FLUKE®

712B/714B

RTD/Thermocouple Calibrator

Calibration Manual

March 2015

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Table of Contents

List of Tables

List of Figures

Introduction

The Fluke 712B/714B RTD/Thermocouple Calibrator (the Product) is a handheld, battery-operated instrument that measures and sources a variety of RTDs/thermocouples. It also has an isolated channel to measure 4-20 mA.

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 download manuals, or 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.**
- **Read all safety information before you use the Product.**
- **Use the Product only as specified, or the protection supplied by the Product can be compromised.**
- **Do not use the Product around explosive gas, vapor, or in damp or wet environments.**
- **Never apply more than 30 V between any two terminals, or between any terminal and earth ground.**
- **Do not use the Product if it is damaged.**
- **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.**
- **Remove the input signals before you clean the Product.**
- **Have an approved technician repair the Product.**
- **Replace the batteries when the low battery indicator shows to prevent incorrect measurements.**

For safe operation and maintenance of the Product:

- **Repair the Product before use if the batteries leak.**
- **Remove the batteries if the Product is not used for an extended period of time, or if stored in temperatures that exceed the specification of the battery manufacturer. If the batteries are not removed, battery leakage can damage the Product.**

Symbols

Symbols used on the Product or in this manual are shown in Table 1.

Table 1. Symbols

Symbol	Description
⏚	Earth Ground
	Battery
	Conforms to relevant Australian Standards.
	Risk of danger. Important information. See Manual.
	Inspected and licensed by TÜV Product Services.
CE	Conforms to European Union directives.
CAT II	MEASUREMENT CATEGORY II is applicable to test and measuring circuits connected directly to utilization points (socket outlets and similar points) of the low voltage MAINS installation.
CAT III	MEASUREMENT CATEGORY III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation.
CAT IV	MEASUREMENT CATEGORY IV is applicable to test and measuring circuits connected at the source of the building's low voltage MAINS installation.
	Conforms to relevant North American Safety Standards.
	Conforms to relevant South Korean EMC Standards.
	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.

712B Specifications

Specifications are based on a one year calibration cycle and apply from +18 °C to +28 °C unless stated otherwise. All specifications assume a 5 minute warmup period.

DC mA Measurement

Range	Resolution	Accuracy (% of Reading + Floor)	
		1 Year	2 Year
0-24 mA	0.001 mA	0.01 % + 2 µA	0.02 % + 4 µA

- Notes:
- Temperature coefficient: ±(0.002 % of reading + 0.002 % of range) /°C (<18 °C or >28 °C)

Ohms Measurement

Range	Resolution	Accuracy (% of Reading + Floor)	
		1 Year	2 Year
0.00 Ω to 400.00 Ω	0.01 Ω	0.015 % + 0.05 Ω	0.03 %+ 0.08 Ω
400.0 Ω to 4000.0 Ω	0.1 Ω	0.015 % + 0.5 Ω	0.03 %+ 0.8 Ω

- Notes:
- Reading accuracy is based on 4-wire input. For 3-wire ohm measurements, assuming all three leads are matched, add 0.05 Ω (0.00 Ω~400.00 Ω), 0.2 Ω (400.0 Ω~4000.0 Ω) to the specifications.
- Temperature Coefficient: ± (0.002 % of reading + 0.002 % of range) /°C (<18 °C or >28 °C)

Ohms Source

Ohms Range	Excitation Current from Measurement Device	Accuracy (% of Output + Floor)	
		1 Year	2 Year
1.00 Ω to 400.00 Ω	0.1 mA to 0.5 mA	0.015 % + 0.1 Ω	0.03 % + 0.2 Ω
	0.5 mA to 3 mA	0.015 % + 0.05 Ω	0.03 % + 0.08 Ω
400.0 Ω to 1500.0 Ω	0.05 mA to 0.8 mA	0.015 % + 0.5 Ω	0.03 % + 0.8 Ω
1500.0 Ω to 4000.0 Ω	0.05 mA to 0.4 mA	0.015 % + 0.5 Ω	0.03 % + 0.8 Ω

Resolution	
1.00 Ω to 400.00 Ω	0.01 Ω
400.0 Ω to 4000.0 Ω	0.1 Ω

- Notes:
- Supports pulsed transmitters and PLCs with pulse times as short as 5 ms.
- Temperature coefficient: ± (0.002 % of output + 0.002 % of range) /°C (<18 °C or >28 °C)

RTD Input and Output

RTD Type (α)	Range (°C)	Measure (°C)			Source (°C)	
		1 Year	2 Year	Source Current	1 Year	2 Year
10 Ω Pt(385)	-200 to 100	1.5	3	1 mA	1.5	3
	100 to 800	1.8	3.6	1 mA	1.8	3.6
50 Ω Pt(385)	-200 to 100	0.4	0.7	1 mA	0.4	0.7
	100 to 800	0.5	0.8	1 mA	0.5	0.8
100 Ω Pt(385)	-200 to 100	0.2 °C	0.4 °C	1 mA	0.2 °C	0.4 °C
	100 to 800	0.015 %+0.18 °C	0.03 %+0.36 °C		0.015 %+0.18 °C	0.03 %+0.36 °C
200 Ω Pt(385)	-200 to 100	0.2 °C	0.4 °C	500 µA	0.2 °C	0.4 °C
	100 to 630	0.015 %+0.18 °C	0.03 %+0.36 °C		0.015 %+0.18 °C	0.03 %+0.36 °C
500 Ω Pt(385)	-200 to 100	0.3 °C	0.6 °C	250 µA	0.3 °C	0.6 °C
	100 to 630	0.015 %+0.28 °C	0.03 %+0.56 °C		0.015 %+0.28 °C	0.03 %+0.56 °C
1000 Ω Pt(385)	-200 to 100	0.2 °C	0.4 °C	250 µA	0.2 °C	0.4 °C
	100 to 630	0.015 %+0.18 °C	0.03 %+0.36 °C		0.015 %+0.18 °C	0.03 %+0.36 °C
100 Ω Pt(3916)	-200 to 100	0.2 °C	0.4 °C	1 mA	0.2 °C	0.4 °C
	100 to 630	0.015 %+0.18 °C	0.03 %+0.36 °C		0.015 %+0.18 °C	0.03 %+0.36 °C
100 Ω Pt(3926)	-200 to 100	0.2 °C	0.4 °C	1 mA	0.2 °C	0.4 °C
	100 to 630	0.015 %+0.18 °C	0.03 %+0.36 °C		0.015 %+0.18 °C	0.03 %+0.36 °C
10 Ω Cu(427)	-100 to 260	1.5	3	1 mA	1.5	3
120 Ω Ni(672)	-80 to 260	0.15	0.3	1 mA	0.15	0.3
50 Ω Cu(427)	-180 to 200	0.4	0.7	1 mA	0.4	0.7
100 Ω Cu(427)	-180 to 200	0.2	0.4	1 mA	0.2	0.4
YSI400	15 to 50	0.2	0.4	250 µA	0.2	0.4
100 Ω Pt(3902)	-200 to 100	0.2 °C	0.4 °C	1 mA	0.2 °C	0.4 °C
	100 to 500	0.015 %+0.18 °C	0.03 %+0.36 °C		0.015 %+0.18 °C	0.03 %+0.36 °C

- Notes:
- Sensor inaccuracies not included.
- Resolution: 0.1 °C.
- Read accuracy is based on 4-wire input. For 3-wire RTD measurements, assuming all three RTD leads are matched, add 1.0 °C (Pt10 and Cu10), 0.6 °C (Pt50 and Cu50), 0.4 °C (Other RTD types) to the specifications.
- Source Accuracy in source mode is based on 0.5 mA~3 mA (1.00 Ω~400.00 Ω), 0.05 mA~0.8 mA (400.0 Ω~1500.0 Ω), 0.05 mA~0.4 mA (1500.0 Ω ~4000.0 Ω), excitation current (0.25 mA for Pt1000 range).
- Temperature Coefficient: ±0.05 °C /°C (<18 °C or >28 °C) for both measure and source.
- Supports pulsed transmitters and PLCs with pulse times as short as 5 ms.

General Specifications

Maximum voltage applied between any terminal and earth ground or between any two terminals:	30 V
Operating temperature	-10 °C to 50 °C
Storage temperature	-20 °C to 60 °C
Operating altitude	2,000 meters
Storage altitude	12,000 meters
Relative Humidity (% RH operating without condensation)	Non condensing 90 % (10 °C to 30 °C) 75 % (30 °C to 40 °C) 45 % (40 °C to 50 °C) (Without condensation)
Vibration Requirements	MIL-T-28800E, Class 2
Drop Test Requirements	1 meter
IP Rating	IEC 60529: IP52
Electromagnetic Environment	IEC 61326-1, Portable FCC: CFR Title 47, Part 15, Subpart B
Safety	IEC 61010-1, Max 30 V to earth, Pollution Degree 2
Electromagnetic Compatibility	Applies to use in Korea only. Class A Equipment (Industrial Broadcasting & Communication Equipment) 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.
Power Supply	4 AA alkaline batteries/NEDA code: 15A, IEC code: LR6
Size (H x W x L)	52.5 x 84 x 188.5 mm
Weight	524 g

714B Specifications

Specifications are based on a one year calibration cycle and apply from +18 °C to +28 °C unless stated otherwise. All specifications assume a 5 minute warmup period.

Thermocouple mV Input

Range	Resolution	Accuracy (% of Reading + Floor)	
		1 Year	2 Year
-10 mV to 75 mV	0.001 mV	0.015 % + 10 µV	0.02 % + 15 µV
Temperature coefficient: ±(0.002 % of reading + 0.002 % of range) /°C (<18 °C or >28 °C)			

Thermocouple mV Output

Range	Resolution	Accuracy (% of Output + Floor)	
		1 Year	2 Year
-10 mV to 75 mV	0.01 mV	0.015 % + 10 µV	0.02 % + 15 µV
Temperature Coefficient: ± (0.002 % of output + 0.002 % of range) /°C (<18 °C or >28 °C)			

Thermocouple mA Input

Range	Resolution	Accuracy (% of Reading + Floor)	
		1 Year	2 Year
0 mA to 24 mA	0.001 mA	0.01 % + 2 µA	0.02 % + 4 µA
Temperature Coefficient: ± (0.002 % of output + 0.002 % of range) /°C (<18 °C or >28 °C)			

Thermocouple Input and Output

TC Type	Range	Measure (°C)		Source (°C)	
		1 Year	2 Year	1 Year	2 Year
E	-250 to 200	1.3	2.0	0.6	0.9
	-200 to -100	0.5	0.8	0.3	0.4
	-100 to 600	0.3	0.4	0.3	0.4
	600 to 1000	0.4	0.6	0.2	0.3
N	-200 to -100	1.0	1.5	0.6	0.9
	-100 to 900	0.5	0.8	0.5	0.8
	900 to 1300	0.6	0.9	0.3	0.4
J	-210 to -100	0.6	0.9	0.3	0.4
	-100 to 800	0.3	0.4	0.2	0.3
	800 to 1200	0.5	0.8	0.3	0.3
K	-200 to -100	0.7	1.0	0.4	0.6
	-100 to 400	0.3	0.4	0.3	0.4
	400 to 1200	0.5	0.8	0.3	0.4
	1200 to 1372	0.7	1.0	0.3	0.4
T	-250 to -200	1.7	2.5	0.9	1.4
	-200 to 0	0.6	0.9	0.4	0.6
	0 to 400	0.3	0.4	0.3	0.4
B	600 to 800	1.3	2.0	1.0	1.5
	800 to 1000	1.0	1.5	0.8	1.2
	1000 to 1820	0.9	1.3	0.8	1.2
R	-20 to 0	2.3	2.8	1.2	1.8
	0 to 100	1.5	2.2	1.1	1.7
	100 to 1767	1.0	1.5	0.9	1.4

S	-20 to 0	2.3	2.8	1.2	1.8
	0 to 200	1.5	2.1	1.1	1.7
	200 to 1400	0.9	1.4	0.9	1.4
	1400 to 1767	1.1	1.7	1.0	1.5
C	0 to 800	0.6	0.9	0.6	0.9
	800 to 1200	0.8	1.2	0.7	1.0
	1200 to 1800	1.1	1.6	0.9	1.4
	1800 to 2316	2.0	3.0	1.3	2.0
L	-200 to -100	0.6	0.9	0.3	0.4
	-100 to 800	0.3	0.4	0.2	0.3
	800 to 900	0.5	0.8	0.2	0.3
U	-200 to 0	0.6	0.9.	0.4	0.6
	0 to 600	0.3	0.4	0.3	0.4
BP	0 to 1000	1.0	1.5	0.4	0.6
	1000 to 2000	1.6	2.4	0.6	0.9
	2000 to 2500	2.0	3.0	0.8	1.2
XK	-200 to 300	0.2	0.3	0.2	0.5
	300 to 800	0.4	0.6	0.3	0.6
G	100 to 300	1.6	2.4	1.2	1.8
	300 to 1500	1.0	1.5	1.0	1.5
	1500 to 2315	2.0	3.0	1.6	2.4
D	0 to 300	1.6	2.4	1.2	1.8
	300 to 1500	1.0	1.5	1.0	1.5
	1500 to 2315	2.0	3.0	1.6	2.4
P	0 to 1000	1.6	2.4	0.6	0.9
	1000 to 1395	2.0	3.0	0.8	1.2
M	-50 to 100	1.0	1.5	0.4	0.6
	100 to 1000	1.6	2.4	0.6	0.9
	1000 to 1410	2.0	3.0	0.8	1.2

Notes:

- Sensor inaccuracies not included.
- Accuracy with external cold junction; for internal junction add 0.2 °C
- Temperature scale: ITS-90
- Compensation: NIST Monograph 175 for B, R, S, E, J, K, N, T. DIN 43710 for L, U. GOST P 8.585-2001 (Russia) for BP and XK. ASTM E988-96 for C. ASTM E1751/E1751M − 09ε1 for G, D, P, M
- Resolution: 0.1 °C
- Temperature Coefficient: 0.05 °C/°C (<18 °C or >28 °C)
  0.07 °C/°C for C type >1800 °C and for BP type >2000 °C

General Specifications

Maximum voltage applied between any terminal and earth ground or between any two terminals:	30 V
Operating temperature	-10 °C to 50 °C
Storage temperature	-20 °C to 60 °C
Operating altitude	2,000 meters
Storage altitude	12,000 meters
Relative Humidity (% RH operating without condensation)	Non condensing 90 % (10 °C to 30 °C) 75 % (30 °C to 40 °C) 45 % (40 °C to 50 °C) (Without condensation)
Vibration Requirements	MIL-T-28800E, Class 2
Drop Test Requirements	1 meter
IP Rating	IEC 60529: IP52 (with TC cap)
Electromagnetic Environment	IEC 61326-1, Portable FCC: CFR Title 47, Part 15, Subpart B
Safety	IEC 61010-1, Max 30 V to earth, Pollution Degree 2
Electromagnetic Compatibility	Applies to use in Korea only. Class A Equipment (Industrial Broadcasting & Communication Equipment) 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.
Power Supply	4 AA alkaline batteries/NEDA code: 15A, IEC code: LR6
Size (H x W x L)	52.5 x 84 x 188.5 mm
Weight	515 g

Maintenance

Replace the Batteries

⚠⚠ Warning

To prevent false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator appears.

Figure 1 shows how to replace the batteries.

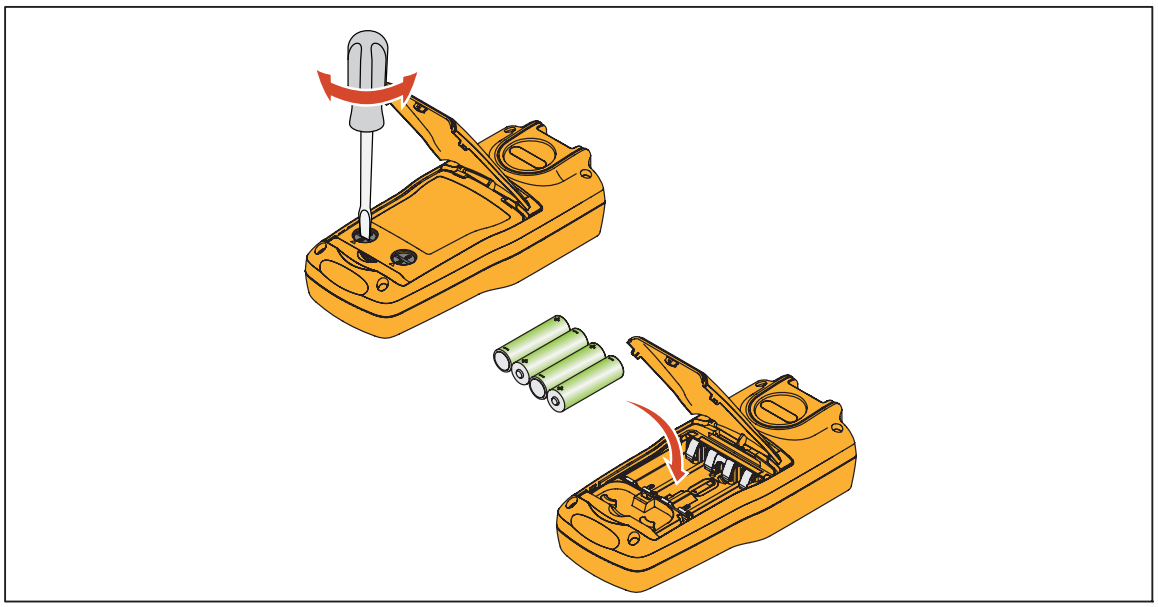

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Figure 1. Replace the Batteries

Clean the Product

⚠ Warning

To prevent personal injury or damage to the Product, use only the specified replacement parts and do not allow water into the case.

⚠Caution

To avoid damaging the plastic lens and case, do not use solvents or abrasive cleansers.

Clean the Product with a soft cloth dampened with water or water and mild soap.

Required Equipment

The equipment listed in Table 2 is necessary to do the calibration and test for the 712B. The equipment listed in Table 3 is necessary to do the calibration and test for the 714B.

Note

Fluke 5522A and Fluke 8508A need an 8-hour warmup period before the calibration starts. The 5522A needs to zero all the functions weekly and zero Ohms output function every day. The 8508A needs to zero the dc V measurement function, the 4-Wire Ohms measurement function and the DCI measurement function.

Table 2. Required Equipment for 712B Verification and Calibration Adjustment

Item	Equipment	QTY	Comment
①	Fluke 5522A	1	—
②	Fluke 8508A	1	Can be replaced with other reference or equivalent DMMs
③	B-36-2,BANANA PLUG PATCH CORD (Part number:1894785, RED, Part number: 1894724, BLACK) Or Fluke-75X-8014, STACKABLE LEAD SET (Part number: 3669716)	2 sets	Used for all the function calibration and verification test

Table 3. Required Equipment for 714B Verification and Calibration Adjustment

Item	Equipment	QTY	Comment
①	Fluke 5522A	1	The mV output should be calibrated by 8508A [1].
②	Fluke 8508A	1	Can be replaced with other reference or equivalent DMMs [2].
③	Fluke 9101-256	1	Can be replaced with a lag bath and standard sensors[3]
④	Pure copper cables with the mini plug	1	Used for the calibration of the mV input function and mV source function
⑤	J TYPE and K TYPE TC Sensor[4]	1	Used for verification and calibration adjustment of the temperature function
⑥	Fluke-75X-8014	1	Fluke Item No: 3669716
⑦	Fluke 7526A	1	-

[1] Before using the mV output function of 5522A, record the 5522A output setting by the reading of the 8508A.

[2] The absolute uncertainties of the DMM's dc voltage need to be better than 10 ppm+0.2 µV in the range of 0 mV and 100 mV.

[3] The accuracy (MAX) of standard sensors should be better than 0.05 °C.

[4] The accuracy (MAX) of the TC sensor should be better than 0.05 °C.

712B Performance Verification

Verify that the 712B performance is within the 1 or 2 year specifications as desired.

Turn the 712B on and let it warm up for 5 minutes.

Verify Ohms Source

1. Make connections between the 712B and the 8508A, as shown in Figure 2.

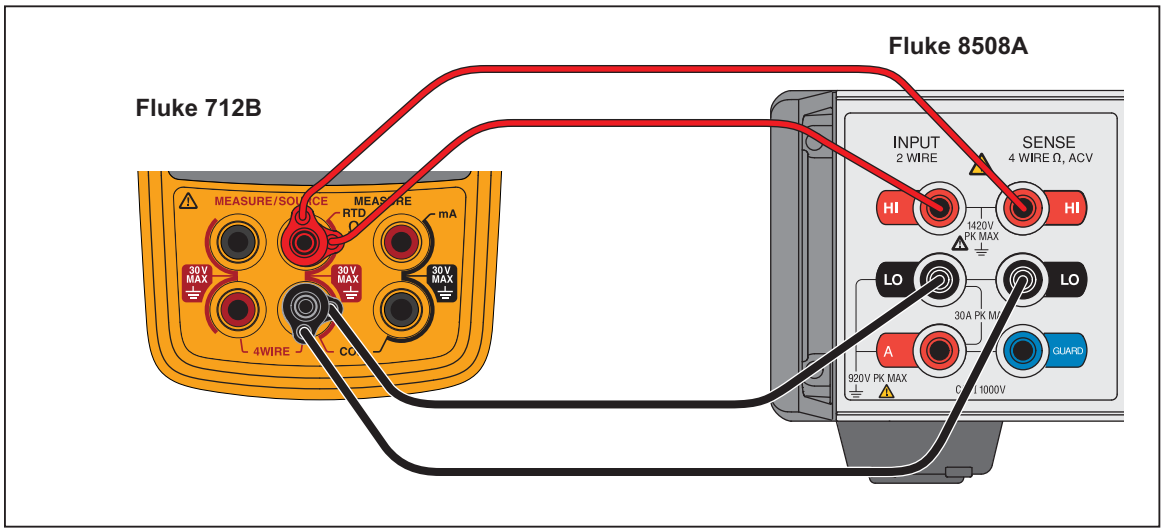

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Figure 2. Verify 712B Ohms Source

2. Set the 8508A to 4-wire ohms measurement mode. Set the resolution of Ohms measurement mode to 7 1/2-digits or above. Set the range of Ohms measurement mode as shown in Table 4.
3. Set the 712B to Ohms Source mode.
   a. Push RTD TYPE.
   b. Push ◠ until Ohms is highlighted.
   c. Push RTD TYPE again.
   d. Push MEASURE SOURCE as necessary to enter Source mode.
4. Set the 712B to output the resistance values at the first column in Table 4.
5. Wait approximately 10 seconds until the 8508A shows a stable reading, and verify that the 8508A readings are within the appropriate limits in Table 4.

Note

The 8508A must be set to 4-Wire measurement and in the requested range to maintain currents that are within 712B's limits.

6. Disconnect the 712B from the 8508A.

Table 4. 712B Ohms Source Limits

Source (Ω)	1 Yr. Lower Limit (Ω)	1 Yr. Upper Limit (Ω)	2 Yr. Lower Limit (Ω)	2 Yr. Upper Limit (Ω)	8508A Range
1	0.950	1.050	0.920	1.080	2k range, 4W
10	9.949	10.052	9.917	10.083	2k range, 4W
100	99.935	100.065	99.890	100.110	2k range, 4W
390	389.892	390.109	389.803	390.197	2k range, 4W
1000	999.35	1000.65	998.90	1001.10	20k range, 4W
4000	3998.90	4001.10	3998.00	4002.00	20k range, 4W

Verify 4-Wire Ohms Measure

1. Push MEASURE SOURCE to set the 712B to Ohms Measure mode.
2. Push 2 3 4 WIRE until 4W shows on the screen.
3. Make the connections between the 712B and the 5522A, as shown in Figure 3.
4. Set the 5522A to output the Ohms value at the second column in Table 5.
5. Wait approximately 10 seconds for a stable output of the 5522A, and verify that the 712B readings are within the limits shown.

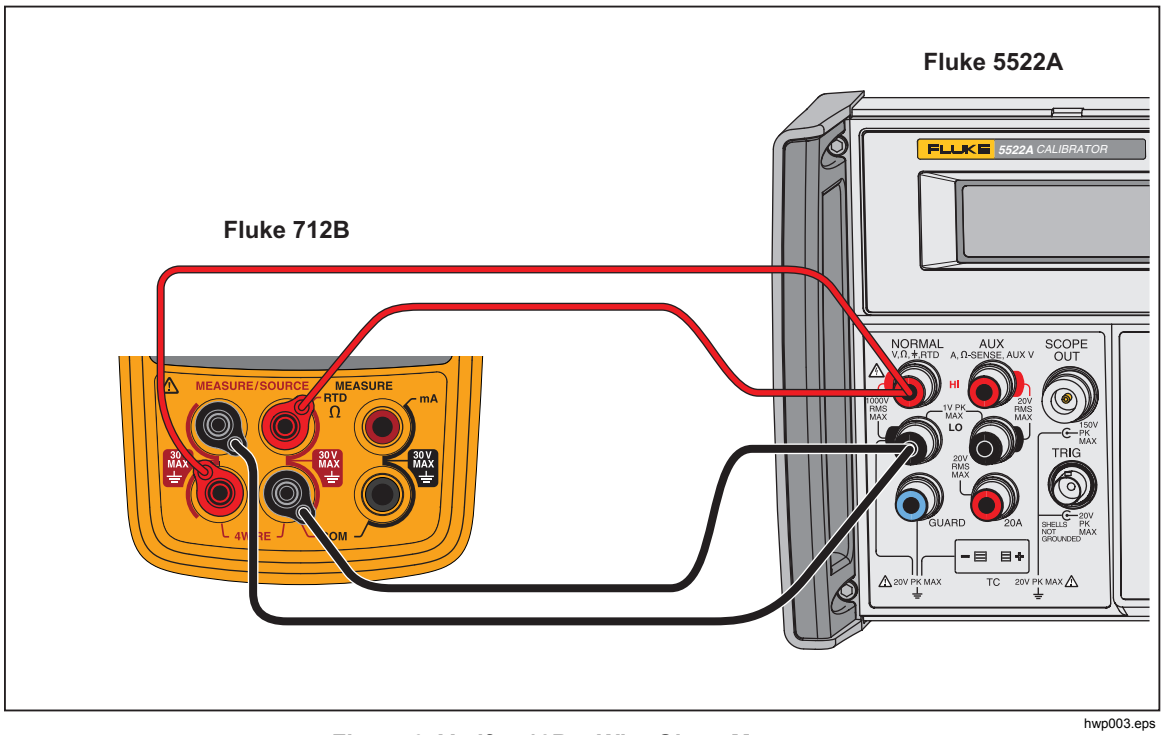

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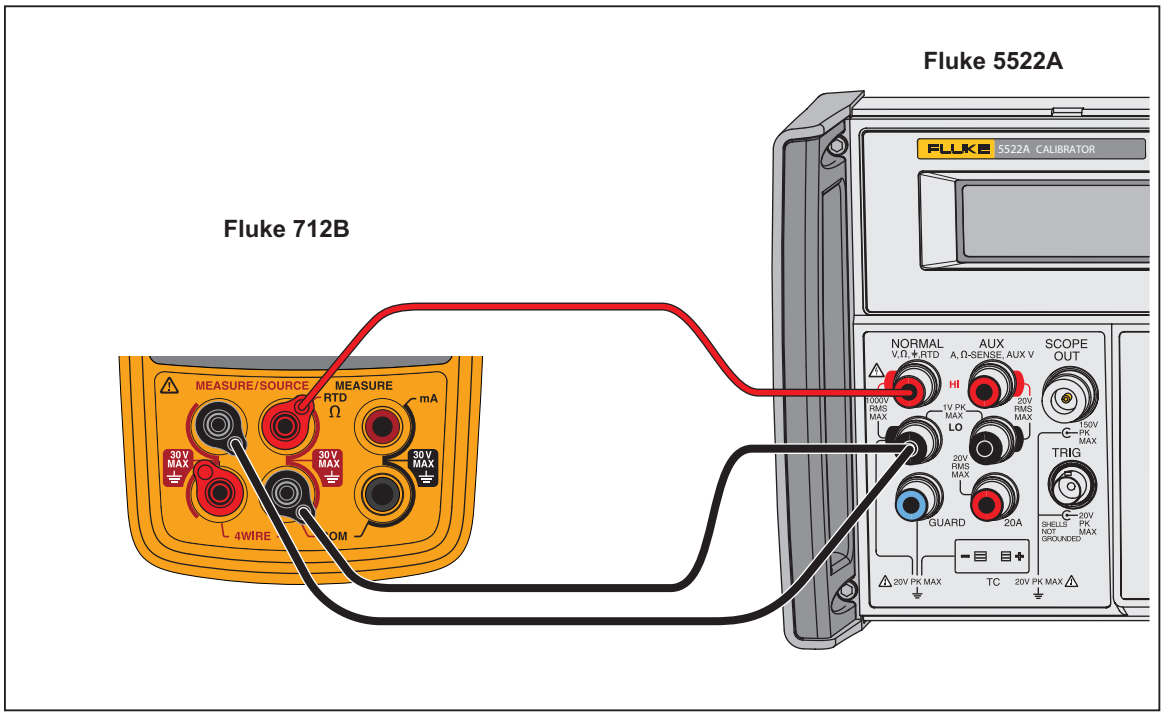
Figure 3. Verify 712B 4-Wire Ohms Measure

Table 5. 712B 4-Wire Ohms Measure Limits

Range (Ω)	Applied Ω from 5522A (Ω)	1 Yr. Lower Limit (Ω)	1 Yr. Upper Limit (Ω)	2 Yr. Lower Limit (Ω)	2 Yr. Upper Limit (Ω)
400	1	0.95	1.05	0.92	1.08
400	10	9.95	10.05	9.92	10.08
400	100	99.94	100.06	99.89	100.11
400	390	389.89	390.11	389.80	390.20
4000	1000	999.4	1000.6	998.9	1001.1
4000	4000	3998.9	4001.1	3998.0	4002.0

Verify 3-Wire Ohms Measure

1. Push MEASURE SOURCE to set the 712B to Ohms Measure mode.
2. Push 2 3 4 WIRE until 3W shows on the screen.
3. Make the connections between the 712B and the 5522A, as shown in Figure 4.
4. Set the 5522A to output the Ohms value at the second column in Table 6.
5. Wait approximately 10 seconds for a stable output of the 5522A, and verify that the 712B readings are within the limits shown.



hwp018.eps

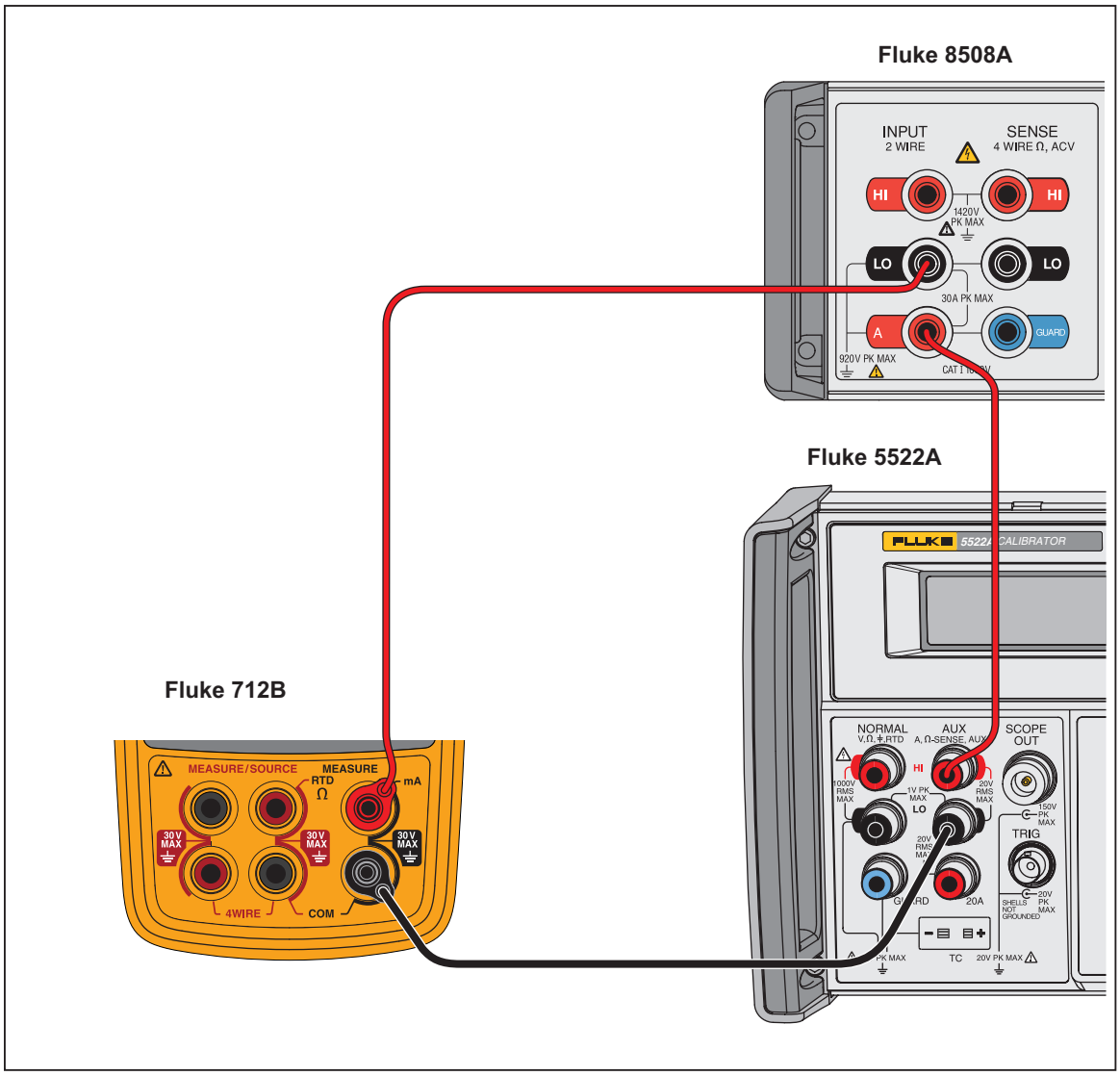
Figure 4. Verify 712B 3-Wire Ohms Measure

Table 6. 712B 3-Wire Ohms Measure Limits

Range (Ω)	Applied Ω from 5522A (Ω)	1 Yr. Lower Limit (Ω)	1 Yr Upper Limit (Ω)	2 Yr. Lower Limit (Ω)	2 Yr Upper Limit (Ω)
400	1	0.90	1.10	0.87	1.13
400	100	99.89	100.11	99.84	100.16
4000	1000	999.2	1000.8	998.7	1001.3

Verify mA Measure

1. Make the connections between the 712B, 8508A, and 5522A, as shown in Figure 5.
2. Set the 8508A to DCI measurement mode, set the range of the DCI measurement mode to 20 mA and the resolution of DCI measurement mode to 7 1/2-digits.
3. Adjust the mA source output of 5522A and make that 8508A shows as the first column in the Table 7, and verify that the 712B readings are within the limits shown.



hwp004.eps

Figure 5. Verify 712B mA Measure

Table 7. 712B mA Measure Limits

DC Current Display from 8508A (mA)	1 Yr. Lower Limit (mA)	1 Yr Upper Limit (mA)	2 Yr. Lower Limit (mA)	2 Yr Upper Limit (mA)
0.100	0.098	0.102	0.096	0.104
19.000	18.996	19.004	18.992	19.008

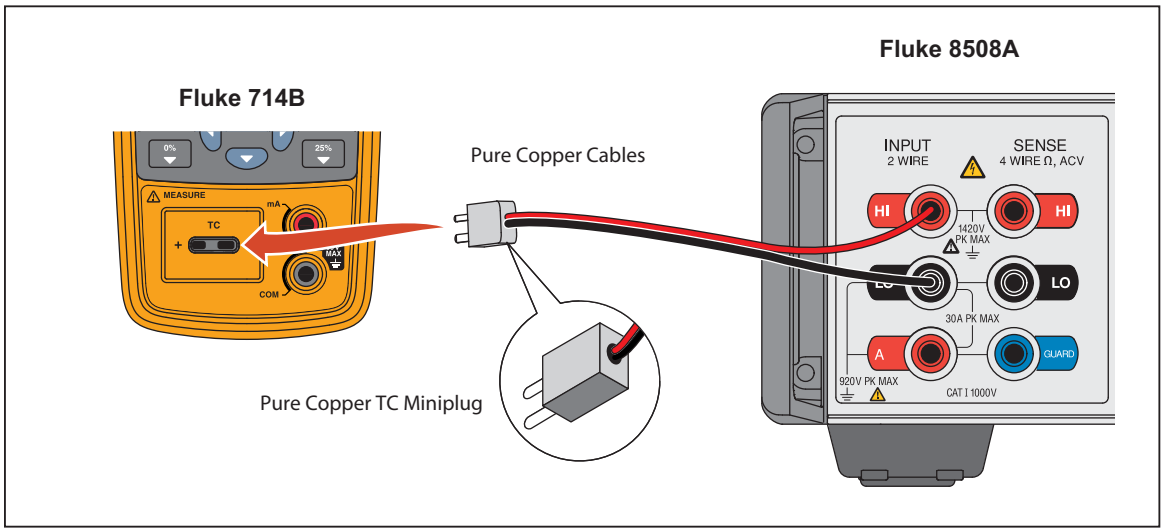
714B Performance Verification

Verify that the 714B performance is within the 1 or 2 year specifications as desired.

Turn the 714B on and let it warm up for 5 minutes.

Verify mV Source

1. Make connections between the 714B and the 8508A with copper wire, as shown in Figure 6.



hwp006.eps

Figure 6. Verify 714B mV Source

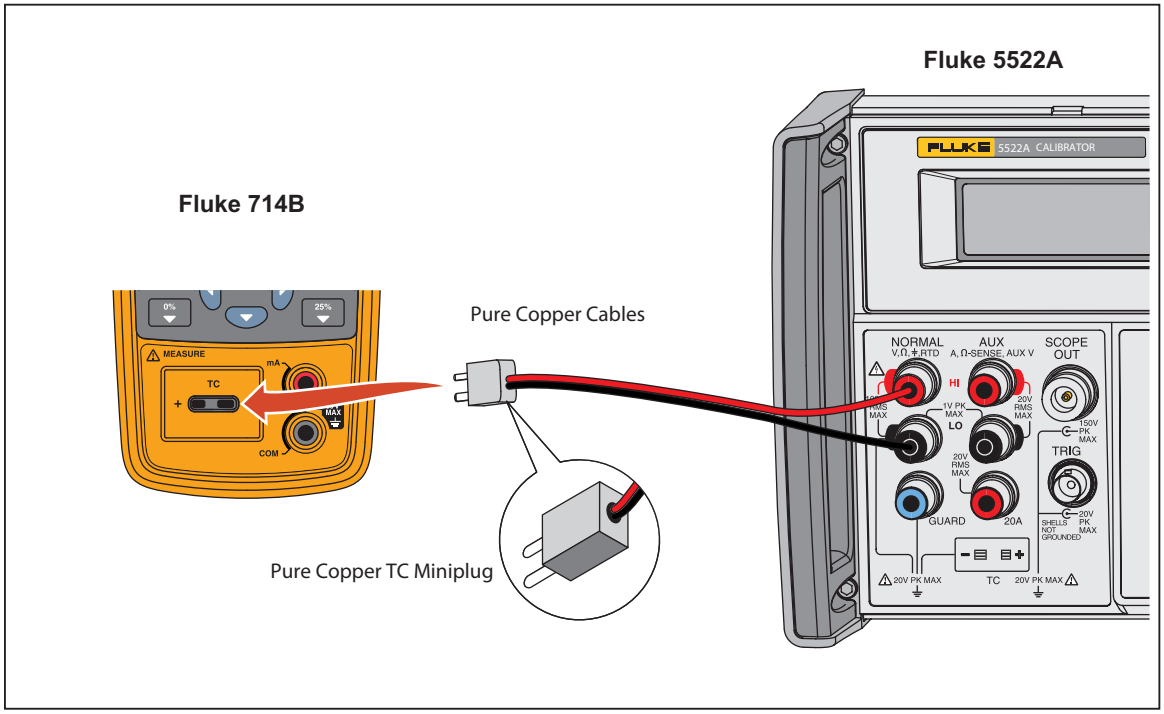
2. Set the 714B to Source mV mode.
   a. Push [TC TYPE].
   b. Push ▲ until mV is highlighted.
   c. Push [TC TYPE] again.
   d. Push [MEASURE SOURCE] as necessary to enter Source mode.
3. Set the 714B to output the mV values in Table 8.
4. Check that the 8508A readings are within the appropriate limits in Table 8.

Table 8. 714B mV Source Limits

Range (mV)	Sourced (mV)	1 Yr. Lower Limit (mV)	1 Yr Upper Limit (mV)	2 Yr. Lower Limit (mV)	2 Yr Upper Limit (mV)
-10 to 75	-9.5	-9.511	-9.489	-9.517	-9.483
-10 to 75	10	9.989	10.012	9.983	10.017
-10 to 75	40	39.984	40.016	39.977	40.023
-10 to 75	70	69.980	70.020	69.971	70.029

Verify mV Measure

1. Make connections between the 714B and the 5522A with copper wire, as shown in Figure 7.



hwp007.eps

Figure 7. Verify 714B mV Measure

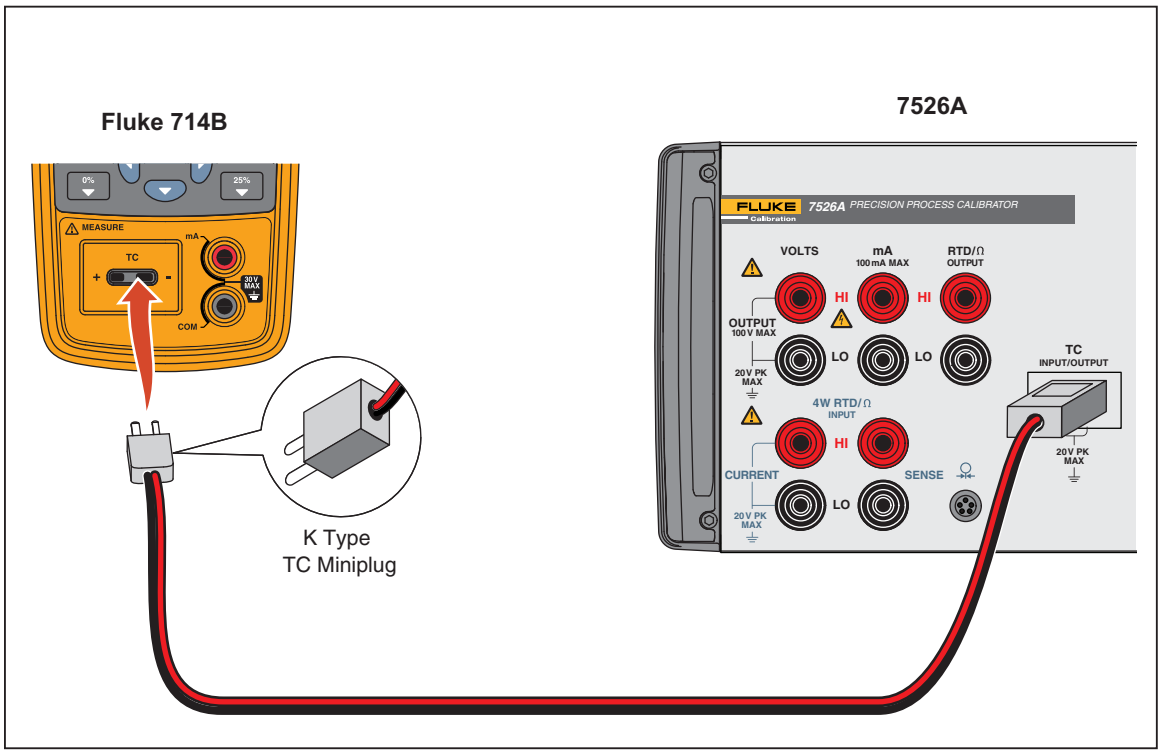
2. Push MEASURE SOURCE to set the 714B to mV Measure mode.
3. Set the 5522A to the first value in Table 9.
4. Output the mV values in Table 9 and verify that the 714B readings are within the limits shown.

Table 9. 714B mV Measure Limits

Sourced (mV)	1 Yr. Lower Limit (mV)	1 Yr Upper Limit (mV)	2 Yr. Lower Limit (mV)	2 Yr Upper Limit (mV)
-9.5	-9.511	-9.489	-9.517	-9.483
10	9.989	10.012	9.983	10.017
40	39.984	40.016	39.977	40.023
70	69.980	70.020	69.971	70.029

Verify TC Measure (Type K)

1. Set the 714B to Type K Measure mode.
2. Set the 7526A to TC Out Type K.
3. Use K type TC sensor to connect the 7526A and the 714B, as shown in Figure 8.



hwp015.eps

Figure 8. Verify Type K Measure

4. Set the 7526A to the values in Table 10 and verify that the 714B readings are within the limits shown.

Table 10. 714B Type K Measure Limits

5522A Sourced (°C)	1 Yr. Lower Limit (°C)	1 Yr Upper Limit (°C)	2 Yr. Lower Limit (°C)	2 Yr Upper Limit (°C)
-180	-180.9	-179.1	-181.2	-178.8
0	-0.5	0.5	-0.6	0.6
1300	1299.1	1300.9	1298.8	1301.2

Verify TC K Source

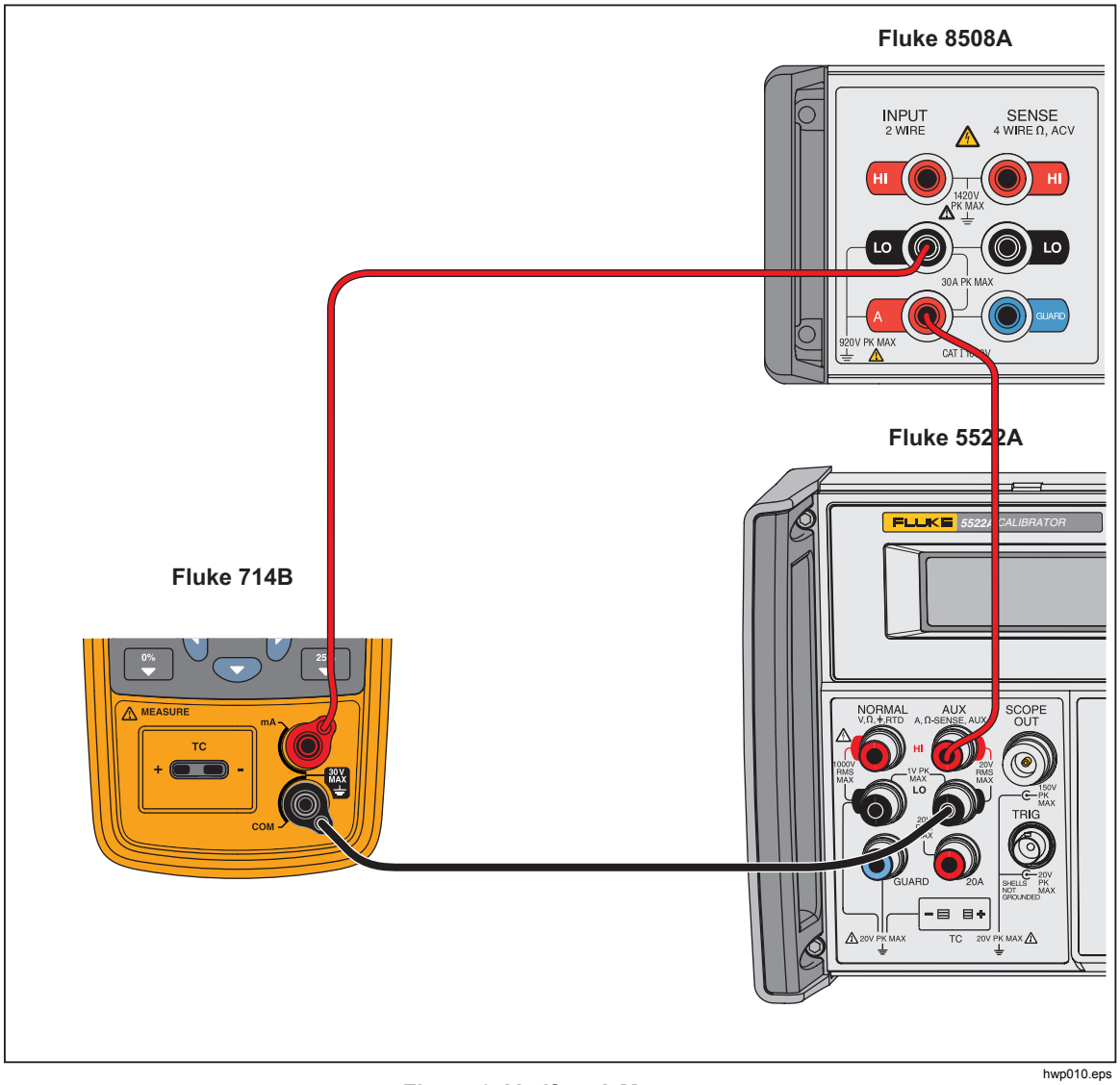
1. Set the 714B to type K Source mode.
2. Set the 7526A to TC IN Type K
3. Maintain the connections in Figure 8.
4. Set the 714B to the values in Table 11 and verify that the 7526A readings are within the limits shown.

Table 11. 714B TC K Source Limits

714B Sourced (°C)	1 Yr. Lower Limit (°C)	1 Yr Upper Limit (°C)	2 Yr. Lower Limit (°C)	2 Yr Upper Limit (°C)
-100	-100.5	-99.5	-100.6	-99.4
0	-0.5	0.5	-0.6	0.6
800	799.5	800.5	799.4	800.6

Verify mA Measure

1. Connect the 5522A, 8508A, and 714B, as shown in Figure 9.
2. Set the 8508A to DCI measurement mode, set the range of the DCI measurement mode to 20 mA and the resolution of DCI measurement mode to 7 1/2-digits.
3. Set the 5522A to source and make sure that 8508A shows the first dc current in Table 12.
4. Output the dc current values in Table 12 and verify that the 714B readings are within the limits shown.



hwp010.eps

Figure 9. Verify mA Measure

Table 12. 714B mA Measure Limits

DC current display from 8508A (mA)	1 Yr. Limit (mA)	2 Yr. Limit (mA)
0.100	0.098 – 0.102	0.096 – 0.104
19.000	18.996 – 19.004	18.992 – 19.008

712B Calibration Adjustment

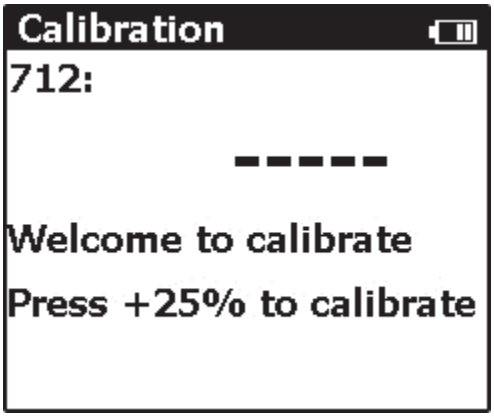
This section describes how to adjust for the 712B.

Enter Manual Calibration Mode

To enter manual calibration mode:

1. Power off the Product.
2. Push and hold down ▭ and 25% at the same time.
3. Push and then release ⏻.
4. Release ▭ and 25%.

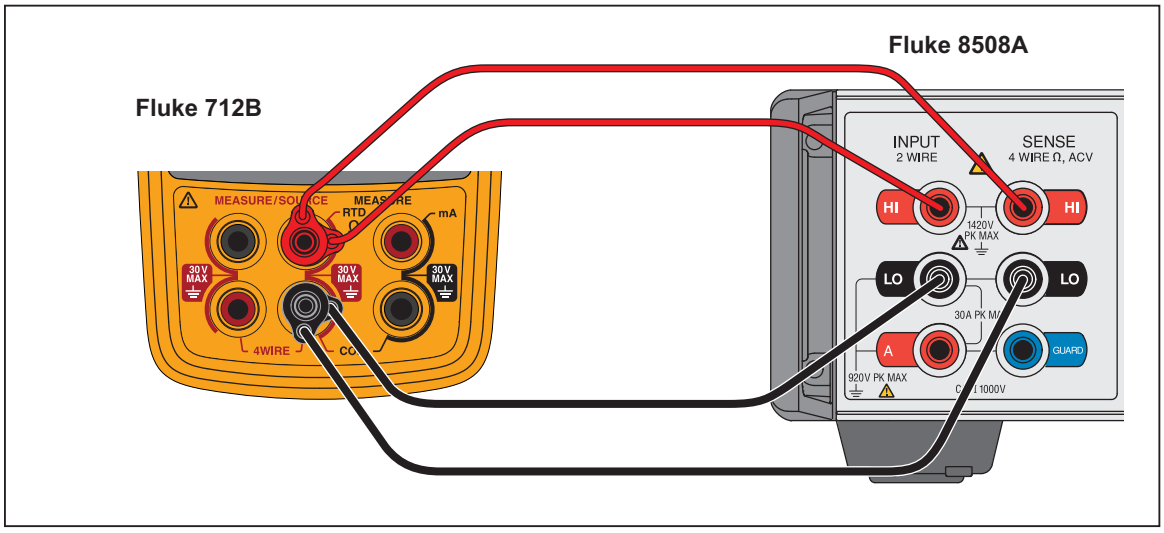
   The Welcome screen shows.
5. After a warmup period of approximately 5 minutes, start the calibration adjustment.



hwp01.jpg

Adjust Ohms Source

Before the calibration adjustment, set the 8508A to 4-Wire Ohms measurement mode, set the resolution of Ohms measurement mode to 7 1/2-digits or above, and use two sets of banana plug patch cords to connect the 712B and the 8508A, as shown in Figure 10.

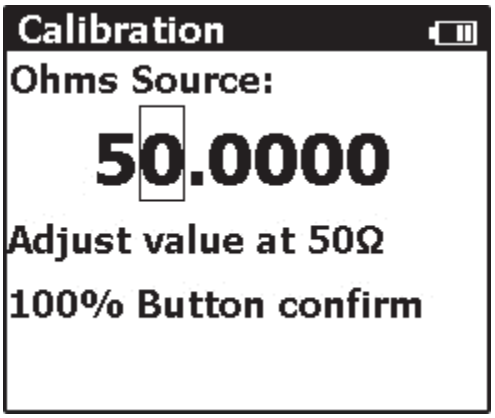


hwp011.eps

Figure 10. Adjust 712B Ohms Source

Adjust 50 Ω Source

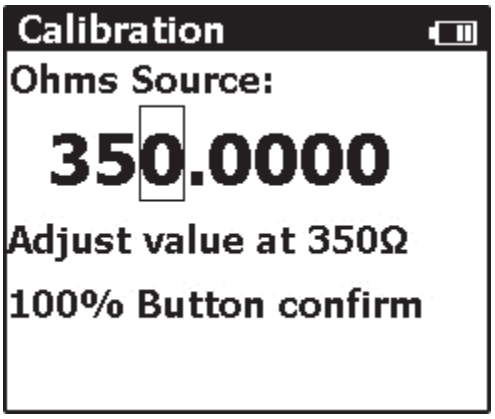
1. Set the range of 8508A 4-Wire measurement to 2 kΩ.
2. Push 25% on the 712B to enter the 50 Ω Source calibration mode.
3. Wait approximately 10 seconds until the 8508A shows a stable reading.
4. Use the arrow keys to input the reading into the 712B.
5. Confirm the input.



hwp02.jpg

Adjust 350 Ω Source

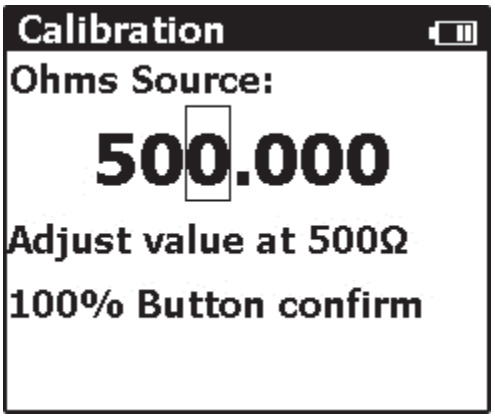
1. Push 100% to enter 350 Ω Source calibration mode.
2. Wait approximately 10 seconds until the 8508A shows a stable reading.
3. Input the reading into the 712B.
4. Confirm the input.



hwp03.jpg

Adjust 500 Ω Source

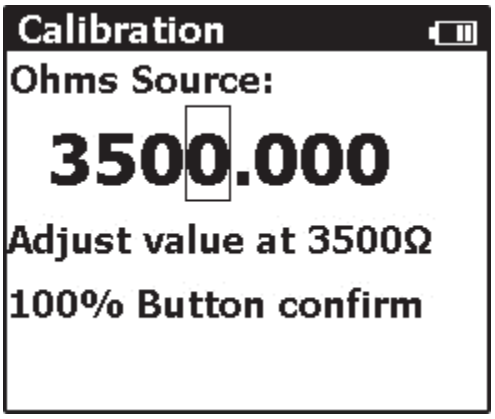
1. Set the range of 8508A 4-Wire measurement to 20 kΩ.
2. Push 100% to enter 500 Ω Source calibration mode.
3. Wait approximately 10 seconds until the 8508A shows a stable reading.
4. Input the reading into the 712B.
5. Confirm the input.



hwp04.jpg

Adjust 3500 Ω Source

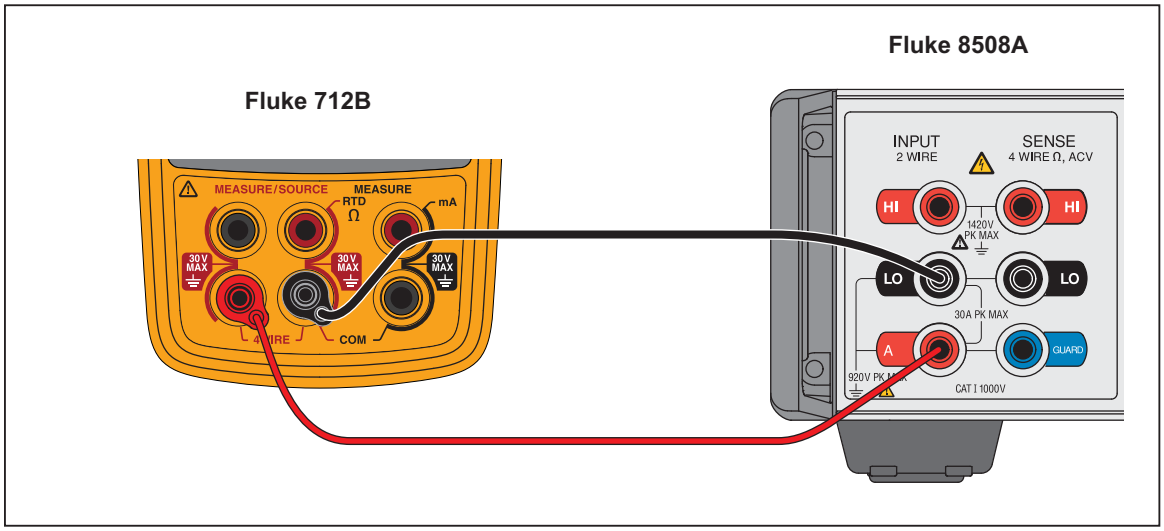
1. Push 100% to enter 500 Ω Source calibration mode.
2. Wait approximately 10 seconds until the 8508A shows a stable reading.
3. Input the reading into the 712B.
4. Confirm the input.



hwp05.jpg

Adjust Trigger Current for Ohms Measure

Before the calibration adjustment, set the 8508A to DCI measurement mode, set the resolution of DCI measurement mode to 7 1/2-digits, and use one set of banana plug patch cords to connect the 712B and the 8508A, as shown in Figure 11.

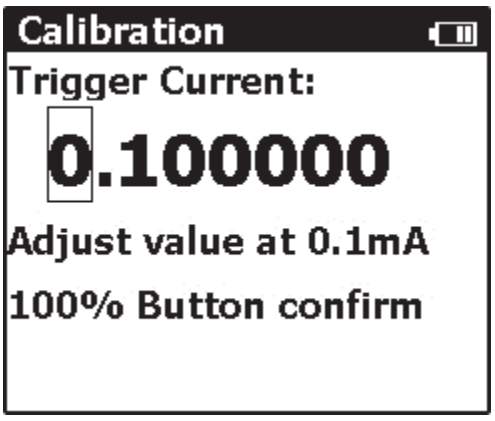


hwp002.eps

Figure 11. Adjust 712B Trigger Current

Adjust 0.1 mA Trigger Current

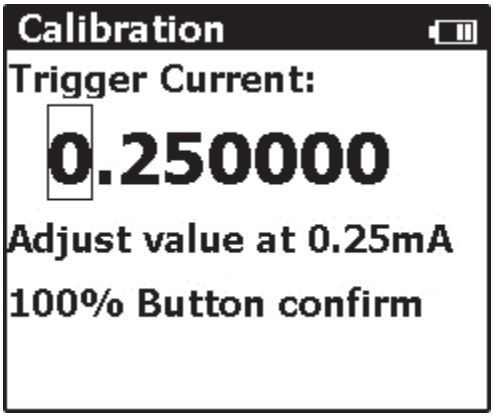
1. Set the range of the 8508A dc mA measurement to 2 mA.
2. Push 100% on the 712B to enter 0.1 mA trigger current calibration mode.
3. Wait approximately 15 seconds until the 8508A shows a stable reading.
4. Input the reading into the 712B.
5. Confirm the input.



hwp06.jpg

Adjust 0.25 mA Trigger Current

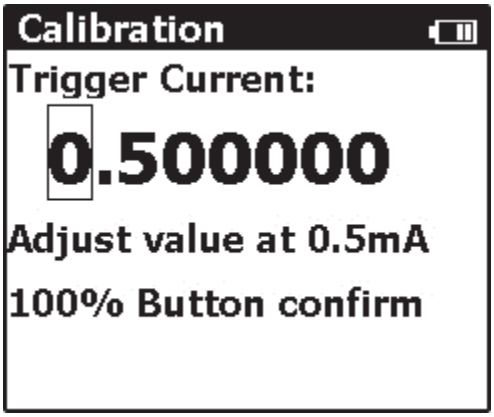
1. Push 100% on the 712B to enter 0.25 mA trigger current calibration mode.
2. Wait approximately 15 seconds until the 8508A shows a stable reading.
3. Input the reading into the 712B.
4. Confirm the input.



hwp07.jpg

Adjust 0.5 mA Trigger Current

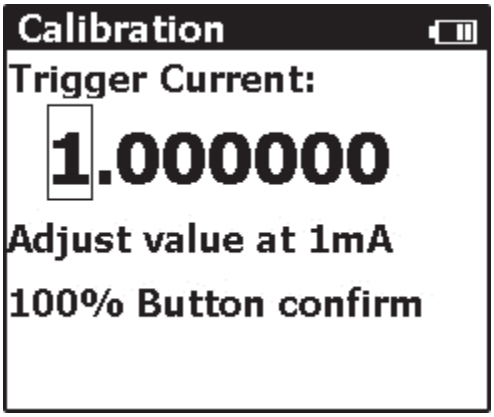
1. Push 100% on the 712B to enter 0.5 mA trigger current calibration mode.
2. Wait approximately 15 seconds until the 8508A shows a stable reading.
3. Input the reading into the 712B.
4. Confirm the input.



hwp08.jpg

Adjust 1 mA Trigger Current

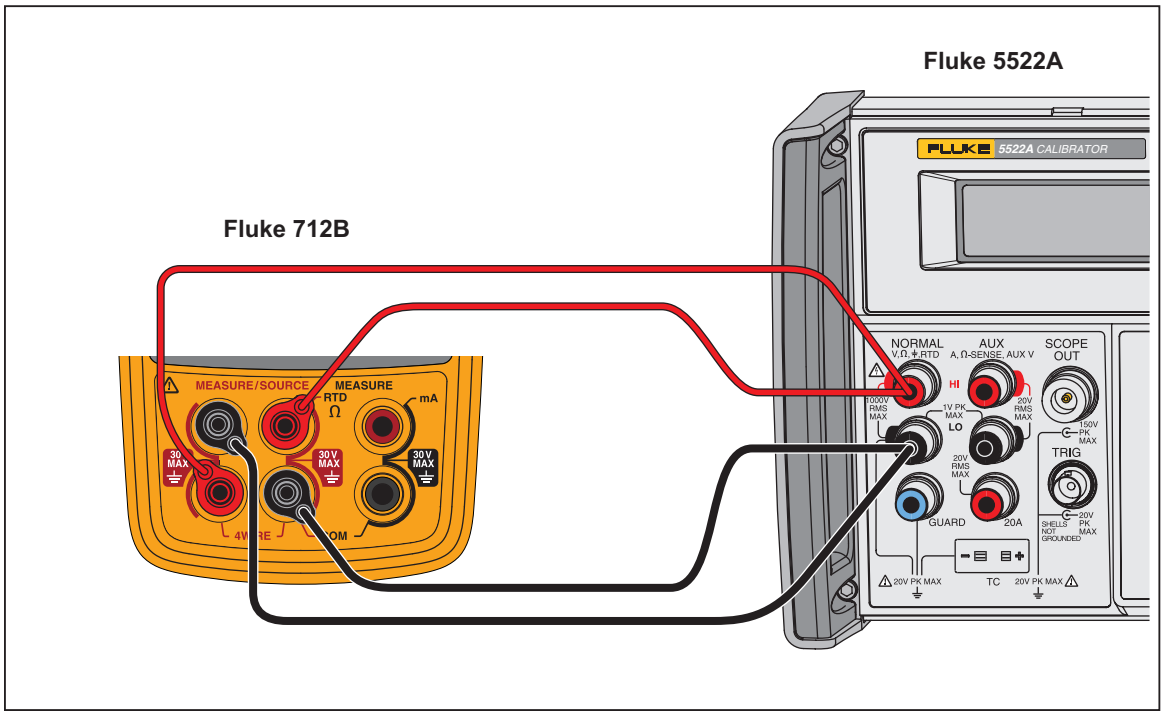
1. Push 100% on the 712B to enter 1 mA trigger current calibration mode.
2. Wait approximately 15 seconds until the 8508A shows a stable reading.
3. Input the reading into the 712B.
4. Confirm the input.



hwp09.jpg

Adjust Ohms Measure

Before the calibration adjustment, set the 5522A to Ohms source output mode, and use two sets of banana plug patch cords to connect the 712B and the 5522A, as shown in Figure 12.

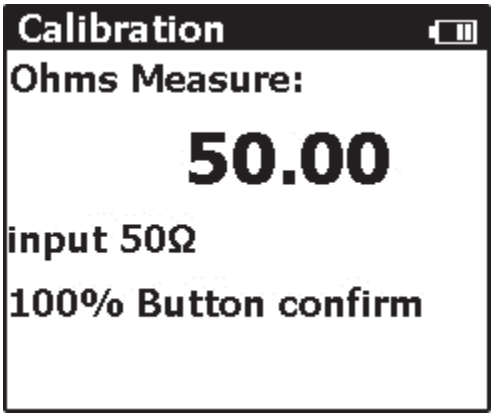


hwp003.eps

Figure 12. Adjust 712B Ohms Measure

Adjust 50 Ω Input

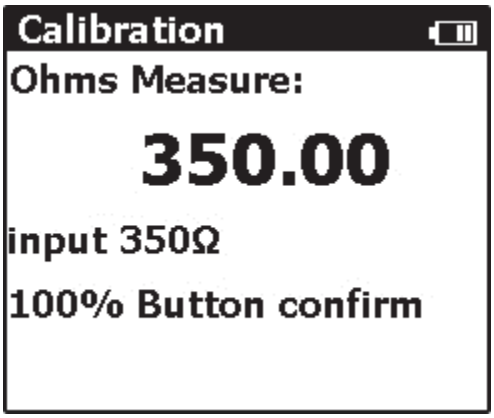
1. Set the 5522A to output 50 Ω.
2. Wait approximately 10 seconds for a stable output of the 5522A.
3. Confirm the reading on the 712B.



hwp10.jpg

Adjust 350 Ω Input

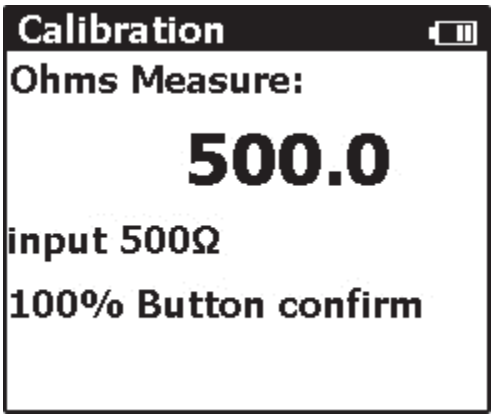
1. Push 100% on the 712B to enter 350 Ω input calibration mode.
2. Set the 5522A to output 350 Ω.
   Wait approximately 10 seconds for a stable output of the 5522A.
3. Confirm the reading on the 712B.



hwp11.jpg

Adjust 500 Ω Input

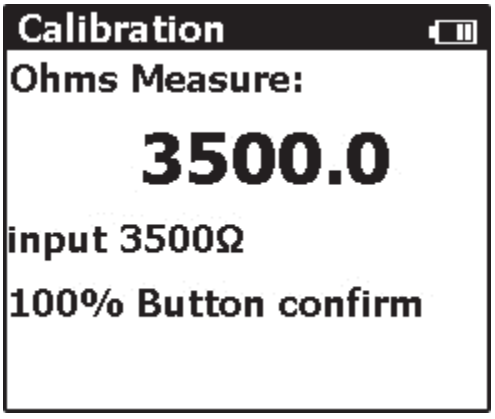
1. Push 100% on the 712B to enter 500 Ω input calibration mode.
2. Set the 5522A to output 500 Ω.
   Wait approximately 10 seconds for a stable output of the 5522A.
3. Confirm the reading on the 712B.



hwp12.jpg

Adjust 3500 Ω Input

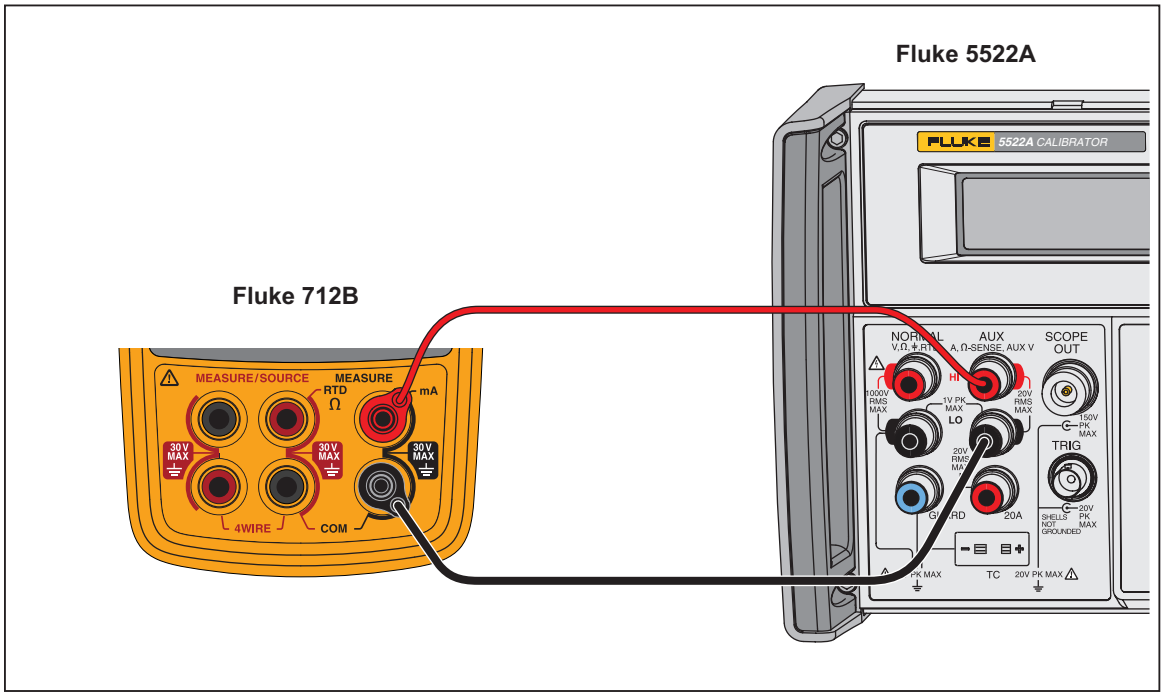
1. Push 100% on the 712B to enter the 3500 Ω input calibration mode.
2. Set the 5522A to output 3500 Ω.
   Wait approximately 10 seconds for a stable output of the 5522A.
3. Confirm the reading on the 712B.



hwp13.jpg

Adjust mA Measure

Before the calibration adjustment, set the 5522A to mA (dc) source output mode, and use one set of banana plug patch cords to connect the 712B and the 5522A, as shown in Figure 13.

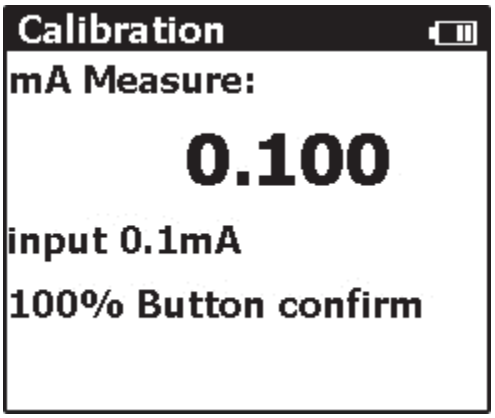


hwp022.eps

Figure 13. Adjust 712B mA Measure

Adjust 0.1 mA Input

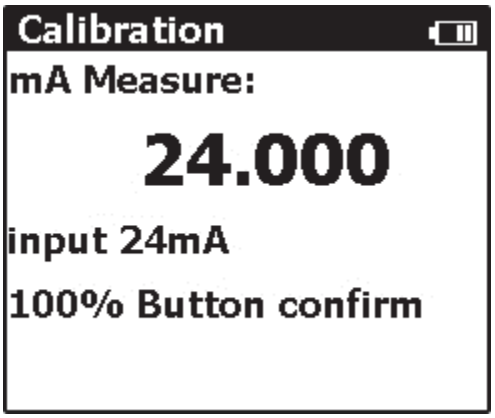
1. Set the 5522A to output 0.1 mA.
2. Push 100% on the 712B to enter 0.1 mA input calibration mode.
   Wait approximately 10 seconds for a stable output of the 5522A.
3. Confirm the reading on the 712B.



hwp14.jpg

Adjust 24 mA Input

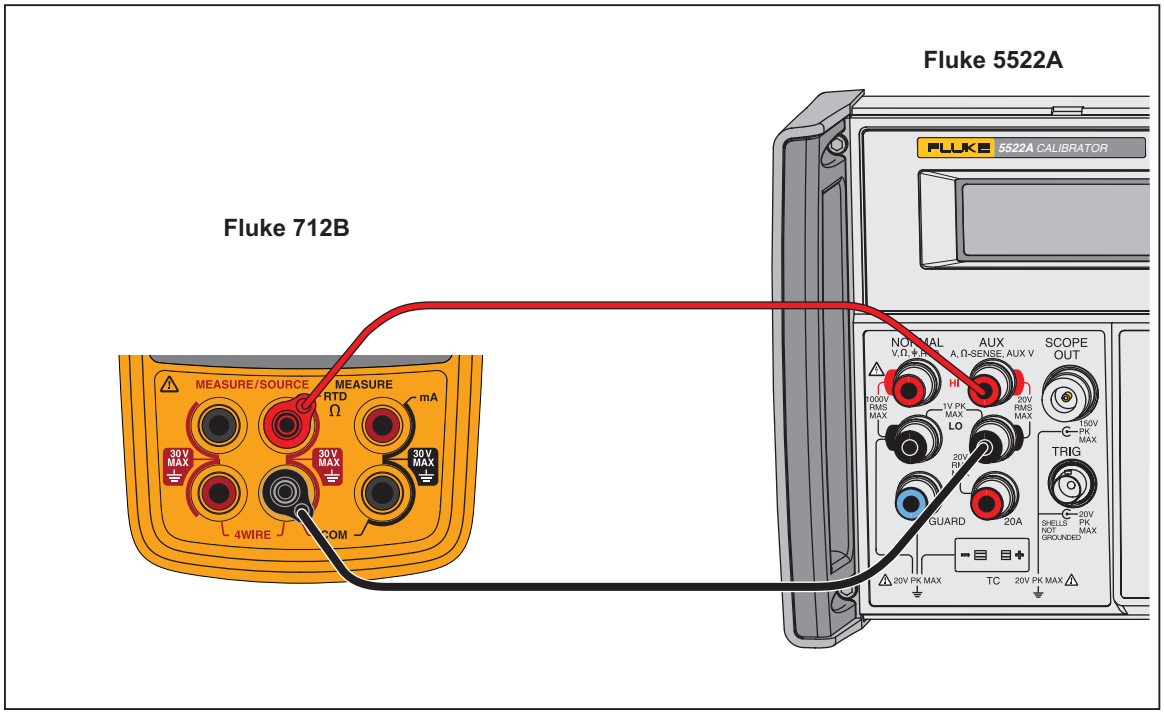
1. Set the 5522A to output 24 mA.
2. Push 100% on the 712B to enter 24 mA input calibration mode.
   Wait approximately 10 seconds for a stable output of the 5522A.
3. Confirm the reading on the 712B.



hwp15.jpg

Adjust External Trigger for Ohms Source

Before the calibration, set the 5522A to mA (dc) source output mode, and use one set of banana plug patch cords to connect the 712B and the 5522A, as shown in Figure 14.

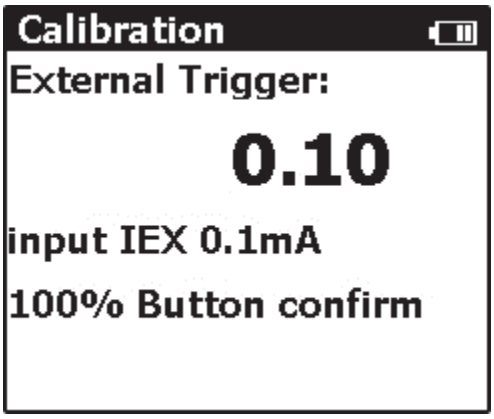


hwp005.eps

Figure 14. Adjust External Trigger for Ohms Source

Adjust 0.1 mA External Trigger

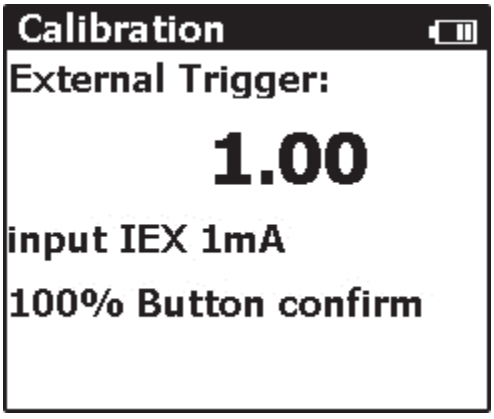
1. Set the 5522A to output 0.1 mA.
2. Push 100% on the 712B to enter 0.1 mA external trigger calibration mode.
3. Wait approximately 10 seconds for a stable output of the 5522A.
4. Confirm the reading on the 712B.



hwp16.jpg

Adjust 1 mA External Trigger

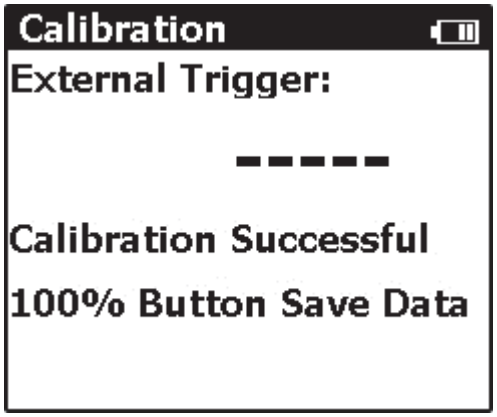
1. Set the 5522A to output 1 mA.
2. Push 100% on the 712B to enter 1 mA external trigger calibration mode.
3. Wait approximately 10 seconds for a stable output of the 5522A.
4. Confirm the reading on the 712B.



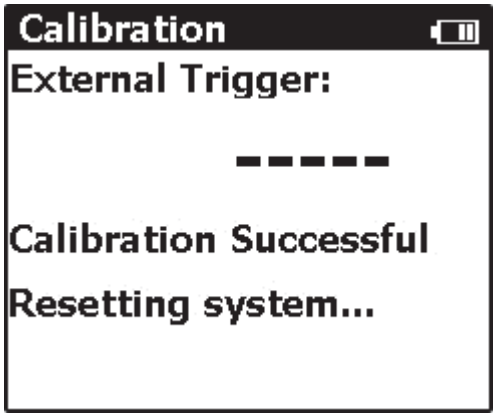
hwp17.jpg

Save Data and Reset the 712B System

After the calibration procedure described above is done, push 100% to confirm and store the calibration data. The 712B system is automatically reset.



hwp18.jpg



hwp19.jpg

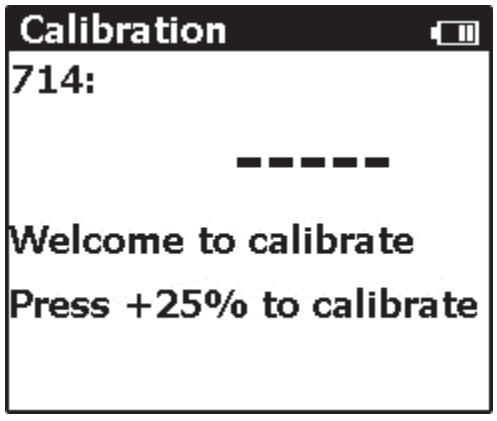
714B Calibration Adjustment

Enter Calibration Mode

To enter manual calibration mode:

1. Power off the Product.
2. Push and hold down ▭ and 25% at the same time.
3. Push and then release ⏻.
4. Release ▭ and 25%.

   The Welcome screen shows.
5. After a warmup period of approximately 5 minutes, start the calibration adjustment.



hwp20.jpg

Use 8508A to Adjust the 5522A Output

To use the 8508A to calibrate the 5522A output:

1. Connect the voltage output terminals of the 5522A with the voltage input connectors of the 8508A via the pure copper cables.
2. Set the resolution of DCV measurement mode to 7 1/2-digits or above.
3. Adjust the output of the 5522A until the reading of the 8508A is -10 mV ±0.2 µV, and record the voltage setting of the 5522A (=*Voltage*$_{-10mV}$ *Setting*).
4. Adjust the output of the 5522A until the reading of the 8508A is 75 mV ±0.2 µV, and record the voltage setting of the 5522A (=*Voltage*$_{75mV}$ *Setting*).

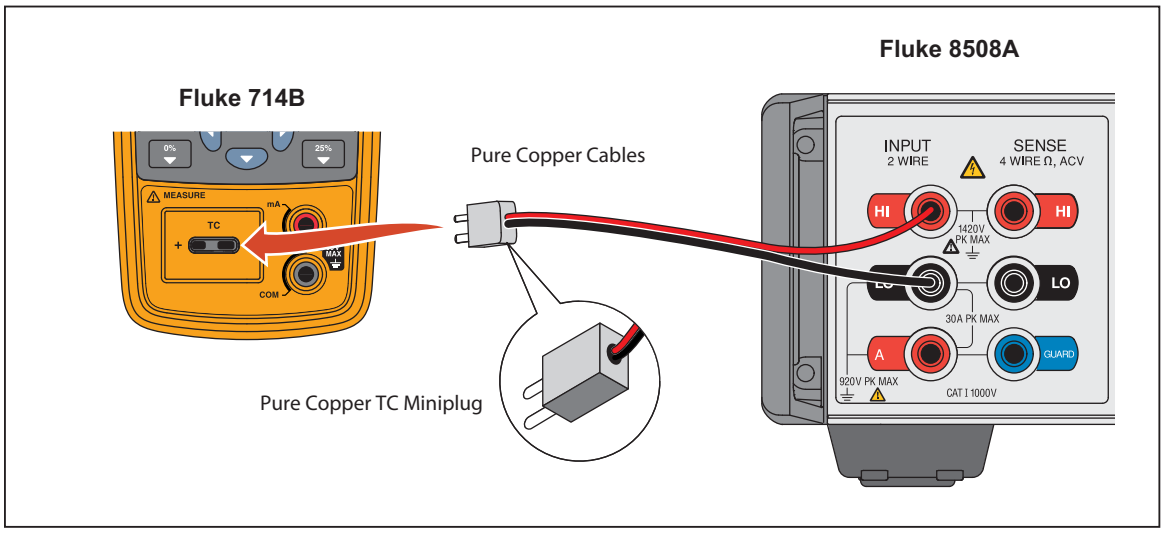
Note

The two voltage setting records are used to calibrate the UUT.

Adjust mV Source

To calibrate the 714B mV Source function:

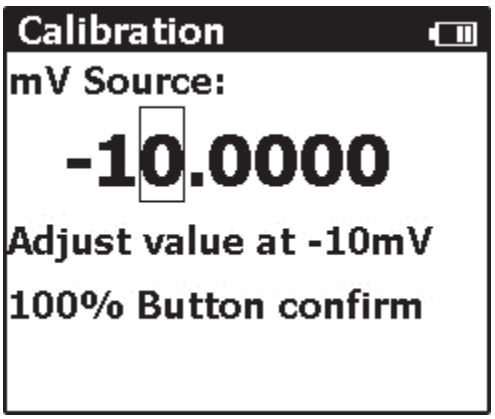
1. Connect the 714B TC mini plug and the 8508A with pure copper cables, as shown in Figure 15.



hwp006.eps

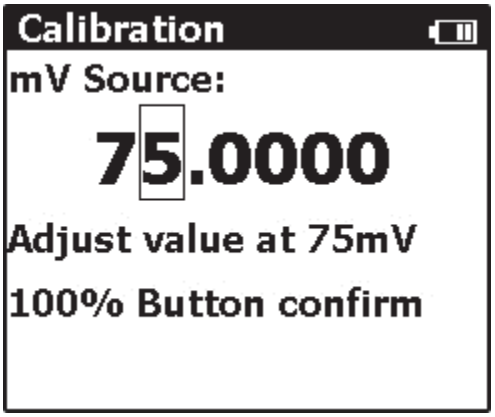
Figure 15. Connect the 714B to the 8508A

2. Push 25% to enter -10 mV Source calibration mode.
3. Input the reading on the 8508A to the 714B.



hwp21.jpg

4. Push 100% to enter the 75 mV source calibration mode.

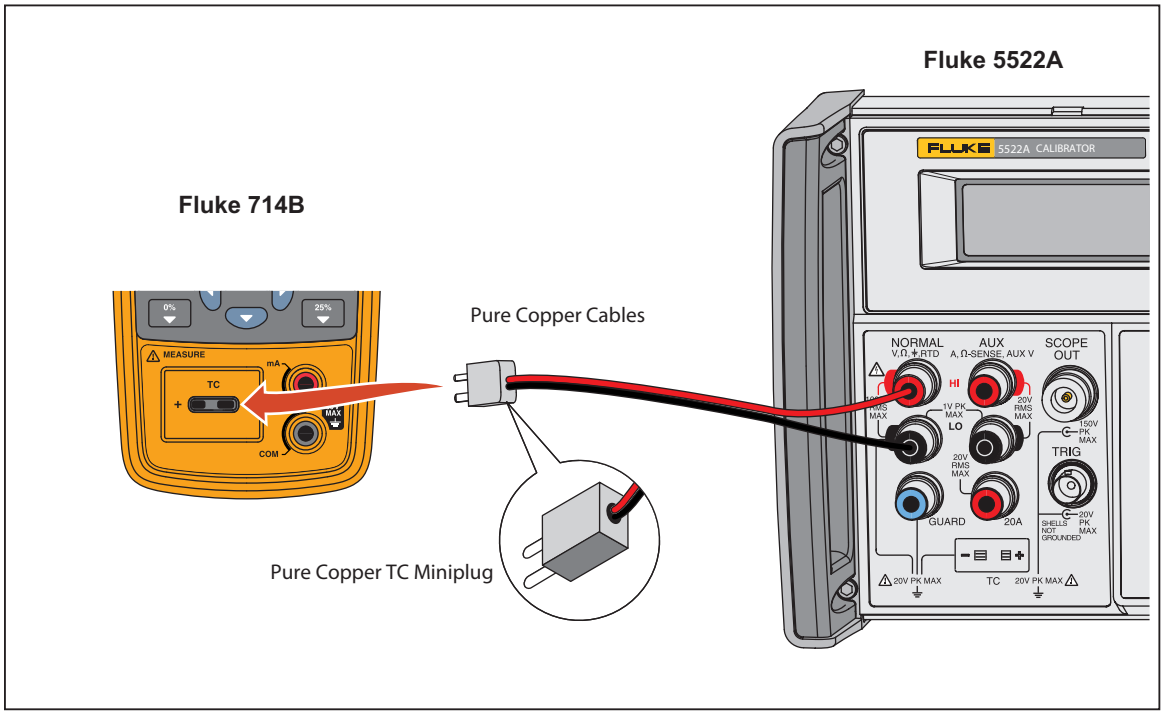


hwp22.jpg

5. Input the new reading on the 8508A to the 714B.
6. Push 100% to confirm.

Adjust mV Measure

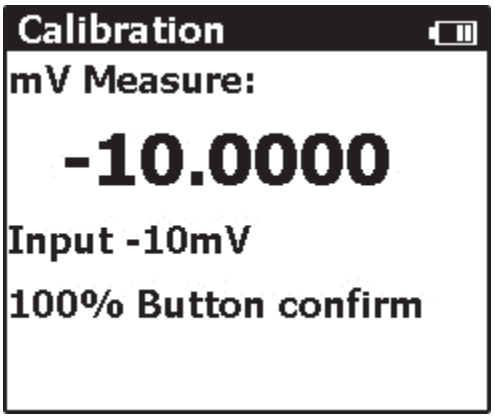
1. Connect the 714B TC mini plug to the 5522A with pure copper cables, as shown in Figure 16.



hwp007.eps

Figure 16. Adjust 714B mV Measure

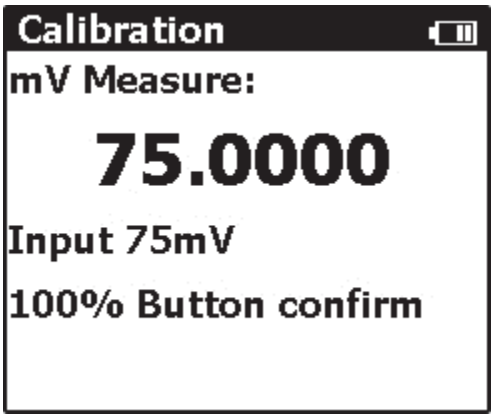
The 5522A outputs the value (*Voltage*$_{-10mV}$ *Setting*).



hwp23.jpg

The 5522A outputs the value (*Voltage*$_{75mV}$ *Setting*).

2. After approximately 10 seconds, push 100% to calibrate the value.



hwp24.jpg

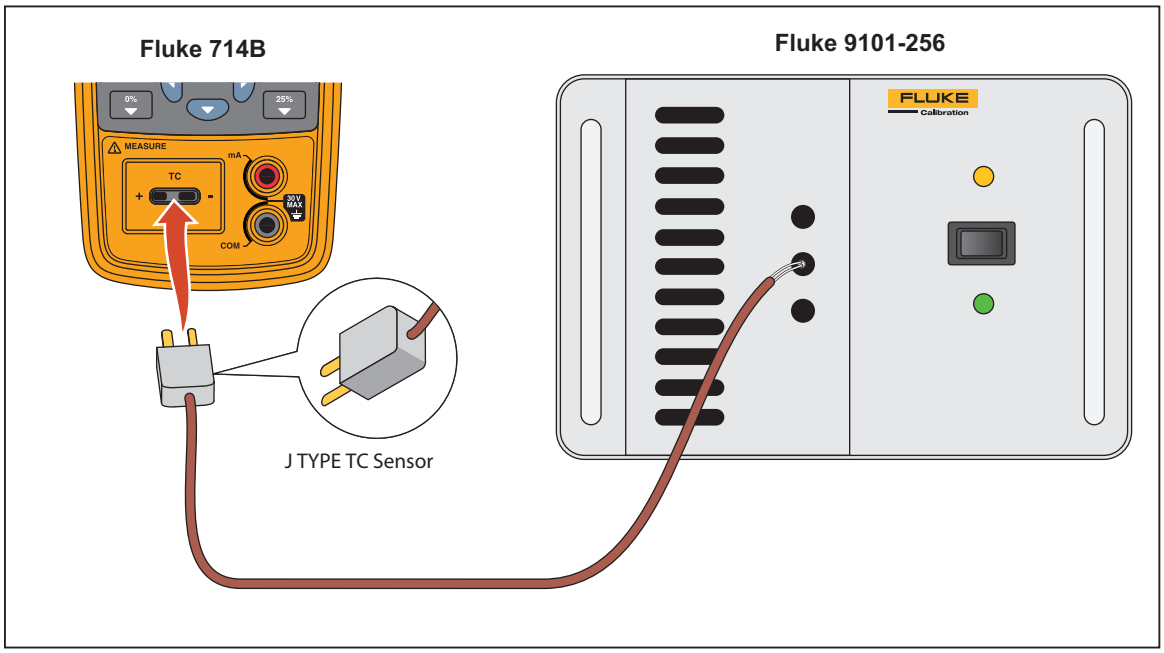
Adjust Internal Cold Junction Temperature

Use the Fluke 9101-256 or a lag bath to calibrate the internal cold junction temperature.

Use the Fluke 9101-256

To use the Fluke 9101-256 to calibrate the internal cold junction temperature:

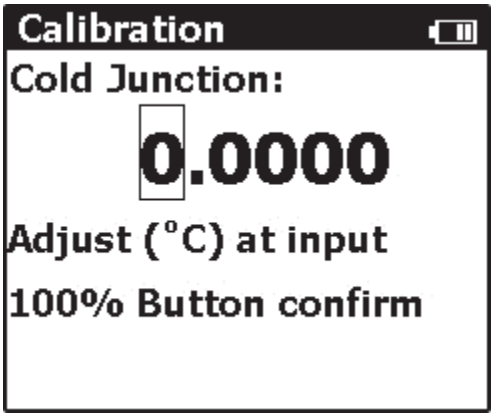
1. Connect the Fluke 9101-256 and the 714B via the J type thermocouple sensor, as shown in Figure 17.



hwp008.eps

Figure 17. Connect the 714B to the Fluke 9101-256

2. After the J type thermocouple is inserted, wait approximately 5 minutes for the temperature reading to stabilize.



hwp25.jpg

3. Push 100% to calibrate the cold junction temperature.

Use a Lag Bath

To use a lag bath to calibrate the internal cold junction temperature:

1. Connect the lag bath and the 714B via the J type thermocouple sensor, and immerse the thermocouple and a precision mercury thermometer in the mineral oil lag bath, as shown in Figure 18.
2. After the thermocouple is inserted, wait approximately 5 minutes for the temperature reading to stabilize.
3. Record the reading on the standard sensor, and input the reading to the 714B.
4. Push 100% to calibrate the cold junction temperature.

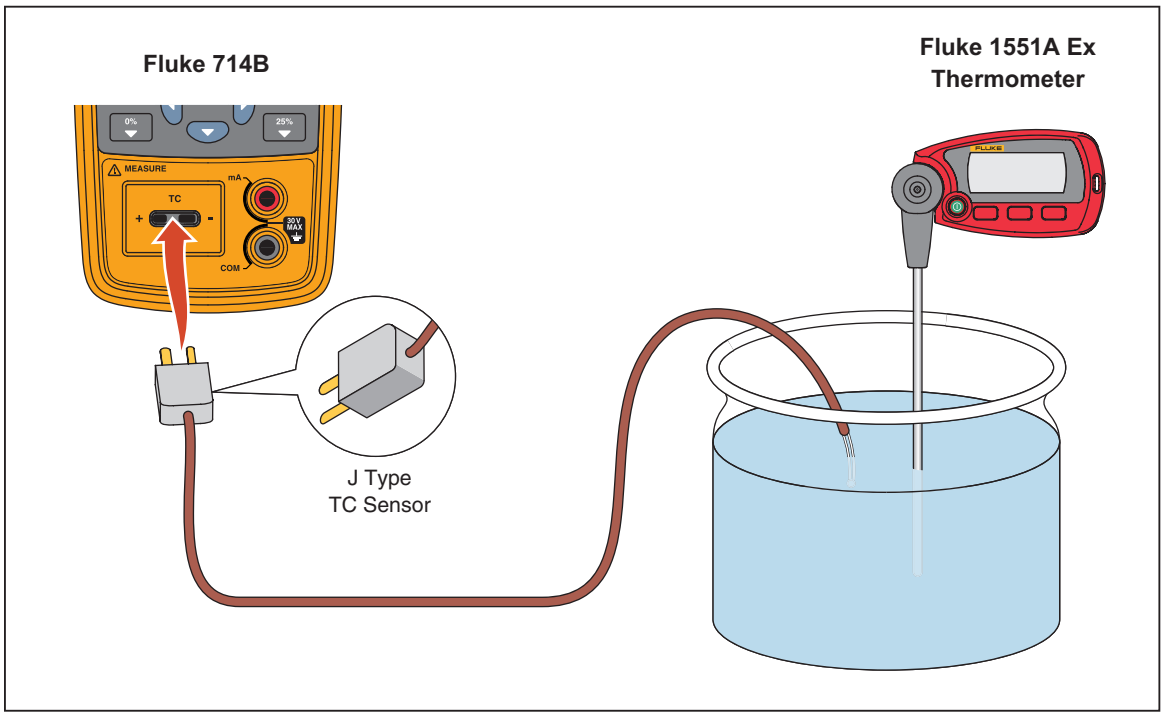


Figure 18. Use Lag Bath to Adjust Cold Junction Temperature

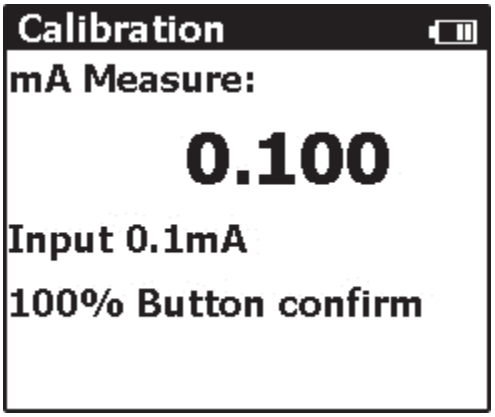
Note

The mercury thermometer can be replaced with other standard temperature sensors. The temperature of the lag bath should be within ±2 °C of ambient temperature.

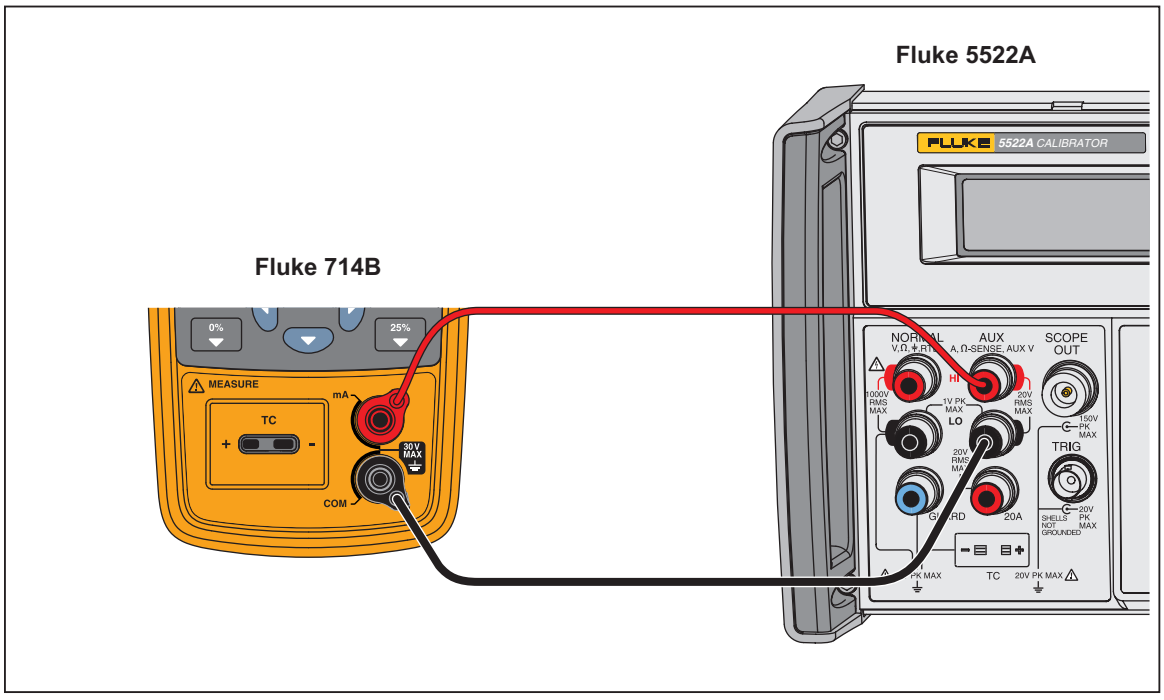
Adjust mA Measure

1. Connect the 5522A and the 714B via the Fluke-75X-8014 cable, as shown in Figure 19.

   The 5522A outputs 0.1 mA.



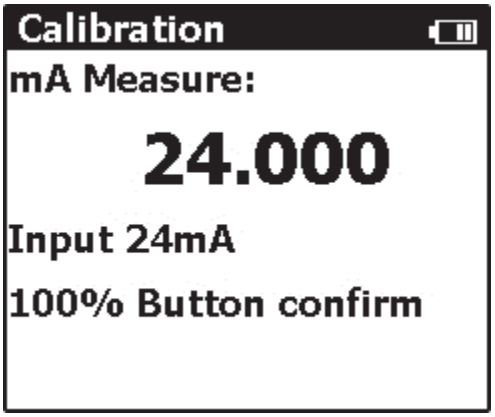
hwp26.jpg



hwp023.eps

Figure 19.714B and 5522A mA Channel Connections

2. Push 100%. The 5522A outputs 24mA.

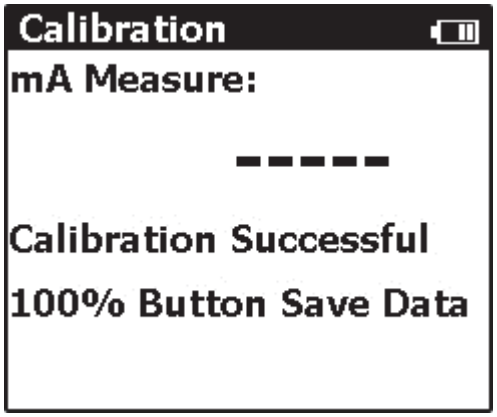


hwp27.jpg

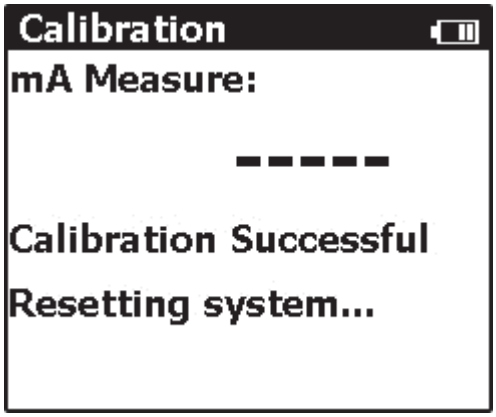
3. Push 100% to adjust.

Save Data and Reset the 714B System

After the calibration procedure described above is done, push 100% to confirm and store the calibration data. The 714B system is automatically reset.



hwp28.jpg



hwp29.jpg

User-Replaceable Parts and Accessories

⚠⚠ Warning

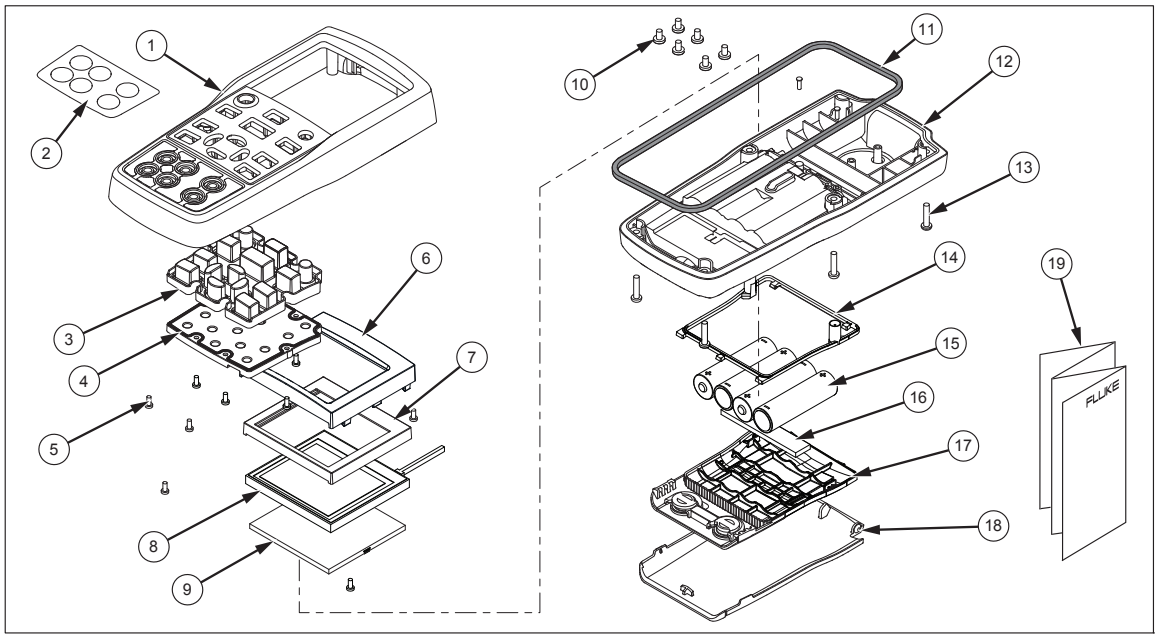
To prevent possible electrical shock, fire, or personal injury, use only specified replacement parts.

User-replaceable parts for the 712B are listed in Table 13 and shown in Figure 20. User-replaceable parts for the 714B are listed in Table 14 and shown in Figure 21. For more information about these items, contact a Fluke representative. See the “Contact Fluke” section of this manual.

Table 13. User-Replaceable Parts and Accessories for 712B

Item	Description	Part Number
①	Case top	4307068
②	Decal	4307164
③	Keypad	4307147
④	Keypad support	4307112
⑤	Screw, M2.2 x 0.8, 5 MM, PAN, PHILLIPS	2032777
⑥	LCD mask	4307101
⑦	LCD protect rubber	4307208
⑧	LCD	4313462
⑨	Support LCD gasket	4307213
⑩	Screw, M3 x 0.5,5MM, PAN, PHILLIPS	2032811
⑪	Case seal rubber	4307186
⑫	Case bottom assembly	4307079
⑬	Screw, M3, 13.5 mm, PAN, PHILLIPS	2388382
⑭	Battery door seal rubber	4307199
⑮	AA battery	376756
⑯	Pad, battery door	4417921
⑰	Battery door assembly	4376901
⑱	Bail stand	4307093
⑲	Quick Reference Guide	4285042
Not Shown	754-8016 alligator clip set	4253535
Not Shown	Stackable test lead set	3669716
Not Shown	Test Leads	variable[1]
Not Shown	Alligator Clips	variable[1]

[1] See www.fluke.com for more information about the test leads and alligator clips available for your region.



hqu46.eps

Figure 20.User-Replaceable Parts and Accessories for 712B

Table 14. User-Replaceable Parts and Accessories for 714B

Item	Description	Part Number
①	Case top	4307120
②	Decal on case top	4307173
③	TC cap	4369726
④	Keypad	4307158
⑤	Keypad support	4307112
⑥	Screw, M2.2 x 0.8, 5 mm, PAN, Philips	2032777
⑦	TC plate	4307381
⑧	Screw, M3-0.5 x 5 mm, Philips	2032811
⑨	LCD mask	4307135
⑩	LCD protect rubber	4307208
⑪	LCD	4313462
⑫	Support LCD gasket	4307213
⑬	Case seal rubber	4307186
⑭	Case bottom assembly	4307079
⑮	Screw, M3, 13.5 mm, PAN, Philips	2388382
⑯	Battery door seal rubber	4307199
⑰	AA battery	376756
⑱	Pad, battery door	4417921
⑲	Battery door assembly	4376901
⑳	Bail stand	4307093
㉑	Quick Reference Guide	4285039
㉒	TC plugkit, K type	773135
Not Shown	Test Leads, not shown	variable[1]
Not Shown	Alligator Clips	
[1] See www.fluke.com for more information about the test leads and alligator clips available for your region.		

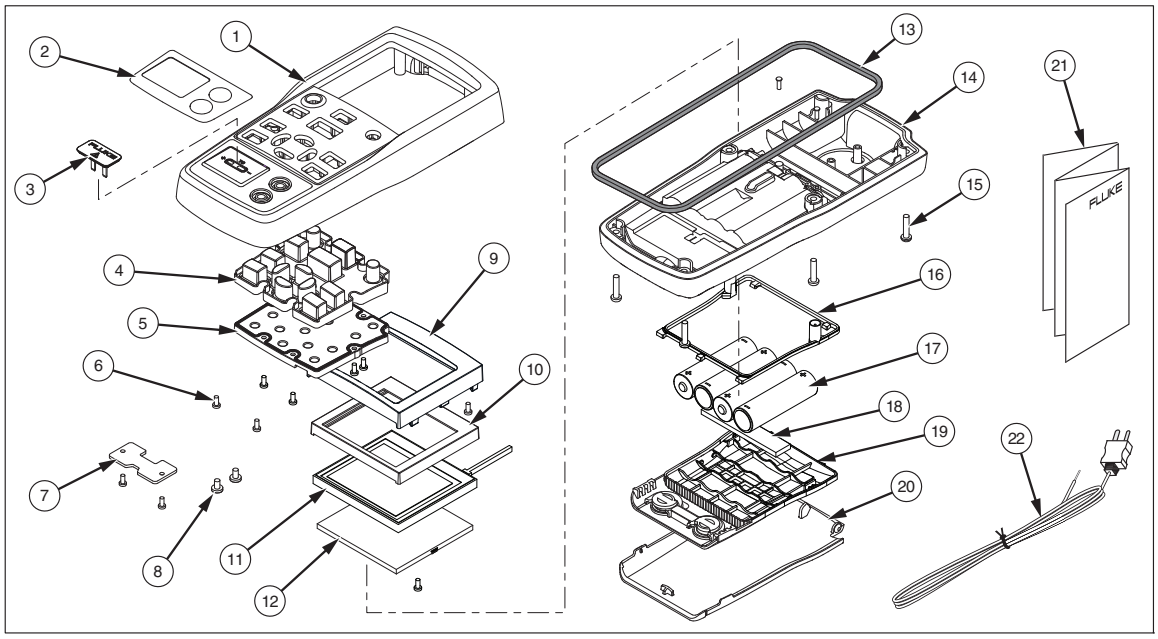


Figure 21. User-Replaceable Parts and Accessories for 714B