

# USER'S MANUAL

BM789  
BM785

Digital  
Multimeter



## 1) SAFETY

This manual contains information and warnings that must be followed for operating the meter safely and maintaining the meter in a safe operating condition. If the meter is used in a manner not specified by the manufacturer, the protection provided by the meter may be impaired.

Observe proper safety precautions when working with voltages above 30 Vrms, 42.4 Vpeak or 60 VDC. These voltage levels pose a potential shock hazard to the user. Do not expose this product to rain or moisture. The meter is intended only for indoor use.

Keep your hands/fingers behind the hand/finger barriers (of the meter and the test probe assembly, where applicable) that indicate the limits of safe access of the hand-held parts during measurements. Inspect lead wires, connectors, and probes for damaged insulation or exposed metal periodically. If any defects are found, replace them immediately. Only use the test probe assembly provided with the meter or a UL Listed test probe assembly to the same meter ratings or better.











Optional offer premium test probe assembly using silicone lead wire insulation, at agent's discretion, is equipped with white inner insulation layers as wear indicators. Replace them immediately if any of the white layers has become visible.

Disconnect the test leads from the test points before changing functions.

The meter meets IEC/EN/BSEN/CSA\_C22.2\_No./UL standards of 61010-1 Ed. 3.0, 61010-2-030 Ed. 1.0, 61010-2-033 Ed. 1.0 to Measurement Categories CAT III 1000V and CAT IV 600V ac & dc.

The accompanied test probe assembly meets IEC/EN/BSEN/CSA\_C22.2\_No./UL standards of 61010-031 Ed. 2.0 to the same meter ratings or better. The 61010-031 requires exposed conductive test probe tips to be  $\leq 4\text{mm}$  for CAT III & CAT IV ratings. Refer to the category markings on your probe assemblies as well as on the add-on accessories (like detachable Caps or Alligator Clips), if any, for applicable rating changes.

## INTERNATIONAL SYMBOLS

	Marking of Electrical and Electronic Equipment (EEE). Do not dispose of this product as unsorted municipal waste. Contact a qualified recycler
	Refer to the explanation in this Manual
	Possibility of electric shock
	Earth (Ground)
	Meter protected throughout by Double Insulation or Reinforced insulation
	Fuse
	Direct Current (DC)
	Alternating Current (AC)
	Three-phase Alternating Current
	Application around and removal from hazardous live conductors is permitted

## BRIEF INFORMATION ON MEASUREMENT CATEGORIES

**Measurement Category IV** is applicable to test and measuring circuits connected at the source of the building's low-voltage MAINS installation. Examples are measurements on devices installed before the main fuse or circuit breaker in the building installation.

**Measurement Category III** is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation. Examples are measurements on distribution boards (including secondary meters), circuit-breakers, cables, bus-bars, junction boxes, switches, socket-outlets, stationary motors in the fixed installation, and equipment for industrial use.

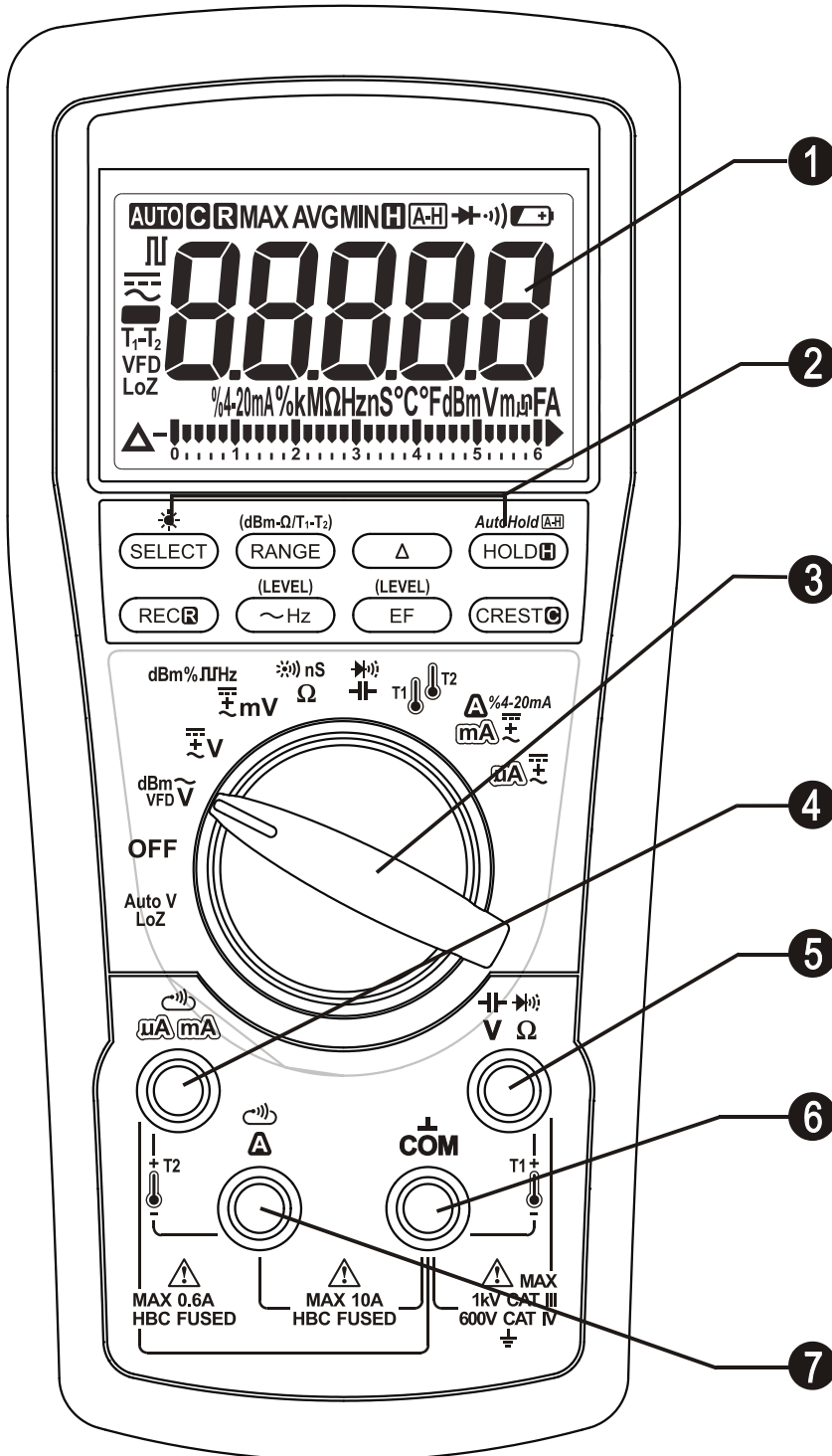
**Measurement Category II** is applicable to test and measuring circuits connected directly to utilization points (socket outlets and similar points) of the low-voltage MAINS installation. Examples are measurements on MAINS CIRCUITS of household appliances, portable tools and similar equipment.

## 2) EUROPEAN DIRECTIVES AND UK STATUTORY REQUIREMENTS

The instruments conform to EUROPEAN (CE) Low-Voltage Directive 2014/35/EU, Electromagnetic Compatibility Directive 2014/30/EU, and RoHS 2 Directive 2011/65/EU plus amendment Directive (EU) 2015/863. The instruments also conform to the UK (UKCA) Electrical Equipment (Safety) Regulations 2016, Electromagnetic Compatibility Regulations 2016, and The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012.

### 3) PRODUCT DESCRIPTION

This user's manual uses only representative model(s) for illustrations. Please refer detailed specifications for function availability to each model.



1) 4-5/6 digits 60000 counts display

2) Push-buttons for special functions & features

3) Selector to turn the Power On or Off and Select a function

4) Positive Input Jack for T2 and mA/ $\mu$ A functions

5) Positive Input Jack for all functions EXCEPT T2, A and  $\mu$ A/mA

6) Common/ Negative (Ground reference) Input Jack for all functions EXCEPT T2

7) Positive Input Jack for A

function while Negative for T2

**Analog bar-graph**



The analog bar graph provides a visual indication of measurement like a traditional analog meter needle. It is excellent in detecting faulty contacts, identifying potentiometer clicks, and indicating signal spikes during adjustments.

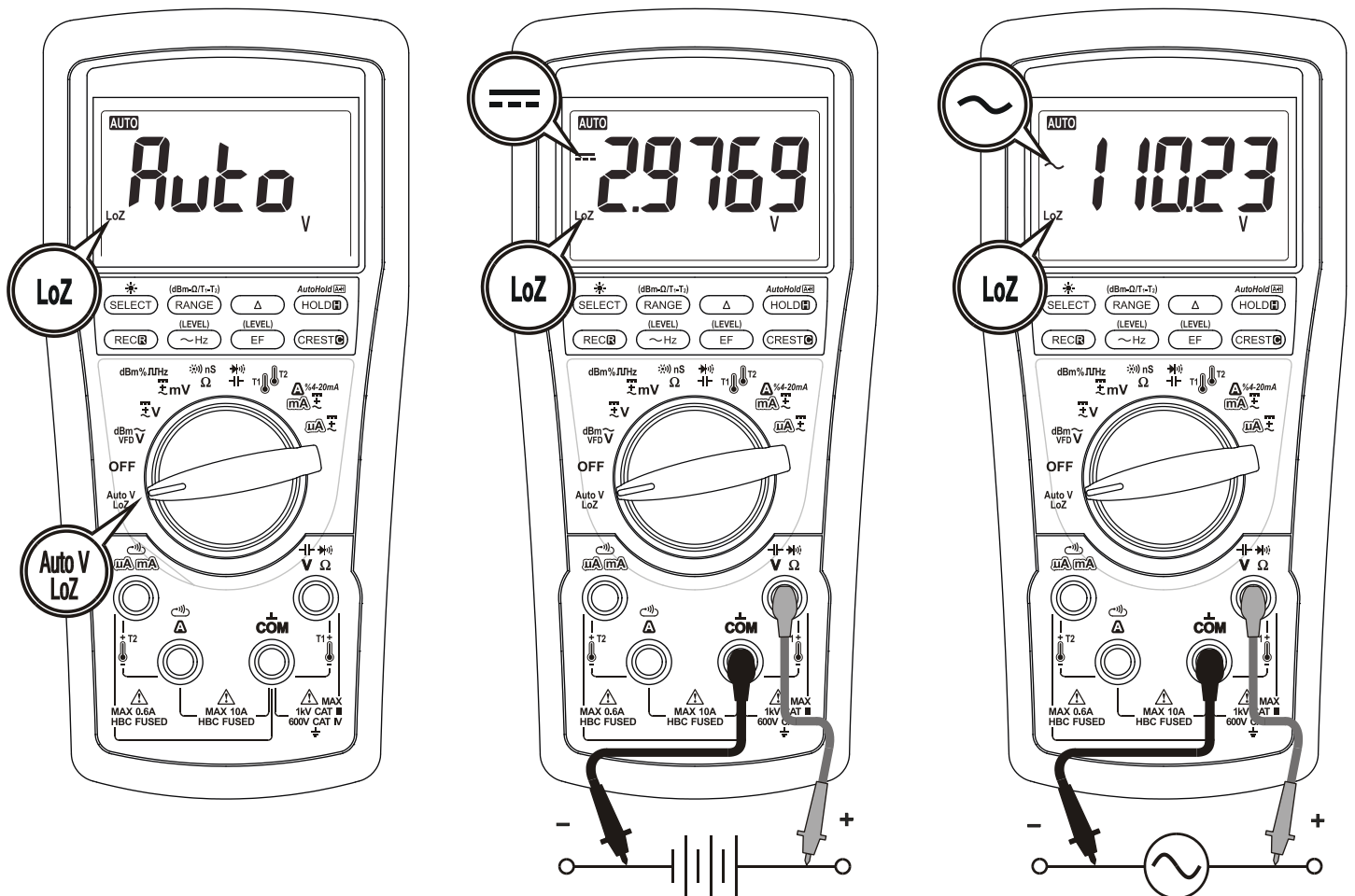
## 4) OPERATION

**Note:** Before and after hazardous voltage measurements, test the voltage function on a known source such as line voltage to determine proper meter functioning.

### AutoV (LoZ) (Model 789 only)

Inputs are made via the test lead terminals **V-COM**. AutoV automatically selects measurement function of DCV or ACV based on their input levels via the test leads. The input also provides a low ramp-up impedance (LoZ) to drain ghost voltages.

- ⊙ With no input, the meter displays “**Auto**” when it is ready.
- ⊙ When a signal above the voltage threshold of 1V DC or AC up to the rated 1000V is present, the meter displays the voltage value in appropriate DC or AC, whichever larger in peak magnitude.
- ⊙ Push-button features of only **HOLD**, **AutoHold**, **EF** and **Backlight** are available in AutoV mode.



**Note:**

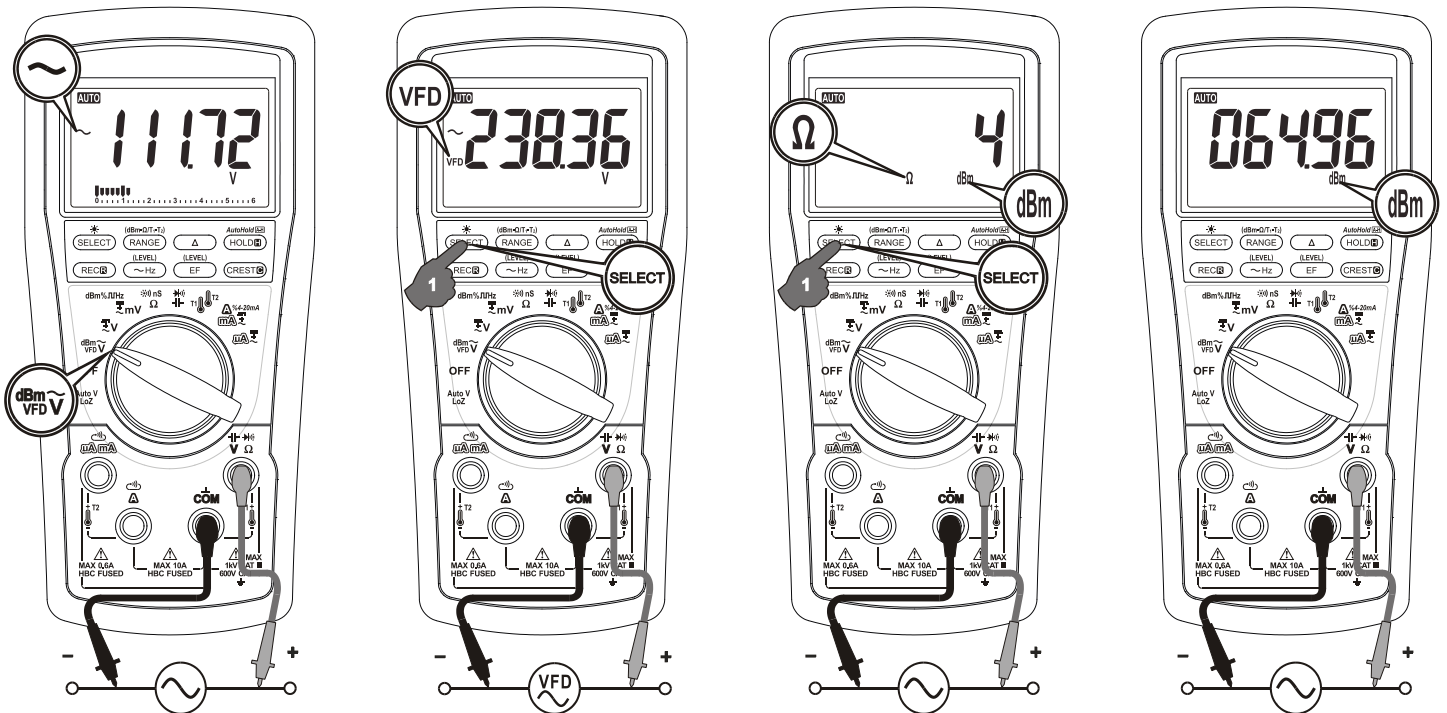
1) **Ghost-voltage Buster:** Ghost-voltages are unwanted stray signals coupled from

adjacent hard signals, which confuse common multimeter voltage measurements. The AutoV mode provides low (ramp-up) input impedance (approx.  $2.1\text{k}\Omega$  at low voltage) to drain ghost voltages leaving mainly hard signal values on meter readings. It is an invaluable feature for precise indication of hard signals, such as distinguishing between hot and open wires (to ground) in electrical installation applications.

2) **AutoV Mode** input impedance increases abruptly from initial  $2.1\text{k}\Omega$  to a few hundred  $\text{k}\Omega$ 's on high voltage hard signals. "**LoZ**" displays on the LCD to remind the users of being in such a low impedance mode. Peak initial load current, while probing  $1000\text{VAC}$  for example, can be up to  $673\text{mA}$  ( $1000\text{V} \times 1.414 / 2.1\text{k}\Omega$ ), decreasing abruptly to approx.  $2.1\text{mA}$  ( $1000\text{V} \times 1.414 / 670\text{k}\Omega$ ) within a fraction of a second. Do not use AutoV mode on circuits that could be damaged by such low input impedance. Instead, use rotary selector  $\tilde{\text{V}}$  or  $\overline{\text{V}}$  high input impedance voltage modes to minimize the test loadings for such circuits.

### ACV; VFD-ACV; dBm (Model 789 only)

Inputs are made via the test lead terminals **V-COM**. Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



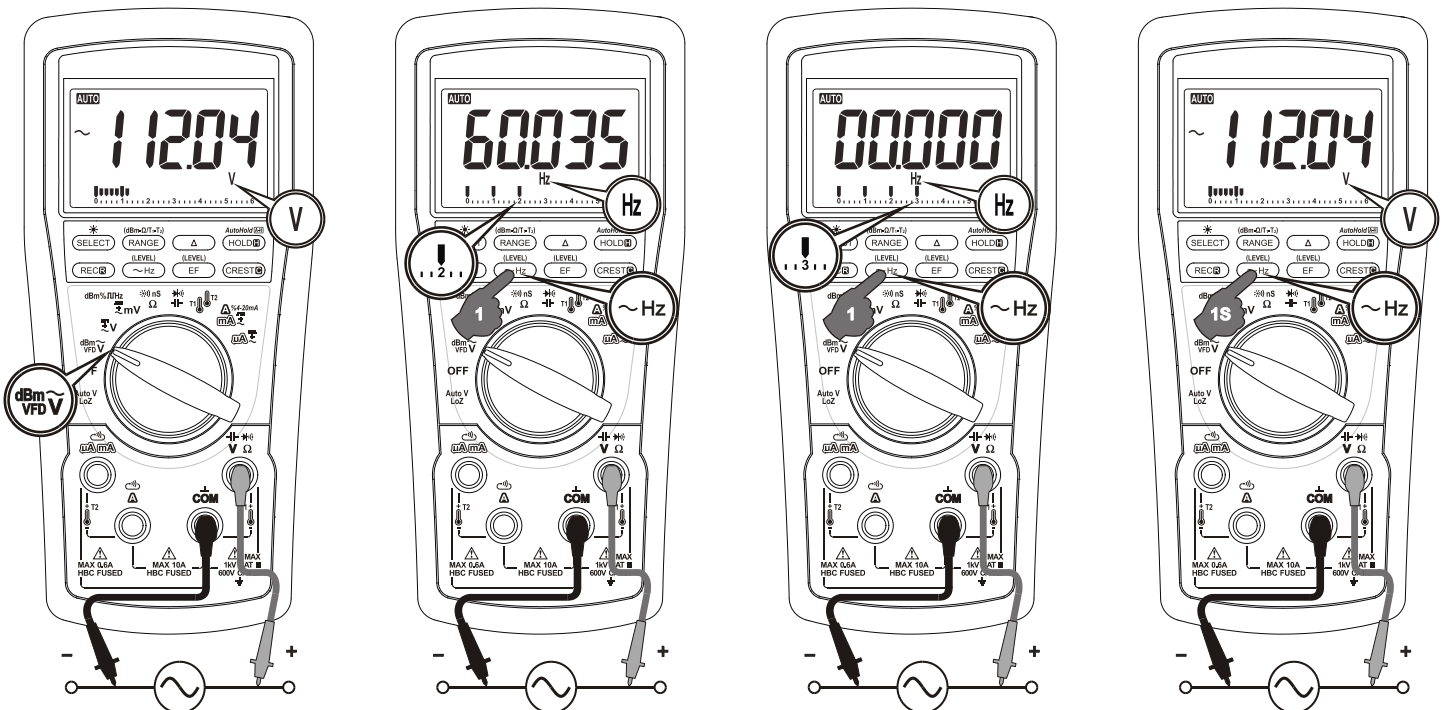
**Note:** In **dBm** function, power up default reference impedance will be displayed for 1 second before displaying the dBm readings. Press **dBm-Ω (RANGE)** button momentarily to select different reference impedance of 4, 8, 16, 32, 50, 75, 93, 110, 125,

135, 150, 200, 250, 300, 500, 600, 800, 900, 1000, up to 1200 $\Omega$ . Last selection will be saved as power up default for repeat measurement convenience.

### ~Hz Line Frequency

Press the **~Hz** button momentarily to switch to Line Frequency function. It is only available to the functions as in the table below. Input sensitivity varies automatically with the function range selected while the ~Hz function is being activated. Level 0 is the highest sensitivity while LEVEL 3 is the lowest. Press momentarily the **~Hz (LEVEL)** button can manually select the available Trigger Levels (see table below) in sequence. Press the **~Hz** button for one-second-or-more to leave Line Frequency function.

TRIGGER	ACV/dBm/DCV/AC+DC V	VFD-ACV	$\mu$ A	mA	A
LEVEL 0	6V		600 $\mu$ A	60mA	6A
LEVEL 1	60V		6000 $\mu$ A	600mA	10A
LEVEL 2	600V	600V			
LEVEL 3	1000V	1000V			

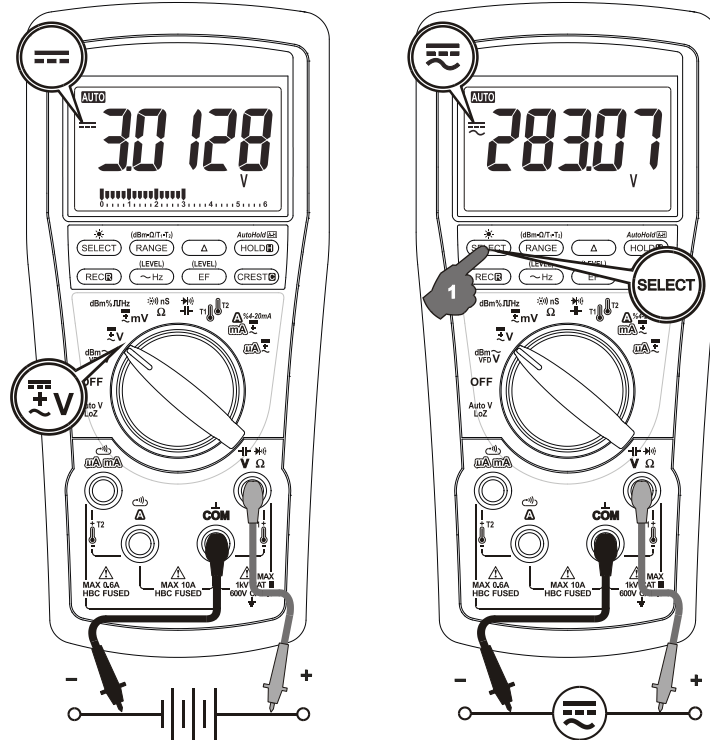


**Note:** It is recommended to direct measure the signals (voltage or current) in auto-ranging mode before activating the ~Hz function right in that range to get the most appropriate trigger level automatically. If the ~Hz reading is unstable, select lower sensitivity to avoid possible electrical noises. If the reading shows zero, select higher

*sensitivity to measure.*

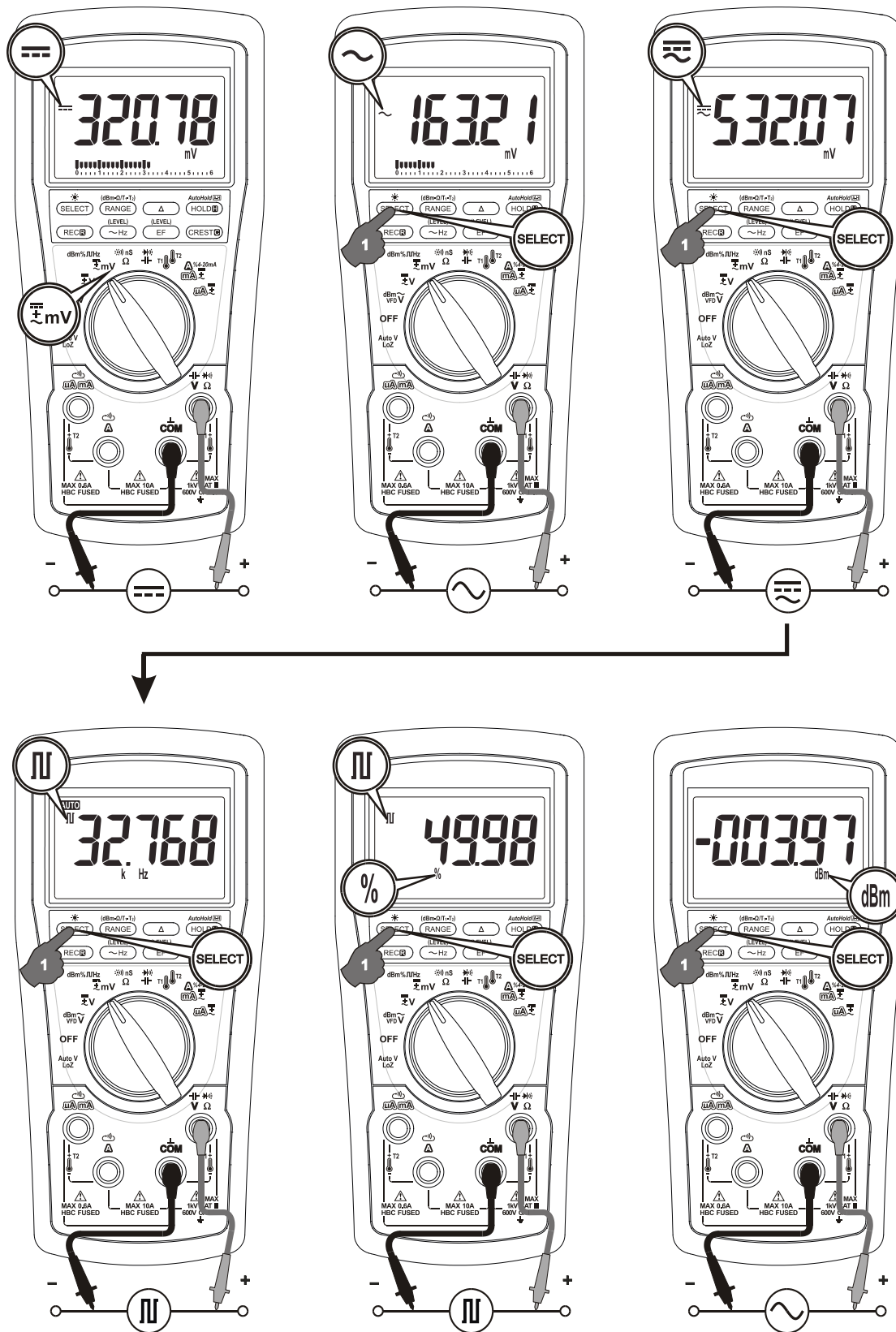
## DCV; DC+ACV

Inputs are made via the test lead terminals **V-COM**. Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



## DCmV; ACmV; DC+ACmV; Logic-level Hz; Logic-level Duty %; dBm (Model 789 only)

Inputs are made via the test lead terminals **V-COM**. Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.

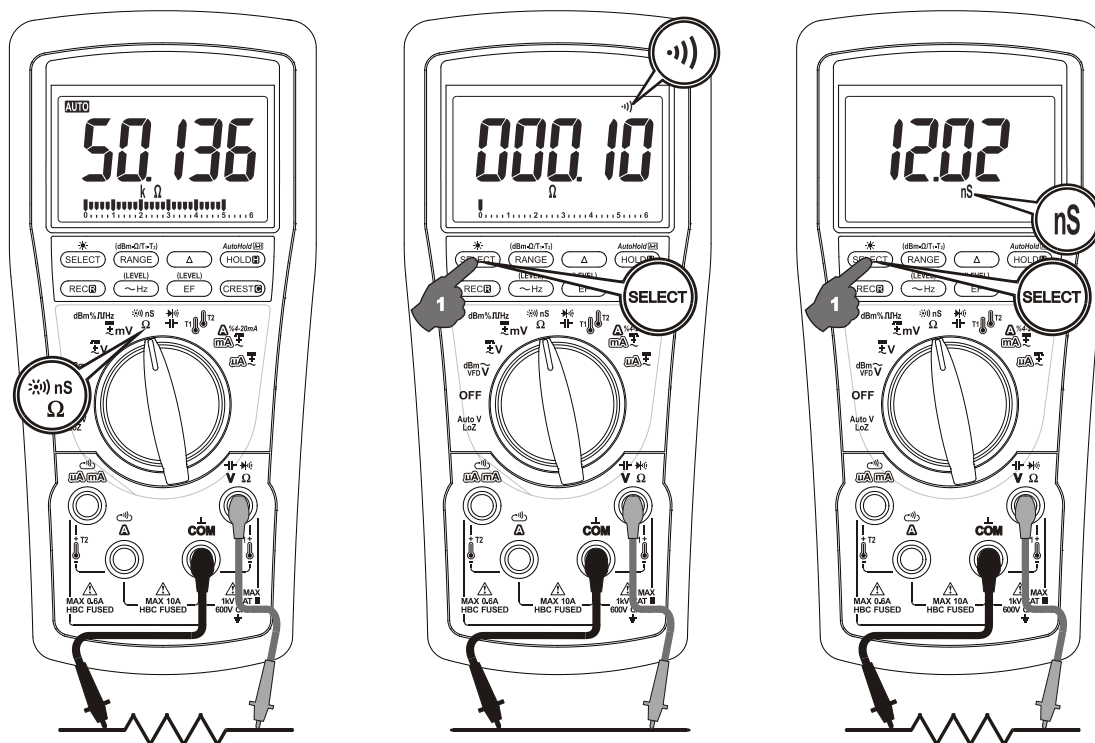


**Note:** In dBm function, power up default reference impedance will be displayed for 1 second before displaying the dBm readings. Press **dBm-Ω (RANGE)** button momentary to select different reference impedance of 4, 8, 16, 32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000, up to 1200Ω. Last selection will be saved as power up default for repeat measurement convenience.



## **$\Omega$ Resistance; BeepLit™ Continuity; nS Conductance (Model 789 only)**

Inputs are made via the test lead terminals **V-COM**. Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



### **BeepLit™ Continuity**

This function is having improved convenience for checking wiring connections and operation of switches. Resistance threshold is being used. A continuous beep tone together with display backlight flashing indicate a complete wire. Such audible and visible indications improve continuity readabilities in noisy working environments.

### **nS Conductance (Model 789 only)**

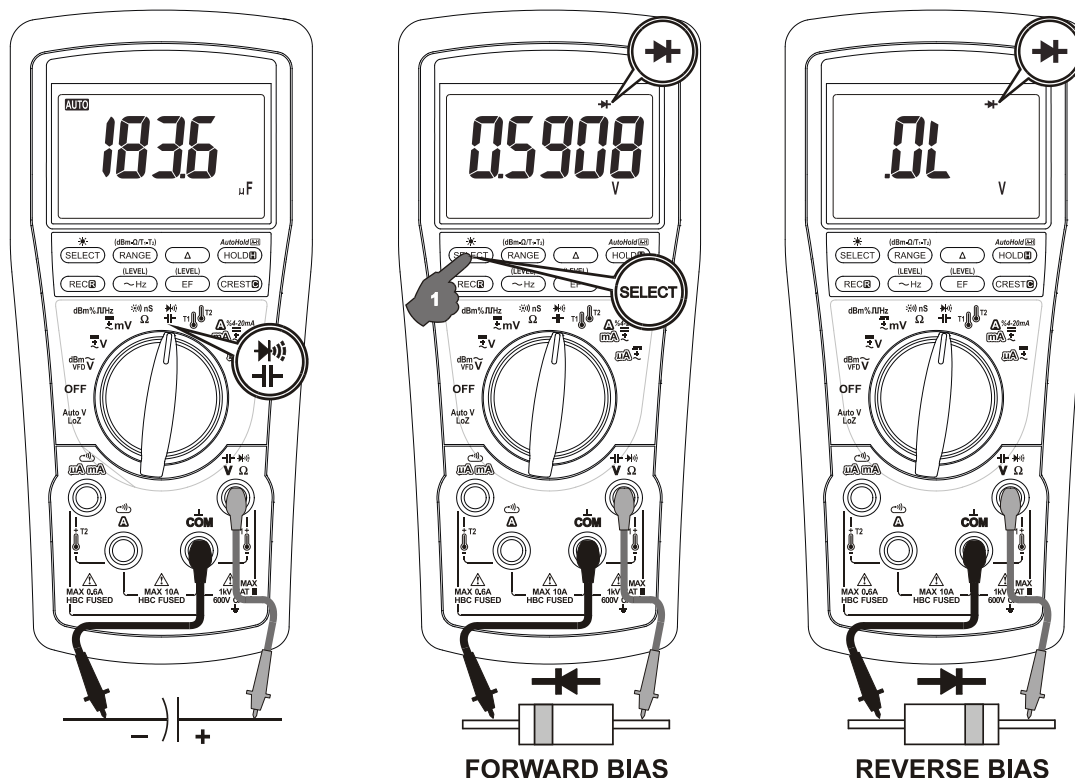
nS Conductance is the inverse of Resistance. That is,  $S=1/\Omega$  or  $nS=1/G\Omega$ . It virtually extends the Resistance measurements to the order of Giga-Ohms for leakage measurements.

**Note:** Using **Resistance**, **BeepLit™ Continuity** or **nS Conductance** function in a live circuit will produce false results and may damage the meter. In many cases, the suspected component(s) must be disconnected from the circuit to obtain an accurate measurement reading.



## **⚡ Capacitance; 🔊 BeepLit™ Diode**

Inputs are made via the test lead terminals **V-COM**. Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



## ⊙ 🔊 BeepLit™ Diode

● **Reading indication:** Forward voltage drop (forward biased) for a good silicon diode is between 0.400V to 0.900V. A higher reading indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective). An over-range display indicates an open diode (defective). Reverse the test leads connections (reverse biased) across the diode. The digital display shows over-range if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).

● **Beep-Alert & BeepLit™ indication:** When the display reading drops across 0.850V, the meter alerts a short beep to signal a reasonable forward voltage drop of common diodes. However, if the reading further drops below 0.100V, the meter gives a continuous beep tone together with flashing display backlight to indicate a shorted diode or a complete wire. It is similar to that of BeepLit™ Continuity function but BeepLit™ Diode, instead, is based on voltage threshold to indicate a complete wire.

**Note:**

- 1) *Discharge capacitor(s) before making capacitance measurements. Large value capacitors should be discharged through an appropriate resistance load.*
- 2) *Using BeepLit™ Diode or Capacitance function in a live circuit will produce false results and may damage the meter. In many cases, the suspected component(s) must be disconnected from the circuit to obtain an accurate measurement reading.*

### **Temperature T1 & T2 (Model 789 only)**

T1 inputs are made via the input terminals **V-COM**. Press **SELECT** button momentarily can toggle between °C (Celsius) and °F (Fahrenheit) readings when enabled. Last selection will be saved as power up default for repeat measurement convenience. Additional T2 inputs are made via the input terminals **uA mA -A**. Press **RANGE (T1-T2)** button momentarily to select T1, T2 and T1-T2 in sequence.

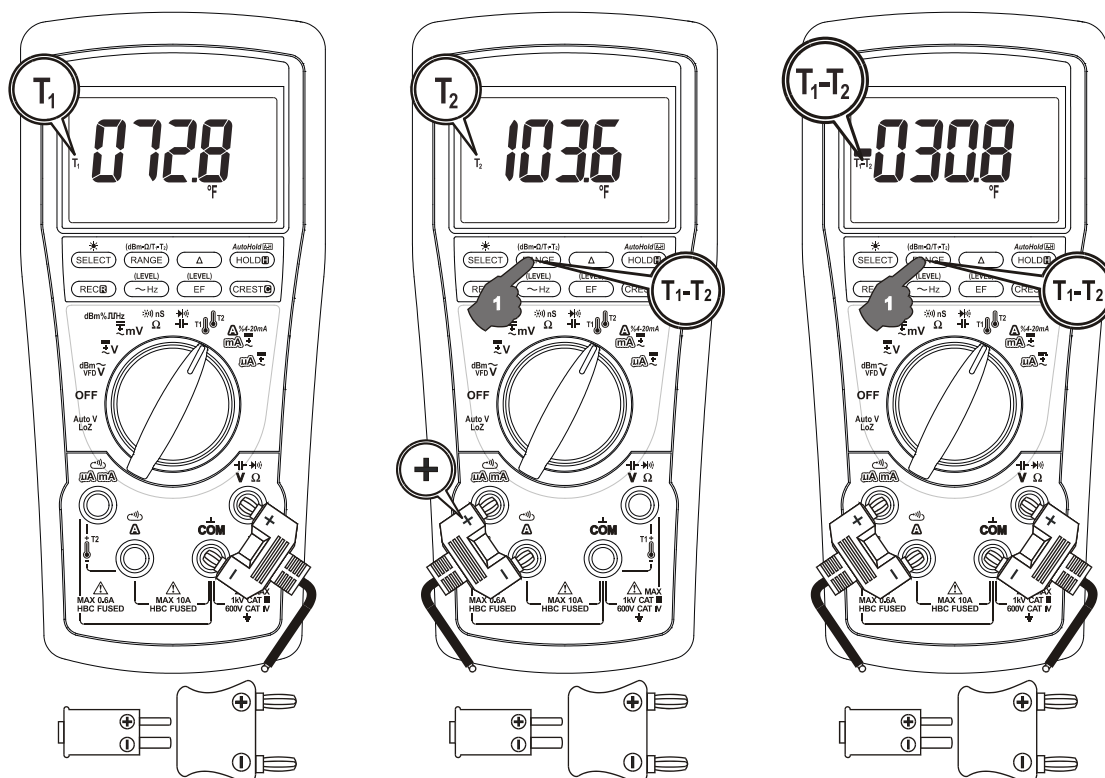
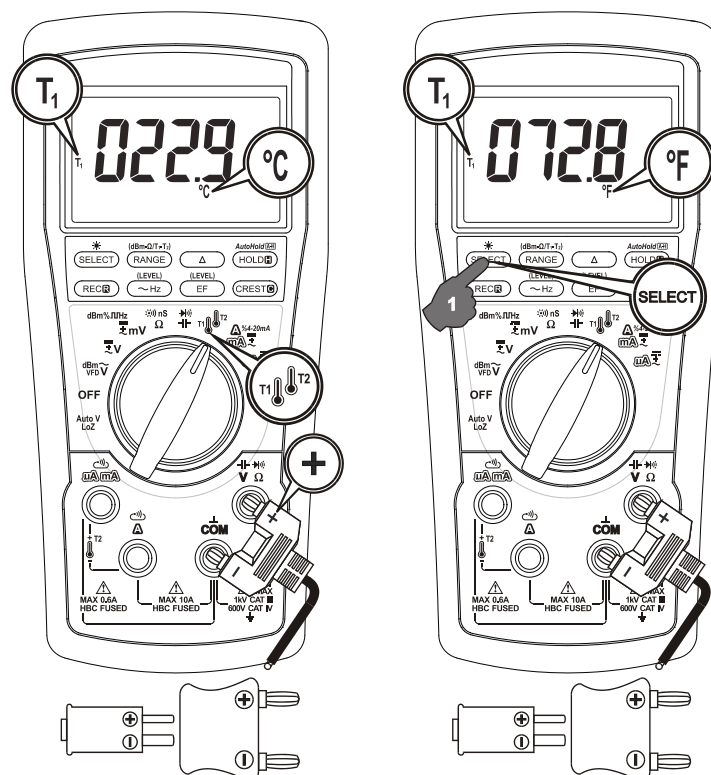
### **☉ Enabling °F and/or °C readings**

- 1) **Enabling both °F and °C readings:** Press-and-hold **EF** button to power on the meter. The meter displays “**C-F**” to acknowledge both °F and °C readings are enabled.
- 2) **Enabling °C readings only:** Repeat step #1 when needed. Turn on the meter to temperature function. Select readings in **°C** and then turn the meter off. Press-and-hold **CREST** button to power on the meter again. The meter displays “**C**” to acknowledge °C readings only is enabled.
- 3) **Enabling °F readings only:** Repeat step #1 when needed. Turn on the meter to temperature function. Select readings in **°F** and then turn the meter off. Press-and-hold **CREST** button to power on the meter again. The meter displays “**F**” to acknowledge °F readings only is enabled.

### **Note:**

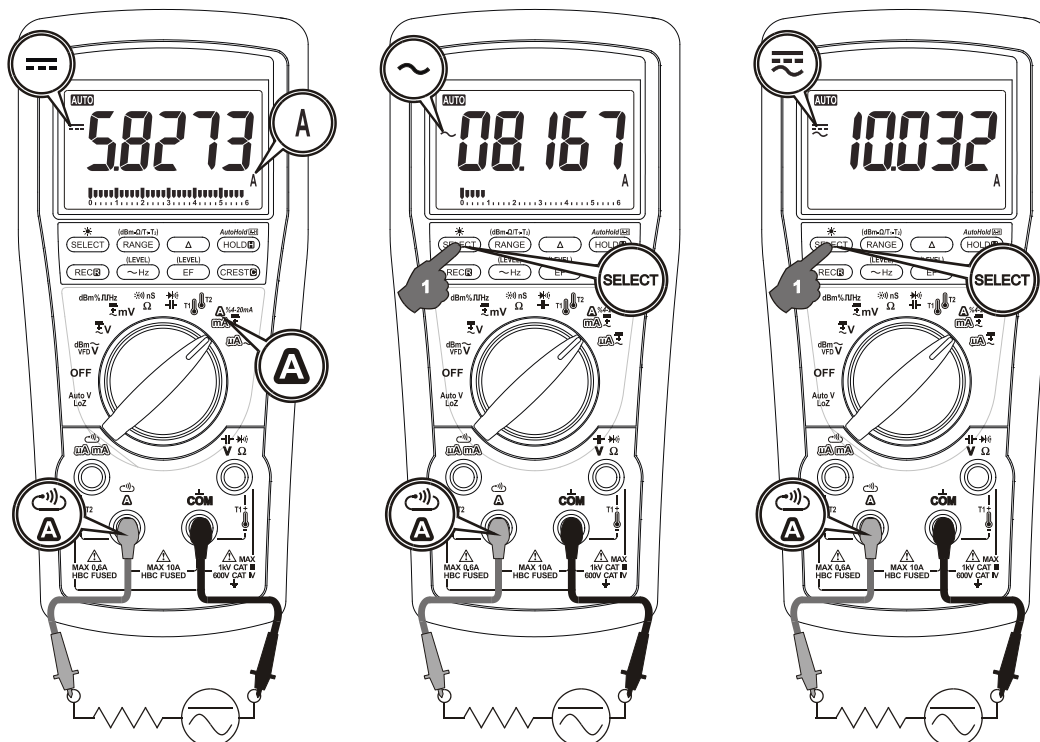
- 1) *Temperature accuracies assume meter interior has the same temperature (isothermal stage) of the ambient for a correct junction voltage compensation. Allow the meter and the type-K probe set to reach isothermal stage for a significant change of ambient temperature. It can take up to an hour for changes > 5°C.*
- 2) *Beware +/- polarities of the banana-plug when using the type-K temperature bead-probe Bkp60.*
- 3) *Banana-pins to type-K socket adapter Bkb32 (Optional purchase) can be used to adapt other type-K probes with standard miniature plugs. However, the adapter*

becomes part of the measurement isothermal block when in use, and should be included in the overall isothermal considerations to minimize erratic readings.



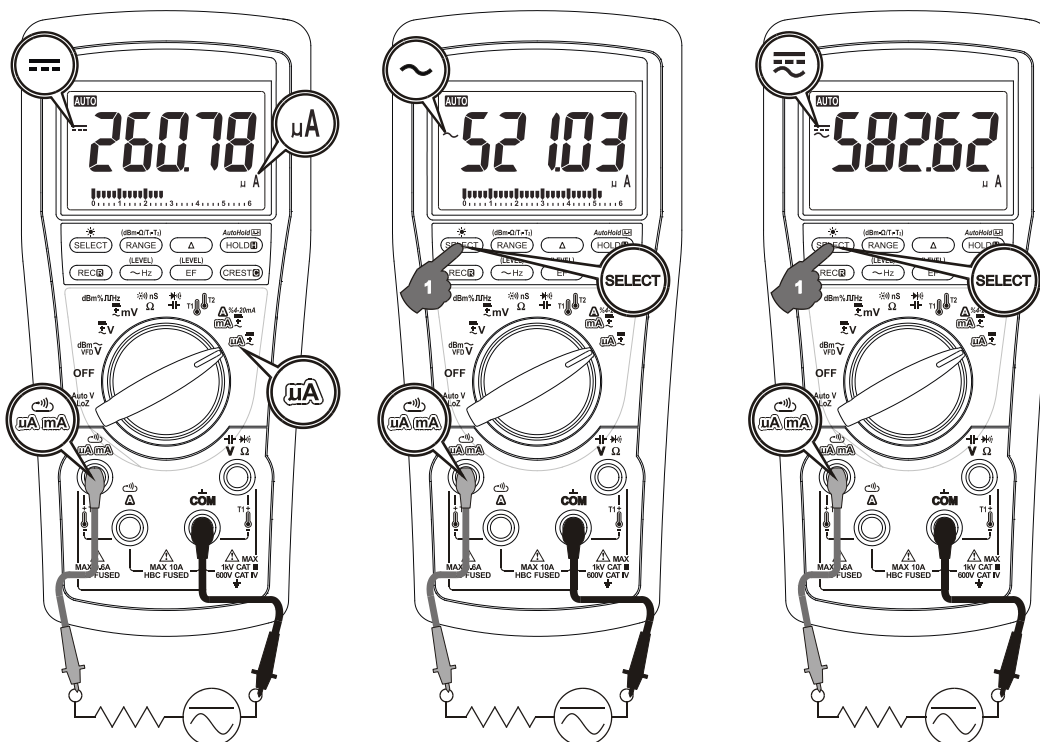
## A Current

Inputs are made via the input terminals **A**-COM. Press the **SELECT** button momentarily to select **DC**, **AC**, **DC+AC** in sequence. Last selection will be saved as power up default for repeat measurement convenience of all current functions.



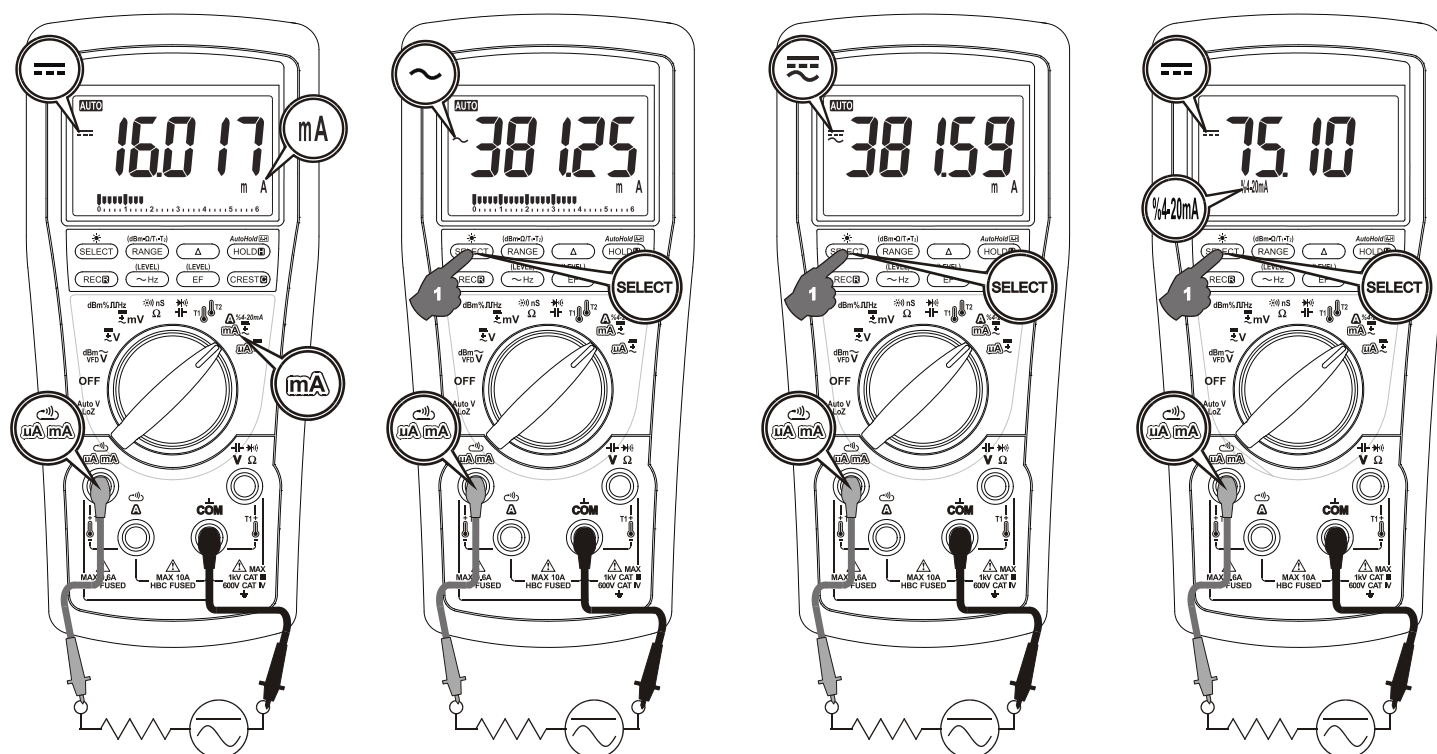
## μA Current

Inputs are made via the input terminals **μA mA**-COM. Press the **SELECT** button momentarily to select **DC**, **AC**, **DC+AC** in sequence. Last selection will be saved as power up default for repeat measurement convenience of all current functions.



## mA Current

Inputs are made via the input terminals **uA mA-COM**. Press the **SELECT** button momentarily to select **DC**, **AC**, **DC+AC** and **%4-20mA** (Model 789 only) in sequence. Last selection will be saved as power up default for repeat measurement convenience of all current functions.



## EF-Detection of Electric Field

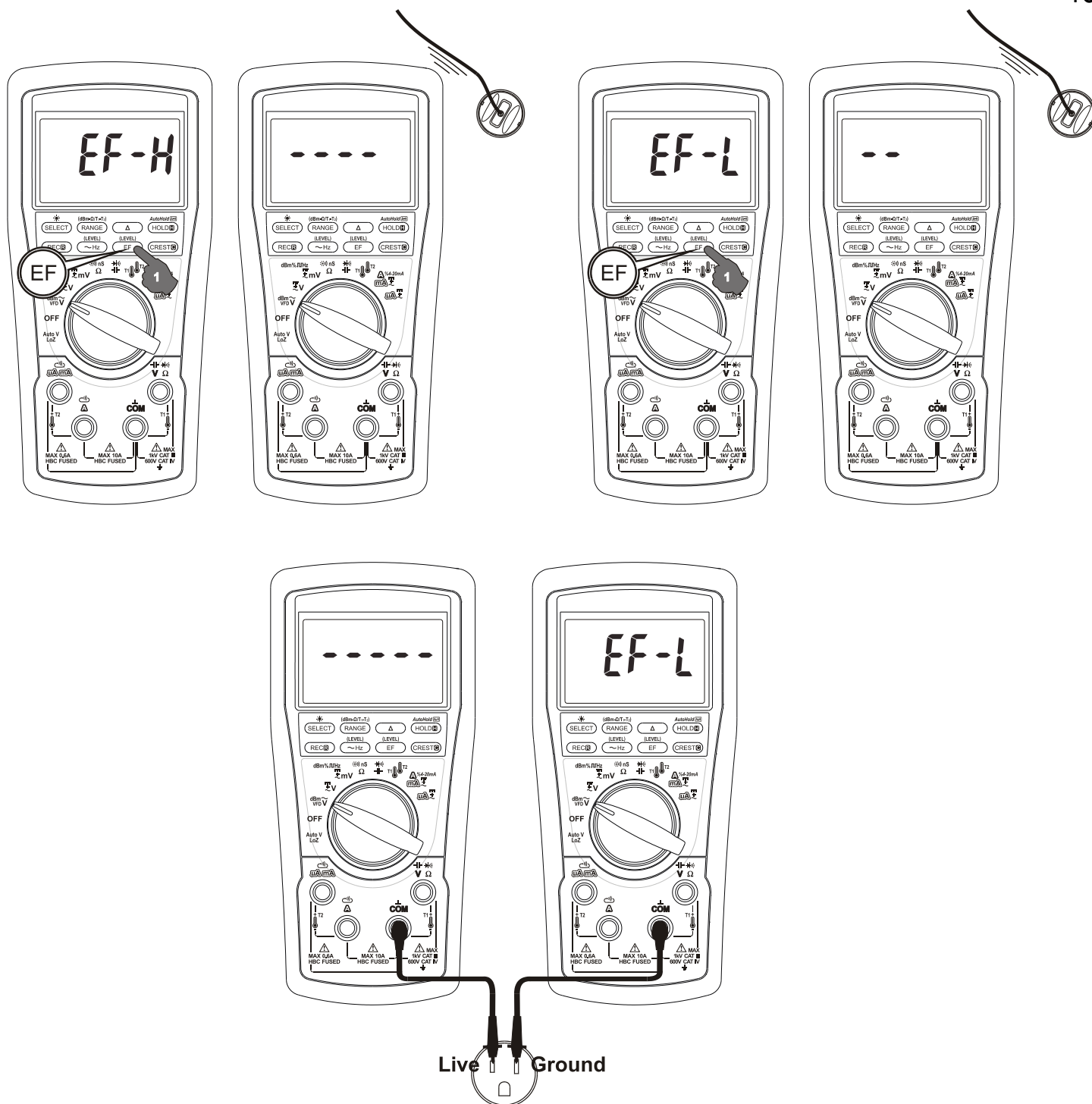
Press **EF** button momentarily to enter **EF-Detection** function. Defaults at high

sensitivity **EF-H**. The meter displays “**EF-H**” when it is ready. If it is too sensitive for your applications, press **EF** button momentarily to select lower sensitivity “**EF-L**”. The detected Electric Field strength is indicated as a series of bar-graph segments on the display plus variable beep tones. Press **EF** button for one-second-or-more to exit **EF-Detection** function.

◎ **Non-Contact EF-Detection (NCV):** *An antenna is located along the top-right corner which detects the electric field surrounding energized conductors. It is ideal for tracing live wiring connections, locating wiring breakages and to distinguish between live and earth connections.*

◎ **Probe-Contact EF-Detection (Single-pole):** *For more precise indication of live wires, such as distinguishing between Live and Ground connections, use one single test-probe to test via terminal **COM** for direct metal contact probing to achieve the most distinctive indications.*





## LCD Backlight

Press the **SELECT** button for one-second-or-more to toggle the LCD backlight. The LCD backlight goes off automatically after idling for approximately 16 minutes to extend battery life.

## Manual or Auto-ranging

For most auto-ranging functions (LCD “**AUTO**” turns on by default), press the **RANGE** button momentarily to override and select manual-ranging. The meter will remain in the range it was in, the LCD “**AUTO**” turns off. Press the button momentarily again to select the next range. Press **RANGE** button for one-second-or-more to resume auto-ranging.

***Note:** Manual-ranging feature is not available to the **Auto-V, dBm, Capacitance & Hz** functions.*

## HOLD

**HOLD** feature freezes the display for later view. LCD “**H**” turns on. Press the **HOLD** button momentarily to toggle the **HOLD** feature.

## AutoHold Real-Read™ **A-H**

**AutoHold** feature displays the last latched stable-reading for later view when the test leads are removed from the test points after a significant-measurement session. Real-Read™ is to show real-time readings during the significant-measurement session to avoid “blind” measurements. Press the **AutoHold **A-H**** button for one-second-or-more to toggle the **AutoHold** feature on. LCD “**A-H**” turns on. Availability: Resistance, Continuity, LoZ AutoV, VFD Volts, Voltage and Current functions.

- ◎ Significant-measurements (readings) are >5% of range in Voltage and Current functions, or non-OL in Resistance function.
- ◎ Stable-reading is a significant-measurement reading having  $\leq 30$  counts in difference with its two immediate preceding measurement readings.
- ◎ Significant-measurement readings are being displayed in real time (Real-Read™); “- - - -” is being displayed while awaiting significant-measurements.
- ◎ The **AutoHold** gives a short-beep with a flashing “**A-H**” when a stable-reading is successfully latched ready for later display. If any of the further significant-measurement readings differs from the latched reading by >30 counts, the latched-reading will be reset waiting to re-latch a new stable-reading.
- ◎ After a significant-measurement session, **AutoHold** gives a short-beep and displays the latched-reading. The reading flashes to emphasize it is on hold to avoid confusions.
- ◎ The **AutoHold** gives 3 short-beeps and “- - - -” flashes to indicate a null capture after a significant-measurement. It represents no stable-reading is being latched or that has been reset after further encountering unstable signal changes to avoid displaying



misleading readings.

**Note:** Make sure both test probes are making good contacts simultaneously when using the **AutoHold** feature. Single probe contact may lead to latching floating-signal readings. Removing both probes from the test points simultaneously largely avoids the mis-latching of an unwanted floating-signal.

### **MAX/MIN/AVG Record mode**

Press **REC** button momentarily to activate **MAX/MIN/AVG** recording mode. LCD "**R** **MAX AVG MIN**" turn on. The meter beeps when new **MAX** (maximum) or **MIN** (minimum) reading is updated. Press the button momentarily to read the **MAX**, **MIN**, **AVG** and **MAXAVGMIN** (active measurement) readings in sequence. Press **REC** button for one-second-or-more to exit this mode. Auto-Power-Off is disabled automatically in this mode.

### **RelativeΔ mode**

**RelativeΔ** mode allows the user to offset the meter consecutive measurements with the displaying reading as the reference value. LCD "**Δ**" turns on. Press the **Δ** button momentarily to toggle **RelativeΔ** mode.

### **CREST mode**

Press **CREST** button momentarily to activate **CREST** mode (Instantaneous PEAK-HOLD) to capture current or voltage peak values in duration as short as 0.25ms. LCD **C** & **MAX** turn on. The meter beeps when new **C****MAX** (maximum) or **C****MIN** (minimum) reading is updated. Press the button momentarily to toggle the **C****MAX** and **C****MIN** readings. Press the button for one-second-or-more to exit this mode. Auto-Power-Off is disabled automatically in this mode. Availability: Voltage and Current functions.

### **Beep-Jack™ Input Warning**

The meter beeps as well as displays "**InEr**" to warn the user against possible damage to the meter due to improper connections to the  $\mu$ A, mA, or A input jacks when another function, especially a voltage function, is selected.

### **Auto-Power-Off (APO)**

The Auto-Power-off (APO) mode turns the meter off automatically to extend battery life after approximately 30 minutes of no rotary switch or push button operations. To wake

up the meter from APO, press the **SELECT** button momentarily and release, or turn the rotary switch OFF and then back on. Always turn the rotary switch to the OFF position when the meter is not in use

### **Power-on Options**

#### **◎ Disabling APO**

Press-and-hold the **SELECT** button while powering on the meter can disable **APO** feature temporarily during the power-on session. The LCD will display “**dSAPO**” to confirm selection before the **SELECT** button is released.

#### **◎ Disabling beep tone**

Press-and-hold the **RANGE** button while powering on the meter can toggle the beep tone OFF or ON in sequence. The meter confirms selection by displaying “**dSbEP**” for beeper OFF (disabled) or “**EnbEP**” for beeper ON (enabled), before the **RANGE** button is released. Last selection will be saved as power up default. When disabled, most operation beep tones are turned off except those for BeepLit™ Continuity and BeepLit™ Diode functions.

#### **◎ Shortening APO idling time for inspection**

Press-and-hold the **Δ (Relative)** button while powering on the meter can shorten the **APO** idling time to approximately 8 seconds temporarily during the power-on session. It is designed mainly for production inspection.

#### **◎ Disabling/Enabling °C or °F function availability**

See Temperature measurement operation description for details.

## 5) MAINTENANCE

**Note:** *To avoid electrical shock, disconnect the meter from any circuit, remove the test leads from the input jacks and turn OFF the meter before opening the case. Do not operate with open case.*

### Trouble Shooting

If the instrument fails to operate, check batteries and test leads etc., and replace as necessary. Double check operating procedure as described in this user's manual. Refer to the LIMITED WARRANTY section for obtaining calibration, repairing or warranty service.

### Accuracy and Calibration

Accuracy is specified for a period of one year after calibration. Periodic calibration at intervals of one year is recommended to maintain meter accuracy.

### Cleaning and Storage

Periodically wipe the meter and the test probe assembly with a damp cloth and mild detergent. Do not use abrasives or solvents. Allow to dry completely before operating. If the meter is not to be used for periods of longer than 60 days, remove the batteries and store them separately.

### Battery use and replacement

The meter uses standard 1.5V AAA Size (IEC R03) battery X 3

Loosen the 2 captive screws on the battery compartment of the bottom housing. Lift the battery compartment cartridge. Replace with new batteries. Replace the battery compartment cartridge. Re-fasten the screws.

### Fuse use and replacement

The Meter uses:

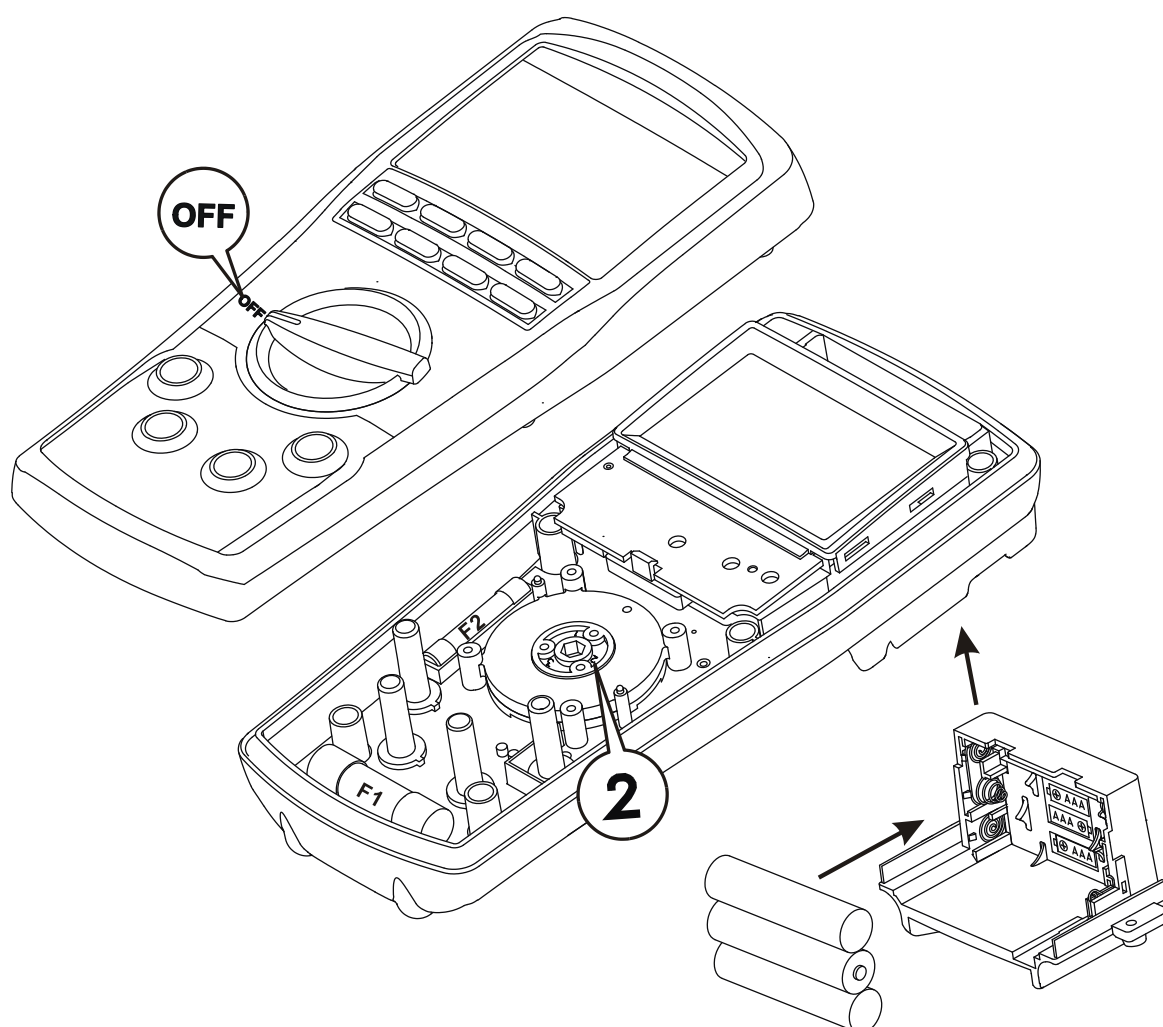
Fuse (F1) for **A** input:

Bussmann DMM-11AR; 11A/1000Vac & Vdc, IR 20kA, F fuse; Dimension: 10 x 38 mm

Fuse (F2) for **μA/mA** input:

SIBA 7017240; 0.4A/1000Vac & Vdc, IR 30kA, F fuse; Dimension: 6 x 32 mm

Turn the rotary knob to OFF position. Loosen 6 captive screws (2 are under the tilt stand) from the bottom housing. Lift the battery compartment cartridge. Further loosen 2 captive screws under the battery compartment cartridge. Lift the upper housing and replace with new fuse(s). Replace the upper housing, and make sure the rotary knob is pointing at the OFF position when doing so. Re-fasten the 2 captive screws under the battery compartment cartridge. Replace the battery compartment cartridge. Re-fasten the 6 captive screws on the bottom housing.



## General Specification

**Display:** 4-5/6 digits 60,000 counts.

**Polarity:** Automatic

**Update Rate:**

4-5/6 digits: Max 5 per second nominal

31 Segment Bar-graph: 50 per second max

**Operating Temperature:** -20°C to 55°C continuous operating (except on **A** function, see Electrical Specifications below for more details)

**Relative Humidity:** Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 55°C

**Pollution degree:** 2

**Storage Temperature:** -20°C to 60°C, < 80% R.H. (with battery removed)

**Altitude:** Operating below 2000m

**Temperature Coefficient:** nominal  $0.10 \times (\text{specified accuracy}) / ^\circ\text{C}$  @ (-20°C ~ 18°C or 28°C ~ 55°C), or otherwise specified

**Sensing:** AC and AC+DC True RMS

**Safety:** Double insulation per IEC/UL/EN/BSEN 61010-1 Ed. 3.0, IEC/UL/EN/BSEN 61010-2-030 Ed. 1.0, IEC/UL/EN/BSEN 61010-2-033 Ed. 1.0, IEC/UL/EN/BSEN 61010-031 Ed. 2.0 and the corresponding CAN/CSA-C22.2 regulations to Measurement Categories III 1000V AC & DC and Category IV 600V AC & DC

**Overload Protections:**

μA & mA: 0.4A/1000V DC/AC, IR 30kA or better, F fuse

A: 11A/1000V DC/AC, IR 20kA or better, F fuse

V: 1100V DC/AC rms

mV, Ω & Others: 1000 V DC/AC rms

**Transient protection:** 8kV (1.2/50μs surge)

**E.M.C.:** Meets EN/BSEN 61326-1:2013

**Power Supply:** 1.5V AAA Alkaline battery x 3

**Power Consumption:** 10mA typical for AC & AC+DC Voltage/Current functions; 8mA typical for other functions

**Low Battery:** Below approx. 3.7V

**APO Timing:** Idle for 15 minutes

**APO Consumption:** 15μA typical.

**Dimension:** L193mm X W89mm X H51mm

**Weight:** 420 gm

**Accessories:** Test lead pair, User's manual, Bkp60 banana plug K-type thermocouple x 1 (Model 789 only)

**Optional Accessories:** BKB32 banana plug to type-K socket plug adaptor (Model 789 only), BMH-02 magnetic hanger strap

**Special Features:** AutoHold; VFD; BeepLit™ Continuity; Record MAX, MIN, & AVG readings; Crest (Instantaneous Peak hold) MAX & MIN readings; Relative Zero mode; Data Hold; Backlighted LCD display; BeepJack™ audible & visible input warning; %4-20mA loop current readings (Model 789 only); T1-T2 differential temperature readings (Model 789 only); dBm readings (Model 789 only)

## ELECTRICAL SPECIFICATIONS

Accuracy is  $\pm$ (% reading digits + number of digits) or otherwise specified, at  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$  & less than 75% relative humidity.

Maximum Crest Factor <1.6:1 at full scale & < 3.2:1 at half scale, and with frequency components fall within the specified frequency bandwidth for non-sinusoidal waveforms.

### DC Voltage

	Model 789	Model 785
RANGE	Accuracy	
600.00mV, 6.0000V, 60.000V	0.03% + 2d	0.03% + 2d
600.00V	0.05% + 5d	0.05% + 5d
1000.0V	0.15% + 5d	0.15% + 5d

Input Impedance:  $10\text{M}\Omega$ , 75pF nominal (280pF nominal for 600mV range)

## AC Voltage

	Model 789 <sup>1)</sup>	Model 785
RANGE	Accuracy	
50Hz ~ 60Hz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V, 1000.0V	0.5% + 30d	0.5% + 30d
40Hz ~ 1kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V, 1000.0V	0.9% + 30d	1.2%+30d
1kHz ~ 7kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V	1.8% + 40d	2.0%+40d <sup>3)</sup>
1000.0V	Unspec'd	Unspec'd
7kHz ~ 20kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V <sup>4)</sup>	2.0%+60d	Unspec'd
1000.0V	Unspec'd	
20kHz ~ 100kHz		
600.00mV <sup>2) 5)</sup> , 6.0000V <sup>5)</sup> , 60.000V <sup>5)</sup>	4.0%+60d	Unspec'd
600.00V, 1000.0V	Unspec'd	

<sup>1)</sup>Accuracy specified from 10% to 100% of range

<sup>2)</sup>Signal peak absolute values, including DC bias, less than 1000mV<sub>peak</sub>

<sup>3)</sup>Accuracy adds 1% @ >5kHz ~ 7kHz

<sup>4)</sup>Bandwidth specified to 10kHz only for 600V range

<sup>5)</sup>Accuracy specified from 30% to 100% of range

Input Impedance: 10MΩ, 75pF nominal (140pF nominal for 600mV range)

Residual reading less than 50 digits with test leads shorted

## AC+DC Voltage

	Model 789 <sup>1)</sup>	Model 785
RANGE	Accuracy	
50Hz ~ 60Hz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V, 1000.0V	0.7% + 40d	0.7% + 40d
0Hz, 40Hz ~ 1kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V, 1000.0V	1.2% + 40d	1.4%+40d
1kHz ~ 7kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V	2.0% + 50d	2.2%+50d <sup>3)</sup>
1000.0V	Unspec'd	Unspec'd
7kHz ~ 20kHz		
600.00mV <sup>2)</sup> , 6.0000V, 60.000V, 600.00V <sup>4)</sup>	2.5%+70d	Unspec'd
1000.0V	Unspec'd	

<sup>1)</sup>Accuracy specified from 10% to 100% of range

<sup>2</sup>)Signal peak absolute values, including DC bias, less than 1000mV<sub>peak</sub>

<sup>3</sup>)Accuracy adds 1% @ >5kHz ~ 7kHz

<sup>4</sup>)Bandwidth specified to 10kHz only for 600V range

Input Impedance: 10MΩ, 75pF nominal (140pF nominal for 600mV range)

Residual reading less than 50 digits with test leads shorted.

### VFD AC Voltage

RANGE	Accuracy <sup>1)</sup>
10Hz ~ 200Hz	
600.00V, 1000.0V	4% + 50d
200Hz ~ 440Hz	
600.00V, 1000.0V	10% + 50d <sup>2)</sup>

<sup>1</sup>)Signal fundamental frequency > 440Hz is unspecified

<sup>2</sup>)Accuracy linearly decreases from 2% + 50d @ 200Hz to 10% + 50d @ 440Hz

### LoZ Auto-DCV (Model 789 only)

RANGE	Accuracy
6.0000V, 60.000V, 600.00V, 1000.0V	0.5%+30d

LoZ Auto-DCV Threshold: > +1.0VDC or < -1.0VDC nominal

LoZ Auto-DCV Input Impedance:

Initially approx. 2.1kΩ, 140pF nominal; Impedance increases abruptly within a fraction of a second as display voltage is above 50V (typical). Ended up impedances vs display voltages typically are:

12kΩ @ 100V

90kΩ @ 300V

300kΩ @ 600V

670kΩ @ 1000V

### LoZ Auto-ACV (Model 789 only)

RANGE	Accuracy <sup>1)</sup>
50Hz ~ 60Hz	
6.0000V, 60.000V, 600.00V, 1000.0V	1.0%+40d

<sup>1</sup>)Accuracy specified from 10% to 100% of range

LoZ Auto-ACV Threshold: > 1.0VAC (50/60Hz) nominal

LoZ Auto-ACV Input Impedance:

Initially approx. 2.1kΩ, 140pF nominal; Impedance increases abruptly within a fraction of a second as display voltage is above 50V (typical). Ended up impedances vs display voltages typically are:

12kΩ @ 100V



90k $\Omega$  @ 300V  
300k $\Omega$  @ 600V  
670k $\Omega$  @ 1000V

**dBm (Model 789 only)**

Range and accuracy are subject to ACmV, ACV and reference impedance selected.

Typical 600Ω reference impedance ranges:

In ACmV: -42.22 dBm to -2.22 dBm

In ACV: -17.78 dBm to 62.22 dBm

Input Impedance: 10MΩ, 140pF nominal

Selectable reference impedance of 4, 8, 16, 32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000 and 1200Ω

**Ohms**

<b>RANGE</b>	<b>Accuracy <sup>1)</sup></b>
600.00Ω	0.085%+10d
6.0000kΩ, 60.000kΩ	0.085%+4d
600.00kΩ	0.15%+4d
6.0000MΩ <sup>2)</sup>	1.5%+5d
60.000MΩ <sup>3) 4)</sup>	2.0%+5d
99.99nS <sup>3) 5)</sup>	1.0%+10d

Open Circuit Voltage: < 1.3VDC (< 1.5VDC for 600Ω range)

<sup>1)</sup>Temperature Coefficient: 0.20 x (specified accuracy)/ °C @ (-20°C ~ 18°C or 28°C ~ 55°C)

<sup>2)</sup>Constant Test Current: 0.1μA Typical

<sup>3)</sup>Constant Test Current: 0.01μA Typical

<sup>4)</sup>Specified accuracy adds 0.5% @ >50MΩ

<sup>5)</sup>For Model 789 only; Specified accuracy adds 30d @ <10nS

**BeepLit™ Continuity Tester**

Audible threshold: between 100Ω and 420Ω

Response time < 100μs

Audible Indication: Beep Sound

Visible Response: LCD Backlight

**BeepLit™ Diode Tester**

<b>RANGE</b>	<b>Accuracy</b>	<b>Test Current (Typical)</b>	<b>Open Circuit Voltage</b>
3.0000V	1%+20d	0.35mA	< 3.1 VDC

Short-Beep-Alert Threshold: Drop Across 0.850V

BeepLit™ continuous ON Threshold: < 0.100V

Audible Indication: Beep Sound

Visible Indication: LCD Backlight

## Capacitance

RANGE	Accuracy <sup>1) 2)</sup>
10.00nF	1.0% + 10d
100.0nF~1000nF	1.0% + 2d
10.00μF~1.000mF	1.8% + 4d
10.00mF	2.0% + 4d

<sup>1)</sup>Accuracies with film capacitor or better

<sup>2)</sup>Temperature Coefficient: 0.20 x (specified accuracy)/ °C @ (-20°C ~ 18°C or 28°C ~ 55°C)

## DC Current

RANGE	Accuracy	Burden Voltage
600.00μA <sup>1) 2)</sup>	0.075%+20d	0.2mV/μA
6000.0μA	0.075%+20d	0.2mV/μA
60.000mA <sup>2)</sup>	0.075%+20d	2.0mV/mA
600.00mA	0.15%+20d	2.0mV/mA
6.0000A	0.3%+20d	30mV/A
10.000A <sup>3)</sup>	0.3%+30d	30mV/A

<sup>1)</sup>Specified with Open-circuit-voltage (OCV) of Current-loop-under-test at >100μV.

<sup>2)</sup>The meter shows a few negative residue counts when the input is short-circuited, with OCV at zero volt. It is the nature of the internal protection circuitry design, and will not affect measurement readings at nominal OCVs greater than 100μV in significant measurements.

<sup>3)</sup>10A continuous up to ambient 40°C only, and is <3 mins on per >15 mins off @ 40°C ~ 55°C; >10A to 20A for <30 seconds on per >15 mins off

## AC Current

	Model 789 <sup>1)</sup>	Model 785	Burden Voltage
RANGE	Accuracy		
	40Hz ~3kHz		
600.00μA, 6000.0μA	0.9%+20d	0.9%+20d	0.2mV/μA
60.000mA, 600.00mA			2.0mV/mA
6.0000A, 10.000A <sup>2)</sup>	1.0%+30d	1.0%+30d	30mV/A

<sup>1)</sup>Accuracy unspecified @ <10% of range

<sup>2)</sup>10A continuous up to ambient 40°C only, and is <3 mins on per >15 mins off @ 40°C ~ 55°C; >10A to 20A for <30 seconds on per >15 mins off

**AC+DC Current**

	Model 789 <sup>1)</sup>	Models 785	Burden Voltage
RANGE	Accuracy		
0Hz, 40Hz ~ 3kHz			
600.00μA, 6000.0μA	1.0%+30d	1.0%+30d	0.2mV/μA
60.000mA, 600.00mA	1.2%+40d	1.2%+40d	2.0mV/mA
6.0000A, 10.000A <sup>2)</sup>			30mV/A

<sup>1)</sup>Accuracy unspecified @ <10% of range

<sup>2)</sup>10A continuous up to ambient 40°C only, and is <3 mins on per >15 mins off @ 40°C ~ 55°C; >10A to 20A for <30 seconds on per >15 mins off

**DC Loop Current %4~20mA (Model 789 only)**

4mA = 0% (zero)

20mA = 100% (span)

Resolution: 0.01%

Accuracy:  $\pm$  25d

**Temperature (Model 789 only)**

RANGE	Accuracy <sup>1) 2)</sup>
-200.0°C to 1090°C	1.0%+1.0°C
-328.0°F to 1994°F	1.0%+1.8°F

<sup>1)</sup>Accuracies assume meter interior has the same temperature (isothermal stage) of the ambient for a correct junction voltage compensation. Allow the meter and the type-K probe set to reach isothermal stage for a significant change of ambient temperature. It can take up to an hour for changes > 5°C.

<sup>2)</sup>Type-K thermocouple range & accuracy not included

**Hz Logic Level Frequency**

RANGE	Accuracy <sup>1) 2)</sup>
5.000Hz ~ 1.0000MHz	0.002%+4d

<sup>1)</sup>Sensitivity: >3.0Vp square wave

<sup>2)</sup>Specified with Pulse Width > 0.5 $\mu$ s

**%Duty Cycle**

5V Logic Frequency	RANGE Specified	Accuracy
5Hz ~ 1kHz	0.10% ~ 99.99%	3d/kHz+2d
1kHz ~ 10kHz	1.00% ~ 99.00%	
10kHz ~ 500kHz	20.00% ~ 80.00%	

Sensitivity: >3.0Vp square wave

### ~ Hz Line Level Frequency

Function RANGE	Sensitivity (Sine RMS)	Range
6V	0.4V	10Hz ~ 50kHz
60V	4V	10Hz ~ 50kHz
600V	40V	10Hz ~ 30kHz
1000V	400V	10Hz ~ 5kHz
VFD 600V	40V	10Hz ~ 400Hz
VFD 1000V	400V	10Hz ~ 400Hz
600 $\mu$ A	40 $\mu$ A	10Hz ~ 5kHz
6000 $\mu$ A	400 $\mu$ A	10Hz ~ 5kHz
60mA	4mA	10Hz ~ 5kHz
600mA	40mA	10Hz ~ 5kHz
6A	0.6A	10Hz ~ 3kHz
10A	6A	10Hz ~ 3kHz

Accuracy: 0.05%+5d

### Non-Contact EF-Detection (NCV)

Bar-Graph Indication	EF-H (Hi Sensitivity)	EF-L (Lo Sensitivity)
	Typical Voltage (Tolerance)	
-	25V ( 18V ~ 45V)	60V (50V ~ 140V)
--	50V (30V ~ 80V)	120V (100V ~ 260V)
---	80V (70V ~ 160V)	230V (180V ~ 400V)
----	120V (110V ~250V)	400V (330V ~ 490V)
-----	350V (>270V)	600V (>500V)

Indication: Bar-graph segments & audible beep tones proportional to the field strength

Detection Frequency: 50/60Hz

Detection Antenna: Top-left end of the meter

**Probe-Contact EF-Detection (Single-pole):** For more precise indication of live wires, such as distinguishing between live and ground connections, use one single test probe to test via terminal COM for direct metal contact probing to achieve the most distinctive indications.

**RECORD mode (MAX MIN AVG)**

Function Mode Where Available	Added Uncertainty <sup>1)</sup> to Specified Accuracy	Min. Volts/Amps Signal Duration	REC Nominal Update Rate per Second
DC	$\pm 30d$	300ms	10
AC	$\pm 300d$ ( $\pm 80d$ <sup>2)</sup> <sup>3)</sup> )	460ms	5 ( $10$ <sup>3)</sup> )
VFD	$\pm 180d$	800ms	5
DC+AC	$\pm 300d$ <sup>2)</sup>	2s	1
nS	--	--	1
Cx	--	--	Subject to Cx Values
Hz, T1-T2	--	--	2
$\Omega$ , T1, T2, Others	--	--	5

<sup>1)</sup> Specified at Range Locked (Manual-ranging)

<sup>2)</sup> Specified at AC Inputs >15% of Range for Model 789

<sup>3)</sup> For Model 789 only

**CREST mode (Instantaneous Peak Hold)**

Accuracy: Specified accuracy  $\pm 100$  digits for changes > 0.35ms in duration

Availability: Voltage and Current functions

Resolution: 6000 counts

**AutoHold Real-Read™**

Accuracy: Specified accuracy  $\pm 50$  digits

Availability: Resistance, Continuity, LoZ AutoV, VFD Volts, Voltage and Current functions

- NOTE -



## LIMITED WARRANTY

BRYMEN warrants to the original product purchaser that each product it manufactures will be free from defects in material and workmanship under normal use and service within a period of one year from the date of purchase. BRYMEN's warranty does not apply to accessories, fuses, fusible resistors, spark gaps, varistors, batteries or any product which, in BRYMEN's opinion, has been misused, altered, neglected, or damaged by accident or abnormal conditions of operation or handling.

To obtain warranty service, contact your nearest BRYMEN authorized agent or send the product, with proof of purchase and description of the difficulty, postage and insurance prepaid, to BRYMEN TECHNOLOGY CORPORATION. BRYMEN assumes no risk for damage in transit. BRYMEN will, at its option, repair or replace the defective product free of charge. However, if BRYMEN determines that the failure was caused by misused, altered, neglected, or damaged by accident or abnormal conditions of operation or handling, you will be billed for the repair.

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