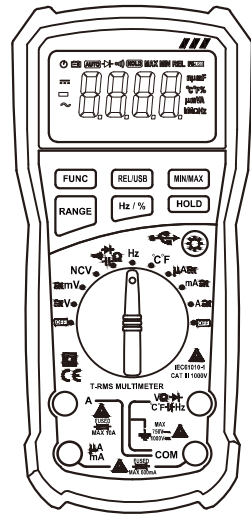


True RMS Auto Range Digital Multimeter

68 Series



Instruction Manual

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1. INTRODUCTION

Congratulations on your purchase of 68 series True RMS Auto range multimeter. This range meters have been designed according to IEC-61010-2-032 concerning electronic measuring instruments with 1000V CAT III & CAT IV and pollution 2.

This range meters measures AC/DC Voltage, AC/DC Current, Resistance, Diode Test, Continuity, Capacitance, Frequency, Transistor, Temperature, and Non-Contact Voltage Detection. It features a rugged design for heavy duty use. Proper use and care of this meter will provide many years of reliable service.

To fully utilize this meter, please keep this manual for reference carefully.

Function	Model No.		
	68A	68B	68C
Max. Display	4000 counts	4000 counts	6000 counts
Basic Accuracy	0.5%	0.5%	0.5%
DC Voltage Range	40mV-1000V	40mV-1000V	60mV-1000V
AC Voltage Range	40mV-750V	40mV-750V	60mV-750V
DC Current Range	400µA-10A	400µA-10A	600µA-10A
AC Current Range	400µA-10A	400µA-10A	600µA-10A
Resistance (Ω)	400Ω-40MΩ	400Ω-40MΩ	600Ω-60MΩ
Capacitance (CAP)	10nF-100mF	10nF-100mF	10nF-100mF
Frequency (Hz)	10Hz-10MHz	10Hz-10MHz	10Hz-10MHz
Temperature Test (°C/°F)	-	-20°C-1000°C -4°F-1832°F	-20°C-1000°C -4°F-1832°F
Transistor hFE Test	Yes	-	-
Diode Test	Yes	Yes	Yes
Continuity Check	Yes	Yes	Yes
Duty Cycle	Yes	Yes	Yes
NCV (Non-Contact Voltage) Detection	Yes	Yes	Yes
LINE (Live Wire Recognition) Test	Yes	Yes	Yes
Max. Input Protection	Yes	Yes	Yes
Relativity (Zero)	Yes	Yes	Yes
LCD Backlight	Yes	Yes	Yes
USB Interface	-	-	Yes

2. SAFETY

⚠ This symbol indicates that the operator must refer to an explanation in the Operating Instruction to avoid personal injury or damage to the meter.

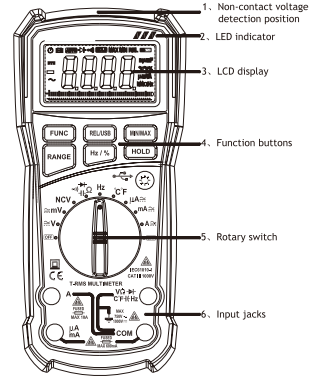
CAUTIONS:

- Improper use of this meter can cause damage, shock, injury or death. Read and understand this user manual before operating the meter.
- Always remove the test leads before replacing the battery or fuses.
- Inspect the condition of the test leads and the meter itself for any damage before operating the meter.
- Do not measure voltage if the voltage on the terminals exceeds 1000V above earth ground.
- Use great care when making measurements if the voltages are greater 30VAC RMS or 60V DC, these voltages are considered a shock hazard.
- Always discharge capacitors and remove power from the device under test before performing Diode, Resistance or Continuity tests.
- To avoid damages to the meter, do not exceed the maximum limits of the input values shown in the specification.
- In case the device is going to be unused for an extended period of time, remove the batteries to prevent them from draining.

3. DESCRIPTION

3.1 Controls and Jacks

- Non-contact voltage detection position
- LED indicator
- LCD display
- Function buttons
- Rotary switch
- Input jacks

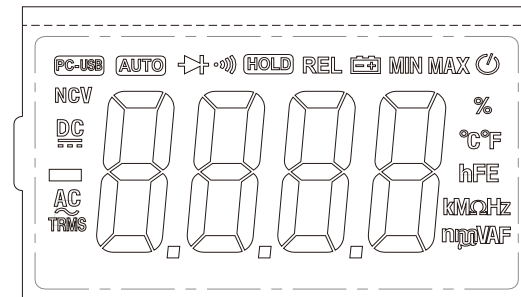


Note: Tilt stand and battery compartment are on rear of unit

3.2 Front Panel Description

1	NCV Detection (Non-Contact Voltage)	Move the rotary switch to NCV position, hold the meter once detect the voltage, meter will be alarmed and LED flash
2	LED Indicator	Once NCV alarm, LED indicator will flash, if detect voltage increasing, the LED twinkles faster. NVC alarm together with beeper sound.
3	LCD Display	The measured readings and symbols will be displayed in this area.
4	Function Buttons	<p>FUNC: the function select key that acts with trigger. Use this key as switch to shift the measures of DC/AC, Resistance/Continuity/Diode/ °C/°F</p> <p>REL: Press the "REL" key, you can measure the relative value and "REL" sign will appear on the LCD display in the relative mode; Hold the button for 2 sec. to activate USB communication with PC</p> <p>MIN/MAX: Press this button LCD shows Max. value, Min. value and difference value between max. & min., holding the button to exit this mode</p> <p>RANGE: It is the auto/manual measurement push key, the default is auto measurement once power is on, to press one more time, will switch to manual measurement. If press and hold this key over 2sec, the meter will switch to auto measurement mode. You can also manually choose the ranges once measures Voltage & resistance.</p> <p>Hz/%: the function shift button on frequency and duty cycle measurement, valid under AC measuring modes.</p> <p>HOLD: Press this button to lock the readings in the LCD, press again to exit the hold mode.</p> <p>Press "⊙" to switch the back light mode, around 15sec. exit from back light mode.</p>
5	Rotary Switch	By moving the rotary switch to each individual range of measurement or to the range needs to be measured
6	Input Jacks	<p>VΩ: the positive input terminal for voltage, resistance, diode, temperature, frequency, capacitance, etc</p> <p>COM: the negative input terminal for voltage, diode, temperature, etc</p> <p>mA: the input terminal for lower 600mA current</p> <p>A: 10A input terminal</p>

3.3 Symbols of LCD display



Symbol	Description	Symbol	Description
	Data Hold		Low Voltage Indication
	Diode Test		Low Pass Filter Function
	Max. Value Hold		Non-Contact Voltage Detection
	Unit of Voltage		Unit of Current
	Unit of Frequency		Unit of Capacitance
	Unit of Resistance		Unit of Inductance
	Transistor		Centigrade Temperature
	True RMS Measurement		Fahrenheit Temperature
	Duty Cycle Measurement		Relative Value Measurement

4. TECHNICAL SPECIFICATIONS

4.1 General Specifications

- Auto range 4000 count digital multimeter (68A/68B) / Auto range 6000 count digital multimeter (68C)
- Overload protection, full range protection
- Data hold function
- Relative mode measurement
- Low voltage indication
- Backlight
- Auto power off
- Max. input voltage: AC750VRMS, DC1000V
- Sampling rate: Approx. 2/sec
- Operating Temperature: 0°C-40°C (32°F-104°F)
- Operating Humidity: < 80%RH
- Storage Temperature: -10°C-60°C (14°F-122°F)
- Storage Humidity: < 70%RH
- Power Supply: 9V Battery (6F22) x 1pc
- Dimension: 200 x 92 x 60mm (L x W x H)
- Weight: Approx. 230g (include battery)
- Accessory: user manual, test leads, gift-box, temperature probe (for 68B & 68C), transistor test kit (for 68A)

4.2 Measurement Specifications

Accuracy: ±(%readings + digit), warranty period: 12 months)
Environment temperature: 18°C-28°C; humidity: ≤80%

4.2.1 DC Voltage

Range	Resolution	Accuracy
40mV/60mV	0.01mV	±(0.5% reading + 5 digits)
400mV/600mV	0.1mV	
4V/6V	0.001V	±(0.8% reading + 3 digits)
40V/60V	0.01V	
400V/600V	0.1V	±(1.0% reading + 5 digits)
1000V	1V	

Input impedance: 10MΩ; Max. input voltage: 1000V DC

4.2.2. AC Voltage

Range	Resolution	Accuracy
40mV/60mV	0.01mV	±(1.0% reading + 20 digits)
400mV/600mV	0.1mV	
4V/6V	0.001V	±(0.8% reading + 5 digits)
40V/60V	0.01V	
400V/600V	0.1V	±(1.0% reading + 5 digits)
750V	1V	

Input impedance: 10MΩ
Max. input voltage: 750V ACRMS
Frequency range: 40-1000Hz

4.2.3 DC Current

Range	Resolution	Accuracy
400µA/600µA	0.1µA	±(1.0% reading + 5 digits)
4mA/6mA	0.001mA	
40mA/60mA	0.01mA	±(0.8% reading + 5 digits)
400mA/600mA	0.1mA	
4A/6A	0.001A	±(1.0% reading + 10 digits)
10A	0.01A	

Overload protection: fuse FF500mA/500V for mA range
fuse FF10A/500V for 10A range

4.2.4. AC Current

Range	Resolution	Accuracy
400µA/600µA	0.1µA	±(1.2% reading + 5 digits)
4mA/6mA	0.001mA	
40mA/60mA	0.01mA	±(1.5% reading + 5 digits)
400mA/600mA	0.1mA	
4A/6A	0.001A	±(1.8% reading + 15 digits)
10A	0.01mA	

Overload protection: fuse FF500mA/500V for mA range,
fuse FF10A/500V for 10A range

Frequency range: 40-1000Hz

4.2.5 Resistance

Range	Resolution	Accuracy
400Ω/600Ω	0.1Ω	±(0.8% reading + 5 digits)
4kΩ/6kΩ	0.001kΩ	
40kΩ/60kΩ	0.01kΩ	±(0.8% reading + 5 digits)
400kΩ/600kΩ	0.1kΩ	
4MΩ/6MΩ	0.001MΩ	±(1.2% reading + 15 digits)
40MΩ/60MΩ	0.01MΩ	

Overload protection: 250V DC or 250V AC RMS

4.2.6 Diode and Continuity

Range	Function
	Display approximate forward voltage of diode
	Built-in buzzer will be sounded if resistance is less than 30Ω

4.2.7 Temperature (for 68B and 68C)

Range	Resolution	Accuracy
-20°C - 400°C	1°C	±(2.0% reading + 3 digits)
400°C - 1000°C		
-4°F - 752°F	1°F	±(2.0% reading + 3 digits)
752°F - 1832°F		

Overload protection: 250V DC or 250V AC RMS

4.2.8 Frequency

Range	Resolution	Accuracy
10Hz	0.01Hz	±(0.5% reading + 2 digits)
100Hz	0.1Hz	
1kHz	0.001kHz	
10kHz	0.01kHz	
100kHz	0.1kHz	
1MHz	0.001MHz	
10MHz	0.01MHz	

Overload protection: 250V DC or 250V AC RMS

4.2.9 Capacitance

Range	Resolution	Accuracy
10nF	0.01nF	±(4.0% reading + 25 digits)
100nF	0.1nF	
1µF	0.001µF	±(4.0% reading + 15 digits)
10µF	0.01µF	
100µF	0.1µF	
1mF	1µF	±(5.0% reading + 25 digits)
10mF	10µF	
100mF	100µF	

Overload protection: 250V DC or 250V AC RMS

Note: It is normal once the small value of capacitance dose not return zero, deduct the readings during measurement for getting the accurate value.

4.2.10. Transistor hFE (for HK68A)

Range	Function
hFE	Display approx. hFE value 1-1000 of transistor under test, base current approx. 1mA.

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- 5) Press the FUNC button to indicate "%"
- 6) Read the % duty cycle in the LCD display.

5.8 Transistor hFE Test (for 68A)

 **WARNING:**

To avoid electric shock, do not apply more than 36VDC or 36V AC rms between hFE terminal and the COM terminal.

- 1) Set the rotary switch to hFE range
- 2) Connect the COM and "+" plug of the special multi-function socket to the COM and V/Ω input jack.
- 3) Determine whether the transistor under test is NPN or PNP type and located the emitter, base and collector leads.
- 4) Insert leads to the transistor into proper holes of the special multi-function socket.
- 5) The meter will show the approx. hFE value in LCD display.

5.9 NCV (Non-Contact Voltage) Detection

 **WARNING:**

Due to external interference source, this function may cause wrong voltage detection, the detection result is for reference only.

Set the rotary switch to NCV position and LCD display EF, contact the top part of meter with the circuit under test, the indicating LED will flash and audible signal will sound, the signal strength showed in LCD display.

NOTE:

- The detection result is for reference, do not determine the voltage by NCV detection ONLY.
- Detection may interfere by socket design, insulation thickness and other variable conditions.
- The external interference sources, such as flashlight, motor, etc, may cause the wrong detection.

5.10 LINE (Live Wire Recognition) Test

Set the rotary switch to LINE position, connect the black test lead to COM jack and red test lead to VΩ jack, hold the insulation part of black test lead and not put into circuit under measurement; contact the red test lead to live wire, the buzzer of meter will be activated and red LED will be flickered, when the red test lead connect the earth line, the buzzer does not sound and LED will not flicker.

NOTE:

When the circuit is in serious leakage (approx. over 15V), the red test lead even contact earth line, the buzzer of meter will be sounded and LED will be flickered.

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5. OPERATING INSTRUCTIONS

5.1 AC and DC Voltage Measurement

 **WARNING:**

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

- To avoid electrical shock and/or damage to the instrument, do not attempt to take any voltage measurement that might exceed 1000VDC or 750VAC RMS.
- To avoid electrical shock and/or damage to the instrument, do not apply more than 1000VDC or 750VAC RMS between the common terminal and the earth ground.

- 1) Set the rotary switch to the voltage position (---mV / ---V).
- 2) Insert the black test lead banana plug into the negative COM jack; insert the red test lead banana plug into the positive V/Ω 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 circuit.
- 4) Read the voltage in the LCD display. The polarity of red test lead connection will be indicated when making DC Voltage measurement.

NOTE:

Unstable display may occur, especially at the low voltage range measurement, even no test leads insert at input terminals, if an erroneous readings suspected, short the V jack and COM jack and make sure the zero displayed at LCD.

5.2 Current Measurement

 **WARNING:**

- To avoid damage to the meter, check the fuse of the meter before current measurement.
- User the proper terminals, function and range for any current measurement
- Never attempt an open circuit potential to earth is greater than 250V, do not place the test leads in parallel with a circuit or component when the test leads are plugged into the current terminals.

- 1) Remove the power from the circuit under test and discharge the capacitors of the circuit.
- 2) Set the rotary switch to current measuring range.
- 3) Insert black test lead banana plug into the negative COM jack, for current measurement less than 400mA (for model 68C less than 600mA) insert the red test lead banana plug into the mA jack, for current measurement between 400mA to 10A (for model 68C between 600mA to 10A), insert the red test lead banana plug into 10A jack.
- 4) Break the circuit under test, connect the black test lead to the more negative side of the break, and connect the red test lead to the more positive side of break.
- 5) Turn on the power of circuit under test and read the value in LCD display. If only display OL, which means the input over range and requested to select the higher range.
- 6) Turn off the power of circuit under test and discharge all capacitors, remove the test leads and recover the measured circuit.

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5.11 MAX/MIN

- 1) Press the MAX/MIN button to activate the MAX/MIN recording mode, the display icon "MAX" will appear, the meter will display and hold the maximum reading and will update only when a new "max" occurs. This display icon "MIN" will appear, the meter will display and hold the minimum reading and will update only when a new "min" occurs.
- 2) To exit MAX/MIN mode press and hold MAX/MIN button for 2 seconds.

5.12 RELATIVE Mode


The relative measurement feature allows you to make measurements relative to a stored reference value. A reference voltage, current, etc. can be stored and measurements made in comparison to that value. The displayed value is the difference between the reference value and the measured value.

- 1) Press REL button to store the reading in the LCD display and the REL indicator will appear on the LCD display.
- 2) The LCD display will indicate the difference between the stored value and measured value
- 3) Press the REL button to exit the relative mode.

5.13 USB Interface (for 68C)

- 1) Install and launch the PC software.
- 2) Press and hold the REL/USB button for 2 seconds to enter USB communication mode.
- 3) When the communication is established, the data will be displayed on the PC screen, plotted and inserted into a list
- 4) Hold the REL button 2 seconds to exit USB communication mode.

5.14 Display Backlight

Press the  button for 1 or 2 seconds to turn on or off the display backlight function, the backlight will automatically turn off after 10 seconds.

5.15 Hold Function

The hold function freezes the reading in the display, press the HOLD button momentarily to activate or to exit the hold function.

5.16 Auto Power Off

The auto off feature will turn the meter off after 15 minutes, to disable the auto power off feature, hold down the FUNC button and turn the meter on.

5.17 Low battery Indication




The  icon will appear in the LCD display when the battery voltage becomes low, replace the battery when this icon appears.

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5.3 Diode Test and Continuity Check

 **WARNING:**

To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking diode test.

- 1) Set the rotary switch to  position, press "FUNC" button to indicate  on the display / press "FUNC" button to indicate  on the display.
- 2) Insert the black test lead banana plug into the negative COM jack, insert the red test lead banana plug into the positive V Ωjack.
- 3) Place the red test lead on the anode of diode and black test lead on the cathode of diode, the meter will show the approx. forward voltage of diode, reverse voltage will indicate OL.
- 4) Touch the test probe tips to the circuit or wire you wish to check, the max. value of resistance under check will be showed in display, if the resistance is less than 30Ω, the audible signal will sound.

NOTE:

In a circuit, a good diode should produce a forward bias reading of voltage, however, the reverse-bias reading can be variable based on resistance of other pathways between the probe tips.

To avoid electric shock, never measure continuity on circuits of wires that have voltage on them.

5.4Resistance Measurement

 **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 rotary switch to Ω position, press "FUNC" button to indicate Ω on the display.
- 2) Insert the black test lead banana plug into the negative COM jack, insert the red test lead banana plug into the positive V 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 LCD display

NOTE:

- The measured value of a resistor in a circuit usually is different from the rated value of resistor, it because the test current of the meter flows through all possible paths between the probe tips.
- In order to ensure the best accuracy in measurement of low resistance, short the test leads before the measurement and subtract this resistance value of the test leads.
- For high resistance measurement, the meter may take a few seconds to stabilize the

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6 MAINTENANCE

 **WARNING:**

- To avoid electric shock, disconnect the test leads from any source of voltage before removing the back cover or the battery or fuse covers.
- To avoid electric shock, do not operate the meter until the battery and fuse covers are in place and fastened securely.

6.1Battery Installation

To avoid the false readings, replace the battery as soon as the battery indicator  appears.

- 1) Turn power off and disconnect the test leads from the meter.
- 2) Open the rear battery cover by using screwdriver.
- 3) Insert the battery into battery holder, observing the correct polarity.
- 4) Put the battery cover back in place, secure with the screws.

6.2Replacing the Fuses

- 1) Turn power off and disconnect the test leads from the meter.
- 2) Remove the battery cover and the battery.
- 3) Remove the screws securing the rear cover.
- 4) Gently remove the old fuse and install the new fuse into fuse holder.
- 5) Replace and secure the rear cover, battery and battery cover.


readings.

- In the open circuit, the meter display OL to indicate the over range

5.5 Capacitance Measurement

 **WARNING:**

To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any capacitance measurements.

- 1) Set the rotary switch to  position, press "FUNC" button to indicate nF on the display.
- 2) Insert the black test lead banana plug into the negative COM jack, insert the red test lead banana plug into the positive V Ω jack.
- 3) Touch the test leads to the capacitor to be tested and read the capacitance value in the display.


NOTE:

- The test may take more time for large capacitors to charge, wait until the readings settle before ending the test.
- To improve the accuracy of measurement less than 10nF, subtract the residual capacitance of the meter and test leads.

5.6Temperature Measurement (for 68B and 68C)

 **WARNING:**

To avoid electrical shock, do not perform temperature measurement when the input the voltage exceed 36V DC or 36V AC rms.

- 1) Set the rotary switch to  position, LCD displays values of environmental of temperature.
- 2) Insert the temperature probe into the input jack, insert red plug of thermo probe into VΩ℃℉ jack, black plug of thermo probe into COM jack, making sure to observe the correct polarity.
- 3) Press FUNC button to indicate ℃ or ℉
- 4) Touch the temperature probe head to the part whose temperature you wish to measure, keep the probe touching the part under test until the reading stabilizes.
- 5) Read the temperature in the LCD display.

5.7Frequency (Duty Cycle) Measurement

 **WARNING:**

To avoid electric shock, do not apply more than 250V DC or 250V AC rms before taking frequency measurement.

- 1) Set the rotary switch to Hz/% position.
- 2) Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive Hz jack
- 3) Touch the test lead tips to the circuit under test.
- 4) Read the frequency value in the LCD display.

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