

Display-Storage Tube

"RUGGEDIZED" TYPE
ONE WRITING GUN
ONE VIEWING GUN

5" - DIAMETER BULB
308" - DIAMETER DISPLAY
INTEGRAL MAGNETIC SHIELD

For Military and Commercial Information-
Handling Displays Where Tube May Be Sub-
jected to Severe Environmental Conditions

DATA

General:

	Writing Section	Viewing Section	
Heater, for Unipotential Cathode:			
Voltage (AC or DC)	6.3 ± 5%	6.3 ± 5%	volts
Current at 6.3 volts.	0.6	0.6	amp
Cathode Heating Time (Minimum) before other electrode voltages are applied.	-	60	sec
Direct Interelectrode Capacitances:			
Grid No.1 to all other electrodes.	6.5	11	pf
Cathode to all other electrodes.	5.5	8	pf
Backplate to all other electrodes.		116	pf
Deflecting electrode DJ1 to deflecting electrode DJ2		1.9	pf
Deflecting electrode DJ3 to deflecting electrode DJ4		2	pf
DJ1 to all other electrodes		6	pf
DJ2 to all other electrodes		7	pf
DJ3 to all other electrodes		5	pf
DJ4 to all other electrodes		4.8	pf
Focusing Method			Electrostatic
Deflection Method			Electrostatic
Deflecting-Electrode Arrangement			See <i>Dimensional Outline</i>
Phosphor.			P20, Aluminized
Minimum Useful Viewing Diameter ^a			3.8"
Maximum Overall Length (Excluding encapsulated screen lead).			13.64"
Maximum Seated Length			12.89"
Maximum Diameter (Excluding encapsulated screen lead).			5.562"
Operating Position.			Any
Weight (Approx.).			5-1/2 lbs
Base.			Medium-Shell Diheptal 14-Pin (JEDEC Group 5, No.B14-38)



BOTTOM VIEW

Pin 1-Heater of the writing gun

Pin 2-Grid No.1 of the writing gun

Pin 3-Grid No.3 of the writing gun

Pin 4-Deflecting electrode DJ3 of the writing gun

Pin 5-Deflecting electrode DJ4 of the writing gun

Pin 6-Grid No.2 of the viewing gun, Grid No.2 and Grid No.4 of the writing gun

Pin 7-Grid No.1 of the viewing gun

Pin 8-Grid No.3 of the viewing gun

Pin 9-Heater of the viewing gun

Pin 10-Heater and cathode of the viewing gun

Diagram labels: BACKPLATE, COLLECTOR (G5V), COLLIMATOR (G4V), SCREEN, G2V, G1V, G3V, HV, Hv, Kv, DJ1, DJ2, DJ3, DJ4, G3W, GIW, HW, KW, HV, KV.

Pin 11-Deflecting electrode DJ1 of the writing gun

Pin 12-Deflecting electrode DJ2 of the writing gun

Pin 13-Cathode of the writing gun

Pin 14-Heater of the writing gun

Leads:

At tube base—

Collector (Grid No.5 of viewing gun)—red wire

Collimator (Grid No.4 of viewing gun)—green wire

Backplate—violet wire

Encapsulated Lead: Screen Connector

Maximum and Minimum Ratings, Absolute-Maximum Values:
All voltages are shown with respect to the cathode of the viewing gun unless otherwise specified.

	Minimum Maximum		
Screen Voltage:			
Peak.	0	11000	volts
DC.	0	10500	volts
Backplate Voltage:			
Peak.	0	15	volts
DC.	-30	10	volts
Collector (Viewing-Grid-No.5)			
Voltage	130	170	volts

	<i>Minimum</i>	<i>Maximum</i>	
Collimator (Viewing-Grid No.4)			
Voltage	0	100	volts
Viewing-Grid-No.3 Voltage	10	50	volts
Viewing-Grid-No.2, Writing-Grid-No.4, and Writing-Grid-No.2			
Voltage ^b	115	135	volts
Viewing-Grid-No.1 Voltage	-200	0	volts
Viewing-Gun Heater-to-Cathode			
Voltage	-125	125	volts
Magnetic-Shield Voltage ^a	-200	200	volts
Writing-Grid-No.4, Writing-Grid-No.2-to-any Deflecting Elec-			
trode Voltage ^b	-500	500	volts
Writing-Grid-No.3 Voltage ^c	0	1200	volts
Writing-Grid-No.1 Voltage ^c	-200	^e	volts
Writing-Gun Cathode Voltage . . .	-2750	145	volts
Writing-Gun Heater-to-Cathode			
Voltage	-125	125	volts
Series Current-Limiting Resistor (Unbypassed) in Screen Circuit.	1	-	megohm
Series Current-Limiting Resistor (Unbypassed) in Collector (Viewing-Grid-No.5) Circuit . .	0.005	-	megohm

Recommended Operating Values:

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

Screen Voltage.	10000	volts
Backplate Voltage	2	volts
Collector (Viewing-Grid-No.5)		
Voltage	150	volts
Collimator (Viewing-Grid-No.4)		
Voltage ^e	20 to 90	volts
Viewing-Grid-No.3 Voltage ^e	10 to 40	volts
Viewing-Grid-No.2 Voltage ^b	125	volts
Viewing-Grid-No.1 Voltage ^e	-60 to 0	volts
Viewing-Gun Cathode	At ground potential	
Magnetic Shield ^f	At ground potential	
Writing-Grid-No.3 Voltage ^g	-1650 to -1250	volts
Writing-Grid-No.1 Voltage	^{d, h}	volts
Writing-Gun Cathode	-2000	volts
Average Deflecting Plate Voltage.	112	volts
Circuit Values:		
Grid-No.1 Circuit Resistance (either gun).	1 max.	megohm
Resistance in any Deflecting Electrode Circuit ^j	0.01 max.	megohm
Backplate-Circuit Resistance. .	0.005 max.	megohm
Series Current-Limiting Resistor (Unbypassed) in Screen Circuit.	1	megohm
Series Current-Limiting Resistor (Unbypassed) in Collector (Viewing Grid-No.5) Circuit . .	0.005	megohm



2053

Performance Data and Characteristics:

	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	
Useful Viewing Diameter ^a	3.8	—	—	inches
Luminance (Brightness) ^k	1000	1900	—	footlamberts
Viewing Duration ^m	20	—	—	seconds
Erasing Time ^m	8	—	50	milliseconds
Undelected Spot Position ⁿ	—	—	10	millimeters
Deflection Factors:				
DJ1 & DJ2	72	81	90	volts/inch
DJ3 & DJ4	70	82	90	volts/inch

Environmental Tests:

The 2053 is designed to withstand the following environmental tests:

Vibration parallel to each of the three orthogonal axes and as specified in the schedule below. Two concurrent survey cycles each having a duration of 15 minutes are taken for each axis. The frequency is first changed from 5 to 54 and back to 5 cycles per second and then from 54 to 500 and back to 54 cycles per second. The frequencies of all resonant points are noted.

Double Amplitude in inches	Acceleration in g's	Frequency in cps	Sweep Duration in minutes (Approx.)
0.080	—	5 to 54	7.5
0.080	—	54 to 5	7.5
—	8	54 to 80	1.5
—	2	80 to 500	6.0
—	2	500 to 80	6.0
—	8	80 to 54	1.5

Resonance for one minute at the resonant point determined in *Vibration* for which resonance is most severe. If no resonant points are observed in *Vibration*, the 2053 is vibrated for one minute at a frequency of 50 cycles per second.

Shock — Non-Destructive consisting of three impact shocks in both directions of the three orthogonal axes. Each impact shock has a peak acceleration of 15 g's and a time duration of 11 milliseconds.

Shock — Destructive consisting of three impact shocks in both directions of the three orthogonal axes. Each impact shock has a peak acceleration of 30 g's and a time duration of 11 milliseconds. Following this destructive shock test, the tube need not be operable and any degree of internal destruction is permissible. However, no destruction or cracking of the tube faceplate is permitted and all internal parts must remain within the magnetic shield.

Fatigue consisting of vibration for 32 hours in each of the three orthogonal axes. A vibration frequency of 25 cps is employed with an amplitude of 0.040" (total excursion 0.080"). Each tube is vibrated for a total of 96 hours.

- a The minimum useful viewing area may not be concentric with respect to the tube face.
- b Grids No.4 and No.2 of Writing Gun and 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 Adjusted for brightest, most uniform, full-size pattern.
- f The integral magnetic shield should be grounded to eliminate shock hazard.
- g Adjusted for the smallest, most circular spot.
- h The bias-voltage value for writing-beam cutoff is between -54 and -92 volts with respect to writing-gun cathode.
- j 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 resistance 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.
- k Luminance (Brightness) is measured after the entire display is written to saturated brightness, the writing gun has been turned off, and with no erasing pulse applied.
- m The time required for any 1.5-inch diameter area of the useful 3.8-inch diameter viewing area to spontaneously rise (with no writing or erasing) from zero brightness (viewing-beam cutoff) to 10% of saturated brightness.
- n Apply a single pulse having an amplitude of 9 volts to the backplate. Erasing time is defined as the shortest duration of such a pulse that will completely erase a full 3.8-inch diameter area display.
- p The undeflected spot position must fall within a circle having a 5/16-inch radius (maximum), 0.2-inch from the geometric center of the tube face, on the radius passing through the center of the screen terminal.
- q The magnetic shield is normally connected to the viewing-gun cathode which is at ground potential.

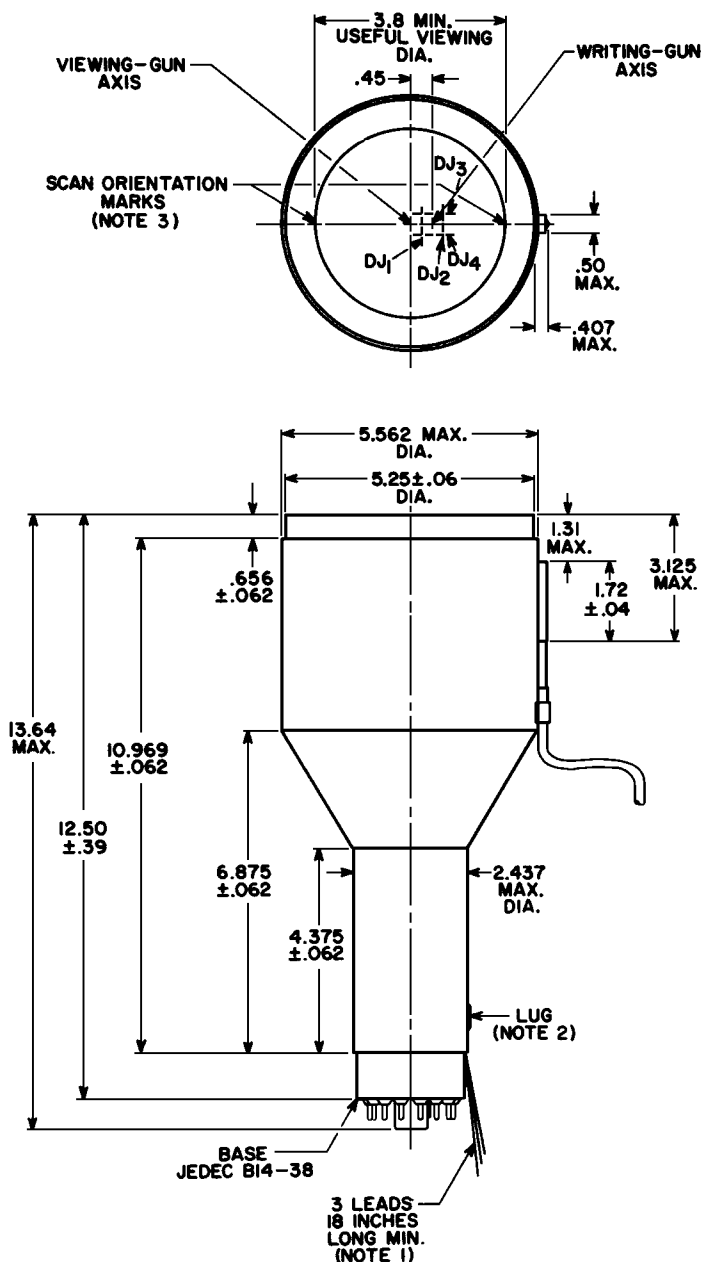
OPERATING CONSIDERATIONS

To prevent possible damage to the tube, allow the viewing-gun beam current to reach normal operating value before turning on the writing-gun beam current, and keep the viewing beam on till the writing beam is turned off.

**FOR ADDITIONAL INFORMATION ON THIS TYPE,
WRITE FOR TECHNICAL BULLETIN AND PUB-
LICATION ICE-277, "RCA DISPLAY-STORAGE
TUBES" AVAILABLE FROM:**

**Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey**





92CM-12176

DIMENSIONS IN INCHES

NOTE 1: RED LEAD IS FOR CONNECTION TO COLLECTOR (VIEWING GRID No.5); GREEN LEAD IS FOR CONNECTION TO COLLIMATOR (VIEWING GRID No.4); VIOLET LEAD IS FOR CONNECTION TO BACKPLATE.

NOTE 2: SOLDER LUG FOR GROUNDING MAGNETIC SHIELD.

NOTE 3: SCAN ORIENTATION MARKS ARE PARALLEL TO TRACE PRODUCED BY DEFLECTING PLATES DJ1 AND DJ2.