CK7570/ QK411A

The CK7570/QK411A 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. Electrostatic focusing and deflection are required. This tube is similar to the CK6835/-QK464A except for deflection and focusing methods.

GENERAL CHARACTERISTICS

ELECTRICAL

Heater

Heater Voltage	6.3 V ±10%
Heater Current	0.6 A

Maximum Ratings

Anode No. 1 Voltage	2800 volts
Anode No. 2 and Grid No. 2 Voltage	6000 volts
Grid No. 1 (control electrode) Voltages	
Negative Bias Value	200 Vdc
Positive Bias Value	0 Vdc
Positive Peak Value	2 V
Peak Heater-Cathode Voltage	±150 Vdc
Deceleration Screen Voltage	500 Vdc
Storage Screen Voltage	500 Vdc
Signal Electrode Voltage	500 Vdc
Deflection Drive (for full screen deflection)	1000 Vdc

Typical Operating Conditions

(All Voltages Measured With Respect to Cathode)

	Prime	Read	Write
Anode Voltage	5000	5000	5000
Deceleration Screen Voltage	500	500	500
Storage Screen Voltage	+20	+10	+500
Signal Electrode Voltage	+500	+500	+500
Cathode Current (μa)	150μa	5μa	*
Signal Electrode Output Current		0.5μa	

MECHANICAL CHARACTERISTICS:

Focusing Method	electrosatic
Deflection Method	electrostatic
Maximum Deflection Angle	20°
Overall Length	13½" ± ½"
Storage Screen Diameter (approx.)	1 ¾
Resolving Power (on diameter as specified for TV)	400 line nom.
Mounting Position	Any
Base	Medium Shell Di Heptal
Capacitance — Signal Electrode to all other elements	20μμf (approx.)

*This value must be determined empirically depending on scan speeds and operating voltages.

Printed in U.S.A.

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 at the decelerator potential for this operation. If "erase" speeds are of no importance, cathode currents of less than 50 μA 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 0.12 microseconds per spot element is required for full modulation.

The erasing time will be comparable to the writing 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 cathode 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 in excess of 400 lines across the diameter and is obtainable when the minimum current for writing a fully modulated signal is employed and the deflector plate dc voltage level is properly set to minimize astigmatism. Resolution is also dependent on 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 400 line resolution across a diameter, the number of storage elements in the tube will be $\frac{\pi d^2}{4}$ or $\frac{\pi(400)^2}{4} \approx 125{,}000$ and is defined as the figure of merit (η). (Resolution measurements include both black and white lines in a television test pattern.)

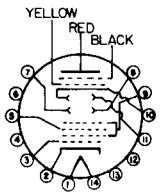
RECORDING STORAGE TUBE

NOTES:

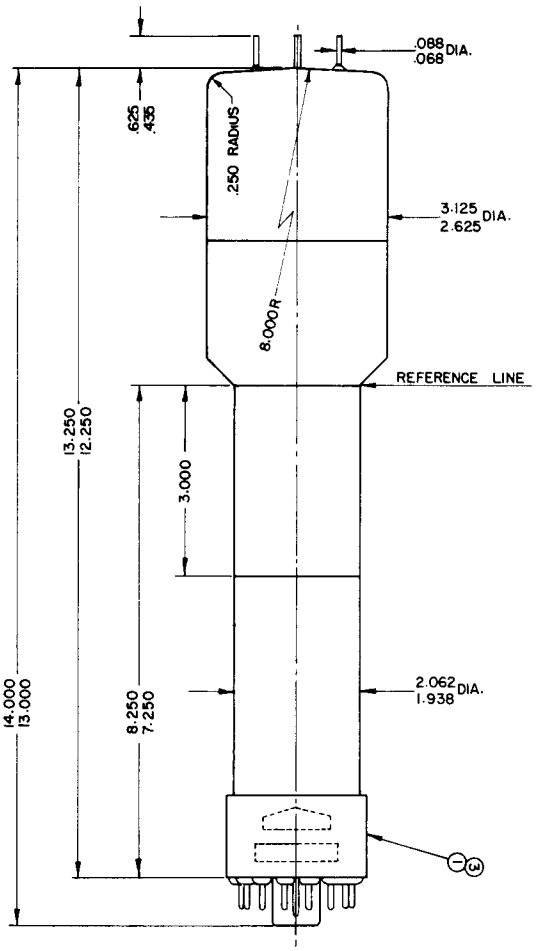
1- SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED. IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH CONE AXIS AND HAVING A DIAMETER OF 2.250.

2- TOP PIN CONNECTIONS SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY.
S-STORAGE SCREEN (BLACK DOT)
E-SIGNAL ELECTRODE (RED DOT)
D-DECELERATOR (YELLOW DOT)

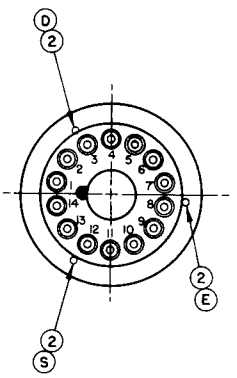
3- 14 PIN MEDIUM SHELL DI-HEPTOL BASE.



SOCKET CONNECTIONS
BOTTOM VIEW

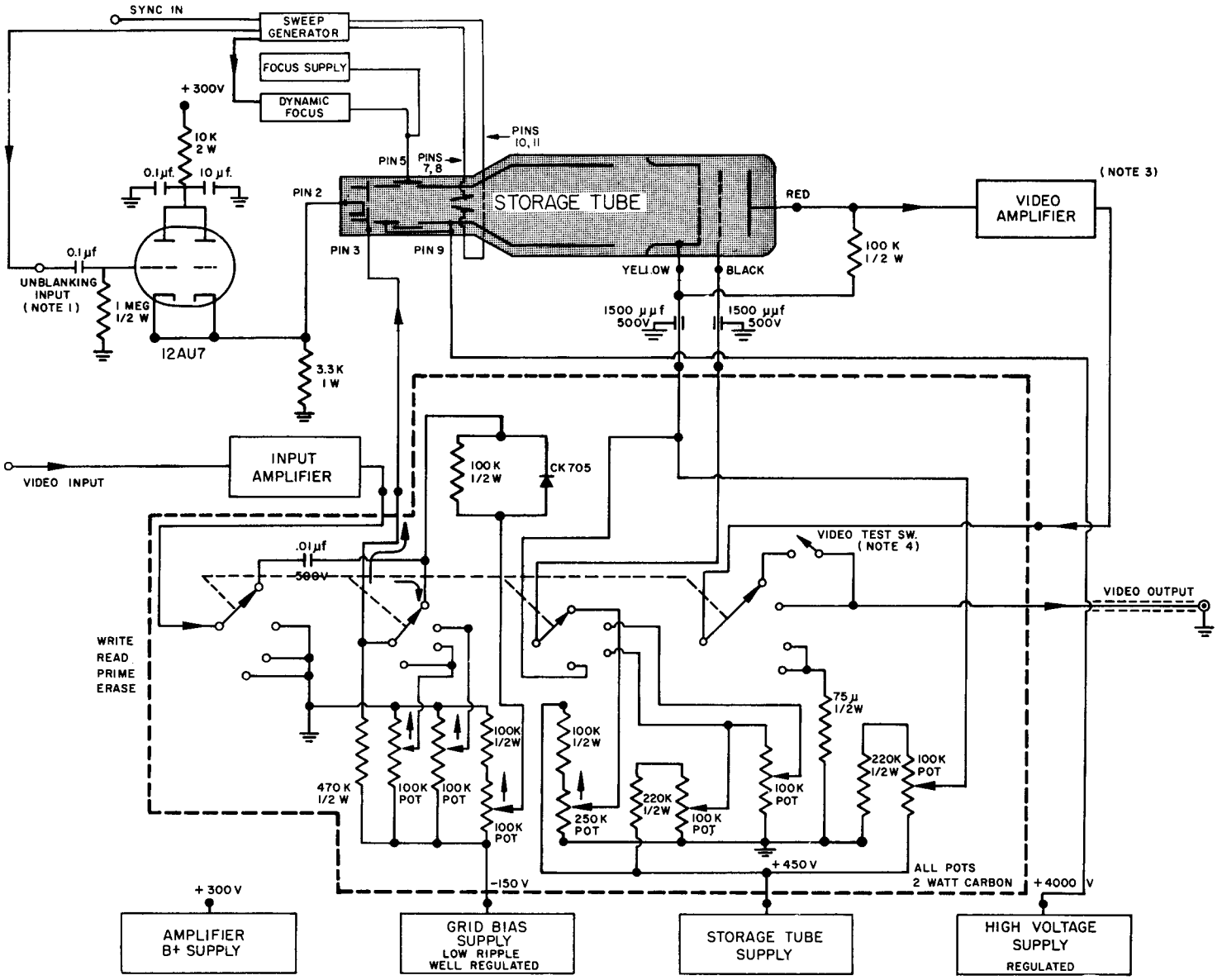


PIN 1 - HEATER
PIN 2 - CATHODE
PIN 3 - GRID No.1
PIN 4 - INTERNAL CONNECTION
PIN 5 - ANODE No.1
PIN 6 - NO CONNECTION
PIN 7 - DEFLECTING ELECTRODE DJ3
PIN 8 - DEFLECTING ELECTRODE
PIN 9 - ANODE No.2 GRID No.2
PIN 10 - DEFLECTING ELECTRODE DJ2
PIN 11 - DEFLECTING ELECTRODE DJ1
PIN 12 - INTERNAL CONNECTION
PIN 13 - NO CONNECTION
PIN 14 - HEATER



RAYTHEON

RECORDING STORAGE TUBE



NOTES FOR SCHEMATIC OUTLINE

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. Resolution near the edges of the storage area can be further improved by use of dynamic focusing.

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.

3. Design considerations for the video output amplifier must include the output capacitance of the storage tube (10-20μμf) and its output signal (0.5-1.0μ 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.)