APPA 103N/105N/106

ANALOG DIGITAL MULTIMETER

CE

OPERATOR'S MANUAL

TABLE OF CONTENTS

⚠ 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. (106 only)
6. Sensor Adaptor. (106 only)

1-2 Meter Safety

Terms as Marked on Equipment.

⚠ ATTENTION —Refer to manual.

⧈ DOUBLE INSULATION — Protection Class II.

⚠ 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 a 4000 counts LCD readout with 82 segments analog bar graph, auto polarity, decimal point, " " AC, DC, , , RANGE, H, APO, REL, MAX, MIN, PMAX, PMIN and unit annunciators. (PMAX, PMIN, REL are 105N / 106 only).

2. Rotary Switch —Select the Function and Range desired.

3. COM Input Terminal —Ground input connector.

4. °C °F ⊣(⊢VΩ Hz Input Terminal —Positive input connector for Volts, Ohms Capacitance , Frequency and Temperature.

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).

Push Switch Functions ("MIN/MAX" and "Peak H" and "Rel △" switch are for 105N / 106 only)

Push switch functions control the special measurement modes of the meter. Some special modes can be nested in other special modes, while some push functions reset all existing special mode. The following table summarizes the push functions in each special mode.

Active mode	Push Switch Functions						
	RANGE[1]	BLUE KEY[1]	HOLD H	REL △	MIN/MAX	PEAK H	∼ Hz[2]
HOLD	O	O	O	X	X	X	X
REL	O	O	O	O	O	X	X
MIN/MAX HOLD	O	O	O	X	O	X	X
PEAK HOLD	O	O	O	X	X	O	X
∼ HZ	O	X	O	X	X	X	O

Note :

1. BLUE KEY switch and RANGE Switch resets all special modes other than ∼HZ mode .
2. ∼HZ switch is only used to toggle between frequency measurement mode and voltage or current measurement mode, and thus can not be nested in any other special modes.
3. The bar graph always shows the current value, regardless of special mode.

7. Light switch —Press the switch to turn on or turn off the back-light.

8. ∼ HZ —If " ∼HZ" switch is pushed in voltage or current measurement mode, the meter enters frequency counter mode with automatic range selection. Therefore, pressing "RANGE" switch in ∼HZ mode does not change the frequency range. However, "RANGE" switch changes the sensitivity of frequency detection. If the input signal has a small amplitude, the user shall increase the sensitivity.

Note : Since ∼ HZ mode is treated as a temporary frequency measurement in voltage or current mode, pressing "RANGE" switch in ∼HZ mode also changes the full scale range of the original voltage or current mode after VAHZ mode is cancelled.

9. PEAK H —The precision of PEAK hold mode measurement can be enhanced by calibration. Calibration for PEAK hold mode is invoked by pressing "PEAK H" switch for more than 2 seconds until the "caL" is displayed.

Pressing the "Peak H" switch to toggle between PMAX and PMIN.

Pressing "Peak H" switch and held for longer than one second to release the peak hold mode.

10. Range Switch, (Manual Range) —"Range" switch is pressed to select manual ranging and to change ranges.
When "Range" switch is pressed on "RANGE" annunciator on the LCD appears.
Press "RANGE" switch to select appropriate range to be used.
Press "RANGE" switch and hold for 2 seconds to return to Autoranging.
In " ∼ HZ" mode "RANGE" is not used to change the full scale frequency range, but change the sensitivity of frequency measurement.

11. 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 Ω/•))/⊣ mode or to measure Frequency or RPM in RPM in Hz/PRM mode.

12. MIN MAX —The meter displays the maximum or minimum value of the input in MAX / MIN mode. When "MIN MAX" switch is pressed for the first time, the meter displays the maximum value. When "MIN MAX" switch is pressed again, the meter displays the minimum value. When "MIN MAX" switch is pressed for the third time, the meter displays current input value and the "MAX" "MIN" annunciator are blink. The meter returns to normal operation if "MIN MAX" switch is pressed and held for longer than one second. Pressing HOLD in MAX/MIN mode makes the meter stop updating the maximum or the minimum value.

13. REL △ —In REL mode, the LCD panel displays D(current) - D(relative), where D(relative) is the last value before "REL △" switch is pressed, and D(current) is the current value. If "REL △" switch is pressed again in REL mode, the meter displays the reference value and the "REL" annunciator is blink. The meter returns to normal operation if "REL △" switch is pressed and held for longer than one second. Pressing "HOLD H" switch in REL mode makes the meter stop updating the LCD panel.
REL with MIN MAX — MAX / MIN mode can be nested in REL mode. The "MIN MAX" meter displays the maximum or the minimum value relative to the reference when "MIN MAX" is pressed in REL mode.
Before release the REL function, the MAX/MIN function is needed to release first.

14. HOLD —HOLD mode makes the meter stop updating the LCD panel. This mode can be nested in most of the special modes. Enabling HOLD function in automatic mode makes the meter switch to manual mode, but the full scale range remains the same. HOLD function can be released by changing the measurement mode, pressing "RANGE" or "BLUE KEY" or push HOLD again. When HOLD mode is nested in Peak H or MIN / MAX or REL mode to release the Peak H or MIN / MAX or REL function is needed to release HOLD function first.

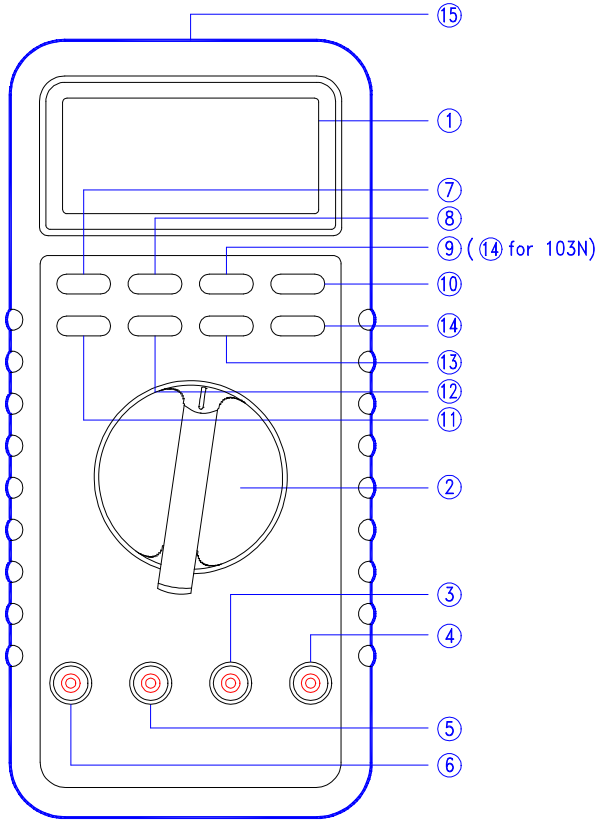


Figure 1

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 (Spec.Acc' y) / °C , <18°C or > 28°C.

Power Requirements : IEC LR03, AM4 or AAA size 1.5V x 2. (103N / 105N)
Standard 9V battery NEDA 1604, IEC6F22, JIS 006P. (106N)

Battery Life : Alkaline 500 hours. (103N / 105N)
Alkaline 300 hours. (106)

Dimensions (W x H x D) : 90mm x 200mm x 42mm , without holster.
100mm x 212mm x 55mm , with holster.

Accessories : Protective Holster , battery (installed), instruction manual, test leads .

2-2 Environmental Conditions

Indoor use.
Maximum Altitude : 2000 Meter.

Installation Category : IEC 1010, 1000V Cat. II, 600V Cat. III.

Pollution Degree : 2

2-3 Electrical Specifications

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

(1) DC Volts

Range	Resolution	Accuracy		Over voltage protection
		103N	105N / 106	
400mV	100μV	±(0.3%reading + 2digits)	±(0.3%reading+ 2digits)	1000V rms
4V	1mV	±(0.4%reading + 2digits)	±(0.1%reading + 2digits)	
40V	10mV	±(0.25%reading + 2digits)		
400V	100mV			
1000V	1V			

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

(2) AC Volts

Range	Resolution	Accuracy		Over voltage protection
		103N	105N / 106	
400mV	0.1mV	±(2.0%reading + 8digits)*	±(2.0%reading + 8digits)*	1000V rms
4V	1mV	±(1.3%reading + 5digits)**	***	
40V	10mV	±(1.5%reading + 5digits) 40Hz to 60Hz	±(1.5%reading + 5digits) 40Hz to 60Hz	
400V	100mV			
750V	1V	±(1.3%reading + 5digits) 60Hz to 1KHz	±(1.0%reading + 5digits) 60Hz to 1KHz	

AC Conversion Type : 103N / 105N : Average sensing rms indication.

106 : AC conversions are ac-coupled, true rms responding, calibrated to the rms value sine wave input. The specified accuracy is for since wave at full scale and non-sine wave at half scale below 500Hz with crest factor up to 2.

Input impedance : 10MΩ // less than 100PF.

*** Frequency Response :** 50Hz ~ 60Hz.

**** Frequency Response :** 40Hz ~ 300Hz.

***** Frequency Response :** 40Hz ~ 500Hz for 4V Range.

AC Conversion Type : AC conversions are average sensing , calibrated to the rms value sine wave input.

(3) DC Current

Range	Resolution	Accuracy		Voltage Burden
		103N	105N / 106	
40mA	10μA	±(0.6%reading + 2digits)	±(0.4%reading + 2digits)	300mV max
400mA	0.1mA	±(0.7%reading + 2digits)	±(0.5%reading + 2digits)	3V max
10A	10mA	±(1.2%reading + 3digits)	±(1.0%reading + 3digits)	3V max

Overload Protection : 1A , 600V IR 10KA fuse (Bussmann BBS-1 or equivaknt) for mA input. (Size 10.3mm x 34.9mm)

15A , 600V IR 100KA fuse (Bussman KTK 15 or equivalent) for A input. (Size 10.3mm x 38.1mm)

(4) AC Current

Range	Resolution	Accuracy		Voltage Burden
		103N	105N /106	
40mA	1μA	±(1.5%reading + 5digits)	±(1.5%reading + 5digits)	300mV max
400mA	0.1mA			3V max
10A	10mA	±(2.5%reading + 5digits)	±(2.0%reading + 5digits)	3V max

Frequency Response : 40Hz ~ 1KHz.

AC Conversion Type : 103N / 105N : Average sensing rms indication.

106 : AC conversions are ac-coupled, true rms responding, calibrated to the rms value sine wave input. The specified accuracy is for since wave at full scale and non-sine wave at half scale below 500Hz with crest factor up to 2.

Overload Protection : 1A , 600V IR 10KA fuse (Bussmann BBS-1 or equivaknt) for mA input. (Size 10.3mm x 34.9mm)
15A , 600V IR 100KA fuse (Bussman KTK 15 or equivalent) for A input. (Size 10.3mm x 38.1mm)

AC Conversion Type : AC conversions are average sensing, calibrated to the rms value sine wave input.

(5) Resistance

Range	Resolution	Accuracy		Overload Protection
		103N	105N / 106	
400Ω	0.1Ω	±(0.7%reading + 3digits)	±(0.7%reading + 3digits)	600V rms
4KΩ	1Ω	±(0.6%reading +3digits)	±(0.4%reading + 2digits)	
40KΩ	10Ω			
400KΩ	100Ω			
4MΩ	1KΩ	±(0.7%reading + 3digits)	±(0.6%reading + 3digits)	
40MΩ	10KΩ	±(1.5%reading + 5digits)	±(1.5%reading + 5digits)	

Open circuit Voltage : -1.3V approx.

(6) Diode Check and Continuity

Range	Resolution	Accuracy	Max. Test Current Current	Max. Open Circuit Circuit Voltage
	1mV	±(1.5%reading + 5digits)*	1.5mA	3V

*** For 0.4V ~ 0.8V.**

Overload Protection : 600V rms max.

Continuity : The internal sounder operates when resistance is less than 30Ω approximately.

(7) Frequency / RPM

Range	Resolution	Sensitivity	Accuracy	Overload Protection
4.0KHz/40KRPM	1Hz/30RPM	150mV rms ≧ 20Hz 1.5V rms ≦ 20Hz	Frequency : ±(0.01%reading + 1digit)	600V rms
40KHz/400KRPM	10Hz/300RPM			
400KHz/4MRPM	100Hz/3KRPM			
4MHz/40MRPM	1KHz/30KRPM	300mV rms		
40MHz/400MRPM	10KHz/300KRPM	1V rms	RPM : ±(0.01%reading + 10digits)	
* 400MHz/4000MRPM	100KHz/3MRPM	* *		

* For 105N / 106 only.

* * The spec is not guaranty.

(8) Capacitance

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

* In these two ranges the reading maybe rolling within specification.

** Specify reading < half of full scale 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)	

For 106 only.

(10) Temperature (°F)

Temperature	Accuracy	Overload Protection
-4°F ~ 32°F	±(2%reading + 8°F)	600V rms
33°F ~ 212°F	±(1%reading + 6°F)	
213°F ~ 932°F	±(2%reading + 6°F)	
933°F ~ 1472°F	±(3%reading + 4°F)	

For 106 only.

(11) PEAK HOLD

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

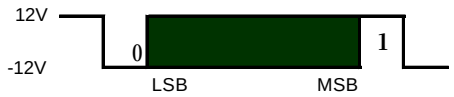
The APO sign on the LCD panel indicates the meter is working in the Auto Power Off mode. If the meter idles for more than 30 minutes, the meter automatically turns the power off. When this happens, the state (non-logic measurement) of the meter is saved, the meter can be turned back on by pushing any key switch, except back light switch, or changing the rotary switch. If the meter is Re-Powered on by pushing key switch, the LCD displays the saved state when meter auto power off itself, pushing Hold key switch to disable the hold state. The meter will give periodic alarm in 15 seconds before automatically turns power off by itself, any key press or rotary change reset Auto-Power-Off.

(13) Disable Auto Power Off

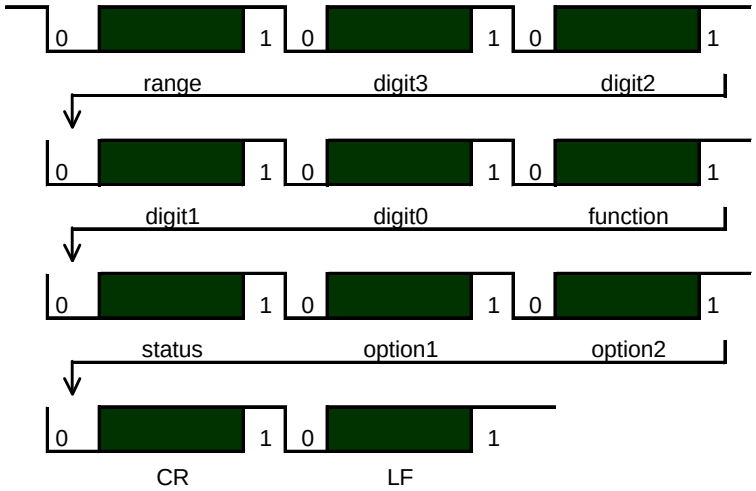
In order to disable auto power off function, power on the meter with pressing anyone of switches, except HOLD switch, back light switch or BLUE switch (for function change) is pressed down.

(14) RS232

Sent a single command string "H" (Hex code "48") to the multimeter or shine the flashlight on the RS232 socket of the meter to enable or disable the RS232. When enable the RS232 the LCD display shows the RS232 annunciator.
The serial data is send from RS232 cable twice every A/D conversion cycle. The data format complies with JIS 7BIT transmission code with a baud rate of 2400. The user can use RS232 interface to read the data. A single dada packet includes a start bit (always 0), 7 data bits, an odd parity check bit, and a stop bit (always 1). The following figure shows the data format of a single packet. The LSB is sent first and the MSB is sent last.



One data block consists of 11 packets, or 110 bits. The following figure shows the format of a data block. The range packet indicates the full scale range of the meter. Digit 3 through digit 0 is just the digits on the LCD panel. The function packet indicates the measurement mode of the meter. Status, option 1 and option 2 gives the status of the meter. CR and LF are delimiters used to separate the blocks.



The meter always outputs the current input value to the serial port. Each block is repeated twice in one conversion cycle. The detailed data format of each packet is listed below.

14-1 FUNCTION

This packet indicates the measurement mode of the meter. The following table summaizes the transmitted code for each mode.

Code	Measurement Mode
0111011	Voltage
0111101	μA Current
0111001	mA Current
0111111	A Current
0110011	Ω
0110101	Continuity
0110001	Diode
0110010	Frequency / RPM[1]
0110110	Capacitance
0110100	Temperature[2]

Note : 1. The Judge bit in the Status packet determines whether it is frequency mode or RPM mode.

2. The Judge bit in the Status packet determines whether the unit is Celsius or Fahrenheit.

14-2 RANGE

This packet indicates the full scale range of the meter. When the meter operates in continuity mode, diode mode, or current (A) mode, this packet is always 0110000 since the full scale range in these modes are fixed. The following table lists the code for each range in each measurement mode.

Code	V	mA	Ω	Frequency	RPM	Capacitance
0110000	400.0mV	40.00mA	400.0Ω	4.000KHz	40.00KRPM	4.000nF
0110001	4.000V	400.0mA	4.000KΩ	40.00KHz	400.0KRPM	40.00nF
0110010	40.00V		40.00KΩ	400.0KHz	4.000MRPM	400.0nF
0110011	400.0V		400.0KΩ	4.000MHz	40.00MRPM	4.000μF
0110100	4000V		4.000MΩ	40.00MHz	400.0MRPM	40.00μF
0110101			40.00MΩ	400.0MHz	4000MRPM	400.0μF
0110110						4.000mF
0110111						40.00mF

14-3 DIGIT 3 —DIGIT 0

Digit 3 is the most significant digit on the LCD panel, and digit 0 is the least significant digit. When the LCD panel shows OL, the serial port outputs 4000.

Digit	Code
0	0110000
1	0110001
2	0110010
3	0110011
4	0110100
5	0110101
6	0110110
7	0110111
8	0111000
9	0111001

14-4 STATUS

The format of this packet is shown below. The Judge field is meaningful only when the Function packet indicates Frequency / RPM mode .

In Frequency / RPM mode, judge is 0 if the meter operates in Frequency mode; otherwise, it is 1. Sign field indicates whether the minus sign on the LCD panel is on or off. BATT field is 1 if battery low condition is true. OL indicates input overflow.

0	1	1	Judge	Sign	BATT	OL
Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

14-5 OPTION 1

This packet contains information on special measurement modes. The format of this packet is shown below. The three non-constant fields is set to one when the meter operates in the corresponding special modes.

0	1	1	P_{MAX}	P_{MIX}	0	VAHZ
Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

14-6 OPTION 2

This packet contains information on the operation mode of the meter. The format is shown below. The DC field indicates that the meter operates in DC measurement mode, either voltage or current. The AC field indicates that the meter operates in AC measurement mode. The AUTO field is set to 1 if the meter operates in automatic mode, and is set to 0 when the meter operates in manual mode. The APO field indicates whether auto power off function is enabled or not.

0	1	1	DC	AC	AUTO	APO
Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

14-7 CR

Carriage return. The transmitted code is 0001101.

14-8 LF

Line feed. The transmitted code is 0001010.

(15) ∼Hz Sensitivity

The sensitivity in the ∼Hz mode is 1/10 of full scale range.

The accuracy is same as Frequency mode. The measuring frequency is from 40Hz up to 1KHz.

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, 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. II, 600V CAT. III .

3-2 Voltage Measurements

1. Connect the red test lead to the "⊣⊢ VΩHz" 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.

⚠ WARNING

TO AVIOD ELECTRICAL SHOCK, HAZARD OR DAMAGE TO METER, DO NOT A ATTEMPT TO MEASURE VOLTAGE THAT MIGHT EXCEED 1000V ms. 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 "⊣⊢ VΩHz" TERMINAL AND THE "COM" TERMINAL, AND MAKE SURE THE ZERO DISPLAY.

3-3 Current Measurements

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 "⊣⊢ VΩHz" terminal and the other (black) test lead to the "COM" terminal.
2. Set the rotary function selector to "Ω ⯈| •))" 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 resistor to be measured. In order to ensure the best accuracy in measurement of low resistance, short the test leads before measurement and memorize the test probe resistance in mind. This is necessary to subtract for the resistance of the test leads themselves.

3-5 Continuity Check by Buzzer

1. Connect the red test lead to the "⊣⊢ VΩHz" terminal and the other (black) test lead to the "COM" terminal.
2. Set the rotary function selector to "Ω ⯈| •))" position.
3. Connect the test leads to the circuit to be measured. The internal sounder operates if the resistance of the circuit measured is lower than 30Ω approximately.

3-6 Diode Check

1. Set the rotary switch at "Ω ⯈| •))" position.
2. Connect black test lead to "COM" terminal and red lead to " ⊣⊢ VΩHz " input terminal.
3. Connect test leads to the diode normally the forward voltage drop of good silicon diode is shown between. 400V to 0.900V. If the diode under test is defective. "0.000" (short circuit) or "OL" (non-conductance) is displayed. Reverse check of diode if the diode under test is defective "0.000" or other value are to be displayed.

3-7 Hz / RPM Measurements

1. Connect the red test lead to the "⊣⊢ VΩHz " 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 with the blue switch.
3. Connect the test leads to the circuit to be measured.

3-8 Capacitance Measurement

1. Connect the red test lead to the "⊣⊢ VΩHz" 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, open the test leads before measurement and memorize the test probe capacitance in mind. This is necessary to subtract for the capacitance of the test probe themselves or use the relative mode for 105N.

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 1.5V x 2 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 screws from the battery case bottom.
3. Lift the end of the battery case bottom until it gently unsnaps from the case bottom.
4. Lift the batteries from the battery case top 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 case top. Make sure that the battery leads do not become pinched between the case bottom and case top.
6. **Replace the case top and battery case .**

4-3 Fuse Replacement

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

1. Perform steps 1 though 3 of the battery replacement procedure.
2. Than 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 case bottom. Make sure that the battery leads do not be come pinched between the case halves. Reinstall the three screws.

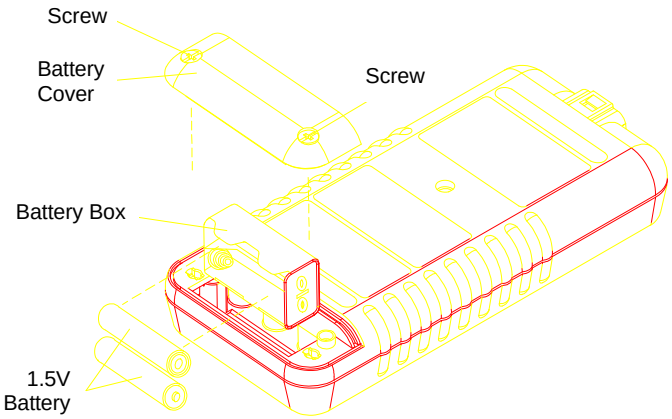


Figure 2. Battery Replacement.

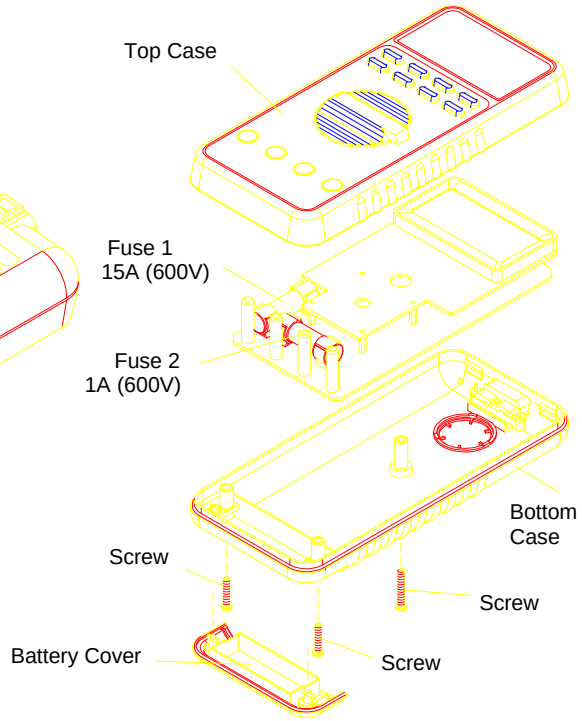
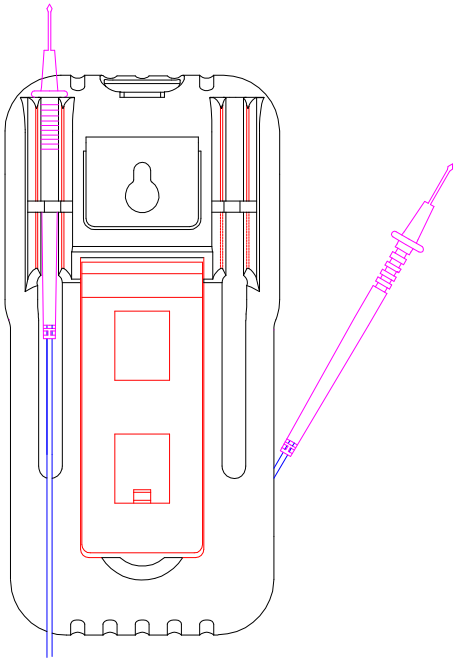
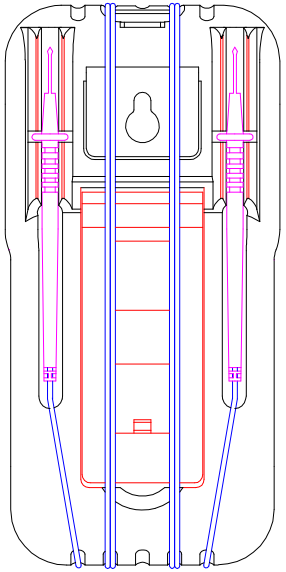


Figure 3. Fuse Replacement

HOW TO USE THE PROBE HOLDER

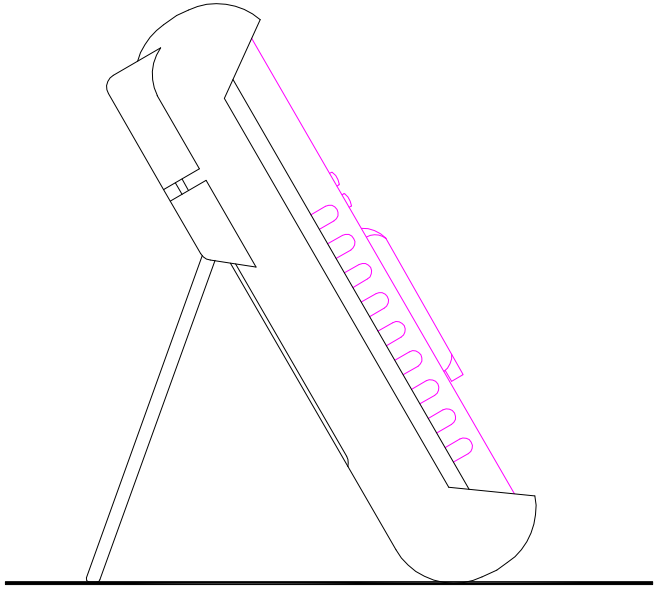


Clip one probe on the holder for one handed meter operation.

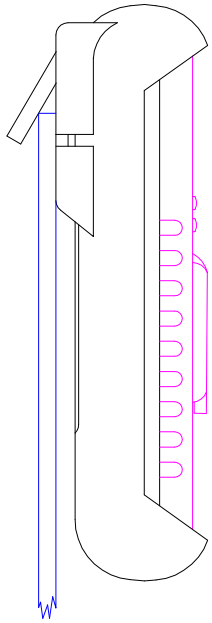


Wrap the test leads around the holster to store the test probes.

HOW TO USE THE TILT STAND AND HOLSTER

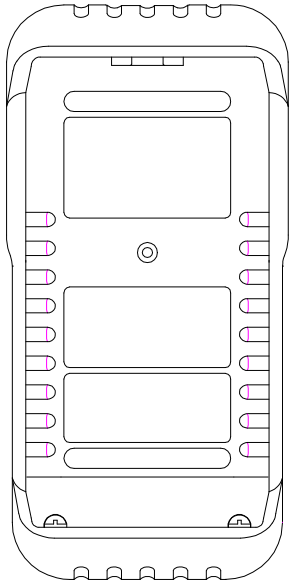


Swing the stand out for easier meter reading.

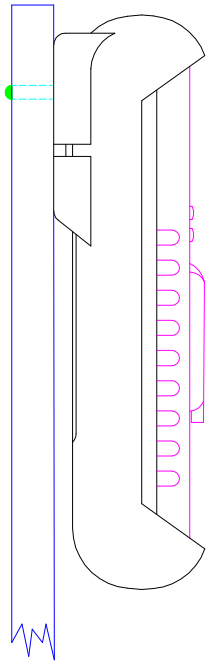


Swing the upper holder out and hook it over a door.

HOW TO USE THE TILT STAND AND HOLSTER



Meter in holster face down.



Hang on nail at workbench.

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