

TECHNICAL MANUAL
CALIBRATION PROCEDURE
FOR
CONDUCTIVITY METER
1151A, 1152
CU PROBE SUBSTITUTION BOX
9904
(EMCEE)

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CONDUCTIVITY METER**1151A, 1152****CU PROBE SUBSTITUTION BOX****9904****(EMCEE)****1 CALIBRATION DESCRIPTION:***Table 1.*

Test Instrument (TI) Characteristics	Performance Specifications	Test Method
Substitution Box	Range: 3.33 and 40 GΩ Accuracy: ±1% of charted value	Measure Resistance
Conductivity Meter (Model 1151A)	Range: 0 to 50, 500 cu Accuracy: ±2% FS	Compare with the Substitution Box
Conductivity Meter (Model 1152)	Range: 0 to 2000 cu Accuracy: ±(2% rdg + 1 cu)	Compare with the Substitution Box

2 EQUIPMENT REQUIREMENTS:

Noun	Minimum Use Specifications	Calibration Equipment	Sub- Item
2.1 CU PROBE SUBSTITUTION BOX	Range: 3.33 and 40 GΩ Accuracy: ±1% of charted value	EMCEE 152-90-9904 *	
2.2 DC DIGITAL VOLTMETER	Range: 0 to 20 VDC Accuracy: ±0.1% of rdg	Hewlett-Packard 3455A	
2.3 TERAOHMMETER	Range: 3 to 50 GΩ Accuracy: ±0.2% of rdg	Guildline 9520	

* Part of Service Kit 152-07-0000.

3 PRELIMINARY OPERATIONS:

3.1 Review and become familiar with entire procedure before beginning Calibration Process.



Unless otherwise designated, and prior to beginning the Calibration Process, ensure that all test equipment voltage and/or current outputs are set to zero (0) or turned off, where applicable. Ensure that all equipment switches are set to the proper position before making connections or applying power.

3.2 Remove side panel from TI Model 1151A and attach the accessory battery hold down clamp.

3.3 Verify the Probe is disconnected from the TI.

NOTE

If erroneous or erratic readings occur, wipe the TIs BNC connectors with an appropriate cleaner and dry the connectors in warm air.

3.4 Connect test equipment to appropriate power source. Set all POWER switches to ON and allow warm-up as required by the manufacturer.

3.5 Use step 3.6 for the Substitution Box, para 4.1 for Model 1151A or para 4.2 for Model 1152.

3.6 SUBSTITUTION BOX CALIBRATION:

NOTE

If a Teraohmeter is not available, calibrate the Substitution Box resistors IAW T.O. 33K8-4-368-1. (Use 5 VDC to calibrate the resistors.) Measure resistance with (+) and (-) VDC and average the values.

Record the actual resistance value, then calculate the true cu value using the following formula:

$$CU = \frac{1}{\text{Resistance (in } G\Omega)} \times 1000$$

Record the true cu values on the Calibration Certification Label. Use these cu values in lieu of the 25 and 300 cu making the appropriate limit changes as required.

3.6.1 Connect the Teraohmeter to the Substitution Box 300 cu terminals.

3.6.2 Set the Teraohmeter TEST VOLTS to 5 V.

3.6.3 Record the Teraohmeter indication.

3.6.4 Disconnect the Teraohmeter from the Substitution Box 300 cu terminals and connect to the Substitution Box 25 cu terminals.

3.6.5 Record the Teraohmeter indication.

3.6.6 Disconnect the Teraohmeter from the Substitution Box.

4 CALIBRATION PROCESS:

NOTE

Unless otherwise specified, verify the results of each test and take corrective action whenever the test requirement is not met, before proceeding.

4.1 CONDUCTIVITY METER CALIBRATION: (Model 1151A)

NOTE

During QVI, omit steps 4.1.8 through 4.1.19.

4.1.1 Using the DC Digital Voltmeter, ensure cell voltage is >5.75 V positive and negative.

4.1.2 Hold the TI with the BNC connector in the vertical position and observe the meter pointer.

4.1.3 The TI must indicate 0 ± 1 div. Adjust mechanical zero, if required.

4.1.4 Press and hold the TI MEASURE switch. Allow 5 seconds for meter to stabilize.

4.1.5 Hold the TI with the BNC connector in the vertical position and observe the meter pointer.

4.1.6 The TI must indicate 0 ± 1 div.

4.1.7 Release the TI MEASURE switch.

4.1.8 Connect the TI BNC connector to the CU Probe Substitution Box 300 cu terminal.

4.1.9 Set the TI RANGE switch to X10.

4.1.10 Hold the TI with the BNC connector in the vertical position. Press and hold the TI MEASURE switch. Allow 5 seconds for meter to stabilize.

4.1.11 The TI METER must indicate the actual cu value within $\pm 1/2$ division (± 10 cu units).

4.1.12 Release the TI MEASURE switch.

4.1.13 Disconnect the TI BNC connector from the CU Probe Substitution Box.

4.1.14 Set the TI RANGE switch to X1.

4.1.15 Connect the TI BNC connector to the CU Probe Substitution Box 25 cu terminal.

4.1.16 Hold the TI with the BNC connector in the vertical position. Press and hold the TI MEASURE switch.

4.1.17 The TI METER must indicate the actual cu value within $\pm 1/2$ division (± 1 cu unit). Allow 5 seconds for meter to stabilize.

4.1.18 Release the TI MEASURE switch.

4.1.19 Disconnect the TI from the CU Probe Substitution Box.

- 4.1.20 Attach the Probe to the TI BNC connector.
- 4.1.21 Remove the battery hold down clamp and replace the TI side panel.
- 4.1.22 Connect the DC Digital Voltmeter positive lead to TI BNC connector outer shell and negative lead to TI Ground Jack.
- 4.1.23 Locate the TI Probe Calibration Number. Record this number.
- 4.1.24 For TIs having serial numbers on front panels, set the RANGE switch to CAL. For TIs having internal serial numbers, set the RANGE switch to X1.
- 4.1.25 Hold the TI with the BNC connector in the vertical position. Press and hold the TI MEASURE and CALIBRATE switches at the same time.
- 4.1.26 Allow 5 seconds for TI METER to stabilize. If necessary, adjust TI R-5 (PROBE CALIBRATE) until the TI indicates the Probe Calibration Number (step 4.1.23).
- 4.1.27 The DC Digital Voltmeter must indicate the Probe Calibration Number times $(-0.02) \pm 0.05$ VDC.

EXAMPLE
Probe Calibration Number = 38
 $38 \times -0.02 = -0.76 \pm 0.05$

- 4.1.28 Release the TI MEASURE and CALIBRATE switches.
- 4.1.29 Disconnect the Probe and DC Digital Voltmeter from the TI.
- 4.1.30 Set all POWER switches to OFF. Disconnect and secure all equipment.

4.2 CONDUCTIVITY METER CALIBRATION: (Model 1152)

NOTE

During QVI, omit steps 4.2.4 through 4.2.15 because the limits in steps 4.2.2, 4.2.6 and 4.2.10 are altered and no longer valid if step 4.2.14 (R20) is adjusted.

- 4.2.1 Press the TI M switch.
- 4.2.2 The TI must indicate between 000 to 001. Adjust TI ZERO (R-19), if required.
- 4.2.3 Release the TI M switch.
- 4.2.4 Connect the TI BNC connector to the CU Probe Substitution Box 300 cu terminal.
- 4.2.5 Press the TI M switch.
- 4.2.6 The TI must indicate the actual value of CU Probe Substitution Box within ± 7 . Adjust TI CAL (R-18), if required.
- 4.2.7 Release the TI M switch.
- 4.2.8 Disconnect the TI BNC connector from the CU Probe Substitution Box 300 cu terminal, then connect it to the 25 cu terminal.

- 4.2.9 Press the TI M switch.
- 4.2.10 The TI must indicate the actual value of CU Probe Substitution Box within ± 2 .
- 4.2.11 Release the TI M switch.
- 4.2.12 Disconnect the TI BNC connector from the CU Probe Substitution Box.
- 4.2.13 Locate the TI Probe Calibration Number. Press the TI C switch.
- 4.2.14 The TI must indicate 10 times the Probe Calibration Number within ± 2 . Adjust TI CAL REF (R-20), if required.
- 4.2.15 Release the TI C switch.
- 4.2.16 Attach the Probe to the TI BNC connector.
- 4.2.17 Press the TI M switch.
- 4.2.18 The TI must indicate 000 ± 1 . (If the ZERO reading is in error, the Probe must be cleaned and the ZERO rechecked.) Release the TI M switch.
- 4.2.19 Press the TI C switch.
- 4.2.20 The TI must indicate 10 times the Probe Calibration Number within ± 5 .
- 4.2.21 Release the TI C switch.
- 4.2.22 Set all POWER switches to OFF. Disconnect and secure all equipment.

CALIBRATION PERFORMANCE TABLE

4.1 CONDUCTIVITY METER CALIBRATION: (Model 1151A)

<u>Applied</u>	<u>TI Limits</u>
0	0 ± 1 div
25 cu	24 to 26 cu
300 cu	290 to 310 cu
CAL	Probe Cal Number times -0.02 ± 0.05 V

4.2 CONDUCTIVITY METER CALIBRATION: (Model 1152)

<u>Applied</u>	<u>Limits</u>
0	000 to 001
25 cu	023 to 027 cu
300 cu	293 to 307 cu
CAL	Probe Cal Number times 10 ± 5