

# **HOBICO<sup>®</sup>**

## **DIGITAL R/C MULTI-METER**

### **OPERATION MANUAL**



#### **PLEASE READ THESE OPERATING INSTRUCTIONS CAREFULLY.**

Misuse and/or abuse of this instrument may cause injury and/or damage to the meter or the equipment under measurement. Please read and follow all instructions carefully. Please inspect the meter and test probes for wear or abnormalities prior to every use. If a flaw exists, do not attempt to take any measurements. Replace the damaged equipment. Never touch exposed wiring, connection, or line circuit conductors when attempting to take measurements. Damage resulting from a failure to follow instructions will void the warranty.

## FEATURES

- Pocket-size
- Simple operation
- 300 hour battery life
- Maximum 10A DC current range
- Recessed safety designed input terminals
- Built-in table stand
- Overload protection on all ranges
- Diode test function
- Audible continuity buzzer
- R/C battery test function with 250mA simulated load and go/no-go LED
- 15 minute auto-off function

## SPECIFICATIONS

Display:	3-½ digit LCD, 0.5" numerals, maximum reading "1999" with automatic polarity sign and weak LCD battery indicators
Overrange Indication:	A "1" will blink in the most significant digit
Sampling Rate:	2.5 times per second
Operating Environment:	32° to 122°F (0° to 50°C) at less than 70% relative humidity
Storage Environment:	-4° to 140°F (-20° to 60°C) at less than 80% relative humidity
Power Source:	One 9V carbon zinc battery
Power Consumption:	30mW typical
Battery Life:	300 hours typical
Sleep Mode:	15 minute auto-off timer
Low Battery Indicator:	Battery symbol in LCD window

Max. Common Mode Volts:	500V DC or AC peak voltage
Accuracy Temp. Coefficient:	(10°C-18°C and 28°C-50°C) less than 0.1x applicable accuracy specification per degree C
Fuse:	0.8A, 250V, 5 x 20mm fast acting cylindrical glass
Dimensions:	5.0" x 2.8" x 1.4"
Weight:	Approximately 7.0oz. (200g) including battery

## RANGES

Accuracies are +/- (% of reading + number of digits) at 23°C (+/-5°C), less than 75% relative humidity.

### R/C Battery Check

Range	Resolution	Red LED	Green LED
4.8V	0.01V	2.0 - 4.7V	4.9V or higher
6.0V	0.01V	2.0 - 5.9V	6.1V or higher
9.6V	0.01V	2.0 - 9.5V	9.7V or higher

Overload protection: 0.8A / 250V fuse on mA inputs.

Load current each selection: 250mA

### DC Voltage

Range:	2V, 20V, 200V +/- (0.8% of reading + 1 digit)
Overload protection:	1000V DC or 750Vrms AC for 15 seconds
Impedance:	10M $\Omega$

### AC Voltage (50-400Hz)

200V selection:	+/- (1.5% of reading + 4 digits)
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500V selection:	+/- (2.0% of reading + 4 digits)
Overload protection:	1000V DC or 750Vrms AC for 15 seconds
Impedance:	10M $\Omega$

### DC Current

Range:	2mA, 20mA, 500mA +/- (1.2% of reading + 1 digit)
10A selection:	+/- (2.0% reading + 3 digits)
Overload protection:	0.8A / 250V fuse, no protection for 10A selection

### Resistance

200 $\Omega$ selection:	+/- (1.5% reading + 3 digits)
2k $\Omega$ , 20k $\Omega$ , 200k $\Omega$ , 2M $\Omega$ :	+/- (1.0% of reading + 1 digit)
Overload protection:	400V DC / AC rms

### Diode Test

Test current:	1.0mA +/- 0.6mA
Test voltage:	3.2V maximum

### Continuity Test

Audible indication:	less than 50 $\Omega$ approx.
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## SAFETY RULES

1. Read these operating instructions thoroughly and completely before operation. Pay close attention to the **WARNINGS** and **CAUTIONS** which will inform of potentially dangerous procedures.
2. Always inspect your meter, test probes and accessories for any sign of damage or abnormality before every use. If any abnormal conditions exist (broken test probes, cracked plugs,

faulty display, etc.), do not attempt to take any measurements. Refer to the Troubleshooting Guide at the rear of this manual for further information.

3. Never ground yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures, etc., which might not be at ground potential. Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.
4. Never touch exposed wiring, connections or any live circuit conductors when attempting to take measurements.
5. Never replace the protective fuse inside the meter with a fuse of a different rating.
6. When testing for voltage, make sure the voltage function is operating properly by reading a known voltage in that range before assuming that a zero reading indicates a no-voltage condition.
7. Calibration and repair on the meter itself should be performed only by a qualified technician.
8. To avoid electric shock use **CAUTION** when working with voltages above 40V DC or 20V AC. Such voltages pose a shock hazard, and should always be considered dangerous.




## FRONT PANEL CONTROLS

1. Digital Display: A 3-½ digit liquid crystal display (LCD), with 0.5" numerals, maximum reading of "1999" with automatic polarity sign and low battery indicator (see figure 1).
2. Rotary Selector Switch: Select desired measurement by rotating dial to the appropriate position.
3. Input Terminals: Color coding of the measurement selections helps determine which banana jacks (recessed for safety) the probes should be connected to for measurement.



## BATTERY REPLACEMENT

This meter has a self-contained 9V battery which can be easily replaced if necessary. When the low battery indicator  appears on the LCD, or if the LCD will not illuminate in any way, the internal 9V battery is likely in need of replacement (see figure 2).

**WARNING:** Before attempting to replace the battery, first disconnect the test probes from any energized circuit and then disconnect the test probes from the instrument.

1. Disconnect the test probes from any energized circuit, and from the meter.
2. Turn the dial to the “OFF” position.
3. Remove the single screw from the rear of the case with a Phillips screwdriver.
4. Remove the battery from the case, and disconnect the connector.
5. Replace the battery with another 9V type battery. These batteries can be found at any local convenience or department store.
6. Reverse the above procedure to close the meter’s case.

## FUSE REPLACEMENT

A 0.2A, 250V, 5 x 20mm fast acting glass fuse is installed inside the meter and is used to protect the ampere ranges (but NOT including the 10A range). If the DC Current ranges (except the “10A ONLY” range) do not operate, the internal fuse may need to be replaced. Refer to figure 2.

**WARNING:** Before attempting to replace the fuse, disconnect the test probes from any energized circuit and then disconnect the test probes from the instrument. Replace the fuse only with a fuse with equivalent ratings. Always use fast acting type fuses.

1. Disconnect the test probes from any energized circuit and then from the meter.
2. Turn the dial to the “OFF” position.
3. Remove the single screw from the rear of the case with a Phillips screwdriver.



4. Remove the battery from the battery clip.
5. Remove the fuse from the clips located in the center of the p.c. board.
6. Install the replacement fuse (making certain it is of the same specifications as the original fuse). Prior to inserting the fuse, make sure each clip is crimped so that the fuse will be held tightly inside the clips when inserted. A loose fuse inside the clips will cause intermittent operation of the meter.
7. Replace the battery and rear cover by reversing the above procedure.

## OPERATION

The Digital R/C Multi-Meter's selection ranges and input jacks are color coded for convenience and safety. **The red test probe should always be inserted in the input jack whose color matches the color of the range in which the dial is positioned.** If the dial is set anywhere in the yellow range, for example, the red test probe must be in the jack marked yellow, and so on. Before making any measurements always examine the meter and accessories for damage, contamination (like dirt, oil, or water, etc.) and defects. Examine the test probes for cracked or frayed insulation and make sure the probes plug snugly into the meter's jacks. If any abnormal conditions exist do not attempt to make any measurements and refer to the Troubleshooting Guide in the rear of this manual for further instructions.

### AC or DC Voltage Measurements

1. Insert the black probe into the black "GROUND" jack, and the red probe into the red "VOLTS AND  $\Omega$ " jack.
2. Move the dial to the 200V DC position if DC volts are to be measured, or into the 500V AC position if AC volts are to be measured. Always start in the highest range of the function

being measured and work down from there. Note these areas of the selection range are red in color, to match the color of the proper jack in which the red test probe should be inserted for this type of measurement. **CAUTION:** To avoid possible electric shock, instrument and/or equipment damage, do not attempt to take any voltage measurements if the voltage is above 200V DC or if the voltage is unknown. The “GROUND” jack potential should not exceed 500V measured to ground.

3. Apply the test probes to the two points at which the voltage reading is to be taken. Be careful not to touch any energized conductors with any parts of your body.
4. Turn the dial to the next lower range for a more accurate reading only if the reading is within that next lower range.
5. When measurements are completed, disconnect the test probes from the circuit under test.

## **DC Current Measurements**

**WARNING:** This meter is NOT designed to measure AC current. Attempts to measure AC current could cause permanent damage to the meter and/or the equipment under test and void the warranty.

1. Always start at the highest range of the function to be measured and move down from there.
2. Insert the black probe into the black “GROUND” jack, and the red probe into the blue “10A ONLY” jack.
3. Adjust the dial to the blue “10A” position. Note this area of the selection range is blue in color to match the color of the proper jack in which the red test probe should be inserted for this type of measurement only. **CAUTION:** The 10A range is NOT protected in any way and has a very low internal resistance. Do not attempt to take a current measurement if the current is unknown or above 10A DC. The “GROUND” terminal potential should not exceed 500V measured to ground.

4. Completely de-energize the circuit in which the current is to be measured. Place the meter in series with the conductor carrying the current which is to be measured. Energize the circuit.
5. If the reading is less than 0.20 amps, you can move the dial to a lower selection for greater accuracy. **CAUTION:** Before changing ranges, always de-energize the circuit completely. Failure to do so could damage the meter or equipment under test and void the warranty.
6. Before moving the dial to a lower current range, you must first move the red probe to the yellow “mA AND R/C BATT” jack (noting the DC current selection range is yellow in color to match the proper jack color). Then, move the dial to the 500mA DC Current selection. **CAUTION:** The mA ranges are fuse protected. To avoid possible electrical shock, meter damage and/or equipment damage **do not:**
  - A. Attempt to take mA current readings on circuits having more than 500mA (0.5A) of current flow.
  - B. Apply a voltage between the “GROUND” and “mA” jacks exceeding 250V AC or DC, as permanent equipment damage and/or injury could result. Partial circuit damage may result for voltages below 250V AC or DC.
  - C. Raise the “GROUND” terminal potential above 500V to ground.
  - D. Energize the circuit. If the reading is within the next lower range, switch to that range after completely de-energizing the circuit under test. Re-energize the circuit and try again. Continue changing to lower ranges if the reading is within the next lowest range to obtain the best accuracy.

### **Resistance and Diode Measurements, and Continuity Check**

1. Insert the black probe to the black “GROUND” jack, and the red probe into the red “VOLTS AND  $\Omega$ ” jack. **CAUTION:** All

resistance and diode measurements should be taken on de-energized circuits only. To avoid possible electrical shock, instrument and/or equipment damage, do not connect the “GROUND” and “VOLTS AND  $\Omega$ ” jacks to circuits having a potential difference exceeding 250V AC or DC. Do not connect the “GROUND” terminal to potentials exceeding 500V to ground.

2. Set the dial to the proper “ $\Omega$ -Resistance” range desired for measurement (again noting this selection area is red to match the color of the proper jack in which to insert the red test probe).
3. For **resistance** measurements:
  - A. Completely de-energize the circuit or device which is to be measured.
  - B. Connect the test probes to the device. A reading of “1.---” indicates an overrange condition, meaning the actual measured resistance value of the device under test is too large for the current position of the dial. Move the dial to the next highest resistance range and try again. If overrange occurs again, move to the next highest setting until a reading is displayed.
4. For **diode** measurements:
  - A. The “DIODE” test range measures resistance from 000  $\Omega$  up to 1999  $\Omega$  and is used to test the forward resistance value of diodes.
  - B. Connect the red probe to the diode’s anode, and the black probe to the cathode. **Note:** On most diodes, the negative or cathode side is marked with a line around the diode.
  - C. A reading of “1.---” indicates a resistance greater than is normal ( $>2k \Omega$ ), which means the diode has an open circuit and is defective. This reading could be displayed if the meter is connected to the diode in reverse, in which event the probes need to be reversed to properly measure the diode. A reading of approximately “.700” is normal and typically indicates the diode is good.

5. For **continuity** measurements:
  - A. Move the dial to the selection marked “DIODE” with the buzzer icon underneath.
  - B. Touch the red and black probes together to confirm the audible buzzer sounds and that the LCD reads “.000”.
  - C. Completely de-energize the circuit or device which is to be measured. Place the probes across the conductor or circuit to be measured.
  - D. If the buzzer sounds and LCD reads “.000”, perfect continuity is occurring.
  - E. If the buzzer sounds and the LCD reads under “.050”, only partial continuity exists (a small resistance exists somewhere in the circuit).
  - F. If the buzzer does not sound and the LCD reads a value greater than “.050”, continuity does not exist.

### **R/C Battery Test Measurements**

1. Insert the black probe into the black “GROUND” jack, and the red probe into the yellow “mA AND R/C BATT” jack.
2. Place the dial into the proper “R/C BATT” position to match the battery being tested; 4.8V is for 4-cell packs, 6.0V is for 5-cell packs, and 9.6V is for 8-cell packs. **Note: The meter automatically applies a 250mA load to the battery under test any time the dial is one of these three positions. This is to test the battery under a similar load to that typically drawn by most R/C transmitters or flight systems to see if the battery is capable of operating under load.**
3. Connect the probes to the battery to be tested. Make certain the black probe is connected to the negative (-) terminal on the battery (usually a black or brown wire) and the red probe is connected to the positive (+) terminal (red wire). **WARNING:** Do not allow the black and red probes, or the battery’s positive (+ red) or negative (-) leads to touch at any

time. Permanent damage to the meter or equipment under test could result and void the warranty. It is highly recommended to remove the battery from either the Tx or Rx before testing. Inaccurate readings could result as a failure to follow these instructions.

4. If the measured voltage exceeds the rating for that battery, the 2-color LED on the far left of the meter will illuminate green to indicate the battery is “OK” to use. The LED will illuminate a red color to indicate the battery is not O.K. and requires a charge “CHG” prior to use. **WARNING:** In no way does this function accurately indicate the precise amount of **capacity** remaining in the battery. The only way to attain such information is by using a cyclor. This function simply provides an indication of the instantaneous state of charge of the battery and its ability to withstand a load condition, and should not be used to gauge the amount of safe flying time left on the batteries.


## SLEEP MODE

This meter has a built-in auto-off timer that will turn off the meter if no activity has occurred within 15 minutes. This is to maximize the lifespan of the battery. Sleep mode can occur when the dial is adjusted to any setting except the “OFF” position. To revive the meter during sleep mode, simply rotate the dial to another selection and the LCD should illuminate indicating the meter is ready.

**WARNING:** Sleep mode simply turns off the meter’s display circuitry but does not disconnect the input jacks from internal electrical connections. While in sleep mode, make sure the probes

are not touching any live electrical circuitry to prevent accidental short circuits and possible damage to the meter and/or other equipment. It is always important to keep the probes completely clear of any live electrical circuitry when not in use.

## TROUBLESHOOTING GUIDE

**Problem:** LCD is fading or does not display - battery indicator  illuminates on LCD.

**Possible Cause and Cure:** Internal 9V battery going dead, replace battery.

**Problem:** LCD always reads "1.---".

**Possible Cause and Cure:**

- Range selection too low, adjust dial to next highest selection.
- For diodes, probes are backwards, reverse probes on diode.
- For diodes, diode may be defective, discard diode.
- Poor connection with probes, recheck all connections.

**Problem:** LCD always reads a negative value.

**Possible Cause and Cure:** Probes are backwards, either disconnect probes from device under test and connect in reverse to the meter's jacks or reverse probes on device being measured.

**Problem:** "R/C Batt" LED will not go red.

**Possible Cause and Cure:** Range selection in wrong position, adjust dial up to the proper setting.

**Problem:** "R/C Batt" LED will not go green.

**Possible Cause and Cure:**

- Range selection in wrong position, adjust dial down to the proper setting.
- Defective battery under test, may need to be cycled or replaced.

**Problem:** Display always reads “.000” in current ranges.

**Possible Cause and Cure:** Internal fuse blown, replace fuse.

**Problem:** Display behaves strangely, readings are incomprehensible.

**Possible Cause and Cure:**

- Dial in wrong setting or range, disconnect probes and adjust dial to proper position.
- Probes are in wrong jacks, disconnect probes from equipment under test and move to proper jacks.
- Poor connection with probes, recheck all connections.
- Frayed or broken probe, replace probe.
- Range selection too high, move dial to lower setting for better accuracy.
- Internal problem with meter, return to Hobby Services for repair.

### 1 YEAR LIMITED WARRANTY

**HOBBICO** warrants this product to be free from defects in materials and workmanship for a period of one (1) year from the date of purchase. During that period, we will repair or replace, at our option, any product that does not meet these standards. You will be required to provide proof of purchase (receipt or invoice).

If, during the 1 year warranty period, your **HOBBICO** product shows defects caused by abuse, misuse, or accident, it will be repaired or replaced at our option, at a service charge not greater than 50% of the current retail list price. Be sure to include your daytime phone number in case we need to contact you about your repair.

*Under no circumstances will the purchaser be entitled to consequential or incidental damages as a result of using this product.*

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

If you attempt to disassemble or repair this unit yourself it may void the warranty.

For service to your **HOBBICO** product, either in or out of warranty, send it post paid and insured to:

**Hobby Services**

1610 Interstate Drive

Champaign, IL 61822

(217) 398-0007

Internet: [www.hobbico.com](http://www.hobbico.com)

E-mail: [productsupport@hobbico.com](mailto:productsupport@hobbico.com)