Protocol Calibration

Before you begin, we recommend using a certified analog thermocouple simulator/calibration source with less that +/-1°F noise. We have experienced signal stability problems with some micro-processor based thermocouple simulator/calibrators that induce an error during the calibration procedure. This error generally results in a non-linear shift in the controller's indicated temperature.

Note: When using a non ambient compensated calibrator or milli-volt source, the ambient temperature of the Protocol Controller must be subtracted from the input signal. Example: 250°F = 6.420mv and 75°F = 1.220mv, the correct input signal would equal 5.200mv. If the ambient temperature of the Protocol Controller is other than 75°F, use the correct milli-volt value.

Milli-volt Table

70°	72°	74°	76°	78°	80°	82°
1.076mv	1.134mv	1.191mv	1.248mv	1.306mv	1.363mv	1.421mv

Note: We recommend using shielded thermocouple lead wire to reduce the possibility of noise corruption.

- Disconnect AC power to the oven.
- Remove Protocol controller to expose thermocouple input terminals.
- Disconnect control and Hi-Limit thermocouples from controller thermocouple input terminals (Control T/C, and Hi-Limit T/C).
- Mark thermocouple leads if not labeled.
- Connect a 6 foot piece of type J thermocouple lead wire to each of the Control T/C and Hi-Limit T/C terminals.
- Twist together or jumper the lead wire end not connected to the Control T/C and Hi-Limit T/C terminals. This creates a junction and prevents a control sensor error [S-T/C ERR] and Hi-Limit sensor error [H-T/C ERR] caused by an open thermocouple.
- Loosely fasten the Protocol controller to the oven.
- Re-connect AC power to the oven.
- Press the **Power on** pushbutton to energize oven.
- Press the **Tune** key. The display reads [TUNE].
- The controller must be configured to operate in °F (Fahrenheit) and CZ0 should be set to zero (0.0) for calibration. Use the up and down arrow keys to scroll through the tune mode configuration.
- Press the **ò** key. The display reads [CODE ***].
  - Press the following key sequence: **+, -, -, +, -, +** .
  - The display reads [PID TUNE]. Protocol is in the tune mode.
  - Record initial tune mode parameters prior to making any changes.

    Note: All error's must be cleared prior to performing calibration. Any active error will inhibit the calibration function.

    Note: To clear a control sensor error [S–T/C ERR] or hi-limit sensor error [H–T/C ERR] caused by an open thermocouple, depress and then release the Reset key after the problem has been corrected.

Note: ### or ##.# represent a numeric value or parameter.

- Allow the controller a thirty (30) minute warm up time before proceeding
- Depress and then release the **Cal** key. The display reads [CAL--MODE].
- Depress and then release the **ò** key. The display reads [CODE ***].
- Depress and then release the following key sequence **+** , **−**, **−**, **+**, **−**, **+**. The display reads [HCAL ###].

    NOTE: If the Display blinks and does not display HCAL, either key sequence is wrong or the controller calibration maybe newer style and proceed to the latest calibration procedure on page #5.

- Depress and then release the **ò** key. The display reads [SCAL ###].
- Connect the piece of type J thermocouple lead wire wired to the, "Control T/C" terminals to a the thermocouple simulator. Set the simulator to output a type J thermocouple signal. Twist together or jumper the piece of type J thermocouple lead wire wired to the, "Hi-limit T/C" terminals to create a junction and prevent a hi-limit sensor error [H–T/C ERR] caused by an open thermocouple.
    - Adjust the simulator to supply a 250°F signal.
        - Milli-volt source only = 6.420mv (250°F) - 1.220mv (75°F) = 5.200mv.
    - Depress the **−** key for approximately three (3) seconds until display indicates 250, then release **−** key.
    - **NOTE:** If 932 is displayed, continue on to the next step. If controller fails to accept 250 on the second or third pass through, abort the calibration procedure.
    - Adjust the simulator to supply a 450°F signal
        - Milli-volt source only = 12.566mv (450°F) - 1.220mv (75°F) = 11.346mv.
    - Depress the **+** key for approximately three (3) seconds until display indicates 450, then release **+** key.
    - Repeat steps.
- Depress and then release the **ñ** key. The display reads [HCAL ###].
- Connect the piece of type J thermocouple lead wire wired to the, "Hi-limit T/C" terminals to a the thermocouple simulator. Again the simulator should be set to output a type J thermocouple signal. Twist together or jumper the piece of type J thermocouple lead wire wired to the, "Control T/C" terminals to create a junction and prevent a control sensor error [S–T/C ERR] caused by an open thermocouple.
    - Adjust the simulator to supply a 250°F signal.
    - Depress the **−** key for approximately three (3) seconds until display indicates 250, then
    - release **−** key.
    - Adjust the simulator to supply a 450°F signal.
    - Depress the **+** key for approximately three (3) seconds until display indicates 450, then
    - release **+** key.
    - Repeat steps.
- Depress and then release the **Manual** key. The display reads [MANUAL].
- Depress and then release the, "Power On" push-button to de-energize oven.
- Disconnect AC power to the oven.
- Remove Protocol controller to expose thermocouple inputs terminals.
- Disconnect the two pieces of type J thermocouple lead wire connected to the, "Control T/C" and, "Hi-limit T/C" terminals.
- Re-connect control and Hi-Limit thermocouples to the controller thermocouple terminals (Control T/C, and Hi-limit T/C).
- Re-install the Protocol controller onto the oven.
- Re-connect AC power to the oven.
- Press the **Power on** pushbutton to energize oven.
- Press the **Tune** key. The display reads [TUNE].
- Reset any tune mode parameters that were changed in step 12 to perform calibration (examples: DEG = F and CZ0 = 0 .0).

- When changes have been completed, press the **Manual** key. The display reads [MANUAL].

The calibration procedure is complete.

LATEST CALIBRATION PROCEDURE

- Allow the controller a thirty (30) minute warm up time before proceeding
- Press the **Cal** key. The display reads [CAL--MODE].
- Press the **ò** key. The display reads [CODE ***].
- Press the following key sequence: **-** , **+**, **+**, **-**, **+**, **-**.
  - The display reads [HCAL 250].
- Apply a 250° F type J signal to the high limit thermocouple input:
  - Twist together or jumper the piece of type J thermocouple lead wire, wired to the Control T/C terminals. This creates a junction and prevents a Control sensor error [S-T/C ERR] caused by an open thermocouple. Press the**Reset** key to clear a Control sensor error [S-T/C ERR] caused by an open thermocouple.
  - Adjust the simulator to supply a 250° F signal. Wait for 30 seconds while the control stabilizes.
- Press the following key sequence: **-** , **-**, **+**. The display now reads HCAL 450.
- Adjust the simulator to supply a 450° F signal. Wait for 30 seconds while the control stabilizes.
- Press the following key sequence: **+** , **+**, **-**. The display now reads HIL 450.
- To verify proper calibration, adjust the simulator to supply a 350° F signal. Within 30 seconds, the display should stabilize and read HIL 350.
- To calibrate the control sensor, press the **ò** key. The display reads [SCAL 250].
- Apply a 250° F type J signal to the control thermocouple input:
  - Connect the piece of type J thermocouple lead wire, wired to the Sensor T/C terminals, to a thermocouple simulator.
  - Twist together or jumper the piece of type J thermocouple lead wire to the Hi-Limit T/C terminals. This creates a junction and prevents a hi-limit sensor error [H-T/C ERR] caused by an open thermocouple. Press the **Reset** key to clear a hi-limit sensor error [H-T/C ERR] caused by an open thermocouple.
  - Adjust the simulator to supply a 250° F signal. Wait for 30 seconds while the control stabilizes.
- Press the following key sequence: **-** , **-**, **+**. The display now reads SCAL 450.
- Adjust the simulator to supply a 450° F signal. Wait for 30 seconds while the control stabilizes.
- Press the following key sequence: **+** , **+**, **-**. The display now reads SENS 450.
- To verify proper calibration, adjust the simulator to supply a 350° F signal. Within 30 seconds, the display should stabilize and read SENS 350.
- Press the Manual key. The display reads [MANUAL]. If the control did not calibrate properly repeat steps # 4 - 15.
- Press the **Power on** pushbutton to de-energize oven.
- Disconnect AC power to the oven.
- Remove Protocol controller to expose thermocouple inputs terminals.
- Disconnect the two pieces of type J thermocouple lead wire connected to the Control T/C and Hi-limit T/C terminals.
- Re-connect control and Hi-Limit thermocouples to the controller thermocouple terminals (Control T/C, and Hi-limit T/C).
- Re-install the Protocol controller onto the oven.
- Re-connect AC power to the oven.
- Press the **Power on** pushbutton to energize oven.
- Press the **Tune** key. The display reads [TUNE].
- Reset any tune mode parameters that were changed in step 12 to perform calibration (examples: DEG = F and CZ0 = 0 .0).
- When changes have been completed, press the **Manual** key. The display reads [MANUAL].

The calibration procedure is complete.

Calibration Recovery

The Protocol control has a factory calibration recovery feature. This feature allows the operator to restore the Protocol to an operational condition should a calibration error occur. The Factory Calibration Recovery feature should only be used as a temporary fix until a proper calibration procedure utilizing a calibration source can be performed. Only a complete calibration will restore the Protocol to an optimum performance level.

For proper calibration instructions refer to the calibration section of this manual.

Instructions

- Select the Diagnose mode by pressing the DIAG key.
- Press the **ò** (down arrow) key until RCVR SEN is displayed.
- To recover the control sensor calibration value, press the key sequence **+** , **-**, **-**, **+**, **-**, **+**.
- Press the **ò** (down arrow) key until RCVR HIL is displayed.
- To recover the high limit sensor calibration value, press the key sequence **+** , **-**, **-**, **+**, **-**, **+**.

The calibration recovery is now complete.

Diagnostics Mode

The diagnostics mode is provided to give certain relative information about Protocol. The following table gives an outline of the diagnostics mode.

Display	Description
DIAGNOSE	Select Diagnostics mode.
SSR	Protocol SSR output level.
EVENTS	Events 1-3 follow
E-1	Event 1 output
E-2	Event 2 output
E-3	Event 3 output
SENS-T/C	Control thermocouple display follows
GOOD ###	Control thermocouple test and input reading in degrees
HL - T/C	Hi-limit thermocouple display follows
GOOD ###	Hi-limit thermocouple test and input reading in degrees
PWR	% output
RCVR SEN	Recover factory calibration for control sensor
RCVR HIL	Recover factory calibration for high limit sensor

Items that can be adjusted by the user include SSR (ON or OFF), Events E-1, E-2 and E-3(ON or OFF) and PWR. The SSR and PWR items can be used to test the solid state relay for proper operation. The SSR item allows the SSR to output 100% (ON) or 0% (OFF). The PWR item allows for adjustable output

from 0% to 100%. to implement, adjust the PWR level with the +/- keys and turn on the heater relay.

RCVR SEN and RCVR HIL are used to restore the factory calibration should a calibration error occur.

We hope you will find this information useful. THANK YOU for contacting us and allowing us to be a service to you. Please contact us at 1-800-473-7373 if you have any questions.