

■ AC CLAMP-ON METER

CM 660

CM 670

CM 685

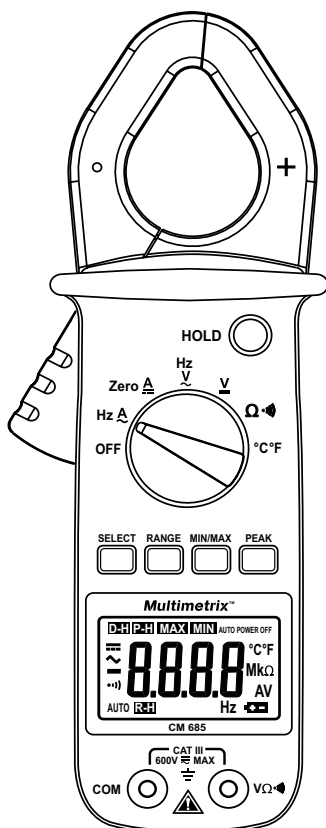
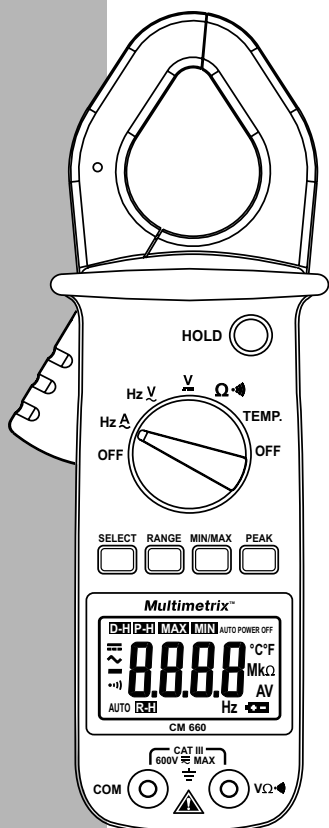


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CHAPTER 1

INTRODUCTION

Warning

These safety warnings are provided to ensure the safety of personnel and proper operation of the instrument.

- Read the instruction manual completely and follow all safety information before operating this instrument.
- Only use leads that comply with the IEC 61010. Before using them, always check that they are in perfect working order.
- Never exceed the protection limit values indicated in the specifications for each type of measurement.
- When the multimeter clamp is linked to the measurement circuits, do not touch any unused terminals.
- Before changing the function, disconnect the measurement leads from the circuit measured.
- Never measure resistances on a live circuit.

1.1 International Electrical Symbols



This symbol signifies that the instrument is protected by double or reinforced insulation. Use only specified replacement parts when servicing the instrument.



This symbol on the instrument indicates a WARNING and that the operator must refer to the user manual for instructions before operating the instrument. In this manual, the symbol preceding instructions indicates that if the instructions are not followed, bodily injury, installation/sample and product damage may result.



Risk of electric shock. The voltage at the parts marked with this symbol may be dangerous.

1.2 Receiving Your Shipment

Upon receiving your shipment, make sure that the contents are consistent with the packing list. Notify your distributor of any missing items. If the equipment appears to be damaged, file a claim immediately with the carrier and notify your distributor at once, giving a detailed description of any damage. Save the damaged packing container to substantiate your claim. Do not use an instrument that appears to be damaged.

1.3 Ordering Information

Model CM 660..... **Cat. #MMX-CM660**
Includes clamp-on meter CM 660, lead set (red & black lead) with needle point test probes, carrying case, 2x1.5V AA batteries and a user manual.

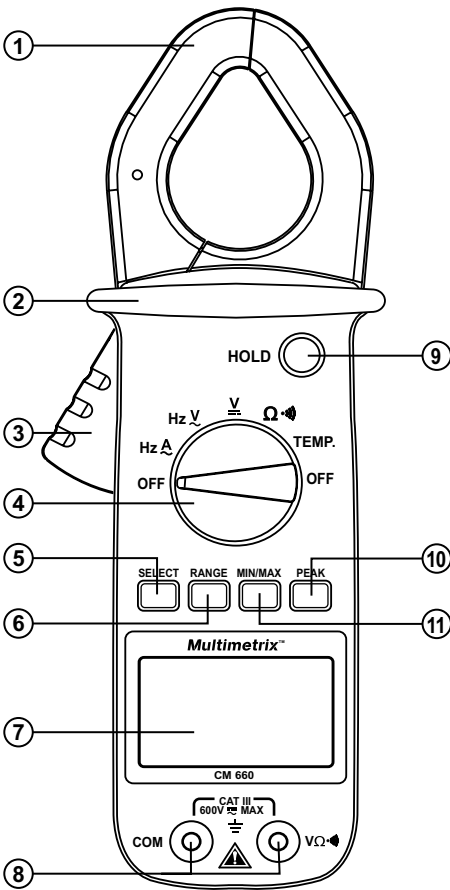
Model CM 670..... **Cat. #MMX-CM670**
Includes clamp-on meter CM 670, lead set (red & black lead) with needle point test probes, carrying case, 2x1.5V AA batteries and a user manual.

Model CM 685..... **Cat. #MMX-CM685**
Includes clamp-on meter CM 685, lead set (red & black lead) with needle point test probes, carrying case, 2x1.5V AA batteries and a user manual.

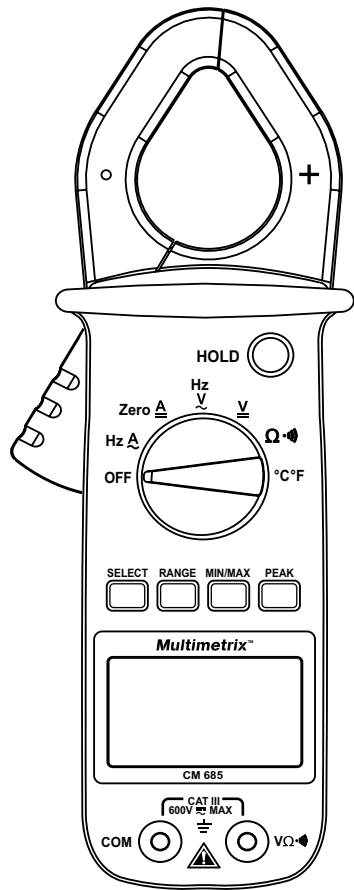
CHAPTER 2

PRODUCT FEATURES

2.1 Control Features



CM 660 - CM 670



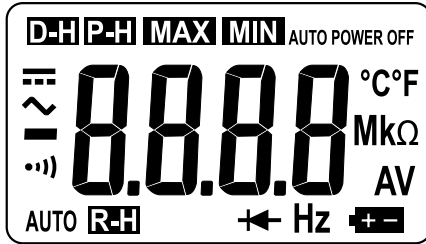
CM 685

1. **Jaw assembly**
Jaws open to 1.57" (40 mm)
2. **Safety guard**
Keep hands behind this protective guard
3. **Lever / Trigger**
Opens or closes jaws
4. **Rotary selection switch**

OFF	Zero voltage
Hz $\overset{\sim}{\Delta}$	Frequency and AC current (1000A)
Zero $\overset{\sim}{\Delta}$	(CM 685) DC current (1000A); Reset 40A range
Hz $\underset{\sim}{\nabla}$	Frequency and AC voltage (600V)
$\underset{\sim}{\nabla}$	DC voltage (600V)
$\Omega \bullet \bullet \bullet$	Resistance (40M Ω) and continuity
TEMP	Temperature (CM 660 and CM 670)
$^{\circ}\text{C } ^{\circ}\text{F}$	Temperature (CM 685)
5. **SELECT button**
Selects or displays various ranges
6. **RANGE button**
Selects Auto Ranging or Manual Ranging measurement ranges
7. **Display**
Liquid crystal display
8. **Positive and Negative terminals**
"COM" : black
" + " : red
9. **HOLD button**
Freezes last measured value on display
10. **PEAK button**
Displays the peak value when measuring current
11. **MIN/MAX button**
Displays the minimum and maximum values of a measurement

NOTE: See §2.3 for button functions

2.2 Display Features



D-H	Data hold
	DC mode
	AC mode
	Negative polarity
	Continuity
AUTO	Auto range
P-H	Peak hold
R-H	Range hold
MAX	Maximum value
MIN	Minimum value
AUTO POWER OFF	Auto-off enabled
	Diode Test
Hz	Frequency
°C°F	Selected temperature
MkΩ	Resistance
AV	Current or Voltage
	Low battery

2.3 Button Functions

2.3.1 Auto-off Function

Except in the **HOLD**, **MIN/MAX** or **PEAK** function, the clamp-on meter shuts down automatically approximately 10 minutes after the last measurement. The buzzer sounds (7 beeps) one minute before shutdown.

Pressing any button except **SELECT** starts a new 10-minute period.

To disable the Auto-off function:

- Turn the rotary switch to **OFF**
- Press and hold down the **HOLD** button and set the rotary switch to any position other than **OFF**
- The **AUTO POWER OFF** icon disappears and the automatic shutdown is deactivated

To enable the Auto-off function:

- Turn the rotary switch to **OFF**
- Set the rotary switch to any position other than **OFF**
- The **AUTO POWER OFF** icon is displayed and the automatic shutdown is activated

2.3.2 HOLD Button

This function locks the present displayed value.

When in this mode, the Auto-off function is automatically deactivated.

- Press the **HOLD** button during the measurement
- The **D-H** icon appears and the measurement is locked
- To deactivate, press the **HOLD** button again

2.3.3 RANGE Button

The default mode is **AUTO RANGE** mode (automatic).

- Press the **RANGE** button to select a measurement range manually.
- The **R-H** icon appears and the **AUTO** icon disappears.
- Holding the button down for 2 seconds reverts to back to **AUTO RANGE** mode. **AUTO** is displayed and the buzzer is activated.

2.3.4 MIN/MAX Button

Set the selector to one of the following positions: **Hz** $\overset{\text{A}}{\sim}$, **°C°F** (CM685) or **TEMP** (CM660/670) or **Zero** $\overset{\text{A}}{\sim}$ (CM685).

When in this mode, the Auto-off function is automatically deactivated.

To record minimum and maximum values, perform the following steps:

1. Take the measurement and press MIN/MAX once

- The **MAX** and **MIN** icons appear and recording minimum and maximum values has now been activated.

2. Press MIN/MAX a second time

- The **MAX** and **MIN** icons flash and the recording is now stopped.

3. Press MIN/MAX a third time

- The **MAX** icon shows that the value displayed is the maximum recorded value.

4. Press MIN/MAX a fourth time

- The **MIN** icon shows that the value displayed is the minimum recorded value.

5. Press MIN/MAX a fifth time

- The cycle reverts to point 2.

To exit the MIN/MAX mode, hold down **MIN/MAX** for 2 seconds. The icons will disappear.

2.3.5 PEAK Button

This function records the peak value when measuring current.

To record the peak value, perform the following steps:

1. Press the PEAK button during measurement

The highest measurement is stored in memory. The automatic shut-down function is deactivated.

2. To cancel the PEAK function, press the PEAK button again

NOTES:

For optimum resolution, press **RANGE** and select the most suitable range before activating the **PEAK** function.

When measuring the peak value for an unknown current, press **PEAK** in **AUTO** mode to lock in the maximum range and avoid any overload.

The AUTO POWER OFF function is deactivated.

CHAPTER 3

SPECIFICATIONS

3.2 Electrical Specifications

AC Volts (TRMS)*

Range	Resolution	Accuracy	Input Impedance
4V	1mV	1.0% ± 5cts	11MΩ <50pF
40V	10mV		10MΩ <50pF
400V	100mV		
600V	1V		

*TRMS - Models CM 670 and CM 685 only

DC Volts

Range	Resolution	Accuracy	Impedance
4V	1mV	0.75% ± 2cts	11MΩ
40V	10mV		10MΩ
400V	100mV		
600V	1V		

AC Amperes (TRMS)*

Range	Resolution	Accuracy
40A	0.01A	1.5% ± 8cts
400A	0.1A	1.0% ± 5cts
1000A	1A	

*TRMS - Models CM 670 and CM 685 only

DC Amperes - (CM 685 only)

Range	Resolution	Accuracy	A Max
40A	0.01A	1.5% ± 8cts	1100
400A	0.1A	1.0% ± 5cts	
1000A	1A		

Resistance (Ω)

Range	Resolution	Accuracy
40 Ω	0.1 Ω	0.9% \pm 2cts
400 Ω	1 Ω	
40k Ω	0.01k Ω	
400k Ω	0.1k Ω	
4M Ω	0.001M Ω	2.0% \pm 2cts
40M Ω	0.01M Ω	5.0% \pm 2cts

Continuity (••••)

Range	Buzzer	V Max
400 Ω	< 50 Ω \pm 25 Ω	3.4V

Frequency (Hz)


Range	Resolution	Accuracy
400Hz	0.1Hz	0.5% \pm 5cts
4000Hz		


Temperature (K type t/c)

Range	Resolution	Accuracy
-50 to 436 $^{\circ}$ C	0.1 $^{\circ}$ C	1.0% \pm 5cts
-50 to 1100 $^{\circ}$ C	1 $^{\circ}$ C	
-58 to 818 $^{\circ}$ F	0.2 $^{\circ}$ F	
-58 to 2012 $^{\circ}$ F	2 $^{\circ}$ F	

*Accuracy @ 23 $^{\circ}$ C \pm 5 $^{\circ}$ C, 80% RH Max, Conductor Centered in A, 40-400Hz in AC and Hz

Digital display: 4300-count 3 $\frac{3}{4}$ digit LCD

Polarity: When a negative signal is applied, the  symbol appears.

Overload: If the range is exceeded, the  symbol is displayed.

Low battery Indicator:  is displayed when the voltage supplied by the batteries is lower than the operating voltage.

Power Supply: 2 batteries - 1.5V type AA (LR6) Alkaline

Auto-off: Automatic shut down after approx 10 min of no use

Sampling: Approx 2 measurements/second for the digital display

3.3 Environmental Specifications

Operating Temperature: 32° to 122°F (0° to 50°C)
80% RH max non-condensing

Storage Temperature: 14° to 140°F (-10° to 60°C)
70% RH max non-condensing

Altitude: 6000 ft (2000m)

3.4 Mechanical Specifications

Maximum jaw opening: Ø 1.57" (40mm)

Dimensions: 9.49 x 3.58 x 1.77" (241 x 91 x 45mm)

Weight: 13.9 oz (390g)

3.5 Safety Specifications

IEC/EN 61010-1 and 2-032 - 600V Cat. III

Pollution Degree 2; Class 2



OPERATION

4.1 Preparation Before Use



For your own safety and to prevent damage to the instrument, you must follow the instructions given in this manual.

This instrument can be used for measurements:

- on circuits in installation category II, in an environment with pollution level 2, for voltages no greater than 600V in relation to the earth.
- or on circuits in installation category III, in an environment with pollution degree level 2, for voltages no greater than 300V in relation to the earth.

Definition of the installation categories (see IEC 61010-1 publication):

CAT II: CAT II circuits are household or similar appliance power circuits, which may carry medium-level transient over-voltage.

Example: household appliance and portable tool power supplies

CAT III: CAT III circuits are high-power appliance power circuits, which may carry high-level transient over-voltage.

Example: industrial machinery or instrument power supplies

For your own safety, only use leads that comply with the IEC/EN 61010. Before using them, always check that they are in perfect working order.

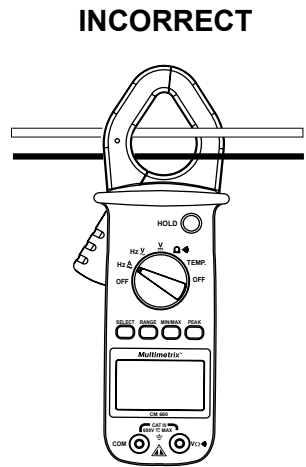
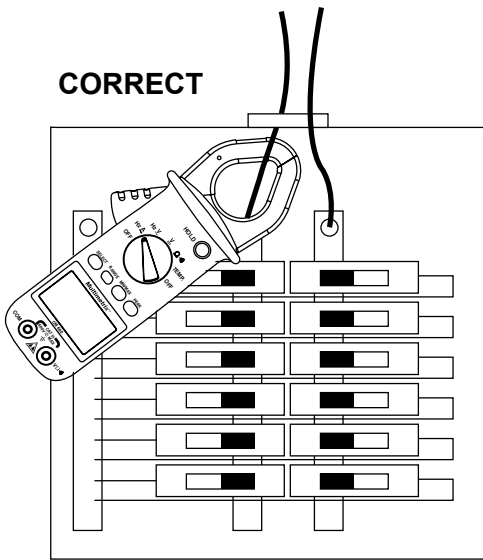
4.2 AC Current Measurement

Automatic measurement ranges: 40 to 1000AAC (3 ranges)

- Turn the rotary switch to the **Hz \tilde{A}** range
- Remove the test leads before measuring current
- Clamp the jaws around the conductor to be measured
- Take the current reading after it stabilizes



Warning: “-----” indicates that the capacity has been exceeded.




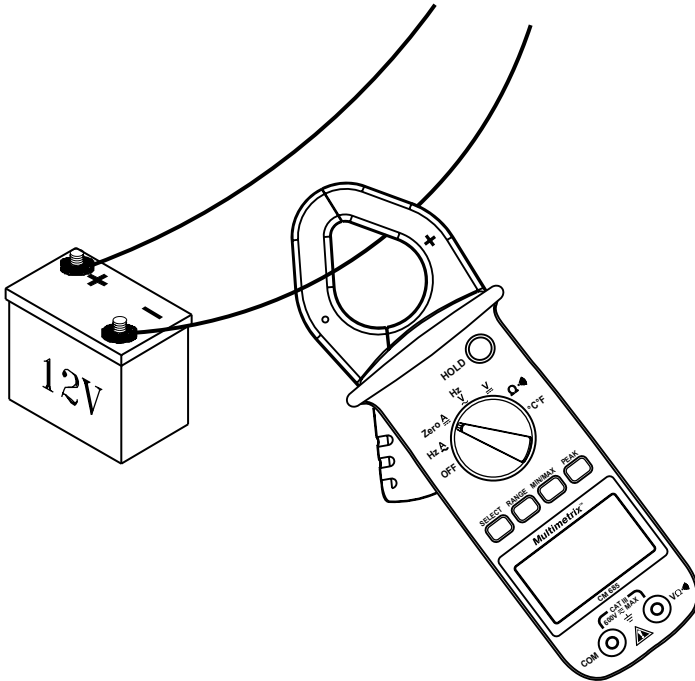
4.3 DC Current Measurement - (CM 685 only)

Automatic measurement ranges: 40 to 1000ADC (3 ranges)

- Turn the rotary switch to the **Zero** Δ range
- Press the **SELECT** button to reset the probe (reset is only available on the 40A range)
- Remove the test leads before measuring current
- Clamp the jaws around the conductor to be measured
- Take the current reading after it stabilizes



Warning: “----” indicates that the capacity has been exceeded. The  icon indicates reversal of the contact point’s polarity.



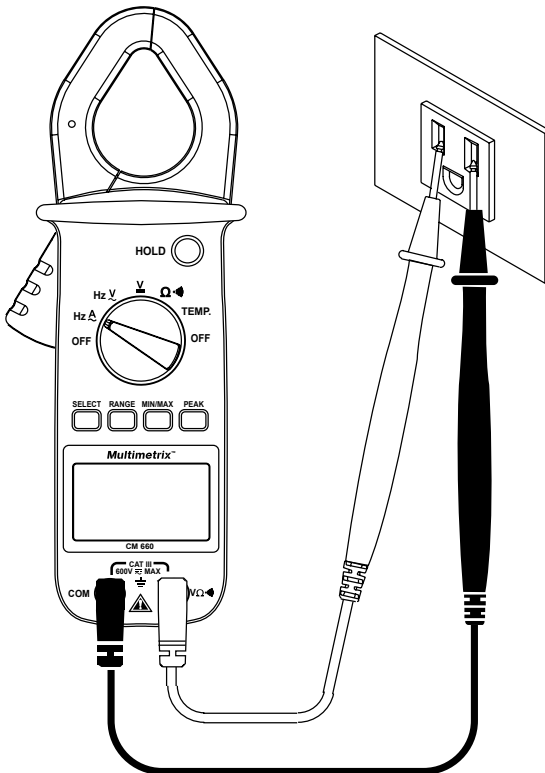
4.4 AC Voltage Measurement

Automatic measurement ranges: 4 to 600VAC (4 ranges)

- Turn the rotary switch to the **Hz V** range
- Insert the red lead to the red “+” input jack and the black lead to the black “COM” input jack
- Bring the test probe tips into contact with the test points.
- Take the voltage reading after it stabilizes



Warning: “-----” indicates that the capacity has been exceeded.




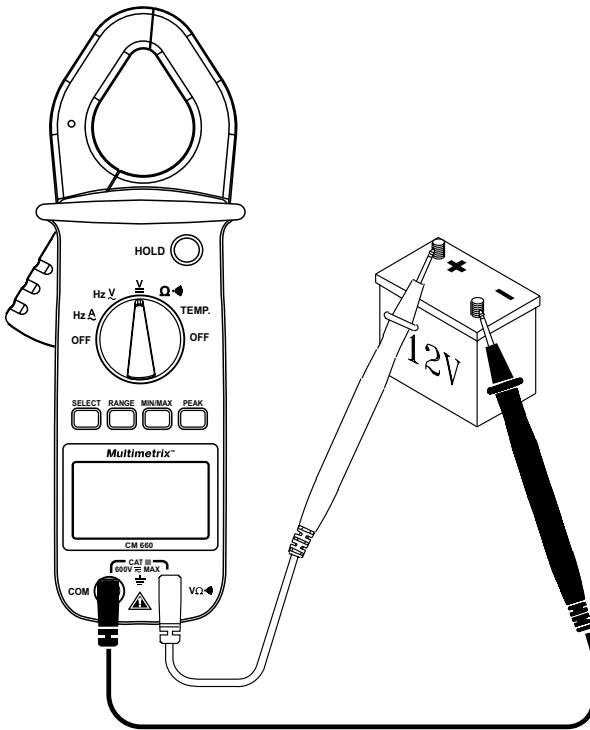
4.5 DC Voltage Measurement

Automatic measurement ranges: 4 to 600VDC (4 ranges)

- Turn the rotary switch to the **V** range
- Insert the red lead to the red “+” input jack and the black lead to the black “COM” input jack
- Take the voltage reading after it stabilizes



Warning: “-----” indicates that the capacity has been exceeded. The  icon indicates reversal of the contact point’s polarity.



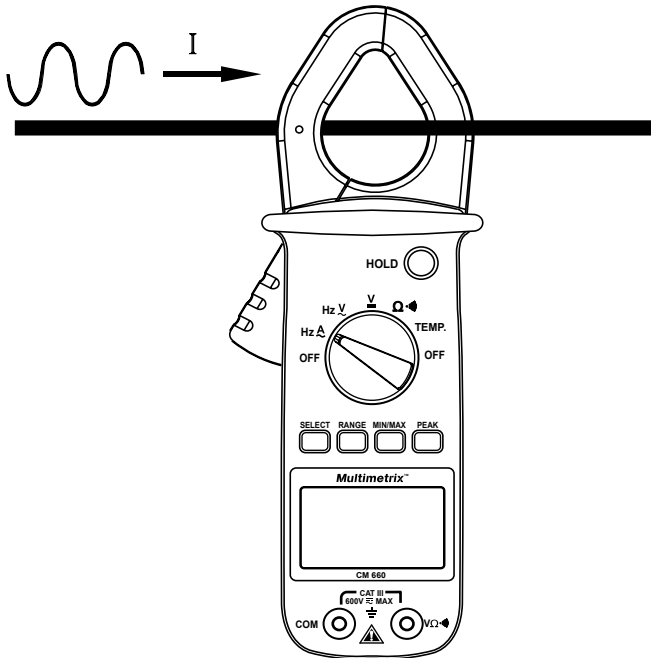
4.6 Frequency Measuring Using Current Input

20 to 4000Hz (2 ranges)

- Turn the rotary switch to the **Hz \tilde{A}** range
- Press the **SELECT** button to measure the frequency (**Hz** will appear on the display)
- Clamp the jaws around the conductor to be measured
- Press the **SELECT** button to display the current



Warning: “-----” indicates that $A < 2A$ and $F < 20Hz$



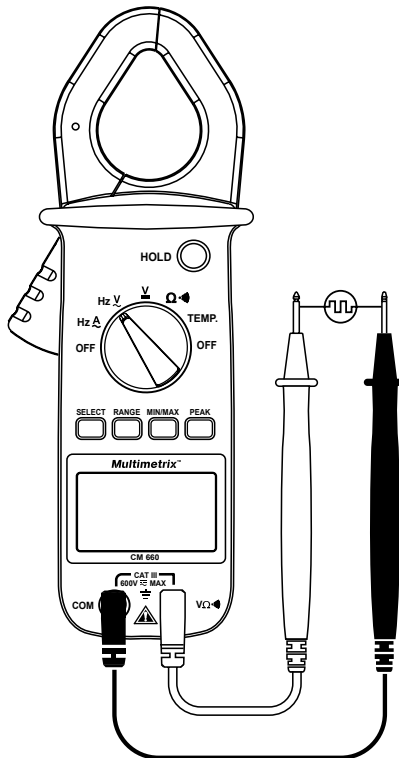
4.7 Frequency Measuring Using Voltage Input

20 to 4000Hz (2 ranges)

- Turn the rotary switch to the $\underline{\underline{V}}$ range
- Press the **SELECT** button to measure the frequency (**Hz** will appear on the display)
- Insert the black lead to the black "COM" input jack and the red lead to the red "+" input jack
- Bring the test probe tips into contact with the sample under test
- Press the **SELECT** button to display the voltage



Warning: "-----" indicates that $V < 0.2V$ and $F < 20Hz$



4.8 Resistance Measurement

Automatic measurement ranges: 400 Ω to 40M Ω (6 ranges)

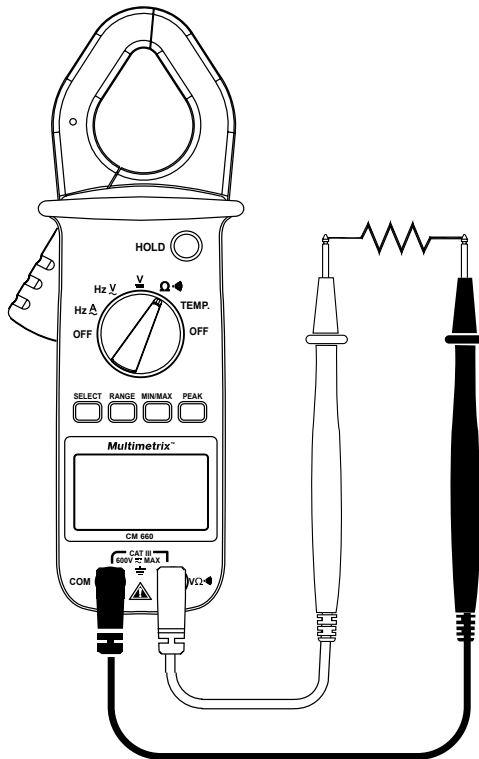


Note: When making a resistance measurement, make sure that the power is off (dead circuit). It is also important that all capacitors in the measured circuit be fully discharged.

- Turn the rotary switch to the Ω $\bullet\bullet$) range
- Insert the red lead to the red “+” input jack and the black lead to the black “COM” input jack
- Bring the test probe tips into contact with the sample under test



Warning: If overload “OL” is displayed, the resistance exceeds the measurement range or the circuit is open.



4.9 Continuity Test

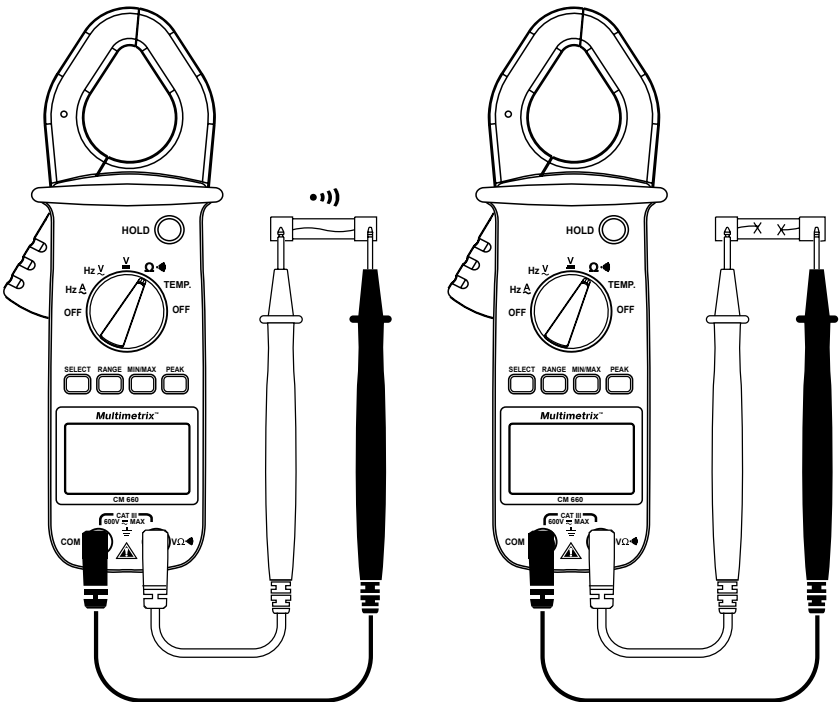


Note: When testing continuity, make sure that the power is off (dead circuit).

- Turn the rotary switch to the Ω (••)) range and press the **SELECT** button to select continuity (••)) will appear on the display)
- Insert the red lead to the red "+" input jack and the black lead to the black "COM" input jack
- Bring the test probe tips into contact with the sample under test
- If the resistance is less than $50\Omega \pm 25\Omega$, the beeper emits a continuous sound



Warning: If overload "OL" is displayed, the continuity exceeds the measurement range or the circuit is open.



4.10 Temperature Measurements

Automatic measurement ranges: -58 to 2010°F (-50 to +1100°C) (2 ranges)

- Turn the rotary switch to the **TEMP** or °C°F range
- Insert the red lead to the red “+” input jack and the black lead to the black "COM" input jack
- Connect the K thermocouple to the instrument input
- Take the reading when the measurement has stabilized
- Put the thermocouple near or on the sample tested
- Press the **SELECT** button to change the measurement unit (°C or °F)




Warning: If overload “OL” is displayed, the capacity has been exceeded.

MAINTENANCE

5.1 Warning

- Remove the test leads from any input before opening the case. Do not operate the instrument without a battery case cover.
- To avoid electrical shock, do not attempt to perform any servicing unless you are qualified to do so.
- If the meter is not going to be used for a long period of time, take out the batteries. Do not store the meter in high temperatures or high humidity.
- To avoid electrical shock and/or damage to the instrument, do not get water or other foreign agents into the probe.

5.2 Battery Replacement

- The batteries will need to be replaced when the  symbol appears on the display.
- The meter must be in the OFF position and disconnected from any circuit or input.
- Replace the battery cover screws with a screwdriver.
- Replace the old batteries with two new 1.5V AA (LR6) batteries.
- Replace the battery compartment cover and tighten the screws.

5.3 Cleaning

- To clean the instrument, wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.
- Do not get water inside the case. This may lead to electrical shock or damage to the instrument.

Repair and Calibration

To ensure that your instrument meets factory specifications, we recommend that it be scheduled back to our factory Service Center at one-year intervals for recalibration, or as required by other standards or internal procedures.

For instrument repair and calibration:

You must contact our Service Center for a Customer Service Authorization Number (CSA#). This will ensure that when your instrument arrives, it will be tracked and processed promptly. Please write the CSA# on the outside of the shipping container. If the instrument is returned for calibration, we need to know if you want a standard calibration, or a calibration traceable to N.I.S.T. (Includes calibration certificate plus recorded calibration data).

Ship To: Multimetrix®
15 Faraday Drive
Dover, NH 03820 USA
Tel: (800) 945-2362 (Ext. 360)
(603) 749-6434 (Ext. 360)
Fax: (603) 742-2346 or (603) 749-6309
repair@multimetrix.com

(Or contact your authorized distributor)

Costs for repair, standard calibration, and calibration traceable to N.I.S.T. are available.

NOTE: You must obtain a CSA# before returning any instrument.

Technical and Sales Assistance

If you are experiencing any technical problems, or require any assistance with the proper operation or application of your instrument, please call, mail, fax or e-mail our technical support team:

Multimetrix®
200 Foxborough Boulevard
Foxborough, MA 02035 USA
Phone: (800) 343-1391
(508) 698-2115
Fax: (508) 698-2118
techsupport@multimetrix.com
www.multimetrix.us

NOTE: Do not ship Instruments to our Foxborough, MA address.

Limited Warranty

The Model CM 660, CM 670 and CM 685 are warranted to the owner for a period of one year from the date of original purchase against defects in manufacture. This limited warranty is given by Multimetrix™, not by the distributor from whom it was purchased. This warranty is void if the unit has been tampered with, abused or if the defect is related to service not performed by Multimetrix™.

For full and detailed warranty coverage, go to www.multimetrix.us. The warranty information is located in our customer service section.

What Multimetrix™ will do:

If a malfunction occurs within the one-year period, you may return the instrument to us for repair, provided you submit a proof of purchase. Multimetrix™ will, at its option, repair or replace the faulty material.

Warranty Repairs

What you must do to return an Instrument for Warranty Repair:

First, request a Customer Service Authorization Number (CSA#) by phone or by fax from our Service Department (see address below), then return the instrument along with the signed CSA Form. Please write the CSA# on the outside of the shipping container. Return the instrument, postage or shipment pre-paid to:

Multimetrix™
Service Department
15 Faraday Drive • Dover, NH 03820 USA
Tel: (800) 945-2362 (Ext. 360)
(603) 749-6434 (Ext. 360)
Fax: (603) 742-2346 or (603) 749-6309

Caution: To protect yourself against in-transit loss, we recommend you insure your returned material.

NOTE: You must obtain a CSA# before returning any instrument.

Multimetrix®

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