1. SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS

Display: 3 1/2digit LCD with a max reading of 1999.  
Polarity: Automatic negative polarity indication.  
Zero adjustment: Automatic.  
Measuring Method: dual-integral A/D converter  
Sampling rate: 3 times/second  
Max. common-mode voltage: 200V DC/AC RMS  
Over range indication: Only the MSD "1" displays.  
Low battery indication: The "a" displays.  
Safety standards: EMC/LVD. The meter is up to the standards of IEC/100 Pollution Degree 2, Over voltage category II or double insulation II.  
Operating environment: Temperature (0 to 40)°C, humidity <80%RH.  
Storage environment: Temperature (-10 to 50)°C, humidity <80%RH.  
Power: Single, standard 9 volt battery. NEDA 1604 IEC6F22  
Dimension: 140(H)X65(W)X40(D)mm  
Weight: Approx. 170g (including battery)

1.2 ELECTRICAL SPECIFICATIONS  
Accuracy is + percentage of reading + number of digit at 23±5°C, <75%RH.

<table>
<thead>
<tr>
<th>DC Voltage</th>
<th>Range</th>
<th>Accuracy</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200mV</td>
<td>± (0.5%)</td>
<td>10μV</td>
</tr>
<tr>
<td></td>
<td>2V</td>
<td>± (0.5%)</td>
<td>1mV</td>
</tr>
<tr>
<td></td>
<td>20V</td>
<td>± (0.8%)</td>
<td>10mV</td>
</tr>
<tr>
<td></td>
<td>200V</td>
<td>± (0.8%)</td>
<td>100mV</td>
</tr>
<tr>
<td></td>
<td>1000V</td>
<td>± (1.2%)</td>
<td>1V</td>
</tr>
</tbody>
</table>

Impedance: 10MΩ  
Overload protection: 200mV range: 250V DC/AC RMS  
2-1000V range: 1000V DC/700VAC RMS

<table>
<thead>
<tr>
<th>AC Voltage</th>
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<th>Accuracy</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200mV</td>
<td>± (0.8%)</td>
<td>10μV</td>
</tr>
<tr>
<td></td>
<td>200V</td>
<td>± (1.2%)</td>
<td>100μA</td>
</tr>
<tr>
<td></td>
<td>1000V</td>
<td>± (1.2%)</td>
<td>1mA</td>
</tr>
</tbody>
</table>

Impedance: 10MΩ  
Overload protection: 700V DC/AC RMS  
Frequency response: 20-200Hz range: 40-400Hz, 700V range: 40-200Hz  
Indication: Average (rms of sine wave)

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Range</th>
<th>Accuracy</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20Ω</td>
<td>± (0.8%)</td>
<td>0.1Ω</td>
</tr>
<tr>
<td></td>
<td>2kΩ</td>
<td>± (0.8%)</td>
<td>1Ω</td>
</tr>
<tr>
<td></td>
<td>20kΩ</td>
<td>± (0.8%)</td>
<td>10Ω</td>
</tr>
<tr>
<td></td>
<td>200kΩ</td>
<td>± (0.8%)</td>
<td>100Ω</td>
</tr>
<tr>
<td></td>
<td>2MΩ</td>
<td>± (0.8%)</td>
<td>1kΩ</td>
</tr>
</tbody>
</table>

Open Circuit voltage: less than 3V  
Overload protection: 250V DC/AC RMS

<table>
<thead>
<tr>
<th>DC Current</th>
<th>Range</th>
<th>Accuracy</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20mA</td>
<td>± (1.2%)</td>
<td>10μA</td>
</tr>
<tr>
<td></td>
<td>200mA</td>
<td>± (1.5%)</td>
<td>100μA</td>
</tr>
<tr>
<td></td>
<td>10A</td>
<td>± (2.0%)</td>
<td>1mA</td>
</tr>
</tbody>
</table>

Max input voltage: 200mV; Max input current: 10A  
Overload protection: Fast 0.2A/250V fuse, 10A/250V fuse

<table>
<thead>
<tr>
<th>AC Current</th>
<th>Range</th>
<th>Accuracy</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20mA</td>
<td>± (1.2%)</td>
<td>10μA</td>
</tr>
<tr>
<td></td>
<td>200mA</td>
<td>± (1.5%)</td>
<td>100μA</td>
</tr>
<tr>
<td></td>
<td>10A</td>
<td>± (2.0%)</td>
<td>1mA</td>
</tr>
</tbody>
</table>

Max measuring voltage: 200mV  
Max input current: 10A  
Frequency response: 40-200Hz  
Indication: Average (rms of sine wave)  
Overload protection: Fast 0.2A/250V fuse, 10A/250V fuse
### 2. FRONT PANEL DESCRIPTION

1. LCD
2. Hold key
3. Function/Range Switch
4. V/Ω/mA Input Jack Terminal;
   - Less than 200mA Input Jack Terminal.
5. COM Input Jack Terminal
6. Capacitance Jack Terminal
7. 10A Input Jack Terminal
8. Transistor hFE socket

### 3. OPERATION

1. Check the 9-volt battery by setting the ON-OFF switch to ON. If the battery is weak, a sign will appear on the display. If this does not appear on the display, proceed as below. See MAINTENANCE if the battery has to be replaced.
2. The mark, or sign next to the lead jacks, is for warning that the input voltage or current should not exceed the indicated values. This is to prevent from damaging the internal circuits.
3. The function switch should be set to the range which you want to test before operation.

#### 3.1 DC and AC Voltage measurement

1. Connect the BLACK test lead to “COM” jack and RED test lead to “V/Ω/mA” jack.
2. Set the FUNCTION switch to desired DCV or ACV position and connect the probes across the source or load under measurement.

**Note:**
1) If the voltage ranges is unknown beforehand set the FUNCTION switch to a high range and work down.
2) When only the figure “1” is displayed, over range is being indicated and the FUNCTION switch must be set to a higher range.
3) : Do not apply more than DCV1000V/AC700rms to the input. Indication is possible at higher voltages but there is danger of damaging the internal circuitry.
4) Pay attention to avoid contact with high voltage circuits when measuring high-voltage.

#### 3.2 DC and AC Current measurement

1. Connect the BLACK test lead to “COM” jack and RED test lead to “V/Ω/mA” jack.
2. Set the FUNCTION switch to desired current range position.
3. Connect the probes in series with the current source to be measured.
4. For current measurement from 200mA to 10A follow generally the above procedure but connect the RED test lead to “10A” jack.

**Note:**
1) If the current range is unknown beforehand, set the FUNCTION switch to a high range and work down.
2) When only the figure “1” is displayed over range is being indicated and the FUNCTION switch must be set to a higher range.
3) : The max input current is 200mA, or 10A depending upon the jack used.
4) The max terminal voltage drop (burden voltage) is 200mV.

#### 3.3 Resistance measurement

1. Connect the BLACK test lead to “COM” jack and RED test lead to “V/Ω/mA” jack.
2. Set the FUNCTION switch to desired resistance range position.
3. Connect the probes across circuit to be tested.

**Note:**
1) If the resistance value being measured exceeds the max value of the range selected, and over range indication will be displayed (“1”). Select a higher range, for resistance of approx. 1MΩ and above, the meter may take a few seconds to stabilize.
2. When the input is not connected, i.e. at open circuit, the figure “1” will be displayed for the over range condition.
3. When checking in-circuit resistance, be sure the circuit under test has all power removed and all capacitor are fully discharged.

3.4 Capacitance measurement
1. Before connecting the test capacitor, note the display that may have readings other than zero each time the range is changed. This offset reading will not affect the accuracy for it can be overridden by true value.
2. Connect the test capacitor to the input sockets, noting the polarity connections when necessary.

Note:
1) If the capacitance value being measured exceeds the max value of the range selected, and over range indication will be displayed (“1”). Select a higher range.
2) Before insert the capacitor into Cx socket, the LCD display may not be zero, the residual figures will be decreased gradually and could be disregarded, because measurement result can override this figure, without affecting the accuracy.
3) Units: 1µF=103nF 1nF=103pF
4) △: Do not connect an external voltage or a charged capacitor (especially larger capacitors) to the measuring terminals. Capacitors should be discharged before insert into Cx socket.

3.5 Frequency measurement
1. Connect test leads or shield cable to “COM” and “V/ Ω /mA” jack.
2. Set the FUNCTION switch to the Frequency range, and connect test leads or cable across the source and load under test.

Note:
1) △: Do not apply more than 250VDC/ACrms to the input. Indication is possible at voltage higher than 10VACrms, but readings may be out of specification.
2) In noisy environment, it is preferable to use shield cable for measuring small signal.
3) Be careful when measurement high voltage.

3.6 Transistor hFE Test
1. Set the FUNCTION switch to the hFE position.
2. Determine whether the transistor is NPN or PNP and locate the Emitter. Base and collector leads. Insert the leads into the proper holes in the socket on the front panel.
3. The display will read the approximate hFE value at the test condition Base Current 10uA,
4. Vce 3.0V.

3.7 Diode and continuity Test
1. Connect the BLACK test lead to “COM” jack and RED test lead the “V/ Ω /mA” jack.
(Note: The polarity of the red test probe is “+”).
2. Set the FUNCTION switch to “→(–) -nil” position.
3. Connect the test leads across the diode under measurement, display shows the approx. forward voltage of this diode.
4. Connect the test probes to two points of circuit, if the resistance is lower than approx. 90 Ω. Buzzer sounds.

4. WARNING
1. When measuring voltage ensure that instrument is not connected or switched to a current or resistance range, or to the diode check. Always ensure that the correct terminals are used for the type of measurement to be made.
2. Be careful when measuring voltage above 50V, especially from sources where high energy is existed.
3. Avoid making connections to “live” circuits whenever possible.
4. When making current measurements ensure that the circuit not “live” before opening it in order to connect the test leads.
5. Before making resistance measurements or diode test, ensure that the circuit under test is de-energized.
6. Always ensure that the correct function and range is selected. If in doubt about the correct range to use, start with the highest and work downwards.
7. Extreme care should be taken when using the instrument to conjunction with a current transformer connected to the terminals if an open circuit occurs.
8. Ensure that the test leads and probes are in good condition with no damage to the insulation.
9. Take care not to exceed the over-load limits given in the specification.
10. FUSE FOR REPLACEMENT MUST BE OF THE CORRECT TYPE AND RATING.
11. Before opening the case of the instrument to replace battery or fuse, disconnect the test leads from any external circuit, set the selector switch to “OFF” position.

5. CARE AND MAINTENANCE
5.1 Care for your multi-meter
Your Digital Multi-meter is an example of superior design and craftsmanship. The following suggestions will help you care for the multi-meter so you can enjoy it for year.
1. Keep the multimeter dry. If it gets wet, wipe it dry immediately. Liquids can contain minerals that can corrode electronic circuits.
2. Use and store the multi-meter only in normal temperature environments. Temperature extremes can shorten the life of electronic devices, damage batteries, and distort or melt plastic part.
3. Handle the multimeter gently and carefully. Dropping it can damage the circuit boards and case and can cause the multi-meter to work improperly although the holster can provide enough protection.
4. Keep the multi-meter away from dust and dirt, which can cause premature wear of parts.
5. Wipe the multi-meter with a damp cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the multi-meter.
6. Use only fresh battery of the required size and type. Always remove old or weak batteries.
7. They can Leak chemicals that destroy electronic circuits.

5.2 Maintenance
1. 9-Volt battery replacement
   a. Ensure the instrument is not connected to any external circuit. Set the selector switch to OFF position and remove the test leads from terminals.
   b. Remove the screw on the bottom case and lift the bottom case.
   c. Remove the spent battery and replace it with a battery of the same type.

2. Fuse replacement
   a. Ensure the instrument is not connected to any external circuit. Set the selector switch to OFF position and remove the test leads from terminals.
   b. Remove the screw on the bottom case and lift the bottom case.
   c. Replace the fuse with same type and rating: 5 \times 20\text{mm}, 200\text{mA}/250\text{V}, 10\text{A}/250\text{V} fast-blow fuse or as the replacements.