TABLE OF CONTENTS

I) SAFETY ................................................................. 1
II) INTRODUCTION ...................................................... 4
III) PRODUCT DESCRIPTION ........................................... 6
   (A) PANEL ILLUSTRATION ...................................... 6
   (B) LCD ILLUSTRATION ........................................... 8
   (C) ANALOG BAR GRAPH .......................................... 11
   (D) CREST FACTOR .................................................. 12
   (E) AVERAGE RESPONDING (AM-90) ............................ 12
   (F) DC + AC TRUE RMS (AM-91) ............................... 13
   (G) ACV BANDWIDTH ................................................. 15
   (H) NMRR (Normal Mode Rejection Ratio) ..................... 15
   (I) CMRR (Common Mode Rejection Ratio) ..................... 15
IV) BASIC OPERATION .................................................. 16
   (A) DCV VOLTAGE function ..................................... 16
   (B) AC, AC + Hz VOLTAGE functions .......................... 18
   (C) DC, AC, AC + Hz mV functions .......................... 20
   (D) DC + AC VOLTAGE function (AM-91 only) ............... 22
   (E) dB, mHz function (AM-91 only) .......................... 24
   (F) DC, AC, AC + Hz ADAPTOR functions ..................... 26
   (G) Hz, % + Hz (AM-91 only) functions ...................... 28
   (H) Ω RESISTANCE, mΩ + GΩ CONDUCTANCE .............. 30
   (I) •Ω AUDIBLE CONTINUITY function ....................... 32
   (J) •Ω CAPACITANCE function .................................. 34
   (K) •Ω DIODE TEST function ................................... 36
   (L) DC, AC, AC + Hz of uA, mA or A functions ............. 38
V) ADVANCED OPERATION ............................................... 42
   (A) 40,000 COUNTS HIGH RESOLUTION SLOW MODE ............ 42
   (B) HOLD & ....................................................... 44
   (C) MANUAL OR AUTO RANGING .................................. 44
   (D) DATA STORE & RECALL ..................................... 44
   (E) RELATIVE MODES Δ.%. UNIT ............................... 46
   (F) RECORD & MODE ............................................. 50
   (G) CREST δ (Instantaneous Peak Value) MODE .............. 52
   (H) SORT δ′′′ MODE .............................................. 54
   (I) BACK LIGHT FEATURE (AM-91 ONLY) ...................... 56
   (J) LINE FILTER FREQUENCY 50 Hz OR 60 Hz SELECT ........ 56
   (K) SET BEEPER OFF ............................................ 56
   (L) AUTO POWER OFF (APO) ...................................... 58
   (M) INPUT WARNING ............................................... 59
VI) SPECIFICATIONS .................................................... 62
   General Specifications .......................................... 62
   Electrical Specifications ....................................... 63
VII) MAINTENANCE ..................................................... 72
    Battery Replacement Procedure .............................. 72
    Fuse Replacement Procedure ................................. 74
    Accessories and Replacement Parts ......................... 74
VIII) SERVICE .......................................................... 75
PRECAUTIONS FOR PERSONAL AND INSTRUMENT PROTECTION

1) Read these instructions thoroughly and follow them carefully.
2) In many instances, you will be working with dangerous levels of voltage and/or current. Therefore, it is important that you avoid direct contact with any uninsulated, current-carrying surfaces. Appropriate insulating gloves, clothing and eye protection should be worn.
3) To avoid electrical shock to the user and/or damage to the instrument, do not apply more than 1000V between any terminal and ground.
4) Before applying test leads to circuit under test, make certain that leads are plugged into proper jacks and switches are set to proper range and function.
5) Before using any electrical instruments or tester for actual testing, the unit should be checked on a low energy high impedance source. Do not use power distribution lines or any other high energy sources.
6) When measuring current using the uA, mA or 10A input: Before connecting or disconnecting the meter to or from the circuit to be tested, turn off all power to the circuit.
7) Do not attempt to measure a voltage unless you are already certain that the voltage is below 750 VAC or 1000 VDC. Do not use the 400 mV range unless you are already certain that the voltage is below 500V (AC or DC).
8) If the instrument should indicate that voltage is not present in circuit, do not touch circuit until you have checked to see that all instrument switches are in proper position and instrument has been checked on a known live line.
9) Make certain no voltage is present in circuit before connecting ohmmeter to circuit.

IMPORTANT: Plug in only one accessory probe set or set of test leads at any one time, except as directed.
IMPORTANT: Failure to follow these instructions and/or observe the above precautions may result in personal injury and/or damage to the instrument and/or accessories.

I) SAFETY

This instrument is designed and manufactured to meet Protection Class II per International Safety Standard IEC1010-1 Installation Category III and UL3111-1.

This manual contains information and warnings that must be followed for operating the instrument safely and maintaining the instrument in a safe operating condition.

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.

INTERNATIONAL ELECTRICAL SYMBOLS

⚠️ Attention ! Refer to the explanation in Manual
⚠️ Dangerous Voltage
-ground
雷 Double Insulation
⚡️ Fuse
DC—Direct Current
AC—Alternating Current
Either DC or AC
DC+AC Voltage
### WARNING

To avoid electrical shock hazard or damage to the meter, do not exceed the overload level shown in TABLE 1.

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>TERMINALS</th>
<th>OVERLOAD LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC VOLTAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC VOLTAGE</td>
<td>ΩV- &amp; COM</td>
<td>1000 VDC or Vpeak</td>
</tr>
<tr>
<td>DC+AC VOLTAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mV MILLI-VOLT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADP ADAPTOR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hz FREQUENCY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% DUTY CYCLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ω RESISTANCE</td>
<td>ΩV- &amp; COM</td>
<td>600 VDC or VAC rms</td>
</tr>
<tr>
<td>nS CONDUCTANCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>→ AUDIBLE CONTINUITY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>⃔ CAPACITANCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➤ DIODE TEST</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A CURRENT</td>
<td>A &amp; COM</td>
<td>10A/600V*</td>
</tr>
<tr>
<td>mA or uA CURRENT</td>
<td>mA uA &amp; COM</td>
<td>630mA/500V</td>
</tr>
</tbody>
</table>

* 10A CONTINUOUS; 20A FOR 30 SECONDS MAXIMUM; 5 MINUTES COOL DOWN INTERVAL

TABLE 1

### WARNING

To avoid electrical shock hazard, observe the proper safety precautions when working with voltages above 60 VDC or 25 VAC rms. These voltage levels pose a potential shock hazard to the user.

Inspect test leads, connectors, and probes for damaged insulation or exposed metal before using the instrument. If any defects are found, replace them immediately.

To avoid electrical shock hazard, do not touch test lead tips or the circuit being tested while power is applied to the circuit being measured.

Never attempt a voltage measurement with the test lead inserted into the mA/uA or A input jacks. You might be injured or damage the meter.

**CAUTION**: To avoid damage to the meter

Disconnect the test leads from the test points before changing functions. Always set the instrument to the highest range and work downward for an unknown value. Always use the correct replacement fuses. Check the manual for proper part numbers.
II) INTRODUCTION

The Ultimate Series™, Models AM-90 and AM-91 are hand held, professional quality digital multimeters with benchtop features used for today's complex electrical and electronic system diagnostics and troubleshooting. The AM-91 offers DC+AC True RMS with a wide AC bandwidth for non-sinusoidal waveform measurements, as well as a Back Lighted LCD display for all light condition applications. The AM-90 is an Average sensing DMM RMS calibrated.

The measuring functions include DC Voltage, AC Voltage, DC+AC Voltage (AM-91), dBM (AM-91), Adaptor input, Frequency, Duty Cycle, Resistance, Conductance, Continuity Test, Capacitance, Diode Test, DC & AC Current. A dual display LCD so you can view 2 variables at the same time, ACV & Hz, ACA & Hz, ADP & Hz, nS & GΩ, Duty% & Hz.

Pushbutton functions include a 4000 count fast measuring mode, 40,000 count high resolution slow measuring mode, Data Hold, 41 segment bargraph that updates 128 times per second, Auto Polarity, Auto or Manual Ranging, Data Store & Recall, Relative Zero mode, Relative Percent Change mode, Relative Per Unit mode, 50ms Record Max/Min/Max-Min/Avg, 0.8ms Crest Max/Min/Max-Min, Sort™ Max/Min/Max-Min/Avg, dBM Reference Impedances Selection (AM-91) as well as Secondary Function Selection.

Power on options include Line Filter Frequency 50/60Hz Selection for best noise rejection (normally only available on expensive bench top instruments), Auto Power off Disable as well as a Beeper Disable.

The Ultimate Series™ is housed inside a gasket sealed heavy duty casing which keeps out grease, oil, dirt and moisture to maintain superb accuracy and reliability. The case is made of a high impact, thick wall fire retardant material to maximize durability of the meter, and safety to the user.

In addition, a sealed battery compartment design keeps battery leakage contaminants off the PC board, which largely reduces the potential risks of shortages and degrading of accuracy due to the contaminants.

The Ultimate Series™ is designed and manufactured according to Protection Class II per the International Safety Standard IEC1010-1 installation category III, UL-3111-1 and CSA 22.2 No.1010-1-92. Contains NO CFC Ozone Depleting Substances, and are not manufactured with such substances.

The Ultimate Series™ from Amprobe are equipped with a heavy duty Rubber holster, Test Leads with Alligator adaptor clips, 9 volt battery and an Instruction Manual.
III) PRODUCT DESCRIPTION

(A) PANEL ILLUSTRATION, See FIG 1

1. LCD display 4-3/4 digit 40000 counts + 4 digit 9999 counts dual display LCD

2. Pushbutton. Press momentarily to activate HOLD, or press and hold for 1 second to activate SORT™ function

3. Pushbutton to select Auto/Manual ranging, or to select different reference impedances in dBm function (AM-91 only)

4. Pushbutton to select Relative Zero, Relative Percentage Change, or Relative Per Unit mode

5. Pushbutton to Recall stored data

6. Turn the Power On or Off and Select a function

7. COMMON (Ground reference) Input Jack for all functions

8. Input Jack for all functions EXCEPT current functions, color coded

9. Input Jack for 4A or 10A current functions, color coded

FIG 1. FRONT PANEL LAYOUT
10. mA uA  Input Jack for 400mA, 40mA, 4000µA, or 400µA current functions, color coded

11. STORE  Pushbutton to store data displayed for later recall

12. SELECT  Pushbutton. Press momentarily to select secondary functions. Press and Hold for 1 second to turn on the LCD backlight (AM-91 only)

13. RECORD  Pushbutton. Press momentary to select 40,000 counts, or Press and Hold for 1 second to activate RECORD function

14. CREST  Pushbutton. Press momentary to select 4,000 counts fast mode, or Press and Hold for 1 second to activate CREST function

(B) LCD ILLUSTRATION, See FIG 2

15. Δ %.UNIT  Δ annunciator indicates relative zero. Δ % annunciators together indicate relative percentage change Δ UNIT annunciators indicate relative per unit

16. *  This annunciator indicates audible continuity function
17. 4200%  
Analog bar graph scale

18. \[\text{\textbullet}\]  
Analog bar graph with overload flag and polarity

19. DATA  
Main digital readings of data being measured

20. \[\text{\textbar}\]  
Low Battery alert, replace the battery as soon as possible to ensure accuracy

21. \[\text{\textbar}\]  
This symbol indicates Negative Polarity

22. \[\text{\textbar}\]  
\[\text{\textbar}\] annunciator indicates direct current (DC) is selected. \[\text{\textbar}\] annunciator indicates alternating current (AC) is selected. \[\text{\textbar}\] \[\text{\textbar}\] annunciator indicates DC + AC is selected

23. \[\text{\textbullet}\]  
This annunciator indicates beeper is on

24. APO  
This annunciator indicates Auto Power Off is enabled

25. AUTO  
This annunciator indicates Autoranging

26. \[\text{\textbullet}\]  
This annunciator indicates data HOLD function is activated

27. \[\text{\textbullet}\]  
This annunciator indicates the CREST function is activated

28. \[\text{\textbullet}\]  
This annunciator indicates the RECORD function is activated

29. \[\text{\textbullet}\]  
This annunciator indicates the SORT™ function is activated

30. MAX–MIN AVG  
This annunciator indicates MAX (Maximum), MIN (Minimum), MAX–MIN (Maximum minus Minimum), or AVG (Average) reading is being displayed

31. MEM  
This annunciator blinks 2 times to confirm data storage when the STORE pushbutton is pressed, and turns on with the recalled data when the RECALL pushbutton is pressed

32. #  
This annunciator together with the secondary display data indicate the number of event in the SORT™ function

33. DATA  
Secondary display for Dual Display data

(C) ANALOG BAR GRAPH
The analog bar graph provides a visual indication of measurement like a traditional analog meter needle. The AM-90/91 analog bar graph updates 128 times per second in DCV and RESISTANCE functions showing excellent signal pattern in detecting faulty contacts, identifying potentiometer clicks, and indicating signal spikes during adjustments.
(D) CREST FACTOR

Crest Factor is the ratio of the Crest (instantaneous peak) value to the total DC + AC True RMS value. That is:

\[ \text{Crest Factor} = \frac{V_{\text{crest}}}{V_{\text{rms}}} \]

A pure sinusoidal waveform has a Crest Factor of 1.414. A badly distorted sinusoidal waveform normally has a much higher Crest Factor. If you are measuring a signal above the DMM's specified Crest Factor, the DMM may not produce accurate measurements. AM-91 can accurately measure the True RMS value of voltage signal with a Crest Factor of at least 3.0 at full scale, and 6.0 at half scale.

(E) AVERAGE RESPONDING RMS CALIBRATED (AM-90)

RMS (Root-Mean-Square) is the term used to describe the effective or equivalent DC value of an AC signal. Most digital multimeters use Average responding RMS calibrated technique to measure RMS values of AC signals. This technique is to obtain the Average value by rectifying and filtering the AC signal. The Average value is then scaled upward (calibrated) to read the RMS value of a sine wave.

In measuring pure sinusoidal waveform, this technique is cost effective and accurate. In measuring nonsinusoidal waveforms, however, significant errors can be introduced because of different scaling factors relating Average to RMS values.

(F) DC + AC TRUE RMS (AM-91)

DC + AC True RMS is a term which identifies a DMM that responds accurately to the total effective RMS value regardless of the waveform, and is given by the expression:

\[ \sqrt{DC^2 + (AC \text{ rms})^2} \]

DC + AC True RMS voltage is the total effective voltage having the same heating value corresponding a DC voltage. With DC + AC True RMS voltage measurement, you can accurately measure the voltage values regardless of the waveforms such as: square, sawtooth, triangle, pulse trains, spikes, as well as distorted waveforms with the presence of harmonics and DC components. Harmonics and DC components may cause:

1) Overheated transformers, generators and motors to burn out faster than their rated life
2) Circuit breakers to trip prematurely
3) Fuses to blow
4) Neutrals to overheat due to triplen harmonics present on the neutral (180Hz)
5) Bus bars and electrical panels to vibrate

AC only True RMS and Average responding meters can introduce significant errors in many applications. See TABLE 2 for typical example.
(G) ACV BANDWIDTH

ACV bandwidth of a DMM is the range of frequencies over which ACV measurements can be made within the specified accuracy. In other words, a DMM cannot accurately measure the ACV value with frequency spectrums beyond the frequency response of the DMM. In reality, complex waveforms, noise and distorted waveforms contain much higher frequency spectrum than its fundamentals. AM-90/91 series has ACV bandwidth specifications up to 20kHz in most ranges, and extended bandwidth specification up to 50kHz on AM-91 AC 400mV range.

(H) NMRR (Normal Mode Rejection Ratio)

NMRR is the DMM's ability to reject unwanted AC noise effect which can cause inaccurate DC measurements. NMRR is typically specified in terms of dB (decibel). AM-90/91 series has a NMRR specification of >60dB at 50 and 60Hz, which means the effect of AC noise is reduced more than 1000 times in DC measurements.

(I) CMRR (Common Mode Rejection Ratio)

Common mode voltage is voltage present on both the COM and VOLTAGE input terminals of a DMM, with respect to ground. CMRR is the DMM's ability to reject common mode voltage effect which can cause digit rattle or offset in voltage measurements.

AM-90/91 series has a CMRR specifications of >60dB at DC to 60Hz in ACV function; and >120dB at DC, 50 and 60Hz in DCV function. If neither NMRR nor CMRR specification is specified, the DMM's performance will be uncertain.

<table>
<thead>
<tr>
<th>TABLE 2. WAVEFORMS AND CREST FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT WAVEFORM</td>
</tr>
<tr>
<td>Sine 1.414V</td>
</tr>
<tr>
<td>ERROR=9% CF=1.414</td>
</tr>
<tr>
<td>Full wave rectified Sine 1.414V</td>
</tr>
<tr>
<td>ERROR=0% CF=1.414</td>
</tr>
<tr>
<td>Half wave rectified Sine 1.414V</td>
</tr>
<tr>
<td>ERROR=0% CF=2.000</td>
</tr>
<tr>
<td>50% duty pulse train 1.414V</td>
</tr>
<tr>
<td>ERROR=9% CF=1.414</td>
</tr>
</tbody>
</table>
IV) BASIC OPERATION

(A) DC VOLTAGE function
1) Set rotary switch to  volts position
2) Insert red (+) test lead into ΩV-Ω jack and black (−) test lead into COM input jack
3) Connect test leads to voltage source and observe the digital display, see FIG 3

FIG 3. DC VOLTAGE FUNCTION
(B) AC, AC + Hz VOLTAGE functions

1. Set rotary switch to \( \Box \) position
2. Insert red (+) test lead into \( \Omega V+H \) jack and black (−) test lead into COM input jack
3. Connect test leads to voltage source and observe the digital display, see FIG 4
4. Default at AC. Press SELECT button momentary to select ACV+Hz in dual display if required

FIG 4. AC, AC+Hz VOLTAGE FUNCTIONS
(C) DC, AC, AC+Hz mV functions

1) Set rotary switch to ε mV position
2) Default at DC. Press SELECT button momentarily to select AC, and press again to select AC+Hz in dual display if required
3) Insert red (+) test lead into Ω V-Ω jack and black (−) test lead into COM input jack
4) Connect test leads to voltage source and observe the digital display, see FIG 5
(D) DC+AC VOLTAGE function (AM-91 only)

1) Set rotary switch to \( \text{\(\bar{V}\)} \) position
2) Default at DC. Press SELECT button momentary to select to DC+AC
3) Insert red (+) test lead into \( \Omega \text{V-H} \) jack and black (−) test lead into COM input jack
4) Connect test leads to voltage source and observe the digital display, see FIG 6.
(E) dBm + Hz function (AM-91 only)

1) Set rotary switch to dBm V position
2) Default at AC. Press SELECT button momentary two times to select dBm. Default Reference impedance 600 Ω will be displayed for 2 seconds before displaying the dBm & Hz readings
3) Press dBm-Ω (RANGE) button momentary to select different reference impedances from 4, 8, 16, 32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000, up to 1200Ω. Impedance values will again be displayed for 2 seconds before displaying the dBm & Hz readings
4) Insert red (+) test lead into Ω V+ jack and black (−) test lead into COM input jack
5) Connect test leads to signal source and observe the digital display, see FIG 7.
DC, AC, AC+ Hz ADAPTOR functions

1) Set rotary switch to ADP position
2) Default at DC. Press SELECT button momentarily to select AC, and press again to select AC+Hz in dual display if required
3) Insert output plug of the adaptor with positive (+) into ΩV+ jack and the negative (−) into COM input jack, see FIG 8
4) The digital display defaults at 10 counts per mV, and can be extended to 100 counts per mV in 40,000 counts mode
5) The extra high input impedance of 1000 MΩ makes the ADP function possible to cope with most voltage output adaptors available. For current clamp adaptor with output 1mV per Ampere, 2000 counts on the digital display represents 200 Ampere. For temperature adaptor with output 1mV per degree, 2000 counts represents 200 degree
(G) Hz, %±Hz (AM-91 only) functions
1) Set rotary switch to %Hz
2) Insert red (+) test lead into ΩV-H± jack and black (−) test lead into COM input jack
3) Connect test leads to signal source and observe the digital display, see FIG 9
4) Default at Hz. Press SELECT button momentarily to select %±Hz in dual display (AM-91 only)
(H) Ω RESISTANCE, nS + GΩ CONDUCTANCE

1) Set rotary switch to nS+GΩ  Ω
2) Insert red (+) test lead into ΩVH+ jack and black (−) test lead into COM input jack
3) Connect the test leads as shown in FIG 10 and observe the digital display
4) Default at Ω. Press SELECT button momentary to select nS+GΩ in dual display for resistance measurements beyond 40MΩ

CAUTION
Using resistance measurement function in a live circuit will produce false results and may damage the instrument. In many cases the suspect component must be disconnected from the circuit to obtain an accurate reading.

FIG 10. Ω, nS+GΩ FUNCTIONS
(1) **AUDIBLE CONTINUITY** function

1) Set rotary switch to **Ω**
2) Default at Ω. Press SELECT button momentary two times to select **Ω** audible continuity function
3) Insert red (+) test lead into **V-Ω** jack and black (-) test lead into **COM** input jack
4) Connect the test leads to the end points of wire as shown in **FIG 11**
5) A continuous beep tone indicates a complete wire. This is useful for checking wiring connections and operation of switches

**FIG 11. Audible Continuity Function**
(J) **CAPACITANCE function**

1. Set rotary switch to **M**:Ω
2. Insert red (+) test lead into **ΩV-Ω** jack and black (−) test lead into **COM** input jack
3. Connect the test leads as shown in **FIG 12** and observe the digital display

**CAUTION**
Discharge capacitors before making any measurement. Large value capacitors should be discharged through an appropriate resistance load.

Note: Some Milli Farad Capacitance measurements may take up to 25 seconds

**FIG 12. M-CAPACITANCE FUNCTION**
(K) **DIODE TEST function**

1) Set rotary switch to **Ω**.

2) Default at **C**. Capacitance. Press SELECT button momentarily to select **Ω** diode test.

3) Insert red (+) test lead into **ΩV+** jack and black (−) test lead into **COM** input jack.

4) Connect the test leads as shown in [FIG 13] and observe the digital display.

5) 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).

6) Reverse the test leads connections (reverse biased) across the diode.

7) The digital display shows OL if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).
\(\Delta\) Do not measure any circuit that draws more than the current ratings of the protection fuses. If the fuse blows, replace it with the proper fuse. Failure to do this may result in injury or damage to the meter. Do not attempt a current measurement where the open circuit voltage is above 500V for mA uA jack; and 600v for A jack. Suspected open circuit voltage must be checked with voltage functions.

Voltage output current clamp adaptors are recommended to use with the meter adaptor or voltage functions for making high current measurements.

(L) DC, AC, AC+Hz of uA, mA or A functions
1) Set rotary switch to A mA or uA
2) Insert red (+) test lead into mA uA jack and black (−) test lead into COM input jack for current measurements below 400mA, see [FIG 14], and Insert red (+) test lead into A jack and black (−) test lead into COM input jack for currents measurements up to 10A, see [FIG 15]. mA or A ranges will be selected automatically after plug in
3) Default at DC. Press SELECT button momentarily to select AC, and press again to select AC+Hz in dual display if required
4) Connect the test leads as shown in [FIG 14] or [FIG 15] and observe the digital display

---

**FIG 14.** uA, mA FUNCTION
V) ADVANCED OPERATION

Note: See TABLE 3 for features availability

(A) 40,000 COUNTS HIGH RESOLUTION SLOW MODE

Press the 40000 button momentary to enter the 4-3/4 digit high resolution slow mode with a maximum display at 40,000 counts. Press the 40000 button momentary to return to 3-3/4 digit fast mode. See FIG 16. The 4-3/4 digit mode is available in all functions except Frequency, Duty Cycle, Capacitance and Diode Test.

In 3-3/4 digit fast mode, the digital display updates 5 times per second nominal to give you the maximum measuring speed. In 4-3/4 digit slow mode, the digit display updates 1.25 times per second nominal to give you smooth readings as well as the full accuracy of the meter.

FIG 16. 40,000 COUNTS HIGH RESOLUTION SLOW MODE
(B) HOLD

Press the HOLD button momentarily to activate the hold function with LCD annunciator 1 turns on. Press momentarily again to release. See FIG 17. When in normal measuring modes, the hold feature freezes the display for later view. When in RECORD or CREST mode, however, the hold function stops updating the measurements, and you can read throughout the locked MAX, MIN, MAX-MIN, and AVG readings. Release the hold function to continue RECORD or CREST.

(C) MANUAL OR AUTO RANGING

Press the RANGE button momentarily to select manual-ranging, and the meter will remain in the range it was in with LCD annunciator AUTO turns off. Press the button momentarily again to step through the ranges. Press and hold the button for 1 second or more to resume auto-ranging. See FIG 18.

Note: When the meter is in Record, Crest, Sort, Hold, Recall or Relative mode, changing the measuring range manually will cause the meter to exit those features.

(D) DATA STORE & RECALL

Press the STORE button momentarily to store the displaying information. The LCD annunciator MEM blinks two times to confirm storage. Press the recalled button momentarily to recall the stored data with LCD annunciator MEM turns on. See FIG 19. Press any other buttons EXCEPT RECALL to resume measurements. This feature stores the whole display data in memory for later recall. The memory will remain even in auto-power-off mode, and can also be recalled while you are in another meter function. The memory will be erased if the rotary switch is switched to the OFF position.
**E** RELATIVE MODES Δ % UNIT

Press the Δ button momentarily to enter the Relative Zero (Δ) mode, the LCD annunciator Δ turns on. Relative zero allows the user to offset the meter measurements with a relative reference value. Practically all displaying readings can be set as relative reference value including MAX, MIN, MAX-MIN, and AVG readings of RECORD or SORT™ functions. See FIG 20a.

Press the Δ button momentarily again to enter the Relative Percentage Change (%) mode, the LCD annunciators Δ% turn on. In this mode, the readings show relative percentage changes, and the bar graph automatically indicates +/- 200%, or +/- 20% full scale changes with respect to the relative reference value as center zero point. It simplifies zero, peaking, nulling measurements, and is excellent for fine adjustments. See FIG 20b.

Press the Δ button momentarily again to enter the Relative Per Unit (U) mode, the LCD annunciators Δ UNIT turn on. This is a unique feature to show the ratio of measuring values to the relative base value. The relative base value is considered to be one unit, and the consecutive measurements will be displayed in terms of units. Measuring the parallel capacitance of co-axial cable or parallel wire in conjunction with the relative per unit mode, for example, helps estimating the total cable length or locating cable breakage locations. See FIG 20c.

Press and hold the Δ button for 1 second or more to exit relative modes and resume normal measurements.

*Note: Bar Graph is not available in the DC + AC voltage mode.*

---

**FIG 20a. RELATIVE ZERO (Δ)**

---
**FIG 20b. RELATIVE PERCENTAGE CHANGE (%)**

**FIG 20c. RELATIVE PER UNIT (U)**
(F) RECORD MODE

Perform measurements as described in BASIC OPERATION. Press and hold the RECORD button for 1 second or more to activate RECORD mode with LCD annunciators MAX-MIN turn on. The meter beeps when new maximum or minimum reading is updated. Press the button momentarily to read throughout the Maximum (MAX), Minimum (MIN), Maximum minus Minimum (MAX - MIN), and Average (AVG) readings. Press the button for 1 second or more to exit RECORD mode. See FIG 21

With the Auto-Ranging RECORD mode, you can easily track intermittent signals, and monitor line voltage changes over a much wider dynamic range with the best resolution. It largely surpasses single range recording which is easily over-flowed, or with insufficient resolution. The AM90/91 features a fast single range sampling speed of 50ms for MAX, MIN, MAX-MIN and AVG readings. The faster the sampling speed, the more accurate the measurement of surges, spikes and sags will be. The true average AVG feature calculates all readings taken over time continually.

Note: 1. Auto Power Off feature will be disable automatically in this mode
2. To retain the readings after measurements, use HOLD function to stop updating the measurements before disconnecting the test leads. Use similar pushbutton procedures described above to read throughout the locked readings

FIG 21. RECORD MODE
(G) CREST (Instantaneous Peak Value) MODE

Perform measurements as described in BASIC OPERATION. Press and hold the CREST button for 1 second or more to activate CREST mode with LCD annunciators MAX turn on. Press the button momentarily to read throughout the Maximum (MAX), Minimum (MIN), and Maximum minus Minimum (MAX−MIN) readings. Press the button for 1 second or more to exit CREST mode. See FIG 22.

With the CREST mode, you can capture transient signal crest voltage (instantaneous peak value) as short as 0.8ms. This function can be used to determine crest factor which can indicate the presence of harmonics. Crest factor is the ratio of crest value to the true rms value. A pure sinusoidal waveform has a crest factor of 1.414.

Note: 1. Auto Power Off feature will be disabled automatically in this mode.
2. To retain the readings after measurements, use HOLD function to stop updating the measurements before disconnecting the test leads. Use similar pushbutton procedures described above to read throughout the locked readings.
3. Do not use Current Transducer to make Crest Measurements while in the 400mVAC or ADP AC mode. In general crest measurements are limited to ±15% of the range.

FIG 22. CREST MODE
(H) SORT™ MODE

Perform measurements as described in BASIC OPERATION. Press and hold the button for 1 second or more to activate SORT™ mode with LCD annunciators turn on. The meter beeps when a stable reading is captured, and the last captured reading together with the number of capture will be automatically hold & displayed. Press the button momentarily to read throughout the Maximum (MAX), Minimum (MIN), Maximum minus Minimum (MAX - MIN), and Average (AVG) readings. Press the button for 1 second or more to exit SORT™ mode. See FIG 23

SORT™ is one of the most useful innovations. The function senses a stable measurement, beeps, captures it for comparison & display, then stores the maximum and minimum readings together with the event numbers in memory for later display. The average feature calculates all the readings taken and displays the true average value together with number of events counted. This simplifies MAX & MIN values sorting, MAX-MIN & AVG values calculation, and quantity counting in component inspection. When used with the relative % change function, readings will be displayed in terms of percentage deviation.

Note: 1. Auto Power Off feature will be disabled automatically in this mode.

FIG 23. SORT™ MODE
(I) BACK LIGHT FEATURE (AM-91 ONLY)
Press and hold the button for 1 second or more to activate backlight. The backlight will be off 42 seconds after each activation automatically to extend battery life. When the backlight is already on, press and hold the button again to reset the automatic off timing.

(J) LINE FILTER FREQUENCY 50 Hz OR 60 Hz SELECTION
The line filter frequency can be selected as a power-on option. Press the button while turning the meter on to display the set frequency. Press the button for 50 Hz or press the button for 60 Hz selection. Then press the button to store the selected frequency. See Fig 24.

Selecting the appropriate line filter frequency to cope with your line frequency can maximize the meter's noise rejection ability. This is normally only available in expensive bench top multimeter.

(K) SET BEEPER OFF
The beeper feature can be disabled manually as a power-on option by pressing the button while turning the meter on. The LCD annunciator will be off during operation. All beeper functions are turned off except input warning beeper.

FIG 24. LINE FILTER FREQUENCY 50Hz OR 60Hz SELECTION
(L) AUTO POWER OFF (APO)

The Auto Power Off (APO) mode turns the meter off automatically to extend battery life after 4.5 minutes of inactivities. The meter turns back on if the rotary switch is turned. Activities are specified as:
1) Rotary switch or push button operations
2) Significant measuring data readings

When the meter enters the RECORD, CREST or SORT mode, the Auto Power Off will be disabled automatically, and the LCD annunciator APO will be off.

The Auto Power Off feature can be disabled manually as a power-on option by pressing the OFF button while turning the meter on. The LCD annunciator APO will be off during operation.

For maintenance purpose, the Auto Power Off timing can be shortened to 5 seconds by pressing the RANGE button while turning the meter on.

Note:
1. Stored data (MEM) remains after Auto Power Off, but will be erased if the rotary switch is switched to the OFF position.
2. Always turn the rotary switch to the OFF position when the meter is not in use. The meter will produce a beep sound to alert the user while turn off.

(M) INPUT WARNING

This meter produces a beep tone as well as a 'InErr' display to warn the user against possible damage to the meter due to improper connections to the mA uA or A input jacks. See FIG 25.

FIG 25. INPUT WARNING
(VI) SPECIFICATIONS

GENERAL SPECIFICATIONS
Display: 3-3/4 digits 4000 counts or 4-3/4 digits 4000 counts selectable (5 digits 99999 counts for Hz), and 4 digits 9999 counts dual display LCD
Polarity: Automatic
Update Rate:
3-3/4 D Data: 5 times per second nominal;
4-3/4 D Data: 1.25 times per second nominal;
41 Segments Bar graph: 128 times per second max
Low Battery: The indicator appears when the battery voltage drops below approx. 5.8V
Operating Temperature: 0°C (32°F) to 35°C (95°F), 0-80% R.H.; 35°C (95°F) to 50°C (122°F), 0-70% R.H.
Storage Temperature: -20°C (-4°F) to 60°C (140°F), 80% R.H. (with battery removed)
Temperature Coefficient: Nominal 0.15 x (specified accuracy)/°C @ (0°C - 18°C or 28°C - 50°C), °F @ (32°F - 64°F or 82°F - 122°F), or otherwise specified
Power Supply: Single Alkaline 9V battery NEDA1604, JIS006P or IEC6F22
APO Timing: Idle for 4.5 minutes
APO Consumption: 20 μA
Sensing: True RMS conversion for AM-91; Average responding for AM-90
Power Consumption: 12 mA

-63-

Weight: 390 gm (.66 lb); 500 gm (1.1 lb) with holster
Dimension: L186mm(7.32") X W87mm(3.42") X H35.5mm(1.39"); L198mm(7.79") X W97mm(3.81") X H55mm(2.16") with holster
Safety: Designed to UL3111-1, CSA C22.2 NO. 1010-1-92, and IEC1010-1 installation category III
Accessories: Test leads (pair), holster, battery installed and user's manual

ELECTRICAL SPECIFICATIONS
ACCUACY IS ±(% READING DIGITS + NUMBER OF DIGITS) OR OTHERWISE SPECIFIED, AT 23°C (73°F) ± 5°C (9°F) & LESS THAN 75% R.H.

<table>
<thead>
<tr>
<th>DC Voltage</th>
<th>AM-90</th>
<th>AM-91</th>
</tr>
</thead>
<tbody>
<tr>
<td>RANGE</td>
<td>Accuracy</td>
<td></td>
</tr>
<tr>
<td>40.00 mV</td>
<td>0.5% + 6d</td>
<td></td>
</tr>
<tr>
<td>400.0mV, 4.000V, 4.000V, 4000V, 1000V</td>
<td>0.08% + 1d</td>
<td></td>
</tr>
</tbody>
</table>

NMRR: >60dB @ 50/60Hz
CMRR: >120dB @ DC, 50/60Hz. Rs=1kΩ
Input Impedance: 10MΩ, 30pF nominal (100pF nominal for 40mV & 400mV ranges)
Temperature coefficient: 0.1 X (Specified accuracy)/°C @ (0°C - 18°C or 28°C - 50°C), °F @ (32°F - 64°F or 82°F - 122°F)
Overload protection: 780 Vrms / 1000Vpeak
### AC Voltage

<table>
<thead>
<tr>
<th>RANGE</th>
<th>AM-90</th>
<th>AM-91*</th>
</tr>
</thead>
<tbody>
<tr>
<td>50Hz - 60Hz</td>
<td>0.5% + 3d</td>
<td>0.5% + 3d</td>
</tr>
<tr>
<td>400.0mV, 4.000V, 40.000V, 400.0V, 750V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40Hz - 1kHz</td>
<td>0.8% + 3d</td>
<td>0.8% + 3d</td>
</tr>
<tr>
<td>400.0mV, 4.000V, 40.000V</td>
<td>0.8% + 4d</td>
<td>0.8% + 4d</td>
</tr>
<tr>
<td>750V</td>
<td>1.0% + 4d</td>
<td>1.0% + 4d</td>
</tr>
<tr>
<td>1kHz - 5kHz</td>
<td>1.0% + 3d</td>
<td>1.0% + 3d</td>
</tr>
<tr>
<td>400.0mV</td>
<td>1.0% + 3d</td>
<td>1.0% + 3d</td>
</tr>
<tr>
<td>4.000V, 40.000V, 400.0V</td>
<td>1.0% + 6d</td>
<td>1.0% + 4d</td>
</tr>
<tr>
<td>750V</td>
<td>3.0%+6d**</td>
<td>3.0%+6d**</td>
</tr>
<tr>
<td>5kHz - 20kHz</td>
<td>2.0%+6d**</td>
<td>1.5%+6d**</td>
</tr>
<tr>
<td>400.0mV</td>
<td>2.0%+6d**</td>
<td>1.5%+6d**</td>
</tr>
<tr>
<td>4.000V, 40.000V, 400.0V</td>
<td>1.8%+8d**</td>
<td>1.8%+6d**</td>
</tr>
<tr>
<td>750V</td>
<td>Unspec'd</td>
<td>Unspec'd</td>
</tr>
<tr>
<td>20kHz - 50kHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400.0mV</td>
<td>Unspec'd</td>
<td>2.5%+6d**</td>
</tr>
</tbody>
</table>

CMRR: >60dB @ DC to 60Hz, Rs=1kΩ

Input Impedance: 10MΩ, 30pF nominal (100pF nominal for 400mV range)

*AC Coupled True RMS Specified from 5% to 100% of range or otherwise specified; Crest Factor: <3:1 at full scale, and <6:1 at half scale

**Specified from 10% to 100% of range

***Add (30000/reading) counts below 30% of range

Overload protection: 780 Vrms / 1000Vpeak

---

### (AC + DC) Voltage

<table>
<thead>
<tr>
<th>RANGE</th>
<th>AM-91*</th>
</tr>
</thead>
<tbody>
<tr>
<td>50Hz - 60Hz</td>
<td>0.8% + 8d</td>
</tr>
<tr>
<td>4.000V, 40.000V, 400.0V, 750V</td>
<td></td>
</tr>
<tr>
<td>40Hz - 1kHz</td>
<td>1.0% + 8d</td>
</tr>
<tr>
<td>4.000V, 40.000V, 400.0V</td>
<td></td>
</tr>
<tr>
<td>750V</td>
<td>1.2% + 8d</td>
</tr>
<tr>
<td>1kHz - 5kHz</td>
<td>1.2% + 8d</td>
</tr>
<tr>
<td>4.000V, 40.000V, 400.0V</td>
<td></td>
</tr>
<tr>
<td>750V</td>
<td>3.2% + 8d**</td>
</tr>
<tr>
<td>5kHz - 20kHz</td>
<td>2.0%+8d**</td>
</tr>
<tr>
<td>4.000V, 40.000V, 400.0V</td>
<td></td>
</tr>
<tr>
<td>750V</td>
<td>Unspec'd</td>
</tr>
</tbody>
</table>

CMRR: >60dB @ DC to 60Hz, Rs=1kΩ

Input Impedance: 10MΩ, 30pF nominal

*DC Coupled True RMS Specified from 5% to 100% of range or otherwise specified; Crest Factor: <3:1 at full scale, and <6:1 at half scale

**Specified from 10% to 100% of range

Update Rate: 1.6 per second nominal

Overload protection: 780 Vrms / 1000Vpeak
### AC Current

<table>
<thead>
<tr>
<th>RANGE</th>
<th>AM-90</th>
<th>AM-91*</th>
<th>Burden Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Accuracy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400.0 μA</td>
<td>1.0%+4d</td>
<td>1.0%+4d**</td>
<td>0.15mV/μA</td>
</tr>
<tr>
<td>4000 μA</td>
<td>0.8%+3d</td>
<td>0.8%+3d</td>
<td>0.15mV/μA</td>
</tr>
<tr>
<td>40.00mA</td>
<td>1.0%+4d</td>
<td>1.0%+4d**</td>
<td>3.3mV/μA</td>
</tr>
<tr>
<td>400.0mA</td>
<td>0.8%+3d</td>
<td>0.8%+3d</td>
<td>3.3mV/μA</td>
</tr>
<tr>
<td>4.000A</td>
<td>1.0%+4d</td>
<td>1.0%+4d**</td>
<td>0.03V/A</td>
</tr>
<tr>
<td>10.00A*</td>
<td>0.8%+3d</td>
<td>0.8%+3d</td>
<td>0.03V/A</td>
</tr>
<tr>
<td>400Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400.0 μA</td>
<td>1.5%+4d</td>
<td>1.5%+4d**</td>
<td>0.15mV/μA</td>
</tr>
<tr>
<td>4000 μA</td>
<td>1.0%+3d</td>
<td>1.0%+3d</td>
<td>0.15mV/μA</td>
</tr>
<tr>
<td>40.00mA</td>
<td>1.5%+4d</td>
<td>1.5%+4d**</td>
<td>3.3mV/μA</td>
</tr>
<tr>
<td>400.0mA</td>
<td>1.0%+3d</td>
<td>1.0%+3d</td>
<td>3.3mV/μA</td>
</tr>
<tr>
<td>4.000A</td>
<td>1.5%+4d</td>
<td>1.5%+4d**</td>
<td>0.03V/A</td>
</tr>
<tr>
<td>10.00A*</td>
<td>1.0%+3d</td>
<td>1.0%+3d</td>
<td>0.03V/A</td>
</tr>
<tr>
<td>3kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400.0 μA</td>
<td>Unspec’d</td>
<td>Unspec’d</td>
<td>0.15mV/μA</td>
</tr>
<tr>
<td>4000 μA</td>
<td>1.2%+3d</td>
<td>1.2%+3d</td>
<td>0.15mV/μA</td>
</tr>
<tr>
<td>40.00mA</td>
<td>Unspec’d</td>
<td>Unspec’d</td>
<td>3.3mV/μA</td>
</tr>
<tr>
<td>400.0mA</td>
<td>1.2%+3d</td>
<td>1.2%+3d</td>
<td>3.3mV/μA</td>
</tr>
<tr>
<td>4.000A</td>
<td>Unspec’d</td>
<td>Unspec’d</td>
<td>0.03V/A</td>
</tr>
<tr>
<td>10.00A*</td>
<td>Unspec’d</td>
<td>Unspec’d</td>
<td>0.03V/A</td>
</tr>
</tbody>
</table>

*AC Coupled True RMS Specified from 5% to 100% of range or otherwise specified

**Specified from 10% to 100% of range

****10A continuous, 20A for 30 seconds maximum, 5 minutes cool down interval

mA μA Overload Protection: 0.63A/500V Fuse, Interrupt Rating 200kA
A Overload Protection: 15A/600V Fuse, Interrupt Rating 100kA

### DC Current

<table>
<thead>
<tr>
<th>RANGE</th>
<th>AM-90</th>
<th>AM-91</th>
<th>Burden Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Accuracy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400.0 μA</td>
<td>0.4%+4d</td>
<td>0.15mV/μA</td>
<td></td>
</tr>
<tr>
<td>4000 μA</td>
<td>0.2%+2d</td>
<td>0.15mV/μA</td>
<td></td>
</tr>
<tr>
<td>40.00mA</td>
<td>0.4%+4d</td>
<td>3.3mV/μA</td>
<td></td>
</tr>
<tr>
<td>400.0mA</td>
<td>0.2%+3d</td>
<td>3.3mV/μA</td>
<td></td>
</tr>
<tr>
<td>4.000A</td>
<td>0.8%+6d</td>
<td>0.03V/A</td>
<td></td>
</tr>
<tr>
<td>10.00A*</td>
<td>0.4%+4d</td>
<td>0.03V/A</td>
<td></td>
</tr>
</tbody>
</table>

mA μA Overload Protection: 0.63A/500V Fuse, Interrupt Rating 200kA
A Overload Protection: 15A/600V Fuse, Interrupt Rating 100kA

*10A continuous, 20A for 30 seconds maximum, 5 minutes cool down interval

### Frequency

<table>
<thead>
<tr>
<th>RANGE</th>
<th>AM-90</th>
<th>AM-91</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Accuracy</td>
<td></td>
</tr>
<tr>
<td>99.99kHz, 99.99kHz</td>
<td>0.002%+3d</td>
<td></td>
</tr>
<tr>
<td>99.999kHz, 99.999kHz</td>
<td>0.002%+3d</td>
<td></td>
</tr>
</tbody>
</table>

Sensitivity: 5kHz — 100kHz, >200 mVrms, <20 Vrms; 100kHz — 500kHz, >100 mVrms, <20 Vrms; 500kHz — 2MHz, >85 mVrms, <20 Vrms; 2MHz — 4 MHz, >1Vrms, <20 Vrms

* Pulse Width > 3 μs in this frequency range

Update Rate: 1.2 per second nominal

Temperature coefficient: 0.05 X (Specified accuracy)°C (0°C — 18°C or 28°C — 50°C), °F @32°F — 64°F or 82°F — 122°F

Overload protection: 600VDC/VAC rms
**Frequency & ACV or AC ADP in Dual Display**

<table>
<thead>
<tr>
<th>RANGE</th>
<th>AM-90</th>
<th>AM-91</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.99Hz, 999.9Hz, 9999kHz</td>
<td>Accuracy</td>
<td></td>
</tr>
<tr>
<td>20.00kHz</td>
<td>0.002% + 1d</td>
<td></td>
</tr>
</tbody>
</table>

Sensitivity*: 5Hz—100Hz**, >15% F.S. of AC range;
100Hz—1kHz, >20% F.S. of AC range;
1kHz—10kHz, >35% F.S. of AC range;
10kHz—20kHz, >50% F.S. of AC range

*ACV 750V range: 5Hz—100Hz, >420VAC;
100Hz—1kHz, >550VAC

**Pulse Width >3μs in this frequency range

Update Rate: 1.3 per second nominal

**Capacitance**

<table>
<thead>
<tr>
<th>RANGE</th>
<th>AM-90</th>
<th>AM-91</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.000nF**</td>
<td>Accuracy</td>
<td></td>
</tr>
<tr>
<td>4.000nF</td>
<td>4.0% + 1d</td>
<td>3.0% + 5d</td>
</tr>
<tr>
<td>4.000μF</td>
<td>0.8% + 5d</td>
<td></td>
</tr>
<tr>
<td>4.000μF</td>
<td>0.8% + 3d</td>
<td></td>
</tr>
<tr>
<td>4.000μF</td>
<td>2.0% + 3d</td>
<td></td>
</tr>
<tr>
<td>4.000μF</td>
<td>3.0% + 5d</td>
<td></td>
</tr>
<tr>
<td>4.000μF</td>
<td>3.5% + 5d</td>
<td></td>
</tr>
</tbody>
</table>

*Accuracies with film capacitor or better
**Specified from 10% to 100% of range

Overload protection: 600VDC/VAC rms

**Duty Cycle**

<table>
<thead>
<tr>
<th>RANGE</th>
<th>AM-91</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1% — 99.9%</td>
<td>Accuracy</td>
</tr>
<tr>
<td>0.5d/kHz + 2d</td>
<td></td>
</tr>
</tbody>
</table>

Input Frequency: 50Hz — 300 kHz; 5V Logic Family

Pulse Width > 2μs

Update Rate: 1.2 per second nominal

Overload protection: 600VDC/VAC rms

**Ohms**

<table>
<thead>
<tr>
<th>RANGE</th>
<th>AM-90</th>
<th>AM-91</th>
</tr>
</thead>
<tbody>
<tr>
<td>40.00Ω</td>
<td>Accuracy</td>
<td></td>
</tr>
<tr>
<td>0.2% + 6d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400.0Ω, 4.000kΩ, 40.00kΩ, 400.0kΩ</td>
<td>0.15% + 2d</td>
<td></td>
</tr>
<tr>
<td>4.000MΩ</td>
<td>0.3% + 2d</td>
<td></td>
</tr>
<tr>
<td>40.00MΩ</td>
<td>1.5% + 5d</td>
<td></td>
</tr>
<tr>
<td>400.0nS</td>
<td>0.7% + 5d</td>
<td></td>
</tr>
</tbody>
</table>

Open Circuit Voltage: <1.3VDC

Temperature coefficient: 0.1 X (Specified accuracy) /°C (0°C — 18°C or 28°C — 50°C), °F (32°F — 64°F or 82°F — 122°F)

Overload protection: 600VDC/VAC rms
**Diode Tester**

<table>
<thead>
<tr>
<th>Range</th>
<th>Accuracy</th>
<th>Test Current (Typical)</th>
<th>Open Circuit Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.000V</td>
<td>2%±1d</td>
<td>0.8mA</td>
<td>&lt; 3.5 VDC</td>
</tr>
</tbody>
</table>

Overload Protection : 600VDC/VAC rms

**Audible Continuity Tester**

Audible threshold: the beeper sounds if the measured resistance is lower than 10 Ω, and turns off when greater than 60 Ω. Response time < 150 μs

Overload protection : 600VDC/VAC rms

**DC Adaptor**

<table>
<thead>
<tr>
<th>10 counts per 1 mVDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
</tr>
<tr>
<td>Input Impedance</td>
</tr>
<tr>
<td>Temperature coefficient</td>
</tr>
</tbody>
</table>

Overload protection : 600VDC/VAC rms

**AC Adaptor**

<table>
<thead>
<tr>
<th>10 counts per 1 mVAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
</tr>
<tr>
<td>Input Impedance</td>
</tr>
<tr>
<td>Temperature coefficient</td>
</tr>
</tbody>
</table>

Overload protection : 600VDC/VAC rms

**dBm (AM-91)**

At 600Ω, -11.76dBm to 54.25dBm,

Accuracy : ±0.25dB ± 2d (±40Hz — 20kHz)

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

Input Impedance : 10MΩ, 30pF nominal

Update Rate : 1.1 per second nominal

Overload protection : 780VRms / 1000Vpeak

**RECORD mode**

Nominal Response for DC : 50ms to 80%, 100ms to 99%

Nominal Response for AC : 50ms to 80%, 100ms to 95%

Accuracy : Specified accuracy ±10 digits for changes > 200ms in duration (±40 digits in AC): 1.5s autoranging buffer (except Cx, AC+DCV)

**CREST mode**

Accuracy : Specified accuracy ±220 digits for changes > 0.8ms in duration

**SORT mode**

Nominal sort rate : 0.2s (except Cx, AC+DCV)

Accuracy : Specified accuracy ±5 digits
VII) MAINTENANCE

WARNING
To avoid electrical shock, remove test leads and any input signals before opening the case. Do not operate with open case. Install only the same type of fuse or equivalent

Battery replacement procedure
When the battery symbol on the display is on, replace the battery as soon as possible to ensure accuracy. The meter uses a single standard 9V alkaline battery (NEDA1604, JIS006P or IEC6F22)
1) Disconnect the meter from any circuit and remove the test leads from the input jacks
2) Turn the meter OFF
3) Loosen the four captive screws from the case bottom and turn the case over, see FIG 28
4) Lift the end of the case top nearest the input jacks until it unsnaps from the case bottom
5) Lift gently the battery from the battery compartment, and disconnect the battery from the battery connector
6) Snap the battery connector to the terminals of the replacement battery, and reinsert the battery into the battery compartment. Dress the battery leads so that they are properly seated in the compartment groove and will not be pinched between the case top and case bottom
7) Replace the case top, ensuring that all the gaskets are properly seated and the two snaps on the case top (near the LCD side) are engaged
8) Re-fasten the 4 captive screws

FIG 28. CHANGING BATTERY & FUSES
Fuse replacement procedure
The meter uses a 500V/0.63A IR 200kA fast acting fuse (FUSE 1) for mA uA input, and a 600V/15A IR 100kA fast acting fuse (FUSE 2) for A input. See TABLE below for P/N#

1) Perform steps 1) through 4) of the battery replacement procedure
2) Replace the blown fuses
3) Perform step 7) through 8) of the battery replacement procedure

Accessories and replacement parts

<table>
<thead>
<tr>
<th>Amprobe</th>
<th>P/N</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-50Y</td>
<td>AM-90/91 Holster</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>TSBC-90</td>
<td>AM-90/91 Case Gasket</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>AM-90/91 Tilt Stand</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AM-90/91 Belt Clip</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 AM-90/91 case upper screws</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 AM-90/91 case lower screws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTL-90</td>
<td>AM-90/91 Test leads</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>FA-6x32/63</td>
<td>AM-90/91 500V/63A Fuse</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>KLK15</td>
<td>AM-90/91 600V/15A Fuse</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>MN1004</td>
<td>9V Battery</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>IR-100</td>
<td>INFRA-RED DMM Probe</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>TMA-1</td>
<td>Temp. Accessory</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>AE63-4B</td>
<td>0-3000A AC Transducer</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>AE64-4B</td>
<td>0-1000A AC Transducer</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>CT-600</td>
<td>AC/DC 600A Transducer</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>AW-80</td>
<td>kWAMP, 1000A, 200kW Transducer</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>AW-81</td>
<td>kWAMP, 1000A, 400kW Transducer</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>MTC-3</td>
<td>1 Red+1 Black Alligator Adaptors</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>