OPERATING INSTRUCTIONS

FOR

PRECISION

HIGH FREQUENCY VACUUM TUBE TEST PROBE

SERIES RF-10A

FOR USE WITH

PRECISION SERIES EV-10, EV-10A, EV-20

VACUUM TUBE VOLTMETERS

PRECISION
TEST EQUIPMENT
Standard of Accuracy

PRECISION APPARATUS COMPANY, INC.
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A. INTRODUCTION

The Series RF-10A High Frequency Vacuum Tube Test Probe is specifically designed for A.C. voltage measurements over a wide range of frequencies when used in conjunction with PRECISION Vacuum Tube Voltmeters.

Precision Vacuum Tube Voltmeters are basically D.C. voltage measuring instruments. In order to provide facilities for measuring high frequency A.C. voltages, a high impedance rectifier probe must be used in conjunction with the Vacuum Tube Voltmeter. Series RF-10A is specifically designed to perform this function through the rectification action of the probe tube circuit. This rectifier network converts the high frequency A.C. voltage under test to a proportionate D.C. value and feeds this D.C. voltage to the V.T.V.M. Circuit.

Analysis and Examination of the RF-10A schematic will reveal that the circuit is of the peak indicating type. The D.C. output of the probe which is applied to the D.C. V.T.V.M. assumes a value substantially equal to the positive peak voltage of the A.C. applied to the tip of the probe. Basically this relationship between the A.C. input and the D.C. output of the probe is true only when the rectified probe output feeds into an infinitely high D.C. load resistance as would be typified by the grid circuit of a vacuum tube.

The design of Precision Vacuum Tube Voltmeters are such that an infinitely high input circuit load cannot be obtained, in that the permanent V.T.V.M. input resistance is 13-1/3 megohms on all D.C. voltage ranges. Accordingly the rectified output of Series RF-10A is never quite truly equal to the full peak A.C. input to the tip of the Probe. However, the difference is small enough to permit calibration on the basis of true positive peak voltage.

B. APPLICATION INSTRUCTIONS

Voltage measurements in high frequency, high impedance circuits cannot usually be made with a low impedance A.C. measuring instrument (1000 ohm per volt sensitivity), because of the high input capacity and low input impedance of these instruments. Such measurements must be made with a suitable high impedance device such as PRECISION Series RF-10A whose design reduces the loading capacity to a minimum and presents high input impedance to the high frequency circuit under test. It is therefore apparent that such a probe should be specifically designed to yield the greatest overall accuracy in the high frequency A.C. spectrum. Measurements at very low frequencies can, in most cases, be satisfactorily effected through use of a standard 1000 ohms per volt instrument such as the 1000 ohms per volt A.C. functions of the Precision Vacuum Tube Voltmeter or of an AC-DC circuit tester.

Applies to EV-10 only

For routine comparison measurements which do not require an unusually high degree of accuracy, direct use of the peak readings obtained on the DC Zero Center EV-10 scales may be used without correction. For those applications which do require maximum measurement accuracy the readings obtained on the EV-10 scales can be referred to the correction curve at the rear of this manual (Fig. 1) for corrected values.

NOTE: Further reference to the RF-10A Schematic will reveal that the D.C. Voltage output from the Probe is negative with respect to ground. Accordingly, the Series EV-10 meter will only deflect to the LEFT or negative side of Zero Center.

If the operator does choose to use the RF-10A for voltage measurements below 200 cycles, the following low frequency corrections should be applied:

A. From 200 CPS to 100 CPS add 5% to the graph-corrected reading.
B. From 100 CPS to 40 CPS add 10% to the graph-corrected reading.
C. From 40 CPS to 20 CPS add 20% to the graph-corrected reading.

It will be noticed that in addition to the "GND" stud mounted on the probe head, a flexible lead terminated in an alligator clip extends from the rear cap of the probe. This flexible lead is an additional ground connection to be used only when measuring relatively low frequency voltages. All high frequency measurements should be made using as short as possible ground lead connected to the ground stud on the head of the probe. The use of this stud provides a much shorter ground connection, minimizing both the ground return loop and the degree of input capacity which will be shunted across the circuit to be measured when the probe is applied.

Although great care has been taken in the Series RF-10A to reduce the input capacity to a minimum, such capacity can nevertheless detune low C high frequency circuits. Whenever such measurements are being made, the resonant circuits being tested should be retuned to resonance before a final reading is made. When such is done, the effect of the additional shunt capacity introduced by the probe will be satisfactorily minimized.

C. GENERAL OPERATION

a. FOR PRECISION SERIES EV-10A & EV-20
See instruction manual supplied with the instrument.

b. FOR PRECISION SERIES EV-10
Inasmuch as the RF-10A probe operates in conjunction with the V.T.V.M. section of the Series EV 10, it is first necessary to set the Series EV-10 for D.C. V.T.V.M. measurements:- the proper procedure is detailed as follows:

1. Before the RF-10A is connected to Series EV-10, the V.T.V.M. "Zero Adjust" control of EV-10 is rotated until Zero Center reading is obtained.

2. We shall now assume that the RF-10A Probe is to be employed on its initial 0-3 Volt range. Series EV-10 Master Range Selector is therefore set to the "3 Volts" position, and the probe connector is inserted into its 2 pole female panel receptacle.

3. After the probe rectifier tube has heated sufficiently the Series EV-10 meter will deflect to approximately 1 volt negative.

NOTE: This initial deflection is a measure of and is produced by Grid-Cathode contact potential of the 9002 diode-connected probe tube. This contact potential naturally produces greatest deflection on the 3 volt EV-10 range, and becomes insignificant on higher ranges. The contact potential applies itself in such a manner as to increase the negative bias on the EV-10 bridge tube and accordingly causes a departure from linearity, as will be noted by reference to the calibration curve.

4. Rotation of the "V.T.V.M. Zero Adjust" control of the EV-10 will bring the meter pointer back to zero center position.

5. The probe may then be applied to the circuit under test for measurements up to 3 volts peak.

6. As noted previously, the readings to be obtained in routine radio maintenance are usually sufficiently non-critical to permit direct use of the EV-10 Meter reading without further correction. Where desired, additional accuracy may be obtained through reference to the correction graph of Fig. 1.

Zero centering of ranges above 3 volts are accomplished in the exact same fashion as for the 3 volt range with the exception that little or no adjustment of the Zero Center Control will be required to counteract the effect of contact potential above the 12 volts range.

APPLICATION NOTES

The applications of a peak indicating probe such as RF-10A are many and varied. Accordingly, it would be impractical to attempt to cover these various useages. Therefore, once the operator has become acquainted with the use of the Series RF-10A he is only limited by his own technical knowledge and familiarity with the measuring problem at hand.

NOTE 1:- In all cases, where practical, use the ground stud on the head of the probe for connection to the ground of the circuit under test. Use the flexible ground lead only for relatively low frequency applications.

NOTE 2:- This Probe tip may be unscrewed from its accompanying stud whenever circuit requirements are such that the added capacity of this tip might prove undesirable.

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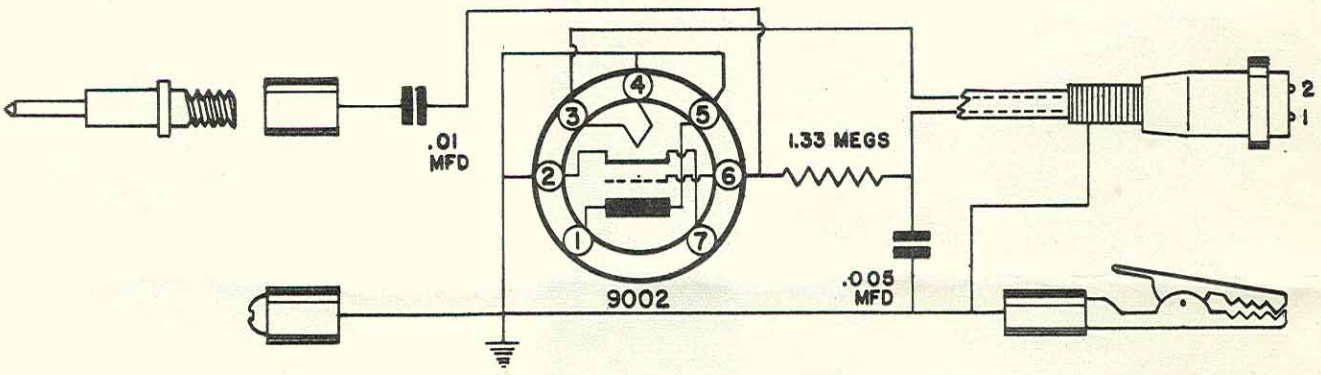

RF-10A SCHEMATIC

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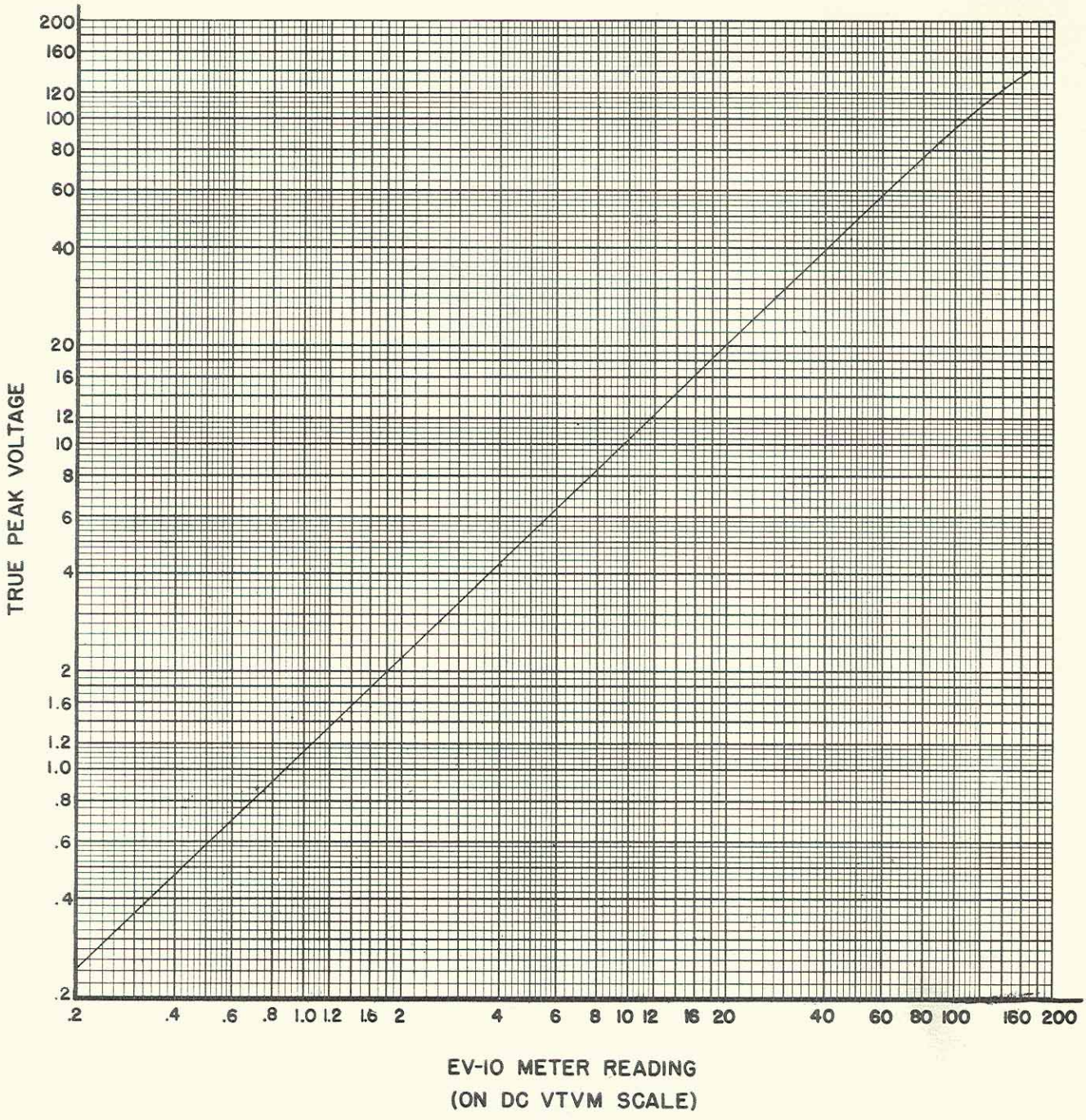

FIG. 1

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