

90F

NETWORK DIGITAL MULTIMETER OPERATOR'S MANUAL

1. Overview

The network multimeter is characterized by slim size, portable, stable performance and anti-dropping capacity. Using 3 1/2 digits LCD monitor with character 16mm high, they offer clear readings. With overall circuitry design centering on large-scale IC A/D converters in conjunction and over-load protection circuit, the meters give excellent performance and exquisite making as a handy utility instrument.

The meter can be used to measure DC & AC voltage, DC & AC current, resistance, battery, positive diode voltage fall and audible continuity. It can be used to test network cable (RJ45) and telephone line (RJ11) too.

2. Panel Layout



- ① LCD display: 3 1/2 digits LCD display.
- ② HOLD key: Press the "HOLD" key to lock display value, and the "H" sign will appear on the display, press it again to exit.
- ③ TEST key: Switch to RJ11 or RJ45 range and connect the telephone line or network cable with the instrument, Press "TEST", the result will show on the LCD screen.
- ④ CDS sensor: The CDS sensor can reaction to the ambient brightness range, then automatically control the LCD backlight to lighten or go out.
- ⑤ Rotary Switch: Use this switch to select functions and ranges.
- ⑥ 10A: 10A Input Jack
- ⑦ VΩ: VΩ Input Jack
- ⑧ mA: mA and battery test Input Jack
- ⑨ COM: COM Input Jack
- ⑩ Network cable (RJ45) test Jack
- ⑪ Telephone line (RJ11) test Jack
- ⑫ Cover of the network test Jack
- ⑬ Crust of meter
- ⑭ Protective casing

3. Safety Information

3-1 The meters are designed according to IEC-1010 concerning electronic measuring instruments with an over-voltage category CAT III 1000V & CAT IV 600V and pollution 2.

3-2 Follow all safety and operating instructions to ensure that the meter is used safely and is kept in good operating condition.

3-3 safety symbols:

⚠ Important safety information, refer to the operating manual.

⚡ Dangerous voltage may be presence.

⊞ Double insulation (protection Class II)

4. Special Cautions for Operation

4-1 The meters can be safe only according to standard procedures when used in conjunctions with the supplied test leads. To replace damaged test leads with only the same model or same electric specifications.

4-2 To avoid risk of electric shock, do not use the meters before the cover is in place.

4-3 The range switch should be right position for the testing.

4-4 To avoid electric shock and damaging the instruments, the input signals are forbidden to exceed the specified limits.

4-5 When measuring TV set or switched power, attention should be paid to the possible pulses that may bring destruction to the circuit.

4-6 Range switch position is forbidden to be changed at random during measurement.

4-7 Take caution against shock in the course of measuring voltage higher than DC 60V & AC 30V.

4-8 Please do not remove the network test cover while not test the network, avoiding a risk of electric shock.

4-9 Protection fuse should be replaced only with same type and same specification.

4-10 After operation is finished, set function switch at OFF range to save battery power.

4-11 If the meter is without usade for long time, take out battery to avoid damage by battery leakage.

5. GENERAL SPECIFICATIONS

5-1 Max Voltage between input terminal and Earth Ground: CAT III 1000V & CAT IV 600V.

5-2 Over-range Indication: display "1" or "-1" for the significant digit.

5-3 Automatic display of negative polarity "-".

5-4 Low Battery Indication: "E" displayed.

5-5 Data hold Indication: "H" displayed.

5-6 Network cable (RJ45) test Indication: "RJ45" displayed.

5-7 Telephone line (RJ11) test Indication: "RJ11" displayed.

5-8 Display: 3 1/2 digit LCD with a max. reading of 1999.

5-9 Manual range control

5-10 Auto LCD backlight

5-11 Fuse protection: 200mA/500V & 10A/500V Fast Fuse

5-12 Power supply: 9V battery (6F22 or NEDA 1604)

5-13 Operating Temp.: 0°C to 40°C (relative humidity <85%)

5-14 Storage Temp.: -10°C to 50°C (relative humidity <85%)

5-15 Guaranteed precision Temp.: 23±5°C (relative humidity <70%)

5-16 Dimension: 180x88x51mm

5-17 Weight: approx. 320g (including battery)

6. Testing Specifications

Accuracy is specified for a period of year after calibration and at 18°C to 28°C (64°F to 82°F) with relative humidity to 70%.

6-1 DC Voltage

Range	Resolution	Accuracy
200mV	0.1mV	±(0.5% of rdg + 2 digits)
2V	1mV	
20V	10mV	
200V	100mV	
1000V	1V	±(0.8% of rdg + 2 digits)

-- Impedance: 10MΩ

-- Overload protection: 1000V DC or 750V AC rms

6-2 AC Voltage

Range	Resolution	Accuracy
2V	1mV	±(1.0% of rdg + 2 digits)
20V	10mV	
200V	100mV	
750V	1V	±(1.2% of rdg + 3 digits)

-- Impedance: 10MΩ (2V range is 1MΩ)

-- Overload protection: 1000V DC or 750 AC rms

-- Frequency Range: 40 to 400Hz

-- Response: average, calibrated in rms of sine wave

6-3 DC Current

Range	Resolution	Accuracy
200μA	0.1μA	±(1.2% of rdg + 2 digits)
2mA	1μA	
20mA	10μA	
200mA	100μA	
10A	10mA	±(2.0% of rdg + 3 digits)

-- Overload protection: 200mA/500V & 10A/500V Fast Fuse

Note: 10A up to 10 seconds

6-4 AC Current

Range	Resolution	Accuracy
2mA	1μA	±(1.5% of rdg + 3 digits)
20mA	10μA	
200mA	100μA	
10A	10mA	±(2.5% of rdg + 5 digits)

-- Overload protection: 200mA/500V & 10A/500V Fast Fuse

Note: 10A up to 10 seconds

-- Frequency Range: 40 to 400Hz

-- Response: average, calibrated in rms of sine wave

6-5 Resistance

Range	Resolution	Accuracy
200Ω	0.1Ω	±(1.0% of rdg + 3 digits)
2kΩ	1Ω	
20kΩ	10Ω	
200kΩ	100Ω	
2MΩ	1kΩ	±(1.5% of rdg + 3 digits)
20MΩ	10kΩ	
200MΩ	100kΩ	±(5.0% of rdg + 10 digits)

-- Overload protection: 500V DC or AC rms

6-6 Diode and Audible continuity test

Range	Description	Test Condition
▶	Display read approximately forward voltage of diode	Forward DC current approx. 1mA Reversed DC voltage approx. 3V
•••)	Built-in buzzer sounds if resistance is less than 50Ω	Open circuit voltage approx. 3V

Overload protection: 500V DC or AC rms

6-7 Battery test

Range	Accuracy	Load Resistance	Resolution
1.5V	±(5.0% of rdg + 5 digits)	Approx. 30Ω	10mV
6V		Approx. 68Ω	
9V		Approx. 909Ω	

Overload protection: 200mA/500V Fast Fuse

6-8 Telephone line (RJ11) test

◆ Normal operation of telephone line: "PASS" symbol will appear on the LCD display,

◆ Abnormal operation of telephone line: "FAULT" symbol will appear on the LCD display.

6-9 Network cable (RJ45) test

◆ Normal network cables connecting: Correct connecting symbol, such as "1-2" or "3-6" will appear on the LCD screen.

◆ Open circuit of network cables connecting: Open Circuit of network cables connecting will not display on the LCD screen. For example, if 1-2 network cable is open circuit, "1-2" will not display on the LCD screen.

◆ Short circuit of network cables: The symbol of short circuit of network cables will display on the LCD screen. For example, if cable 1-2 is short circuit, "1-2", "SHO." will display on the LCD screen.

◆ Misconnection of network cables: The symbol of misconnection of network cables will display on the LCD screen. For example, if cable 1-2 is misconnecting, "1-2", "MIS." will display on the LCD screen.

◆ Reverse connection of network cables: The symbol of reverse connection of network cables will display on the LCD screen. For example, if cable 1-2 is reverse connecting, "1-2", "REV." will display on the LCD screen.

◆ Split pairs of network cables: The Split pairs network cables will display on the LCD screen. For example, if cable 1-2 and 3-6 are split pairs, "1-2", "3-6", "SPL." will display on the LCD screen.

◆ Shield of network cable: If shield of network cable is normal, "SHIELD" will display on the LCD screen, if shield of network cable is open circuit or not excite, "SHIELD" will not display on the LCD Screen.

7. OPERATING INSTRUCTIONS

7-1 Attention before operation

7-1-1 Check battery. When the battery voltage drop below proper operation range, the "🔋" symbol will appear on the LCD display and the battery need to be changed.

7-1-2 Pay attention to the "⚠️" besides the input jack which shows that the input voltage or current should be within the specified value.

7-1-3 The range switch should be positioned to desired range for measurement before operation.

7-2 Measuring DC Voltage

7-2-1 Set the rotary switch at the desired "V_{DC}" range position.

7-2-2 Connect the black test lead to **COM** jack and the red to **V_Ω** jack.

7-2-3 Connect test leads across the source or load under measurement.

7-2-4 You can get reading from LCD. The polarity of the red lead connection will be indicated along with the DC voltage value.

NOTE:

1. When the value scale to be measured is unknown beforehand, set the range selector at the highest position.
2. When only the figure "1" or "-1" is displayed, it indicates over-range situation and the higher range has to be selected.
3. "⚠️" means you can't input the voltage more than 1000V, it's possible to show higher voltage, but it may destroy the inner circuit or pose a shock.
4. Be cautious against shock when measuring high Voltage.

7-3 Measuring AC Voltage

7-3-1 Set the rotary switch at the desired "V_{AC}" range position.

7-3-2 Connect the black test lead to **COM** jack and the red to **V_Ω** jack.

7-3-3 Connect test leads across the source or load under measurement.

7-3-4 You can get reading from LCD.

NOTE:

1. When the value scale to be measured is unknown beforehand, set the range selector at the highest position.
2. When only the figure "1" or "-1" is displayed, it indicates over-range situation and the higher range has to be selected.
3. "⚠️" means you can't input the voltage more than 750V, it's possible to show higher voltage, but it may destroy the inner circuit or pose a shock.
4. Be cautious against shock when measuring high Voltage.

7-4 Measuring DC Current

7-4-1 Set the rotary switch at the desired "A_{DC}" range position.

7-4-2 Connect the black test lead to **COM** jack and the red to the **mA** jack for a maximum 200mA current, for a 200mA to 10A current, move the red lead to the **10A** jack.

7-4-3 Connect test leads in series with the load under measurement.

7-4-4 You can get reading from LCD. The polarity of the red lead connection will be indicated along with the DC current value.

NOTE:

1. When the value scale to be measured is unknown beforehand, set the range selector at the highest position.
2. When only the figure "1" or "-1" is displayed, it indicates over-range situation and the higher range has to be selected.
3. "⚠️" means the socket mA's maximum current is 200mA and 10A's maximum current is 10A, over 200mA or 10A current can be protected by the fast fuse.
4. On the 10A range, the measuring time should be less than 10 seconds to prevent precision from affecting by circuit heating.

7-5 Measuring AC Current

7-5-1 Set the rotary switch at the desired "A_{AC}" range position.

7-5-2 Connect the black test lead to **COM** jack and the red to the **mA** jack for a maximum 200mA current, for a 200mA to 10A current, move the red lead to the **10A** jack.

7-5-3 Connect test leads in series with the load under measurement.

7-5-4 You can get reading from LCD.

NOTE:

1. When the value scale to be measured is unknown beforehand, set the range selector at the highest position.
2. When only the figure "1" or "-1" is displayed, it indicates over-range situation and the higher range has to be selected.
3. "⚠️" means the socket mA's maximum current is 200mA and 10A's maximum current is 10A, over 200mA or 10A current can be protected by the fast fuse.
4. On the 10A range, the measuring time should be less than 10 seconds to prevent precision from affecting by circuit heating.

7-6 Measuring Resistance

7-6-1 Set the rotary switch at the desired "Ω" range position.

7-6-2 Connect the black test lead to **COM** jack and the red to **V_Ω** jack.

7-6-3 Connect test leads across the resistance under measurement.

7-6-4 You can get reading from LCD.

NOTE: Max. input overload: 500V rms < 10sec

1. When only the figure "1" or "-1" is displayed, it indicates over-range situation and the higher range has to be selected.
2. For measuring resistance above 10MΩ, the meter may take a few seconds to get stable reading.
3. When the input is not connected, i.e. at open circuit, the figure "1" or "-1" will be displayed for the over-range condition.
4. When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors have been discharged fully.

7-7 Diode & Audible continuity Testing

7-7-1 Set the rotary switch at the "→" range position.

7-7-2 Connect the black test lead to **COM** jack and the red to **V_Ω** jack.

7-7-3 On **diode** range, connect the test leads across the diode under measurement, display shows the approx. forward voltage of this diode.

7-7-4 On **audible continuity** range, connect the test leads to two point of circuit, if the resistance is lower than approx. 50Ω, the buzzer sounds.

NOTE: Make sure the power is cut off and all capacitors need to be discharged under this measurement.

7-8 Battery Testing

7-8-1 Set the rotary switch at the desired "🔋" range position.

7-8-2 Connect the black test lead to **COM** jack and the red to **mA** jack.

7-8-3 Connect test leads across the source or load under measurement.

7-8-4 You can get reading from LCD.

7-9 Telephone Line (RJ11) Testing

7-9-1 Open the cover of the network test on the top of the instrument by a screwdriver, take out the test cover, and keep the screw well as we need the screw on after finish checking.

7-9-2 Set the rotary switch at the "RJ11" range position, the "RJ11" symbol will display on the LCD screen.

7-9-3 Connect the telephone line with the test hole (RJ11) on the top of the instrument and make sure it is good connection.

7-9-4 Connect the other side of the telephone line with SPC telephone exchange.

7-9-5 Press "TEST" key, if shows "PASS", then the telephone line working normally, if shows "FAULT", the telephone line is abnormal.

7-10 Network Cable (RJ45) Testing

Warning: Please do not use this function in the condition of alive circuit, or it will damage the instrument.

Network cable testing function is suitable for network cable which is T168A, T568B, 10Base-T and Token Ring. It can find out the error cables and show on the cables symbol and their problem. If few cables have error, all the error and cables symbol will display on the screen first, and press "TEST" key one by one, cables symbol and its error detail will show on the screen one by one. You should eliminate the error connections one by one until all the cable connection is correct.

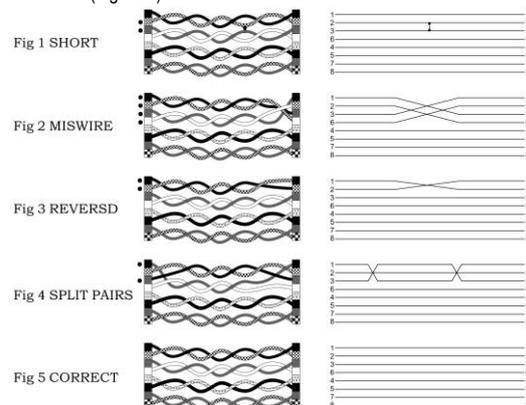
Open Circuit: There is no indicating symbol for open circuit in this instrument. Normally there is 2~4 pair of twisted pair on a typical network, the symbol of cable which is open circuit will not display on the screen, user should identify which symbol should be or should not be displayed on the screen according to the true situation. If the cables symbol should be display but it did not, then means this cables are open Circuit.

Short Circuit: There is short connection among cables (Figure 1).

Miswire: One side of two cables are wrong (Figure 2).

Reversed: One side of cable is reverse (Figure 3).

Split pairs: As wrong operation, a line of cable twine to other cable line while pressing the line (Figure 4).



7-10-1 Open the cover of the network test on the top of the instrument by a screwdriver, take out the test cover, and keep the screw well as we need the screw on after finish checking.

7-10-2 Set the rotary switch at the "RJ45" range position, the "RJ45" symbol will display on the LCD screen.

7-10-3 Connect the network cable with the test hole (RJ45) on the top of the instrument and make sure it is good connection.

7-10-4 Connect the other side of the network cable with network cable remote.

7-10-5 Press "TEST" key. For example: a network cable error conditions as follows: 1-2, 3-6 are short circuit, "1-2", "3-6", "4-5", "7-8", "SHIELD" and "SHO." will display on the screen.

7-10-6 Press "TEST" key again, "1-2", "3-6" and "SHO." will display on the screen, keep press "TEST" key, the result of next pair of cable will display on the screen.

8. Battery replacement

8-1 When the battery voltage drop below proper operation range the "🔋" symbol will appear on the LCD display and the battery need to be changed.

8-2 Before changing the battery, power off the meter and remove the test leads from the terminals. Open the cover of the battery cabinet by a screwdriver.

8-3 Replace the old battery with the same type battery (9V 6F22 or NEDA 1604).

8-4 Close the cover of the battery cabinet and fasten the screw.

9. Fuse replacement

9-1 This meter is provided with a 200mA/500V fast fuse to protect the battery test and the current measuring circuits which measure up to 200mA, with a 10A/500V fuse to protect the 10A range.

9-2 Ensure the meter is not connected to any external circuit, power off the meter and remove the test leads from the terminals. Open the bottom case by a screwdriver.

9-3 Replace the old fuse with the same type and rating: 6×30mm 200mA/500V fast fuse or 6×30mm 10A/500V fast fuse.

9-4 Close the bottom case and fasten the screw.

10. Maintenance

10-1 Before attempting to remove the battery door or open the case, be sure that test leads have been disconnected from measurement circuit top avoid electric shock hazard.

10-2 You must replace the test leads if the lead is exposed, and should adopt the leads with the same specifications as origin.

10-3 Use only moist fabric or small amount of detergent but not chemical solution for cleaning.

10-4 Do not use the meter before the back cover is properly closed and screw secured. Upon any abnormality, stop operation immediately and send the meter for maintenance.

10-5 Please take out the battery when not using for a long time.

11. Accessories

[1] Test Leads: electric rating 1000V 10A

[2] Operator's Manual

[3] Network Cable Remote

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