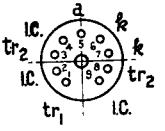
Ferranti

STROBOSCOPIC LIGHT SOURCE

EN15

A neon filled cold cathode tetrode discharge tube designed for use as a Stroboscopic Light Source. Operating frequency is controlled by low voltage, low energy pulses. For some applications it may be operated as a free running oscillator with simple Resistance/Capacity control of frequency.



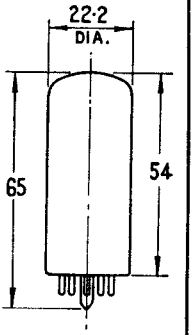
Base Connections
Underside View of Base

PHYSICAL SPECIFICATION.

Base	B9A/D.
Max. Seated Height	54 mm. (2⅛in.).
Max. Overall Length	65 mm. (2⅝in.).
Max. Diameter	22·2 mm. (⅞in.).
Mounting Position	Any.*

PIN CONNECTIONS.

Pin 1—Trigger Electrode 1.	Pin 5—Anode.
Pin 2—Internal Connection.	Pin 6—Cathode.
Pin 3—Trigger Electrode 2.	Pin 7—Cathode.
Pin 4—Internal Connection.	Pin 8—Trigger Electrode 2.
Pin 9—Internal Connection.	



RATINGS (Absolute).

Max. Anode Voltage (Static)	440 volts.
Max. Anode Voltage (Operating) ...	375 volts.
Min. Anode Voltage (Operating) ...	230 volts.
‡Max. Trigger Electrode No. 2 voltage	75 volts.
Max. Average Anode Current	80 mA.
Max. Discharge Capacitor	8 μF.
Min. $R_{trig.\ 1-k}$	1000 ohms.
Min. $R_{trig.\ 2-k}$	1000 ohms.

CHARACTERISTICS.

§Trigger Voltage ($V_{trig.\ 1-trig.\ 2}$) ... (Single Flashes)	80 to 130 volts.
†Trigger Electrode No. 1 Voltage (Stroboscopic Operation) ...	−150 volts (min.).
Max. Flashing frequency	250 per sec.

TYPICAL OPERATION (As Stroboscopic Light Source).

DC supply Voltage	300 volts.
†Trigger Pulse amplitude ($V_{trig.\ 1}$) ...	−150 volts.
‡Trigger Electrode No. 2 voltage ($V_{trig.\ 2}$)	70 volts.
**Charging Resistor	3000 ohms.

Discharge Capacitor.

6—40 f.p.s.	4 μF.
40—50 f.p.s.	3 μF.
50—75 f.p.s.	2 μF.
75—140 f.p.s.	1 μF.
140—200 f.p.s.	0·75 μF.
200—250 f.p.s.	0·5 μF.

*A position between horizontal or vertically base up is preferred.

‡Positive to Cathode.

§Trigger Electrode No. 1 negative to Trigger Electrode No. 2.

†Negative to Cathode.

**Of suitable wattage. For most applications a readily available small vitreous enamel type rated at 14 watts is satisfactory.

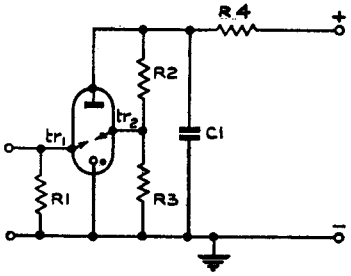
Tentative
Issue 1
Mar., 1961

Ferranti

NOTES ON OPERATION.

The basic circuit for operation of this tube is shown in the diagram below.

The capacitor C1 (Discharge capacitor), connected between anode and cathode is charged through a resistor R4 (Charging resistor). A voltage of sufficient amplitude applied between the two trigger electrodes tr_1 and tr_2 will initiate a glow discharge between these electrodes, which will cause breakdown between anode and cathode, discharging the capacitor C1 and producing a bright flash of light.



The recommended method of triggering is to apply a positive voltage to trigger electrode No. 2 (tr_2) and a negative pulse to trigger electrode No. 1 (tr_1).

The voltage applied to tr_2 is conveniently obtained by means of the potentiometer chain R2, R3, shown in the diagram above, and should have a value of about 70 volts. (max. 75 volts).

Trigger Pulse. To ensure reliable operation at all frequencies, the negative trigger pulse should be steep fronted with amplitude of at least 150 volts, and a width of 30 to 100 microseconds at half amplitude. A suitable pulse may be derived by differentiation of a pulse from a multivibrator or Miller circuit. If a square pulse is used, the pulse width may be slightly less.

The duration of the pulse must be limited to the time required for the capacitor to recharge to about 80 volts, as during deionization time, pulses of greater length are liable to cause a second discharge when the anode reaches 80 volts, or to initiate a glow discharge in the main gap with consequent serious deterioration of the cathode. (A glow discharge is characterised by a more diffused appearance and is of a less intense colour than the required arc discharge).

Discharge Capacitor. This should be chosen in accordance with the recommendation on Page 1, dependent on the frequency range required.

Charging Resistor. The minimum value of charging resistor should be approx. 3,000 ohms, and must be rated for the appropriate dissipation. For maximum light output it is essential-to ensure a nearly complete recharge of the capacitor between flashes The time constant should be not greater than about one third of the flash interval (for a 96% recharge). At the higher operating frequencies it may not be possible to ensure such a complete recharge, as a spurious discharge will ocucr as the charging rate is faster than the valve de-ionisation time. This discharge may in turn initiate a series of uncontrolled flashes, quite independent of the trigger pulse and at a higher repetition rate. Suitable values of discharge capacitor and charging resistance are given on Page 1 of this data sheet.

Anode Voltage. The operating anode voltage should be preferably in the range 300—330 volts. A low impedance power supply is desirable to avoid large fluctuations of the anode voltage and tr_2 voltage over the frequency range.

Mean Anode Current. The mean anode current may be calculated as follows:—

$$I_a \text{ (mean)} = \frac{CVf}{1000} \text{ mA.}$$

where C = discharge capacitor in μF.

V = voltage on discharge capacitor at instant of triggering.

f = flash frequency per second.

Trigger Electrode/Cathode Connections. The tube must not be operated without a D.C. connection between each trigger electrode and cathode. The circuit resistance between cathode and tr_1 and between cathode and tr_2 must have a value of at least 1000 ohms in each instance. A resistance of the order of 100,000 ohms is recommended.