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| TRANSMATION Products Group | 422 FIELD CALIBRATION PROCEDURE | DOCUMENT NO. | REV. |
| | | 1-776 | A |
| Created by: D.J.NEFF | | 3JUN93 | Sheet 1 of 4 |

| Rev | Date | Appd | DCN | | | | | | | | |
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| — | 3JUN93 | RPC | --- | | | | | | | | |
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Suggested Equipment

Precision millivolt source capable of $\pm 0.002\text{mV}$ accuracy with a full scale of 100mV or greater and a resolution of 0.001mV. OR Precision digital voltmeter capable of $\pm 0.002\text{mV}$ accuracy with a full scale of 100mV or greater and a resolution of 0.001mV. (Note: Most $5\frac{1}{2}$ digit DMM's are not accurate to $\pm 0.002\text{mV}$. Altek recommends $6\frac{1}{2}$ digits or better.)

A stable ice bath (see note 1 for construction details). Stable to within $\pm 0.1^\circ\text{F}$.

OR

Thermocouple ice point calibrator. Stable to within $\pm 0.1^\circ\text{F}$.

Thermocouple probe with N.I.S.T. traceability.

Precautions

Please observe antistatic procedures.

Avoid touching thermocouple connections, as this will cause temperature errors in calibration. It is recommended that the Model 422 be handled as little as possible during calibration to reduce errors. If the unit is held without its box, the heat from your body may cause uneven heating of temperature sensitive components. Before any adjustments are made to the Model 422, fresh batteries (Alkaline 9volts are recommended) should be placed in the unit.

CALIBRATION

Please refer to figure 1 for all test points and adjustment potentiometers. Allow 1 hour for the Model 422 to stabilize to the ambient temperature of the calibration room.

DC Millivolt Calibration

The user's dip switch positions should be recorded in table 1.

With the 422 in the OFF position, put all dip switches up (dsw1-dsw4).

Connect the precision millivolt source, sourcing 0.000mV to the 422 input terminals observing proper polarity.

Slide the Model 422 power switch to READ. During the first 3 seconds after turning the 422 on, press the SCROLL button until mV is displayed in the lower right hand corner of the display. The Model 422 will then take 4 seconds for the unit to initialize. Then wait 1.5 minutes for the 422 to settle.

The 422 should display 0.000mV $\pm 0.003\text{mV}$.

Adjust the millivolt source to +99.900mV, the 422 should read 99.900mV $\pm 0.001\text{mV}$.

If the 422 does not read within $\pm 0.001\text{mV}$, short the two holes at the bottom of the upper board (J3) and place dsw1 and dsw3 DOWN. The holes are properly shorted if the display comes up with a number between -10.0 and +10.0. (If the display comes up reading a temperature in $^\circ\text{F}$, then the holes are not properly shorted). Make sure that the holes are indeed shorted before continuing with this procedure.

When the 422 displays a number between -10.0 and +10.0, remove the short and place dsw1 and dsw3 back into the UP position.

Adjust the D.C. mV calibration pot #2, figure 1, to agree within $\pm 0.001\text{mV}$ of 99.900mV.

*Set the millivolt source to 0.000mV.

Flip dsw4 down for 2 seconds or more, then return dsw4 to the up position.

Check the reading at 0.000mV, the 422 should agree within $\pm 0.003\text{mV}$.

Adjust the millivolt source to +99.900mV, the 422 should agree within $\pm 0.001\text{mV}$, if necessary adjust pot #2 again and repeat the previous procedure (starting at *), until they agree within tolerance at the respective points.

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With that done, adjust the millivolt source to -99.900mV, the 422 should read -99.900mV \pm 0.004mV.
 Adjust the millivolt source to \pm 75.000mV, \pm 50.000mV, \pm 25.000mV, the 422 should read within \pm 0.004mV at all test voltages.
 Short the holes at the bottom of the upper board once again (J3). Place dsw1 and sw3 down and be sure the unit displays a number between -10.0 and +10.0.
 Remove the short and place dsw1 and dsw3 back into the up position.
 Slide the Model 422 power switch to off.

Cold Junction Calibration

Connect the leads of the Model 422 to the N.I.S.T. traceable thermocouple probe.
 Place the thermocouple into the ice bath as described in note 1 (or ice point calibrator).
 Slide the Model 422 power switch to READ, select the correct thermocouple type in °F.
 Wait approximately 10 minutes for temperature differences to settle.
 Adjust the cold junction calibration pot #1 so the Model 422 displays a temperature of 32.0°F (or a value that compensates correctly for the inaccuracy of the thermocouple probe between 32.0°F and room temperature if known).
 Please wait 10 seconds between adjustments to allow the 422 to update the calibration changes.
 Slide the Model 422 power switch to off.

FUNCTIONAL TESTING

Each feature of the Model 422 should be tested for proper function.

READ MODE TESTING

Connect a known good thermocouple to the leads of the Model 422.
 Turn the unit on to READ with the correct thermocouple type.
 With the QUIK-CHEK switch in the READ position, push the RESET button to reset the MAX and MIN.
 Expose the thermocouple to temperatures above and below room temperature (a hot and a cold cup of water, oven, refrigerator, etc.) and observe that the displayed temperature rises and falls.

Max & Min

Move the QUIK-CHEK switch to both the MAX and the MIN position and observe that the higher temperature is stored in the MAX position, the lower is stored in the MIN position.
 Press the RESET button with the QUIK-CHEK switch in the READ position.
 Move the QUIK-CHEK switch to the READ, MAX, and MIN positions and observe that all positions read the same temperature.
 Turn the Model 422 off.

SOURCE MODE TESTING

Storing QUIK-CHEK Values
 With the unit off, place all dip switches down (dsw1-dsw4).
 Turn the unit on to SOURCE and select a thermocouple type.
 With the 422 QUIK-CHEK switch in the HI position, dial the knob in a clockwise direction and observe that the temperature on the display increases, observing that turning the knob faster causes the display to increase more rapidly.
 Continue turning the knob until an easily remembered value appears on the display (1000 for example), and press the STORE button to store the value.
 Move the QUIK-CHEK switch to the LO position.

Repeat the same procedure moving the knob in a counterclockwise direction to an easily remembered value (-100 for example), and press the STORE button.

Recalling QUIK-CHEK Values

Turn the Model 422 off
 Turn the Model 422 on in SOURCE.
 Move the QUIK-CHEK switch to the HI and the LO positions, verifying that the Model 422 has recalled the previously

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stored values.

Turn the Model 422 off.

Selecting and Deselecting Thermocouple Types

With the unit off, place dip switches 1, 3, and 4 down (dsw1, dsw2, dsw4) and place dip switch 2 up (dsw2).

Turn the 422 on to READ mode.

Deselect all thermocouple types except for mV. This is done by pressing the scroll button while the desired type is displayed in the lower right corner of the LCD. The thermocouple type will begin to flash when it has been deselected. Turn the digi-pot one click at a time to scroll through the remaining thermocouple types and deselect them by pressing the scroll button.

Turn the unit off and place dip switch 2 down (dsw2).

Turn the 422 back on to READ mode and verify that all of the thermocouple types have been deselected by trying to scroll to them. Only mV should be able to be selected.

Turn the unit off and place dip switch 2 up (dsw2) and turn the unit on to READ mode. Select any desired thermocouple types by pressing the scroll button when the desired thermocouple type is displayed in the lower right corner of the LCD. The thermocouple type will stop flashing once it has been selected.

Turn the unit off and place dip switch 2 down (dsw2).

Turn the 422 on to READ mode and verify that the thermocouple types that were selected did indeed get selected by scrolling through them and making sure that the desired thermocouple types can be selected.

Turn the Model 422 off.

The user's dip switch positions should be restored at this time. Please refer to table 1 for the recorded positions.






If the unit should fail to meet any of its stated specifications after recalibration, it should be returned to the factory for repair.

Note 1

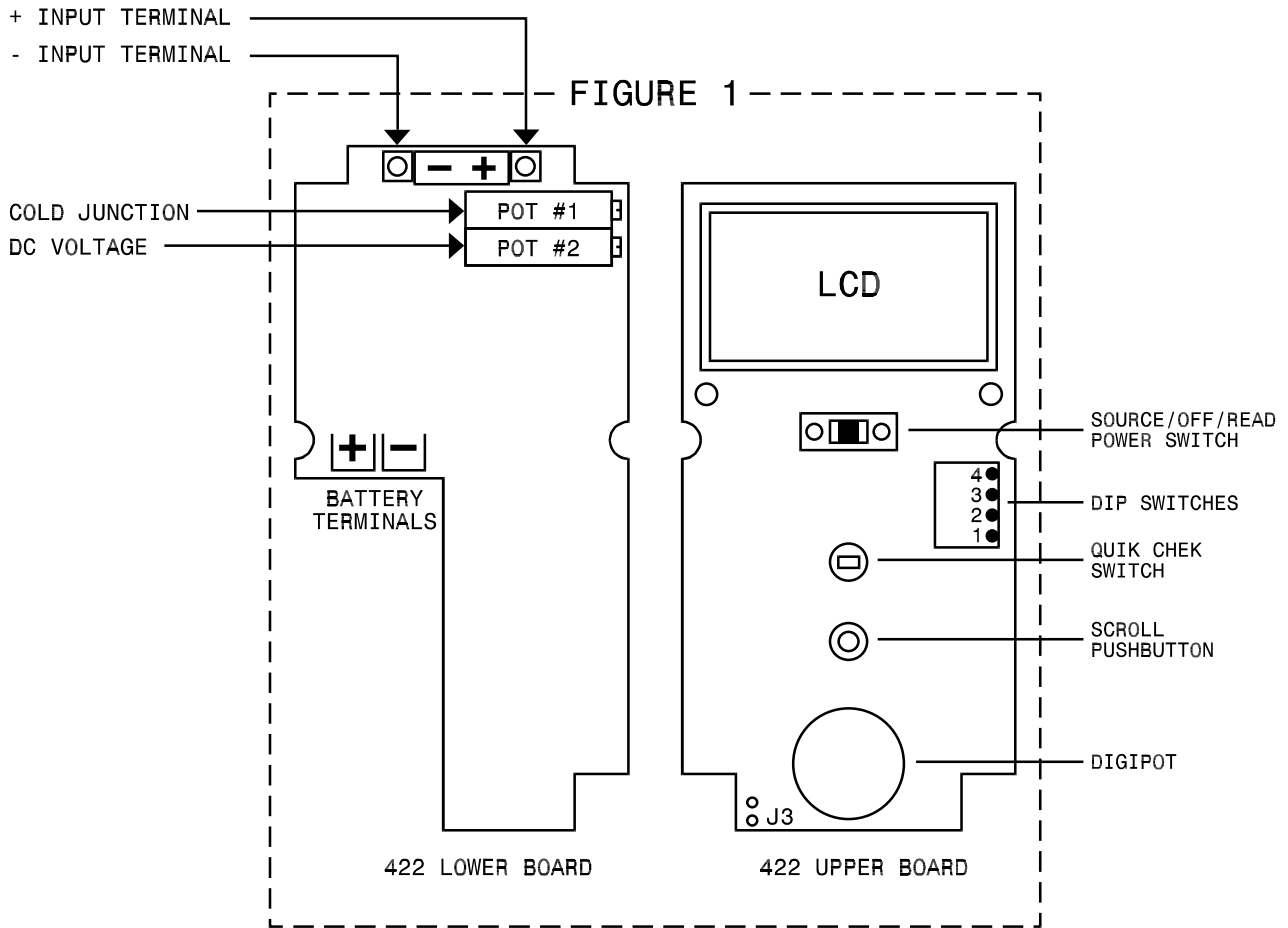
Ice Bath Construction

- 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.

TABLE 1
CUSTOMER PRECALIBRATION INFORMATION
(Record all information BEFORE calibration.)

| UP | DIP Switches | | | | T/C Type |
|---|--|---|--|---|----------|
|  |  1 |  * 2 |  3 |  4 | |

* NOTE: If DIP2 is up, record the T/C type displayed at TURN-ON. Return to this value after completing calibration by pushing the SCROLL button at TURN-ON with DIP2 down until the T/C type is displayed, and put DIP2 in the UP position.



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