

User's Manual for Victor 88E Digital Multimeter



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

OVERVIEW

The **Victor 88E** digital multimeter is a battery-driven 3-3/4" digital multimeter. It uses an LCD with a 1" display for easy reading. The 15 second backlight and overload protection make all types of operation more convenient. The digital multimeter has the function of measuring DCV, ACV, DCA, ACA, resistance, capacitance, frequency, temperature, duty cycle and diode and a continuity performance test. The meter can provide functions including analog bar and unit symbol display, data holding (HOLD), relative value measuring (REL), maximal/minimal value measuring (MAX/MIN), auto/manual range switching (RANGE), auto power off and warning functions. It adopts double integral A/D converter as its core. It is an ideal tool for labs, factories, radio-technology and HVAC field use.

SAFETY NOTES:


The instrument is designed according to IEC1010 standard (safety standard issued by International Electro Technical Committee). Please read the following before operation.

1. Voltage less than 36V is a control and safety voltage. When measuring voltage higher than DC 36V, AC 25V, check the connection and insulation of test leads to avoid electric shock.
2. Do not input a limited voltage higher than DC 1000V or AC 750V when measuring.
3. When measuring voltage higher than DC 60V, AC 40V, please be careful.
4. Select correct function and range to avoid fault operation.
5. Move the test leads away from test points when switching the function.
6. Never input voltage when measuring current.
7. Never modify the meter's internal circuits.
8. Introduction for safety symbol:

 = high voltage present;  = GND;  = dual insulation;  = refer to manual;  = Low battery

SPECIFICATION

1. General features

- 1-1. Display: LCD;
- 1-2. Max display: 3999 (3-3/4") digits automatic polarity and unit symbol display;
- 1-3. Measurement method: double integral A/D conversion;
- 1-4. Sampling rate: approximately 3 times/sec.
- 1-5. Over-range display: 'OL' displayed in the highest digit.
- 1-6. Low battery display 
- 1-7. Working environment: (0-40), relative humidity: less than 80%;
- 1-8. Power supply 2 pieces 1.5V battery 'AAA' 7# battery
- 1-9. Dimension: 7.4" x 3.8" x 1.3" (length x width x height);
- 1-10. Weight: approximately 14 ounces (including battery)
- 1-11. The **Victor 88E** Standard Package comes complete with U36 Deluxe Test leads, #C1 Clip Set, TP3 Temperature Probe, Duracell[®] batteries and P25 hard case.
- 1-12. The **Victor 88E-C** comes with Standard Package, L36 Test Leads, FSG1 Flame Safeguard Adapter, GA1 and GA2 Gas Burner Thermocouple Adapters, PT1 Probe Pins and one pair of J1 Jumpers.
- 1-13. 1-12. The **Victor 88E-C/A** comes with 88E-C Package and 88CP9 AmpKlamp. (see Appendix A).

TECHNICAL FEATURES

2-1. Accuracy: $\pm (a\% \times \text{reading data} + \text{digits})$, environment temperature at $(23^{\circ}\text{C} \pm 5)$, relative humidity less than 75%,

2-2. DC Voltage DCV

Range	Accuracy	Resolution
400mV	$\pm(1.5\%+6)$	0.1mV
4V	$\pm(0.5\%+6)$	1mV
40V		10mV
400V		100mV
1000V	$\pm(1.0\%+4)$	1V

Input impedance 400mV Range $10\text{M}\Omega$, other range is $40\text{M}\Omega$.

Overload protection 1000V DC or 750V AC.

2-3. AC Voltage ACV

Range	Accuracy	Resolution
400mV	$\pm(1.5\%+6)$	0.1mV
4V	$\pm(0.8\%+6)$	1mV
40V		10mV
400V		100mV
750V	$\pm(1.0\%+6)$	1V

Input impedance 400mV Range $10\text{M}\Omega$, other range is $40\text{M}\Omega$.

Overload protection 1000V DC or 750V AC.

Frequency response: mV and 750V range: 40 to 100Hz, other range: 40 to 400 Hz. Display: Sine wave RMS (Average value response).

2-4. DC Current DCA

Range	Accuracy	Resolution
400uA	$\pm(1.0\%+5)$	0.1 μA
4000uA		1 μA
40mA		10 μA
400mA		100 μA
20A	$\pm(1.2\%+10)$	10mA

MAX measurement voltage drop: full range mA: 1.2VA:100mV Max input current: 20A (within 15 seconds)

Overload protection: 400mA/ 250V and 20A/250V fast acting fuse.

2-5. AC Current ACA

Range	Accuracy	Resolution
400uA	$\pm(1.5\%+5)$	0.1 μA
4000uA		1 μA
40mA		10 μA
400mA		100 μA
20A	$\pm(2.0\%+15\text{d})$	10mA

MAX measurement voltage drop: full range mA: 1.2V A: 100mV Max input current: 20A (within 15 seconds)

Overload protection: 400mA/ 250V and 20A/250V fast acting fuse.

Frequency response 20A range: 40 100Hz, other range: 40 to 400Hz

2-6. Resistance Ω

Range	Accuracy	Resolution
400 Ω	$\pm(0.8\%+5d)$	0.1 Ω
4k Ω		1 Ω
40k Ω		10 Ω
400k Ω		100 Ω
4M Ω		1k Ω
40M Ω	$\pm(1.2\%+5d)$	10k Ω

Open circuit voltage: 400mV Overload protection: 250V DC or AC peak value;

NOTE: At a range of less than 400 Ω , short-circuit the test leads to measure the wire resistance, and then subtract it from the real measurement.

2-7. Capacitance C

Range	Accuracy	Resolution
40nF	$\pm(2.5\%+6d)$	1pF
		10pF
400nF	$\pm(3.5\%+8d)$	100pF
4 μ F		1nF
40 μ F		10nF
400 μ F	$\pm(5.0\%+8d)$	100nF

Overload protection: 250V DC or AC peak value;

2-8. Frequency F

Range	Accuracy	Resolution
100Hz	$\pm(0.5\%+4d)$	0.1Hz
1000Hz		1Hz
10kHz		10Hz
100kHz		100Hz
1MHz		1kHz
30MHz		10kHz

Input sensitivity: 1.0V. Overload protection: 250V DC or AC peak value;

2-9. Diode and continuity performance test

Range	Value displayed	Testing condition
→ ∞)	Forward voltage drop of diode	Forward DCA is approx. 0.5mA, the backward voltage is approx 1.5V
	Buzzer makes a long sound while resistance is less than $(30\pm 20)\Omega$	Open circuit voltage is approx. 0.5V

Over load protection: 250V DC or AC peak value;

CAUTION: DO NOT INPUT VOLTAGE IN THIS RANGE!

2-10. Temperature

Range	Accuracy	Resolution
-40°C-1000°C	-0°C $\pm(1.0\%+4)$	1°C
	0°C - 400°C $\pm(1.0\%+4)$	
	+400C $\pm(1.5\%+15)$	
0°F-1832°F	-750°F $\pm(0.8\%+5)$ +750°F $\pm(1.5\%+15)$	1°F

Sensor: TP01 (K type thermocouple)

CAUTION: DO NOT INPUT VOLTAGE IN THIS RANGE!

OPERATION

4-1. Panel description

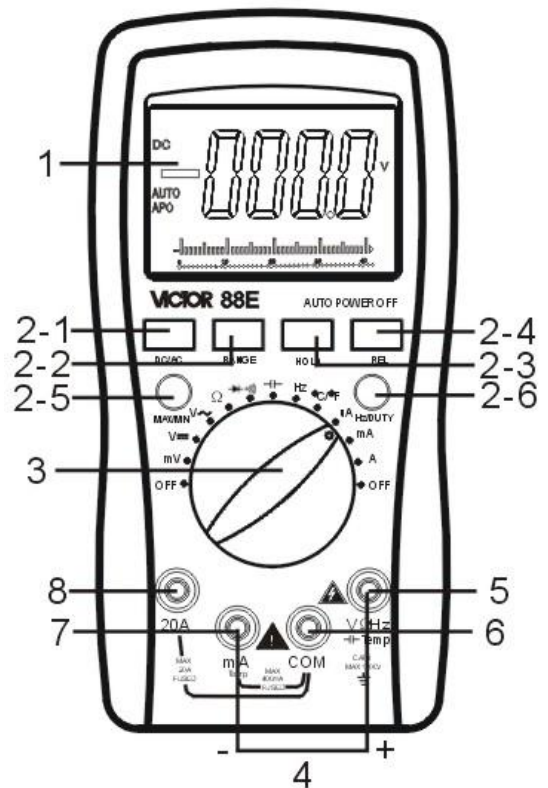
1. LCD: display the measuring value and unit.
2. Function key:
 - 2-1. **SELECT** key: DC /AC mode, temperature C/F, Diode / Continuity performance switch.
 - 2-2. **RANGE** key: select auto range or manual range mode. Auto range is the normal mode, it will display AUTO symbol. Press it to change to manual range. Press it more than 2 seconds, it will return to auto range mode.
 - 2-3. **HOLD** key: press it, the presently measured value is held on LCD and HOLD symbol displays. Press it again, HOLD symbol disappears, and the meter is exited the holding mode.
 - 2-4. **REL** key: press it, reading clears and goes to relative value measurement mode. REL symbol displays, press it again, REL symbol disappears, and the meter exits the relative mode.
 - 2-5. **MAX/MIN** key: press it, meter goes to MAX mode, it will hold the max value of measured reading. Press it again, goes to MIN mode, it will hold the minimum value of measurement. No auto power off and analog bar display in this mode. Press it more than 2 seconds, it exits MAX/MIN mode.
 - 2-6. **Hz/DUTY** key: When measuring AC Voltage (Current), press it, meter switches to Frequency/duty cycle/Voltage (Current). When measuring the Frequency, it will switch frequency/duty cycle 1~99%.
3. Selector Knob: Selects measuring function and range
4. Temperature (positive) and VΩHz-|- terminal
5. Voltage, resistance, frequency, capacitor and temperature terminal
6. COM terminal
7. Less than 400mA current testing terminal and temperature (negative) terminal
8. 20A current terminal

4-2. DCV measurement

1. Insert the black test lead to “COM” terminal and the red one to “V/Ω/Hz” terminal.
2. Turn the selector knob to V_{DC} range;
3. Auto range is the normal mode, it will display AUTO symbol. Press the **RANGE** key to change to the manual range mode, 400mV, 4V, 40V, 400V, 1000V range is selective;
4. Connect the leads in parallel across the electric circuit under test; LCD displays polarity and voltage under test connected by the red test lead.

Note

1. Users should first set the select knob to the highest range, if users have no idea about the range of voltage under test, and then select the proper range based on the displaying value. If LCD displays OL, it means meter is over the maximum value of this range, select a higher range.
2. Never input a voltage over DC 1000V.



3. Be careful while measuring a high voltage. DO NOT touch the high voltage circuit.

4-3. ACV measurement

1. Insert the black test lead into the COM terminal and the red one to the V/ Ω /Hz terminal.

2. Turn the selector knob to $V\sim$ range.

3. Auto range is the original mode, it will display AUTO symbol. Press the RANGE key to change to the manual range mode, 400mV, 4V, 40V, 400V, 750V range is selective.

Note: When measuring ACV under auto range mode, pressing the **RANGE** key will display AC mV range.

4. Connect the leads in parallel across the electric circuit under test, LCD displays voltage by the test lead.

Note:

1. Users should first set the selector knob to the highest range, if users have no idea about the range of voltage under test, and then select the proper range based on displaying value. If LCD displays OL, it means meter is over the maximum value of this range, select a higher range.

2. Never input a voltage over AC 750V.

3. Be carefully while measuring a high voltage. DO NOT touch the high voltage circuit.

4-4. DCA measurement

1. Insert the black test lead into the COM terminal and the red one into the mA terminal (the Max. 400mA) or into the 20A terminal (the Max.20A). When measuring μ A DC use the FSG1 adapter between the meter leads and the control.

2. Use the selector knob and set to the proper DCA range, press the **DC/AC** key to select the measurement mode, and then connect the leads in series into the electric circuit under test. LCD displays current under test.

Note:

1. Users should first set the selector knob to the highest range, if users have no idea about the range of current under test, and then select the proper range based on displaying value.

2. If the LCD displays OL, it means the current is over range. Now you need to select the knob to the higher range.

3. Maximum input current is 400mA or 20A subject to the terminal the red test lead is inserted into, too large a current will damage the fuse and meter.

4-5. ACA measurement

1. Insert the black test lead into the COM terminal and the red one into the mA terminal (maximum 400mA) or to the 20A terminal (maximum 20A)

2. Use the selector knob to set the proper ACA range, press the DC/AC key to select the measurement mode, and then connect the leads in series to the electric circuit under test. LCD displays current under test.

Note:

1. Users should first set the selector knob to the highest range, if users have no idea about the range of current under test, and then select the proper range based on displaying value.

2. If the LCD displays OL, it means the current is over range. Now you need to select the knob to the higher range.

3. Maximum input current is 400mA or 20A subject to the terminal the red test lead is inserted into, too large a current will damage the fuse and meter.

4-6. Resistance measurement

1. Insert the black test lead into the COM terminal and the red lead into the V/ Ω /Hz terminal.
2. Turn the selector knob to Ω range.
3. Connect the leads in parallel with the resistance being measured.
3. Auto range is the original mode; press the **RANGE** key change to the manual range mode.
4. When measuring the actual minimum resistance, short-circuit the test leads first, press the **REL** button and then test the resistance, it will now display the actual resistance.

Note:

1. The LCD displays OL when the resistance is over the selected range. When measuring a value over 1M Ω , the reading will take a few seconds to become stable. This is normal for high resistance measuring.
2. When the input lead is in an open circuit, overload displays OL.
3. When measuring in line resistors, be sure that the power is off and all capacitors are completely discharged.
4. Never input any voltage while the meter is set for resistance range!

4-7. Capacitance measurement

1. Discharge any capacitor to be tested by shorting the terminals of the capacitor with an insulated device.
2. Turn the selector knob to “-F” range.
3. Insert the black test lead into the COM terminal and the red lead into the V/ Ω /Hz terminal.
4. If the LCD doesn't display 0, press the **REL** button to clear the reading;
5. Place the test leads in parallel with the capacitor being tested. The red test lead is for the positive pole. LCD displays capacitance value.

Note:

1. Never input voltage or current to the V Ω Hz terminal when measuring capacitance.
2. In order to assure an accurate reading, press the **REL** button to clear the reading before testing.
3. There is only the auto range mode for testing capacitors.
4. The capacitance must be completely discharged before testing to protect the meter.
5. A reading over the 400 μ F range will delay 15 seconds.

4-8. Frequency measurement

1. Insert the black test lead into the COM terminal and the red one into the V/ Ω /Hz terminal.
2. Turn the selector knob to the Hz range.
3. Place the test leads to the signal source or the load which is to be tested.
4. Press the **Hz/DUTY** key to switch frequency/duty cycle; it will display the frequency or duty cycle of the signal source which is tested.

Note:

1. There is only the auto range mode under the frequency mode.
2. The meter can still work if the input is higher than 10Vrms, but the accuracy is not guaranteed.
3. In noise environment, you should use shielded cable to measure a low signal.
4. When measuring high voltage circuits, no part of your body should touch the high voltage circuit.
5. Never input a voltage higher than 250V DC or AC peak value, or it may damage the meter.

4-9. Diode performance test:

1. Insert the black test lead into the COM terminal and the red one into the V/ Ω /Hz terminal (the polarity of the red lead is “+”).
2. Turn the selector knob to $\rightarrow \text{V} \rightarrow \Omega$ range, press the **SELECT** key to select the measurement mode. Connect the test leads to the diode being tested, the red test lead connects to the diode positive polarity, the black test lead to the diode cathode polarity, the reading is the approx. value of the diode forward volt drop.
3. With the red test connected to the diode cathode polarity and the black test lead to the diode positive polarity, the LCD will display OL.
4. This will complete diode testing including forward and backward measurement, if the desired result isn't met by performing the above tests; it means the diode is bad.

4-10. Continuity performance test:

1. Insert the black test lead into the COM terminal and the red one into the V/ Ω /Hz terminal.
2. Turn the selector knob to $\rightarrow \text{V} \rightarrow \Omega$ range, press the **SELECT** key to select the Continuity measurement mode.
3. Insert the test leads onto two points of the tested circuit, if the inner buzzer sounds, the resistance is less than 50 Ω .

Note: Never input voltage at “ $\rightarrow \text{V} \rightarrow \Omega$ ” range.

4-11. Temperature measurement

1. Turn the selector knob to the $^{\circ}\text{C}/^{\circ}\text{F}$ range.
2. Using the TP3 temperature probe insert the cathode (black pin) of the cold end (free end) of the probe into the mA terminal jack and the anode (red pin) into the V Ω Hz terminal. Put the working end (temperature measurement end) of the thermocouple on the surface or inside the object to be tested. Read the temperature from the screen, and the data is in Centigrade.
3. Press the **SELECT** key to select Fahrenheit, the data is in degrees Fahrenheit.

Note:

1. When the input terminal is in ambient air, it will display the temperature.
2. Only use the TP01 probe or the value accuracy isn't guaranteed.
3. Never input voltage at temperature range.

4-12. Flame measurement

Testing of flame signals will either be in DC microamps (DC μA) or DC Volts V_{DC} depending on the manufacturer of the control device.

For DC microamps (DC μA) refer to Section 4-4.

For DC volts refer to Section 4-2.

4-13. Data holding

1. The presently measured value is held on the LCD and the **HOLD** symbol displays. Press the **HOLD** button again, the HOLD function is cancelled.


4-14. Auto power off

1. When the meter has not been used for about 15 minutes, the built-in buzzer will sound 5 times and the meter goes into sleeping mode, 1 minute later, the buzzer sounds a long tone 1 time and the meter powers off. Press any key to restart the power.

4-15. Meter maintenance

The 88E is a high accuracy precision instrument; please do not attempt to modify any of the internal circuits.

1. Keep the meter away from water, dust and shock.


2. Do not store and operate the meter under extremes of high temperature, high humidity, combustibles, explosives and strong magnetic areas.
3. Wipe the case with a damp cloth and a mild detergent; do not use abrasives and alcohol.
4. If do not operate the meter for a long time, you should take out the battery to avoid leakage and corrosion.
5. When the  symbol displays, you should replace the battery following the steps:
 - 5-1. Unlock the button and remove the battery case;
 - 5-2. Take out the old battery and replace with new ones. Alkaline batteries are better and have a longer service life.
 - 5-3. Fit on the battery case and lock the button;
6. Fuse change: When replacing the fuse, use a fuse of the same type and specification.

Note:

1. Never input a voltage value higher than DC 1000V or AC 750V
2. Never measure a voltage with the meter selector knob in the current, resistance, temperature, capacitance or diode and continuity range.
3. Never use the meter without a battery installed and the back case closed securely.
4. When replacing the fuse, remove the test leads from the measuring terminals and power off the meter first.

4-16. Troubleshooting

If the meter does not work properly, check the meter as following:

Fault	Solution
No reading on LCD	<ul style="list-style-type: none"> ■ Turn on the power ■ Set the HOLD key to a correct mode ■ Replace battery
 signal appears	<ul style="list-style-type: none"> ■ Replace battery
No current or temperature input	<ul style="list-style-type: none"> ■ Replace fuse
Big Error Value	<ul style="list-style-type: none"> ■ Replace battery

- These specifications are subject to change without notice.
- We hereby will not be responsible for any accident and damage caused by improper operation .The functions stated in this User Manual cannot be exceeded by special usage.

MB-088E-FD.08/10

APPENDIX A

OPERATING INSTRUCTIONS FOR 88CP9 AMP KLAMP

Thank you for purchasing the 88CP9, a smaller sized, convenient to use AC Current Clamp-On Adapter for the Victor 88E Multimeter. The 88CP9 is a 200Amp AC Clamp-on Adapter using the voltage output of the adapter and the standard meter inputs of a multimeter. It can also be used with power harmonics, oscilloscopes, or other voltage measurement devices.

Using the Amp Klamp Safely

Warning

To prevent electric shock, fire and personal injury, carefully read all safety information before attempting to operate the

current Clamp and follow these procedures.

- Do not use the clamp on circuits rated higher than 600V in Installation Category II. Use caution when clamping around un-insulated conductors or bus bars.
- Do not use a Klamp that is cracked, damaged, or has a defective cable. Such Klamps should be made inoperative by taping the Klamp shut to prevent operation and disposed of.
- Check the magnetic mating surfaces of the Klamp jaws; these should be free of dust, dirt, rust, and other foreign matter.
- Keep your fingers off the Klamp jaws.
- Keep your fingers behind the safety barrier as shown in **Figure 1**.

General Specifications:

Output Impedance	<1kΩ
AC Bandwidth	40 to 400Hz
Jaw opening	½ inch or 16 mm
Operating conditions	32°F to 86°F (0°C to 30°C) 90%RH; 86°F to 104°F (30°C to 40°C) 75% RH; 104°F to 122°F (40°C to 50°C) 45% RH
Storage conditions	-22°F to 140°F (-30°C to 60°C); <90% Relative Humidity
Altitude	Operate at less than 9800 feet or 3000 meters
Weight	4.5 ounces
Dimensions	4.25” x 1.9” x 1.25” (H x W x D)
Standards	IEC1010-1 (1995); EN61010-1 (1995) Category II 600V, Category III 300V. CE

Range Specifications

Function	Range	Output	Sensitivity	Accuracy (of reading)
AC Current (50/60Hz)	0 to 200A	1mV/A	1A/mV AC	±2.0%±0.5A

Using the Amp Klamp

To use the Amp Klamp, follow these instructions:

1. Connect the test leads of the Klamp probe to the terminals of the 88E Multimeter.
Insert the black test lead to “COM” terminal and the red test lead to “V/Ω/Hz” terminal.
2. Turn the selector knob on the 88E multimeter to the mV (millivolt) range.
3. Hit to select AC push **SELECT** button on 88E.
4. Position the Klamp jaw perpendicular to and centered around the conductor to be measured.
5. Read the measured value from the 88E LCD display.

Example for using multimeter with the CP09 AC Current Clamp-on Adapter

Current Clamp Sensitivity = 1mV/A. Multimeter displays 100.0mV.

Actual current – display value / sensitivity Current Clamp = 100.0mV/1mV/A=100.0A

EXAMPLE:

When measuring AC current to transformer in a 24Vac circuit, multimeter reads 0.03 mV, actual reading is 0.03 Amps.

When measuring input to typical small powerburner PSC motor, multimeter reads 1.30 mV, actual reading is 1.3 amps.



Figure 1

Description of Amp Klamp 88CP9

1. Current sensing jaw.
2. Klamp trigger (to open).
3. Safety barrier.
4. Voltage output lead.

Safety Information



This symbol, adjacent to another symbol or terminal, indicates the user must refer to the manual for further information.



This symbol, adjacent to a terminal, indicates that, under normal use, hazardous voltages may be present



This symbol denotes Double Insulation