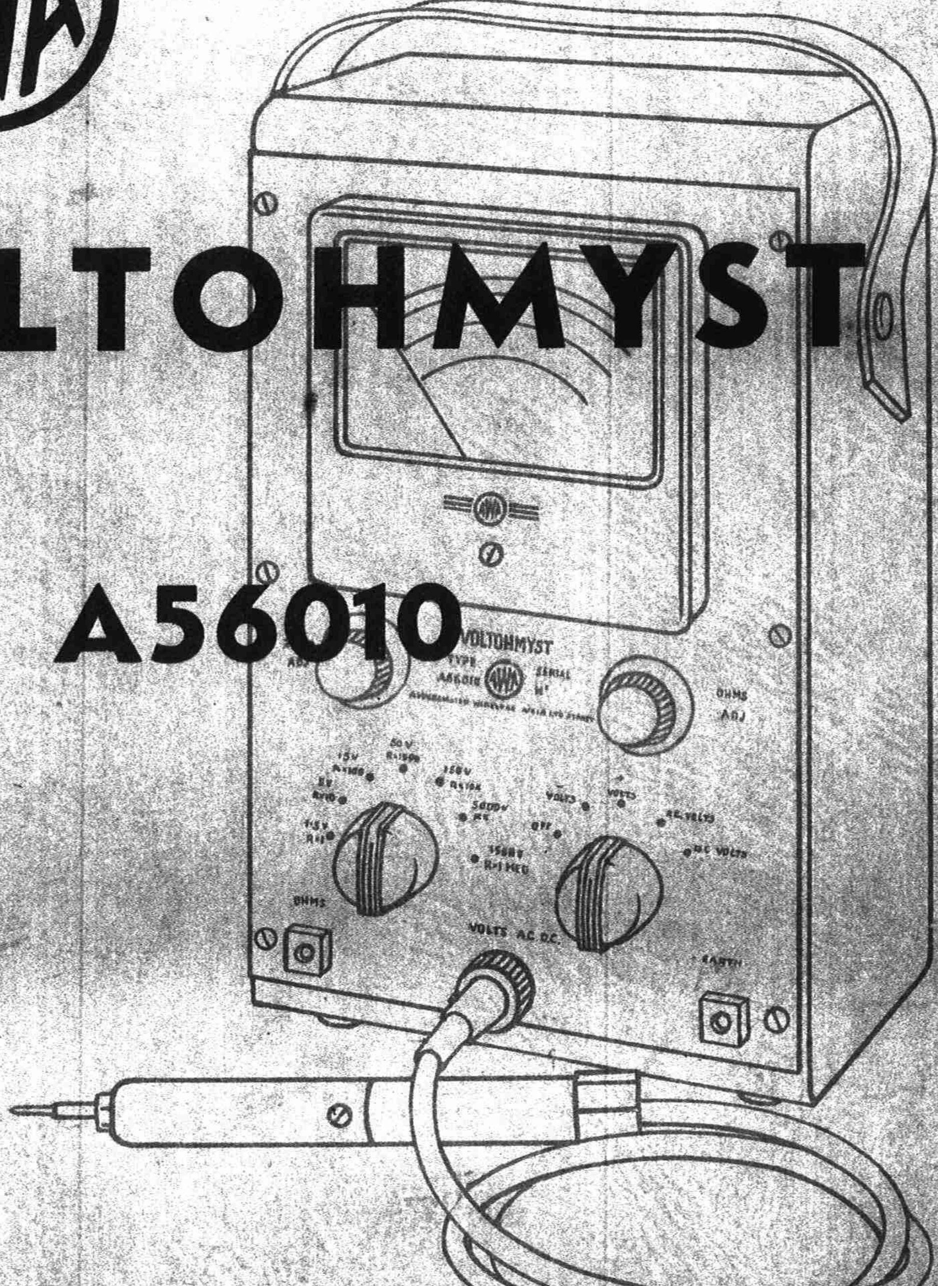
AWA

VOLTOHMYST

TYPE A56010



AMALGAMATED WIRELESS (AUSTRALASIA) LTD.

SYDNEY · MELBOURNE · LONDON · WELLINGTON

INSTRUCTION BOOK 2-56010R

A.W.A. VOLTOHMYST TYPE A56010

(Serial No.153 and onwards)

Amalgamated Wireless (Australasia) Limited

47 York Street

SYDNEY

271053


VOLTOHMYST
TYPE AWA A56010
AMALGAMATED WIRELESS (AUSTRALASIA) LTD.
SYDNEY
ZERO ADJ.
OHMS ADJ.
+mA OHMS
-mA EARTH
VOLTS A.C. D.C.
D.C. PROBE
DIRECT PROBE

I N D E X

SECTION		PAGE NO.
1.	DESCRIPTION:	
1.1	Application	1
1.2	Mechanical Construction	3
1.3	Design Characteristics and Circuit Description	3
1.4	Summary of Controls, Facilities and Electrical Characteristics	6
1.4.1	Facilities	6
1.4.2.	Controls and Input Connections	7
1.4.3	Electrical Characteristics	7
1.5	Probes and Cables used with Voltohmyst A56010	9
1.5.1	Cables and Probes Supplied with the Instrument	9
1.5.2	Probes Not Normally Supplied with the Instrument (available on separate order)	10
2	METHOD OF USE:	
2.1	Warning Notes	13
2.2	Setting Up Procedure	14
2.3	D.C. Voltage Measurement (using D.C. and Direct Probes)	14
2.4	Centre-zero Readings	15
2.5	A.C. Voltage Measurement (With Direct probe alone)	15
2.6	Resistance Measurement	16
2.6.1	Normal Measurement of Resistance up to 1,000 M.ohm	16
2.6.2	High Resistance (insulation) Measurement	16
2.7	Current Measurement	17
2.8	Measurement and Calculation of dbm	17
3	MAINTENANCE:	
3.1	Valve Replacement	19
3.2	Checking the Condition of the 1.5V. cell	19
3.3	Electrical Balance Check	19
3.4	Calibration	20
3.4.1	D.C. Calibration	20
3.4.2	A.C. Calibration	21
3.4.3	A.C. Compensation Adjustment (C2)	21
4	COMPONENT SCHEDULE:	23

5 DIAGRAMS:	DRG. NO.	FIG. NO.
Voltohmyst A56010		
Circuit	56010C2	7
Probes & Cables used with Voltohmyst	56010D7	8

1. DESCRIPTION

1.1 Application.

A.W.A. Voltohmyst type A56010 is a versatile instrument which has application in the measurement of positive and negative D.C. voltages, D.C. current, resistance and A.C. voltages.

The instrument features a circuit which measures directly the peak-to-peak values of sinusoidal and complex waveforms, the scales being calibrated directly in peak-to-peak values and also in R.M.S. for sinusoidal waveforms.

The instrument has a rated input for non-symmetrical waveforms of 2,100V., but sinusoidal and symmetrical waveforms of up to 4,200V. can be measured. (Refer to figure 1 below for waveforms measurable with the instrument.)

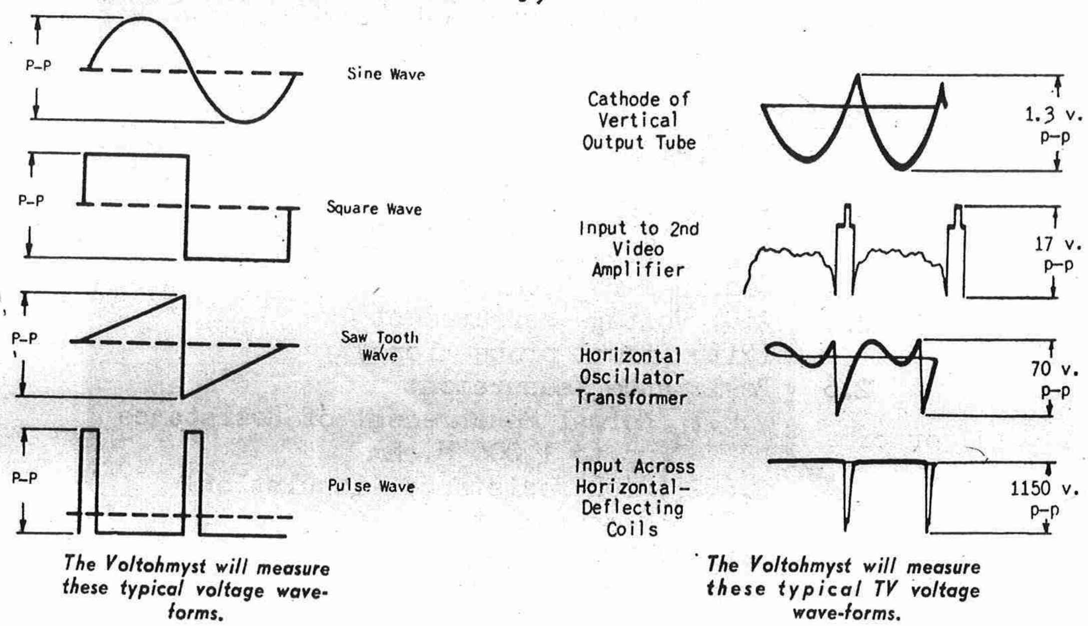


Fig. 1 Waveforms Measurable with the Instrument

When measuring voltages with a source impedance of approximately 100 ohms, the A.C. ranges up to and including 0-500V. are frequency compensated to provide a flat characteristic from 30 cycles to 2.5 Mc. When used in conjunction with a crystal diode probe such as A.W.A. type 2R56020, the input capacitance is reduced to a low value and the A.C. voltage ranges are made accurate to within ± 10% from 50 kc. to 250 Mc. (Refer to subsection 1.4.3 for frequency response figures.)

When using an associated D.C. probe, on all D.C. ranges, the instrument has an input resistance of 11 M.ohms, thus offering considerable advantages over conventional test equipment in a number of applications such as those listed below:-

(i) Oscillator Grid-bias

The negative D.C. voltage developed at the grid of an oscillator is proportional to the amplitude of oscillation.

The instrument, when connected directly to the grid, measures this bias, with negligible effect on the conditions of oscillation.

When checking multi-band receivers, comparative readings should be taken, rotating the oscillator tuning control through its entire range during each check.

(ii) A.V.C. Voltage

The instrument has negligible effect on A.V.C. measurements, allowing them to be taken directly at the grids of the stages to which the A.V.C. is applied, or on the A.V.C. line or at the output of the diode load.

(iii) Output Meter

In the alignment of TV, AM or FM receivers the instrument can be employed as an output meter. The centre-zero feature is particularly useful in aligning the discriminators of the latter receivers (refer to sub-section 2.4 of this book).

(iv) Detection of Gassy Valves and Leaky Coupling Capacitors

The presence of an abnormally low value of negative bias or of a definite positive bias at the grid of a stage may indicate a gassy valve or leaky coupling capacitor; this fault is readily located with the aid of the Voltohmyst.

(v) Insulation Resistance Measurement

High insulation resistances such as those of capacitors, transformers etc. can be measured by applying an external voltage and connecting the instrument as indicated in fig. 4. (Refer also to sub-section 2.6.)

Additional applications of the instrument are:-

(i) Measurement of dbm

By using the instrument in conjunction with the dbm conversion chart (refer to fig. 5), it is possible to determine the dbm values corresponding to R.M.S. values measured across a 600-ohm resistive circuit.

(ii) Peak-to-peak pulse values

The peak-to-peak values of pulse waveforms may be measured, using the A.C. peak-to-peak scale of the instrument. A long time-constant is incorporated in the circuits to allow for measurement of signals having low repetition rates.

Further information on facilities and electrical characteristics is given in sub-section 1.4.

1.2 Mechanical Construction

The instrument is housed in a compact metal case, having meter, four controls and three terminals mounted symmetrically on the front. An engraved front panel is fitted, and a carrying handle provided at the top of the case.

Dimensions are as follows:-

Height:-	10"
Width:-	6¼"
Depth:	6¼"
Weight:	8½ lbs

1.3 Design Characteristics and Circuit Description

The circuit is designed to give a high degree of accuracy in all applications, making the instrument especially adaptable for work in television and industrial equipment.

Maximum peak-to-peak input rating for non-symmetrical complex waveforms is 2,100V. and for sinusoidal or symmetrical waveforms up to 4,200V.

In the case of sine waves, the instrument is calibrated directly for R.M.S. and peak-to-peak values (a feature made practicable by the constant ratio of 2.83:1 of these values). The peak-to-peak-reading feature has particular application in servicing television receivers when taking measurements of waveforms as indicated in Fig. 1.

It should be noted that in this instrument, as in all voltage measuring devices, certain precautions are necessary in interpreting the readings, and inaccuracies may be due to external conditions such as high impedance of the circuit being measured, high-frequency voltage source, or if the voltage waveform consists of short pulses with a low repetition rate. The error introduced increases with the ratio of the source impedance to the impedance of the instrument, and varies with frequency. Refer to para. 1.4.3 (c). The error in short-pulse measurement when the repetition rate is low is due to the time constants involving the capacitors in the peak-to-peak rectifier in the instrument. These capacitors do not have time to become fully charged during the pulse, and in the relatively long period between pulses, are unable to retain the charge they have received. The error thus introduced in the measurement of essentially rectangular pulses derived from a 50-ohm source is indicated in fig. 2 below. For sources of higher impedance, this error will be correspondingly greater.

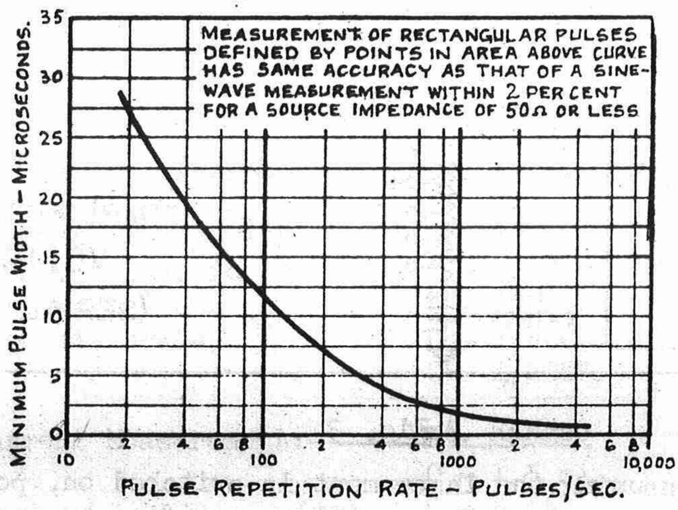


Fig. 2 Pulse Response Capability

The instrument is frequency-compensated for A.C. voltage ranges up to and including 0-500V. On the higher range the response varies with frequency.

All resistors in the divider networks associated with the voltage and ohms applications are high stability carbon types, having a tolerance of ± 1%, and in conjunction with the D.C. amplifier, ensure reliable service for a considerable period.

The fundamental element of the circuit is a D.C. bridge involving a type 12AU7 valve (V3) and its associated network. Refer to the simplified schematic in fig. 3 below.

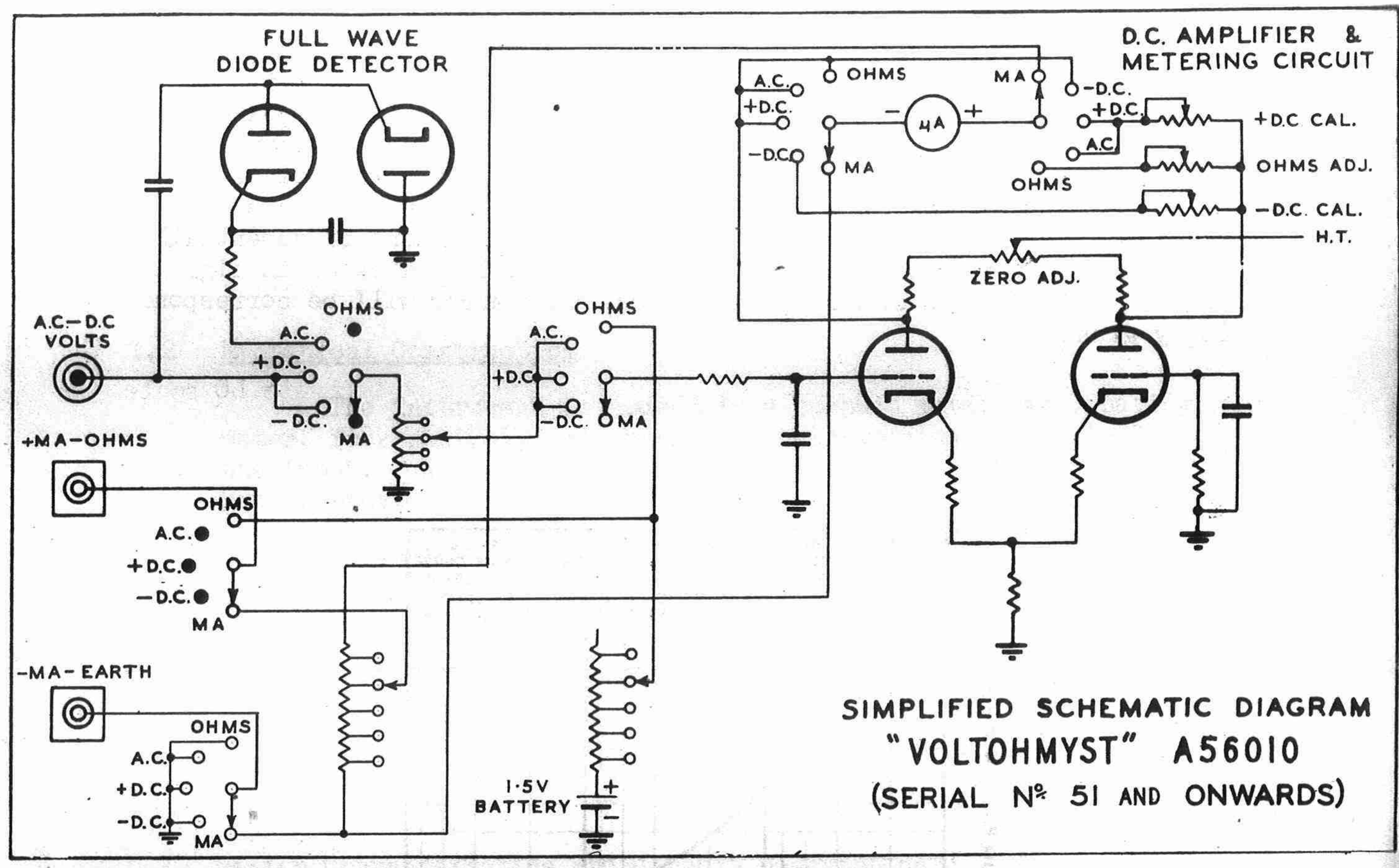


Fig. 3

Assuming the instrument is switched on, power is supplied from the power transformer (T1), rectified by one half of a type 6AL5 valve (V2) and applied to the bridge (V3).

Providing no readings are being taken, and the circuit has been previously balanced by adjustment to the balance resistor (R21), the cathode currents of the two triode sections of the valve (V3) are equal, and the microammeter connected between the anodes reads zero.

When the facility selector (S2) is set in any of the voltage or ohms positions, and a reading is taken, a voltage is applied via range selectors, etc., to the grid of the left-hand triode (as drawn on the simplified schematic) section of V3, thus altering the current through this section and in turn changing the potential across the common cathode resistor (R25). The change in the latter voltage then acts as a reverse change in the bias on the second section, and the meter responds to the resulting changes in potential at the anodes due to the voltage drops across anode resistors R20 and R22, respectively.

When used as a milliammeter, the facility selector (S2) disconnects the meter from the electronic circuit, and connects the "+" terminal of the meter to the "+" mA-OHMS input terminal, and the "-" terminal to the "-" mA. EARTH input, which is then disconnected from earth. Operation is then as for a conventional milliammeter, but it should be noted that all electronic protection for the meter is now out of circuit, and care must be taken not to overload.

1.4 Summary of Controls, Facilities and Electrical Characteristics

1.4.1 Facilities

	Ranges
"+" D.C. Volts "-" D.C. Volts A.C. (R.M.S. volts)	0 - 1.5V. (on separate LO scale for A.C.) 0 - 5V. 0 - 15V. 0 - 50V. 0 - 150V. 0 - 500V. 0 - 1,500V.
A.C. Volts, Peak-to-Peak; (read simultaneously with R.M.S. values for sine waves) on separate scale.	0 - 4.2V. (On separate LO scale) 0 - 14V. 0 - 42V. 0 - 140V. 0 - 420V. 0 - 1,400V. 0 - 4,200V.
Current Measurement:-	**mA. Ranges** 0 - 1.5 mA. 0 - 5 mA. 0 - 15 mA. 0 - 50 mA. 0 - 150 mA. 0 - 500 mA. 0 - 1,500 mA.
Ohms Measurement:- (meter calibrated 0-1,000 ohms)	**Ranges** R x 1 R x 10 R x 100 R x 1000 R x 10,000 R x 100,000 R x 1 M. ohm