be done with the circuit power OFF.

- ① Turn the selector to Diode.
  - ② Connect the leads as shown: insert the black and red test leads into the **COM** and **VΩ-|Hz** input terminals respectively.
  - ③  and  are not available in diode test, all other buttons can be used.
1. Select the () position by turning the rotary switch.
  2. Insert the black and red test leads into the COM and **VΩ-|Hz** input terminals respectively.
  3. The red lead should be connected to the anode and the black lead to the cathode of the diode.
  4. The typical voltage drop should be about 0.6V for a silicon diode or 0.3V for a germanium diode.
  5. If the diode is reverse biased or there is an open circuit and the reading will be between 3.000V and 3.400V.
  6. The Diode test is always fixed range.

## Measuring Resistance and Continuity

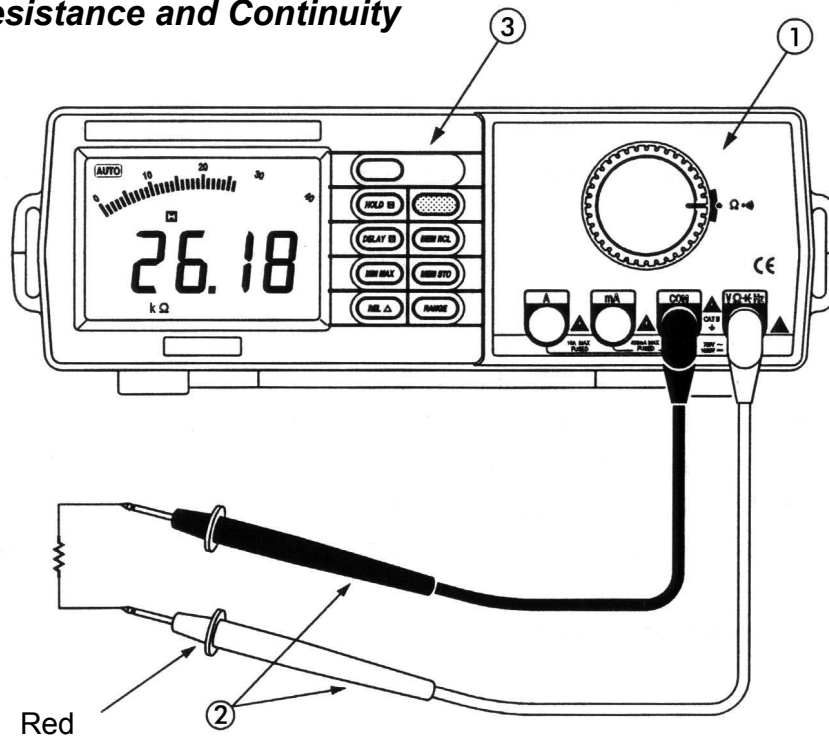






Figure 2-8. Measuring Resistance and Continuity

- ① Turn the selector to Resistance and Continuity measurement.
- ② Connect the leads as shown.
- ③  is not available in continuity test, all other buttons can be used.


Each press of the button  switches alternately between resistance and continuity measurement.

Resistance measurement is as follows:

1. Select resistance by pressing the  button.
2. Insert the black and red test leads into the **COM** and **VΩ Hz** input terminals respectively.
3. Select the desired ohms ( $\Omega$ ) range or set to auto range. Connect the black and red test probes to the circuit or device under test. First make sure that the circuit or device is dead.
4. Turn off any power to the resistor to be measured. Discharge any capacitors. Any voltage present during a resistance measurement will cause inaccurate readings and could damage the meter if the overload protection of 250V DC or AC rms is exceeded.
5. Open circuits will be displayed as an overload condition and the MSD (Most Significant Digit) will blink.

6. The resistance of the test leads can diminish accuracy in the lowest ( $400\Omega$ ) range. The error is usually  $0.1$  to  $0.2\Omega$  for a standard pair of test leads. To determine the error, short the test leads together and use the  Relative mode to automatically subtract the lead resistance from the resistance measurement.
7. After all measurements have been completed, disconnect the test leads from the circuit and multimeter input terminals.

The Continuity (  ) measurement is as follows:

1. Select the continuity measurement by pressing the  button.
2. Insert the black and red test leads into the **COM** and **V $\Omega$  Hz** input terminals respectively.
3. Connect the black and red test probes to the circuit or device under test. First make sure that the circuit or device is dead.
4. An audible tone will sound when the resistance is less than approximately  $40\Omega$ .
5. After the continuity measurement has been completed, disconnect the test leads from the circuit and multimeter input terminals.
6. The continuity measurement is always fixed range. Open circuit voltage is approximately  $0.45V$ .

# Chapter 4

## Specifications

### General Specifications

**Maximum voltage between terminals and earth:** CAT. II 1000V DC or 750V AC rms (sine)

**Display:** 3 3/4 digit (4000 count) digital indication. Frequency range: 9999 counts max.

42 segment analogue bar graph


Full indicators, automatic polarity indication

**Measuring rate:** Digital 2 times per second

Analogue bar graph 20 times per second

Capacitance 1 time per second

**Over range indications:** MSD (Most Significant Digit) blinks

**Low Battery indication:** The "" indicator is displayed when the battery voltage drops below the reliable operating level.

**Temperature coefficient:** 0.15 x specified accuracy per °C  
< 18°C to >28°C

**Temperature:** Operating: 5°C to 35°C

Storage: -10°C to 60°C

**Relative humidity:** 20% to 75% RH (5°C to 35°C)

Back light

Safety:

Power requirements

Size

Weight

Accuracy is given as  $\pm$  (% of reading + number of least significant digit) at 18°C to 28°C, with relative humidity up to 75%.

All specifications assume less than 1 year since calibration.

## Resolution and Accuracy

### DC Volts (mV DC)

Range	resolution	Accuracy (% reading + digits)
400mV	0.1mV	$\pm (0.3\% \text{ rdg} + 5\text{d})$
4V	1mV	$\pm (0.3\% \text{ rdg} + 2\text{d})$
40V	10mV	$\pm (0.3\% \text{ rdg} + 2\text{d})$
400V	100mV	$\pm (0.3\% \text{ rdg} + 2\text{d})$
1000V	1V	$\pm (0.3\% \text{ rdg} + 2\text{d})$

Input impedance:  $10\text{M}\Omega$ ,  $< 100\text{pF}$

Overload Protection: 1000V DC or 750V AC RMS

### AC Volts (true rms, ac-coupled)

Range	resolution	Accuracy (% reading + digits)
4V	1mV	$\pm (0.8\% \text{ rdg} + 5\text{d})$ 50 to 60Hz $\pm (1.2\% \text{ rdg} + 5\text{d})$ 45 to 1kHz
40V	10mV	
400V	100mV	
750V	1V	

Input impedance:  $10\text{M}\Omega$ ,  $< 100\text{pF}$

Overload Protection: 1000V DC or 750V AC RMS

AC coupled true RMS

### DC Current

Range	resolution	Accuracy (% reading + digits)
4mA	1 $\mu\text{A}$	$\pm (0.8\% \text{ rdg} + 5\text{d})$
40mA	10 $\mu\text{A}$	$\pm (0.8\% \text{ rdg} + 5\text{d})$
400mA	100 $\mu\text{A}$	$\pm (0.8\% \text{ rdg} + 5\text{d})$
10A (20A for 30 seconds)	10mA	$\pm (1.5\% \text{ rdg} + 10\text{d})$

Input protection: 1A/250V fuse for mA input, 15A / 250V fuse for A input

Load voltage: 600mV max. for mA input, 900mV max. for A input

## **AC Current**

Range	resolution	Accuracy (% reading + digits)	
4mA	1 $\mu$ A	$\pm$ (1.5% rdg + 5d)	45 to 400Hz
40mA	10 $\mu$ A	$\pm$ (1.5% rdg + 5d)	45 to 400Hz
400mA	100 $\mu$ A	$\pm$ (1.5% rdg + 5d)	45 to 400Hz
10A (20A for 30 seconds)	10mA	$\pm$ (2% rdg + 10d)	45 to 400Hz

Input protection: 1A/250V fuse for mA input, 15A / 250V fuse for A input

Load voltage: 600mV max. for mA input, 900mV max. for A input

AC coupled true RMS

## **Resistance**

Range	resolution	Accuracy (% reading + digits)	
400 $\Omega$	0.1 $\Omega$	$\pm$ (0.5% rdg + 5d)	
4k $\Omega$	1 $\Omega$	$\pm$ (0.5% rdg + 3d)	
40k $\Omega$	10 $\Omega$	$\pm$ (0.5% rdg + 3d)	
400k $\Omega$	100 $\Omega$	$\pm$ (0.5% rdg + 3d)	
4M $\Omega$	1k $\Omega$	$\pm$ (1% rdg + 5d)	
40M $\Omega$	10k $\Omega$	$\pm$ (1.5% rdg + 10d)	

Open circuit Voltage: 0.45V

Input protection: 250V RMS

## **Continuity Test**

Continuity threshold: approx. 40 $\Omega$

Continuity threshold: 2kHz buzzer tone

Input protection: 250V RMS

## **Diode Test**

Test current: 0.6mA

Open circuit voltage: approx. 3.0V

Input protection: 250V RMS

## Capacitance

Range	resolution	Accuracy (% reading + digits)
4nF	1pF	$\pm (2\% \text{ rdg} + 40\text{d})$ in relative mode
40nF	10pF	$\pm (2\% \text{ rdg} + 5\text{d})$ in relative mode
400nF	100pF	$\pm (2\% \text{ rdg} + 5\text{d})$ in relative mode
4 $\mu$ F	1nF	$\pm (0.5\% \text{ rdg} + 5\text{d})$
40 $\mu$ F	10nF	$\pm (2\% \text{ rdg} + 5\text{d})$ at $\leq 20\mu\text{F}$ $\pm (5\% \text{ rdg} + 5\text{d})$ at $> 20\mu\text{F}$

Input protection: 250V RMS

## Frequency Counter

Ranges: 100Hz, 1kHz, 10kHz, 100kHz, 1MHz

Resolution: 0.01Hz in the 100Hz range

Accuracy:  $\pm (0.1\% + 4\text{d})$

Sensitivity: 100mV rms for 1Hz to 20kHz, 500mV rms for 20kHz to 1MHz

Input protection: 250V RMS

## Adaptive Range

Display: 10 units per 1mV DC

Accuracy:  $\pm (0.3\% + 5\text{d})$

Input protection: 250V RMS

# Chapter 4

## Maintenance

### Introduction

Any repairs or servicing not covered by this manual should only be done by qualified personnel.

### Battery Replacement



#### WARNING

To avoid electric shock, disconnect the power leads from the mains, and disconnect the test leads and any input signals before replacing the battery. Only replace with same type of battery.

When the multimeter displays the "" indicator, the battery must be replaced to maintain proper operation. Use the following procedure to replace the battery:

1. Disconnect the test leads from any live source, turn the rotary switch to off, and remove the test leads from the input terminals.
2. Remove the screws on the battery cover and open it.
3. Remove the dead battery and replace with a new equivalent 9V battery.
4. Two types of battery are used in the bench multimeter: one is a NEDA 1604 6F22 006P type x 1 or equivalent 9V battery, the other is IEC LR6 AM3 AA 1.5V x 6.
5. Never use the bench multimeter unless the battery cover is in place and properly fastened.

## ***Fuse Replacement***



### **WARNING**

To avoid electric shock, disconnect the test leads and any input signals before replacing the fuses. Replace only with the same type of fuse. The **A** input terminal is protected by a F 15A/250V fast blow ceramic fuse. The **mA** input terminal is protected by a F 1A/250V fast blow ceramic fuse.

Use the following procedure to examine or replace the multimeter fuses:

1. Turn the power switch to off, and disconnect the power cable from the mains.
2. Disconnect the test leads from any live source, turn the rotary switch to off, and remove the test leads from the input terminals.
3. Open the tools cover on the top, and open the fuse cover in the tool case.
4. Remove the blown fuse, replace with a fuse of the same size and rating. Make sure the new fuse is centred in the fuse holder.
5. Replace the blown fuse with one of the same rating.
6. The **A** input terminal is protected by a F 15A/250V fast blow ceramic fuse, Ø 6 x 30mm. The **mA** input terminal is protected by a F 1A/250V fast blow ceramic fuse, Ø 5 x 20mm.
7. Fuses rarely need replacement and almost always blow as a result of operator error.
8. Never use the bench multimeter unless the fuse cover is in place and fully fastened.

## ***Power Fuse Replacement***



### **WARNING**

To avoid electric shock, disconnect the power cable from the mains, and disconnect the test leads and any input signals before replacing the power fuse. Only replace with same type of fuse

Use the following procedure to examine or replace the power fuse:

1. Turn the power switch to off, and disconnect the power cable from mains.
2. Disconnect the test leads from any live source, turn the rotary switch to off, and remove the test leads from the input terminals.
3. Replace the power fuse in the power supply input. Replace the blown fuse with one of the same rating.
4. The power fuse is 80mA/250V, Fast, Ø 5 x 20mm

## ***Other notes***

1. Do not use abrasives or solvents on the bench multimeter, use a damp cloth with mild detergent only.
2. If any faults or abnormalities are observed, the bench instrument should not be used and needs to be inspected.