



INSTRUCTION MANUAL
MT21
600V AC/DC MULTIMETER



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1. SAFETY INSTRUCTIONS

This meter has been designed for safe use but must be operated with caution. The rules listed below must be carefully followed for safe operation.

1. **NEVER** apply voltage or current to the meter that exceeds the specified maximum: maximum:

Input Limits	
Function	Maximum Input
VAC 600V	DC/AC
V DC or V AC	600V DC/AC, 200Vrms on 200mV range
mA DC	200mA 250V fast acting fuse A DC 10A 250V fast acting fuse (30 seconds max every 15 minutes)
Resistance, Continuity	250Vrms for 15sec max

2. **USE EXTREME CAUTION** when working with high voltages.
3. **DO NOT** measure voltage if the voltage on the "COM" input jack exceeds 500V above earth ground.
4. **NEVER** connect the meter leads across a voltage source while the function switch is in the current, resistance, or diode mode. Doing so can damage the meter.
5. **ALWAYS** discharge filter capacitors in power supplies and disconnect the power when making resistance or diode tests.
6. **ALWAYS** turn off the power and disconnect the test leads before opening the doors to replace the fuse or batteries.
7. **NEVER** operate the meter unless the back cover and the battery and fuse doors are in place and fastened securely.

2. SAFETY SYMBOLS



This symbol adjacent to another symbol, terminal or operating device indicates that the operator must refer to an explanation in the Operating Instructions to avoid personal injury or damage to the meter.

WARNING

This WARNING symbol indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.

CAUTION

This CAUTION symbol indicates a potentially hazardous situation, which if not avoided, may result damage to the product.



This symbol advises the user that the terminal(s) so marked must not be connected to a circuit point at which the voltage with respect to earth ground exceeds (in this case) 500 VAC or VDC.



This symbol adjacent to one or more terminals identifies them as being associated with ranges that may, in normal use, be subjected to particularly hazardous voltages. For maximum safety, the meter and its test leads should not be handled when these terminals are energized.

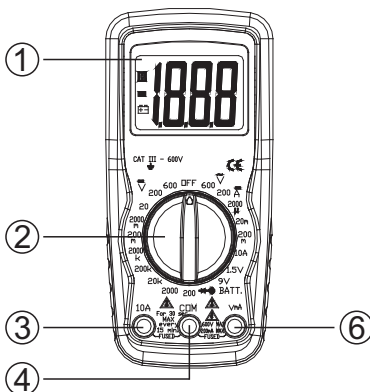


This symbol indicates that a device is protected throughout by double insulation or reinforced insulation.

3. CONTROLS AND JACKS

- 1 - LCD Display
- 2 - Function switch
- 3 - 10A jack
- 4 - COM jack
- 5 - Positive jack

Note: Tilt stand, fuse and battery compartment are on rear of unit.



4. SYMBOLS AND ANNUNCIATORS

- | | | | |
|----------|---------------------|------------|---------------------------|
| | Continuity | Ω | ohms |
| | Diode test | VDC | volts direct current |
| μ | micro (amps) | VAC | volts alternating current |
| m | milli (volts, amps) | ADC | amps direct current |
| k | kilo (ohms) | BAT | Battery test |

5. SPECIFICATIONS

Function	Range	Resolution	Accuracy
DC Voltage (V DC)	200mV	0.1mV	±(0.5% reading + 2 digits)
	2000mV	1mV	
	20V	0.01V	
	200V	0.1V	±(0.8% reading + 2 digits)
	600V	1V	
AC Voltage (V AC)	200V	0.1V	±(1.2% reading + 10 digits (50/60Hz))
	600V	1V	
DC Current (A DC)	2000µA	1µA	±(1.0% reading + 2 digits)
	20mA	10µA	±(1.2% reading + 2 digits)
	200mA	100µA	
	10A	10mA	±(2.0% reading + 2 digits)
Resistance	200Ω	0.1Ω	±(0.8% reading + 2 digits)
	2000Ω	1Ω	
	20kΩ	0.01kΩ	
	200kΩ	0.1kΩ	
	2000kΩ	1kΩ	±(1.0% reading + 2 digits)
Battery Test	9V	10mV	±(1.0% reading + 2 digits)
	1.5V	10mV	

NOTE: Accuracy specifications consist of two elements:

- (% reading) – This is the accuracy of the measurement circuit.
- (+ digits) – This is the accuracy of the analog to digital converter.

NOTE: Accuracy is stated at 18°C to 28°C (65°F to 83°F) and less than 75% RH.

Function	Range
Diode Test	Test current of 1mA maximum, open circuit voltage 2.8V DC typical
Continuity Check	Audible signal will sound if the resistance is less than approximately 30Ω
Battery Test current	9V (6mA); 1.5V (100mA)
Input Impedance	> 1MΩ
ACV Bandwidth	45Hz to 450Hz

Function	Range
DCA voltage drop	200mV
Display	3½ digit, 2000 count LCD, 1.1" digits
Overrange indication	"1" is displayed
Polarity	Automatic (no indication for positive polarity); Minus (-) sign for negative polarity.
Measurement Rate	2 times per second, nominal
Low Battery Indication	"BAT" is displayed if battery voltage drops below operating voltage
Battery	one 9 volt (NEDA 1604) battery
Fuses	mA, μ A ranges; 0.2A/250V fast blow A range; 10A/250V fast blow
Operating Temperature	0°C to 50°C (32°F to 122°F)
Storage Temperature	-20°C to 60°C (-4°F to 140°F)
Relative Humidity	<70% operating, <80% storage
Operating Altitude	2000 meters (7000ft.) maximum.
Weight	255g
Size	150mm x 70mm x 48mm
Safety	For indoor use and in accordance with Overvoltage Category II, Pollution Degree 2. Category II includes local level, appliance, portable equipment, etc., with transient overvoltages less than Overvoltage Category III.

6. BATTERY INSTALLATION



WARNING: To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery door.

1. Disconnect the test leads from the meter.
2. Open the battery door by loosening the screw using a Phillips head screwdriver.
3. Insert the battery into battery holder, observing the correct polarity.
4. Put the battery door back in place. Secure with the screw.



WARNING: To avoid electric shock, do not operate the meter until the battery door is in place and fastened securely.

WARNING: To avoid electric shock, do not operate the meter until the battery door is in place and fastened securely.

NOTE: If your meter does not work properly, check the fuses and batteries to make sure that they are still good and that they are properly inserted.

7. OPERATING INSTRUCTIONS

WARNING: Risk of electrocution. High-voltage circuits, both AC and DC, are very dangerous and should be measured with great care.

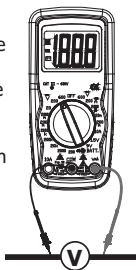
1. ALWAYS turn the function switch to the OFF position when the meter is not in use.
2. If "OL" appears in the display during a measurement, the value exceeds the range you have selected. Change to a higher range.

NOTE: On some low AC and DC voltage ranges, with the test leads not connected to a device, the display may show a random, changing reading. This is normal and is caused by the high-input sensitivity. The reading will stabilize and give a proper measurement when connected to a circuit.

7.1. DC VOLTAGE MEASUREMENTS

CAUTION: Do not measure DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

1. Set the function switch to the highest V DC position.
2. Insert the black test lead banana plug into the negative (COM) jack. Insert the red test lead banana plug into the positive (V) jack.
3. Touch the black test probe tip to the negative side of the circuit. Touch the red test probe tip to the positive side of the circuit.
4. Read the voltage in the display. Reset the function switch to successively lower V DC positions to obtain a higher resolution reading. The display will indicate the proper decimal point and value. If the polarity is reversed, the display will show (-) minus before the value.



7.2. AC VOLTAGE MEASUREMENTS

⚠ WARNING: Risk of Electrocutation. The probe tips may not be long enough to contact the live parts inside some 240V outlets for appliances because the contacts are recessed deep in the outlets. As a result, the reading may show 0 volts when the outlet actually has voltage on it. Make sure the probe tips are touching the metal contacts inside the outlet before assuming that no voltage is present.

CAUTION: Do not measure AC Volts if a motor on the circuit is being switched ON/OFF. Large voltage surges may occur damaging the meter.

1. Set the function switch to the highest V AC position.
2. Insert the black test lead banana plug into the negative (COM) jack. Insert red test lead banana plug into the positive (V) jack.
3. Touch the black test probe tip to the negative side of the circuit. Touch the red test probe tip to the positive side of the circuit.
4. Read the voltage in the display. Reset the function switch to successively lower V AC positions to obtain a higher resolution reading. The display will indicate the proper decimal point and value.



7.3. DC CURRENT MEASUREMENTS

CAUTION: Do not make current measurements on the 10A scale for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads.

1. Insert the black test lead banana plug into the negative (COM) jack.
2. For current measurements up to 200mA DC, set the function switch to the highest DC mA position and insert the red test lead banana plug into the (mA) jack.
3. For current measurements up to 10A DC, set the function switch to the 10A range and insert the red test lead banana plug into the (10A) jack.
4. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
5. Touch the black test probe tip to the negative side of the circuit. Touch the red test probe tip to the positive side of the circuit.
6. Apply power to the circuit.



7. Read the current in the display. For mA DC measurements, reset the function switch to successively lower mA DC positions to obtain a higher resolution reading. The display will indicate the proper decimal point and value.

7.4. RESISTANCE MEASUREMENTS

⚠ WARNING: To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements. Remove the batteries and unplug the line cords.

1. Set the function switch to the highest Ω position.
2. Insert the black test lead banana plug into the negative (COM) jack. Insert the red test lead banana plug into the positive Ω jack.
3. Touch the test probe tips across the circuit or part under test. It is best to disconnect one side of the part under test so the rest of the circuit will not interfere with the resistance reading.
4. Read the resistance in the display and then set the function switch to the lowest Ω position that is greater than the actual or any anticipated resistance. The display will indicate the proper decimal point and value.



7.5. CONTINUITY CHECK

⚠ WARNING: To avoid electric shock, never measure continuity on circuits or wires that have voltage on them.

1. Set the function switch to the $\rightarrow \bullet \rightarrow$ position.
2. Insert the black lead banana plug into the negative (COM) jack. Insert the red test lead banana plug into the positive (Ω) jack.
3. Touch the test probe tips to the circuit or wire you wish to check.
4. If the resistance is less than approximately 30Ω , the audible signal will sound. If the circuit is open, the display will indicate "1".

7.6. DIODE TEST


1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive diode jack.
2. Turn the rotary switch to the $\rightarrow \bullet \rightarrow$ position.
3. Touch the test probes to the diode under test. Forward voltage will indicate 400 to 700mV. Reverse voltage will indicate "1". Shorted devices will indicate near 0mV. Shorted devices will indicate near 0mV and an open device will indicate "1" in both polarities.

7.7. BATTERY TEST


1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive V jack.
2. Select the 1.5V or 9V BAT position using the function select switch.
3. Connect the red test lead to the positive side of the 1.5V or 9V battery and the black test lead to the negative side of the 1.5V or 9V battery.
4. Read the voltage in the display.

	Good	Weak	Bad
9V battery:	>8.2V	7.2 to 8.2V	<7.2V
1.5V battery:	>1.35V	1.22 to 1.35V	<1.22V


7.8. REPLACING THE BATTERY

 **WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery door.


1. When the batteries become drained or drop below the operating voltage, "BAT" will appear in the right-hand side of the LCD display. The battery should be replaced.
2. Follow instructions for installing battery. See the Battery Installation section of this manual.

 **WARNING:** To avoid electric shock, do not operate your meter until the battery cover is in place and fastened securely.

7.9. REPLACING THE FUSES

 **WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the fuse cover.

1. Open the fuse cover by loosening the screw on the cover using a phillips head screwdriver.
2. Remove the old fuse from its holder by gently pulling it out.
3. Install the new fuse into the holder.
4. Always use a fuse of the proper size and value (0.5A/250V fast blow for the 200mA range, 10A/250V fast blow for the 10A range).
5. Put the fuse cover back in place. Insert the screw and tighten it securely.

 **WARNING:** To avoid electric shock, do not operate your meter until the fuse cover is in place and fastened securely.



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