Warner Instruments
1320 Fulton Street PO Box 604
Grand Haven MI 49417-0604
Phone: 616-842-7658
FAX: 616-842-1471

TECH MEMO

Author:	**Gene Warner**
Date:	**7 Jan 1997**
Rev:	**6 Dec 2007**
No of Pages:	**3**

Re: Field Calibration Procedure for p/n 012017 KilnTroller II Kiln Soak/Shut-Off Controller - Range: 0/2500°F (-17/+1371°C)

Notes

Specified Accuracy/Uncertainty: The KilnTroller II is designed for commercial production use in artistic applications usually involving ceramics, pottery and glass. Such heat treating applications present no stringent requirements for precision concerning temperature. The KilnTroller II is therefore represented as being suitable for these purposes, without specifying any typical or guaranteed limits of accuracy or uncertainty with respect to temperature measurement or control. As a practical matter, production calibration and factory service experience indicates that serviceable units seldom exhibit indicating errors outside of 0.25% of its 2500°F (1389°C) Span when the input is driven by a precision emf source in a laboratory environment (temperatures within the range of 0°C to +55°C, with relative humidity maintained low enough to prevent condensation.)

Warm-Up Considerations: The only significant concern with respect to pre-calibration warm-up is the controller's *cold junction compensation* scheme. The KilnTroller II compensates for the sensor circuit's cold junction by measuring the temperature of the controller's terminal area and injecting an emf equivalent to that generated by the junction occurring at the point where the sensor cable is connected to the controller. Warm-up is therefore a function of the time required for the materials involved and the compensating component to arrive at an isothermal condition. This can be observed by connecting a voltmeter to the junction of R5, R6 and U2 (just aft of the "Span" trimmer, item 5 on the following diagram.) At room temperature U2 will stabilize at a potential of about +2.98vdc (the exact voltage varies with temperature and component tolerances and is not particularly significant.) After this voltage has remained relatively stable for several minutes, the "warm-up" process may be considered complete.

Other CJC Considerations: The cold junction compensator is ordinarily enclosed within the encased unit, and therefore operates in still air. When calibrating the controller with the cover removed, strong drafts impinging on the circuitry can prevent the sensor terminal area from becoming isothermal, thereby affecting the calibration.

Component symbols included in the following instructions refer to the diagram on Page 2.

1. Connect a digital voltmeter between the right-hand pin of U23 (LM337T), and ground ([-] side of C42, C43 or C44, the tantalum capacitors just forward of U23). Adjust the "-15v" trimmer, R93, for an indication of exactly -15.0v ±0.1v.

2. Connect the DVM (+) lead to the center pin of U22 (LM317T). Adjust the "+15v" trimmer, R92, to provide an indication of +15.0 v±0.1v

3. Connect the (+) lead to pin 14 of any logic chip (e.g.: CD4066B, CD4093B, etc). Adjust the "+5.1v" trimmer to provide an indication of exactly +5.1v ±0.1v

4. Connect the (+) lead to U10, pin 2 (ICL7135CPI). Adjust "Vref" trimmer, R40, to provide an indication of exactly +1.000v ±0.005v.

5. Disconnect the sensor, and connect a compensated (ISA Type K - nickel-chromium vs. nickel-aluminum) portable potentiometer or precision mV source to the input of the controller. Set the input at exactly "0°F" (-17.8°C) or -0.692mV. With the DVM connected to U7, pin 14 (the LM324N adjacent to the 4N36 optical isolator chip), adjust the "Zero" trimmer, R3, to provide a DVM indication of exactly 0.00v ±0.01v.

6. Set the input at "+2500°F" (1371°C) or +54.845mV, and adjust the "Span" trimmer, R7, to provide an indication of exactly +5.00v ±0.01v. ***Large span adjustments will effect the zero adjustment somewhat; therefore repeat Steps 6 and 7 if a large span adjustment was required.***

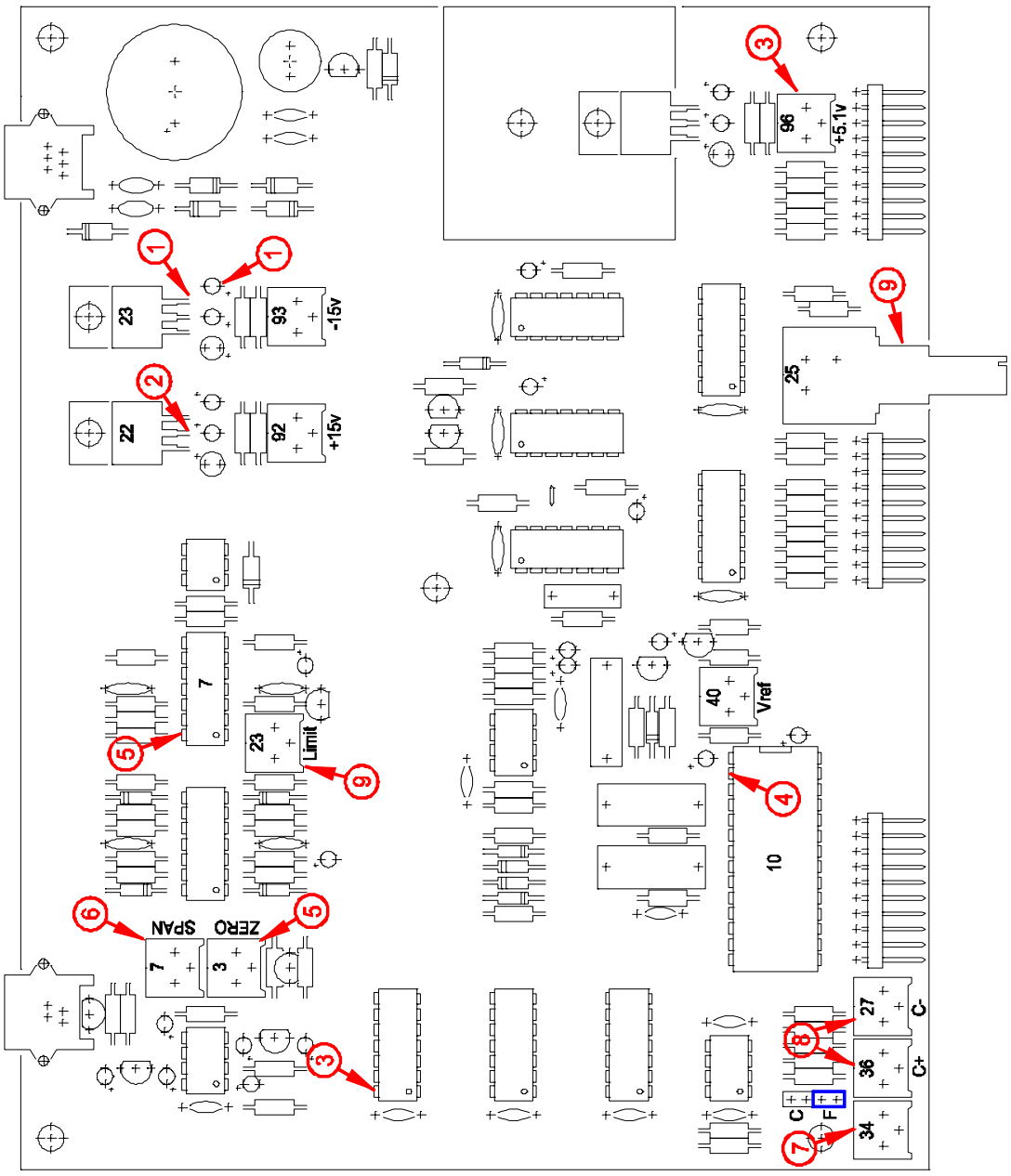
7. With the controller displaying °F information, adjust the "F+" trimmer, R43 (front left edge of circuit board), to provide an indication of exactly "2500".

8. Move the range jumper (front-left side of circuit board) to the "C" position. With the portable potentiometer set to provide a 0°F (-17.8°C) input, adjust the "C-" trimmer, R27, to provide an indication of exactly "-17". Return the input setting to 2500°F (1371°C) and adjust the "C+" trimmer to provide an indication of exactly "1371". ***Return the jumper to the "F" position.***

9. Turn the **LIMIT ADJ** control all the way clockwise. Select the limit display mode by pressing the **DISPLAY LIMIT** button. Adjust the "Limit Calib" trimmer, R23, for a read-out of exactly 2550°F (1399°C).

10. To check the controller's switching accuracy, press the **DISPLAY LIMIT** button and adjust the **LIMIT ADJ** potentiometer to 2250°F (1230°C). Then, using the portable potentiometer, move the input back and forth across this setting, observing that the on-off differential zone is centered on the limit setting.

To check the controller's shut-off mode, depress the **SELECT** button to place the controller in the shut-off mode. With the input less than the limit setting, depress the **RESET** button to enable the output. Now move the setting of the portable to any temperature higher than the limit setting, and observe that the controller's output switches off, and the green "**S.O.**" light is enabled.


23
93
-15v
22
92
+15v
96
+5.1v
25
7
23
Limit
40
Vref
10
ZERO
SPAN
7
3
27
C-
36
C+
C
F
34