7268A

Display-Storage Tube

"RUGGEDIZED" TYPE
TWO WRITING GUNS
ONE VIEWING GUN

5-INCH DIAMETER
4-INCH-DIAMETER DISPLAY
INTEGRAL MAGNETIC SHIELD

For Use in Military and Commercial Information-Handling Displays Where Rough Tube Usage May be Encountered. The 7268A is Unilaterally Interchangeable with Type 7268.

ELECTRICAL

Heater, for Unipotential Cathode		
All guns		
Voltage (AC or DC)	6.3 ± 10%	V
Current at 6.3 V	0.6	A
Cathode Heating Time	30	s
Minimum, before other electrode voltages are applied		

Writing Section - Each Gun

Focusing Method	Electrostatic	
Deflection Method	Electrostatic	
Deflecting-Electrode Arrangement	See *Dimensional Outline*	
Direct Interelectrode Capacitances		
Grid No.1 to all other electrodes	15 max	pF
Cathode to all other electrodes	8 max	pF
Deflecting electrode DJ1 to deflecting electrode DJ2	3 max	pF
Deflecting electrode DJ3 to deflecting electrode DJ4	2 max	pF
DJ1 to all other electrodes	10 max	pF
DJ2 to all other electrodes	10 max	pF
DJ3 to all other electrodes	10 max	pF
DJ4 to all other electrodes	10 max	pF

Viewing Section

Direct Interelectrode Capacitances		
Grid No.1 to all other electrodes	18 max	pF
Cathode to all other electrodes	10 max	pF
Backplate to all other electrodes	110 max	pF

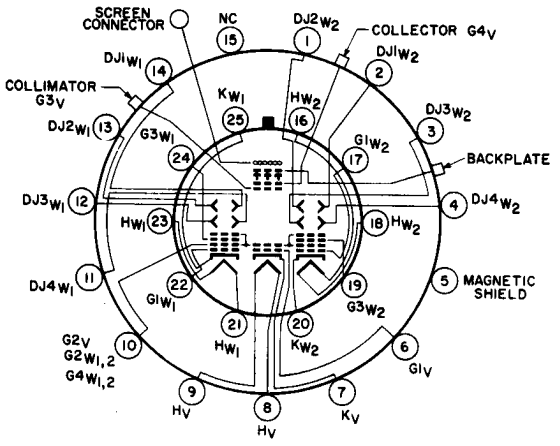
OPTICAL

Phosphor . . . . . P20, Aluminized

MECHANICAL

Operating Position	Any
Minimum Useful Viewing Diameter	4 in
Maximum Overall Length	16 in
Maximum Diameter	5.28 in
Excluding screen lead	
Screen-Connector Assembly	See *Dimensional Outline*
Weight	5-1/4 lb
Bulb Terminals	Recessed Small-Ball (JEDEC No.J1-22)
Caps (Three)	
Base	JEDEC No.B25-216

TERMINAL DIAGRAM (Bottom View)



Pin 1 – Deflecting Electrode DJ2 of Writing Gun No. 2
Pin 2 – Deflecting Electrode DJ1 of Writing Gun No. 2
Pin 3 – Deflecting Electrode DJ3 of Writing Gun No. 2
Pin 4 – Deflecting Electrode DJ4 of Writing Gun No. 2
Pin 5 – Integral Magnetic Shield
Pin 6 – Grid No. 1 of Viewing Gun
Pin 7 – Cathode of Viewing Gun
Pin 8 – Heater of Viewing Gun
Pin 9 – Heater of Viewing Gun
Pin 10 – Grid No. 2 of Viewing Gun, Grid No. 2 and Grid No. 4 of Writing Guns No. 1 and No. 2
Pin 11 – Deflecting Electrode DJ4 of Writing Gun No. 1
Pin 12 – Deflecting Electrode DJ3 of Writing Gun No. 1
Pin 13 – Deflecting Electrode DJ2 of Writing Gun No. 1
Pin 14 – Deflecting Electrode DJ1 of Writing Gun No. 1
Pin 15 – NC — No Internal Connection
Pin 16 – Heater of Writing Gun No. 2
Pin 17 – Grid No. 1 of Writing Gun No. 2
Pin 18 – Heater of Writing Gun No. 2
Pin 19 – Grid No. 3 of Writing Gun No. 2
Pin 20 – Cathode of Writing Gun No. 2
Pin 21 – Heater of Writing Gun No. 1
Pin 22 – Grid No. 1 of Writing Gun No. 1
Pin 23 – Heater of Writing Gun No. 1
Pin 24 – Grid No. 3 of Writing Gun No. 1
Pin 25 – Cathode of Writing Gun No. 1
Flexible Lead–Screen (Encapsulated)
Recessed Small Ball Caps—
Over Pin No. 3 Collimator (Viewing Grid No. 3)
Over Pin No. 13 Collector (Viewing Grid No. 4)
Over Pin No. 14 Backplate

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MAXIMUM AND MINIMUM RATINGS, ABSOLUTE-MAXIMUM VALUES

All voltages are shown with respect to the cathode of the viewing gun unless otherwise specified.

	Min	Max	
Screen Voltage			
Peak	-	11500	V
DC	0	11000	V
DC Backplate Voltage	0	35	V
Collector Voltage[a]	0	300	V
Viewing-grid-No.4			
Collimator Voltage[b]	0	300	V
Viewing-grid-No.3			
Viewing-Grid-No.2, Writing-Grid-No.4, and Writing-Grid-No.2 voltage[c,d]	0	200	V
Viewing-Grid-No.1 Voltage[a]	-150	0	V
Viewing-Gun Heater-to-Cathode Voltage	-125	125	V
Magnetic Shield Voltage	-200	200	V
Writing-Grid-No.4, Writing-Grid-No.2 To Any Deflecting Electrode Voltage	-500	500	V
Each gun[b]			
Writing-Grid-No.3 Voltage	0	2000	V
Each gun[c]			
Writing-Grid-No.1 Voltage	-200	(d)	V
Each gun[c]			
Writing-Gun Cathode Voltage	-2800	0	V
Each gun			
Writing-Gun Heater-To-Cathode Voltage	-125	125	V
Each gun			
Series Current-Limiting Resistor			
Unbypassed, in screen circuit	1	-	MΩ
Unbypassed, in viewing-grid-No.4 circuit	0.005	-	MΩ

RECOMMENDED OPERATING VALUES

All voltages are shown with respect to the cathode of the viewing gun unless otherwise specified.

Screen Voltage	10000	V
Backplate Voltage[e]	2	V
Collector Voltage	265	V
Viewing-grid No.4		
Collimator Voltage[f]	50 to 125	V
Viewing-grid No.3		
Viewing-Grid-No.2 Voltage[a]	100	V
Viewing-Grid-No.1 Voltage[f]	-50 to 0	V
Writing-Grid-No.3 Voltage	-2325 to -1975	V
Each gun[g]		
Writing-Grid-No.1 Voltage		
Each gun	(d,h)	V
Writing-Gun Cathode Voltage	-2400	V
Magnetic Shield Voltage	0	V
Average Deflecting Plate Voltage[j]	100	V
Circuit Values		
Grid-No.1 circuit resistance, either gun	1 max	MΩ

Circuit Values (cont'd)

Impedance in any deflecting electrode circuit[k]	0.01	max	MΩ
Backplate-circuit resistance	0.005	max	MΩ
Series current-limiting resistor:			
Unbypassed, in screen circuit	1		MΩ
Unbypassed, in collector viewing-grid-No.4 circuit	0.01		MΩ

CHARACTERISTICS

	Min	*Typ*	*Max*	
Useful Viewing Diameter	4	-	-	in
Brightness (Luminance)[m]	-	2500	-	fL
Viewing Duration[n]	15	-	-	s
Erase Time[k]	-	28	-	ms
Resolution[q]	70	-	-	lines/in
Undeflected Spot Position	-	-	(r)	mm
Deflection Factors				
DJ1 & DJ2	82	-	100	V/in
DJ3 & DJ4	82	-	100	V/in

[a] These voltages should never be adjusted to values which will permit the display of a sharply-defined circular area of brightness having a diameter of less than 3.5 inches. See *Operating Procedure* for the proper set-up to follow.

[b] Grids No.4 and No.2 of writing gun and the grid No.2 of viewing gun are connected within the tube.

[c] Voltages are shown with respect to cathode of writing gun.

[d] The writing-gun grid No.1 should never be more positive than necessary to write the display to saturated brightness for a given scanning and drive condition. In no case should the writing-gun grid-No.1 voltage have a value greater than zero with respect to the writing-gun cathode.

[e] The backplate should be maintained at 2 volts between erasing pulses when dynamic erasure is employed.

[f] Adjusted for brightest, most uniform, full-size pattern.

[g] Adjusted for the smallest, most circular spot.

[h] The bias-voltage value for writing-beam cutoff is between -60 and -100 volts with respect to writing-gun cathode.

[j] With respect to the viewing-gun cathode for each pair of deflecting electrodes.

[k] Recommended value for minimum distortion because of viewing beam collection by the deflecting plates. Where strict display accuracy and display uniformity are not required, the impedance value for any deflecting-electrode circuit may be as high as 0.1 megohm maximum. For optimum performance, it is recommended that the deflecting-electrode-circuit impedances be approximately equal.

[m] Brightness (Luminance) is measured after the entire display is written to saturated brightness, the writing gun has been turned off, and with no erasing pulse applied.

[n] The time required for any 0.5-inch diameter area of the 4-inch-diameter viewing area to rise spontaneously (with no writing or erasing) from zero brightness (viewing-beam visual cutoff) to 10% of saturated brightness.

[p] With the display at saturated brightness, a series of rectangular pulses 5 milliseconds in width and at a repetition frequency of 2 p/s is applied to the backplate. The number of pulses required to just erase completely the center of the display is noted. This number is multiplied by 5 milliseconds to obtain the erase time. The amplitude of the erase pulses is adjusted to obtain the minimum erase time.

[q] Measured by the "shrinking" raster method under conditions of continuous writing and erasing with erase pulses of 60 μsec width and a repetition frequency of 300 p/s. The amplitude of the erase pulses is adjusted to provide 3.5-second erasure and grid No.1 is adjusted to provide 1000 foot-lamberts brightness of the just "shrunken" raster.

[r] The undeflected spot position must fall within a square having a 15 millimeter side (maximum) centered on the tube face and parallel to a trace produced by one set of deflecting plates.

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Performance Data:

Writing Ability and *Writing Uniformity* characteristics are measured singly for both guns. A 3.5 x 3.5 inch raster is centered on the tube face. Vertical scanning is accomplished by an interrupted linear sawtooth waveform having a scan time of 625 microseconds and a prf of 500 p/s. Horizontal scanning is provided by a triangular waveform having a scan rate of 3.5 inches per second.

Writing Ability. The writing-gun grid No. 1 of the gun under test is driven above cutoff during the vertical scan time by white noise, of approximately 5 megacycles bandwidth, having a zero-to-peak amplitude of approximately 35 volts. The display brightness under these conditions shall be at least 20% of saturated brightness.

Writing Uniformity. This characteristic is determined under the same conditions as specified above except that the rms amplitude of the white noise is adjusted to produce brightness of 40% of saturated brightness of the dimmest area in the display. The measured brightness at the brightest area of the display shall be not more than 80% of saturated brightness.

Environmental Tests:

The 7268A is designed to withstand the following operational and non-operational environmental tests.

Operational Tests:

Sinusoidal Vibration. This test consists of tube vibration in each of three orthogonal axes. One of these axes is in the plane passing through the major axis of the tube and the center of the tube-base key. The tube is mounted so that its major axis is parallel to the plane of the earth. A total of 6 cycles of swept sinusoidal vibration, from 10 to 500 and back to 10 cycles per second, is performed. The duration of a sweep cycle is 15 minutes. The frequencies of any resonant points are noted. The sinusoidal vibration schedule is shown below.

Double Amplitude inches	Peak Acceleration g's	Sweep Frequency c/s	Sweep Cycle Duration minutes
0.27	-	10 to 20	15
-	4	20 to 46	
-	2	46 to 500	
-	2	500 to 46	
-	4	46 to 20	
0.27	-	20 to 10	

Vibration of Resonance. This test consists of tube vibration at the resonant point or points determined in *Sinusoidal Vibration* for a period of 30 minutes. If more than one

resonant point is noted for a given axis, the tube is vibrated for a total of 30 minutes at that resonant point in each axis most likely to produce tube failure. If no resonant points are determined in *Sinusoidal Vibration*, the tube is vibrated for 60 minutes at a frequency of 55 cycles per second.

Low Pressure - High Temperature. This test consists of tube storage for a period of not less than one hour at a temperature of +100 °C. At the termination of this storage period, the tube is operated with the values shown under *Recommended Operating Values* applied and at a pressure equivalent to an altitude of 32,000 feet. The temperature is then reduced to +53 °C. The tube is stored at this temperature for 1 hour and then is operated with normal voltages applied at a pressure equivalent to an altitude of 60,000 feet.

Low Temperature. This test consists of the tube being maintained at a temperature of -65 °C for 48 hours. At the end of this period and while the tube is still at -65 °C, the tube is operated with recommended voltages applied for 15 minutes.

Non-Operational Tests:

Temperature Cycling. This test consists of tube storage for a period of not less than 2 hours at a temperature of -65 °C followed within 5 minutes by storage for a period of 2 hours at a temperature of +100 °C. A minimum of five consecutive cycles are performed.

High Pressure. This test consists of tube exposure to an absolute pressure of 45 pounds per square inch for a period of at least 60 seconds. This pressure shall be attained within 60 seconds.

Torque. This test consists of the application of a torque of 40 inch-pounds between the integral magnetic shield and the tube base.

Salt Spray. This test consists of tube exposure to a fine spray from a salt solution for a period of 48 hours. The ambient temperature is maintained at approximately 35 °C.

OPERATING PROCEDURE

The following steps should be followed when the 7268A is first placed in operation. Refer to the precautions shown under *Operating Considerations* in the publication ICE-277 "RCA Display-Storage Tubes". *Note that all electrode voltages are referred to the cathode of the viewing gun unless otherwise specified.*

1. *Viewing Gun*-Apply power to the heater of the viewing gun and allow 60 seconds for the cathode to reach normal operating temperature. Next apply the following voltages to the viewing-gun electrodes: zero volts to the viewing-gun cathode, zero volts to the viewing-gun grid No.1, +100 volts to the viewing-gun grid No.2, +125 volts to the collimator, +265 volts to the collector, +2 volts to the backplate, and +10,000 volts to the screen. Except for the application of screen voltage, which may be increased, at the user's option,

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from 0 volts to 10,000 volts slowly, all of the above voltage values should be applied to the tube simultaneously and without first passing through intermediate voltage values. Next apply dynamic erasing pulses to the backplate. Adjust the viewing-gun grid-No. 1 voltage to a value midway between zero volts and that voltage at which the viewing diameter begins to decrease. Reduce the collimator voltage until the viewing diameter starts to decrease, and then increase the collimator voltage by 10 volts. The storage property of the tube can be observed by setting the amplitude of the dynamic erasing pulses at +12 volts for several seconds and by then reducing it to zero volts. As the erasing pulse amplitude is reduced the screen should go dark. The 7268A is now storing an overall "black picture" and stays in this condition until the screen begins to brighten as a result of the storage grid being gradually discharged by positive ions landing on it.

2. *Writing Gun*—Apply power to the heater of the writing gun and allow 60 seconds for the cathode to reach normal operating temperature. Then, with reference to the typical operating values shown in the tabulated data under *Recommended Operating Values*, set the grid-No. 1 voltage to cutoff, and apply dc voltages to the electrodes of the writing gun. With the screen made dark by the charging method described under (1), the grid-No. 1 bias is reduced until the writing beam is seen as a spot on the screen. If the beam is caused to move, either by centering adjustment or by application of deflection voltage, it should leave a bright trace. After an area has been written to full brightness, the writing-beam spot may be seen as a slightly brighter spot on the bright background. Writing-beam focus can then be optimized by adjusting the grid-No. 3 voltage.

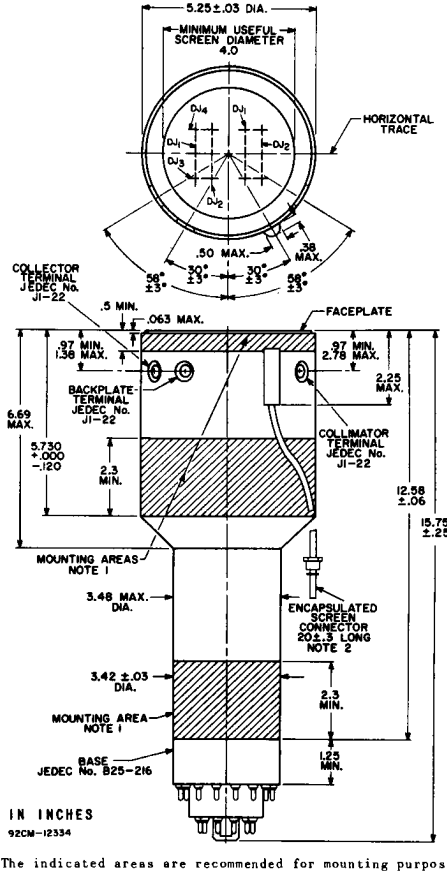
3. *Final Display Adjustments*—The dc bias and the video-signal amplitude applied to grid No. 1 or cathode of the writing gun should be adjusted to set the black level and the highlight level in the display. These adjustments depend on the scanning rate used. Resolution decreases with increasing writing-gun beam current. Excessive writing-gun beam current will produce screen saturation and any further beam-current increase will not produce additional highlight brightness and may also decrease half-tone rendition. It is recommended that the writing-beam current always be adjusted to a minimum value to produce the best display without saturation of highlight brightness. The dynamic erasing-pulse amplitude and duty cycle should be adjusted in accordance with the information contained in ICE-277. The collimator voltage should be adjusted for optimum display uniformity. If the collimator voltage is too high, the center area of the display will tend to erase slowly. If the collimator voltage is too low, the edges of the display will tend to erase slowly.

The following operating precautions must be followed to protect the 7268A from inadvertent damage—

1. Do not exceed maximum ratings.
2. Be sure to include the screen resistor.
3. Be sure to include the collector resistor.

4. Do not apply excessive writing-beam current density.
5. Protect against scanning failure.
6. Protect against loss of bias.
7. Apply voltages to tube in correct order.
8. Never write unless viewing beam is on.
9. Stay within recommended viewing-grid voltage ranges.

DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

92CM-12334

Note 1: The indicated areas are recommended for mounting purposes.

Note 2: Amp Part No. Amp 832 692-0; manufactured by Aircraft Marine Products, Inc., Harrisburg, Pa., or equivalent.

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