Practical Instrument Electronics	**PIE Model 525B FIELD CALIBRATION PROCEDURE**	DOCUMENT NO. **525B-0300**	34 May Street Suite 3.14 Webster New York 14580 Phone (585) 872-9350 Fax (585) 872-2638
Created by: Jed W	DATE: 4-13-2015	Sheet 1 of 10	

Rev.	Date	Appd	CHANGE	Approved
A	04-13-15	JBW	INITIAL RELEASE	*MJK 04-24-15*
B	01-03-18	JBW	CHANGED ADDRESS	*MJK 01-08-18*

Equipment Needed:

1) Precision DC Voltage Meter with accuracy of
    a. ±0.0032 mV @ 0, and 83.000 mV
2) Precision DC Voltage Source with resolution of
    a. ±0.0001 mV @ 83 mV
3) Precision Ohm Meter with accuracy of
    a. ±0.028 Ohms @ 0.000 and 400.000 Ohms with 1 mA excitation current
    b. ±0.23 Ohms @ 0.00 and 4000.00 Ohms with 100 µA excitation current
4) Precision 100 Ω Resistor accurate to ±0.016 Ohms
5) 2 sets of quality test leads with banana plugs.

Abbreviations:

UUC = Unit Under Calibration = PIE Model 525B

Disassembly:

Begin by removing the Boot, EZ-Dial™ Knob and the nut under the knob. Next turn the unit over and remove the battery cover, the batteries, and the four black Phillips head corner screws. While holding the PIE 525B in one hand, carefully remove the top of the housing. Place the EZ-DIAL knob back on to make adjusting the calibrator easier.
Place fresh batteries in and allow 15 minutes for the Model 525B to stabilize to the ambient temperature.

Enabling Calibration:

On the back side of the PCB is a pair of small switches (Dual in Line Package or DIP Switches). Move DIP switch 2 (the switch on the right) up (ON). Turn the UUC / Unit Under Calibration /PIE 525B ON. The word “CALIBRATION” will appear on instead of the normal splash screen. Verify it is in calibration mode by making sure the word “CAL” is in the upper left corner of the display.

As you calibrate the PIECAL 525B please be patient and wait a few seconds after you press the knob to store values before double clicking the knob to go to the next step.

This is the SOURCE section of the calibration procedure

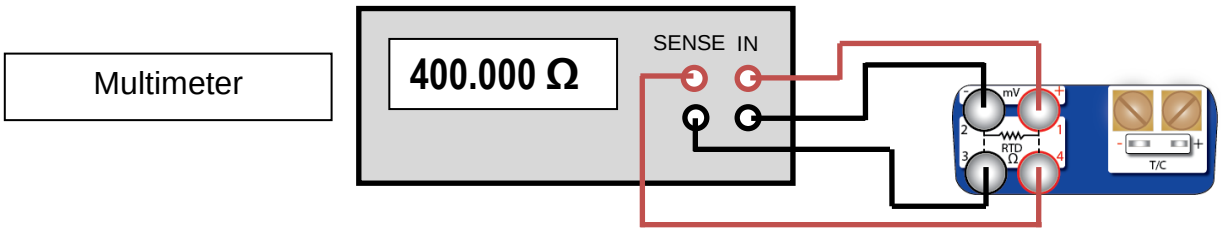
Source Ohms

Source 400 Ohms Range (400 Ω):

1) Connect 4 leads from the UUC to the meter using 4 wire hookup and set meter to 1mA excitation current (#.#### K Ω).
2) Move EZ-CHECK switch to LO. SOURCE 0.00 Ω should appear on the UUC display.
3) Dial the UUC output until the meter reads as close to 0.000 Ω as possible.
   NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within ±0.006 Ω.
4) Press the knob until the display shows STORE.
5) Move EZ-CHECK switch to HI. SOURCE 400.00 Ω should appear on the UUC display.
6) Dial the UUC output until the meter reads as close to 400.000 Ω as possible.
   NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within ±0.006 Ω.
7) Press the knob until the display shows STORE.
8) Double click the knob to change to the next function to be calibrated.

Source 4000 Ohms Range (4K Ω):

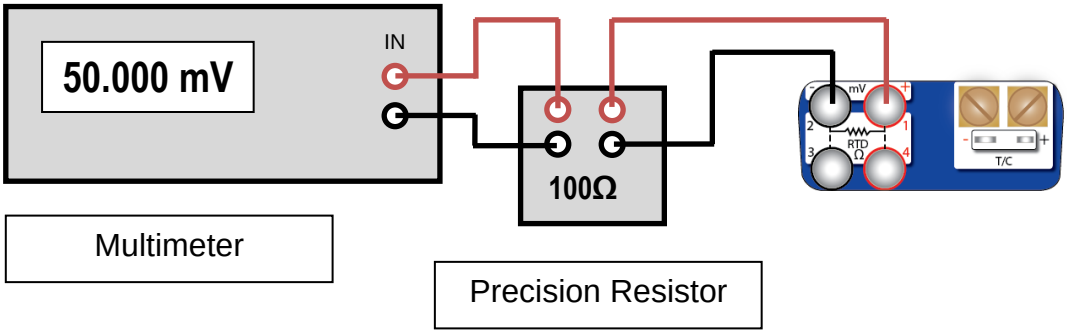
1) Connect 4 leads from the UUC to the meter using 4 wire hookup and set meter to 100 uA excitation current (##.#### K Ω).
2) Move EZ-CHECK switch to LO. SOURCE 0.00 Ω should appear on the UUC display.
3) Dial the UUC output until the meter reads as close to 0.00 Ω as possible.
   NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within ±0.06 Ω.
4) Press the knob until the display shows STORE.
5) Move EZ-CHECK switch to HI. SOURCE 4000.0 Ω should appear on the UUC display.
6) Dial the UUC output until the meter reads as close to 4000.00 Ω as possible.
   NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be ±0.06 Ω.
7) Press the knob until the display shows STORE.
8) Double click the knob to move to the next function to be calibrated.



Source mA

Open Thermocouple detection pulse (0.005 mA) & Read Ohms Excitation Current 0.500 mA) (mA Ω):

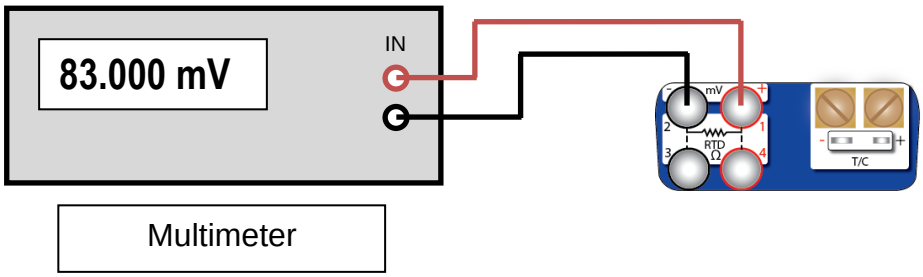
1) Connect leads from the UUC terminals 1 & 2 to a precision 100 Ω resistor. Connect another set of leads from the resistor to the meter and set meter to mV range (##.### mV)
2) Move EZ-CHECK switch to LO. SOURCE 0.0050 mA should appear on the UUC display.
3) Dial the UUC output until the meter reads as close to 0.500 mV as possible.
   NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within ±0.006 mV
4) Press the knob until the display shows STORE.
5) Move EZ-CHECK switch to HI. SOURCE 0.5000 mA should appear on the UUC display.
6) Dial the UUC output until the meter reads as close to 50.000 mV as possible.
   NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within ±0.009 mV.
7) Press the knob until the display shows STORE.
8) Double click the knob to move to the next function to be calibrated.



Source V

Source 83 mV Range (mV):

1) Connect leads from the UUC terminals 1 & 2 to DC meter and set meter to mV range (#.#### mV).
2) Move EZ-CHECK switch to LO. SOURCE 0.000 mV should appear on the UUC display.
3) Dial the UUC output until the meter reads as close to 0.000 mV as possible.
   NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within ±0.0012 mV.
4) Press the knob until the display shows STORE.
5) Move EZ-CHECK switch to HI. SOURCE 83.000 mV should appear on the UUC display.
6) Dial the UUC output until the meter reads as close to 83.000 mV as possible.
   NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within ±0.0012 mV.
7) Press the knob until the display shows STORE.
8) Double click the knob to move to the next function to be calibrated.

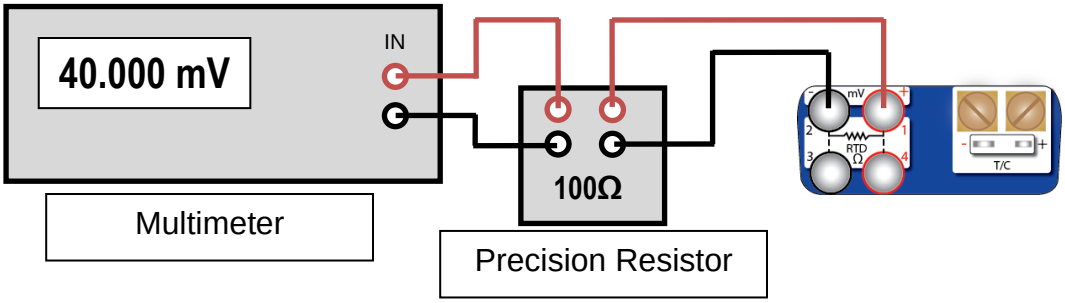


This concludes the SOURCE section of the calibration. The next steps are to calibrate the READ circuitry.

Read Ohms

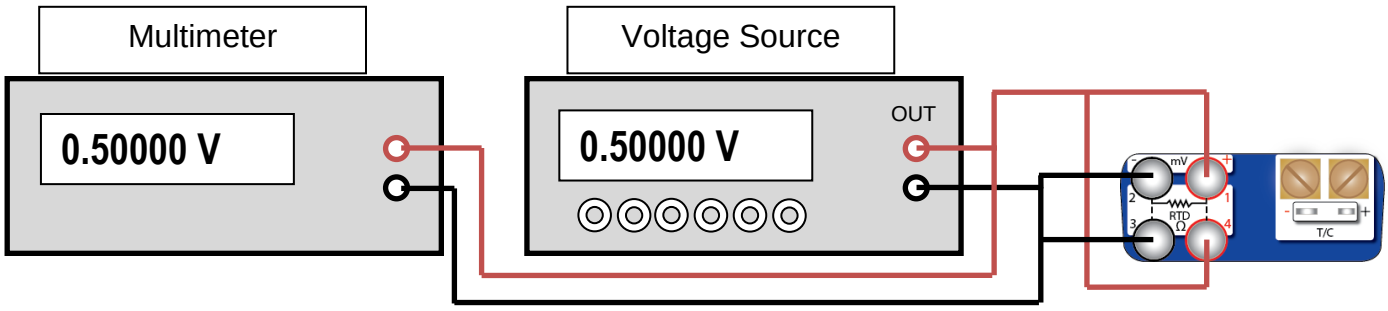
Read Ohms Excitation Current verification (mA Ω): (No Adjustments Required)

1) Switch the power switch to OFF, wait 5 seconds then move the power switch to READ.
2) Connect leads from the UUC terminals 1 & 2 to a precision 100 Ω resistor. Connect another set of leads from the resistor to the precision V meter and set meter to mV range (##.### mV).
3) Move EZ-CHECK switch to LO. VERIFY 3µA should appear on the UUC display. Verify that the meter (0.300 mV) matches the display within ±0.012 mV. If not, repeat Source Ohms Excitation Currents from the Source Ohms section of the calibration procedure.
4) Move EZ-CHECK switch to SET. VERIFY 400µA should appear on the UUC display. Verify that the meter (40.000 mV) matches the display within ±0.012 mV. If not, repeat Source Ohms Excitation Currents from the Source Ohms section of the calibration procedure.
5) Move EZ-CHECK switch to HI. VERIFY 900µA should appear on the UUC display. Verify that the meter (90.000 mV) matches the display within ±0.012 mV. If not, repeat Source Ohms Excitation Currents from the Source Ohms section of the calibration procedure.
6) Double click the knob to move to the next function to be calibrated.



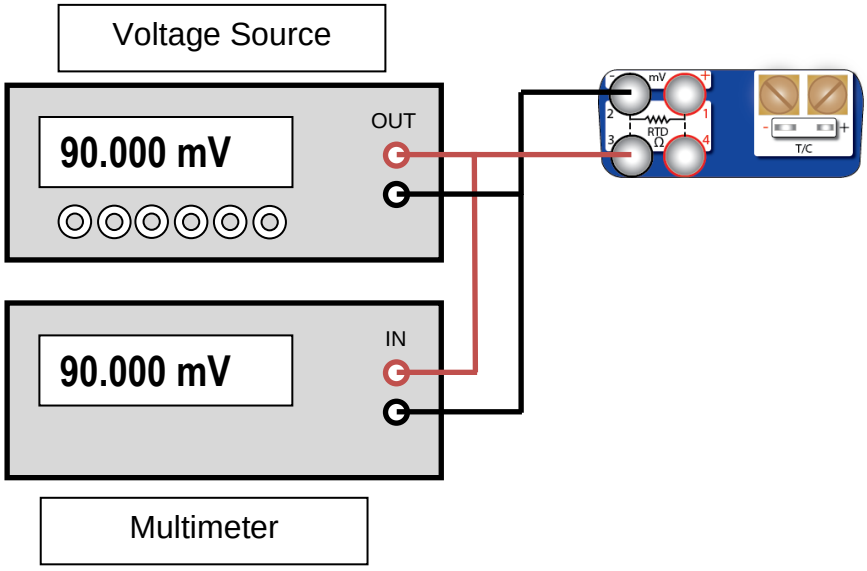
Read Ohms 2 & 4 Wire Calibration (2WV 4WV Ω):

1) Move EZ-CHECK switch to LO. APPLY 0.000 V should appear on the UUC display. Short all four (1, 2, 3 & 4) inputs together.
2) Press the knob until the display shows STORE.
3) Move EZ-CHECK switch to SET. APPLY 500 mV should appear on the UUC display.
4) Connect a precision voltage source **+** to terminals 1 & 4 and **–** to 2 & 3 on the UUC. Connect another set of leads to a precision DC voltage meter.
5) Dial the voltage source as close to 0.50000 V as possible. NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within. ±0.00004 V.
6) Press the knob until the display shows STORE.
7) Move EZ-CHECK switch to HI. APPLY 2.0 V should appear on the UUC display.
8) Dial the voltage source to as close 2.0000 V as possible. NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within ±0.0013 V.
9) Press the knob until the display shows STORE.
10) Double click the knob to move to the next function to be calibrated.



Read Ohms 3 Wire Calibration (3WV Ω):

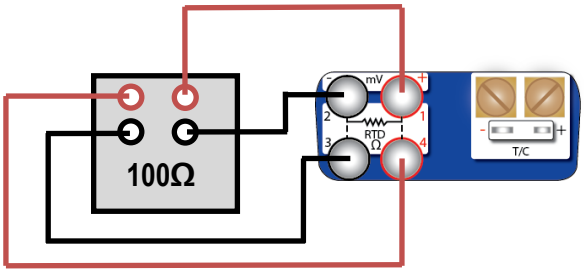
1) Short UUC terminals 2 &3 together.
2) Move EZ-CHECK switch to LO. APPLY 0.000 mV should appear on the UUC display.
3) Press the knob until the display shows STORE.
4) Move EZ-CHECK switch to HI. APPLY 90.000 mV should appear on the UUC display.
5) Connect a precision voltage source **+** to terminal 3 and **–** to 2. Connect another set of leads to a precision DC voltage meter.
6) Dial the voltage source to as close to 90.0000 mV as possible. NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within ±0.0135 mV.
7) Press the knob until the display shows STORE.
8) Double click the knob to move to the next function to be calibrated.



Note: *The Ohms verification test requires that all four leads are of equal low (< .1 ohm) resistance (equal length with identical connectors on each end).*

Read 400 Ohms Verification (400 Ω):

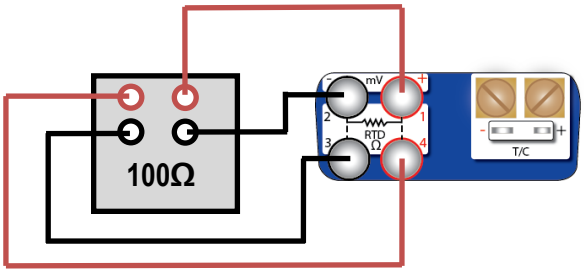
1) Connect one pair of identifiable test leads to the meter and short the ends. Note this reading (lead wire resistance) for use in steps 3 and 8.
2) Connect a precision 100 Ohm resistor to all four Ω terminals.
3) Move EZ-CHECK switch to LO (2 W). Verify display is 100.00 Ω ±0.165 Ω + Wire Resistance noted in step 1 Ω.
4) Move EZ-CHECK switch to SET (3 W). Verify display reads 100.00 Ω ±0.065 Ω.
5) Move EZ-CHECK switch to HI (4 W). Verify display reads 100.00 Ω ±0.065 Ω.
6) Double click the knob to move to the next function to be calibrated.



Precision Resistor

Read 4000 Ohms Verification (4000 Ω):

7) Connect a precision 100 Ω resistor to all four Ω terminals.
8) Move EZ-CHECK switch to LO (2 W). Verify display is 100.0 Ω ±0.165 Ω + Wire Resistance noted in step 1Ω.
9) Move EZ-CHECK switch to SET (3 W). Verify display reads 100.0 Ω ±0.065 Ω.
10) Move EZ-CHECK switch to HI (4 W). Verify display reads 100.0 Ω ±0.065 Ω.
11) Double click the knob to move to the next function to be calibrated.

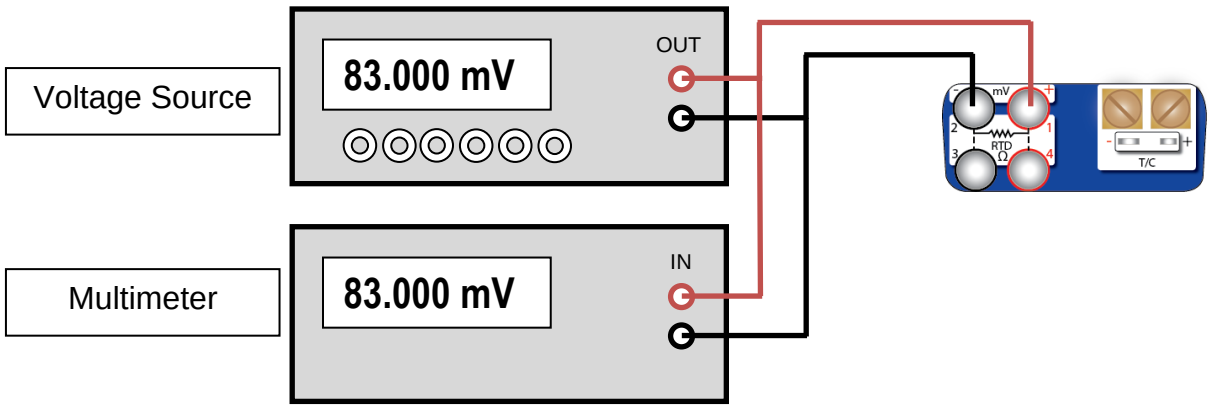


Precision Resistor

Read V

Read mV Range:

1) Short UUC terminals 1 & 2 together.
2) Move EZ-CHECK switch to LO. APPLY 0.000 mV should appear on the UUC display. Wait several seconds for the UUC's readings to stabilize (when the least significant digits stop changing)
3) Press the knob until the display shows STORE.
4) Move EZ-CHECK switch to HI. APPLY 83.000 mV should appear on the UUC display.
5) Connect a precision voltage source + to terminal 1 and – to terminal 2 and connect another set of leads to a precision volt meter.
6) Dial the precision voltage source to as close to 83.000 mV as possible.
   NOTE: This value may be above or below the target value. Always select value closest to the target value. This should be within ±0.0076 mV.
7) Press the knob until the display shows STORE.
8) Double click the knob to move to the next function to be calibrated.



Thermocouple Cold Junction Temperature & LCD Contrast

Important! The cold junction sensor is a NIST traceable thermistor that is accurate to ±0.05°C for 10 years. There should not be any need to perform the following adjustments. Perform this calibration ONLY if you require repeatability of the UUC to match other temperature device calibrated in your laboratory to within 0.05°C. If you decide not to do any of the optional adjustments skip to Completion of Calibration.

Note: There are two possible ways to calibrate the cold junction sensor.

1) Automatic Adjustment (recommended) of the UUC stores the actual cold junction temperature as measured by the cold junction thermistor.
2) Manual Adjustment (optional) of the UUC applies an offset to the UUC cold junction sensor to match thermocouple standards of the calibration laboratory.

Note: There is also an optional step to adjust the contrast of the LCD display. This is set at the factory and should not require adjustment.

Automatic Cold Junction Temperature Reading:

1) Leave all connections open
2) Move EZ-CHECK switch to SET. AUTOCAL TEMP should appear on the UUC LCD.
3) Press and hold the knob until the display shows STORE.
   NOTE: This will reset Manual Temp calibration.

Manual Cold Junction Temperature Reading:

1) Leave all connections open
2) Move EZ-CHECK switch to LO. MANUAL CAL TEMP should appear on the UUC LCD.
3) Dial the UUC to the Desired CJC temperature as measured by the temperature probe.
4) Press and hold the knob until the display shows STORE.

Contrast Adjustment:

1) Move EZ-CHECK switch to HI. CAL CONTRAST should appear on the UUC LCD.
2) Dial the UUC to the Desired LCD contrast
3) Press and hold the knob until the display shows STORE

Completion of Calibration

Turn the UUC OFF and Move DIP switch 2 (the switch on the right) down toward the batteries (OFF). The next time the unit is turned on the PIECAL 525B will be calibrated and in normal operational mode. Reassemble in reverse order from disassembly.