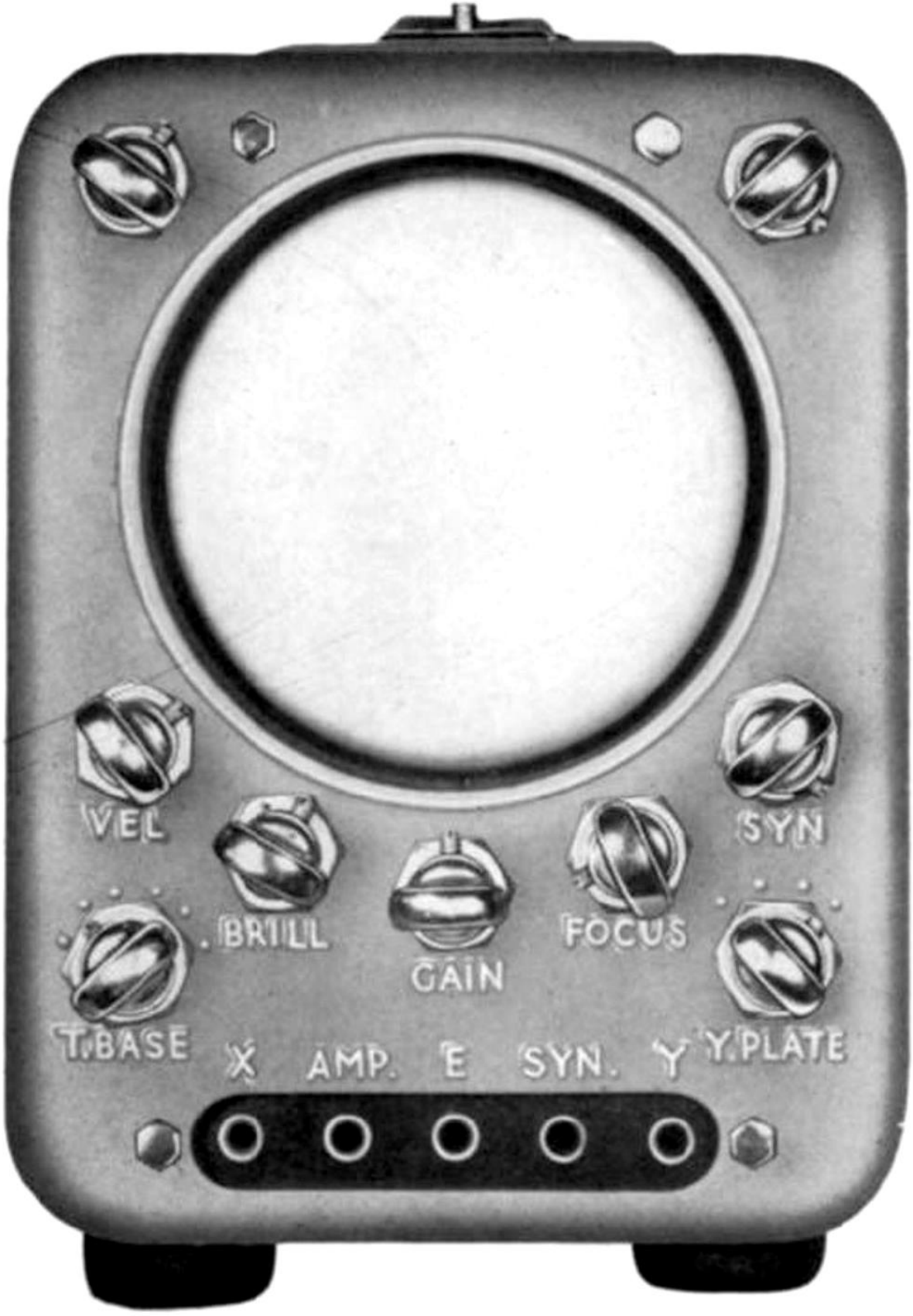
INSTRUCTION BOOKLET

COSSOR OSCILLOGRAPH

MODEL 1039M

A. C. COSSOR LTD

HIGHBURY GROVE · LONDON N.5 ENGLAND



FRONT PANEL.

OSCILLOGRAPH MODEL 1039M

The Cossor Model 1039M Oscillograph is a small lightweight instrument and truly portable. Miniature components and a compact mechanical design have enabled the size and weight to be kept small while retaining many of the facilities offered by larger instruments.

The Oscillograph is intended for general use by servicemen in the field or workshop and it enables sources of distortion to be traced in audio frequency amplifiers, ripple on H.T. supplies to be checked etc., etc. It provides a suitable companion instrument to the Cossor "Tele-Check" and with this combination, the alignment of television receivers can be carried out in the customer's home. The response of T.V. R.F. and I.F. circuits can be displayed on the cathode ray tube screen and all adjustments made while actually observing their effect.

A cathode ray tube having a diameter of 2¾ inches is used and this is sufficiently large to provide a clear display of a waveform or a response curve. When the instrument is not in use, the tube face is protected by a metal cap.

The time base has five overlapping switched ranges and a continuously adjustable potentiometer control which together enable the frequency to be varied from 10 c/s to more than 50 Kc/s. The sawtooth waveform which it generates can be synchronised with an external signal and the time base output is available at a socket on the front panel. The internal time base may be switched off and an external time base signal applied instead.

An amplifier is provided for use when small signals are to be displayed and this can be operated under conditions of high maximum gain with narrow bandwidth or low maximum gain with wide bandwidth as desired.

All input connectors and controls are mounted on the front panel. The input sockets, carried on a recessed insulating strip, are as follows; X (direct connection to one X plate), AMP (amplifier input), E (connected to case), SYN (synchronising signal), Y (direct or A.C. connection to tube Y plate or amplifier output, depending on position of Y plate switch).

The controls are X (X shift), Y (Y shift), T.BASE (time base range), VEL (time base velocity), Y PLATE (selects input to tube from Y socket or from amplifier with wide or narrow bandwidth), GAIN (of amplifier), SYN (amplitude of synchronising signal applied to time base valve), BRILL (brilliance) and FOCUS.

A leather carrying handle, fitted to the top of the oscillograph, folds flat when not in use. The instrument stands 5½ inches high on its four rubber feet, it is 4½ inches wide and 11½ inches long. Its weight is 9¼ lbs.

SPECIFICATION.

POWER SUPPLIES.

Main Supply.	220—240 Volts, 50—100 c/s.
Power Consumption.	30 Watts.
Amplifier and Time Base H.T.	260 Volts.
Cathode Ray Tube E.H.T.	725 Volts.

CATHODE RAY TUBE.

Type 23D. Diameter $2\frac{3}{4}$ inches. Green trace.

X and Y sensitivity direct to tube 170/V, 0.23 mm/Volt D.C. (or 4.4 Volts/mm.)

Input impedance to X and Y plates from front panel, 2 Megohms in parallel with 30pF.

TIME BASE.

Free-running sawtooth generator with paraphase amplifier.
Push-pull deflection of trace.
Frequency range, 10 c/s to 50 Kc/s.
Switched range control, with time base off in position 1.
Continuously variable velocity control.
Output available at X socket at high impedance.
Flyback suppressed.
Minimum amplitude of scan 5 cms.
External synchronisation with negative signal.
Input impedance to SYN socket at least 50 K ohms.

AMPLIFIER.

Single stage amplifier.

Switch control selects, with GAIN control at maximum setting, either,

(*a*) Gain of 75 from 25 c/s to 120 Kc/s (30% down). Maximum sensitivity at least 0.06 Volts peak to peak/mm. Maximum undistorted trace amplitude 4.5 cms.

(*b*) Gain of 20 from 25 c/s to 1.5 Mc/s (30% down). Maximum sensitivity at least 0.22 Volts peak to peak/mm. Maximum undistorted trace amplitude 2 cm.

Continuously variable GAIN control.

FINISH.

Sage grey stove enamel.

CIRCUIT DESCRIPTION.

The circuit, shown on pages 6 and 7, can be divided into three main sections, the cathode ray tube (V1) and power supply circuits, the time base (V2, V3, V4 and associated components) and the Y-amplifier (V5 and associated components).

CATHODE RAY TUBE AND POWER SUPPLIES.

The cathode ray tube (Type 23D) employs electrostatic deflection and focusing of the beam. It is designed to work with a final anode voltage of about 750 Volts and this E.H.T. supply is obtained from the 350 Volts winding on the mains transformer by means of the voltage-doubling circuit consisting of metal rectifiers MR1, MR3 and condenser C1. Smoothing is performed by the filter C2, R1, C3. The anode of the cathode ray tube is earthed and the rectifiers provide a negative output which is applied to the cathode of the tube. A separate heater winding for the tube is provided on the mains transformer, to avoid a large potential difference existing between heater and cathode.

Sawtooth scanning voltages are applied in anti-phase to the two X plates of the tube and the D.C. potential of one of these can be varied by the X shift potentiometer VR4. The use of push-pull scanning reduces trapezoidal distortion of the trace on the cathode ray tube screen. The voltage under examination is applied to one Y plate, while the other is decoupled to earth by C8 and is held at a D.C. potential which can be controlled by the Y shift potentiometer VR3. The input to the Y plate is selected by switch S2A from the output of the Y amplifier or the Y socket on the front panel, to which it may be A.C. or D.C. connected.

The brilliance control BRILL, VR1, sets the D.C. level of the grid and negative pulses are superimposed on this to obtain fly-back suppression. The pulses are fed from the time base by C10.

The H.T. supply to the time base and amplifier is provided by metal rectifier MR2, and smoothing circuit C4, R9, C5. Resistance-capacity smoothing is used for lightness in weight and to avoid the difficulties which a choke, with its large magnetic field, would introduce into so compact an instrument.

TIME BASE.

The sawtooth scanning waveform is generated by valve V3, which is connected as a Miller-Transitron oscillator.

The simple Miller Integrator circuit uses negative feedback through a condenser connected between the anode and control grid of the valve to produce a sawtooth waveform when triggered by a succession of negative pulses applied to the control or suppressor

grids. At the same time, an approximation to a square wave is produced at the screen grid. By coupling the screen to the suppressor instead of decoupling it to earth, the circuit is made to provide its own triggering pulses and becomes a free running sawtooth oscillator.

In this form of time base, the repetition frequency is controlled by the rate of ' run-down ' of the anode potential. This rate in Volts/second is equal to V/CR where V is the voltage at the point to which the grid resistance R is connected, and C is the feedback capacity in Farads. The T.BASE range switch S1A selects one value of C from the condensers C15-19 and the velocity control potentiometer VEL, VR6, enables V to be varied; the grid resistance R15 is fixed. These switch and potentiometer controls provide coarse and fine adjustment of time base speed from 10 c/s to better than 50 Kc/s.

In position 1 of switches S1A and S1B, operation of the time base is prevented by a negative potential applied to the control grid, cutting off the valve current. An externally generated time base voltage may then be used, the X terminal on the front panel being directly connected to one X plate of the C.R.T. In other positions of S1, the internally generated scanning waveform appears at X, at high impedance.

A synchronising signal may be injected at the SYN terminal, the synchronising control SYN, VR5, enabling the amplitude applied to the suppressor grid to be varied. A signal of about 20V peak to peak is required for effective synchronisation, when the sweep will start from the end of the negative-going portion.

Two outputs are taken from the anode of valve V3. One is fed to one X plate of the C.R.T. through S1B and C11. The other goes to valve V4, which is connected as a floating paraphase amplifier. Negative feedback through R17 ensures that the gain of the stage is unity and is independent of valve characteristics, and so an inverted but equal version of the waveform appearing at V3 anode is produced at that of V4 to be fed to the other X plate through C21.

The diode V2 prevents V3 screen grid from becoming more positive than the junction of R28 and R14, to which V2 cathode is returned. This squares the positive-going portions of the V3 screen grid waveform so that the signal fed through C10 consists of flat-topped positive pulses lasting for the forward strokes of the time base. This waveform is superimposed on the standing bias of the CRT grid set by VR1 so that the trace is uniformly brightened during the time base sweep and blacked-out during fly-back.

Y AMPLIFIER.

The single valve Y amplifier (V5) can provide a maximum voltage gain of at least 75 over the frequency range 25 c/s to 120 Kc/s (at

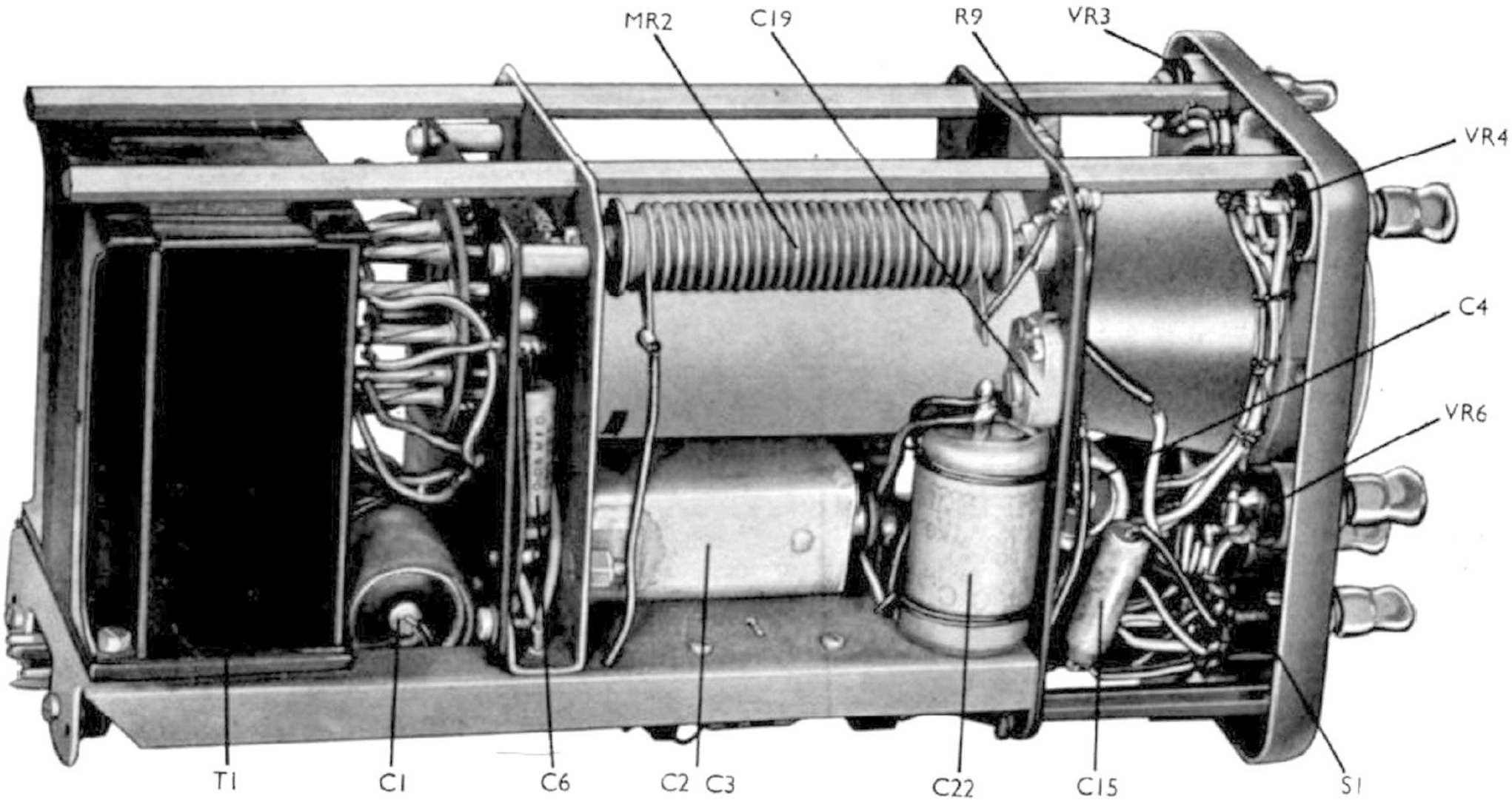
which the response is 30% down) or a gain of 20 from 25 c/s to 1.5 Mc/s (30% down). The alternative values of maximum gain and bandwidth are selected by switches S2B and S2C. In the wide band position, S2B short-circuits part of the anode load to improve high frequency response while the resulting loss in gain is off-set to some extent by reducing the bias on the valve; this is carried out by S2C which short circuits R21, part of the cathode bias resistance chain. The inductance L1 is included to improve high frequency response.

Gain is controlled by variation of negative feedback. By increasing the value of cathode resistance VR7 up to its maximum of 2.5K ohms, the gain is reduced by a factor of approximately ten times. This means that, although the output from the amplifier cannot be reduced to zero, the two amplifier ranges overlap to provide continuous variation of the gain up to a maximum of 75. The great advantage of this type of gain control is that it provides continuous variation with almost no effect on the frequency response of the amplifier over its whole range. R21 and R11 decoupled by C22 provide the bias voltage of V5. The grid resistance R29 is joined to the junction of R21 and VR7 so that variation of VR7 does not alter the bias applied to the valve.

The maximum trace amplitudes that can be observed without distortion are 2 cm. on the 1.5 Mc/s range and 4.5 cm. on the 120 Kc/s range. Signals greater than this overload the amplifier.

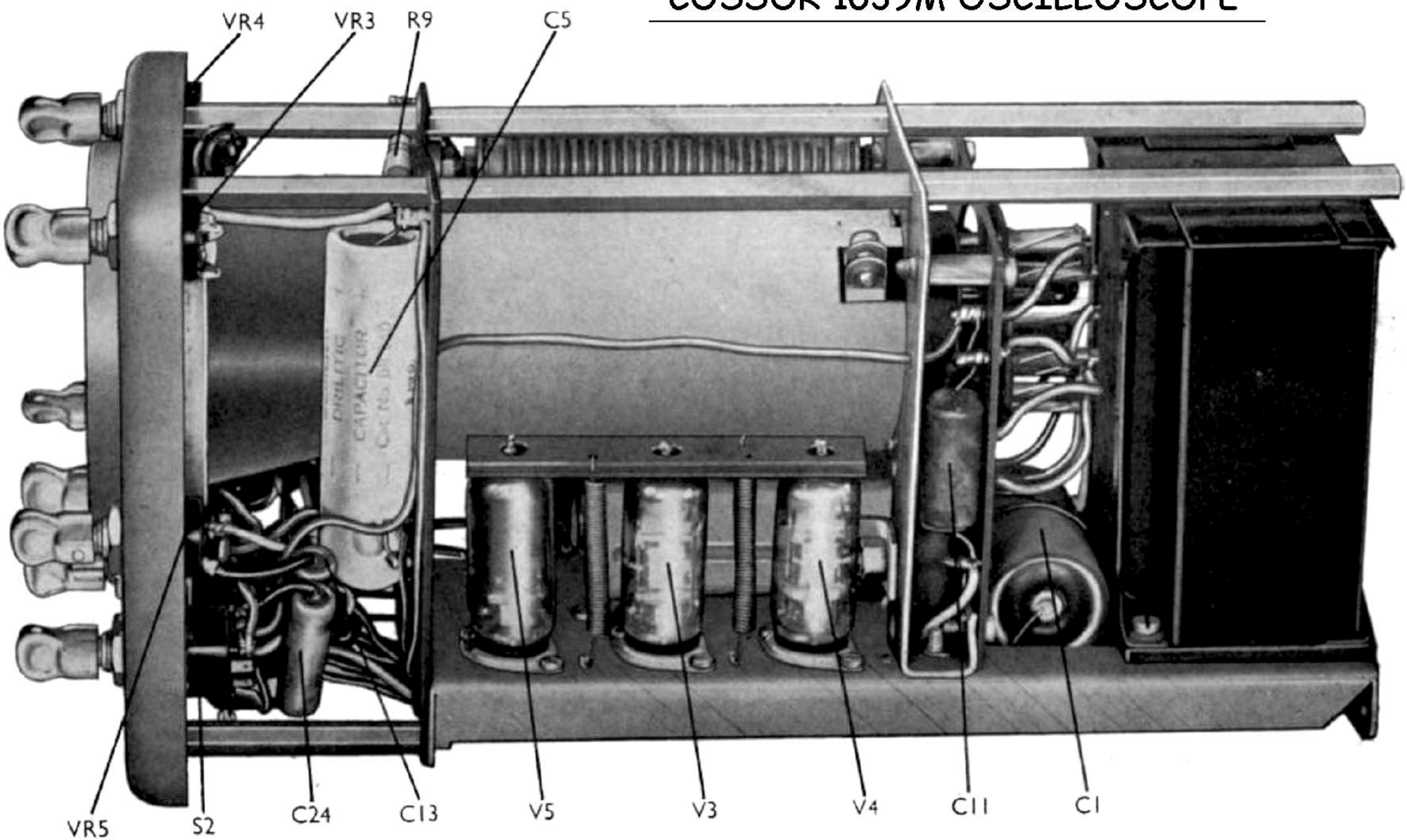
The switch S2A connects the amplifier output or front panel Y terminal to one Y plate of the C.R.T. The Y terminal may be connected directly or through a blocking condenser C24. In switch positions 3 and 4, the amplifier is connected to the tube and its output appears at the Y terminal. This enables it to be used separately; its output impedance is about 25 K ohms on the 120 Kc/s range and 4.7 K ohms on the 1.5 Mc/s range.

COSSOR 1039M OSCILLOSCOPE



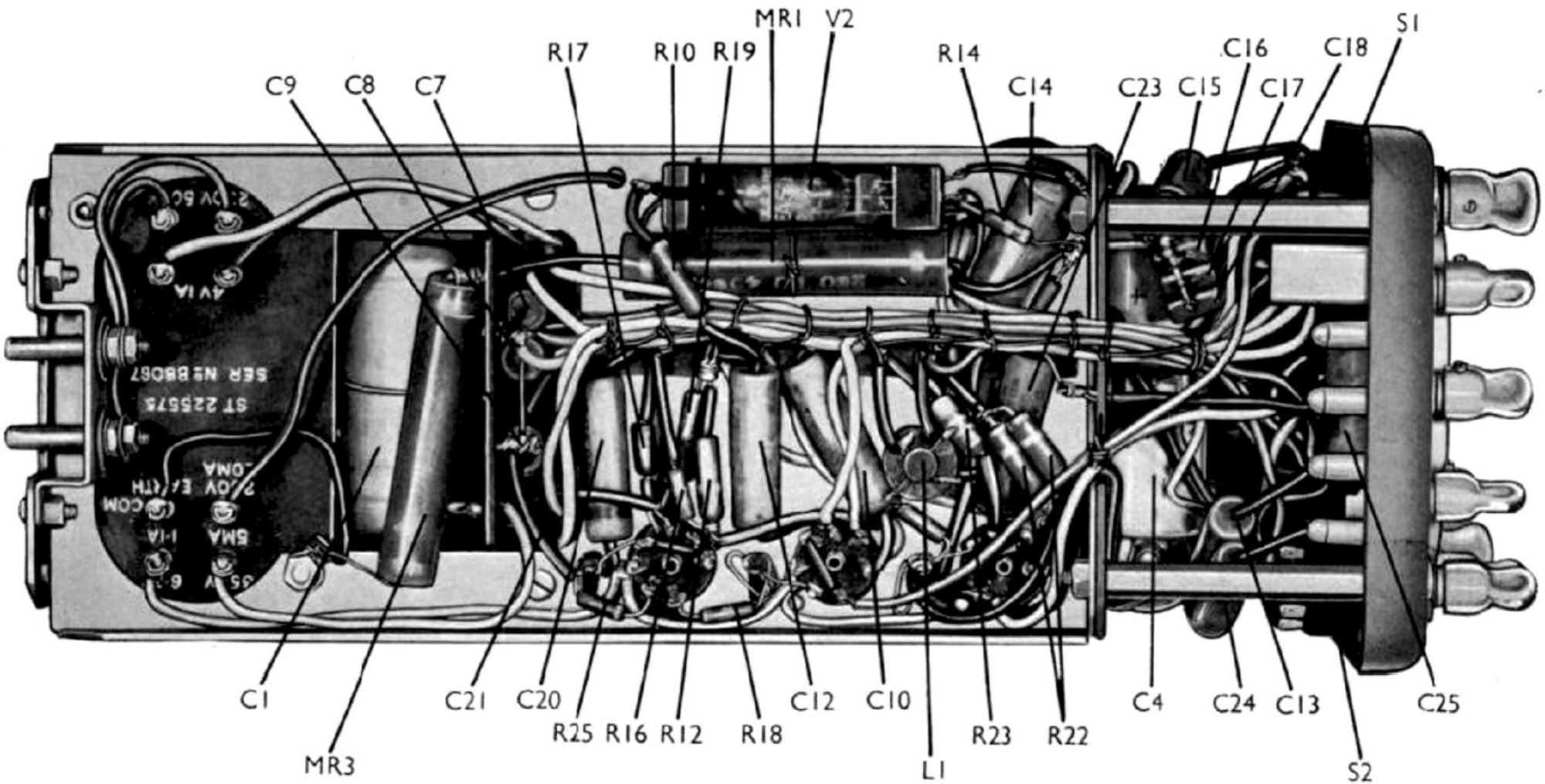
LEFT SIDE VIEW, CASE REMOVED.

COSSOR 1039M OSCILLOSCOPE

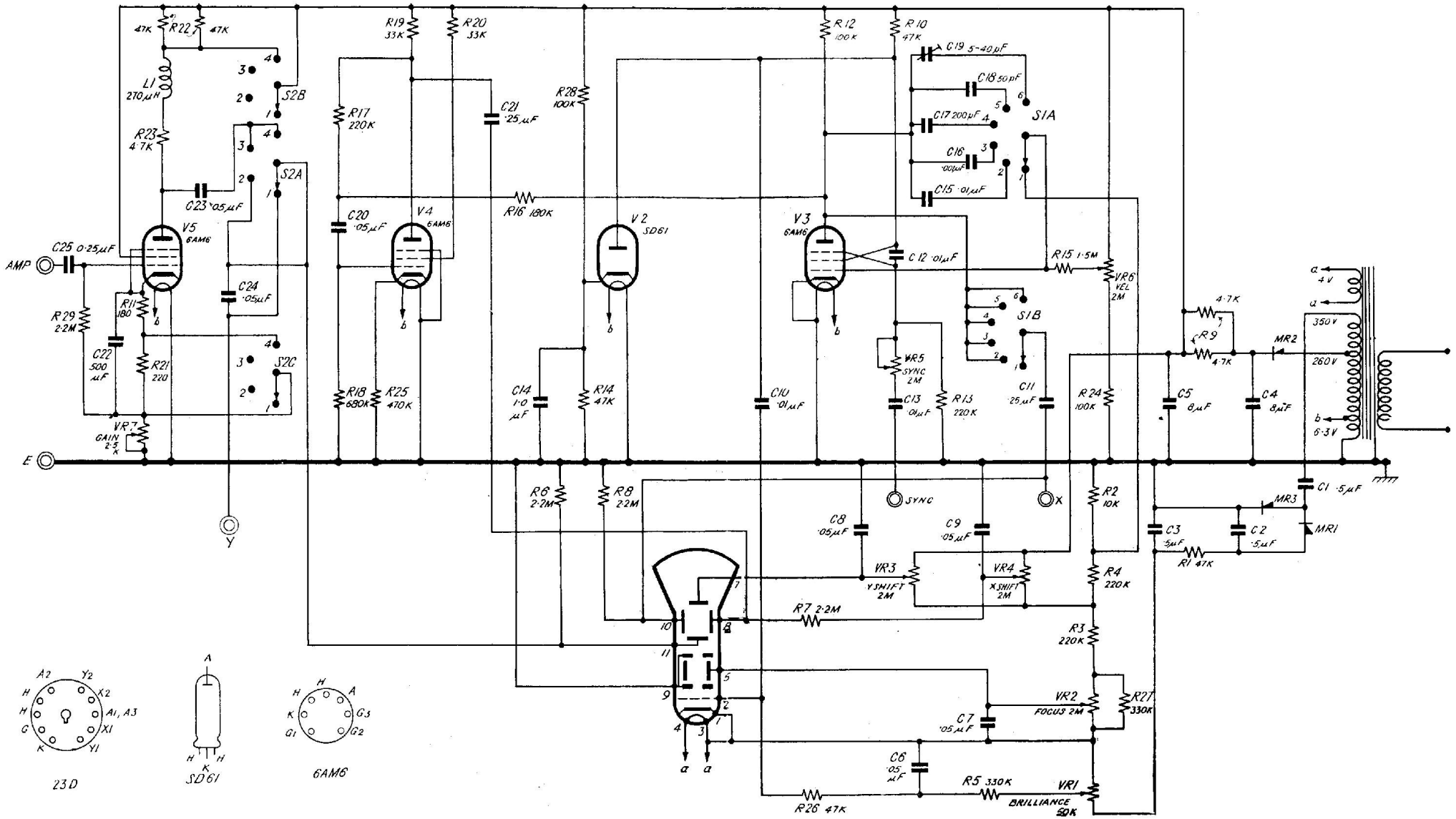


RIGHT SIDE VIEW, CASE REMOVED.

COSSOR 1039M OSCILLOSCOPE



BOTTOM VIEW, CASE REMOVED.



CIRCUIT DIAGRAM