TYPE 5SP-A CATHODE-RAY TUBES

The Du Mont Type 5SP-A is a two-beam electrostatic focus and deflection cathode-ray tube. It is identical to the Du Mont Type 5SP- with the exception of having very closely controlled tolerances. Deflection factors are held to within 10%; angle alignment is held to within 1°; and grid cut-off bias is held to within 25%.

GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts
Heater Current	0.6 ±10% Ampere
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 (for each unit)	Min.	Max.
Cathode to all other electrodes	2.7	5.0 μμf.
Grid No. 1 to all other electrodes	3.5	6.5 μμf.
D1 to D2	1.0	2.0 μμf.
D3 to D4	1.1	2.2 μμf.
D1 to all other electrodes	2.2	4.7 μμf.
D2 to all other electrodes	2.2	4.7 μμf.
D3 to all other electrodes	2.5	5.1 μμf.
D4 to all other electrodes	2.5	5.1 μμf.

Mechanical

Overall Length	18¼ ±¼ Inches
Greatest Diameter of Bulb	5¼ ±3/32 Inches
Minimum Useful Screen Diameter	4½ Inches
Bulb Contacts (Recessed Small Ball Caps)	J1-22
Neck Contacts (Miniature Caps)	C1-2
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14K
Base Alignment: (for each unit)	
D3D4 trace aligns with Pin No. 4 and tube axis	±10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin No. 1	
Positive voltage on D3 deflects beam approximately toward Pin No. 11	
Angle between D3D4 and D1D2 traces	90 ±1 Degrees
Trace Alignment:	
Corresponding traces of each gun are within 1 degree of each other	
Bulb Contact Alignment:	
J1-22 contacts align with D3D4 trace	±10 Degrees
Contacts on same side as Pin No. 4	

MAXIMUM RATINGS—Design Center Values (Values are for each unit)

Post Accelerator Voltage	7,500 Max. Volts D-C
Accelerator Voltage[1]	2,500 Max. Volts D-C
Ratio Post Accelerator Voltage to Accelerator Voltage	3 Max.
Focusing Voltage	1,000 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
Peak Heater 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
Peak Voltage between Accelerator and any Deflection Electrode ..... 550 Max. Volts

TYPICAL OPERATING CONDITIONS (Values are for each unit)

For Post Accelerator Voltage of	3,000	4,000	Volts
For Accelerator Voltage of	1,500	2,000	Volts
Focusing Voltage	272 to 521	363 to 695	Volts
Grid No. 1 Voltage[2]	—34 to —56	—45 to —75	Volts
Modulation[3]	32		Volts Max.
Line Width A[3]	.027		Inch Max.
P1 Light Output[3]	10		Ft. L. Min.
Deflection Factors[4]			
D1 and D2	62 to 76	83 to 101	Volts D-C per Inch
D3 and D4	53 to 65	70 to 86	Volts D-C per Inch
Deflection Factor Uniformity[5]	2	2	% Max.
Pattern Distortion at 75% of Useful Scan[6] ..	2½	2½	% Max.

Tracking Error[7] ..... 2% Max.
Interaction Factor[8] ..... 14 x 10^{-6} Inch/Volt D-C Max.
Spot Position ..... Within a 5/16-inch radius circle[9]

CIRCUIT DESIGN VALUES

Focusing Voltage ..... 181 to 348 Volts/Kilovolt of Accelerator Voltage
Focusing Current for any operating condition ..... —50 to +10 Microamperes
Grid No. 1 Voltage[2] ..... —22.5 to —37.5 Volts/Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance ..... 1.5 Max. Megohms

Deflection Factors[4]:
Post Accelerator Voltage = Accelerator Voltage
D1 and D2 ..... 32.5 to 40.5 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4 ..... 28.5 to 35.5 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting Electrode Circuit[10] ..... 5 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. Ratio of deflection factors of corresponding sets of deflection plates (larger deflection factor) divided by lower deflection factor shall not exceed 1.15.
5. 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 the indicated value.
6. The edges of a raster pattern, whose mean dimensions are the indicated percentage of useful scan* shall not deviate from the mean dimension rectangle by more than the specified amount.
7. The positions of the spot of each beam, when deflected from the center by applied voltages proportional to the deflection factor, will not deviate from each other by more than the indicated percentage of deflection.
8. The deflection of one beam when balanced D-C voltages are applied to the deflection electrodes of the other beam will not be greater than the indicated value.
9. When the tube is operated at typical operating conditions (Eh = 6.3 V., Eb 3 = 3000 V., Eb2 = 1500 V., Eb1 at focus); Ecl adjusted to avoid damage to the screen; with each of the deflecting electrodes connected to the accelerator; and with the tube shielded against external influences, both spots will fall within a 5/16-inch radius circle centered on the tube face.
   Under stable operating conditions, the position of either spot will not shift with changes in intensity by more than .025-inch.
10. It is recommended that the deflecting electrode circuit resistances be approximately equal.

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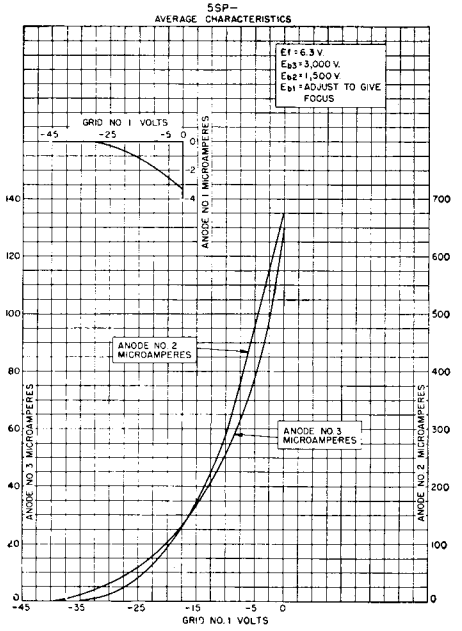
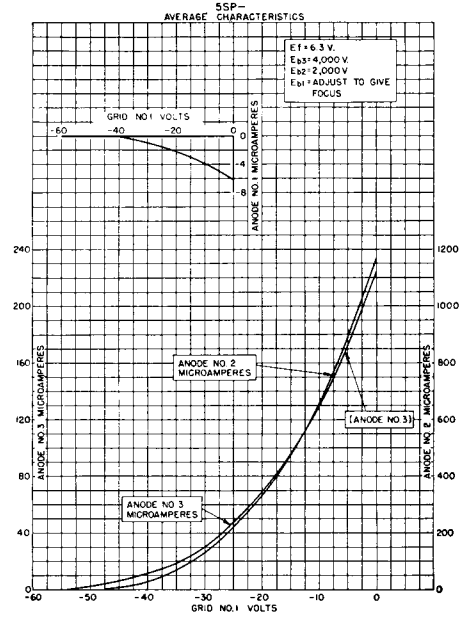
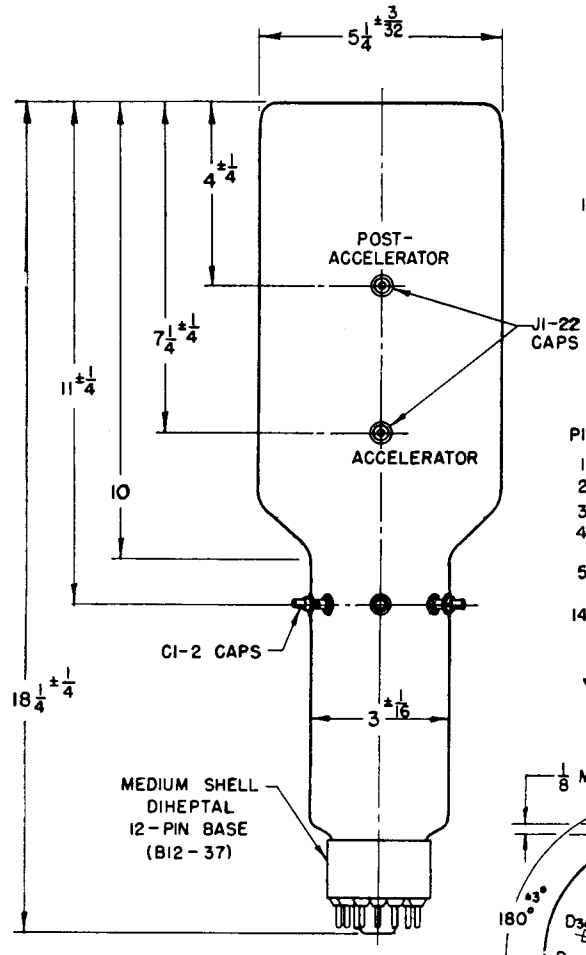
* Useful scan is equal to the useful screen diameter.


5SP–
AVERAGE CHARACTERISTICS
Ef = 6.3 V.
Eb3 = 3,000 V.
Eb2 = 1,500 V.
Eb1 = ADJUST TO GIVE FOCUS
GRID NO. 1 VOLTS
-45
-25
-5
0
0
-4
ANODE NO. 1 MICROAMPERES
ANODE NO. 2 MICROAMPERES
ANODE NO. 3 MICROAMPERES
ANODE NO. 3 MICROAMPERES
ANODE NO. 2 MICROAMPERES
0
20
40
60
80
100
120
140
0
100
200
300
400
500
600
700
-45
-35
-25
-15
-5
0
GRID NO. 1 VOLTS

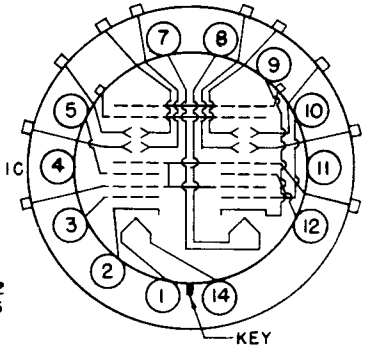

5SP–
AVERAGE CHARACTERISTICS
Ef = 6.3 V.
Eb3 = 4,000 V.
Eb2 = 2,000 V.
Eb1 = ADJUST TO GIVE FOCUS
GRID NO. 1 VOLTS
-60
-40
-20
0
0
-4
-8
ANODE NO. 1 MICROAMPERES
ANODE NO. 2 MICROAMPERES
(ANODE NO. 3)
ANODE NO. 3 MICROAMPERES
ANODE NO. 3 MICROAMPERES
ANODE NO. 2 MICROAMPERES
0
40
80
120
160
200
240
0
200
400
600
800
1000
1200
-60
-50
-40
-30
-20
-10
0
GRID NO. 1 VOLTS

TYPE 5SP-A



NOTE:
THE THREE ACCELERATOR CAPS MUST BE CONNECTED TOGETHER

14 K



UNIT "A"	UNIT "B"
PIN	PIN
1 – HEATER	7 – HEATER
2 – CATHODE	8 – HEATER
3 – GRID NO. 1	9 – CATHODE
4 – INTERNAL CONNECTION	10 – GRID NO. 1
5 – FOCUSING ELECTRODE	12 – FOCUSING ELECTRODE
14 – HEATER