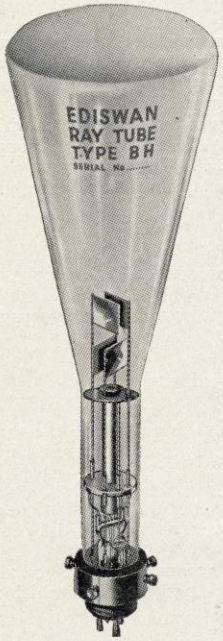
EDISWAN

Cathode Ray Oscillograph

Type BH.



THE EDISWAN CATHODE RAY TUBE is of the high vacuum sealed-off type, possessing a green fluorescent high luminosity screen suitable for photographic and visual observations.

Recent improvements in the design of this tube have given several important advantages over the gas-focused type. These are:

Long life, owing to the absence of ionic bombardment of the cathode. Absence of "origin distortion."

Improved focusing properties of the beam, enabling waves of several megacycles frequency to be recorded with ease.

Improved modulation characteristics, with particular reference to television image reception.

SPECIFICATION.

Cathode Heater Volts	0.4 (Approx.)
Cathode Heater Current	Approx. 1.0 amps.
1st Accelerator Potential	250-800 volts
2nd. Accelerator Potential	800-2,000 volts
Negative Shield Potential	50-150 volts
Tube length	45 cm.
Screen diameter...	10 cm.
Base	Standard 4 pin

APPLICATIONS.

A list of the more common applications of the oscillograph is given below. Further suggestions for its use can be found in the references given at the end of this pamphlet, and our engineers will always be pleased to supply information and advice as to the use of the tube in special cases.

Delineation of alternating current wave-forms.
Study of transient phenomena.
Investigation of acoustic vibrations, by means of amplifier equipment and microphone.
Measurement of output from radio receivers; response curves of pickups, etc.
Alignment of intermediate frequency stages in superheterodyne receivers.
Demonstration of characteristics of radio valves.
Measurement of frequency, phase difference, dielectric loss, etc.
Plotting of hysteresis loops.
Examination of gas discharge tube phenomena, and effect of smoothing equipment, etc.
RECEPTION OF TELEVISION IMAGES.

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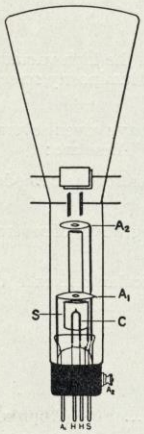

Fig. 2

DESCRIPTION.

The tube consists of a conical bulb with a flattened end, on which a fluorescent screen is deposited internally. In the neck of the bulb are mounted: the cathode C, the negative cylinder or 'shield' S, and two accelerating electrodes A, and A_2 which serve to project the electron beam and focus it on the fluorescent screen. Above the second accelerating electrode A_2 are mounted two pairs of deflecting plates which control the movement of the beam in two planes. These plates are brought out to terminals at the base of the tube labelled A_1, A_2, B_1, B_2 respectively.
If required, the beam may be deflected magnetically by coils placed outside the bulb.

OPERATION.

The tube may be operated from H.T. batteries or from rectified A.C. supply. A diagram of connections of a suitable exciter circuit is given (Fig. 3), which includes negative-bias for the shield and adjustment of 1st accelerator voltage for focussing the spot.

Full operating instructions and circuit diagrams are supplied with each tube.

In the reception of television images the modulating signal is applied to the shield circuit by means of a potentiometer connected in series with the auto-bias resistance.

It is advisable to include an ammeter in the cathode circuit to ensure that the correct operating conditions are maintained. The cathode is conveniently fed from a 2-volt accumulator and a fixed resistance of 1-1½ ohms should be included in the circuit to avoid the possibility of over-running.
Before connecting the tube to the circuit under test, the deflector plates should be connected together and to the 2nd accelerator. On switching on the cathode and H.T. supply, a spot will appear on the screen which can then be sharply focussed by adjustment of the shield bias, and 1st. accelerator.

CAUTION. Do not allow the spot to remain stationary on the screen for appreciable periods, or damage to the screen will result.
After the spot has been focussed the tube may be connected to the circuit under test, taking care that the deflector plates are always connected to closed circuits.
If the beam does not focus sharply, the cause may lie in too low a cathode temperature, incorrect ratio of accelerator voltages, or in external magnetic interference.

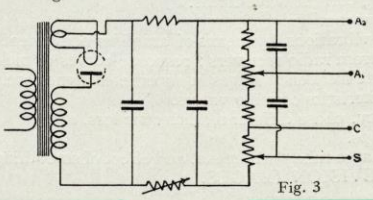

Fig. 3

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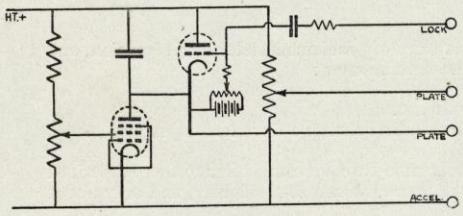

Fig. 4

LINEAR TIME-BASE.

The majority of wave-form observations made with the cathode ray tube require to be referred to linear time scale. A suitable circuit for the deflection of the beam is shown in Fig. 4, in which a condenser is charged through a pentode acting as a constant current device and periodically discharged by the action of the mercury vapour relay. The frequency of charge is controlled by the impedance of the pentode, while the length of travel of the beam is varied by the bias applied to the grid of the relay. Suitable valves for this circuit are the Mazda AC/S2 Pen, and the M.R./AC1 mercury relay Leaflet No. 763-10A).

The value of charging condenser used depends on the speed required, and a selector switch giving values from .5–.005 mfd. is recommended to cover a wide range.

The wave-form observed can be held stationary on the screen by feeding a small proportion of the voltage to the grid of the relay through a .01 condenser and 2 megohm variable resistance.

CENTRING THE BEAM.

The direction of the beam is easily influenced by external magnetic fields. It is advisable, therefore, to surround the tube with a magnetic shield, which should be earthed. Steel shields specially designed for the purpose can be supplied.
The oscillograph should be placed as far as possible from local sources of interference, such as generators or electro-magnets.
Should the deflection of the beam not be symmetrical with reference to the screen after these precautions have been taken, it can be deflected by (1) a permanent magnet placed in the rear of the shield ; (2) by means of a small biassing battery connected in series with one deflector plate, or (3) a battery operated coil attached to the side of the tube.

GENERAL NOTES.

If it is required to deflect the beam magnetically, two coils should be attached to the outside of the tube parallel to a pair of deflector plates. The coils must be as nearly as possible identical, and should have a diameter approximately equal to the distance between them. The number of turns required will depend on the magnitude of the current to be measured.
When only one pair of plates is in use, the other pair should be short-circuited and earthed in order to prevent charges accumulating on them.
A preliminary test should be made to ensure that the deflection obtained is within the effective diameter of the screen. The amplitude of the potential supplied to the deflector plates can be adjusted by the usual methods of potentiometer or transformer, care being taken that the circuit under observation is not appreciably modified by their insertion.

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TELEVISION AND THE CATHODE RAY TUBE.

The Cathode Ray tube offers a satisfactory solution to the majority of problems in television reception, and the following advantages commend it to the consideration of the experimenter :

It is silent in operation.
It requires the minimum of energy to operate and to modulate.
The line screen produced can be varied in speed and amplitude by simple electrical adjustments.
There are no moving parts of a mechanical nature.

The multi-line screen is produced by a combination of two linear time-base circuits similar to those described overleaf. The modulating signal is applied to the shield of the tube, as stated previously, and only about 10-20 volts is required for full modulation.

The output stage of the receiver need consist therefore of nothing more elaborate than a small power valve, and good results are assured if the signal is loud headphone strength.

A suggested circuit for the use of the tube as a television viewer and full instructions for its assembly will be furnished on application to the Technical Service Dept., Radio Division, The Edison Swan Electric Co., Ltd., 155 Charing Cross Road, W.C.2.

In the event of any enquiry respecting the performance of the tube, letters should be addressed as above.

REFERENCES.

The following articles will be found of use, both with regard to the general theory, and with reference to some special applications of the oscillograph.

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