

# sanwa

# MM

# CD800F

## DIGITAL MULTIMETER

## INSTRUCTION MANUAL

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### CAUTION

- Correct measurement may not be performed when using the meter in a ferromagnetic/intense electric field such as a place near a transformer, high-current circuit or a radio.
- The meter may malfunction or correct measurement may not be performed when measuring a special waveform such as that from an inverter circuit.

### 1-3 Overload protections

Function	Input terminals	Max. rated input value	Max. overload protection input
ACV Hz	+ (Red)	AC 1000 V	AC/DC 1100 V
DCV	- (Black)	DC 1000 V	
		Voltage input prohibited	
EF	+ or -	AC/DC 1000 V	AC/DC 1000 V

## [2] APPLICATIONS AND FEATURES

### 2-1 Applications

This instrument is a digital multimeter with rms value response, designed for measurements within the range specified as CAT.IV 1000 V in IEC61010.

### 2-2 Features

- Safety design compliant to IEC61010.
- AC measurements with True RMS conversion.
- High portability thanks to the case-integrated design.
- Backlight.
- EF (Electric Field sensing).

### Measurement categories (Overvoltage categories)

- CAT. II : Primary circuit of equipment with a power cord to be connected to a mains socket.  
 CAT. III : Primary circuit of equipment that inputs power directly from the distributor and the circuit from the distributor to the mains socket.  
 CAT. IV : Circuit from the leading wire to the distributor.

## [4] DESCRIPTION OF FUNCTIONS

### 4-1 Power/Function switch

Turn this switch to turn on and off the power and to switch the measuring functions.

### 4-2 Auto Power Save

The Auto Power Save function turns the display off automatically in about 15 minutes after the last operation or after an input of 20 V or higher was applied to save the power consumption. To return from this status, press the SELECT or RANGE button or turn the power switch to OFF then to another position. To disable the Auto Power Save function, switch the meter on by turning the function switch while holding the SELECT button depressed. A short buzzer beep is generated, "dRPS" is displayed for 2 seconds, and the  $\odot$  indicator disappears.  
 \* A small current flows inside the meter even in the Auto Power Save status. After measurement, always turn the function switch to the OFF position.

### 4-3 Low battery indication

When the batteries are exhausted until the supply voltage drops below about 2.3 V, the  $\nabla$  indicator lights on the display. Replace the batteries when this indicator appears.

### 4-4 Measurement function selection : SELECT button

When the SELECT button is pressed, the functions change as follows.

ACV position : ACV  $\rightarrow$  Hz  $\rightarrow$  ACV  $\rightarrow$  ...  
 $\Omega$  position :  $\Omega$   $\rightarrow$   $\rightarrow$   $\rightarrow$   $\rightarrow$   $\rightarrow$  ...

### 4-5 Backlight : SELECT (\*) button

When the SELECT button is held depressed (for more than 2 sec.), the backlight of the LCD turns on. Holding the same button depressed again turns it off. The backlight also turns off automatically in about 30 seconds.

### 4-6 Range Hold : RANGE button

Press the RANGE button momentarily to set the manual range mode (AUTO disappears in the display). In manual range mode, press the button again to step through the ranges. To return to the auto mode, press and hold the button for 1 sec. or more (then 'AUTO' is shown). Manual range hold mode is not available in the Hz,  $\rightarrow$ ,  $\rightarrow$ ,  $\rightarrow$  and EF functions.

### 4-7 Relative value measurement : $\Delta$ REL button

When the  $\Delta$  REL button is pressed,  $\Delta$  appears on the display, the measuring range is fixed and the display shows the relative values assuming that the value at the moment the button is pressed is 0 (reference value). When the button is pressed again,  $\Delta$  disappears and the relative value measurement is canceled. Relative value measurement mode is not available in the Hz,  $\rightarrow$ ,  $\rightarrow$  and EF functions.

### 4-8 MAX/MIN memory : $\Delta$ REL (MAX/MIN) button

When the  $\Delta$  REL button is held depressed, the meter enters the MAX/MIN mode, in which the measurement range is fixed and the Auto Power Save and Relative value measurement functions are canceled.

- Every time the SELECT button is pressed, the displayed information changes as follows : Current measurement display (MAX MIN displayed)  $\rightarrow$  MAX value display (MAX displayed)  $\rightarrow$  MIN value display (MIN displayed)  $\rightarrow$  Current measurement display (MAX MIN displayed)  $\rightarrow$  ...
- Current measurement display : The meter stores the maximum and minimum values while displaying the current measurement value. The buzzer beeps every time a value is updated. The maximum and minimum values can be checked by pressing the button to view the MAX value display and MIN value display. To cancel the MAX/MIN mode, press the button for 1 sec. or more.
- MAX value display : Maximum value measured since the entry in MAX/MIN mode.
- MIN value display : Minimum value measured since the entry in MAX/MIN mode.

The MAX/MIN mode can also be entered when the relative value measurement function is active ( $\Delta$  displayed). In this case, the MAX/MIN mode displays the relative values assuming that the value at the moment the button is pressed is 0 (reference value). MAX/MIN memory mode is not available in the Hz,  $\rightarrow$ ,  $\rightarrow$ ,  $\rightarrow$  and EF functions.  
 \* The MAX/MIN mode is canceled when the function or range is switched.

### 4-9 Data Hold : HOLD button

When the HOLD button is pressed, the current display is hold (HOLD appears on the display). The display will not be changed even when the input varies thereafter. Press the button again to cancel the Data Hold mode (HOLD on the display disappears). This function is not available in the EF function.  
 \* The Data Hold mode is also canceled when the function switch is switched or the RANGE or SELECT button is pressed.

### 4-10 Disable Buzzer

When the meter is switched on while holding the  $\Delta$  REL button displayed, the display shows dBEP for 2 seconds and the buzzer beep is canceled. Even when the buzzer is canceled, it still stays in the case of OL alarm, in the continuity check, when the meter is turned on and before Auto Power Save. To enable all of the buzzer sounds, turn the meter off then on again.  
 \* This mode cannot be used when the Auto Power Save function is canceled.

## 7-2 Repair

Customers are asked to provide the following information when requesting services:

- Customer name, address, and contact information
- Description of problem
- Description of product configuration
- Model Number
- Product Serial Number
- Proof of Date-of-Purchase
- Where you purchased the product

Please contact Sanwa authorized agent / distributor / service provider, listed in our website, in your country with above information. An instrument sent to Sanwa / agent / distributor without those information will be returned to the customer.

### Note:

- Prior to requesting repair, please check the following:
  - Capacity of the built-in batteries and polarity of installation.
  - Discontinuity of the test leads.
- Repair during the warranty period:
  - The failed meter will be repaired in accordance with the conditions stipulated in 7-1, Warranty and provision.
- Repair after the warranty period has expired:
  - When the original functionality is expected to be restored by repair, we will repair the product upon request and payment by the customer.
  - In some cases, repair and transportation cost may become higher than the price of the product. Please contact Sanwa authorized agent/service provider in advance.
  - The minimum retention period of service functional parts is six (6) years after the discontinuation of manufacture. This retention period is the repair warranty period. Please note, however, if such functional parts become unavailable for reasons of discontinuation of manufacture, etc., the retention period may become shorter accordingly.
- Precautions when sending the product to be repaired
  - To ensure the safety of the product during transportation, place the product in a box that is larger than the product 5 times or more in volume and fill cushion materials fully.
  - Clearly mark "Repair Product Enclosed" on the box surface.
  - The cost of sending and returning the product shall be borne by the customer.

## 7-3 SANWA web site

http://www.sanwa-meter.co.jp  
 E-mail: exp\_sales@sanwa-meter.co.jp

## [8] SPECIFICATIONS

### 8-1 General specifications

Operation method	$\Delta$ - $\Sigma$ method
AC detection method	True RMS method (AC coupling)
Display	Max. 6000 counts
Sampling rate	Max. approx. 5 times/sec.
Overload indication	"OL" mark indication on digital display
Range selection	Auto and Manual
Polarity switching	Auto ("-" indicated when negative voltage is input)
Low battery indication	$\nabla$ mark displayed when battery voltage drops at 2.3 V or less.
Operating environmental conditions	Altitude $\leq$ 2000 m, indoor use, pollution degree II
Operating temperature/humidity ranges	-10 °C to 40 °C. Humidity range is as follows (without condensation): Max. 80 %RH at 5 °C to 31 °C, decreasing linearly to 50 %RH at 40 °C.
Storage temperature/humidity range	-20 °C to 40 °C: $\leq$ 80 %RH (without condensation). 40 °C to 50 °C: $\leq$ 70 %RH (without condensation). (Batteries should be removed when the instrument is not to be used for a long period.)
Temperature coefficient	Below 18 °C and above 28 °C: Accuracy $\times$ 0.15 should be added per °C. (Accuracy $\times$ 0.25 should be added in the $\rightarrow$ function.)
Power supply	LR03 ("AAA"-size alkaline battery) 1.5 V $\times$ 2
Auto Power Save	Power Save in about 15 minutes after last operation. Typ. 20 $\mu$ A
Current drain	About 1.5 mA (backlight off), max. about 38 mA
Battery life	About 600 hours (backlight off)
Dimensions & mass	166 (H) $\times$ 100 (W) $\times$ 43 (D) mm, about 360 grams (incl. batteries)
Test lead length	About 0.8 m
Safety standards	IEC61010-1, IEC61010-2-030, IEC61010-2-33, IEC61010-31 CAT.IV 1000 V
EMC Directive, RoHS Directive	IEC61326 (EMC), EN50581 (RoHS)
Accessories	Instruction manual, "AAA"-size alkaline battery $\times$ 2, hand strap

## [5] MEASUREMENT PROCEDURE

### WARNING

- Never apply an input signal exceeding the maximum rating input value of each function.
- Be sure to disconnect the test pins from the circuit when changing the function.
- Always keep your fingers behind the finger guards on the probe when making measurements.
- After measurement, release the red and black test pins from the object measured and set the function switch to the OFF position.

### 5-1 Start-up inspection

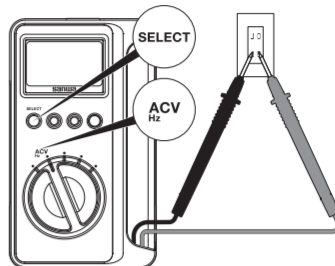
Check the following items before starting the daily measurement work.

- Appearance check : Check the appearance of the meter to see if it is free from damage caused by falling, etc.
- Accessory : Check that the test leads are free from irregularities such as wire disconnection and crack.
- Battery : Install the battery before using the meter for the first time. Ensure that the  $\nabla$  low battery indication is not displayed and, if it is displayed, replace the battery with new one. If nothing is displayed, the battery may be exhausted totally (see 6-4).
- Test lead wire disconnection can be checked by setting the function switch to  $\rightarrow$  and shorting the test pins.
- Also check that the meter and your hands are not moistened by water, etc.

### 5-2 AC voltage measurement (ACV), frequency measurement (Hz)

Display	Coverage	Ranges
ACV	0.005 - 1000	6.00/60.00/600.0/1000 V
Hz	10.00 - 99.99 k	99.99/999.9/9.999 k/99.99 kHz

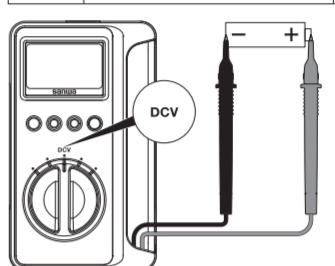
The accuracy-assured frequencies of the ACV measurement are 45 Hz to 5000 Hz (sine wave AC).  
 Hz input sensitivity : 10.00 to 9.999 kHz:  $\geq$ 1 Vrms. 10.00 kHz or more:  $\geq$ 5 Vrms.



Set the function switch to ACV. Each press of the SELECT button alternates ACV and Hz.  $\Delta$  appears on the display when a voltage of 20 V or more is input. At the moment the input exceeds 20 V, the buzzer beeps and the backlight flashes to indicate it.

### 5-3 DC voltage measurement (DCV)

Display	Coverage	Ranges
DCV	0.0 m - 1000	600.0 m/6.000/60.00/600.0/1000 V



Set the function switch to DCV.  $\Delta$  appears on the display when a voltage of 20 V or more is input. At the moment the input exceeds 20 V, the buzzer beeps and the backlight flashes to indicate it.

### 5-4 Resistance ( $\Omega$ ), diode ( $\rightarrow$ ), continuity ( $\rightarrow$ ), capacitance ( $\rightarrow$ )

#### WARNING

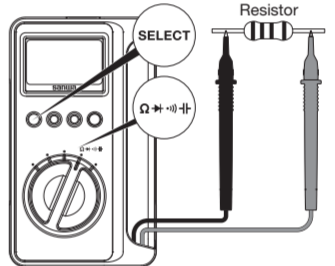
- Never apply voltage to the input terminals.

Set the function switch to  $\rightarrow$   $\rightarrow$   $\rightarrow$   $\rightarrow$ . Each press of the SELECT button switches the function in order of  $\Omega$   $\rightarrow$   $\rightarrow$   $\rightarrow$   $\rightarrow$   $\rightarrow$   $\rightarrow$   $\rightarrow$  ...

#### 5-4-1 Resistance measurement ( $\Omega$ )

Display	Coverage	Ranges
$\Omega$	0.0 - 60.00 M $\Omega$	600.0/6.000 k/60.00 k/600.0 k/6.000 M/60.00 M $\Omega$

The open voltage across the measurement terminals is about DC 1.2 V.



If measurement is likely to be influenced by noise, shield the object to measure with negative potential (COM). If a finger touches a test pin during measurement, measurement will be influenced by the resistance in the human body, and that results in measurement error.

## 8-2 Optional accessory

Hanger magnet: HM-1

## 8-3 Measurement ranges and accuracies

Accuracy-assured temperature/humidity ranges: 23 $\pm$ 5 °C,  $\leq$  80 %RH, no condensation.  
 rdg: reading. dgt: digits (lowest digits)  
 As the ACV measurements employ the rms value response, the accuracy-assured ranges and crest factor become as follows.  
 Accuracy range: 1 % to 100 % of measurement range.  
 Crest factor CF: Full scale CF < 1.8, half scale CF < 3.6.

Function	Range	Accuracy	Remarks
AC voltage ACV	6.000 V	$\pm$ (1.2 %rdg+9 dgt)	Input resistance: About 10 M $\Omega$ • Accuracy-assured frequencies: 45 Hz - 500 Hz
	60.00 V	$\pm$ (1.2 %rdg+5 dgt)	
	600.0 V	$\pm$ (1.5 %rdg+7 dgt)	
	1000 V	$\pm$ (1.5 %rdg+7 dgt)	
Frequency Hz	99.99 Hz	$\pm$ (0.5 %rdg+3 dgt)	Input resistance: About 10 M $\Omega$ • Accuracy not assured below 10 Hz. • Sensitivity 10 Hz: $\geq$ 1 Vrms 10 kHz: $\geq$ 5 Vrms
	999.9 Hz		
	9.999 kHz		
	99.99 kHz		
DC voltage DCV	600.0 mV	$\pm$ (0.8 %rdg+3 dgt)	Input resistance: About 10 M $\Omega$
	6.000 V		
	60.00 V		
	600.0 V		
Resistance $\Omega$	1000 V	$\pm$ (1.1 %rdg+5 dgt)	• Open voltage: About DC 1.8 V • Measurement current varies depending on the resistance value of the object measured.
	60.00 $\Omega$		
	6.000 k $\Omega$	$\pm$ (1.2 %rdg+5 dgt)	
	600.0 k $\Omega$		
	6.000 M $\Omega$	$\pm$ (2.0 %rdg+5 dgt)	
Diode test $\rightarrow$	60.00 M $\Omega$	$\pm$ (4.0 %rdg+5 dgt)	Open voltage: About DC 3.2 V "OL" displayed at 3.000 V or more.
Continuity check $\rightarrow$			Open voltage: About DC 1.0 V Buzzer beep generated at 10 to 50 $\Omega$ or less.
Capacitance $\rightarrow$	60.00 nF	$\pm$ (3.0 %rdg+10 dgt)	Auto range only. Accuracy with a capacitor with low leak current such as a film capacitor or equivalent. Less than 10 nF add +15 dgt to the accuracy.
	600.0 nF		
	6.000 $\mu$ F		
	60.00 $\mu$ F		
Electric field sensing EF	At the standard sensing voltage of about 60 V or more, the bar graph and intermittent sound vary in 5 steps.		Sensing frequencies: 50/60 Hz. Sensing antenna: Near $\blacktriangle$ on top left of main unit. Contact type EF sensing : Test pin

### Accuracy calculation method

Example AC voltage measurement (ACV)  
 Displayed value: 100.0 V  
 Range accuracy: 600.0 V range  $\pm$ (1.2 %rdg + 5 dgt)  
 Error:  $\pm$ (100.0 V  $\times$  1.2 %rdg + 5 dgt) =  $\pm$ 1.7 V  
 True value: 100.0 V  $\pm$ 1.7 V (between 98.3 - 101.7 V)  
 \* In the 600.0 V range, 5 dgt corresponds to 0.5 V.

Specifications and external appearance of the product described above may be revised for modification without prior notice.

## [1] SAFETY PRECAUTIONS

Before use, read the following safety precautions.

This instruction manual explains how to use your new digital multimeter CD800F safely. Before use, please read this manual thoroughly. After reading it, keep it together with the product for reference to it when necessary.

If you use the product in a method not specified in this manual, the protection function of the product may be imperiled.  
 The instruction given under the heading of "  $\Delta$  WARNING" and "  $\Delta$  CAUTION" must be followed to prevent accidental burn or electrical shock.

### 1-1 Explanation of Warning Symbols

The meaning of the symbols used in this manual and attached to the product is as follows.

- $\Delta$  : Very important instructions for safe use.
- The WARNING messages are intended to prevent accidents to operating personnel such as burn and electrical shock.
- The CAUTION messages are intended to prevent damage to the instrument.

Symbols attached to the product

- $\Delta$  : Symbol soliciting reference to this manual before use
- $\square$  : Double or enhanced insulation
- $\oplus$  : Ground
- $\Omega$  : Resistance
- $\rightarrow$  : Diode
- $\rightarrow$  : Buzzer
- $\rightarrow$  : Capacitance
- $\ast$  : Backlight

### 1-2 Warning Instructions for Safe Use

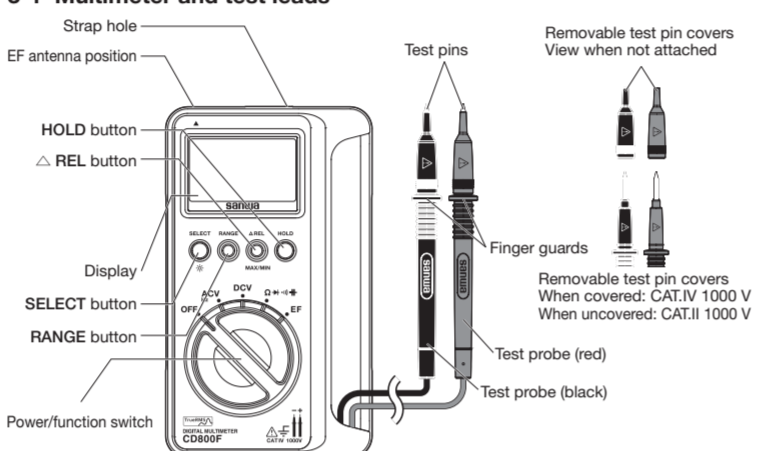
#### WARNING

The following instructions are intended to prevent personal injury such as burn and electric shock. Be sure to follow them when using the tester.

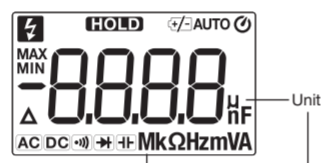
- This instrument is a digital multimeter for measuring low voltages. Never use it on electric circuits that exceed CAT.IV 1000 V.
- Pay special attention when measuring the voltage of AC 33 Vrms (46.7 V peak) or DC 70 V or more to avoid injury.
- Never apply an input signal exceeding the maximum rating input value (see 1-3).
- Never use the meter for measuring the line connected with equipment (i.e. motors) that generates induced or surge voltage since it may exceed the maximum allowable voltage.
- Never use meter if the meter or test leads are damaged or broken.
- Never use uncased meter or the meter without the lid.
- Always keep your fingers behind the finger guards on the probe when making measurements.
- Be sure to disconnect the test pins from the circuit when changing the function.
- Before starting measurement, make sure that the function and range are properly set in accordance with the measurement.
- Never use meter with wet hands or in a damp environment.
- Never open tester case except when replacing batteries.
- Do not attempt any alteration of original specifications.
- To ensure safety and maintain accuracy, check the meter in the start-up inspection as well as in the inspection/calibration to be performed at least once a year.
- The meter is for indoor use only.
- Wear insulating protective gear when using the meter with equipment containing a hazardous live part. Also be sure to observe your local and national safety rules.
- Always use the meter in a specified method to prevent the protective function from being imperiled.

## [3] NAMES OF COMPONENT UNITS

### 3-1 Multimeter and test leads

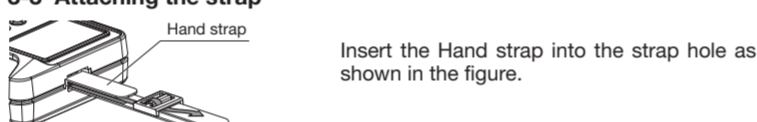


### 3-2 Display



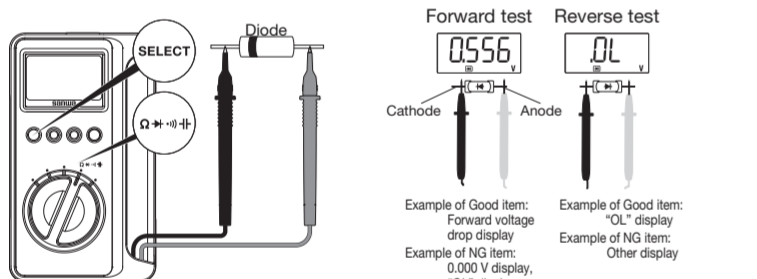
- $\nabla$  : Voltage alarm
- AUTO : Auto Range indicator
- $\odot$  : Auto Power Save indicator
- $\rightarrow$  : Continuity check
- AC : Alternative Current
- DC : Direct Current
- HOLD : Data Hold indicator
- $\nabla$  : Low battery indication
- $\Delta$  : Relative operation indicator
- $\rightarrow$  : Diode
- $\rightarrow$  : Capacitor
- MAX MIN : MAX/MIN mode indicator

### 3-3 Attaching the strap



### 5-4-2 Diode test ( $\rightarrow$ )

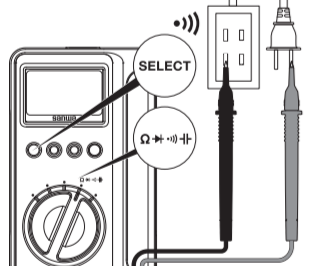
Display	Coverage	Note
$\rightarrow$	0.000 - 3.000 V	Open voltage across input terminals: About 3.2 V "OL" is displayed at 3.000 V or more.



### 5-4-3 Continuity check ( $\rightarrow$ )

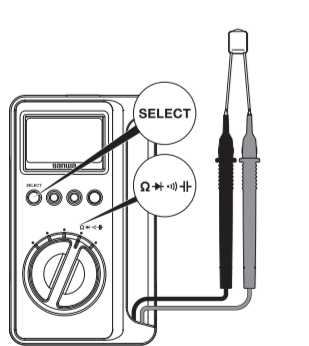
Display	Coverage	Note
$\rightarrow$	0.0 - 600.0 $\Omega$	Open voltage across input terminals: About 1.0 V

The buzzer beeps at 10 to 50  $\Omega$  or less.



### 5-4-4 Capacitance measurement ( $\rightarrow$ )

display	Coverage	Range
$\rightarrow$	0.00 - 600.0 $\mu$ F	60.00 n/600.0 n/6.000 $\mu$ /60.00 $\mu$ /600.0 $\mu$



Discharge the capacitor before measurement. It takes a while to measure large capacitance. This measurement is not suitable for measurement of a capacitor with a high leak current such as an electrolytic capacitor.

## 5-5 EF (Electric Field) sensing

### WARNING

- Before EF sensing, check the operation of this instrument using a known power source.
- Always keep your fingers behind the finger guards on the probe when making EF sensing.
- Note that the voltage is not always absent and that a voltage below the sensing voltage may exist.

This function identifies the presence of voltage in a simplified manner by sensing the electric field generated by AC voltage.