

FIELD CALIBRATION PROCEDURE FOR ALTEK MODEL 820

Drawing # 1-1125

Date	Rev.	Revision Record	Dr.	Review	Approve
16 July 97	A	Initial Production Release	MJK	PBG	RPC
28 July 97	B	Updated Release of 820 Field Calibration	MJK	PBG	RPC
3 Sept 97	C	Changed Read OHM Calibration	MJK	PBG	RPC
15Sept98	D	Added Equipment for RTD & Type K T/C Wire	MJK	DJN	RPC

Suggested Equipment:

1. Thermocouple Source with accuracy of ± 0.25 °C (Altek model 322 or 422). If not available see alternate equipment.
2. Type K Thermocouple wire.
3. Precision Current Meter with accuracy of $\pm 0.023\%$ of reading at 24mA.
4. Precision Voltmeter with accuracy of $\pm 0.015\%$ of reading at 110mV, $\pm 0.037\%$ of reading at 10.25V and $\pm 0.006\%$ of reading at 400mV for RTD.
5. Precision Frequency Meter with accuracy of $\pm 0.038\%$ of reading at 1000Hz and 10.00KHz.
6. Precision Current Source with accuracy of $\pm 0.023\%$ of setting at 24mA and ± 0.0187 of setting at 1mA for RTD.
7. Precision DC Voltage Source with accuracy of $\pm 0.015\%$ of setting at 110mV, $\pm 0.037\%$ at 10.25V and 0.513% at 200.0V.
8. Precision Ohm Source with accuracy of $\pm 0.015\%$ of setting at 1000.0 Ω .
9. Precision AC Voltage Source with accuracy of $\pm 0.51\%$ of setting at 250VAC.

Alternate Equipment

1. If a Thermocouple Source is not available use a stable ice bath (See note 1 for construction details). Stable to within ± 0.25 °C.
OR
Electronic Ice Point Reference Cell. Stable to within ± 0.25 °C.
2. Type K Thermocouple probe that is N.I.S.T. traceable.

ENABLING CALIBRATION:

Place in fresh batteries and allow one hour for the Model 820 to stabilize to the ambient temperature of the calibration room. Remove the battery cover and the four black Phillips head screws. While holding the 820 face down in one hand, carefully separate the top and bottom of the housing. Place the unit into Calibration mode by placing the jumper (JP101) located on the top right hand side of the board into the shorted position (See Figure 1). Verify the 820 is in Calibration mode by viewing the top of the LCD for the word SETUP.

SOURCE MODE CALIBRATION:

Verify the 820 is in source mode by viewing the top left corner of the LCD for the word SOURCE. If the 820 is not in source mode, press the SOURCE/READ button until SOURCE appears.

SOURCE mA:

1. Switch the 820 to mA.
2. Lo Calibration: Connect terminals 1 and 2 from the 820 to a Current Meter (See figure 2). Dial the 820 so the meter reads 0.000mA. Press *STORE*; make sure you hear a beep, then press *RANGE/TYPE*.
3. Hi Calibration: Dial the 820 so the meter reads 20.000mA. Press *STORE*; make sure you hear a beep, then press *SOURCE/READ*.

SOURCE 2-WIRE:

1. Press the *RANGE/TYPE* button once to switch to 2-WIRE mode.
2. Lo Calibration: Disconnect all wires to have an open loop and press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. 2 Wire Configuration: Connect terminals 3 and 4 from the 820 in series with a Voltage Source (Set to 12V) and a Current Meter (See figure 3).
4. Hi Calibration: Dial the 820 so the meter reads 20.000mA. Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.

SOURCE PWR XMTR:

1. Press the *RANGE/TYPE* button once to switch to PWR XMTR mode.
2. Lo Calibration: Leave terminals 1 and 2 open. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
4. Hi Calibration: Connect terminals 1 and 2 from the 820 in series with a Current Meter and an Ohm Source (See figure 4). Dial the Ohm Source so the Current Meter reads 20.00mA. Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.

SOURCE mV:

1. Switch the 820 to Vdc. Connect terminals 1 and 2 from the 820 to a Voltage Meter (See figure 5).
2. Lo Calibration: Dial the 820 until the meter reads 0.00mV. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. Hi Calibration: Dial the 820 until the meter reads 100.00mV. Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.

SOURCE V :

1. Press the *RANGE/TYPE* button once to switch to V. Leave the same connection as in source mV.
2. Lo Calibration: Dial the 820 until the meter reads 0.00V. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. Hi Calibration: Dial the 820 until the meter reads 10.00V. Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.

SOURCE OHMS & RTD:

1. Switch the 820 to OHMs.
2. Lo Calibration A (mV): Place the toggle switch in the LO position. Short terminals 1 and 2. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. Lo Calibration B (mA): Disconnect the short and place the toggle switch to the HI position. Connect a Current Source (Set to 0mA) to terminals 1 and 2 of the 820. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
4. Hi Calibration: Switch the toggle switch to the middle position. Connect a Current Source (Set to 1mA) and a Voltage Meter to terminals 1 and 2 of the 820 (See figure 6). Dial the 820 until the meter reads 0.400V and press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.

SOURCE FREQUENCY:

1. Switch the 820 to *FREQ*. Connect terminals 1 and 2 from the 820 to a Frequency meter.
2. Dial the 820 to 5 KHz and check for accuracy of ± 0.02 KHz.
3. Press the *RANGE/TYPE* button once to switch to Hz. Dial the 820 to 500 Hz and check for accuracy of ± 2 Hz.

READ MODE CALIBRATION:

Verify the 820 is in read mode by viewing the top left corner for the word READ. If the 820 is not in read mode press the SOURCE/READ button until READ appears.

READ mA:

1. Switch the 820 to mA. Make sure all wires are disconnected.
2. Lo Calibration: Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. Hi Calibration: Connect a Current Source (Set to 20mA) to terminals 3 and 4 of the 820 (See figure 7). Press *STORE*;, make sure you hear the beep, then press *SOURCE/READ*..

READ mV:

1. Switch the 820 to Vdc.
2. Lo Calibration: Short terminals 3 and 4 of the 820. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. Hi Calibration: Connect a Voltage Source (Set to 100.00mV) to terminals 3 and 4 of the 820 (See figure 8). Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*..

READ V:

1. Change the range to 10.25V (x.xxV) by pressing the *RANGE/TYPE* button.
2. Lo Calibration: Short terminals 3 and 4 of the 820. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. Hi Calibration: Connect a Voltage Source (Set to 10.00V) to terminals 3 and 4 of the 820 (See figure 8). Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.

READ HI V:

1. Change the range to 200.0V (x.xV) by pressing the *RANGE/TYPE* button.
2. Lo Calibration: Short terminals 4 and 5 of the 820. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. Hi Calibration: Connect a Voltage Source (Set to 200V) to terminals 4 and 5 of the 820 (See figure 9). Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.

READ T/C :

- 1: Switch the 820 to T/C. Place the toggle switch to the center position. Connect a Voltage Source to the T/C terminal of the 820 (See figure 10).
- 2: Lo Calibration: Source 0.0mV into the 820. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
- 3: Hi Calibration: Source 80.0mV into the 820. Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.
- 4: Switch the toggle switch to the HI position. Connect a K type T/C wire to the 820 at the T/C terminals (See figure 11). Connect the other end to a Thermocouple Source. Source for 75°F and wait 5 minutes for temperature differences to settle. Dial the 820 to 75 °F. Please wait 10 seconds between adjustments. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
- 5: If a Thermocouple Source is not available place the other end of the T/C probe into an icebath as described in note 1 or an ice point reference cell. Wait approximately 10 minutes for temperature differences to settle. Dial the 820 until it reads 32.0°F (Or a value that compensates correctly for any known inaccuracies of the thermocouple probe). Please wait 10 seconds between adjustments to allow the 820 time to recalculate the cold junction compensation. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.

READ OHMs:

1. Switch the 820 to OHMs.
2. Lo Calibration: Short terminals 1, 2 and 3 of the 820. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. Hi Calibration: Connect an Ohms Source (Set to 1000Ω) to terminals 1, 2 and 3 on the 820 (See figure 12). For maximum accuracy, the three leads should be of equal length. Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.

READ RTD:

1. Switch the 820 to RTD.
2. Lo Calibration: Short terminals 1, 2 and 3 on the 820. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. Hi Calibration: Connect an Ohms Source (Set to 400Ω) to terminals 1, 2 and 3 of the 820 (See figure 13). For maximum accuracy, the three leads should be of equal length. Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.

READ VAC:

1. Switch the 820 to Vac.
2. Lo Calibration: Short terminals 4 and 5 of the 820. Press *STORE*; make sure you hear a beep, then *RANGE/TYPE*.
3. Hi Calibration: Connect an AC Voltage Source (Set to 240V 60Hz) to terminals 4 and 5 of the 820(See figure 9). Press *STORE*; make sure you hear the beep, then press *SOURCE/READ*.

COMPLETION OF CALIBRATION:

Turn the 820 off. Place the 820 into normal operating mode by placing the jumper located on the top right hand side of the board on to just one of the jumper pins (See figure 1).

Note 1

1. Prepare a thermos (or equivalent vacuum insulated bottle) by drilling a hole in its cap to accept the thermocouple or use a standard laboratory cork.
2. Fill the thermos with shaved or crushed ice made from distilled water.
3. Fill the thermos with enough distilled water so that the ice becomes slush, but not enough to float the ice.
4. Replace the thermos cap or cork and insert the thermocouple.

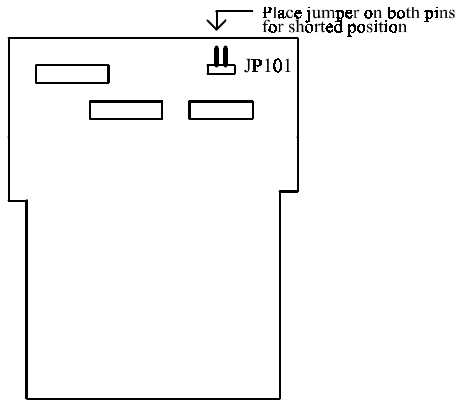


FIGURE 1

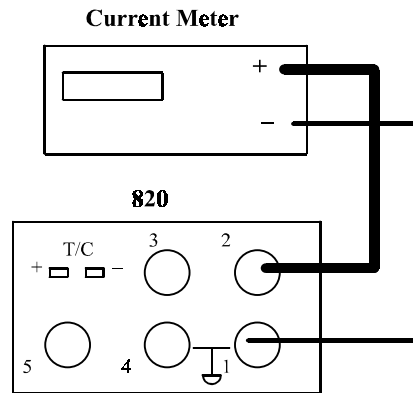


FIGURE 2

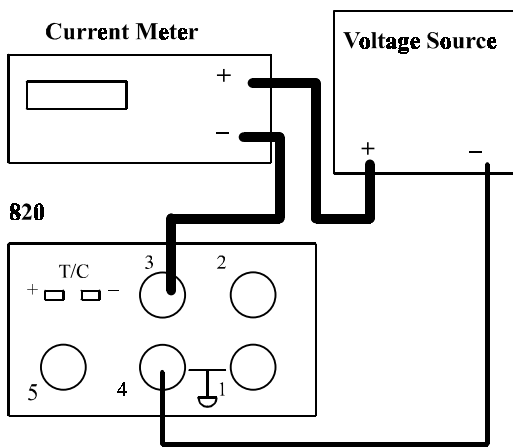


FIGURE 3

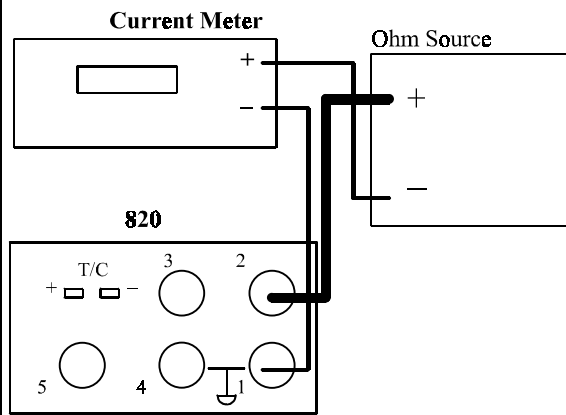


FIGURE 4

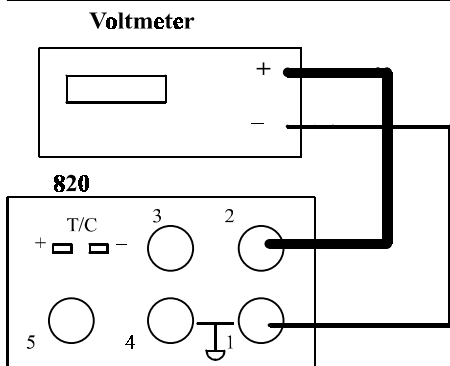


FIGURE 5

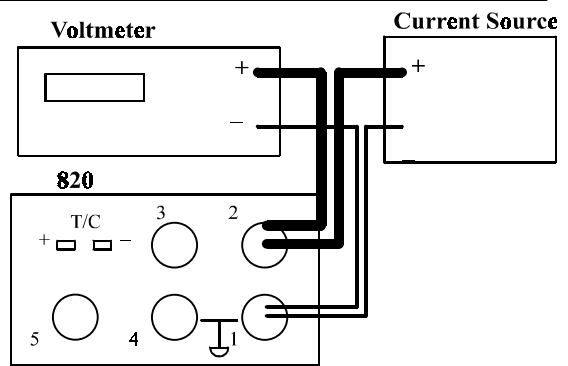


FIGURE 6

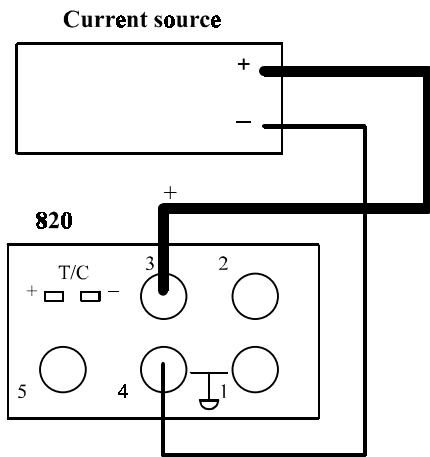


FIGURE 7

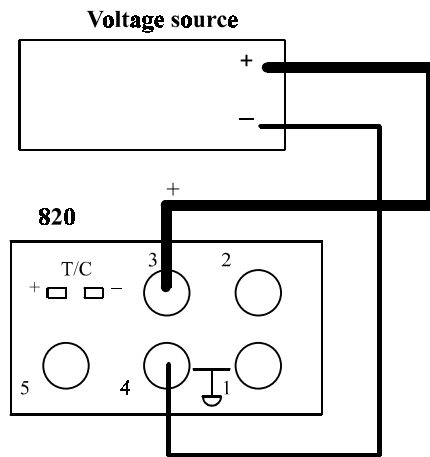


FIGURE 8

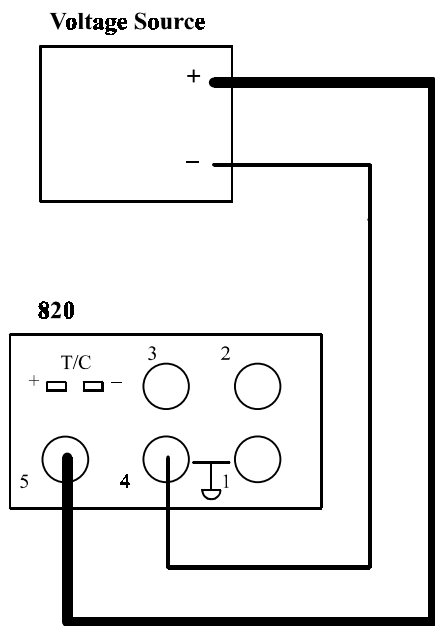


FIGURE 9

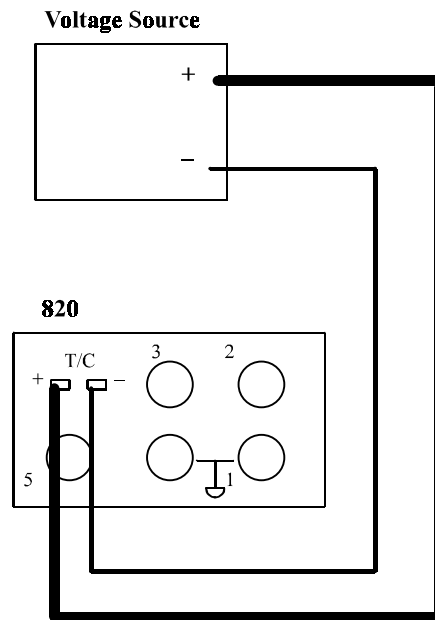
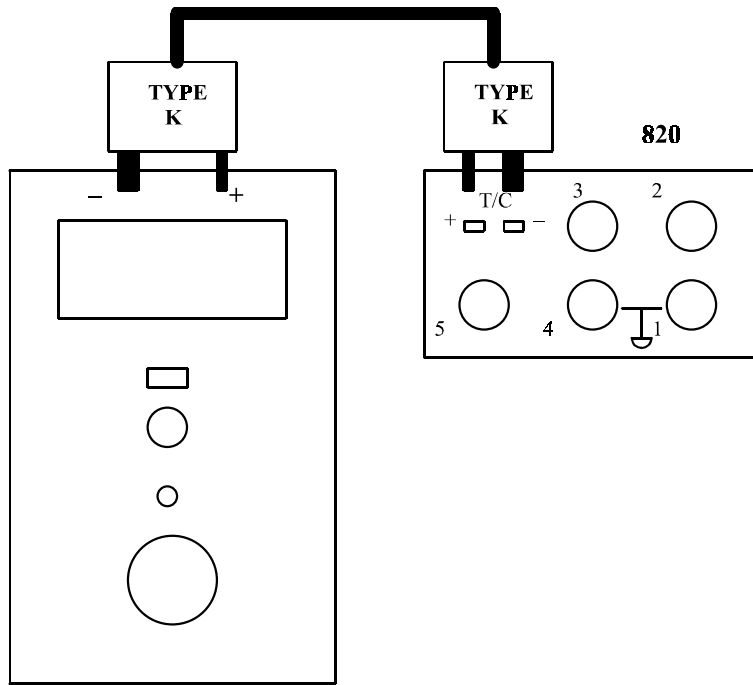


FIGURE 10



Thermocouple Source **FIGURE 11**

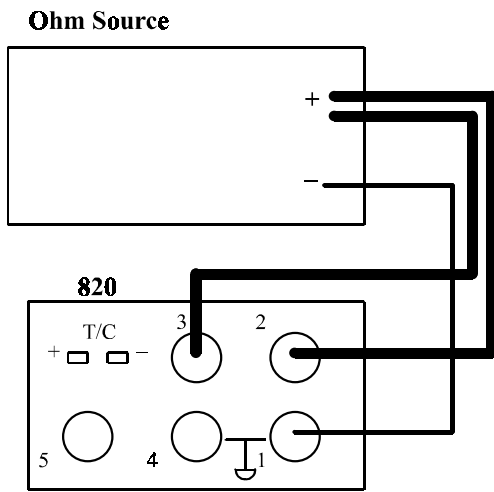


FIGURE 12

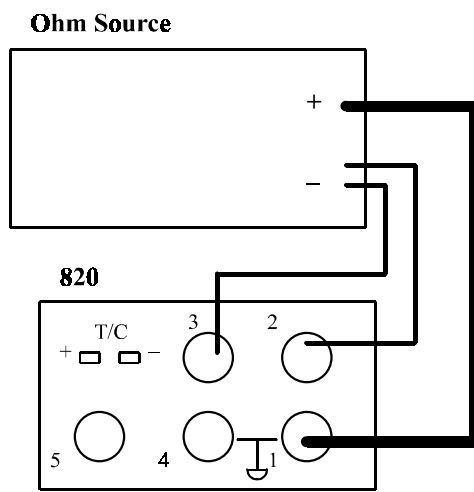


FIGURE 13