ECD M.O.L.E.® EV THERMAL PROFILERS

Calibration Procedure | A61-3800-05 | Rev-1.0

ECD | 4287-B S.E. International Way, Milwaukie, Oregon 97222-8825

CALIBRATION INFORMATION

Because the M.O.L.E.® Thermal Profiler is made with precision components with high temperature stability and tight tolerances, the analog-to-digital converters remains stable for years. High quality components together with software algorithms based on the **ITS-90*** standard for **Type K** thermocouples have been provided to yield the specified accuracy and long-term stability. Each unit has been tested at the factory before it is shipped.

Good thermal quality programs require periodic calibration to show the Thermal Profiler continues to remain in calibration using a temperature standard.

> Do not attempt to calibrate the M.O.L.E. EV Thermal Profiler if you have never used a thermocouple simulator, or you are unsure of the accuracy of your Thermocouple Simulator. (Contact ECD for further assistance).

* **ITS-90 - International Temperature Scale of 1990**

DEFINITIONS:

- **Calibration:** The name (noun) of the procedure that determines the accuracy of a measurement device by comparing it to a known standard.
- **Calibrate:** To perform (verb) the procedure of calibration, which involves measuring against a standard. It does not include adjustment, though adjustment may follow calibration if needed.
- **Adjustment (Calibration Adjustment):** The procedure of modifying the device to bring its measurements closer to the standard.
- **Certificate of Calibration (COC):** The resulting documentation issued by a laboratory that states the device's accuracy, the instruments used and conditions while the procedure was performed.
    - Accredited COC is Issued by a laboratory that follows standard practices has been assessed and accredited by an independent accreditation body.
    - Unaccredited COC is issued by a laboratory that may follow standard practices but has not been formally accredited by in independent body.

EQUIPMENT REQUIRED:

1. A Thermocouple Standard which may be either:
   - Thermocouple Simulator* with accuracy ±0.1°C and output impedance ≤ 0.1Ω
   - Voltage Reference with accuracy ±3µV and output impedance ≤ 0.1Ω, Ice-point Cell with accuracy ±1°C or better and TRP
2. Thermocouple harness (special limits of error)
   - If calibrating a M.O.L.E.® EV6 - ECD Item #E65-3806-26
   - If calibrating a M.O.L.E.® EV12 - ECD Item #E65-3812-26
   - If calibrating a M.O.L.E.® EV20 - ECD Item #E65-3820-26
3. Foam insulator (to wrap around the M.O.L.E. EV Thermal Profiler thermocouple connections and provide access to the display, ON/OFF and Record buttons)
4. M.O.L.E. MAP Software (installed on PC)
5. Optional – MAP Machine and KPI Template files
   - MOLECalibration.xmr
   - MOLECalibrationTemplate.tpf

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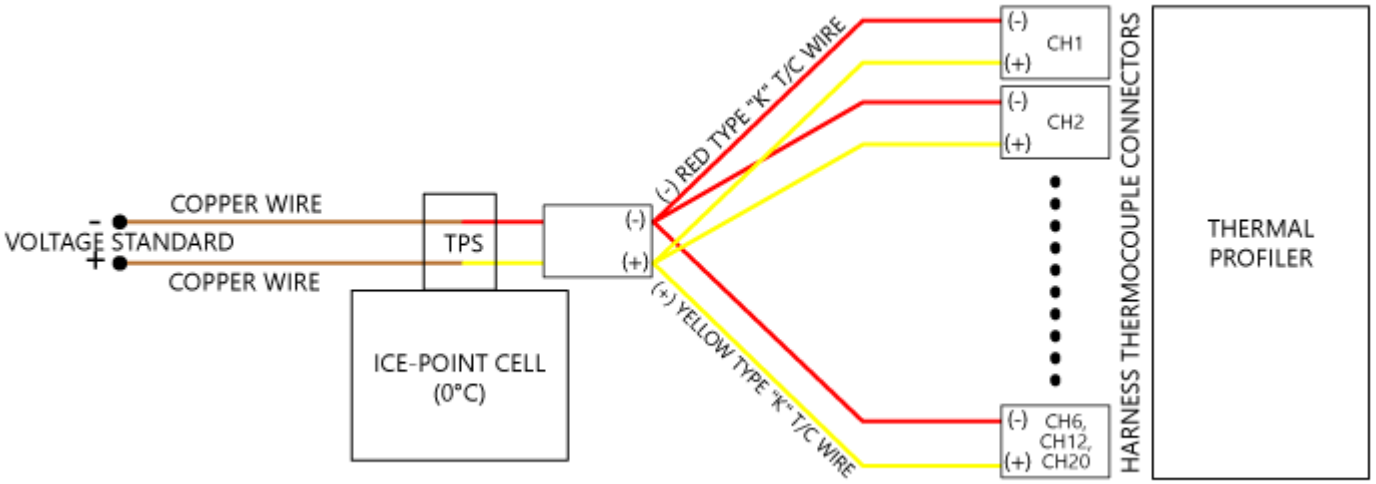
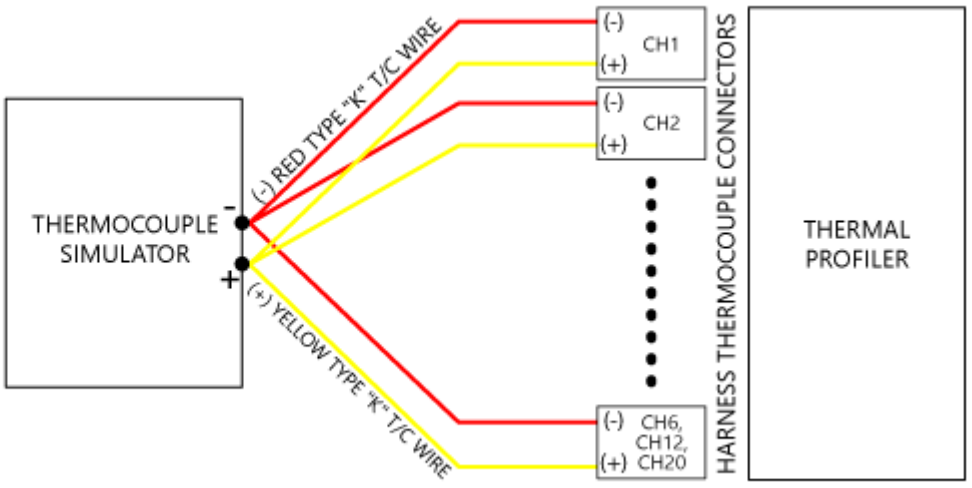
SETUP

The equipment you use for the calibration determines the setup procedure. The number of thermocouples vary depending on the M.O.L.E.® EV Thermal Profiler.

Voltage Reference, Ice-point Cell and TRP connection:



Thermocouple Simulator connection:

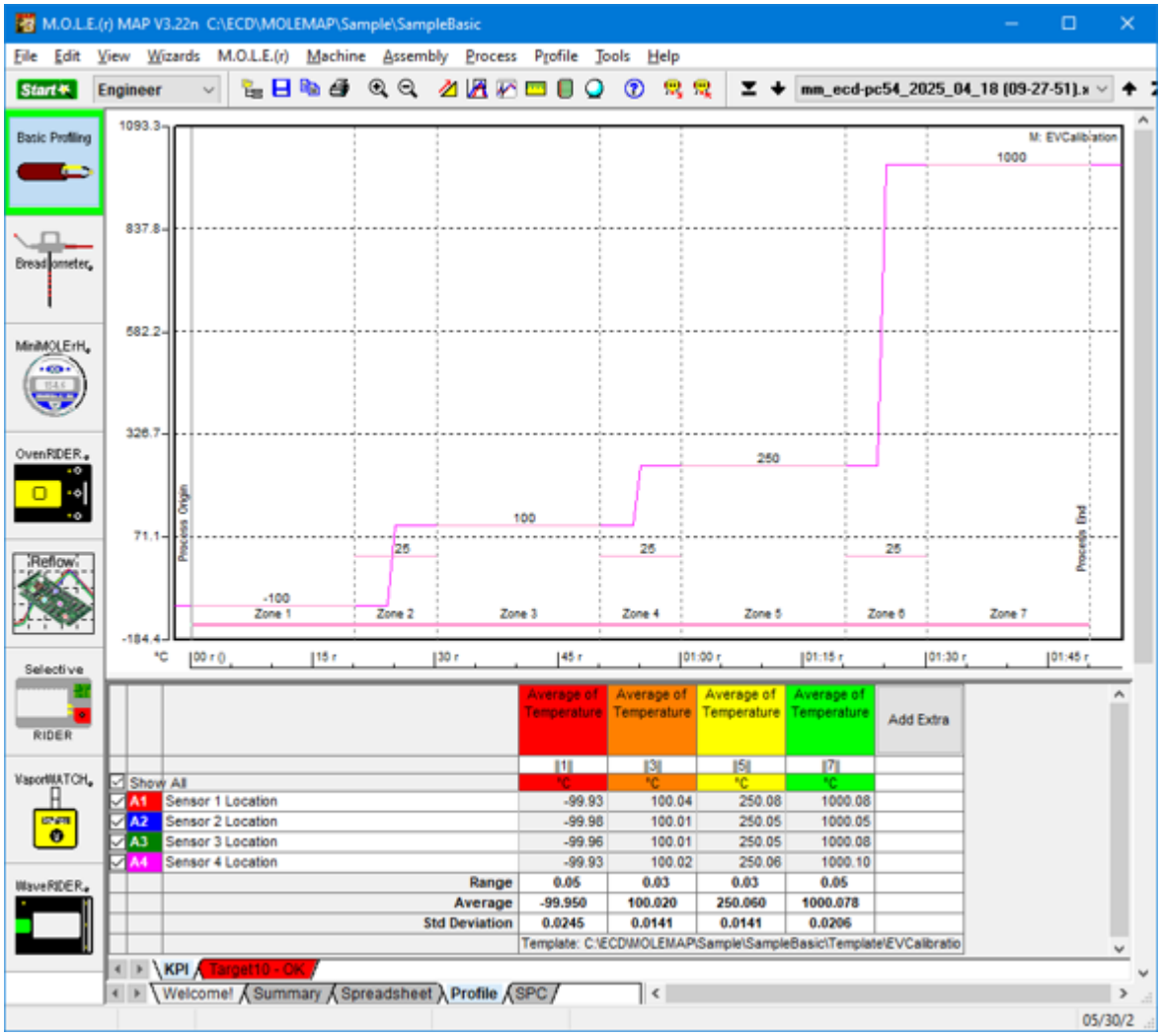


PROCEDURE: CALIBRATION VERIFICATION

1. Connect the M.O.L.E. EV Thermal Profiler to the thermocouple harness.
2. Wrap the thermocouple connection of the M.O.L.E. EV with foam insulator.
3. Turn ON the M.O.L.E. EV by pressing the ***ON/OFF*** button.

4. Start M.O.L.E. MAP software and set M.O.L.E. EV recording parameters as follows:
   - Log Interval: 1 sec
   - All channels ON and type K
5. Set the Thermocouple Standard to -100°C (-3.554mV). **Allow at least 1 minute for thermal stabilization**.
6. Make sure no channels are reading open (----.-) and read near -100°C (-3.554mV) on the M.O.L.E. EV display.
7. Start M.O.L.E. EV recording, and allow to log for at least 30 seconds at -100°C or user determined value.
8. Change the Thermocouple Standard to 100°C (4.096mV) or user determined value, and allow it to continue logging for at least 30 more seconds.
9. Change the Thermocouple Standard to 250°C (10.153mV) or user determined value, and allow it to continue logging for at least 30 more seconds.
10. Change the Thermocouple Standard to 1000°C (41.276mV) or user determined value, and allow it to continue logging for at least 30 more seconds.
11. Stop M.O.L.E. EV recording.

12. Download the data run from the M.O.L.E. EV to the M.O.L.E. MAP Software.



13. Confirm M.O.L.E. EV recorded the temperatures ±1°C from the Thermocouple Standard (guard-band using your standard's accuracy, and or uncertainty as you prefer).
    - If within spec, Calibration Verification complete.
    - If out of spec, Perform Calibration Adjustment procedure.

PROCEDURE: CALIBRATION ADJUSTMENT

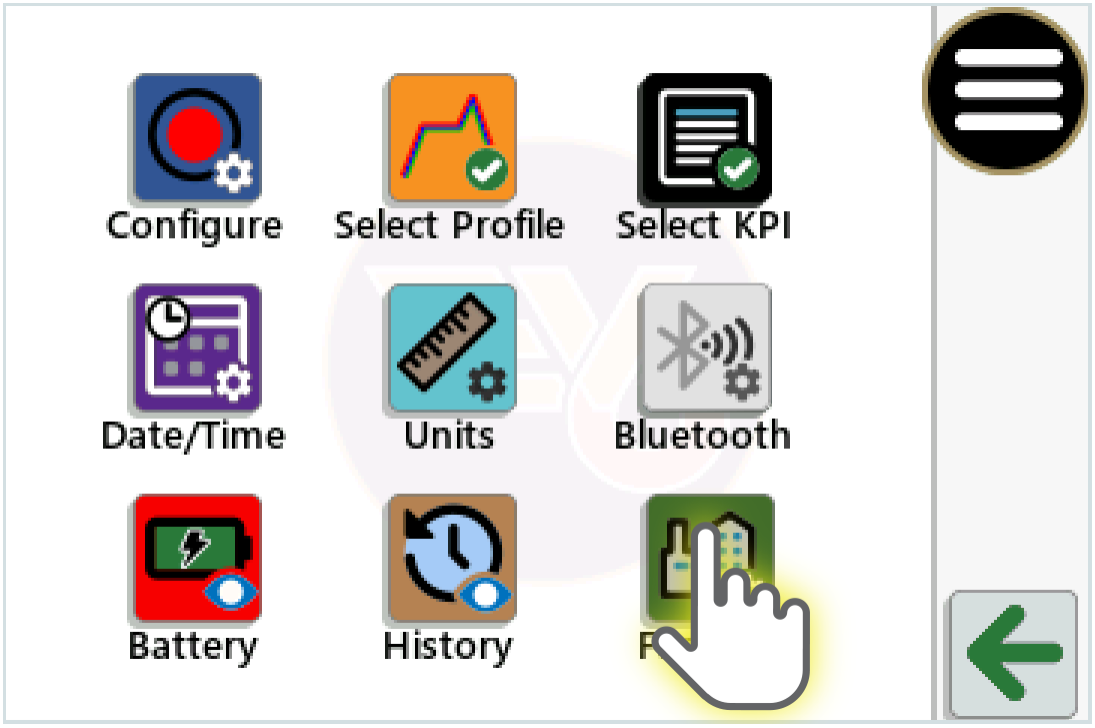
1. Connect the M.O.L.E. EV Thermal Profiler to the thermocouple harness.
2. Wrap the thermocouple connection of the M.O.L.E. EV with foam insulator.
3. Turn ON the M.O.L.E. EV by pressing the ***ON/OFF*** button.

4. Set the Thermocouple Standard to 0°C (0.000mV). **Allow at least 1 minute for thermal stabilization.**
5. Make sure no channels are reading open (----.-) and read near 0.0°C on the M.O.L.E. EV display.

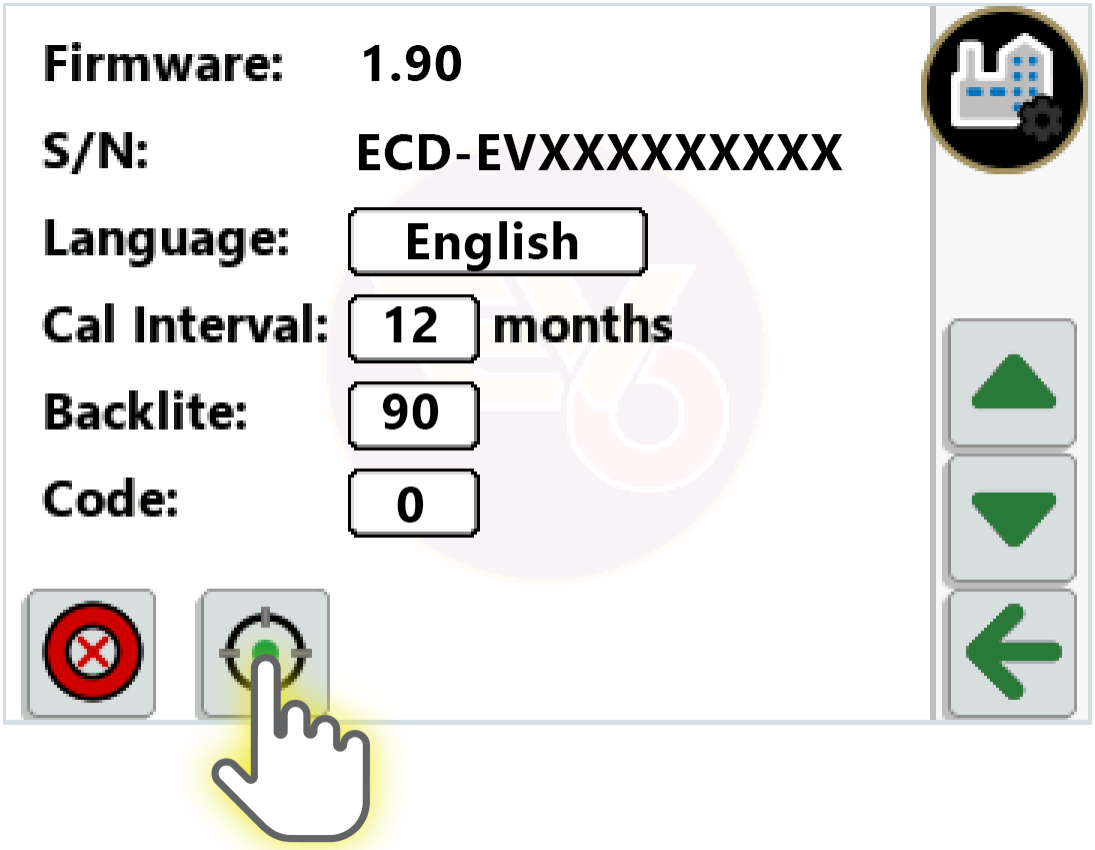
When interacting with the M.O.L.E. EV avoid any extended contact as it may thermally influence the readings.

6. From the ***Home Screen***, touch the ***Main Menu*** button.

7. Touch the ***Factory Settings*** button.



8. Touch the ***Start Calibration Adjust*** button.



9. Follow the instruction on the display, changing from 0.0°C to 1100°C (45.119mV) when prompted.
10. Success or failure will be prompted at the end of each step.
    - If successful Calibration Adjustment complete. Repeat the Calibration Verification to confirm.
    - If not, confirm again that ALL channels are reading at or near the current standard's setting, checking for bad connections, and repeat the Calibration Adjustment procedure.