Met dank aan Jaap Wolterson

Ned. Ver. v. Historie v/d Radi

MODEL K-142

Vacuum Tube Volt Meter

INSTRUCTION MANUAL

Kyoritsu ELECTRICAL INSTRUMENTS WORKS, LTD.

CONTENTS

1. General Description

This VTVM is our latest model, highly dependable for measurements in wide ranges of voltages from DC to RF, output (dB) and DC resistance.
Most suitable for tests and adjustments of FM radio, Stereo, TV and other communication apparatus.

2. Features

1) Use of a large 150×100 m/m plastic meter ensures precise and easy scale reading.
2) Due to high input impedance, circuit loading is practically nil.
3) Frequency response is excellent.
   Parallel capacity of DC voltage is as small as 1.5 $\mu\mu$F even when it is superposed by RF voltage, which hardly affects measurements.
4) Uniform performance and excellent stability even at continued use.
5) Almost free from trouble because of printed circuit and unified components. Light-in-weight and yet sturdy in construction.
6) Simple to handle as an ordinary circuit tester.

3. Specifications :

AC Voltage

Measurement Range : Sin wave : 0.1V–1500V (in 7 ranges)
0–1.5V 0–5V 0–15V 0–50V
0–150V 0–500V 0–1500V

Peak-to-peak : 0–4000V (in 7 ranges)
0–4V 0–14V 0–40V 0–140V
0–400V 0–1400V 0–4000V

Output (dB m): −20 dB to +65 dB (in 7 ranges)
(0 dB=1 mW in 600 ohm line)
−20 to +5/16/25/36/45/56/65 dB

Input impedance : 1.4 M ohms

Input capacitance : 30 $\mu\mu$F or below (1.5/5/15/50/150V Range)
15 $\mu\mu$F or below (500/1500 Range)

Accuracy : within ±5% full scale

Frequency Response : 30 c/s—500 Kc within ±3 %
20 c/s—10 Mc within ±10 %

DC Voltage

Measurement Range : 0.1V–1500V (in 7 ranges)
0–1.5V 0–5V 0–15V 0–50V 0–150V 0–500V 0–1500V

Input impedance : 11 M ohms 2 $\mu\mu$F or below (using "D.C." Probe)

Accuracy : within ±3 % full scale

Resistance

Measurement Range	:	0.2 Ω—1000M Ω (in 7 ranges)	
		0–1K/10K/100K/1000K/10M/100M/1000M ohms	
Accuracy	:	within ±3 % of the scale length.	
Power Consumption	:	8VA within ±2VA	
Rectifier and Tubes	:	SR1A–4	1 pc.
		12AU7	1 pc.
		6AL5	1 pc.

Meter used : Model P–60 DC 200 μA

Input Power : AC 50/60 c/s

Dimensions	:	160×190×80 m/m (7½×6¾×4⅛ inch)	
Weight	:	1.8 kg net (4.5 lbs.)	
Accessories	:	DC Probe	1 pc.
		Test Lead (red)	1 pc.
		Test Lead (black)	1 pc.
		Instruction Manual	1 copy

4. Preparations

1) Place the unit either horizontally or vertically.
2) Set the "Function Selector" to the "OFF" position.
3) Make sure it the pointer of the meter is at the "0" position.
   If not, adjust it properly by turning the zero adjusting screw located on the meter.
4) Insert the red testlead into the "AC OHMS" jack, the black lead into the "COMMON" jack, and the D.C. Probe into the "D.C." Jack, each located on the front panel.
5) Connect the AC Cord to the AC outlet.
6) Turn the Function Selector clockwise from the "OFF" position so the unit will begin to work. Allow about a minute for warm-up which is necessary for stabilized performance of this unit.
7) Once again see if the pointer is at zero position.
   If not, adjust it properly, this time by turning the "ZERO ADJ" knob on the front panel.
   The rotation of knob and the swing of the pointer are of the same direction when the Function Selector is at "A.C." or "D.C. —": reverse direction if at "D.C. +" or "OHMS" position.

5. AC Voltage Measurements

1) Set the "Function Selector" to "A.C." position.
2) Short the tips of the test leads (red and black), each connected to "A.C. OHMS" and "COMMON" Jacks. Adjust the "ZERO ADJ" knob until the pointer comes to "0" on the scale.

   Next, set the Range Selector to the "R×1 1.5V" Range and the "R×1Meg 150V" Range and make sure if the pointer is at the zero position on each range.

   If the pointer is not zeroed at the lower range, turn the "AC BAL" screw by means of a screw-driver; if not zeroed at the higher range, adjust it by rotating the "ZERO ADJ" knob.
3) Now set the Range Selector to a desired position and read the meter as you apply the tips of test leads to the circuit being measured.

Cautions :

1. Select a proper range likely to correspond to an estimated value.
2. If the voltage being measured is unknown, first set the Range Selector to a higher range, gradually going to lower one for easier reading.

Measurements of sine wave voltage.

Table 1.

Ranges	Scale to be used	Multiplier
1.5V	AC–1.5V (Blue Scale)	Direct reading
5V	AC–5V (〃)	〃 〃
15V	AC–DC 15V (Black Scale)	〃 〃
50V	〃 50V (〃)	〃 〃
150V	〃 15V (〃)	×10
500V	〃 50V (〃)	×10
1500V	〃 15V (〃)	×100

Example :

If an estimated voltage is about 350V, select the "R×100K 500V" Range, use the "AC–DC 50V" Scale and multiply the reading by 10. In case the indicated value is 35.6, the value in quest is 35.6×10=356V.

Measurement of peak-to-peak voltage.

Table 2.

Ranges	Scales to be used	Multiplier
1.5V	AC–1.5V (blue) & 40V P–P (red)	Direct reading
5V	AC–5V (〃) & 140V P–P (〃)	〃 〃
15V	AC–15V (black) & 40V P–P (〃)	〃 〃
50V	AC–50V (〃) & 140V P–P (〃)	〃 〃
150V	AC–15V (〃) & 40V P–P (〃)	×10
500V	AC–50V (〃) & 140V P–P (〃)	×10
1500V	AC–15V (〃) & 40V P–P (〃)	×100

Example :

If the voltage being measured is nearly 350V, select the "R×10K 150V" range, use the scale of P–P 40V (right below the "AD–DC 15V" Scale) and multiply the reading by 10.
If the indicated value is 35.6, the desired value is 35.6×10=356V.

Measurement of Output Voltage (dB)

Table 3.

Ranges	Scales to be used	Value to be added
1.5V	DBM5 (red)	Direct reading
5V	DBM15 (red)	〃 〃
15V	AC-DC 15V & DBM5	20 dB
50V	AC-DC 50V & DBM15	〃
150V	AC-DC 15V & DBM5	40 dB
500V	AC-DC 50V & DBM15	46 dB
1500V	AC-DC 15V & DBM5	60 dB

Example:

When measuring an amplifier with the output of 7V (600 ohm load), set the Range Selector to "R×100 15V" range and apply the tip of each test lead to the amplifier.
As the 15V Scale has no dB calibration, use the "AC −1.5V" (blue) (+5 dBm Full Scale) Calibration. If the value indicated at this time is −0.9, the output of the amplifier being measured is −0.9+20=+19.1 dBm.

Note: Decibel can be read direct on the 1.5V and 5V Ranges but not on 5 ranges of 15V, 50V, 150V, 500V and 1500V as each of them lacks dB calibration. With such ranges, it is necessary that a proper value is added in accordance with the Table 3.

6. DC Voltage Measurement

1) Set the Function Selector either to "D.C. —" or "D.C. +" position. At the "D.C. —" position, the "COMMON" is positive (+), and the "D.C." Probe gets negative (—). At the "D.C. +" position, the polarities get reverse.

2) Short the tip of "D.C." probe and the "COMMON" black test lead and adjust the pointer to zero by turning the "ZERO ADJ" knob.

3) Set the Range Selector to a desired range, connect each tip of "D.C." Probe and the test lead (black) to the circuit being measured and read the meter.

Caution.

1) Never fail to connect the "COMMON" test lead first.

2) Select a range somewhat higher than an estimated value, gradually going to lower one.

Table 4.

Ranges	Scale to be used	Multiplier
1.5V	AC-DC 15V (black)	×0.1
5V	〃 50V (〃)	×0.1
15V	〃 15V (〃)	Direct Reading
50V	〃 50V (〃)	〃 〃
150V	〃 15V (〃)	×10
500V	〃 50V (〃)	×10
1500V	〃 15V (〃)	×100

Example 1.

For measurement of a 9V dry battery, where polarities and approximate voltage are known, set the Range Selector to "R×100 15V" Range, connect the "COMMON" test lead (black) to the negative polarity of the battery, the tip of "D.C." Probe to the positive polarity. Reading can be made direct on the scale.

Example 2.

Use of this unit as a zero-center tester for adjusting the detector of FM receiver. If the estimated value is ±2V or so, first set the Range Selector to "R×100 15V" and turn the ZERO ADJ Knob until the pointer of the meter rests at the center 7.5V. When the indicated value at this measurement is 10V, the value in quest is 10−7.5=2.5V. If the indicated value is 5V the value in quest is 7.5−5=2.5V, namely −2.5V.

7. Resistance Value Measurement.

1) Set the Function Selector to the "OHMS" position.

2) Short the tips of "A.C. OHMS" test lead (red) and the "COMMON" test lead (black) and turn the "ZERO ADJ" Knob until the pointer is exactly zeroed.

3) Release the shorted leads, rotate the "OHMS ADJ" Knob until the pointer comes right to "∾" position.

4) Set the Range Selector to a desired range, apply the tip of each test lead to the material or circuit being measured and take the reading.

Caution :

1. Select a range on which estimated value may be read at the mid-scale.

2. When the ohmage of the material being measured is unknown, start with a higher range, gradually going down to a lower one.

Table 5.

Ranges	Multiplier
R×1	1
R×10	10
R×100	100
R×1K	10^3
R×10K	10^4
R×100K	10^5
R×1MEG	10^6

Example 1.

When measuring a resistance body estimated at about 80K ohms, set the Range Selector to "R×10K 15V" position and apply each tip of the test leads across the resistance body. If the indicated value is 8.5, the value in quest is 8.5×10K=85K.

Example 2.

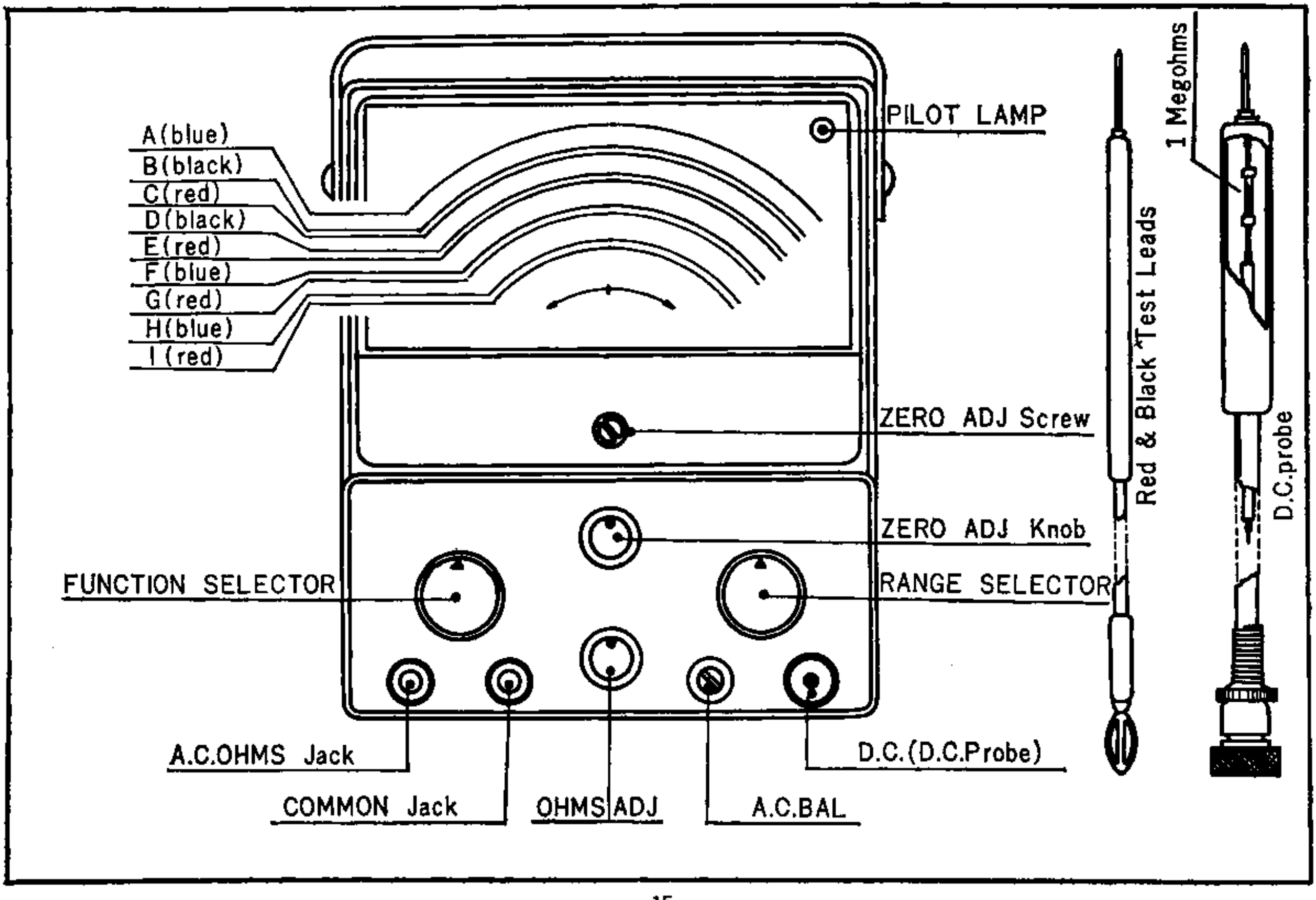
How to measure the insulation resistance of capacitor.
Prior to measurement, be sure to discharge the capacitor by shorting its both ends.
Then, select a proper range and apply the tip of each test lead. At this time, the pointer will go to the zero point before indicating the value in quest.
With capacitors with small capacity, it usually occurs that the pointer does not swing to the zero point, because such capacitor is to be charged during the measurement. The larger the capacity of the capacitor, and the higher the range, it will take time before indicating the value.

TABLE 6

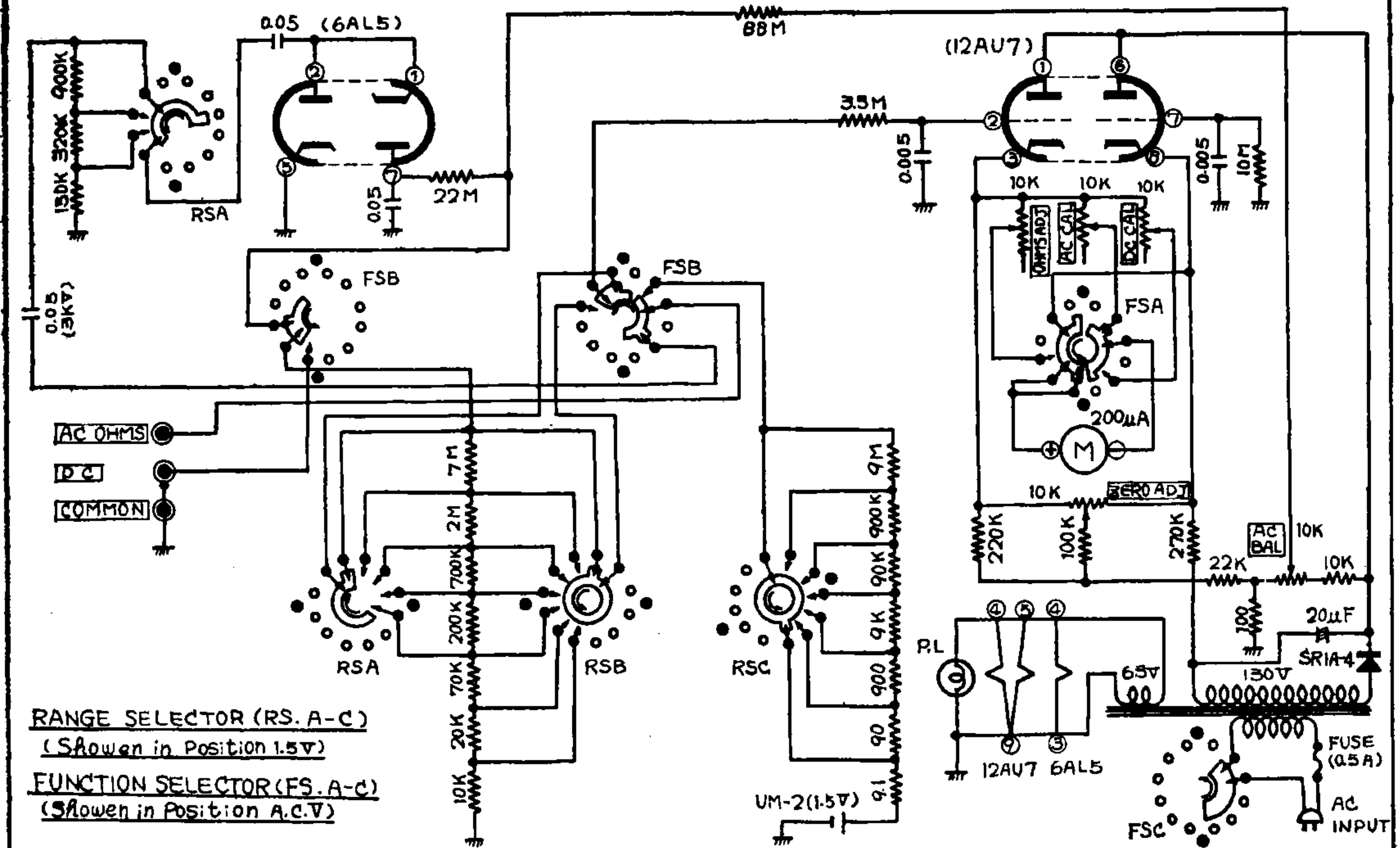
(Use in conjunction with the drawing shown on next)

Type of Measurement	Quantity To Be Measured	Set Function Selector Switch To	Set Range Selector Switch To	Connect Test Leads To	Read From Scale	CORRECTION To Scale Reading
AC Volts	0–1.5V	A.C.	R×1, 1.5V	(A.C. OHMS) & (COMMON) Jacks	H	Read Directly
〃	1.5–5V	〃	R×10, 5V	〃	F	Read Directly
〃	5–15V	〃	R×100, 15V	〃	D	Read Directly
〃	15–50V	〃	R×1K, 50V	〃	B	Read Directly
〃	50–150V	〃	R×10K, 150V	〃	D	Multiply by 10
〃	150–500V	〃	R×100K, 500V	〃	B	Multiply by 10
〃	500–1500V	〃	R×1MEG, 1500V	〃	D	Multiply by 100
DC Volts	0–1.5V	D.C.	R×1, 1.5V	(D.C.) & (COMMON) Jacks	D	Divide by 10
〃	1.5–5V	〃	R×10, 5V	〃	B	Divide by 10
〃	5–15V	〃	R×100, 15V	〃	D	Read Directly
〃	15–50V	〃	R×1K, 50V	〃	B	Read Directly
〃	50–150V	〃	R×10K, 150V	〃	D	Multiply by 10
〃	150–500V	〃	R×100K, 500V	〃	B	Multiply by 10
〃	500–1500V	〃	R×1MEG, 1500V	〃	D	Mutliply by 100
Resistance	0–30	OHMS	R×1, 1.5V	(A.C. OHMS) & (COMMON) Jacks	A	Read Directly
〃	30–300	〃	R×10, 5V	〃	A	Multiply by 10
〃	300–3K	〃	R×100, 15V	〃	A	Multiply by 100
〃	3K–30K	〃	R×1K, 50V	〃	A	Mnltiply by 1K
〃	30K–300K	〃	R×10K, 150V	〃	A	Multiply by 10K
〃	300K–3M	〃	R×100K, 500V	〃	A	Multiply by 100K
〃	3M–1000M	〃	R×1MEG, 1500V	〃	A	Multiply by 1MEG
Peak to peak	−20~+5DBM	A.C.	R×1, 1.5V	(A.C. OHMS) & (COMMON) Jacks	I	Read Directly
〃	+5~+15DBM	〃	R×10, 5V	〃	G	Read Directly
〃	0–40V	〃	R×100, 15V	〃	E	Read Directly
〃	40–140V	〃	R×1K, 50V	〃	C	Read Directly
〃	140–400V	〃	R×10K, 150V	〃	E	Multiply by 10
〃	400–1400V	〃	R×100K, 500V	〃	C	Multiply by 10
〃	1400–4000V	〃	R×1MEG, 1500V	〃	E	Multiply by 100

9. Front Panel Arrangement



10. Schematic Diagram



11. Maintenance.

Although the K-142 VTVM is designed to stand a long and continued use, the aging of the tubes 6AL5, 12AU7, and battery is not avoidable. They have to be replaced with new ones after a reasonable period of time.

1. 6AL5 Tube

   The following phenomena show that the tube has been aged and it should be replaced.

   a. Impossible to adjust the "ZERO ADJ" Knob properly.

   b. Decreased indication at measurements of AC voltage.

For replacement, remove the 3 screws at the back of this unit, expose the interior and remove the tube-holder.

2. 12AU7 Tube

   The following phenomena show that the tube has been aged and it should be replaced.

   a. Decrease in indicated value.

   b. Fluctuation in power source causing shift of zero indication; impossible to make zero adjusting.

   c. Impossible to adjust zero and "∾" for resistance measurements.

For replacement, follow the above procedure.

3. Dry Battery

The following phenomena show that the weak or exhausted battery and it should be replaced.

a. The pointer cannot be set to "Ω" when the Range Selector is set to the "OHMS" position.
b. The pointer cannot be zeroed or falls back when the "AC OHMS" test lead and "COMMON" test lead are shorted together and left in this condition for about ten seconds.

For replacement, remove the 3 screws at the back so that the interior can be exposed. Remove the battery-holder.