

Verifying the Calibrators

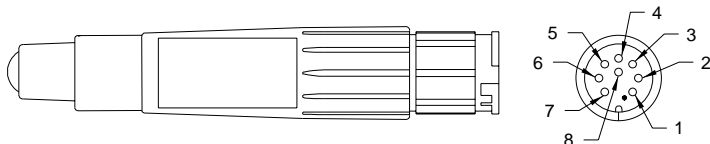
Calibrators should be returned to Thornton periodically for "NIST Traceable" re-calibration. If desired they can be checked on site. A precision "NIST Traceable" resistance meter is needed to perform the verification. Each calibrator consists of two precision resistors: one for the resistivity signal and the other for the temperature signal.

A. Verify the Resistance Signal:

1. Connect one lead of the ohm meter to pin #1 of the calibrator.
2. Connect the other lead of the ohm meter to pin #6 of the calibrator.
3. Measure the resistance and compare it to the value listed on the calibrator label.

A. Verify the Temperature:

1. Connect one lead of the ohm meter to pin #4 of the calibrator.
2. Connect the other lead of the ohm meter to pin #6 of the calibrator.
3. Measure the resistance and compare it to the value listed on the calibrator label.



If the calibrator is within performance limits, a verification label can be applied to the calibrator to show the last verification date. A set of blank verification labels is included with each calibrator system (1865) with space for the date and initials.

Limited Warranty

Mettler-Toledo Thornton, Inc. warrants products it manufactures against defects in materials or workmanship for 18 months from the date of shipment from Thornton. Items returned for warranty must be properly packaged, shipped prepaid and insured, and be accompanied by a Return Materials Number assigned by Thornton Customer Service.

Additional Information

If you have any questions regarding these operating instructions or wish further information about the calibrators or the 200CR, please contact us by phone or fax.

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INSTRUCTION MANUAL 1865 Calibration Systems Used with 200CR & 200CRS Conductivity/Resistivity Measuring Systems

Thornton calibrators perform a meter calibration without removing the instrument from the installation and without any additional equipment. The complete calibration process takes only a few minutes with minimal operator involvement. The accuracy of Thornton Calibrators can be traced to NIST (National Institute of Standards and Technology) standards. A simple test and verification procedure can be performed periodically to verify that each calibrator has maintained its accuracy.

Calibration equipment for the 200CR & 200CRS Instruments is provided at three levels: a Complete full range Calibration System including four calibrators, High or Low Resistance Calibration Systems each containing two calibrators, and individual and special calibrators as outlined below.

200CR & 200CRS Calibration Equipment Structure

1865-03 Complete Calibration System

1865-01 Resistance High Range Calibration System

- 1864-01 4 Mohm Calibrator with 104C, Pt 1000 temperature
- 1864-02 100 kohm Calibrator with 0C, Pt 1000 temperature

1865-02 Resistance Low Range Calibration System

- 1864-03 20 kohm Calibrator with 104C, Pt 1000 temperature
- 1864-04 1 kohm Calibrator with 0C, Pt 1000 temperature

Special Calibrators

- 1865-04 1.8 Mohm Calibrator with 25C, Pt 1000 temperature

The 200CR & 200CRS Instruments have two internal ranges of measurement. They automatically operate in their high resistance range for measured resistances greater than 75 kohms where:

$$\begin{aligned}\text{measured resistance (ohms)} &= \text{cell constant (cm}^{-1}\text{)} \times \text{resistivity (ohm-cm)} \\ \text{measured resistance (ohms)} &= \text{cell constant (cm}^{-1}\text{)} / \text{conductivity (S/cm)}\end{aligned}$$

(Be sure to convert conductivity in microsiemens/cm ($\mu\text{S/cm}$) into siemens/cm (S/cm) by multiplying it by 10^{-6} before use in the above calculation.)

Measured resistances below 75 kohms operate in the low resistance range of the instrument. If the application requires measurement within only one of the ranges then only that range need be calibrated, at two points. Two-point temperature calibration is also performed.

METTLER TOLEDO

Special calibrators enable calibration at ultrapure water levels (1.8 Mohm, equivalent to 18 Mohm-cm with 0.1 cm⁻¹ cell) and with systems using Ni-Fe 500 temperature sensors.

Verification/Calibration

NOTE: the 200CR & 200CRS will not give direct readings of calibrator values in the normal measuring mode.* The Verify mode should be used for this.

The 200CR instrument provides two independent measurement channels (as well as high and low ranges on each channel) which must be calibrated separately. To assure that the electronic circuitry has reached a stable operating temperature, power the instrument at least two hours prior to calibration. The procedure is initiated by disconnecting the cell on one channel and installing a calibrator.

Verification

Press the CALIBRATE key. The meter will read "Calibrate Sensor". Use the up or down arrow keys to select "Calibrate Verify". Press the ENTER key. Select the desired channel and press the ENTER key. If the instrument reading is within $\pm 0.5\%$ of the values for resistivity and temperature listed on the calibrator, the instrument is within proper calibration. However, a calibration may be performed to "fine tune" the instrument.

Calibration

To perform a calibration press the CALIBRATE key on the 200CR. The display will show the following:

Calibrate Sensor

Use the up arrow key to toggle to:

Calibrate Meter

Press the OK/NEXT key.

You may now choose which channel of the meter to calibrate. Thornton recommends that both channels be calibrated unless verification shows the channels to be within specification. A sample of a two point Res Hi calibration on Channel A is shown below. A valid calibration must also include a Temperature calibration. This example should be repeated for Channel B.

Cal Meter Ch A

Press the OK/NEXT key to select channel A. The ranges for **Res Hi**, **Res Lo**, or **Temp** can be selected using arrow keys. Press the OK/NEXT key. Then select Res Hi by using the up and down arrow keys. Connect the 1864-02 calibrator in place of the sensor on Channel A.

Cal A #1: Res Hi

Press the OK/NEXT key.

A ResHi=100.00K

Adjust the display to read the calibration value shown on the calibrator for resistance (Res) using the up and down arrows. Press the OK/NEXT key.

A = 100.3K OK?

The value displayed at this point is the value the meter is reading before calibration. Allow approximately 15 seconds for this value to stabilize. (*This will NOT be the value input from the calibrator. The value on the calibrator is only displayed by the meter in the Calibrate Verify mode.*) Press the OK/NEXT key. When the calibration is done, the meter will display:

Done, Press Enter

Press the OK/NEXT key.

Do Point #2? Yes

Press the OK/NEXT key.

Before proceeding, detach the 1864-02 calibrator and attach the 1864-01 calibrator. (For applications measuring near 18 Mohm-cm it may be preferred to use the 1865-04 calibrator at 1.8 Mohm, equivalent to 18 Mohms-cm with a 0.1 cm⁻¹ cell.)

A ResHi=4,000M

Adjust the display to read the calibration value shown on the calibrator for resistance (Res) using the up and down arrows. Press the OK/NEXT key.

A = 4.001M OK?

The value displayed at this point is the value the meter is reading before calibration. Allow approximately 15 seconds for this value to stabilize. (*This will NOT be the value input from the calibrator. The value on the calibrator is only displayed by the meter in the Calibrate Verify mode.*) Press the OK/NEXT key. When the calibration is done, the meter will display:

Done, Press Enter

Press the OK/NEXT key.

Save Changes Yes

Press the OK/NEXT key.

Temperature calibrations must also be completed. For full range meter calibration a two point low resistivity calibration should also be performed with calibrators 1864-03 and 1864-04.

* In order to obtain direct readings with calibrators in the normal measuring mode, it is necessary to select "None" for (temperature) Compensation and set the cell constant "Edit Sensor Cal" to 1.0000 for the channel to be verified. After verification, set the Compensation and cell constant back to the settings for the particular sensor connected.