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2101 CALIBRATION PROCEDURE
Cal Procedure № 2101-021E

Date: April 19, 2002 Revision: E

EQUIPMENT REQUIRED

2	DC Voltage Calibrator	Valhalla 2701C (or equivalent)
1	AC Voltage and Phase Standard	Valhalla 2703-2705 (or equivalent)
1	AC/DC Current Calibrator	Valhalla 2500EP (or equivalent)
1	DC Digital Voltmeter	

1. ENERGIZE THE UNIT

1.2 With the switch in the 115V position, apply AC power and turn on the power switch. Current draw ≈ 63mA.
1.3 Check display for uniform brightness between the display devices.
1.4 Check for correct positioning of the decimal points in the various voltage and current ranges. Note: 2101's have extra watts resolution when in the 30V range.
1.5 Check power supplies at the following points:

(DVM common at ground post)
+5V unregulated at D2 wire
+15V regulated at C21 positive
-15V regulated at C22 negative
+1V ref at C29 positive (adjust R100)*
+1V ref at C35 positive (adjust R107)*
*If these voltages will not come in, center R100 and select R99.

2. CALIBRATION CONNECTIONS

2.1 Refer to fig 5.1.

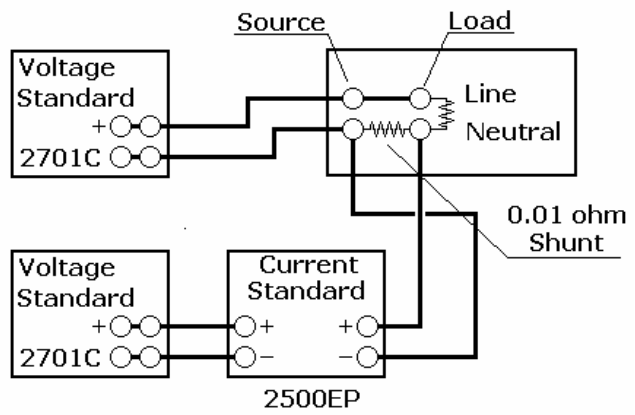

Figure 5.1
Calibration Equipment Connections

2.2 For final cal, install covers and allow unit to warm-up for at least 30 minutes before proceeding.

3. OFFSET ADJUSTMENT

3.1 Set the 2101 to Volts and the 150V range. Set the 2701C to the 120V range, 10V operate.
3.2 Alternating polarity of the input voltage, adjust R8 for an equal reading at both polarities.

4. -5 VOLT REFERENCE ADJUSTMENTS

4.1 DVM positive lead to TP1 (or hook by IC6), DVM on 20V range. Voltage source to 120V range, 30 volts standby.
4.2 Place the 2101 in the 30V range. Apply +30V and adjust R2 for -5VDC on the DVM.
4.3 Select the 150V range. Apply +150V and adjust R4 for -5VDC on the DVM.
4.4 Select the 300V range. Apply +300V and adjust R6 for -5VDC on the DVM.

5. DISPLAY ADJUSTMENTS

5.1 2101 in the 300V range, voltage source to 300V operate. Adjust R49 for a 300.0 display. Reverse polarity of input and share any offset between the two polarities (±3 digits max).
5.2 Voltage source to 150V operate. 2101 in the 150V range. Adjust R45 for a 150.00 display. Reverse polarity of input and share any offset between the two polarities (±10 digits max on each side).
5.3 Voltage source to 30V operate. 2101 in the 30V range. Check that the display indicates 30.00 ±3 digits at both polarities (no adjustment).
5.4 2101 to 150V range. Voltage source to 375V operate. Check that the VOLTS overload LED is lit.
5.5 Voltage source to standby.

6. LINEARITY ADJUSTMENTS

6.1 2701C to 10V operate, 2101 to 150V range. Adjust R117 for 10.00 display. Note: Allow time for reading to fall.
6.2 Reverse input polarity and adjust R8 for balanced display.
6.3 Repeat 6.1 - 6.2 until ±10V readings are balanced and reading exactly 10.00.
6.4 Repeat steps 5.1 - 5.3. Check linearity on each range at 10% and 50% of range, both polarities for ±0.1% ±6 digits.
6.5 Voltage source to standby.

7. 20A RANGE ADJUSTMENTS

7.1 2101 to Amps, 20A range.
7.2 Current source input voltage to 1V Op., current source to 10A Op.
7.3 DVM Negative lead to right side of R63, DVM Positive lead to rear of R64. Adjust R62 for -100.00mV.
7.4 DVM Negative lead to E2, positive lead to TP1. Adjust R65 for -2.5V.
7.5 Adjust R52 for a 10A display. Check reverse polarity ±2 digits.
7.6 Apply 1 amp and check linearity at both polarities for ±2 digits.

8. 2A RANGE ADJUSTMENTS

8.1 2101 to 2A range.
8.2 Reversing input polarity repeatedly, adjust R71 for an equal reading at both polarities.
8.3 Adjust R74 for a display of 1.000.
8.4 Apply 100mA and check linearity at both polarities for ±2 digits.

9. .2A RANGE ADJUSTMENTS

9.1 Current source to 100mA Op., 2101 to .2A range.
9.2 Reversing input polarity repeatedly, adjust R83 for an equal reading at both input polarities.
9.3 Adjust R85 for a display of .1000. Apply 10mA and check display for .0100 ±6 digits at both polarities.
9.4 Check for overload indication by applying 1A, ensure amps overload LED is lit. Current source to STBY.

10. WATTS ZERO AND OFFSET ADJUSTMENTS

10.1 Current source to 1 amp standby, voltage source to 150 volts standby. 2101 to Amps, 2A, 300V ranges.
10.2 Adjust R43 for 000.0 on the watts display.
10.3 Voltage source to operate. Reversing polarity repeatedly, adjust R28 until the watts display indicates the same value at both input polarities. Note: Pot adjustment initially causes a change that may be *opposite to and greater than* the change desired. Allow time for the reading to restabilize after making any adjustment.
10.4 Readjust R43 for 000.0 on the watts display. Voltage source to standby.
10.5 Current source to 1 amp operate. Reversing polarity repeatedly, adjust R29 until the watts display indicates the same value at both input polarities. Note: Pot adjustment initially causes a change that may be *opposite to and greater than* the change desired. Allow time for the reading to restabilize after making any adjustment.
10.6 Readjust R43 for 000.0 on the watts display. Current source to standby.
10.7 Repeat steps 10.3 through 10.6 as needed until all points come in.

11. FULL SCALE WATTS ADJUSTMENTS

11.1 Set the 2101 to the 2A, 300V ranges. Apply 1 amp and 300 volts, positive polarity. Adjust R34 for 300.0 in the watts display.
11.2 Reverse polarity of both the voltage and current inputs. The watts display should indicate 300.0 "15 digits. If not, go back and re-check the watts zero and offset adjustments. Share any difference between the two polarities by readjusting R34.
11.3 Return polarity of voltage and current to positive. Reduce voltage to 150.0 volts. Check linearity of watts display ±4 digits. Reverse polarity and check within ±4 digits. Check with 10 volts input for ±3 digits at both polarities.
11.4 Voltage source to 300V operate, current source to 2 amps. Ensure that the watts display reads 600.0 watts ±21 digits at both polarities. Set current back to 1 amp.
11.5 Voltage source to 150V operate, 2101 to the 150V range. Adjust R32 for a watts display of 150.0. Reverse polarity and check for 150.0 ±4 digits. Share any difference between the two polarities by readjusting R32. Reduce input voltage to 50 volts and check watts display for 50.0 ±3 digits at both polarities.

11.6 Voltage source to 30 volts operate, 2101 to the 30V range. Check that the watts display indicates 30.00 ±6 digits. Reverse input polarities and ensure that the watts display is 30.00 ±13 digits.
11.7 Reduce voltage input to 10 volts. Check watts display for 10.0 ±3 digits at both input polarities.
11.8 Voltage and current sources to standby.

12. AC ADJUSTMENTS AND CHECKS

12.1 Move the voltage input to a 2703 set for 300 volts, 100Hz, standby. Move the input to the current source to a 2705 set for 1 volt, 0E, operate. Current source to 10A range standby. Select AMPS and the 20A, 300V ranges on the 2101.
12.2 Current and voltage sources to operate. Adjust R69 for 10.00 in the current display. Check Watts display for 3000 ±5 digits.
12.3 Current source to 1A operate. Check linearity of AMPS display ±2 digits. 2101 to the 2A range. Check for 1.000 display ±3 digits.
12.4 Reduce current source to .1 amp. Check display for .100 ±3 digits. 2101 to .2A range. Check for .1000 ±8 digits. Increase range to 2A and input to 1 amp.
12.5 Switch to VOLTS display. Check each voltage range with the corresponding inputs ±3 digits (±20 digits for 150V display). Check for proper watts display ±3 digits.
12.6 1A, 120V inputs on the 2A, 150V ranges. Check frequency response at 40Hz, 1000Hz and 10KHz. Voltage accuracy ±100 digits at 10kHz. Current accuracy ±6 digits. Watts accuracy ±6 digits.
12.7 Frequency to 100Hz. Change phase to: 0°, 90°, 180°, and 240° and check for 120.0, 000.0, -120.0, and -60.0 respectively (±6 digits).
12.8 Phase to 0°. Note readings on displays. Vary line voltage from 105 to 125VAC and make sure readings don't change.

13. FOR FINAL CAL

13.1 Install cover with screws and feet. Ensure no wires are pinched! With screws firmly tightened, check the operation of all switches for free motion.
13.2 Recheck at 1A and 120V inputs, 100Hz for correct readings ±6 digits.