RAYTHEON RECORDING STORAGE TUBE CK1521

The CK1521 is an ultra–high resolution, high output–signal, electronic output single–gun recording storage tube. The CK1521 is similar to the 7571/QK685 in operating principle. Rugged design makes the CK1521 suitable for operation in environments such as military airborne applications.

A unique electron gun design makes possible fast erasure, fast writing speed, high output–signal amplitude, and wide dynamic range, all at very high resolution. At intermediate levels of output–signal, the CK1521 is capable of long storage of information. Several thousand readouts are possible without serious deterioration of signal strength or quality. Without readout, signals may be stored for many hours.

Output uniformity or shading characteristics have been enhanced in the CK1521 through the use of very accurately spaced and aligned elements in an improved collimating lens system.

The CK1521 design yields important improvements in virtually all critical storage tube operating parameters, suggesting its use in improved versions of existing systems and allowing its use in new applications demanding extended storage tube capabilities.

The CK1521 employs magnetic deflection and magnetic and/or electrostatic focus. For highest resolution magnetic focus is recommended. For uniform resolution over the storage surface, dynamic focus correction is necessary.

MECHANICAL CHARACTERISTICS

See Page 4

Overall Length	13½'' Maximum
Bulb Diameter	3'' Maximum
Neck Diameter	1½'' Maximum
Electrode Connections	Teflon–insulated Flying Leads

PERFORMANCE CHARACTERISTICS

Resolution (Magnetic Focus) TV lines per diameter	2500 Minimum*
Resolution (Electrostatic Focus) TV lines per diameter	1800 Nominal*
Writing Speed – nanoseconds per element	40 Nominal
Erasure Speed – nanoseconds per element	100 Nominal
Output Signal – microamps peak	0.5 Nominal
Output Capacitance	16pf Nominal
Beam & Cathode Current Transfer Characteristics	Figure 1

*At 50% Modulation.

GENERAL CHARACTERISTICS

Deflection	Magnetic
Focusing	Magnetic and/or Electrostatic
Max. Deflection Angle	30°
Gun Type	Tetrode, High Resolution
Mounting Position	Any

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ELECTRICAL CHARACTERISTICS

HEATER

Heater Voltage	6.3V ± 5%
Heater Current	0.6 amp. Nominal

RATINGS – ABSOLUTE MAXIMUM VALUES

All voltages with respect to cathode unless otherwise noted.

Anode Voltage	5000 Vdc
Focus Anode Voltage	5000 Vdc
Condenser Lens Voltage	5000 Vdc
Grid #2 Voltage	1000 Vdc
Grid #1 Voltage Positive	0 Vdc
Grid #1 Voltage Negative	–150 Vdc
Heater Cathode Voltage	
Positive	+10 Vdc
Negative	–125 Vdc
Storage Assembly Voltage (between adjacent elements in storage assembly)	1000 Vdc
Collimating Lens #1	1000 Vdc
Collimating Lens #2	1000 Vdc

TYPICAL OPERATING CONDITIONS

All voltages with respect to cathode unless otherwise noted.

Cathode (with respect to ground)	0 Vdc
Grid #1 (cutoff)	–30 to –80 Vdc
Grid #2	600 Vdc
Anode	3500 Vdc
Focus Electrode (Magnetic Focus) Note 1	3500 Vdc
Focus Electrode (Electrostatic Focus) Note 2	100 to 500 Vdc
Focus Electrode (Magnetic and Electrostatic Focus) Note 3	1000 Vdc
Condenser Lens (Write & Read Modes) Note 4	3500 Vdc
Condenser Lens (Erase & Prime Modes) Note 4	400 Vdc
Collimating Lens #1	750 Vdc
Collimating Lens #2 Note 5	200 to 500 Vdc
Decelerator Screen	750 Vdc
Storage Screen Note 6	Adjust Vdc
Collector (Signal Electrode)	750 Vdc

NOTES

1. Operation with all magnetic focus is necessary to achieve highest resolution. Magnetic dynamic focus is necessary to obtain uniform resolution over the storage surface. The approximate shape and amplitude of the magnetic dynamic focus waveform are given in Figure 2.

2. If electrostatic focus is used, focus electrode voltage is adjusted for best focus. For the anode voltage given, best focus will be obtained with focus voltage between the limits shown in typical operating conditions.

3. For certain applications, the combined use of electrostatic and magnetic focus is desirable. The principle purpose of this mode of operation is to facilitate dynamic focus correction by superimposing a time varying voltage on the quiescent value of focus voltage noted in typical operating conditions. The approximate shape and amplitude of the electrostatic dynamic focus waveform are given in Figure 3.

4. The condenser lens is used as a beam current enhancement electrode in the electron gun to achieve the high levels of beam current necessary to accomplish fast erasure. This electrode is operated at anode voltage in the write and read modes. During erasure (erase and prime modes) the condenser lens voltage is pulsed from anode voltage to the level noted in typical operating conditions. The condenser lens voltage for optimum beam–current enhancement varies with anode voltage as shown in Figure 4.

5. Output uniformity is controlled by the voltages of the elements in the collimating lens system of the storage tube. For the operating conditions given in typical operating conditions, output uniformity is optimized by the adjustment of the collimating lens #2. Optimum output uniformity will be obtained with a setting of collimating lens #2 voltage between limits shown in typical operating conditions.

6. In the storage assembly, storage screen voltage is switched to achieve the various modes of operation (erase, prime, write, read) in the storage tube. The following table shows typical operating conditions for the storage screen voltage:

Erase	Prime	Write	Read
750 Vdc	20 Vdc	500 Vdc	15 Vdc (approx)

The exact setting of storage screen voltage in the read mode is determined experimentally by adjustment to the value at which output signal on the collector electrode is uniformly cut off across the storage surface.

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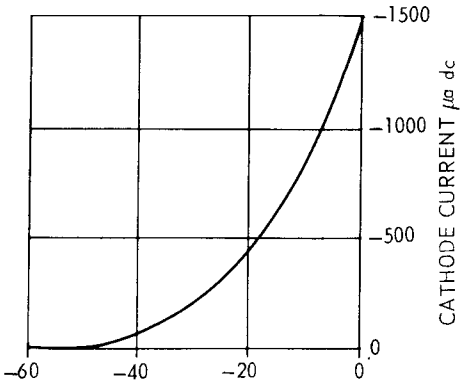
TYPICAL ELECTRON GUN TRANSFER CHARACTERISTICS



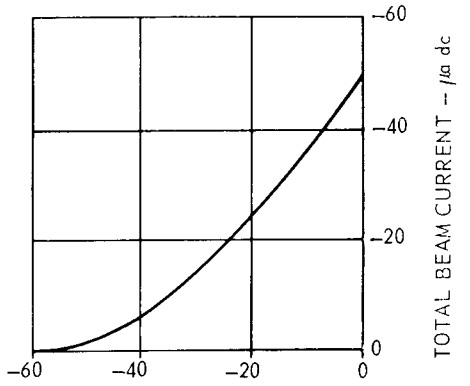


FIGURE 1

TYPICAL MAGNETIC DYNAMIC FOCUS CHARACTERISTIC

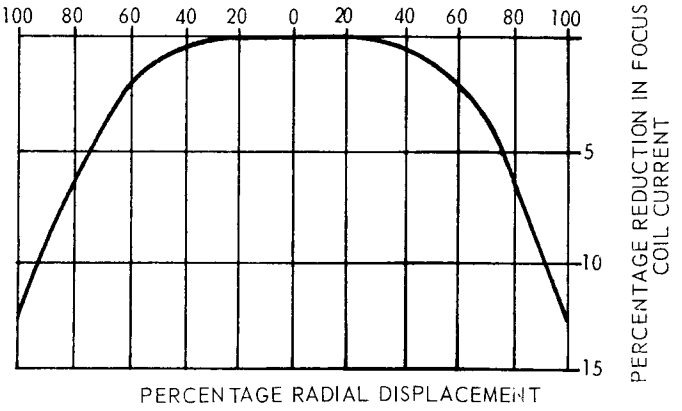


FIGURE 2

TYPICAL ELECTROSTATIC DYNAMIC FOCUS CHARACTERISTIC

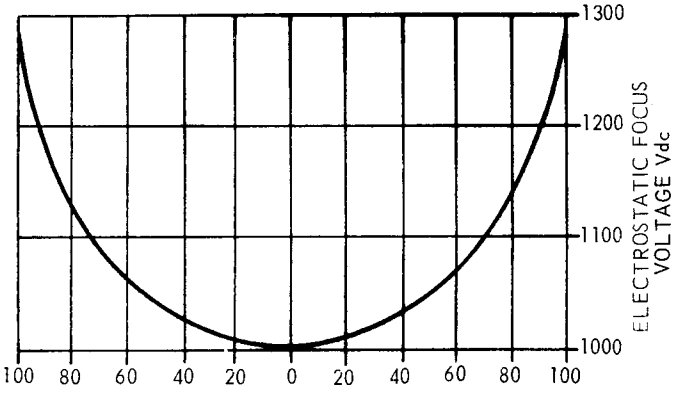


FIGURE 3

TYPICAL BEAM CURRENT ENHANCEMENT CHARACTERISTIC

$$\text{ENHANCEMENT \%} = \frac{\text{TOTAL BEAM CURRENT}}{\text{CATHODE CURRENT}} \times 100\%$$

E_{A_1} = ACCELERATING ANODE VOLTAGE

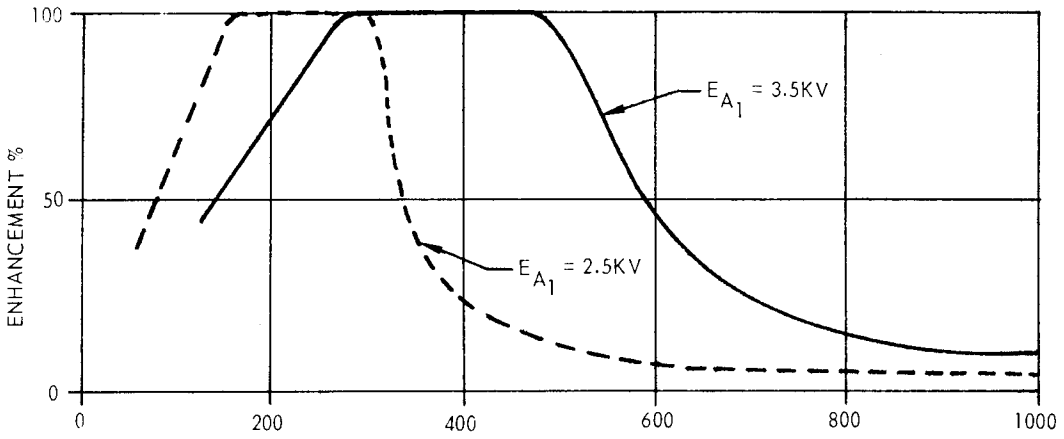


FIGURE 4

NOTES:

1. All contact buttons are JEDEC type J1-22.
2. Dimensions applies to plane nearest base beyond which magnetic focus or centering coils should not be located due to possible interference from internal gun structures.
3. Reference line is defined as that plane where a ring gauge 2.000 I.D. and parallel to neck axis comes to rest on neck flare.
4. Wire color coding as follows:
   Heaters – Brown
   Cathode – Clear
   Grid #1 – Green
   Grid #2 – Orange
   Condenser Lens – White
   Electrostatic Focus – Blue
   Anode – Red
5. Wire length: 12.000 in. approx.