



Excellence in Electronics

**CK6835/
QK464A**

The CK6835/QK464A is a cathode ray Recording Storage Tube capable of repeating information stored for many hours up to 30,000 times without appreciable deterioration of signal strength or quality. Magnetic Focusing and deflection are required. This tube is unique in its speed of operation, its dynamic range and in the quantity of data which it can store.

GENERAL CHARACTERISTICS

ELECTRICAL

Heater

Heater Voltage	6.3 V \pm 10%
Heater Current	0.6 A

Maximum Ratings

Anode Voltage	4000 Vdc
Grid #1 (control electrode) Voltage	
Negative Bias	-125 Vdc
Positive Bias	0 Vdc
Positive Peak Value	150 V
Deceleration Screen Voltage	500 Vdc
Storage Screen Voltage	500 Vdc
Signal Electrode Voltage	500 Vdc

Typical Operating Conditions

(All Voltages Measured With Respect to Cathode)

	Prime	Read	Erase	Write
Anode Voltage	3500 Vdc	3500 Vdc	3500 Vdc	3500 Vdc
Deceleration Screen Voltage	350 Vdc	350 Vdc	350 Vdc	350 Vdc
Storage Screen Voltage	20 Vdc	10 Vdc	350 Vdc	350 Vdc
Signal Electrode Voltage	350 Vdc	350 Vdc	350 Vdc	350 Vdc
Signal Electrode Current (pk)		0.2 μ a		
Cathode Current	100 μ a	1 μ a	50 μ a	*

*This value must be determined empirically depending on scan speeds and electrode settings.

MECHANICAL CHARACTERISTICS

Focusing	Magnetic
Deflection	Magnetic
Maximum Deflection Angle	20°
Over-all Dimensions	13 $\frac{3}{4}$ " x 3" Dia.
Storage Screen Diameter (approx)	1 $\frac{3}{4}$ "
Base	Small Shell Duodecal
Resolving Power (on diameter as specified for television)	600 lines minimum
Capacitance — Signal Electrode to all other elements	20 uuf (approx)
Mounting Position	Any





DETAILED ELECTRICAL INFORMATION

CONDITIONS OF OPERATION

Application of the recording storage tube involves four operations, namely: prime, write, read and erase. Any form of scanning may be utilized for the above operations. These operations are performed in the following manner and sequence:

Prime— Priming is accomplished by uniformly charging the storage surface. To prime the storage screen reduce the screen voltage below the critical potential (usually 30 V) and scan the raster with 10 to 50 uA depending on priming speed desired.

Write— Set control grid bias at cutoff either manually or automatically and apply signal to be stored. Signal voltage amplitude required will depend on the sweep speed employed and is measured in terms of average cathode current.

Read— Set grid bias to permit an unmodulated beam current of approximately 2 uA. If the storage screen voltage is properly set, the stored signal will modulate the beam and an output can be taken from the signal electrode.

Erase— Erasing is performed by writing a DC signal into the tube, thus normalizing the storage element at full modulation level. Both the signal electrode and storage screen voltage should be 350 volts for this operation. If erase speeds are of no importance, cathode currents of less than 50 uA are recommended.

WRITING AND ERASING TIME

Writing time is defined as the time required for the electron beam to change the storage element charge to a potential corresponding to the full modulation range. With the proper current adjustment for high speed writing, less than 0.05 microseconds per spot element is required for full modulation.

The erasing time will be comparable to the writ-

ing time since the erasing operation is simply the writing in of an unmodulated signal.

STORAGE ABILITY

The length of time a tube will retain the stored information is a function of the operating conditions and varies inversely as the cathode current.

When reading with a low beam current of about 2 uA at a television repetition rate and scan, 20,000 to 30,000 consecutive readings can be made without any appreciable deterioration of the stored signal. This indicates that a single spot element can be read continuously for approximately 5 milliseconds without significant fading or reorientation of the charge.

The tube is capable of storing information for many hours without appreciable change or deterioration and may be read over 10,000 times after the delay period and still yield satisfactory results.

RESOLVING POWER

The resolution of the storage tube at the 50% modulation level is usually in excess of 650 lines across the diameter and is obtainable when the minimum current for writing a fully modulated signal is employed and the focus coil magnetic shell is designed to minimize astigmatism. Resolution is also dependent on the orientation of the focus coil with respect to the gun, and the sharpness of focus across the storage screen. Therefore, for applications requiring optimum resolution, dynamic focusing is often desirable.

FIGURE OF MERIT

A storage element is defined as: "An area of the storage surface which retains information distinguishable from that of adjacent areas". (55 IRE 7.PS5.) Assuming 600 line resolution across a diameter, the number of storage elements in the

tube will be $\frac{\pi d^2}{4}$ or $\frac{\pi(600)^2}{4} \approx 283000$

and is defined as the figure of merit (η). (Resolution measurements include both black and white lines in a television test pattern.)

INDUSTRIAL TUBE DIVISION

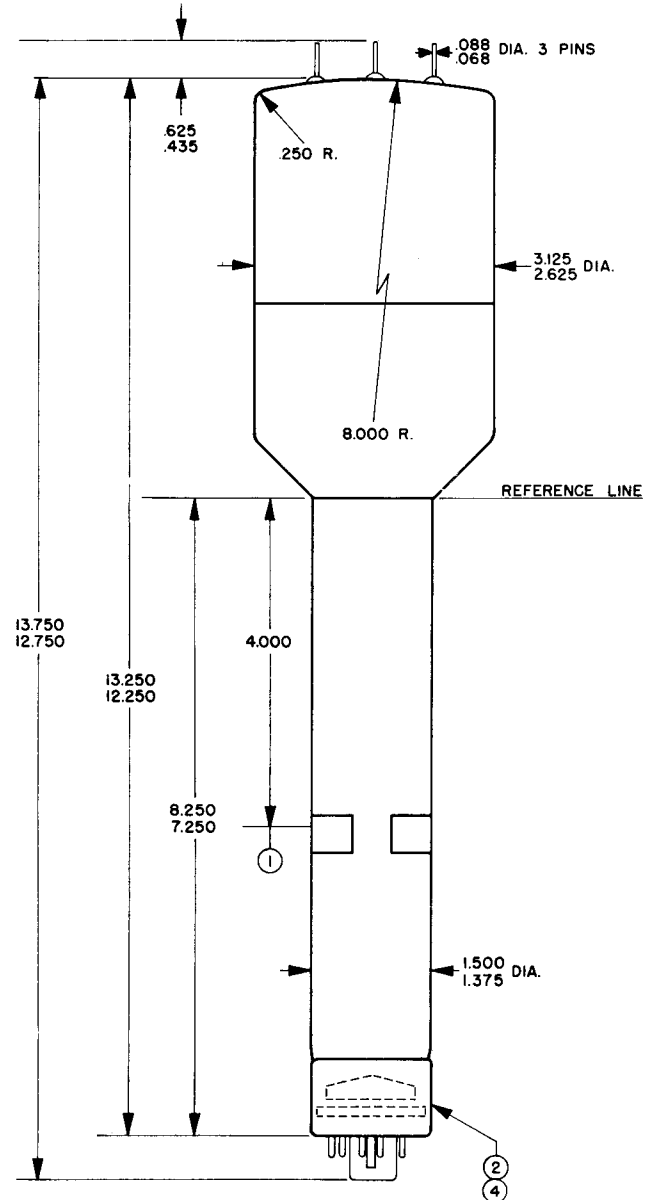
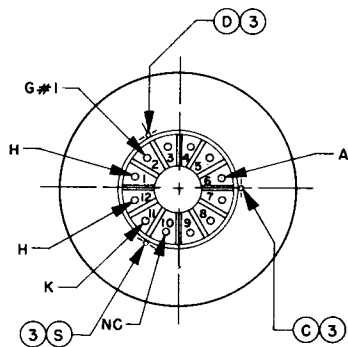
RAYTHEON COMPANY

55 CHAPEL ST., NEWTON 58, MASS.

RECORDING STORAGE TUBE

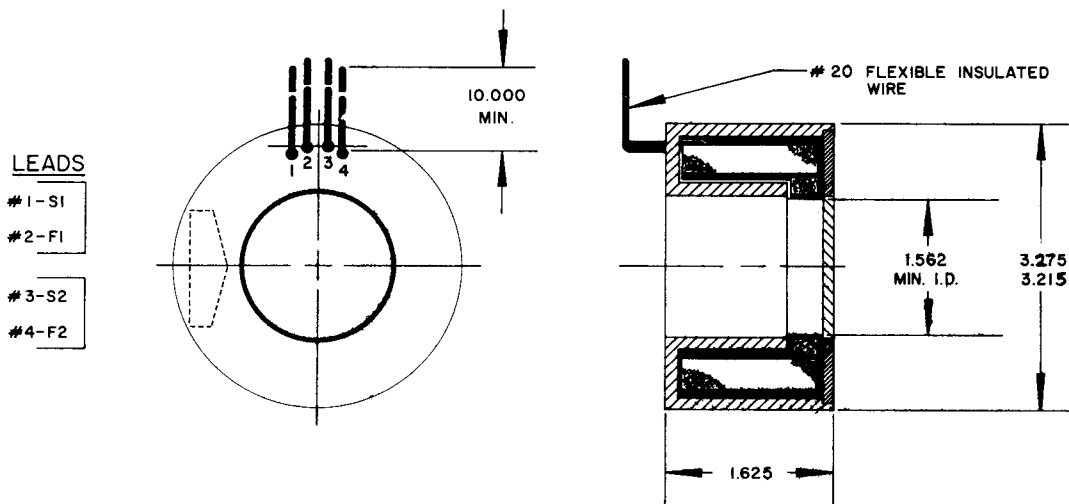
NOTES

- 1) LOCATION OF DEFLECTION YOKE AND FOCUSING COIL MUST BE WITHIN THIS SPACE.
- 2) SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH CONE AXIS AND HAVING A DIAMETER OF 2.00G.
- 3) TOP PIN CONNECTIONS SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY.
 S-STORAGE SCREEN (BLACK)
 C-COLLECTOR (RED)
 D-DECELERATOR (YELLOW)
- 4) B12-43 12 PIN BASE.





RECORDING STORAGE TUBE

BM-411 FOCUS COILLEADS

#1-S1

#2-F1

#3-S2

#4-F2

NOTES:

- 1) FOR USE WITH QK357 OR CK6835/QK464A RECORDING STORAGE TUBES.
- 2) TICKLER COIL IS PROVIDED TO PERMIT COMPENSATING FOR IMPROPER FOCUS AT THE EDGES OF A PATTERN CAUSED BY THE VARIATION IN DISTANCE FROM THE CENTER OF DEFLECTION TO a) THE CENTER OF A STORAGE AREA OF A STORAGE TUBE, AND b) THE PERIPHERY OF THE STORAGE AREA.
- 3) WHEN NOT REQUIRED, THE TICKLER COIL MAY BE LEFT UNCONNECTED.
- 4) SHELL MATERIAL—ANNEALED SWEDISH IRON OR EQUIVALENT.

TICKLER COIL
RESISTANCE — 35 TO 50 OHMS (AT 20°C)
MAX. CURRENT — 30 mA RMS
VOLTAGE RATING — 250 V
INDUCTANCE — 45 MILLIHENRIES APPROX.

FOCUS COIL
RESISTANCE — 6500 TO 9000 OHMS (AT 20°C)
MAX. CURRENT — 25 mdc
VOLTAGE RATING — 250 V

NOTES FOR SCHEMATIC OUTLINE ON PAGE 5

1. The unblanking circuit shown is designed to cut off the storage tube during retrace and when the scan is off. Insertion of a negative pulse to the unblanking amplifier permits the storage tube to conduct during scan.
2. Since the storage tube anode voltage is considerably lower than most magnetically focused cathode ray tubes, a non-astigmatic focus coil is recommended where high resolution is desired. Resolution near the edges of the storage area can be further improved by use of dynamic focusing. (A focus coil providing both these features is being manufactured by Raytheon for use with the QK464A. It is designated as coil #BM411.)
- 2a. Since the dynamic focus correction is a function of the displacement of the electron beam from the axis of the tube at any instant, it can be generated from an output equivalent to the algebraic sum of two parabolas generated from the horizontal and vertical sweeps respectively.
- 2b. It is suggested that the dc focus be provided from a constant current source to minimize focus drift caused by the change in resistance of the focus coil during warm-up.
3. Design considerations for the video output amplifier must include the output capacitance of the storage tube (10-20 μ f) and its output signal (0.5-1.0 μ amps). When using a high load resistor to minimize noise, frequency compensation within the amplifier is necessary. (See "Television" by V. K. Zworykin etc., John Wiley & Sons, 1940. P.P. 432-5.)

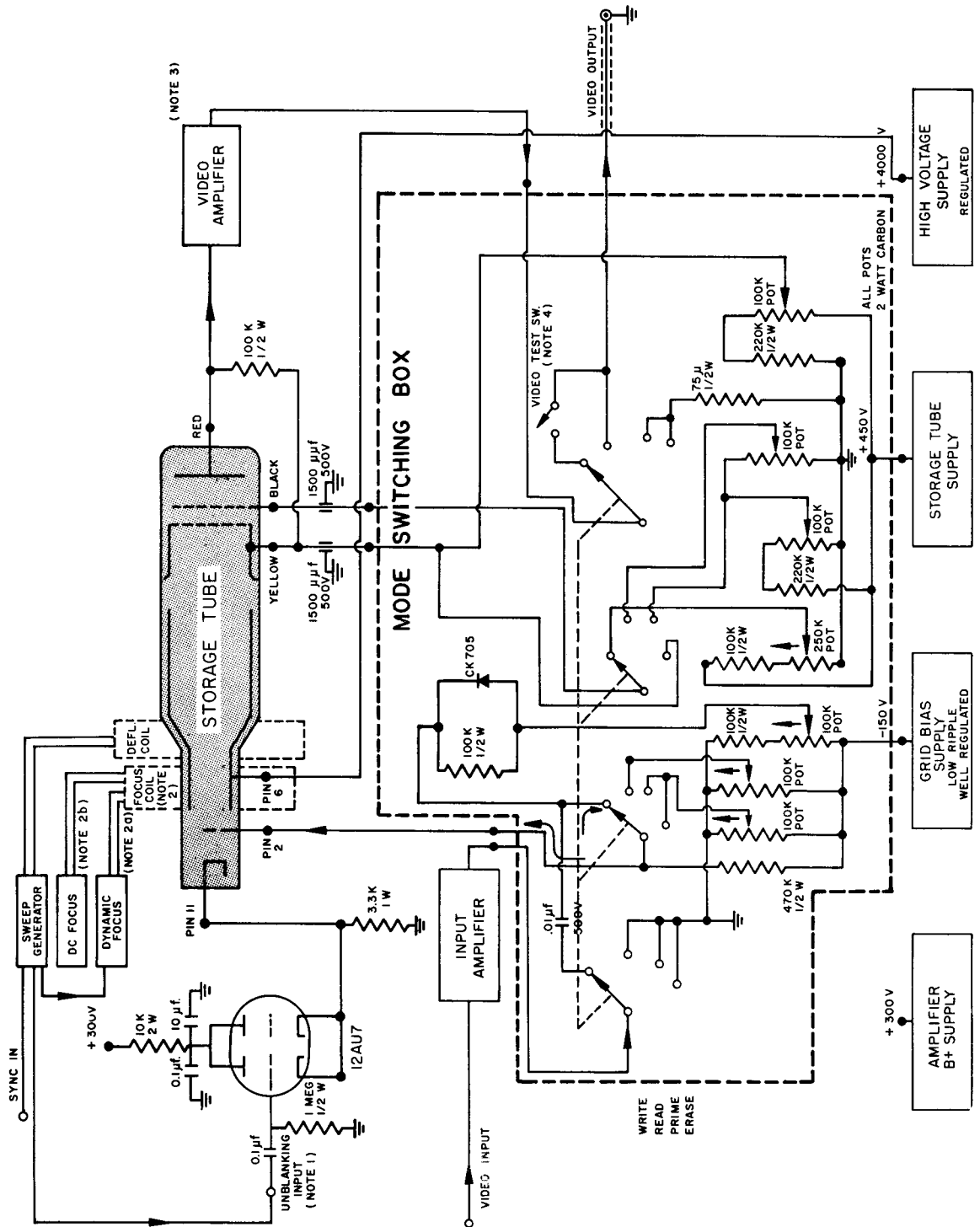
INDUSTRIAL TUBE DIVISION

RAYTHEON COMPANY

55 CHAPEL ST., NEWTON 58, MASS.



RECORDING STORAGE TUBE



Printed in U.S.A.

INDUSTRIAL TUBE DIVISION

RAYTHEON COMPANY