



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	



4HP - CATHODE RAY TUBE

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 (Ib3) 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 Ib3 of 25uAdc.
6. Measured in accordance with MIL-E-1B specifications, using an Ib3 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.

4HP- CATHODE RAY TUBE



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:

+ ID2 INDEX KEY

ELECTRONIC TUBE CORP.
PHILADELPHIA, PENNA.

4-18-57.

H.W



4NP - CATHODE RAY TUBE

The Electronic Tube Corporation Type 4NP - is a 4x1-3/4 inch rectangular, nono-accelerator Cathode Ray Tube. The 4NP - is designed for use with equipment subject to extreme shock, severe vibration, and altitudes above 50,000 feet. All electrode leads are brought out through the base to simplify the mechanical design of the equipment in which the tube is used. The tube is available with mumetal shield secured to the base. The base is designed for high altitude use, along with a mating socket.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 Volts
Heater Current	0.6 $\pm$ 10% 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

Cathode to All	5.5 uuf
Grid No. 1 to All	6.4 uuf
D1 to D2	1.7 uuf
D3 to D4	2.8 uuf
D1 to all	8.2 uuf
D2 to all	8.2 uuf
D3 to all	8.5 uuf
D4 to all	8.5 uuf

Mechanical Data

Overall Length	10.0 Inches Max.
Greatest Bulb Dimension (Diagonal)	4.268 Inches
Minimum Useful Screen Diameter (along tube axes)	1.125x3.5 Inches
Base	
Basing	Special
Base Alignment	Special
D1 D2 trace aligns with Pin No. 8 and tube axis	10 Degrees
Positive voltage on D1 deflects the beam approximately towards Pin No. 8	---
Positive voltage on D3 deflects the beam approximately towards Pins No. 5 and 6.	---

CATHODE RAY TUBE
4NP -

Page 2 of 3

Trace Alignment

Angle between D3 D4 and D1 D2 trace
D3 D4 Trace Aligns with bulb side wall

± 1 Degrees
 $\pm 1\frac{1}{2}$ Degrees

MAXIMUM RATINGS Design Center Values

Accelerator Voltage (Note 1)	3000 Max. Volts D-C
Focusing Voltage	1500 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 Altitude	550 Max. Volts D-C 70,000 ft.

TYPICAL OPERATING CONDITIONS

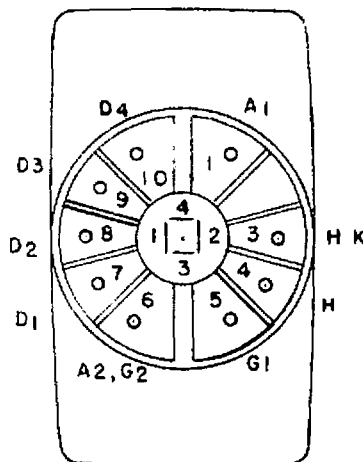
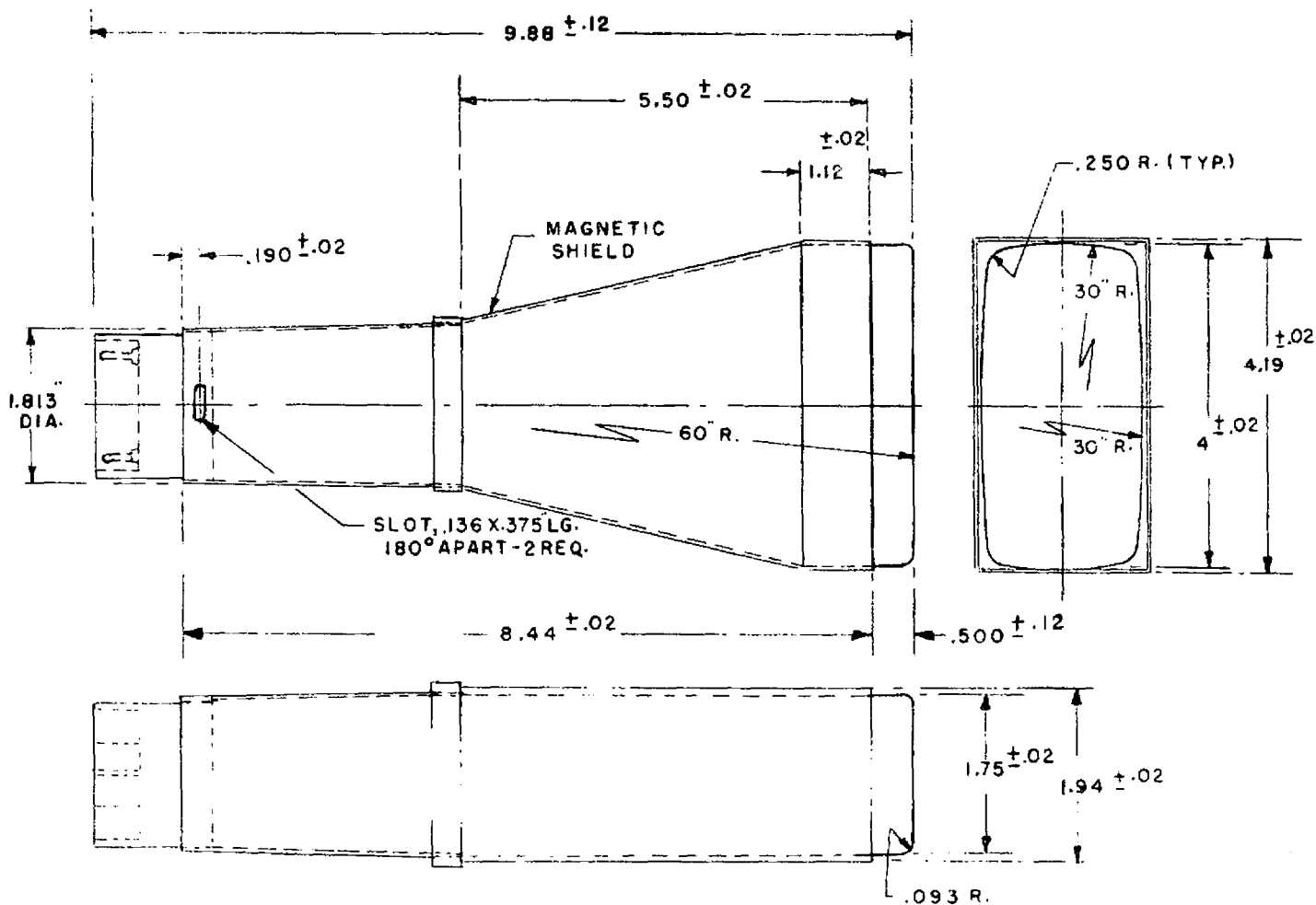
For Accelerator Voltage of	2500 Volts D-C
Focusing Voltage	510 to 710 Volts D-C
Grid No. 1 Voltage (Note 2)	-60 to -100 Volts D-C
Line Width A Ecl = 20V above cut-off	.7 MM
Line Width B (Note 3)	1.0 MM
Deflection Factors	
D1 and D2	117 145 Volts D-C/Inch
D3 and D4	82 100 Volts D-C/Inch
Deflection Factor Uniformity	3% Max.
Useful Scan	
D1 D2	3-1/2 Inches
D3 D4	1-1/4 Inches
Pattern Distortion (Notes 4 and 5)	
Spot Position (Undelected and focused)	7 MM
Spot Displacement	5 MM

CIRCUIT DESIGN VALUES

Focusing Current for any operating condition	-15 $\pm$ 15 Microamperes
Grid No. 1 Voltage (Note 2)	25.6 to 38.4 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	47.3 to 57.7 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	32.9 to 40.1 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting-Electrode Circuit (Note 6)	1 Max. Megohms

NOTES

1. The product of accelerator voltage and average current should be limited to 6 watts.
2. Visual extinction of the undeflected spot.
3. Measurement shall be made at ± 1.5 and $\pm .5$ from the tube face center horizontally and vertically respectively.
4. The total vertical movement of the upper or lower ends of a 1 inch vertical trace (centered with respect to the tube face), deflected horizontally 1.75 inches to the left and right of the center of the tube face, shall not exceed 0.040 inch. The 102 trace shall be considered vertical.
5. The total horizontal movement of the left or right ends of a 3-1/2 inch horizontal trace (centered with respect to the tube center), deflected vertically 0.5 inches above and below the center of the tube face, shall not exceed 0.020 inches. The D3D4 trace shall be considered horizontal.
6. It is recommended that the deflecting electrode circuit resistances be approximately equal.



BOTTOM VIEW OF BASE CONNECTIONS.

NOTE:
+1D2 TOWARDS PIN 8



ELECTRONIC TUBE CORPORATION

PHILADELPHIA, PA.

TITLE

4NP TUBE OUTLINE DRAWING

TOLERANCES

DEC.

FRAC.

ANG.

ENG.

DATE 1-16-59

APP.

DR. H. WARREN

SCALE $\times$

DRAWING NO.

CKD.

H. Warren

REV. WAS 41WHP

A-3400

4QP- CATHODE RAY TUBE

The E.T.C. 4QP- is a rectangular 3-1/4 inches by 2-3/4 inches flat face, electrostatic focus and deflection cathode ray tube. The 4QP- is designed for a minimum useful scan of 2-1/2 inches horizontal and 2-1/4 inches vertically and a high light output with very low deflection factors. These design features permit the use of this tube in compact transistorized equipment.

This tube also features a linear Post-Accelerator and a Geometry adjust electrode for maximum deflection uniformity and minimum pattern distortion.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 $\pm$ 10% Volts			
Heater Current	0.6 $\pm$ 10% 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	Max.			
Cathode to all other electrodes	5.3 uuf			
Grid #1 to all other electrodes	6.8 uuf			
D1 to D2	2.8 uuf			
D3 to D4	1.0 uuf			
D1 to all	6.3 uuf			
D2 to all	6.7 uuf			
D3 to all	3.8 uuf			
D4 to all	3.8 uuf			

Mechanical Data

Overall Length	13-1/2 $\pm$ 1/4 Inches
Greatest Bulb Diameter (Diagonal)	3.765 Inches
Minimum Useful Screen (Rounded Corner)	2-13/16 x 2-5/16 Inches
Bulb Contacts (Deflection Electrode)	Pins
Bulb Contact	J1-22
Base (Small shell, 12 Pin Duodecal)	Special
Basing	Special

Base Alignment

D3D4 trace aligns with Pin #4

Positive voltage on D1 deflects the beam approx. towards Pin #4
Positive voltage on D3 deflects the beam approx. towards Pin #1

CATHODE RAY TUBE

Bulb Contact Alignment

J1-22 contact aligns with D1D2 trace ± 10 Degrees
 J1-22 contact on same side as #14

Trace Alignment

Angle between D1D2 and D3D4 trace 90 ± 1 Degrees
 Each Trace aligns with bulb wall $\pm .5$ Degrees

MAXIMUM RATINGS - Design Center Values

Post-Accelerator Voltage	3400 Max. Volts D-C
Accelerator Voltage	650 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage	5.2 Max.
Focusing Voltage	100 Max. Volts D-C
Grid #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
Heater Positive with respect to Cathode	180 Max. Volts
Peak Voltage between Accelerator and any Deflection Electrode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	3000 Volts D-C
For Accelerator Voltage of	575 to 625 Volts D-C
Post-Accelerator Current (Note 1)	40 uAdc
Focusing Voltage	40 - 160 Volts D-C
Grid #1 Voltage (Note 2)	30 - 40 - 50 Volts D-C
Modulation Factor (Note 3) at 15uA	35 Volts Max.
Geometry Adjust (Note 5)	575 to 625 Volts D-C
Deflection Plate Shield Voltage (3D4) (Note 6)	550 to 600 Volts D-C
Deflection Factors (No Pattern Correction)	
D1 and D2	25.0 to 30.0 Volts D-C/Inch
D3 and D4	12.5 to 15.5 Volts D-C/Inch
Spot Position (Note 4) within 3/15 Inch Square	
Minimum Useful Scan	D2 = 2-1/2 3D4 = 2-1/4
Light Output at 10uA	5 Ft. L. Min.

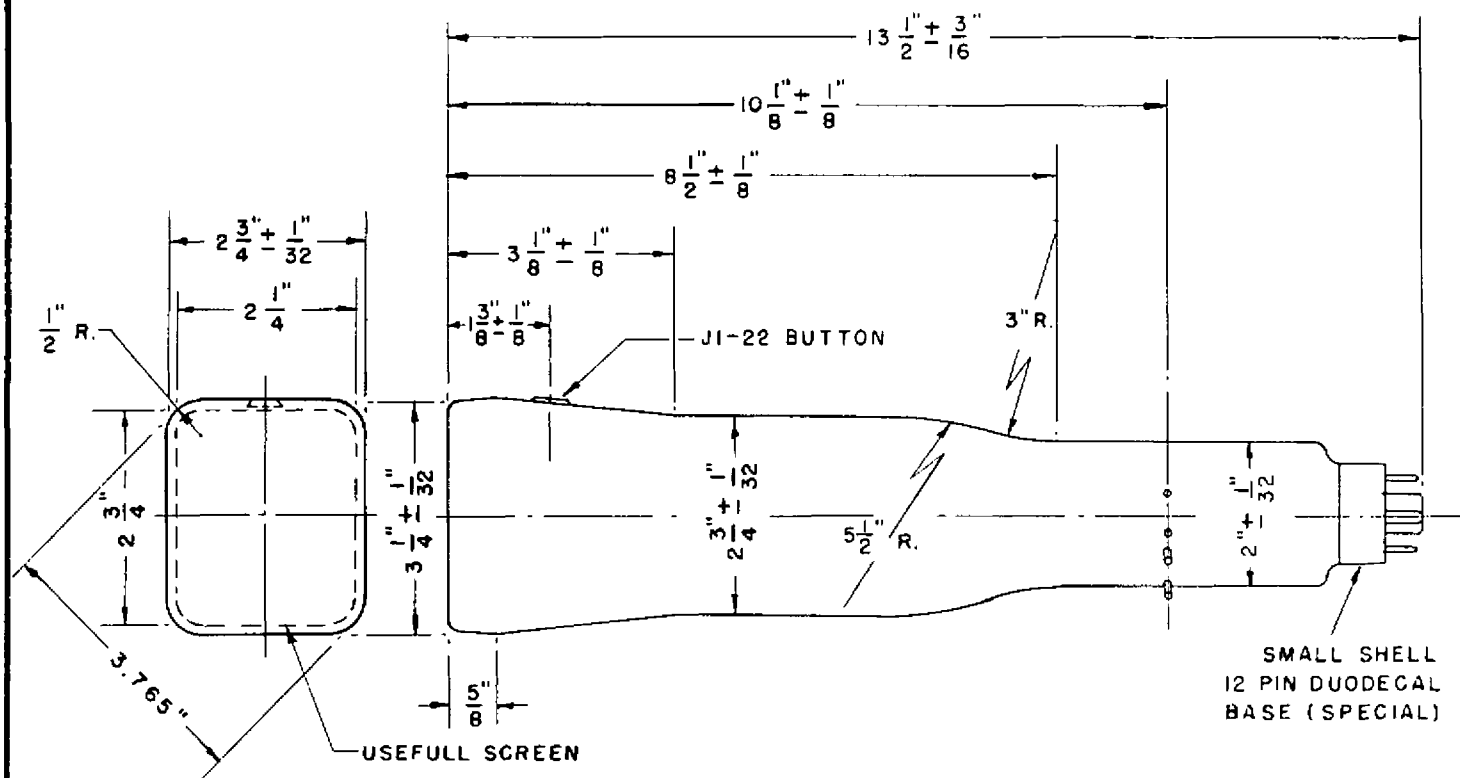
CIRCUIT DESIGN VALUES

Focusing Current for any operating condition	-15 to ± 10 Microamperes
Grid #1 Circuit Resistance	1.5 Max. Megohms
Resistance in any deflecting-electrode circuit (Note 7)	1 Megohms

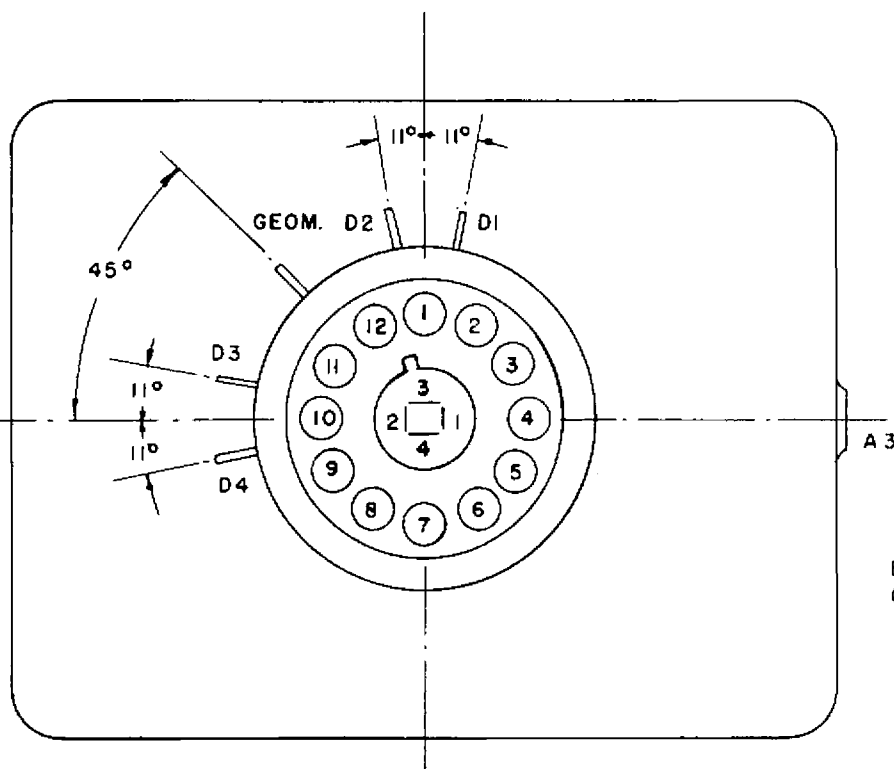
CATHODE RAY TUBE

NOTES

- 1 - Measured with the beam cutoff. All readings of beam current shall be in addition to the readings obtained for post-accelerator current.
- 2 - Visual extinction of the undeflected, focused spot.
- 3 - Measured in accordance with MIL-E-1 specifications with a beam current of 15 uAdc.
- 4 - Centered with respect to the tube face and with the tube shielded.
- 5 - The Post-Accelerator spiral band lower end and the Geometry Adjust are connected internally. By voltage potential adjustment on this electrode combination, pin cushion and barrel distortions are minimized.
- 6 - Normally operated at accelerator potential linearity improvements can be obtained by proper adjustment of deflection plate shield voltage which controls the edge effect of the 3M₄ plate field.
- 7 - It is recommended that the deflection electrode circuit resistance be approximately equal.



PIN NO.	ELEMENT
1	HEATER
2	CATHODE
3	GRID
4	N.C.
5	A1
6	N.C.
7	A2
8	N.C.
9	V SHIELD
10	N.C.
11	N.C.
12	HEATER



BOTTOM VIEW OF
BASE AND NECK
CONNECTIONS.

NOTE:

+102 TOWARDS PIN #4
+304 TOWARDS PIN #1



ELECTRONIC TUBE CORPORATION

PHILADELPHIA, PA.

TITLE

4QP TUBE OUTLINE DRAWING

TOLERANCES

DEC.

FRAC.

ANG.

ENG. *R. S. Martin*

DATE 9-14-60

APP.

DR. J. E. G. JR.

SCALE *1/8"*

DRAWING NO.

A 3619

CKD. *1/8 Warren*

REV. 338-1-4-61.

4RP- CATHODE RAY TUBE

The E.T.C. 4RP- is a rectangular 3-1/4 inches by 2-3/4 Inches flat face, electrostatic focus and deflection cathode ray tube. The 4RP- is designed for a minimum useful scan of 2-1/2 inches horizontal and 2-1/4 inches vertically and a high light output with very low deflection factors. These design features permit the use of this tube in compact transistorized equipment.

This tube also features a linear Post-Accelerator and a Geometry Adjust electrode for maximum deflection uniformity and minimum pattern distortion.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 $\pm$ 10% Volts			
Heater Current	0.3 $\pm$ 10% 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	Max.			
Cathode to all other electrodes	5.3 uuf			
Grid #1 to all other electrodes	6.8 uuf			
D1 to D2	2.8 uuf			
D3 to D4	1.0 uuf			
D1 to all	6.3 uuf			
D2 to all	6.7 uuf			
D3 to all	3.8 uuf			
D4 to all	3.8 uuf			

Mechanical Data

Overall Length	13-1/2 $\pm$ 1/4 Inches
Greatest Bulb Diameter (Diagonal)	3.765 Inches
Minimum Useful Screen (Rounded Corner)	2-13/16 x 2-5/16 Inches
Bulb Contacts (Deflection Electrode)	Pins
Bulb Contact	J1-22
Base (Small shell, 12 Pin Duodecal)	Special
Basing	Special

Base Alignment

D3D4 trace aligns with Pin #4

Positive voltage on D1 deflects the beam approx. towards Pin #4
Positive voltage on D3 deflects the beam approx. towards Pin #1

CATHODE RAY TUBE

Bulb Contact Alignment

J1-22 contact aligns with D1D2 trace ± 10 Degrees
 J1-22 contact on same side as #4

Trace Alignment

Angle between D1D2 and D3D4 trace 90 ± 1 Degrees
 Each Trace aligns with bulb wall $\pm .5$ Degrees

MAXIMUM RATINGS - Design Center Values

Post-Accelerator Voltage	3400 Max. Volts D-C
Accelerator Voltage	650 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage	5.2 Max.
Focusing Voltage	100 Max. Volts D-C
Grid #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
Heater Positive with respect to Cathode	180 Max. Volts
Peak Voltage between Accelerator and any Deflection Electrode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	3000 Volts D-C
For Accelerator Voltage of	575 to 625 Volts D-C
Post-Accelerator Current (Note 1)	40 uAdc
Focusing Voltage	40 - 160 Volts D-C
Grid #1 Voltage (Note 2)	30 - 40 - 50 Volts D-C
Modulation Factor (Note 3) at 15uA	35 Volts Max.
Geometry Adjust (Note 5)	575 to 625 Volts D-C
Deflection Plate Shield Voltage (3D4) (Note 6)	550 to 600 Volts D-C
Deflection Factors (No Pattern Correction)	
D1 and D2	25.0 to 30.0 Volts D-C/Inch
D3 and D4	12.5 to 15.5 Volts D-C/Inch
Spot Position (Note 4) within 3/15 Inch Square	
Minimum Useful Scan	1F2 = 2-1/2 3D4 = 2-1/4
Light Output at 10uA	5 Ft. L. Min.

CIRCUIT DESIGN VALUES

Focusing Current for any operating condition -15 to ± 10 Microamperes
 Grid #1 Circuit Resistance 1.5 Max. Megohms
 Resistance in any deflecting-electrode circuit (Note 7) 1 Megohms

CATHODE RAY TUBE

NOTES

- 1 - Measured with the beam cutoff. All readings of beam current shall be in addition to the readings obtained for post-accelerator current.
- 2 - Visual extinction of the undeflected, focused spot.
- 3 - Measured in accordance with MIL-E-1 specifications with a beam current of 15 uAdc.
- 4 - Centered with respect to the tube face and with the tube shielded.
- 5 - The Post-Accelerator spiral band lower end and the Geometry Adjust are connected internally. By voltage potential adjustment on this electrode combination, pin cushion and barrel distortions are minimized.
- 6 - Normally operated at accelerator potential linearity improvements can be obtained by proper adjustment of deflection plate shield voltage which controls the edge effect of the 304 plate field.
- 7 - It is recommended that the deflection electrode circuit resistance be approximately equal.



5CSP- CATHODE RAY TUBE

The ETC Type 5CSP- cathode ray tube contains a 5" diameter flat screen, and a single electrostatic focused type gun with which is supplied three pairs of electrostatic deflection plates.

This tube was designed for use with the uniformly rotating drum type camera, making possible, through the application of a very low frequency sawtooth voltage to one pair of deflection plates, the recording of very high frequency pulses, which are incidentally applied to a second pair of deflection plates which deflect the beam in the same direction as the first pair, on a spiral time base. The third pair of plates, which are outermost with respect to the gun, deflect the beam at right angles to the first and second pairs, and is used primarily for positioning.

The use of the 5CSP- cathode ray tube eliminates the need for any mechanical displacement of the camera drum ordinarily required to accomplish a spiral sweep, and greatly simplifies the signal amplifier problem. When two pair of plates are used, as in the 5CSP-, the signal amplifier need be designed to pass only the signal pulse band. Application of the low frequency sawtooth required to accomplish the spiral time base is made independent.

While this tube can be supplied with the various commercial phosphors, its major application to photographic recording dictates the use of the P11 phosphor in most instances, or the P5 phosphor when the signals are of such a frequency as to require an appreciably shorter decay characteristic than is obtainable with the P11.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 Volts	
Heater Current	.6 Amperes	
Focusing Method	Electrostatic	
Deflecting Method	Electrostatic	
Phosphor	P5	P11
Fluorescence	Blue	Blue
Phosphorescence	Blue	Blue
Persistence	Very Short	Short
Direct Interelectrode Capacitances, Bogie		
Grid to all other electrodes	7.6 mmfd	
D1 to D2	1.1 mmfd	
D3 to D4	1.2 mmfd	
D5 to D6	0.8 mmfd	

from JEDEC release #2403, March 9, 1959

5CSP- CATHODE RAY TUBEMechanical Data

Overall Length	17-1/4" $\pm$ 3/8"
Greatest Diameter of Bulb	5-1/4" $\pm$ 3/32"
Minimum Useful Screen Diameter	4-1/2"
Bulb Contacts	J1-22
Neck Contacts	C1-2
Base	B11-66

Base Alignment

- Positive voltage on D1 deflects beam approximately toward pin #3.
 Positive voltage on D3 deflects beam approximately toward position between pins #1 and #11.
 Positive voltage on D5 deflects beam approximately toward position between pins #1 and #11.

Bulb Contact Alignment

Snap terminals contact alignment with 3D4 trace $\pm$ 10 degrees.

TYPICAL OPERATING CONDITIONS

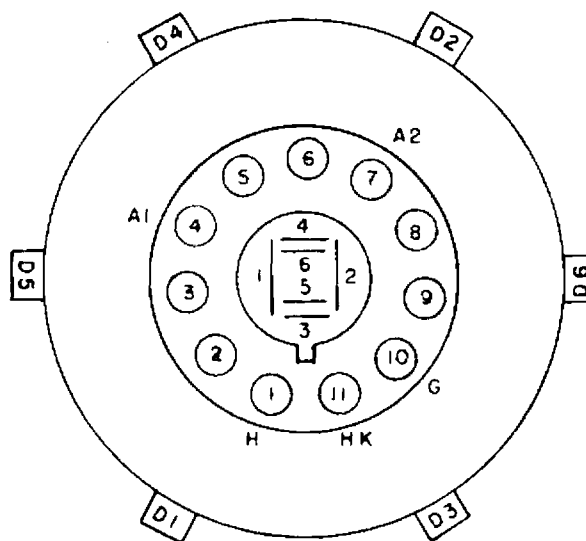
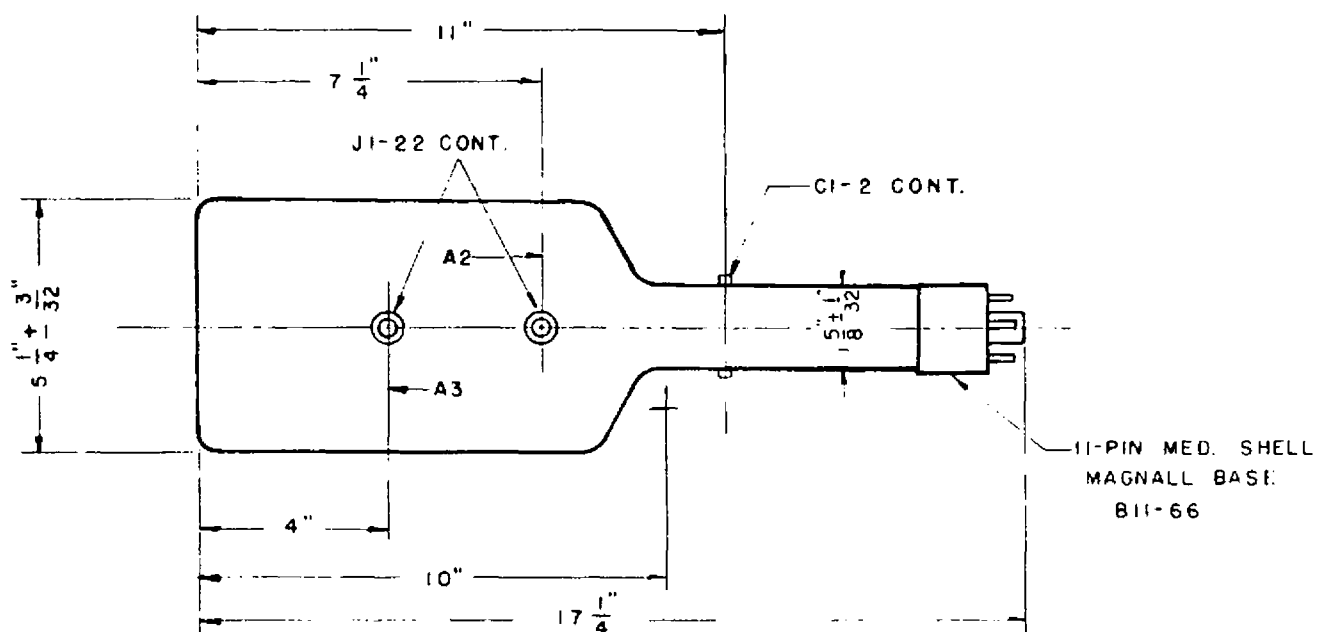
Anode #3 Voltage (Eb3)	3000	4000	Volts DC
Anode #2 Voltage (Eb2)	1500	2000	Volts DC
Anode #1 Voltage for focus when Ec1 is 75% of cutoff	400	575	V-DC $\pm$ 20%
Grid Voltage (Ec1) for beam cutoff	-56	-75	V-DC $\pm$ 20%

Deflection Factors

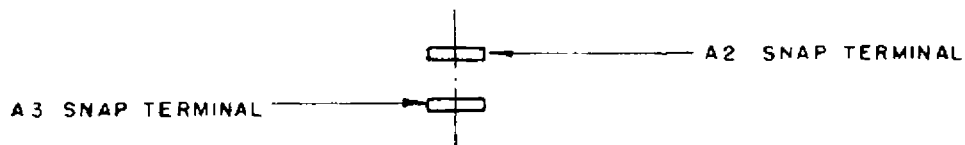
D1 and D2	72	100 V-DC/in $\pm$ 20%
D3 and D4	72	100 V-DC/in $\pm$ 20%
D5 and D6	110	160 V-DC/in $\pm$ 20%

Spot Position (Undelected)

Within 15 millimeters square.



BOTTOM VIEW OF BASE & NECK CONNECTIONS.



NOTE

- +102 TOWARDS PIN #3
- +304 TOWARDS PIN #18 11

 ELECTRONIC TUBE CORPORATION PHILADELPHIA, PA.			
TITLE 5CSP TUBE OUTLINE DRAWING			
TOLERANCES	DEC.	FRAC. 1/4"	ANG.
ENG.	DATE 1-4-57		APP. <i>J. E. G. JR.</i>
DR. J. E. G. JR.	SCALE 1/4" = 1"		DRAWING NO.
CKD. <i>J. E. G. JR.</i>	REV. WAS 51UCP		A-1659



5CTP- CATHODE RAY TUBE

The ETC Type 5CTP- is a dual beam electrostatic deflection and focus cathode ray tube having a multiband post-accelerator electrode and extremely high sensitive signal deflection plates. Each of the beams is independently controlled with the exception of post-acceleration which is common to both. The deflector leads have been brought directly out through the bulb wall for shortest lead length.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 Volts
Heater Current	.6 $\pm$ 10% Amperes
Focusing Method	Electrostatic
Deflecting Method	Electrostatic

Phosphor	P1	P2	P7	P11
Fluorescence	Green	Green	Blue	Blue
Phosphorescence	-	Green	Yellow	-
Persistence	Medium	Long	Long	Short

Direct Interelectrode Capacitances

Cathode to all other electrodes
Grid No. 1 to all other electrodes
D1 to D2
D3 to D4
D1 to all other electrodes except D2
D2 to all other electrodes except D1
D3 to all other electrodes except D4
D4 to all other electrodes except D3

Mechanical Data

Overall Length	18-5/8 $\pm$ 3/8 Inches
Greatest Bulb Diameter	5-1/4 $\pm$ 3/32 Inches
Minimum Useful Screen Diameter	4.5 Inches
Bulb Contact	J1-22
Base	B12-37
Neck Contacts	J1-25
Base Alignment	
D3D4 trace aligns with Pin No. 4 and tube axis	$\pm$ 10 Degrees
Positive voltage on D4 deflects the beam approximately towards Pin No. 11	
Positive voltage on D1 deflects the beam approximately towards Pin No. 7 and 8.	
Bulb Contact Alignment	
J1-22 contact aligns with D3D4 trace	45 $\pm$ 10 Degrees
Trace Alignment	
Angle between D3D4 and D1D2 trace	3 Degrees

50TP - CATHODE RAY TUBE

MAXIMUM RATINGS Design Center Values

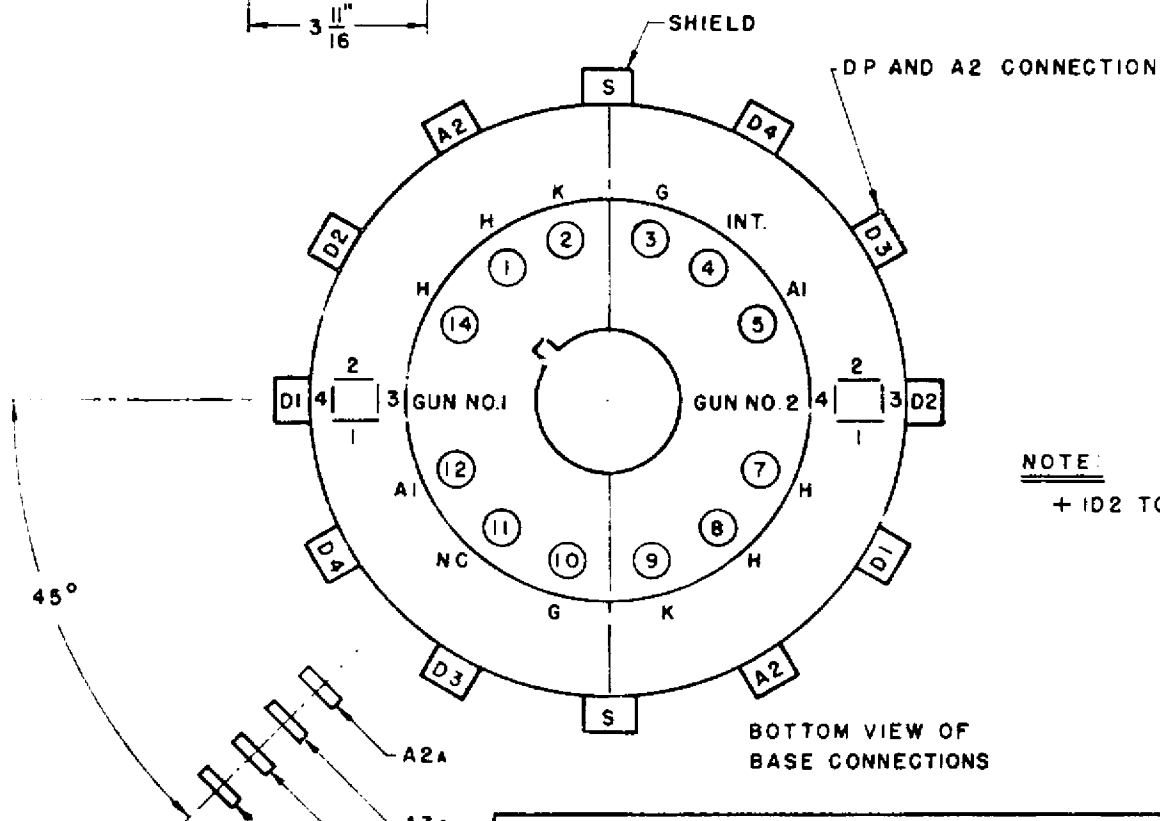
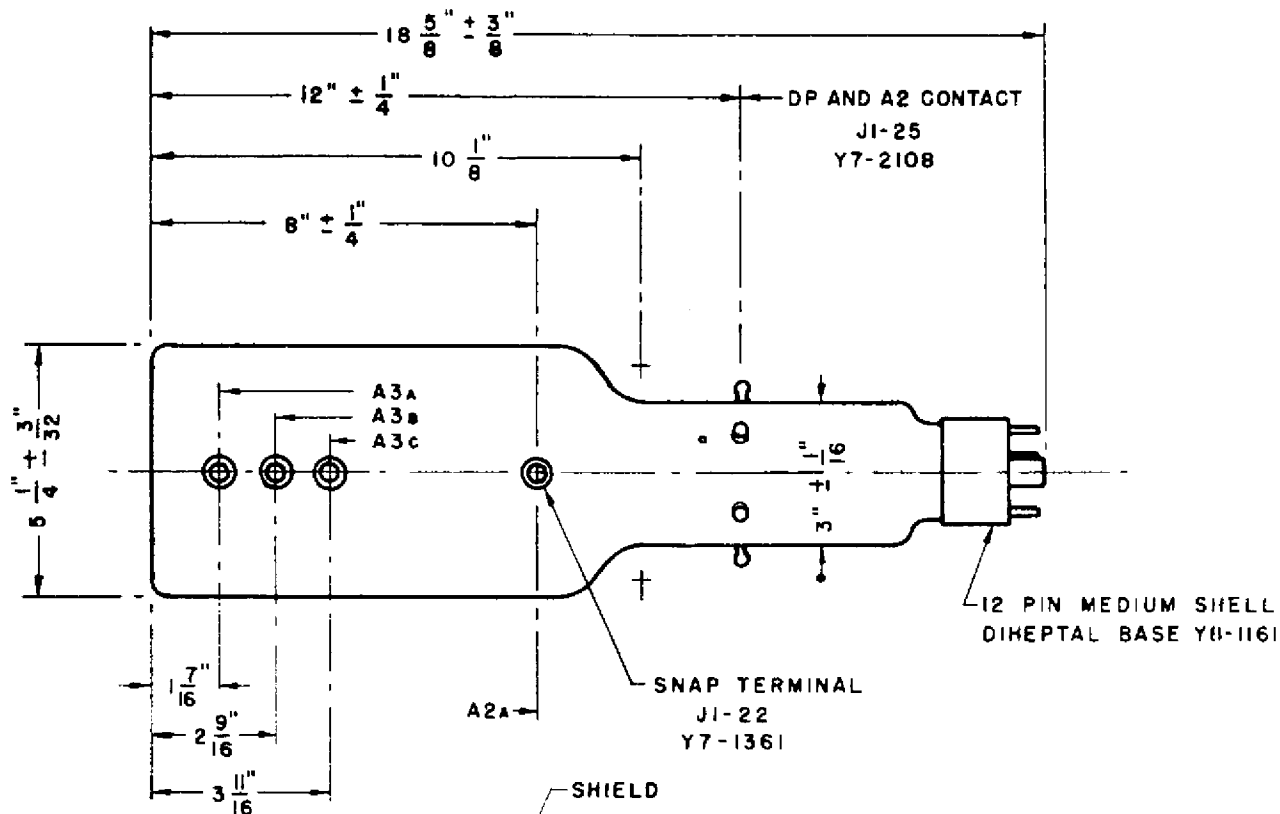
Post Accelerator Voltage	6600 Max. Volts D-C
Accelerator Voltage	2200 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage	3.0 Max.
Focusing Voltage	1500 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	200 Max. Volts D-C
Positive Bias Value	0 Max. Volts D-C
Positive Peak Value	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	Max. Volts D-C

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	6000 Volts D-C
For Accelerator Voltage of	2000 Volts D-C
Focusing Voltage	300 to 550 Volts D-C
Grid No. 1 Voltage	-30 to -70 Volts D-C
Modulation Factor	Ib3 = 25 us
Line Width A	Ib3 = 25 ua
	50 Volts Max.
	.028 Inches Max.
Deflection Factors	
D1 and D2	65 to 75 Volts D-C/Inch
D3 and D4	25 to 35 Volts D-C/Inch
Deflection Factor Uniformity	5% Max.
Useful Scan	
D1D2	4 Inches
D3D4	3-1/2 Inches
Spot Position (Undelected and focused)	25 mm. square

CIRCUIT DESIGN VALUES

Focusing Voltage	Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-50 to +10 Microamperes
Grid No. 1 Voltage	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	Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting-Electrode Circuit	5 Max. Megohms



NOTE:
+ ID2 TOWARDS PIN NO.10



ELECTRONIC TUBE CORPORATION

PHILADELPHIA, PA.

TITLE

5CTP TUBE OUTLINE DRAWING

TOLERANCES

DEC.

FRAC.

$\pm \frac{1}{8}$

ANG.

ENG.

DATE 11-26-54

APP.

DR. W. ZIEGLER

SCALE $\frac{1}{4} = 1$ "

DRAWING NO.

CKD. H. Warren

REV REDRAWN-1986
WAS52REP

A-2358

5DNP- CATHODE RAY TUBE

The E.T.C. 5DNP- is a five inch diameter, flat face, single gun electrostatic deflection and focus cathode-ray tube. The tube features a post-accelerator and is designed to operate at high voltages with a resultant high brightness and small spot size. The deflection plate leads and Anode connections are brought out through the neck of the tube to minimize lead inductance and capacitance. The gun is designed to draw negligible focusing electrode current.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage 6.3 $\pm$ 10% Volts
Heater Current .6 $\pm$ 10% Amperes

Focusing Method Electrostatic
Deflecting Method Electrostatic

Phosphor	No. 1	No. 2	No. 7	No. 11	No. 19 (Note 1)
Fluorescence	Green	Green	Blue	Blue	Yellow-Orange
Phosphorescence	- - -	Green	Yellow	- - -	- - -
Persistence	Medium	Long	Long	Short	Medium-Long

Direct Interelectrode Capacitances	Max.
Grid #1 to all other electrodes	7.9 uuf
Cathode to all other electrodes	5.8 uuf
D1 to D2	3.1 uuf
D3 to D4	1.3 uuf
D1 to all	5.1 uuf
D2 to all	5.1 uuf
D3 to all	4.0 uuf
D4 to all	4.0 uuf

Mechanical Data

Overall Length	16-3/4 $\pm$ 3/16 Inches
Greatest Bulb Diameter	5-1/4 $\pm$ 3/32 Inches
Minimum Useful Screen Diameter	4-1/2 Inches
Bulb Contacts	J1-25
Bulb Contact	J1-22
Base	BI2-37
Basing	14Q

Base Alignment

D3D4 trace aligns with Pin #2 and Tube Axis $\pm$ 10 Degrees
Positive voltage on D1 deflects the beam approx. towards Pin #5
Positive voltage on D3 deflects the beam approx. towards Pin #2

Bulb Contact Alignment

J1-22 contact aligns with ID2 trace $\pm$ 10 Degrees

J1-22 contact on same side as No. Pin 5

Trace Alignment

Angle between D1D2 and D3D4 trace 90 $\pm$ 1 Degrees

5DNF - CATHODE RAY TUBEMAXIMUM RATINGS - Design Center Values

Post-Accelerator Voltage	16,000 Max. Volts D-C
Accelerator Voltage	8,000 Max. Volts D-C
Ratio-Post-Accelerator Voltage to Accelerator Voltage (Note 2)	2.0 Max.
Focusing Voltage	1,750 Max. Volts D-C
Grid #1 Voltage	
Negative Bias Value	200 Max. Volts D-C
Positive Bias Value	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts D-C
Peak Heater to Cathode Voltage	
Heater Negative with respect to Cathode	180 Max. Volts
Heater Positive with respect to Cathode	180 Max. Volts
Peak Voltage between Accelerator and any Deflection Electrode	750 Max. Volts

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	10,000	Volts D-C
For Accelerator Voltage of	5,000	Volts D-C
Focusing Voltage	1250 to 1550	Volts D-C
Grid #1 Voltage (Note 3)	-53 to -87	Volts D-C
Modulation Factor (Note 4) (For P19)	18	Volts Max.
Line Width A (Note 5)	.3	MM
Line Width B (Note 5)	.35	MM
Deflection Factors		
D1 and D2	135 to 165	Volts D-C/Inch
D3 and D4	100 to 125	Volts D-C/Inch
Deflection Factor Uniformity (Note 6)	2%	Max.
Spot Position (Note 7) within 5/16 Inch Square Useful Scan		
1D2	4-1/2	Inches Min.
3D4	4-1/2	Inches Min.

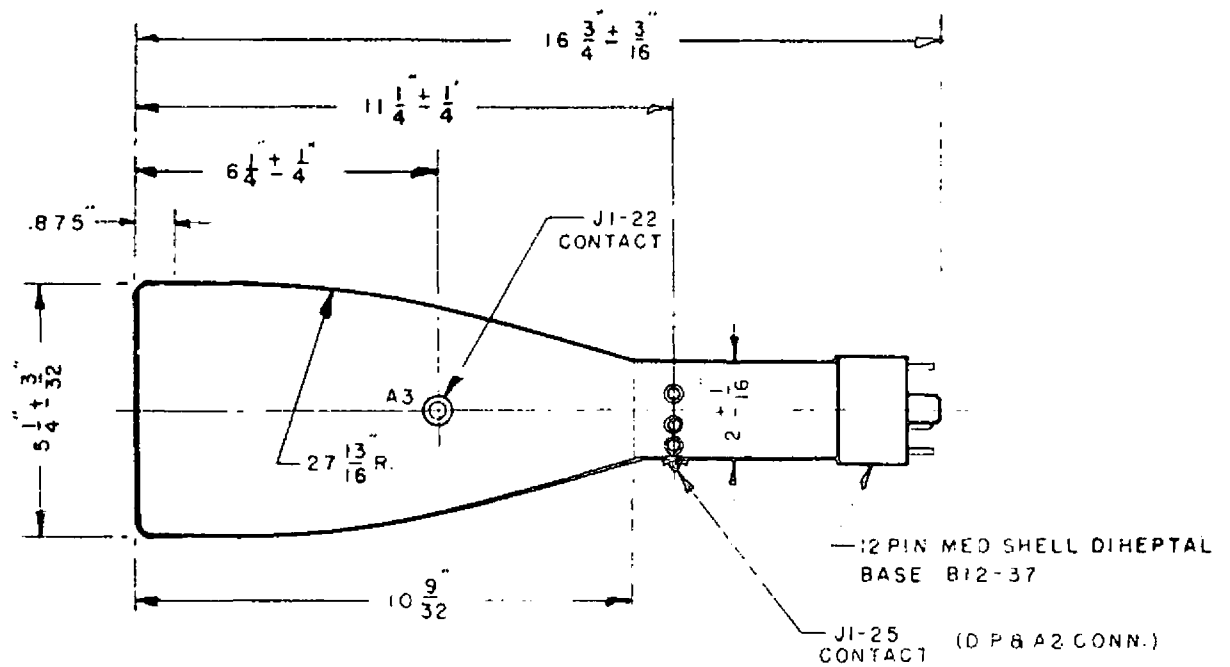
CIRCUIT DESIGN VALUES

Focusing Current for any operating condition	-15 to +10 Microamperes
Grid #1 Circuit Resistance	1.5 Max. Megohms
Resistance in any deflecting-electrode circuit (Note 8)	1 Megohms

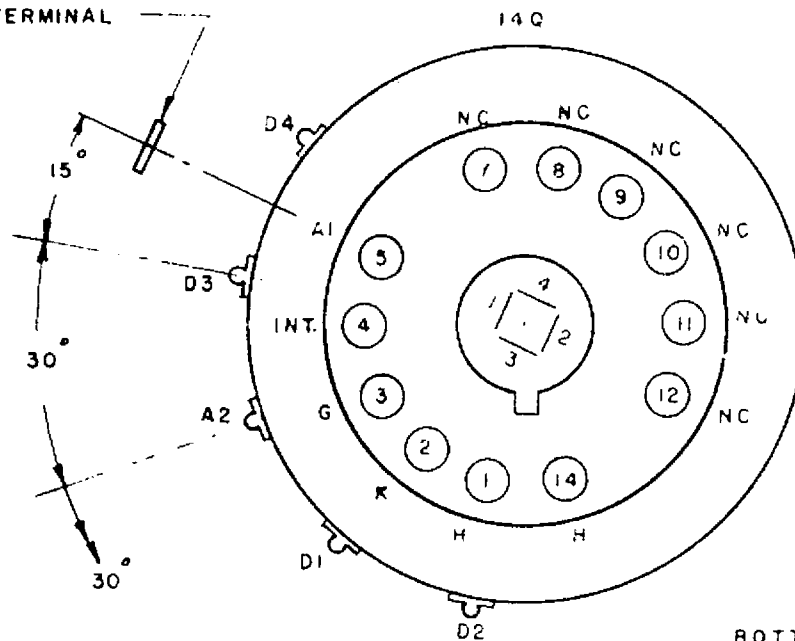
NOTES:

- 1 - The tube can be severely and permanently damaged if the current density on the P19 is allowed to rise too high in static tests. For this reason, the length of time during which the screen is bombarded should be kept as short as possible and I_{b3} limited to 5 uA max.
2. This tube is designed for optimum performances when operating at an E_{b3}/E_{b2} ratio of 2.0. Operation at other ratios may result in changes in deflection uniformity, pattern distortion and useful scan.
3. Visual extinction of undeflected, focused spot.

- 4 - The increase in Grid Voltage from cutoff to produce an I_{b3} of 5 uAdc for P19 screen.
- 5 - Measured in accordance with MIL-E-1 specifications using an I_{b3} of 2 uAdc for P19 screen.
- 6 - The deflection (for both D1D2 and D3D4 plate pairs separately) for a deflection of less than 75% of the useful scan will not differ from the deflection factor for a deflection at 25% of the useful scan by more than the indicated value.
- 7 - Centered with respect to the tube face with the tube shielded.
- 8 - It is recommended that the deflecting electrode circuit resistance be approximately equal. Higher resistance values up to five megohms may be used for low current operation.



A3 SNAP TERMINAL



BOTTOM VIEW OF BASE
AND NECK CONNECTIONS

NOTE:

1. + ID2 PIN 5
2. GRID NO.2 AND ANODE NO.2 ARE CONN. INTERNALLY
AND REFERRED TO AS A2



ELECTRONIC TUBE CORPORATION

PHILADELPHIA, PA.

TITLE

5DNP TUBE OUTLINE DRAWING

TOLERANCES

DEC.

FRACTION

ANG.

ENG.

DATE 1-27-61

APP.

REV.

DR. H. WARREN

SCALE 1/4" = 1"

DRAWING NO.

CKD.

H. Warren

REV. WAS 51TCP

A-3648



CATHODE RAY TUBE

6FP-

The ETC type 6FP is a 4.5 x 5.5 inch rectangular, electrostatic deflection and focus mono-accelerator cathode-ray tube.

The mono-accelerator feature of the 6FP- assures considerable improvement in general performance without sacrificing spot size, light output, or sensitivity.

For minimizing variation in focus with accelerator voltage variations, a low-voltage electrostatic focus lens is employed which requires only a small fraction of the accelerator voltage for focusing.

Deflection plates, the deflection plate leads are brought out through the neck of the tube.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% 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	Max.
------------------------------------	------

Cathode to all other electrodes	4.5 uuf
Grid No. 1 to all other electrodes	4.5 uuf
D1 to D2	3.5 uuf
D3 to D4	1.7 uuf
D1 to A11	5.0 uuf
D2 to all	5.0 uuf
D3 to all	3.0 uuf
D4 to all	3.0 uuf

Mechanical Data

Overall Length	15-3/4 ± 1/4 Inches
Greatest Bulb Diameter	4-1/2 x 5-1/2 ± 1/16 In.
Minimum Useful Screen (Along Tube Axis)	3-3/4 x 4-3/4 Inches
Neck Contacts	Pins
Base (Medium Shell Diheptal 12 Pin)	D-12-37
Basing	Special

CATHODE RAY TUBE

6FP--

Mechanical Data

Base Alignment

D3D4 trace aligns with Index Key and Tube Axis ± 10 Degrees
Positive voltage on D1 deflects the beam approximately towards Pin No.4
Positive voltage on D3 deflects the beam approximately towards Pin No.1

Trace Alignment - Side Walls

Angle between D3D4 and D1D2 trace $90^\circ \pm 1$ Degrees

MAXIMUM RATINGS Design Center Values

Accelerator Voltage (Note 1)	3500 Max. Volts D-C
Focusing Voltage	1500 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	900 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

For Accelerator Voltage of	2500 Volts D-C
Focusing Voltage	0 to 300 Volts D-C
Grid No. 1 Voltage (Note 2)	-34 to -56 Volts D-C
Modulation Factor (Note 3)	40 Volts Max.
Line Width A (Note 3)	.030 Inches Max.
P1 Light Output (Note 3)	15 Ft. L. Min.
Deflection Factors	
D1 and D2	48 to 60 Volts D-C/Inch
D3 and D4	32 to 42 Volts D-C/Inch
Deflection Factor Uniformity (Note 4)	1% Max.
Useful Scan	
D1D2	4-3/4 Inches
D3D4	3-3/4 Inches
Spot Position (Undelected and focused)	Within 1/4" Radius Circle

CIRCUIT DESIGN VALUES

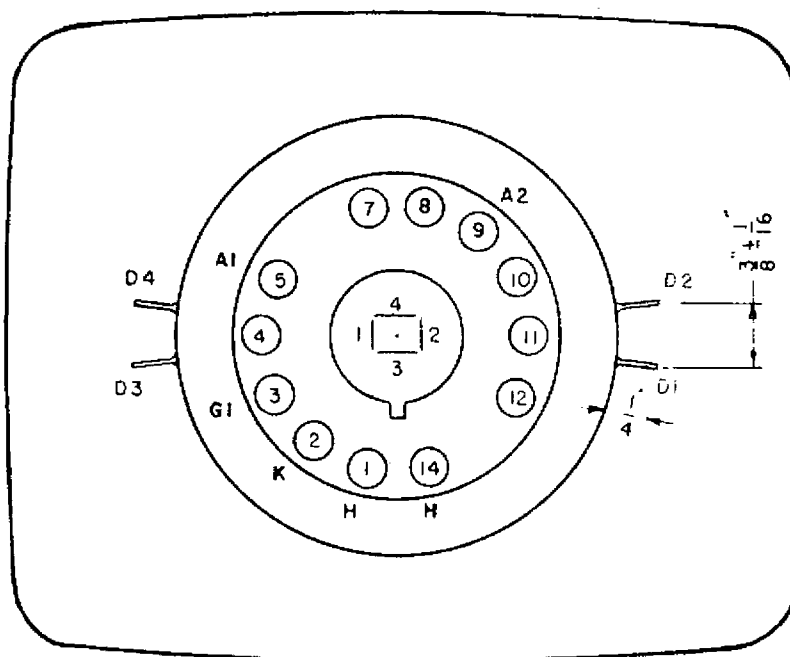
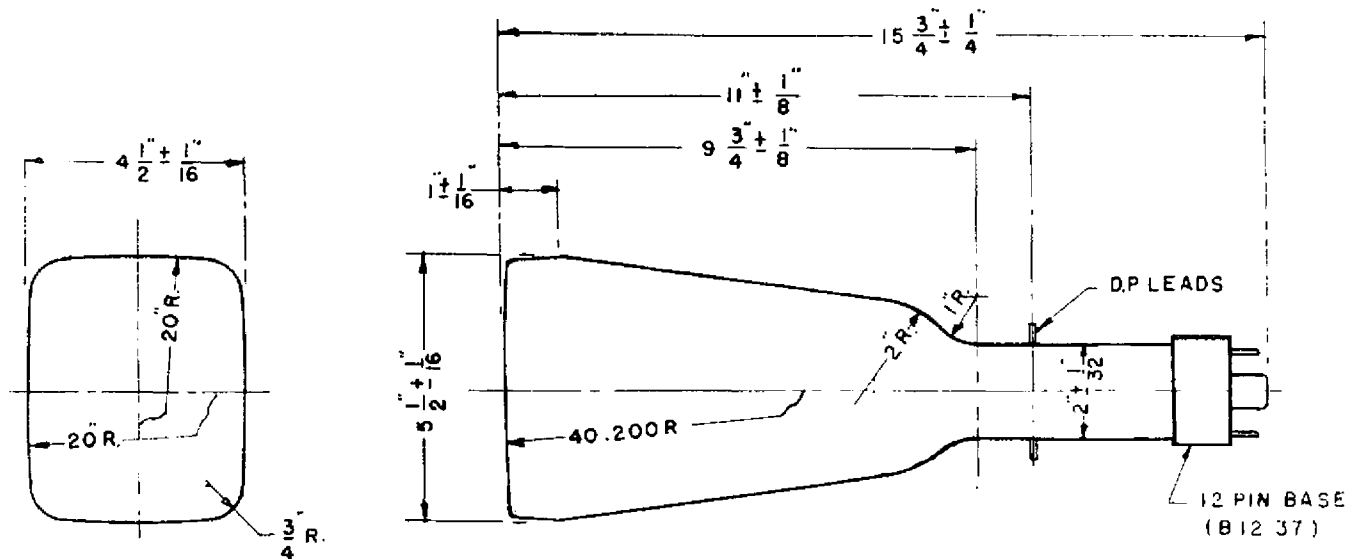
Focusing Current for any operating condition	-15 to ± 15 Microamperes D.C.
Grid No. 1 Voltage	-13/6 to -22.4 Volts per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Deflection Factors:	
D1 and D2	19.4 to 24.0 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	12.8 to 16.8 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting-Electrode Circuit (Note 5)	1 Max. Megohms

CATHODE RAY TUBE

6FP-1000

NOTES

1. The product of accelerator voltage and average accelerator current should be limited to 6 watts.
2. Visual extinction of undeflected focused spot.
3. Measured in accordance with MIL-E-1B Specifications
4. The deflection factor (for both D1D2 and D3D4 plate pairs, separately) for any deflection of less than 75% of the useful scan will not differ from the deflection factor for a deflection at 25% of the useful scan by more than indicated value.
5. It is recommended that the deflecting electrode circuit resistance be approximately equal.
6. An adjustable D-C potential between the accelerator and deflection plates may be used to secure best overall focus.



NOTE:
†102 TOWARDS PIN 4

BOTTOM VIEW OF BASE AND
NECK CONNECTIONS.



ELECTRONIC TUBE CORPORATION

PHILADELPHIA, PA.

TITLE

6FP TUBE OUTLINE DRAWING

TOLERANCES DEC. FRAC. AS NOTED ANG.

ENG.

DATE 3-5-58.

APP.

G. Roman

DR. H. WARREN

SCALE 1/8" = 1"

DRAWING NO.

CKD. *H. Warren*

REV. WAS 61DRP

A-3340



CATHODE-RAY TUBE

6GP

The ETC type 6GP is a 4.5 x 5.5 inch rectangular, two beam, electrostatic deflection and focus mono-accelerator cathode-ray tube. The two guns are independent of each other with the exception of the accelerators and pattern adjustment electrodes.

The mono-accelerator feature of this tube assures considerable improvement in general performance without sacrificing spot size, light output, or sensitivity.

For minimizing variation in focus with accelerator voltage variations, a low-voltage electrostatic focus lens is employed which requires only a small fraction of the accelerator voltage for focusing.

The deflection plates and pattern adjustment electrode connections for each gun are brought through the bulb wall in order to minimize lead inductance and capacitance. Astigmatism electrode connection is brought out through the base.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 Volts
Heater Current	0.6 $\pm$ 10% 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

Cathode to all other electrodes	4.8 uuf
Grid No. 1 to all other electrodes	4.5 uuf
D1 to D2	2.8 uuf
D3 to D4	1.9 uuf
D1 to all	7.0 uuf
D2 to all	7.0 uuf
D3 to all	6.5 uuf
D4 to all	6.5 uuf

Mechanical Data

Overall Length	18-1/4 $\pm$ 1/4 Inches
Greatest Bulb Dimension	4-1/2x5-1/2 $\pm$ 1/16 Inches
Minimum Useful Screen Dimension	3-3/4x4-3/4 Inches
Neck Contacts	Pins
Base (Medium Shell Diheptal 12 Pin)	D12-37
Basing	Special

6GP - CATHODE RAY TUBE

Base Alignment	
D3D4 Trace aligns with Index Key	± 10 Degrees
Tube Axis	
Positive voltage on D1 deflects the beam approximately towards Pin No. 4	
Positive voltage on D3 deflects the beam approximately toward Base Key	
Trace Alignment - Side Wall	2 Degrees
Angle between D3D4 and D1D2 trace	90 ± 1 Degrees
Alignment Corresponding Traces	$\pm 2^{\circ}$ Degrees

MAXIMUM RATINGS Design Center Values

Accelerator Voltage (Note 1)	3500 Maximum Volts DC
Focusing Voltage	1500 Max. Volts DC
Grid No. 1 Voltage	
Negative Bias Value	200 Max. Volts DC
Positive Bias Value	0 Max. Volts DC
Positive Peak Value	0 Max. Volts DC
Peak Heater to Cathode Voltage	
Heater Negative with respect to Cathode	180 Max. Volts DC
Heater Positive with respect to Cathode	180 Max. Volts DC
Peak Voltage between Accelerator and any Deflection Electrode	900 Max. Volts DC
Peak Voltage between Accelerator and Pattern Adjustment Electrodes	500 Max. Volts DC

TYPICAL OPERATING CONDITIONS

Accelerator Voltage	2500 Volts DC
Astigmatism Electrode	2,350 - 2800 Volts DC
Pattern Electrode Voltage	
Wall	2,500 - 2800 Volts DC
Shield	2,500 - 2850 Volts DC
D1D2 Average D.C. Potential	2,500 - 2800 Volts DC
D3D4 Average D.C. Potential	2,500 - 2800 Volts DC
Focusing Voltage	0 to 400 Volts DC
Grid No. 1 Voltage (Note 2)	-34 to -56 Volts DC
Modulation Factor (Notes 3 and 4)	40 Volts Max. DC
Line Width A (Notes 3 and 4)	.030 Inches Max.
Pl Light Output (Notes 3 and 4)	15 Ft. Long Min.
Deflection Factors	
D1 and D2 (Note 4)	48 to 60 Volts D-C/Inch
D3 and D4 (Note 4)	27 to 35 Volts D-C/Inch
Useful Scan (Note 5)	
D1D2	4-3/4 Inches
D3D4	4-3/4 Inches
Spot Position (Undelected and focused) (Note 5) Within a 1/4" Radius Circle	

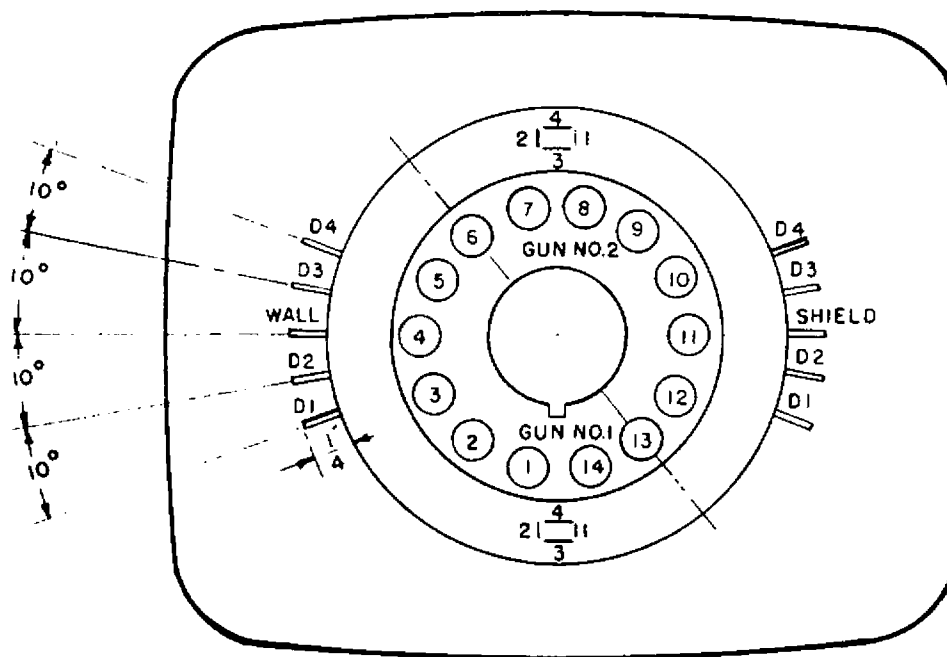
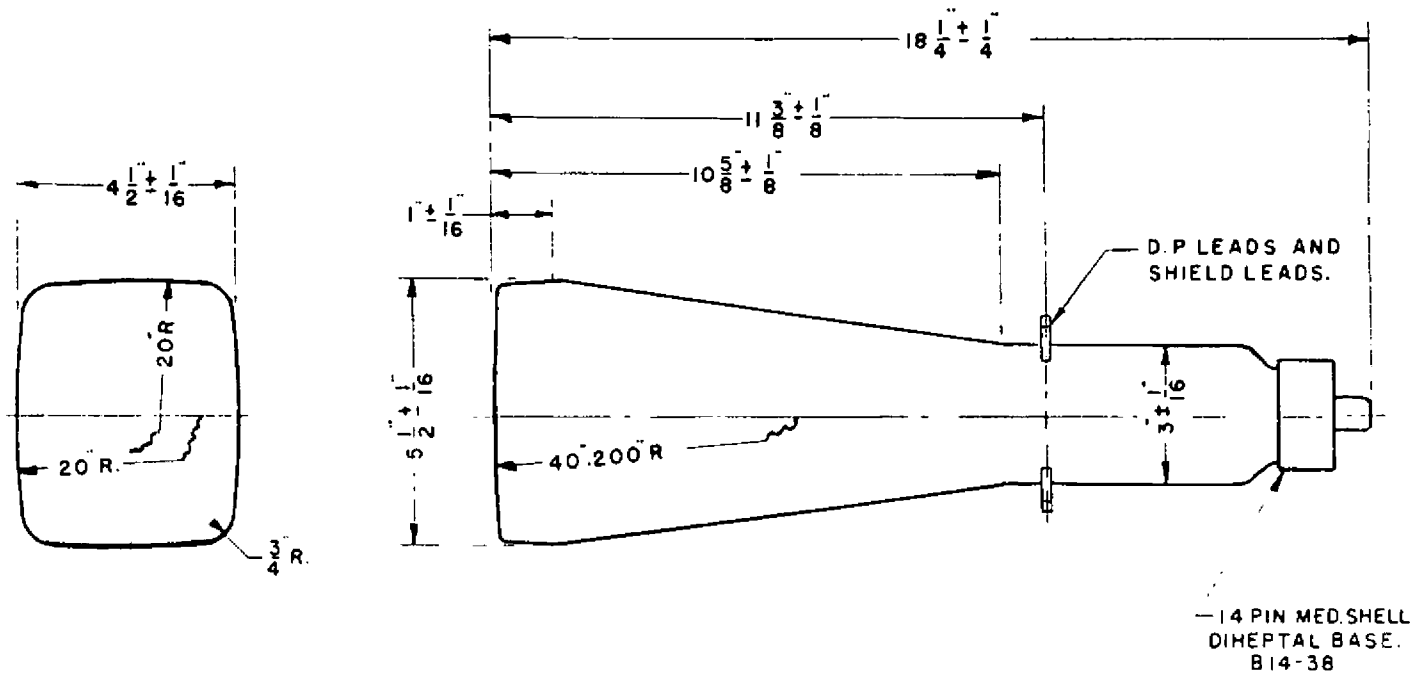
6GP - CATHODE-RAY TUBE

CIRCUIT DESIGN VALUES

Focusing Current for any operating condition -15 to +15 Microamperes
Grid No. 1 Voltage -13.6 to -22.4 Volts per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance 1.5 Max. Megohms
Deflection Factors
D1 and D2 19.4 to 24.0 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4 10.8 to 14.0 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting-Electrode Circuit (Note 6) 1 Max. Megohms

NOTES

- (1) The product of accelerator voltage and average accelerator current should be limited to 6 watts.
- (2) Visual extinction of undeflected focused spot.
- (3) Measured in accordance with MIL-E-1 Specifications
- (4) Values given are for balanced deflection voltages. These values are measured with accelerator, astigmatism control, and pattern adjustment electrodes connected together.
- (5) Centered with respect to the tube face and tube shielded.
- (6) It is recommended that the deflecting electrode circuit resistances be approximately equal.



GUN 1	
PIN NO.	ELEMENT
14	HEATER
1	HEATER
2	CATHODE
3	GRID
4	ANODE 1
5	ANODE 2
6	PRE-ACCEL. GUN 1 & 2
GUN 2	
7	HEATER
8	HEATER
9	CATHODE
10	GRID
11	ANODE 1
12	ANODE 2
13	NO CONN.

NOTE:
+ ID2 TOWARDS PIN 11

BOTTOM VIEW OF BASE AND
NECK CONNECTIONS.



ELECTRONIC TUBE CORPORATION

PHILADELPHIA, PA.

TITLE

6GP TUBE OUTLINE DRAWING

TOLERANCES DEC. FRAC. AS NOTED ANG.

ENG.	DATE 6-6-58.	APP. <i>[Signature]</i>
DR. H. WARREN	SCALE $\frac{1}{4}$ $\frac{3}{4}$	DRAWING NO.
CKD. <i>H. Warren</i>	REV. WAS 62DRP	A-3362

from JEDEC release
#2403, March 9, 1959



7AXP- CATHODE RAY TUBE

The ETC type 7AXP- is a 7" diagonal square face, four beam, electrostatic deflection and focus cathode-ray tube. Each beam is independently controllable.

The deflection and acceleration electrode connections are brought out through side wall to minimize lead capacity and improve insulation.

The four second anodes, the shield, and the first ring of the post-accelerator system are all brought out separately for special applications. The tube incorporates a special 22 pin collar ring for ease of connection.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 Volts
Heater Current	.6 $\pm 10\%$ 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	Max.
------------------------------------	------

Cathode to all other electrodes	5.6 uuf
Grid No. 1 to all other electrodes	5.8 uuf
D1 to D2	2.5 uuf
D3 to D4	2.8 uuf
D1 to A11	5.3 uuf
D2 to A11	5.3 uuf
D3 to A11	4.5 uuf
D4 to A11	4.5 uuf

Mechanical Data

Overall Length	18.5 $\pm$ 3/8 Inches
Greatest Bulb Diagonal	7-1/32 Inches
Minimum Useful Screen Width (Note 2)	4.5 Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Collar - 22 Pin	Special
Base - 25 Pin	Special
Basing	Special
Base Alignment	
D3D4 trace aligns with Index Key and Tube Axis	Degrees
Positive voltage on D1 deflects the beam approximately towards	
Pin No. 18	
Positive voltage on D3 deflects the beam approximately towards	
Index Key	

Bulb Contact Alignment	± 10 Degrees
J1-22 contact aligns with D3D4 trace	

7 AXP= CATHODE RAY TUBE

Page 2 of 3

Bulb Contact Alignment	
J1-22 contact on same side as Index Key	
Trace Alignment & Bulb Wall	2 Degrees
Angle between D ₃ D ₄ and D ₁ D ₂ trace	90 $\pm$ 1 Degrees
Corresponding traces align within	2 Degrees

MAXIMUM RATINGS Design Center Values

Post Accelerator Voltage	10,500 Max. Volts D-C
Accelerator Voltage (Note 3)	3,500 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 4)	3 Max.
Focusing Voltage	1,750 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
Focusing Voltage	470-670 Volts D-C
Grid No. 1 Voltage (Note 5)	-52 to -76 Volts D-C
Modulation Factor (Note 6)	55 Volts Max.
Line Width A (Note 7)	.26 Inches Max.
Deflection Factors	
D1 and D2	56 to 68 Volts D-C/Inch
D3 and D4	48 to 59 Volts D-C/Inch
Useful Scan	
D1D2	4.5 Inches
D3D4	4.5 Inches
Spot Position (Undelected and focused)	15 MM Square

CIRCUIT DESIGN VALUES

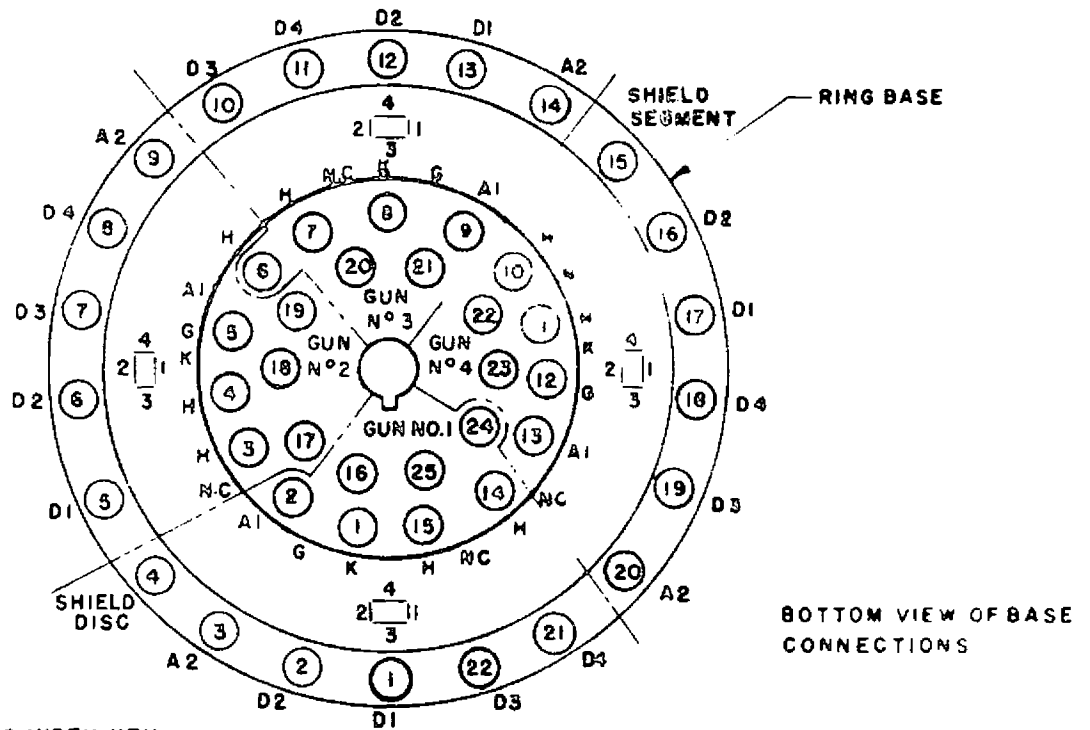
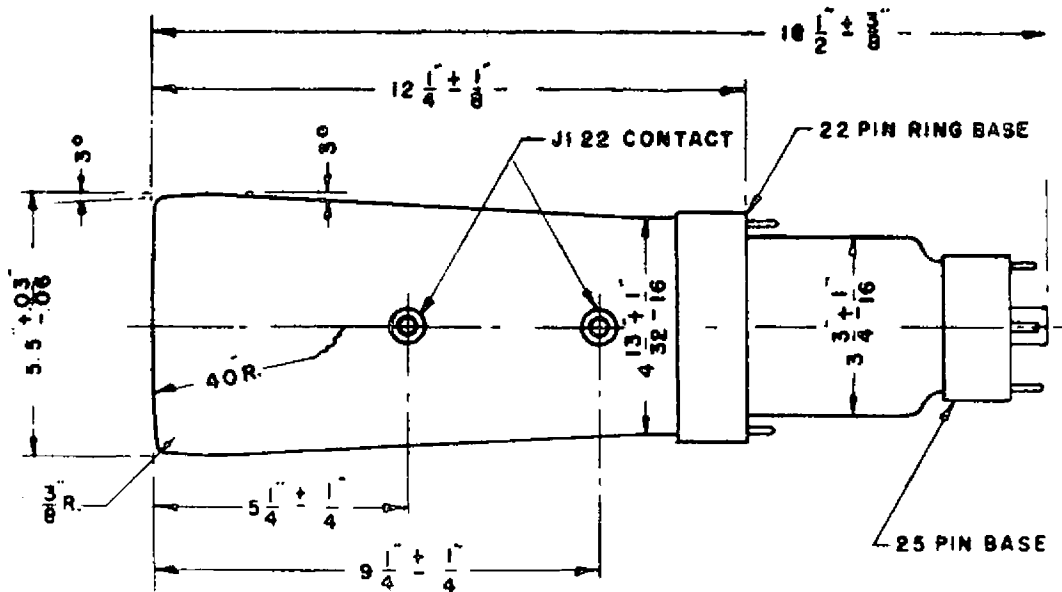
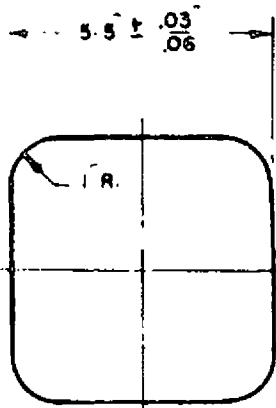
Focusing Voltage	214 to 356 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-15 to +15 Microamperes
Grid No. 1 Voltage (Note 5)	25.6 to 38.4 Volts per Kilovolt of Accelerator Voltage
	1.5 Max. Megohms
Grid No. 1 Circuit Resistance	
Deflection Factors:	
Post-Accelerator Voltage = Accelerator Voltage	
D1 and D2	27.9 to 31.0 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	23.1 to 23.8 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting-Electrode Circuit (Note 8)	1.0 Max. Megohms

7AXP- CATHODE RAY TUBE

- NOTES -

Page 3 of 3

- 1- Values are for each unit unless otherwise stated.
- 2- Following the Bulb contour
- 3- Accelerator power input (AVG) should be limited to 6 watts.
- 4- This tube is designed for optimum performance when operating at an E_{b3}/E_{b2} ratio of 2.0. Operation at other ratios of E_{b3}/E_{b2} may result in changes in deflection uniformity and pattern distortion.
- 5- Visual extinction of the undeflected, focused spot.
- 6- The increase in Grid No. 1 voltage from cutoff to produce an I_{b3} of 50 μ ADC.
- 7- Measured in accordance with MIL-E-1B specification using an I_{b3} of 25 μ ADC.
- 8- It is recommended that deflecting electrode circuit resistance be approximately equal.



NOTE:
+3 D4 TOWARDS INDEX KEY



ELECTRONIC TUBE CORPORATION

PHILADELPHIA, PA.

TITLE

7AXP TUBE OUTLINE DRAWING

TOLERANCES

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DATE 6-9-58

APP

1 K. S. R. A. N.

DR. H. WARREN

SCALE 1/4" = 1"

DRAWING NO.

CKD.

H. Warren

REV. WAS 74DRP

A-3363

7BJP2 CATHODE RAY TUBE

The ETC Type 7BJP2 is a 7" diagonal square face, five beam electrostatic deflection and focus cathode ray tube. Each beam is independently controllable, utilizes limited available scan with increased deflection sensitivity in the D3D4 direction and is so positioned that they scan separate areas of the screen. The deflection electrode and acceleration electrode connections are brought out through the bulb wall to minimize lead inductance and capacity and to improve insulation. A collar or ring base provides ease of connection to these leads.

GENERAL CHARACTERISTICSElectrical Data

Heater Voltage	6.3 Volts			
Heater Current	0.3 $\pm$ 10% Amperes			
Focusing Method	Electrostatic			
Deflecting Method	Electrostatic			
Phosphor	P1	P2	P7	P11
Fluorescence	Green	Green	Blue	Blue
Phosphorescence	Green	Green	Yellow	Blue
Persistence	Medium	Long	Long	Short
Direct Interelectrode Capacitances	Max.			
Cathode to all other electrodes	4.9	6.5 uuf		
Grid #1 to all other electrodes	4.8	7.0 uuf		
D1 to D2		2.7 uuf		
D3 to D4		3.2 uuf		
D1 to all other electrodes except D2		8.1 uuf		
D2 to all other electrodes except D1		8.0 uuf		
D3 to all other electrodes except D4		7.8 uuf		
D4 to all other electrodes except D3		7.8 uuf		

Mechanical Data

Overall Length	18-1/2 $\pm$ 3/8 Inches
Greatest Bulb Diameter	7-1/32 Inches
Minimum Useful Screen Diameter	4.5 Inches
Bulb Contact	J1-22
Base	Special
Base Alignment	
D3D4 trace aligns with Pin #8 and tube axis	$\pm$ 10 Degrees
Positive voltage on D1 deflects the beam approx. towards Pin #5	
Positive voltage on D3 deflects the beam approx. towards Pin #1	
Bulb Contact Alignment	
J1-22 contact aligns with D3D4 trace	$\pm$ 10 Degrees
J1-22 contact on same side as Pin #1	
Trace Alignment	
Angle between D3D4 and D1D2 trace	90 $\pm$ 2 Degrees

MAXIMUM RATINGS Design Center Values

Post-Accelerator Voltage	7700 Max. Volts D=C
Accelerator Voltage (Note 1)	3850 Max. Volts D=C

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7BJP2 CATHODE RAY TUBE

MAXIMUM RATINGS (CONT'D)

Ratio Post-Accelerator Voltage to Accelerator Voltage	2.0 Max.
Focusing Voltage	1650 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	1250 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	4000 Volts D-C
Accelerator Voltage of	2000 Volts D-C
Focusing Voltage	450 to 650 Volts D-C
Grid #1 Voltage (Note 2)	-50 to -90 Volts D-C
Modulation Factor (Note 3)	55 Volts D-C
Line Width "A" (Note 4)	.65 mm
Deflection Factors	
D1 and D2	68 to 84 Volts D-C/Inch
D3 and D4 (Note 8)	27 to 37 Volts D-C/Inch
Deflection Factor Uniformity (Note 5)	2% Maximum
Useful Scan (Note 6)	
D1D2	4.5 Inches
D3D4	1.5 Inches
Interaction Factor	.00001 Max. Inches/Volts D-C

CIRCUIT DESIGN VALUES

Focusing Voltage	225 to 350 Volts per KV of Accelerator Voltage
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid #1 Voltage (Note 2)	-25 to -45 Volts per KV of Accelerator Voltage
Deflection Factors:	
Post-Accelerator Voltage = Accelerator Voltage	
D1 and D2	25 to 37.5 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	11.5 to 19 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting-Electrode Circuit (Note 7)	1.0 Max. Megohms

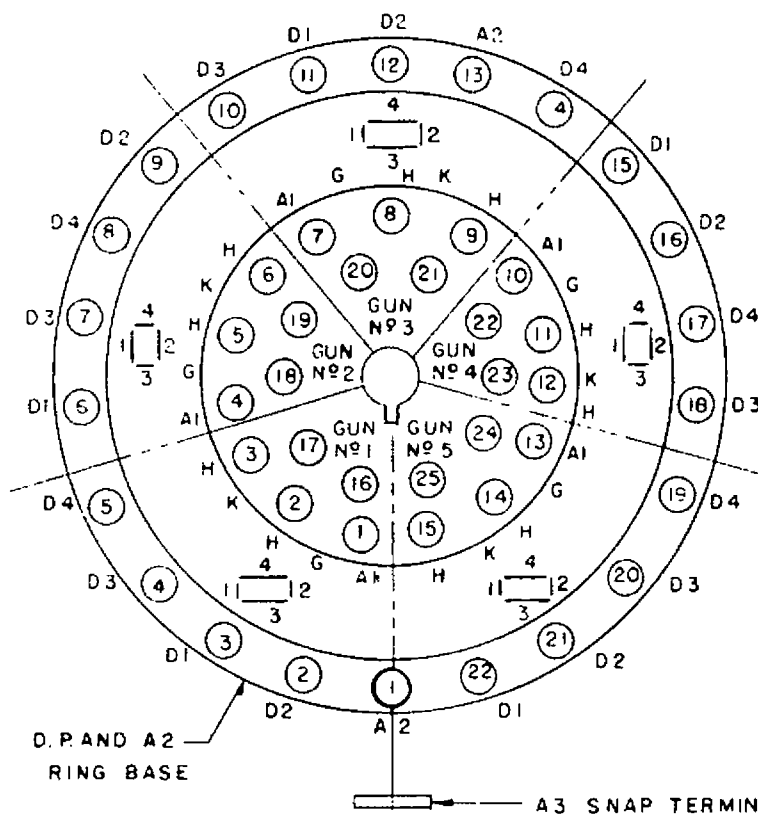
7BJ NOTES:

- 1 - Accelerator Power Input (Avg.) should be limited to 6 watts.
- 2 - Visual extinction of the undeflected, focused spot.
- 3 - Increase in Grid Voltage from cutoff to produce an Ib3 of 50 uAdc.
- 4 - Measured in accordance with JAN-1A Specifications dated 29 May, 1949 with an Ib3 of 25 uAdc.
- 5 - The deflection factor (for both D1D2 and D3D4 plate pairs, separately) for deflections of less than 75% of the useful scan will not differ from the deflection factor for a deflection of 25% of the useful scan by more than the indicated value.
- 6 - Centered about normal undeflected spot position.
- 7 - It is recommended that the deflecting electrode circuit resistances be approximately equal, otherwise beam shift at high drives can be expected - Higher

7BJP2 CATHODE RAY TUBE

7BJP2 NOTES (CONT'D):

- 7 - resistance values up to five megohms may be used for low beam current operation.
- 8 - The Deflection in the direction is limited to $\pm .75$ inches minimum from the undeflected spot position.



PHILADELPHIA, PA.

A-3797

7BMP- CATHODE RAY TUBE

The E.T.C. 7BMP- is a 7-inch rectangular faced, single gun electrostatic deflection and focus cathode ray tube. The tube utilizes a post-accelerator and has been designed for high voltage operation with a resultant high brightness and small spot size. This tube has also been designed to minimum edge defocusing. The deflection plate leads and anode connections are brought out through the neck of the tube to minimize lead inductance and capacitance. The gun is designed to draw negligible focusing electrode current.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 $\pm$ 10% Volts				
Heater Current	0.6 $\pm$ 10% Amperes				
Focusing Method	Electrostatic				
Deflecting Method	Electrostatic				
Phosphor	No. 1	No. 2	No. 7	No. 11	No. 19 (Note 1)
Fluorescence	Green	Green	Blue	Blue	Yellow-Orange
Phosphorescence	-----	Green	Yellow	-----	-----
Persistence	Medium	Long	Long	Short	Medium Long
Direct Interelectrode Capacitances	Max.				
Cathode to all other electrodes	5.00 uuf				
Grid #1 to all other electrodes	6.00 uuf				
D1 to D2	4.00 uuf				
D3 to D4	1.6 uuf				
D1 to all	9.00 uuf				
D2 to all	9.00 uuf				
D3 to all	4.00 uuf				
D4 to all	4.00 uuf				

Mechanical Data

Overall Length	17 $\pm$ 3/8 Inches
Greatest Bulb Diameter	6-5/8 $\pm$ 1/16 Inches
Minimum Useful Screen	3-1/4 x 5-1/4 Inches
Bulb Contacts	
Bulb Contact	J1-25
Base	J1-22
Basing	B12-37

Base Alignment

D3D4 trace aligns approx. with Pin #2 $\pm$ 10 Degrees
 Positive voltage on D1 deflects the beam approx. towards Pin No. 5
 Positive voltage on D3 deflects the beam approx. towards Pin No. 2

Bulb Contact Alignment

J1-22 contact aligns with D2 trace $\pm$ 10 Degrees
 J1-22 contact on same side as No. 5

Trace Alignment

Angle between D1D2 and D3D4 trace 90 $\pm$ 1 Degrees
 D1D2 trace aligns with bulb wall 1 Degrees

MAXIMUM RATINGS - Design Center Values

Post-Accelerator Voltage	16,000 Max. Volts D-C
Accelerator Voltage	8,000 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 2)	2 Max.
Focusing Voltage	1750 Max. Volts D-C
Grid #1 Voltage	
Negative Bias Value	200 Max. Volts D-C
Positive Bias Value	0 Max. Volts D-C
Positive Peak Value	2 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

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage	10000 Volts D-C
For Accelerator Voltage	5000 Volts D-C
Focusing Voltage	1000 to 1400 Volts D-C
Grid #1 Voltage (Note 3)	-53 to -87 Volts D-C
Modulation Factor (Note 4)	45 Volts Max.
Line Width A (Note 5)	For P19 .30 .40 MM
Deflection Factors	
D1 and D2	125 to 150 Volts D-C/Inch
D3 and D4	100 to 125 Volts D-C/Inch
Deflection Factor Uniformity (Note 6)	1-1/2% Max.
Spot Position (Note 7) within 3/8 Inch Square Useful Scan	
1D2	5-1/4 Inches Min.
3D4	3-1/4 Inches Min.

CIRCUIT DESIGN VALUES

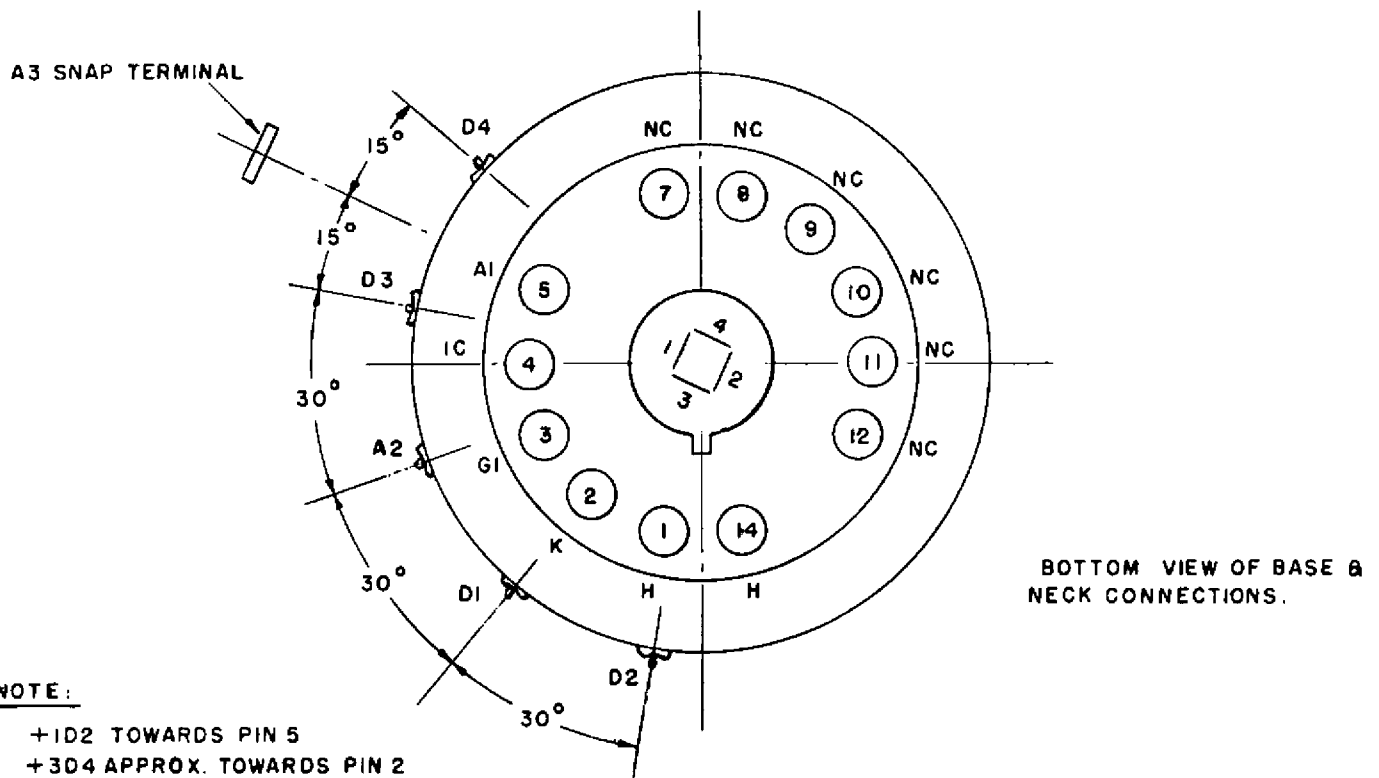
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid #1 Circuit Resistance	1.5 Max. Megohms
Resistance in any deflecting Electrode Circuit (Note 8)	1 Megohms

NOTES:

- 1 - The tube can be severely and permanently damaged if the current density on the P19 screen is allowed to raise too high in static tests. For this reason, the length of time during which the screen is bombarded should be kept as short as possible and within the specified current limits.
- 2 - The tube is designed for optimum performances when operating at an E_{b3}/E_{b2} ratio of 2.0. Operation at other ratios may result in changes in deflection uniformity, pattern distortion and useful scan.

NOTES (CONT'D)

- 3 - Visual extinction of undeflected focus spot.
- 4 - The increase in grid voltage from cutoff to produce an I_{b3} of 25 uAdc for a Pl9 screen the I_{b3} should be limited to 5 uA Max.
- 5 - Measured in accordance with MIL-E-1 specifications using an I_{b3} of 25 uAdc. Pl9 screen an I_{b3} of 2 uAdc.
- 6 - The deflection (for both D1D2 and D3D4 plate pairs separately) for a deflection of less than 75% of the useful scan will not differ from the deflection factor for a deflection at 25% of the useful scan by more than the indicated value.
- 7 - Centered with respect to the tube face with the tube shielded.
- 8 - It is recommended that the deflection electrode circuit resistance be approximately equal. Higher resistance values up to five megohms may be used for low current operation.



PHILADELPHIA, PA.

TITLE

TOLERANCES

DEC.

FRAC.

ANG.

ENG.

DATE 3-13-61

APP.

DR. J. E. G. JR.

SCALE 1/4"-FULL

DRAWING NO.

CKD.

REV. WAS - 7ITCP

A 3651



7XP- CATHODE RAY TUBE

The ETC Type 7XP is a seven inch diameter, five gun, electrostatic focus and deflection cathode ray tube. Each gun is independently controllable and scans the whole screen area. The deflection electrodes are electrostatically shielded to minimize interaction and the deflection leads are brought out through the bulb wall to minimize lead inductance and capacity and to improve insulation. A ring base provides ease of connection to the leads.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 Volts			
Heater Current	.6 $\pm$ 10% Amperes			
Focusing Method	Electrostatic			
Deflecting Method	Electrostatic			
Phosphor	P1	P2	P7	P11
Fluorescence	Green	Green	Blue	Blue
Phosphorescence	Green	Green	Yellow	Blue
Persistence	Medium	Long	Long	Short

Direct Interelectrode Capacitances, maximum

Cathode to all other electrodes	6.0 uuf
Grid No. 1 to all other electrodes	6.0 uuf
D1 to D2	3.0 uuf
D3 to D4	3.0 uuf
D1 to all	4.0 uuf
D3 to all	4.0 uuf
D1 to all other electrodes except D2	2.0 uuf
D2 to all other electrodes except D1	2.0 uuf
D3 to all other electrodes except D4	2.0 uuf
D4 to all other electrodes except D3	2.0 uuf

Mechanical Data

Overall Length	18 5/8 $\pm$ 3/8 Inches
Greatest Bulb Diameter	7.000 $\pm$.078 Inches
Minimum Useful Screen Diameter	6 Inches
Bulb Contact	J1-22
Collar (22 pin)	Special
Base (25 pin)	Special
Basing	Special
Base Alignment	
D1D2 trace aligns with Pin No. 8 and tube axis $\pm$ 10 Degrees	
Positive voltage on D1 deflects the beam approximately towards Pin No. 8	

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052253

7XP- CATHODE RAY TUBE

Positive voltage on D3 deflects the beam approximately towards Pin No. 18.

Trace Alignment

Angle between D3D4 and D1D2 trace

90 $\pm$ 3 Degrees

MAXIMUM RATINGS Design Center Values

Post Accelerator Voltage	4400 Max. Volts D-C
Accelerator Voltage (Note 1)	2200 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 2)	2.0 Max.
Focusing Voltage	1100 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	825 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	4000 Volts D-C
For Accelerator Voltage of (Note 3)	2000 Volts D-C
Focusing Voltage	440 to 750 Volts D-C
Grid No. 1 Voltage (Note 4)	-22.5 to -67.5 Volts D-C
Modulation Factor (Note 5)	.45 Volts Max.
Line Width A (Note 6)	.028 Inches Max.
Line Width B (Note 6)	.032 Inches Max.
Deflection Factors	
D1 and D2	63 to 105 Volts D-C/Inch
D3 and D4	59 to 94 Volts D-C/Inch
Deflection Factor Uniformity (Note 7)	5% Max.
Spot Position (Undeflected and focused) (Note 8)	Within a 20 mm. square

CIRCUIT DESIGN VALUES

Focusing Voltage 220 to 375 Volts per Kilovolt of Accelerator Voltage



7XP- CATHODE RAY TUBE

Focusing Current for any operating condition -50 to +10 Microamperes
Grid No. 1 Voltage (Note 4) - 11 to -34 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 26 to 43 Volts D-C/Inch/KV of Accelerator Voltage

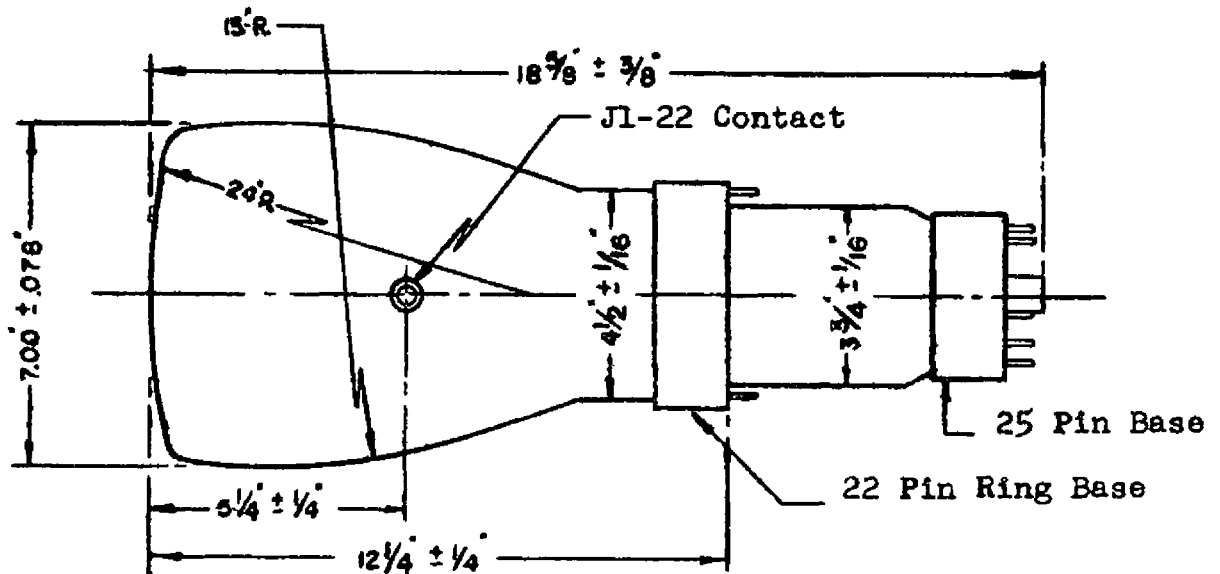
D3 and D4 24 to 39 Volts D-C/Inch/KV of Accelerator Voltage

Resistance in any Deflecting-Electrode Circuit (Note 9) 5 Max. Megohms

7XP NOTES

- 1 - Accelerator input power (average) should be limited to 6 watts.
- 2 - This tube is designed for optimum performance at a ratio of Eb3/Eb2 of 2. Operation at other ratios may result in an increased deflection non-uniformity and pattern distortion.
- 3 - Accelerator and grid #2 are connected internally.
- 4 - Visual extinction of undeflected, focused spot.
- 5 - The increase of grid #1 voltage from cutoff to an Ib3 of 25 uadc.
- 6 - Measured in accordance with the MIL-E-1B specifications dated 2 May 1952.
- 7 - The deflection factor (for both 1D2 and 3D4 plate pairs, separately) for deflections of less than 75% of the useful scan will not differ from the deflection factor for a deflection of 25% of the useful scan by more than the indicated value.
- 8 - Centered with respect to the tube face and with the tube shielded.
- 9 - Deflection electrode circuit resistance should be equal.

7XP- CATHODE RAY TUBE



NOTE:
#2 D1 - Index Key

