



**DIGITAL MULTIMETER**

CE

**INSTRUCTION MANUAL**

**APPA 99II**





 **WARNING**

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY.  
TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT  
CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.





## **INTRODUCTION**

### **1-1 Unpacking and Inspection**

Upon removing your new Digital Multimeter from its packing, you should have the following items:


1. Digital Multimeter.
2. Test lead set (one black, one red).
3. Instruction manual.
4. Protective holster.
5. K Type Temperature Sensor.
6. Sensor Adaptor.





### 1-2 Meter Safety


Terms as Marked on Equipment.

 ATTENTION —Refer to manual.


 DOUBLE INSULATION —Protection Class .

 DANGER —Risk of electric shock.

Symbols in this Manual.

 This symbol indicates where cautionary or other information is found in the manual.

 FUSE

 Battery



### 1-3 Front Panel

Refer to Figure 1 and to the following numbered steps to familiarize yourself with the meter's front panel controls and connectors.



- 1. Digital Display** —The digital display has 4000 counts LCD readout with 82 segments analog bar graph, auto polarity, decimal point, "AC, DC" RANGE, "APO REL MAX, MIN, PMAX, PMIN and unit annunciators.
- 2. Rotary Switch** —Select the Function and Range desired.
- 3. COM Input Terminal** —Ground input connector.
- 4. °C V Hz Input Terminal** —Positive input connector for Volts, Ohms Capacitance and Temperature Frequency.
- 5. mA Input Terminal** —Positive input connector for Amp measurements (up to 400mA).
- 6. A Input Terminal** —Positive input connector for Amp measurements (up to 10A).
- 7. Range Switch, (Manual Range)** —Press the "Range" switch to select manual ranging. The "RANGE" annunciator will be displayed. Pressing the "Range" switch permits selection of the appropriate measuring range. To return to Autoranging press and hold the "Range" switch for 2 seconds.



- 8. REL / (PMIN/MAX) switch** —A. In voltage and current modes, pressing “REL” performs maximum and minimum PEAK hold function. Pressing “REL” toggles between PMIN and PMAX measured values and the PMIN or PMAX annunciators are displayed. To calibrate this function press and hold “REL” until the “CAL” annunciator is displayed, then short the test leads until the display reads zero. Press and hold the “REL” switch to exit this function.
- B. In all other modes pressing the “REL” switch precuts comparison between two measured values. When taking the first measurement press the “REL” switch to store the reading, the “REL” annunciator will be displayed and the reading is zeroed. When taking the second measurement the display will show the difference between measurement 2 and measurement 1 (will be negative if measurement 1 is large than measurement 2). Pressing the “REL” switch again causes the display to show measurement 2, and the “REL” annunciator will flash. To exit this mode press and hold the “REL” switch for 2 seconds.
- 9. MIN/MAX switch** —This switch is used to display “MAX” and “MIN” values of measurement, press 2 seconds to quit. In this mode, when “MAXMIN” is blinking the reading is of measuring signal.





- 10. Hold Switch** —This switch is used to hold measured value for all functions, the “” “RANGE” annunciator are displayed. Conversions are made but the numeric display is not updated.  
This switch can be invoked to “MIN/MAX” mode or “PMIN/PMAX” mode.
- 11. Light switch** —Press this switch to turn on or turn off the back-light.
- 12. Blue Switch** —Press the switch to measure AC Voltage / Current or DC Voltage / Current in the voltage / Current mode or to measure Resistance or continuity or diode in  mode or to measure Frequency or RPM in Hz/RPM mode.



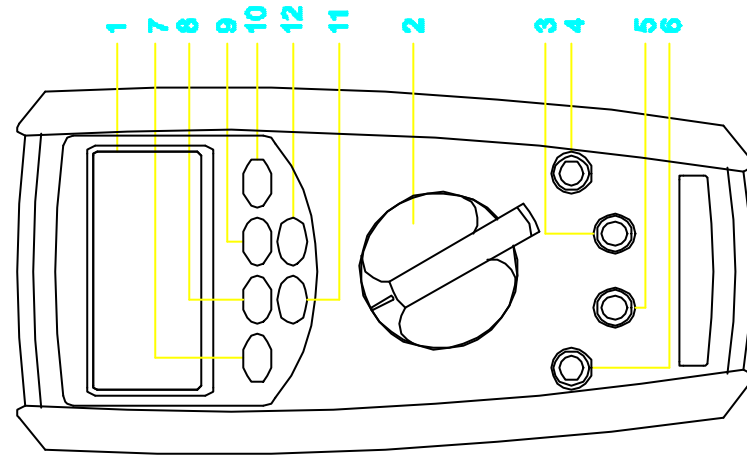


Figure 1








## **SPECIFICATIONS**

### **2-1 General Specifications**

**Display** : The Liquid Crystal Display (LCD) with a maximum reading of 4000 and 82 segments bar graph.

**Polarity Indication** : Automatic, positive implied, negative indicated.

**Overrange Indication** : "OL" or "-OL".

**Low Battery Indication** : "  " is displayed when the battery voltage drops below operating voltage.

**Sampling** : 2 times/sec for digit. 12 times/sec for analog bargraph.

**Auto Power Off** : Approx 30 minutes.

**Operating Ambient** : 0°C ~ 30°C ( 80%R.H), 30°C ~ 40°C ( 75%R.H),  
40°C ~ 50°C ( 45%R.H).

**Storage Temperature** : -20°C to 60°C , 0 to 80% R.H. when battery removed from meter.

**Temperature Coefficient** : 0.15 x (specified accuracy) /°C , <18°C or > 28°C .

**Power Requirements** : Standard 9V battery NEDA 1604, IEC6F22, JIS006P.

**Battery Life** : Alkaline 300 hours.





**Dimensions (W x H x D) :** 88mm x 180mm x 33.5mm , without holster.  
94mm x 188mm x 40mm , with holster.

**Accessories :** Protective Holster , battery (installed), instruction manual, test lead, K-type Temperature Sensor and Sensor Adaptor.

#### **2-2 Environmental Conditions**

**Indoor use.**

**Maximum Altitude :** 2000 Meter.

**Installation Category :** IEC 1010, 1000V Cat. , 600V Cat. .

**Pollution Degree :** 2



### 2-3 Electrical Specifications

Accuracy is  $\pm$ (% reading + number of digits) at 23°C  $\pm$ 5°C , less than 80% R.H.

#### (1) DC Volts

Range	Resolution	Accuracy	Over voltage protection
400mV	100 $\mu$ V	$\pm$ (0.25% reading + 5 digits)	DC 1000V
4V	1mV	$\pm$ (0.4% reading + 1 digit)	
40V	10mV	$\pm$ (0.25% reading + 1 digit)	
400V	100mV		
1000V	1V		

**Input Impedance :** 10M . (over 1000M in 400mV range).

(2) AC Volts

Range	Resolution	Accuracy	Over voltage protection
400mV	0.1mV	$\pm(2.0\% \text{ reading} + 8 \text{ digits})^3$	750V rms
4V	1mV	$\pm(1.3\% \text{ reading} + 5 \text{ digits})^1 \ 2$	
40V	10mV	$\pm(1.3\% \text{ reading} + 5 \text{ digits})^1$ 40Hz to 1KHz	
400V	100mV		
750V	1V		

Input Impedance : 10M // less than 100pF.

1.  $\pm(1.5\% \text{ reading} + 5 \text{ digits})$  for (50% ~ full scale) of range.
2. Frequency Response : 40Hz ~ 1KHz ;  $\pm(1.5\% + 5 \text{ digits})$  for 500Hz ~ 1KHz.
3. Frequency Response : 50Hz ~ 60Hz.

**AC Conversion Type** : AC conversions are ac-coupled, true rms responding, calibrated to the rms value sine wave input.

**Crest Factor** : +1.5% addition error for C.F. from 1.4 to 3  
+3.0% addition error for C.F. from 3 to 4

where C.F. =  $\frac{\text{Peak}}{\text{RMS}}$

**(3) DC Current**

Range	Resolution	Accuracy	Voltage Burden
40mA	10 $\mu$ A	$\pm$ (0.6% reading + 2 digits)	200mV max
400mA	0.1mA	$\pm$ (0.7% reading+ 2 digits)	2V max
10A	10mA	$\pm$ (1.0% reading + 3digits)	2V max

**Overload Protection** : 1A (500V) fast blow fuse for mA input.

10A (500V) fast blow fuse for A input.

Both 10KA breaking capacity @ 440 Vac , size 32 x 6.3mm.

(4) AC Current

Range	Resolution	Accuracy	Voltage Burden
40mA	10 $\mu$ A	$\pm$ (2.0% reading + 5 digits)	200mV max
400mA	0.1mA		2V max
10A	10mA	$\pm$ (2.5% reading + 5 digits)	2V max

**Frequency Response :** 40Hz ~ 1KHz.

**Overload Protection :** 1A (500V) fast blow fuse for mA input.

10A (500V) fast blow fuse for A input.

Both 10KA breaking capacity @ 440 Vac , size 32 x 6.3mm.

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+3.0% addition error for C.F. from 3 to 4


where C.F. =  $\frac{\text{Peak}}{\text{RMS}}$

(5) Resistance

Range	Resolution	Accuracy	Overload Protection
400	0.1	$\pm(0.7\% \text{ reading} + 3 \text{ digits})$	600V rms
4K	1	$\pm(0.4\% \text{ reading} + 3 \text{ digits})$	
40K	10		
400K	100		
4M	1K	$\pm(0.6\% \text{ reading} + 3 \text{ digits})$	
40M	10K	$\pm(1.5\% \text{ reading} + 5 \text{ digits})$	

Open circuit Voltage : -1.3V approx.

(6) Diode Check and Continuity

Range	Resolution	Accuracy	Max. Test Current	Max. Open Circuit Voltage
	1mV	$\pm(1.5\% \text{ reading} + 5 \text{ digits})^*$	1.5mA	3V

\* For 0.4V ~ 0.8V.

**Overload Protection** : 600V rms max.

**Continuity** : Internal sounder will activate when resistance is less than 30  $\Omega$  approximately.



(7) Frequency / RPM

Range	Resolution	Sensitivity	Accuracy	Overload Protection
4.0KHz/40KRPM	1Hz/30RPM	100mV rms	Frequency : 0.01% ±1 digit	600V rms
40KHz/400KRPM	10Hz/300RPM			
400KHz/4MRPM	100Hz/3KRPM			
4MHz/40MRPM	1KHz/30KRPM	250mV rms	RPM : 0.01% ±10 digits	
40MHz/400MRPM	10KHz/300KRPM	1V rms		

(8) Capacitance

Range	Resolution	Accuracy	Overload Protection
4nF	1pF	±(3%reading + 10digits)	600V rms
40nF	10pF		
400nF	100pF	* ±(2%reading + 8digits)	
4μF	1nF		
40μF	10nF		
400μF	100nF	** ±(5%reading + 20digits)	
* 4mF	1μF		
* 40mF	10μF		

\* 4mF and 40mF ranges may have rolling within accuracy.

\*\* specify reading < half full scale of range.

(9) Temperature (°C)

Temperature	Accuracy	Overload Protection
-20°C ~ 0°C	±(2% reading + 4°C)	600V rms
1°C ~ 100°C	±(1% reading + 3°C)	
101°C ~ 500°C	±(2% reading + 3°C)	
501°C ~ 800°C	±(3% reading + 2°C)	

(10) Temperature ( )

Temperature	Accuracy	Overload Protection
-4 ~ 32	$\pm(2\% \text{ reading} + 8)$ )	600V rms
33 ~ 212	$\pm(1\% \text{ reading} + 6)$ )	
213 ~ 932	$\pm(2\% \text{ reading} + 6)$ )	
933 ~ 1472	$\pm(3\% \text{ reading} + 4)$ )	

(11) PEAK HOLD

Function	Range	Accuracy	Function	Range	Accuracy
DCV	400mV	Unspecified	DCI	40mA	±(3% reading +60 digits)
	4V	±(1.5% reading + 300 digits) 2*		400mA	
	40V	±(1.5% reading + 60 digits)		10A	±(1.5% reading + 60 digits)
	400V				
	1000V				
ACV	400mV	Unspecified	ACI	40mA	±(3% reading +60 digits)
	4V	±(1.5% reading + 300 digits) 2*		400mA	
	40V	±(1.5% reading + 60 digits)		10A	±(1.5% reading + 60 digits)
	400V				
	750V				



- Note :**
1. With zero calibrated before measurement.
  - 2\* 4V range specifies readings above 10% of full scale of range.
  3. Amp ranges specify reading <90% of full scale of range.
  4. In the noise generating field, may affect intervals.

**(12) Auto Power Off (APO)**

The APO annunciator on the LCD panel indicates that the meter is working in the Auto Power Off mode. If the meter idles for more than 30 minutes, the meter automatically turns the power off. When this happens, the state (non-logic measurement) of the meter is stored. The meter can be turned back on by pushing any switch except back light switch or changing the rotary switch. If the meter is Re-Powered by pushing any switch, the LCD displays the stored value. Pressing the Hold switch disables the hold state. The meter will produce a periodic alarm 15 seconds before automatically turning power off , any key press or rotary change will reset the Auto-Power-Off delay of 30 minutes.

**(13) Disable Auto Power Off**

In order to disable Auto Power Off function, power up the meter whilst pressing any of the function switches other than the "Hold" or BLUE switches.






### **OPERATION**

This instrument has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus and has been supplied in a safe condition. This instruction manual contains some Information and warnings which have to be followed by the user to ensure safe operation and to retain the instrument in safe condition.

#### **3-1 Preparation and Caution before Measurement**

1. Before measurement, switch the meter on and allow it to warm up for at least 60 seconds.
2. When the rotary function selector is changed during measurement, be sure do so only after removing the test leads from the equipment.
3. If the equipment is used near noise generating equipment, be aware that may become unstable or indicate large errors.
4.  Maximum rated voltage to earth for voltage and current measurements terminals is 1000V CAT. , 600V CAT. .



### 3-2 Voltage Measurements

1. Connect the red test lead to the "C V Hz" input terminal and the other (black) test lead to the "COM" terminal.
2. Set the rotary function to the V · position.
3. Measurement of AC voltage can be performed by pushing the "BLUE" key switch.
4. Connect the test leads to the circuit to be measured.

#### **WARNING**

TO AVOID ELECTRICAL SHOCK, HAZARD OR DAMAGE TO METER, DO NOT ATTEMPT TO MEASURE VOLTAGE THAT MIGHT EXCEED 1000V rms. DO NOT APPLY MORE THAN 1000V rms BETWEEN THE COMMON INPUT TERMINAL AND EARTH GROUND.

#### **NOTICE**

UNSTABLE DISPLAY MAY OCCUR ESPECIALLY AT 400mV RANGE, EVEN THOUGH YOU DON T PUT TESTED LEADS INTO INPUT TERMINALS. IN THIS CASE, IF AN ERRONEOUS READING IS SUSPECTED, SHORT THE " V Hz" TERMINAL AND THE "COM" TERMINAL, AND MAKE SURE THE DISPLAY READS ZERO.






### 3-3 Current Measurement

1. Connect the red test lead to “mA” terminal and the other (black) test lead to “COM” terminal, or use the “A” and “COM” terminal in the 10A range.
2. Set function selector rotary switch to “ mA · ” or “ A · ” .
3. Measurement of AC current can be performed by pushing the “BLUE” switch.
4. Connect the test leads to the circuit to be measured.

### 3-4 Resistance Measurement

1. Connect the red test lead to the “ Ω V Hz” terminal and the other (black) test lead to the “COM” terminal.
2. Set the rotary function selector to “  ” position to measure the resistance.
3. For correct reading, ensure that the device being tested contains no voltage.
4. Connect the test leads across the circuit to be measured. In order to ensure the best accuracy in measurement of low resistance, to except the resistance of test leads by REL function, short the test leads and stored it by pressing REL key.





### 3-5 Continuity Check by Internal Sounder

1. Connect the red test lead to the “ $\Omega$  V Hz” terminal and the other (black) test lead to the “COM” terminal.
2. Set the rotary function selector to “ $\rightarrow \Omega$ ” position.
3. Connect the test leads to the circuit to be measured. The internal sounder will operate if the resistance of the circuit measured is lower than 30  $\Omega$  approximately.

### 3-6 Diode Check

1. Set the rotary switch at “ $\rightarrow \Omega$ ” position.
2. Connect black test lead to “COM” terminal and red lead to “ $\Omega$  V Hz” input terminal.
3. Connect test leads to the diode normally the forward voltage drop of good silicon diode is shown between 0.400V and 0.900V. If the diode under test is defective, “0.000” (short circuit) or “OL” (non-conductance) is displayed. During check, the diode under test is defective, if “0.000” or other values are displayed.






### **3-7 Hz / RPM Measurement**

1. Connect the red test lead to the “ °C V Hz ” terminal and the other (black) test lead to the “COM” terminal.
2. Set the rotary function selector to “Hz RPM” position to measure the frequency or RPM.
3. Connect the test leads to the circuit to be measured.

### **3-8 Capacitance Measurement**

1. Connect the red test lead to the “ °C V Hz ” terminal and the other (black) test lead to the “COM” terminal.
2. Set the rotary function selector to “  ” position to measure capacitance.
3. Connect the test leads to the circuit to be measured.
4. In order to ensure the best accuracy in measurement of low capacitance, to except the stray capacitance of test leads by test leads open with pressing REL key to store.

### **3-9 Temperature**

1. Connect the “ + ” of ADAPTOR to the “ °C V Hz ” terminal and “ - ” to the “COM” terminal .
2. Combine the sensor with the adaptor.
3. Set the rotary function selector to “ °C ” or “ ” position to measure temperature value.





## MAINTENANCE

**⚠ WARNING :** TO AVOID ELECTRICAL SHOCK REMOVE TEST LEAD BEFORE OPENING THE COVER.

### 4-1 General Maintenance

1. Repairs or servicing not covered in this manual should only be performed by qualified personal.
2. Periodically wipe the case with a dry cloth and detergent do not use abrasives or solvents.

### 4-2 Battery Installation or Replacement

The meter is powered by 9V battery. Refer to Figure 2 and use the following procedure to replace the battery:

1. **Disconnect the test leads and turn the meter off.** Remove the test leads from the front terminals.
2. Position the meter face down. Remove the screw from the battery cover.
3. Lift the end of the battery cover until it gently unsnaps from the case bottom.
4. Lift the battery from the battery compartment and carefully disconnect the battery connector leads.
5. Snap the battery connector leads to the terminals of a new battery and reinsert the battery into the battery compartment.
6. **Replace the battery cover.** Make sure that the battery leads do not become pinched between the case bottom and case top.



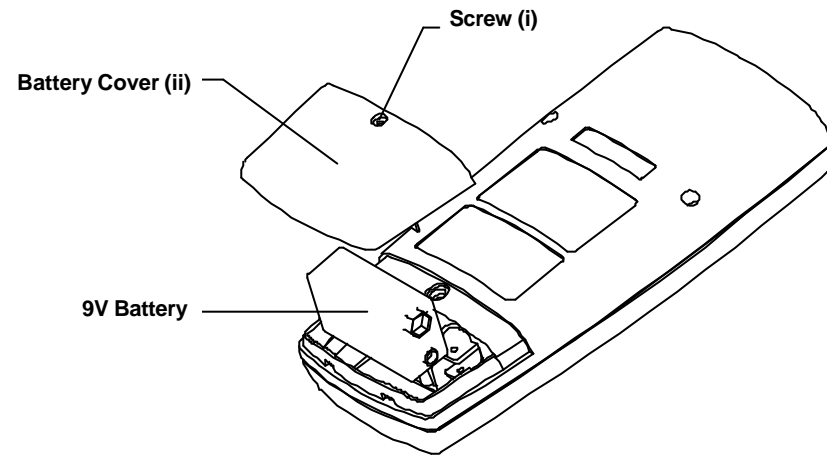


Figure 2



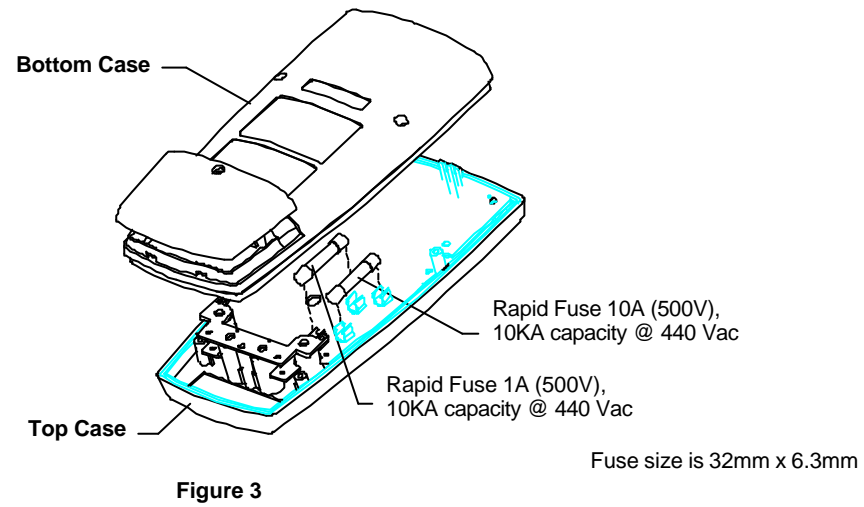


#### **4-3 Fuse Replacement**

Refer to Figure 3 and the following procedure to examine or replace the meter's fuse:

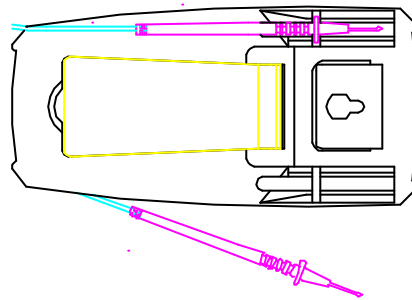
1. Perform steps 1 through 3 of the battery replacement procedure.
2. Remove the two screws from the case bottom and lift the case bottom until it gently unsnaps from the case top.
3. Remove the defective fuse by gently prying one end of the fuse loose and sliding the fuse out of the fuse holder.
4. Install a new fuse of same size and rating. Make sure the new fuse is centered in the fuse holder.
5. Replace the case top and case bottom and battery cover bottom. Make sure that the battery leads do not become pinched between the case halves. Reinstall the three screws.



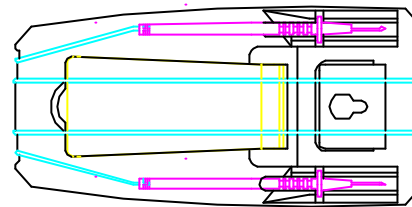




### HOW TO USE THE PROBE HOLDER



Clip one probe on the holder for one handed meter operation.



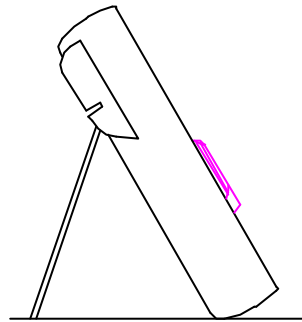
Wrap the leads around the holder to store the test probes.



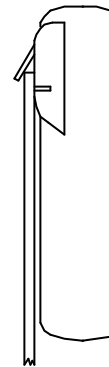




### HOW TO USE THE TILT STAND AND HOLSTER



Swing the stand out for easier meter reading.

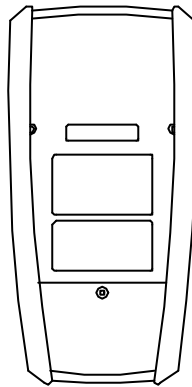


Swing the upper holder out and hook it over a door.

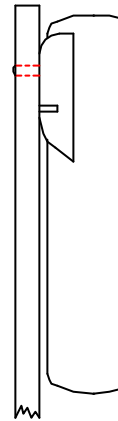




### HOW TO USE THE TILT STAND AND HOLSTER



Meter in holster face down.



Hang on nail at workbench.





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