JOINT ELECTRON TUBE ENGINEERING COUNCIL

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Announcement

of

Electron Device Type Registration

Release No. 2112

February 24, 1958

The Joint Electron Tube Engineering Council announces the registration of the following electron device designation

6896

according to the ratings and characteristics found on the attached data sheets on the application of

Radio Corporation of America
Harrison, New Jersey

2 and 4

6896/1855

GRAPHECHON

Signal-Converter Storage Tube

Magnetic Deflection
Electrostatic Focus

Two Coaxial Electron Guns
Induced-Conductivity Writing
Capacitance-Charge Reading

19-1/8" Max. Length
2.33" Max. Diameter

TENTATIVE DATA

RCA-6896/1855 is a charge storage tube designed for use in data-processing applications where signal information must be transformed continuously from one time base to another.

For example, the 6896 permits the display on direct-viewing and projection television receivers of PPI (Plan Position Indicator) information generated by conventional radar systems. If desired, a large number of such receivers may be used to repeat the display at locations remote from the master-display unit. Furthermore, information from several radar installations as well as ground-map or special-command information picked up by TV cameras, may be readily mixed and presented as a composite display.

The characteristics of the 6896 are such that the stored information may be extracted and displayed at essentially constant brightness for a period corresponding to many TV scanning frames. Depending on the signal-to-noise ratio required, this period may be adjusted from several seconds to more than a minute by suitable choice of tube operating voltages.

The 6896 has a writing gun mounted at one end of the tube, a reading gun mounted at the opposite end, and a target between them. The high-velocity beam of the writing beam and the medium-velocity beam of the reading gun are each focused electrostatically and deflected magnetically, as in a cathode-ray tube.

The designation 6896/1855, or simply 6896, is the new type number for the graphechon previously supplied under the type designation 1855.

PRINCIPLES OF OPERATION

The 6896 has three sections--a writing section, a reading section, and a target section, as shown in Fig. 1.

Writing Section

The writing section contains an electron gun consisting of an indirectly heated cathode, a control grid (grid No.1), an accelerating grid (grid No.2), a focusing grid (grid No.3), and a final accelerating electrode (grid No.4) connected to the external conductive coating. This gun produces a high-velocity electron beam which is deflected by the magnetic fields of external deflecting coils.

Reading Section

The reading section contains an electron gun consisting of an indirectly heated cathode, a control grid (grid No.1), an accelerating grid (grid No.2), a focusing grid (grid No.3), and a final accelerating electrode (grid No.4) connected to the external conductive coating. This gun produces a medium-velocity electron beam which is deflected by the magnetic fields of external deflecting coils.

Target Section

The target section contains a target and a shading-electrode. The target consists of a thin layer of insulating material deposited on the reading-gun side of a metallic backing-electrode. The insulating material, which has high insulating qualities and a maximum secondary-emission ratio greater than unity, serves as the dielectric for the capacitor formed between the backing-electrode and the reading-gun electron beam incident on the insulating layer.

When the front surface of the insulating layer, i.e., the surface facing the reading gun,

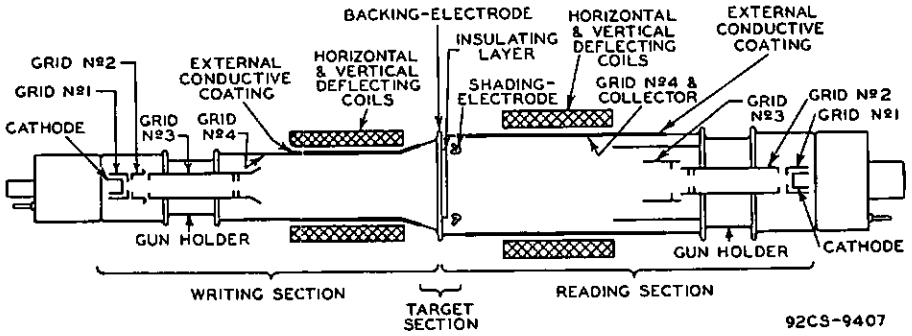


Fig. 1 - Schematic Arrangement of Type 6896.

is bombarded by the medium-velocity electron beam of the reading gun, secondary electrons are emitted. Since the secondary-electron emission ratio of the front surface is greater than unity, the surface tends to charge in the positive direction. Under continued bombardment, the surface becomes increasingly positive with respect to the collector until a retarding potential of a few volts is built up and equilibrium is established.

The opposite side (back) of the insulating layer is in mechanical and electrical contact with the backing-electrode which is maintained at a negative potential with respect to the collector. Thus, a difference of potential exists between the two surfaces of the insulating layer.

When the high-velocity electron beam of the writing gun bombards the target, it goes through the backing-electrode and penetrates the insulating layer. The resulting induced conductivity produced in the insulating layer lowers the potential of the front insulating-surface elements by varying degrees toward that of the negative backing-electrode. The front surface of the insulating layer thus acquires a pattern of potential variations between the potential of the collector and that of the backing-electrode. When the writing beam is removed, the insulating layer gradually regains normal conductivity.

The discharging or writing characteristic of the 6896 is a function of the writing-beam current, the writing-beam velocity, the scanning speed, and the width as well as the repetition rate of the pulse signal applied to grid No. 1 of the writing gun.

The change in potential of the insulating-surface elements caused by the writing-beam bombardment upsets the equilibrium condition established by the reading beam. As the elements are further bombarded by the reading beam, they shift their potentials acquired during writing in the direction to re-establish equilibrium, i.e., toward the potential of the collector. As the elements are sequentially charged positive, a corresponding capacitive (charging) current flows in the target circuit. It is this current which constitutes the signal current.

The charging or reading characteristic of the 6896 is a function of the backing-electrode potential and the reading-beam current. Increasing the backing-electrode potential and decreasing the reading-beam current result in increased charging time. By suitably adjusting these operating values, the reading time can be varied from a few seconds to about a minute.

Since the reading process removes the stored charge pattern and brings the insulating-surface elements to the equilibrium potential essential for writing, no erasing process is necessary other than reading.

The flow of current produced by the writing beam in the target circuit must be separated from the target current produced by the reading beam. Separation of the two target-current components may be accomplished either by time sharing (i.e., sequential writing and reading), or in the case of simultaneous writing and reading, by intensity-modulating the reading beam at a radio frequency well above the maximum frequency contained in the input writing signal. The target current produced by the reading beam will then be an rf-modulated signal which can be separated from the lower-frequency writing-gun component by a tuned output amplifier.

The maximum number of scanning frames (copies) obtainable during the reading process depends on the magnitude of the potential variations produced on the insulating-surface elements during the writing process, and the minimum value of reading-beam current that can be used in relation to the noise level of the associated amplifier. In typical applications, utilizing standard TV scanning of the reading beam, approximately 1000 copies can be obtained.

The shading-electrode is used to reduce variation in the equilibrium potential of the insulating-surface elements as a function of their location on the surface. As a result of its action, the output signal is relatively free from the effect commonly called "shading". The shading-electrode is operated at a potential somewhat positive with respect to that of the backing-electrode.

DATA

General:

	Writing Gun	Reading Gun	
Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3 ± 10%	6.3 ± 10%	volts
Current	0.6	0.6	amp
Direct Interelectrode Capacitances:			
Grid No.1 to all other electrodes	9	10.5	μμf
Cathode to all other electrodes	5.5	6.5	μμf
Backing-electrode to shading-electrode	40 min.		μμf
Backing-electrode and shading-electrode to all other electrodes (Effective output capacitance)	7		μμf
Focusing Method	Electrostatic	Electrostatic	
Deflection Method	Magnetic	Magnetic	
Deflection Angle (Approx.)	40°	40°	
Overall Length	18-3/4" ± 3/8"		
Greatest Diameter	2.320" ± 0.010"		
Minimum Useful Target Diameter	1.3"		
Bases:			
Writing section	Long Medium-Shell Octal 8-Pin (JETEC No.B8-65)		
Reading section	Small-Shell Diheptal 12-Pin (JETEC No.B12-45)		
Operating Position	Any except those positions where the diheptal base is up and the tube axis is at an angle of less than 60° from the vertical.		
Weight (Approx.)	1 lb		

Maximum Ratings, *Absolute Values:*

BACKING-ELECTRODE-TO-SHADING-ELECTRODE VOLTAGE:		
Backing-electrode positive with respect to shading-electrode	0 max.	volts
Backing-electrode negative with respect to shading-electrode	37.5 max.	volts
BACKING-ELECTRODE-TO-GRID-No.4 (Either Gun) VOLTAGE:		
Backing-electrode positive with respect to grid No.4	0 max.	volts
Backing-electrode negative with respect to grid No.4	12.5 max.	volts
SHADING-ELECTRODE-TO-GRID-No.4 (Either Gun) VOLTAGE:		
Shading-electrode positive with respect to grid No.4	25 max.	volts
Shading-electrode negative with respect to grid No.4	0 max.	volts

	Writing Gun	Reading Gun	
Voltages are referred to cathode of respective gun unless otherwise indicated			
GRID-No.4 VOLTAGE	13000 max.	1500 max.	volts
GRID-No.4-TO-GRID-No.2 VOLTAGE	10000 max.	–	volts
GRID-No.3 VOLTAGE	3000 max.	400 max.	volts
GRID-No.2 VOLTAGE	450 max.	1500 max.	volts
GRID-No.1 VOLTAGE:			
Negative bias value	180 max. / 70 min.	125 max. / 0 min.	volts / volts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	10 max.	10 max.	volts

Typical Operating Conditions and Characteristics:

With Grid No.4 of Writing Gun and Grid No.4 of Reading Gun Grounded

Backing-Electrode-to-Grid-No.4 (Either Gun) Voltage	−10	volts
Shading-Electrode-to-Grid-No.4 (Either Gun) Voltage	+20	volts

	Writing Gun	Reading Gun	
Voltages are referred to ground unless otherwise indicated			
Grid-No.4 Voltage*	0	0	volts
Grid-No.3 Voltage for Focus	−7800 to −7000	−800 to −700	volts
Grid-No.2 Voltage	−8750	0	volts
Grid-No.1-to-Cathode Voltage for Beam-Current Cutoff	−70 to −120	−25 to −65	volts
Cathode Voltage	−9000	−1000	volts
Grid-No.1 Drive above Cutoff:			
For target current** of 5 μamp#:			
Average value	38	–	volts
Maximum value	56	–	volts
For target current of 1 μamp##:			
Average value	–	5	volts
Maximum value	–	12.5	volts
Max. Grid-No.3 Current:			
For target current of 5 μamp	230	–	μamp
For target current of 1 μamp	–	15	μamp
Max. Cathode Current:			
For target current of 5 μamp	235	–	μamp
For target current of 1 μamp	–	16	μamp
Beam-Landing Position	🌡	🕮	
Storage Factor for essentially saturated writing●	2.5	–	μamp-sec
Storage-Factor Variation:			
Circular⊕	25	–	per cent
Radial□	25	–	per cent

Maximum Circuit Values:

	Writing Gun	Reading Gun	
Grid-No.1-Circuit Resistance	1.5 max.	1.5 max.	megohms

* Grid No.4 of Writing Gun and Grid No.4 of Reading Gun are normally operated at zero (ground) potential.

** Measured with backing-electrode voltage and shading-electrode voltage of 75 volts with respect to grid No.4 of either gun. With either the writing beam or the reading beam turned on, the total current flowing in the paralleled backing-electrode circuit and shading-electrode circuit (see Fig.2, switch in position 2) is approximately equal to the beam current and is called the "target current". This current is not signal current.

\# This value represents peak writing-beam current necessary to write to saturation a range calibration ring at approximately 20% maximum range in a particular PPI radar application as follows:

Maximum Range	80,000 yards
Pulse Repetition Frequency	60 cps
Antenna Rotation Rate	15 rpm
Pulse Width	10 μsec

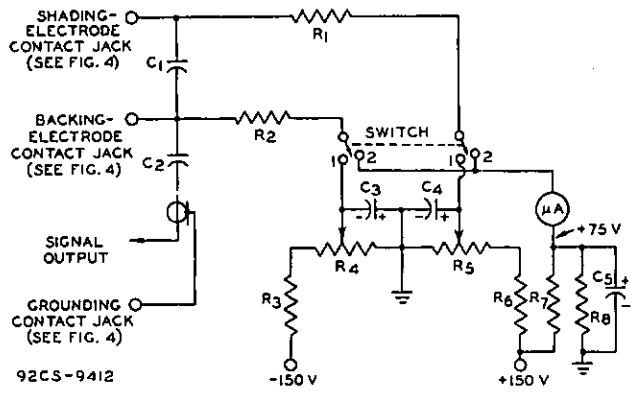
In general, the value of peak writing-beam current necessary for saturated writing increases with increasing antenna rotation rate and decreases with increasing pulse repetition frequency, maximum range, and pulse width.

\#\# This value represents the average reading-beam current for reading durations in the order of 2.5 seconds.

🌡 With the tube shielded from all extraneous fields and all metal parts of the tube demagnetized, the undeflected focused beam will fall within a circle having a diameter equal to 3% of the minimum useful target diameter and having its center coincident with the center of the target.

🕮 With the tube shielded from all extraneous fields and all metal parts of the tube demagnetized, the undeflected focused beam will fall within a circle having a diameter equal to 4% of the minimum useful target diameter and having its center coincident with the center of the target.

- Storage factor is defined as the product of the initial value of the peak amplitude of the signal output current (above background or equilibrium level) and the time required for the peak amplitude of the signal output current to drop to 50% of its initial value.
- ⊕ On a circle having its center coincident with the center of the target and a radius which is 75% of the target radius, under conditions of saturated writing for any given set of reading conditions.
- □ From the center of the target to a circle having its center coincident with the center of the target and a radius which is 75% of the target radius, under conditions of saturated writing for any given set of reading conditions.



C1: 0.1 μf, 200 v working voltage
C2: 0.5 μf, 200 v working voltage
C3 C4: 40 μf, electrolytic, 150 v working voltage
C5: 10 μf, electrolytic, 150 v working voltage
R1: 500000 ohms, 1/2 watt
R2: 50000 ohms, 1/2 watt. In time-sharing system of writing and reading, this resistor is the load. In rf system employed with simultaneous reading and writing, this resistor is shunted by a suitable tuned impedance.
R3: 250000 ohms, 1/2 watt
R4: 50000-ohm potentiometer, 1/2 watt
R5: 100000-ohm potentiometer, 1/2 watt
R6: 200000 ohms, 1/2 watt
R7: 240000 ohms, 1/2 watt
R8: 240000 ohms, 1/2 watt

Fig. 2 - Output Circuit for Type 6896 with Provision for Measuring Target Current.

OPERATING CONSIDERATIONS

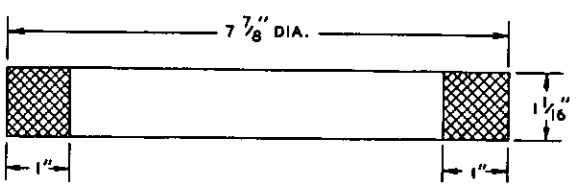
The *maximum ratings* in the tabulated data for the 6896 are limiting values above which the serviceability of the 6896 may be impaired from the viewpoint of life and satisfactory performance. Therefore, in order not to exceed these absolute ratings, the equipment designer has the responsibility of determining an average design value below each absolute rating by an amount such that the absolute values will never be exceeded under any usual condition of supply-voltage variation, load variation, or manufacturing variation in the equipment itself.

Handling. The 6896 should preferably be transported or handled with the diheptal-base end down to prevent any loose particles in the tube from striking the storage surface and adhering to it. *AVOID STRIKING THE METAL-TO-GLASS SEALS.*

Degaussing. During transportation, the 6896 can become magnetized. Before it is placed in operation, it should be degaussed by subjecting it to an ac magnetic field produced by a torroidal coil such as that shown in Fig. 3. After connecting the coil to an ac supply line (117 volts), slowly pass the 6896 through the coil and then slowly withdraw it completely from the ac magnetic field. Finally, disconnect the coil from the supply line.

Shielding. Magnetic shielding of the entire tube must be provided to prevent the influence of external magnetic fields on its performance. Use of a properly annealed high-permeability material for shielding is recommended. It is also recommended that the base end of the reading gun be electrostatically shielded, as shown in Fig. 4, to reduce interference with the sensitive reading beam.

Support for the 6896, which is preferably operated in a horizontal position to prevent any loose particles within the tube from striking the insulating surface, may be provided by a mounting arrangement suggested by the schematic diagram shown in Fig. 4. In this arrangement, a set of right-angle "V-blocks" within the magnetic shield is used to support the tube. One rim of each gun holder rests in each "V-block", and is engaged on the opposite side by a spring-loaded plunger to hold the tube firmly in position. Since the gun holder for the writing gun is connected to grid No. 3 of the writing gun, the material of the associated "V-block" must have insulating properties adequate to withstand the



Winding: 600 turns, No. 18 enameled wire, layer wound
Voltage: 117 volts rms, 60 cycles
Current: 3.6 amperes (Approx.)

Fig. 3 - Degaussing Coil for Type 6896.

applied grid-No. 3 voltage. Similarly, the plunger bearing on the rim of the gun holder for the writing gun must be insulated to withstand the applied grid-No. 3 voltage. Any clamps or pressure contacts should exert firm but not excessive pressure on the 6896.

Terminal Connections. The base pins of the octal base on the writing section fit an octal 8-contact socket. The base pins of the small-shell diheptal base on the reading section fit a small diheptal 14-contact socket. Connection to the backing-electrode flange is made by a spring-loaded contact bearing against the rim of the flange. Similarly, connection to the shading electrode is made by a spring-loaded contact bearing on the L-shaped conductive strip adjacent to the backing-electrode flange. Connection to

each of the external conductive coatings is made close to and on each side of the backing-electrode flange by a spring-finger ring contact.

Positioning Deflecting Coils. Because the axes of both the writing and reading gun holders are accurately aligned with respect to the axes of the writing and reading electron beams, respectively, it is possible to position the axes of the deflecting coils accurately with respect to the axes of the electron beams by measurements from the gun-holder rims. Unless the axes of the beams and deflecting coils are coincident, distortions in the scan-conversion process may result.

Power-Supply Requirements. A typical power-supply circuit to provide the operating voltages for the 6896 is shown in Fig.5. This figure also shows in block-diagram form the associated equipment required for operation of the 6896.

Since the cathodes of both guns are at high negative voltages, the transformers used to supply current to the heaters as well as the sources of control-grid signals must be adequately insulated from ground. It is recommended that the cathode of each gun be connected directly to the mid-tap of its associated heater winding.

The high voltages at which the 6896 is operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltages. Safety precautions include the enclosing of high-potential terminals and the use of interlocking switches to break the primary circuit of the power supply when access to the equipment is desired.

In the use of high-voltage tubes, it should always be remembered that high voltages may appear at normally low-potential points in the circuit as a result of capacitor breakdown or incorrect circuit connections. Therefore, before any part of the circuit is touched, the power-supply switch should be turned off, and both terminals of any capacitors grounded.

Failure of Scanning. Failure of scanning while the writing beam is turned on may permanently damage the target. It is essential, therefore, that provision be made to cut off the beam current automatically in case of scanning failure. The beam current must be cut off nearly as rapidly as the scanning current drops off. The protective circuit should be capable of cutting off the writing beam within 2 milliseconds after scanning failure occurs. The beam current can be cut off by making grid No.1 of the writing gun at least 120 volts negative with respect to the cathode of the writing gun. The protective circuit may be actuated by a tube that is controlled by a portion of the scanning pulse voltage developed across the deflecting coils. It is important that the horizontal and vertical scanning each independently actuate the protective circuit in case either should fail.

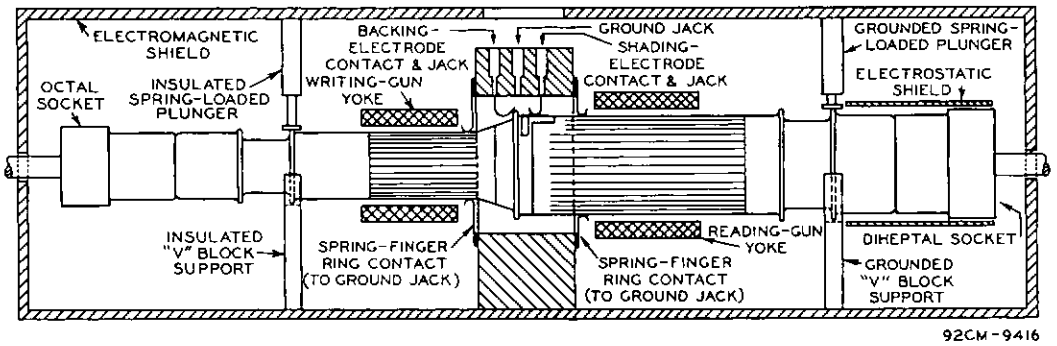
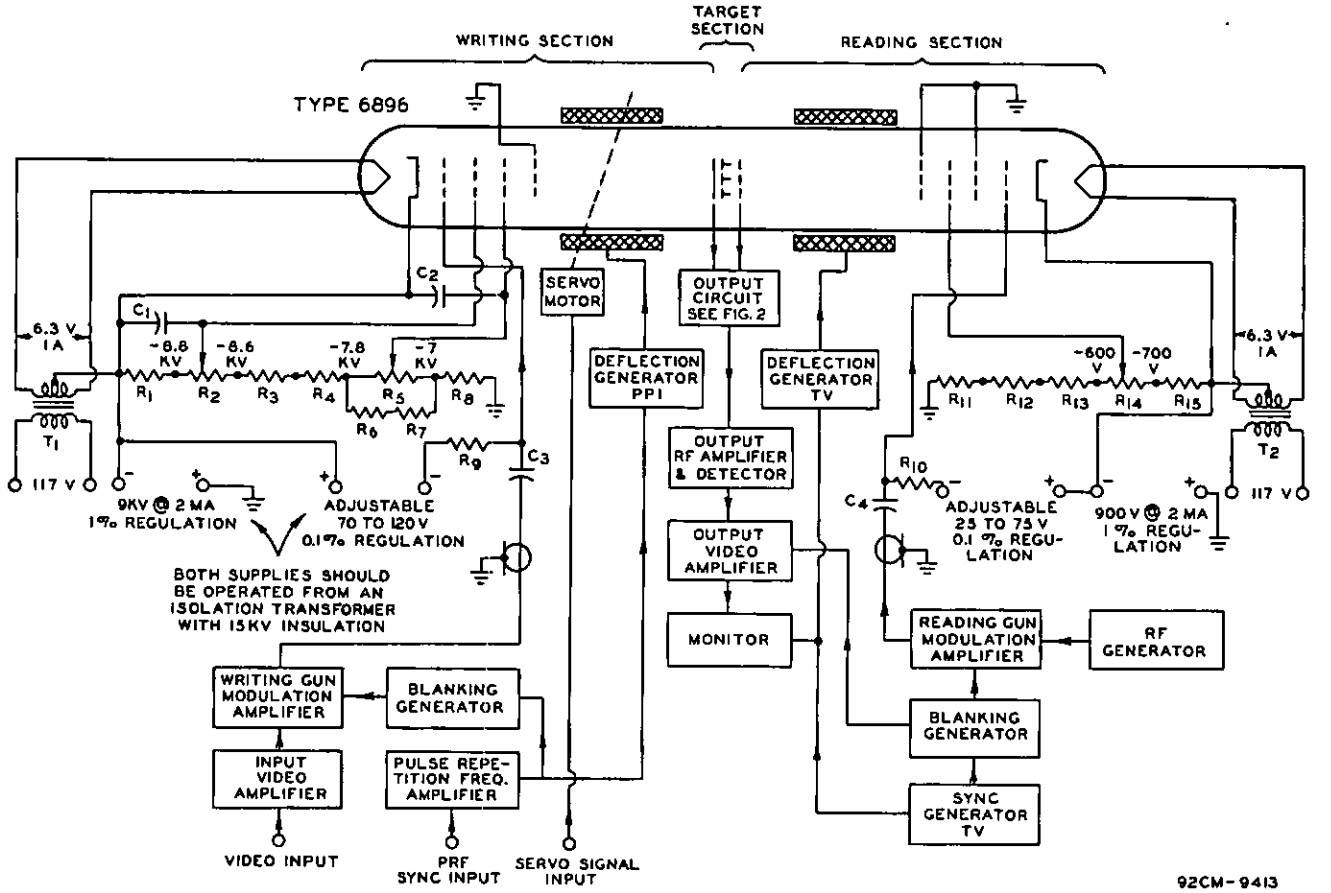


Fig.4 - Schematic Arrangement Showing "V"-Block-and-Plunger Support for Type 6896 Within External Magnetic Shield; Location of Finger Contacts on External Conductive Coatings, Backing-Electrode, and Shading-Electrode; and Cylindrical Electrostatic Shield over the Base End of the Reading Gun.

Simultaneous Reading and Writing. When writing and reading are carried out at the same time, the writing and reading components of the target current may be separated by intensity modulating the reading beam at a radio frequency well above the maximum frequency contained in the input writing signal, and then separating the rf-modulated reading-beam component of the target current from the lower-frequency writing-gun component by a tuned output amplifier. The rf voltage is applied between grid No.1 and cathode of the reading gun. When the input writing signal is at video frequencies, the frequency of the rf modulating voltage applied to the reading gun may be in the order of 30 Mc.

Only the ac component of the reading-beam current produces useful output; the dc component merely serves to charge the target and is blocked by the tuned output circuit. Therefore, it is desirable, if long reading duration is required, to adjust the amplitude of the rf voltage and the



All resistors may have tolerance of ±5 per cent

C1: 0.1 μf, paper, 600 v working voltage
C2: 0.1 μf, plastic film, 3000 v working voltage
C3: 0.05 μf, plastic film, 15000 v working voltage
C4: 0.1 μf, plastic film, 1500 v working voltage

R1: 200000 ohms, 1 watt
R2: 200000-ohm potentiometer, 1 watt
R3: 330000 ohms, 1 watt
R4: 470000 ohms, 1 watt
R5: 1-megohm potentiometer, 2 watts
R6 R7: 2 megohms, 1 watt
R8: 7 megohms, 25 watts, 10-kv rating

R9 R10: 1 megohm, 1 watt
R11 R12: 100000 ohms, 2 watts
R13 R15: 100000 ohms, 2 watts
R14: 50000-ohm potentiometer, 2 watts
T1: Heater Transformer with secondary insulated for 15 kilovolts
T2: Heater Transformer with secondary insulated for 1.5 kilovolts

Fig. 5 - Typical Power-Supply Circuit and Block Diagram of Associated Equipment for Type 6896.

grid-No. 1-to-cathode bias of the reading gun so that the amplitude of the fundamental component of the beam pulse is as large as possible in comparison with the dc component of the beam. For small conducting angles, the ratio of the peak amplitude of the fundamental to the dc component is two. As the conducting angle is increased, this ratio gradually decreases to unity at a conduction angle of 360°. Although a small conduction angle would be chosen for maximum reading duration, the rf amplitude required for a given reading duration increases as the angle is decreased. In the 6896, it is necessary to limit the rf amplitude to about 15 volts (zero to peak) so that rf leakage will not be excessive. The use, therefore, under class C conditions of a current pulse with a conducting angle of about 100° allows a satisfactory compromise between storage efficiency and undesired rf leakage. A current pulse angle of 100° is obtained when grid No. 1 of the reading gun is operated with a bias about 10 volts beyond cutoff and with an rf voltage having an amplitude of 15 volts (zero to peak).

The tuned output amplifier should be designed to cover a range of ac signal voltages corresponding to a signal output current of 0.01 to 2 microamperes in the load impedance.

The output signal decreases with increase in reading time. The reading time may be increased by increasing the grid-No. 1 bias or by decreasing the amplitude of the rf voltage applied to grid No. 1. In practice, the rf voltage is maintained at a constant value and the bias on grid No. 1 is adjusted to give the desired reading time.

Sequential Writing and Reading. Separation of the target current produced by the writing beam from that produced by the reading beam can also be accomplished by time sharing, i.e., sequential writing and reading. With this method of operation, a higher signal-to-noise ratio is obtained.

Regulation of Bias Supplies and RF Voltage Amplitude. Because the output signal and reading duration are critically dependent on the beam current of both the reading gun and the writing gun, it is essential that grid-No.1 bias supplies as well as the rf voltage amplitude have good regulation if variations in output signal and in reading duration are to be avoided.

3. Be sure the grid-No.1 voltage of each gun is adjusted to beam cutoff and then apply voltages as indicated under *Typical Operation.* This procedure is essential to avoid possible damage to the target.

4. Adjust the reading-gun grid-No.1 bias and the amplitude of the rf modulation if used,

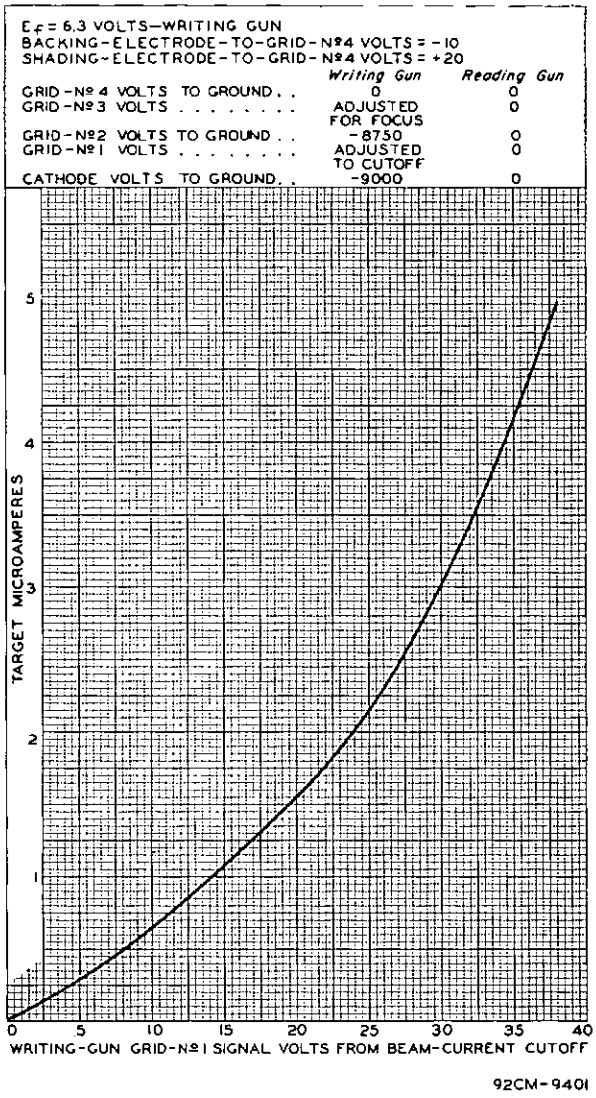


Fig. 6 - Average Grid-No. 1 Drive Characteristic for Writing Gun of Type 6896.

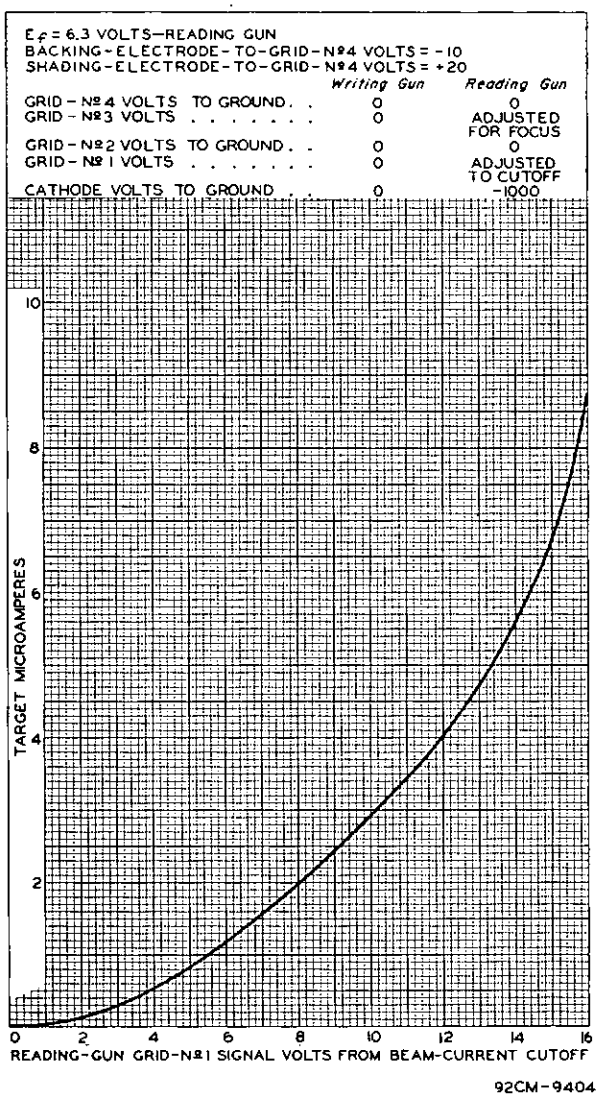


Fig. 7 - Average Grid-No. 1 Drive Characteristic for Reading Gun of Type 6896.

Operating Procedure. The following steps should be followed when first placing the 6896 in operation.

1. Insert the 6896 in its mount and attach the sockets.

2. Make certain that the deflection circuits are functioning properly to cause the electron beams to scan the target.

so that a picture of the target becomes visible on the system monitor.

5. Adjust grid-No.3 voltage of the reading gun for best focus as observed on the system monitor.

6. Adjust writing-gun grid-No.1 bias, input-signal level, and grid-No.3 voltage to produce the desired display on the system monitor.

7. The reading-gun grid-No.1 bias and the amplitude of the rf modulation if used may now be adjusted to give the desired reading duration.

REFERENCES

L. Pensak, *"Picture Storage Tube"*, Electronics, Vol.22, No.7, pp.84-88 (July, 1949).

L. Pensak, *"The Graphechon--A Picture Storage Tube"*, RCA Review, Vol.X, No.1, pp.59-73 (March, 1949).

A. H. Benner and L. M. Seeberger, *"Graphechon Writing Characteristics"*, RCA Review, Vol.XII, No.2, pp.230-250 (June, 1951).

M. Knoll and B. Kazan, *"Storage Tubes and Their Basic Principles"*, John Wiley & Sons, Inc., New York (1952).

DOS and DON'TS on Use of RCA-6896/1855

Here are the "dos"--

1. Handle the 6896 with care.
2. Degauss the 6896 before installing.
3. Use extreme caution when installing the 6896.
4. Always be sure that both beams are cut off before applying operating voltages.
5. Adjust the reading side properly before applying writing-gun voltages or video signal.

Here are the "don'ts"--

1. Don't strike glass-metal seals of the 6896.
2. Don't operate the 6896 without scanning.
3. Don't use excessive writing-beam current.

The significance of each of these "dos" and "don'ts" in obtaining optimum performance from the 6896 is explained in the preceding pages of this bulletin.

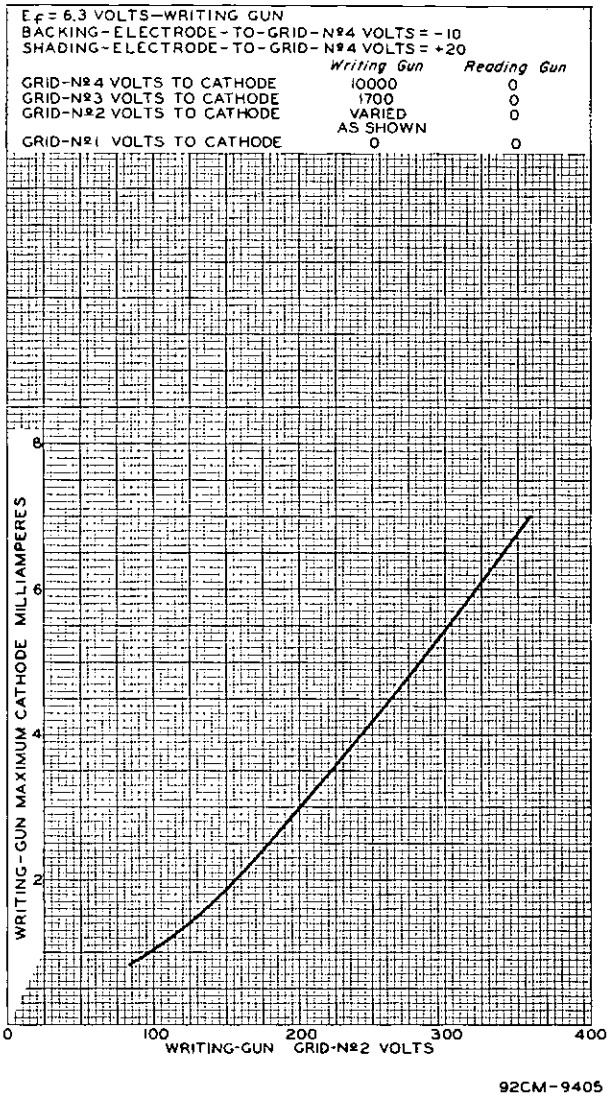


Fig. 8 - Writing-Gun Maximum Cathode Current for Any Type 6896 under the Specified Conditions with Zero Grid-No. 1 Voltage.

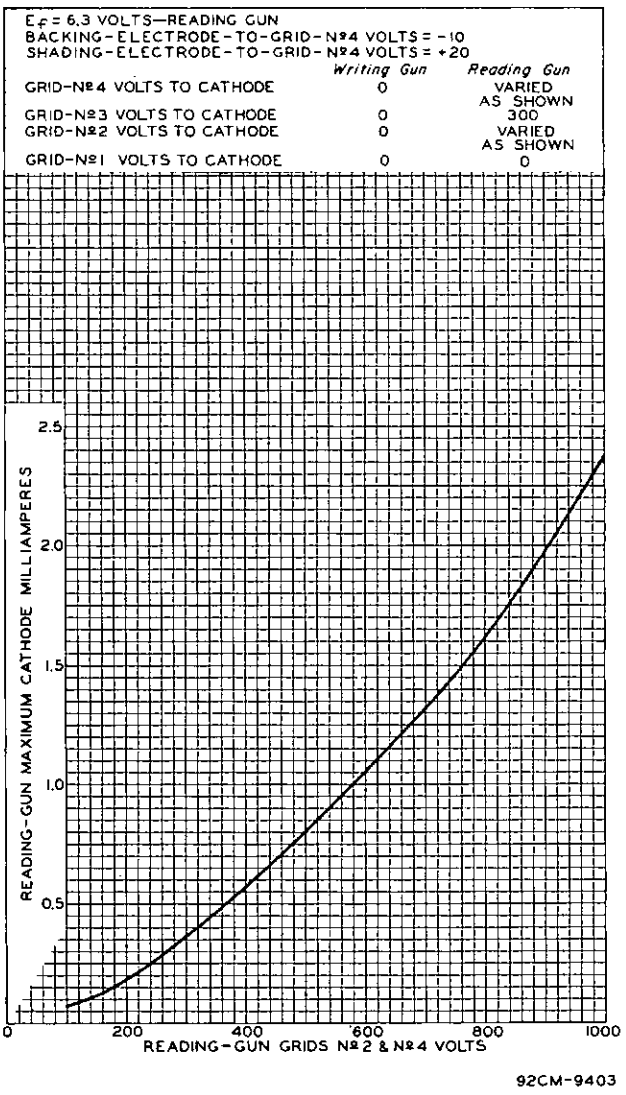


Fig. 9 - Reading-Gun Maximum Cathode Current for Any Type 6896 under the Specified Conditions with Zero Grid-No. 1 Voltage.

E_f = 6.3 VOLTS—EACH GUN
BACKING-ELECTRODE-TO-GRID-№4 VOLTS = -10
SHADING-ELECTRODE-TO-GRID-№4 VOLTS = +20

	Writing Gun	*Reading Gun*
GRID-№4 VOLTS TO GROUND	0	0
GRID-№3 VOLTS	ADJUSTED FOR FOCUS	ADJUSTED FOR FOCUS
GRID-№2 VOLTS TO GROUND	+8750	0
GRID-№1 VOLTS	ADJUSTED TO CUTOFF	ADJUSTED TO GIVE TARGET μAMP = 0.5
CATHODE VOLTS TO GROUND	-9000	-1000
TARGET MICROAMPERES	—	0.5
SCANNING:	PPI	TV
RATE (REV/SEC)	0	—
SWEEP PRF (PPS)	1000	—
SWEEP TIME (μSEC/RADIUS)	100	—
INPUT SIGNAL, RECTANGULAR PULSE:		
DURATION (μSEC)	1	—
REPETITION RATE (PPS)	1000	—
NUMBER OF PULSES	AS SHOWN	—

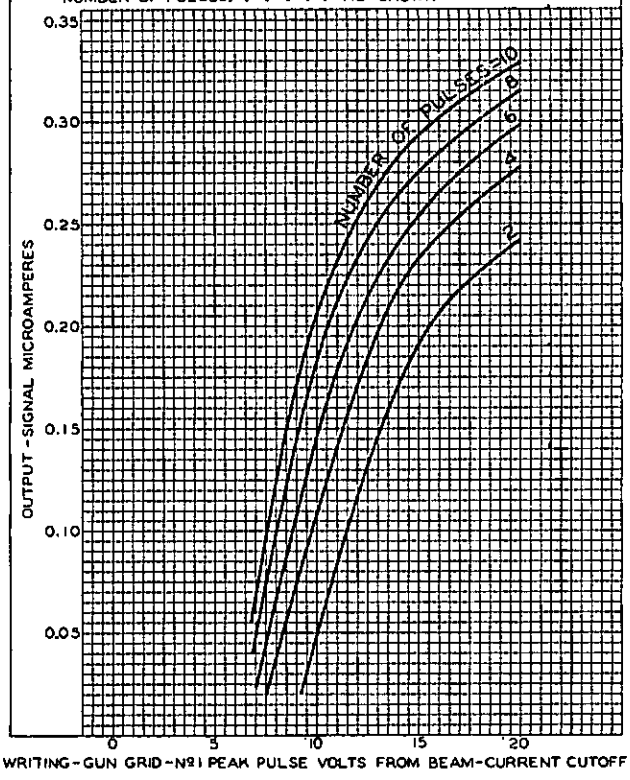


Fig. 10 - Operation Characteristics of Type 6896.

E_f = 6.3 VOLTS—EACH GUN
BACKING-ELECTRODE-TO-GRID-№4 VOLTS = -10
SHADING-ELECTRODE-TO-GRID-№4 VOLTS = +20

	Writing Gun	*Reading Gun*
GRID-№4 VOLTS TO GROUND	0	0
GRID-№3 VOLTS	ADJUSTED FOR FOCUS	ADJUSTED FOR FOCUS
GRID-№2 VOLTS TO GROUND	+8750	0
GRID-№1 VOLTS	ADJUSTED TO CUTOFF	VARIED TO GIVE TARGET μAMP AS SHOWN
CATHODE VOLTS TO GROUND	-9000	-1000
GRID-№1 PEAK PULSE VOLTS FROM BEAM-CURRENT CUTOFF	12.5	—
SCANNING:	PPI	TV
RATE (REV/SEC)	0	—
SWEEP PRF (PPS)	1000	—
SWEEP TIME (μSEC/RADIUS)	100	—
INPUT SIGNAL, RECTANGULAR PULSE:		
DURATION (μSEC)	1	—
REPETITION RATE (PPS)	1000	—
NUMBER OF PULSES	AS SHOWN	—

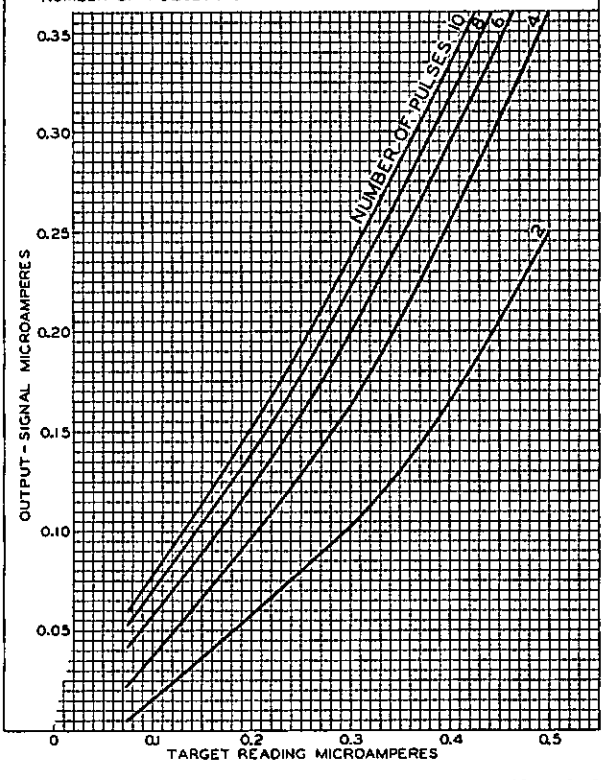


Fig. 11 - Operation Characteristics of Type 6896.

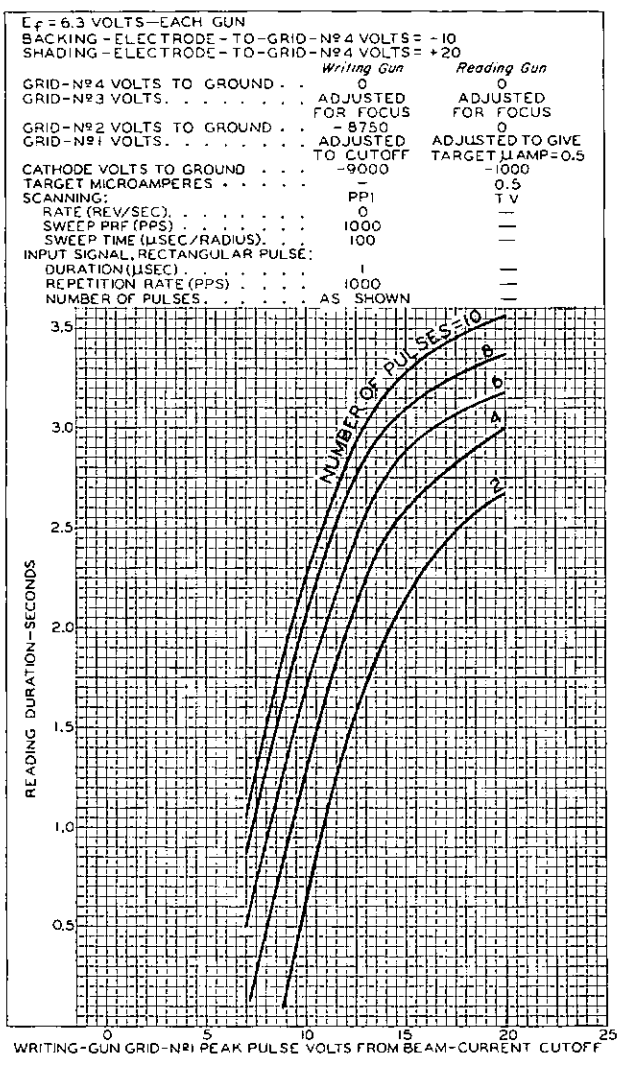


Fig. 12 - Operation Characteristics of Type 6896.

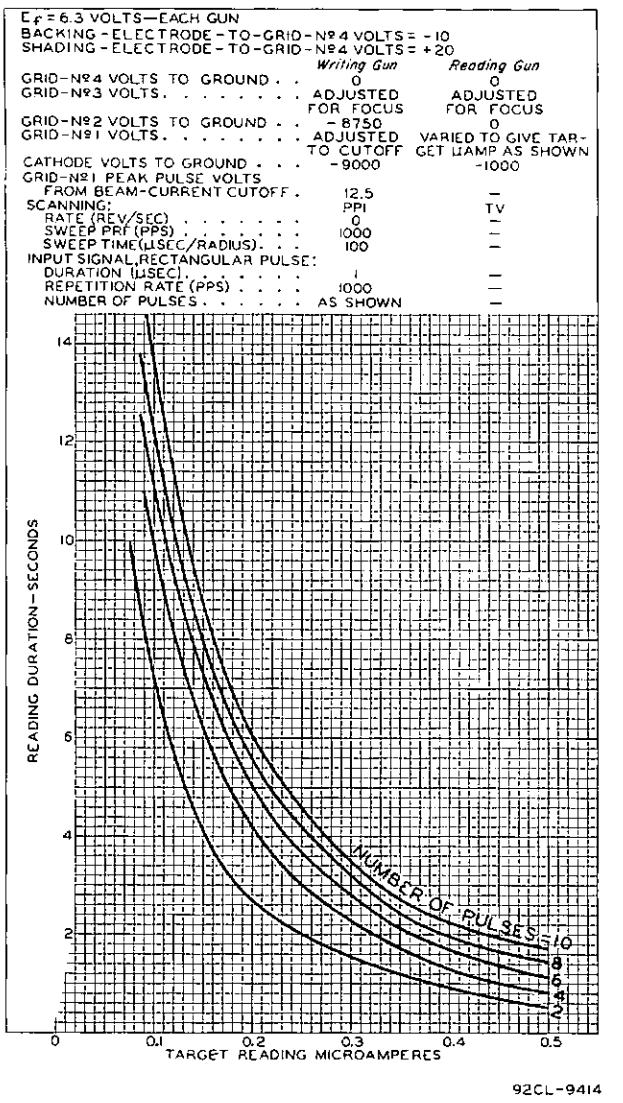
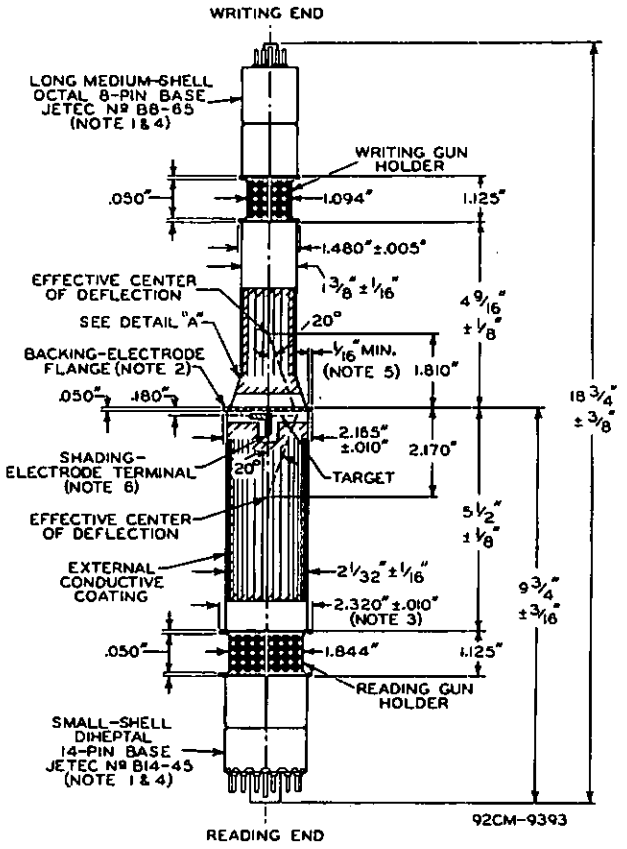
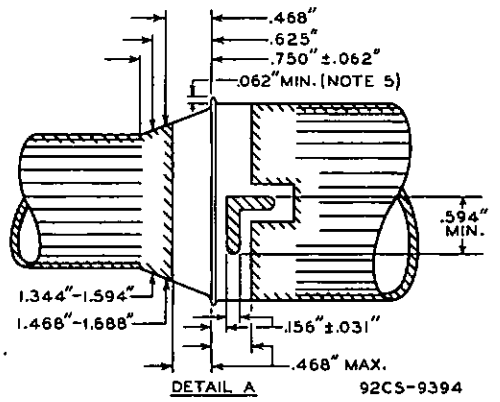


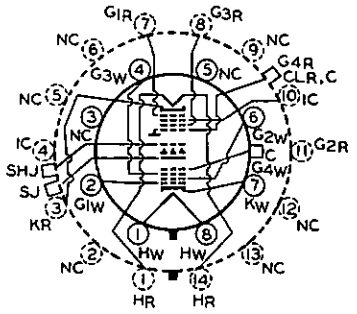
Fig. 13 - Operation Characteristics of Type 6896.

DIMENSIONAL OUTLINE





SOCKET CONNECTIONS



SOLID-LINE CIRCLES DEPICT OCTAL BASE
BROKEN-LINE CIRCLES DEPICT DIHEPTAL BASE

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND THE KEY OF THE DIHEPTAL BASE MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE KEY OF THE OCTAL BASE BY AN ANGULAR TOLERANCE OF 10° MEASURED ABOUT THE TUBE AXIS. BOTH KEYS ARE ON THE SAME SIDE OF THE TUBE.

NOTE 2: THE CIRCUMFERENCE OF THE BACKING-ELECTRODE FLANGE WILL FALL WITHIN A 2.165" ± 0.010" DIAMETER CIRCLE CONCENTRIC WITH THE AXIS OF THE WRITING-GUN HOLDER.

NOTE 3: THE CIRCUMFERENCE OF EITHER RIM OF THE READING-GUN HOLDER WILL FALL WITHIN A 2.320" ± 0.010" DIAMETER CIRCLE CONCENTRIC WITH THE AXIS OF THE WRITING-GUN HOLDER.

NOTE 4: THE AXIS OF EITHER THE OCTAL OR DIHEPTAL BASE WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE AXIS OF THE TUBE ENVELOPE.

NOTE 5: WITHIN THIS DIMENSION, THERE WILL BE NO GLASS AT ANY POINT ON THE WRITING-GUN SIDE OF FLANGE.

NOTE 6: THE PLANE THROUGH THE TUBE AXIS AND THE KEY OF THE DIHEPTAL BASE MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE SHADING-ELECTRODE TERMINAL (PORTION EXTENDING PARALLEL WITH TUBE AXIS) BY AN ANGULAR TOLERANCE OF 5° MEASURED ABOUT THE TUBE AXIS.

WRITING SECTION

LONG MEDIUM-SHELL OCTAL 8-PIN BASE
View of Octal-Base End of Tube

PIN 1: HEATER
PIN 2: GRID No.1
PIN 3: NO CONNECTION
PIN 4: GRID No.3
PIN 5: NO CONNECTION
PIN 6: GRID No.2
PIN 7: CATHODE
PIN 8: HEATER
G_{4W}, C: GRID No.4, EXTERNAL CONDUCTIVE COATING

READING SECTION

SMALL-SHELL DIHEPTAL 14-PIN BASE
View of Diheptal-Base End of Tube

PIN 1: HEATER
PIN 2: NO CONNECTION
PIN 3: CATHODE
PIN 4: INTERNAL CONNECTION—DO NOT USE
PIN 5: NO CONNECTION
PIN 6: NO CONNECTION
PIN 7: GRID No.1
PIN 8: GRID No.3
PIN 9: NO CONNECTION
PIN 10: INTERNAL CONNECTION—DO NOT USE
PIN 11: GRID No.2
PIN 12: NO CONNECTION
PIN 13: NO CONNECTION
PIN 14: HEATER
G_{4R}, CL_R, C: GRID No.4, COLLECTOR, EXTERNAL CONDUCTIVE COATING
SJ: SIGNAL ELECTRODE (CENTER FLANGE)
SHJ: SHADING-ELECTRODE (CONDUCTIVE L-SHAPED STRIP ADJACENT TO CENTER FLANGE)