



## AM-42, AM-45 & AM-47 USER'S MANUAL



### 1) PRODUCT DESCRIPTION

Note: Our top of the line model is used as the representative for illustration purposes. Please refer to your respective model for function availability.

1) LCD display

2) Rotary Selector to Select additional functions (AM-47 & AM-42 only), and to turn the Power On or Off (AM-42 only). AM-45 does not have a physical Rotary Selector.

3) Push-button to Select additional functions (all models), and to switch the Power On or Off (AM-47 & AM-45 only)

4) Input for all functions, or otherwise specified. Red test lead for positive (+) polarity and Black test lead for Ground reference (-).

### 2) SAFETY

#### Terms in this manual

**WARNING** identifies conditions and actions that could result in serious injury or even death to the user.

**CAUTION** identifies conditions and actions that could cause damage or malfunction in the instrument.

This manual contains information and warnings that must be followed for operating the instrument safely and maintaining the instrument in a safe operating condition. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired. The meter is intended only for indoor use. The meter is protected by double insulation per EN61010-1, IEC61010-1, CSA C22.2 No. 1010-1-92 and UL61010B-1 to CAT III 300V & CAT II 600V (CAT II 450V for model AM-45).








**Measurement Category III (CAT III)** is for measurements performed in a building installation. Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.

**Measurement Category II (CAT II)** is for measurements performed on circuits directly connected to the low voltage installation. Examples are measurements on household appliances, portable tools and similar equipment.

#### **WARNING**

To reduce the risk of fire or electric shock, do not expose this product to rain or moisture. To avoid electrical shock hazard, observe the proper safety precautions when working with voltages above 60 VDC or 30 VAC rms. These voltage levels pose a potential shock hazard to the user. Do not touch test lead tips or the circuit being tested while power is applied to the circuit being measured. Keep your fingers behind the finger guards of the test leads during measurement. Inspect test leads and probes for damaged insulation or exposed metal before using the instrument. If any defects are found, replace them immediately.

## INTERNATIONAL ELECTRICAL SYMBOLS

	Caution ! Refer to the explanation in this Manual
	Caution ! Risk of electric shock
	Earth (Ground)
	Double Insulation or Reinforced insulation
	Fuse
	AC--Alternating Current
	DC--Direct Current

### 3) CENELEC DIRECTIVES

The instrument conforms to CENELEC Low-voltage directive 73/23/EEC and Electromagnetic compatibility directive 89/336/EEC

### 4) OPERATION

Note: All function operations described hereafter are via the Red test lead for positive (+) polarity and Black test lead for Ground reference (-), or otherwise specified

#### 4-1) FUNCTIONS IN “Auto V.Ω” POSITION (AM-47 & AM-45 only)

##### -Quick Start (AM-47 & AM-45 only)

AutoCheck™ mode is the default function in “Auto V.Ω” position. Press the SELECT button momentarily to select and step through the functions: *AutoCheck™* → *Continuity* → *EF* → *ACV* → *DCV* → *Ω* → *Hz* → *Cx* → *AutoCheck™*

##### -AutoCheck™ mode (AM-47 & AM-45 only)

This innovative AutoCheck™ feature automatically selects measurement function of DCV, ACV or Resistance (Ω) based on the input via the test leads.

- With no input, the meter displays “Auto” when it is ready.
- With no voltage signal but a resistance below 6MΩ is present, the meter displays the resistance value. When below 25Ω is present, the meter AM-47 produces a continuity beep tone.
- When a signal above the threshold of DC 1.2V or AC 1.5V up to the rated 600V (450V for AM-45) is present; the meter displays the appropriate voltage value in DC or AC, whichever larger in peak magnitude.
- **Overload-Alert Feature:** When above rated 600V (450V for AM-45) is present; the meter displays “OL” with a warning beep tone. Disconnect the test leads from the signal immediately to avoid hazards.



Note:

**\*Range-Lock Feature:** When a measurement reading is being displayed in AutoCheck™ mode, press the **SELECT** button momentarily **1 time** can lock the function-range it was in. The LCD annunciator “**AUTO**” turns off. Range-lock can speed up repetitive measurements. Press the **SELECT** button momentarily again to return to AutoCheck™ mode.

**\*Hazardous-Alert:** When making resistance measurements in AutoCheck™ mode, an unexpected display of voltage readings alerts you that the part under test is still energized.

\*AutoCheck™ nominal input impedances are slightly lower than that of common digital multimeters. They are, in fact, more similar to that of most traditional analog multimeters. “LoZ” will display on the LCD to remind the users in such cases. Although not likely, if such impedance might damage your circuits, use the common impedance (Hi-Z) voltage mode (AM-47 and AM-42 only) for making voltage measurements on them.

##### -Continuity, Audible With Symbolic Display (AM-47 & AM-45 only)

From AutoCheck™ with “Auto” being displayed, press the **SELECT** button momentarily **1 time** to select Continuity function. The meter displays a symbolic open-switch display “” when it is ready. Continuity is convenient for checking wiring connections and operation of switches. A continuous beep tone with a symbolic closed-switch display “” indicates a complete circuit. In noisy environments, it is helpful to “see” continuity measurements.

### **-Electric Field EF-Detection (AM-47 & AM-45 only)**

From AutoCheck™ with “Auto” being displayed, press the **SELECT** button momentarily **2 times** to select EF-Detection feature. The meter displays “EF” when it is ready. Signal strength is indicated as a series of bar-graph segments on the display and variable beep tones.

●**Non-Contact EF-Detection:** An antenna is located at the top left corner of the meter, which detects electric field surrounds current-carrying conductors. It is ideal for tracing live wiring connections, locating wiring breakage and to distinguish between live or earth connections.

●**Probe-Contact EF-Detection:** For more precise indication of live wires, such as distinguishing between live and ground sockets, use the Red (+) test probe for direct contact measurements.

### **-V and $\Omega$ of AutoCheck™ In Manual Selection (AM-47 & AM-45 only)**

From AutoCheck™ with “Auto” being displayed, press the **SELECT** button momentarily **3 times** to select ACV, **4 times** to select DCV and **5 times** to select Resistance ( $\Omega$ ) functions of AutoCheck™. Such selected function remains auto-ranging.

### **-Frequency And Capacitance (AM-47 & AM-45 only)**


From AutoCheck™ with “Auto” being displayed, press the **SELECT** button momentarily **6 times** to select Frequency (Hz), **7 times** to select Capacitance (F) functions and **8 times** to return to AutoCheck™ mode.

*Note:*

*\*Unlike the Line Level Hz Frequency function (for AM-47 only) as stated, this (Common) Hz Frequency function is set only at the highest input sensitivity mainly for measuring small electronic signals of below 20VAC rms.*

## **4-4) OTHER FUNCTIONS**


### **-DCV, ACV & Line-Level Hz functions (AM-47 only)**

Rotate the rotary selector to the V position selects common impedance (Hi-Z) voltage measurements. DCV is the default function. Press **SELECT** button momentarily to select ACV. The AC annunciator “” turns on. Press momentarily again to activate the Line-Level Hz function.

*Note:*

*\*Line-Level Hz input sensitivity varies automatically with ACV range selected when Line-Level Hz is selected. AC 6V range has the highest and AC 600V range has the lowest sensitivity. Measuring the signal in ACV function WHILE selecting Line-Level Hz function in that ACV range automatically sets the most appropriate sensitivity for higher voltage applications. This can avoid electrical noises as in 110/220V line voltage applications for example. If the reading shows zero due to insufficient signal levels, select Line-Level Hz function BEFORE making measurements (at AC 6V range) will set the highest sensitivity.*


### **-Diode & 600 $\Omega$ functions (AM-47 only)**

Rotate the rotary selector to the /600 $\Omega$  position.



Diode test is the default function. The reading shows the approximate voltage drop across the test leads. Normal forward voltage drop (forward biased) for a good silicon diode is between 0.400V to 0.900V. A reading higher than that indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective), and the meter will give a long beep as continuity warning. An OL indicates an open diode (defective). Reverse the test leads connections (reverse biased) across the diode. The digital display shows OL if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).

Press **SELECT** button momentarily selects the lowest 600 $\Omega$  range for lower resistance measurements. It is an extended range to complement the AutoCheck™ Resistance ( $\Omega$ ) function.

### **-DC- $\mu$ A & AC- $\mu$ A Micro-Amp functions (AM-47 only)**


Rotate the rotary selector to the  $\mu$ A position. The display-reading unit is in  $\mu$ A although there is no unit annunciator on the display. DC- $\mu$ A is the default function. There is no annunciator for DC. Press **SELECT** button momentarily to select AC- $\mu$ A. The AC annunciator “” turns on. These ranges, like other functions, are protected up to the maximum rated voltages of the meter.


### -DCV & ACV functions (AM-42 only)

Rotate the rotary selector to the V position selects common impedance (Hi-Z) voltage measurements. DCV is the default function. The DC annunciator “” turns on. Press **SELECT** button momentarily to select ACV. The AC annunciator “” turns on.

### -Resistance, Continuity, Diode & Capacitance functions (AM-42 only)

Rotate the rotary selector to the  $\Omega$ /// position. Resistance “ $\Omega$ ” is the default function.

Press **SELECT** button momentarily selects Continuity function. The Audible annunciator “” turns on. Continuity is convenient for checking wiring connections and operation of switches. A continuous beep tone indicates a complete circuit.

Press **SELECT** button momentarily AGAIN selects Diode test function. The annunciator “” turns on. The reading shows the approximate voltage drop across the test leads. Normal forward voltage drop (forward biased) for a good silicon diode is between 0.400V to 0.900V. A reading higher than that indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective). An OL indicates an open diode (defective). Reverse the test leads connections (reverse biased) across the diode. The digital display shows OL if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).

Press **SELECT** button momentarily AGAIN selects Capacitance function.

### -Frequency function (AM-42 only)

Rotate the rotary selector to the Hz position selects Frequency function.

*\*Unlike the Line Level Hz Frequency function (for AM-47 only) as stated, this (Common) Hz Frequency function is set only at the highest input sensitivity mainly for measuring small electronic signals of below 20VAC rms.*

## 4-3) OTHER FEATURES

### -Power On & Off



For models AM-47 and AM-45, press and hold the SELECT button for 1 second and then release to turn the power ON or OFF. Press and hold the SELECT button for approximately 6 seconds to master reset the system to the default stage if in case the meter hangs up unexpectedly.



For model AM-42, rotate the rotary selector to turn the power ON or OFF.

### -Auto Power Off

Models AM-47 and AM-45 turn off after approximately 3 minutes of idle measurement readings and no button/switch activities. Model AM-42 turns off automatically after approximately 30 minutes of no button/switch activities.

### -HOLD and 30ms MAX features (AM-42 only)

The Hold feature freezes the display for later viewing. Press the HOLD  (MAX ) button momentarily to activate or to exit the Hold feature.

The Max feature captures voltage signals that have durations as short as 30ms (milliseconds) within a single range, and has automatic up range capability. This mode is available in DCV & ACV functions. Press the HOLD  (MAX ) button for 1 second or more to activate or to exit the Max feature.

### -Auto-ranging

If the function selected has more than one range, the meters will auto-range to the best range and resolution. No manual ranging is required.

## 5) MAINTENANCE

### WARNING

To avoid electrical shock, disconnect test leads from live circuits before opening the case. Do not operate with open case.

## Cleaning and Storage


Periodically wipe the case with a damp cloth and mild detergent; do not use abrasives or solvents. If the meter is not to be used for periods of longer than 60 days, remove the battery and store it separately

## Trouble Shooting

If the instrument fails to operate, check battery, leads, etc., and replace as necessary. Double check operating procedure as described in this user's manual

If the instrument voltage-resistance input has subjected to high voltage transient (mostly caused by lightning or switching surge to your system) by accident or abnormal conditions of operation, the series fusible resistors will be blown off (become high impedance) like fuses to protect the user and the instrument. Most measuring functions through this input will then be open circuit. The series fusible resistors and the spark gaps should then be replaced by qualified technician. Refer to the LIMITED WARRANTY section for obtaining warranty or repairing service.

## Battery replacement

If the meter starts up with persistent resetting display or with low battery icon  turns on, replace the battery ASAP. The meter uses one 3V coin battery IEC-CR2032.

Before opening the case bottom, make sure the meter is switched off to avoid abrupt power reset to a running meter system. Disconnect test leads from live circuits. Loosen the screw from the case bottom. Lift the end of the case bottom nearest the input test leads until it unsnaps from the case top. Replace the battery. Observe battery polarities with positive (+) faces up (towards the case bottom). Replace the case bottom, and ensure that the snap on the case top (near the LCD side) is engaged. Re-fasten the screw.

*Note for AM-47 and AM-45 battery replacement:*

*\*AM-47 and AM-45 use micro-controller (like a computer) to run the meter system. WHEN THE METER IS POWER-ON, intermittence battery power failure (fast intermittence battery contact interval in the order of millisecond) may cause the meter reset/re-startup abnormally. Simply press and hold the SELECT button for approximately 6 seconds to master reset the system if such a situation occurs.*

## 6) SPECIFICATION

### GENERAL SPECIFICATIONS

#### Display & Update Rate:

AM-42: 3-3/4 digits 4000 counts; Updates 3 per second nominal

AM-45 & AM-47: 3-5/6 digits 6000 counts; Updates 5 per second nominal

**Operating Temperature:** 0°C ~ 40°C

**Relative Humidity:** Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C

**Altitude:** Operating below 2000m

**Storage Temperature:** -40°C ~ 60°C, < 80% R.H. (with battery removed)

**Temperature Coefficient:** Nominal 0.15 x (specified accuracy)/ °C @ (0°C ~ 18°C or 28°C ~ 40°C), or otherwise specified

**Sensing:** Average sensing

**Pollution Degree:** 2

**Safety:** Meets IEC61010-1, CAN/CSA-C22.2 No. 1010.1-92

**Transient Protection:** 4kV lightning surge (1.2/50µs)

#### Measurement Category:

AM-42 & AM-47: CAT II 600V and CAT III 300V

AM-45: CAT II 450V and CAT III 300V

**E.M.C.:** Meets EN61326 (1997, 1998/A1), EN61000-4-4 (1995), & EN61000-4-3 (1996)

In an RF Field of 3V/m:

Capacitance function is not specified

Other function ranges:

Total accuracy = Specified accuracy + 45d

Performance above 3V/m is not specified

**Overload Protection:**

AM-42 & AM-47: 600VDC & VAC rms

AM-45: 450VDC & VAC rms

**Low Battery:** Below approx. 2.4V

**Power Supply:** 3V standard button battery x 1 (IEC-CR2032; ANSI-NEDA-5004LC)

**Power Consumption (typical):**

AM-42 & AM-45: 2mA

AM-47: 6mA for Voltage functions on Auto-V $\Omega$  position, and 2mA for other functions

**APO Consumption (typical):** 2.2 $\mu$ A

**APO Timing:**

AM-42: Idle for 30 minutes

AM-45 & AM-47: Idle for 3 minutes

**Dimension / Weight:** L122mm x W65mm x H13mm / Approx. 100 gm

**Special Features:**

AM-42: Data Hold, and 30ms MAX Hold

AM-45 & AM-47: AutoCheck™ (Automatic V &  $\Omega$  Selection), and EF-Detection

**Accessories:** Battery installed, and User's manual

**Electrical Specification**

Accuracy is given as +/- (% of reading digits + number of digits) or otherwise specified @ 23°C +/- 5°C and less than 75% R.H.

**DC Voltage (AM-45 & AM-47)**

RANGE	Accuracy
6.000V	0.5%+3d
60.00V	1.0%+5d
450.0V <sup>1)</sup>	1.2%+5d
600.0V <sup>2)</sup>	2.0%+5d
600.0V <sup>3)</sup>	1.5%+5d

AM-45 Input Impedance:

AutoCheck™ Lo-Z DCV: 160k $\Omega$ , 160pF nominal

AM-47 Input Impedance:

AutoCheck™ Lo-Z DCV: 833k $\Omega$  (4.2k $\Omega$  when displaying "Auto"), 90pF nominal

Hi-Z DCV: 5M $\Omega$ , 90pF nominal

NMRR: > 30dB @ 50Hz/60Hz

CMRR: > 100dB @ DC, 50Hz/60Hz; Rs=1k $\Omega$

DCV AutoCheck™ Threshold:

> +1.2VDC or < -0.6VDC nominal

<sup>1)</sup>AM-45 AutoCheck™ DCV only

<sup>2)</sup>AM-47 AutoCheck™ DCV only

<sup>3)</sup>AM-47 Hi-Z DCV only

**AC Voltage (AM-45 & AM-47)**

RANGE	Accuracy
<b>50Hz -- 60Hz</b>	
6.000V, 60.00V, 450.0V <sup>1)</sup> , 600.0V <sup>2)</sup>	1.5%+5d

CMRR: > 60dB @ DC to 60Hz, Rs=1k $\Omega$

AM-45 Input Impedance:

AutoCheck™ Lo-Z ACV: 160k $\Omega$ , 160pF nominal

AM-47 Input Impedance:

AutoCheck™ Lo-Z ACV: 833k $\Omega$  (4.2k $\Omega$  when displaying "Auto"), 90pF nominal

Hi-Z ACV: 5M $\Omega$ , 90pF nominal

ACV AutoCheck™ Threshold:

> 1.5VAC (50/60Hz) nominal

<sup>1)</sup>Range for AM-45 only

<sup>2)</sup>Range for AM-47 only

**DC Voltage (AM-42)**

RANGE	Accuracy
400.0mV	1.0%+2d
4.000V, 40.00V, 400.0V	2.0%+2d
600V	2.5%+4d

NMRR: > 50dB @ 50Hz/60Hz

CMRR: > 120dB @ DC, 50Hz/60Hz; Rs=1kΩ

Input Impedance: 10 MΩ, 30pF nominal; (1000MΩ for 400.0mV range)

**AC Voltage (AM-42)**

RANGE	Accuracy
<b>50Hz -- 60Hz</b>	
4.000V, 40.00V, 400.0V	2.0%+5d
<b>60Hz -- 500Hz</b>	
4.000V, 40.00V, 400.0V	3.0%+5d
<b>50Hz -- 500Hz</b>	
600V	3.5%+5d

Input Impedance: 10 MΩ, 30pF nominal

CMRR: > 60dB @ DC to 60Hz, Rs=1kΩ

**Capacitance (AM-45 & AM-47)**

RANGE <sup>1)</sup>	Accuracy <sup>2)</sup>
100.0nF, 1000nF, 10.00μF, 100.0μF <sup>3)</sup> , 2000μF <sup>4)</sup>	3.5%+6d <sup>5)</sup>

<sup>1)</sup>Accuracy below 50nF is not specified

<sup>2)</sup>Accuracies with film capacitor or better

<sup>3)</sup>AM-45 top range. Updates > 1 minute on large values

<sup>4)</sup>AM-47 only. Updates > 1 minute on large values

<sup>5)</sup>Specified with battery voltage above 2.8V (half full battery). Accuracy decreases gradually to 12% at low battery warning voltage of approx 2.4V

**Capacitance (AM-42)**

RANGE <sup>1)</sup>	Accuracy <sup>2)</sup>
500.0nF, 5.000μF, 50.00μF, 500.0μF, 3000μF <sup>3)</sup>	3.5%+6d <sup>4)</sup>

<sup>1)</sup>Additional 50.00nF range accuracy is not specified.

<sup>2)</sup>Accuracies with film capacitor or better.

<sup>3)</sup>Updates > 1 minute on large values

<sup>4)</sup>Specified with battery voltage above 2.8V (half full battery). Accuracy decreases gradually to 12% at low battery warning voltage of approx 2.4V

**Ohms (AM-45 & AM-47)**

RANGE <sup>1)</sup>	Accuracy
600.0Ω	2.0%+6d <sup>2)</sup>
6.000kΩ	1.2%+6d <sup>2)</sup>
60.00KΩ, 600.0KΩ	1.0%+4d
6.000MΩ	2.0%+4d

Open Circuit Voltage: 0.4VDC typical

<sup>1)</sup>AutoCheck™ is for 6.000kΩ ~ 6.000MΩ ranges;

600.0Ω is an independent range for AM-47 only

<sup>2)</sup>Add 40d to specified accuracy while reading is below 20% of range

**Ohms (AM-42)**

RANGE	Accuracy
400.0Ω	1.5%+6d
4.000KΩ, 40.00KΩ, 400.0KΩ	1.0%+4d
4.000MΩ	1.5%+4d
40.00MΩ	2.5%+4d

Open Circuit Voltage: 0.4VDC typical

**Hz Frequency (AM-45 <sup>1)</sup> & AM-47 <sup>1) 2)</sup>)**

RANGE	Accuracy	Specified at
10.00Hz -- 30.00kHz <sup>1) 2)</sup>	0.5%+4d	< 20V Sine-rms
10.00Hz -- 999.9Hz <sup>2)</sup>		< 600V Sine-rms

Sensitivity (Sine-rms):

<sup>1)</sup>Hz in Auto-VΩ position: > 3V

<sup>2)</sup>Line-level Hz in V position (AM-47 only):

@ 6.000VAC range: > 3V

@ 60.00VAC range: > 6V

@ 600.0VAC range: > 60V

**Hz Frequency (AM-42)**

RANGE <sup>1)</sup>	Accuracy
5.000Hz -- 1.000MHz	0.5%+4d

<sup>1)</sup>Specified at Input Voltage < 20VAC rms

Input Signal: Sine-wave, or Square-wave with duty cycle > 40% & < 70%

Sensitivity (V-peak):

5Hz -- 100kHz : > 1.3Vp

100kHz -- 500kHz : > 2.2Vp

500kHz -- 1MHz : > 4.2Vp

**Diode Tester (AM-42 & AM-47 only)**

Test Current (Typical)	Open Circuit Voltage
0.25mA for AM-42	< 1.6VDC
0.48mA for AM-47	



**DC  $\mu$ A Current (AM-47 only)**

RANGE	Accuracy	Burden Voltage
400.0 $\mu$ A	1.5%+3d	6mV/ $\mu$ A
2000 $\mu$ A	1.2%+3d	6mV/ $\mu$ A

**AC  $\mu$ A Current (AM-47 only)**

RANGE	Accuracy	Burden Voltage
<b>50Hz -- 60Hz</b>		
400.0 $\mu$ A	2.0%+3d	6mV/ $\mu$ A
2000 $\mu$ A	1.5%+3d	6mV/ $\mu$ A

**Audible Continuity Tester**

Open Circuit Voltage: 0.4VDC typical

Audible Threshold:

AM-45 & AM-47: between 50 $\Omega$  and 300 $\Omega$ AM-42: between 10 $\Omega$  and 120 $\Omega$ **Non-Contact EF-Detection (AM-45 & AM-47)**

Typical Voltage	Bar Graph Indication
15V to 55V	-
30V to 85V	--
55V to 145V	---
85V to 190V	----
above 120V	-----

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

Detection Frequency: 50/60Hz

Detection Antenna: Top left corner of the meter

Probe-Contact EF-Detection: For more precise indication of live wires, use the Red (+) probe for direct contact measurements

**LIMITED WARRANTY**

Congratulations! Your new instrument has been quality crafted according to quality standards and contains quality components and workmanship. It has been inspected for proper operation of all of its functions and tested by qualified factory technicians according to the long-established standards of our company.

Your instrument has a limited warranty against defective materials and/or workmanship for one year from the date of purchase provided that, in the opinion of the factory, the instrument has not been tampered with or taken apart.

**Should your instrument fail due to defective materials, and/or workmanship during this one year period, a no charge repair or replacement will be made to the original purchaser. Please have your dated bill of sale, which must identify the instrument model number and serial number and call the number listed below:**

**Repair Department  
ATP – Amprobe, TIF, Promax  
Miramar, FL**

**Phone:954-499-5400**

**Toll Free: 800-327-5060**

**Fax:954-499-5454**

**Website:www.amprobe.com**

**Please obtain an RMA number before returning product for repair.**

Outside the U.S.A. the local representative will assist you. Above limited warranty covers repair and replacement of instrument only and no other obligation is stated or implied.