TE-46

CAPACITANCE-RESISTANCE ANALYZER

OPERATING MANUAL

PRELIMINARY

The TE-25 operates on 117 volt 60 cycle alternating current. To energize the unit, rotate the METER switch knob clockwise, from "AC OFF" to "OFF". After a short delay, the face of the BALANCE indicator tube will light up with a green glow. Allow approximately 5 minutes for warm-up. NOTE: the indicator tube will be lit only when the METER switch is in the "OFF" position. Therefore, as you read the operating instructions, always assume that the METER switch is at the OFF position, unless specifically different instructions are given.

MEASURING CAPACITANCE

To measure capacitance, proceed as follows:

1. Connect the test capacitor between binding posts B and C.

   a. If the capacitor is electrolytic, make sure that its positive side is connected to binding post C.

   b. If the capacitor is already wired into a circuit, disconnect one lead so that the measurement will not be affected by other parts of the circuit. Use a pair of the test leads to make connections between the binding posts and the capacitor. NOTE: If the capacitor is likely to have a very small value, remove it from the circuit altoghther, and connect it directly to the binding posts.

2. From the fifth to eighth position of the RANGE/FUNCTION switch are capacitance measuring ranges. If the approximate value of the test capacitor is known, set the RANGE/FUNCTION switch at a range that includes the approximate figure. Then, rotate the dial until the instrument's bridge circuit is balanced (see section below on the Action of the Balance Indicator Tube).

ACTION OF THE BALANCE INDICATOR TUBE

When the bridge circuit is far out of balance, the face of the BALANCE indicator tube will be evenly lit with a green glow. As the balance point is approached, a sector of the bottom half of the tube face will become shadowed. The closer the circuit is brought to balance, the wider the shadowed sector will become. Conversely, if the balance point is overshot, the sector will begin to narrow again. The balance point, therefore, is indicated by maximum width of the darkened sector.

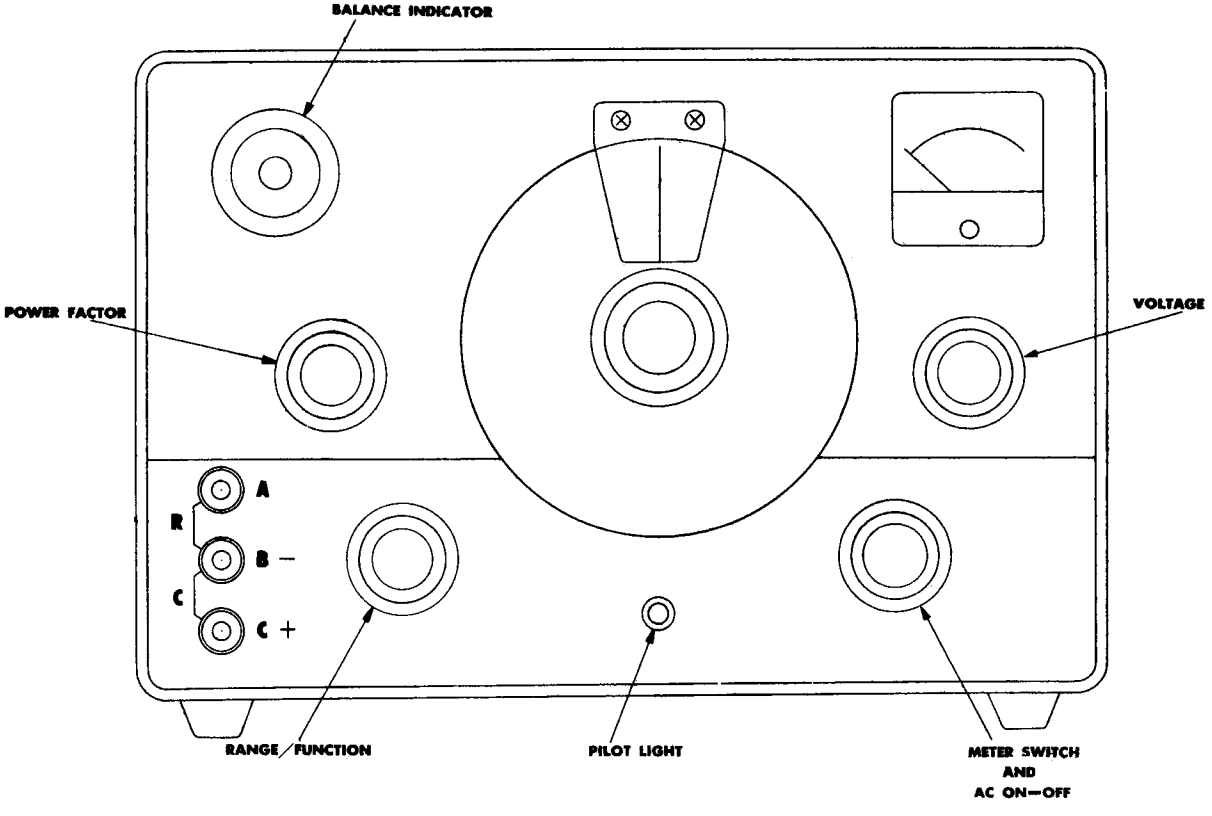

BALANCE INDICATOR
POWER FACTOR
VOLTAGE
R
A
B −
C
C +
RANGE / FUNCTION
PILOT LIGHT
METER SWITCH
AND
AC ON—OFF

FIGURE 1

3. If you have begun by setting the RANGE/FUNCTION switch too high, balance will not be indicated until the dial has been rotated counter-clockwise nearly or completely past its last marking. Try successively lower range settings, until an on-scale reading is obtained.
NOTE: In general, for the most accurate readings, use a setting that will give a balance indication when the dial is near the middle of its range of rotation.

    a. If no on-scale reading can be obtained even when the lowest range is used, the capacitor is open, and should be discarded.

4. Conversely, if you have begun by setting the RANGE/FUNCTION switch too low, balance will not be indicated until the dial has been rotated clockwise nearly or completely past its last marking. Try successively higher ranges until an on-scale reading can be obtained.

    a. If no on-scale reading can be obtained even on the highest range, the capacitor is shorted, and should be discarded.

5. A marked flickering of the indicator tube is a sign that the capacitor is "intermittent", and should be discarded.

READING THE DIAL

As soon as balance is indicated, read the capacitor's value from the appropriate scale on the dial. As shown in Figure 2, the C x 10 range is covered by a separate scale on the dial. All the other ranges (C x 0.00001, C x 0.001 and C x 0.1) are covered by the scale marked "C". Then multiply the dial reading by the appropriate factor as determined by the position of the RANGE/FUNCTION switch.

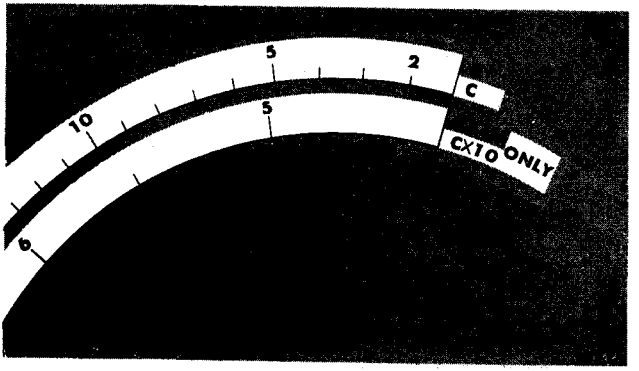


FIGURE 2

POWER FACTOR

To measure the Power Factor of a capacitor, proceed as follows:

1. Place the RANGE/FUNCTION switch at the appropriate capacitance range setting. NOTE: The Power Factor measuring circuit operates on the two upper (.2 - 50 μf and 50 - 2000 μf) ranges, only.

2. Connect the test capacitor to binding posts B and C. The positive side of electrolytics must be connected to binding post C.

3. Use the dial to bring the circuit into balance. NOTE: At this time, the POWER FACTOR control knob should be set at 0.

4. After balance has been achieved, slowly rotate the POWER FACTOR control knob clockwise. If the power factor of the test capacitor is significant, the dark sector of the BALANCE indicator tube will begin to widen, again.

5. Continue to rotate the POWER FACTOR control until the dark sector ceases to widen.

6. The chart given below summarizes the maximum Power Factors of some typical electrolytic capacitors (when new). Capacitors with ratings greater than 150 volts should usually be considered defective if their Power Factors exceed twice the indicated values. Low voltage portions of multiple-section capacitors may have Power Factors as much as 50% greater than the indicated values.

WVDC	475	450	400	350	300	250	150	50	25	15	12	6
MAX. NEW P.F.	15	15	15	15	15	18	20	25	30	50	55	60

MEASURING LEAKAGE

To measure the leakage current of a capacitor, proceed as follows:

1. Connect the test capacitor between binding posts B and C. If the capacitor is electrolytic, make sure that its positive lead is connected to binding post C.

2. Rotate the RANGE/FUNCTION switch to the position marked LEAKAGE INSULATION.

3. Rotate the VOLTAGE selector knob until the working voltage of the test capacitor is approximated as closely as possible. Advance the voltage gradually. Allow a short interval of time to pass (5 minutes), so that the capacitor may become fully charged.

    a. When an electrolytic capacitor is taken from storage, apply the rated voltage for five minutes, plus one minute for each month of storage.

4. Rotate the METER switch to the 10 ma position and observe the meter. At this setting of the METER switch, full scale on the meter will be equivalent to a 10 ma leakage current. If only a slight reading is obtained, shift the METER switch to the more sensitive 1 ma position. Full scale reading will then be equivalent to 1 ma. Capacitors with a leakage value of 10 ma should almost always be discarded.

CAUTION: Before disconnecting the capacitor, rotate the METER switch back to OFF again. This will automatically discharge the capacitor.

MEASURING INSULATION RESISTANCE

Insulation resistance checks are performed on paper, mica and ceramic capacitors (electrolytics are checked by means of the leakage current test). To measure insulation resistance, proceed as follows:

1. Connect the test capacitor between binding posts B and C.

2. Set the RANGE/FUNCTION switch at the position marked LEAKAGE INSULATION.

3. Rotate the METER SWITCH to the position marked INS RES.

   NOTE: Do not conduct an insulation resistance test on capacitors not capable of handling a 600 volt emf.

4. Read the insulation resistance directly from the lower meter scale, in megohms. New capacitors may read near the "infinity" mark.

5. A marked fluctuation of the meter needle indicates an intermittent capacitor, which should be replaced.

6. Wait until the meter needle comes to rest before taking a reading.

7. A capacitor used for screen by-passing should be replaced if its insulation resistance has fallen to 50 megohms or less.

8. Capacitors employed for coupling should have insulation resistances not lower than 200 megohms.

CAUTION: Before disconnecting the capacitor, rotate the METER switch back to the OFF position. This will automatically discharge the capacitor.

MEASURING RESISTANCE

1. Connect the test resistor to binding posts A and B. If the resistor is part of a circuit, disconnect at least one lead so that the measurement will not be affected by other components.

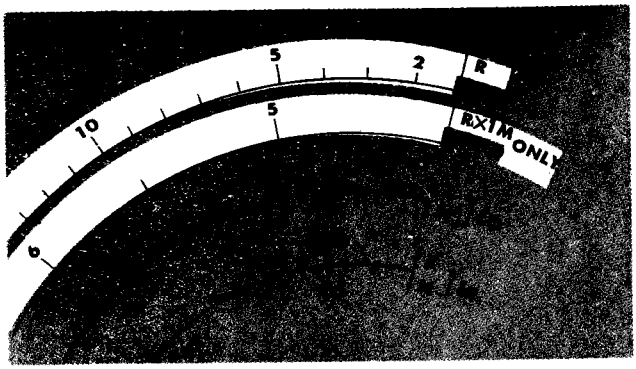
2. The RANGE/FUNCTION switch has four resistance range positions. If an approximate value of the test resistor is known, set the RANGE/FUNCTION switch at a resistance range that includes the approximate figure.

NOTE: As shown in Figure 3, the RxlM range is covered by a separate scale on the dial. All the other ranges (Rxl, Rxl00, and Rx 10K) are covered by the scale marked "R" (see Paragraph 3).

3. Rotate the dial until balance is indicated. Then, multiply the dial reading by the appropriate factor (Rx 1, Rx 100, etc.), as determined by the position of the RANGE/FUNCTION switch.

   a. If a balance indication can be obtained only after rotating the dial counter-clockwise past the last division on the dial, the range setting is too high and should be reduced. If the foregoing still applies even on the lowest resistance range, the test resistor is <u>short-circuited,</u> and should be discarded.

   b. If a balance reading can be obtained only after rotating the dial clockwise past the last division on the dial, the range setting is too low and should be raised. If the foregoing still applies even on the highest resistance range, the test resistor is <u>open</u>, and should be discarded.



MEASURING TURNS AND IMPEDANCE RATIOS

NOTE: Do not attempt to measure the turns or impedance ratios of low inductance or high frequency coils (RF, IF transformers, etc.). Severe damage may be done to the instrument.

To measure turns and impedance ratios, proceed as follows:

1. Set the **RANGE/FUNCTION** switch at the first N, Z, RATIO position, marked LO.

2. Connect the test transformer to the binding posts, as shown in Figure 4. Note that:
   a. Winding #2 is connected in series with winding #1.
   b. Binding post B is a common point between the two windings.
   c. Proper reading cannot be obtained unless winding #1 has more turns than winding #2 (or at least an equal number). Connect step-up and step-down transformers in such a way as to comply with this requirement.

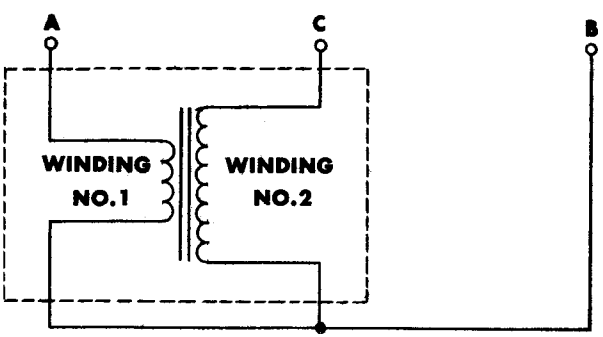


FIGURE 4

3. Rotate the dial across its range. If an on-scale balance indication is not obtained, shift the RANGE/FUNCTION switch to N, Z RATIO-HI and rotate the dial again. If a balance indication is still not obtained, reverse the lead connections of winding #1, and begin from N, Z RATIO-LO as before.

READING THE DIAL

Figure 5 highlights the location of the two Turns-Impedance Ratio scales.

1. If a balance indication is obtained when the RANGE/FUNCTION switch is set at N, Z RATIO-LO, take the reading from scale 1. Scale 1 consists of Turns Ratio scale N-LO and Impedance Ratio scale Z-LO. The N-LO scale measures Turns Ratios from 1:1 through 10:1. The Z-LO scale measures Impedance Ratios from 1:1 through 100:1.

2. If a balance indication is obtained when the RANGE/FUNCTION switch is set at N,Z RATIO-HI, take the reading from scale 2. Scale 2 consists of Turns Ratio scale N-HI and Impedance Ratio scale Z-HI. The N-HI scale measures Turns Ratios from 10:1 through 200:1. The Z-HI scale measures Impedance Ratios from 100:1 through 40,000:1 (40K:1).

    a. Note that the impedance ratio of a transformer is equal to the square of its turns ratio. This may be of help in obtaining more refined readings from the scales.

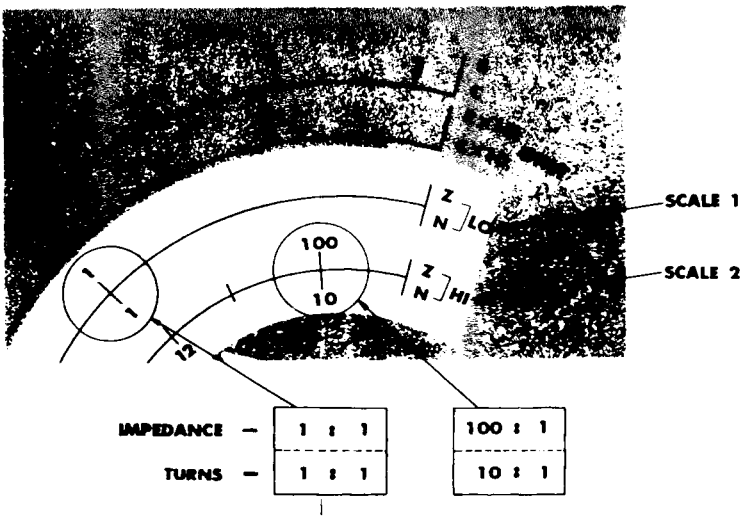


FIGURE 5

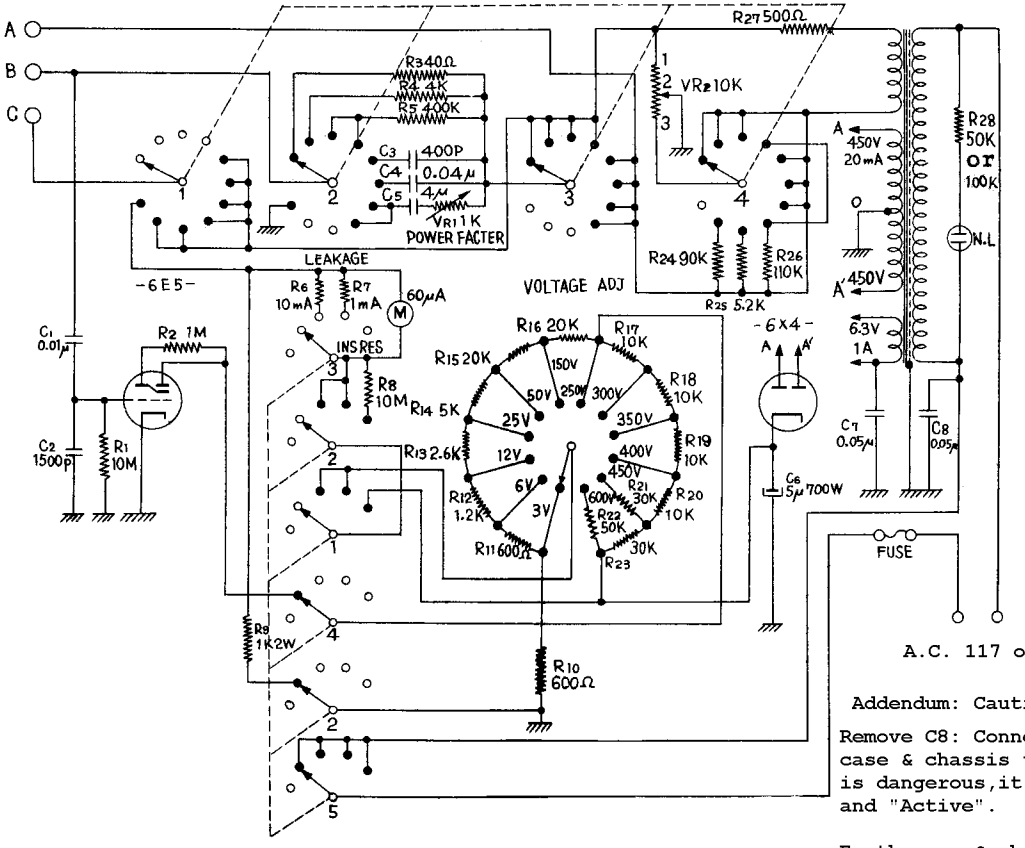
TE-46

CAPACITANCE-RESISTANCE ANALYZER

OPERATING MANUAL

SPECIFICATIONS

CAPACITY, 4 RANGES	.00002 µf - .005 µf .002 µf - .5 µf .2 µf - 50 µf 50 µf - 2000 µf
RESISTANCE, 4 RANGES	2 ohms - 500 ohms 200 ohms - 50 K ohms 20K ohms - 5 megohms 5 megohms - 200 megohms
TRANSFORMER TURNS RATIO	1:1 - 10: 1 10 : 1 - 200 : 1
IMPEDANCE RATIO	1:1 - 100:1 100:1 - 40K:1
D-C LEAKAGE TEST	
VOLTAGES	3 - 600 Volts DC
LEAKAGE CURRENT	2 Ranges (0 - 1 ma; 0 - 10 ma)
D-C INSULATION TEST	
VOLTAGES	600 Volts Constant 0 megohms - 300 megohms
POWER REQUIREMENTS	117 Volts, 50-60 cps. AC **or** 220 Volts, 50-60 cps. AC
TUBE COMPLEMENT	1 - 6X4 1 - 6E5
DIMENSIONS	7"H x 10-1/2"W x 5-1/4"D.
SHIPPING WEIGHT	12 lbs.



A.C. 117 or 220V

Addendum: Caution Live fuse

Remove C8: Connecting the metal case & chassis to Mains "Neutral" is dangerous, it may be inverted and "Active".

Earth case & chassis only with an earthed (3 wire mains cable).

SCHEMATIC DIAGRAM

Printed in Japan