OPERATING INSTRUCTIONS
for
AMPROBE®
Digital Multimeters
Models
AM-20
AM-21
AM-22

See "Precautions for Personal and Instrument Protection" on Page 3
See "Limited Warranty" on Page 2
LIMITED WARRANTY

Congratulations! You are now the owner of an AMPROBE® instrument. It has been quality crafted according to quality standards and contains quality components and workmanship. This instrument has been inspected for proper operation of all of its functions. It has been tested by qualified factory technicians according to the long-established standards of AMPROBE INSTRUMENT.

Your AMPROBE 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 the one-year warranty period, return it along with a copy of your dated bill of sale which must identify instrument by model number and serial number.

For your protection, please use the instrument as soon as possible. If damaged, or should the need arise to return your instrument, it must be securely wrapped to prevent damage in transit and sent prepaid via Air Parcel Post insured or UPS where available to:

Service Division
AMPROBE INSTRUMENT
630 Merrick Road (For UPS) • P.O. Box 329 (For P.P.)
Lynbrook, NY 11563-0329

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

WARNING
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 earth 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) 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.
7) Make certain no voltage is present in circuit before connecting ohmmeter to circuit.
SAFETY
This Instruction Manual has warnings and safety precautions which must be followed in order to ensure safe operating conditions.

CAUTION
To avoid damage to the meter:
1) Disconnect the test leads from circuit under test before changing functions.
2) Never connect instrument to a voltage source with the rotary switch in the Ohms position.
3) Always use the correct replacement fuse. Check manual for proper fuse rating.

INTRODUCTION
Amprobe's Model's AM-20, AM-21 and AM-22 Digital Multimeters are designed for use in the field, laboratory and the home. These compact instruments give the user all the job rated functions to get the job done.

In addition to measuring Volts, Ohms and Amps, etc. some models can measure frequency, perform diode and continuity tests.

The units are equipped with a tilt stand for ease of readability.

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Unpacking and Inspection of Contents
Included with each Multimeter should be the following items:
1. Two test leads, one black and one red.
2. Instruction booklet.

SPECIFICATIONS
Type of Display: 3½ digit, 0.55 inch (14mm) height
2000 count

Ranging: Manual
Automatic Polarity Indication: “—” display for negative input.

Overload Indication: LCD displays “OL”.

Auto Zero on all Ranges
Low Battery Indication: Battery replacement is required when LCD displays “BAT”

Sampling Rate: 3 times/sec

Operating Temperature & Humidity:

0° to 45°C (-32°F to 113°F) @ 80% RH

Storage Temperature & Humidity:

0° to 50°C (-32°F to 122°F) @ 80% RH

Overload Protection:
Diode and 2A, 550 volt fuse

Case Breakdown Voltage: 3000 VAC

Dimensions: 12cm (L) x 750 cm (W) x 330 cm (H)

4.72” (L) x 2.95” (W) x 1 1/8” (H)

Weight: 220 gm (7.7 oz)

Battery Life: Greater than 200 Hrs.

Power Source: 9V battery. P/N (MN1604)
Circuit Protection:
Micro-amp (µA) and milliamp (mA) ranges are fuse protected up to 550 volts AC/DC maximum with a 6.3X25-2.12 two amp fuse. Do not use substitute fuses.

All resistance ranges are overload protected against momentary misapplication of up to maximum of 500 AC/DC for no longer than ten seconds.

The 10 ampere range is overload protected up to 10 amperes maximum. All voltage ranges are overload protected up to 600 VAC and 1100VDC.

IMPORTANT: Use of instrument and/or accessories on circuits with higher voltages and/or currents than the indicated overload limits may result in personal injury and/or damage to the instrument and/or accessories.

DC Voltage:
Range: 200mV, 2V, 20V, 200V, 1000V
Resolution: 0.1 mV to 1V
Accuracy: ±1.0% rdg + 2 digits on all ranges
Overload Protection: 1100 VDC
Input Impedance: 1 MQ on all ranges

AC Voltage for AM-20, AM-21: @ 50Hz-500Hz
Range: 200V, 500V
Resolution: 0.1V, 1V
Accuracy: ±2% rdg + 5 digits on all ranges
Overload Protection: 600VAC
Input Impedance: 750k on all ranges

AC Voltage for AM-22: @50Hz-500Hz
Range: 2V, 20V, 200V, 300V
Resolution: 1mV to 1V
Accuracy: ±1.5% rdg + 4 digits on all ranges

Overload Protection: 600VAC on all ranges
Input Impedance: 10MQ on all ranges

DC Current:
Range: 200µA, 20mA, 200mA, 10A
Resolution: 1µA to 10mA
Accuracy: ±2% rdg + 3 digits on µmA ranges
±1% rdg with 2 digits on 10A range
Overload Protection: 550 VAC/VDC by 600V fuse.
Voltage Burden: 0.2V max

AC Current for AM-22: @ 50Hz - 500Hz
Range: 200µA, 20mA, 200mA, 10A
Resolution: 1µA to 10mA
Accuracy: ±2% rdg + 5 digits on µmA ranges
±1% rdg + 3 digits on 10A range
Overload Protection: 550 VAC/VDC by 600V fuse
10A input unfused
Voltage Burden: 0.3V max

Resistance:
Range: 200Ω, 2kΩ, 20kΩ, 200kΩ, 2MΩ, 20MΩ
Resolution: 0.1Ω to 10kΩ
Accuracy: ±2.5% rdg + 3 digits on 200Ω range
±0.5% rdg + 2 digits on all other ranges
Overload Protection: 500 VAC/VDC for 10 sec
Test Voltage: 200V range 3.2V max
other ranges 10V max

Diode Test:
Test Current: 1.0 ± 0.5 mA
Test Voltage: 3.2V max
Overload Protection: 500 VAC/VDC for 10 sec
Continuity Test: (Audible) - F
Threshold: < 4Ω

Frequency Measurement for AM-21, AM-22:
Range: 1 Hz to 20 MHz autorange. TTL level
Accuracy: ±0.1% rdg + 2 digits
Overload Protection: 500 VDC/VAC for 10 sec
INPUT TERMINALS AND CONTROLS

BATTERY REPLACEMENT

To install a new battery:
1. Disconnect the test leads from any circuit under test and turn off the meter.
2. Remove the test leads from the meter.
3. Lay the meter face down on a work surface that will not damage its face.
4. Remove the two screws on the case bottom.
5. Gently lift the end of the case bottom from which the screws were removed.
6. Remove the old 9 volt battery and replace with a new one. Be careful not to break barrier.
7. Replace the case bottom, secure both screws.

FUSE REPLACEMENT

1. Follow steps 1 through 5 from the “Battery Replacement” procedure.
2. Remove the defective fuse and replace it with a new one of the same size and rating. Catalog Number 6.3X25-2-12.
3. Replace bottom case and secure both screws.

1. Digital Display — 3 1/2 digit LCD readout, (max. rdg 1999) K. "BAT" Low Battery.
2. ROTARY SWITCH
3. V, V, Hz — Positive terminal for volts, ohms, diode and frequency measurements. (red)
4. COM — Common input terminal (black)
5. μA — Positive Terminal for current measurements
6. 10 A — Positive Terminal for current measurements.
MAKING MEASUREMENTS

Preparation & Caution Before Measurement
1. Wait 10 seconds after turning on the meter before making a measurement.
2. The rotary switch should be set to the function which you want to use before connecting the probes to the device being tested. Be sure to remove the test leads from the equipment being measured before switching the rotary switch to a new function.
3. If the meter is used near equipment that generates electromagnetic interference, the display may be unstable or indicate incorrect measurement values.
4. Inspect the test leads periodically for breaks in the insulation or the wire. Make a continuity check whenever in doubt. Replace leads if found defective.

Diode and Transistor Test Measurements
The special Diode Test Function allows relative measurements of forward voltage drops across diodes and transistor junctions. This function also permits measurement of in-circuit semiconductor junctions.

Diode Test
1. Connect red test lead to the V/Ω/µA input connector and black test lead to the COM input connector.
2. Set Function/Range Switch to the diode test position.
3. If the semiconductor junction being measured is connected to a circuit, turn off power to circuit being tested and discharge all capacitors.
4. Connect test leads to the device.
5. Read forward value on the LCD display.
6. If the LCD display reads overrange (1) reverse the lead connections. The placement of the test leads when the forward reading is displayed indicates the orientation of the diode. The red lead is positive and the black lead is negative. If overrange (1) is displayed with both lead connections, the junction is open. If a low reading (less than 1,000) is obtained with both lead connections, the junction is shorted internally or (if junction is measured in a circuit) the junction is shunted by a resistance less than 1KΩ. In the latter case the junction must be disconnected from the circuit in order to verify its operation.

Transistor Junction Tests
1. Bipolar transistors can be tested in the same manner as a diode. Junctions are formed between the base and emitter and emitter and collector of the transistor. Measurement between the collector and emitter also should be made to determine if a short is present.

Do not apply more than 1100 VDC or 600 VAC to input. Do not apply more than 500 volts between any input terminal and earth ground. Exceeding these limits creates a shock hazard and may damage the instrument.

DC/AC Voltage Ranges
All voltage measurements are read directly from the digital display.

AC Voltage Measurement (See Operating Precautions on page 3)
1. Move rotary switch to desired AC voltage range.
2. Plug the black test lead into "COM" jack.
3. Plug the red test lead into "V/LΩ" jack.
4. Place one test probe on each side of the AC voltage.
5. If meter reading falls within the range of a lower scale, move selector switch to the lower range.

DC Voltage Measurement (See Operating Precautions on page 3).
1. Move rotary switch to desired DC voltage range.
2. Plug the Black test lead into “COM” jack.
3. Plug the Red test lead into “VΩ” jack.
4. If Negative and Positive sides of the circuit to be tested are known:
   a) connect the Black test probe to the Negative side of the circuit.
   b) connect the Red test probe to the Positive side of the circuit.
5. If the Negative and Positive sides of the circuit are not known:
   a) connect the Black and Red probes to the circuit.
   b) If “–” sign appears in the left of display, reverse the Black and Red probes.
6. If meter reading falls within the range of a lower scale, move selector switch to the lower range.

WARNING
Do not apply voltage between “10A”, µA and COM terminals.

Do not exceed the current rating of current ranges. If current range is not known, start at the highest range and work down.

AC/DC Current Measurement (See Operating Precautions on page 3).
A milliampere is one thousandth (1/1000) of an ampere and may be written as 1 mA or 0.001 ampere.
A microampere is one millionth (1/1,000,000) of an ampere and may be written as 1 µA or 0.000001 ampere.
Meter must be connected in series with the circuit under test.
1. Using rotary switch, select appropriate function and range. When current is unknown, use the highest current range.
2. Plug Black test lead into “COM” jack.
3. Plug Red test lead into the µA jack for measurements up to 200 µA, for readings above 200µA up to 10A, plug Red test lead into “10A” jack.
4. Using the Red and Black test leads connect the meter in series with the circuit under test.
5. If “–” sign appears to the left of the reading when measuring DC, reverse the Red and Black test probes.
6. If meter reading falls within the range of a lower scale, move switch to a lower range.

Resistance Measurements (See Operating Precautions on page 3).
1. Move rotary switch to desired ohms range.
2. Plug the Black test lead into “COM” jack.
3. Plug the Red test lead into “VΩ” jack.
4. When the test lead tips are shorted together, the display should indicate zero resistance on all ohmmeter ranges, except for 200Ω range. This range will indicate resistance of test lead, which is less than 1Ω.
5. Connect test leads across the resistance to be measured. Caution: Resistance to be measured must be disconnected from all power before applying ohmmeter test leads.

6. If meter reading falls within the range of a lower scale, reset selector switch to the lower range.

**Continuity Measurement**

1. Set selector switch to the “Ω” position.
2. Continuity between probe tips will be indicated by the audible beeper when resistance is below <4Ω.

**Frequency Measurement**

1. Connect the Red lead to the “Hz” jack and the Black lead to the “COM” jack.
2. Set the range switch to the “Hz” position.
3. Connect test leads to device or circuit to be measured.
4. Read frequency on the Display.

**REPLACEMENT PARTS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Catalog/Part No.</th>
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<tr>
<td>Test Leads</td>
<td>MTL-20</td>
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<tr>
<td>Battery (9V)</td>
<td>MN-1604</td>
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<tr>
<td>Fuse</td>
<td>6.3X25-2-12</td>
</tr>
<tr>
<td>Carry Case</td>
<td>SV</td>
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</table>

**TROUBLESHOOTING**

If there appears to be a malfunction during the operation of the meter, the following steps should be performed in order to isolate the cause of the problem.

1. Check the battery.
2. Review operating instructions for possible mistakes in operating procedure.
3. Inspect and test the Test Probes for a broken or intermittent connection.
4. Inspect and test the fuse. If it necessary to replace the fuse, be sure to install the one noted in this booklet. If the instrument still malfunctions, place it with packing slip along with a brief description of the problem in sufficient cushioning material in a shipping carton. Be sure to indicate the serial number located on the back of the Instrument. Amprobe is not responsible for damage in transit. Make certain your name and address also appears on the box as well. packing slip; ship prepaid via U.P.S. (where available) or Air Parcel Post insured to:

   Service Division
   AMPROBE INSTRUMENT
   630 Merrick Road (use for U.P.S.)
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