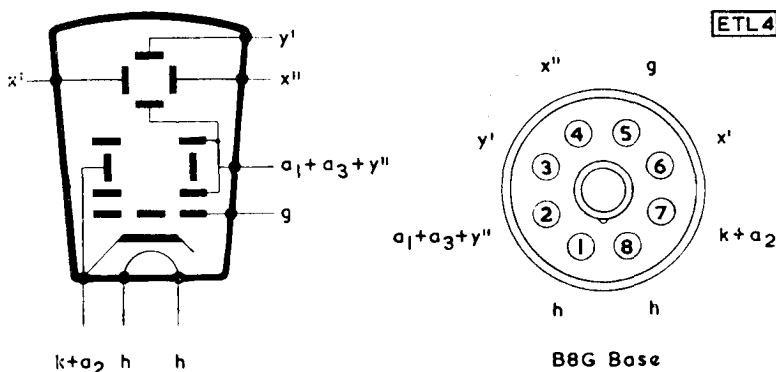


ETEL ICPI

OSCILLOSCOPE TUBE

Low voltage oscilloscope tube with 1-in. diameter screen. This tube incorporates automatic focus.



GENERAL DATA

Screen type	P1
Fluorescent colour of screen	green
Persistence	medium
Focus	electrostatic (self-focusing)
Deflection	electrostatic
Maximum overall diameter	31 mm
Maximum overall length	105 mm
Weight (approx.)	$\begin{cases} 39 \\ 1.4 \end{cases}$ g oz
Mounting position	Any—see section on mounting (page 3)

CATHODE

Indirectly heated—suitable for parallel operation only

Heater voltage	V_h	6.3	V
Heater current	I_h	550	mA

CAPACITANCES

C_{g-all}	4.8 to 7.7	pF
$C_{x'-all}$	4.8 to 7.2	pF
$C_{x''-all}$	4.8 to 7.2	pF
$C_{y'-all}$	2.3 to 4.7	pF
$C_{x'-x''}$	0.5 to 1.5	pF
$C_{x'-y'}$ max.	0.3	pF
$C_{x''-y'}$ max.	0.3	pF

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LIMITING VALUES (absolute ratings)

Max. anode voltage	$V_{a1+a3+y''}$ max.	1.0	kV
Min. anode voltage	$V_{a1+a3+y''}$ min.	350	V
Max. grid voltage	V_g max.	-100	V
Min. grid voltage	V_g min.	-1.0	V
Max. grid resistor	R_{g-k} max.	1.0	M Ω
Max. peak heater to cathode voltage	$V_{h-k(pk)}$ max.	250	V
Max. power input to screen	p_i max.	2.0	mW/cm ²
Max. resistance from either x plate to anode	$R_{x-a1+a3+y''}$ max.	5.0	M Ω
Max. resistance from y' plate to anode	$R_{y'-a1+a3+y''}$ max.	5.0	M Ω

TYPICAL OPERATING CONDITIONS

Anode voltage	$V_{a1+a3+y''}$	500	V
Grid voltage for visual cut-off	V_g	-8 to -27	V
Min. intensity at max. grid drive		0.004	cd
x plate sensitivity	S_x	53	V/cm
y plate sensitivity	S_y	45	V/cm

If $V_{a1+a3+y''}$ is altered, the grid cut-off voltage and the deflection sensitivities will change in the same ratio.

DEFLECTION

In the y direction, only asymmetrical operation is possible since the y'' plate is internally connected to the final anode.

In the x direction the tube is designed for symmetrical operation. Although asymmetrical operation is permissible, this will result in trapezium distortion being introduced. The x plates are those nearest the screen.

The arrangement of the plates is such that viewing the screen with the tube axis horizontal and pin 5 vertically above pin 1, a positive voltage on the x' plate deflects the spot to the left and a positive voltage on the y' plate deflects the spot upwards. When symmetrically operated the mean potential of the x plates must be that of the final anode. When asymmetrical operation is used, one plate must not differ from the final anode potential by more than the deflection voltage.

x plate sensitivity	S_x max.	$\frac{125}{V_{a1+a3+y''}}$	mm/V
	S_x min.	$\frac{65}{V_{a1+a3+y''}}$	mm/V
y plate sensitivity	S_y max.	$\frac{145}{V_{a1+a3+y''}}$	mm/V
	S_y min.	$\frac{75}{V_{a1+a3+y''}}$	mm/V

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LINE WIDTH

With a final anode potential of 500V and under d.c. conditions, the width of a line of length 30mm and intensity 0.001candelas is approximately 0.6mm.

SPOT ECCENTRICITY

With the tube magnetically shielded an undeflected spot lies within 2.0mm of the physical screen centre.

ORIENTATION AND RECTANGULARITY

The angle between the y axis and the centre line of the base spigot key is $22.5^\circ \pm 5^\circ$.

The angle between x and y axes is $90^\circ \pm 5^\circ$.

MOUNTING

There is no restriction on the position of mounting.

The tube may be supported by the base alone provided that this is mounted in such a manner that the effects of sudden acceleration and shock are minimised. Where the tube projects through a panel, or is mounted against it, resilient material should be provided between the panel and the glass envelope.

The use of a viewing hood is recommended with this tube, especially when it is used at low h.t. voltages.

This tube is not intended to be soldered directly into the wiring and a socket of approved type should be used at all times.

SHIELDING

The 1CP1 is not very susceptible to interference from magnetic fields, especially at higher h.t. voltages. In some instances a mumetal shield may not be required, but the necessity depends on individual circuit layout.

Mumetal shields suitable for use with this tube are made by:

Telegraph Construction and Maintenance Co. Ltd.
Crawley, Sussex.

Type ET2

Magnetic and Electrical Alloys Ltd.,
Burnbank, Hamilton, Lanarkshire.

Type ST39

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SUPPLY ARRANGEMENTS

In view of the simplicity of the operating requirements no additional supplies may be required when the tube is incorporated in some equipment. An arrangement suitable for use in such a case is shown in Fig. 1. Fixed bias is provided by the cathode resistor R3 which may be by-passed if necessary by a $0.5\mu\text{F}$ capacitor. Although tubes may not be identical in respect of their 'brightness-grid voltage' characteristic this method of auto-bias produces almost constant brilliance in changing from tube to tube.

Owing to the presence of a transparent conducting film connected to anode between the screen of the tube and the glass, the tube may be operated with its cathode at earth potential without any oscillogram distortion when an earthed body is brought near the screen.

Depending on the individual application, the simple arrangement shown may be unsuitable for a variety of reasons. Two of the commonest drawbacks, with suggestions for overcoming them, are:

- (1) If various patterns are to be displayed on the same tube it is probable that different beam currents will be required to produce the same brightness on each oscillogram. A modified variable brilliance control can be provided merely by using a variable cathode bias resistor. Alternatively, if it is required to 'black-out' the trace a combination of tube current and bleed can be used. In either case it is desirable to incorporate a limiting resistor in order to prevent excessive beam current being drawn.
- (2) Since the deflector plates are essentially at h.t. potential it is not normally possible to employ d.c. coupling to them. Should this be required it is necessary to run the tube anode at the mean potential of the deflector plates, which usually involves tapping the anode across the h.t. supply. If there is no point from which the d.c. signal can be taken which allows the necessary minimum h.t. to be obtained, it is recommended that a negative supply be utilised. This may already be incorporated in the apparatus.

Note—If it is required to run the y plate only from a d.c. signal the anode tap can be used as a centering device.

Fig. 2 shows the two modifications listed above. In it the y plates are shown d.c. connected and the x plates a.c. connected. No x shift network is included. V1 is the actual working voltage of the tube.

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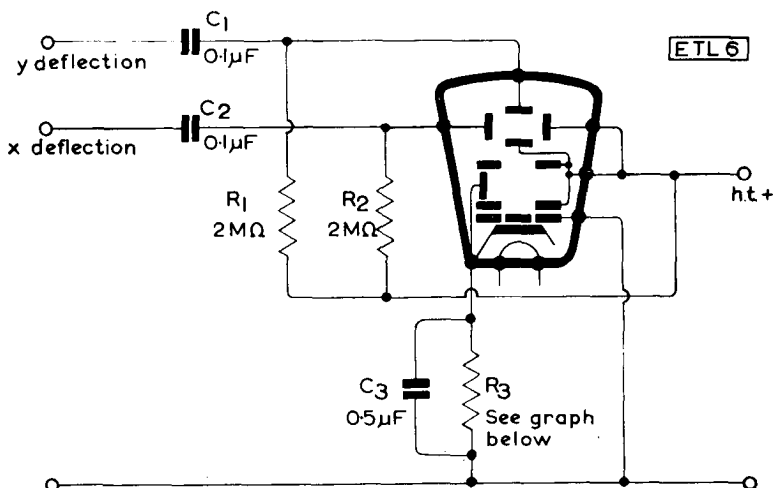
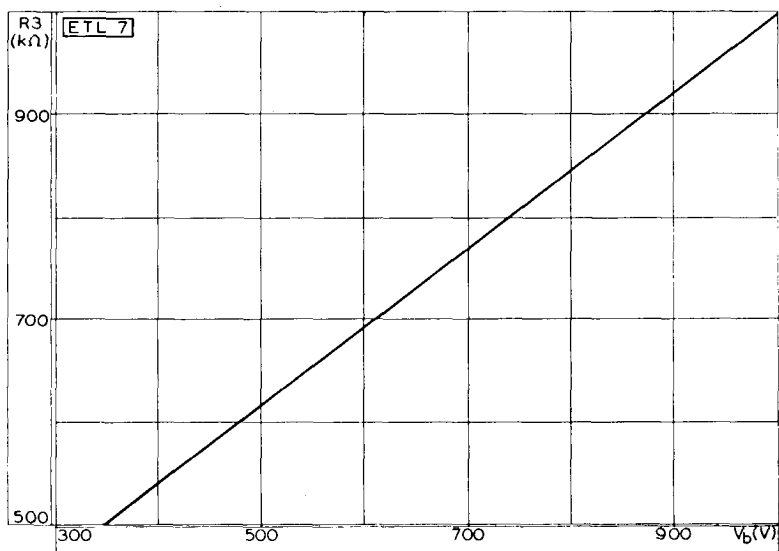


Fig. 1



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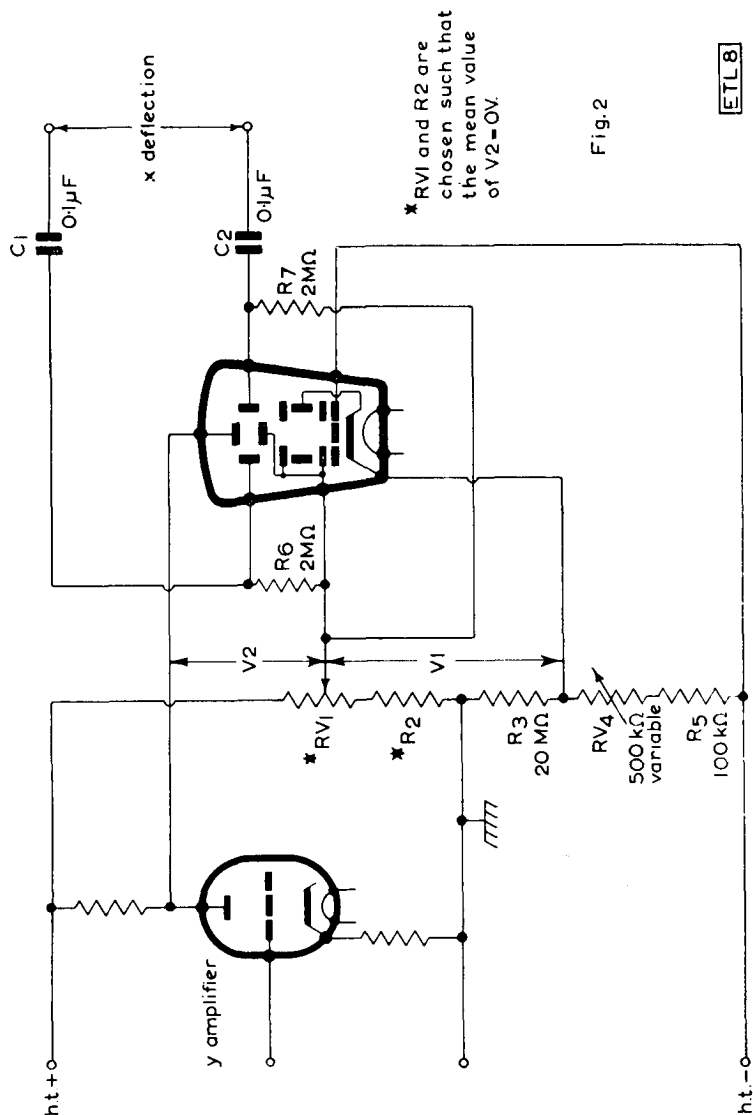


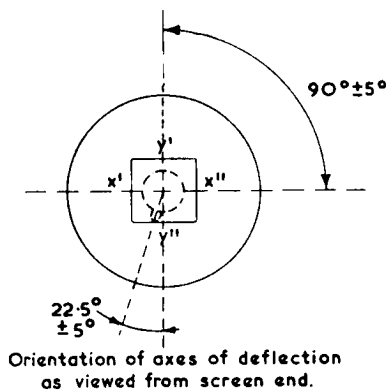
Fig. 2

ETL 8

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ETL3



All dimensions in mm

