




CEN-TECH 37772 Digital Multimeter User Manual

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CEN-TECH

CEN-TECH 37772 Digital Multimeter User Manual



Save This Manual Keep this manual for safety warnings and precautions, assembly, operating, inspection, maintenance, and cleaning procedures. Write the product's serial number on the back of the manual near the assembly diagram (or the month and year of purchase if the product has no number). Keep this manual and the receipt in a safe and dry place for future reference. When unpacking, make sure that the product is intact and undamaged. If any parts are missing or broken, please call 1-888-866-5797 as soon as possible. Copyright© 2004 by Harbor Freight Tools®. All rights reserved. No portion of this manual or any artwork contained herein may be reproduced in any shape or form without the express written consent of Harbor Freight Tools. Diagrams within this manual may not be drawn proportionally. Due to continuing improvements, the actual product may differ slightly from the product described herein. Tools required for assembly and service may not be included. Read this material before using this product. Failure to do so can result in serious injury. **SAVE THIS MANUAL.**

WARNING SYMBOLS AND DEFINITIONS

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

NOTICE

CAUTION Addresses practices not related to personal injury.

IMPORTANT SAFETY INFORMATION

Safety Warnings and Precautions Read all safety warnings and all instructions. Failure to follow the warnings and instructions may result in electric shock, fire, and/or serious injury

Save all warnings and instructions for future reference.

1. Electrical shock can cause death or injury! NEVER TOUCH exposed conductors of electricity.
2. Inspect the Multimeter before use. In addition to a general inspection, look specifically for:
 - Pay special attention to the insulation protecting the connectors.
 - Check the leads for exposed metal, damaged insulation, and continuity.
 - Replace damaged test lead immediately, before use.
3. Do not use the multimeter if:
 - The test lead is damaged in any way.
 - The battery is low.
 - Near any explosive gasses or fumes.
 - Any abnormal operation is detected.
 - (If in doubt about the condition of the meter, have it serviced.)
 - The battery cover is open.
4. This meter should be powered only by a single, correctly installed 9V battery.
5. Use caution when working near voltages above 30 VAC rms, 42 VAC peak, or 60 VDC. Voltages this high present a risk of electric shock.

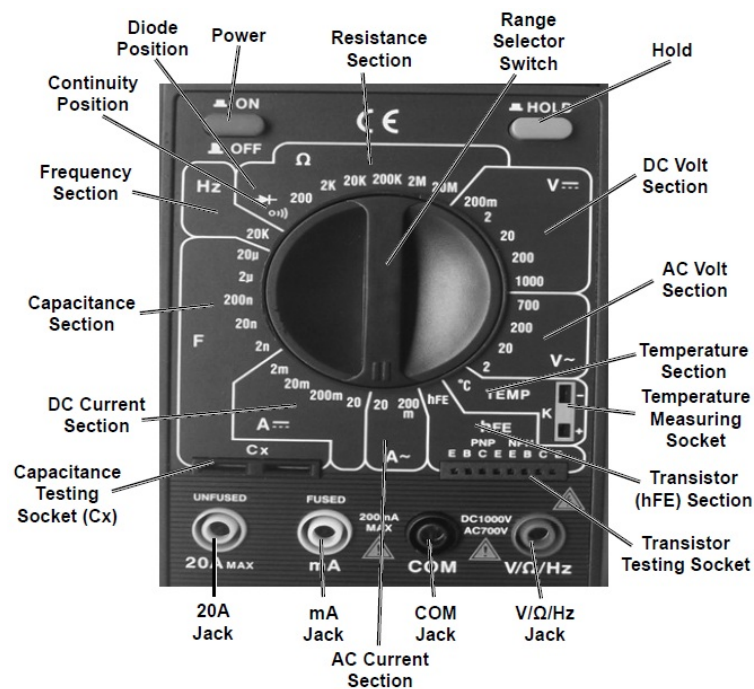
6. Disconnect the circuit's power before connecting the meter in series, when measuring current.
7. Connect the common (COM) test lead first and disconnect it last.
8. Hold the probes with your fingers behind the guards.
9. Avoid electrical shock. Use extreme caution when working near uninsulated conductors or bus bars. Prevent body contact with grounded surfaces such as pipes, radiators, ranges, and cabinet enclosures when testing voltages.
10. Observe work area conditions. Do not test voltages in damp or wet locations. Don't expose to rain. Keep the work area clean and well-lit.
11. Keep children away. Children must never be allowed in the work area.
12. Stay alert. Watch what you are doing, use common sense. Do not operate any meter when you are tired.
13. Do not operate the meter if under the influence of alcohol or drugs. Read warning labels on prescriptions to determine if your judgment or reflexes are impaired while taking drugs. If there is any doubt, do not operate the meter.
14. **WARNING:** This product contains lead, a chemical known to the State of California to cause cancer and birth defects or other reproductive harm. (California Health & Safety Code § 25249.5, et seq.)
15. **WARNING:** The cord of this product contains lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. Wash hands after handling. (California Health & Safety Code § 25249.5, et seq.)
16. People with pacemakers should consult their physician(s) before use. Electromagnetic fields in close proximity to the heart pacemaker could cause pacemaker interference or pacemaker failure.
17. Do not test voltage on circuits higher than 750 volts AC or 1000 volts DC. This type of testing should only be done by a qualified electrician.
18. Do not test current on circuits higher than 20 mA.
19. Store idle equipment. When not in use, meters must be stored in a dry location to decrease exposure to moisture. Lock up meters and keep out of reach of children.
20. Dress properly. Protective, electrically non-conductive clothes and nonskid footwear are recommended when working.
21. Wear ANSI-approved safety goggles during use.
22. Only use accessories intended for use with this meter.
23. The warnings, cautions, and instructions discussed in this instruction manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that common sense And caution are factors that cannot be built into this product but must be supplied by the operator.
24. Avoid damaging the meter. Use only as specified in this manual.
25. Prior to testing, resistance, diodes, or continuity; disconnect all power to the circuit and discharge all high-voltage capacitors.
26. The performance of this meter may vary depending on battery condition.
27. Use the proper settings, terminals, techniques, and range for the tests performed. Start with the range stated in the instructions.
28. Do not apply voltage to the Test Leads when the Multimeter is in the Ohms testing setting. Damage can occur to the multimeter.
29. Do not switch between testing modes with the multimeter connected to a circuit.
30. Do not use the meter at a setting marked as blank on the scale.

31. Prior to testing capacitors, resistance, diodes, or continuity; disconnect all power to the circuit and discharge all high-voltage capacitors.
32. Has the Multimeter been calibrated by a qualified technician every year? A multimeter that is not calibrated yearly may not yield accurate results.

Setup – Before Use

Read the ENTIRE IMPORTANT SAFETY INFORMATION section at the beginning of this manual including all text under subheadings therein before set up or use of this product.

Functions



Specifications

Max. Voltage	1000Vdc/700rms ac (sine)
DC Voltage	Ranges: 200mV/2/20/200/1000V
DC Voltage Accuracy	(@200mV-200V) 0.5% of rdg $\pm 1D$; (@1000V) 0.8% of rdg $\pm 2D$
AC Voltage	Ranges: 200mV/2/20/200/700V Frequency Range: 40-400Hz
AC Voltage Accuracy	(@200mV) 1.2% of rdg $\pm 3D$; (@2-200V) 0.8% of rdg $\pm 3D$; (@700V) 1.2% of rdg $\pm 3D$
DC Current	Ranges: 200 μ A/2mA/20mA/2A/10A
DC Current Accuracy	(@ 200 μ A-20mA) 0.8% of rdg $\pm 1D$ (@200mA-2A) 1.5% of rdg $\pm 1D$ (@10A) 2% of rdg $\pm 5D$
AC Current	Ranges: 200 μ A/2mA/20mA/2A/10A Frequency Range: 40-400Hz
AC Current Accuracy	(@ 200 μ A&200mA) 1.8% of rdg $\pm 3D$ (@ 2mA-20mA) 1.0% of rdg $\pm 3D$ (@ 10A) 3.0% of rdg $\pm 7D$
Resistance	Ranges: 200 Ω /2K Ω /20K Ω /200K Ω /2M Ω /20M Ω
Resistance Accuracy	(@200 Ω) 0.8% of rdg $\pm 3D$; (@2K-2M Ω) 0.8% of rdg $\pm 1D$; (@20M Ω) 1.0% of rdg $\pm 2D$;
Capacitance	Ranges: 2nF/20nF/200nF/2 μ F/20 μ F
Capacitance Accuracy	(@2nf-20 μ F) 4.0% of rdg $\pm 3D$
Frequency	Range: 20KHz
Frequency Accuracy	(@20KHz) 1.5% of rdg $\pm 5D$
Temperature	Range: -20° to 1000°C
Temperature Accuracy	(@-20° to 0°C) 5.0% of rdg $\pm 4D$ (@ 0° to 400°C) 1.0% of rdg $\pm 3D$ (@ 400° to 1000°C) 2.0% of rdg
Sampling Rate	2-3 times/second
Overload Protection	Fast-Acting 200mA/250V Fuse
Operating Temperature	Range: 32° – 104° F
Display	LCD
Battery	One 9 V (included)

Operating Instructions

Read the ENTIRE IMPORTANT SAFETY INFORMATION section at the beginning of this manual including all text under subheadings therein before set up or use of this product.

Tool Set Up

1. There are different functions and 30 ranges provided. A rotary switch is used to select functions as well as ranges.

2. A Power Button is used to turn the meter on or off.
3. A push-push switch (push ON, push OFF) is used to hold data. This switch can be used with all available settings, including DCV, ACV, DCA, ACA, Hz, and C.
4. As a general rule, the LCD display box is locked. To adjust the angle of the display, pull on the top of the meter and rotate it.
5. This meter has four input jacks that are protected against overload to the limits shown. Depending on the intended function, connect either the black or red test lead to the COM jack.
6. **WARNING!** Before attempting to insert a transistor's capacitor thermocouple for testing, disconnect the Test Leads from all measurement circuits.
7. **ARNING!** Before taking voltage measurements with Test Leads, remove the thermocouple. Do not connect Test Leads to the hFE or capacitor socket.

Function	Red Lead connection	Input Limits
200mV ₋ & 200mV _~	V/ Ω or V/ Ω /Hz	250Vdc or rms ac
V & V _~	V/ Ω or V/ Ω /Hz	1000Vdc, 700Vac (sine)
,	V/ Ω or V/ Ω /Hz	250Vdc or rms ac
Hz	V/ Ω or V/ Ω /Hz	250Vdc or rms ac
Ω	V/ Ω or V/ Ω /Hz	250Vdc or rms ac
(μ A) mA & (μ A) mA _~	mA	200mAdc or rms ac
2A & 2A _~	A	2Adc or rms ac
20A & 20A _~	20A	10A dc or rms ac continuous
		20A for 15 seconds maximum

Additional Multimeter Precautions

1. Do not test voltage on AC circuits higher than 700 volts.
2. Do not test voltage on DC circuits higher than 1000 volts.
3. Do not test current on circuits higher than 20 amps.
4. Be careful not to apply voltage to the Test Leads when they are connected to the COM and V Ω mA Jacks or when the Multimeter is in an Ohms testing setting. Damage can occur to the multimeter and the fuse may blow.
5. Do not switch between testing modes with the multimeter connected to a circuit.

General Operating Instructions

AC Voltage Measurements Measure AC conductors carrying up to 700 VAC, 45-450 Hz.

1. Turn the Range Selector Switch to 700 ACV setting. Start with the highest range if the voltage is unknown.
2. Plug the red lead into the V/ Ω /Hz Jack. Plug the black lead into the COM Jack. Switch the Multimeter ON.
3. Carefully touch the exposed conductors with the tips of the probes to measure the voltage (not amperes).
4. Read the measurement. If the voltage is less than 200 volts, set the Range Selector Switch to the lower range.
5. When testing is complete, remove Test Leads and store them with a multimeter.

DC Voltage Measurements

1. Measure DC conductors carrying up to 1000 VDC.
2. Turn the Range Selector Switch to 1000 DCV setting. Follow the directions above under
3. "AC Voltage Measurements", only use the DC settings instead

AC Current Measurements

Measure AC conductors carrying up to 20 amperes.

1. Turn the Range Selector Switch to the 20A~ position. Start with the highest range if the amperage is unknown.
2. Plug the red lead into the 20A Jack. (For current under 20A, plug the red lead into the mA Jack.) Plug the black lead into the COM Jack. Switch the Multimeter ON.

Carefully touch the exposed conductors with the tips of the probes to measure the amperage.

Note: Amperage is always tested in series with the circuit under test.

3. Read the measurement. If the reading is less than 0.2 amps, switch the red lead to the VΩmA Jack and set the Range Selector Switch to the 200 mA setting.
4. When testing is complete, remove Test Leads and store them with a multimeter.

DC Current Measurements

Measure DC conductors carrying up to 20 amperes.

1. Turn the Range Selector Switch to the 20A position. Start with the highest range if the amperage is unknown.
2. Follow the directions above under "AC Current Measurements", only use the DC settings instead.

Resistance Measurements

Measure circuit resistance up to 20M Ohms.

WARNING! Do not measure the resistance on the circuit with voltage running through it. Notice: When measuring Ohms, start with the lowest range if the resistance is unknown.

1. Turn the Range Selector Switch to the 200Ω position.
2. Plug the red Test Lead into the V/Ω/ Hz Jack. Plug the black Test Lead into the COM Jack. Switch the Multimeter ON. Short the Test Leads together. The meter should read "0" Ohms.
3. Touch the exposed conductors with the tips of the Test Leads Read measurement. If the reading is "1", set the Range Selector Switch to the next higher Ohm (Ω) position. 5. When measuring resistance above 1 MΩ, the meter may take a few seconds to give a stable reading. This is normal for high-resistance measurements.
4. At the 20MΩ range, the display reading will be around 0.1 counts over the actual measurement.
5. These counts should be subtracted from the resulting reading. For example, when measuring MΩ resistance, the display will read 10.1, but the correct measurement should be $10.1 - 0.1 = 10.0\text{M}\Omega$
6. Remove and store Test Leads.

Capacitance Measurements

Measure capacitance up to 20μF.

1. Turn the Range Selector Switch to the 20μF position. Start with the highest range if the capacitance is

unknown.

WARNING! Fully discharge the capacitor before measuring

2. Plug the capacitor into the capacitance testing socket (Cx).
3. Switch the Multimeter ON.
4. Read measurement. If the reading is less than 20 μ F, set the Range Selector Switch to a lower range.

WARNING! Avoid electric shock. Remove the capacitor before switching between testing modes.

Frequency Measurements

Measure frequency up to 20kHz.

1. Turn the Range Selector Switch to the 20kHz position.
2. Plug the red Test Lead into the V/ Ω /Hz Jack. Plug the black Test Lead into the COM Jack. Switch the Multimeter ON.
3. **Note:** Reading is possible at input voltages above 10Vrms, but the accuracy is not guaranteed.
Note: In noisy environments, use a shielded cable to measure smaller signals.
4. Remove and store Test Leads.

Transistor (hFE) Measurements

Test transistors to ensure proper function.

1. Turn the Range Selector Switch to the hFE position. Switch the Multimeter ON.
2. Insert transistor pins into the appropriate holes of the hFE testing socket (NPN or PNP) according to the EBC (Emitter, Base, Collector) sequence.
3. The meter will show the approximate hFE value at the test condition of base current 10 μ A and Vce 3.2V.
4. Remove and store Transistor.

Diode Measurement

Test the voltage drop in diodes.

1. Turn the Range Selector Switch to the Diode () position.
2. Plug the red Test Lead into the V/ Ω /Hz Jack. Plug the black Test Lead into the COM Jack. Switch the Multimeter ON
3. Connect the red probe to the anode of the diode and the black to the cathode.
4. The approximate forward voltage drop of the diode will be displayed in mV. If the connection is reversed, only "1" will be shown.
5. Remove and store Test Leads.

Continuity Measurement

Test continuity between two points of a circuit.

1. Turn the Range Selector Switch to the position. Switch the Multimeter ON.
2. Connect Test Leads to two points of the circuit. If continuity exists (i.e., resistance is less than 50 Ω), a buzzer will sound.
3. Remove and store Test Leads.

Temperature Measurement

1. Turn the Range Selector Switch to the TEMP position. Switch the Multimeter ON. The display will show the current ambient temperature.
2. Plug a "K"-type thermocouple into the temperature-measuring socket
3. Contact object to be measured with the thermocouple probe.

Read measurement.

WARNING! Avoid electric shock. Remove the thermocouple before switching between testing modes.

Maintenance and Servicing

Procedures not specifically explained in this manual must be performed only by a qualified technician.

Cleaning, Maintenance, and Lubrication

1. Wipe the unit with a dry, lint-free cloth. Do not use solvents or abrasives.
2. Remove the battery if not in use for long periods.
3. Store the unit in a dry location.
4. Other than the battery and fuse, there are no replaceable parts on this unit. Repairs should be done by a qualified technician.

Battery/Fuse Replacement

If the sign " " appears on the LCD display, the battery should be replaced.

1. Remove the Test Leads from the multimeter.
2. Turn the unit over.
3. Remove screws.
4. Remove the back cover carefully. There may be wires attached.
5. Pull the battery/fuse out of the unit and replace it with the same. (9V battery or F 2A/250V (quick acting) fuse)
6. Replace the cover and retighten the screws.

Note: If the product has no serial number, record the month and year of purchase instead.

Limited 90-Day Warranty

Harbor Freight Tools Co. makes every effort to assure that its products meet high quality and durability standards, and warrants to the original purchaser that this product is free from defects in materials and workmanship for the period of 90 days from the date of purchase. This warranty does not apply to damage due directly or indirectly, to misuse, abuse, negligence or accidents, repairs or alterations outside our facilities, criminal activity, improper installation, normal wear and tear, or to lack of maintenance. We shall in no event be liable for death, injuries to persons or property, or for incidental, contingent, special or consequential damages arising from the use of our product. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation of exclusion may not apply to you. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

To take advantage of this warranty, the product or part must be returned to us with transportation charges prepaid.

Proof of purchase date and an explanation of the complaint must accompany the merchandise. If our inspection verifies the defect, we will either repair or replace the product at our election or we may elect to refund the purchase price if we cannot readily and quickly provide you with a replacement. We will return repaired products at our expense, but if we determine there is no defect, or that the defect resulted from causes not within the scope of our warranty, then you must bear the cost of returning the product. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

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