

Figure C-3. Assembling the Divider

- f. Adjust  $R_x$  for a null indication on the Null Voltmeter, 30  $\mu V$  range. This matches  $R_x$  to the series string of 10 previously matched 1 k $\Omega$  resistors.
- g. Repeat steps e and f for the five remaining 10 k $\Omega$  resistors. This matches the remaining five resistors to the original  $R_x$  (series string of 10 matched 1 k $\Omega$  resistors).
- h. Rebuild the matching bridge using any three of the matched 10 k $\Omega$  resistors for R1, R2 and R3. Do not adjust the matched resistors. Use one of the three remaining unmatched 10 k $\Omega$  resistors for  $R_x$ .
- i. Adjust  $R_x$  for null on the Null Voltmeter, 30  $\mu V$  range.
- j. Repeat steps h and i for the two remaining unmatched 10 k $\Omega$  resistors. All of the 10 k $\Omega$  resistors are now matched to each other and to the series string of 10 matched 1 k $\Omega$  resistors.

C-9. MATCHING THE 100 k $\Omega$  RESISTORS.

C-10. The 100 k $\Omega$  resistors can be matched using the 10 k $\Omega$  matching procedure with the following exceptions:

- 1. Use 200 Vdc to drive the matching bridge.
- 2. Set null voltmeter to the 300  $\mu V$  range to read null.

- 3. Use a series string of 10 matched 1 k $\Omega$  resistors and 9 matched 10 k $\Omega$  resistors (total 100 k $\Omega$ ) for the initial  $R_x$ .

C-11. ASSEMBLING AND USING THE DIVIDER.

- a. Connect the matched resistors as shown in Figure C-3.
- b. The divider is now ready for use. Maintain constant oil temperature whenever using the divider.

C-12. CALIBRATING THE -hp- MODEL 735A TO 1 V 2 PPM

C-13. The following procedure can be used to calibrate a Model 735A DC Transfer Standard to 1 V  $\pm$  2 ppm. Table C-2 lists the required test equipment.

- a. Turn on the Transfer Standard and allow it to warm up for at least 30 minutes.
- b. Construct the calibration setup shown in Figure C-4. Make connections with insulated solid copper wire, 20 gauge or larger. Omit one connection to the standard cell.
- c. Zero the Null Voltmeter on the 3  $\mu V$  range. Return range to 300  $\mu V$ .
- d. Set Transfer Standard Function switch to 1.018 +  $\Delta$  for saturated or 1.019 +  $\Delta$  for unsaturated

Table C-2. Required Test Equipment

ITEM	REQUIRED CHARACTERISTICS	RECOMMENDED MODEL
Standard Cell	NBS Calibrated	Eppley Laboratory, Inc. MIN type
6 Dial Kelvin-Varley Divider	Accuracy: 0.0001% full scale Resistance: 100 k $\Omega$	Julie Research Laboratories Model VDR106
DC Null Voltmeter	Range: 3 $\mu V$ full scale	-hp- Model 419A
Fixed Resistors	1000 $\Omega \pm 0.05\%$ 1/4 W low TC wirewound  8543.5 $\Omega \pm 0.1\%$ 1/4 W low TC wirewound	-hp- Part No. 0811-0936  -hp- Part No. 0811-0125
Power Supply	Output: 8 to 10 V adjustable Resolution: 1 ppm of range Noise: < 1 ppm of range	-hp- Model 740B

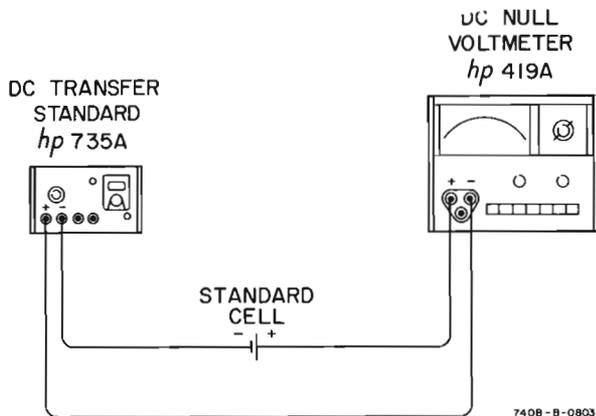


Figure C-4. Transferring the Standard Cell Voltage

standard cell. Adjust MICROVOLTS control so that the Function switch position plus MICROVOLTS setting is exactly equal to the certified voltage of the standard cell. Lock MICROVOLTS knob.

- e. Connect remaining lead to the standard cell.
- f. Adjust CAL control on the Transfer Standard and reduce Null Voltmeter range until null is obtained on the 3  $\mu$ V range. This calibrates the Transfer Standard to the standard cell voltage.

- g. Construct the calibration setup shown in Figure C-5.
- h. Set the Kelvin-Varley divider for a 1:1 ratio. Set the 740B Range to 10 V and adjust output voltage for a null on the Null Voltmeter, 3  $\mu$ V range. Make final adjustment for null using ZERO Control on the Model 740B. Model 740B output will be approximately 9.63 V.

NOTE

Self heating of R1 and R2 may cause slight changes in the ratio of R1:R2. Periodically readjust Model 740B output to maintain null. The resistors should stabilize after 10 to 15 minutes.

- i. Set the Kelvin-Varley divider for a ratio equal to

$$\frac{1}{\text{transfer standard setting}}$$

- j. Set the Transfer Standard to 1.000 V position and adjust the CAL control for a null on the Null Voltmeter 3  $\mu$ V range. The Transfer Standard is now calibrated to 1 V  $\pm$  2 ppm referenced to the standard cell used in steps a through f.

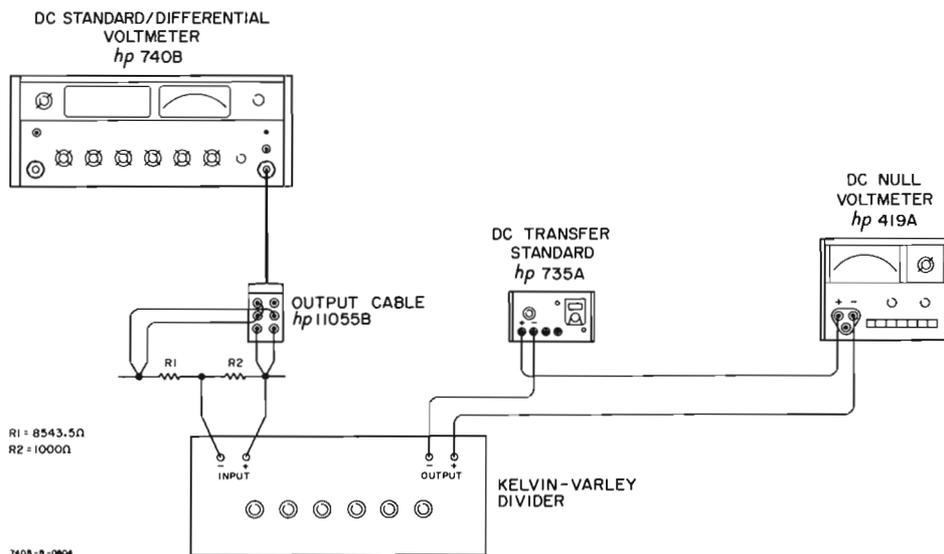


Figure C-5. Calibrating the Transfer Standard to 1 V