*MEGA*M.O.L.E.® Series Thermal Profilers
Calibration Procedure

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

SINCE 1964

ECD, Inc.

4287-B S.E. International Way
Milwaukie, Oregon 97222-8825
Telephone: (800) 323-4548
FAX: (503) 659-4422
Technical Support: (800) 323-4548
Email: ecd@ecd.com
Internet: http://www.ecd.com

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.

3. Extremely low Power Pack charge.

    • 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
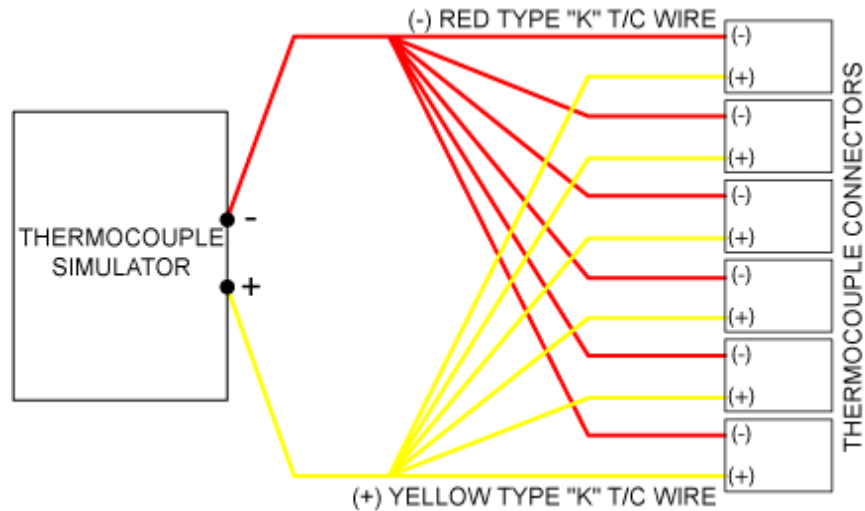   - Hyperterminal (Windows)
5. USB computer interface cable

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.

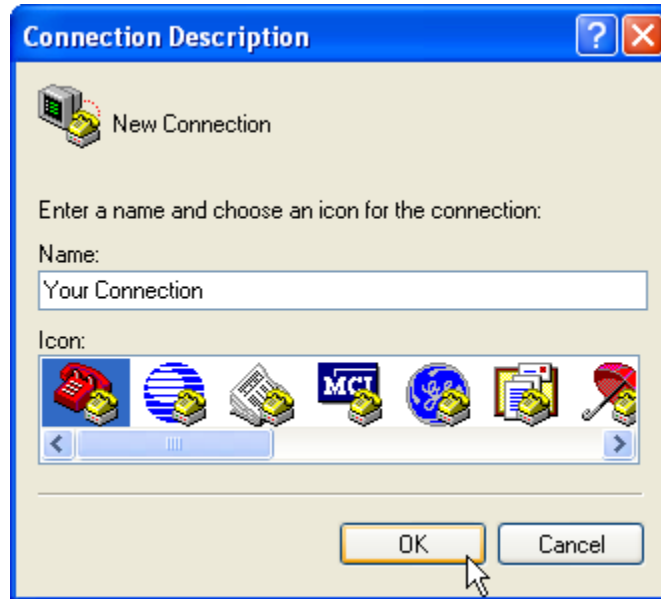### Voltage reference and ice point reference:
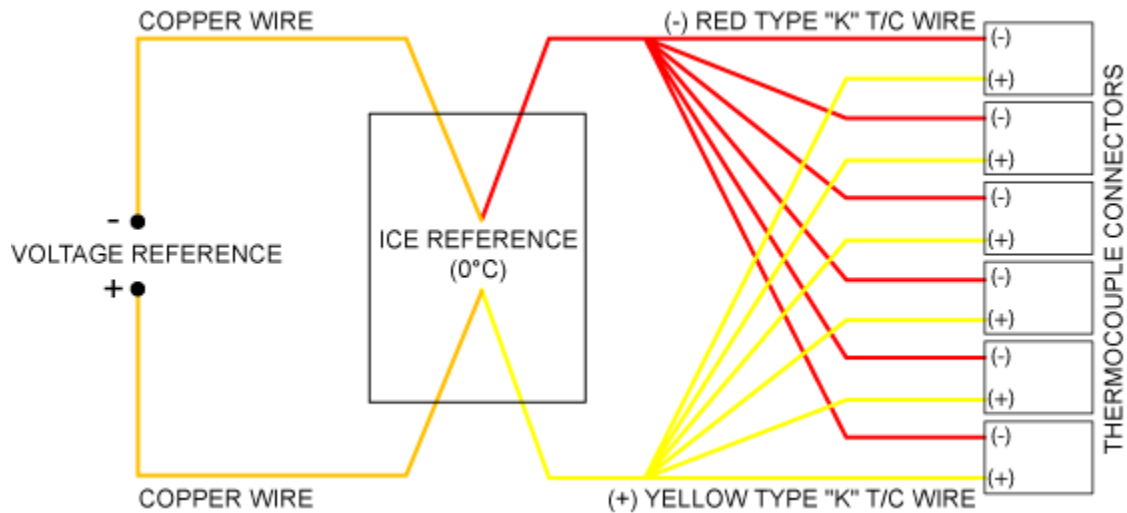
### Thermocouple Simulator:

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.
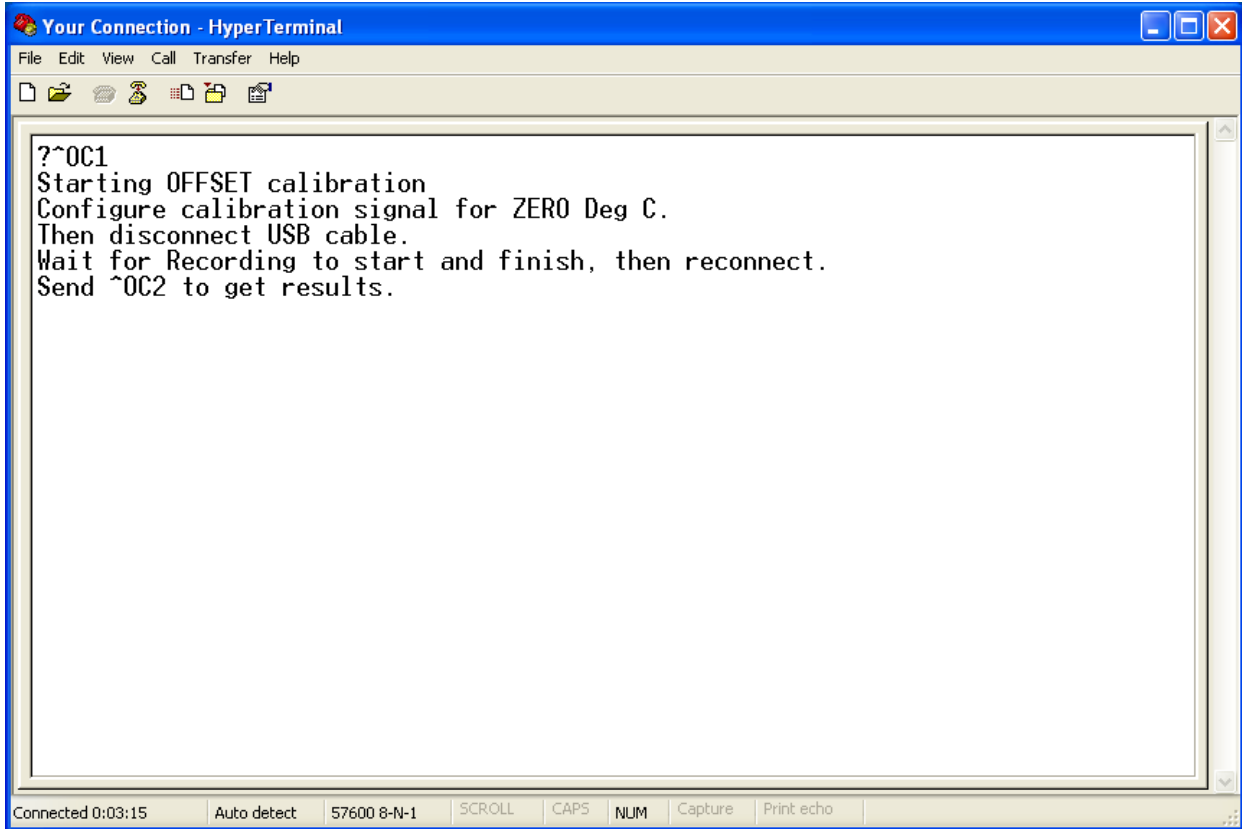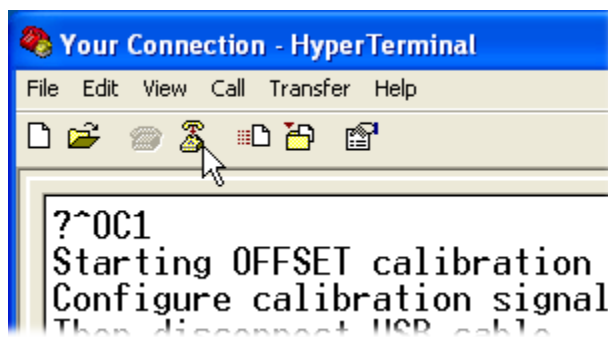
7. Enter the COM Port Properties as shown.
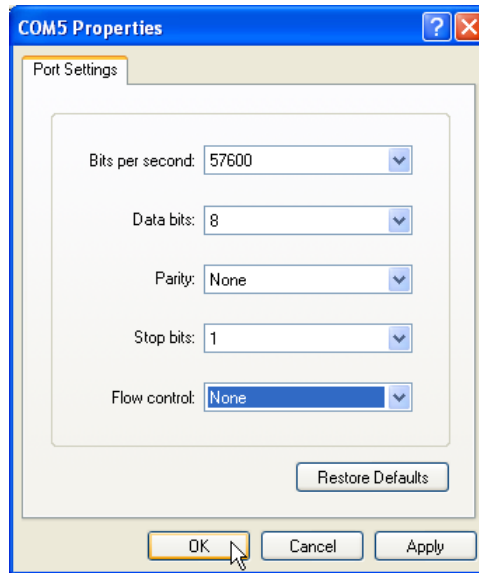
8. When finished select the **OK** command button and Hyperterminal displays a blank screen to enter commands directly to the M.O.L.E.®.

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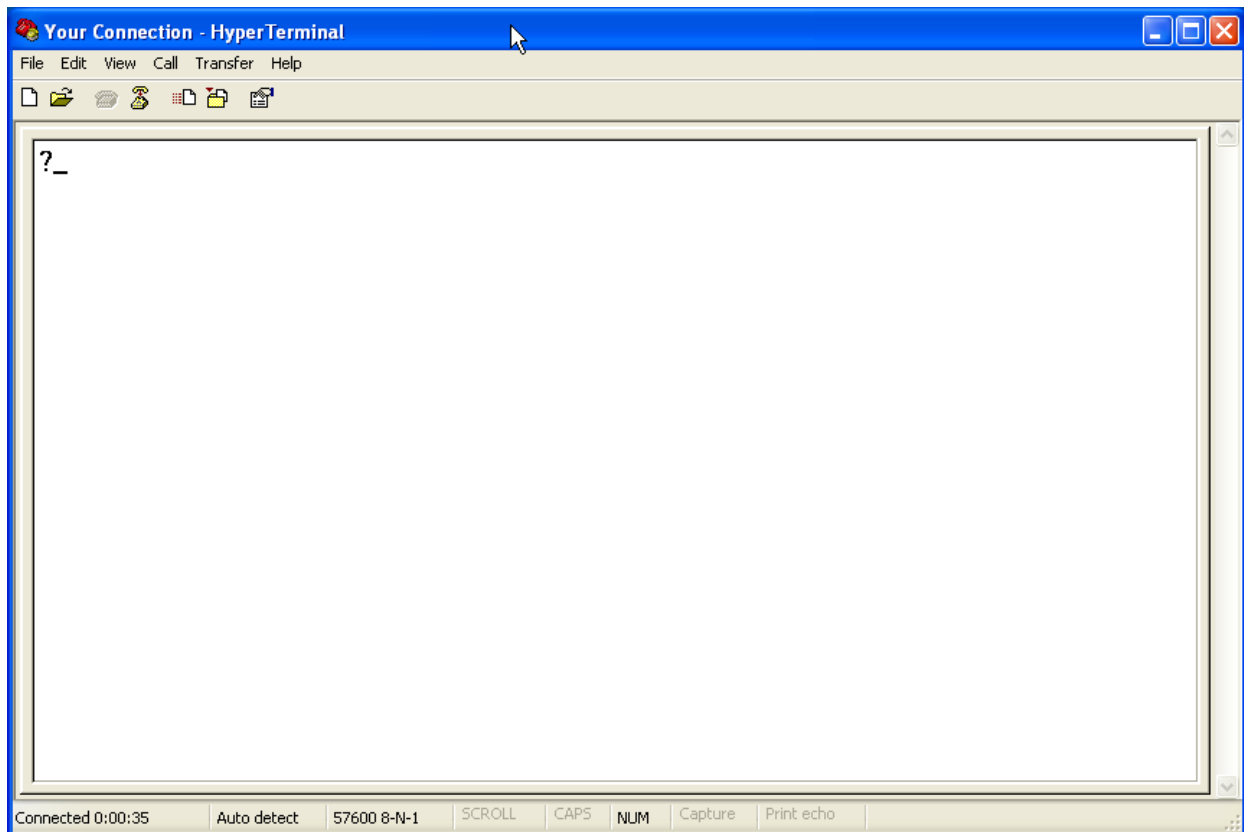
10. Enter: **^OC1.** This starts the calibration and the M.O.L.E.® replies with instructions:

```
Your Connection - HyperTerminal
File  Edit  View  Call  Transfer  Help

?^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.




Connected 0:03:15    Auto detect    57600 8-N-1    SCROLL    CAPS    NUM    Capture    Print echo
```

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.

```
Your Connection - HyperTerminal
File  Edit  View  Call  Transfer  Help

?^OC1
Starting OFFSET calibration
Configure calibration signal
Then disconnect USB cable
```

12. Connect the M.O.L.E.® to the computer again and select *Call* on the Hyperterminal Toolbar.
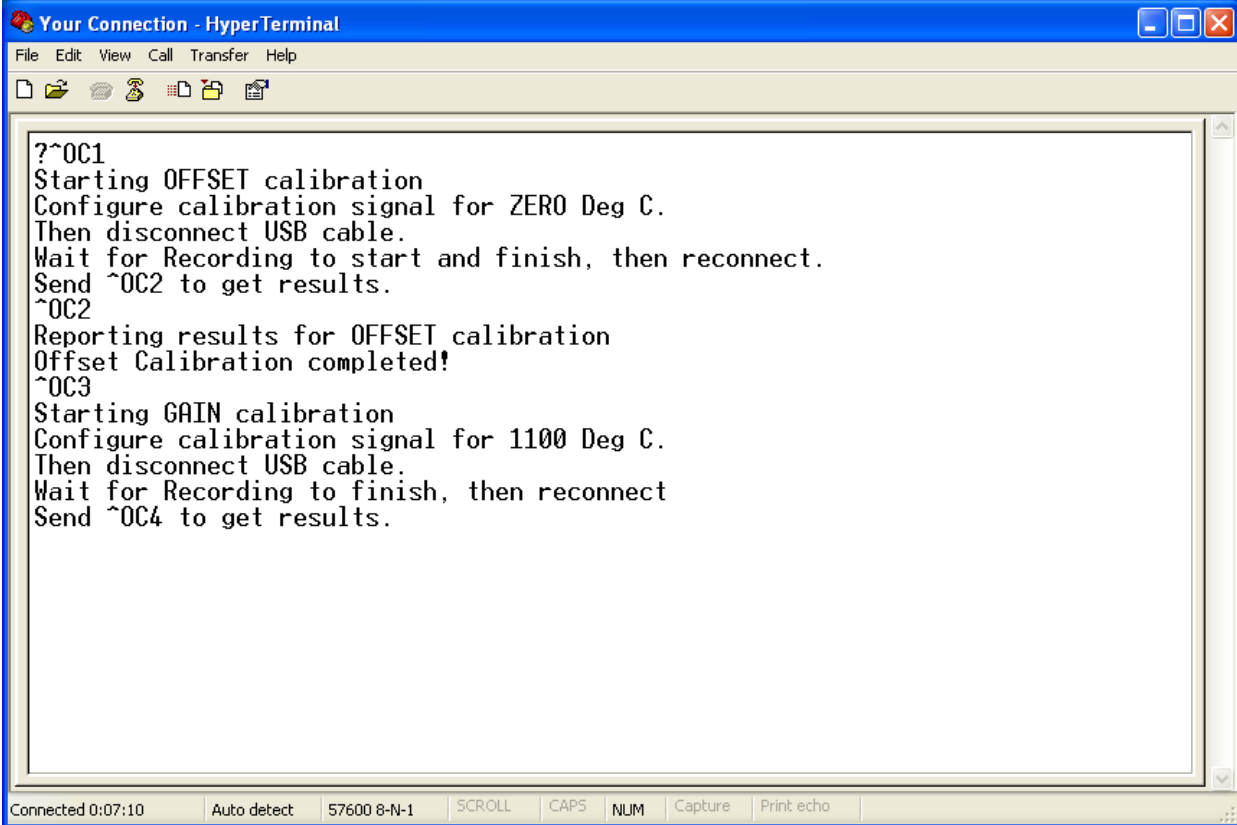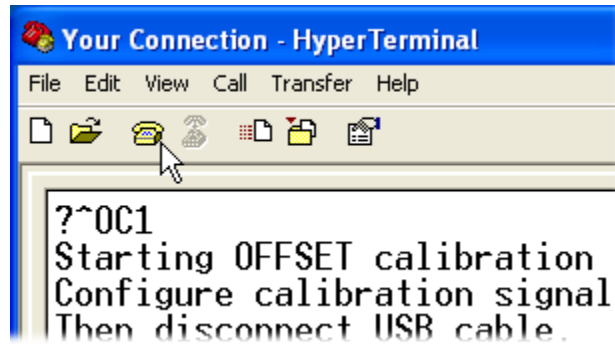

13. Enter: **^OC2**.
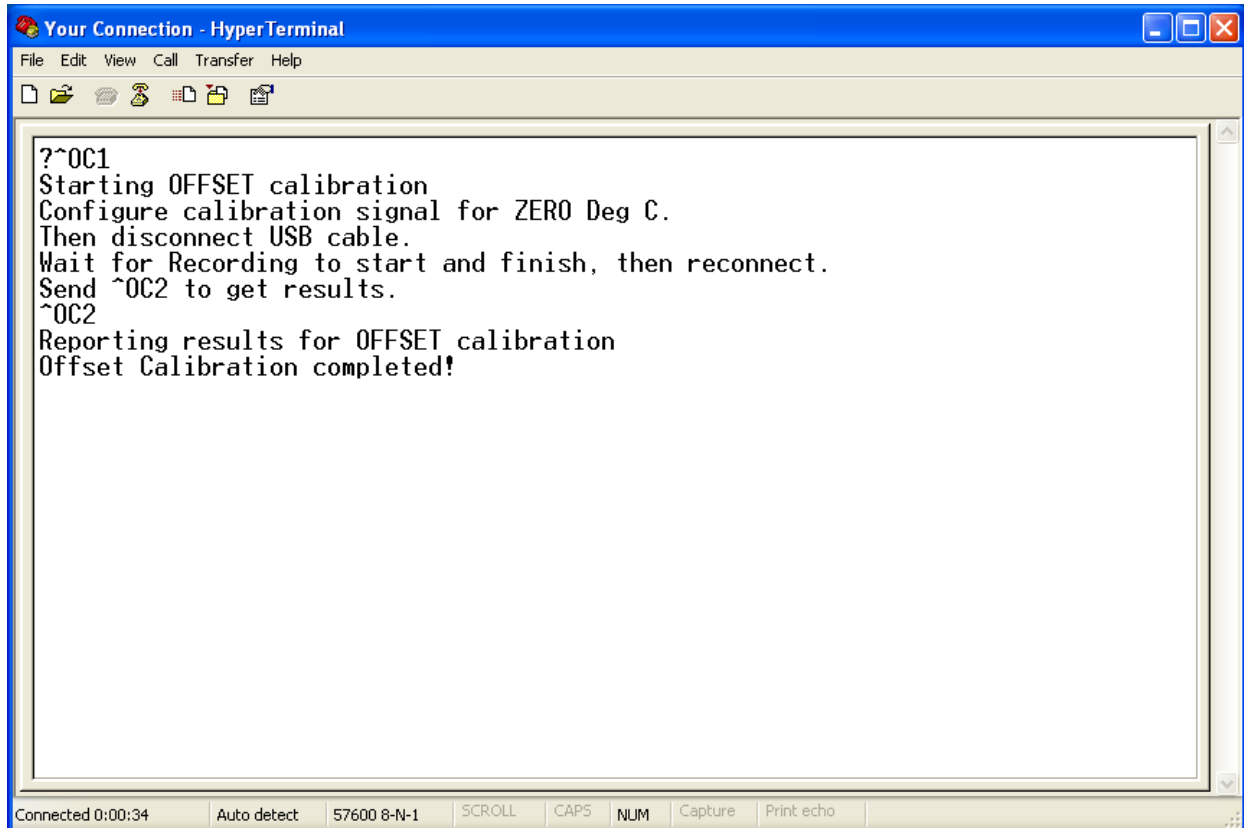
14. The M.O.L.E.® reports success or failure. If successful, Hyperterminal dispays: *Offset Calibration completed!* then enter: **^OC3.** If **failure**, repeat **^OC1** as directed in Step 10.
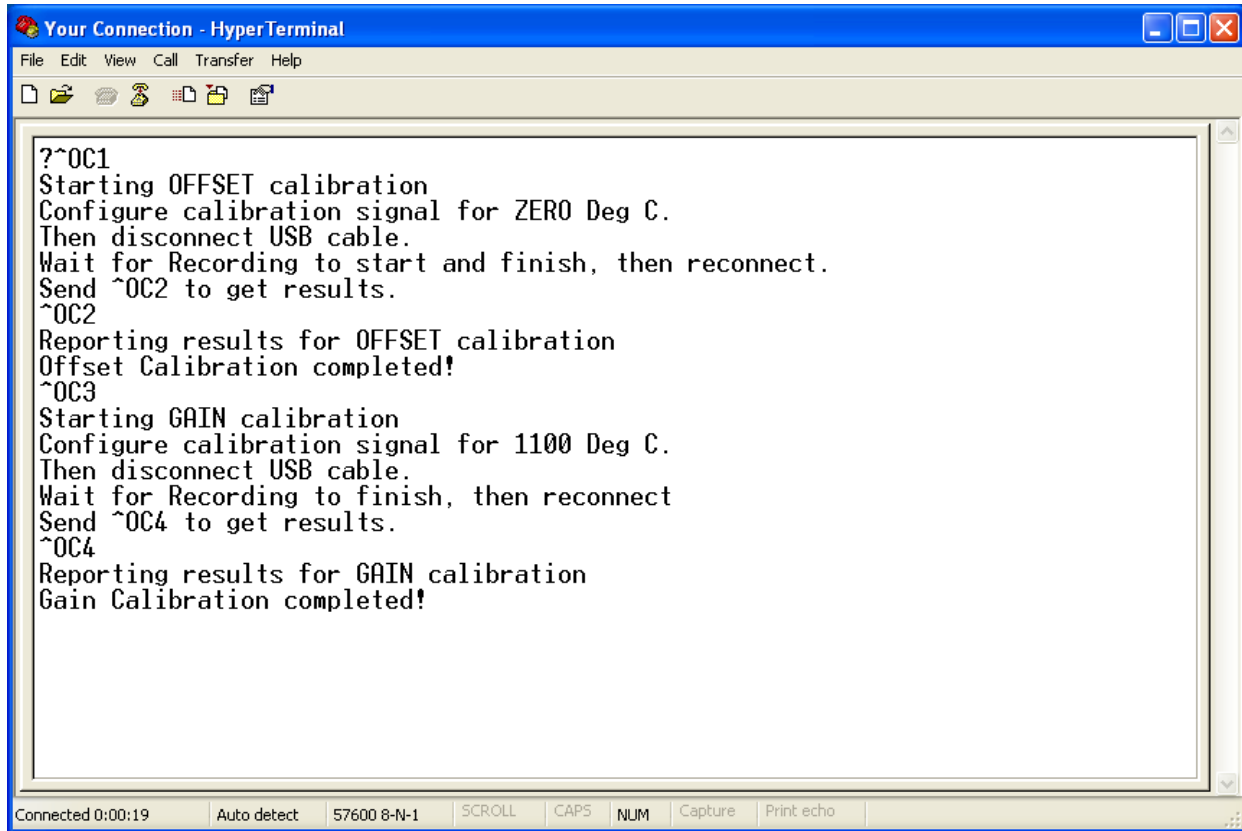
15. The M.O.L.E.® replies with instructions:

```
?^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.

18. Enter: **^OC4**.

```
Your Connection - HyperTerminal
File  Edit  View  Call  Transfer  Help

?^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.
^OC4
Reporting results for GAIN calibration
Gain Calibration completed!




Connected 0:00:19    Auto detect   57600 8-N-1   SCROLL  CAPS  NUM  Capture  Print echo
```

19. The M.O.L.E.® reports success or failure. If successful, Hyperterminal dispays: *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.