

DECADE COUNTER TUBE

E1T

Indirectly heated decade counter tube designed to operate at high counting speeds.

The E1T is an indirectly heated decade counting tube designed to operate at high counting speeds. A ribbon shaped electron beam is moved in a horizontal plane and passes in succession through the ten apertures of a cylindrical anode, and impinges on a fluorescent layer on the wall of the tube.

This tube is particularly suitable for use in computers, radiation counters and industrial counting and batching applications.

With the circuit shown in this data the maximum counting speed is limited to 30 kc/s.

HEATER Suitable for series or parallel operation a.c. or d.c.

V_h	6.3	V
I_h	300	mA

MOUNTING POSITION Any, except with tube horizontal and the fluorescent screen downward.

CAPACITANCES

C_{a1-a11}	4.9	pF
C_{a2-a11}	10.5	pF
$C_{x'-a11}$	3.5	pF
$C_{x''-a11}$	3.8	pF
C_{g1-a11}	6.8	pF
C_{g4-a11}	7.7	pF

OPERATING CONDITIONS

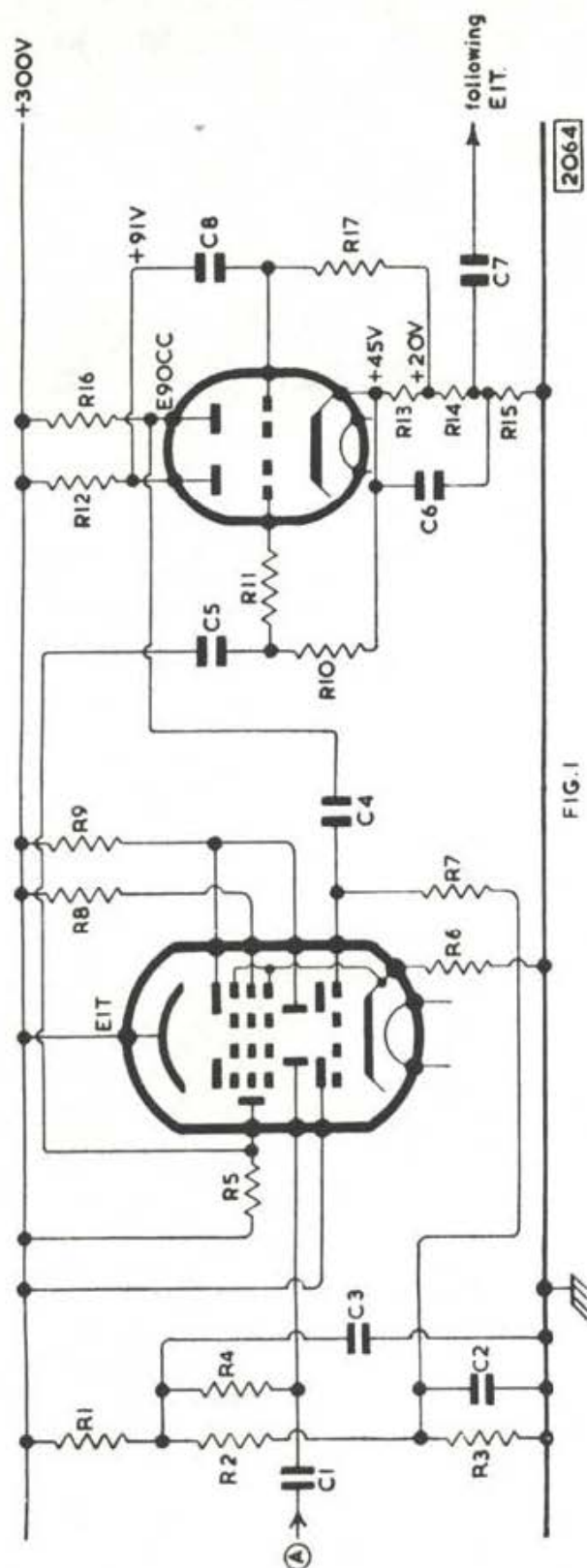
$*V_b$	300	V
$*V_t$	300	V
$*V_{g2}$	300	V
$*V_{g1}$	11.9 ± 0.15	V
$*V_{x'}$	156 ± 1.5	V
I_{g3}	100	μA
I_k	950	μA
R_k	15	$k\Omega \pm 1\%$
R_{a1}	39	$k\Omega \pm 10\%$
R_{a2}	1.0	$M\Omega \pm 1\%$
R_{g4}	47	$k\Omega \pm 5\%$

*All voltages are quoted with respect to the chassis. Provided the ratios of the supply voltages are strictly maintained by using a suitably designed voltage divider consisting of 1% precision resistors, there is no need to stabilise the supply unit, voltage fluctuations of $\pm 10\%$ then being permissible.

Note—The operation of this tube can be influenced by external magnetic fields and for satisfactory operation the flux density of these fields should not exceed 2 gauss in any direction.

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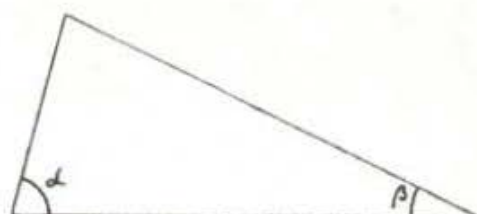
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ADDITIONAL NOTES

In order to move the ribbon beam from any one position to the next a pulse of correct shape must be applied to the left hand deflection plate A as shown in Fig. 1.



$$\tan \alpha > 20 \times 10^6 \text{ V/sec}$$

$$\tan \beta < 1.2 \times 10^6 \text{ V/sec}$$

Fig. 2

The required pulse is shown in Fig. 2. The slope of the leading edge should be at least 20×10^6 volts/sec, that of the trailing edge should not exceed 1.2×10^6 volts/sec. The amplitude of the pulse should have an average value of 13.6 volts and must lie between 11.5 volts and 15.5 volts.

When the beam is moved on from the 9th position it will strike the reset anode a_1 . The negative pulse thus produced must be employed to generate two signals, one to reset the beam to its zero position and another to act as a counting pulse for the 2nd E1T in the counting chain.

The reset pulse is negative going and is applied to the E1T control grid so that the tube is temporarily cut off. The necessary reset time is a function of the circuit used and imposes the limit on maximum counting speed. However, if the reset pulse is too short the beam may return to an intermediate position instead of to the zero position. Referring again to the circuit of Fig. 1 the reset pulse should have an average duration of $27.2 \mu\text{sec}$ with minimum and maximum limits of $23 \mu\text{sec}$ and $32 \mu\text{sec}$ respectively. It is essential for operation at maximum counting speed that the stray capacitance associated with anode (a_2) be kept to a minimum. The minimum amplitude of the reset pulse must be 27 volts.

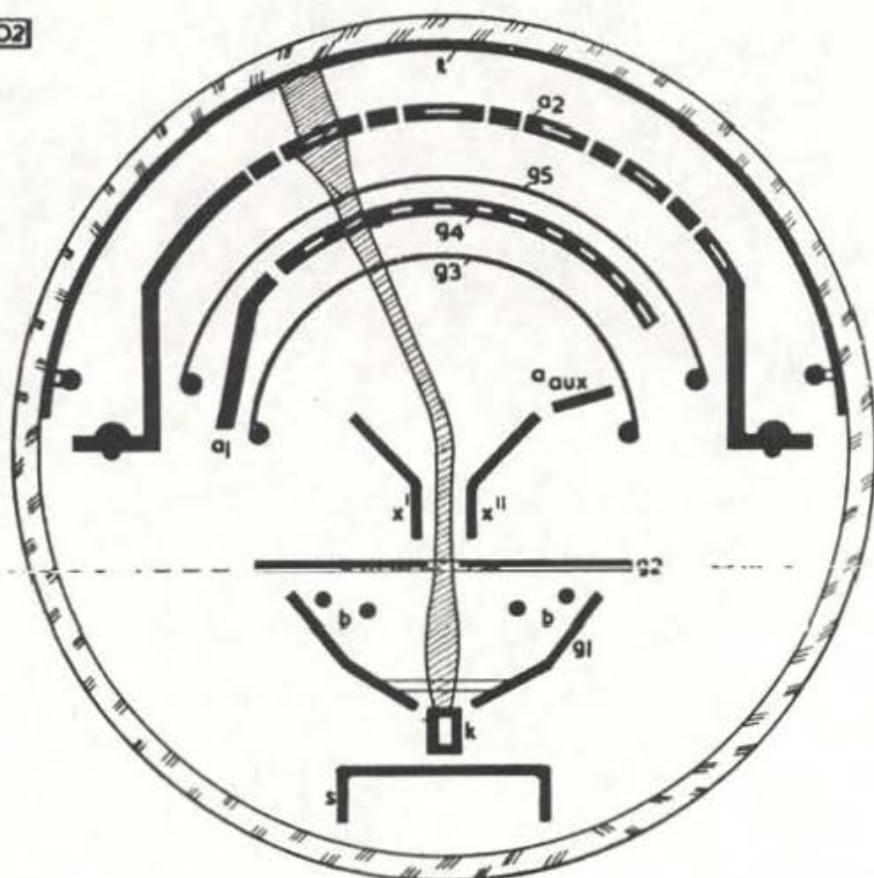
CIRCUIT COMPONENTS

R1	68 k Ω \pm 1%	R10	560 k Ω \pm 10%
R2	68 k Ω \pm 1%	R11	5.6 k Ω \pm 10%
R3	5.6 k Ω \pm 1%	R12	39 k Ω \pm 2%
R4	15 k Ω \pm 2%	R13	4.7 k Ω \pm 2%
R5	39 k Ω \pm 10%	R14	2.7 k Ω \pm 2%
R6	15 k Ω \pm 1%	R15	1 k Ω \pm 1%
R7	330 k Ω \pm 10%	R16	3.3 k Ω \pm 2%
R8	47 k Ω \pm 5%	R17	150 k Ω \pm 2%
R9	1 M Ω \pm 1%		
C1	*	C5	220 pF \pm 10%
C2	0.39 μF \pm 20%	C6	68 pF \pm 2%
C3	0.15 μF \pm 20%	C7	680 pF \pm 5%
C4	6800 pF \pm 10%	C8	68 pF \pm 2%

*To preceding E90CC input pulse shaper ($C1 = 6800 \text{ pF} \pm 10\%$) or preceding coupling stage pulse shaper ($C1 = 680 \text{ pF} \pm 5\%$).

*Indirectly heated decade counter tube
designed to operate at high counting
speeds.*

1402



CONSTRUCTIONAL DETAILS

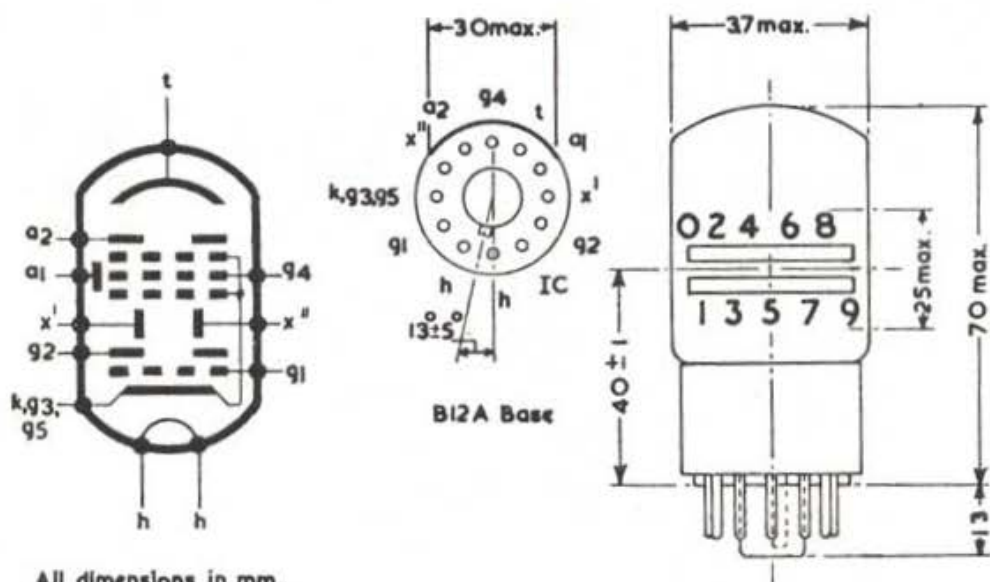
The following letter symbols refer to the cross-sectional diagram.

h	heater	a _{Aux}	auxiliary anode
k	cathode	g ₃ , g ₅	suppressor grids
s	screen	g ₄	slotted electrode
g ₁	control grid	a ₁	reset anode
b	beam-forming electrodes	a ₂	anode
g ₂	accelerating electrode	t	conducting layer coated with fluorescent material
x'	left deflection electrode		
x''	right deflection electrode		

DECADE COUNTER TUBE

EIT

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All dimensions in mm.