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Rev	Date	Appd	DCN								
A	4MAY00		10964								

### Suggested Equipment:

1. Precision current meter with accuracy of  $\pm 0.023\%$  of reading at 24.00mA.
2. Precision voltmeter with accuracy of  $\pm 0.016\%$  of reading at 100.00mV,  $\pm 0.006\%$  of reading at 400mV, and  $\pm 0.0038\%$  of reading at 10.00V.
3. Precision frequency meter with accuracy of  $\pm 0.038\%$  of reading at 1000Hz and 10.00KHz.
4. Precision Current Source with accuracy of  $\pm 0.023\%$  of setting at 24mA and  $\pm 0.018\%$  of setting at 1mA.
5. Precision DC Voltage Source with accuracy of  $\pm 0.016\%$  of setting at 100mV,  $\pm 0.038\%$  at 10.00V and 0.513% at 200.0V.
6. Thermocouple Source with accuracy of  $\pm 0.25$  °C (Altek model 322 or 422). If not available, see alternate equipment.
7. Type K Thermocouple wire.
8. Precision Ohm Source with accuracy of  $\pm 0.015\%$  of setting at 1000.0 $\Omega$
9. Precision AC Voltage Source with accuracy of  $\pm 0.531\%$  of setting at 240VAC.

### Alternate Equipment

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


### ENABLING CALIBRATION:

Remove the battery cover and four corner screws. While holding the UUT face down in one hand, carefully separate the top and bottom housing. Place the unit into Calibration mode by shorting the header (XCAL) located on the upper left side of the circuit board (See Figure 1). Verify the UUT is in Calibration mode by turning on the UUT and viewing the lower left of the display for the word CAL-MODE. Place fresh batteries into the UUT before any calibration adjustments are made.

### CALIBRATION:

**NOTE:** During calibration, pressing the *STORE/RESET/RESET* button will cause *STORE/RESET* to illuminate on the display. Then pressing either *READ/POWER TRANSMITTER* or *TYPE/ENG UNITS* will cause the unit to beep, indicating the UUT received the calibration.

**NOTE:** If necessary, the contrast can be adjusted. Press and hold the *DISPLAY/SOURCE READ* button while turning the unit on. Release the *TYPE/ENG UNITS* button when the display comes up saying *SETUP CONTRAST ON GRAPHIC DISPLAY*. The contrast can then be adjusted to the preferred setting by dialing the unit.

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### SOURCE MODE CALIBRATION:

Verify the 830 is in source mode by viewing the top left corner of the display for the word SOURCE. If the 830 is not in source mode, press the *DISPLAY/SOURCE READ* button until SOURCE appears.

### SOURCE mA:

1. Switch the 830 to mA.
2. Lo Calibration: Connect terminals 1 and 2 from the 830 to a Current Meter (See figure 2). Dial the 830 so the meter reads 0.00mA. Press *STORE/RESET* and then press *READ/POWER TRANSMITTER*.
3. Hi Calibration: Dial the 830 so the meter reads 24.00mA. Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

### SOURCE 2-WIRE:


1. Press the *TYPE/ENG UNITS* button once to switch to 2-WIRE mode.
2. Lo Calibration: Disconnect all wires to have an open loop and press *STORE/RESET* and then *READ/POWER TRANSMITTER*.
3. 2 Wire Configuration: Connect terminals 1 and 2 from the 830 in series with a Voltage Source (Set to 12V) and a Current Meter (See figure 3).
4. Hi Calibration: Dial the 830 so the meter reads 24.00mA. Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

### SOURCE mV:

1. Switch the 830 to VDC (mV Range). If the unit is not in mV range, press the *TYPE/ENG UNITS* button until mV is displayed. Connect terminals 1 and 2 from the 830 to a Voltage Meter (See figure 5).
2. Lo Calibration: Dial the 830 until the meter reads 0.00mV. Press *STORE/RESET* and then *READ/POWER TRANSMITTER*.
3. Hi Calibration: Dial the 830 until the meter reads 100.00mV. Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

### SOURCE V:

1. Press the *TYPE/ENG UNITS* button once to switch to V range. Leave the same connection as in source mV.
2. Lo Calibration: Dial the 830 until the meter reads 0.00V. Press *STORE/RESET* and then *READ/POWER TRANSMITTER*.
3. Hi Calibration: Dial the 830 until the meter reads 10.00V. Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

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### SOURCE OHMS & RTD:

1. Switch the 830 to OHMs.
2. Lo Calibration A (mV): Place the toggle switch in the LO position. Short terminals 1 and 2. Press *STORE/RESET/RESET* and then *READ/POWER TRANSMITTER*.
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 830. Press *STORE/RESET* and then *READ/POWER TRANSMITTER*.
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 830 (See figure 6). Dial the 830 until the meter reads 0.400V and press *STORE/RESET* and then press *TYPE/ENG UNITS*.

### SOURCE FREQUENCY:

1. Switch the 830 to *FREQ* (Khz Range). If the unit is not in Khz range, press the *TYPE/ENG UNITS* button until Khz is displayed. Connect terminals 1 and 2 from the 830 to a Frequency meter.
2. Dial the 830 to 5Khz and check for accuracy of  $\pm 0.02$  KHz.
3. Press the *TYPE/ENG UNITS* button once to switch to Hz. Dial the 830 to 500 Hz and check for accuracy of  $\pm 2$  Hz.

### READ MODE CALIBRATION:


Verify the 830 is in read mode by viewing the top left corner for the word READ. If the 830 is not in read mode, press the *DISPLAY/SOURCE READ* button until READ appears.

### Common Mode Cal:

1. Switch the 830 to read mA.
2. Connect a voltage source (set to 0V) to terminals 4 and 5 of the 830. Note what the 830 is reading.
3. Change the voltage source to a setting of 100V. Adjust pot R289 so the 830 displays the same reading as noted in the previous step.  
**WARNING:** Take caution while adjusting R289. Do not accidentally touch the 100V line coming into the unit.
4. Repeat steps 2 and 3 until the readings match between 0V and 100V.

### READ mA:

1. Switch the 830 to mA. Make sure all wires are disconnected.
2. Lo Calibration: Press *STORE/RESET* and then *READ/POWER TRANSMITTER*.
3. Hi Calibration: Connect a Current Source (Set to 24mA) to terminals 5 and 6 of the 830 (See figure 7). Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

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### SOURCE PWR XMTR:

1. Press the *READ/POWER TRANSMITTER* button to switch to PWR-XMTR mode.
2. Lo Calibration: Connect terminals 5 and 6 from the 830 in series with a Current Meter and an Ohm Source (See figure 4). Set the Ohm Source so the current meter reads 0.00mA. Press *STORE/RESET* and then *READ/POWER TRANSMITTER*.
3. Hi Calibration: Dial the Ohm Source so the Current Meter reads 24.00mA. Press *STORE/RESET* and then *TYPE/ENG UNITS*.

### READ mV:

1. Switch the 830 to VDC.
2. Lo Calibration: Short terminals 1 and 2 of the 830. Press *STORE/RESET* and then *READ/POWER TRANSMITTER*.
3. Hi Calibration: Connect a Voltage Source (Set to 100.00mV) to terminals 1 and 2 of the 830 (See figure 8). Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

### READ V:

1. Change the range to 10.25V (x.xxV) by pressing the *TYPE/ENG UNITS* button.
2. Lo Calibration: Short terminals 1 and 2 of the 830. Press *STORE/RESET* and then press *READ/POWER TRANSMITTER*.
3. Hi Calibration: Connect a Voltage Source (Set to 10.00V) to terminals 1 and 2 of the 830 (See figure 8). Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

### READ HI V:

1. Change the range to 200.0V (x.xV) by pressing the *TYPE/ENG UNITS* button.
2. Lo Calibration: Short terminals 3 and 4 of the 830. Press *STORE/RESET* and then *READ/POWER TRANSMITTER*.
3. Hi Calibration: Connect a Voltage Source (Set to 200V) to terminals 3 and 4 of the 830 (See figure 9). **CAUTION: Note polarity.** Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

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### READ VAC:

1. Change to VAC mode by pressing the *TYPE/ENG UNITS* button.
2. Lo Calibration: Short terminals 3 and 4 of the 830. Press *STORE/RESET* and then *READ/POWER TRANSMITTER*.
3. Hi Calibration: Connect an AC Voltage Source (Set to 240V, 60Hz) to terminals 3 and 4 of the 830 (See figure 9). **CAUTION: Note polarity.** Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

### READ T/C:

1. Switch the 830 to T/C. Place the toggle switch to the center position. Connect a Voltage Source to the T/C terminal of the 830 (See figure 8).
2. Lo Calibration: Source 0.00mV into the 830. Press *STORE/RESET* and then press *READ/POWER TRANSMITTER*.
3. Hi Calibration: Source 80.00mV into the 830. Press *STORE/RESET* and then press *TYPE/ENG UNITS*.
4. Switch the toggle switch to the HI position. Connect a K type T/C wire to the 830 at the T/C terminals. Connect the other end to a Thermocouple Source (See figure 10). Source 75°F into the 830 and wait 5 minutes for temperature differences to settle. Dial the 830 to 75 °F. Please wait 10 seconds between adjustments. Press *STORE/RESET* and then press *READ/POWER TRANSMITTER*.
5. If a Thermocouple Source is not available, place the other end of the T/C probe into an ice point reference cell, or an ice bath as described in note 1. Wait approximately 10 minutes for temperature differences to settle. Dial the 830 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 830 time to recalculate the cold junction compensation. Press *STORE/RESET* and then *READ/POWER TRANSMITTER*.

### READ OHMs:

1. Switch the 830 to OHMs.
2. Lo Calibration: Short terminals 1, 2 and 3 of the 830. Press *STORE/RESET* and then press *READ/POWER TRANSMITTER*.
3. Hi Calibration: Connect an Ohms Source (Set to 1000Ω) to terminals 1, 2, and 3 on the 830 (See figure 11). For maximum accuracy, the three leads should be of equal length. Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

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**READ RTD:**

1. Switch the 830 to RTD.
2. Lo Calibration: Short terminals 1, 2 and 3 on the 830. Press *STORE/RESET* and then *READ/POWER TRANSMITTER*.
3. Hi Calibration: Connect an Ohms Source (Set to 400Ω) to terminals 1, 2, and 3 of the 830 (See figure 11). For maximum accuracy, the three leads should be of equal length. Press *STORE/RESET* and then press *TYPE/ENG UNITS*.

**COMPLETION OF CALIBRATION:**

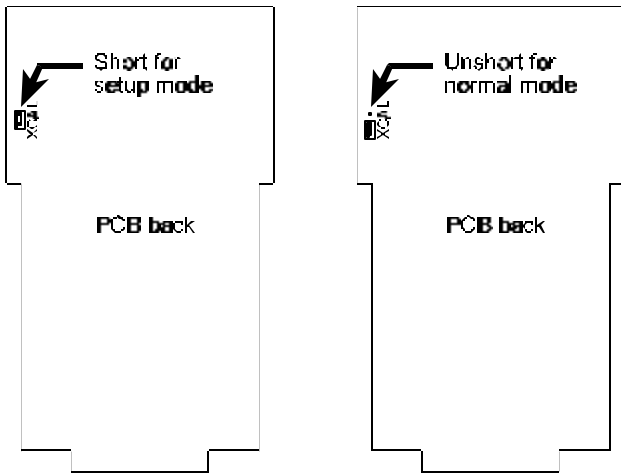
Disconnect UUT and turn the UUT off. Place the 830 into normal operating mode by unshorting the header located on the top left hand side of the board (See figure 1).

Reset the unit by holding the *STORE/RESET* button while turning the power on. Continue to hold the *STORE/RESET* button until the display comes up saying *SETTING UP DEFAULT*.

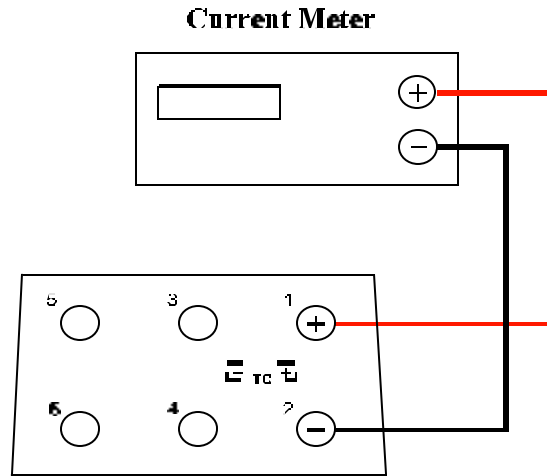
**This completes the procedure.**

**Note 1**

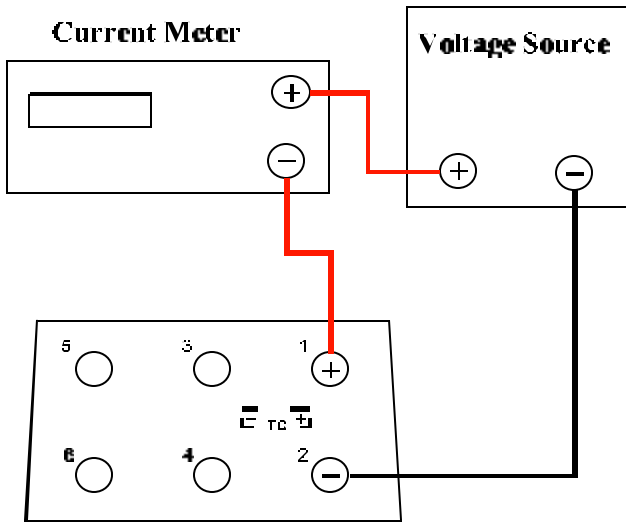
1. Prepare a thermos (or equivalent vacuum insulated bottle) by drilling a hole in its cap to accept the thermocouple or use a standard laboratory cork.
  2. Fill the thermos with shaved or crushed ice made from distilled water.
  3. Fill the thermos with enough distilled water so that the ice becomes slush, but not enough to float the ice.
  4. Replace the thermos cap or cork and insert the thermocouple.
- When Calibration is completed, turn the UUT Off. Place the UUT into normal operating mode by unshorting JP201 (See Figure 1).



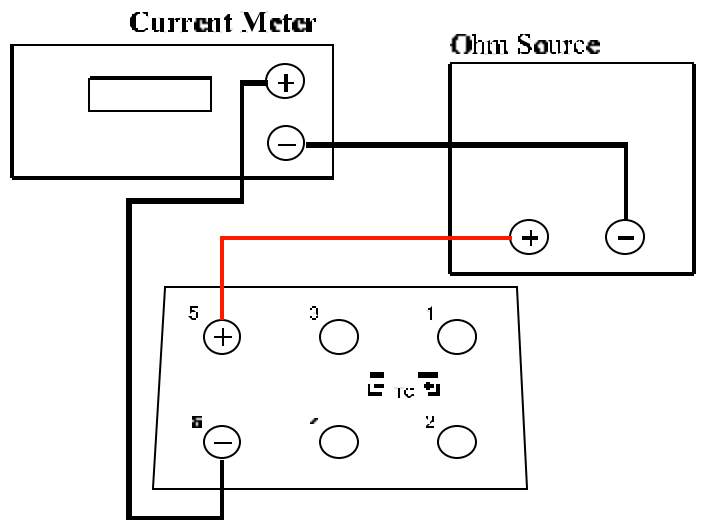
**FIGURE 1**



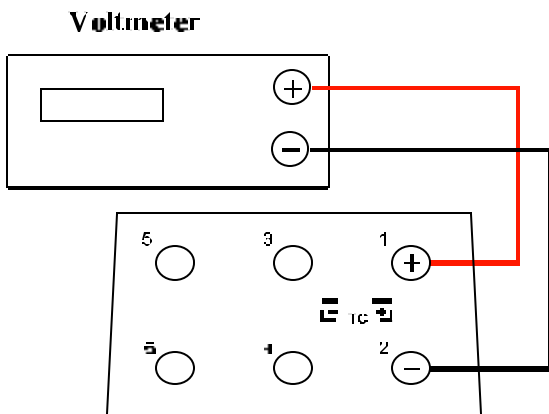
**FIGURE 2**



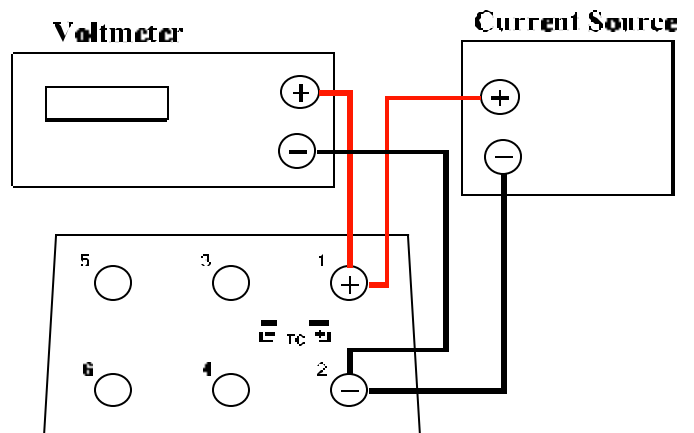
**FIGURE 3**



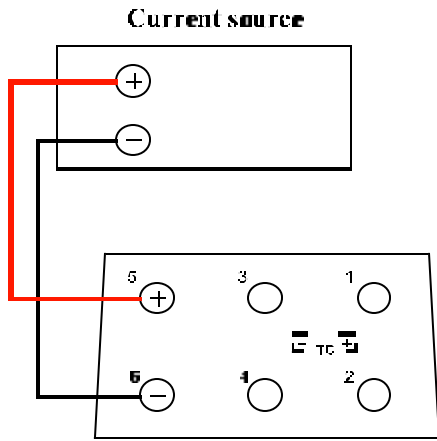
**FIGURE 4**



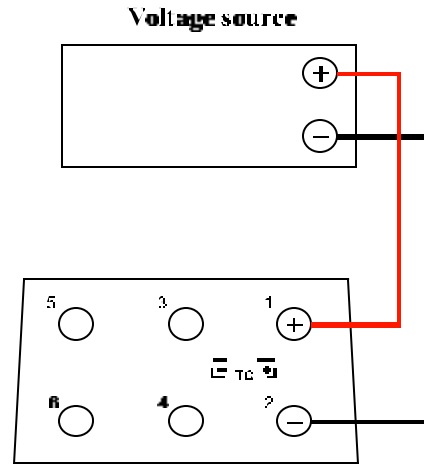
**FIGURE 5**



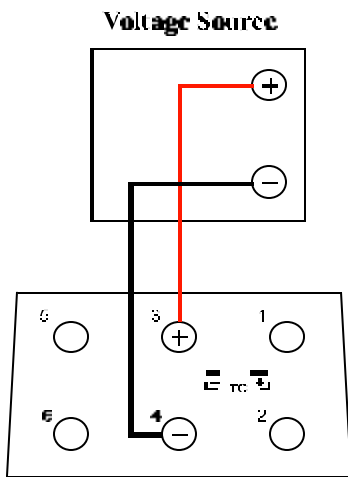
**FIGURE 6**



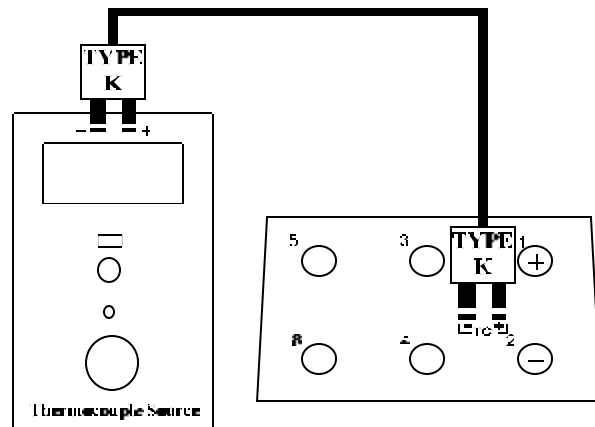
**FIGURE 7**



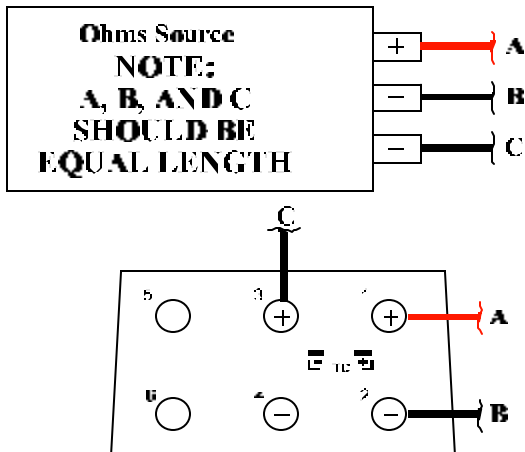
**FIGURE 8**



**FIGURE 9**



**FIGURE 10**



**FIGURE 11**