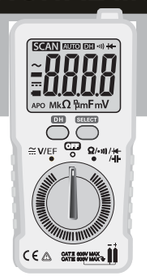
AUTO SCAN DIGITAL MULTIMETER



INSTRUCTION MANUAL

Thank you for purchasing AUTO SCAN DIGITAL MULTIMETER.
To obtain the maximum performance of this instrument, read this Instruction Manual carefully, and take safe measurement.

FOR SAFETY MEASUREMENTS!!

Prior to use, to avoid an electrical shock hazard to the operator and/or damage to the instruments, read carefully the CAUTION and WARNING ⚠ in this instruction manual.

⚠	The symbol listed in IEC 61010-1 and ISO 3864 means “Caution (refer to instruction manual)”.
⚠ **WARNING**	WARNING: The symbol in this manual advises the user of an electrical shock hazard that could result in serious injury or even death.
⚠ **CAUTION**	CAUTION: The symbol in this manual advises the user of an electrical shock hazard that could cause injury or material damages.

⚠ WARNING

Do not measure High Power Line of more than 6kVA with this instrument. High Power Line is very dangerous and/or lethal to measure. High Power Line sometimes includes High Surge Voltage that could possibly induce dangerous arcs of explosive short in the instrument and could result in serious injury to the operator. Even if it is Low Power Line (Low Energy Circuit), when measuring high voltage, use extreme case to avoid electrical shock hazard and/or damage to the instrument.

1. UNPACKING AND INSPECTION

Before unpacking, examine the shipping cartons for any sign of damage. Unpack and inspect the instrument and accessories for any damage from mechanical shock, water leakage, or other causes. If any damage or missing item is found, consult the local dealer for replacement.

1. Digital Multimeter with Test Leads 1pc
2. 3V CR2032 Battery 1pc（Installed）
3. Instruction Manual 1pc

2. SPECIFICATIONS

2-1. GENERAL SPECIFICATIONS

1. DISPLAY (LCD)
a. Numerical Display : 3000 counts, 14mm high.
b. Units and Symbols : SCAN, AUTO, DH, mV, V, nF, µF, mF,Ω,KΩ, MΩ,APO, •))) , ⊣◀ , ⎓ , ∼ , ⎓ , ▬ , and decimal point.
2. OPERATING PRINCIPLE : Dual Slope Integration
3. RANGE SELECTION : Auto-Ranging
4. SAMPLING RATE : 4times / second
5. POLARITY : Auot-Polarity (”-” symbol appears in minus)
6. OVERLOAD INDICATION : “OL” symbol appears.
7. DISPLAY HOLD : Press DH key to hold display values.
8. SELECT : Press SELECT key to select functions.
9. CONTINUITY TEST : Buzzer sounds and •)))symbol appears on LCD.
10. BATTERY WARNING : ▬ symbol appears when battery voltage becomes at approx. 2.3V or less.
11. OPERATABLE TEMPERATURE & HUMIDITY :
0℃～40℃, 80%RH or lower in non-condensing.
12. STORAGE TEMPERATURE & HUMIDITY :
-20℃ ～ 60℃, 70%RH or lower in non-condensing.
13. POWER SUPPLY : 3V CR2032 Battery x 1pc
14. POWER CONSUMPTION : Approx. 2.5mA
15. CONTINUOUS OPERATING TIME :
100 hours or more (in DC Voltage range, 0mV input)

16. AUTO POWER OFF :
Power turns off automatically after 10 minutes of any operation.
17. DIELECTRIC STRENGTH :
3.6kV for 1 minute (between input terminal and case)
18. OVERLOAD PROTECTION :
a. V : 900V DC or AC rms Max for 1 minute
b. Ω/ •))) / ⊣◀ / ⊣⊢ : 600V DC or AC rms Max for 1 minute
19. SAFETY LEVEL : CE Marking approved (IEC-61010-1, CATIII 300V, CATII 600V and EMC Test passed.)
20. DIMENSION & WEIGHT : 57(W) x 119(H) x 9(D)mm, Approx.72g
21. ACCESSORIES :
3V CR2032 Battery (installed) x 1pc, Instruction Manual
22. OPTIONAL ACCESSORIES : 940 Alligator Clips

2-2. MEASUREMENT SPECIFICATIONS

(23℃±5℃,<80%RH in non-condensing)

1. DC VOLTAGE (⎓ V)

Range	Accuracy	Resolution	Input Resistance	Max.Input Voltage	Overload Protection
3.000 V	±0.5%rdg±3dgt	1 mV	≒11MΩ	600V DC	900V rms for 1 minute
30.00 V	±1.0%rdg±3dgt	10 mV	≒10MΩ		
300.0 V		100 mV			
600 V		1 V			

2. AC VOLTAGE (∼V)

Range	Accuracy	Resolution	Input Resistance	Max.Input Voltage	Overload Protection
3.000 V	±1.5%rdg±5dgt	1 mV	≒12MΩ	600V AC	900V rms for 1 minute
30.00 V		10 mV	≒10MΩ		
300.0 V		100 mV			
600 V		1 V			

Frequency Response : 50Hz～400Hz

3. RESISTANCE (Ω)

Range	Accuracy	Resolution	Test Current	Open Circuit Voltage	Overload Protection
300.0 Ω	±1.5%rdg±4dgt	0.1 Ω	≦1.4mA	≒1.33V	600V rms for 1 minute
3.000 kΩ	±1.0%rdg±3dgt	1 Ω	≦0.5mA	≒0.86V	
30.00 kΩ		10 Ω	≦80µA		
300.0 kΩ		100 Ω	≦9µA		
3.000MΩ	±3.0%rdg±3dgt	1 kΩ	≦0.9µA		
30.00MΩ	±7.0%rdg±3dgt	10 kΩ	≦90nA		

30.00MΩ: this range is not available in auto scan mode.
300.0MΩ: if auto scan mode is set, continuity check is implemented in this range.

4. CONTINUITY TEST (•))))

Range	Buzzer Sound	Response	Open Circuit Voltage	Overload Protection
300.0Ω	Approx.≦30Ω	Approx.1m sec	≒1.2V	600Vrms

5. DIODE TEST (⊣◀)

Range	Accuracy	Test Current	Open Circuit Voltage	Overload Protection
2.000V	±5.0%rdg±4dgt	≦2.5mA	≦2.5V	600Vrms

Buzzer sounds when approx. ≦30mV.

6. CAPACITANCE (⊣⊢)

Range	Accuracy	Resolution	Test Voltage	Overload Protection
3.000 nF	±5.0%rdg±10dgt	1pF	≦1.7V	600V rms for 1 minute
30.00 nF		10pF		
300.0 nF		100pF		
3.000 µF		1nF		
30.00 µF		10nF		
300.0 µF		100nF		
3.000 mF	±20%rdg±10dgt	1µF		
30.00 mF		10µF		

3.000mF and 30.00mF both ranges are not available for auto scan mode.

7. NON-CONTACT AC VOLTAGE MEASUREMENT (EF)

This instrument can detect Electronic Field by sound and LCD display.
Weak “-” “- -” “- - -” “- - - -” Strong

3. NAME ILLUSTRATION

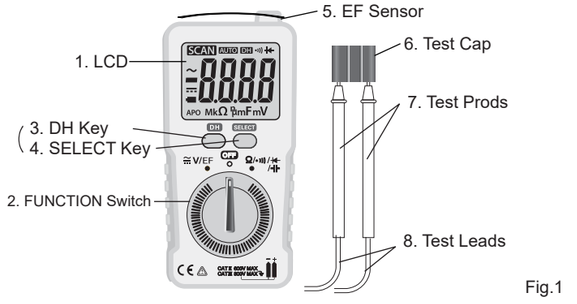


Fig.1

3-1. LCD

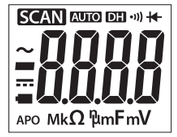


Fig.2

⎓	:	Direct Current (DC)
∼	:	Alternating Current (AC)
–	:	Minus symbol (automatically appears when polarity is minus.)
SCAN	:	Auto Scanning (Detection) Mode
AUTO	:	Auto-Ranging
DH	:	Display Hold
•)))	:	Continuity Test
⊣◀	:	Diode Test
▬	:	Battery Warning
APO	:	Auto Power OFF
Ω、kΩ、MΩ	:	Units of Resistance
mV、V	:	Units of Voltage
nF、µF、mF	:	Units of Capacitance
EF	:	Non-contact AC Voltage Measurement

3-2. FUNCTION Switch

Set FUNCTION Switch to measurement position.
SCAN : In “SCAN” mode, the instrument automatically selects the appropriate measurement mode and range.
⎓V/EF : ”SCAN” mode automatically detects AC or DC signal.
Ω/•)))/⊣◀/⊣⊢ : “SCAN” mode automatically detects Resistance (including continuity), Diode or Capacitance.
*For EF measurement, push the SELECT Key to select.
*Set FUNCTION Switch to OFF position after finish the measurement.

3-3. DH Key and Delay-Hold Function

Enables to hold display values by pressing DH key once and “DH” symbol appears on LCD. To cancel display hold, press DH key again.
The delay-hold function is enabled when DH key is pressed more than 2 seconds. When delay-hold function is entered successfully, the meter will stop to update the LCD data after six seconds delayed.

3-4. SELECT Key

Enables to cancel SCAN mode and select functions (as bellow).
⎓V/EF : ∼V(ACV) → ⎓V(DCV) → EF→ SCAN
Ω/•)))/⊣◀/⊣⊢ : Ω → •))) → ⊣◀ → ⊣⊢ → SCAN
*When SCAN mode is canceled, “SCAN” symbol on LCD disappears.
*When SELECT key is pushed more than 2 seconds, power is turned off, and SELECT key is pushed again for more than 2 seconds, power is turned on.

3-5. EF Sensor

Enables to detect Electronic Field by sound and LCD display.

3-6. Test Cap and Test Leads

Enable to put back Test Leads and Test Prods as Fig.3 after the measurement.

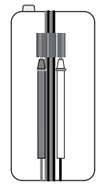


Fig.3

4. SAFETY PRECAUTIONS

Correct knowledge about electronic measurements is required because electronic measurement is sometimes a very dangerous work.
To eliminate possibility of injury to the operator and damage to the instrument, the following precautions and measurement procedures must be taken. Mis-use, abuse and carelessness cannot be prevented by any written word and is fully the operator’s responsibility. Observing the following warnings and cautions, take safe measurements.

4-1. WARNINGS

⚠WARNING 1. Check of Body and Test Leads
Before every measurement, do not fail to confirm that the body of this instrument and handle insulators of the attached Test Leads have no cracks nor any other damage on them. Make sure that the body and the handle insulators are free to dust, grease and moisture.

⚠WARNING 2. Measurements of High Power Line (more than 6kVA) are Prohibited
Do not measure with this instrument High Power Line (High Energy Circuits more than 6kVA) such as Distribution Transformers, Bus Bars, Power Line for Big Motors, etc. High Power Line is very dangerous as it sometimes includes High Surge Voltage that will induce short circuit in the instrument and results in shock hazard. Use the special instrument designated to measure High Power Line of more than 6kVA.

⚠WARNING 3. Warning for High Voltage Measurements
Even if to measure Low Energy Circuits (more than 100V) of electric/electronics appliances, heating elements, small motors, line cords and plugs, etc., High Voltage Measurements are very dangerous. Do not touch the Live Part of Multimeter, its Test Leads and Circuit while it is on.
Generally, shock hazard shall be exist at any part involving a potential in excess of 30V rms or 42.4V DC or peak and where a leakage current from that part to ground exceeds 0.5mA.

⚠WARNING 4. Dangerous Voltage Measurement Procedure
Always observe strictly the following measurement procedure when measuring dangerous voltage.
1. Before measurement, turn off power to the circuit to be measured.
2. Set FUNCTION Switch to ⎓V/EF position.
3. Attach - (Black) and + (Red) Alligator Clips (optional) to Test Prods of Test Leads.
4. Confirm that the power of this circuit to be measured is OFF. Then, connect Black Alligator Clip to - (earth) side and Red Alligator Clip to + (positive) side of the circuit to be measured.
5. Place the instrument away from your body, and do not touch it with your hands. Also, take safety distance from the power source or the circuit to prevent any part of your body form touching dangerous voltage.
6. Turn on power to the circuit to be measured and read the voltage on the Instrument. Refer to the Fig.4.

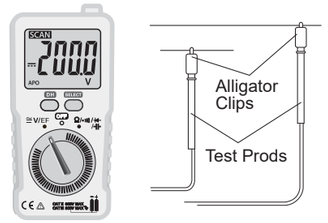


Fig.4

7. Turn off power to the circuit to be measured and discharge all capacitors in the circuit.
8. Disconnect Alligator Clips of Test Prods from the circuit.

In case you want to measure live line, observe the following procedure.
1. Place the instrument away from your body.
2. Set FUNCTION Switch to ⎓V/EF position.
3. Take safety distance for the power or the circuit to be measured to prevent any part of your body from touching dangerous voltage.
4. Attach Black Alligator Clip to Black Test Prod. Then, connect Black Alligator Clip to - (earth) side of the circuit to be measured.
5. Hold Red Test Prod with one hand and connect it to + (positive) side of the circuit to be measured.
6. Read the voltage on LCD. Refer to the Fig. 5

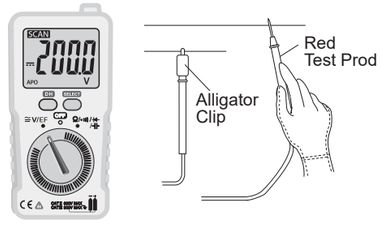


Fig.5

7. Disconnect Red Test Prod from the circuit and then disconnect Black Alligator Clip from the circuit.

⚠WARNING 5. Maximum Input Observance
Do not attempt to measure voltage that might exceed 600V AC or DC, the specified maximum input of this instrument.

⚠WARNING 6. Correct Selection of FUNCTION Switch
When taking measurement, always confirm that FUNCTION Switch is set to correct position. Do not measure voltage on Ω/•)))/⊣◀/⊣⊢ position.

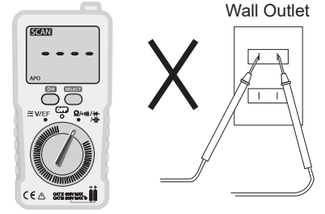


Fig.6

⚠WARNING 7. Test Leads Disconnection

Prior to change FUNCTION Switch to another position when measuring, or opening Rear Case for replacement of battery, always disconnect Test Leads from the circuit being measured.

4-2. GENERAL WARNINGS AND CAUTIONS

⚠WARNING 1. Do not let the children use the instrument or those people who are unable to recognize the dangers of electric measurements.

⚠WARNING 2. Do not make electric measurements in a naked or barefooted state. This will give electric shock hazard to the operator.

⚠WARNING 3. The points of Test Prods are sharp and dangerous. Do not get hurt with them.

⚠WARNING 4. Do not polish the meter case, or attempt to clean it with silicon oil or antistatic fluid.

⚠WARNING 5. Avoid severe mechanical shock or vibration, extreme temperature or very strong magnetic field.

⚠WARNING 6. Remove the batteries when not in use for an extended time since the exhausted batteries might leak electrolyte and corrode the internal components.

5. MEASUREMENT PROCEDURES

5-1. PREPARATION FOR USE

1. INSTRUCTION MANUAL

Read Instruction Manual carefully to understand the specification and functions correctly.「4. SAFETY PRECAUTIONS」is very important for safety measurement.

2. BATTERY

One 3V CR2032 battery is installed in this instrument. When the battery is exhausted and ▬ symbol appears on LCD, replace the battery referring to「6-1. BATTERY REPLACEMENT」

3. TEST PRODS

Connect Black Test Prod to - (Earth) side of the circuit and Red Test Prod to + (Positive) side of the circuit being measured.

4. OVERLOAD INDICATION

If input value exceeds 3000 counts which is the maximum value of the measurement range being used, “OL” symbol appears on LCD. However, in 600V AC/DC measurement range, “OL” symbol appears when the input value exceeds 600 counts.

5. AUTO POWER OFF

After 10 minutes of the last operations, power turns off automatically to conserve battery life (goes down in sleep condition and 0.01mW consumption). After measurement, turn FUNCTION Switch back to the OFF position. To cancel AUTO POWER OFF function, turn on the power with holing down SELECT Key (”APO” symbol does not appear on LCD).

6. SYMBOL MARK

The following symbols shown on instrument and in the instruction manual are listed in IEC 61010-1 and ISO 3864.

⚠	WARNING or CAUTION (refer to instruction manual.)		
⎓	Direct Current (DC)	~	Alternating Current (AC)
⏚	Earth (Ground)	⧈	Double Insulation

5-2. AUTO SCANNING MEASUREMENT for DC / AC VOLTAGE (⎓V / ~V)

⚠ WARNING

- Maximum measurable DC/AC Voltage Line is 600V. Do not measure voltage that exceeds 600V to avoid electric shock hazard to the operator or serious damage to the instrument.
- Do not measure High Power Line at 6kVA or above.
- Before measurements, read 「4.SAFETY PRECAUTIONS」carefully for safety measurements.

1. Set FUNCTION Switch to [≅V/EF] position. SCAN is displayed.
2. Connect Black Test Prod to the ー (earth) side of the circuit to be measured and Red Test Prod to the ＋ (positive) side.
3. The instrument automatically detects the items to be measured (DCV or ACV) and start the measurement. Read the test result on LCD.

   NOTE : When canceling “SCAN” mode to select the item to be measured, push SELECT Key. The items are changed as follows :

   [SCAN → ~V (ACV) → ⎓V (DCV) → EF→ SCAN]
4. After the measurements, set FUNCTION Switch to OFF position.

■**When detecting DC Voltage** (Example : Battery)

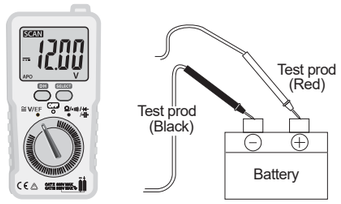


Fig.7

■**When detecting AC Voltage** (Example : Wall outlet)

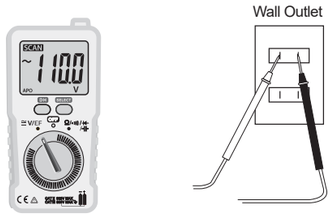


Fig.8

5-3. NON-CONTACT AC VOLTAGE MEASUREMENT (EF)

⚠ WARNING

- Maximum measurable Electric Field is 600V. Do not measure voltage that exceeds 600V to avoid electric shock hazard to the operator or serious damage to the instrument.
- Do not measure High Power Line at 6kVA or above.
- Before measurements, read 「4.SAFETY PRECAUTIONS」carefully for safety measurements.

1. Set FUNCTION Switch to [≅V/EF] position. SCAN is displayed.
2. Press SELECT Key for 3 times. “EF” symbol appears on LCD.
3. When the EF sensor detects Electric Field, Four levels of strength will be showed on LCD by “-“ and buzzer sounds.

   Weak ”-” ”--” ”---” ”----” Strong

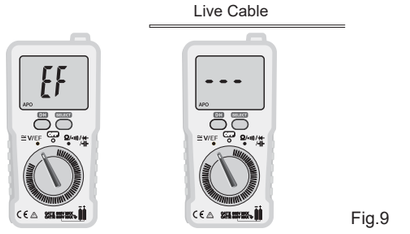


Fig.9

4. After the measurements, set FUNCTION Switch to OFF position.

5-2. AUTO SCANNING MEASUREMENT for Ω/•))/⊣◂/⊣⊢ RESISTANCE / CONTINUITY / DIODE / CAPACITANCE

⚠ WARNING

- Do not measure voltage in [Ω/•))/⊣◂/⊣⊢] position. This will cause electrical shock hazard to the operator and/or serious damage to the instrument.
- When measuring in-circuit components, turn off the power of the circuit to be measured and discharge all capacitors.
- Before measurements, read「4.SAFETY PRECAUTIONS」carefully for safety measurements.

1. Set FUNCTION Switch to [Ω/•))/⊣◂/⊣⊢] position. SCAN is displayed.
2. Connect Test Prods to the components to be measured.
3. The instrument automatically detects the items to be measured (Resistance / Continuity / Diode / Capacitance) and start the measurement. Read the test result on LCD.

   NOTE : When canceling “SCAN” mode to select the item to be measured, push SELECT Key. The items are changed as follows:

   [SCAN → Ω → •)) → ⊣◂ → ⊣⊢ → SCAN]
4. After the measurements, set FUNCTION Switch to OFF position.

■**When detecting Resistance** (Example : Resistor)

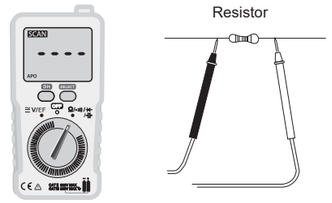


Fig.10

■**When Testing Continuity** (Example : Plug)
Buzzer sounds when the testing circuit has good continuity.

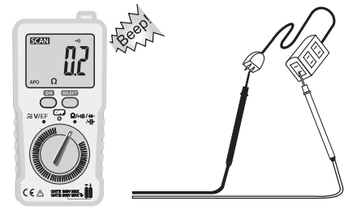


Fig.11

■**When Testing Diode** (Example : Diode)

1. Connect Black Test Prod to Anode side and Red Test Prod to Cathode side of the diode (Reverse Connection). Confirm “OL” is displayed on LCD.
2. Connect Test Prods to the opposite side of 1. (Forward Connection). The tested diode is judged good if following voltages are displayed on LCD.

   Silicon diodes : 0.4V to 0.7V
   Germanium diodes : 0.1V to 0.4V

NOTE : Lighting-emitting diode is not testable.

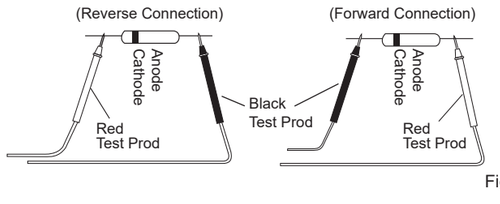


Fig.12

6. MAINTENANCE

6-1. BATTERY REPLACEMENT

⚠ WARNING

- To avoid electrical shock, make sure to finish the measurement before replacing the batteries.
- Detach test prods from circuit and set FUNCTION Switch to "OFF".

Replace the battery when ▬ symbol appears on LCD.

1. Set FUNCTION Switch to “OFF” position.
2. Loosen the screw on Rear Case.
3. Remove exhausted battery and insert new 3V CR2032 battery in the correct polarity. (see Fig. 13)
4. Close the Rear Case and tighten the screw.

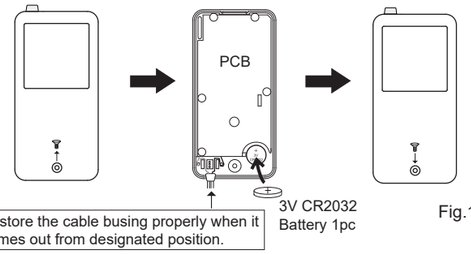


Fig.13

NOTE : Supplied battery is for testing purpose that may run out earlier than the new one.

6-2. PERIODICAL CHECK AND CALIBRATION

Periodical check and calibration are necessary to make safety measurements as well as to maintain the specifications.

It is recommended that the instrument may be checked and calibrated once a year and/or after the repair service. Periodical Check and Calibration services are available at Authorized Service Agency through your local dealer at a cost basis charge.

6-3. REPAIR

Repair service is available at AUTHORIZED SERVICE AGENCY through your local dealer. Pack the instrument securely with your name, address, telephone number and problem details, and ship prepaid to your local dealer.

Check the following items before asking repair service.

1. Check the battery connection, polarity, and capacity.
2. Confirm if the over input, exceeding the specified range value, are not applied.
3. Confirm that measured accuracy is adopted in the operating environment.
4. Confirm that the body of this instrument and the handle insulators of the Test Prods have no cracks nor any other damage.

WARRANTY

This instrument is warranted in its entirety against any defects of material or workmanship under normal use and service within a period of one year from the date of purchase of the original purchaser. Warranty service is available at AUTHORIZED SERVICE AGENCY through your local dealer. Their obligation under this warranty is limited to repairing or replacing the instrument returned intact or in warrantable defect with proof of purchase and transport charges prepaid. AUTHORIZED DEALER and the manufacturer, shall not be liable for any consequential damages, loss or otherwise. The foregoing warranty is exclusive and in lieu of all other warranties including any warranty of merchantability, whether expressed or implied. This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside of AUTHORIZED SERVICE AGENCY, nor which have been subject to misuse, negligence, accident, incorrect repair by users, or any installation or use not in accordance with instructions provided by the manufacturer.

H70-E62-1201-1 1812