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一、General

It is a good performance and Auto Range 3 3/4 digital instrument with USB interface, driven by battery. It adopts the LCD with 42mm high figure to make the reading very clear and it possesses the Data Hold and Auto Power Off function to make the use more convenient.











This instrument has the function of measuring ACV, DCV, ACA, DCA, Resistance, Capacitance, Temperature, Diode, Continuity, Frequency, and Duty Circle, etc. It takes the dual-integral A/D Converter as core, and possesses the Auto Range and Manual Range selection function. It is an excellent tool and most suitable for lab, factory, maintenance and repair users.

二、Safety Note

The instrument meets the standard of IEC1010 (safety standard promulgated by the International Electrician Committee). Please read the safety notes carefully before operation.

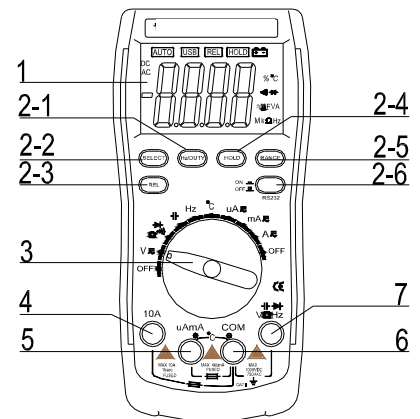
1. When measuring each range, do not input the value over the range limit.
2. It is prerequisite to make sure the test lead connects reliably, links up correctly, insulates properly to avoid the electric shock when measuring the voltage higher than 36V DC and 25V AC. The voltage less than 36V is safety voltage.
3. Be sure to keep the test leads off the tested point when converting the function and range.
4. Select the correct function and range to avoid fault operation. Even though this instrument has the full-function protection, please pay your close attention when measuring for your safety.
5. Do not use this instrument to measure before fixing the battery and tightening the bottom case.
6. Do not input the voltage at the Capacitance and Current Range.
7. Be sure to keep the test leads off the tested point and turn off the power before replacing the battery or fuse.

三、Safety Symbol Description

	Warning		DCA
	High Voltage! Dangerous!		ACA
	GND		DCA & ACA
	Dual Insulation		Meets the direction of European IEC
	Low Battery		Fuse

四、Front Panel Description

1. LCD Display.
2. Function Button: Select each measuring function.
 - 2-1 Frequency、Duty Circle selection button
 - 2-2 Function switch button
 - 2-3 Relative Value measuring Button
 - 2-4 Data Hold button
 - 2-5 Manual Range selection button
 - 2-6 RS232 interface switch button



3. Function/range selection knob: select the measuring function and range

4. 10A current input terminal: Measuring AC/DC 10A positive input terminal, insert the red test lead.
5. uA/mA and Temperature input terminal: Measuring AC/DC uA/mA and Temperature positive input terminal, insert the red test lead.
6. COM input terminal: negative input terminal, insert the black test lead.
7. VΩHz input terminal: measure Voltage, Frequency/Duty Circle, Resistance, Capacitance, Diode and Continuity positive input terminal, insert the red test lead.

五、Button function description

- (1) SELECT: When there are two or more measuring functions compound at one range, press the button to switch the measuring function.
- (2) RANGE: Auto Range/ Manual Range switch, the default is set as Auto Range mode when turning on. Press the button and switch to Manual Range. Press the button once, the range is switched to the higher one at the mode, press the button again to switch the range to the lowest one when measuring the highest range, the cycle is in proper order from low to high. Keep pressing the button more than 2 seconds, return to Auto Range mode. There is no Auto Range mode at Frequency and Capacitance range.
- (3) REL: Relative Value measuring button.
- (4) HZ/DUTY: Frequency/Duty Circle selection button, press the button to switch between the Frequency and Duty Circle mode at Frequency Range; Press the button to switch to Voltage/Frequency/Duty Circle or Current/Frequency/Duty Circle model at AC/DC Voltage or AC/DC Current Range.
- (5) HOLD: Date Hold button, press the button, the value is held on LCD; Press the button again, exit the hold mode and get into the normal measuring status.
- (6) RS232: serial output control button, worked at the locked mode. When the button is close, RS232 symbol is displayed on LCD, it indicates the instrument is getting into the status of data transmission, and can transmit the data to outside; When the button is open, exist this mode, and data transmission is stopped.

六、Other Function

(1) Auto Power Off function: no matter it is function button or range knob, the instrument will be "Auto Power Off" when there is no action about 30 seconds during measurement. In the mode of Auto Power Off, press the function button or switch the range knob, the instrument will "Auto power on", get into the measuring mode. Press the select button when turning on, the Auto Power Off function is cancelled. The Auto Power Off is cancelled at RS232 work mode.

⚠ NOTE: "Auto Power Off" is a kind of sleeping mode, it still consumes the slight current (less than $5\mu\text{A}$), if the instrument isn't used for long time, it is better to cut the power.

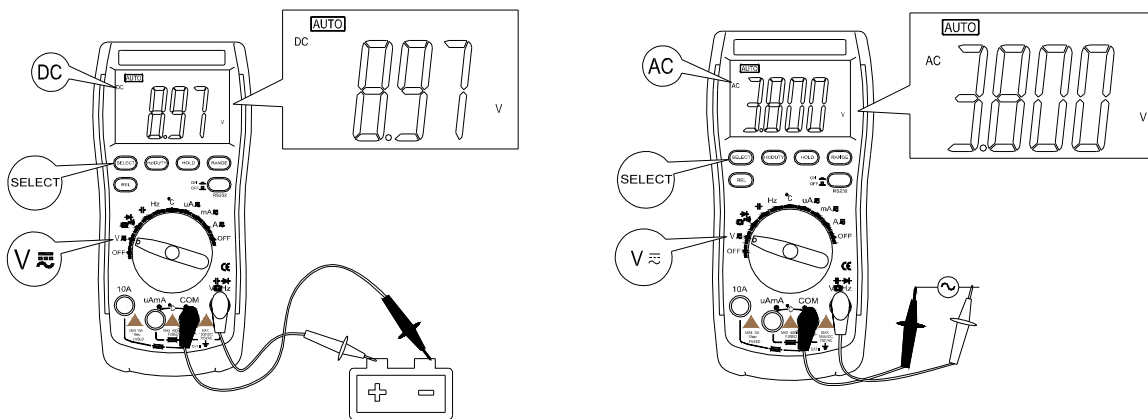
(2) BUZZER: Press any button, the buzzer is sound (about 0.25~1 second). The buzzer is sound when the resistance is less than $(70\pm 30)\Omega$ at Continuity Test.

(3) Data transmission function: Install the software, accessory of the instrument. Connect the instrument to PC by USB Cable, and then can transmit the measuring data to PC, it is convenient to record, analyze, process and print the measuring results, etc.

七、Measurement Operation

1. ACV/DCV Measurement

A) Turn the function/range selection knob to $V\overline{\sim}$, the default is set as DCV measurement, if measuring ACV, press SELECT button to make it at the status of ACV measurement, displayed as the following pictures.



- B) Insert the red and black test lead separately to $V\Omega\text{Hz}$ and COM input terminal.
- C) Connect the test lead to the tested circuit or power in parallel, the polarity of the red test lead and the tested voltage value will be displayed on LCD simultaneously.
- D) At the Manual Range mode, if "OL" is displayed on LCD, it indicates the tested voltage value has exceeded the present range limit, please select the higher range to complete the measurement.
- E) Read the present test result from LCD.

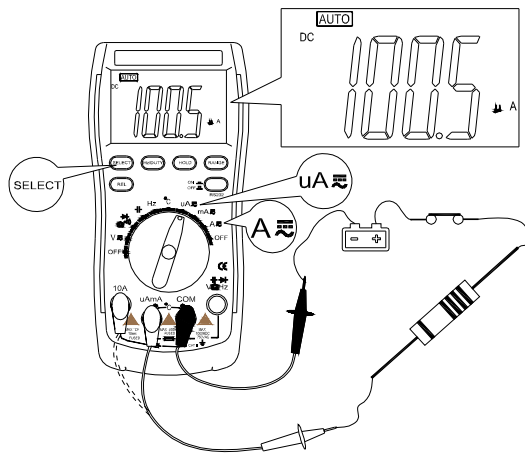
⚠ Note:

- Do not measure the voltage higher than DC 1000V or AC 750V.
- * When measuring the high voltage, caution to avoid electric shock. Cut the connection between the test lead and tested circuit at once after measurement.

2. ACA/DCA Measurement

A) Turn the function/range selection knob to μA 、 mA or A range, the default is set as DCA measurement, if measuring ACA, press SELECT button to make it at the status of

ACA measurement displayed as the following picture.



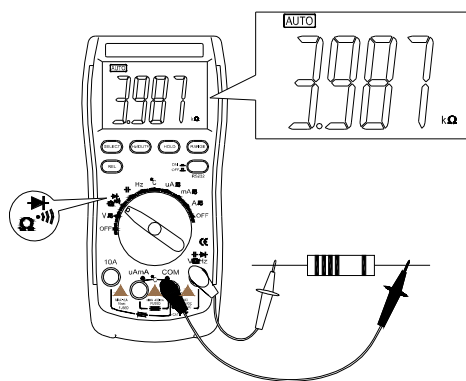
- B) Insert the red and black test lead separately to uA/mA and COM input terminal.
- C) Connect the test lead to the tested circuit or power in series, the polarity of the red test lead and the tested current value will be displayed on LCD simultaneously.
- D) At the Manual Range mode, if "OL" is displayed on LCD, it indicates the test current value has exceeded the present range limit, please select the higher range to complete the measurement.
- E) Read the present test result from LCD.

⚠ Note:

- Do not measure the current higher than 10A at Range 10A and higher than 400mA at uA and mA Range, otherwise the fuse will be burnt out or the instrument will be damaged.
- When measuring the high current, the time of each measurement can't be over 10 seconds, and the interval of each measurement should be longer than 15 seconds.
- Cut the connection between the test lead and tested circuit at once after measurement.

2. Resistance Measurement

- A) Turn the function/range selection knob to Ω , displayed as the following picture.



- B) Insert the red and black test lead separately to V Ω Hz and COM input terminal.
- C) Connect the test lead to the tested resistance in parallel, the tested resistance value will be displayed on LCD.
- D) At the Manual Range mode, if "OL" is displayed on LCD, it indicates the tested resistance value has exceeded the present range limit, please select the higher range to complete the measurement.
- E) Read the present test result from LCD.

⚠ Note:

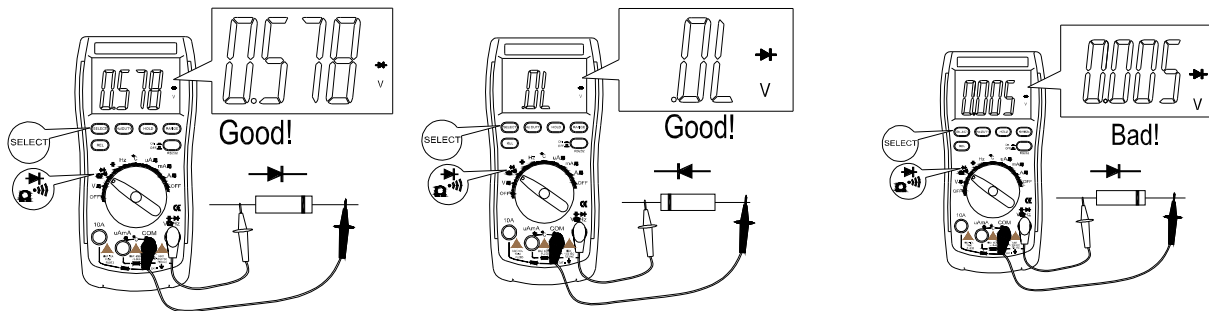
- When measuring the in-circuit resistance, be sure the power of the circuit has been turned off and all capacitors are fully discharged.
- When the tested resistance is not connected, i.e. at open circuit, or its value exceeds the range limit, "OL" will be displayed on LCD.
- When measuring the resistance larger than $1M\Omega$, the reading may take a few seconds to be stable, it is normal for the high value resistance measurement.
- Do not input the voltage when measuring the resistance. Otherwise it will cause the reading incorrect. If the voltage exceeds 250V, over-range protection voltage, it is possible to damage the instrument and endanger the safety of the users.
- Cut the connection between the test lead and tested circuit at once after measurement.

3. Diode Measurement

A) Turn the function/range selection knob to Ω .

B) Insert the red and black test lead separately to $V\Omega Hz$ and COM input terminal.

C) Press the SELECT button to choose the diode measurement function, displayed as the following pictures.



D) Connect the RED test lead to the positive pole of the tested diode, BLACK test lead to the negative pole.

E) Read the present test result from LCD.

⚠ Note:

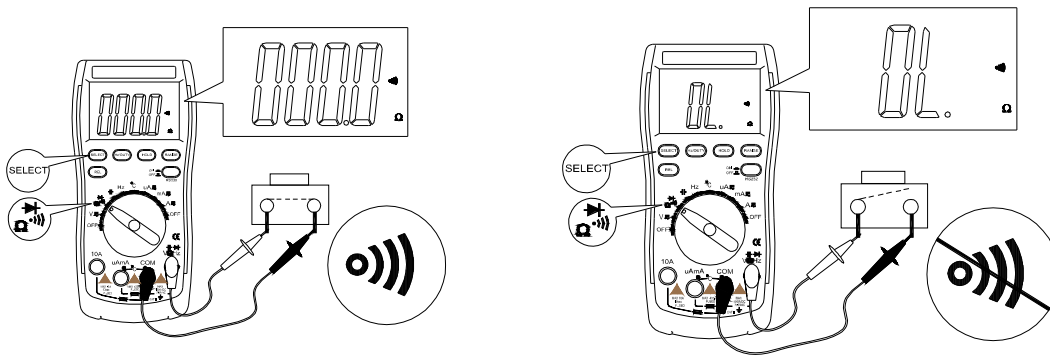
- If the diode is open circuit or the polarity is connected counter, "OL" will be displayed on LCD.
- When measuring the in-circuit diode, make sure the power of circuit has been turned off and all capacitors are fully discharged.
- Cut the connection between the test lead and tested circuit at once after measurement.

4. Continuity Measurement

A) Turn the function/range selection knob to Ω .

B) Insert the red and black test lead separately to $V\Omega Hz$ and COM input terminal.

C) Press the SELECT button to choose the continuity measurement function, displayed as the following pictures.



- D) Connect the test lead to the two ends of tested circuit in parallel.
- E) If the value of resistance between the two ends of the tested circuit is less than $(70 \pm 30) \Omega$, buzzer inside sounds.

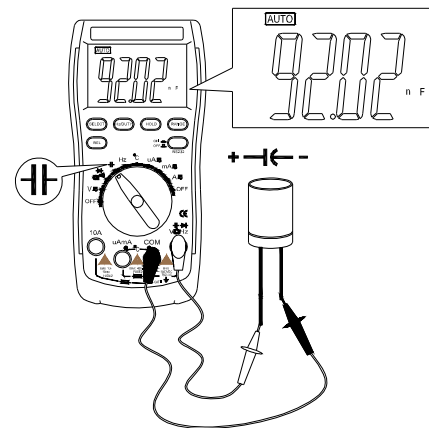
⚠ Note:

- If the tested circuit is open, "OL" will be displayed on LCD.
- When detecting the continuity of the circuit, make sure the power of circuit has been turned off and all capacitors are fully discharged.
- Cut the connection between the test lead and tested circuit at once after measurement.

5. Capacitance Measurement

A) Turn the function/range selection knob to Capacitance Range, displayed as the following picture.

- B) Insert the red and black test lead separately to V Ω Hz and COM input terminal.
- C) Connect the test lead to the tested capacitor in parallel, the tested capacitor value will be displayed on LCD.
- D) At the Manual Range mode, if "OL" is displayed on LCD, it indicates the test capacitor value has exceeded the present range limit or the capacitor is short-circuit, please select the higher range to complete the measurement.
- E) Read the present test result from LCD.



⚠ Note:

- When measuring the in-circuit capacitor, make sure the power of circuit has been turned off and all capacitors are fully discharged.
- It requires longer testing time when measuring the large capacitor, it takes about 15 seconds at Range 100uF.
- Cut the connection between the test lead and tested circuit at once after measurement.

6. Frequency/ Duty Circle measurement.

- A) Turn the function/range selection knob to Hz Range, displayed as the following picture.
- B) Insert the red and black test lead separately to V Ω Hz and COM input terminal.
- C) Connect the test lead to the tested signal source in parallel.

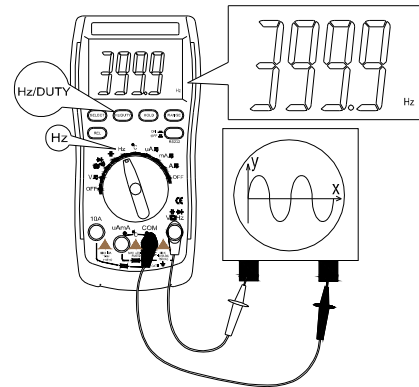
D) When measuring Frequency, press the Hz/DUTY button once to get into the mode of DUTY Circle measurement, and press the Hz/DUTY button again to return to the mode of Frequency measurement.

E) When measuring the current or voltage, press the Hz/DUTY button to get into the mode of Frequency measurement, and press the Hz/DUTY button again to get into the mode of Hz/DUTY measurement, and press the button third to return to the mode of current or voltage measurement.

F) Read the present test result from LCD.

⚠ Note:

- Do not input the signal more than 60V. Otherwise it is possible to damage the instrument and endanger the safety of the users.
- Cut the connection between the test lead and tested circuit at once after measurement.



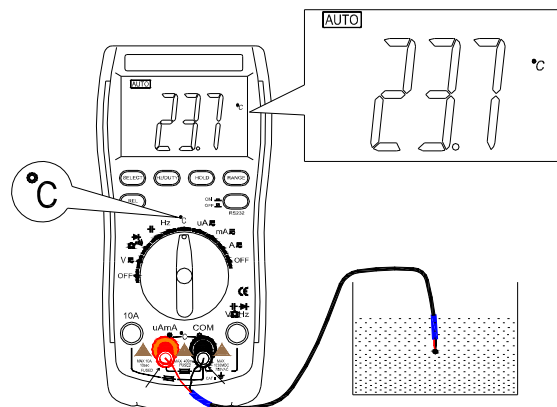
7. Temperature Measurement

A) Turn the function/range selection knob to Temperature Range, displayed as the following picture.

B) Insert the red and black temperature sensor separately to uAmA and COM input terminal.

C) Connect the sensor of the temperature cable to the surface or inside of the tested object.

D) Read the present test result from LCD.



⚠ Note:

- Without the signal input, LCD automatically displays the inside temperature of the instrument.

* Do not input any other signal, caution to avoid damaging the instrument or endangering the safety of the users.

八、Property

1. General Feature

1-1 Display: LCD

1-2 Max Display: 3999 (3 3/4) counts automatic polarity display and unit display.

1-3 Measuring method: dual-integral A/D converter

1-4 Sampling range: 3 times/second

1-5 Over range indication: display "OL"

1-6 Low battery indication: "⎓" appearance (about 2.4V)

1-7 RS232 serial data transmission

1-8 Auto Power Off function (No Auto Power Off function at the model of RS232)

1-9 Operation environment: 0~40℃ relative humidity <80%

1-10 Storage environment: -10~50℃ relative humidity <80%

1-11 Power: 2pcs 1.5V batteries (AAA 7# battery)

1-12 Dimension: 192mm x 95mm x 48mm

1-13 Weight: Approx. 390g (including batteries)

1-14 Accessories: operation manual, leather carrying case, holster, gift box, test lead, temperature cable and 2pcs 1.5V batteries.

1. Technic Feature

Accuracy: ($a\% \times \text{reading} + \text{digits}$) at $23 \pm 5^\circ\text{C}$ relative humidity <75%. One year calibration guarantee since the time dispatched from the factory.

2-1 DC Voltage (DCV)

Range	Accuracy	Resolution
400mV	$\pm(0.5\%+4d)$	0.1mV
4V		1mV
40V		10mV
400V		100mV
1000V	$\pm(1.0\%+6d)$	1V

Input impedance: $10M\Omega$.

Overload protection: 1000V DC or 750V AC peak value.

2-2 AC Voltage (ACA)

Range	Accuracy	Resolution
400mV	$\pm(1.6\%+8d)$	100 μV
4V	$\pm(0.8\%+10d)$	1mV
40V		10mV
400V		100mV
750V	$\pm(1.0\%+10d)$	1V

Input impedance: $10M\Omega$.

Overload protection: 1000V DC or 750V AC peak value.

Frequency response: 40-200Hz.

Indication: average value response (RMS of sine wave).

2-3 DC Current (DCA)

Range	Accuracy	Resolution
400uA	$\pm(1.0\%+10d)$	0.1 μA
4000uA		1 μA
40mA		10 μA
400mA		100 μA
4A	$\pm(1.2\%+10d)$	1mA
10A		10mA

Max input current: 10A (less than 15 seconds).

Overload protection: 0.5A/250V fuse at Range uA/mA, 10A/250V fuse at Range A.

2-4 AC Current (ACA)

Range	Accuracy	Resolution
400uA	$\pm(1.5\%+10d)$	0.1 μA
4000uA		1 μA
40mA		10 μA
400mA		100 μA
4A	$\pm(2.0\%+15d)$	1mA
10A		10mA

Max input current: 10A (less than 15 seconds).

Overload protection: 0.5A/250V fuse at Range uA/mA, 10A/250V fuse at Range A.

Frequency response: 40-200Hz.

2-5 Resistance (Ω)

Range	Accuracy	Resolution
400 Ω	$\pm(0.8\%+5d)$	0.1 Ω
4K Ω	$\pm(0.8\%+4d)$	1 Ω
40K Ω		10 Ω
400K Ω		100 Ω
4M Ω		1K Ω
40M Ω		$\pm(1.2\%+10d)$

Open circuit voltage: 400mV.

Overload protection: 250V DC/AC peak value.

Note: At Range 400 Ω , short-circuit the test lead to measure the wire resistance, and then subtract it from the real measurement.

2-6 Capacitance (C)

Range	Accuracy	Resolution
50nF	$\pm(5.0\%+30d)$	10pF
500nF	$\pm(3.0\%+10d)$	100pF
5uF		1nF
50uF		10nF
100uF	$\pm(5.0\%+10d)$	100nF

Overload protection: 250V DC/AC peak value.

2-7 Frequency and Duty Circle

Range	Accuracy	Resolution
4Hz	$\pm(0.5\%+4d)$	0.001Hz
40Hz		0.01Hz
400Hz		0.1Hz
4kHz		1Hz
40kHz		10Hz
400kHz		100Hz
4MHz		1kHz
30MHz		10kHz
0.1~99.9%	For reference only	0.1

Input sensitivity: 0.7V RMS.

Overload protection: 250V DC/AC peak value.

Note: when measuring the high voltage frequency, please select the ACV Range, then press "Hz/duty" button to get into the mode of Frequency measurement.

2-8 Temperature ($^{\circ}$ C)

Range	Accuracy	Resolution
-20~400 $^{\circ}$ C	$\pm(1.0\%+5^{\circ}$ C)	0.1 $^{\circ}$ C
400~1000 $^{\circ}$ C	$\pm(1.5\%+15^{\circ}$ C)	1 $^{\circ}$ C

Overload protection: 0.5A/250V fuse.

2-9 Diode and Continuity Measurement


Range	Resolution	Description
Diode	1 mV	Open Voltage :1.4V Forward voltage drop: 0.5~0.8V
Continuity	0.1 Ω	Open Voltage: 0.45V, Buzzer sound at less than 30 Ω

Overload protection: 250V DC/AC peak value.

九、Instrument Maintenance

This is a highly precise instrument, do not try to modify the inner circuit at will.

1. Keep the instrument dry, and keep it away from dust and shock.
2. Do not store and use the instrument in high humidity, high temperature, combustible, explosive and strong magnetic places.
3. Clean the surface of the instrument with the damp cloth and gentle detergent, do not use the strong solvent like the abrasive cleaner and alcohol, etc.
4. Take out the batteries if do not use the instrument for a long time to prevent the batteries from leaking the liquid to corrode the instrument.

4-1 When LCD displays "  " symbol, should replace the batteries as the following steps:

4-1-1 Loose the screw that fixes the batteries, and remove the battery case.


4-1-2. Remove the spent 1.5V batteries, and replay them by two same type new batteries.

It is better to use alkaline batteries for lengthening the usage time.

4-1-3 Fit on the battery case and lock the screw tightly.

十、Defect Elimination

If the Instrument does not work properly, the following methods could help you to solve the common problems promptly. If the defects still can't be eliminated, please contact the maintenance centers or agents.

Defects	solution
No display	<ul style="list-style-type: none">● Power Off - Turn on the power;● Replace the batteries.
 symbol appearance	<ul style="list-style-type: none">● Replace the batteries.
Error value	<ul style="list-style-type: none">● Replace the batteries.

The instruction manual is subject to change without notice.

The contents in the instruction manual are considered to be correct, if the users find any errors or pretermissions, etc., please contact the manufacturer.

The manufacturer hereby will not be responsible for any accident and damage caused by the improper operation.

The functions described in this instruction manual do not be the reason for special usage.

CD edition V1.0

MB-086B-50