

377/377 FC/378/378 FC
Clamp Meter

Calibration Manual

LIMITED WARRANTY AND LIMITATION OF LIABILITY

Each Fluke product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is three years and begins on the date of shipment. Parts, product repairs, and services are warranted for 90 days. This warranty extends only to the original buyer or end-user customer of a Fluke authorized reseller, and does not apply to fuses, disposable batteries, or to any product which, in Fluke's opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation or handling. Fluke warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. Fluke does not warrant that software will be error free or operate without interruption.

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Fluke's warranty obligation is limited, at Fluke's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a Fluke authorized service center within the warranty period.

To obtain warranty service, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that service center, with a description of the difficulty, postage and insurance prepaid (FOB Destination). Fluke assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Fluke determines that failure was caused by neglect, misuse, contamination, alteration, accident, or abnormal condition of operation or handling, including overvoltage failures caused by use outside the product's specified rating, or normal wear and tear of mechanical components, Fluke will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

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Introduction

Warning

Read *Safety Information* before you use the Product.

This manual explains the Performance Tests for the *377/377 FC/378/378 FC Clamp Meter* (the Product). See the *377/377 FC/378/378 FC Users Manual* for usage information.

Contact Fluke

Fluke Corporation operates worldwide. For local contact information, go to our website: www.fluke.com.

To register your product, view, print, or download the latest manual or manual supplement, go to our website.

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Safety

General Safety Information is in the printed Safety Information document that ships with the Product and at www.fluke.com. More specific safety information is listed where applicable.

A **Warning** identifies conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

Specifications

Complete specifications are at www.fluke.com. See the *377/377 FC / 378/378 FC Product Specifications*.

Performance Test Procedures

Table 1 is a list of the standard equipment for the Performance Tests.

Table 1. Standard Equipment

Equipment	Required Characteristics	Recommended Model
Calibrator	4.5-digit resolution	Fluke 55xxA
Transconductance Amplifier	100 A	Fluke 52120A
FieldSense Test Fixture	NA	PN 2041567
Wired Coil	25-turn	52120A/3kCOIL
Wired Coil	50-turn	5500A/COIL
Test Lead	NA	PN 2070140

All procedures refer to the performance tests and the readout limits in Table 2.

AC Voltage

To verify ac voltage:

1. Connect the normal output HI and LO of the calibrator to the V Ω and COM input connections on the bottom of the device under test (DUT).
2. Set the DUT to \tilde{V} (AC Volts measurement mode).
3. Set the calibrator NORMAL output to the voltage and frequency.
4. Apply the voltage to the DUT:
 - a. Verify that the DUT reads within the display limits.
 - b. Verify the DUT readings for the remaining steps for AC voltage.

DC Voltage

To verify dc voltage:

1. Connect the normal output HI and LO of the calibrator to the V Ω and COM input connections on the bottom of the device under test (DUT).
2. Set the DUT to $mV \overline{V}$ (DC Volts measurement mode).
3. Set the calibrator to the voltage.
4. Apply the voltage to the DUT.
Verify that the DUT reads within the display limits.
Verify the DUT reading for the remaining steps for DC voltage.
5. Push to enter the mV mode.
6. Apply the voltage to the DUT:
 - a. Verify that the DUT reads within the display limits.
 - b. Verify the DUT reading for the remaining steps for DC mV.


Resistance/Capacitance

To verify resistance and capacitance:

1. Connect the normal output HI and LO of the calibrator to the V Ω and COM input connections on the bottom of the device under test (DUT).
2. Set the DUT to $\overline{\Omega}$ (Resistance measurement mode).
3. Set the calibrator to the resistance.
Verify that the DUT reads within the display limits.
Verify the DUT reading for the remaining steps for resistance.
4. Push to enter the Capacitance mode
5. Set the calibrator to the capacitance:
 - a. Verify that the DUT reads within the display limits.
 - b. Verify the DUT reading for the remaining steps for capacitance.


DC Current (Jaw)

To verify dc current measurement with the jaw:

1. Connect the normal output HI and LO of the calibrator to the HI and LO input of the 5500A/COIL.
2. Place the DUT inside the center of the 50-turn coil. Calibration accuracy to specifications is guaranteed only when proper clamp alignment is made. The DUT should be centered as much as possible on the base during verification.
3. Set the DUT to $\overline{0}$  (DC current measurement mode).
4. Set the calibrator to the current:
 - a. Verify that the DUT reads within the display limits shown.
 - b. Verify the DUT reading for the remaining steps for dc current.

AC Current (Jaw)

To verify ac current measurement with the jaw:

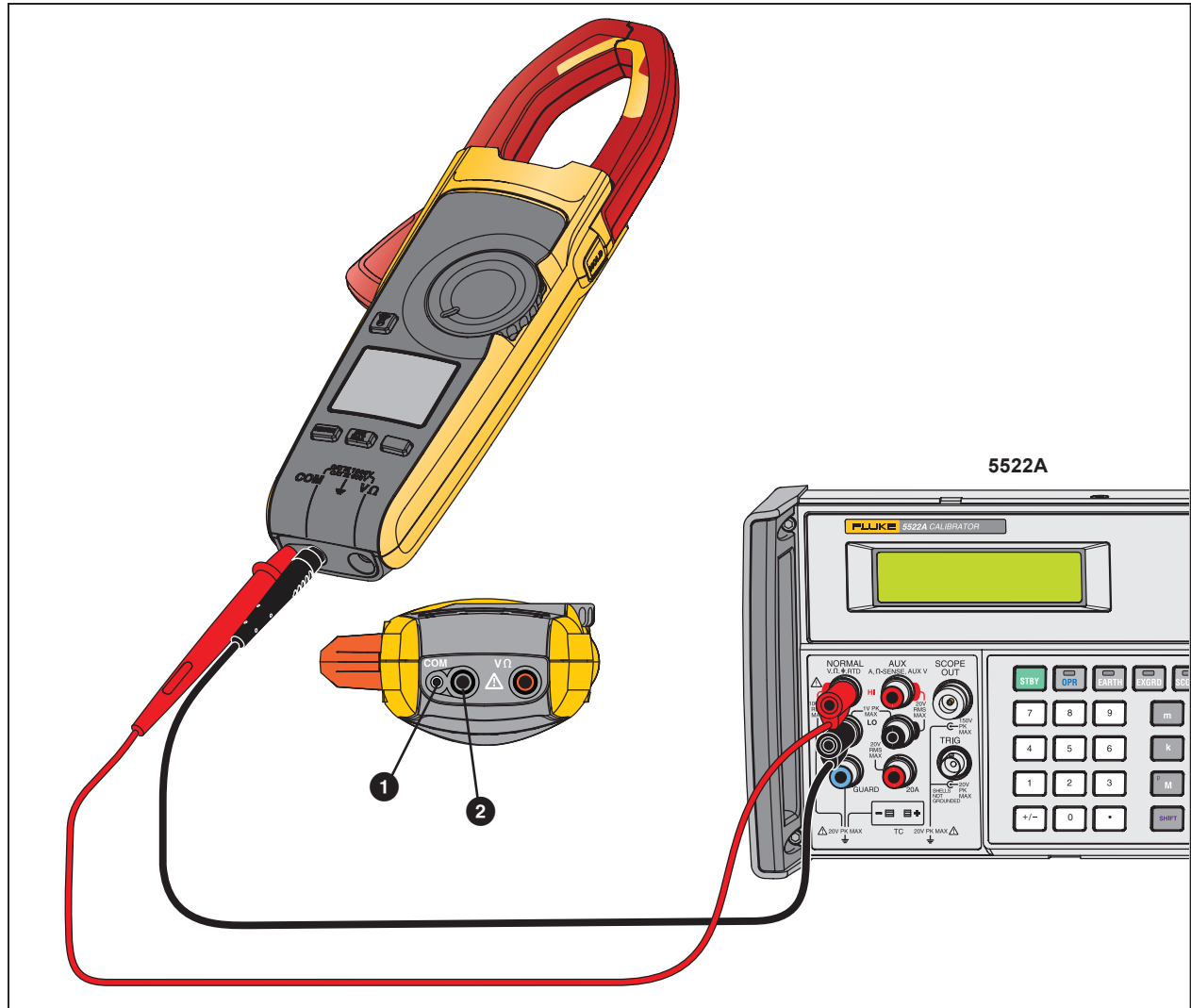
1. Connect the normal output HI and LO of the calibrator to the HI and LO input of the 5500A/COIL.
2. Place the DUT inside the center of the 50-turn coil. Calibration accuracy to specifications is guaranteed only when proper alignment is made. The DUT should be centered as much as possible on the base during verification.
3. Set the DUT to  (AC current measurement mode).
4. Set the calibrator to the current and frequency:
 - a. Verify that the DUT reads within the display limits.
 - b. Verify the DUT reading for the remaining steps for ac current.


AC Current (iFlex Current with AC Voltage Simulation)

To verify ac current measurement with the iFlex, use the AC voltage simulation from the calibrator:

1. Connect the normal output HI to the Calibrator Output HI to the iFlex 2 mm jack flexible probe input terminal ❶ and the Calibrator Output LO goes to the black COM jack ❷. See Figure 1.

Figure 1. iFlex Current Probe Connections



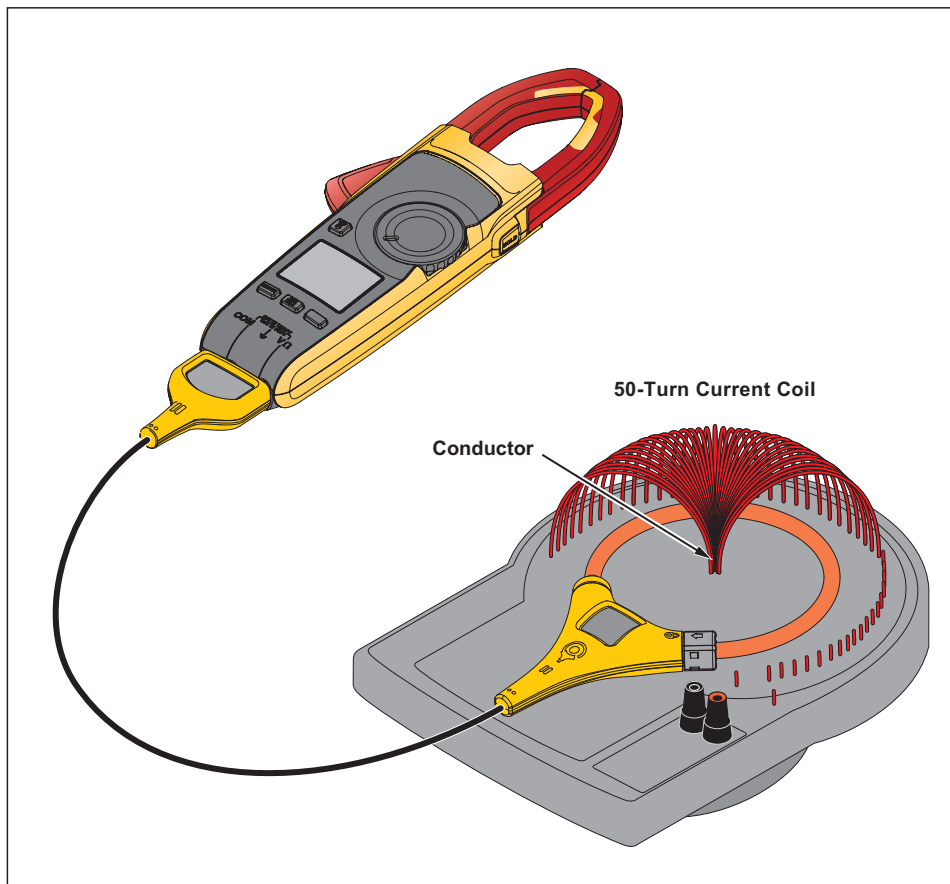
2. Set the DUT to  iFlex \tilde{A} Hz (iFlex AC current measurement mode).
3. Set the calibrator to the voltage and frequency:
 - a. Verify that the DUT reads within the display limits.
 - b. Verify the DUT reading for the remaining steps for iFlex Current Probe (with simulation).

AC Current (iFlex Current Probe with 50-Turn Coil)

To verify ac current measurement with the iFlex and 50-turn coil:

1. Connect the iFlex Current Probe to the DUT.
2. Place the probe centered with equal distance of the conductor and the cable within the 5500/COIL. See Figure 2.

Figure 2. iFlex with 50-Turn Current Coil



3. Connect the 50-Turn Coil HI and LO input to the 5522A normal output HI and LO.
4. Set the DUT to $iFlex_{\text{AC}}^{\text{A}} \text{ Hz}$ (iFlex AC current measurement mode).
5. Set the calibrator to the current and frequency:
 - a. Verify that the DUT reads within the display limits.
 - b. Verify the DUT reading for the remaining steps for iFlex current probe (with 50-turn coil).

AC Current (iFlex Current Probe with Amplifier and 25-Turn Coil)

The iFlex AC current tests with a 52120A transconductance amplifier and a 25-turn 52120A/3kCOIL is for performance tests >950 A. This procedure is for performance tests 0 A to 2400 A. Low AC voltage input from a 5522A is amplified into a current output of up to 96 A, then input into the 25-turn coil to produce up to 2400 A ac.

⚠ Caution

Read all safety Information before you use the 377/378, 52120A, and 52120A/3kCOIL. High currents are used during this test.

For performance tests 0 A to 950 A, see [AC Current \(iFlex Current Probe with 50-Turn Coil\)](#).

To test iFlex AC current >950 A:

1. Connect the 5522A to the input HI and LO and select VOLTS on the input selection.
2. Turn LCOMP to ON at the 52120A.
3. Select the Range and Output terminals provided in the footnote of each test point for iFlex Current Probe (with 52120A and 25-turn coil).
4. Connect the 52120A/3kCOIL HI and LO to the 52120A to output specified for the test point in table 2, HI and LO.
5. Connect the iFlex Current Probe to the DUT. See Figure 2.
6. Place the probe centered with equal distance of the conductor and the cable within the 52120A/3kCOIL.
7. Set the calibrator to the voltage and frequency:
 - a. Verify that the DUT reads within the display limits.
 - b. Verify the DUT reading for the remaining steps for iFlex Current Probe with Amplifier and 25-Turn Coil.

Performance Tests

Warning

To prevent possible electrical shock, fire, or personal injury, do not perform the performance test procedures unless the Product is fully assembled.

Fluke recommends a 1-year cycle for the Performance Tests. If the Product fails any test, return the Product to a Fluke Service Center or Authorized Service Partner. See [Contact Fluke](#) for more information.

Before you start the Performance Tests, make sure that all test equipment has adequate warm-up time and is allowed to stabilize in an environment of 23 °C ±5 °C. Table 2 is a list of performance tests to verify the complete operation of the Product and check the accuracy of each function against the Product specifications.

Table 2. Performance Tests


Test (Switch Position)	Calibrator Output	Readout Limit	
		Low	High
 V AC Volts	30 V @ 20 Hz	29.2 V	30.8 V
	30 V @ 55 Hz	29.2 V	30.8 V
	30 V @ 500 Hz	29.2 V	30.8 V
	570 V @ 45 Hz	563.8 V	576.2 V
	570 V @ 55 Hz	563.8 V	576.2 V
	570 V @ 500 Hz	563.8 V	576.2 V
	950 V @ 45 Hz	935.5 V	964.5 V
	950 V @ 55 Hz	935.5 V	964.5 V
	950 V @ 500 Hz	935.5 V	964.5 V

Table 2. Performance Tests (cont.)

Test (Switch Position)	Calibrator Output	Readout Limit	
		Low	High
$\overline{\text{mV}} \overline{\text{V}}$ DC Volts	-570 V	-576.2 V	-463.8 V
	-50 V	-51 V	-49 V
	0 V	-0.5 V	0.5 V
	50 V	49 V	51 V
	570 V	463.8 V	576.2 V
	-950 V	-964.5 V	-935.5 V
	950 V	935.5 V	964.5 V
	0.000 mV	-0.5 mV	0.5 mV
	500 mV	494.5 mV	505.5 mV
	-500 mV	-505.5 mV	-494.5 mV
$\overline{\Omega}$ Resistance	0 Ω	-0.5 Ω	0.5 Ω
	570 Ω	563.8 Ω	576.2 Ω
	5700 Ω	5638 Ω	5672 Ω
	57 k Ω	56.38 k Ω	57.62 k Ω
$\overline{\Omega}$ Capacitance	10 μF	9.5 μF	10.5 μF
	95 μF	93.65 μF	96.35 μF
	950 μF	936.5 μF	963.5 μF
$\overline{\text{A}}$ DC Amps (with 50-turn coil)	0.2 A	9.3 A	10.7 A
	10 A	440.5 A	459.5 A
	18 A	955 A	995 A
	-18 A	-995 A	-955 A
	-10 A	-459.5 A	-440.5 A
	-0.2 A	-10.7 A	-9.3 A
$\sim \text{A}$ AC Amps (with 50-turn coil)	0.2 A @ 45 Hz	9.3 A	10.7 A
	9 A @ 66 Hz	440.5 A	459.5 A
	19.5 A @ 60 Hz	955 A	995 A
$\sim \text{A}$ AC Current Frequency	3 A @ 45 Hz	44.275 Hz	45.725 Hz
	9 A @ 66 Hz	65.17 Hz	66.83 Hz
	19.5 A @ 440 Hz	437.3 Hz	442.7 Hz

Table 2. Performance Tests (cont.)




Test (Switch Position)	Calibrator Output	Readout Limit	
		Low	High
 iFlex Current Probe (with ac voltage simulation)	1.05 mV @ 35 Hz	48 A	52 A
	3 mV @ 100 Hz	48 A	52 A
	15 mV @ 500 Hz	48 A	52 A
	11.4 mV @ 20 Hz	921 A	979 A
	58.5 mV @ 100 Hz	921 A	979 A
	292.5 mV @ 500 Hz	921 A	979 A
	28.8 mV @ 20 Hz	2423 A	2477 A
	147 mV @ 100 Hz	2423 A	2477 A
	720 mV @ 500 Hz	2423 A	2477 A
 iFlex Current Probe (with 50-turn coil) ^[1]	0.2 A @ 10 Hz	9.2 A	10.8 A
	0.2 A @ 55 Hz	9.2 A	10.8 A
	0.2 A @ 440 Hz	9.2 A	10.8 A
	6 A @ 10 Hz	290.5 A	309.5 A
	6 A @ 55 Hz	290.5 A	309.5 A
	6 A @ 440 Hz	290.5 A	309.5 A
	10 A @ 10 Hz	484.5 A	515.5 A
	10 A @ 55 Hz	484.5 A	515.5 A
	10 A @ 440 Hz	484.5 A	515.5 A
	19 A @ 10 Hz	921 A	979 A
	19 A @ 55 Hz	921 A	979 A
	19 A @ 440 Hz	921 A	979 A

Table 2. Performance Tests (cont.)

Test (Switch Position)	Calibrator Output	Readout Limit	
		Low	High
 iFlex Current Probe (with 52120A and 25-turn coil) ^{[1][4]}	0.6 V @ 10 Hz ^[2]	145 A	155 A
	0.6 V @ 55 Hz ^[2]	145 A	155 A
	0.6 V @ 500 Hz ^[2]	145 A	155 A
	0.38 V @ 10 Hz ^[3]	921 A	979 A
	0.38 V @ 55 Hz ^[3]	921 A	979 A
	0.38 V @ 500 Hz ^[3]	921 A	979 A
	0.96 V @ 10 Hz ^[3]	2323 A	2477 A
	0.96 V @ 55 Hz ^[3]	2323 A	2477 A
	0.96 V @ 250 Hz ^[3]	2323 A	2477 A
iFlex AC Current Frequency	0.5 V @ 5 Hz ^[3]	4.475 Hz	5.525 Hz
	0.5 V @ 55 Hz ^[3]	54.225 Hz	55.775 Hz
	0.5 V @ 500 Hz ^[3]	497 Hz	503 Hz
[1] For performance tests 0 A to 2400 A, use iFlex Current Probe (with 52120A and 25-turn coil). For performance tests 0 A to 950 A, use the procedure for AC Current (iFlex Current Probe with 50-Turn Coil) . [2] 52120A, 20A terminal output selected. Low current output terminals. [3] 52120A, 120A terminal output selected. High current output terminals. [4] LComp ON.			

Maintenance

If the Product is used appropriately it does not require special maintenance or repair. In case of repair, go to www.fluke.com for contact information of Fluke Service Centers worldwide.

Warning

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




- Remove the input signals before you clean the Product.
- Repair the Product before use if the battery leaks. Battery leakage may create a shock hazard or damage the Product.
- Use only specified replacement parts.
- Have an approved technician repair the Product.
- Remove the batteries if the Product is not used for an extended period of time, or if stored in temperatures above 50 °C. If the batteries are not removed, battery leakage may result.

Maintenance Mode

In Maintenance Mode you can check:

- LCD segments
- Firmware version
- Battery status annunciators
- Fluke Connect LED
- Backlight


To enter Maintenance Mode:




1. Turn off the Clamp.
2. Push and hold  as you turn the control knob to \tilde{v} .
3. The Clamp goes into the option mode.
4. Push  until זלורה זלורה shows on the display.
5. Push .

All LCD segments turn on and the backlight turns off.

6. Release .

All LCD segments continue to show on the display.

7. Press  again to show the firmware version.

8. Continue to press  to cycle through:
 - Empty battery annunciator
 - 25 % battery annunciator
 - 50 % battery annunciator
 - 75 % battery annunciator
 - Blue LED + live battery annunciator (for FC model only, step is skipped for non-FC model)
 - White backlight + live battery annunciator
 - Green backlight + live battery annunciator
9. Press  again to show $\epsilon R L$ on the display.
10. Press  again to loop back to show all LCD segments (step 6).

To exit Maintenance Mode at any time, turn off the Meter.

How to Clean the Case

Wipe the case with a damp cloth and mild detergent.

Caution

Do not use abrasives, isopropyl alcohol, or solvents to clean the case or lens/window.

Battery Replacement

Warning

To prevent personal injury and for safe operation of the Product:

- **The battery door must be closed and locked before you operate the Product.**
- **Remove all probes, test leads, and accessories before the battery door is opened.**
- **Replace the batteries when the low battery indicator shows to prevent incorrect measurements.**
- **When batteries are changed, ensure that the calibration seal in the battery compartment is not damaged. If damaged, the Product may not be safe to use. Return the Product to Fluke for replacement of the seal.**

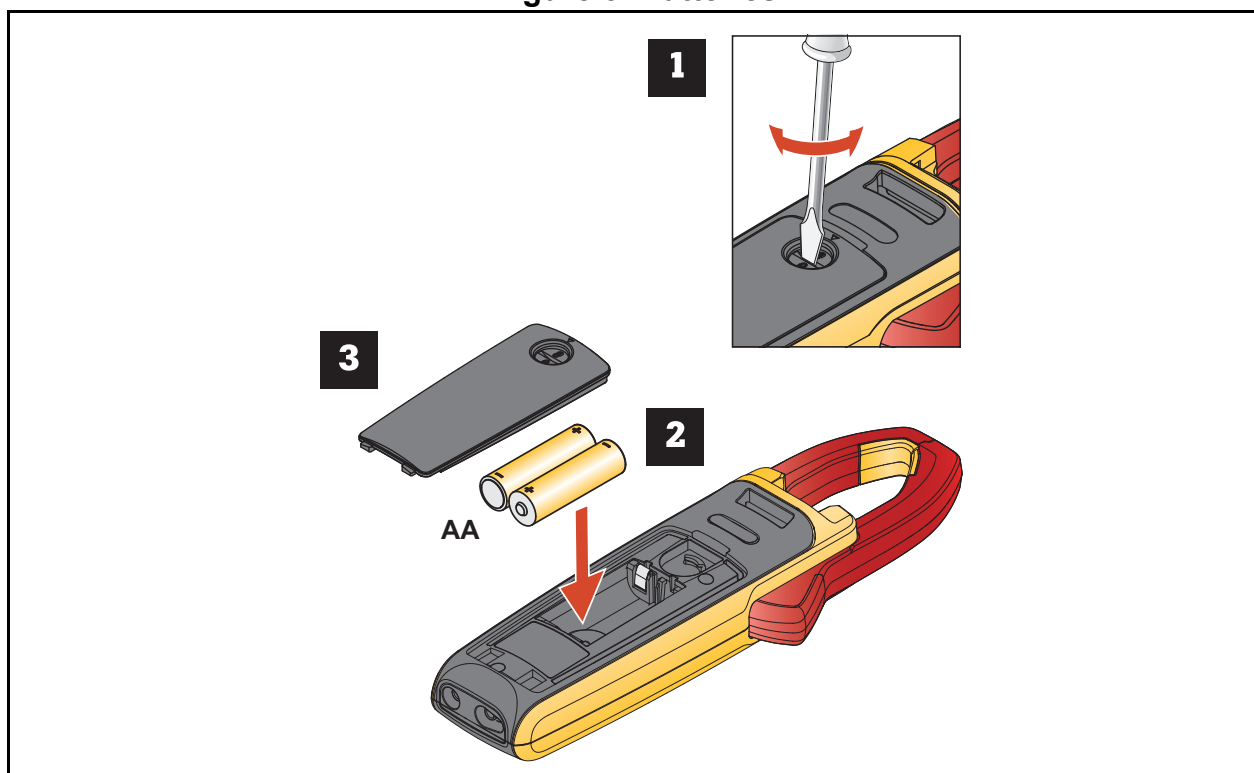
⚠ Caution

To prevent damage to the battery:

- Repair the Product before use if the battery leaks.
- Do not expose battery to heat sources or high-temperature environments such as an unattended vehicle in the sun.
- Always operate in the specified temperature range.
- Do not incinerate the Product and/or battery.

The Product ships with the batteries installed. To replace batteries, see Figure 3.

Figure 3. Batteries



User Replaceable Parts

An authorized Fluke Calibration service center should service the Product at two-year intervals to maintain optimum performance.

Contact your equipment distributor or authorized Fluke Calibration Service Center for any equipment performance failure or to schedule regular maintenance service. See [Contact Fluke](#) for more information.

Table 3 is a list of replacement parts.

Table 3. Replacement Parts

Item/Description	Fluke Part or Model Number
Battery, AA 1.5 V (x2)	376756
Battery Door	5105034
Test Lead Set	TL75
Test Lead Set	TL175
Test Probe	TP175
Alligator Clip	AC285
Flexible Current Probe i2500-10	3676410
Flexible Current Probe i2500-18	3798105
Magnet Strap	669952
Strap (9-inch)	669960
Carry Case	5211830

