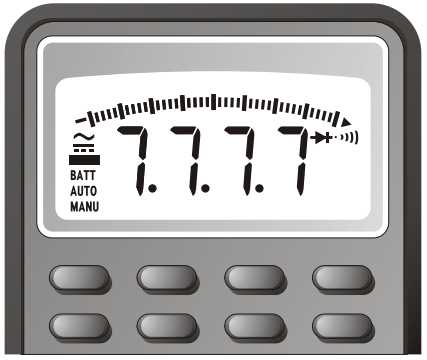
EZ

Digital Multimeter

DM-530 SERIES

Digital Multimeter
Operation manual

EZ Digital Co.,Ltd.



DIGITAL MULTIMETER

DM-530SRS

DIGITAL MULTIMETER
Operation Manual

EZ Digital Co.,Ltd.

WARNING

Before using the meter, you must read the following safety information for Maximum input specifications carefully.

◎ Voltage measurements	:	Below 1000VDC, 750VAC RMS (DM-531/532) True RMS (DM-531T/532T)
◎ mA measurements	:	Below 500mA (Fuse rating 600V)
◎ 10A measurements	:	Below 10A (Fuse rating 600V)
◎ Ω measurements	:	Below 600V AC/DC (1 minute)
◎ →|– •))) measurements	:	Below 600V AC/DC (1 minute)
◎ Capacitance	:	Below 600V AC/DC (1 minute)
◎ Hz measurements	:	Below 600V AC/DC (1 minute)

If you don't follow the safety information, DMM SET may be damaged.

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN (45014)

Manufacturer's Name EZ Digital Co., Ltd
Manufacturer's Address #222-28, Nae-dong, Ojeong-gu Bucheon-si, Gyeonggi-do, KOREA, 421-160

Declares that the product :

Product Name : **DIGITAL MULTI METER**
Model Numbers : **DM-531, DM-532, DM-531T, DM-532T**
Data : **July. 05. 2001.**

Conforms to the following product specifications :

Certified by TÜV Rheinland
Safety : **EN 61010-1 :**
(IEC 1010-1 : 1992,1010-2-031)
EMC **EN 50081-1 : 1992**
EN 50082-1 : 1992

Supplementary Information :
The product herewith complies with the requirements of the Low Voltage Directive 73/72/EEC and the EMC Directive 89/336/EEC.

Bucheon, Gyeonggi
Location

cheol-young, Kim
Quality Assurance Manager

WARRANTY

This instrument is warranted against defects in material and workmanship for a period of one year from the data of sale. During the warranty period, EZD will repair or replace it which prove to be defective. But warranty shall not apply to defects resulting from improper or inadequate maintenance by buyer, In this case, the repair will be billed at nominal cost.
For warranty service or repair, this instrument must be returned to a service facility designated by EZD.
Buyer shall prepay shipping charges to EZD and EZD shall pay shipping charges to return it to buyer.

CONTENTS

TITLE PAGE

INTRODUCTION

NOTE

All material in this manual applies to the DM-530SRS unless otherwise indicated.

This meter has been designed and tested according to IEC 61010-1, UL 3111-1 Safety Requirements for Electronic Measuring Apparaturs.
This manual contains information and warnings which must be followed ensure safe operation and retain the meter in safe condition.

HOLSTER

The meter comes with a snap-on holster that absorbs shocks and protects the meter from rough handling. you can also hang the meter on your belt for easy viewing while probing
The test leads may be snapped into the holster that allows you to hold both the meter and probe tip with one hand.

CLEANING

When you clean meter, you use a damp towel or cloth only.

INTERNATIONAL ELECTRICAL SYMBOLS

- ⚠ Caution
- ⧈ Double Insulation (Protection Class)
- ⏚ Ground
- ⎓ Fuse

ELECTRICAL UNITS OF MEASUREMENT

Volts (V)
Amps (A)
Ohms (Ω)
Hertz (Hz)
Milli (m)
Micro (μ)
Capacitance (⊣⊢)

MULTIMETER SAFETY

MULTIMETER SAFETY

Before using the meter, read the following safety information carefully. In the manual the word "WARNING" is used for conditions and actions that pose hazards to the user, the word "CAUTION" is used for conditions and actions that may damage your meter. The symbols shown in Figure 1 are used internationally to denote the electrical function and conditions indicated.

	DANGEROUS VOLTAGE		GROUND
	AC-ALTERNATING CURRENT		SEE EXPLANATION
	DC-DIRECT CURRENT		DOUBLE INSULATION
	EITHER DC OR AC		FUSE

Figure 1. international Electrical Symbols

SAFETY DESIGNED

V / Ω terminal is colored in red, COM terminal in black and 10A terminal in RED
to be recognized With easy

- Inspect the test leads for damaged insulation or exposed.
- Select the proper function and range for your measurement.
- Follow all safety procedures for equipment being tested. Disconnect the input power and discharge all high voltage capacitors through a protective impedance before testing in the Ω and (DIODE) function.
- When making a current measuring , turn the power off before connection the meter in the circuit
- Check the meter fused before measuring current trans-former secondary or motor winding current. An open fuse may allow high voltage build-up, which is potentially hazardous.
- To take a measurement, use the test lead probes to make the proper contacts. Remember, insert the meter in the circuit in parallel for voltage and in series for current measurements.

WARNING

TO AVOID ELECTRICAL SHOCK OR DAMAGE TO THE METER, DO NOT APPLY MORE THAN 1000V BETWEEN COM TERMINAL AND EARTH GROUND.
TO AVOID ELECTRICAL SHOCK, USE CAUTION WHEN WORKING ABOVE 60V DC OR 30V AC RMS / True RMS , SUCH VOLTAGES POSE A SHOCK HAZARD.

FEATURES

3 3/4 Digits - 4000 counts LCD
Different colors of input terminals
Auto power off - (30 minute)
Low battery indication
Protection for input overload : Most-significant digit flickered displayed
Battery life : Typical 500HRS with a regular battery
Temperatures
Operating : 0 ~ 40 ℃ (below 80% RH)
Storage : -10 ~ 60 ℃ (below 70% RH)
Guaranteed accuracy : 23 ℃ ±5 ℃
Installation Category (Overvoltage Category) : CAT Ⅱ Pollution Degree2
Relative Humidity : 0% to 80% @ (0 ℃ to 35 ℃)
0% to 70% @ (35 ℃ to 45 ℃)
Altitude : Operating - up to 2000m
Storage - 10000m

HOW TO USE THE METER

This section describes your meter and how to use it, For ease of reference, each description is numbered and keyed the illustration in page 35 of this manual.

Input Terminal

Item ①～④ describe the input terminals and different colors of input terminal allow you to have ease operation (See Table 1 for overload limits.)

① **10A Ampere input Terminal** - For current measurements(AC or DC) up to 10A continuous **(Red color)** when the function selector switch is in 10A position.

② **mA/uA Ampere input Terminal (Red color)**

③ **COM - Common Terminal** - Return terminal for all measurements. Do not apply more than **(Black color)** 1000V between The COM terminal and Earth ground

④ **V/Ω : Volts, Ohms, Continuity, Frequency, CAP, Diode Test input terminal (Red color)**

Table 1. Input terminals and Limits

FUNCTION	INPUT TERMINALS		MIN DISPLAY READING	MAX DISPLAY READING	MAXIMUM INPUT
	RED	BLACK			
V	V/Ω	COM	0.1mV	1000V	1000V DC, 750V AC
10A	10A	COM	0.01A	10.00A	10A / 600V
mA	mA/uA	COM	0.01mA	399.9mA	400mA / 600V
uA	mA/uA	COM	0.1uA	3999uA	400mA / 600V
Ω	V/Ω	COM	0.1Ω	39.99MΩ	600V AC/DC (1minute)
CAP	V/Ω	COM	0.001nF	39.99mF	600V AC/DC (1minute)
Hz	V/Ω	COM	1Hz	399.9MHz	600V AC/DC (1minute)
⊣◂ •))	V/Ω	COM			600V AC/DC (1minute)

Function Selector Rotary Switch

Item ⑤ describes function that are selected by setting the rotary switch. The meter is ready for normal operations and will respond to the rotary switch and pushbuttons.

$\widetilde{\overline{V}}$	DC & AC Voltage Measurement
$\widetilde{\overline{A}}$	DC & AC Ampere Measurement
Ω	Resistance Measurement
⊣▶	Diode Test
⊣⊢	Capacitance Measurement
•))	Beeper Sound Continuity Test
Hz	Frequency Measurement

Pushbuttons

Item ⑥～⑭ describe how use the pushbuttons

⑥ POWER ON / OFF

Press the power button to turn on the meter

⑦ PEAK HOLD

In current and voltage measurement, this button performs a peak hold function. The peak hold mode must be calibrated prior to use. To calibrate the peak hold, press the key until the meter displays "CAL" Short the test leads to calibrate.

⑧ DATA HOLD

Press hold switch to toggle in and out of the touch hold mode. In the touch hold mode the "HOLD" annunciator is displayed and the last reading is hold on the display.

⑨ FUNCTION

Press this switch to measure AC/DC voltage, AC/DC current, Resistance, Continuity, Diode test selector button to turn on.

⑩ MAX / MIN

Press this switch to toggle between the minimum and maximum values. Pressing the button for 2 seconds to escape MIN / MAX mode.

⑪ V-Hz (DM-531/532)

This switch is used to quickly view the frequency during measuring the AC voltage or current. Push "V-Hz"switch once the LCD is changed to display frequency. Push "V-Hz"switch again, the LCD back to display the AC signal amplitude reading. in "V-Hz"mode, pressing RANGE key switch does not change the frequency range. however, RANGE key switch changes the sensitivity of frequency detection, if the input signal amplitude is less than 1% of full scale reading, the user shall increase the sensitivity. pressing range switch in "V-Hz"mode also changes the full scale range of the original voltage mode.

⑫ RANGE HOLD

Press RANGE to select the manual range mode, then the word “AUTO” will disappear (the meter remains in the range it was in when manual range was selected). In the manual range mode, each time you press range button, the range increases, and a new value is displayed. To exit the manual range mode and turn to the auto ranging, press and hold down range switch for 2 seconds the word “AUTO” will appear again.

⑬ RS-232C (DM532 / DM532T)

Measuring in the RS-232 port DATA pc mode Pc program is avaliable at EZ digital homepage Please Download.

⑭ REL (DM531 / DM531T)

For resistance, frequency, capacitance measurements, this button enables the relative change function. When pressed the value is stored, and all new measurements are displayed as their difference from the stored value.

*** Auto power off** - The auto power off sign on the LCD panel indicates the meter is working in the auto power off mode. if the meter idles for more than 30 minutes, the meter automatically turns the power off. When this happens, the state of the meter is saved, the meter can be turned back on by pushing any key switch or changing the rotary switch. The meter will give an alarm in 15 seconds before the meter automatically turns the power off. To disable the auto power off function, power up the meter while pressing either the range, REL or MAX/MIN switch.

APPLICATION

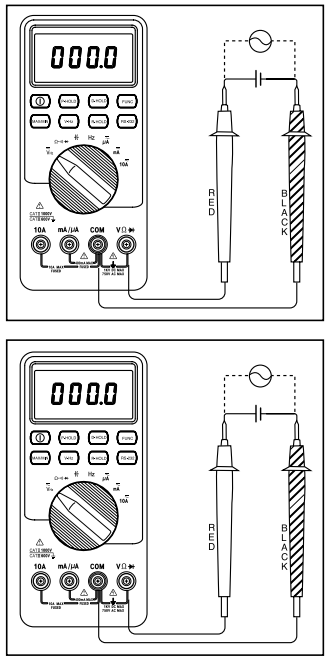


Figure 5-1. Measuring Voltage

This section discusses some common application for your meter, and alerts you to some things to keep in mind when taking measurements.

Measuring Voltage (AC / DC)

To measure voltage, connect the black lead to common terminal and red one to V/Ω terminal , and turn the rotary switch to VHz range as Figure 5-1

Each of AC/DC voltage ranges presents an input impedance of approximately 10MΩ, AC voltage is AC-Coupled to the frequency range is 40Hz to 400Hz.

* Over range is being indicated by flickered "OL" display

* Press this switch to measure AC voltage FUNC selector button to turn on

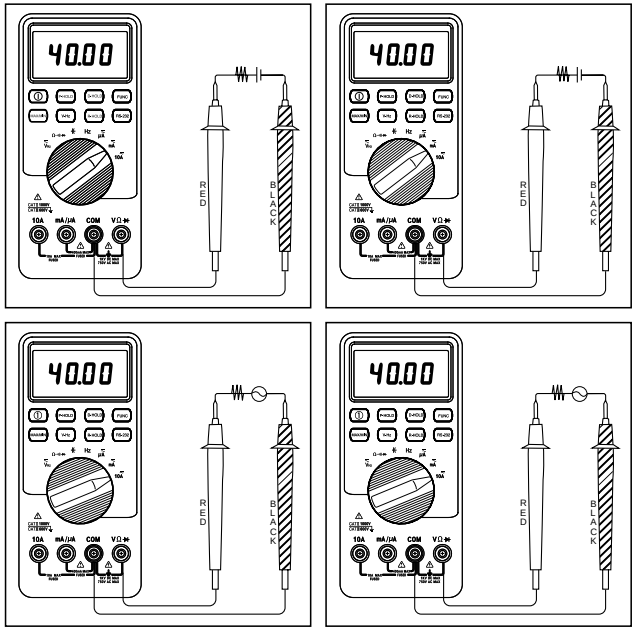


Figure 5-2. Measuring current

Measuring Current (AC / DC)

If you don't know what the current is, connect the black lead to the common terminal and red one to the 10A input terminal
first to see if you have a safe level for the mA input (max. 400 mA) terminal and turn rotary switch to A range as Figure 5-2

Connect the meter in series with the load or circuit under test, and note that the frequency range for AC current measurement is 40Hz to 400Hz.

* Over range is being indicated by flickered "OL" display

* Press this switch to measure AC voltage FUNC selector button to turn on

*** WARNING**

DO NOT APPLY THE VOLTAGE OF MORE THAN 600V DC OR 600V AC RMS

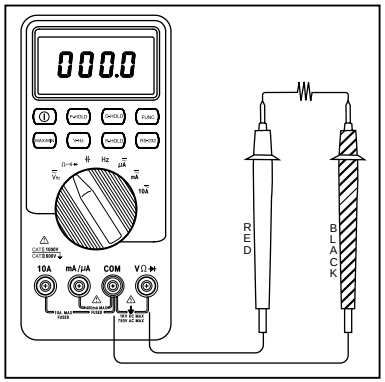


Figure 5-3. Measuring resistance

Measuring Resistance

To measure resistance, connect the black lead to common terminal and red one to V/Ω terminal, and turn the rotary switch to Ω range as Figure 5-3. Connect the test leads across the resistance under measurement.

*** CAUTION**

Turn off power on the test circuit and discharge all capacitors before attempting in-circuit resistance measurements, If an external voltage is present across a component, it will be impossible to take an accurate measurement of the resistance of that component.

Due to the sensitive nature of the 400 Ω range, a residual resistance is present. This resistance will display itself, if the probes are
shorted. This residual resistance is due to the lead, track and switch resistance. To obtain measurement within the stated accuracy when using the 400 Ω range subtract from your value the residual resistance reading.

* Over range is being indicated by flickered "OL" display

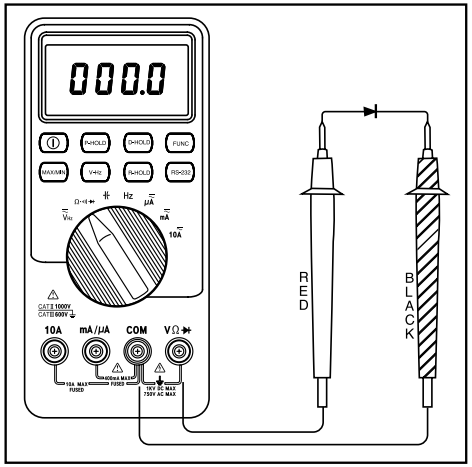


Figure 5-4. Diode test

Diode Test

To perform a diode test, plug the black test lead to the COM terminal and the red one into the V/Ω input, turn the rotary switch to (diode setting) and connect the test leads across the diode under measurement as Figure 5-4.

* Press this switch to measure diode range selector button

The forward voltage drop is displayed in V unit.

Test condition : Forward DC current (2 mA)
Reversed DC voltage (1 V)

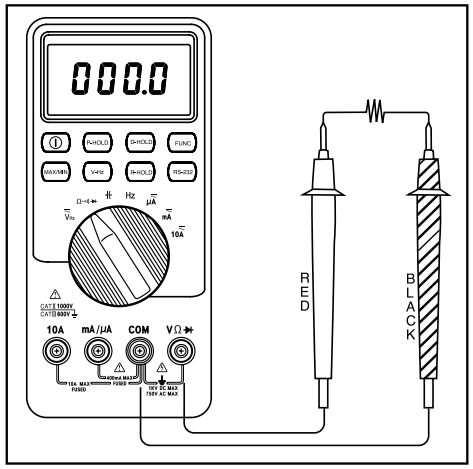


Figure 5-5. Continuity test

Continuity Test

Continuity testing verifies that circuit connections are intact. To perform audible continuity tests, turn the rotary switch to the (continuity test) position.

* Press this switch to measure continuity range selector button

Test resistance below 35 Ω

*** CAUTION**

Turn off power on the test circuit and discharge all capacitors before attempting continuity testing.

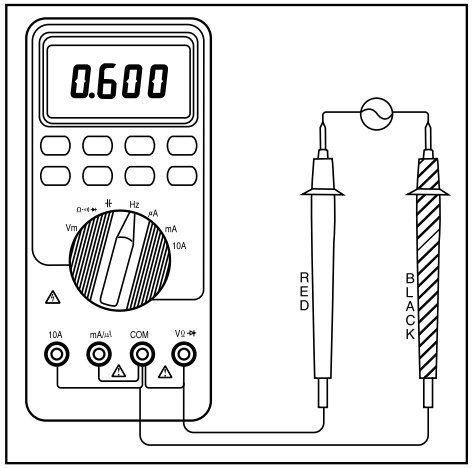


Figure 5-6. Measuring frequency

Measuring Frequency

* Plug the black test lead into the COM port and the red test lead into the V / Ω port.

* Set the rotary switch to the Hz position

* Connect the meter in parallel with the load or circuit

CAUTION

Overload Protection : 600V RMS

INPUT SENSITIVITY (RMS)

V-Hz MODE(Function) (DM-531, 532)

FREQUENCY	40Hz ～ 400Hz ～ 4KHz ～ 40KHz ～ 400KHz ～ 1MHz
SENSITIVITY	200mV 5V 10V

Hz(FREQUENCY) MODE (Function)

FREQUENCY	40Hz～400Hz～4KHz～40KHz～400KHz～1MHz～40MHz～400MHz
SENSITIVITY	200mV 1V 5V 10V

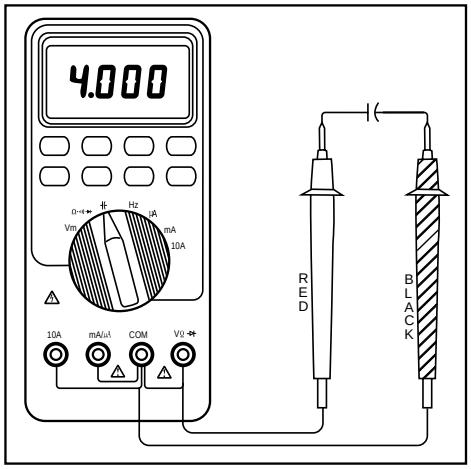


Figure 5-7. Measuring Capacitance

Measuring Capacitance

Before connecting the test capacitance turn off the power Figure 5-7

Connect the test leads across the capacitance under measurement.

*** CAUTION**

- **Capacitor should be discharged before being tested.**
- **When testing large capacitors, note that there will be a certain time lag before displaying final indication**

TRUE RMS (DM-531T, DM-532T)

In order to compare dissimilar waveform, calculate ohm's law statements or power relationship, you must know the effective value of a signal.

If it is a dc signal, the effective value equals the dc level.

If the signal is ac, however, we have to use the root mean square or rms value. The rms value of an ac current or ac voltage is defined as being numerically equal to the dc current or voltage that produces the same heating effect in a given resistance that the ac current or voltage produces.

In the past, average responding converters were the type of converter most widely used. theoretically, the rms value of a pure sine wave is $1/2^{\frac{1}{2}}$ of the peak value and the average value is $2/\pi$ of the peak value.

Since the meters converted to the average value, the value was $1/2^{\frac{1}{2}} \div 2/\pi = 1.11$ of the average value when measuring a sine wave. Most meters used an average responding converter and multiplied 1.11 to present true rms measurements of sine waves.

As the signal being measured deviated from a pure sine waves, the errors in measurement rose sharply. Signals such as square waves, mixed frequencies, white noise, modulated signals, etc., could not be accurately measured.

Rough correction factors could be calculated for ideal waveforms if the signal being measured was distortion free, noise-free, and a standard waveform. The true rms converter in this meter provides direct accurate measurement of these and other signals.

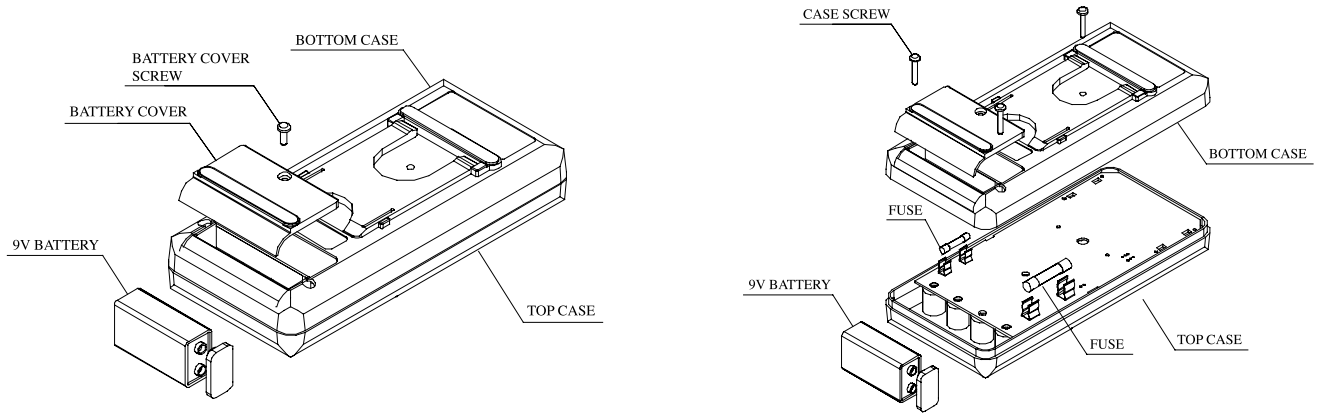


Figure 5-8. Battery or Fuse Replacement (DM-531T, DM-532T)

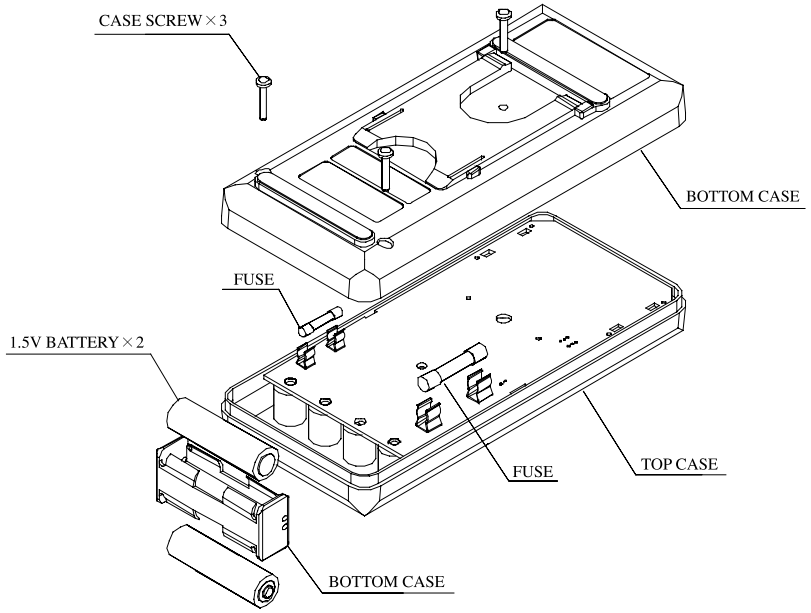


Figure 5-9. Battery or Fuse Replacement (DM-531, DM-532)

◎ **SPECIFICATION (MODEL : DM-531, DM-532)**

FUNCTION	RANGE	RESOLUTION	ACCURACY
DC VOLTAGE	400mV	0.1mV	±0.5 % of READING ±5 DIGIT
	4V	0.001V	
	40V	0.01V	
	400V	0.1V	
	1000V	1V	±1.0 % of READING ±5 DIGIT
AC VOLTAGE	400mV	0.1mV	±1.2 % of READING ±5 DIGIT 40Hz ~ 400Hz
	4V	0.001V	
	40V	0.01V	
	400V	0.1V	
	750V	1V	±2 % of READING ±5 DIGIT 40Hz ~ 400Hz
DC AMPERE	400uA	0.1uA	±1 % READING ±5 DIGIT
	4000uA	1uA	
	40mA	0.01mA	
	400mA	0.1mA	
	10A	0.01A	

AC AMPERE	400uA	0.1uA	±2 % READING ±5 DIGIT 40Hz ~ 400Hz
	4000uA	1uA	
	40mA	0.01mA	
	400mA	0.1mA	
	10A	0.01A	
OHMS	400.0Ω	0.1Ω	±1.0 % READING ±5 DIGIT
	4.000kΩ	0.001kΩ	
	40.00kΩ	0.01kΩ	
	400.0kΩ	0.1kΩ	
	4.000MΩ	0.001MΩ	±1.5 % READING ±5 DIGIT
	40.00MΩ	0.01MΩ	
CONTINUITY	35Ω		
DIODE CHECK	1V 2mA		
FREQUENCY	40Hz ~ 400MHz		±0.5 % READING ± 5 DIGIT
CAPACITANCE	40nF ~ 400uF		±2 % READING ± 40 DIGIT
	400uF ~ 4mF		±6 % READING ± 40 DIGIT
VOLT/FREQ (V-Hz)	40Hz ~ 1MHz		±0.5 % READING ± 3 DIGIT

◎ **SPECIFICATION (MODEL : DM-531T, DM-532T)**

FUNCTION	RANGE	RESOLUTION	ACCURACY
DC VOLTAGE	400mV	0.1㎷	±0.5 % of READING ±5 DIGIT
	4V	0.001V	
	40V	0.01V	
	400V	0.1V	
	1000V	1V	±1.0 % of READING ±5 DIGIT
AC VOLTAGE	400㎷	0.1㎷	±1.2% of READING ±5 DIGIT 40㎐ ~ 1k㎐
	4V	0.001V	
	40V	0.01V	
	400V	0.1V	
	750V	1V	±2% of READING ±5 DIGIT 40㎐ ~ 1k㎐
DC AMPERE	400uA	0.1uA	±1 % READING ±5 DIGIT
	4000uA	1uA	
	40mA	0.01mA	
	400mA	0.1mA	
	10A	0.01A	
AC AMPERE	400uA	0.1uA	±2 % READING ±5 DIGIT 40㎐ ~ 1k㎐
	4000uA	1uA	
	40mA	0.01mA	
	400mA	0.1mA	
	10A	0.01A	

OHMS	400.0Ω	0.1Ω	±1.0 % READING ±5 DIGIT
	4.00kΩ	0.001kΩ	
	40.00kΩ	0.01kΩ	
	400.0kΩ	0.1kΩ	
	4.000MΩ 40.00MΩ	0.001MΩ 0.01MΩ	±1.5 % READING ±5 DIGIT

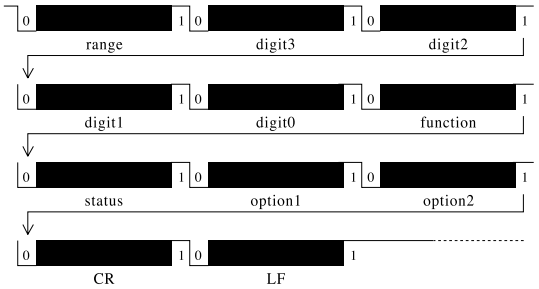
CONTINUITY	35Ω		
DIODE CHECK	1V 2mA		
FREQUENCY	40Hz ~ 400MHz		±0.5 % READING ± 5 DIGIT
CAPACITANCE	40nF ~ 400uF		±2 % READING ± 40 DIGIT
	400uF ~ 4mF		±6 % READING ± 40 DIGIT

* Accuracy is ginven as ±(% of reading + number of least sgnificant digits) at 18℃ to 28℃ with relative humidity up to 80% for a period of one year after calibraton.
* Sources like small hand-held radio transceivers, fixed station radio and television transmitters, vehicle radio transmitters and cellular phones generate electromagnetic radiation that may induce voltages in the test leads of the multimeter. In such cases the accuracy of the multimeter cannot be guaranteed due to physical reasons.

◎ SPECIFICATION (SERIAL DATA OUT)

The serial data is sent to SDO pin twice every A/D conversion cycle. The data format complies with JIS 7BIT transmission cord with a baud of 2400. The host can use RS-232 interface to read the data. A single data packed includes a start bit (always 0), 7 data bits, an odd parity check bit, and a stop bit (always 1). The following figure shows the data format of a single packet. The LSB is sent first and the MSB is sent last.

One data block consists of 11 packets, or 110 bits. The following figure shows the format of a data block. The range packet indicates the full scale range of the meter. Digit 3 through digit 0 is just the digits on the LCD panel. The function packet indicates the measurement mode of the meter. Status, option 1 and option 2 gives the status of the meter. CR and LF are delimiters used to separate the block.



The meter always outputs the current input value to the serial port. Each block is repeated twice in on conversion cycle. The detailed data format of each packet is listed below.

FUNCTION

This packet indicates the measurement mode of the meter. The following table summaizes the transmitted cord for each mode. Note that the encoding of this packet is different from the encoding of **FC1** ∼**FC4** switch.

CORD	MEASUREMEN MODE
0111011	VOLTAGE
0111101	μA CURRENT
0111001	mA CURRENT
0111111	A CURRENT
0110011	OHM
0110101	CONTINUITY
0110001	DIODE
0110010	CAPACITANCE
0110110	FREQUENCY
0111110	ADP 0
0111100	ADP 1
0111000	ADP 2
0111010	ADP 3

*** CAUTION**

1. The Judge bit in the Status packet determines whether it is frequency mode or RPM mode
2. The Judge bit in the Status packet determines whether the unit is Celcius or Fahrenheit.

RANGE

This packet indicates the full scale range of the meter. When the meter operates in continuity mode,

CORD	VOLT	mA	μA	OHM	FREQ	CAP
0110000	400.0mV	40.00mA	400.0μA	400.0Ω	4.000kHz	4.000nF
0110001	4.000V	400.0mA	4000μA	4.000kΩ	40.00kHz	40.00nF
0110010	40.00V			40.00kΩ	400.0kHz	400.0nF
0110011	400.0V			400.0kΩ	4.000kHz	4.000μF
0110100	4000V			4.000MΩ	40.00MHz	40.00μF
0110101				40.00MΩ	400.0MHz	400.0μF
0110110						4.000mF
0110111						40.00mF

diode mode, or current (A) mode, this packet is always 0110000 since the full scale range in these modes are fixed. The following table lists the code for each range in each measurement mode.

DIGIT3 - DIGIT0

Digit 3 is the most significant digit on the LCD panel, and digit 0 is the least significant digit. When the LCD panel shows "OL" the serial port output 4000

STATUS

The format of this shown below. The Judge field is meaningful only when the Function packet indicates Frequency/RPM mode or temperature mode. In temperature mode, judge is 1 if the unit is ℃ and is 0 if the unit is ˚F. In Frequency/RPM mode, judge is 1 if the meter operates in Frequency mode; otherwise, it is 0. Sign field indicates whether the minus sign on the LCD panel in on or off. BATT field is battery low condition is true. "OL" indicates input overflow.

0	1	1	PMAX	PMIN	0	V/A-Hz
BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

OPTION1

This packet contains information on special measurement modes. The format of this packet is shown below This three non-constant fields is set to one when the meter operates in the corresponding special modes.

DIGHT	CORD
0	0110000
1	0110001
2	0110010
3	0110011
4	0110100
5	0110101
6	0110110
7	0110111
8	0111000
9	0111001

0	1	1	PMAX	PMIN	0	V/A-Hz
BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

OPTION2

This packet contains information on the operation mode of the meter. The format is shown below. The DC field indicates that the meter operates in DC measurement mode, either voltage or current. The AC field indicates that the meter operates in AC measurement mode. The AUTO field is set to one if the meter operates in automatic mode, and in set to zero when the meter operates in manual mode. The APO field indicates whether auto power off function is enabled or not.

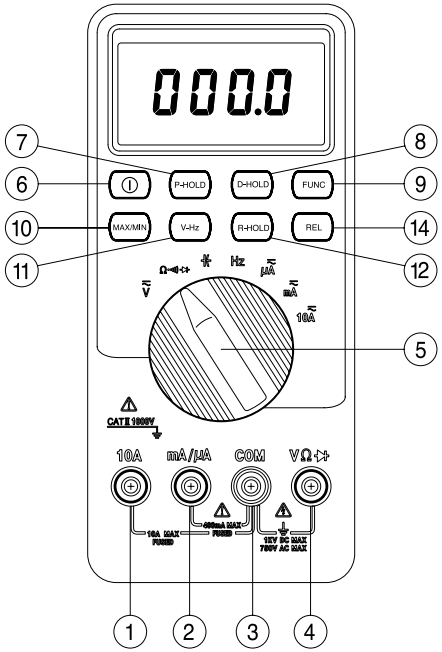
0	1	1	DC	AC	AUTO	APO
BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

CR

Carrage return. The transmitted cord is 0001101.

LF

Line feed. The transmitted cord is 0001010.



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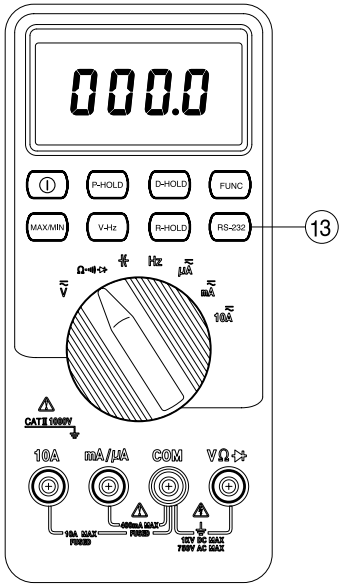
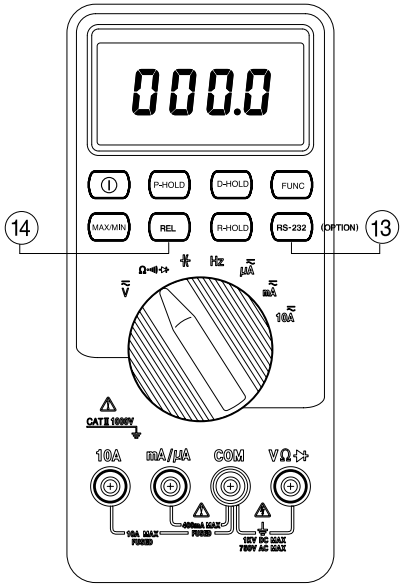


DM-532



DM-531T, 532T

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