

BK PRECISION®



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Instruction Manual

Model 2831D 4 ½ Digit True RMS Digital Multimeter

1. PRODUCT DESCRIPTION

1-1. Introduction

Thank you for purchasing our product. Electronic measuring instruments produced by us are high technology products made under strict quality control. We guarantee their exceptional precision and utmost reliability. For proper use of the product, please read this operation manual carefully.

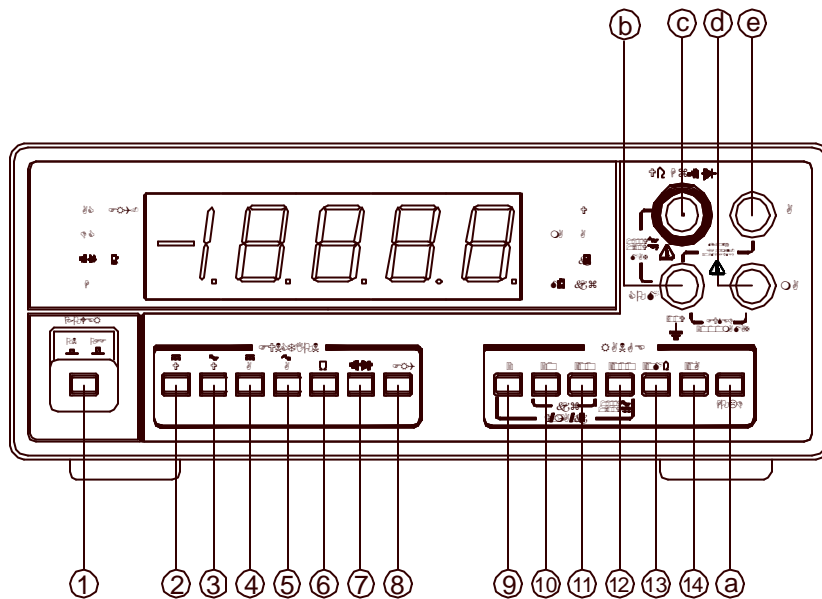
Note

1. To fully maintain the precision and reliability of the product use it within the range of standard setting (Temperature 10 °C~35 °C, Humidity 45%~85%)
2. After turning of power, please allow a pre-heating period of as long as some 30 minutes before use.
3. This equipment should be used with a triple line power cord for safety.
4. For quality improvement the exterior design and specification of the product can be changed without prior notice.
5. If you have further questions concerning use, please contact our service center or sales outlet.

This Digital multimeter is a portable, bench type Digital multimeter with a 4 1/2 digit light-emitting diode. This Digital multimeter can make diode measurements, Frequency measurements & continuity test, in addition to Current, Voltage and Resistance measurements.

■ Features

- Bench type True RMS Digital Multimeter with 4 1/2 digit (LED)display.
- Basic accuracy for DCV ; 0.05 %
- Overload protection on all range
- AC/DC Voltage measurement(Up to DC 1200V, AC 1000V)
- AC/DC Current measurement(Up to 20A)
- Resistance measurement(Up to 20Mohm)
- Frequency Measurement(Up to 200kHz)
- Audible continuity test



Input Terminal

- ? COM : COMMON Terminal
- ? V/O /Hz : VOLT/ OHM/CONTINUITY/ FREQUENCY/ DIODE TEST Input Terminal
- ? mA : mil Ampere Input Terminal
- ? A : Ampere Input Terminal

Function Selection

? I/O	Power ON/OFF	? AC A	AC Current
? DC V	DC Voltage	? O	Resistance
? AC V	AC Voltage	? DIODE	Diode & Continuity
? DC A	DC Current	? FRQ	Frequency

Range Selection

? 2	2V, 2mA ,2 kohm	? 20 M	20 Mohm
? 20	20V, 20mA , 20kohm, 20kHz	? 20A	20A
? 200	200V,200mA, 200kohm, 200kHz	? HOLD	Data Hold

? 2000	DC 1200V/AC1000V, 2000mA,2000 kohm
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■ Input Terminal Limits

Switch Function	Input Terminals		Min. Display Reading	Max. Display Reading	Maximum Input
	Red	Black			
DC V	VΩHz	COM	0.0001V	1200.0V	1200Vdc,
AC V	VΩHz	COM	0.0001V	1000.0V	1000 Vac
OHM	VΩHz	COM	0.0001kΩ	19.999MΩ	600 V(1Min)
Diode/Cont.	VΩHz	COM	0.1	1999.9	600 V(1Min)
DC mA	mA	COM	0.0001mA	1999.9mA	2 A
AC mA	mA	COM	0.0001mA	1999.9mA	2 A
DC A	A	COM	0.001 A	19.999 A	20.00 A
AC A	A	COM	0.001 A	19.999 A	20.00 A
Frequency	VΩHz	COM	0.001KHz	199.99KHz	600 V(1 Min)

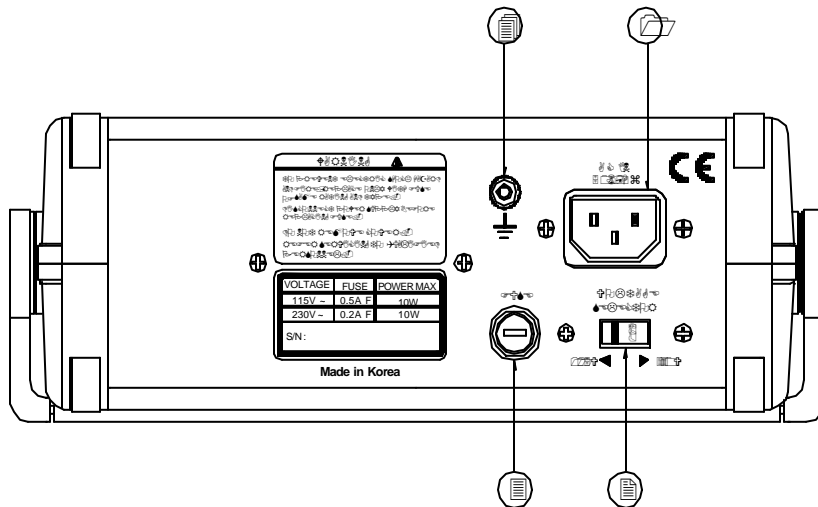


FIG.2 REAR PANEL

- ① AC INLET : AC power input connector
- ② VOLTAGE SELECTOR : Selects the AC Power (115V or 230V)
- ③ FUSE HOLDER : Replace fuse by unscrewing.

④ GROUND TERMINAL

1-2 Technical Specification

Important Note: All accuracies apply to 5% to 95% full scale of each range

- DC VOLT

Range		Resolution	Accuracy	Impedance
2 V		100 μ V	$\pm(0.05\% + 5d)$	10 M Ω
20 V		1 mV		
200 V		10 mV		
1200V	1000V	100m V	$\pm(0.1\% + 5d)$	
	1200V	100m V	$\pm(0.3\% + 5d)$	

- AC VOLT

Range	Resolution	Frequency	Accuracy	Impedance
2V	100 μ V	40Hz to 60Hz	$\pm(0.75\% + 10d)$	10 M Ω
		60Hz to 1kHz	$\pm(1.5\% + 10d)$	
		1kHz to 5kHz	$\pm(2.5\% + 10d)$	
		5kHz to 10kHz	$\pm(5.0\% + 10d)$	
20V	1 mV	40Hz to 60Hz	$\pm(0.75\% + 10d)$	
		60Hz to 1kHz	$\pm(2.5\% + 10d)$	
		1kHz to 5kHz	$\pm(5.0\% + 10d)$	
		5kHz to 10kHz	$\pm(10\% + 10d)$	
200V	10 mV	40Hz to 50Hz	$\pm(1.0\% + 10d)$	
		50Hz to 60Hz	$\pm(0.75\% + 10d)$	
		60Hz to 1kHz	$\pm(2.5\% + 10d)$	
		1kHz to 5kHz	$\pm(5\% + 10d)$	
1000V	100 mV	40Hz to 50Hz	$\pm(1.0\% + 10d)$	
		50Hz to 60Hz	$\pm(0.75\% + 10d)$	
		60Hz to 400Hz	$\pm(2.5\% + 10d)$	
		400Hz to 1kHz	$\pm(5\% + 10d)$	

- DC CURRENT

Range	Resolution	Accuracy	Over Load Protection
2 mA 20 mA 200 mA	100 nA 1 uA 10 uA	$\pm(0.75\% + 5d)$	2A/250V
2 A	100 uA	$\pm(1.0\% + 5d)$	
20 A	1 mA	$\pm(1.0\% + 10d)$	15A/250V

20A Range for 15 seconds max during each 15 minute period

- AC CURRENT

Range	Resolution	Frequency	Accuracy	Over Load Protection
2mA 20mA 200mA	100 nA 1 uA 10 uA	40Hz to 50Hz 50Hz to 60Hz 60Hz to 1kHz 1kHz to 5kHz	$\pm(1.5\% + 10d)$ $\pm(0.75\% + 10d)$ $\pm(2.0\% + 10d)$ $\pm(3.0\% + 10d)$	2A/250V
2000mA	100 uA	40Hz to 50Hz 50Hz to 60Hz 60Hz to 1kHz 1kHz to 5kHz	$\pm(1.5\% + 10d)$ $\pm(1.0\% + 10d)$ $\pm(2.0\% + 10d)$ $\pm(3.0\% + 10d)$	
20A	1mA	40Hz to 50Hz 50Hz to 60Hz 60Hz to 1kHz 1kHz to 2kHz	$\pm(1.5\% + 10d)$ $\pm(1.0\% + 10d)$ $\pm(2.0\% + 10d)$ $\pm(3.0\% + 10d)$	15A/250V

20A Range for 15 seconds max during each 15 minute period

- RESISTANCE

Range	Resolution	Accuracy	Over Load Protection
2 KO	0.1 Ω	±(0.2% + 5d)	600V DC or Peak
20 KO	1 Ω		
200 KO	10 Ω		
2 MO	100 Ω		
20 MO	1 KO	±(1% + 10d)	

- FREQUENCY

Range	Resolution	Accuracy	Over Load Protection
20 KHz	1 Hz	±(1.0% + 5d)	600V DC or Peak
200 kHz	10 Hz	±(2.0% + 5d)	

* The digit error (less than 5 digits) is added in measuring value.

- AUDIBLE CONTINUITY

Test Volt	Threshold	Over Load Protection
3V	Less Than 200 ohm	600V DC or Peak

- DIODE TEST

Test Volt	Max. Test Current	Over Load Protection
2V	Approx. 1.0 mA	600V DC or Peak

■ DIMENSION AND WEIGHT

- Dimensions HWD: 9.4 x 3.5 x 10.6" (240 x 90 x 270mm)
- Weight Aprox : 4.6lb (2.1 kg.)

1-3. Equipment Ratings

- Plug and Socket : 3 wire ac power plug and 3 wire outlet
- Power & Fuse Ratings

Input Voltage	Fuse	Power Max.

103 ~ 126V AC (50/60Hz)	F 0.5A / 250V	10 W
206 ~ 252V AC (50/60Hz)	F 0.2A / 250V	

- Operating Environment:
Temperature : 0°C to + 40 °C (Accuracy Specified at 23 °C ± 5 °C)
Temperature Coefficient : 0.1x(Specified Accuracy) per°C
HUMIDITY: up to 85% RH (Relative Humidity) to 40°C without temperature extremes causing condensation within the instrument.
- Storage Environment:
TEMPERATURE: -20°C to +70°C HUMIDITY: below 85% RH
- Insulation Category II: Portable equipment of local level.
- Pollution Degree: 2
- Protection to IEC 529: Ordinary

Note: Specifications are subject to change without notice.

1-4. Supplied Accessories






- User's Manual ----- 1
- Test Leads----- 1
- Power cord----- 1
- Spare Fuse----- 1

1-5. International electrical symbol

SAFETY RULES

- Remember: THINK SAFETY AND ACT SAFELY.
- Read these operating instructions thoroughly and completely before operating this meter.
- Pay particular attention to WARNINGS used for conditions and actions that pose hazard to the user and CAUTIONS used for conditions and actions that may damage the meter.
- Always to inspect this meter, test probes and accessories for any sign of damage or abnormality before every use.
- Never ground yourself and keep your body isolated from ground.
- Never touch exposed wiring, connections or any live circuit conductors.
- Disconnect the live test probe before disconnecting the common test probe.
- Use caution when working above 60V DC or 25V AC rms. Such voltages pose a shock hazard.

SAFETY SYMBOLS

	DANGEROUS VOLTAGE		SEE EXPLANATION IN MANUAL
	AC-ALTERNATING CURRENT		GROUND
	DC-DIRECT CURRENT		FUSE

2. INSTALLATION

2-1. Initial Inspection

This instrument was carefully inspected both mechanically and electrically before shipment. It should be physically free of damage. To confirm this, the instrument should be inspected for physical damage which may have occurred in transit. Also, verify that all supplied accessories have been included.

2-2. Connecting AC Power

This instrument requires 115V AC or 230V AC (50-60 Hz) power socket with protective earth contact (PE-contact). If it is available only a power socket without PE-contact (so a 2-conductor ac power) then a power socket with PE-contact must be installed before or the appliance should be provided with a PE-screw-terminal which is not soluble by hand and not soluble before 2-conductor power lines.

CAUTION
AC POWER OF THIS INSTRUMENT IS PRESET TO 115V IN FACTORY. BEFORE POWERING ON THIS INSTRUMENT, CHECK AND MAKE SURE THE VOLTAGE OF THE POWER SOURCE IS SAME WITH THE MARKING OF UNIT.

IN CASE OF AC230V, VOLTAGE SELECTOR (on rear panel) SHOULD BE SELECTED TO 230V POSITION.

2-3. Cooling and Ventilation

No special cooling and ventilation is required. However, the instrument should be operated where the ambient temperature is maintained.

2-4. Position

This instrument is built as a bench-type instrument with rubber feet and tilt stand in place. The stand-up angle can be adjusted by changing the angle of the carrying handle.

2-5. Warming-Up

Allow at least 30 minutes for the unit to warm up so that it can stabilize.

3. OPERATION

3-1 Voltage Measurement

Voltage is the difference of electrical energy (potential) between two points. Measuring voltage allows you to verify the following questions.

- Is voltage present? The presence of voltage tells you that the circuit is delivering voltage to the component you are testing.
- What is the level of voltage? The voltage level tells you that whether the proper voltage is arriving at the components.
- What is the voltage drop? The voltage drop tells you how much of voltage is being consumed by the components.

WARNING---HIGH VOLTAGE
TO AVOID POSSIBLE ELECTRIC SHOCK AND/OR EQUIPMENT DAMAGE, DO NOT ATTEMPT TO TAKE ANY VOLTAGE MEASUREMENTS IF THE VOLTAGE IS ABOVE 1200V DC OR 1000V AC. THE "COM" TERMINAL POTENTIAL SHOULD NOT EXCEED 500V TO THE GROUND.

- (1) Plug the red and the black test leads into the $V\Omega$ and the COM input terminals respectively.
- (2) Verify dc or ac. Select the function (dc V or ac V) and set the range switch to the desired volt range. For unknown voltage, always start from highest range and move down to lower range to select scale for best reading.
- (3) Connect the probe tips in parallel with the voltage source to be measured.
- (4) Read voltage value on the Display.

3-2 Current Measurement

Current is the flow quantity of electrons through a conductor. Ampere is the amount of electrons flowing through a conductor.

CAUTION
DO NOT ATTEMPT TO TAKE A CURRENT OF MORE THAN SPECIFIED.

ALWAYS START WITH THE HIGHEST RANGE FOR UNKNOWN CURRENT. THE “mA INPUT” TERMINAL IS PROTECTED BY A 2000mA/250V F TYPE FUSE AND “A INPUT” TERMINAL IS FUSED WITH 15A/250V T TYPE.

WARNING

MAKE SURE OF NO POWER BEFORE DISCONNECTING CIRCUIT. EVEN SMALL AMOUNT OF CURRENT CAN BE DANGEROUS. DO NOT ATTEMPT A CURRENT MEASUREMENT WHERE VOLTAGE IS ABOVE 600 V. IF THE FUSE BLOWS, YOU MIGHT BE INJURED OR THE METER DAMAGED.

- (1) Plug the red test leads into the “mA input” for less than 2000 mA/dc or into “A input” terminal between 2000mA and 20A.
- (2) Plug the black test leads into the COM input terminal.
- (3) Verify dc or ac. Select the function (dc A or ac A) and set the range switch to the desired volt range. For unknown current, always start from highest range and move down to lower range to select scale for best reading.
- (4) Connect the probe tips in series with the current source to be measured.
- (5) Read current value on the Display.
- (6) Fuse Replacement
 - Disconnect and remove all connections from any live power source.
 - Open the top case.
 - Locate the defective fuse and remove it in input board.
 - Install a new fuse of the SAME SIZE AND RATING.
 - Close the top case.

**** 20 A ac/dc Measurement - “Max . 15sec each 15minute”**

3-3 Resistance Measurement

Resistance is an obstacle that is hindering the current flowing through a conductor. Ohm is the unit of this resistance.

- The resistance displayed in meter is the total resistance through all possible paths between red and black probes.
- Resistance must always be measured with meter in series with the circuit.
- Resistance in test lead is about 0.1 - 0.2 ohm
- Be sure that the contact between the probes and the circuit is clean. Contact resistance coming from dirt, oil, paint, etc. can affect accuracy seriously.

CAUTION

ALL RESISTANCE MEASUREMENTS SHOULD BE TAKEN ON DE-

ENERGIZED CIRCUITS ONLY. COMPLETELY DE-ENERGIZE THE CIRCUIT OR DEVICE WHICH IS TO BE MEASURED. POWER TO THE CIRCUIT UNDER TEST MUST BE OFF AND ANY CAPACITORS SHOULD BE DISCHARGED. IF AN EXTERNAL VOLTAGE IS PRESENT ACROSS A COMPONENT, IT WILL CAUSE ERRONEOUS RESISTANCE READING.

- (1) Plug the red and black test leads into the $V\Omega$ input and the COM input terminals respectively.
- (2) Select the function(OHM) and set the range switch to the desired resistance range.
- (3) Connect the probe tips in parallel with the resistance to be measured.
- (4) Read resistance value on the Display.

3-4 Diode Measurement

A good diode allows current in one direction. To test a single diode, turn the power off and remove the diode from circuit.

- (1) Connect the red probe to the plus(+) side of diode and the black probe to the minus(-) side.
- (2) If diode is good, the voltage drop will be displayed. (ex : 300.0 ~ 800.0)
- (3) Reverses the probes and measure the voltage across the diode again.
 - If diode is good, the display shows "000.0" and is flickering.
 - If diode is shorted, the display shows 000.0 with beep sound in both direction.
 - If display shows "000.0" and is flickering in both directions, the diode is open.

3-5 Continuity test

Continuity test verifies by beeper if the circuit is closed or open.

Meter detects opens and shorts.

- (1) Set the push switch to continuity function & diode range.
- (2) Connect the probes to the circuit and listen for beeper. Continuity tone confirms that the circuit is continued, closed and connected.

3-6 Frequency Measurement

- (1) Plug the red and black test leads into the $V\Omega$ input and the COM input terminals respectively.
- (2) Select the function to FRQ. and set the range switch to the desired frequency range. For unknown frequency, always start from highest range and move down to lower range to select scale for best reading.
- (3) Connect the probe tips in parallel with the circuit to be measured.
- (4) Read frequency value on the Display.

NOTE ;

The digit error (less than 5digits) is added in measuring value.

To compensate this error, check the digit error by shorting test leads(+,-) before measuring unknown frequency and deduct this value from measuring value.

4. MAINTENANCE

CAUTION

IT IS ESSENTIAL FOR SAFETY TO PROPERLY MAINTAIN AND SERVICE THIS INSTRUMENT

WARNING

VOLTAGES WITHIN THIS INSTRUMENT ARE SUFFICIENTLY HIGH TO ENDANGER LIFE. COVERS MUST NOT BE REMOVED EXCEPT BY PERSONS QUALIFIED AND AUTHORIZED TO DO SO AND THESE PERSONS SHOULD ALWAYS TAKE EXTREME CARE ONCE THE COVERS HAVE BEEN REMOVED.

4-1. Fuse Replacement

- Disconnect and remove all connections from any live power source.
- Unscrew fuse holder by screw driver.
- Locate the defective fuse and remove it by gently pulling-out.
- Install a new fuse of the SAME SIZE AND RATING.
- Screwing fuse holder.

CAUTION

MAKE SURE THAT THE RATED AND SPECIFIED FUSES ARE USED FOR REPLACEMENT.

4-2. Adjustment And Calibration

It is recommendable to regularly adjust and calibrate this instrument. Qualified and authorized personnel only should execute performance and procedures.

4-3. Cleaning and decontamination

The instrument can be cleaned with a soft clean cloth to remove any oil, grease or grime. Never use liquid solvents or detergents. If the instrument gets wet for any