

909 VTVM



PRECISE

PRECISE DEVELOPMENT CORP.
Oceanside, L. I., N. Y.
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GENERAL DESCRIPTION

Your Model 909 Vacuum Tube Voltmeter is another example of "an engineered product" by PRECISE.

This instrument was initially designed to permit rapid and accurate measurements in electronic circuits.

Each component, from the Amphenol connector on the front panel to the Precision CERAMIC and WIREWOUND resistors used internally, was carefully selected for accuracy and durability. The circuit has been time-tested and proved; thereby assuring the operator of quality and stability.

SPECIFICATIONS:

| | | |
|-------------|----------------|--|
| Electrical: | Power | 11 watts. |
| | Voltage | 105-125 volts. |
| | Line Frequency | 60 cycles. |
| | DC Impedance | 25 Megohms. |
| | AC Impedance | 3.5 Megohms (approx.). |
| | Battery | 1.5 volts (flashlight). |
| | Ranges | DC from .1 to 1,000 volts. |
| | | AC from .25 to 1,000 volts. |
| | | OHMS from .2 to 1,000,000,000 |
| | | DB from -20 to +55 db |
| | Tubes | 1 - 6AL5 |
| | | 1 - 6SN7 |
| | | 1 - 6X5 |
| Mechanical: | Height | 9-1/2 inches |
| | Width | 6 inches |
| | Depth | 5-3/4 inches |
| | Weight | 10 pounds |
| | Panel | Slate grey, etched, raised numerals, aluminum. |
| | Cabinet | Steel, wrinkle grey, baked finish. |
| | Handle | Genuine leather, stitched. |

O P E R A T I O N

POWER ON: Insert the line cord and rotate the FUNCTION switch to any position, other than the POWER OFF. This will automatically turn on the instrument. Always allow the instrument an initial "warm-up" period before any adjustments are made.

DC VOLTAGE MEASUREMENTS:

- (1) All DC measurements are made with the Red DC VOLTS test prod and the COMMON alligator lead.
- (2) Rotate the FUNCTION switch to - or +DC, as required.
- (3) Rotate the SELECTOR switch to the voltage range required.
- (4) Short the COMMON and DC VOLTS leads together and adjust the ZERO ADJUST for "0" on the left side of the meter scale. Note: There may be a tendency for the meter to go off its zero position when the leads are no longer shorted. This is due to the high sensitivity of the instrument and should be of little concern, since it will still read correctly when connected across a circuit.
- (5) Connect the COMMON and DC VOLTS leads to the circuit being measured. Note: The COMMON lead is usually clipped to the ground side.
- (6) All DC voltage measurements are then read on the lower portion of the top meter scale.

AC VOLTAGE MEASUREMENTS:

- (1) All AC voltage measurements are made with the Black OHMS-AC test prod and the COMMON alligator clip.
- (2) Rotate the FUNCTION switch to the AC-VOLTS position.
- (3) Rotate the SELECTOR switch to the voltage range required.
- (4) Short the COMMON and AC leads together and adjust the ZERO ADJUST for "0" on the left side of the meter scale.
- (5) Connect the leads across the device being measured.
- (6) All AC measurements, except those of the 5 Volt range, are read on the lower portion of the top meter scale, marked A.C. When the 5 Volt range is used, measurements are read on the 5 VOLTS A.C. ONLY scale of the meter.

RESISTANCE MEASUREMENTS:

- (1) All resistance measurements are made with the OHMS-AC and COMMON leads.
- (2) Rotate the FUNCTION switch to the OHMS position.
- (3) Rotate the SELECTOR switch to the resistance multiplier desired.

RESISTANCE MEASUREMENTS (cont'd):

- (4) Short the OHMS and COMMON leads together and adjust the ZERO ADJUST knob for "0" on the top of the scale.
- (5) Remove the short across the test leads and adjust the OHMS ADJUST knob for " ∞ " on the OHMS scale.
- (6) Place the test leads across the part to be measured and multiply the reading on the OHMS meter scale by the multiplier shown on the SELECTOR switch. Caution: Whenever OHMS measurements are being made, make certain that no voltage is applied to the part being tested.

DECIBELS:

- (1) Proceed as described in AC VOLTS except for the following:
 - (a) All measurements are made on the DB meter scale.
 - (b) For each AC Setting on the SELECTOR switch, the following chart should be used for determining the number of DB to be added to that read:

| <u>AC RANGE</u> | <u>Add the following DB</u> |
|-----------------|-----------------------------|
| 25 | +0 |
| 250 | +20 |
| 500 | +26 |
| 1000 | +32 |

As an example: If the meter read +21 db, and the 250 volt range were used- the true reading would be: $+21 +20 = +41$ db. The 5 Volt AC Range is not used on DB measurements.

FM ALIGNMENT SCALE:

- (1) Proceed as in DC, except that the meter is ZERO ADJUSTED to the "0" shown on the bottom of the scale. Note: Use the +DC range on the FUNCTION switch, if the -DC range is used the polarities indicated on the scale are reversed.

C I R C U I T D E S C R I P T I O N

This instrument has a proved and advanced circuit that may be best appreciated by consulting the block diagram of Figure 1.

DC CIRCUIT:

In the DC position of the FUNCTION switch, the DC voltage being measured is directed as follows:

- (1) The voltage is applied to the DC lead.
- (2) The FUNCTION DECADE, composed of Precision Resistors, drops the voltage to the proper ratio.

DC CIRCUIT (cont'd):

- (3) The output voltage is applied to the CATHODE-FOLLOWER DC AMPLIFIER and then to one side of the DC meter.
- (4) The BALANCE BRIDGE AMPLIFIER is connected to the other side of the meter and, by bridge action, stabilizes and insures reading accuracy.
- (5) The +DC and -DC CALIBRATION POTENTIOMETERS adjust the meter to the proper reading by setting the upper portion of the scale- the lower portion was set by the ZERO ADJUST.

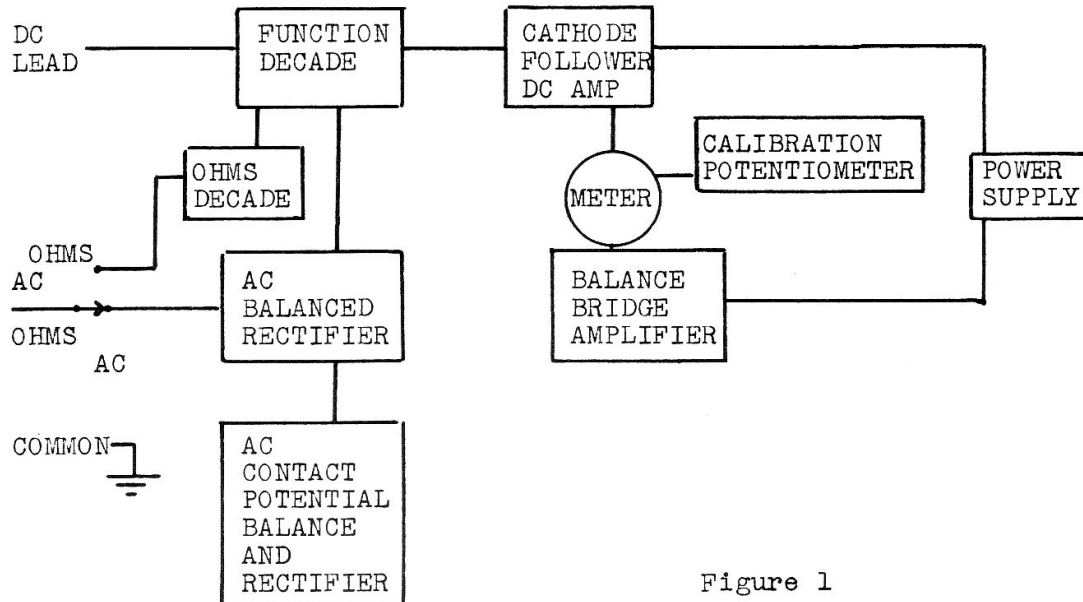


Figure 1

AC CIRCUIT:

- (1) In the AC position of the FUNCTION switch, the AC voltage follows a similar pattern to that shown in DC, except that it is sent to the AC BALANCED RECTIFIER where it is connected to the DC circuit. The contact potential is balanced in order to keep Zero Adjust and to maintain accuracy.

DB CIRCUIT:

- (1) The DB circuit operates in the same manner as that described under AC CIRCUIT.

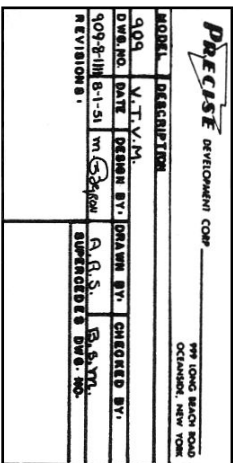
OHMS CIRCUIT:

- (1) In the OHMS Circuit the battery voltage is applied to the Precision Ceramic resistors of the OHM'S decade. The series voltage drop across the unknown resistance is then measured by the CATHODE FOLLOWER DC AMPLIFIER as described under DC VOLTS.

W A R R A N T Y

All merchandise is warranted to be free from defects in material and workmanship, and is fully protected by the standard RMA guarantee.

SCHEMATIC



* Precision Resistor

ELECTRICAL CALIBRATION:

Insert line cord and turn power on by rotating the FUNCTION selector to the -DC position. Turn the SELECTOR switch to the "5V" position. Note: The pilot light and tubes should light immediately. If they do not, turn power off and recheck circuit for the possibility of a short or open circuit. Allow set an initial warm-up period of about a half hour.

-DC CALIBRATION: Short the COMMON and DC PROBE leads together; adjust the ZERO ADJUST potentiometer for a zero reading on the left side of the meter scale. On low voltage ranges, a change in zero setting may be observed when the leads are unshorted. This should not be of concern as it is due to the extreme sensitivity of the meter. Connect three $1\frac{1}{2}$ volt batteries in series, thus giving an open circuit voltage of 4.68 volts. (The open circuit voltage of a flashlight battery is 1.56 volts.) Connect the COMMON lead to the plus side of the batteries and the DC PROBE lead to the negative side. Adjust the -DC CALIBRATION potentiometer (located on the chassis) for 4.68 volts on the top DC scale. See Diagram 9.

+DC CALIBRATION: Repeat as in -DC CALIBRATION except that the FUNCTION switch is rotated to the +DC position; the leads to the battery are reversed and the +DC CALIBRATION potentiometer is adjusted.

OHMS CALIBRATION: The ohmmeter is automatically calibrated and it operates as indicated in the following instruction book.

AC CALIBRATION: Rotate the FUNCTION switch to the AC VOLTS and the SELECTOR switch to the "5V" range. Short the AC and COMMON leads together and adjust the AC ZERO potentiometer (located on chassis) for a zero reading on the left side of the meter scale. A standard AC meter should actually be used during this calibration. But for accuracies as normally encountered, the following may be used: rotate the SELECTOR switch to the 250 volt range and connect the COMMON lead to one side of the 110 volt AC power line and the AC-OHMS lead to the other side. (Note: Since the COMMON lead is connected to the panel of the meter, and this lead is being connected to one side of the AC line, be very careful not to ground yourself during this adjustment. Use one hand and make sure you are standing on a dry surface.) Adjust the AC CALIBRATION potentiometer for 110 vol' on the 250 volt range (near center reading).

FINAL CALIBRATION: Vacuum tubes have what is technically called an "aging characteristic". The tube ages rapidly at first and then tapers off to a balanced or equilibrium condition. Before aging has taken place, the meter may have a tendency to lose its zero adjust or readings may be a bit non-linear. A true calibration occurs after the tubes have been used over a period of a few months. It is suggested, therefore, that a final calibration be made several months after the instrument has been in use. At that time the CALIBRATION and ZERO potentiometers should be re-adjusted and finally sealed by sealing wax or a touch of varnish between the shaft and screw assembly.

