

**FLUKE®**

# **183 & 185**

True RMS Multimeters

**Users Manual**

February 2001 Rev.2, 4/02

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Fluke Corporation  
P.O. Box 9090  
Everett, WA 98206-9090  
U.S.A.

Fluke Europe B.V.  
P.O. Box 1186  
5602 BD Eindhoven  
The Netherlands

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# **Fluke 183 & 185**

## **True RMS Digital Multimeters**

### ***Introduction***

The Fluke 183 and 185 True RMS Digital Multimeters (hereafter referred to as "the meter") are handheld, battery-operated instruments that measure and source electrical and physical parameters. These Meters comply with IEC 1010 2<sup>nd</sup> edition for CAT III 1000 V and CAT IV 600 V environments.

#### **⚠ Warning**

**To avoid injury and ensure safe operation of the meter, follow all safety precautions detailed in this manual.**

### ***Contacting Fluke***

To order accessories, receive operating assistance, or get the location of the nearest Fluke distributor or Service Center, call:

USA: 1-888-99-FLUKE (1-888-993-5853)

Canada: 1-800-36-FLUKE (1-800-363-5853)

Europe: +31 402-678-200

Japan: +81-3-3434-0181

Singapore: +65-738-5655

Anywhere in the world: +1-425-446-5500

Or, visit Fluke's Web site at **[www.fluke.com](http://www.fluke.com)**.

## **Safety Information**

Review the following safety precautions to avoid injury and prevent damage to the meter or any products connected to it. To avoid potential hazards, use the meter only as specified

### **Safety Terms**

The following terms appear in this manual:











**⚠ Warning-** Warning statements identify conditions or practices that could result in injury or loss of life.

**Caution-** Caution statements identify conditions or practices that could result in damage to the meter or other property.

### **Symbols**

Refer to Table 1 for a listing of symbols that may appear on the meter or in this manual.

**Table 1. Symbols**

	Risk of electric shock
	See manual
	Equipment protected by double or reinforced Insulation
	Battery
	Conforms to CSA C22.2 No 1010. 2.032-96
	Conforms to EU directives
	Earth
	AC or DC
 N10140	Conforms to relevant Australian standards
	Inspected and licensed by TÜV Product Services
VDE	Conforms to VDE EN61010

## **Safety Precautions**

### **⚠ Warning**

**Only qualified personnel should perform service procedures.**

**To avoid fire or personal injury:**

- **Connect and disconnect properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.**
- **Observe all ratings and markings on the meter. Consult the meter manual for further ratings information before making connections to the meter.**
- **Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.**
- **If this product is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**
- **Replace batteries only with the proper type and rating specified.**
- **Do not operate the meter with covers or panels removed.**
- **Use only the fuse type and rating specified for this meter.**
- **Avoid exposed circuitry. Do not touch exposed connections and components when power is present.**
- **If you suspect there is damage to the meter, have it inspected by qualified service personnel.**
- **Do not operate in wet/damp conditions. Do not operate in an explosive atmosphere. Keep meter surfaces clean and dry.**
- **This meter is sensitive to strong external magnetic fields.**

**Do not use the meter within 1-inch (2.54 cm) of strong external magnetic fields such as that produced by the Fluke ToolPak hanging magnet accessory. Incorrect readings may result. If erratic behavior is noted, turn meter off to reset.**

**⚠ Warning**

To avoid possible electric shock or personal injury, follow these guidelines:

- **Before and after measuring hazardous voltages ( $\geq 30$  V ac rms, 42 V peak, or 60 V dc), verify the meter's proper operation by measuring a known voltage.**
- **Do not use the meter if it is damaged. Before you use the meter, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.**
- **Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads before you use the meter.**
- **If this product is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**
- **Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter serviced.**
- **Do not operate the meter around explosive gas, vapor, or dust.**
- **Do not apply more than the rated voltage, as marked on the meter, between terminals or between any terminal and earth ground.**
- **Before use, verify the meter's operation by measuring a known voltage.**
- **When measuring current, turn off circuit power before connecting the meter in the circuit. Remember to place the meter in series with the circuit.**
- **When servicing the meter, use only specified replacement parts.**
- **Use caution when working above 30 V ac rms, 42 V peak, or 60 V dc. Such voltages pose a shock hazard.**
- **Avoid working alone.**
- **When using the probes, keep your fingers behind the finger guards on the probes.**

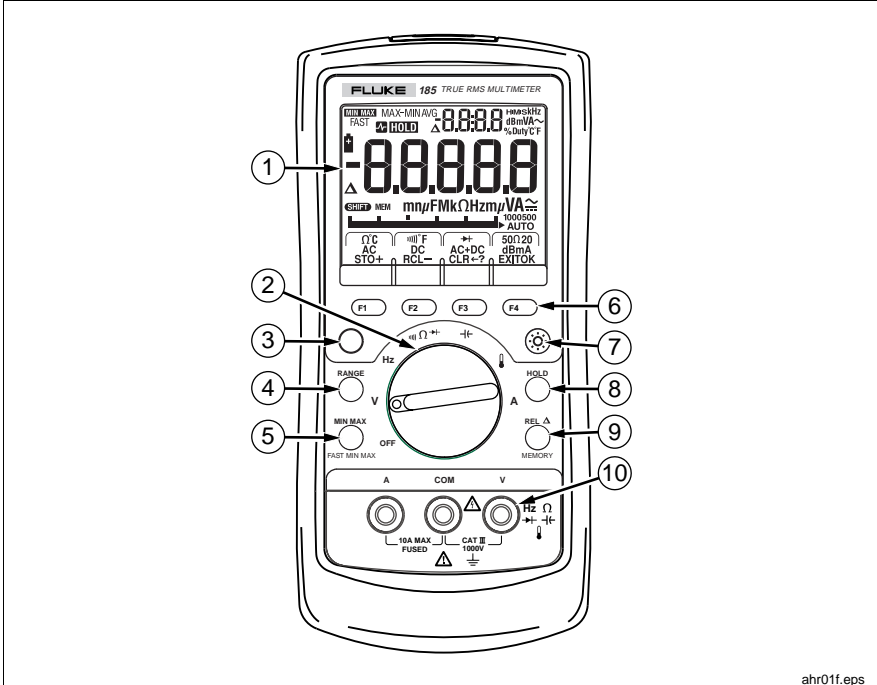
- **Connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.**
- **Remove test leads from the meter before you open the battery door.**
- **Do not operate the meter with the battery door or portions of the cover removed or loosened.**
- **To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator (🔋) appears.**
- **Use only type AA batteries, properly installed in the meter case, to power the meter.**
- **To avoid the potential for fire or electrical shock, do not connect the thermocouples to electrically live circuits.**

#### **Caution**

To avoid possible damage to the meter or to the equipment under test, follow these guidelines:

- **Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.**
- **Use the proper terminals, function, and range for your measurements.**
- **Before measuring current, check the meter's fuses and turn power OFF to the circuit before connecting the meter to the circuit.**

## Front and Rear Panel Overview

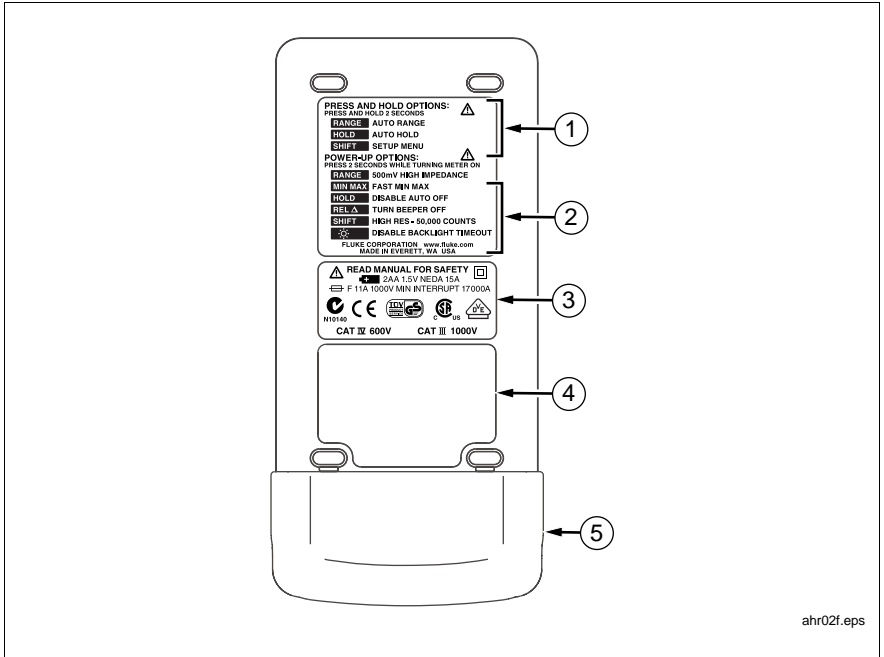


ahr01f.eps

①	Extra large LCD display with dual numerical readout.
②	Measurement function knob – Use to select a measurement.
③	Yellow (shift) button– Use to access FAST MIN MAX, MEM, and Setup menu.
④	<b>RANGE</b> button – Use to set measurement range.
⑤	<b>MIN MAX</b> button – Use to set meter to MIN MAX or Fast (1ms) modes.
⑥	F1 F2 F3 F4 Softkeys – Use with measurement function knob to select measurements.
⑦	☼ – Use to turn backlight on and off.
⑧	<b>HOLD</b> button – Use to freeze display or select Auto Hold.
⑨	<b>REL Δ</b> button – Use to make relative measurements and access the memory.
⑩	Input connectors.

Figure 1. Front Panel (185 is shown)

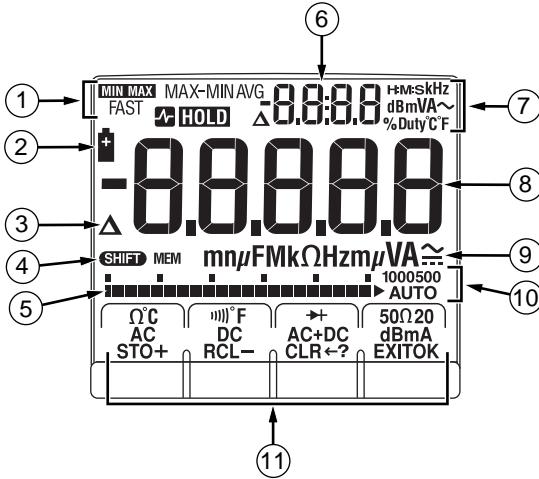
# True RMS Digital Multimeters Front and Rear Panel Overview



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①	Press and hold options – Activate by holding down the specified button for two seconds while the meter is on.
②	Power-up options – Activate by holding down the specified button while turning on the meter.
③	Compliance and battery and fuse replacement information.
④	Serial number and barcode tag.
⑤	Removable battery cover.

**Figure 2. Rear Panel View (185 is shown)**



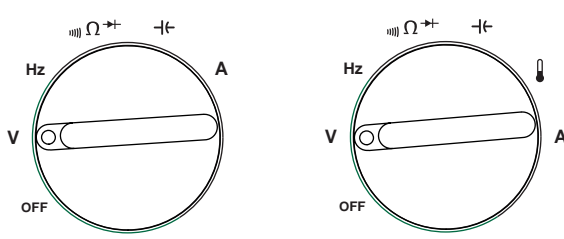
ahr03f.eps

①	Special feature indicators
②	Low battery indicator
③	<b>RELA</b> indicator
④	Yellow (shift) button and memory mode indicators
⑤	Bargraph
⑥	Upper display
⑦	Upper display units
⑧	Main display
⑨	Main display units
⑩	Range indicators
⑪	Softkey menus

Figure 3. Display Indicators

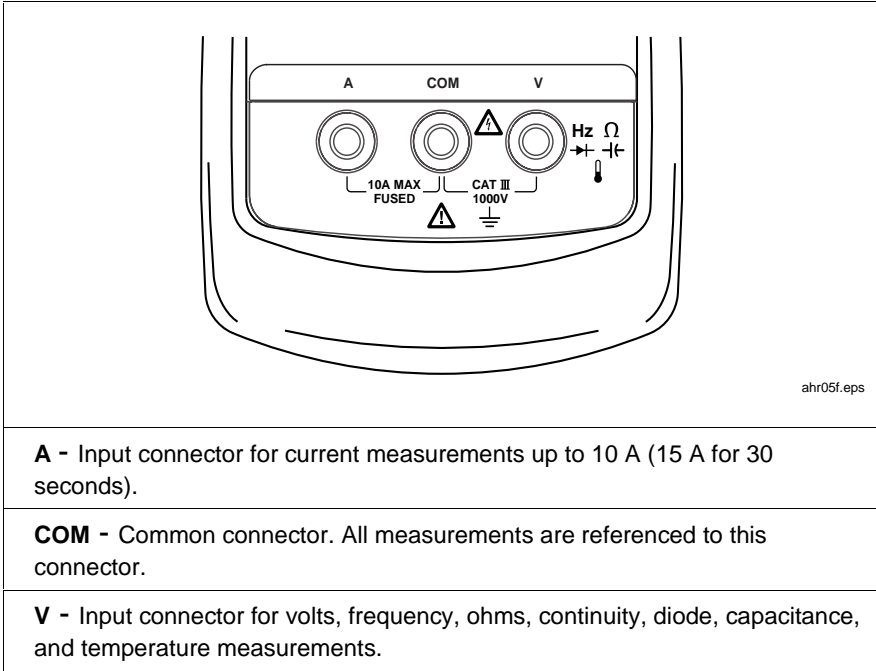


## Measurement Function Knob

 <p style="text-align: center;">183 <span style="margin-left: 200px;">185</span></p> <p style="text-align: right; font-size: small;">ahr04f.eps</p>
<p><b>OFF</b> -Turns off the meter. Setup parameters and stored measurements are saved.</p>
<p><b>V</b>- Volts AC RMS, Volts DC, Volts AC DC dual display, Volts AC+DC total RMS, dB, and dBm.</p>
<p><b>Hz</b> - Frequency measurements. Duty factor also shows if it is turned on in the Setup menu.</p>
<p><b>Ω/⚡</b> -Access to resistance and continuity measurements and diode test.</p>
<p><b>⚡</b>- Capacitance measurements.</p>
<p><b>🌡</b> - Temperature measurements in degrees Celsius or Fahrenheit.</p>
<p><b>A</b> - Amps AC RMS, Amps DC, Amps AC + DC total RMS, Amps AC DC dual display, and Amps DC 4-20 mA% (process control loop measurement).</p>

**Figure 4. Measurement Function Knob**

## Input Connectors



**A** - Input connector for current measurements up to 10 A (15 A for 30 seconds).

**COM** - Common connector. All measurements are referenced to this connector.

**V** - Input connector for volts, frequency, ohms, continuity, diode, capacitance, and temperature measurements.

**Figure 5. Input Connectors**

### **⚠ Warning**

**To avoid personal injury, do not attach meter leads with the battery cover removed.**

### **Caution**

**To avoid damaging the meter, do not attempt to measure current with the batteries removed.**

## ***Operating Basics***

Before you take any of the measurements described in this section, follow these steps:

- For specified accuracy, allow the meter to stabilize for 30 seconds after you turn on the meter.
- Observe the safe test lead connections below when you remove the test leads from the meter.
- Always disconnect power to the circuit when you measure resistors, capacitors, diodes, or continuity within the circuit.
- Discharge capacitors before taking capacitance measurements.

### ***Safe Test Lead Connections***

To safely disconnect the test leads from the meter, first disconnect all test leads from the circuit being tested, then disconnect the leads from the input connectors.

#### **⚠ Warning**

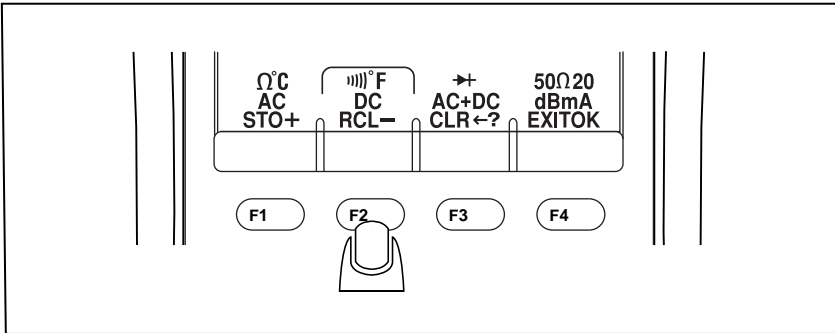
**To prevent electrical shock, do not insert unnecessary test leads or metal pins into the A (amps) connector. Voltages applied to any connector may be present at all other input connectors. Only use the test leads supplied or recommended (or their equivalent) with the meter. Refer to the "Accessories" section.**

## **Using Procedures in this Section**

All measurements are made by first setting the measurement function knob to a function setting and then selecting a measurement from the softkeys. Note that not all knob settings have corresponding softkey settings.

For example, the steps below explain how to make a DC voltage measurement:

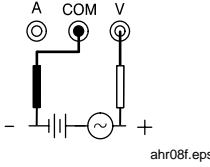
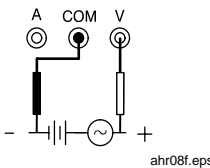
1. Set the measurement function knob to V for a voltage measurement.
2. Select softkey **F2** for DC voltage.
3. Connect the leads to the measurement points.



**Figure 6. Meter Softkeys**

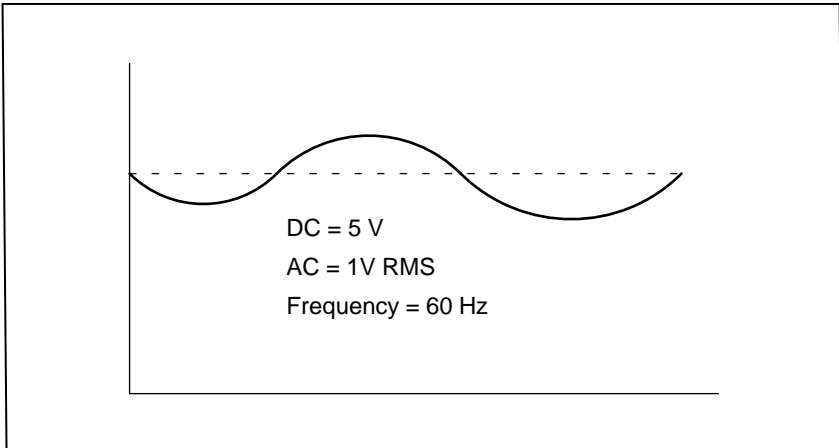
ahr07f.eps

## Voltage Measurements

Measurement	Softkey	Connect Leads	Main Display	Upper Display
True RMS AC voltage (default)	(F1) AC	 <p style="text-align: right; font-size: small;">ahr08f.eps</p>	AC	Hz
DC voltage	(F2) DC		DC	—
AC DC dual display	(F3) AC DC or AC+DC (press to toggle)	 <p style="text-align: right; font-size: small;">ahr08f.eps</p>	DC	AC
AC+DC total RMS <sup>1</sup>			AC+DC	Hz

$$^1 V_{RMS} = \sqrt{V_{AC}^2 + V_{DC}^2}$$

*Application: Using AC DC and AC+DC in Volts Mode*

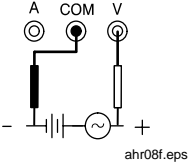


ahr09f.eps

AC voltages riding on power supplies can cause problems with electronic circuits. If you set the meter to DC Volts mode, the display shows the DC component of 5.000 V. However, the AC component may be missed. It is recommended that you set the meter to AC DC dual display mode. The main display shows the 5.000 V DC voltage and the upper display shows the 1.000 V AC voltage. AC DC mode also allows you to simultaneously make AC and DC measurements without changing the meter settings.

Another useful measurement is AC+DC total RMS. To take this measurement, press softkey **(F3)** to toggle to AC+DC. In the above example, the total RMS of 5.099 V shows on the main display and the frequency of 60.00 Hz shows on the upper display. When calculating the power dissipated in a circuit component, it is critical that the DC value is factored into the equation  $VRMS \times IRMS$ , where  $VRMS$  is AC+DC total RMS.

## ***dB and dBm Voltage Measurements***

Measurement	Softkey	Connect Leads	Main Display	Upper Display
dB (185 only) <sup>1</sup>	(F4) dB		AC	dB
dBm (185 only) <sup>2</sup>	or dBm (press to toggle)		AC	dBm

<sup>1</sup> dB readout = 20 X log (main display readout/ref), where ref = 1 V is the default.  
<sup>2</sup> dBm readout = 10 X log (main display readout2/R), where R=600 Ω.

### ***Application: Using a Reference Value Other than Default 1.000 V RMS in dB Mode***

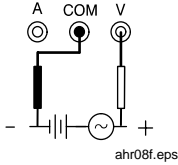
To manually change the reference voltage in dB mode, press and hold the yellow (shift) button to display the Setup menu. Adjust the **REF (dB)** value to the value you want and press softkey (F4) for OK. Subsequent dB measurements will use this stored value as the reference voltage until you turn off the meter.

### ***Application: Using Voltage in a Circuit as the Reference Value in dB Mode***

An example of using a voltage in a circuit as the reference value is measuring the AC voltage gain of an amplifier. Set the meter to dB mode and measure the voltage that you want to use for the reference (the input of the amplifier). Press **REL Δ** to save the measured value as the reference value. Next, measure the output of the amplifier. The voltage gain of the amplifier (in dB) shows in the upper display.

In both of these applications, the **Δ** indicator shows in the upper display to indicate the reference is a voltage other than the default value of 1.000 VRMS. The reference value returns to 1.000 V when you exit dB mode.

## Frequency Measurements

Measurement	Softkey	Connect Leads	Main Display	Upper Display
Frequency	(no selection)		Hz	- EdGE <sup>1</sup>
Frequency and duty factor dual display			Hz	% Duty <sup>2</sup>

<sup>1</sup> Displayed when you set negative edge triggering in the Setup menu. -EdGE is active but not displayed when % duty is on.

<sup>2</sup> You must turn on positive or negative duty in Setup menu.

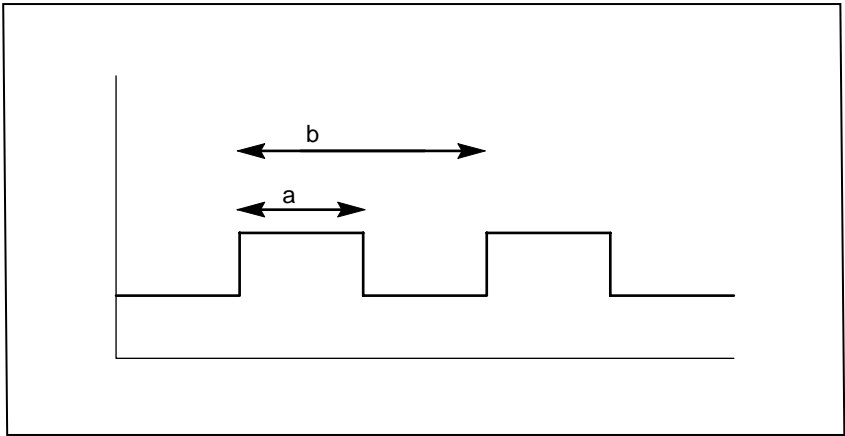
### Negative Edge Triggering

To trigger on the negative edge of the waveform, set **EdGE** to **nEG** in the Setup menu. The word **-EdGE** shows in the upper display when you exit the Setup menu.

### Positive and Negative Duty Factor

To measure duty factor, set duty (**POL** in the Setup menu) to either **POS** or **nEG**. When you measure negative duty factor, a “-” symbol shows in the upper display.





ahr10f.eps

**Figure 7. Positive and Negative Duty Factor**

Positive duty factor: % duty =  $(a/b) \times 100$

Negative duty factor: % duty =  $(1-a/b) \times 100$

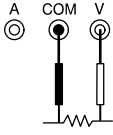

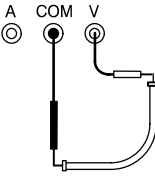

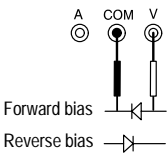
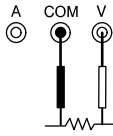
### *AC vs. DC Coupled Frequency Measurements*

When the duty factor measurement mode is off, the frequency measurement is AC coupled; otherwise, it is DC coupled.

### *Changing Voltage Range in Frequency Mode*

To change voltage range, press **RANGE**. The voltage range shows momentarily in the upper display. Continue pressing **RANGE** to cycle through the available voltage ranges until the range you want shows. The default voltage range is 5 V.

**Resistance Measurements (Ohms, Continuity, Diode, and 50 Ω Range)**

Measurement	Softkey	Connect Leads	Main Display	Upper Display
Resistance (default)	F1 Ω	 <p style="text-align: center;">ahr11f.eps</p>	Ω	--
Continuity	F2 	 <p style="text-align: center;">ahr12f.eps</p>	Ω	<b>OPEN</b> or <b>Shrt</b> (beeps on short)
Diode	F3 	 <p style="text-align: center;">ahr13f.eps</p>	V	--
50 Ω <sup>1</sup>	F4 50 Ω	 <p style="text-align: center;">ahr14f.eps</p>	Ω	--

<sup>1</sup> See application below.

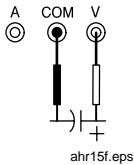
### *Application: Measuring Low Resistance Values*

To measure low resistance values to 0.01  $\Omega$  resolution, set the meter to 50  $\Omega$  mode and short the leads together to subtract the lead resistance from low-resistance measurements. If you do not short the leads together, the meter will not enter 50  $\Omega$  mode. The lead resistance must be less than 5  $\Omega$ . The measured resistance shows on the main display.

#### **Caution**

**To avoid damaging the meter, remove all power from the circuit before connecting the test leads.**

### **Capacitance Measurement**

Measurement	Softkey	Connect Leads	Main Display	Upper Display
Capacitance	(no selection)		F	--

#### **Caution**

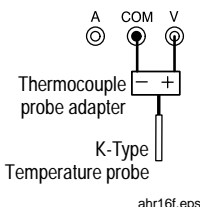
**To avoid damaging the meter, remove all power from the circuit before connecting the test leads.**

Measuring large-value capacitors may take several seconds.

Follow the procedures below when making capacitance measurements:

- Remove capacitors from circuitry.
- Discharge capacitors before measuring them.
- To measure small values of capacitance accurately, press **REL**  $\Delta$  when the leads are open.

**Temperature Measurements (185 only)**

Measurement	Softkey	Connect Leads	Main Display	Upper Display
Celsius temperature (default)	<b>F1</b> °C		°C	Ambient temp. °C
Fahrenheit temperature	<b>F2</b> °F		°F	Ambient temp. °F

Before you take a temperature measurement, momentarily change the temperature of the thermocouple to verify a shorted or open thermocouple is not incorrectly displaying the ambient temperature.

**Helpful Tip: Increased Temperature Accuracy**

To achieve high accuracy temperature measurements to  $\pm 1.0$  °C it is necessary to calibrate the meter to account for any thermocouple offset. Temperature accuracy without performing the following calibration is  $\pm 3$  °C:

1. Turn on the meter in the environment you will make the measurements.
2. Fill a wide, shallow container with ice and water. Stir the ice and water mixture for two or three minutes to evenly distribute the temperature of the mixture. Place the container next to the meter and submerge the tip of the bead probe in the ice and water.
3. While in °C or °F mode, allow the temperature reading to stabilize on a value (this value should be very close to 0 °C for °C mode or 32.0 °F for °F mode). Any deviation from 0 °C or 32 °F represents the thermocouple's offset.
4. Once the reading stabilizes, press and hold softkey **F1** for °C mode or softkey **F2** for °F mode for five seconds until the display shows 0000 or 0032.

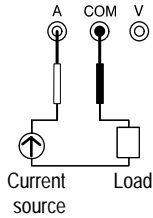
This calibrates the meter for the operating environment.  $\Delta$  shows in the upper display. If you hear an error beep, the offset is greater than  $\pm 5$  °C. You can repeat this calibration at any time. To undo this calibration, return the meter to factory settings by pressing both the yellow (shift) button and **MIN MAX** while powering up the meter (see Table 3. Power-up Options).

To insure accuracy of temperature measurements, you should follow this procedure when using other K-type thermocouple probes with the 183/185 DMMs because accuracy specifications vary in different types of probes.

*Note*

*Observe proper polarity on the probe adapter and do not calibrate the offset immediately following high amperage measurements.*

### Current Measurements

Measurement	Softkey	Connect leads	Main Display	Upper Display
True RMS AC Amps	F1 AC	 <p style="text-align: center;">ahr17f.eps</p>	AC	Hz
DC Amps (default)	F2 DC		DC	--
Amps AC DC dual display	F3 AC DC or AC+DC (press to toggle)		DC	AC
Amps AC+DC total RMS <sup>1</sup>			AC+DC	Hz
4-20 mA current % <sup>2</sup> (185 only)	F4 20 mA		DC	%

$$^1 I_{rms} = \sqrt{I_{AC}^2 + I_{DC}^2}$$

<sup>2</sup> 4-20 mA measurement is used in process loop calibration. % = (measured current – 4 mA)/16 mA

When overrange occurs in manual range, the meter will uprange in order to protect the internal circuitry.

### **Caution**

**To avoid damaging the meter, limit large current measurements to 15 A for 30 seconds and allow ten minutes of cooling between measurements.**

**Do not attempt to measure current with batteries removed.**

When you exit current measurement mode, the words **CHEC ProbE** show on the display reminding you to remove your test lead from the A (amps) input connector.

When you make high current measurements, >15 A, use a current clamp probe (optional accessory).

## ***Button and Softkey Overview***

### ***Yellow (Shift) Button***

To access functions in yellow text, press the yellow (shift) button and then press a function button while the **SHIFT** indicator is on. The **SHIFT** indicator shows on the display for five seconds.

Press and hold the yellow(shift) button for two seconds to access the Setup menu. See "Setup Menu" for more information.

### ***RANGE Button***

Use the **RANGE** button to manually select a range. Press and hold **RANGE** for two seconds to return the meter to auto range mode. The meter is in auto range mode when the **AUTO** indicator is on.

The range and units are displayed above the **AUTO** indicator, to the right of the bargraph.

### **MIN MAX (Minimum, Maximum) Button**

Press this button to scroll through the live, maximum, minimum, maximum–minimum, and average value. The elapsed time between the last recorded event and the start of the test shows in the upper display.

Press and hold **MIN MAX** for two seconds to exit MIN MAX mode.

See "MIN MAX AVG Operation" for more information.

### **FAST MIN MAX (1 ms Peak)**

To activate 1 ms peak, first press the yellow (shift) button and then **MIN MAX** while the **SHIFT** indicator shows on the display. When in fast mode, the LCD displays the **FAST** and **MIN MAX** indicators. Display resolution in fast MIN MAX is 5,000 counts. Live and average (AVG) readings are not available in fast MIN MAX mode.

You can use FAST MIN MAX when you take AC or DC measurements. The meter only records events that have a pulse width that is greater than 1 ms.

Press **MIN MAX** to view 1ms peak minimum and maximum values. The **MAX** value shown is the value of the positive peaks and the **MIN** value shown is the value of the negative peaks.

Press and hold **MIN MAX** for two seconds to exit FAST MIN MAX mode.


### **Backlight Button (☼)**

Press ☼ to turn the backlight on or off. Adjust the LOFF setting in the Setup menu to adjust the backlight timeout setting. To adjust the setting for the backlight, refer to the "Setup Menu" section.

### **HOLD Button**

Press **HOLD** to turn hold mode on and off. When you activate the hold feature, the instrument beeps, freezes the display, and displays the **HOLD** indicator. Hold mode freezes the display so you can remove the probes from the test points without losing the measurement reading.

## **Auto Hold**

To activate auto hold, press down on **HOLD** until  **HOLD** appears on the display. Auto hold is not available for capacitance or AC DC measurements.

In auto hold mode the display automatically freezes and the instrument beeps when the measurement reading stabilizes. The displayed value will be updated when the meter stabilizes on a new measurement value.

Auto hold is useful when it is not possible for you to press **HOLD** or see the meter display while probing and taking measurements.

## **REL $\Delta$ Button (Making Relative (REL $\Delta$ ) Measurements)**

Use this button to set the meter to delta mode and make relative measurements. The reference value for the  $\Delta$  measurement can be a measured, a stored, or a programmed value.

### **$\Delta$ Relative to a Measured Value**

When you take the measurement and the meter settles on the measurement value, press **REL  $\Delta$** . For subsequent readouts, the measured reference value is subtracted from the actual measurement.

### **$\Delta$ Relative to a Saved Value**

Use the measurement function knob and softkeys to set the meter to the measurement function you want. Use the memory information in the "MEM (Memory)" section to recall (RCL) a reference value from memory, then press **REL  $\Delta$** . To exit delta mode, press **REL  $\Delta$** .

For subsequent readouts, the recalled reference value is subtracted from the actual measurement.



## **Δ** *Relative to a Programmed Value*

Use the measurement function knob and softkeys to set the meter to the measurement function and range you want and then press **REL Δ**. While the meter is in delta mode, press and hold the yellow (shift) button until the Setup menu appears. Use the softkeys to edit *rEF* to the desired value and press softkey **(F4)** for OK. To exit delta mode, press **REL Δ**.

For subsequent readouts the programmed reference value is subtracted from the actual measurement. The programmed reference value is lost when you turn off the meter.

You can also use **REL Δ** to make relative dB (**Δ** dB) measurements. See "dB and dBm Voltage Measurements" for more information.

## **MEMORY**

Use the memory mode to store and recall measurement values. No data is lost during power cycles.

To activate the MEMORY mode, press the yellow (shift) button and then **REL Δ** while **SHIFT** shows on the LCD display. The display shows four softkey selections: **STO**, **RCL**, **CLR**, and **EXIT**.

### **STO**

Select **STO** to store the held value in the next available memory location. The memory location number momentarily shows on the upper display. If no memory locations are available, **FULL** shows on the upper display for two seconds and nothing is stored.

To overwrite an existing memory value, recall the memory location using the **RCL** button, press **CLR**, then press **STO** to store the new value in this location.

### **RCL**

Select **RCL** to scroll through the stored values in reverse order. The upper display momentarily shows the memory location while the main display shows the value stored in that location.

## **CLR**

Select **CLR** to clear the currently selected memory location. The location is replaced with “-----”.

To clear all memory locations, press and hold **CLR** for five seconds. A **?** shows on the display next to the **CLR** enunciator. The word **done** shows on the display indicating that all memory locations are clear and you can release the button. If you release the button before the word **done** shows, no data is cleared from the memory.

## **EXIT**

Select **EXIT** to exit memory mode. You can also exit memory mode by pressing any button.

## **Softkeys** ( **F1**   **F2**   **F3**   **F4** )

Each setting on the measurement function knob may activate one or more softkey settings on the LCD. If there is more than one measurement for a function knob setting, a softkey menu appears on the display. Press the corresponding softkey to select the desired measurement.

## **Setup Menu**

The Setup menu allows you to customize default settings. To activate the Setup menu, press and hold the yellow (shift) button for two seconds.

Use the softkeys as shown in the following table to edit setup values. Setup menu values are saved when you turn off the meter, except for reference values.

<b>Softkey</b>	<b>F1</b> <b>+</b>	<b>F2</b> <b>-</b>	<b>F3</b> <b>←</b>	<b>F4</b> <b>OK</b>
<b>Function</b>	Press to increase setting value	Press to decrease setting value	Press to step to next digit in setting value	Press to save setting and move to next setup parameter

Table 2 lists the setup menu prompts, the definition of parameters, and default values.

**Table 2. Setup Prompts, Definitions, and Default Values**

Upper Display Prompt	Definition of Parameter (press OK to cycle through parameters)	Default Value
<b>POFF</b>	Sets auto-off time (in minutes)	30 minutes
<b>LOFF</b>	Sets backlight auto-off time (in seconds)	60 seconds
<b>bBEEP</b>	Toggles beeper on and off	ON
<b>HrES</b>	Changes display to 50,000 counts	OFF
<b>POL (Duty)</b>	Scrolls through OFF, POS (positive duty factor), and NEG (negative duty factor)	OFF
<b>EdGE (Hz)</b>	Toggles between POS (positive edge) and NEG (negative edge) triggering in Hz measurement	Positive (rising)
<b>rEF<sup>1</sup></b>	Changes the reference value for delta measurements	Value before <b>REL Δ</b> is pressed
<b>(Δ)rEF(dB)<sup>1</sup></b>	Changes the reference value for dB measurements	1 V
<sup>1</sup> Meter must be in <b>REL Δ</b> or dB mode to access these setup parameters		

## **Special Features**

### **High Resolution (HrES) 50,000-Count Mode**

By default, the meter is set to 5,000-count mode. For 50,000-count mode, press the yellow (shift) button when you turn on the meter. To change the default resolution to 50,000-count mode, use the Setup menu information in the "Setup Menu" section.

The following measurements are limited to 5,000-count mode: 50 Ω, 50 MΩ, 1 ms peak hold, AC + DC amps, AC DC amps, AC + DC volts, AC DC volts, capacitance, and Hertz dual display mode.

## ***Beeper***

A single beep indicates correct operation. You can turn the single-beep feature off in the Setup menu. A double beep indicates a warning or error condition. A triple beep indicates the meter will auto-off in one minute. Continuous beeping indicates there is circuit continuity while in continuity mode. You can not disable double, triple, or continuous beeps.

## ***Auto-Off***

The auto-off feature automatically turns off the meter if no controls or settings are changed within a set amount of time. To turn on the meter after auto-off, press any button. The meter will return to the state it was in before auto-off occurred, but held values are lost.

Use the Setup menu to adjust the auto-off delay. The default auto-off time is thirty minutes. You can disable auto-off by pressing **HOLD** when you turn on the meter or by using the Setup menu.



Auto-off is disabled during MIN MAX mode.

## ***Power-Up Options***

To activate power-up functions, press and hold a button or softkey when you turn on the meter. Hold the button or softkey until you hear a single beep and see a text acknowledgment on the display (see Table 3 below). The following table lists all power-up options. Most of the power-up option descriptions also appear on the rear panel.

When you turn off the meter, the power-up options are not saved. Use the Setup menu to change default settings.

**Table 3. Power-up Options**

Button	Power-up Function	Explanation
RANGE <i>(HI <math>\Omega</math> mV)</i> <sup>1</sup>	Sets meter to 500 mV high impedance mode	Enables high impedance (> 10 M $\Omega$ ) across the input jacks in the 500 mV DC range so that the device under test is not loaded when you measure small voltages.
MIN MAX <i>(1 SEC)</i> <sup>1</sup>	Sets meter to 1 second MIN MAX mode	See "MIN MAX" for more information.
RELA <i>(bEEP)</i> <sup>1</sup>	Turns off beeper	Double, triple, and continuity beeps are not affected.
Shift (yellow button) <i>(HrES)</i> <sup>1</sup>	Sets meter to high resolution (50,000 count) mode	See "High Resolution (HrES) 50,000-Count Mode" for further information.
LIGHT <i>(LOFF)</i> <sup>1</sup>	Disables light timeout	--
Softkey 	Displays software version and calibration date	Displays the software version (M.mm, where M is the major revision and mm is the minor revision). Press softkey  again to display the date the meter was last calibrated (upper display shows month and main display shows year).

**Table 3. Power-up Options (Cont.)**

<b>Button</b>	<b>Power-up Function</b>	<b>Explanation</b>
Softkey <b>(F2)</b>	Overall Diagnostics	Displays all LCD segments. Press softkey <b>(F2)</b> again to hear the beeper. Press softkey <b>(F2)</b> again to perform button and knob diagnostics. The display shows two two-digit numbers. The numbers on the left confirm the knob location and the numbers on the right confirm the button operation. To exit diagnostics, turn off meter.
Softkey <b>(F3)</b>	LCD test	Displays all LCD segments so you can verify correct LCD operation and display. Compare this to the LCD figure in the "Display Indicators" section.
Softkey <b>(F4)</b>	Battery test	Displays the voltage across the battery terminals. The meter will shut off at 1.5 V.
<b>HOLD (POFF)</b> <sup>1</sup>	Disables auto-off	--
<b>YELLOW and MIN MAX (rESEt)</b>	Resets meter to factory default settings	You must press both buttons at the same time while powering on the meter.
<sup>1</sup> The bolded text in parentheses in the Button column shows when the meter registers the power-up setting. Do not release the button until you either hear a single beep or see the text.		

## **MIN MAX AVG Operation**

Press **MIN MAX** to start recording MIN MAX values. In 5,000 count mode the MIN MAX default recording rate is 4 measurements per second. Press and hold **MIN MAX** when turning on the meter to apply averaging, which reduces the recording rate to 1 measurement per second (1 sec MIN MAX).

The **MIN MAX** button cycles through the operations listed in Table 4.

**Table 4. Min/Max Operations**

<b>Display Indicator</b>	<b>Description</b>
<b>MIN MAX</b>	The live signal value is shown. The upper display shows the elapsed time since the recording began.
<b>MAX</b>	The MAX indicator and maximum value are shown. The upper display shows the timestamp at which the maximum value occurred, relative to the start of the test.
<b>MIN</b>	The MIN indicator and minimum value are shown. The upper display shows the timestamp at which the minimum value occurred, relative to the start of the test.
<b>MAX-MIN</b>	The MAX-MIN indicator and maximum value minus minimum value are shown. The upper display shows the time difference between the MAX and MIN events.
<b>AVG</b>	The AVG indicator is shown and the value shown is the average value of all meter readings. The upper display shows the elapsed time since recording began.

Once you set the meter to MIN MAX mode, the meter will uprange, or automatically increase range setting, but will not downrange. You must exit MIN MAX mode to restore downranging abilities to the meter.

While in MIN MAX mode, press **HOLD** to stop the recording and freeze the most recent MIN MAX values. Press **MIN MAX** to cycle through the held values. Press **HOLD** a second time to reset and restart the MIN MAX recording.

While in MIN MAX mode, activate memory mode to hold the displayed MIN MAX value for storage into memory without stopping or resetting the MIN MAX recording.

To exit MIN MAX mode and clear stored values, press and hold **MIN MAX** for two seconds.

### ***Auto Fuse Detection***

The meter automatically verifies the integrity of the internal fuse when you set the measurement function knob to A. If an open fuse is detected, the word **FUSE** shows on the main display.

See "Replacing the Fuse" for instructions on how to replace fuse F1.



## Specifications

All specifications are warranted, unless noted as typical, for the rated temperature range of  $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  at less than 80% relative humidity.

Characteristics	Description
LCD display digits	3 4/5 (default) or 4 4/5
Display counts	5,000 (default) or 50,000
Bargraph	20 segment, updated 20 times per second
Memory locations	183: 10, 185: 30
Out of range indicator	<i>OL</i> : overrange <i>Ur</i> : underrange
Low voltage indicator	Battery symbol shows on LCD at 2.0 V. Meter powers down at 1.5 V.
Battery life	100 hours continuous use with backlight off (typical)
Auto-off	Adjustable, 30 minute default
Power source	Two AA 1.5 V alkaline batteries (NEDA 15 A)
Maximum input voltage between terminals and between terminals and earth.	1000 V RMS <sup>1</sup>
F1 fuse protection	11 A (1000 V) service-replaceable
Backlight	Green LEDs
<sup>1</sup> If the meter is exposed to water have it inspected by qualified service personnel.	

**Table 5. DC Voltage Characteristics**

<b>Characteristic</b>	<b>Description</b>
Settling time	3 readings (typical)
Reading rate	5,000 ct.: 4 readings per second 50,000 ct.: 1 reading per second
Rejection ratio	
Common mode	120 dB at DC or 50 Hz or 60 Hz
Normal mode	60 dB at 50 Hz or 60 Hz
Input impedance	10 MΩ (typical)

**Table 6. DC Voltage Range, Resolution, and Accuracy**

<b>Range</b>	<b>Resolution</b>		<b>Accuracy<sup>1</sup></b>	
	<b>5,000 counts</b>	<b>50,000 counts</b>	<b>183</b>	<b>185</b>
0.5 V	100 μV	10 μV	±(0.07% + 1 count)	± (0.05% + 1 count)
5 V	1 mV	100 μV		
50 V	10 mV	1 mV		
500 V	100 mV	10 mV		
1000 V	1 V	100 mV		
Temperature coefficient		Add (0.005% + 0.1 ct.)/°C to accuracy beyond rated temperature range.		
<sup>1</sup> Accuracy in 50,000-count mode is % + 10 counts.				

**Table 7. AC Voltage Characteristics**

Characteristic	Description
Input impedance	10 M $\Omega$ in parallel with 100 pF (typical)
Settling time	4 readings (typical)
Reading rate	5,000 ct.: 4 readings per second 50,000 ct.: 1 reading per second
Common mode rejection ratio	60 dB at DC to 60 Hz
Crest factor, maximum	Full scale: 3 Half scale: 6
AC+DC <sup>1</sup> total RMS volts accuracy	AC (RMS) accuracy + 0.1% + 1 count
AC DC <sup>1</sup> dual display accuracy	DC Accuracy + 0.05% + 1 count AC RMS Accuracy + 0.1% + 1 count
Upper display frequency (5,000 counts)	
Accuracy	$\pm$ (0.002% + 1 count) for 20 Hz to 20 kHz
Sensitivity	10% of selected voltage range
dB reference <sup>2</sup>	1 VRMS (adjustable)
dBm reference <sup>2</sup>	775 mV across 600 $\Omega$ (1 mW)
<sup>1</sup> 5,000-count mode only.	
<sup>2</sup> See "dB and dBm Voltage Measurements" for dB and dBm calculations.	

**Table 8. AC Voltage Range, Resolution, and Accuracy**

Range	Resolution		Accuracy <sup>1</sup>	
	5,000 Counts	50,000 Counts	183	185
0.5 V	100 µV	10 µV	40 Hz – 20 kHz ± (0.6% + 2 counts):	40 Hz – 20 kHz: ± (0.4% + 2 counts)
5 V	1 mV	100 µV		
50 V	10 mV	1 mV		
500 V <sup>2</sup>	100 mV	10 mV		
1000 V <sup>2</sup>	1 V	100 mV	40 Hz – 10 kHz: ± (0.6% + 2 counts)	40 Hz – 10 kHz: ± (0.4% + 2 counts)
Temperature coefficient		AC: Add (0.03% + 0.1 ct.)/°C beyond rated temperature range.		
		AC+DC: Add (0.06% + 0.1 ct.)/°C beyond rated temperature range.		
<sup>1</sup> Accuracy in 50,000-count mode is % + 20 counts. <sup>2</sup> For voltages > 100 V, the maximum volts–Hz product < 1 X 10 <sup>7</sup> VHz.				

**Table 9. DC Current Characteristics**

Characteristics	Description
Burden voltage	5 mA to 5 A: 0.3 V max. 10 A: 0.5 V max.
Percent 4-20 mA (calculated in 50 mA range)	4 mA = 0% 20 mA = 100%
Settling time	4 readings (typical)
Reading rate	5,000 ct.: 4 readings per second 50,000 ct.: 1 reading per second

**Table 10. DC Current Range, Resolution, and Accuracy**

Range	Resolution		Accuracy	
	5,000 Counts	50,000 Counts	183	185
500 $\mu$ A	100 nA	10 nA	$\pm (0.2\% + 4 \text{ counts})^1$	
5 mA	1 $\mu$ A	100 nA	$\pm (0.2\% + 2 \text{ counts})^2$	
50 mA	10 $\mu$ A	1 $\mu$ A		
500 mA	100 $\mu$ A	10 $\mu$ A		
5 A	1 mA	100 $\mu$ A	$\pm (0.4\% + 2 \text{ counts})^2$	
10 A for 3 minutes (15 A for 30 sec.) Allow 10 minutes of cooling between measurements	10 mA	1 mA	$\pm (0.8\% + 2 \text{ counts})^2$	
Temperature coefficient		Add (0.05% + 0.1 ct.)/ $^{\circ}$ C beyond rated temperature range.		
<sup>1</sup> Accuracy in 50,000-count mode is % + 40 counts. <sup>2</sup> Accuracy in 50,000-count mode is % + 20 counts.				

**Table 11. AC Current Characteristics**

Characteristics	Description
Burden voltage	0.5 mA to 5 A: 0.9 V max. 10 A: 1.0 V max.
AC+DC <sup>1</sup> Accuracy	AC RMS amps accuracy + DC amps accuracy
Upper display frequency	
Accuracy	$\pm (0.002\% + 1 \text{ count})$ for 20 Hz to 5 kHz
Sensitivity	10% of range
Settling time	4 readings (typical)
Reading rate	5,000 ct.: 4 readings per second 50,000 ct.: 1 reading per second
<sup>1</sup> 5,000-count mode only.	

**Table 12. AC Current Range, Resolution, and Accuracy**

Range	Resolution		Accuracy <sup>1,2</sup>	
	5,000 Counts	50,000 Counts	183	185
0.5 mA	100 nA	10 nA	40 Hz – 1 kHz: ± (0.6% + 2 counts)  1 kHz – 5 kHz: ± (7.5% + 2 counts)	
5 mA	1 µA	100 nA		
50 mA	10 µA	1 µA		
500 mA	100 µA	10 µA		
5 A	1 mA	100 µA		
10 A for 3 minutes (15 A for 30 sec.) Allow 10 minutes of cooling between measurements	10 mA	1 mA		
Temperature coefficient		Add (0.05% + 0.1 ct.)°C beyond rated temperature range.		
<sup>1</sup> Accuracy in 50,000-count mode is % + 20 counts. <sup>2</sup> > 5% of range.				

**Table 13. Resistance (Ω) Characteristics**

Characteristics	Description
Update rate	5,000 ct.: 2 readings per second 50,000 ct.: 1 reading per second 50 MΩ: 1 reading per second
Settling time	50 Ω to 5 MΩ range: 3 readings (typical) 50 MΩ range: 4 readings (typical)
Compliance voltages (typical)	0.6 V (50 Ω and 500 Ω range is 1.3 V)
Common mode rejection ratio	60 dB at DC, 50 Hz, or 60 Hz
Normal mode rejection ratio	20 dB at ≥ 50 Hz

**Table 14. Resistance Range, Resolution, and Accuracy**

Range	Resolution		Accuracy
	5,000 Counts	50,000 Counts	183 185
50 Ω	0.01 Ω <sup>1</sup>	—	± (0.1% + 10 counts)
500 Ω	0.1 Ω	0.01 Ω	± (0.1% + 4 counts) <sup>2</sup>
5 kΩ	1 Ω	0.1 Ω	± (0.1% + 2 counts) <sup>3</sup>
50 kΩ	10 Ω	1 Ω	
500 kΩ	100 Ω	10 Ω	
5 MΩ	1 kΩ	100 Ω	± (0.4% + 4 counts) <sup>2</sup>
50 MΩ	10 kΩ	—	± (1.0% + 4 counts) <sup>2</sup>
Temperature coefficient	50 Ω to 500 kΩ: Add (0.03% + 0.1 ct.)/°C beyond rated temperature range. 5 MΩ to 50 MΩ: Add (0.2% + 0.1 ct.)/°C beyond rated temperature range.		
<sup>1</sup> 5,000 count mode only. <sup>2</sup> Accuracy in 50,000-count mode is % + 40 counts. <sup>3</sup> Accuracy in 50,000-count mode is % + 20 counts.			

**Table 15. Continuity Characteristics**

Characteristics	Description
Continuity threshold	Beeper sounds when resistance is 100 Ω or less (typical)
Response time	< 1 ms

**Table 16. Diode Test Characteristics**

Characteristics	Description
Test current (typical)	0.35 mA
Test voltage	3.3 V maximum, open circuit
Accuracy	± 1.0%

**Table 17. Capacitance Range, Resolution, and Accuracy (5,000 counts only)**

Range	Resolution <sup>1</sup>	Accuracy <sup>2</sup>	
		183	185
5 nF <sup>3</sup>	1 pF	± (1.0% + 5 counts) (using REL Δ mode)	
50 nF	10 pF	± (1.0% + 3 counts) (using REL Δ mode)	
500 nF	100 pF	± (1.0% + 3 counts)	
5 μF	1 nF		
50 μF	10 nF	± (3.0% + 3 counts)	
500 μF	100 nF		
5 mF	1 μF		
50 mF	10 μF		
Temperature coefficient	Add (0.05% + 0.1 ct.)/°C beyond rated temperature range.		
<sup>1</sup> 5,000 count mode only. <sup>2</sup> > 1% of range. <sup>3</sup> ± (1% + 10) below 0.500 nF			



**Table 18. Frequency Characteristics, Resolution, and Accuracy**

Characteristics	Description
Signal coupling	AC
Minimum frequency	0.5 Hz
Maximum frequency	1 MHz
Accuracy	$\pm (0.002\%) + 1$ count
Best resolution	10,000 count: 0.01 Hz 100,000 count: 0.001 Hz
Temperature coefficient	Add 0.00004%/°C beyond rated temperature range.

**Table 19. Frequency Voltage Range**

Range	Sensitivity, 10 Hz - 100 kHz	Sensitivity, 1 MHz <sup>1</sup>
500 mV	100 mV	—
5 V	500 mV	2 V
50 V	5 V	20 V
500 V	50 V	—

<sup>1</sup> For voltages > 100 V, the maximum volts–Hz the meter is < 10<sup>7</sup> VHz.

**Table 20. Duty Factor Characteristics**

Characteristics	Description
Range	1 Hz to 100 kHz
Accuracy	$\pm (0.1\% + 0.05\%$ per kHz) for 5 V input (logic signals only)
Signal coupling	DC
Resolution	0.1%
Sensitivity	30% of range

**Table 21. Temperature Characteristics**

<b>Characteristics</b>	<b>Description</b>
Main display	
Range	-50 °C to +980 °C
Accuracy	± 3 °C <sup>1</sup> (typical)
Thermocouple type	K
Upper display	
Accuracy	± 3 °C of ambient temperature (typical)
<sup>1</sup> Use the water and ice offset calibration method in the "Temperature Measurements (185 only)" section for accuracy to ±1.0 °C.	

**Table 22. FAST MIN MAX (1 ms) Characteristics**

<b>Characteristics</b>	<b>Description</b>
Accuracy <sup>1</sup>	Specified voltage or current measurement ± 30 counts of the peak value of a single 1ms pulse.
<sup>1</sup> 5,000-count mode only.	

**Table 23. Physical Characteristics**

<b>Characteristic</b>	<b>Description</b>
Dimensions (H × W × D)	38 mm × 88 mm × 183 mm (without holster)
Weight (with batteries)	383 g (13.5 oz)
With holster	539 g (1 lb 3 oz)

**Table 24. Environmental Characteristics**

Characteristic	Description
Temperature	
Operating	-10 to +50 °C
Non-operating (storage)	-40 to +60 °C
Humidity	-40 to +35 °C: < 80% +35 to +40 °C: < 70% +40 to +60 °C: < 55%
Altitude	
Operating	2,000m (6,562 ft) For altitudes from 2,000 m up to 3,000 m (9,843 ft) derate voltage input to 600 VAC CAT III.
Non-operating (storage)	12,300 m (40,354 ft)
Vibration	
Operating	2.66 gRMS, 5 to 500 Hz, 3 axes (10 minutes each)
Non-operating	3.48 gRMS, 5 to 500 Hz, 3 axes (10 minutes each)

**⚠ Warning**

**This meter is sensitive to strong external magnetic fields.**

**Do not use the meter within 1-inch (2.54 cm) of strong external magnetic fields such as that produced by the Fluke ToolPak hanging magnet accessory. Incorrect readings may result. If erratic behavior is noted, turn meter off to reset.**

**Table 25. Certifications and Compliances**

<b>Category</b>	<b>Standards or description</b>
<p>EC Declaration of Conformity – EMC</p>	<p>Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities: EN 61326 Class A <sup>1,2</sup></p>
<p>Australia/New Zealand Declaration of Conformity – EMC</p>	<p>Complies with EMC provision of Radio communications Act per the following standard(s):            AS/NZS 2064.1/2 Class A Radiated Emissions</p>
<p>EC Declaration of Conformity – Low Voltage</p>	<p>Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities:            Low Voltage Directive 73/23/EEC as amended by 93/69/EEC.            EN 61010-1/A2:1995            Safety requirements for electrical equipment for measuring control, and laboratory use.</p>
<p>U.S. Nationally Recognized Testing Laboratory Listing</p>	<p>ANSI/ISA S82.01-1994            CAN/CSA C22.2 No. 1010.1            Safety requirements for electrical equipment for measurement, control, and laboratory use</p>
<p>Additional Compliance</p>	<p>IEC61010-1/A2:1995            Safety requirements for electrical equipment for measurement, control, and laboratory use.</p>


**Table 25. Certifications and Compliances (cont.)**

Category	Standards or description
Installation Category DUAL RATINGS	<p>Complies with IEC 1010-1 to 1000 V Overvoltage Category III, Pollution Degree 2; and IEC 664-1 to 600 V Overvoltage Category IV, Pollution Degree 2</p> <p>OVERVOLTAGE (Installation) Categories refer to the level of Impulse Withstand Voltage protection provided at the specified Pollution Degree.</p> <ul style="list-style-type: none"> <li>• Overvoltage Category III equipment is equipment in fixed installations. Examples include switch gear and polyphase motors.</li> <li>• Overvoltage Category IV equipment is equipment for use at the origin of the installation. Examples include electricity meter and primary over-current protection equipment.</li> </ul>
Pollution Degree	A measure of the contaminates that could occur in the environment around and within a meter. Typically the internal environment inside a meter is considered to be the same as the external. Meters should be used only in the environment for which they are tested.
Pollution Degree 2	Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the meter is out of service.
Pollution Degree 3	Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
<p><sup>1</sup> Add 25 counts (250 counts in 50,000 count mode) to the accuracy specifications when in the presence of an RF field as defined in IEC801-3.</p> <p><sup>2</sup> Amps DC: Add 60 counts (600 counts in 50,000 count mode) to the amps accuracy specifications when in the presence of an RF field as defined in IEC801-3.</p>	

## **Accessories**

This section lists all standard accessories for the 183 and 185 true RMS digital multimeters.

**Table 26. Standard Accessories**

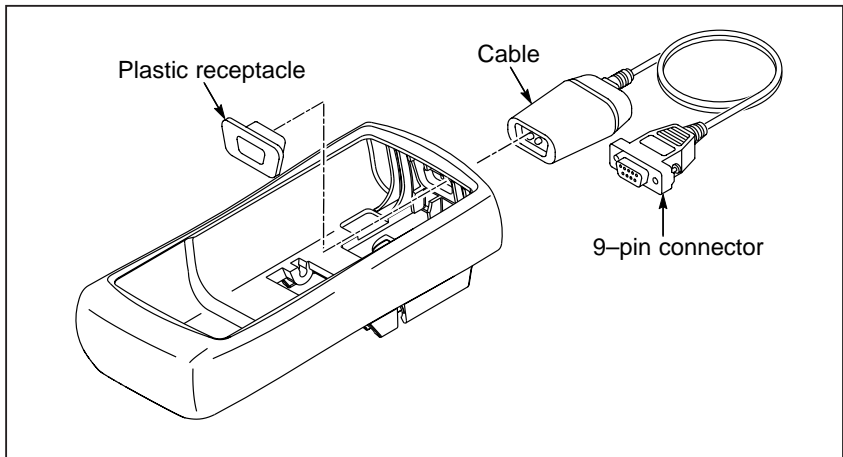
<b>Standard accessory</b>	<b>Product or part number</b>
Test lead set	TL75, or equivalent
Test leads (1 red, 1 black)	Certified to 1000 V CAT III
Alligator clips (185 only) (1 red, 1 black)	AC70 (red) PN 738120 AC70 (black) PN 738047
Protective Holster	PN 1556861
Installed dry cell batteries -	Two AA 1.5 V alkaline batteries (IEC LRG or ANSI/NEDA 15A)
 Fuse (installed) 11 A, 1000 VRMS	PN 803293 FUSE, 11A, 1000V
<b>Users Manual</b>	
<b>Language</b>	<b>Part Number</b>
English	1574586
English, French, Spanish, Portuguese	1574599
English, French, German, Italian, Dutch	1574607
English, Simplified Chinese, Traditional Chinese, Korean, Japanese	1574629
English, Danish, Finnish, Norwegian, Swedish	1587740

## **Setup for Optional Computer Interface Accessory (FlukeView Forms)**

Follow the steps below to set up the computer interface accessory (see Figure 8):

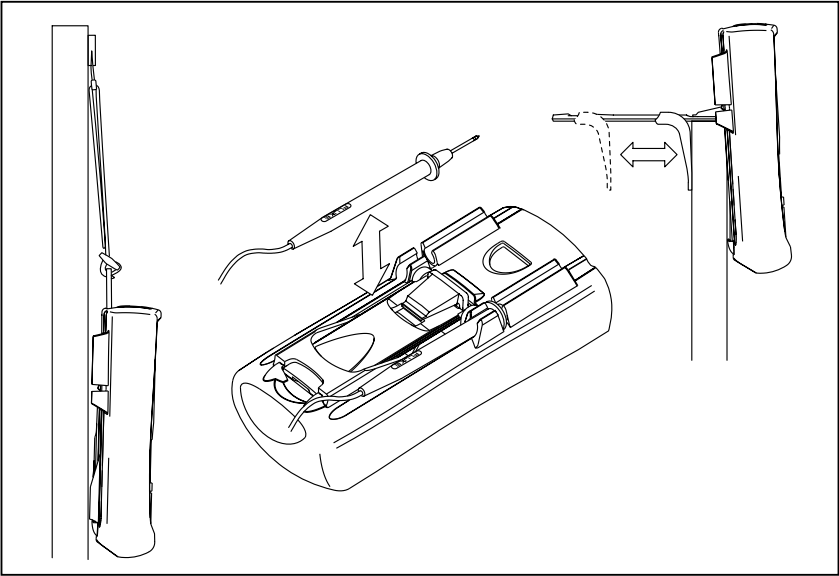
1. Press the plastic receptacle into place in the top of the DMM protective holster. Connect the FlukeView cable to the plastic receptacle.
2. Connect the other end of the FlukeView cable to your computer using the 9-pin connector. If you require a 25-pin connection to your PC, you will need to use a 9-pin-to-25-pin adapter.
3. Insert FlukeView Forms CD-ROM into your computer drive and proceed with software installation. Refer to the FlukeView Forms documentation for further instructions on using FlukeView Forms.

You can find further information about FlukeView Forms features on the FlukeView Forms CD-ROM.



**Figure 8. Setup for the Optional Computer Interface Accessory**

## Using Protective Holster and Tilt-Stand



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Figure 9. Holster and Tilt Stand

## Battery Replacement

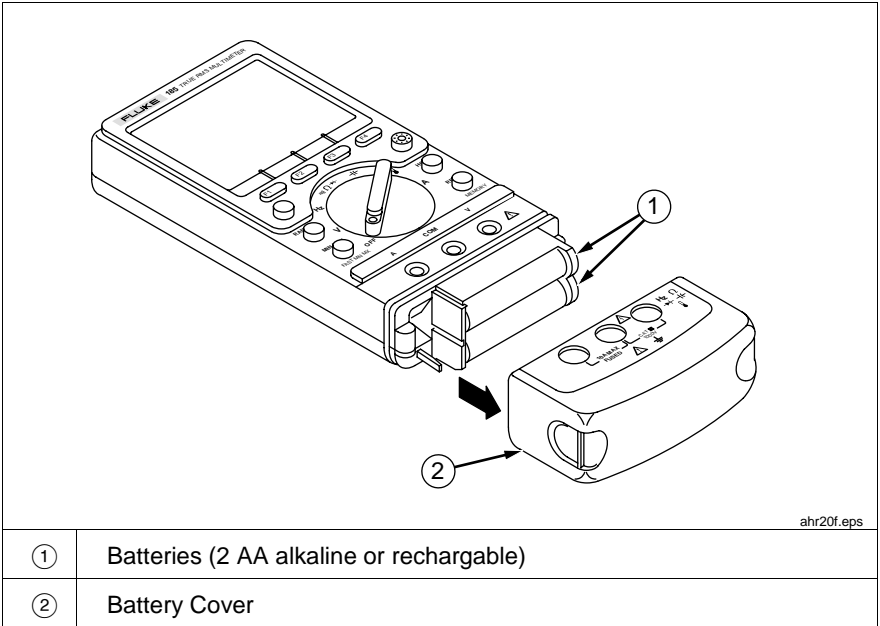
When you replace a battery, the meter calibration is not affected and the stored data is not lost.

Refer to Figure 10 to replace the battery.

Remove the battery cover only in a clean, dry environment.

See Table 26 for the descriptions and part numbers of the replaceable batteries.





**Figure 10. Replacing the Batteries**

## ***Servicing the Meters***

Only qualified personnel should perform service procedures. Read the Safety Information section before performing any service procedures.

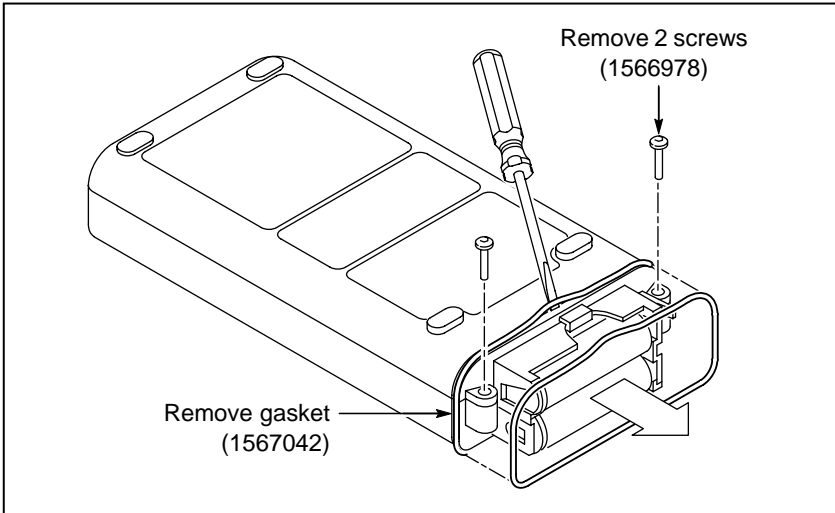
### **⚠ Warning**

- **Do not service alone. Do not perform internal service or adjustments of this meter unless another person capable of rendering first aid and resuscitation is present.**
- **Use care when servicing with power on. Dangerous voltages or currents may exist in this meter. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.**
- **To avoid electric shock, do not touch exposed connections.**
- **Service only in a clean, dry environment.**
- **Annual calibration verification is recommended.**
- **Installing improper fuses can cause injury and meter damage.**

## **Replacing the Fuse**

Follow the steps below to access and replace the service-replaceable fuse:

1. Remove the battery cover. Remove the batteries and two screws on both sides of the batteries (see Figure 11).



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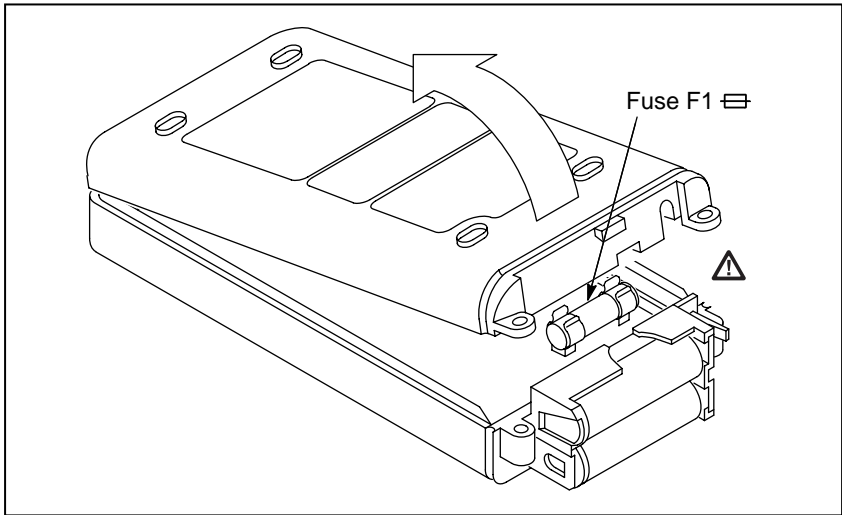
**Figure 11. Opening the Case**

2. Carefully insert a screwdriver between the gasket and meter case and gently lift and remove the gasket. You must remove the gasket before opening the meter case.
3. Carefully lift the rear panel of the meter up to access the fuse F1 (see Figure 12). Remove and replace the fuse. Refer to Table 26 for more information on which fuse to use.

### **⚠ Warning**

**Installing improper fuses can cause injury and meter damage.**

4. Verify meter calibration after replacing F1.



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**Figure 12. Fuse Access**

## ***General Care and Cleaning***

### **Caution**

- **Protect the meter from adverse weather conditions.**
- **Do not expose the LCD display to direct sunlight for long periods of time.**
- **To avoid damage to the meter, do not expose the interior of the meter to sprays, liquids, or solvents.**

Clean the exterior of the meter by removing dust with a lint-free cloth. Use care to avoid scratching the clear plastic display filter.

For further cleaning, use a soft cloth or paper towel dampened with water. You can use an alcohol-free glass cleaner for more efficient cleaning.

### **Caution**

**To avoid damage to the surface of the meter, do not use abrasive or chemical cleaning agents.**

**⚠ Warning**

**The meter is not protected from exposure to water.  
Exposing the meter to water can create a shock hazard.**

If the meter is exposed to water, open the case and allow the meter to fully dry.  
To open the meter, use the procedure in the "Servicing the Meters" section.