

# OWNER'S MANUAL

AUTO/MANUAL RANGE DUAL-DISPLAY  
DIGITAL MULTIMETER

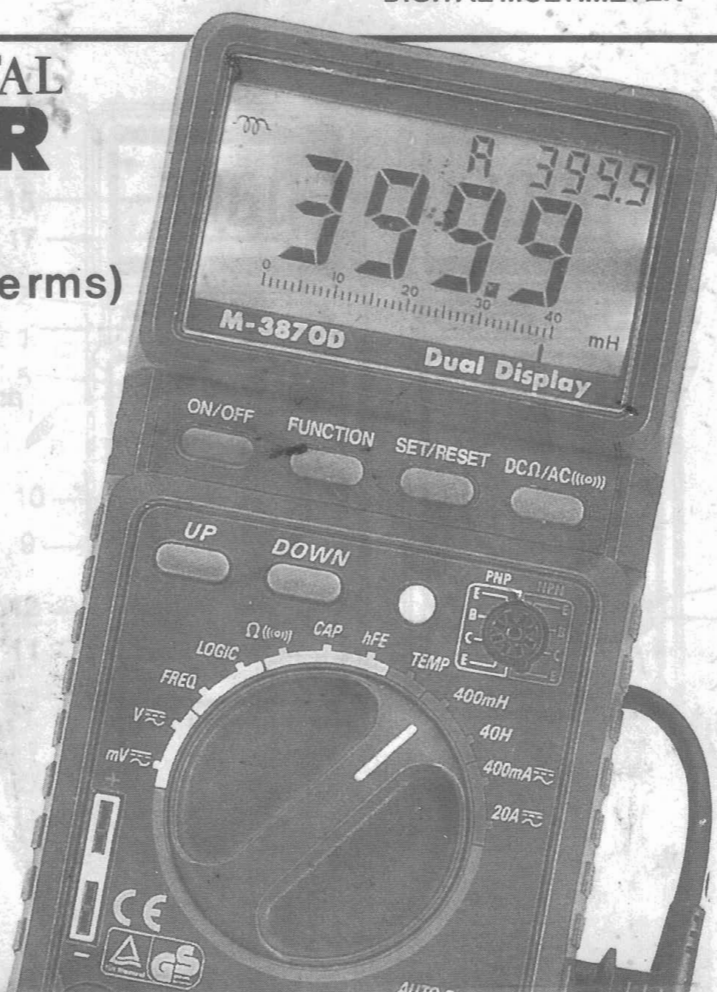
## DUAL DISPLAY DIGITAL **MULTIMETER**

With PC Interface

M-3850D / M-3860D (True rms)  
M-3870D

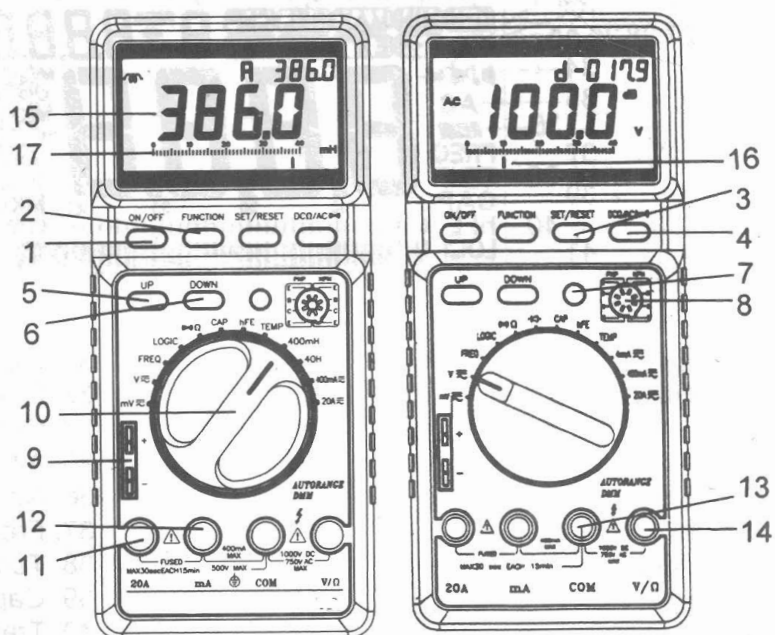


# METEX<sup>®</sup>



## FAMALIARIZATION

1. Power Button
2. Function Button
3. SET/RESET Button
4. DC  $\Omega$ /AC  $\llcorner(\circ)\llcorner$  Button
5. UP Button
6. DOWN Button
7. Back-Light Button
8. Transistor Socket
9. Capacitance/Inductance Socket
10. Rotary Function Selector Switch
11. 20A Terminal
12. mA Terminal
13. COM Terminal
14. V/ $\Omega$  Terminal
15. LCD (3 3/4 Digit Max. 3999)
16. Bargraph Scale
17. Analog Bargraph





18. Overload Indication
19. Auto-Hold
20. Dual
21. Pulse
22. Data-Hold
23. Minium
24. Maximum
25. Relative
26. Comparison
27. Range-Hold
28. Extra
29. Memory
30. Memory Recall
31. Number of the Memory

32. Inductance
33. Diode
34. Continuity
35. Alternative Volt or Current
36. Negative Polarity
37. Frequency
38. Temperature
39. Capacitance
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41. Logic Test
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Due to our policy to refine the products continuously, this manual may contain minor differences in specification, components, parts and circuit design of the instrument actually delivered.

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## 1. Introduction

With this Digital multimeter, you have acquired a high-quality, powerful performance, heavy-duty rugged and handheld multimeter that will give you confidence and peace of mind in your every measuring job.

Please read these operating instructions very carefully, before commencing your measurements

## 2. Safety Information

### 2-1. Safety requirements

This meter has been manufactured and tested in accordance with IEC1010-1/EN61010-1 Part 1: Safety Requirement for Electrical Equipment for measurement, control and laboratory use, Safety Class II, Overvoltage category II.

This manual contains information and warnings which must be observed to assure safe operation and maintain the

meter in safe condition.

### 2-2. Safety symbols

The following symbols have been placed on the meter to remind you of measurement limitations and safety.

#### 20A

The maximum current that you can measure at this terminal is 20amps DC/AC. This terminal is fuse protected. When using this range with high current, keep the duty cycle to 30 seconds on load, 15 minutes off load.

#### mA

The maximum current that you can measure with this terminal is 4mA or 400mA DC/AC. This terminal is protected by a 800mA fuse.

**MAX**  
 **500V**

To avoid electric shock or instrument damage, do not connect the common Input Terminal **COM** to any source of more than 500 Volts with respect to earth/ground.

**MAX**  
 **1000V**  
**750V**

The maximum voltage this meter can measure is 1000V DC or 750V AC.



Be exceptionally careful when measuring high voltages. **DO NOT TOUCH THE TERMINALS OR PROBE ENDS.**



Refer to the complete operating instructions.



Indicates protection class II, double insulation.

**NOT FOR HIGH ENERGY INDUSTRIAL USE.**

## 2-3. Safety Warnings

- 2-3-1. To prevent electric shock hazard and/or damage to the meter, do not attempt to measure voltage exceeding 1000V DC or 750V AC.
- 2-3-2. To avoid damage to the meter and/or injury, observe the input limits as stated in Table 1.
- 2-3-3. To avoid damage to the meter, disconnect test leads from test points before changing the function/range.
- 2-3-4. To avoid electric shock, be careful when working above 60V DC 25V AC. Such voltage pose a shock hazard.



2-3-5. The 20A range is protected by a fuse.

To avoid damage or injury, use the meter only in circuits limits by fuse or circuits-breaker to 20A or 4000VA. Do not apply voltage to between **20A** or **mA** and **COM** terminals. This warning is to assure protection against injury and/or damage to the meter and the user.

2-3-6. Do not get the meter and test leads wet.

2-3-7. Ensure the test leads are in good condition.

Table 1. **INPUT LIMITS**


FUNCTION	TERMINAL	INPUT LIMIT
V DC	V/ $\Omega$ +COM	1000V DC
V AC	V/ $\Omega$ +COM	750V AC
$\Omega$ 	V/ $\Omega$ +COM	250V DC/AC
mA DC/AC	mA+COM	400mA DC/AC
20A DC/AC	20A+COM	20A DC/AC
	V/ $\Omega$ +COM	250V DC/AC
Freq.	V/ $\Omega$ +COM	750V DC/AC
Logic	V/ $\Omega$ +COM	250V DC/AC

**Warning:** Sources like small hand-held radio transceivers, fixed station radio and television transmitters, vehicle radio transmitters and cellular phones generate electromagnetic radiation that may induce voltages in the test leads of the multimeter. In such cases the accuracy of the multimeter cannot be guaranteed due to physical reasons.



## PREPARING FOR OPERATION

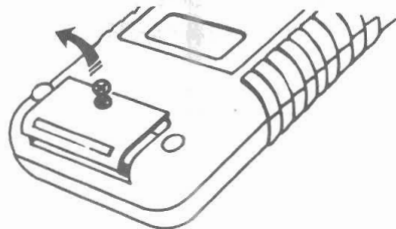
### 3-1. Installing the Battery

Your meter requires a 9V battery for power. The  symbol appears when the battery voltage drops to certain limits. For correct operation, replace the battery as soon as possible. Continued use with a low battery will lead to errors in readings.

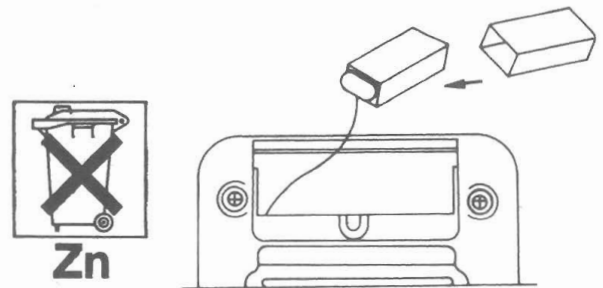
**WARNING :** TO AVOID ELECTRIC SHOCK, DISCONNECT BOTH LEADS FROM ANY EQUIPMENT BEFORE YOU REMOVE OR INSTALL THE BATTERY.

Follow these steps to install the battery.

1. Turn off the power and disconnect the two test leads.
2. Remove the screw to open the battery compartment.



3. Place the battery inside the insulation capsule and snap it onto place.



**WARNING :** DO NOT DISCARD THE PROVIDED BATTERY INSULATION CAPSULE. IF YOU DO NOT USE THIS INSULATION CAPSULE PROPERLY, IT MIGHT CAUSE DAMAGE OR INJURY.

4. Replace the battery compartment cover and the screw.

**WARNING :** DO NOT OPERATE THE METER UNTIL YOU REPLACE THE BATTERY AND CLOSE THE BATTERY COMPARTMENT COVER.

### 3-2. Using the Test Probes

Use only the type of test probes supplied with your meter. These test probes are rated for 1200 volts.



#### Cautions:

- Although the supplied test probes are rated for 1200 volts, the maximum input voltage to the meter is 1000V DC and 750V AC. If you try to measure DC voltages above 1000V or AC Voltages above 750V, you might damage your meter and expose yourself to a serious shock hazard. Use extreme care when you measure high voltages.
- Never connect the probe you plug into the **COM** terminal to a source of voltage greater than 500 volts with respect to earth ground. This creates a serious shock hazard.

### 3-3. Using the Stand

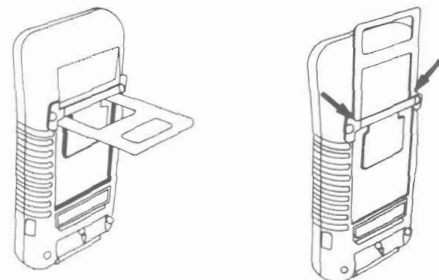
Use your meter's stand to prop up or hang the meter.

#### Propping Up the Meter

If you prop the meter on a benchtop, the stand helps provide a better viewing angle. To use the stand as a prop, just open it away from the meter and set it on a flat surface.

#### Hanging the Meter

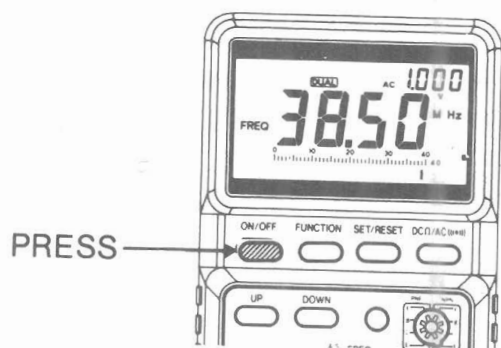
To hang the meter, remove the stand by pressing the lower parts of the stand together. Then insert the stand into top 2 holes.



## PRE-OPERATION CHECK

To ensure correct operation and familiarize yourself with the meter, follow these steps before you use it.

**4-1.** Press **ON/OFF** button to ON.



**4-2.** To select a function, turn the rotary switch to the appropriate switch position at your desire. The meter is ready for normal operation.

**4-3.** To select an additional operation, press the appropriate push buttons above the rotary switch (See Table 2)

- To operate **UP DOWN** buttons, press to address the number of memory in the **MEM**, **REL** modes, press to determine the polarity, value and range of the reference value in the **REL**, **CMP** modes, and press to decrease/increase the range value in the **R-H** mode and Signal Output Checking.
- To operate the back-lit display, press **YELLOW** button to turn the back-light on/off.
- To operate **FUNCTION** button, press to select the function mode, press again to scroll and press **SET/RESET** button to exit.
- To operate **SET/RESET** button, press to enter, and press again to exit.
- To operate **DCΩ /AC** ( $\text{⏏}$ ) button, press to alternate between AC and DC when the rotary switch set to Voltage or Current, or between Resistance and Continuity when the rotary switch is set to  $\text{⏏}$ Ω

## HOW TO USE THE METER

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This section describes your meter and how to use it.

FOR EASY REFERENCE, EACH DESCRIPTION IS NUMBERED AND KEYED TO THE ILLUSTRATION INSIDE THE FRONT COVER.

### 5-1. Pushbuttons

Items 1 – 7 describe how to use the pushbuttons. These buttons are used (in conjunction with rotary switch) to select operating modes. When a button is pushed, the beeper sounds. A summary of pushbutton operations is shown in Table 2. An annunciator is displayed to indicate that a mode or function has been selected. A quick way to reset all the pushbuttons to their default state is to turn the rotary switch to an adjacent function and then back to the function you are using.

#### 1. **ON/OFF** POWER ON/OFF

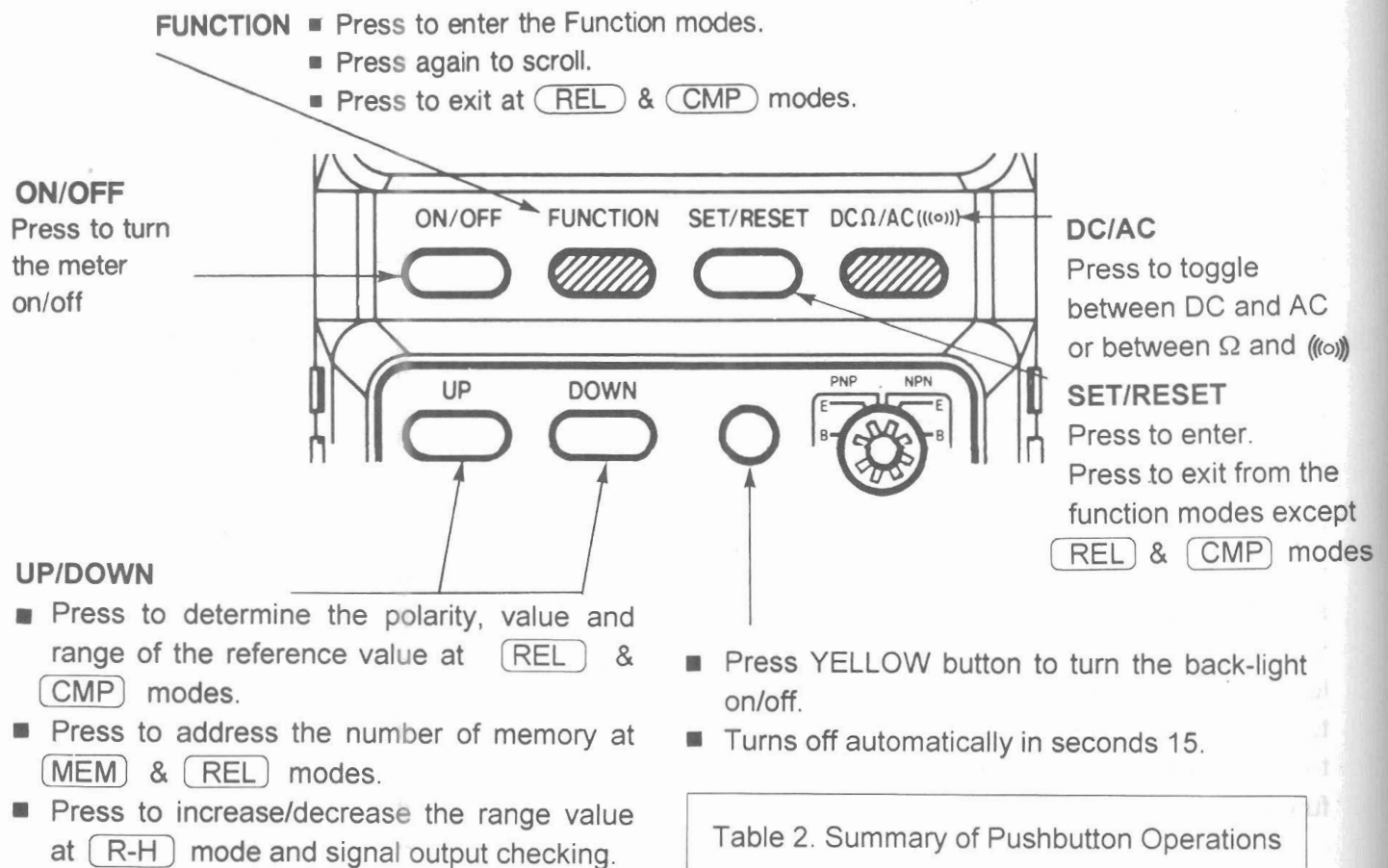
Press **ON/OFF** (RED) button to turn the meter on. Press again to turn the meter off.

#### **Automatic Power-off**

Automatic Power-off extends the life of the battery by turning the meter off if neither the rotary switch nor a pushbutton is operated for 10 minutes.

However, during signal output checking and communication with a PC, the power will not be turned off automatically.





## 2. Function

When you first on the meter, **A** (auto hold), **d** (dual) or **P** (pulse) indicator will be displayed at the front of secondary display depending on the measuring ranges selected. Each press of the **FUNCTION** button, your meter will enter the advanced functions.

Sequence of scroll in **FUNCTION** modes.



## 3. SET/RESET

You can select or deselect the functions by pressing **SET/RESET** button.

In the function modes of **REL** and **CMP**, the **RESET** function does not work.

To exit from these modes, you have to move the function selector to an adjacent range or press **FUNCTION** key.

## 4. DCΩ/AC (Ω)

Press **DCΩ/AC (Ω)** button to toggle between AC and DC when the rotary switch is set to Voltage or Current, or between Resistance and Continuity when the rotary switch is set to **Ω**.

## 5. & 6. UP/DOWN

Press **UP** or **DOWN** buttons to determine the polarity, value, and range of the reference value in **REL** and **CMP** modes, to address the number of memory in **MEM** & **RCL** modes, and to increase/decrease the range value in **R-H** mode and signal output checking.

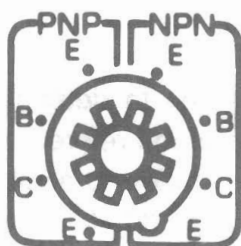
## 7. Back-Lit Display

Press Yellow button to turn the Back-light on/off. Back-lit display can be used in poor light conditions. Back-light turns off automatically after 15 seconds to extend battery life.

5-2. Items 8-9 describe the Sockets.

8. Transistor hFE.

Insert the base, collector, and emitter pins into the correct sockets, as marked.

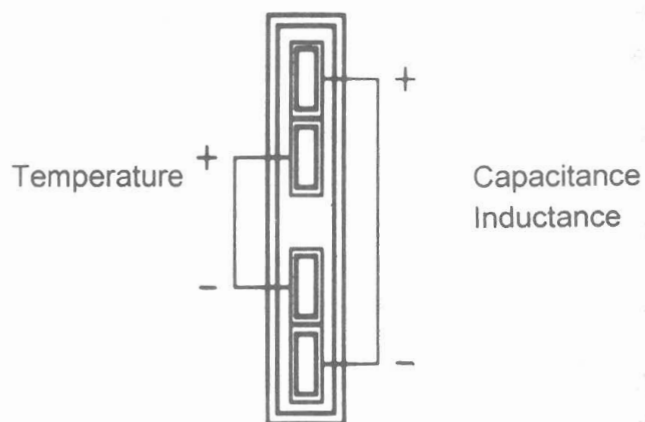


9. Capacitor & Inductance sockets  
Temperature

Insert a discharged capacitor into the outermost connections observing correct polarity if required.





Insert a "K" type thermocouple into the innermost connections.

Insert a discharged coil into the outermost connections.



## 10. Function Selector Rotary Switch

Item 10 describes functions that are selected by setting the rotary switch.

mV 	Millivolts ac/ds.
V 	Volts ac/dc
FREQ	Frequency
LOGIC	Logic test
 $\Omega$	Continuity/Resistance
	Diode Test
CAP	Capacitance
hFE	Transistor
TEMP	Temperature
4mA	Milliamperes ac/dc
400mA	Milliamperes ac/dc
20A	Amperes ac/dc
mH	Millihenry
H	Henry

## 5-3. Input Terminals

Item 11–14 describe the input terminals (See Table 1 for overload limits.)

### 11. 20A Amperes Input Terminal

For current measurements (ac or dc) up to 20A continuous when function selector switch is in the **20A** position.

### 12. mA Milliamp Input Terminal

For current measurements of up to 4mA or 400mA (ac or dc) when the function selector switch is in the **4mA** or **400mA** position.

### 13. COM Common Terminal

Return terminal for all measurements

### 14. V/ $\Omega$

Volt, Ohms, Continuity, Diode, Frequency, Logic Test, Sig. Output Terminal.



#### 5-4. Digital and Bar Graph Displays

Items 15–18 describe the digital and bar graph displays.

##### 15. Digital Display

Digital readings are displayed on a 4000-count display with automatic polarity indication and decimal point placement.

##### 16. Analog Bar Graph

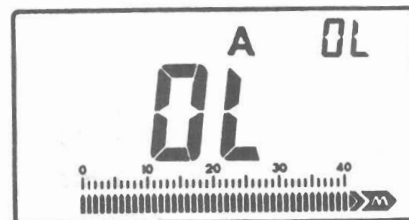
The bar graph consists of 43 segments that illuminate from left to right as the input increase. It functions much the same as the needle on an analog meter without the mechanical overshoot inherent in needle movements.

If the input equals or exceeds 4,000 counts on the range selected, **OL** is displayed with flashing the bar-graph and beeping when input is too excessive to display.

##### 17. Bar Graph Scale Scale for absolute readings.

##### 18. **OL** Overload Indication

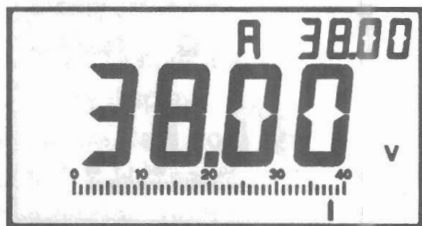
**OL** is displayed with flashing the bar-graph and beeping when input is too excessive to display.



### 5-5. Using the Advanced Functions

Item 19–31 describe the advanced functions.

#### 19. A Auto Hold



For the measurements of DC Voltage, Current, Diode, Capacitance, hFE and Inductance, **A** is displayed at the front of secondary display. When this feature is turned on, the secondary display shows the reading taken 4-5 seconds earlier.

#### 20. P Pulse

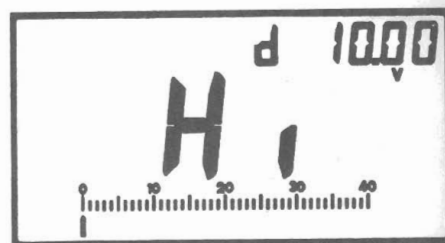
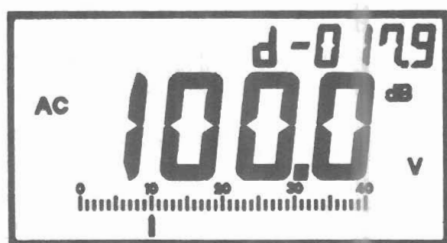
For AC Current measurements, **A** or **P** is displayed at the front of secondary display. When **P** is turned on, it indicates that the input value has a frequency while shows the reading taken by auto-hold mode on the secondary display. If you set the meter at **EXT** mode, your meter can directly display the frequency on the secondary display.



## 21. d Dual Display

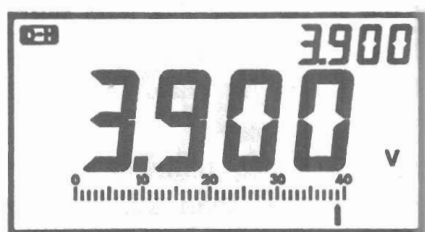
For the measurements of AC Voltages, Frequency, Temperature and Logic, d is displayed at the front of secondary display to measure and

readout two different types of measurement at the same time. The meter displays the following dual measurements;



Input Range Selection	Main Display	Secondary Display
AC Voltage	Ac Voltage	dB(m)
Frequency	Frequency	Ac Voltage
Temperature	°C	°F
Logic	HI/LO	DC Voltage

## 22. D-H Data Hold



The data hold feature lets you hold a reading on the secondary display.

To turn on the data hold feature, press **FUNCTION** until **D-H** appears in the upper left corner of the display. Both the main and secondary displays show the current reading.

To hold a reading on the secondary display, press **SET/RESET**. The main display continues to track the current measurement. Press **SET/RESET** to release the measurement.

**Note:** When main display is **OL** while measuring frequency and Capacitance, the secondary display updates to **OL**.

## 23. MIN Minimum



The minimum feature lets you measure the minimum value of changing reading. To turn on the minimum reading feature, repeatedly press **FUNCTION** until **MIN** appears at the top of the display. Press **UP** or **DOWN** to determine the range and press **SET/RESET** to activate the minimum feature. **MIN** & **R-H** appears.

The secondary display only updates when the current reading is lower than the previously held reading, but shows **OL** if the main display is overrange conditions. When the main display continues to track the current measurement, the secondary display shows the previously held minimum value.



Press **SET/RESET** to release the measurement.

**Note:** You can not hold **R-H** at **FREQ** and **CAP** measurements. But your meter still updates the secondary display if the current measuring digits is lower than the previously held digits. Decimal point is not valid.

#### 24. **MAX** Maximum



The maximum feature lets you measure the maximum value of a changing reading. To turn on the maximum reading feature, repeatedly press **FUNCTION** until **MAX** appears at the

top of the display. Both the main and secondary display shows the current reading. Press **UP** or **DOWN** to determine the range and press **SET/RESET** to activate the maximum feature. **MAX** & **R-H** appears.

The secondary display only updates when the current reading is higher than the previously held reading, but shows **OL** if the main display is overrange conditions. When the main display continues to track the current measurement, the secondary display shows the previous held maximum value. Press **SET/RESET** to release the measurement.

**Note:** You can not hold **R-H** at **FREQ** and **CAP** measurements. But your meter still updates the secondary display if the current measuring digits is lower than the previously held digits. Decimal point is not valid.

## 25. REL Relative Offset



The relative measurement feature lets you measure values relative to a reference value that you set. For example, you can set a reference voltage and then measure the difference between the actual voltage and the reference voltage. Follow these steps to set a reference value.

1. Repeatedly press **FUNCTION** until **REL** appears at the top of the display.
2. Press **UP** or **DOWN** to set the reference value's polarity ( - appears for negative value). Press **SET/RESET**.
3. Press **UP** or **DOWN** to set the reference value's first digit. Press **SET/RESET**.

4. Repeat step 3 for the other three digits.

5. Press **UP** or **DOWN** to determine the range and press **SET/RESET** to activate the relative measurements.

The main display shows the actual measurement. The secondary display shows the difference between the measured value and the reference value.

For example, if the stored reference is 100V and the current reading is 90V, the main display shows 090.0V and the secondary display shows -010.0V. If the reading is the same as the stored value, the secondary display will show 0.

### Notes:

- The first digit of the secondary display can be 0 to 3.
- If the main display is overrange condition, the secondary display shows **OL**.
- You can not set the **R-H** at **FREQ** and **CAP** measurements. But your meter still compare the difference between the mea-

sured and the reference value. The decimal point is NOT valid.

- To release from **REL** mode, press **FUNCTION** or turn the rotary switch to another range.

## 26. **CMP** Comparison



The Comparison function lets you rapidly compare a voltage measurement to stored high and low reference values. If the measured value is between the reference values, the meter's secondary display shows **PASS**. If the measured value is above (the upper reference) voltage or

below the lower reference value, the meter displays **HIGH** or **LOW** respectively.

Follow these steps to set the reference values and begin comparison measurements.

1. Repeatedly press **FUNCTION** until the meter displays **CMP**.
2. Press **UP** or **DOWN** to set the minimum reference value's polarity (– appears for negative values). Press **SET/RESET**.
3. Press **UP** or **DOWN** to set the minimum reference value's first digit. Then press **SET/RESET**. Repeat this step for the rest of the minimum reference value's digits.
4. Repeat step 2 and 3 to set the maximum reference value.

After you set both reference values, the meter displays the current measurement in the main display and the comparison result (**LO**, **PASS**, or **HIGH**) in the secondary display.

## 27. R-H Range Hold



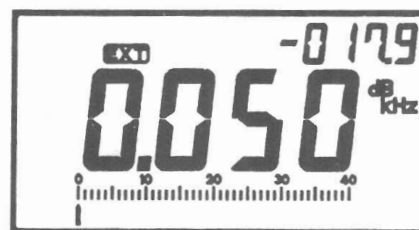
The range hold feature lets you set the meter from auto-ranging to manual range mode except Frequency and Capacitance ranges.

To turn on the range hold feature, repeatedly press **FUNCTION** until **R-H** appears at the top of the display.

In the manual mode, each press of **UP** or **DOWN** buttons will increment or decrement the range and annunciators.

To release **R-H** mode, press **SET/RESET** button.

## 28. EXT Extra

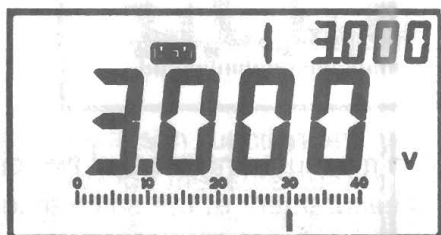


Your meter can measure and readout two different types of measurement at the same time. To set the extra feature, repeatedly press **FUNCTION** until **EXT** appears at the top of the display.

The meter displays the following extra measurements:

Input Range Selection	Main Display	Secondary Display
AC Voltage	AC Voltage	Frequency
AC Current	AC Current	Frequency
Frequency	Frequency	dB
Temperature	°C	°F
DC V.A/CAP/DIODE/hFE/ OHM/Inductance	DC V.A/CAP/DIODE/hFE/ OHM/Inductance	Auto Hold

## 29. MEM Memory



Follow these steps to store up to five measured values in memory for later recall.

1. Select the measurement type and range with the rotary switch.
2. Repeatedly press **FUNCTION** until **MEM** appears at the top of the display.
3. Repeatedly press **UP** or **DOWN** until the secondary display shows the number of memory (0 to 4) you want to store a value in.
4. While making a measurement, press **SET/RESET** to store the current measurement.



If you store a reading into a memory location which already stores data, the old data will be replaced with the new.

#### 30. RCL Recall



Follow these steps to recall a measured value from one of the five memories.

1. Repeatedly press **FUNCTION** until **RCL** appears at the top of the display.
2. Repeatedly press **UP** or **DOWN** until the number of memory you want to recall appears in the secondary display.
3. Press **SET/RESET**. The stored value appears in the secondary display.

#### 31. Number of memory

In modes of **MEM** and **RCL**, lets you address the number of memory each time press **UP** or **DOWN** buttons.

#### 5-6. Annunciators

Items 32–44 describe annunciators that indicate the mode or state in which the meter is operating.

#### 32. Continuity Check

Make it easy to check wiring, continuity of cables, fuses and connections, etc.

#### 33. Diode Test (For M-3850D only)

This value displayed is the forward voltage of semiconductor function(s) at approximately 1mA test current. Single 0-2.0V range.

#### 34. **AC** Alternating Current or Voltage

#### 35. Negative Polarity

Automatically indicates negative inputs.

When **REL** is enabled, indicates negative results of math calculations.

### 36. **FREQ** Frequency Count mode

Your meter readouts the measured frequency of up to 4MHz (M-3860D & M-3870D) and 40MHz (M-3850D).

### 37. **TEMP** Temperature

In this mode, the meter can measure and display the temperature from -40°C up to 1200°C by using the K-type thermocouple.

### 38. **CAP** Capacitance

Lets you to measure capacitance from nF 4, 40, 400, to uF 4, 40, 400.

### 39. **hFE** Transistor hFE

Enables you to measure hFE value.

### 40. Inductance

Enables you to measure coils of up to 400mH

(M-3860D) and 40H (M-3870D).

### 41. **LOGI** Logic Test

Enables you to check logic levels without extra logic probe. This function displays **Hi**, **Lo** or **■■■** to indicate logic high, logic low, or undetermined, respectively.

### 42. Secondary display

Allows secondary readings to be displayed independently of the main display.

### 43. Low Battery

This meter is powered by a single 9V battery. When this symbol is displayed, replace the battery to avoid errors in reading.

### 44. **dB** Decibel

Allows the dBm measurement for the frequency bands of up to 400Hz in **d** mode at AC Volt and in **EXT** mode at Frequency. dBm measurement (dB in the display) is indi-

## HOW TO MAKE MEASUREMENTS

cates the logarithmic ratio of input voltage to the standard stored value.

Input Voltage	dB
0.075mV	-60dB
109mV	-17dB
1.94V	8dB
19.40V	28dB

44. The following annunciators indicate the unit of the value displayed.

<b>AC</b>	Alternating current or voltage
<b>DC</b>	Direct current or voltage
<b>mV</b>	Millivolts ( $1 \times 10^{-3}$ volts)
<b>V</b>	Volts
<b>KHz</b>	Kilohertz ( $1 \times 10^{-3}$ cycles). Frequency
<b>MHz</b>	Megahertz ( $1 \times 10^{-3}$ cycles). Frequency
<b>°C</b>	Centigrade Degree
<b>°F</b>	Fahrenheit Degree
<b>μF</b>	Microfarads ( $1 \times 10^{-6}$ Farads)
<b>nF</b>	Nanofarads ( $1 \times 10^{-9}$ Farads)
<b>A</b>	Ampere (Amps). Current
<b>mA</b>	Milliampere ( $1 \times 10^{-3}$ amps) Current

<b>μA</b>	Microampere ( $1 \times 10^{-6}$ amps)
<b>Ω</b>	Ohm
<b>KΩ</b>	Kiloohm ( $1 \times 10^3$ )
<b>MΩ</b>	Megaohm ( $1 \times 10^6$ )
<b>dB</b>	decibels
<b>mH</b>	Millihenry
<b>H</b>	Henry

This section discusses some common applications for your meter, and alerts you to some considerations to keep in mind when taking measurements.

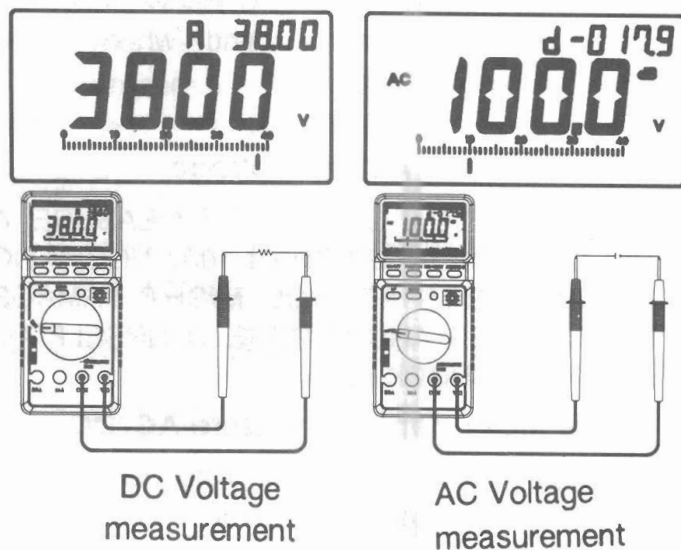
### 6-1. Measuring AC/DC Voltage

**WARNING:** DO NOT TRY TO MEASURE A VOLTAGE GREATER THAN 1000 VOLTS DC OR 750 VOLTS AC. YOU MIGHT DAMAGE YOUR METER AND EXPOSE YOURSELF TO A SEVERE SHOCK HAZARD.

#### Follow these steps to measure AC/DC Voltage

1. Rotate the function selector to the desired position.

2. Press **DCΩ/AC** (⎓) to toggle between DC and AC. **AC** appears for AC measurement.
3. Plug the black probe into the meter's **COM** terminal and the red probe into the **V/Ω** terminal.
4. Connect the probes to the AC/DC voltage source you want to measure.



#### Notes:

- During AC voltage measuring, your meter can directly display **AC** on the main display and **dB** on the secondary display in **d** (dual) mode and **AC** on the main display and frequency on the secondary display in **EXT** mode.
- If polarity is negative, – appears on the left of display.
- Each of the five AC/DC voltage ranges presents an input impedance of approximately 10MΩ in parallel with less than 100pF. AC voltage is AC coupled to the 100MΩ input.
- The meter's high input sensitivity produces a wandering effect when the probes are not connected to any circuit. This is normal and accurate reading will be appeared when you connect the probes to a circuit.

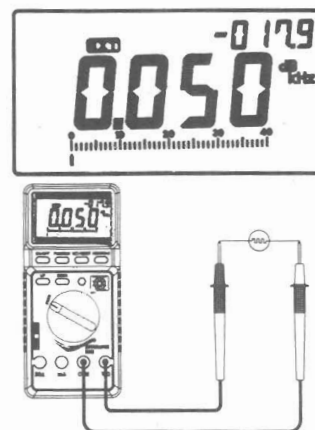
## 6-2. Measuring Frequency

When you first turn on the meter, your meter can directly display the frequency on the main display and AC voltage on the secondary display in **d** (dual) mode and also can measure the frequency on the main display and **dB** on the secondary display in **EXT** mode.

**WARNING:** IF YOU TRY TO MEASURE THE FREQUENCY OF A SIGNAL THAT EXCEEDS 750 VOLTS AC RMS, YOU MIGHT DAMAGE YOUR METER AND EXPOSE YOURSELF TO A SEVERE SHOCK HAZARD.

Follow these steps to measure the frequency of a signal.

1. Rotate the function selector to **FREQ** position.
  2. Plug the test probe into the **COM** and **V/ $\Omega$**  terminals.
  3. Connect the probe to the frequency source.
- Input Sensitivity  
150mV up to 3MHz  
between 300mV & 500mV over 3MHz



Frequency measurement

### Notes:

- When the test probes are connected to an AC outlet, do not turn the function selector switch to another range. It may damage the internal components or you.
- Overload Protection: 750V DC/AC RMS.
- For the most accurate measurement, we strongly recommend you to use the type of BNC cable.



### 6-3. Logic Test

The logic function lets you check digital circuits easily to determine the logic state of different parts of the circuit. Instead of displaying an absolute voltage, this function displays **HI**, **LO**, or **■■■■**, which indicate logic high, low or undetermined respectively.

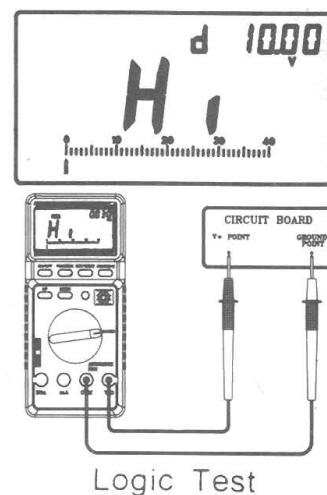
**Follow these steps to perform a logic test:**

1. Rotate the function selector to **LOGIC** range.
2. Plug the test probe into the **COM** and **V/Ω** terminals.
3. Connect the black probe to the ground point (GND) of the test circuit and the red probe to the supplying voltage point (V+). While keeping the test probe firmly connected to each point, press **SET/RESET**.
4. While keeping a connection between the black probe and the circuit's GND point, move the red probe to the other desired

points.

The meter immediately displays one of the three indications.

- If the measured value exceeds 70% of the stored (V+) value, **Hi** (high) appears.
- If the measured value falls below 30% of the stored (V+) value, **Lo** (low) appears.
- If the measured value is between 30% and 70% of the stored (V+) value, **■■■■** appears.



#### Notes:

- In this mode, **MIN** **MAX** and **D-H** functions do not work.
- The logic level is limited to a voltage range of up to 39.99V.
- After performing Logic test, press **SET/RESET** before rotating to another range.

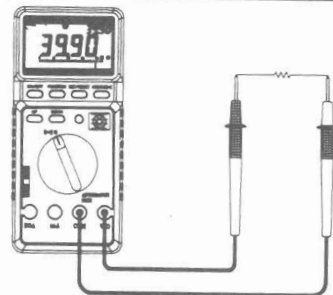
#### 6-4. Measuring Resistance

**WARNING:** NEVER CONNECT THE TEST PROBES TO A SOURCE OF VOLTAGE WHEN YOU HAVE SELECTED THE OHMS FUNCTION AND PLUGGED THE PROBES INTO THE V/ $\Omega$  TERMINAL.

BE SURE THAT THE CIRCUIT UNDER TEST HAS ALL POWER REMOVED AND THAT ANY ASSOCIATED CAPACITORS ARE FULLY DISCHARGED BEFORE YOU MAKE A RESISTANCE MEASUREMENT.

#### Follow these steps to measure Resistance

1. Rotate the rotary switch to  $\Omega$  position.
2. Press **DC $\Omega$ /AC** button to toggle between Resistance and Continuity.
3. Connect the probe to the device you want to measure.



Resistance measurement

#### Notes:

- The resistance in the test leads can diminish the accuracy on the lowest (400-ohm) range. The error is usually 1 to 0.2 ohms for a standards pair of test leads. To determine the error, short the test leads together and read the resistance of the leads.
- When measuring resistance, be sure that the contact between the probes and the circuit is good. Dirt, oil, solder flux, or other foreign matter seriously affect resistance.
- If the measured resistance value exceeds the maximum value, **OL** displays to indicate overload and the bar graph flashes.
- For resistance of approximately 4 Megaohm and above, the display might take a few seconds to stabilize. This is normal for high resistance readings.

#### 6-5. Continuity Testing

Continuity testing verifies that circuit connections are intact.

Follow these steps to perform audible continuity test.

1. Rotary the function selector to  $\langle\langle\circ\rangle\rangle \Omega$
2. Press **DC $\Omega$ /AC $\langle\langle\circ\rangle\rangle$**  button to toggle between resistance and continuity.
3. Remove power from the circuit.
4. Connect the probes to the circuit.


**Warning:** Never perform a continuity measurement on a circuit that has power connected.

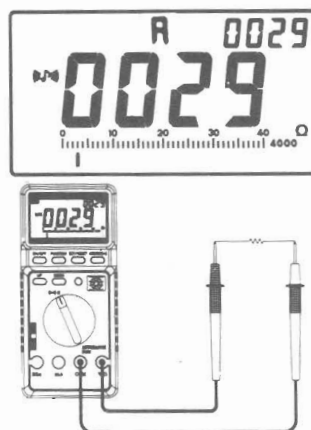
**Note:** The buzzer sounds if the measured resistance is below 40 ohms.

### 6-6. Checking Diodes (For M-3850D only)

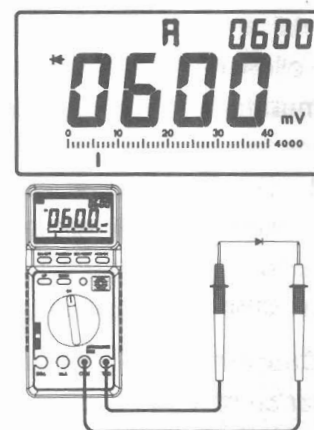
This function lets you check diodes and other semiconductors for opens and shorts. It also lets you determine the forward voltage for diodes. You can use this function when you need to match diodes.

#### Follow these steps to check Diode

1. Rotate the function selector to  position.
2. Plug the test leads into the **COM** and **V/ $\Omega$**  terminals.
3. Connect the probes to the diode you want to check and note the meter's reading.



Audible Continuity Test



Diode measurement

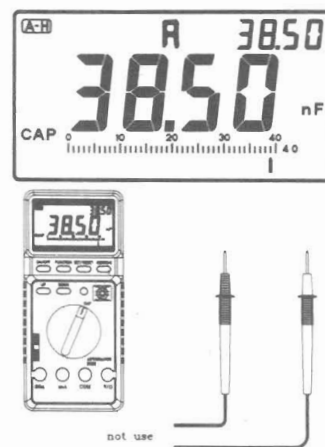
## 6-7. Measuring Capacitance

Follow these steps to measure capacitance normal:

1. Discharge each capacitor before testing by shorting its leads together. Use caution when handling some capacitors, as they can hold a considerable charge.

**Caution:** If you attempt to measure the capacitance of a charged capacitor, you might damage your meter.

2. Rotate the rotary switch to **CAP** range.
3. Insert the discharged capacitor into the CAP + and – clips connector. Your meter displays the capacitance value. For polarized capacitors, be sure to insert the negative lead in the - (minus) clip.



## Capacitance Measurement

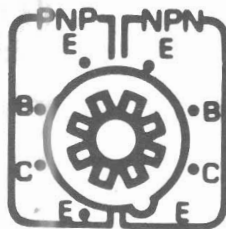
## 6-8. Checking Transistors

**Warning:** The transistor socket is not protected against overload. You can damage the meter and void your warranty if you build and use external leads for the transistor socket.



**Follow these steps to determine a transistor's base gain.**

1. Rotate the rotary switch to **hFE**.
2. Insert the transistor you want to measure into the appropriate transistor socket. Your meter displays the transistor's hFE value.



**Transistor hFE Test**

**Notes:**

Insert the base, collector, and emitter pins into the correct sockets.

- Some Darlington transistors contain internal resistors because the meter uses two current readings to calculate hFE, any internal transistor resistance causes unreliable readings.
- Do not take the hFE reading as an absolute measurement value, but rather as an indication that the transistor is under operation. The true gain of a transistor depends on its operating current. This meter applies up to 1000  $\mu\text{A}$  to the emitter and collector and measures the collector current to calculate the hFE.
- You cannot measure the hFE of a transistor that is connected in a circuit.
- You cannot measure the hFE of a FET or other non-bipolar transistor.
- High-voltage junctions in power transistors prevent correct readings. Also, the larger leads of the power transistor can damage the test socket.

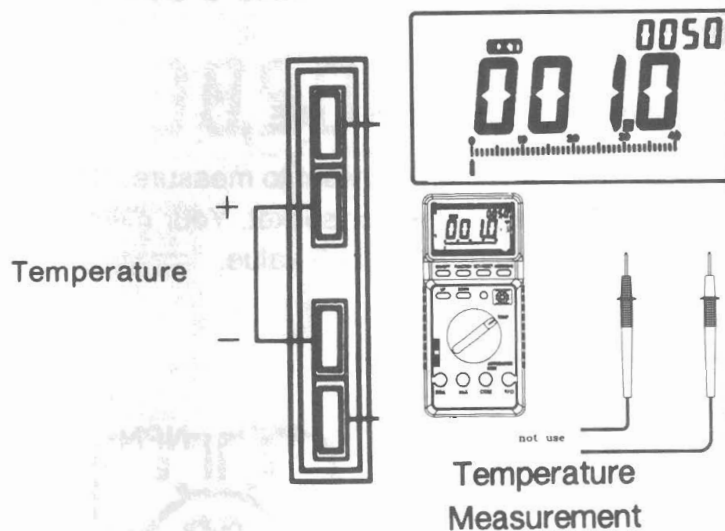
### 6-9. Measuring Temperature

The meter can directly display the temperature with dual-display by reading Celsius on the main-display and Fahrenheit on the secondary display.

Temperature measurement is exclusively executed with type "K" temp probes (NiCrNi).  
The measuring range is from  $-40^{\circ}\text{C}$  to  $+1200^{\circ}\text{C}$ .

Follow these steps to measure Temperature.

1. Rotate the function selector switch to **TEMP**.
2. Insert the K-type thermocouple into the inner-most connections and connect to the device you want to measure the temperature.



### 6-10. Signal Output Checking (For M-3860D)

Your meter generates a built-in C-MOS signal generator with 8 steps of frequencies and levels. You can check digital circuits with it.

**Follows these steps to check Signal Output.**

1. Rotate the function selector to Sig. Out.
2. Plug the test leads into the **COM** and **V/ $\Omega$**  terminals.
3. Press UP or DOWN to select the frequency level.
4. Connect the test probes to the device you want to check.
5. Fix the test probes with the supplied Signal probe's alligator parts.

#### Notes:

- Your meter generates C-MOS signal with a fixed level of approx. 3Vpp with 8 steps of frequencies Hz 1-10-100 up to KHz 1-2-3-4-5.
- In this mode, the programmed **FUNCTION** does not work.

#### Hints !

You can use the supplied Signal probe to check the discharged capacitor or coil which can not be inserted into the CAP socket directly. To check those components, plug the supplied Signal probe into the innermost connection and connect the components's leads to each alligator part.



## 6-11. Measuring Inductance (For M-3860D & M-3870D)

Your meter can measure coils of up to 400mH (M-3860D) and 40H (M-3870D).

Follow these steps to measure inductance.

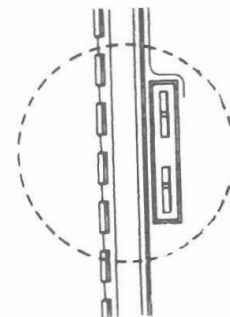
1. Rotate the function selector switch to 400mH or 40H.
2. Insert the discharged coil into the outermost connections and read the display.

### Notes :

- When the input is not connected, ie, at an open circuit, OL is displayed to indicate an overrange condition.
- If OL is not displayed at open status, press  $DC\Omega/AC \llcorner \circ \llcorner$  so your meter displays OL .
- Pls refer to a test condition in p. 39.



not use



# Inductance & Quality Factor

Test Condition

Frequency = 550 Hz ( Square Wave )

Internal Series Resistance

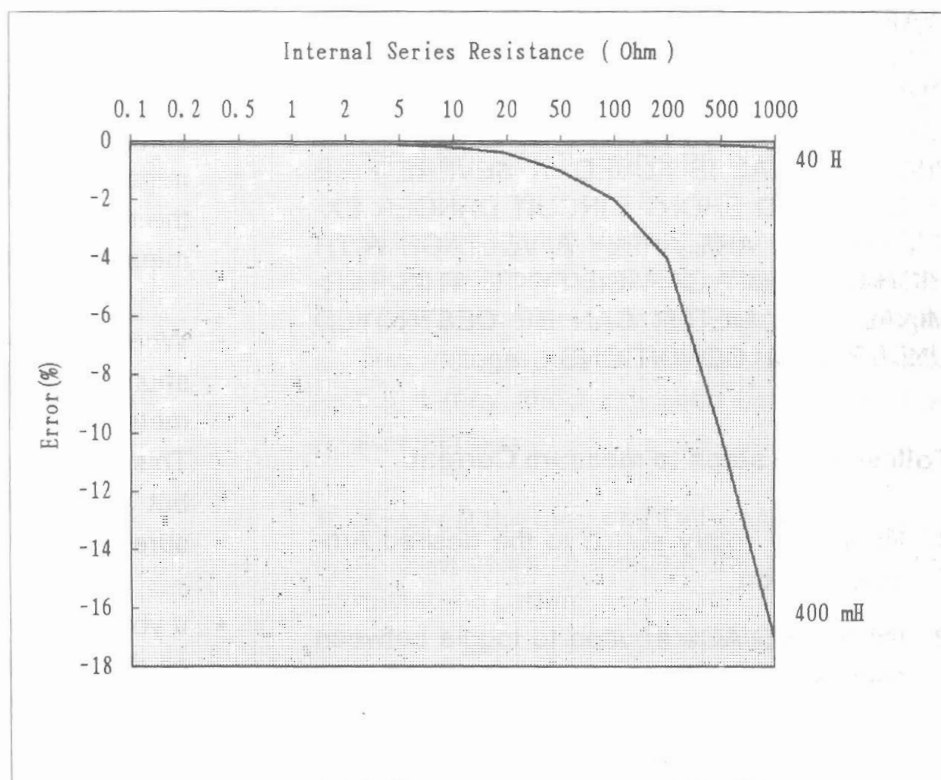
400 mH  $R_s = 4.7 \text{ K}\Omega$

40 H  $R_s = 470 \text{ K}\Omega$

Internal Resistance Error ( % )

R(s)	400 mH	40 H
Ohm	Error (%)	Error (%)
0.1	-0.1	-0.1
0.2	-0.1	-0.1
0.5	-0.1	-0.1
1	-0.1	-0.1
2	-0.1	-0.1
5	-0.1	-0.1
10	-0.2	-0.1
20	-0.4	-0.1
50	-1	-0.1
100	-2	-0.1
200	-4	-0.1
500	-10	-0.1
1000	-17	-0.2

Refer to reading error as specified at special characteristics.





## 6-12. Measuring Current

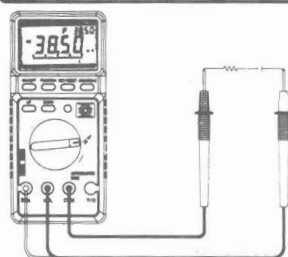
**WARNING:** YOU MAY DAMAGE THE METER OR BE INJURED IF THE FUSE BLOWS WHILE CURRENT IS BEING MEASURED IN A CIRCUIT VOLTAGE GREATER THAN 250V. THE 20A TERMINAL IS FUSED. A SEVERE FIRE HAZARD AND SHORT CIRCUIT DANGER EXISTS IF YOU ARE APPLY A VOLTAGE WITH HIGH-CURRENT CAPABILITY TO THIS TERMINAL. THE METER CAN BE DESTROYED UNDER SUCH CONDITIONS.

### Follow these steps to measure Current.

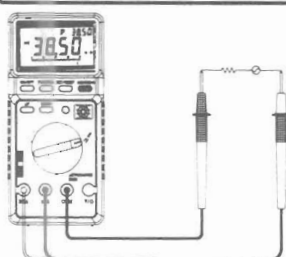
1. Rotate the rotary switch to the desired Ampere position.
2. Press **DCΩ/AC** button to toggle between alternating and direct current.
3. Connect the meter in series with the load or circuit under test.

### Notes:

- If you do not know approximately what the current is, connect the circuit to **20A** input terminal first to see if you have a safe level for the mA input terminal. Use the **mA** input terminal for Current up to 4mA or 400mA.
- When measuring Current, the meter's internal shunt resistors develop a voltage across the meter's terminals called "burden voltage". This voltage drop is very low in your meter, but it may affect precision circuits or measurements.
- If you set the meter for DC current, – appears or disappears to indicate the polarity of the measured current.



DC Current  
measurement



AC Current  
measurement

#### Notes:

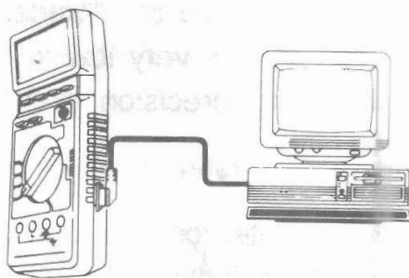
- If you do not know approximately what the current is, connect the circuit to **20A** input terminal first to see if you have a safe level for the mA input terminal. Use the **mA** input terminal for Current up to 4mA or 400mA.
- When measuring Current, the meter's internal shunt resistors develop a voltage across the meter's terminals called "burden voltage". This voltage drop is very low in your meter, but it may affect precision circuits or measurements.
- If you set the meter for DC current, – appears or disappears to indicate the polarity of the measured current.

## 6-13. Using the Meter with a Computer

### 6-13-1 Interfacing the Meter with a PC

Follow these steps to interface the meter with a computer.

1. Connect the RS-232C cable between the meter's and the computer's serial ports.
2. Turn on the meter.



**Caution :** Use only the type of serial interface cable MT/RS232C exclusively designed for your meter.

Never attempts to extend the cable over length of 3m.

### 6-13-2. Using the supplied software

We have included two programs to log and display data collected with your meter. The MS-DOS program is called **METEX**, and is in the **GRAPHIC** subdirectory on the supplied diskette. The windows program is called **Scopeview**, and is in the **SCOPE** directory on the supplied diskette.

### 6-13-3. Using the DOS Software

Follow these steps to install and run the MS-DOS software.

**Note:** The following steps assume a basic knowledge of MS-DOS commands, and also assume you have a hard disk. Refer to your computer's MS-DOS User's Guide for information about MS-DOS commands. This software requires a **VGA** monitor.

1. Insert the supplied diskette in your computer's drive.

- 
2. Create a directory on your hard disk for the software. For example, to make a directory called **METER** for the software, type:

```
cd \ [ENTER]  
md METER [ENTER]
```

3. Make the directory you create the current directory. For example, if the directory is **METER**, type:

```
cd \ METER [ENTER]
```

4. Copy the files from the **GRAPHIC** sub-directory on the floppy drive to your hard disk.

For example, type:  
copy a:\GRAPHIC c:

5. To turn the program, type **METEX** [ENTER]. Follow the on-screen help for specific operating instructions.

**Notes:**

- If you do not have a hard disk, you can still run the program from the supplied floppy

diskette. Change to the **GRAPHIC** sub-directory on the diskette, and type **METEX** [ENTER]

- To stop the program or to escape from a device I/O error, press [CTRL+BREAK].

#### 6-13-4. Using the Windows Software

Follow these steps to install and run the Windows software.

**Note:** The following steps assume a basic knowledge of Microsoft Windows. Refer to your computer's Window's User's Guide for information about using Windows. This software requires Microsoft Window. Version 3.1 and a **VGA** or **EGA** display.

1. Start your computer and run Windows.
2. Insert the supplied diskette in your computer's drive.

3. From the Windows Program Manager, pull down the FILE menu and select the RUN option.
4. At the prompt, type:  
a:\scope\setup [ENTER] (if you placed the diskette in Drive A)  
b:\scope\setup [ENTER] (if you placed the diskette in Drive B)
5. Follow the on-screen prompts to complete the installation.
6. To run the program, double-click the **SCOPE-VIEW** icon. Follow the on-screen help for specific operating instructions.

Also, refer to the **README** file in the diskette's **SCOPE** subdirectory for operation hints.

### 6-13-5. Technical information

#### Communication parameters

- Transmission rate: 1200 baud
- Character coding: 7-bit ASCII
- Parity: None
- Stop Bits: 2

#### Data Format

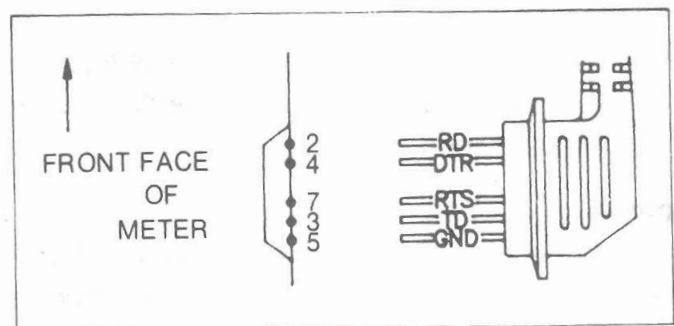
The Data Format consists of a frame of 14 bytes. The frames are set as follows:

BYTE) 1 2 3 4 5 6 7 8 9 A B C D E

Ex. 1) DC -3.999 V CR

Ex. 2) OH 3.999 Mohm CR

Connection of MT/RS-232C cable to the meter.





## CARE AND MAINTENANCE

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### Hints for Writing Your Own Software

If you write your own program, the host computer must give the meter the D command to activate data transmission.

The following program is an example of a BASIC program that gets a single reading from the meter:

```
10 OPEN "COM 1:1200, N, 7, 2, RS, CS, DS,  
    CD" AS #2  
20 A$="D"  
30 PRINT #2, A$  
40 IN$=INPUT$(14, #2)  
50 PRINT IN$  
60 CLOSE #2  
70 END
```

Your digital multimeter is a precise electronic device. Do not tamper with circuit. To prevent electric shock hazard, turn off the meter and disconnect test leads before removing the back cover.

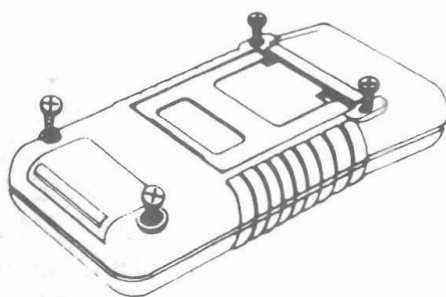
### 7-1. Replacing the Fuse

**WARNING:** TO AVOID ELECTRIC SHOCK, DISCONNECT THE TEST PROBES BEFORE REMOVING THE BATTERY OR THE FUSE. REPLACE ONLY WITH THE SAME TYPE OF BATTERY OR FUSE. DO NOT REMOVE THE TOP COVER. SERVICE SHOULD BE PERFORMED ONLY BY QUALIFIED PERSONNEL.

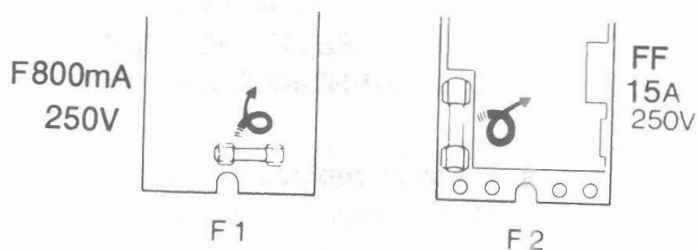
**CAUTION:** FOR CONTINUED PROTECTION AGAINST FIRE OR OTHER HAZARD, REPLACE ONLY WITH FUSE OF THE SPECIFIED VOLTAGE AND CURRENT RATINGS.

#### Follow these steps to replace the fuse:

1. Press **ON/OFF** button to turn the meter off and disconnect the test probes.
2. Remove the back cover by unscrewing the four screws and pulling off the meter's cover.
3. Remove the blown fuse.



3. Remove the blown fuse.



4. Install the new fuse in the fuse compartment.
5. Replace the cover and secure it with the screws.

**WARNING:** DO NOT OPERATE YOUR METER UNTIL THE BACK COVER IS IN PLACE AND FULLY CLOSED.

## 7-2. General Maintenance

Any adjustments, maintenance, or repair of the instrument except battery and fuse replacement, should be done only by qualified service personnel.

1. Keep your meter dry. If it does get wet, wipe it dry immediately. Liquids might contain minerals that can corrode the electronic circuits.
2. Use and store your meter only in normal temperature environments. Extreme temperatures can shorten the life of electronic devices, damage battery and distort or melt

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plastic parts.

3. Handle your meter gently and carefully. Dropping it can damage circuit boards and cases and cause the meter to work improperly.
4. Keep your meter away from dust and dirt, which can cause premature wear of parts.
5. Wipe your meter with a damp cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strongly detergents to clean the meter.
6. Use only a brand-new battery of the same size and type. Always remove an old or weak battery. It can leak chemicals that destroy electronic circuits.

Modifying or tampering with your meter's internal components can cause a malfunction and might invalidate its warranty.

## SPECIFICATIONS

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### 8-1. General Characteristics

Maximum Display .....	4000 counts (3 3/4 Digit) with automatic polarity indication
Max Input Current AC & DC .....	20A
Reading Time .....	10 reading per second
Operating Temperature .....	0°C to 40°C (32°F to 104°F)
Storage Temperature .....	-10°C to 50°C (14°F to 122°F)
Temperature for Guaranteed Accuracy .....	+23°C±5°C
Battery Type .....	NEDA 1604 9V or 6F22 9V
Size (H×W×L) .....	87×147×34
Net Weight .....	305g±10g (incl. 9V Battery)
Accessories    Supplied.....	Operating Manual, A pair of Test Leads, A Spare Fuse (800mA/250V), A 9V Battery
Optional .....	Carrying Case, Interface Cable MT/RS-232C, Floppy disc with software, K-type thermocouples, Signal Out probe

## 8-2. Special Characteristics

MODEL	FUNCTION	RANGE	ACCURACY	RESOLUTION
M-3860D M-3850D M-3870D	DC VOLTAGE	400 mV 4 V 40 V 400 V	$\pm 0.3\%$ of rdg +1 dgt	100 $\mu$ V 1 mV 10 mV 100 mV
		1000 V	$\pm 0.5\%$ of rdg +1 dgt	1 V
M-3850D M-3870D	AC VOLTAGE	400 mV 4 V 40 V 400 V	$\pm 0.8\%$ of rdg +3 dgt	100 $\mu$ V 1 mV 10 mV 100 mV
		750 V	$\pm 1.0\%$ of rdg +3 dgt	1 V
3860D	AC VOLTAGE (True rms)	400 mV 4 V 40 V	$\pm 0.8\% + 3$ dgt ( $\pm 2.5\% + 5$ dgt)	100 $\mu$ V 1 mV 10 mV
		400 V 750V	$\pm 1.0\%$ of rdg +3 dgt	100 mV 1 V

Note: Impedence of AC Voltage True rms (M-3860D)

1. 40Hz to 20KHz for 400mV, 4V, 40V & 200V
2. 40Hz to 1KHz for above 200V to 750V



MODEL	FUNCTION	RANGE	ACCURACY	RESOLUTION
M-3850D M-3860D M-3870D	DC CURRENT	* 400µA 4 mA	± 1.0% of rdg + 1 dgt	100 nA 1 µA
		40 mA 400 mA	± 0.8% of rdg + 1 dgt	10 µA 100 µA
		4 A 20 A	± 1.5% of rdg + 5 dgt	1 mA 10 mA
M-3850D M-3870D	AC CURRENT	* 400µA 4 mA	± 1.8% of rdg + 3 dgt	100 nA 1 µA
		40 mA 400 mA	± 1.5% of rdg + 3 dgt	10 µA 100 µA
		4 A 20 A	± 2.0% of rdg + 5 dgt	1 mA 10 mA
M-3860D	AC CURRENT	40 mA 400 mA	(± 2.5% of rdg + 3 dgt)	10 µA 100 µA
		4 A 20 A	± 2.0% of rdg + 5 dgt	1 mA 10 mA

**Notes:**

- \* Not available for M-3870D and M-3860D
- Impedance of AC Current True rms for M-3860D
  - 1) 40Hz to 20KHz for 4mA/400mA.
  - 2) 40Hz to 1KHz for 20A

MODEL	FUNCTION	RANGE	ACCURACY	RESOLUTION
M-3850D M-3860D M-3870D	RESISTANCE	400 $\Omega$ 4 K $\Omega$ 40 K $\Omega$ 400 K $\Omega$ 4 M $\Omega$	$\pm 0.5\%$ of rdg + 1 dgt	0.1 $\Omega$ 1 $\Omega$ 10 $\Omega$ 100 $\Omega$ 1 K $\Omega$
		40 M $\Omega$	$\pm 1.0\%$ of rdg + 2 dgt	10 K $\Omega$
M-3850D M-3860D M-3870D	CAPACITANCE	4 nF 40 nF 400 nF	$\pm 2.0\%$ of rdg + 3 dgt	1 pF 10 pF 100 pF
		4 $\mu$ F 40 $\mu$ F 400 $\mu$ F	$\pm 3.0\%$ of rdg + 5 dgt	1 nF 10 nF 100 nF
	* DIODE	Measures forward resistance of a semiconductor junction in K $\Omega$ a test current of 1.5mA.		

\* Not available for M-3860D/M-3870D

MODEL	FUNCTION	RANGE	ACCURACY	RESOLUTION
M-3860D M-3870D	INDUCTANCE	40 mH	$\pm 3.0\%$ of rdg + 20 dgt	10 $\mu$ H
		400 mH	$\pm 3.0\%$ of rdg + 10 dgt	100 $\mu$ H
		* 4 H	$\pm 3.0\%$ of rdg + 20 dgt	1 mH
		* 40 H	$\pm 3.0\%$ of rdg + 10 dgt	10 mH
M-3860D	SIGNAL OUTPUT	Generate C-MOS level signal with 8 steps of frequencies Hz 1-10-100/KHz 1-2-3-4-5		

**Notes:** • Inductance \* Not available for M-3860D.

- Pulse frequency for Inductance measurement: Typical 550Hz

MODEL	FUNCTION	RANGE	ACCURACY	RESOLUTION
M-3850D M-3860D M-3870D	FREQUENCY	4 KHz	$\pm 0.1\%$ of rdg + 1 dgt	1 Hz
		40 KHz		10 Hz
		400 KHz		100 Hz
		4 MHz		1 KHz
		* 40 MHz		10 KHz
	TEMPERATURE	-40°C — 200°C	$\pm (3.0\%$ of rdg + 5 dgt)	1 °C
		200°C — 1200°C	$\pm (3.0\%$ of rdg + 2 dgt)	

Frequency: \* Not available for M-3860D & M-3870D.

RESOLUTION	ACCURACY	GENCO	FUNCTION	WARRANTY
1 Hz		1000 Hz		
10 Hz		10 KHz		
100 Hz		100 KHz		
1 KHz		1 MHz		
10 KHz		10 MHz		

#### WARRANTY

Warrants this instrument to be free from defects in material and workmanship for a period of one year. Any instrument found defective within this period from the delivery date and returned to the factory with transportation charge prepaid will be repaired, adjusted, or replaced at no charge to the original purchaser. This warranty does not cover expendable items such as batteries or fuses. If the defect has been caused by a misuse or abnormal operating conditions, the repair will be billed at a nominal cost.