



4HP - CATHODE RAY TUBE

The ETC type 4HP is a short, three beam, Electrostatic focus and deflection cathode-ray tube having a 3.5 inch square face and employing spiral type post-acceleration. Each beam is independent of the other except for accelerating potentials and heater connections.

Spiral type post-acceleration is used to obtain minimum pattern and deflection distortions. The spiral accelerator also permits higher accelerating voltage to obtain greater brightness without increase in pattern and deflection distortions. The electron gun structures are so designed as to require no appreciable focusing current. As many of the electrode connections as practical have been brought out through the base pins in order to simplify the problem of connection. The post accelerator is connected to a bulb contact in order to obtain maximum insulation.

GENERAL CHARACTERISTICS (Note 1)

Electrical Data

Heater Voltage	6.3 $\pm$ 10% Volts
Heater Current	1.6 to 2.0 Amperes

Focusing Method	Electrostatic
Deflecting Method	Electrostatic

Phosphor	No. 1	No. 2	No. 7	No. 11
Fluorescence	Green	Green	Blue	Blue
Phosphorescence	--	Green	Yellow	--
Persistence	Medium	Long	Long	Short

Direct Interelectrode Capacitances	Min.	Max.
Cathode to all other electrodes		5.5 uuf
Grid No. 1 to all other electrodes		7.5 uuf
D1 to D2		1.7 uuf
D3 to D4		2.7 uuf
D1 to all		8.5 uuf
D2 to all		8.5 uuf
D3 to all		8.5 uuf
D4 to all		8.5 uuf

Mechanical Data

Overall Length	12-1/2 $\pm$ 1/4 Inches
Greatest Bulb Diameter (Diagonal)	4-1/4 $\pm$ 3/32 Inches
Minimum Useful Screen Dimensions (Rounded Corners)	2-7/8 x 2-7/8 Inches
Bulb Contact	J-22
Base (25 Pin)	Special
Basing	Special
Base Alignment	
D1D2 trace aligns with Pin No. 8 and tube axis	10 Degrees
Positive voltage on D1 deflects the beam approximately towards Pin No. 1	
Positive voltage on D3 deflects the beam approximately towards Pin No. 4	

Bulb Contact Alignment	
J1-22 contact aligns with D3D4 trace	10 Degrees
J1-22 contact on same side as Pin No. 4	

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Mechanical Data (Cont'd.)

Trace Alignment

Angle between D1D2 and D3D4 Traces	± 2 Degrees
Corresponding traces of each gun align within	± 2 Degrees
D1D2 trace aligns with bulb wall	± 3 Degrees

MAXIMUM RATINGS Design Center Values

Post Accelerator Voltage	5,500 Max. Volts D-C
Accelerator Voltage	2,750 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 2)	Max. 3.0
Focusing Voltage	1,500 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	200 Max. Volts D-C
Positive Bias Value	0 Max. Volts D-C
Positive Peak Value	0 Max. Volts D-C
Peak Heater to Cathode Voltage	
Heater Negative with respect to Cathode	180 Max. Volts D-C
Heater Positive with respect to Cathode	180 Max. Volts D-C
Peak Voltage between Accelerator and any Deflection Electrode	750 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	4,000	Volts D-C
For Accelerator Voltage of	2,000	Volts D-C
For Post-Accelerator Current (Note 3)		
Focusing Voltage	350 to 450	Volts D-C
Grid No. 1 Voltage (Note 4)	-42 to - 78	Volts D-C
Modulation Factor (Note 5 and 3)	.45	Volts Max.
Line Width A (Note 6 and 3)	.45	MM Max.
Line Width B (Note 6 and 3)	.65	MM Max.
Deflection Factors		
D1 and D2	120 to 147 Volts D-C/Inch	
D3 and D4	45 to 55 Volts D-C/Inch	
Useful Scan (Note 7)		
Spot Position (Undelected and focused) (Note 8)	10 MM Square	

CIRCUIT DESIGN VALUES

Focusing Voltage 175 to 225 Volts per Kilovolt of Accelerator Voltage
 Focusing Current for any operating conditions -15 to + 10 Microamperes
 Grid No. 1 Voltage 21 to 39 Volts per Kilovolt of Accelerator Voltage
 Grid No. 1 Circuit Resistance 1.5 Max. Megohms
 Deflection Factors:
 Post accelerator Voltage = Accelerator Voltage
 D1 and D2 49.5 to 60.7 Volts D-C/Inch/KV of Accelerator Voltage
 D3 and D4 18.2 to 22.3 Volts D-C/Inch/KV of Accelerator Voltage
 Resistance in any Deflecting-Electrode Circuit (Note 9) 1.0 Max. Megohms

- NOTES -

1. The values shown are for each unit unless otherwise stated. All tests are to be made on each gun separately.



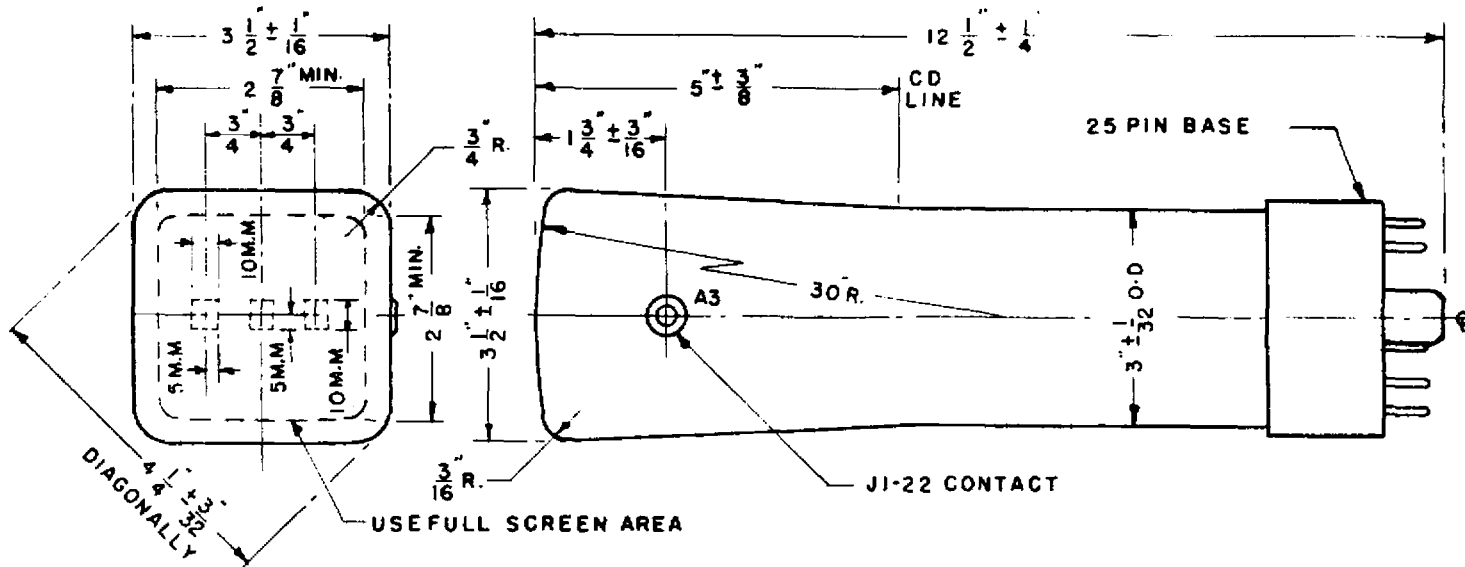
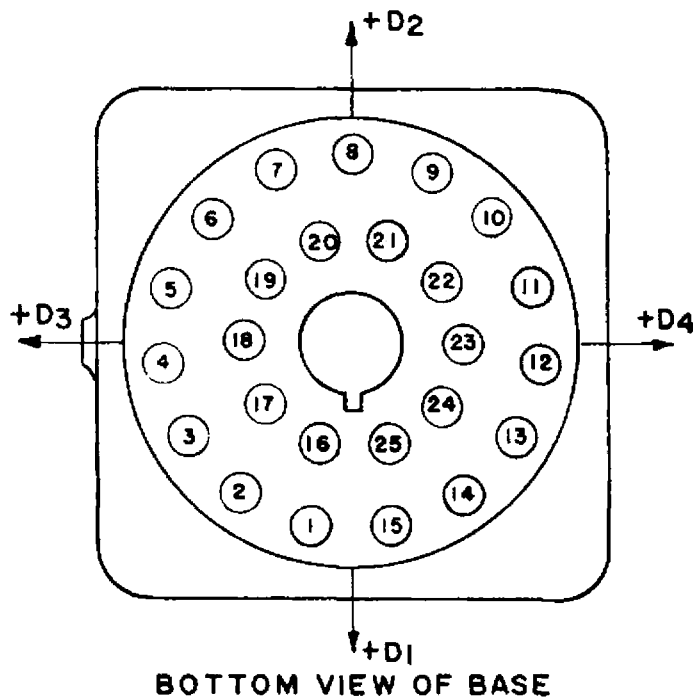
LHP - CATHODE RAY TUBE

- NOTES -

2. This tube is designed for optimum performance when operating on an Eb3/Eb2 ratio of 2.0. Operation at other ratios of Eb3/Eb2 may result in changes in deflection uniformity, pattern distortion, and tracking accuracy.
3. With three beams cut off, the post accelerator anode (A3) will draw a maximum of 65uAdc current.
All readings of beam current (lb3) shall be in addition to the readings obtained for Anode No. 3 current.
4. The visual extinction of the focused, undeflected spot.
5. The increase in Grid No. 1 voltage from cut-off to produce and lb3 of 25uAdc.
6. Measured in accordance with MIL-E-1B specifications, using an lb3 of 25uAdc.
7. The minimum useful scan for Guns A, B, C.

D1D2 = 2.750 inches
D3D4 = .875 inches
8. When the tube is operated at typical operating conditions, and with (1) Eb1 adjusted for focus, (2) Ec1 set at such a value as will void damage to the screen, (3) each of the deflecting electrodes connected to the accelerator and, (4) the tube shielded against external influence, the spots will fall with 10 MMX square as shown on outline drawing.
9. It is recommended that the deflection electrode circuit resistance be approximately equal. Higher resistance values up to 5.0 megohms may be used for low beam operation.

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PIN NO.	ELEMENT	UNIT
1	CATHODE	B
2	GRID NO.1	A
3	CATHODE	A
4	ANODE NO.1	A
5	DEFLECTOR D2	A
6	DEFLECTOR D3	A
7	DEFLECTOR D2	B
8	ANODE NO.2	
9	DEFLECTOR D3	B
10	DEFLECTOR D2	C
11	DEFLECTOR D3	C
12	ANODE NO.1	C
13	GRID NO.1	C
14	CATHODE	C
15	GRID NO.1	B
16	HEATER 1	
17	NO CONN.	
18	DEFLECTOR D1	A
19	DEFLECTOR D4	A
20	DEFLECTOR D1	B
21	DEFLECTOR D4	B
22	DEFLECTOR D1	C
23	DEFLECTOR D4	C
24	ANODE NO.1	B
25	HEATER 2	

NOTE:
 +1D2 INDEX KEY