

CNX t3000

Wireless K-Type Thermometer

Calibration Manual

riešenia na presné meranie™

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Introduction

Warning

Read "Safety Information" before you use the Product.

This manual has the verification and calibration adjustment procedures for the CNX t3000 Wireless K-Type Thermometer (the Product). Please see the *CNX t3000 Quick Reference Guide* for usage information.

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: +81-3-6714-3114
- Singapore: +65-6799-5566
- 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 view, print, or download the latest manual supplement, visit <http://us.fluke.com/usen/support/manuals>.

Safety Information

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.

Warning










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

- Carefully read all instructions.
- Use the Product only as specified, or the protection supplied by the Product can be compromised.
- Limit operation to the specified measurement category, voltage, or amperage ratings.
- Do not touch voltages > 30 V ac rms, 42 V ac peak, or 60 V dc.
- Do not use the Product around explosive gas, vapor, or in damp or wet environments.
- Do not use, and disable the Product if it is damaged.
- Do not use the Product if it operates incorrectly.
- The battery door must be closed and locked before you operate the Product.
- Replace the batteries when the low battery indicator shows to prevent incorrect measurements.
- Have an approved technician repair the Product.
- Use only specified replacement parts.
- Do not connect directly to mains.
- For safe operation and maintenance of the Product:
 - Remove batteries to prevent battery leakage and damage to the Product if it is not used for an extended period.
 - Repair the Product before use if the battery leaks.
 - Be sure that the battery polarity is correct to prevent battery leakage.
 - Batteries contain hazardous chemicals that can cause burns or explode. If exposure to chemicals occurs, clean with water and get medical aid.

Symbols

The symbols in Table 1 are used on the Product or in this manual.

Table 1. Symbols

Symbol	Meaning
	Risk of Danger. Important information. See Manual.
	Hazardous voltage
	Double insulation
	Battery
	Earth ground
	Conforms to European Union directives.
	Conforms to relevant North American Safety Standards.
	Conforms to relevant Australian EMC requirements.
	This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 "Monitoring and Control Instrumentation" product. Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.

Specifications

Range	K-type: -200 °C to 1372 °C (-328 °F to 2501 °F)
Resolution	0.1 °C/ 0.1 °F
Probe	80PK-1 K-type bead probe
Accuracy	±(0.5 % of reading + 0.5 °C) counts, ±(0.5 % of reading + 0.9 °F) counts not including thermocouple probe inaccuracies
Input Terminals	K-type mini
LCD w/Backlight.....	3 ½ digits, 6000 counts, 1.6/sec update rate
Log Rate/Interval.....	adjustable by PC from 1 second to 1 hour
Memory	Record a maximum 65,000 readings
Battery Type.....	2 AA, NEDA 15 A, IEC LR6
Battery Life.....	400 hours
RF Communications	2.4 GHz ISM Band
RF Communication Range.....	20 m (65.61 ft)
Operating Temperature.....	-10 °C to +50 °C
Storage Temperature.....	-40 °C to +60 °C with batteries removed
Temperature Scale	ITS-90
Operating Humidity	90 % from 0 °C to 35 °C, 75 % to 40 °C, 45 % to 50 °C (90 % from 32 °F to 95 °F, 75 % to 104 °F, 45 % to 122 °F)
Operating Altitude.....	2,000 m (6561.68 ft)
Storage Altitude.....	12,000 m (39370.079 ft)
EMC	
Applies to use in Korea only	Class A Equipment (Industrial Broadcasting & Communication Equipment) [1] [1] This product meets requirements for industrial (Class A) electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and is not to be used in homes.
Ingress Protection (IP) rating	IP42
Radio Frequency Certification.....	FCC Part 15 Subpart C Sections 15.207, 15.209, 15.249, FCCID : T68-FWCS IC:6627A-FWCS
EM Environment	IEC 61236-1: Portable
Temperature Adder.....	add 0.01 % of reading +0.03 °C / °C (<18 °C or >28 °C)
Size.....	(160 tall x 66 wide x 38) mm (6.3 tall x 2.6 wide x 1.5 deep) in
Weight.....	0.255 kg (9 oz)

Required Equipment

The equipment in Table 2 is necessary for performance tests and calibration adjustment.

Table 2. Required Equipment

Equipment	Required Characteristics		Recommended Model	Notes
Calibrator	Output Voltage: 30 mV dc Accuracy: $\pm 0.125\%$ Resolution: 0.1 μA		Fluke 5500A Calibrator (or equivalent)	Calibration only
	Temperature	Accuracy		Verification only
	-25 to 100 °C -200 to 1300 °C	$\pm 0.16\text{ }^{\circ}\text{C}$ $\pm 0.40\text{ }^{\circ}\text{C}$		
Copper Wire				Calibration only
Thermocouple Connector	Copper		Fluke PN 601747	Calibration only
Thermocouple Connector	For K-type thermocouple		Fluke 80CK-M PN 779942	Verification only
K-type Thermocouple Wire	Standard		Omega	Verification only
Use copper wire, not thermocouple wire, to source voltage during calibration. Use copper plugs with copper wire. Use yellow K-type plugs and wires to source temperature.				

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.

The performance tests verify the full operation of the Product and measure the accuracy of each function against Product specifications. If the Product fails a part of the test, calibration adjustment and/or repair is necessary. See “Calibration Adjustment”.

Test the Display

To verify that all segments of the display function:

1. With the Product off, push and hold **LOG**.
2. Push **⏏** while you keep **LOG** pushed until all of the display segments are shown. See Figure 1.

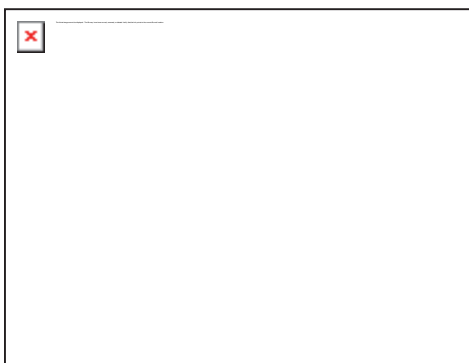


Figure 1. All Segments of the Display

hby002.eps

If segments of the display are missing, repair is necessary. See “Contact Fluke”.

Backlight

To verify that the backlight functions:

1. With the Product on, push **☉**.
2. The backlight will come on. If it does not, repair is necessary. See “Contact Fluke”.

Keypad Test

To verify that the keypad functions, turn on the Product and push each button separately. Each button push will turn on a display annunciator. If the buttons do nothing, repair is necessary. See “Contact Fluke”.

Note

*For the CNX t3000 SI, available only in Japan, the **C** button does not function.*

Temperature Test

Before you do the temperature test:

1. Make sure that you have the necessary equipment. See Table 2.
2. Make sure the Product battery is good and replace it if necessary. See “Battery Replacement”.
3. Warm up the Calibrator as necessary. Refer to its specifications.
4. Let the temperature of the unit under test (UUT) become stable to room temperature (60 minutes minimum).

To do the temperature test:

1. Connect the Product to Calibrator with the K-type thermocouple wire and the thermocouple connector. See Figure 2.
2. Apply the input level for each step shown in Table 3.
3. Compare the indication on the Product display with the UUT reading limits in Table 3.
4. If the display indication falls outside of the range shown in Table 3, calibration adjustment or repair of the Product is necessary. See “Calibration Adjustment”.

Table 3. Performance Tests

Test	Calibrator Output	Resolution	Specification	Low	High
Temperature (K-Type output)	-190 °C	0.1 °C	$\pm[0.5 \% + 0.5\text{ °C}]$	-188.6 °C	191.5 °C
	0 °C			-0.5 °C	0.5 °C
	100 °C			99.0 °C	101.0 °C
	200 °C			198.5 °C	201.5 °C
	1300 °C			1293 °C	1307 °C

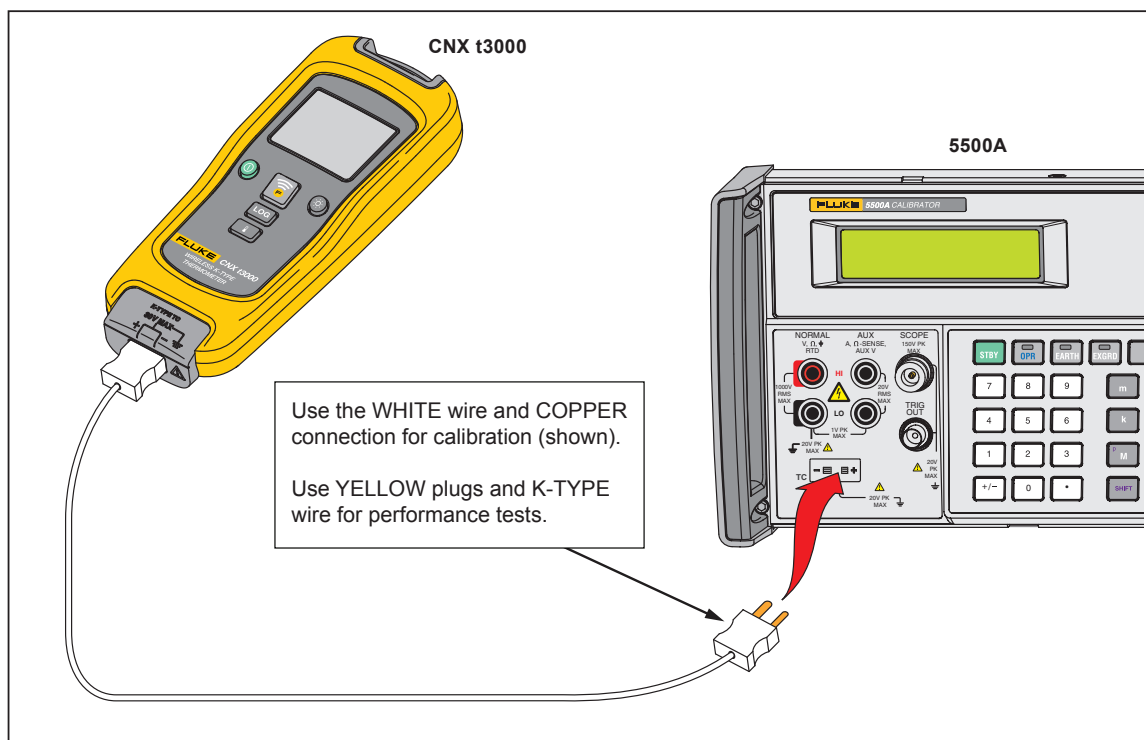


Figure 2. Performance Test and Calibration Connections

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Before Calibration Adjustment

Before the Product calibration can be adjusted, you must go through the maintenance mode menu and enter your password.

Maintenance Mode

The Product maintenance mode can be used to set different parameters on the Product that include auto power off, backlight adjustment, and calibration. To use the maintenance mode:

1. With the Product off, push and hold **LOG**.
2. Push **1**. Keep **LOG** pushed until all the display segments are shown.
3. Release **LOG** and **1**.

The Product is now in maintenance mode.

Password Entry

To go to the calibration mode, push **LOG** five times until **CAL** is shown. You will need to enter a password to access calibration mode.

To enter the password:

1. Push **0** and the **CAL** version is shown. For example **n002**.
2. Push **0** to show “????”.
3. Push **LOG** to change the first digit of your password (default: 1234).
4. Push **0** to confirm your choice. The subsequent “?” changes to “_”.
5. Do steps 3 and 4 again to enter the subsequent digits of the four-number password.
6. When all of the correct digits are entered, push **0** to confirm the input.

If the correct password is entered, “**C-01**” is shown. If the incorrect password is entered, “????” is shown and the password must be correctly entered.

Change the Password

Note

If you change the password and then lose it, see the “Restore the Default Password” section.

To change the password:

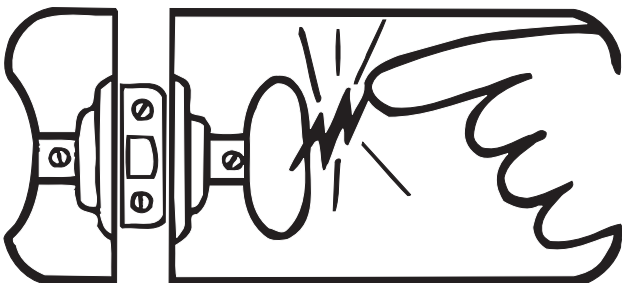
1. Do steps 1 through 5 in the “Password Entry” section.
2. Before you push **0** to confirm your final input (step 6), push **0** to show “----” on the display.
3. Push **LOG** to change the first “-” to the first digit of your new password.
4. Push **0** to confirm your choice.
5. Repeat steps 3 and 4 to enter the subsequent digits of the new four-number password.
6. When the correct digits are entered, push **0** to confirm the input and change the password. If the Product has been calibrated, it will go to normal measurement mode.



static awareness



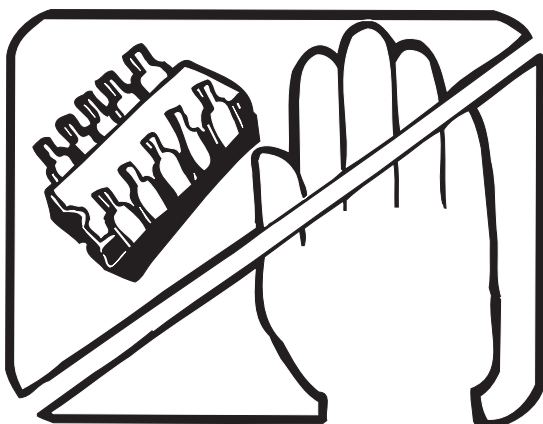
A Message From
Fluke Corporation



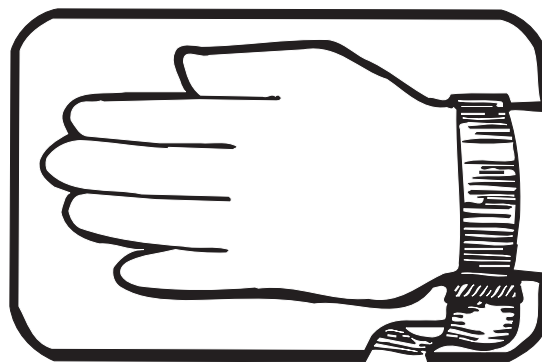
Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

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.

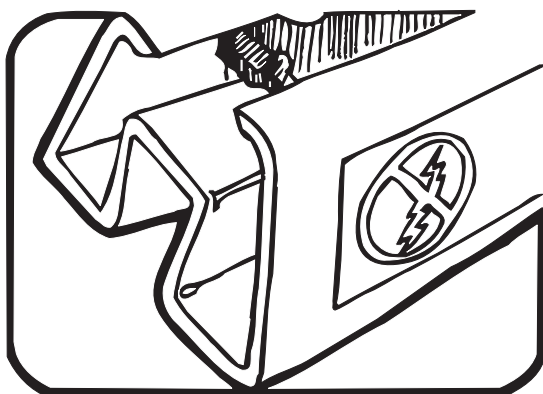
The following practices should be followed to minimize damage to S.S. (static sensitive) devices.



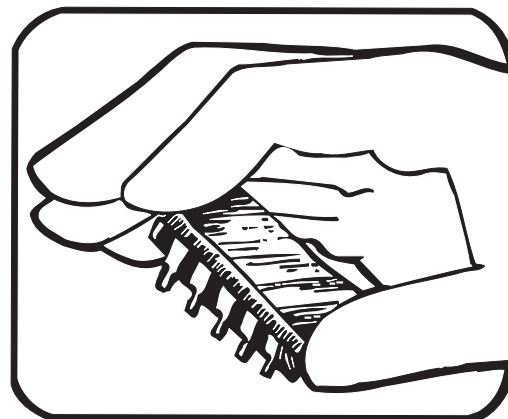
1. MINIMIZE HANDLING



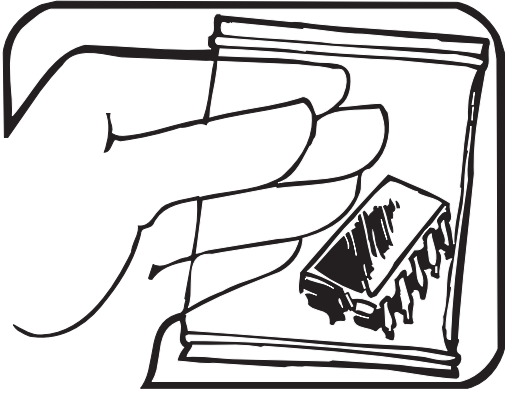
3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICES. USE A HIGH RESISTANCE GROUNDING WRIST STRAP.



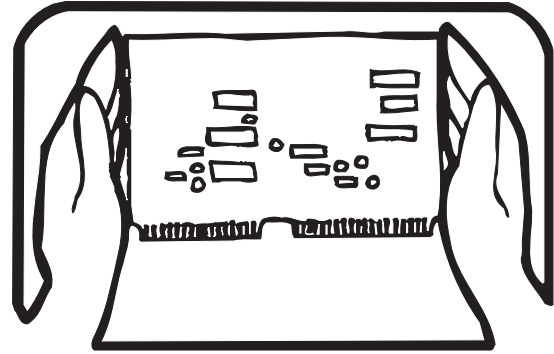
2. KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.



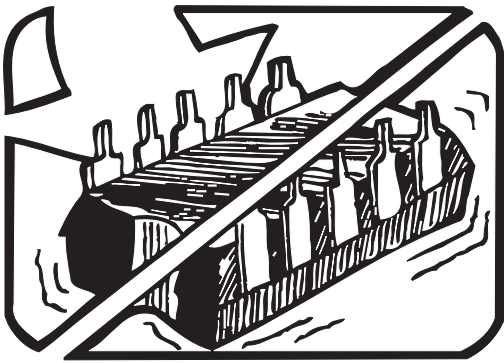
4. HANDLE S.S. DEVICES BY THE BODY.



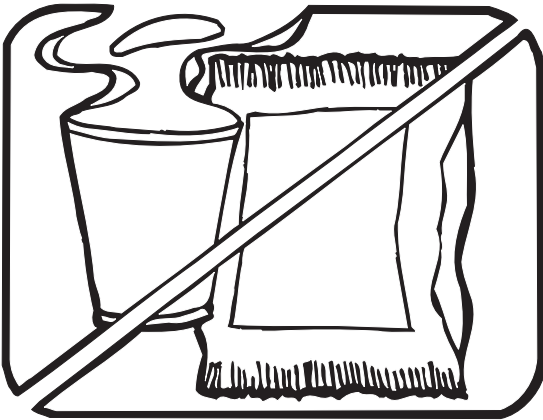
5. USE STATIC SHIELDING CONTAINERS FOR HANDLING AND TRANSPORT.



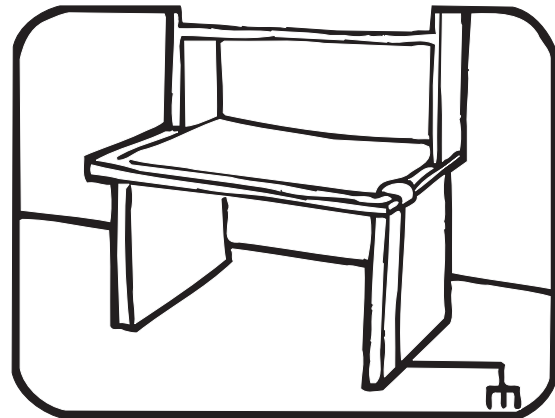
8. WHEN REMOVING PLUG-IN ASSEMBLIES HANDLE ONLY BY NON-CONDUCTIVE EDGES AND NEVER TOUCH OPEN EDGE CONNECTOR EXCEPT AT STATIC-FREE WORK STATION. PLACING SHORTING STRIPS ON EDGE CONNECTOR HELPS PROTECT INSTALLED S.S. DEVICES.



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



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



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.

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Restore the Default Password

If the calibration password is lost, the default password (1234) can be manually restored with the subsequent steps:

⚠⚠ Warning

To prevent electric shock or personal injury, remove all input signals before you open the Product.

1. Remove the Product battery door. See “Battery Replacement”.
2. With a Phillips screwdriver, remove the bottom case screws. Two of the screws are inside of the battery door.
3. Keep the pca in the top case.
4. Apply 3.0 V across the battery contacts on the pca. Note the polarity that is shown in Figure 3.
5. Push **ⓘ** on the front of the Product.
6. Short across the CAL keypad on the pca. See Figure 3. The default password is now restored.
7. Remove the 3.0 V supply and replace the bottom case, batteries, and battery door.

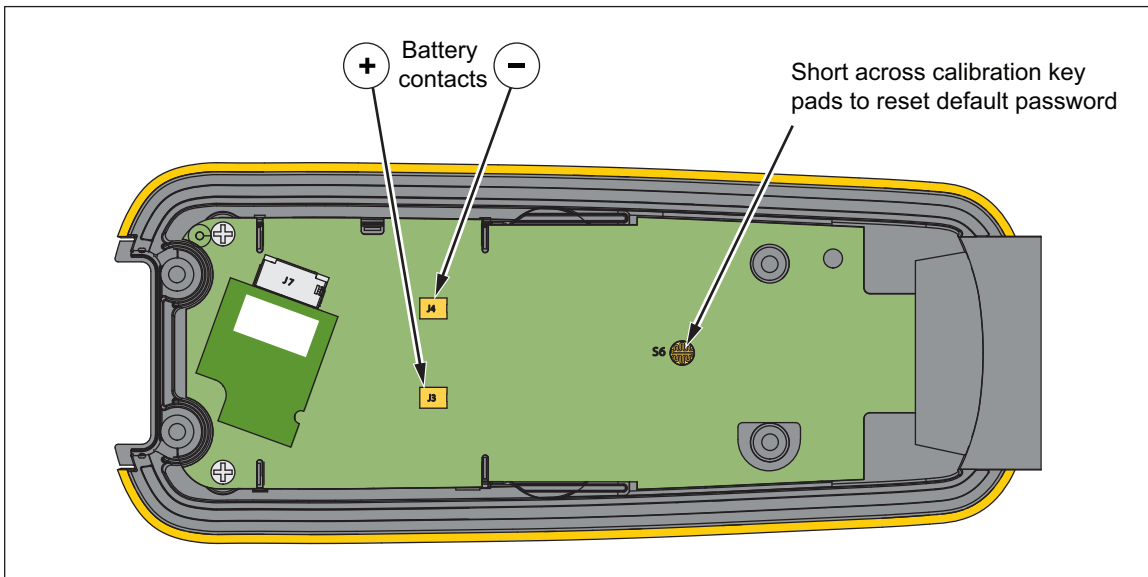




Figure 3. Calibration Password Reset

hcb08.eps

Calibration Adjustment


The Product features closed-case calibration adjustment and uses known reference sources. The Product measures the applied reference source, calculates correction factors, and stores the correction factors in nonvolatile memory.

Should the Product fail any of the performance tests, do the calibration adjustment procedure.

When “C-01” is shown on the display, apply the correct input signal shown in Table 4 to the Product. Then push  to confirm the calibration step. If the input signal does not satisfy the calibration requirement, “Err” is shown. If the signal is not stable, it can be necessary to push  several times to confirm the calibration.

After confirmation, the Product goes to the subsequent calibration step.

Note

After you push , wait until the calibration step number advances before you change the Calibrator source. Some adjustment steps can take several seconds to execute before the Product goes to the subsequent step.

Set the calibrator to Standby after you complete adjustment of each function.

Input each signal to the Product in the sequence shown in Table 4. When the last calibration point is recorded, “End” shows on the display.

Note

*While the calibration adjustment points are shown in Table 4, the Product also can show the necessary inputs. For each step, push **LOG** to see the necessary voltage input.*

Note

*To source 30 mV dc from the 5500A Calibrator thermocouple output, it is necessary to select the **10 μ V/°C Type** from the softkey menu of the 5500A. Then source 3000 °C. The connections are the same as in Figure 2 but it is necessary to use the thermocouple and wire specified for calibration that is shown in Table 2. Do not use the thermocouple and wire specified for the performance test.*

Table 4. Calibration Adjustment

Calibration Step	Calibrator Output Signal
C-01	30 mV dc

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, replace the batteries when the low battery indicator () shows to prevent incorrect measurements.

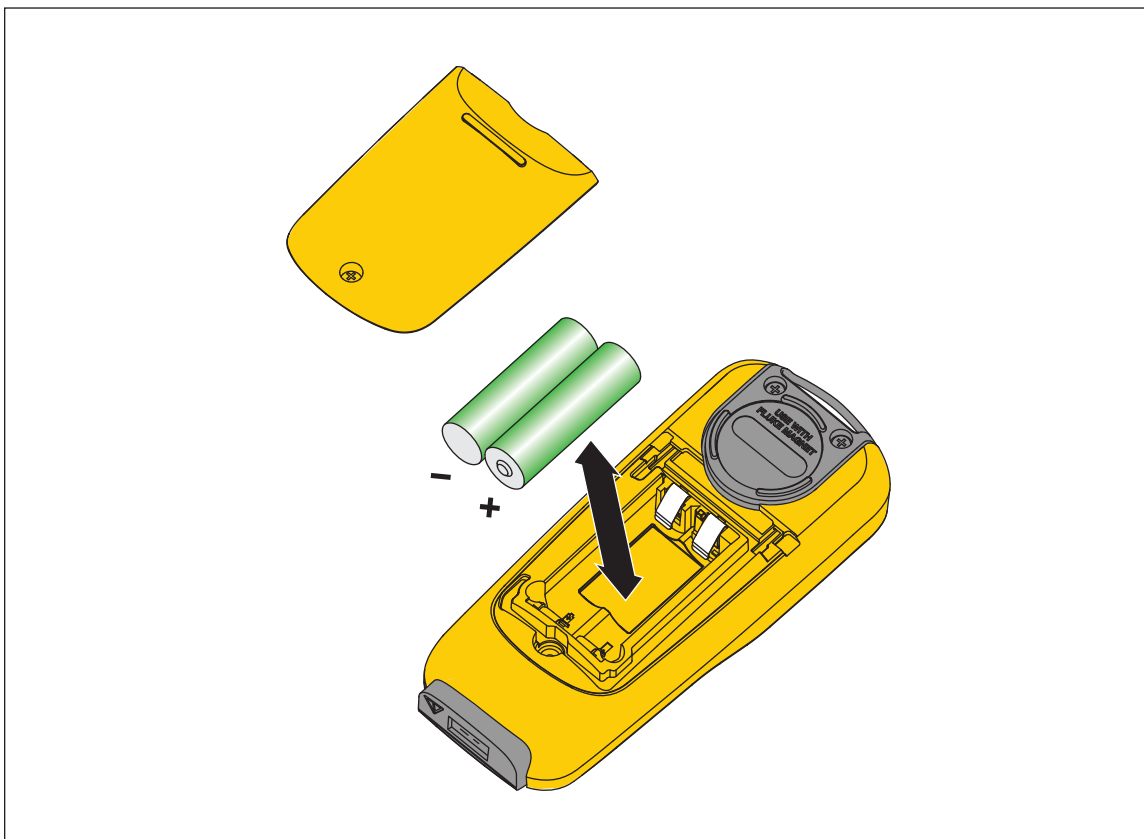
Caution

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 4:

1. Make sure the Product is off.
2. Turn over the Product to access the battery compartment door screw.
3. Use a Phillips screwdriver to loosen the battery compartment door screw and lift off the battery compartment door.
4. Replace the two AA batteries. Make sure to use the correct polarity when you put the batteries into the battery compartment door.
5. Reattach the battery compartment door.
6. Tighten the battery compartment door screw.



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Figure 4. Battery Replacement

User-Replaceable Parts

User-replaceable parts are shown in Table 5.

Table 5. User-Replaceable Parts

Fluke Part Number	Description	Qty
4130305	FLK-3000-2003, DOOR, BATTERY	1
1881997	TPAK Meter Hanging Kit	1
773135	THERMO COUPLE ASSY, T/C ASSY, K-TYPE, BEADED, MOLDED-PLUG	1
376756	Battery, AA 1.5 V, NEDA 15 A, IEC LR6	2
4252118	INFORMATION PACK, FLK-CNX T3000	1