SECTION 5

CALIBRATION UNIT UN2/501

Introduction

Calibration Unit UN2/501 provides a standard voltage source of approximately square waveform for the calibration of oscilloscopes and the setting up of amplifiers, etc. It can also be used for the accurate measurement of signal amplitude by using an uncalibrated oscilloscope to display simultaneously the waveform to be measured and the waveform of the UN2/501 and adjusting the amplitude of the latter by means of a variable attenuator until the two amplitudes are equal; an unbalance of as little as 0·1 dB can be detected.*

General Description

The unit generates an approximately square waveform at a frequency of about 16·5 kc/s variable over a range of about ± 200 c/s and an open-circuit voltage which may be selected to be either one or two volts d.a.p. plus or minus one per cent. To maintain this accuracy the unit should be used at the correct mains voltage and checked against a standard voltage source occasionally, say at intervals of three months. In both conditions the output impedance is 75 ohms.

The unit with power supply is contained in a metal box 7½ in. high by 11 in. wide by 9 in. deep and weighs 9 lb.

Circuit Description (Fig. 12)

The circuit of the unit is shown in Fig. 12. It employs a conventional multivibrator stage V1 which generates an approximately square waveform and this is fed via a d.c. restorer stage to the output valve V3 to give a d.c. output which is positive going with respect to earth.

Valve V1 consists of two triodes, the anode of each being coupled to the grid of the other by the capacitors C1 and C2. Resistors R18 and R19 are grid stoppers to prevent spurious oscillation.

Because of the charging and discharging of C1 and C2,the grid potentials of the two triodes only permit one triode at a time to be in the conducting condition, the other being cut off. When the first triode is conducting and passing grid current, C1 charges up through R3. Meanwhile C2, which became charged up through R2 when the second triode was conducting, is discharging through R4 and enabling the grid of the second triode to rise towards h.t. potential until this triode begins to conduct. This causes a drop in potential at the anode which is transmitted to the grid of the first triode and causes the current through the first triode to fall. This fall causes a rise in anode potential of the first triode which is communicated to the grid of the second triode, thus helping the current through the second triode to increase and cause a further drop in the grid potential of the first triode until the first triode cuts off.

The change-over process is further assisted by the common cathode resistor R5, which causes the total current through the two triodes to tend to remain constant, so causing a drop in the current through one triode to produce an increase through the other.

When the first triode has cut off, C1 begins to discharge through R1 and a similar change-over process occurs until the first triode again conducts and the second triode cuts off.

By suitable choice of the values of the capacitors and resistors, the current flowing through each triode is made to approximate to a square wave.* The output waveform is taken from the anode of the first triode of V1 and has the positive excursion d.c. restored to the anode of the voltage reference tube V2.

The amplitude of the output waveform from V1 is about 100 volts and exceeds the reference voltage by approximately 15 volts. The grids of the double-triode valve V3 are therefore switched between

* See Designs Department Technical Memorandum No. 9.11 (60): 'The Accurate Measurement of Signal Amplitude'.

* For further information on the use of multivibrators to generate square waveforms see *Television Engineering, Vol. 3*, by S. W. Amos and D. C. Birkinshaw.

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