6896/1855

GRAPHECHON

Signal-Converter Storage Tube

TWO COAXIAL ELECTRON GUNS

ELECTROSTATIC FOCUS — MAGNETIC DEFLECTION

INDUCED-CONDUCTIVITY WRITING — CAPACITANCE-CHARGE READING

For use in data-processing applications where signal information must be transformed continuously from one time base to another

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"

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

Bases:

Writing section . . . . . Long Medium-Shell Octal 8-Pin (JETEC No. B8-65)

Reading section . . . . . Small-Shell Diheptal 14-Pin (JETEC No. B14-45)

Socket Connections:

WRITING SECTION — Octal Base

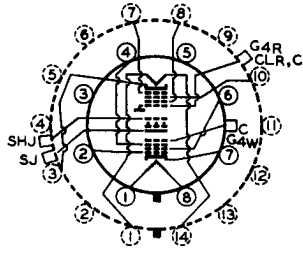
Pin 1 - Heater	Pin 6 - Grid No.2
Pin 2 - Grid No.1	Pin 7 - Cathode
Pin 3 - No Connection	Pin 8 - Heater
Pin 4 - Grid No.3	G_{4_W}, C - Grid No.4, External Conductive Coating
Pin 5 - No Connection	

6896/1855
GRAPHECHON
Signal-Converter Storage Tube

READING SECTION — Diheptal Base

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 – Backing-Electrode (Center flange)
SHJ – Shading-Electrode (Conductive L-shaped strip adjacent to center flange)

Basing Diagram:
With each base viewed from its respective end of tube:



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

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

6896/1855

GRAPHECHON

Signal-Converter Storage Tube

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 Operation 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 μa#:			
Average value	38	–	volts
Maximum value	56	–	volts
For target current of 1 μa##:			
Average value	–	5	volts
Maximum value	–	12.5	volts

*, **, #, ##: See next page.

6896

6896/1855

GRAPHECHON

Signal-Converter Storage Tube

	Writing Gun	Reading Gun	
Max. Grid-No.3 Current:			
For target current of 5 μa.	230	–	μa
For target current of 1 μa.	–	15	μa
Max. Cathode Current:			
For target current of 5 μa.	235	–	μa
For target current of 1 μa.	–	16	μa
Beam-Landing Position . . .	♦	♦♦	
Storage Factor for essentially saturated writing●.	2.5	–	μa-sec
Storage-Factor Variation:			
Circular#	25	–	%
Radial□	25	–	%

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 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.

#, □: See next page.

6896/1855
GRAPHECHON
Signal-Converter Storage Tube

⊕ 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.

OPERATING CONSIDERATIONS

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 to reduce interference with the sensitive reading beam.

6896

6896/1855

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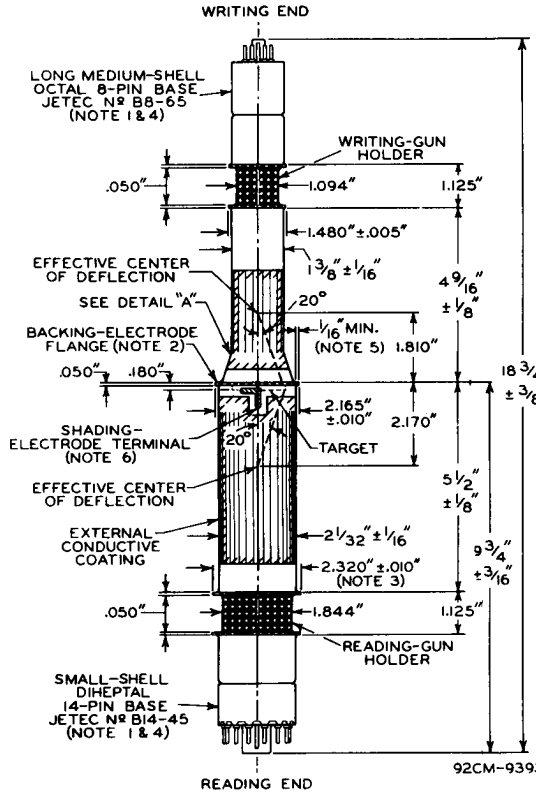
Signal-Converter Storage Tube



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.

Notes 3 to 6: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

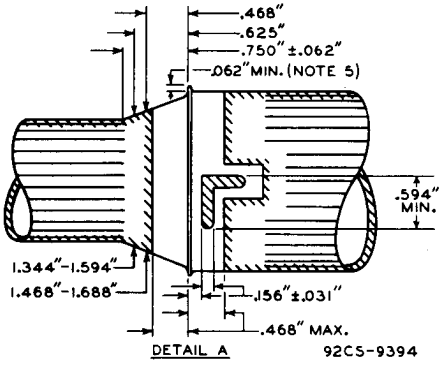
6896/1855
GRAPHECHON
Signal-Converter Storage Tube

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.



DETAIL A 92CS-9394

6896

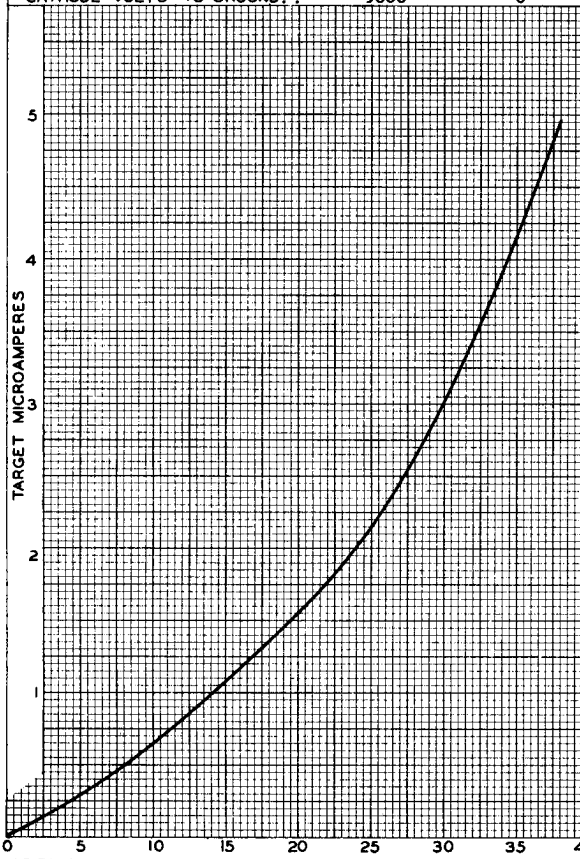
6896/1855

AVERAGE GRID-Nº1-DRIVE CHARACTERISTIC

WRITING GUN

E_f = 6.3 VOLTS—WRITING GUN
BACKING-ELECTRODE-TO-GRID-Nº4 VOLTS = −10
SHADING-ELECTRODE-TO-GRID-Nº4 VOLTS = +20

	Writing Gun	*Reading Gun*
GRID-Nº4 VOLTS TO GROUND . .	0	0
GRID-Nº3 VOLTS	ADJUSTED FOR FOCUS	0
GRID-Nº2 VOLTS TO GROUND . .	−8750	0
GRID-Nº1 VOLTS	ADJUSTED TO CUTOFF	0
CATHODE VOLTS TO GROUND . .	−9000	0



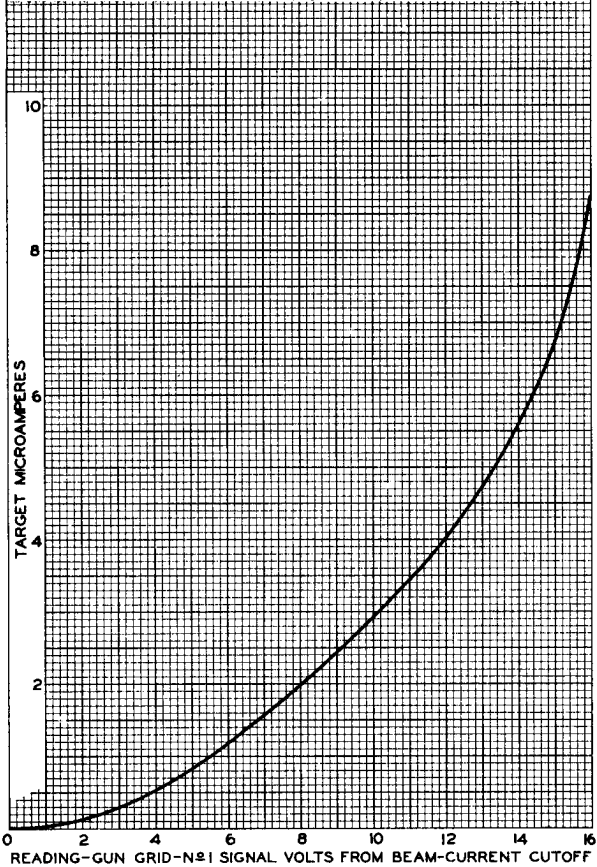
6896/1855

AVERAGE GRID-Nº1-DRIVE CHARACTERISTIC

READING GUN

E_f = 6.3 VOLTS—READING GUN
BACKING-ELECTRODE-TO-GRID-Nº4 VOLTS = -10
SHADING-ELECTRODE-TO-GRID-Nº4 VOLTS = +20

	Writing Gun	*Reading Gun*
GRID-Nº4 VOLTS TO GROUND	0	0
GRID-Nº3 VOLTS	0	ADJUSTED FOR FOCUS
GRID-Nº2 VOLTS TO GROUND	0	0
GRID-Nº1 VOLTS	0	ADJUSTED TO CUTOFF
CATHODE VOLTS TO GROUND	0	-1000



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9404

6896

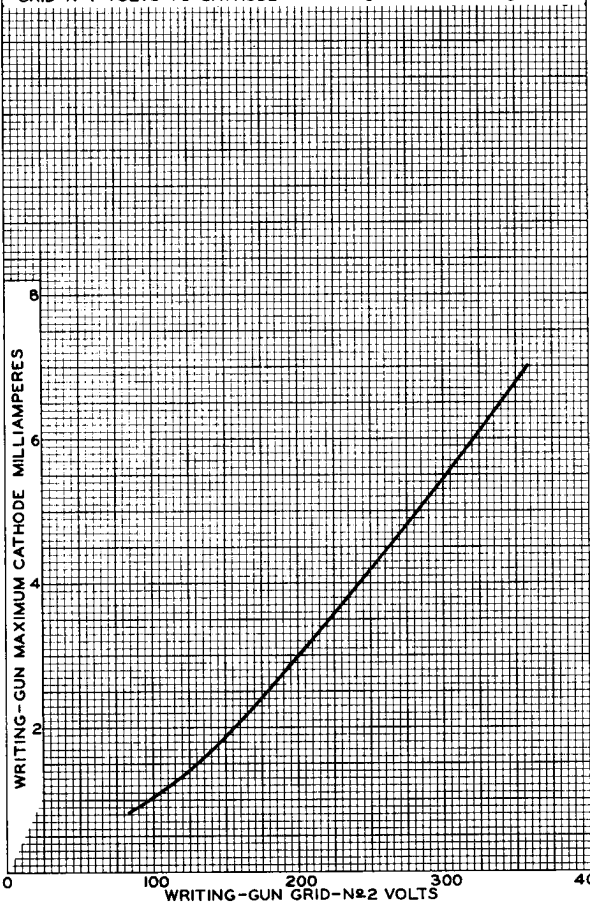
6896/1855

MAXIMUM CATHODE CURRENT

WRITING GUN

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

	Writing Gun	*Reading Gun*
GRID-№4 VOLTS TO CATHODE	10000	0
GRID-№3 VOLTS TO CATHODE	1700	0
GRID-№2 VOLTS TO CATHODE	VARIED AS SHOWN	0
GRID-№1 VOLTS TO CATHODE	0	0



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-9405

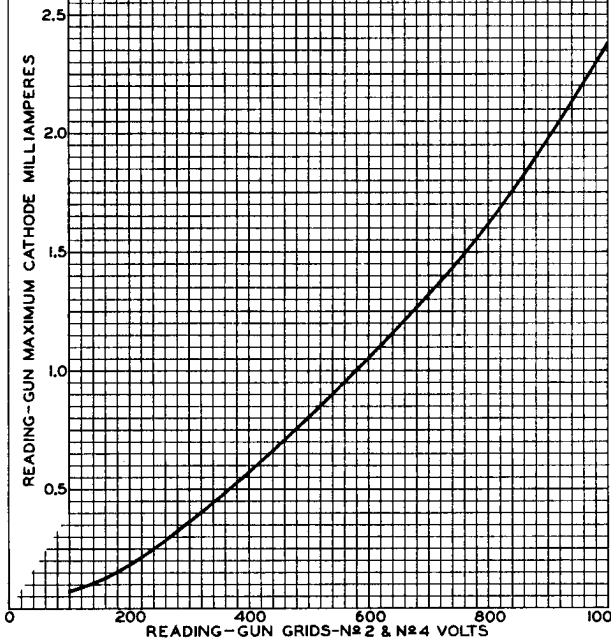
6896/1855

MAXIMUM CATHODE CURRENT

READING GUN

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

	Writing Gun	*Reading Gun*
GRID-№4 VOLTS TO CATHODE	0	VARIED AS SHOWN
GRID-№3 VOLTS TO CATHODE	0	300
GRID-№2 VOLTS TO CATHODE	0	VARIED AS SHOWN
GRID-№1 VOLTS TO CATHODE	0	0



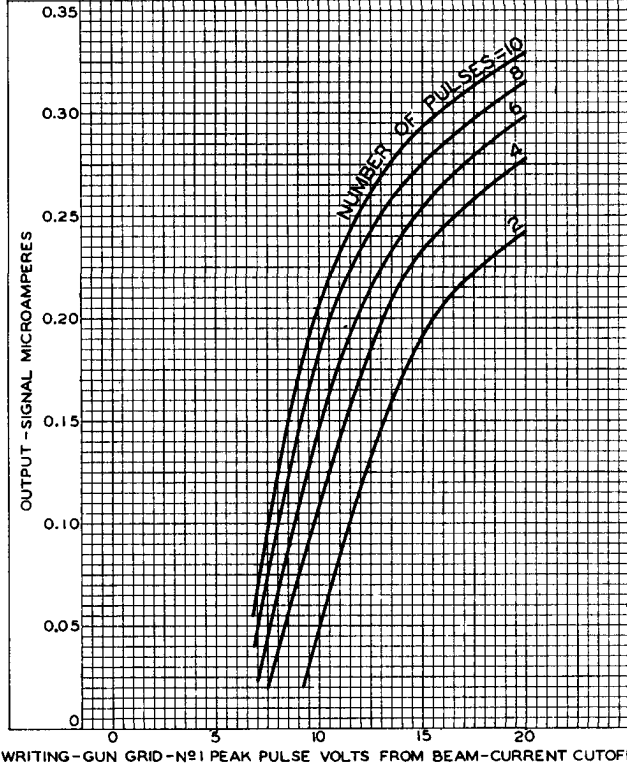
6896

6896/1855

OPERATION CHARACTERISTICS

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 $\mu A = 0.5$
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	—

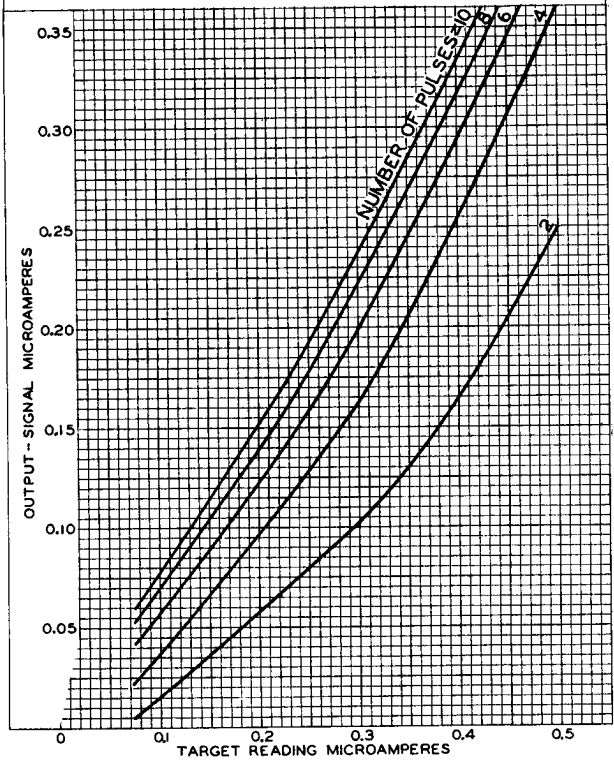


6896/1855

OPERATION CHARACTERISTICS

E_f = 6.3 VOLTS—EACH GUN
BACKING-ELECTRODE-TO-GRID-Nº4 VOLTS = -10
SHADING-ELECTRODE-TO-GRID-Nº4 VOLTS = +20

	Writing Gun	*Reading Gun*
GRID-Nº4 VOLTS TO GROUND	0	0
GRID-Nº3 VOLTS	ADJUSTED FOR FOCUS	ADJUSTED FOR FOCUS
GRID-Nº2 VOLTS TO GROUND	-8750	0
GRID-Nº1 VOLTS	ADJUSTED TO CUTOFF	VARIED TO GIVE TARGET μA AS SHOWN
CATHODE VOLTS TO GROUND	-9000	-1000
GRID-Nº1 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	—

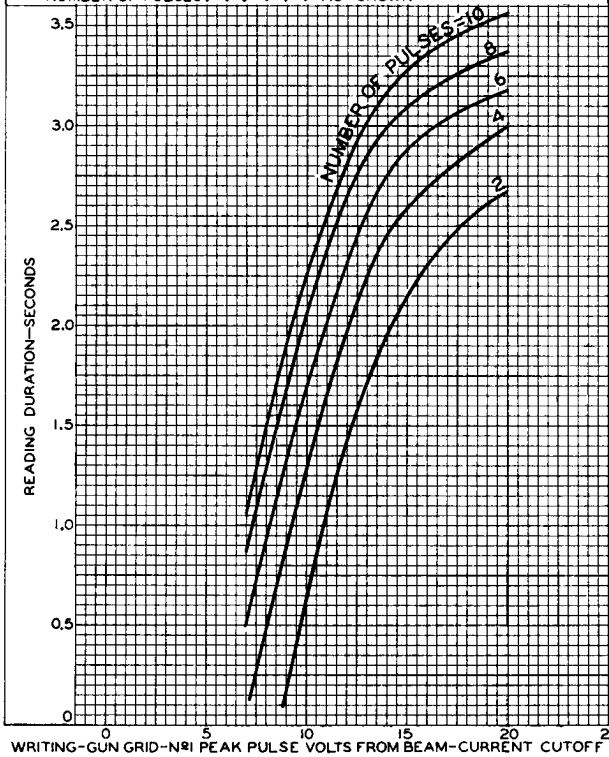


6896/1855

OPERATION CHARACTERISTICS

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 μA=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	—



6896/1855

OPERATION CHARACTERISTICS

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	+750	0
GRID-№1 VOLTS	ADJUSTED TO CUTOFF	VARIED TO GIVE TARGET μA AS SHOWN
CATHODE VOLTS TO GROUND	-900	-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	—