MEGAM.O.L.E.® Series Thermal Profilers
Calibration Procedure

For MEGAM.O.L.E.® 20, V-M.O.L.E.® & SuperM.O.L.E.® Gold 2

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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 converter remains stable for years. High quality components together with software algorithms based on the IPTS-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.

ECD recommends the M.O.L.E.® Thermal Profiler is factory re-calibrated every 6 months when it is being used constantly. If the use is occasional, a period of no greater than 12 months between calibrations is recommended.

Good thermal quality programs require periodic calibration to show the Thermal Profiler continues to remain in calibration using a temperature standard. Any observed inaccuracies are probably not caused by calibration error but by any one of a number of other sources, primarily the following:

1. Poor thermocouple connections or open thermocouples.
2. Using a standard that is inaccurate or one not traceable to the National Institute of Standards and Technology.
   - Check the accuracy of your standard and that it is traceable to NIST. Be sure that you're using Type K special limits of error wire connected to the standard. Be sure that your standard is cold-junction compensated, or use an ice-point reference.
   - Make sure that IPTS-90 tables are being used.
   - Recharge the Power Pack. Refer to M.O.L.E.® MAP User Help System for details.
4. Sudden changes in ambient temperature.
   - Allow the M.O.L.E.® Thermal Profiler to stabilize for 1/2 hour before calibration.

If after checking these possible sources of inaccuracy and the M.O.L.E.® Thermal Profiler still needs to be calibrated, proceed as directed.

* IPTS-90 - International Practical Temperature Scale of 1990
Equipment Required:

1. Voltage reference and an ice point reference.
   - Resolution: 1µV or better
   - Accuracy: 5µV or better
   - Output Imp: ≤10ohms

   OR

   Thermocouple Simulator
   - Resolution: 0.1°C
   - Accuracy: 0.25°C
   - Output Imp: ≤10ohms

2. Thermocouple harness (special limits of error)
3. Thermal Isolation Box (Thermal Barrier)
4. Thermocouple Simulator software program
   - Hyperterminal (Windows)
5. USB computer interface cable
Setup

The equipment you use for the calibration determines the setup procedure. The number of thermocouples vary depending on the M.O.L.E.® Thermal Profiler. These examples display the use of 6 channels.

Voltage reference and ice point reference:

![Voltage reference and ice point reference diagram]

Thermocouple Simulator:

![Thermocouple Simulator diagram]
Procedure

1. Connect the M.O.L.E.® Thermal Profiler to calibration standard.
2. Connect the M.O.L.E.® to a USB port with the USB computer interface cable.
3. Insert the M.O.L.E.® into the Thermal Isolation Box.
4. Start Hyperterminal.
5. Enter any Name for the Connection Description.

6. Select the COM port number that the operating system assigned to the USB port that the M.O.L.E.® is connected to. The Connect Using drop down list displays all of the available COM ports so it may require a few attempts to determine the correct port.
7. Enter the COM Port Properties as shown.

8. When finished select the **OK** command button and Hyperterminal displays a blank screen to enter commands directly to the M.O.L.E.®.

9. Hit **Enter** to display a “?_”. If Hyperterminal does not display a “?_”, that means the correct COM Port was not selected in Step 7.
10. Enter: `^OC1`. This starts the calibration and the M.O.L.E.® replies with instructions:

```
^OC1
Starting OFFSET calibration
Configure calibration signal for ZERO Deg C.
Then disconnect USB cable.
Wait for Recording to start and finish, then reconnect.
Send ^OC2 to get results.
```

11. Set the standard to 0.0°C, disconnect the M.O.L.E.® from the computer and then select **Disconnect** on the Hyperterminal Toolbar. The M.O.L.E.® records for about 20 seconds and stops.
12. Connect the M.O.L.E.® to the computer again and select Call on the Hyperterminal Toolbar.

13. Enter: \^OC2.

14. The M.O.L.E.® reports success or failure. If successful, Hyperterminal displays: **Offset Calibration completed!** then enter: \^OC3. If failure, repeat \^OC1 as directed in Step 10.
15. The M.O.L.E.® replies with instructions:

```
?^OC1
Starting OFFSET calibration
Configure calibration signal for ZERO Deg C.
Then disconnect USB cable.
Wait for Recording to start and finish, then reconnect.
Send ~OC2 to get results.
^OC2
Reporting results for OFFSET calibration
Offset Calibration completed!
^OC3
Starting Gain calibration
Configure calibration signal for 1100 Deg C.
Then disconnect USB cable.
Wait for Recording to finish, then reconnect
Send ~OC4 to get results.
```

16. Set the standard to 1100.0°C, disconnect the M.O.L.E.® from the computer and then select **Disconnect** on the Hyperterminal Toolbar. The M.O.L.E.® records for about 20 seconds and stops.
17. Connect the M.O.L.E.® to the computer again and select Call on the Hyperterminal Toolbar.


19. The M.O.L.E.® reports success or failure. If successful, Hyperterminal displays: Gain Calibration completed then hit the Enter key which displays the “?_” If failure, repeat ^OC3 as directed in Step 14.

20. Now perform a calibration confirmation. Select Disconnect on the Hyperterminal Toolbar, disconnect the M.O.L.E.® from the computer and record several temperature values downloading them into M.O.L.E.® MAP software to see if they are within the ECD specification. If acceptable, connect the M.O.L.E.® to the computer again and select Call on the Hyperterminal Toolbar. Enter: ^OCD then ^OCA.

Manufacturer Specification: +/- 1ºC of reading

Those commands set the calibration date and stores the calibration constants as archive values:

Your M.O.L.E.® Thermal Profiler is now calibrated.