

1551A Ex/1552A Ex

Stik Thermometer

Calibration Manual

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Introduction

The Stik Thermometer (the Product) is a precision digital thermometer that can be used as an alternative to mercury liquid-in-glass (LIG) thermometers. It can also be used as a reference standard for other types of digital or analog thermometers. Because of its intrinsically safe certification, it can be used in many of the same hazardous locations as analog thermometers. For complete usage instructions, see the *1551A Ex/1552A Ex Users Manual*.

How to Contact Fluke

To contact Fluke, call one of the following telephone numbers:

- Technical Support USA: 1-800-44-FLUKE (1-800-443-5853)
- Calibration/Repair USA: 1-888-99-FLUKE (1-888-993-5853)
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31 402-675-200
- Japan: +81-3-3434-0181
- Singapore: +65-738-5655
- Anywhere in the world: +1-425-446-5500

Or, visit Fluke's website at www.fluke.com.

To register your product, visit <http://register.fluke.com>.

To see, print, or download the latest manual supplement, visit <http://us.fluke.com/usen/support/manuals>.

Safety Information

A **Warning** identifies conditions and actions that pose hazard(s) to the user. A **Caution** identifies conditions and procedures that could cause Product damage, equipment under test damage, or permanent loss of data.

Symbols used on the Product and in this manual are explained in Table 1.

Warning

To prevent possible electrical shock, fire, or personal injury:

- Use the Product only as specified, or the protection supplied by the Product can be compromised.
- Do not use the Product to measure the temperature of hazardous live components.
- Do not open the Product case. If you open the case, the Ex approval is not applicable.
- Change the batteries only in areas that are not Ex-hazardous.
- Use only specified approved batteries in the Product. Refer to the battery replacement instructions for a list of approved batteries.
- Do not use and disable the Product if it is damaged.
- Replace the batteries when the low battery indicator shows to prevent incorrect measurements.
- Check for proper operation of the Product before taking it into a hazardous area. Should the Product not operate as expected do not take the Product into a hazardous area and return it to the manufacturer for inspection.
- The Product is intended for installation only in locations providing adequate protection against the entry of solid foreign objects or water capable of impairing safety.

Caution

To prevent possible damage to the Product or to equipment under test:

- If the display message changes to “OL,” the range limit is exceeded and the Product must immediately be removed from the heat source to prevent damage.
- Do not immerse the Probe beyond its maximum immersion depth. This may damage its internal electronics. See “Immersion Depth and Usage” later in this manual.
- DO NOT drop or strike the Probe in any way. Mechanical shock damages the Probe internally and affects its calibration.



If the Product overheats or is exposed to sudden physical shock, examine it for damage that can cause a safety risk. If possible, compare the displayed temperature to a known reference before Product use. If not sure, send the Product to Fluke Corporation. Refer to “How to Contact Fluke”.

Substitution of components will impair suitability for hazardous locations.

ATEX Safety Information

This manual contains data and safety regulations that must be followed for safe, reliable use of the Product in hazardous areas under the detailed conditions. If you do not follow these instructions, personal injury or Product damage can occur. Violation of applicable legislation can also occur. Read the full manual before you use the Product. To make sure of safe Product operation, fully follow all instructions and warnings in the manual. If you are not sure (due to translation and/or printing errors), refer to the English manual.

An “Ex-hazardous area,” as used in this manual, refers to an area made hazardous by the possible presence of flammable or explosive vapors. These areas are also referred to as “hazardous locations.”

	Ex ib IIB T4 Gb (-10 °C ≤ Ta ≤ +50 °C)	
	ITS10ATEX27114X	
	Ex ib IIB T4 Gb	
II 2 G	IECEX ITS10.0049	0344








Manufactured by Martel Electronics, Inc.,
3 Corporate Park Dr.
Derry, NH, USA

gjo006.eps

Symbols

International symbols used on the Product and in this manual are explained in Table 1.

Table 1. Symbols

Symbol	Meaning	Symbol	Meaning
	Earth ground		Battery
	Risk of Danger. Important information. See Manual.		Hazardous Voltage
	Do not dispose of this product as unsorted municipal waste. Go to Fluke’s website for recycling information.		Conforms to ATEX requirements
	Conforms to relevant European Union directives.		

Approvals

The Product meets the above requirements using:

EN 60079-0:2006 ELECTRICAL APPARATUS FOR
EXPLOSIVE GAS ATMOSPHERES -- PART
0: GENERAL REQUIREMENTS (IEC
60079-0:2004 (MOD))

EN 60079-11:2007
EXPLOSIVE ATMOSPHERES -- PART 11:
EQUIPMENT PROTECTION BY INTRINSIC
SAFETY "I" (IEC 60079-11:2006 (EQV) +
CORRIGENDUM DEC. 2006 (EQV))

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Specifications

(Ambient: 23 °C ±5 °C)

Measurement Range

1551A Ex -50 °C to 160 °C (-58 °F to 320 °F)
1552A Ex -80 °C to 300 °C (-112 °F to 572 °F)

Accuracy (1 year) ±0.05 °C (0.09 °F)

Resolution Selectable (0.1, 0.01, 0.001) factory default is 0.01

Sample Rate User selectable 0.5/sec, 1/sec or 2/sec factory default is
1/sec

Operating Temperature Range of Readout: -10 °C to 50 °C (14 °F to 122 °F)

Probe Response Time Approximately 20 seconds

EMC Compliance..... EN61326:2006 Annex C
CISPR 11, Edition 5.0-2009
Class "B"

Humidity Range..... 0 to 95 % RH Non-condensing

Storage Temperature Range..... -20 °C to 60 °C (-4 °F to 140 °F)

Enclosure Rating IP50

Readout Temperature Coefficient Add ±10 ppm/°C of full scale temperature from -10 °C to
18 °C and 28 °C to 50 °C

Probe Temperature Coefficient 0.00385 Ω/Ω/°C nominal

Nominal Probe Resistance at 0 °C	100 Ω
Probe Hysteresis	±0.01 °C
Power	3 AAA alkaline batteries (Must use only approved batteries. See Table 2)
Battery Life	Approximately 300 hours without back light
Battery Save (auto-off) Range	Selectable from 1 to 30 minutes or can be disabled
Size (readout only)	Approximately 4 in. x 2 in. x 1 in.
Probe Size	1551A-9: 4.8 mm x 229 mm (3/16 in. x 9 in.) 1551A-12: 6.35 mm x 305 mm (1/4 in. x 12 in.) 1551A-20: 6.35 mm x 508 mm (1/4 in. x 20 in.) 1552A: 6.35 mm x 305 mm (1/4 in. x 12 in.)
Weight	6.9 oz

Calibration

⚠⚠ Warning

To prevent possible electrical shock, fire, or personal injury, the RS-232 interface must not be used in hazardous areas.

This procedure is to be considered a general guideline. Each laboratory should develop their own specific procedure based on their equipment and requirements. The procedure should be accompanied by an uncertainty analysis also based on the laboratory's equipment and environment.

Calibration should only be performed by qualified personnel. The technician should be familiar with the *1551A Ex/1552A Ex Users Manual*.

The calibration must be performed in the following ambient conditions:

Temperature: 23 °C ±2 °C

Relative humidity: 70 % maximum

Overview

The calibration consists of inserting the Product probe into a temperature bath having a known temperature and observing the difference between the temperature measured by the Product and the known temperature of the bath. The temperature of the bath is determined using an accurate reference thermometer. An equilibration block helps to ensure that the temperatures of the reference thermometer and 1551A Ex/1552A Ex Thermometer are uniform and stable.

If necessary, the calibration parameters in the Product can be adjusted to improve its accuracy. Adjustments are made by sending the appropriate command to the Product through an RS-232 cable connected to a computer. For completeness of documentation, the calibration parameters should be recorded before and after adjustment.

In summary, the main calibration steps are as follows:

- Record as-found calibration parameter values
- Evaluate as-found measurement errors
- Adjust the calibration parameters
- Evaluate as-left measurement errors
- Record as-left calibration parameters values

Recommended Equipment

The equipment listed in Table 2 will satisfy the calibration requirements:

Table 2. Recommended Equipment

Equipment	Recommended Model
Temperature Baths	Fluke 6331 40 °C to 300 °C Hot Bath Fluke 7381 -80 °C to 110 °C Cold Bath Fluke 7196 Equilibration Block
Reference Thermometer	Fluke 5699-S Extended Range Metal-Sheath SPRT
Reference Thermometer Readout	1594A Super-Thermometer readout
Computer	Computer with an RS-232 com port RS-232 serial cable Terminal software to communicate with the 1551A Ex/1552A Ex Thermometer

Initial Setup

Check the batteries in the Product and replace them if necessary. The battery level indication is found in the Setup menu.

Several settings in the Setup menu relate to measurement and should be set as follows:

- Sample Rate: 1 per second
- Damping: OFF
- Display Resolution: 0.001
- Auto Power Off: OFF

The unit of measurement in the 1551A Ex/1552A Ex Thermometer may be set to °C or °F, but must match the unit of the reference thermometer.

The baud rate in the computer software must match the baud rate of the 1551A Ex/1552A Ex Thermometer, which is usually 9600 but may be set to 2400.

Record as-found Calibration Parameters

Before any adjustments are made, the present values of the Product calibration parameters should be recorded. Connect the serial cable between the computer and the Product. The commands used to read the values of the calibration parameters are given in Table 3. Commands must be terminated with a carriage return character. Table 3 may also be used to record the values of the calibration parameters.

Table 3. As-found Calibration Parameters

Parameter	Command	Value (fill in)
TEMP1	CAL:USER:TEMP1?	
ADJ1	CAL:USER:ADJ1?	
TEMP2	CAL:USER:TEMP2?	
ADJ2	CAL:USER:ADJ2?	
TEMP3	CAL:USER:TEMP3?	
ADJ3	CAL:USER:ADJ3?	
DATE	CAL:DEV:DATE?	

Evaluate as-found Measurement Errors

The Product should be tested to evaluate its accuracy before any adjustments are made. It is recommended that it be tested near the five temperatures listed in Table 4, depending on the model.

Table 4. Test Temperatures

Point	1551A Ex	1552A Ex
1	-50 °C	-80 °C
2	-25 °C	-25 °C
3	0 °C	0 °C
4	100 °C	100 °C
5	157 °C	300 °C

At each of the test temperatures, readings are recorded of the temperature of the reference thermometer and the indication of the Product. Before recording the readings, make sure the temperatures of the bath, reference thermometer, and 1551A Ex/1552A Ex Thermometer are settled and stable.

At each calibration point the measurement error may be calculated by subtracting the reference thermometer temperature from the 1551A Ex/1552A Ex temperature. The temperatures and measurement errors may be recorded in Table 5.

Table 5. As-found Measurement Errors

Point	Reference (fill in)	1551A Ex/1552A Ex (fill in)	Error (fill in)
1			
2			
3			
4			
5			

If the measurement errors are well within the specified accuracy, it may not be necessary to adjust the calibration parameters. If the error is larger than desired (say 50 % of the specified accuracy), then adjustments to the Product calibration parameters are necessary. Proceed to the next section.

Adjustment at the Low Calibration Point

When necessary, the first adjustment is made for the low end of the temperature range of the Product. Set the bath temperature to the Low Adjustment Temperature given in Table 6, depending on the model. Make sure the temperatures of the bath, reference thermometer, and Product are settled and stable before proceeding.

Table 6. Low-Adjustment Temperature

Point	1551A Ex	1552A Ex
Low	-50 °C	-80 °C

Before adjustments to any calibration parameters can be made, access to the protected calibration parameters must be enabled by sending the following command to the Product through the serial interface:

```
SYST:PASS:CEN <password>
```

The parameter <password> is the current password, originally "1234".

To make an automatic adjustment at the low calibration point, issue the following command:

```
CAL:USER:LOW <temperature>
```

The parameter <temperature> is the temperature of the bath as measured by the reference thermometer. Product accepts a temperature value with up to three decimal places of resolution. The temperature value must be in the same unit in which the 1551A Ex/1552A Ex is measuring.

The command will set the value of the CAL:USER:TEMP1 parameter to the given temperature and automatically adjust the CAL:USER:ADJ1 parameter to cause the Product to measure the given temperature accurately. The adjustment made here will not affect the measurements at the other Adjustment temperatures.

Allow the readings of the Product to settle and then verify that the readings match the temperature of the reference thermometer and are well within the specified accuracy of the 1551A Ex/1552A Ex.

Adjustment at the Zero Calibration Point

The next adjustment is made for the middle of the temperature range of the Product. Set the bath temperature to the Zero Adjustment Temperature given in Table 7. Make sure the temperatures of the bath, reference thermometer, and the Product are settled and stable before proceeding.

Table 7. Zero Adjustment Temperature

Point	1551A Ex	1552A Ex
Zero	0 °C	0 °C

To make an automatic adjustment at the Zero calibration point, issue the following command:

`CAL:USER:ZERO <temperature>`

The parameter <temperature> is the temperature of the bath as measured by the reference thermometer. The Product accepts a temperature value with up to three decimal places of resolution. The temperature value must be in the same unit in which the Product is measuring.

The command will set the value of the CAL:USER:TEMP2 parameter to the given temperature and automatically adjust the CAL:USER:ADJ2 parameter to cause the Product to accurately measure the given temperature. This adjustment will not affect the measurements at the other Adjustment temperatures.

Allow the readings of the Product to settle and then verify that the readings match the temperature of the reference thermometer well within the specified accuracy of the 1551A Ex/1552A Ex.

Adjustment at the High Calibration Point

The final adjustment is made for the high end of the temperature range of the Product. Set the bath temperature to the High Adjustment Temperature given in Table 8, depending on the model. Make sure the temperatures of the bath, reference thermometer, and Product are settled and stable before proceeding.

Table 8. High Adjustment Temperature

Point	1551A Ex	1552A Ex
High	157 °C	300 °C

To make an automatic adjustment at the High calibration point, issue the following command:

`CAL:USER:HIGH <temperature>`

The parameter <temperature> is the temperature of the bath as measured by the reference thermometer. The Product accepts a temperature value with up to three decimal places of resolution. The temperature value must be in the same unit in which the Product is measuring.

The command will set the value of the CAL:USER:TEMP3 parameter to the given temperature and automatically adjust the CAL:USER:ADJ3 parameter to cause the Product to measure the given temperature accurately. The adjustment made here will not affect the measurements at the other Adjustment temperatures.

Allow the readings of the Product to settle and then verify that the readings match the temperature of the reference thermometer well within the specified accuracy of the 1551A Ex/1552A Ex.

Set the Calibration Date

The date of calibration should be stored in the Product using the following command:

```
CAL:DEV:DATE <year>, <month>, <day>
```

Parameters <year>, <month>, and <day> are numbers representing the year, month, and day of the month respectively.

After all the adjustments have been made and the calibration date has been set, protection of the calibration parameters should be restored using the following command:

```
SYST:PASS:CDIS
```

(Protection will always be restored when the Product is switched on.)

Evaluate as-left Measurement Errors

After all adjustments have been made, the Product should be subjected to a final test to ensure that it is measuring accurately over its entire range. The measurements are collected and errors are evaluated in the same way that was explained in “*Evaluating As-found Measurement Errors.*” Table 9 may be used to record the as-left data.

Table 9. As-left Measurement Errors

Point	Reference (fill in)	1551A Ex/1552A Ex (fill in)	Error (fill in)
1			
2			
3			
4			
5			

Record as-left Calibration Parameters

As the last step in the calibration procedure, the final values of the Product calibration parameters should be recorded. The commands required to read the values of the calibration parameters are given in Table 10. Each command must be terminated with a carriage return character. The table may also be used to record the values of the calibration parameters.

Table 10. As-left Calibration Parameters

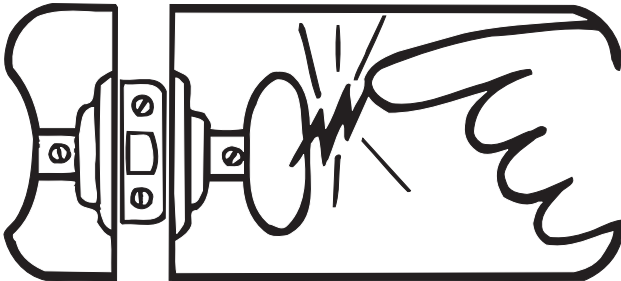
Parameter	Command	Value (fill in)
TEMP1	CAL:USER:TEMP1?	
ADJ1	CAL:USER:ADJ1?	
TEMP2	CAL:USER:TEMP2?	
ADJ2	CAL:USER:ADJ2?	
TEMP3	CAL:USER:TEMP3?	
ADJ3	CAL:USER:ADJ3?	
DATE	CAL:DEV:DATE?	



static awareness



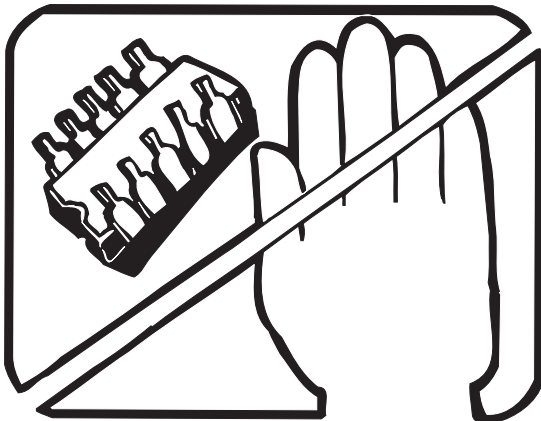
A Message From
Fluke Corporation



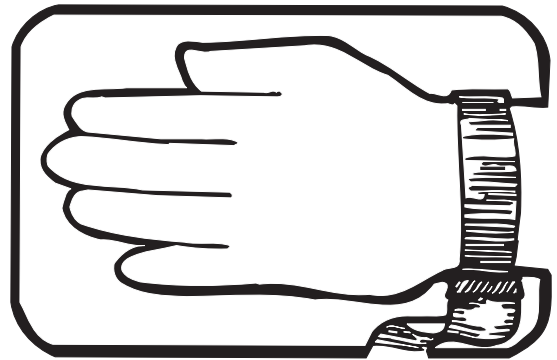
Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

1. Knowing that there is a problem.
2. Learning the guidelines for handling them.
3. Using the procedures, packaging, and bench techniques that are recommended.

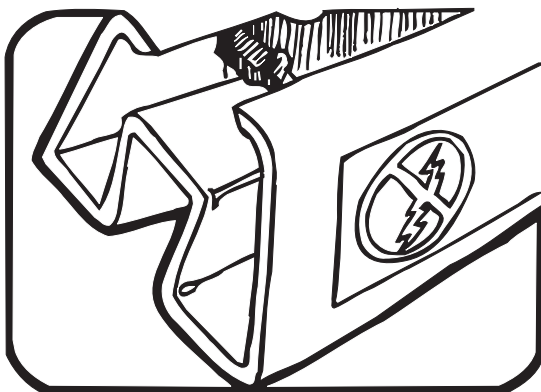
The following practices should be followed to minimize damage to S.S. (static sensitive) devices.



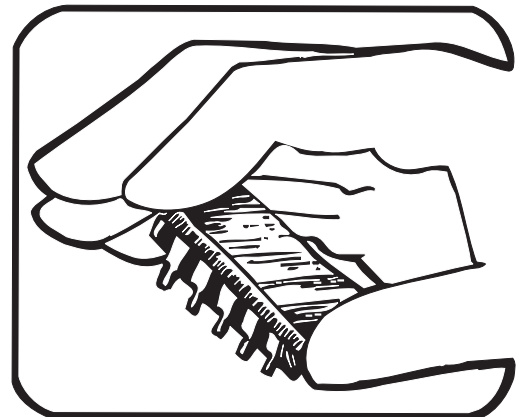
1. MINIMIZE HANDLING



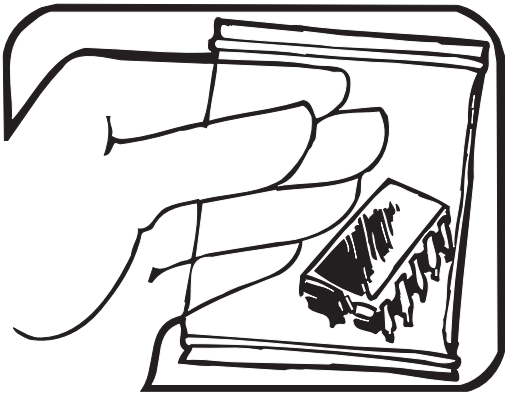
3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICES. USE A HIGH RESISTANCE GROUNDING WRIST STRAP.



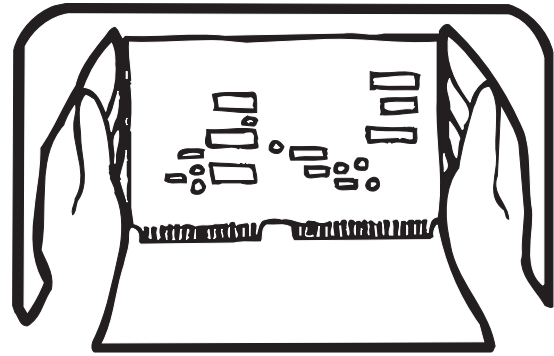
2. KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.



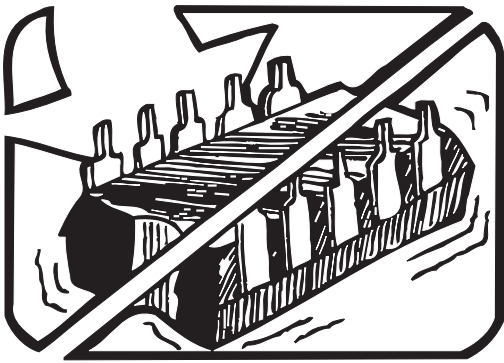
4. HANDLE S.S. DEVICES BY THE BODY.



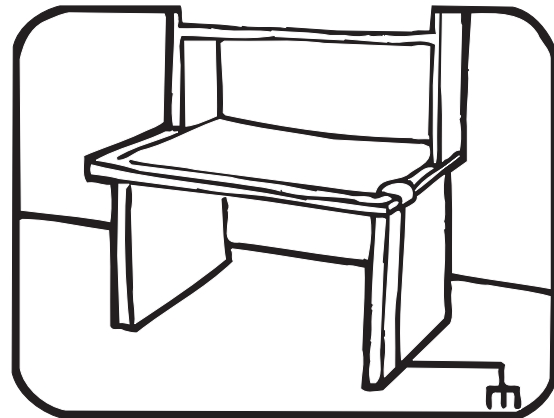
5. USE STATIC SHIELDING CONTAINERS FOR HANDLING AND TRANSPORT.



8. WHEN REMOVING PLUG-IN ASSEMBLIES HANDLE ONLY BY NON-CONDUCTIVE EDGES AND NEVER TOUCH OPEN EDGE CONNECTOR EXCEPT AT STATIC-FREE WORK STATION. PLACING SHORTING STRIPS ON EDGE CONNECTOR HELPS PROTECT INSTALLED S.S. DEVICES.



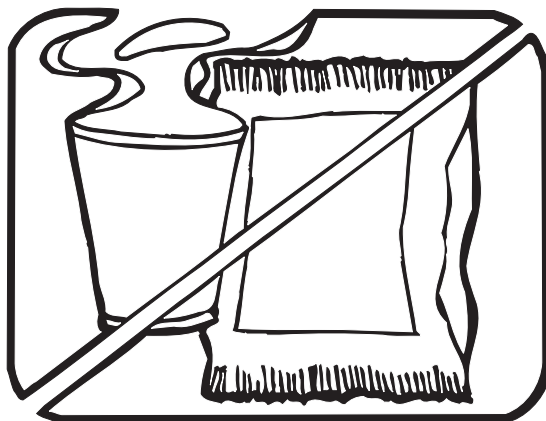
6. DO NOT SLIDE S.S. DEVICES OVER ANY SURFACE.



9. HANDLE S.S. DEVICES ONLY AT A STATIC-FREE WORK STATION.

10. ONLY ANTI-STATIC TYPE SOLDER-SUCKERS SHOULD BE USED.

11. ONLY GROUNDED-TIP SOLDERING IRONS SHOULD BE USED.



7. AVOID PLASTIC, VINYL AND STYROFOAM® IN WORK AREA.

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Maintenance

Clean the Product

⚠ Caution

To prevent possible damage to the product or to equipment under test, do not use abrasive cleaners. They will damage the case.

To clean the Product, use a cloth with a mild cleaning solution.

Battery Replacement

⚠⚠ Warning

To prevent possible explosion, fire, or personal injury:

- Change the batteries only in areas that are not Ex-hazardous.
- Replace the batteries when the low battery indicator shows to prevent incorrect measurements.

⚠ Caution

To prevent possible damage to the Product or to equipment under test:

- Remove batteries to prevent battery leakage and damage to the Product if it is not used for an extended period.
- Be sure that the battery polarity is correct to prevent battery leakage.

To change the batteries, see Figure 1:

1. Use a flat-blade screwdriver to remove the battery door screw.
2. Remove the battery door to access the three AAA batteries.
3. Replace only with approved AAA batteries listed in this document. See Table 11. Any substitution voids the Product safety rating.
4. Make sure the battery polarity is correct.
5. Replace the battery door and install the screw.

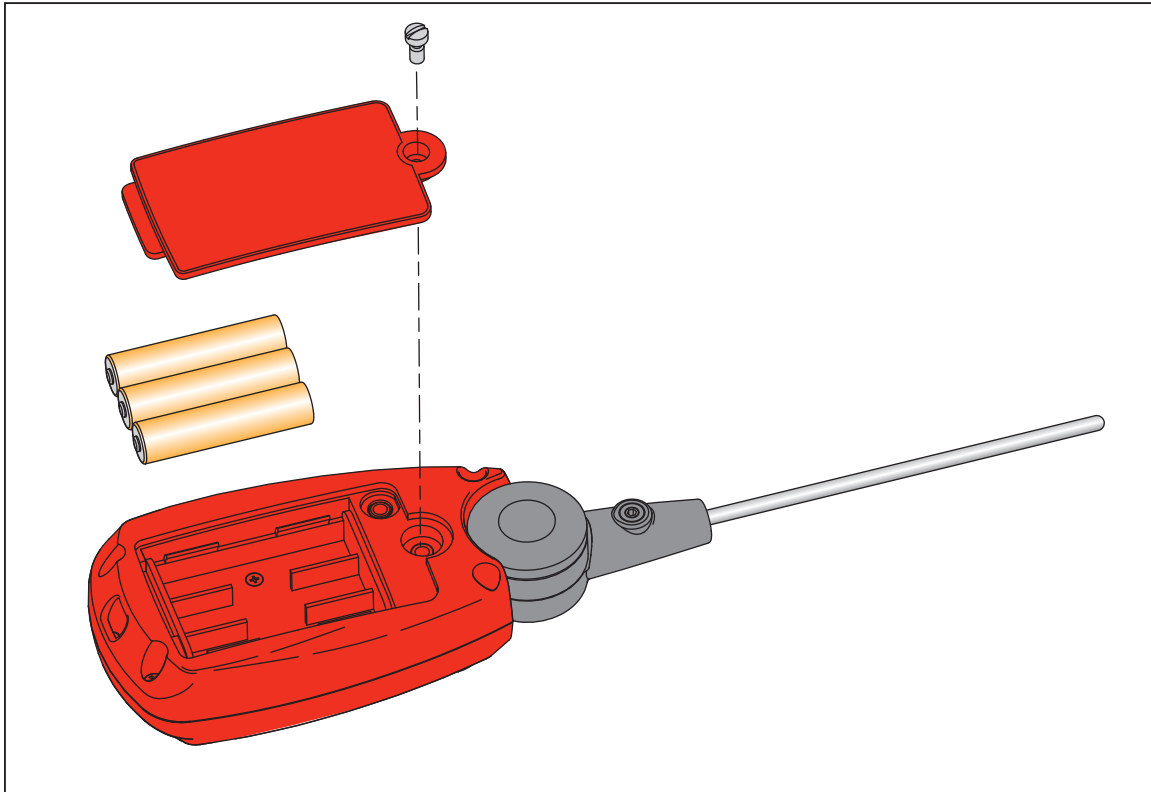


Figure 1. Battery Replacement

Table 11. Approved Batteries

Battery	Manufacturer	Type
Alkaline AAA	Duracell	LR03/MN2400
	Rayovac	LR03/824
	Energizer	LR03/E92
	Panasonic	LR03X