

**KENWOOD**

DIGITAL MULTIMETER

**DL-711**

**DL-712**

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# INSTRUCTION MANUAL

KENWOOD CORPORATION

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# INSTRUCTIONS

Thank you for purchasing a digital multimeter. The DL-711/712 digital multimeter which incorporate a 3-and-half digit liquid crystal display and a CMOS LSI consumes very little power and may be powered by dry cells for many hours.

The "auto-range" feature facilitates measurement of voltage and resistance.

Read this manual carefully to make the most of the instrument.

## Symbol in This Manual

 This symbol indicates where applicable cautionary or other information is to be found.

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A product of

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## FEATURES

- The DL-712/711 digital multimeter is compact and lightweight. The FE-type liquid crystal display reduces fatigue of your eyes and provides good legibility outdoors.
- The ranges of measurement are 100  $\mu$ V to 1,000V for DC voltage, 1mV to 750Vrms for AC voltage, 100 milliohms to 19.99 megohms for resistance, and 0.1  $\mu$ A to 10.00 A for direct and alternating currents.
- The auto-range feature may be used in measurement of DC and AC voltages and resistance.
- Protected against over load with a metal oxide varistor and fuse to DC voltage measurement up to max  $\pm$ 1,100 V, to AC voltage measurement up to 850 Vrms, to resistance measurement up to  $\pm$ 250 V DC/rms and AC/DC current measurement up to 0.2A except 10A range.
- Power consumption is very small thanks to the use of CMOS LSI and liquid crystal display. The instrument may be powered with four type-B(SUM-2) dry cells continuously for about 1,000 hours. It is possible to supply power through an AC adaptor.
- The capabilities of the multimeter include continuity test, diode check, and is provided data hold and AUX adaptor.
- It is possible to control "measurement" and "data hold" externally through the REMOTE HOLD terminal.

# SPECIFICATIONS

## DC voltage

Range automatic/manual

Range	Accuracy (at 23° ± 5°C, below 80% R. H.)		Resolution	Input impedance
	DL-712	DL-711		
—	DL-712	DL-711	—	—
200mV	±0.1% of rdg ±2 digits	±0.5% of rdg ±2 digits	100μV	1000 Megohms or more
2000mV	±0.1% of rdg ±1 digit	±0.5% of rdg ±1 digit	1mV	11MΩ ± 2%
20 V			10mV	10MΩ ± 2%
200 V			100mV	
1000 V			1 V	

rdg : reading

Maximum permissible input 1,100V DC or 850V AC rms

Temperature coefficient 0° ~ 18°C, 28° ~ 40°C

DL-712 (±0.02% of rdg ± 0.1 digit)/°C

DL-711 (±0.03% of rdg ± 0.1 digit)/°C

NMR 40 dB or more (50Hz, 60Hz)

CMR 100 dB or more (50Hz, 60Hz) RS=1kΩ

## AC voltage

Range automatic/manual

Mean value rectification

(calibrated to rms value)

Range	Accuracy (at 23° ± 5°C, below 80% R.H.)		Resolution	Input impedance
	DL-712	DL-711		
—	DL-712	DL-711	—	—
2000mV	±0.75% of rdg ±3 digits	±1% of rdg ±5 digits	1mV	11MΩ ± 2%
20 V			10mV	10MΩ ± 2%
200 V			100mV	
750 V			1 V	

Maximum permissible input 1,100V DC or 850V AC rms

Frequency range 40 ~ 500Hz

Temperature coefficient 0° ~ 18°C, 28° ~ 40°C

DL-712 □ (±0.05% of rdg ± 0.3 digit)/°C

DL-711 □ (±0.05% of rdg ± 0.3 digit)/°C

## DC current

Range manual

Range	Accuracy (at 23° ± 5°C, below 80% R.H.)		Resolution	Maximum permissible current
	DL-712	DL-711		
—	DL-712	DL-711	—	—
200μA	±0.75% of rdg ±1 digit	±1% of rdg ±1 digit	100nA	200mA
2000μA			1μA	
20mA			10μA	
200mA			100μA	
10 A	±1% of rdg ±2 digits	±1.2% of rdg ±2 digits	10mA	10A

In the range of 200μA to 200mA, the instrument is protected from input current exceeding 200mA with a fuse.

Temperature coefficient 0° ~ 18°C, 28° ~ 40°C

DC-712 □ (±0.05% of rdg ± 0.1 digit)/°C

DC-711 □ (±0.05% of rdg ± 0.1 digit)/°C

## AC current

Range manual  
Mean value rectification  
(calibrated to rms value)

Range	Accuracy (at 23°C ± 5°C, below 80%R.H.)		Resolution	Maximum permissible current
	DL-712	DL-711		
—	DL-712	DL-711	—	—
200 μA	±1% of rdg ± 3 digits	±1.2% of rdg ± 5 digits	100 nA	200mA
2000 μA			1 μA	
20mA			10 μA	
200mA			100 μA	
10 A	±1.2% of rdg ± 3 digits	±1.5% of rdg ± 5 digits	10mA	10A

Frequency range 40~500Hz

In the ranges of 200μA to 200mA, the instrument is protected from input current exceeding 200mA with a fuse.

Temperature coefficient 0°~18°C, 28°~40°C

DL-712  $\left[ \right]$  (±0.1% of rdg ±0.2 digit)/°C  
DL-711  $\left[ \right]$

## Resistance

Range automatic/manual

Range	Accuracy (at 23°C ± 5°C, below 80%R.H.)		Resolution	Maximum permissible current
	DL-712	DL-711		
—	DL-712	DL-711	—	—
200 Ω	±0.2% of rdg ± 3 digits	±0.5% of rdg ± 3 digits	100mΩ	0.55mA
2000 Ω			1 Ω	86μA
20 kΩ			10 Ω	22μA
200 kΩ			100 Ω	3.7μA
2000 kΩ	±1% of rdg ± 1 digit	±1% of rdg ± 1 digit	1 kΩ	0.4μA
20MΩ	±2% of rdg ± 2 digits	±2% of rdg ± 2 digits	10 kΩ	40nA

Open terminal voltage

200 ohms range 1.8V or less

2000 ohms – 20 megohms range 0.8V or less

Maximum permissible voltage ± 250V DC/250V rms

Temperature coefficient 0°~18°C, 28°~40°C

200 ohms – 200 kilohms range

DL-712  $\left[ \right]$  (±0.025% of rdg ±0.2 digit)/°C

DL-711  $\left[ \right]$  (±0.03% of rdg ±0.2 digit)/°C

2000 kilohms range

DL-712  $\left[ \right]$  (±0.05% of rdg ±0.2 digit)/°C

DL-711  $\left[ \right]$

20 megohms range

DL-712  $\left[ \right]$  (±0.1% of rdg ±0.2 digit)/°C

DL-711  $\left[ \right]$

## Continuity test

Test range 200 ohms range

Beeping occurs at 20±10 ohms.

Fixed to 200Ω range by “Ω/ ●”) ” switch regardless of the range switch setting.

## Diode check

Test current Approx. 1mA ±5% (when shorted,  
supply voltage : 6.0V)

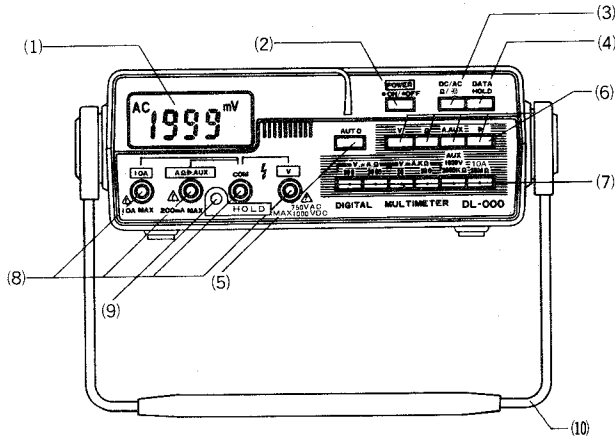
Reading accuracy ±5% of rdg ±1 digit

Open terminal voltage Approx. 2.7V ±10%  
(supply voltage : 6.0V)

Display	FE-type LCD panel (displaying unit mark)	Withstand voltage	$\pm 500\text{V}$ DC (across the COM terminal and ground)
Maximun reading	1999 or -1999	Weight	Approx. 610g (batteries included)
Operation	By integration with drift compensated	Dimensions	(162)W $\times$ (60)H $\times$ (130)D mm
Polarity	Automatic selection	Temperature and humidity ranges for guaranteed accuracy	$23^{\circ} \pm 5^{\circ}\text{C}$ , under 80% R.H.
Overflow indication	1 or -1 appears at MSD position (decimal point and unit displayed)	Operating temperature and humidity ranges	$0^{\circ}$ to $40^{\circ}\text{C}$ , under 80% R.H.
Range selection	Automatic/manual (manual only for AC/DC current) Automatic switching UP level exceeding 1999 DOWN level below 179	Accessories	Input leads ... 1 set Instruction manual ... 1 Manganese batteries SUM-2 ... 4 Fuse ... 1
Sampling time	Approx. 500msec/sample		
Supply power	Dry cells (SUM-2) $\times$ 4 or external supply power 4.5~9V, less than 10mA.		
Battery service life	Approx. 1000 operating hours continuously (with manganese battery) Mark "B" appears on the liquid crystal display when the battery voltage has fallen.		
Power consumption	Less than 20mW (with buzzer operationg)		

# SWITCHES AND CONNECTORS

## Front panel



### ( 1 ) Digital display

The 3-and-1/2 digit liquid crystal display reads from 000 up to 1999, indicates the decimal point; sign “ - ” identifying negative polarity ; marks identifying functions, “AC”, “←”, and “●))” ; and unit marks of “mV”, “V”, “ $\mu$ A”, “mA”, “A”, “ $\Omega$ ”, “k $\Omega$ ”, and “M $\Omega$ ”.

It indicates mark “B” when the supply voltage is lower than the minimum required level.

### ( 2 ) Power switch

Turns on and off power. When depressed this switch, locks up and turns on power.

Press it again and it gets released and turns off power.

### ( 3 ) DC/AC $\Omega$ / ●)) selector

In measurement of voltage and current; selects DC or AC mode according to the signal. DC and AC modes alternate by push and push.

Only AC mode is indicated with sign “AC”.

In measurement of resistance ; selects ordinary resistance measurement or continuity test.

By push and push switch and only continuity test mode is indicated with sign “ ●)) ”.



#### (4) DATA HOLD switch

Permits to hold the displayed data.

In ordinary measurement, keep it unlocked. If engaged this switch, the display continues to indicate the value regardless of input signal.

If changed the function or range switch, the data indication value held, but "V", "Ω", and "A" will indicate.

Refer to (9) for Remote Hold function.

#### (5) Auto Range selector

In measurement of voltage and resistance, engage this switch to enable Auto Range function.

This switch is ineffective for the other functions.

#### (6) Function selector

[V] function switch

Depress this for voltage measurement.

[Ω] function switch

Depress this for resistance measurement.

[A, AUX] function switch

Depress this for current measurement or when the AUX adaptor is used.

[→+ ] function switch

Depress this to perform diode check.

#### (7) Range selector

[200mV 200Ω 200μA] range switch

This range does not cover AC 200mV.

[2,000mV 2,000Ω 2,000μA] range switch

[20V 20kΩ 20mA] range switch

[200V 200kΩ 200mA] range switch

[1,000V 2,000kΩ AUX] range switch

The 1,000V range covers up to 1,000V DC and 750V AC rms.

Select both this switch and [A, AUX] to use the AUX adaptor.

[20MΩ 10A] range switch

This range is the same as the 1,000V range when the [V] function is selected.

#### (8) Input terminals

[10A] terminal

Use this terminal to measure currents of 200mA to 10A. The test leads should endure the current under measurement.

[A, Ω, →+ ,AUX] terminal

Use this terminal for measurement of current and resistance, diode check, and to use the AUX adaptor.

[COM] terminal

Common terminal of all measurements.

[V] terminal

Use this terminal for voltage measurement.

### (9) REMOTE HOLD signal input jack

With the Data Hold switch depressed, this terminal allows remote switching between measurement and data hold.

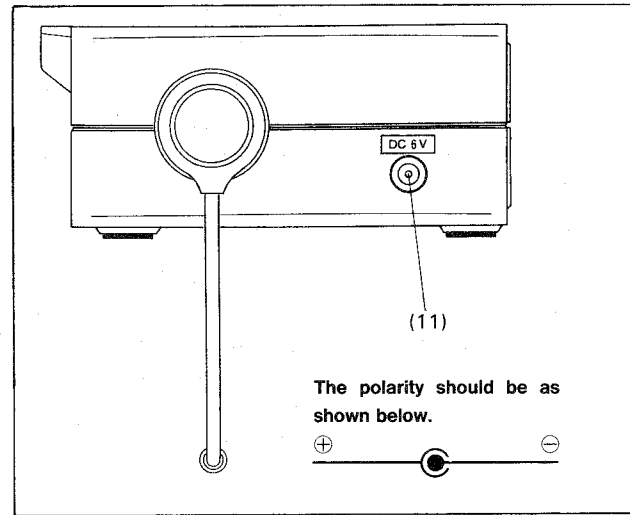
A 2-pin mini plug (2.5-mm-dia) fits to this terminal. Measurement is possible when the lines of this plug are shorted and data will be held otherwise.

This terminal is ineffective when (4) DATA HOLD is off.

### (10) Stand

The stand may be fastened to the body at some positions. Install it for most convenience.

### Side panel

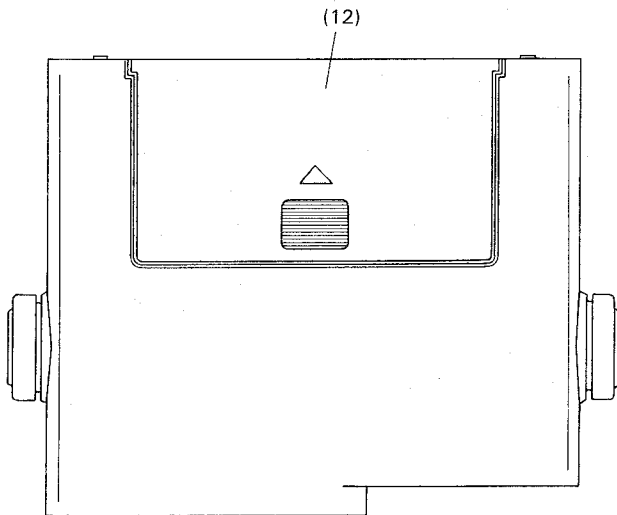


### (11) External power input jack

Use the AC adaptor AD-700 (option) to take power from AC line (90V~140V).

If used a regulated DC power supply, select one which is capable of supplying 6V and more than 10mA. In this case, indication value of resistance measurement may vary.

## Top panel



### (12) Battery compartment lid

Push the lid the direction of "▲" to remove it. Install four type-B dry cells. The spare fuse provided may be stored in the compartment.

# OPERATION

## DC/AC voltage measurement

1. Plug the test leads to the input terminals ; the red lead to the [V] terminal and the black lead to the [COM] terminal.
2. Select [V] function with the function selector.
3. Select DC or AC mode with the [DC/AC,  $\Omega$ ,  $\bullet$ )] selector according to the object signal.  
DC and AC modes alternate by depression of the selector. Only AC mode is indicated with mark "AC".
4. Select a suitable range according to the object signal. To select Auto-range, depress and lock the [AUTO] range switch. Then the range of 200mV DC, 2,000mV AC is selected with input open.
5. Apply the test leads to the circuit under test.

## DC/AC current measurement

1. Plug the test leads to the input terminals ; the red lead to the [A. $\Omega$ . $\rightarrow$ . AUX] terminal and the black lead to the [COM] terminal.  
In the [10A] range, plug the leads to the [10A]

and [COM] terminals. The leads should have a sufficient capacity for possible test currents.

2. Select [A. AUX] function with the function selector.
3. Select DC or AC mode with the [DC/AC,Ω/ ●))] ] selector. Only AC mode is indicated with mark "AC".
4. Select a suitable range according to the object signal.
5. The test leads to the circuit under test.

### Resistance measurement

1. Plug the test leads to the input terminals; the red lead to the [A.Ω. →+ . AUX] terminal and the black lead to the [COM] terminal.
2. Select [Ω] function with the function selector.
3. Select a suitable range according to the object resistance, To select Auto-range, depress and lock the [AUTO] range switch. Then the range of 20 megohms is selected with input open.
4. Apply the test leads to the circuit under test.
5. To make measurement of high megohms range, response time is slow, (under 10 sec at 19 MΩ).

### Continuity test

1. Plug the test leads to the input terminals ; the red lead to the [A.Ω. →+ . AUX] terminal and the black lead to the [COM] terminal.
2. Select [Ω] function with the function selector.
3. Select [ ●))] ] function with the [DC/AC,Ω/ ●))] ] selector. Mark " ●))] )" appears on the liquid crystal display.
4. The 200 ohms range is selected independently of the range selector.
5. Apply the test leads to the circuit under test.
6. Beeping occurs when the resistance of the circuit under test is less than  $20 \pm 10$  ohms.

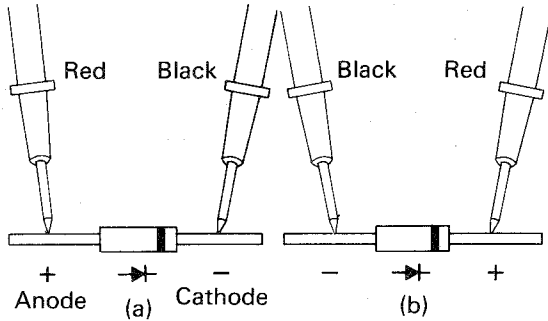
### Diode check,

1. Plug the test leads to the input terminals ; the red lead to the [A.Ω. →+ . AUX] terminal and the black lead to the [COM] terminal.
2. Select [ →+ ] function with the function selector.
3. Apply the red test lead to the anode side of the diode under test and the black lead to the cathode side (see Figure(a)).

If the diode is not defective, this instrument reads a forward voltage which is normally 400~800mV.

4. Apply the red test lead to the cathode side of the diode under test and the black lead to the anode side (see Figure(b)).

If the diode is not defective, the instrument indicates overflow (  $\rightarrow \leftarrow 1mV$  ).



### Supply power

To power the instrument with dry cells, install four type B dry cells in the battery compartment on the back of the device. Be sure to install the batteries at the right polarity.

To power it from an external DC power supply, connect the AC adaptor AD-700(option to use 90V ~ 140V) to the external power input jack provided on the right side.

To power it with another regulated power supply, use one which is capable of supplying voltage of 4.5 ~ 9V and current of more than 10mA.

The polarity should be as shown below. In this case, indication value of resistance measurement may vary.



## MAINTENANCE

### **▲ How to Check Blowout of Protection Fuse**

Set the resistance measurement range to the continuity test mode and short-circuit the testing leads ; a beeping alarm occurs. If the beeping alarm does not stop by separating the test leads, the current protection fuse may have blowout.

### **Replacement of the fuse**

Perform the following procedure to replace the fuse installed for protection in A.  $\Omega$ .AUX function modes.

1. Remove two screws from the lower case.
2. Remove the upper case.
3. Remove the fuse from the inside of the lower case.
4. Replace the fuse with new fuse (F05-2019-05) located in the battery compartment. Please apply following specification for your further replacement of Fuse. Specification of Fuse 250V, 0.2A, Resistance : less than  $5\Omega$ , Size :  $6.3\phi \times 30\text{mm}$
5. Replace the upper case.
6. Fasten the upper case with the two screws.

During this procedure, be careful not to change the settings of variable resistors inside and apply force to parts.

## PRECAUTIONS FOR USE

1. Do not use the instrument under direct sunlight. Temperature would rise excessively inside, leading to malfunction or damage of transistors and/or ICs.
2. Do not use it in an environment where temperature and/or humidity is high.
3. Do not use it in an environment where vibration is affecting very much : error might result.
4. Be sure to observe the specifications on the maximum permissible input voltage and current. If an excessive input is applied, not only the instrument is likely to break but also it is very dangerous.
5. Do not measure resistance without applying no voltage across the input terminals.
6. If desired accurate measurements, warm it up for more than 10 minutes before making measurements.
7. The attached battery (manganese dry cell battery SUM-2) should be replaced with a battery that complies with the IEC Standards.