

Cathode-ray Tubes

by **DU MONT**

DU MONT
INDUSTRIAL
CATHODE-RAY TUBES

Second Edition

INDUSTRIAL TUBE SALES DEPARTMENT
ALLEN B. DU MONT LABORATORIES, INC.
PASSAIC
NEW JERSEY

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Industrial Tube Sales Department

ALLEN B. DU MONT LABORATORIES, INC.

Passaic, New Jersey, U. S. A.

GENERAL INFORMATION

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CONSIDERATIONS INVOLVED IN THE CHOICE AND USE OF CATHODE-RAY TUBES FOR OSCILLOGRAPHS AND FOR SPECIAL APPLICATIONS

In choosing a cathode-ray tube for any particular application, points which should be considered are type of screen to be used, operating potentials which can be supplied conveniently or economically, spot size and intensity required, deflection sensitivity required, and the importance of deflection-plate and grid capacitance.

Operating Potentials, Spot Size, Intensity, Deflection Sensitivity

In most applications, high deflection sensitivity, high intensity, small spot-size, and minimum operating potentials are desirable. Since there are several conflicting factors involved, compromise is usually necessary. In general, intensity and spot size must be considered together. With a given tube, the spot size decreases and brilliance improves with increasing accelerating voltage, but the deflection sensitivity decreases. Furthermore, high accelerating voltages are, from the standpoint of economy and simplicity, undesirable. The particular application will, therefore, determine the tube to be used and the conditions of its operation. Where maximum intensity and minimum spot size are most important, high accelerating volt-

ages are indicated. Where maximum deflection sensitivity is the most important requirement, lower accelerating potentials should be used. For applications where maximum deflection sensitivity and maximum brilliance are required, intensifier-type cathode-ray tubes should be used, since a high final accelerating potential can be used with a minimum of effect on the deflection sensitivity. The intensifier-type cathode-ray tube also simplifies the power supply problem for a given overall accelerating potential by reducing the maximum voltage for which the power supply must be insulated from ground.

Deflection-plate Capacitances

For applications where high-frequency potentials are supplied to the deflection plates, minimum deflection-plate lead lengths and capacitances are essential. For such applications, special high-frequency cathode-ray tubes are made in which the leads are brought from the deflection plates directly to terminal caps on the neck of the cathode-ray tube opposite the plates. In this way the total effective capacitance between two plates of a deflection-plate pair can be lowered to one or two μf .

RETMA SCREEN PHOSPHORS

Screens

The screen is the part of the cathode-ray tube where the energy of the electron beam is transformed into useful light output. Particular attention must be given, therefore, to the proper choice of the screen material according to the desired application.

Du Mont can supply any phosphor with any cathode-ray tube. However, the phosphors listed as standard with each oscillograph in the Du Mont Instrument Catalog¹ are those which have proved themselves most satisfactory for the instrument in question, and which provide the best performance over the range of applications for which that instrument was designed. It is only in the most unusual circumstances that a phosphor other than those recommended for use with the instrument is required.

A brief description of various screen types and their applications is given in the following paragraphs.

¹See Du Mont Catalog of Cathode-ray Instruments, 10th Edition.

Common Oscillographic Phosphors

While many of the RETMA phosphors were developed specifically for oscillographic applications, only five of them are currently in general use: the P1, P2, P5, P7, and P11. Other RETMA phosphors either find little application in oscillography, or, like the Type P3, have been made obsolete by more recent developments.

The P15 and P19 phosphors are not found in general oscillographic work. However, with the possibility that they will find broader application in the future, a description of them here is not out of place.

Type P1

The P1 phosphor is probably the most commonly used for general-purpose oscillography, where the usual application is the visual observation of repetitive phenomena. The P1 is an efficient screen material, producing a relatively brilliant green trace at low accelerating potentials. The spectral

STANDARD RETMA PHOSPHORS

Designation	Color		Spectral Range Between 10% Points	Spectral Peak	Persistence	Applications
	Fluorescent	Phosphorescent				
P1	Green	Green	4900 - 5800	5250	Medium	High visual efficiency; general screen for oscillographs.
P2	Blue-green	Green	4500 - 6400	5430	Long	General purpose. By the use of filters either short or long persistence characteristics may be utilized.
P3	Yellow	Yellow	5040 - 7000	6020	Medium	No longer in general use.
P4, Sulfide	White	White	3900 - 6630	2 components 5650, 4400	Short	Used primarily for television picture tubes.
P4, Silicate (See P18)	White	Blue	3260 - 7040	2 components 5400, 4100	Medium	Used primarily for television picture tubes.
P4, Silicate Sulfide	White	Yellow	3300 - 6990	5400, 4350	Medium	Used primarily for television picture tubes.
P5	Blue	Blue	3480 - 5750	4300	Very Short	Used primarily for photography on continuous-motion film for frequencies above 200 KC. Not as actinic as P11.
P6	White	White	4160 - 6950	2 components 5630, 4600	Short	No longer in general use.
P7	Blue-White	Yellow	3900 - 6500	2 components 5580, 4400	One Short One Long	Developed for radar. Similar in characteristics to P2, but has longer persistence. Useful for radar, low speed transients, and integrating repetitive phenomena.
P8	No longer in general use.					
P9	No longer in general use.					
P10	Dark trace: color depends upon absorption characteristics and type of illumination		4000 - 5500		Very Long	Used chiefly for radar. Pattern erased by infra-red radiation.
P11	Blue	Blue	4000 - 5500	4600	Short	Used primarily for oscillographic recording; has higher visual and photographic efficiency than P5, but persistence is greater.
P12	Orange	Orange	5450 - 6800	5900	Medium Long	Used primarily for fire-control radar for scanning rates of from 2 to 5 scans per second.

Designation	Color		Spectral Range Between 10% Points	Spectral Peak	Persistence	Applications
	Fluorescent	Phosphorescent				
P13	No longer in general use.					
P14	Purple	Orange	3900 - 7100	2 components 6010, 4400	One Short One Medium Long	Similar to P7 but of shorter decay characteristics.
P15	Blue-green	Blue-green	3700 - 6050	5040, 3910	Extremely Short	Used primarily for flying-spot scanners; or for high-resolution, high-frequency continuous motion recording. Not as actinic as P11.
P16	Violet and near UV	Violet and near UV	3350 - 4370	3940	Extremely Short	Flying spot scanner applications. Shortest persistence screen at present time.
P17	Greenish-Yellow	Yellow	3800 - 6350	4500, 5540	Two components one long, one extremely short	Similar to P7 except for extremely short fluorescence.
P18 (See P4, Silicate)	White	Blue	3260 - 7040	5400, 4100	Medium	Used primarily for television picture tubes.
P19	Orange	Orange	5450 - 6650	5950	Very long	Radar indication, particularly for night application.
P20	Yellow-green	Yellow-green	4600 - 6490	5550	Short	Similar in decay to P11; has high visual efficiency.
P21	Orange	Orange	5540 - 6500	6060	Very long	Used where both PPI and sector scan are viewed simultaneously; has double decay rate: initial decay, medium, changing to long.
P22	Tri-color		3900 - 6800	3 components 6430, 5260, 4500	One Short Two Medium	Used for color television.
P23	White	White	4000 - 7200	2 components 5750, 4600	Short	Used for television picture tubes where a sepia-tone effect is desired.
P24	Blue-green	Blue-green	4260 - 6400	5070	Extremely Short	Flying-spot scanner use, particularly for color television. Similar to P15 but has wider spectral response in the red region.
P25	Orange	Orange	5300 - 7100	6100	Very Long	Similar to P19; less efficient than P19 but more burn resistant.

distribution of the light output of the P1 screen lies in the region of maximum sensitivity of the human eye. Thus good contrast may be obtained, even under unfavorable conditions of ambient light. The P1 screen is also relatively efficient for photographic recording. Satisfactory oscillograms may be obtained of repetitive or transient phenomena, when there is no need for moving-film photography.

Type P2

The P2 phosphor is the most versatile screen material available for oscillographs operating with an accelerating potential of 4000 volts or more. The P2 is a dual-purpose screen, having a blue-green fluorescence of short persistence and a yellow-green phosphorescence of long persistence. The blue component has high photographic efficiency; and persistence of this component is sufficiently short that in almost all instances, it may be used satisfactorily for continuous-motion recording.

The persistence of the yellow component is, on the other hand, sufficiently long that visual observation of single transients and repetitive phenomena of low rates is possible. In most photographic applications, the yellow component serves to increase the photographic-writing-rate capabilities of the instrument. In continuous-motion recording, where the long-persistence phosphorescence would cause blurring, the yellow component may be eliminated by the use of a standard blue filter, such as the Du Mont Type 2560-E Color Filter. However, the P2 will not offer as satisfactory performance in continuous-motion-recording applications as a short-persistence phosphor. In cases where it is desired, the blue "flash" may be removed from the yellow component by means of a yellow filter, such as the Du Mont Type 2560-F. This practice is advantageous when visual observation of this screen over protracted periods is necessary.

When used at higher accelerating potentials, the P2 screen offers characteristics not unlike those of the P1 phosphor. This similarity between the P1 and P2 screens may be greatly increased by the use of a standard green filter such as the Du Mont Type 2560-D.

Type P5

The P5 phosphor produces a blue trace of very short persistence and high photographic efficiency. While the persistence of the P5 is somewhat shorter than that of the P11 screen, the efficiency of the P5 phosphor is lower. Thus the P5 screen is

recommended only for those few applications where the shorter persistence is absolutely necessary. In practice, the chief oscillographic application requiring this shorter persistence is the continuous-motion recording of signals containing frequency components above approximately 200 kc.

Type P7

The P7 screen, like the P2, is a dual-purpose one, producing a short-persistence blue fluorescence and a long-persistence yellow phosphorescence. As in the case of the P2 phosphor, either component may be eliminated by means of filtering. The Du Mont Types 2560-E and 2560-F filters are recommended. The P7 serves over a broad range of oscillographic applications, including visual observation, as well as photographic recording, of recurrent or transient phenomena. The P7 is more efficient than the P2 at accelerating potentials of less than 5000 volts and so is used primarily with instruments of low or medium accelerating potentials.

Type P11

The P11 phosphor produces a blue trace of high photographic efficiency. Its persistence is sufficiently short for the great majority of recording applications, and except for the very few applications where the slightly shorter persistence of the P5 is required, the P11 is recommended as the most practical short-persistence screen for general-purpose oscillography.

Type P15

The P15 screen is one of the shortest persistence phosphors presently available. It produces a light-blue-green trace at higher accelerating potentials, and tends to become somewhat more yellow as the accelerating potential is decreased. The P15 has a decay time¹ of less than 1.5 microseconds under normal operating conditions. Decay times of less than one microsecond are possible under special operating conditions. The P15 phosphor is used primarily in the scanning generator of flying-spot scanners, although there are a few oscillographic applications where the very short persistence of the P15 screen may be required. Chief among these applications is high-resolution, high-frequency continuous-motion recording. The P15 screen phosphor is not generally recommended for use at lower accelerating potentials.

¹Decay time is defined in this instance as the time required for the light output to drop to 30% of its initial value.

Type P19

The P19 screen is a long-persistence screen having an orange fluorescence and phosphorescence. Under normal circumstances the P19 is backed by an evaporated film of metal to improve light output and to retard deactivation of the screen material by the electron beam. The P19 is particularly well suited for night radar applications.

Grid-drive Characteristics

Due to unavoidable manufacturing tolerances, large variations occur in the grid-voltage versus screen-current¹ characteristics or the grid voltage versus light output characteristics of individual cathode-ray tubes of the same type. Average characteristics, plotted in the usual way as in Figure 1, are therefore of little help to equipment designers. A somewhat different method of approach has been found more satisfactory for cathode-ray tubes.

The designer of cathode-ray tube equipment is interested primarily in two characteristics insofar as the grid (control electrode) is concerned. First, he must know the cutoff bias limits in order that he may provide a sufficient range of negative d-c grid bias to cut the tube off (extinguish the

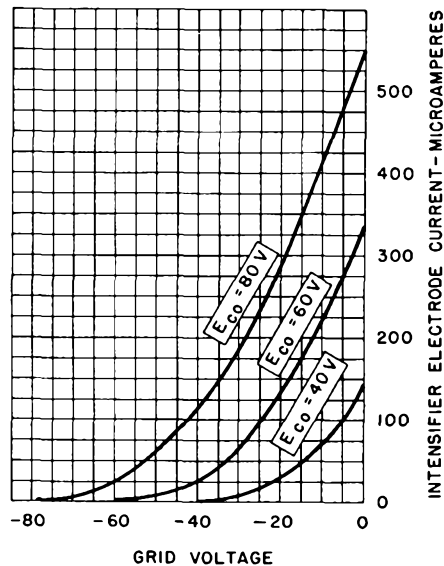


Figure 1. Typical grid-voltage vs. screen-current characteristics for three different tubes of the same tube type

beam and spot) in all cases. Secondly, he is interested in the variation of screen current or brightness as the grid is made more positive with respect to the cutoff voltage². In general, the modulating signal is a-c and is superimposed on the d-c grid voltage, so that the absolute value of grid voltage for a given brightness is not so important as the voltage above cutoff; the designer must know how much modulation signal (above cutoff) he needs to provide in order to produce the required screen current or brightness. This voltage above cutoff has become known as *Grid Drive*, and the characteristic of Grid Drive versus screen current or light output has become known as the *Grid Drive Characteristic*.

If Grid Drive is plotted against screen current for a large number of tubes, it is found that most of the tubes give approximately straight lines, at least over the part of the curve which is of interest. In tubes in which only a small part of the total cathode current is utilized, which includes most electrostatic deflection tubes, this curve has a slope of approximately 2, indicating an exponential of the form $I = KE_s^2$, for the grid drive versus screen current characteristic. Furthermore, on such tubes, the grid drive characteristic curves do not vary appreciably with cutoff bias. It is therefore possible to represent the average grid drive characteristic of an electrostatic deflection tube by a straight-line curve on log paper such as shown in Figure 2. To provide for manufacturing variations, a minimum curve can be drawn below the average curve.

The equipment designers approach then resolves into the following: (1) provide sufficient negative d-c bias at the intensity control to cut off the tube having the maximum cutoff bias permitted by the tube specifications; and (2) if grid modulation is used, provide sufficient grid-modulation voltage (grid drive) to drive the tube to the desired screen current or brightness.

Of course, each tube has a specified brightness, or beam-current rating, (specified for a given operating condition) and the equipment designer cannot depend upon the tube providing more than the specified value. The tube characteristic sheet also specifies the grid drive which must be provided in the equipment for the specified

¹Current in the electron beam reaching the fluorescent screen.

²Note that this does not mean that the grid is made positive, but only less negative.

screen current or light output. Thus, the answer is given immediately for the designer who is operating the tube under the conditions for which the light output or screen current is specified, and who wants to obtain the full, rated screen current or light output. He must be careful, however, to take precautions against the grid being driven positive with respect to the cathode.

For most magnetic deflection tubes, the grid drive characteristics differ from those of electrostatic tubes in that they vary appreciably with the cutoff bias of the particular tube as shown in Figure 3. However, this fact in no way precludes the tube manufacturer from specifying a maximum grid drive for the rated screen current, and the equipment designer proceeds exactly as for the electrostatic tube.

Operating Notes

Cathode-ray tube power supplies must usually provide between 1000 and 5000 volts d-c at from one to three milliamperes. In oscillographic applications, usual practice is to operate the accelerating electrode (second anode) at ground potential, in order that the deflection plates may be substantially at ground potential and thus facilitate their coupling to deflecting-signal circuits and reduce the hazard in making connections directly to the deflection plates. When this method of operation is used, it is necessary to insulate the transformer winding supplying heater power to the cathode-ray tube for the full accelerating voltage, since the heater and cathode are operated at a negative potential with respect to ground equal to this voltage.

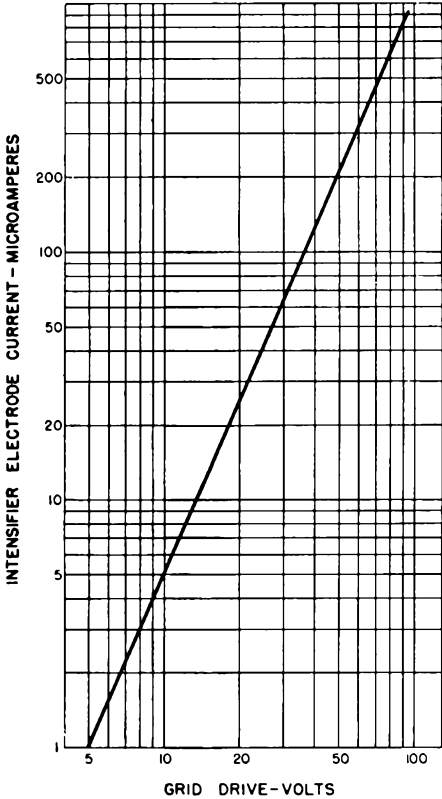


Figure 2. Average grid-drive characteristic for a typical electrostatic cathode-ray tube

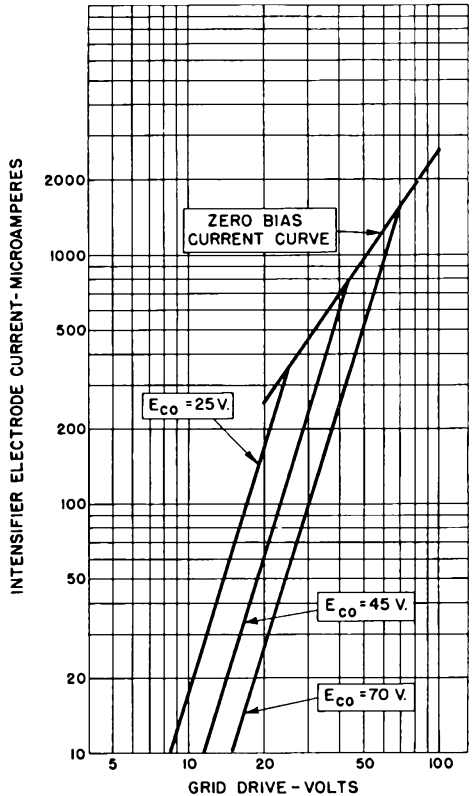


Figure 3. Average grid-drive characteristics for typical magnetic cathode-ray tubes

A voltage divider is ordinarily used to provide the required voltages for the control electrode (grid) and focusing electrode (first anode). The negative voltage is provided by a rheostat or potentiometer at the negative end of the voltage divider, and sufficient range should be provided to permit variation of grid bias from zero to a value at least equal to the maximum cut-off voltage for the tube at the accelerating voltage at which it is to be operated. The focusing voltage potentiometer should be capable of providing a range of voltage to the focusing electrode corresponding to the range over which the voltage required for focus is permitted to vary by the specification for the particular tube type involved.

In order to reduce defocusing of the spot to a minimum, positioning and signal voltages should be balanced whenever possible; that is, equal positive and negative voltages should be applied to the two plates of a deflection-plate pair.

The intensifier should ordinarily be operated at a potential 30% to 100% of the accelerating electrode potential. When lower

values of intensifier voltage are to be used, the intensifier can be connected to a 300- or 400-volt plate supply if such a supply is readily available. If a higher intensifier potential is desired, a separate rectifier, operating from the same high-voltage transformer winding as the accelerating voltage supply, with heater winding and a simple resistance-capacitance filter, are easily provided.

In a transformer designed for operating cathode-ray tube circuits, both the heater winding of the cathode-ray tube and the primary winding should be completely surrounded with grounded electrostatic shields. These shields are necessary to prevent electrostatic coupling to the heater winding which might cause intensity modulation of the cathode-ray beam, and to prevent electrostatic coupling from the high voltage winding to the power-line. It is advisable to ground the chassis of cathode-ray equipment to prevent any possibility of the chassis attaining a high potential with respect to ground. The potentials at which cathode-ray tubes operate are dangerous, and precaution should be taken to prevent contact with them.

CATHODE-RAY TUBE WALL CHARTS

For the convenience of its customers, the Industrial Tube Sales Department has prepared two wall charts, one listing the complete line of *RETMA tubes* offered by Du Mont, and the other listing typical *Special Cathode-ray Tubes*. Complete mechanical and electrical specifications, and other pertinent information are set forth.

These charts are available free of charge by requesting them from the Industrial Tube Sales Department, 2 Main Avenue, Passaic, New Jersey, on your company letterhead.

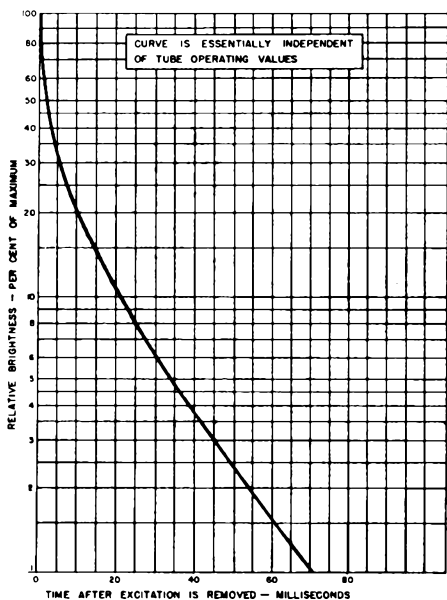
DU MONT
SCREEN
CHARACTERISTICS

DU MONT P1 SCREEN CHARACTERISTICS

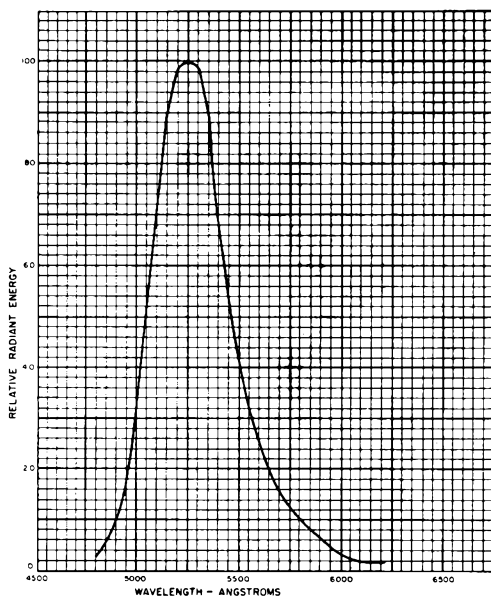
General Description

Medium-persistence green screen of high visual efficiency, suited for general-purpose

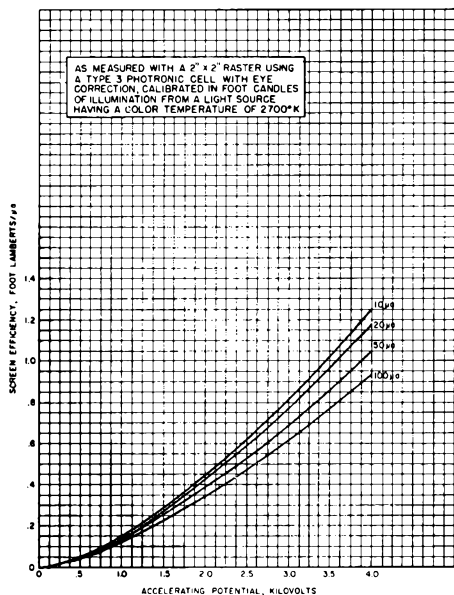
visual oscillographic and indicating applications.



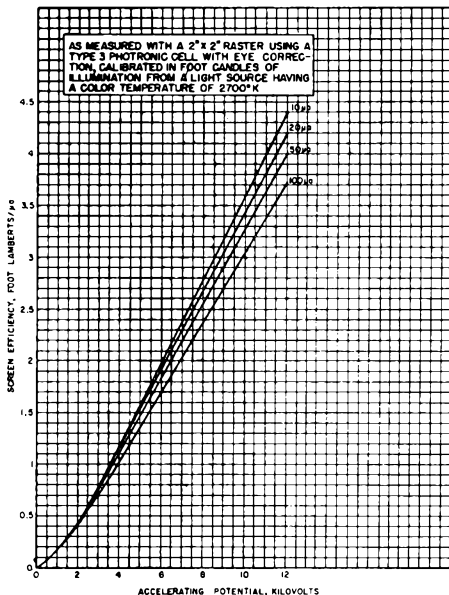
Persistence Characteristic of Phosphor P1



Spectral-Energy Emission Characteristic of Phosphor P1

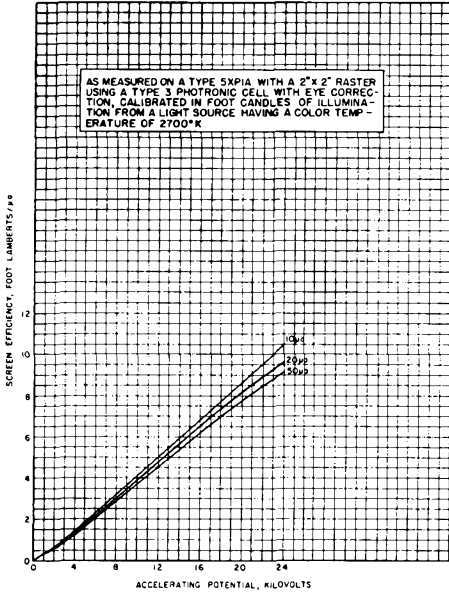


Typical Low Voltage Visual Screen Efficiency Phosphor P1

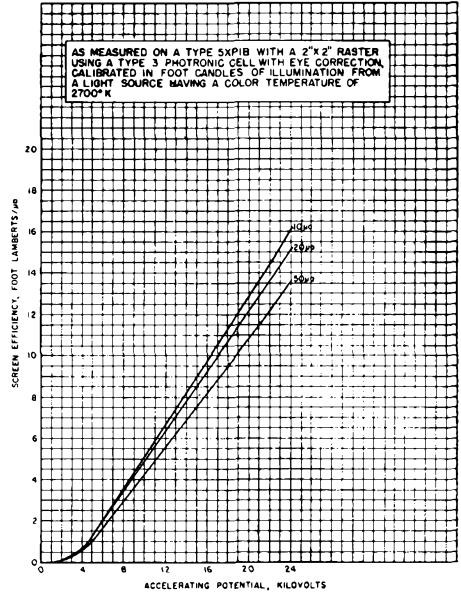


Typical Visual Screen Efficiency Phosphor P1

DU MONT P1 SCREEN CHARACTERISTICS (Cont'd)



Typical High Voltage Visual Screen Efficiency Phosphor P1



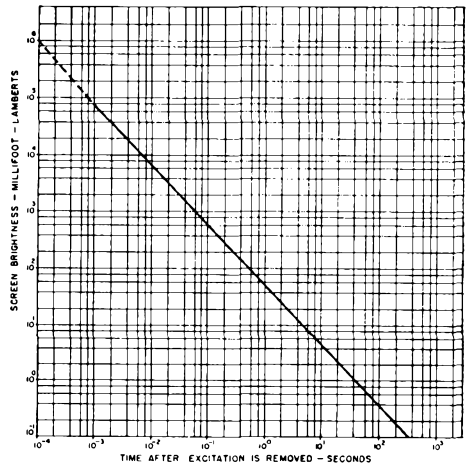
Typical High Voltage Visual Screen Efficiency Phosphor P1, Aluminized Screen

DU MONT P2 SCREEN CHARACTERISTICS

General Description

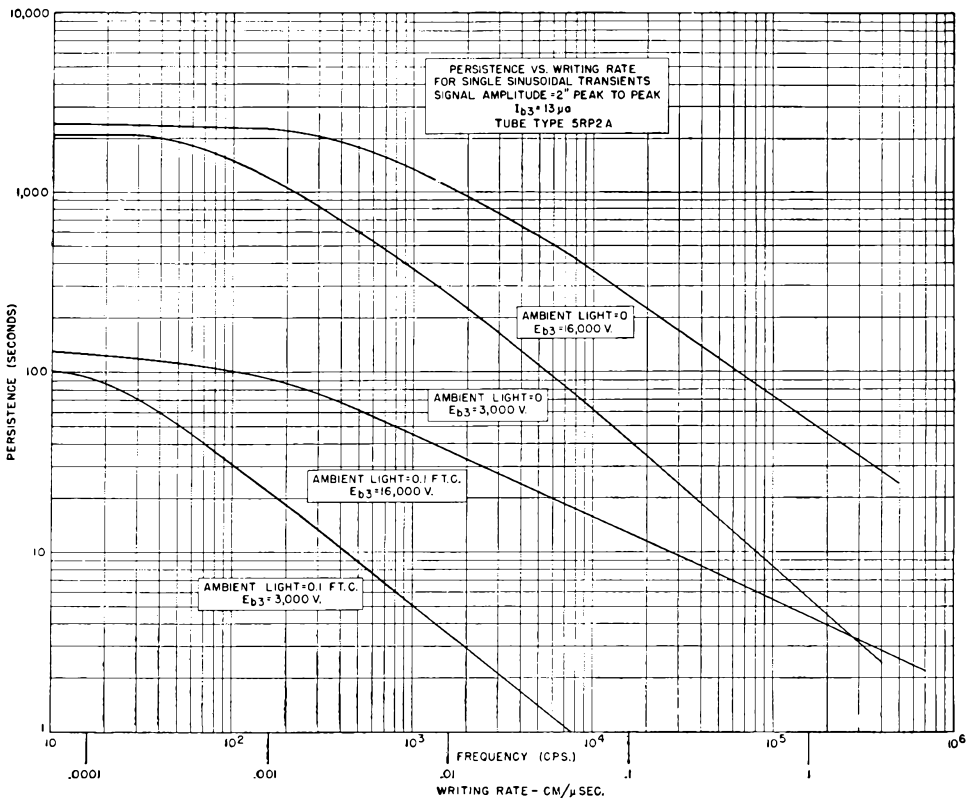
Long-persistence screen with a short persistence blue-green fluorescent characteristic, and a very long yellow-green phosphorescence, suited for applications requiring long persistence at high writing rates (short interval excitation).

Because the ratio of fluorescent to phosphorescent light is very high, the P2 screen may also be used for visual observation and photography in applications where it is desirable to have the characteristics of a short persistence screen. By the use of a suitable filter the fluorescent light only may be selected.

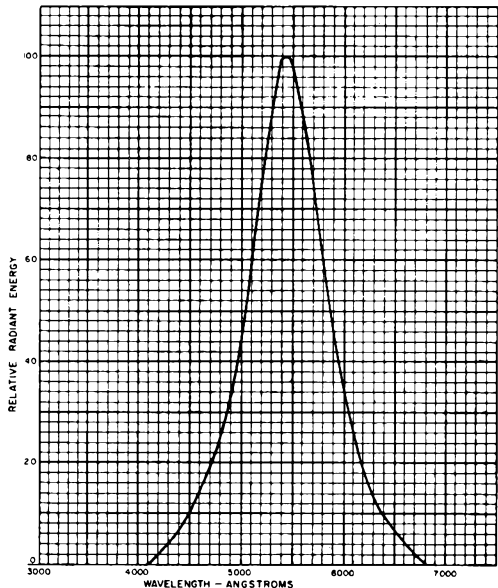


Persistence Characteristic of Phosphor P2

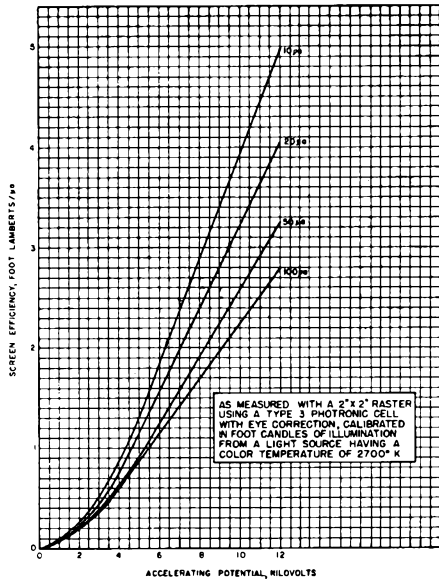
DU MONT P2 SCREEN CHARACTERISTICS (Cont'd)



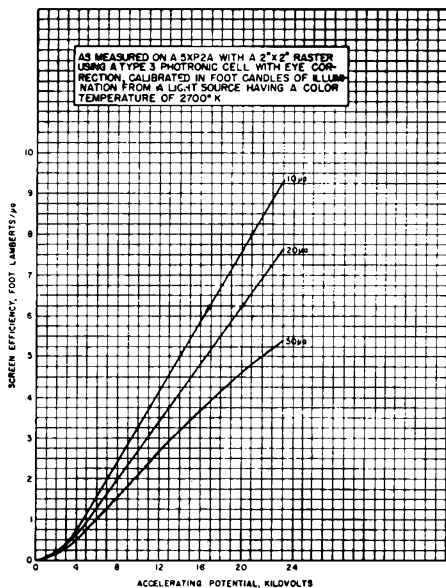
Persistence versus writing rate for single sinusoidal transients. (Eye adapted to ambient light condition.)



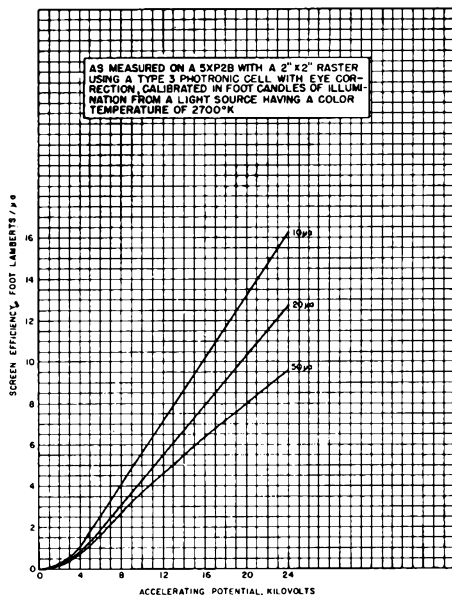
Spectral-Energy Emission Characteristic of Phosphor P2



Typical Visual Screen Efficiency Phosphor P2



Typical High Voltage Visual Screen Efficiency
Phosphor P2



Typical High Voltage Visual Screen Efficiency
Phosphor P2, Aluminized Screen

DU MONT P7 SCREEN CHARACTERISTICS

General Description

Long-persistence screen with blue fluorescence and yellow phosphorescence, suited for applications requiring long persistence at slow and intermediate writing rates, for applications where it is desirable to filter out the initial "flash," and for applications where high build-up of phosphorescent intensity as a result of repeated excitation is desired.

The P7 screen is also well suited for dual-purpose equipment where it is desirable to have available the characteristics of a long persistence screen and a short persistence screen in the same tube. By the use of suitable filters either the short persistent blue light, or the long persistent yellow light may be selected.

METHOD OF SPECIFYING DATA

Light Output

P7 light output is measured one second after the application of one or more 200 line rasters applied at one second intervals and at $Q = 20$ millimicrocoulombs/cm² where

$$Q = \frac{I_b \cdot t}{A} \quad (I_b = \text{microamps to screen, } t = \text{total excitation time in seconds} = 1/60 \text{ second, } A = \text{area of raster in cm}^2).$$

The light output generally used for indicating tube

quality is the light output from a standard screen area of 7.1 x 7.1 cm, one second after the fifth raster application. This value is known as C_b , and is expressed in units of the logarithmic centibel* scale, with reference to the light output from a standard P7 light source prepared by the M.I.T. Radiation Laboratory.

* $C_b = 100 \log_{10} \frac{L1}{L2}$ where $\frac{L1}{L2}$ = ratio of light output.

Build-up Ratio

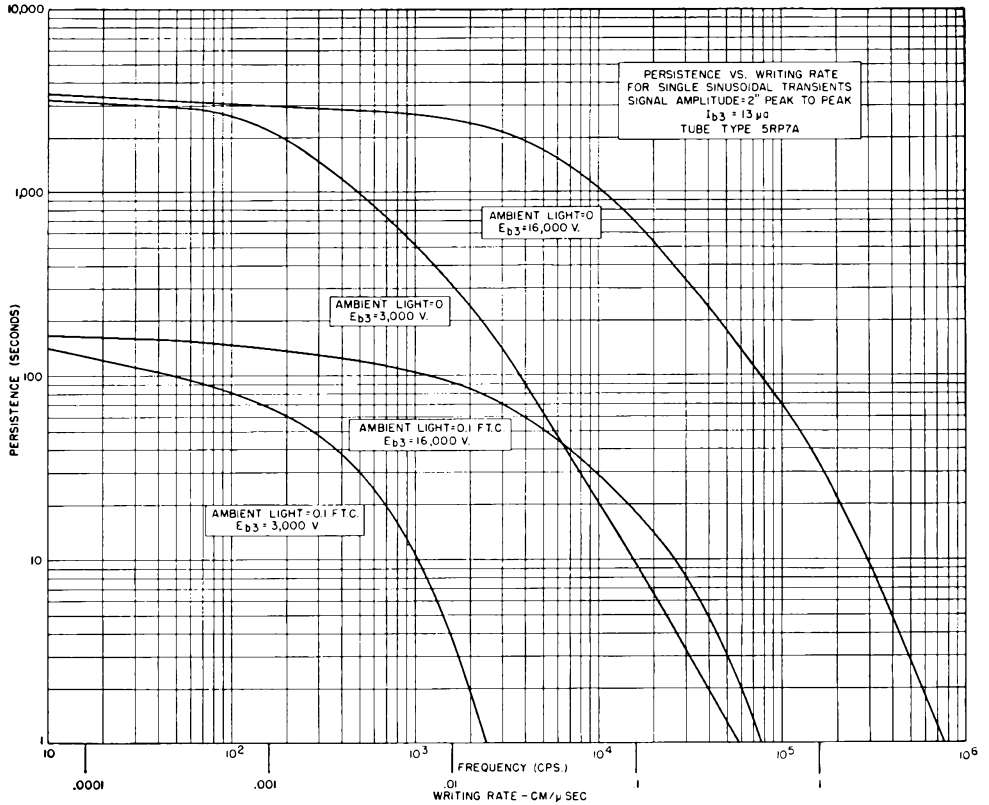
The build-up ratio is the ratio of the light output measured one second after a pulse following the initial pulse, to the light output measured one second after the initial pulse. (Note: The word "pulse" as used here refers to application of the 200 line test raster for 1/60 second.)

Usually the ratio $G_{5:1}$ is used, where $G_{5:1}$ is the ratio of light output one second after the fifth pulse to the light output one second after the initial pulse.

Flash Ratio

Flash ratio is the ratio of the initial "flash" light output to the C_{b_1} light output. It is usually expressed as the difference $C_{b_1} - C_{b_2}$ in centibels.

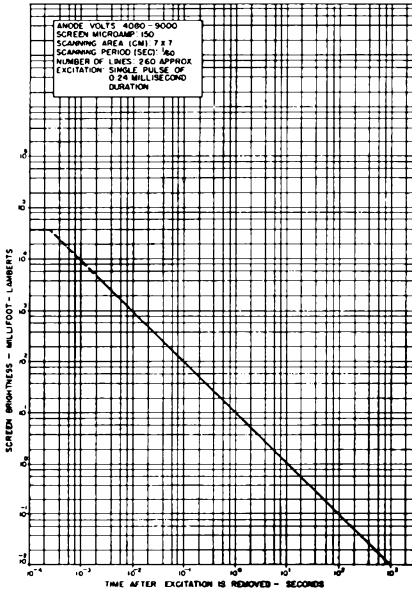
The flash light output (C_{b_1}) is the calculated C_{b_1} level which, if maintained constant for one tenth second, would integrate to give the same value as the integration of the light output one second following and including the initial excitation pulse.



Persistence versus frequency for single sinusoidal transients. (No filter used; eye adapted to ambient light condition.)

Persistence Characteristic of P7 Screen

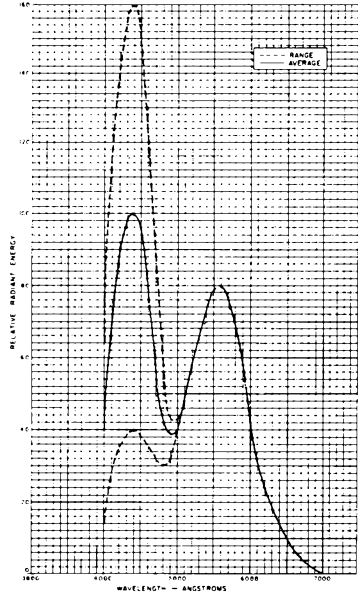
Excitation by a single 200 line raster in 1/60 of a second, and persistence characteristic after excitation by a large number of 200 line rasters applied 1 second apart.



Persistence Characteristic of Phosphor P7

Representative Spectral Characteristic

Stationary spot excitation. The short wave length peak is representative of the blue fluorescence. The long wave length peak is representative of the yellow phosphorescence. The curve with filter is for the Wratten #15 filter which is recommended for filtering out the blue "flash" of the screen.

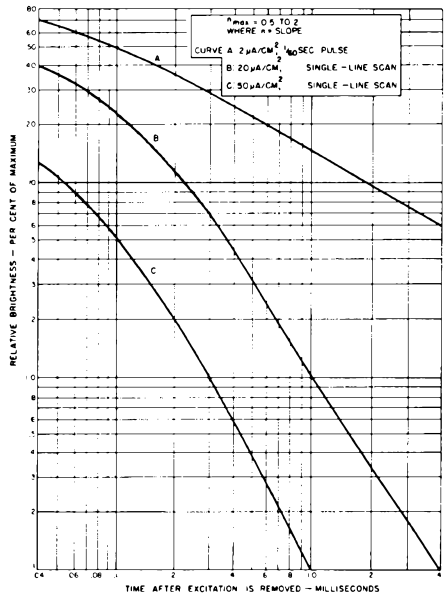


Spectral-Energy Emission Characteristic of Phosphor P7

DU MONT P11 SCREEN CHARACTERISTICS

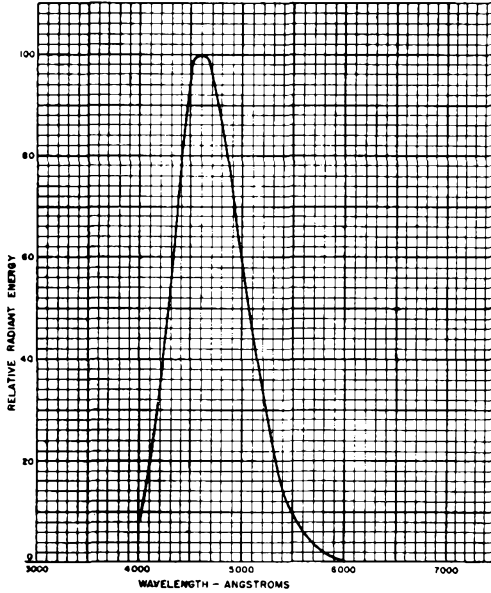
General Description

A short-persistence blue screen material of very high photographic efficiency, suited for photography where the extremely short persistence of the P5 screen is not required.

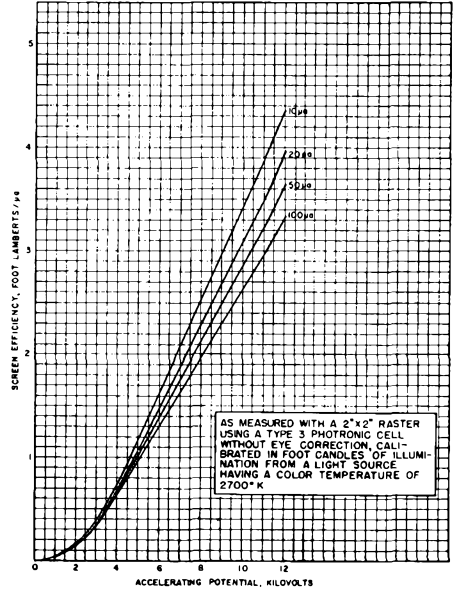


Persistence Characteristic of Phosphor P11

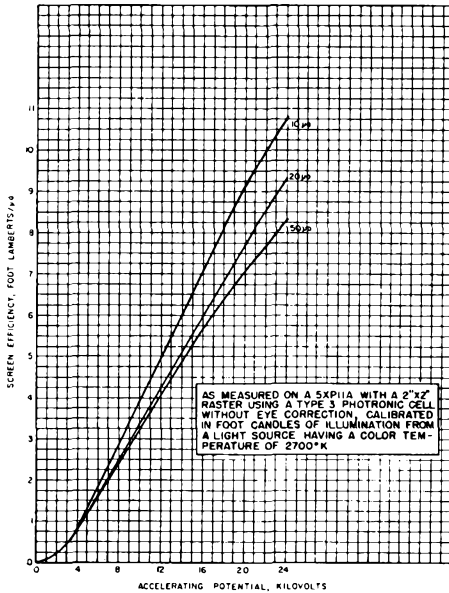
DU MONT P11 SCREEN CHARACTERISTICS (Cont'd)



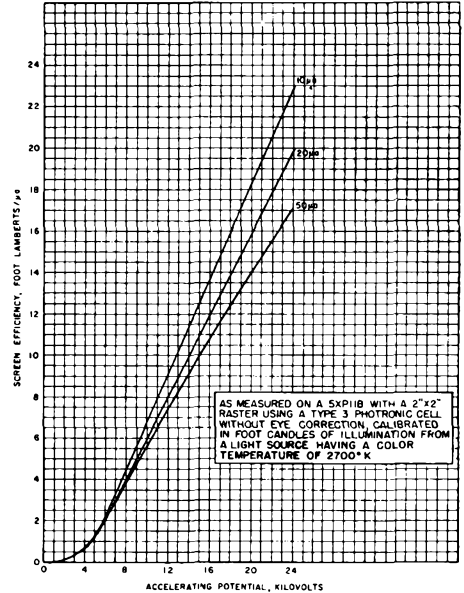
Spectral-Energy Emission Characteristic of Phosphor P11



Typical Screen Efficiency Phosphor P11 Screen



Typical High Voltage Screen Efficiency Phosphor P11, Alumined



Typical High Voltage Screen Efficiency Phosphor P11

DU MONT P19 SCREEN CHARACTERISTICS

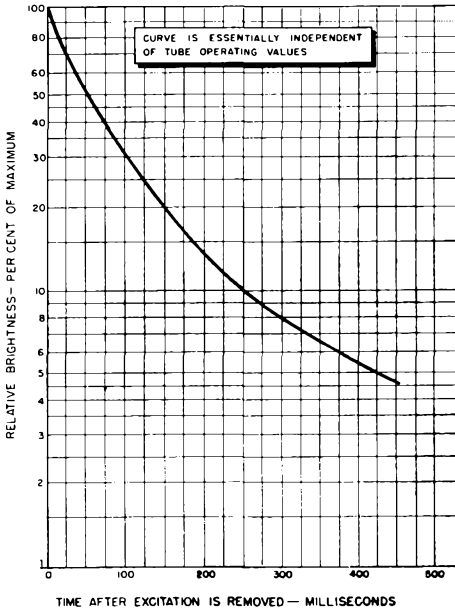
General Description

Very long-persistence orange screen, suited for the same applications, broadly speaking, as the P7 screen. However, the P19 screen has a considerably longer persistence than the P7 screen and no initial "flash."

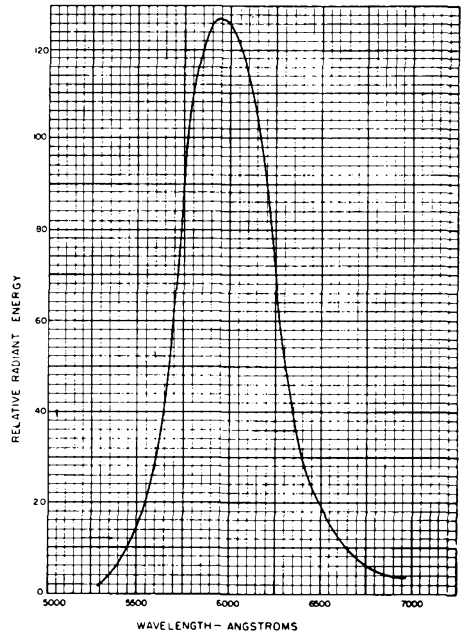
The screen material of the P19 screen is magnesium fluoride, in contrast to the usual sulfide or silicate phosphors, such as the P7 or P1 screens. Magnesium fluoride is much more susceptible to burning than the usual screen materials. To prevent burning the highest possible accelerating potential and the minimum beam current should be employed.

For certain applications, especially in the radar indicator field, the P19 screen is well suited. However, because of its susceptibility to burning, it is recommended that other screen types be fully investigated before specifying the P19 screen.

PERSISTENCE CHARACTERISTIC
OF PHOSPHOR P19



SPECTRAL-ENERGY EMISSION CHARACTERISTIC
OF PHOSPHOR P19



DU MONT

INDUSTRIAL

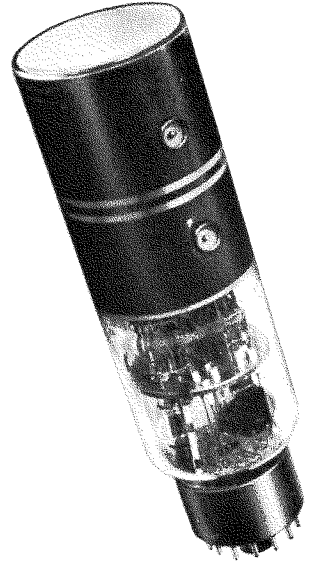
CATHODE-RAY TUBES

Note: In the Cathode-ray Tube Section the following terms are employed interchangeably:

- 1. "Anode No. 3" and "Post-accelerator"*
- 2. "Anode" (electromagnetic tubes), "Anode No. 2", and "Accelerator"*
- 3. "Anode No. 1" and "Focusing"*

3ABP- CATHODE-RAY TUBE

The Du Mont Type 3ABP- is a flat-faced electrostatically focused and deflected cathode-ray tube containing two separate electron-guns. Each electron beam is independent of the other except for the accelerator, heater and cathode connections. For high brightness with maximum deflection sensitivity, post-acceleration is utilized. The Type 3ABP- is one of the line of Du Mont tight-tolerance cathode-ray tubes.



The Type 3ABP- is used in applications requiring a two-beam presentation with high deflection sensitivity and good tracking accuracy on a short three-inch cathode-ray tube.

Deflection electrodes are designed for excellent deflection and tracking accuracy and are electrostatically shielded from each other to prevent interaction.

Both electron-guns employ a design requiring essentially zero focusing anode current.

All connections except for the accelerator and post-accelerator are brought out to the base pins to simplify the problem of connection. For insulation, the accelerator and post-accelerator connections are bulb terminals.

GENERAL CHARACTERISTICS (Note 1)

Electrical

Heater Voltage	6.3 Volts
Heater Current (Both Units)	1.2±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	Min.	Max.	
Cathodes to all other electrodes	4.8	7.2	μμf
Grid No. 1 to all other electrodes	3.7	5.5	μμf
D1 to D2	1.7	2.6	μμf
D3 to D4	1.7	2.6	μμf
D1 to all other electrodes except D2	5.6	8.4	μμf
D2 to all other electrodes except D1	5.6	8.4	μμf
D3 to all other electrodes except D4	4.9	7.3	μμf
D4 to all other electrodes except D3	4.9	7.3	μμf

Mechanical

Overall Length	10¾±¼ Inches
Greatest Diameter of Bulb	3±1/16 Inches
Minimum Useful Screen Diameter	2.62 Inches
Bulb Contacts (Recessed Small Ball Caps)	J1-22
Base (Medium shell diheptal, 14 Pin)	E14-38
Basing	14T
Base Alignment	
D3D4 trace aligns with Pin No. 5 and Tube Axis	±10 Degrees

Positive voltage on D1 deflects beam approximately towards Pin No. 1
 Positive voltage on D3 deflects beam approximately towards Pin No. 12

Bulb Contact Alignment

J1-22 contacts align with D3D4 trace ± 10 Degrees
 J1-22 contacts on same side as Pin No. 5

Trace Alignment

Angle between D1D2 and D3D4 traces 90 ± 1 Degree
 Corresponding traces of each gun align with each other Within 1 Degree

MAXIMUM RATINGS

Post-Accelerator Voltage 6,000 Max. Volts D-C
 Accelerator Voltage (Note 2) 2,000 Max. Volts D-C
 Ratio Post-Accelerator Voltage to
 Accelerator Voltage (Note 3) 3 Max.
 Focusing Voltage 1,000 Max. Volts D-C
 Grid No. 1 Voltage
 Negative Bias Value 200 Max. Volts D-C
 Positive Peak Value 0 Max. Volts D-C
 Positive Bias Value 0 Max. Volts
 Peak Voltage between Accelerator and any
 Deflection Electrode 550 Max. Volts

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of 4,000 Volts D-C
 For Accelerator Voltage of 2,000 Volts D-C
 Focusing Voltage 380 to 580 Volts D-C
 Grid No. 1 Voltage (Note 4) -45 to -75 Volts D-C
 Modulation Factor (Note 5) 40 Max. Volts D-C
 Line Width "A" (Note 6)018 Max. Inches
 P1 Light Output (Note 6) 20 Ft. L. Min.
 Deflection Factors:
 D1 and D2 164 to 198 Volts DC/Inch
 D3 and D4 148 to 181 Volts DC/Inch
 Deflection Factor Uniformity (Note 7) $2\frac{1}{2}\%$ Maximum
 Tracking Error (Note 8) 2%
 Pattern Distortion @ 75% of Minimum
 Useful Screen Diameter (Note 9) 2% Max.
 Interaction Factor (Note 11)000012 Max. Inches/Volt
 Spot Position (Undelected, Focused) (Note 12) Within a $\frac{1}{4}$ Inch Radius Circle

CIRCUIT DESIGN VALUES

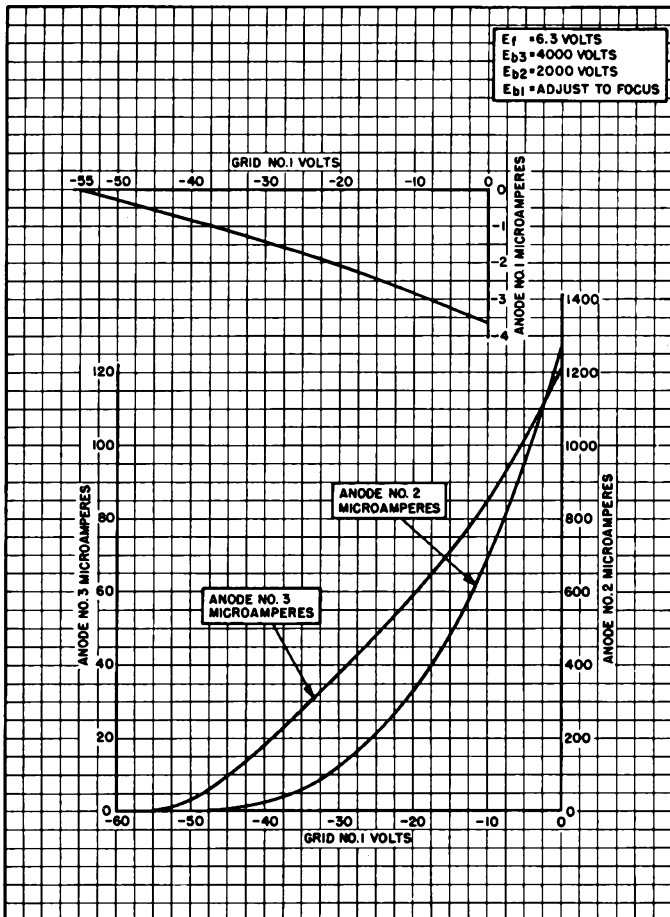
Focusing Voltage 190 to 290 Volts per Kilovolt of Accelerator Voltage
 Focusing Current for any operating condition -50 to +10 Microamperes
 Grid No. 1 Voltage (Note 4) -22.5 to -37.5 Volts per Kilovolt of Accelerator Voltage
 Grid No. 1 Circuit Resistance 1.5 Max. Megohms
 Deflection Factors:
 Post-Accelerator Voltage = Accelerator Voltage
 D1 and D2 63 to 77 Volts D-C/Inch/KV of Accelerator Voltage
 D3 and D4 59.5 to 72.5 Volts D-C/Inch/KV of Accelerator Voltage
 Resistance in any Deflecting-Electrode Circuit (Note 13) 5.0 Max. Megohms

NOTES

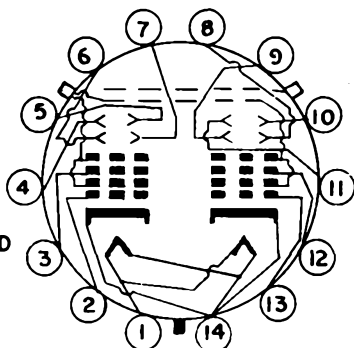
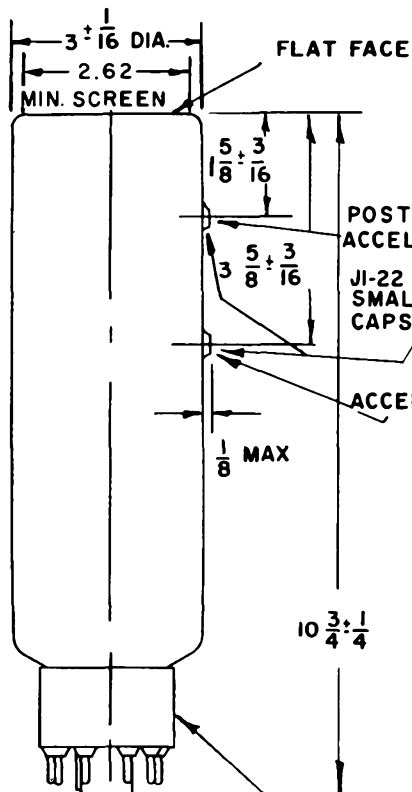
1. Values are for each unit unless otherwise stated.
2. Accelerator power input (avg.) should be limited to 6 watts.
3. This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 2.0. Operation at other ratios of Eb3/Eb2 may result in increased deflection (non) uniformity, pattern distortion and tracking error.
4. For visual extinction of the focused undeflected spot.
5. The increase in Grid No. 1 voltage from cut-off to produce an Ib3 of 25 μ ADC.
6. Measured in accordance with MIL-E-1 specifications using an Ib3 of 25 μ ADC.
7. 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.

8. 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 the deflection.
9. The edges of a raster pattern, whose mean dimensions are the indicated percentage of useful screen diameter, shall not deviate from the mean dimension rectangle by more than the specified amount.
10. Deflection accuracy may be obtained by combining angle between traces, deflection factor uniformity and pattern distortion characteristics. In general, for deflections less than those indicated the accuracy will improve.
11. The deflection of one beam when balanced DC Voltages are applied to the deflection electrodes of the other beam will not be greater than the indicated value.
12. Centered with respect to the tube face and with the tube shielded.
13. Deflection electrode circuit resistance should be equal.

TYPE 3ABP-
AVERAGE CHARACTERISTICS



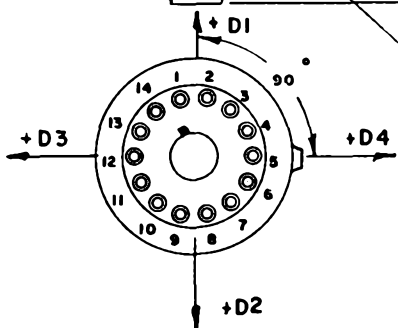
TYPE 3ABP-



BOTTOM VIEW 14 T

UNIT A		UNIT B	
PIN NO.	ELEMENT	PIN NO.	ELEMENT
1	HEATER	8	DEFLECTOR 4
2	GRID NO.1	9	DEFLECTOR 3
3	FOCUSING ELECTRODE	10	DEFLECTOR 2
4	DEFLECTOR 1	11	DEFLECTOR 1
5	DEFLECTOR 2	12	FOCUSING ELECTRODE
6	DEFLECTOR 3	13	GRID NO.1
7	DEFLECTOR 4	14	HEATER & CATHODE

NOTE: 1. PIN NOS. 1 AND 14, HEATER AND CATHODE ARE COMMON TO BOTH UNITS.
 2. THE BULB SHALL BE A J24-X1

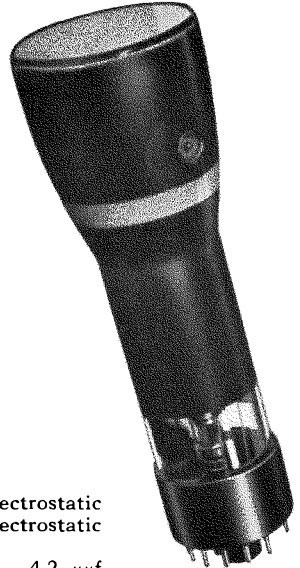


MEDIUM SHELL
 14 PIN DIHEPTAL
 BASE (B14-38)

BOTTOM VIEW

TYPE 3ACP-A CATHODE-RAY TUBES

The Du Mont Type 3ACP-A is a flat face, single beam, electrostatic deflection and focus Cathode-ray Tube. A combination of post-acceleration and a very efficient gun design results in high light output, high deflection sensitivity and small spot size. The deflection structure is designed so as to improve the deflection accuracy and is electrostatically shielded where possible in order to minimize interaction. The electron gun is so designed as to require no appreciable focus electrode current. The electrode connections are arranged to give maximum insulation yet retain simplicity of connection. The 3ACP-A is one of the line of Du Mont tight-tolerance cathode-ray tubes.



GENERAL CHARACTERISTICS

Electrical Data

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Direct Interelectrode Capacitances - Maximum	
Cathode to all	4.2 μf
Grid No. 1 to all	5.5 μf
D1 to D2	2.1 μf
D3 to D4	1.5 μf
D1 to all	5.8 μf
D2 to all	5.8 μf
D3 to all	4.5 μf
D4 to all	4.5 μf

Optical Data

Phosphor Number	1	2	7	11
Fluorescent Color	Green	Green	Blue	Blue
Phosphorescent Color	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

Mechanical Data

Overall Length	10 \pm 3/16 Inches
Greatest Diameter of Bulb	3 \pm 1/16 Inches
Minimum Useful Screen Diameter	2.68 Inches
Bulb Number	J24-V1
Bulb Contact — Recessed Small Ball Cap	J1-22
Base — Medium Shell Diheptal, 12 Pin	B12-37
Basing	14J
Base Alignment	
D1D2 trace aligns with Pin No. 5 and tube axis	0 \pm 10 Degrees
Positive voltage on D1 deflects beam approximately toward Base Pin No. 5	
Positive voltage on D3 deflects beam approximately toward Base Pin No. 2	
Bulb Contact Alignment	
J1-22 contact aligns with D1D2 trace	0 \pm 10 Degrees
J1-22 contact on same side as Pin No. 5	
Trace Alignment	
Angle between D3D4 and D1D2 traces	90 \pm 1 Degrees

MAXIMUM RATINGS (Design Center Value)

Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	0.6 \pm 10% Ampere
Post-Accelerator Voltage	6000 Max. Volts D-C
Accelerator Voltage	2000 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 1)	3.0
Accelerator Input (Avg.)	6.0 Max. Watts
Focusing Electrode 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
Peak Heater-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	550 Max. Volts

TYPICAL OPERATING CONDITIONS

Post-Accelerator Voltage	4000 Volts
Accelerator Voltage	2000 Volts
Focusing Electrode Voltage	390 to 550 Volts
Grid No. 1 Voltage (Note 2)	-45 to -75 Volts
Anode No. 3 Current (Note 3)	500 Min. μ ADC
Cathode Current (Note 4)	125 Max. μ ADC
Cathode Current (Note 5)	600 Max. μ ADC
Deflection Factors:	
D1 and D2	175 to 205 Volts D-C per Inch
D3 and D4	138 to 158 Volts D-C per Inch
Deflection Factor Uniformity (Note 6)	2% Max.
Pattern Distortion (Note 7)	2% Max.
Modulation (Note 8)	21 Max. Volts D-C
Modulation (Note 9)	45 Max. Volts D-C
Line Width "A" (Note 10)	0.016 Max. Inches
Line Width "A" (Note 9)	0.028 Max. Inches
Light Output (Note 11)	
P1	80 Foot Lamberts Min.
P11	35 Foot Lamberts Min.
Focusing Electrode Current for any operating condition	-15 to +5 μ A
Spot Position (focused and undeflected) (Note 12)	within a 3/16 Inch radius circle
For Accelerator Voltage not shown in the preceding table, the following can be used as a guide:	
Focusing Electrode Voltage	19.5% to 27.5% of Accelerator Volts
Grid No. 1 Voltage	2.2% to 3.8% of Accelerator Volts
Ratio Post-Accelerator to Accelerator Voltage	1.0
D1 and D2	71 to 81.5 Volts D-C per Inch per Kilovolt of Accelerator
D3 and D4	55 to 63.5 Volts D-C per Inch per Kilovolt of Accelerator
Ratio Post-Accelerator to Accelerator Voltage	2.0
D1 and D2	87.5 to 102.5 Volts D-C per Inch per Kilovolt of Accelerator
D3 and D4	69 to 79 Volts D-C per Inch per Kilovolt of Accelerator

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting Electrode Circuit (Note 13)	1.0 Max. Megohms

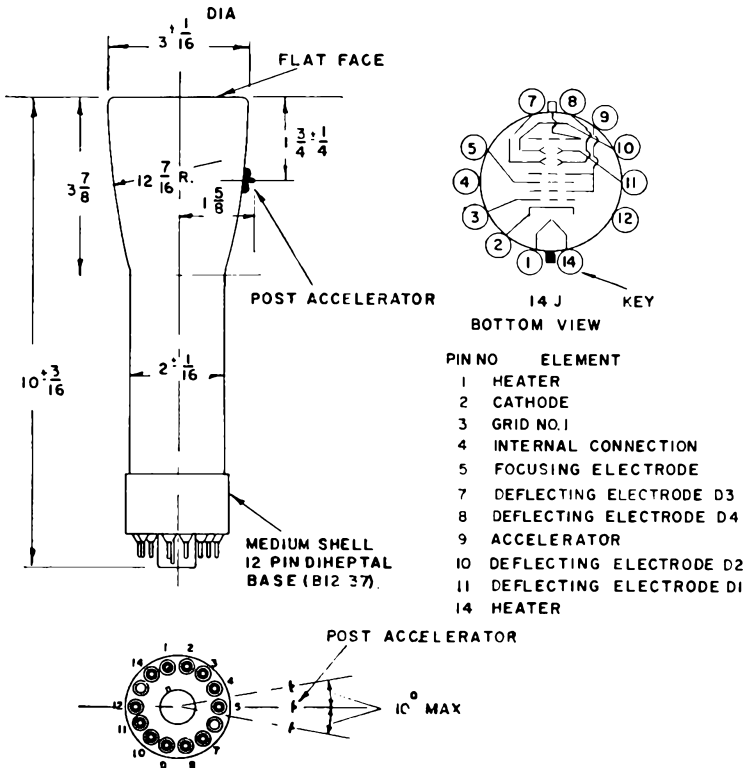
NOTES

1. This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 2.0. Operation at other ratios of Eb3/Eb2 may result in changes in deflection uniformity and pattern distortion.
2. Visual extinction of undeflected focused spot.
3. For E_{c1} = 0 VDC.
4. For an Ib3 of 50 μ ADC.
5. For an Ib3 of 200 μ ADC.
6. As per MIL-E-1B specifications.
7. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 1.938 inch square, will fall within the area bounded by the 1.938 inch square and an inscribed 1.862 inch square.
8. For an Ib3 of 25 μ ADC measured in accordance with MIL-E-1 specifications.
9. For an Ib3 of 200 μ ADC measured in accordance with MIL-E-1 specifications.

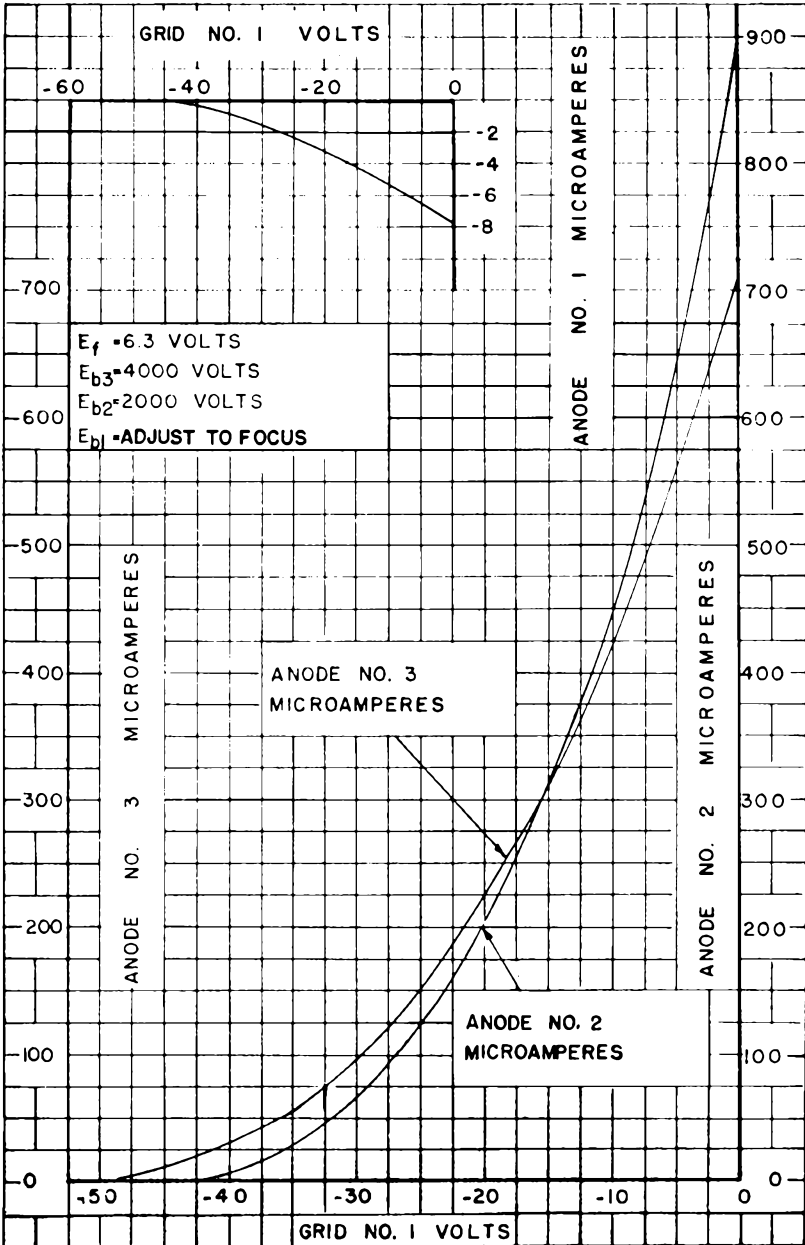
10. For an Ib3 of 50 μ ADC measured in accordance with MIL-E-1 specifications.
11. For an Ib3 of 100 μ ADC measured in accordance with MIL-E-1 specifications using a raster size of $1\frac{7}{8} \times 1\frac{7}{8}$ inches. The P11 phosphor is measured with a photronic cell without eye correction.
12. Centered with respect to the tube face and with the tube shielded. Connect free deflecting electrodes to accelerator.
13. It is recommended that the deflecting-electrode circuit resistance be approximately equal. Higher resistance values up to five megohms may be used for low beam current operation.

TYPE 3ACP-

2.68 MIN. SCREEN

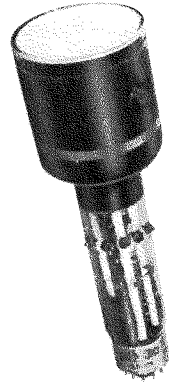


TYPE 3ACP- AVERAGE CHARACTERISTICS



TYPE 3ADP- CATHODE-RAY-TUBES

The Du Mont Type 3ADP- is a 3 inch, flat face, single beam, electrostatic deflection and focus Cathode-ray Tube of compact design. Post-acceleration coupled with restricted deflection area provides high light output, very high deflection sensitivity, and small spot size. The electron gun is so designed as to require no appreciable focus electrode current. The deflector and anode leads are brought out directly through the bulb wall in order to provide maximum insulation while minimizing lead inductance and capacitance. The 3ADP- is one of the line of Du Mont Tight-tolerance Cathode-ray Tubes.



GENERAL CHARACTERISTICS

Electrical Data

Focusing Method Electrostatic
 Deflecting Method Electrostatic

Direct Interelectrode Capacitances	Min.	Max.	
Cathode to all	3.0	4.5	$\mu\mu\text{f}$
Grid No. 1 to all	5.5	7.2	$\mu\mu\text{f}$
D1 to D2	1.4	2.0	$\mu\mu\text{f}$
D3 to D4	0.9	1.5	$\mu\mu\text{f}$
D1 to all	3.6	4.6	$\mu\mu\text{f}$
D2 to all	3.6	4.6	$\mu\mu\text{f}$
D3 to all	2.7	3.6	$\mu\mu\text{f}$
D4 to all	2.7	3.6	$\mu\mu\text{f}$

Optical Data

Phosphor Number	1	2	7	11
Fluorescent Color	Green	Green	Blue	Blue
Phosphorescent Color	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

Mechanical Data

Overall Length	10 \pm 1/4 Inches
Greatest Diameter of Bulb	3 \pm 1/16 Inches
Minimum Useful Screen Diameter	2.68 Inches
Bulb Number	J24ZA1
Bulb Contact	J1-22
Neck Contacts	J1-25
Base — Small Shell, 12 Pin Duodecal	B12-43
Basing	12Z
Base Alignment	
D1D2 trace aligns with Pin No. 5 and tube axis	\pm 10 Degrees
Positive voltage on D1 deflects beam approximately toward Base Pin No. 5	
Positive voltage on D3 deflects beam approximately toward Base Pin No. 2	
Bulb Contact Alignment	
J1-22 contact aligns with D1D2 trace	\pm 10 Degrees
J1-22 contact on same side as Pin No. 5	
Trace Alignment	
Angle between D3D4 and D1D2 traces	90 \pm 1 Degrees

MAXIMUM RATINGS (Design Center Values)

Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	0.6 ± 10% Ampere
Post-Accelerator Voltage	6000 Max. Volts D-C
Accelerator Voltage	3000 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 1)	2.0
Accelerator Input (Avg.)	6.0 Max. Watts
Focusing Electrode Voltage	1000 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
Heater positive with respect to cathode	180 Max. Volts
Peak Voltage between Accelerator and any Deflection Electrode	550 Max. Volts

TYPICAL OPERATING CONDITIONS

Post-Accelerator Voltage	4000 Volts
Accelerator Voltage	2000 Volts
Focusing Electrode Voltage	320 to 470 Volts
Grid No. 1 Voltage (Note 2)	-52 to -87 Volts
Deflection Factors:	
D1 and D2	140 to 155 Volts D-C per Inch
D3 and D4	61 to 68 Volts D-C per Inch
Deflection Factor Uniformity (Note 3)	2% Max.
Useful Scan	
D1 and D2	2.63 (± 1.315 from tube face center) Min. Inches
D3 and D4	1.5 (± 0.750 from tube face center) Min. Inches
Pattern Distortion (Note 4)	2% Max.
Modulation (Note 5)	38 Max. Volts D-C
Line Width "A" (Note 5) .....	.014 Max. Inches
Light Output (Note 6)	
P1 (Note 7)	38 Foot Lamberts Min.
P11 (Note 8)	14 Foot Lamberts Min.
Focusing Electrode Current for any operating condition	-15 to +5 μA
Spot Position (focused and undeflected) (Note 9)	Within a 10 mm Square
For Accelerator Voltage not shown in the preceding table, the following can be used as a guide:	
Focusing Electrode Voltage	16% to 23.5% of Accelerator Volts
Grid No. 1 Voltage	2.6% to 4.4% of Accelerator Volts
Ratio Post-Accelerator to Accelerator Voltage	2.0
D1 and D2	70 to 78 Volts D-C per Inch per Kilovolt of Accelerator
D3 and D4	30 to 34 Volts D-C per Inch per Kilovolt of Accelerator

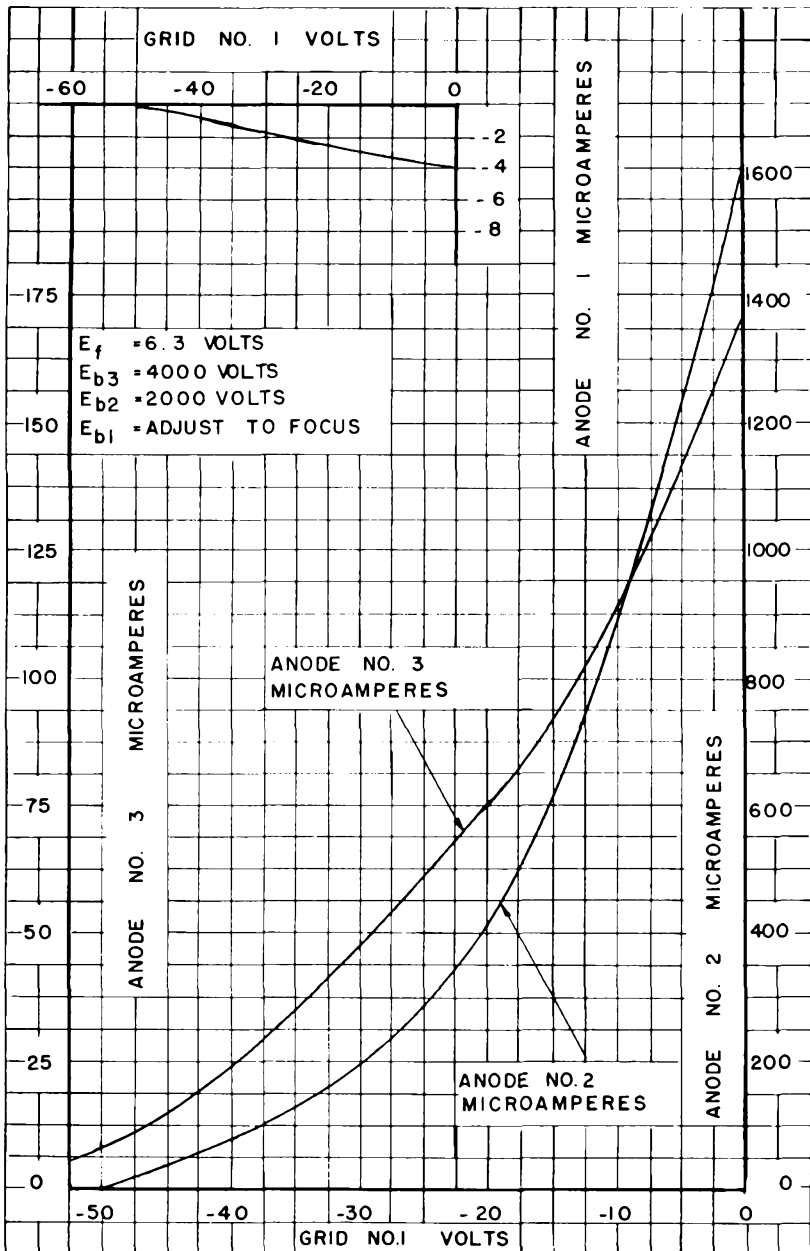
MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting Electrode Circuit (Note 10)	1.0 Max. Megohms

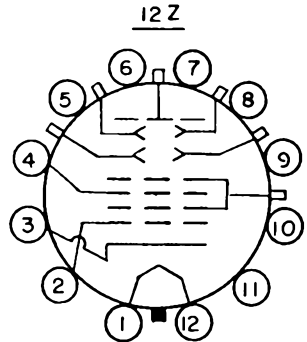
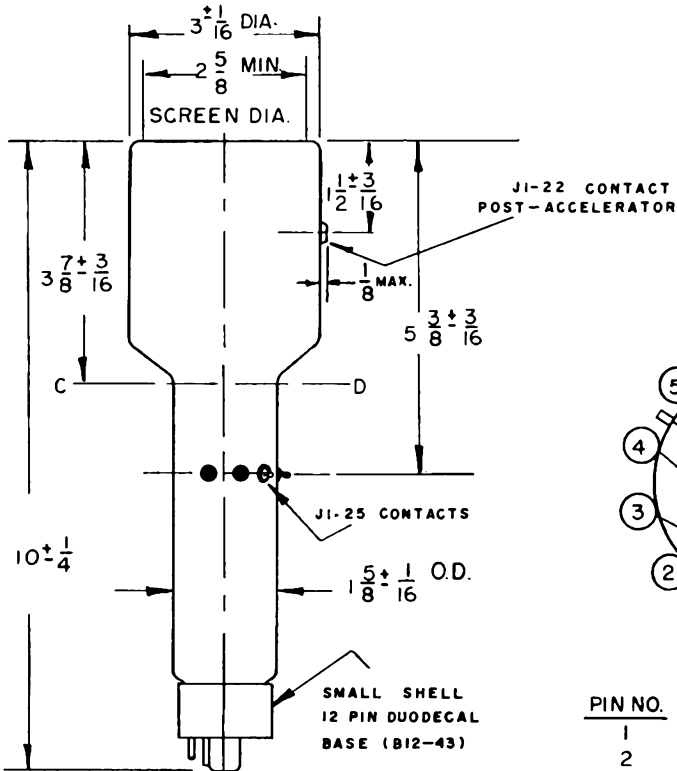
NOTES

1. This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 2.0. Operation at other ratios of Eb3/Eb2 may result in changes in deflection uniformity and pattern distortion.
2. Visual extinction of undeflected focused spot.
3. As per MIL-E-1 specifications using useful scan as reference.
4. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 2.295 x 1.530 inch rectangle, will fall within the area bounded by the 2.295 x 1.530 inch rectangle and an inscribed 2.205 x 1.470 inch rectangle.
5. For an Ib3 of 25 μADC measured in accordance with MIL-E-1 specifications.
6. Using a raster size of 2¼ x 1½ inches and an Ib3 of 25 μADC.
7. Using a #594 Photronic cell with Viscor filter (for eye correction).
8. Using a #594 Photronic cell without Viscor filter (without eye correction).
9. Centered with respect to the tube face and with the tube shielded. Connect free deflecting electrodes to accelerator.
10. It is recommended that the deflecting-electrode circuit resistance be approximately equal.

TYPE 3ADP- AVERAGE CHARACTERISTICS

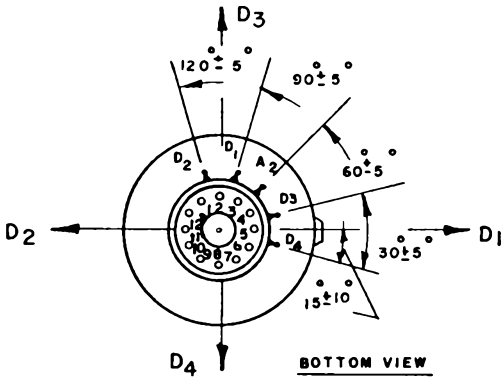


TYPE 3ADP-



BOTTOM VIEW

<u>PIN NO.</u>	<u>ELEMENT</u>
1	HEATER
2	GRID NO.1
3	CATHODE
4	FOCUSING ELECTRODE
5	INTERNAL CONNECTION
12	HEATER



BOTTOM VIEW

3GP-A CATHODE-RAY TUBES

The 3GP-A Cathode-ray Tubes are designed for oscillographic and other applications where small spot size, a brilliant trace, and a minimum of defocusing with deflection are required. The gun is designed to draw negligible focusing electrode current.

The 3GP-A is recommended for replacement only.



GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts	
Heater Current	0.6 ± 10% Ampere	
Focusing Method	Electrostatic	
Deflecting Method	Electrostatic	
Phosphor	No. 1	No. 11
Fluorescence	Green	Blue
Persistence	Medium	Short
Direct Interelectrode Capacitances,		
Nominal Grid No. 1 to all other		
electrodes	7 μmf.	
D1 to D2	2 μmf.	
D3 to D4	1.5 μmf.	
D1 to all other electrodes except D2	7 μmf.	
D2 to all other electrodes except D1	6 μmf.	
D3 to all other electrodes except D4	5 μmf.	
D4 to all other electrodes except D3	5 μmf.	

Mechanical

Overall Length	11½ ± ⅜ Inches
Greatest Diameter of Bulb	3 ± 1/16 Inches
Minimum Useful Screen Diameter	2¾ Inches
Base	Medium Magnal
Basing	11N
Base Alignment	
D3D4 trace aligns with Pin No. 6 and tube axis	+10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin No. 3	
Positive voltage on D3 deflects beam approximately toward locating key	
Angle between D3D4 and D1D2 traces	90 ± 3 Degrees

MAXIMUM RATINGS—(Design Center Values)

Anode No. 2 Voltage ^{1,2}	1500 Max. Volts D-C
Anode No. 1 Voltage	1000 Max. Volts D-C
Grid No. 1 Voltage:	
Negative Bias Value	125 Max. Volts D-C
Positive Bias Value	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts
Peak Voltage between Anode No. 2 and any Deflection Electrode	550 Max. Volts

TYPICAL OPERATING CONDITIONS

For Anode No. 2 Voltage of	1000	1500	Volts
Anode No. 1 Voltage for focus	163 to 291	245 to 437	Volts
Grid No. 1 Voltage ³	-16.5 to -49.5	-25 to -75	Volts
Deflection Factors:			
D1 and D2	64 to 96	96 to 144	Volts D-C per Inch
D3 and D4	56 to 84	84 to 126	Volts D-C per Inch

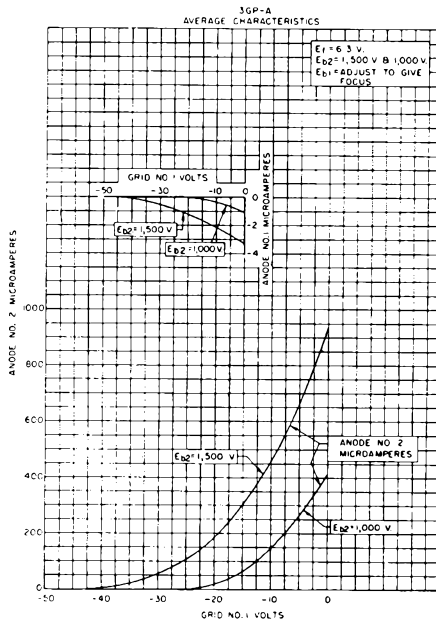
Anode No. 1 Voltage for focus 16.3% to 29.1% of Eb2 Volts
 Grid No. 1 Voltage³ 1.7% to 5% of Eb2 Volts
 Anode No. 1 Current for any operating condition -50 to +10 Microampères
 Spot Position (Undelected)⁴ Within a 7½ millimeter radius circle

MAXIMUM CIRCUIT VALUES

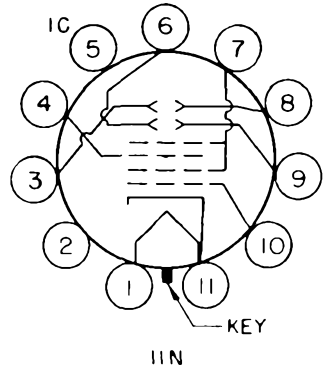
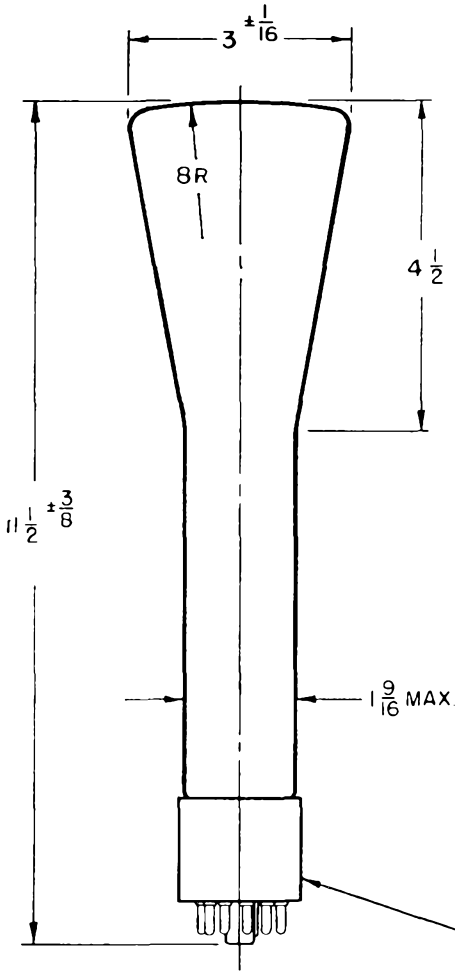
Grid No. 1 Circuit Resistance 1.5 Max. Megohms
 Resistance in any Deflecting Electrode Circuit⁵ 5 Max. Megohms

NOTES

1. The product of Anode No. 2 voltage and average Anode No. 2 current should be limited to 6 watts.
2. Anode No. 2 and Grid No. 2, which are connected together within the tube, are referred to herein as Anode No. 2.
3. Visual extinction of undeflected spot.
4. Centered with respect to the tube face with the tube shielded.
5. It is recommended that the deflecting electrode circuit resistances be approximately equal.
6. For optimum focus the average potentials of the deflection plates and second anode should be the same.



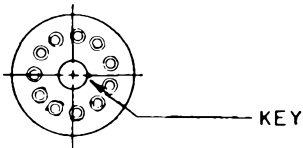
TYPE 3GP-



BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
1	HEATER
3	DEFLECTING ELECTRODE D_1
4	ANODE NO 1
5	INTERNAL CONNECTION
6	DEFLECTING ELECTRODE D_4
7	ANODE NO 2, GRID NO 2
8	DEFLECTING ELECTRODE D_2
9	DEFLECTING ELECTRODE D_3
10	GRID NO. 1
11	HEATER, CATHODE

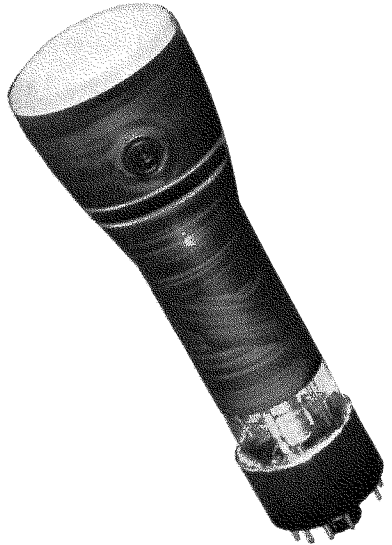
MEDIUM
MAGNAL BASE



3JP- CATHODE-RAY TUBES

The Type 3JP- Cathode-ray Tubes are designed for oscillographic applications requiring a small short tube with very high light output and good deflection sensitivity. The intensifier electrode and extremely high current gun provide high excitation of the screen. The gun is designed so that the focusing electrode current under operating conditions is negligible. The 2" diameter neck and diheptal base provide adequate insulation between electrode leads for high altitude installation.

The four types differ only in the characteristics of the fluorescent screens. Other screen types may be obtained on special order.



GENERAL CHARACTERISTICS

Electrical

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

Cathode to all other electrodes $8 \mu\text{f.}$
 Grid No. 1 to all other electrodes $8 \mu\text{f.}$
 D1 to D2 $2.5 \mu\text{f.}$
 D3 to D4 $2 \mu\text{f.}$
 D1 to all other electrodes except D2 $8 \mu\text{f.}$
 D2 to all other electrodes except D1 $7 \mu\text{f.}$
 D3 to all other electrodes except D4 $7 \mu\text{f.}$
 D4 to all other electrodes except D3 $8 \mu\text{f.}$

Mechanical

Overall Length $10 \pm \frac{1}{4}$ Inches
 Greatest Diameter of Bulb $3 \pm \frac{1}{16}$ Inches
 Minimum Useful Screen Diameter $2\frac{3}{4}$ Inches
 Bulb Contact (Recessed Small Ball Cap) J1-22
 Base (Medium Shell Diheptal 12-Pin) B12-37
 Basing 14J

Base Alignment

D1D2 trace aligns with Pin No. 5 and tube axis ± 10 Degrees
 Positive voltage on D1 deflects beam approximately toward Pin No. 5
 Positive voltage on D3 deflects beam approximately toward Pin No. 2
 Angle between D3D4 and D1D2 traces 90 ± 3 Degrees

Bulb Contact Alignment

J1-22 Cap aligns with D1D2 trace ± 10 Degrees
 J1-22 Cap on same side as Pin No. 5

MAXIMUM RATINGS—(Design Center Values)

Anode No. 3 Voltage (Accelerator High-Voltage Electrode)	4,000 Max. Volts D-C
Anode No. 2 Voltage ^{1,2}	2,000 Max. Volts D-C
Ratio Anode No. 3 Voltage to Anode No. 2 Voltage	2.3 Max.
Anode No. 1 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	2 Max. Volts
Peak Heater Cathode Voltage	
Heater Negative with respect to cathode	125 Max. Volts D-C
Heater positive with respect to cathode	125 Max. Volts D-C
Peak Voltage between Anode No. 2 and any deflection Electrode	500 Max. Volts

TYPICAL OPERATING CONDITIONS

For Anode No. 3 Voltage of	1,500	3,000	4,000	Volts
For Anode No. 2 Voltage of	1,500	1,500	2,000	Volts
Anode No. 1 Voltage for focus	300 to 515	300 to 515	400 to 690	Volts
Grid No. 1 Voltage ³	-22.5 to -67.5	-22.5 to -67.5	-30 to -90	Volts
Deflection Factors:				
D1 and D2	102 to 138	127 to 173	170 to 230	Volts D-C per Inch
D3 and D4	76 to 102	94 to 128	125 to 170	Volts D-C per Inch
Anode No. 1 Voltage for focus				20% to 34.5% of Eb2 Volts
Grid No. 1 Voltage ³				1.5% to 4.5% of Eb2 Volts
Anode No. 1 Current for any operating condition				-50 to +10 Microamperes
Deflection Factors:				
No 3rd Anode or Eb3 = Eb2				
D1 and D2				68 to 92 Volts D-C per Inch per Kilovolt of Eb2
D3 and D4				50 to 68 Volts D-C per Inch per Kilovolt of Eb2
Eb3 = Twice Eb2				
D1 and D2				85 to 115 Volts D-C per Inch per Kilovolt of Eb2
D3 and D4				62.5 to 85 Volts D-C per Inch per Kilovolt of Eb2
Spot Position (Undelected) ⁴	Within a 6 millimeter radius circle.			

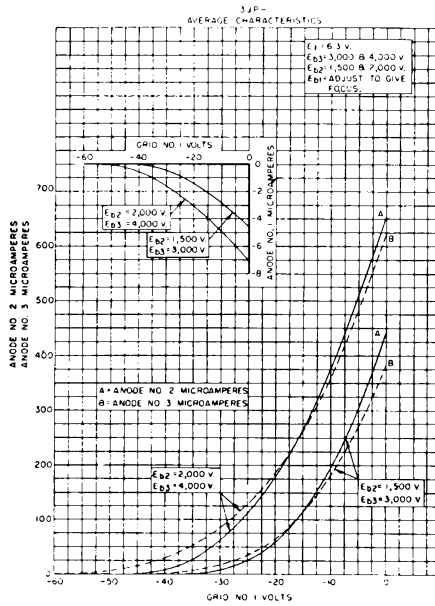
MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting Electrode Circuit ⁵	5 Max. Megohms

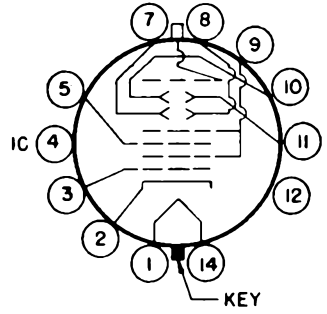
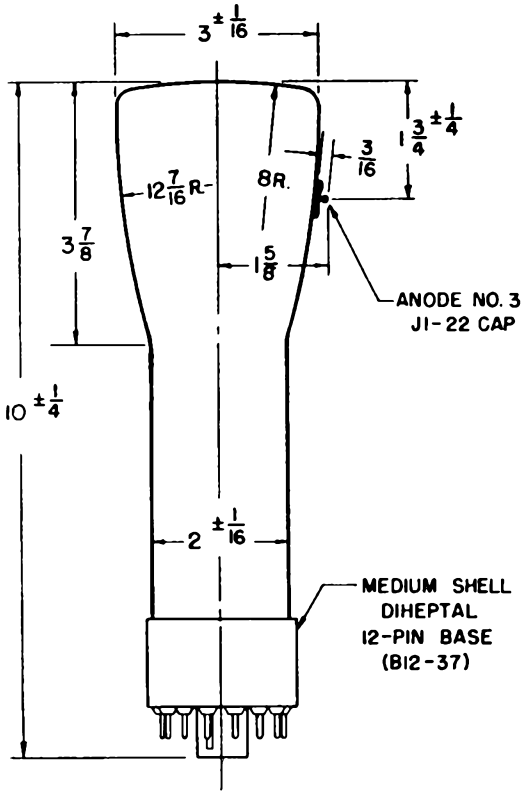
NOTES

1. Anode No. 2 and Grid No. 2, which are connected together within the tube, are referred to herein as Anode No. 2.
2. The product of Anode No. 2 voltage and average Anode No. 2 current should be limited to 6 watts.
3. Visual extinction of undeflected focused spot.
4. Centered with respect to the tube face with the tube shielded.

5. It is recommended that the deflecting electrode circuit resistances be approximately equal.
6. For optimum focus the average potentials of the deflection plates and second anode should be the same.

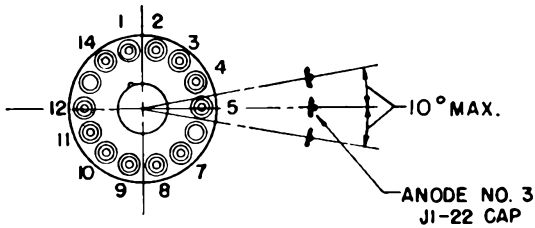


TYPE 3JP-



BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
1	HEATER
2	CATHODE
3	GRID NO 1
4	INTERNAL CONNECTION
5	ANODE NO. 1
7	DEFLECTING ELECTRODE D_3
8	DEFLECTING ELECTRODE D_4
9	ANODE NO. 2, GRID NO. 2
10	DEFLECTING ELECTRODE D_2
11	DEFLECTING ELECTRODE D_1
14	HEATER



3RP-A CATHODE-RAY TUBES

The Type 3RP-A is a short, flat-face, 3" cathode-ray tube. High brilliance and definition at relatively low Anode No. 2 voltages, and negligible focusing electrode current, make the Type 3RP-A ideally suited for low- and medium-voltage oscillographic applications.

The Type 3RP-A features high deflection sensitivity with a maximum Anode No. 2 rating of 2500 volts. Special construction of deflection plates D1-D2 minimizes pin-cushion distortion, usually found in flat-face tubes of such short overall length.

Each deflection plate of the Type 3RP-A is connected to a separate pin of a 12-pin duo-decal base, permitting the use of balanced deflection voltages. This greatly reduces astigmatic distortion of both the spot and the pattern it describes.

The flat surface of its tube-face and new production techniques greatly improve the optical qualities of the Type 3RP-A.



GENERAL CHARACTERISTICS

Electrical

Heater Voltage 6.3 Volts
Heater Current $0.6 \pm 10\%$ Ampere
Focusing Method Electrostatic
Deflecting Method Electrostatic

Phosphor P1
Fluorescence Green
Persistence Medium

Direct Interelectrode Capacitances, Approx.

Cathode to all other electrodes $6 \mu\text{f.}$
Grid No. 1 to all other electrodes $8 \mu\text{f.}$
D1 to D2 $2 \mu\text{f.}$
D3 to D4 $2 \mu\text{f.}$
D1 to all other electrodes except D2 $13 \mu\text{f.}$
D2 to all other electrodes except D1 $10 \mu\text{f.}$
D3 to all other electrodes except D4 $9 \mu\text{f.}$
D4 to all other electrodes except D3 $10 \mu\text{f.}$

Mechanical

Overall Length $9\frac{1}{8} \pm \frac{1}{4}$ Inches
Greatest Diameter of Bulb $3 \pm \frac{1}{16}$ Inches
Minimum Useful Screen Diameter $2\frac{3}{4}$ Inches
Base (Small Shell 12-Pin Duodecal) B12-43
Basing 12E

Base Alignment

D3D4 trace aligns with Pin No. 1 and tube axis ± 10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin No. 4
Positive voltage on D3 deflects beam approximately toward Pin No. 1
Angle between D3D4 and D1D2 traces 90 ± 3 Degrees

MAXIMUM RATINGS—(Design Center Values)

Anode No. 2 Voltage ^{1,2}	2,500 Max. Volts D-C
Anode No. 1 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	2 Max. Volts
Peak Heater-Cathode Voltage	
Heater Negative with respect to Cathode	125 Max. Volts D-C
Heater Positive with respect to Cathode	125 Max. Volts D-C
Peak Voltage between Anode No. 2 and any Deflection Electrode	500 Max. Volts

TYPICAL OPERATING CONDITIONS

For Anode No. 2 Voltage of	1,000	2,000	Volts
Anode No. 1 Voltage for focus	165 to 310	330 to 620	Volts
Grid No. 1 Voltage ³	-22.5 to -67.5	-45 to -135	Volts

Deflection Factors:

D1D2	73 to 99	146 to 198	Volts D-C per Inch
D3D4	52 to 70	104 to 140	Volts D-C per Inch

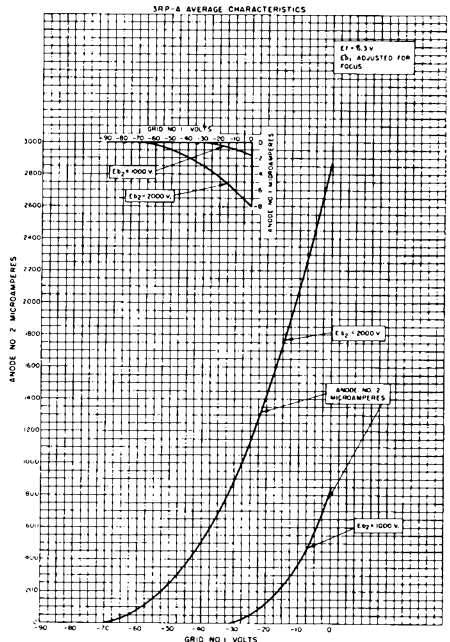
Anode No. 1 Voltage for focus	16.5% to 31% of Eb2 Volts
Grid No. 1 Voltage ³	2.25% to 6.75% of Eb2 Volts
Anode No. 1 Current for any operating condition	-15 to +10 Microamperes
Spot Position (Undelected) ¹	Within a 7½ millimeter radius circle

MAXIMUM CIRCUIT VALUES

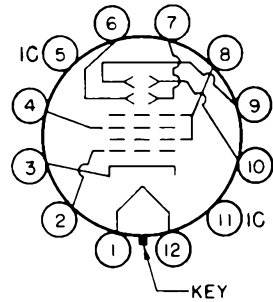
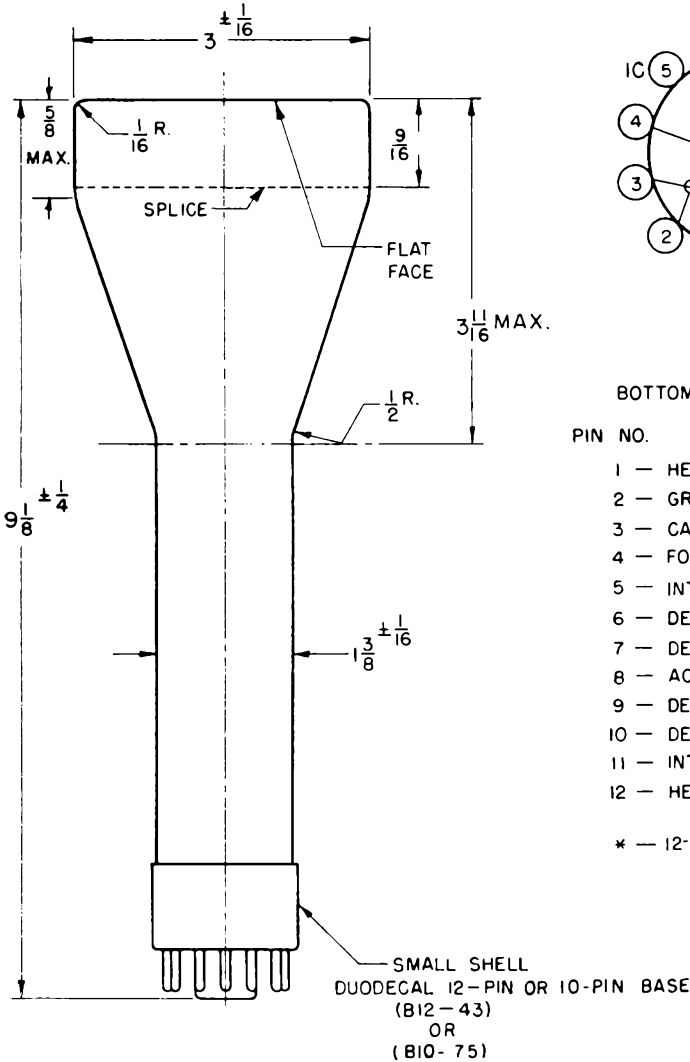
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting-Electrode Circuit ⁷	5 Max. Megohms

NOTES

1. Anode No. 2 and Grid No. 2, which are connected together within the tube, are referred to herein as Anode No. 2.
2. The product of Anode No. 2 voltage and average Anode No. 2 current should be limited to 6 watts.
3. Visual extinction of undeflected focused spot.
4. Centered with respect to the tube face with the tube shielded.
5. It is recommended that the deflecting electrode circuit resistances be approximately equal.
6. For optimum focus the average potentials of the deflection plates and second anode should be the same.



TYPE 3RP-A



BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
1	HEATER
2	GRID NO 1
3	CATHODE
4	FOCUSING ELECTRODE
5	INTERNAL CONNECTION *
6	DEFLECTING ELECTRODE D ₃
7	DEFLECTING ELECTRODE D ₄
8	ACCELERATOR
9	DEFLECTING ELECTRODE D ₂
10	DEFLECTING ELECTRODE D ₁
11	INTERNAL CONNECTION *
12	HEATER

* — 12-PIN BASE ONLY

3WP- CATHODE-RAY TUBES

The Type 3WP- Cathode-ray Tubes are designed for applications where tight tolerances and high sensitivity are important. Among the important features of this line of industrial tubes are: reduction by 50% in critical tolerances for deflection sensitivity and grid cutoff; improved perpendicularity with angle alignment between "X" and "Y" deflection plates held to $90^\circ \pm 1^\circ$; greatly improved sensitivity on both axes without reduction in useful scan and a flat face to reduce parallax error.

The inherently higher sensitivity of this line of "Tight-tolerance" cathode-ray tubes, such as the Type 3WP-, over previously available commercial tubes permits smaller, lower cost amplifiers, while tight tolerances afford greater freedom in cathode-ray equipment design.



GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts
Heater Current	$0.6 \pm 10\%$ Ampere
Focusing Method	Electrostatic
Deflecting Method	Electrostatic

Phosphor	P1	P11
Fluorescence	Green	Blue
Persistence	Medium	Short

Direct Interelectrode Capacitances

	Min.	Max.	
Cathode to all other electrodes	3.0	5.7	$\mu\mu\text{f.}$
Grid No. 1 to all other electrodes	4.6	8.7	$\mu\mu\text{f.}$
D1 to D2	1.7	3.3	$\mu\mu\text{f.}$
D3 to D4	1.0	2.0	$\mu\mu\text{f.}$
D1 to all other electrodes except D2	3.8	7.2	$\mu\mu\text{f.}$
D2 to all other electrodes except D1	3.8	7.2	$\mu\mu\text{f.}$
D3 to all other electrodes except D4	2.5	4.8	$\mu\mu\text{f.}$
D4 to all other electrodes except D3	2.5	4.8	$\mu\mu\text{f.}$

Mechanical

Overall Length	$11\frac{1}{2} \pm \frac{1}{8}$ Inches
Greatest Diameter of Bulb	$3 \pm \frac{1}{16}$ Inches
Minimum Useful Screen Diameter	$2\frac{3}{4}$ Inches
Base (Small Shell 12-pin Duodecal)	B12-43
Basing	12T

Base Alignment

D1D2 trace aligns with Pin No. 3 and tube axis	± 10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin No. 3	
Positive voltage on D3 deflects beam approximately toward Pin No. 12	
Angle between D3D4 and D1D2 traces	90 ± 1 Degrees

MAXIMUM RATINGS—(Design Center Values)

Accelerator Voltage ¹	2,500 Max. Volts D-C
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 Deflection Electrode	500 Max. Volts

TYPICAL OPERATING CONDITIONS

For Accelerator Voltage of	1,500 Volts
Focusing Voltage	247 to 465 Volts
Grid No. 1 Voltage ²	-45 to -75 Volts
Modulation ³	50 Volts Max.
Line Width A ³ .....	.026 Inch Max.
P1 Light Output ³	7 Ft. L. Min.
Deflection Factors:	
D1D2	62 to 76 Volts D-C per Inch
D3D4	43 to 52 Volts D-C per Inch
Deflection Factor Uniformity ⁴	2% Maximum
Useful Scan	
D1D2	2.50 Inches*
D3D4	2.25 Inches**
Pattern Distortion at 90% of Useful Scan ⁵	2% Max.
Spot Position (Undelected)	Within a 3/16-inch radius circle ⁷

CIRCUIT DESIGN VALUES

Focusing Voltage	165 to 310 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid No. 1 Voltage ²	30 to 50 Volts per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Deflection Factors	
D1 and D2	41.5 to 50.5 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	28.5 to 35.0 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting-Electrode Circuit ⁸	5 Max. Megohms

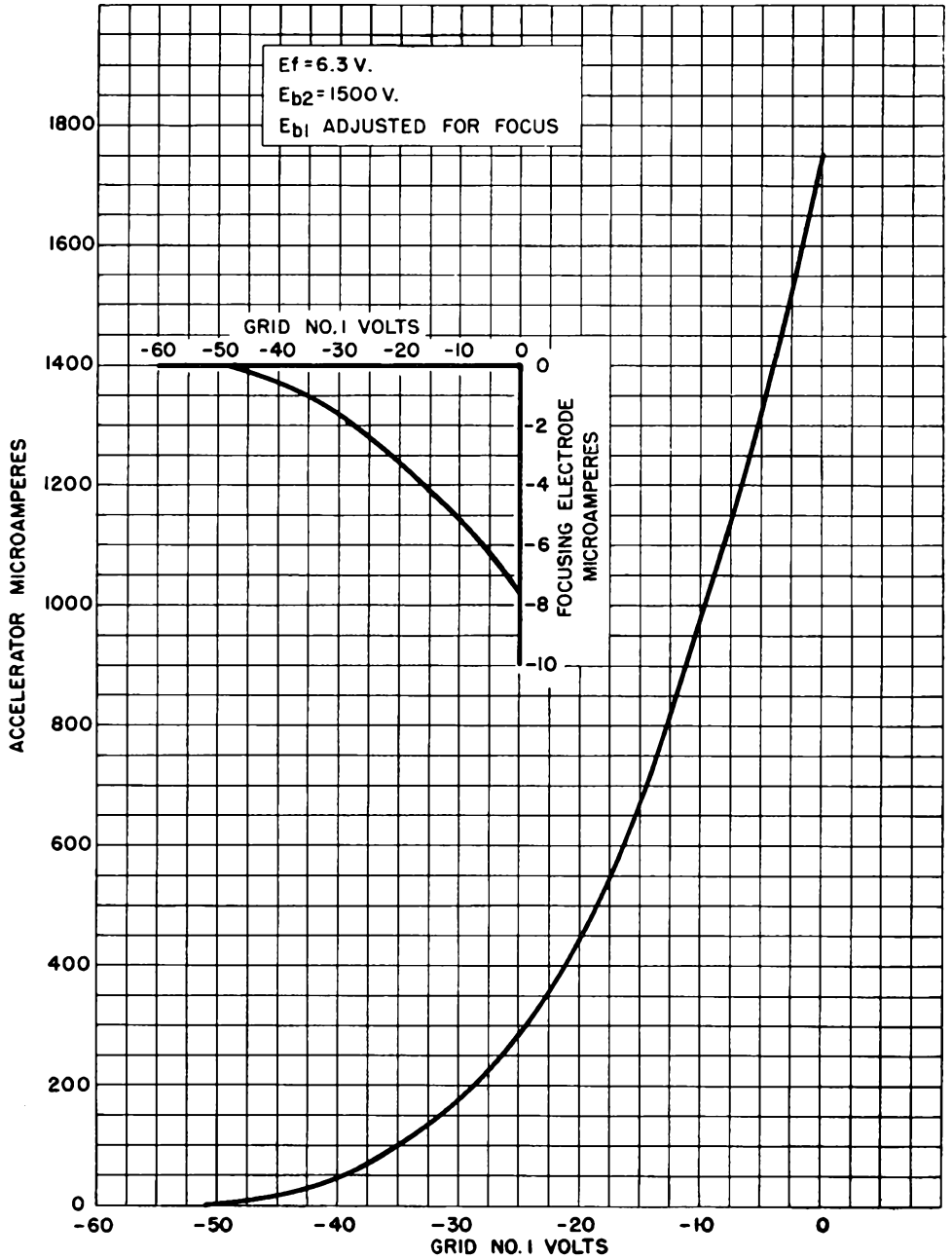
* $\pm 1.25''$ minimum from tube face center

** $\pm 1.125''$ minimum from tube face center

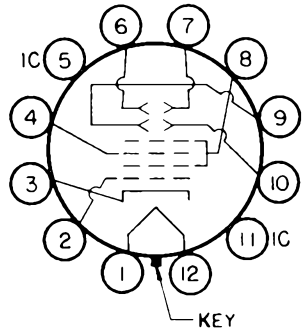
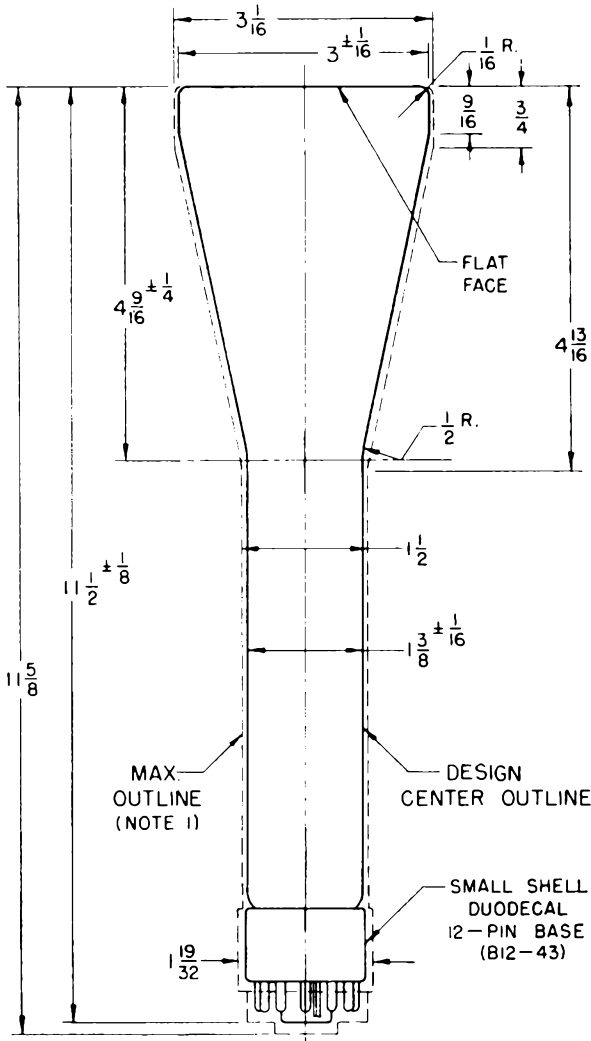
NOTES

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. The deflection factor (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.
5. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 2.295 x 2.065-inch rectangle, will fall within the area bounded by the 2.295 x 2.065-inch rectangle and an inscribed 2.205 x 1.985-inch rectangle.
6. Deflection accuracy may be obtained by combining angle between traces, deflection factor uniformity and pattern distortion characteristics. In general, for deflections less than those indicated the accuracy will improve.
7. When the tube is operated at typical operating conditions ($E_h = 6.3$ V., $E_{b2} = 1500$ V., E_{b1} at focus); E_{c1} 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, the spot will fall within a 3/16-inch radius circle centered on the tube face.
8. It is recommended that the deflecting electrode circuit resistances be approximately equal.
9. For optimum focus the average potentials of the deflection plates and second anode should be the same.

3WP-
AVERAGE CHARACTERISTICS



TYPE 3WP-



BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
1	HEATER
2	GRID NO. 1
3	CATHODE
4	FOCUSING ELECTRODE
5	INTERNAL CONNECTION
6	DEFLECTING ELECTRODE D_1
7	DEFLECTING ELECTRODE D_2
8	ACCELERATOR
9	DEFLECTING ELECTRODE D_4
10	DEFLECTING ELECTRODE D_3
11	INTERNAL CONNECTION
12	HEATER

NOTE:
1-NO TUBE WILL EXCEED MAXIMUM OUTLINE.

4DP- CATHODE-RAY TUBES

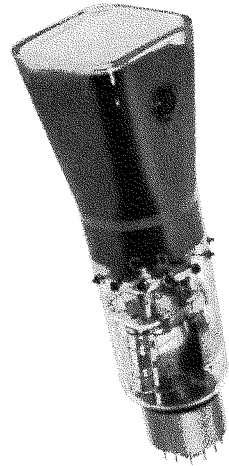
The Du Mont Type 4DP- is a dual-beam cathode-ray tube featuring the usable screen area of 5-inch tubes without occupying the space a five-inch tube requires. The 3.5-inch square faceplate of the 4DP- is partly responsible for this feature. Short overall length adds further to the space-saving design.

The two electron guns mounted in the 4DP- are completely independent of one another except for common accelerator and post-accelerator connections. In addition, deflection-plate and accelerator electrode leads are brought out through the tube wall for minimum capacitances and as insulation from other terminals.

Post-acceleration of the electron streams provides greater trace brilliance with minimum sacrifice in deflection sensitivity. Increased deflection sensitivity appreciably reduces the necessary gain of driver-amplifiers.

Du Mont's exclusive tight-tolerance manufacturing technique results in excellent tracking accuracy between beams.

Screen types other than those listed are available on order.



GENERAL CHARACTERISTICS (Note 1)

Electrical Data

Heater Voltage	6.3 Volts			
Heater Current	0.6 ± 10% Ampere			
Deflection Method	Electrostatic			
Focusing 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	3.6	5.0		μμf
Grid No. 1 to all other electrodes	3.7	5.1		μμf
D1 to D2	1.5	2.3		μμf
D3 to D4	1.5	2.3		μμf
D1 to all	4.0	5.3		μμf
D2 to all	4.0	5.3		μμf
D3 to all	4.8	6.5		μμf
D4 to all	4.8	6.5		μμf

Mechanical Data

Overall Length	12¼ ± ¼ Inches
Greatest Bulb Dimension (Diagonal)	4¼ ± 3/32 Inches
Minimum Useful Screen Dimensions (Rounded Corners)	2⅞ x 2⅞ Inches
Bulb Contacts (Post Accelerator)	
Recessed Small Ball Cap	J1-22
Bulb Contacts (Accelerator and Deflection Electrodes)	
Small Ball Cap	J1-25
Base — Medium Shell Diheptal, 12 Pin	B12-37
Basing	14Y
Base Alignment	
D3D4 trace aligns with Base Key and Tube Axis	± 10 Degrees
Positive Voltage on D1 deflects the beam approximately toward Pin. No. 4	
Positive Voltage on D3 deflects the beam approximately toward the Base Key	

Bulb Contact Alignment	
Post Accelerator and Accelerator Contacts align with D1D2 trace	± 10 Degrees
Bulb Contact (J1-22) on same side as Base Pin No. 4	
Trace Alignment	
Angle between D1D2 and D3D4 traces	90 ± 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	6000 Max. Volts D-C
Accelerator Voltage	3000 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 2)	2.0 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
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 Electrodes	750 Volts

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	4000 Volts D-C
For Accelerator Voltage of	2000 Volts D-C
Focusing Voltage	335 to 615 Volts D-C
Grid No. 1 Voltage (Note 3)	-52 to -87 Volts D-C
Modulation (Note 4)	35 Max. Volts D-C
Line Width "A" (Note 5)	.024 Max. Inches
Deflection Factors:	
D1 and D2	115 to 140 Volts D-C/Inch
D3 and D4	90 to 115 Volts D-C/Inch
Spot Position (Note 6)	Within $\frac{5}{8}$ Inch Square
Tracking Error (Note 7)	

CIRCUIT DESIGN VALUES

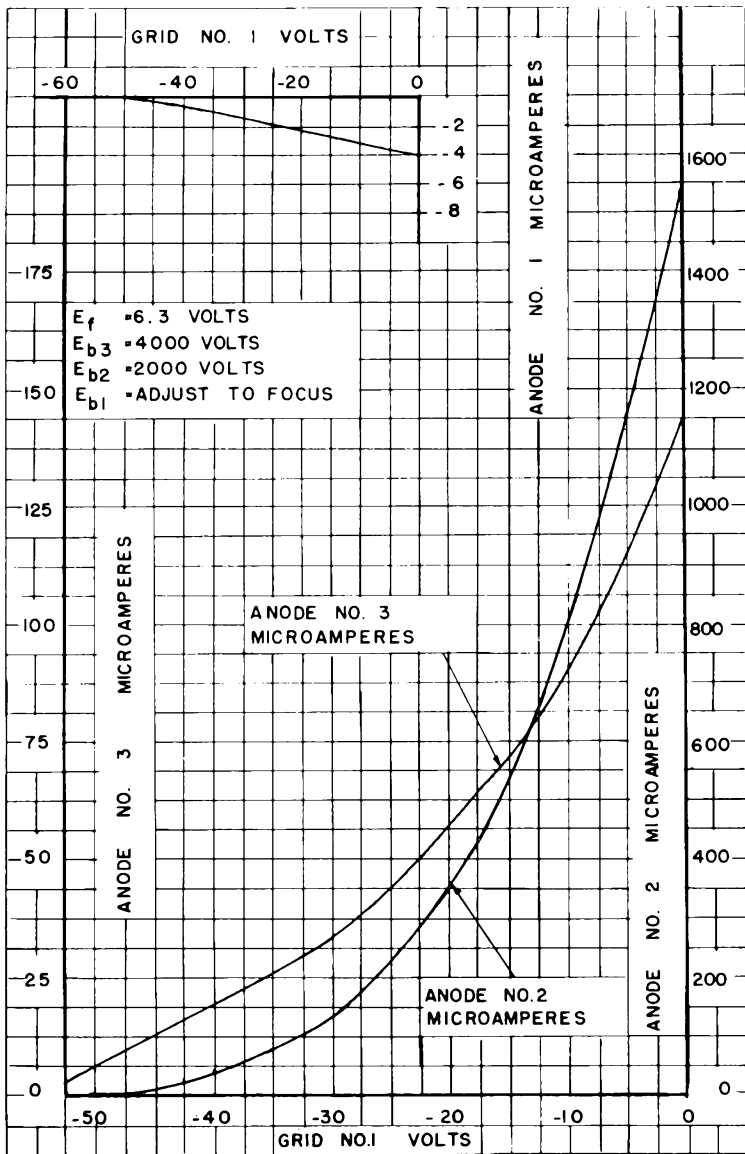
Focusing Voltage	167 to 308 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid No. 1 Voltage (Note 3)	-26 to -44 Volts per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Deflection Factors:	
Ratio Post-Accelerator Voltage to Accelerator Voltage	1.0
D1 and D2	44 to 54 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	39 to 50 Volts D-C/Inch/KV of Accelerator Voltage
Ratio Post-Accelerator Voltage to Accelerator Voltage	2.0
D1 and D2	57.5 to 70 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	45 to 57.5 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflection Electrode Circuit (Note 8)	1.0 Max. Megohms

NOTES

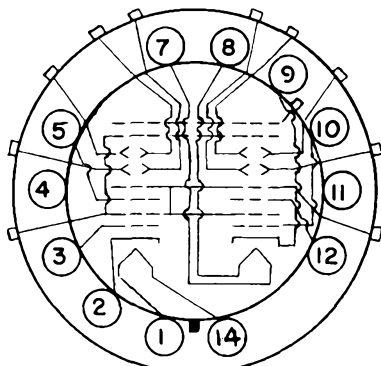
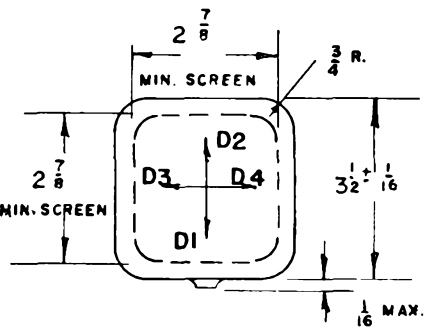
1. The values shown are for each unit unless otherwise stated. All tests are to be made on each gun separately.
2. This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 2.0. Operation at other ratios of Eb3/Eb2 may result in changes in deflection uniformity, pattern distortion, and tracking accuracy.
3. The visual extinction of the focused, undeflected spot.
4. The increase in Grid No. 1 voltage from cut-off to produce an Ib3 of 25 μ AD-C.
5. Measured in accordance with MIL-E-1 specifications, using an Ib3 of 25 μ AD-C.
6. 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 avoid damage to the screen, (3) each of the deflecting electrodes connected to the accelerator and (4) the tube shielded against external influences; the spots will fall within a $\frac{5}{8}$ inch square, the center of which coincides with the geometric center of the tube face, and the sides of which are parallel to the traces produced by deflecting electrodes D1 and D2 and by deflecting electrodes D3 and D4 respectively.
7. The tracking accuracy over an area bounded by $\pm 1\text{-}7/16$ inches from the geometric center of the tube in the D1D2 plane and $\pm 1\frac{1}{8}$ inches in the D3D4 plane shall be such that if the two spots are made coincident at the tube face center and then each

- is moved to any spot within above area by means of deflection voltages that should give corresponding deflections in the D1D2 or D3D4 direction from the tube face center, the two spots will lie within 0.043 of an inch of each other.
8. 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 current operation.
 9. After compensation for deflection sensitivity and centering, the deviation of the D1D2 trace shall not vary from a straight line tangent to the trace by more than .050 of an inch at $\pm 1\frac{1}{8}$ inches from the geometric center of the tube face.

**TYPE 4DP-
AVERAGE CHARACTERISTICS**



TYPE 4DP-



14 Y

UNIT A

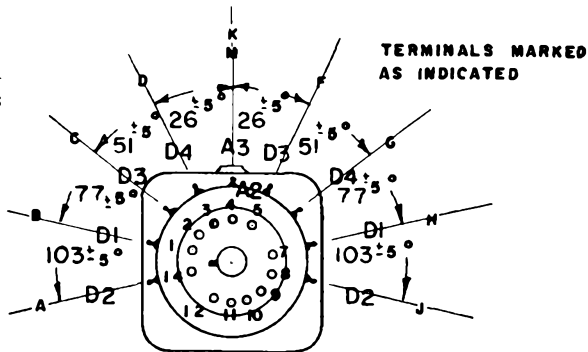
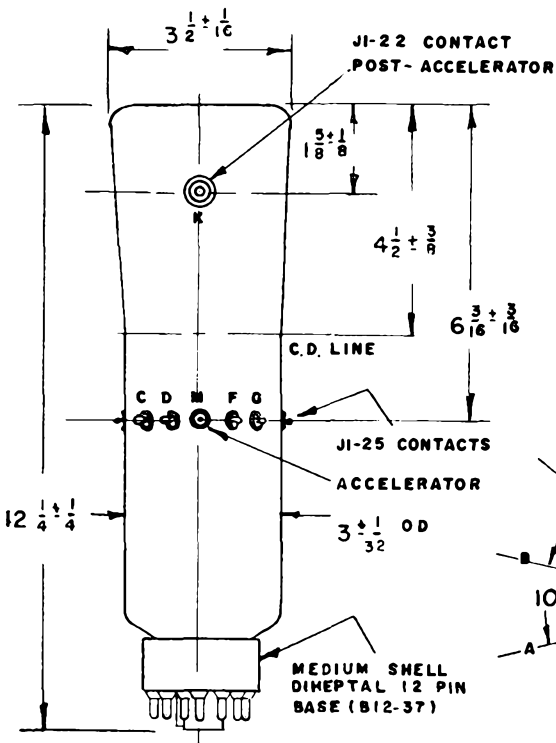
UNIT B

PIN

PIN

- 1 HEATER
- 2 CATHODE
- 3 GRID NO.1
- 5 FOCUSING ELECTRODE
- 14 HEATER

- 7 HEATER
- 8 HEATER
- 9 CATHODE
- 10 GRID NO.1
- 12 FOCUSING ELECTRODE



BOTTOM VIEW

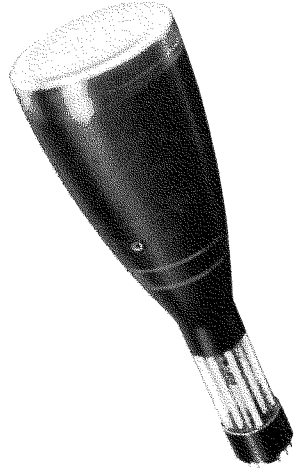
NOTE: 1. ANGLES WITH RESPECT TO ACCELERATOR CONTACT.
2. THE BULB SHALL BE A TYPE J28-B1

5ADP- CATHODE-RAY TUBES

The Type 5ADP- Cathode-ray Tubes are flat-faced electrostatically focused and deflected cathode-ray tubes, designed for applications where tight tolerances and high sensitivity are important. The high sensitivity is achieved by the use of long deflection plates.

Tolerances are very closely controlled: angle alignment between the D1D2 and D3D4 traces is held to within 1°, while deflection factors are held to within 10% with low pattern distortion. Grid cutoff bias is maintained within 25%. A gun which draws negligible focussing electrode current is also employed.

Similar to the Type 3WP- Cathode-ray Tubes, the Type 5ADP- Cathode-ray Tubes permit smaller, lower cost amplifiers, while tight tolerances afford greater freedom in cathode-ray equipment design.



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

	Min.	Max.	
Cathode to all other electrodes	3.1	5.8	μμf.
Grid No. 1 to all other electrodes	4.2	7.9	μμf.
D1 to D2	1.7	3.1	μμf.
D3 to D4	.7	1.3	μμf.
D1 to all other electrodes except D2	2.7	6.1	μμf.
D2 to all other electrodes except D1	2.7	6.1	μμf.
D3 to all other electrodes except D4	2.1	4.0	μμf.
D4 to all other electrodes except D3	2.1	5.0	μμf.

Mechanical

Overall Length	16¾ ± 3/16 Inches
Greatest Diameter of Bulb	5¼ ± 3/32 Inches
Minimum Useful Screen Diameter	4½ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Medium Shell Diheptal 12-pin)	B12-37
Basing	14J
Base Alignment	
D1D2 trace aligns with Pin No. 5 and Tube Axis	±10 Degrees
Positive voltage on D1 deflects beam approximately toward pin No. 5	
Positive voltage on D3 deflects beam approximately toward pin No. 2	
Angle between D3D4 and D1D2 traces	90 ± 1 Degrees
Bulb Contact Alignment	
J1-22 contact aligns with D1D2 trace	± 10 Degrees
J1-22 contact on same side as Pin No. 5	

MAXIMUM RATINGS—(Design Center Values)

Post Accelerator Voltage	6,000 Max. Volts D-C
Accelerator Voltage ¹	2,600 Max. Volts D-C
Ratio Post Accelerator Voltage to Accelerator Voltage	2.3 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 Deflection Electrode	500 Max. Volts

TYPICAL OPERATING CONDITIONS

For Post Accelerator Voltage of	3,000 Volts
For Accelerator Voltage of	1,500 Volts
Focusing Voltage	300 to 515 Volts
Grid No. 1 Voltage ²	-34 to -56 Volts
Modulation ³	45 Volts Max.
Line Width A ³ .....	.030 Inches Max.
P1 Light Output ³	15 Ft. L. Min.
Deflection Factors:	
D1 and D2	40 to 50 Volts D-C per Inch
D3 and D4	30.5 to 37.5 Volts D-C per Inch
Deflection factor uniformity ⁴	2% Maximum
Useful Scan ⁵	
D1D2	4 Inches*
D3D4	4 Inches*
Pattern Distortion at 75% of useful scan ⁶	2½% Max.
Spot Position (Undelected)	Within a 5/16-inch radius circle*

CIRCUIT DESIGN VALUES

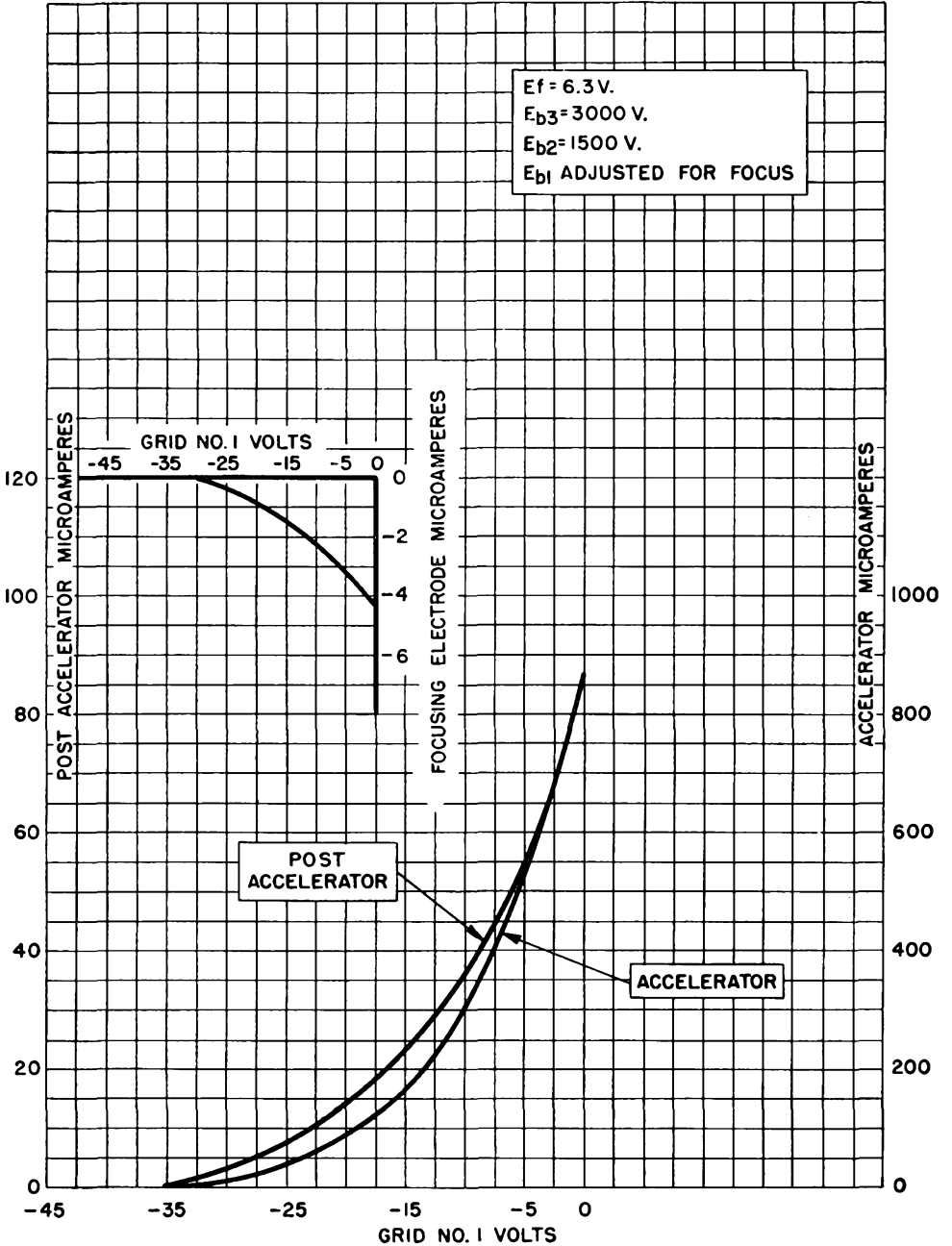
Focusing Voltage	187 to 345 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid No. 1 Voltage ²	22.5 to 37.5 Volts per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Deflection Factors:	
Post Accelerator Voltage = Accelerator Voltage	
D1 and D2	21.5 to 26.5 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	16 to 20 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting-Electrode Circuit ⁹	5 Max. Megohms
* ±2" minimum from tube face center.	

NOTES

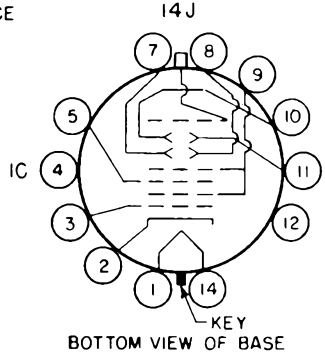
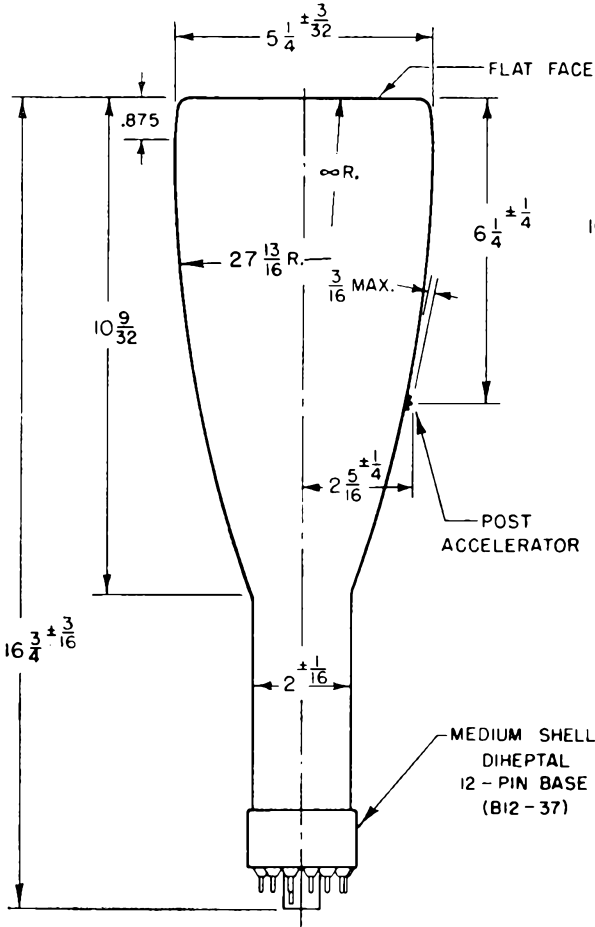
1. The product of Accelerator Voltage and average Accelerator Current should be limited to 6 watts.
2. Visual extinction of undeflected focused spot.
3. Measured in accordance with JAN-1A Specifications at Post Accelerator Current = 25 ua.
4. The deflection factor (for both D1D2 and D3D4 plate pairs, 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 the indicated value.
5. Reduction in useful scan when Post Accelerator Voltage is greater than Accelerator Voltage is determined by the ratio of these voltages measured with respect to cathode. Values shown are therefore applicable to any operating condition with the same voltage ratios.
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. Deflection accuracy may be obtained by combining angle between traces, deflection factor uniformity and pattern distortion characteristics. In general, for deflections less than those indicated the accuracy will improve.

8. Centered with respect to the tube face with the tube shielded.
9. It is recommended that the deflecting electrode circuit resistances be approximately equal.
10. For optimum focus the average potentials of the deflection plates and second anode should be the same.

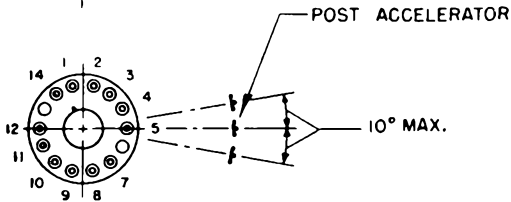
**5ADP-
AVERAGE CHARACTERISTICS**



TYPE 5ADP-



PIN NO.	ELEMENT
1	HEATER
2	CATHODE
3	GRID NO. 1
4	INTERNAL CONNECTION
5	FOCUSING ELECTRODE
7	DEFLECTING ELECTRODE D ₃
8	DEFLECTING ELECTRODE D ₄
9	ACCELERATOR
10	DEFLECTING ELECTRODE D ₂
11	DEFLECTING ELECTRODE D ₁
14	HEATER



5AFP- CATHODE-RAY TUBE

The Du Mont Type 5AFP- is a five-inch flat-faced electrostatically focused and deflected cathode-ray tube containing two independent beams. The Type 5AFP- features extremely low interaction between traces plus high deflection sensitivity and excellent deflection accuracy. It is one of the line of Du Mont tight-tolerance cathode-ray tubes.

The Type 5AFP- is designed for applications requiring a dual-beam presentation with high brightness level, excellent deflection accuracy, and minimum spot-size.

High brightness levels can be obtained because of the post-accelerator type of construction. Deflection sensitivity is maintained high, even at high accelerating potentials, by use of limited-scan deflection electrodes.

Termination of deflection electrodes and accelerators are made through the bulb wall, at a ring base, for ease of connection. This minimizes lead inductance and capacitance and improves insulation. The two accelerators, the intergun-shield and the first ring of the post-accelerator which are normally tied together, are provided with separate connections in the Type 5AFP-. These independent and separate connections assure maximum versatility in specialized applications.



GENERAL CHARACTERISTICS

Electrical

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	Green	Yellow	Blue
Persistence	Medium	Long	Long	Short

Direct Interelectrode Capacitances	Min.	Max.	
Cathode to all other electrodes	3.4	4.6	$\mu\mu\text{f}$
Grid No. 1 to all other electrodes	3.2	4.0	$\mu\mu\text{f}$
D1 to D2	1.5	2.1	$\mu\mu\text{f}$
D3 to D4	0.9	1.4	$\mu\mu\text{f}$
D1 to all	4.0	5.0	$\mu\mu\text{f}$
D2 to all	4.0	5.0	$\mu\mu\text{f}$
D3 to all	3.1	4.1	$\mu\mu\text{f}$
D4 to all	3.1	4.1	$\mu\mu\text{f}$

Mechanical

Overall Length	$18\frac{1}{4} \pm \frac{1}{4}$ Inches
Greatest Diameter of Bulb	$5\frac{1}{4} \pm \frac{3}{32}$ Inches
Minimum Useful Screen Diameter	4.5 Inches
Bulb Contacts	J1-22
Collar (12 Pin Diheptal)	Special
Base (Medium Shell Diheptal 12-pin)	B12-37

Basing	Special
Collar and Base Alignment	
Collar Pin No. 1 and Base Key each aligns with the D3D4 trace	± 10 Degrees
Positive Voltage on D1 deflects the beam approximately towards Pin No. 4	
Positive Voltage on D3 deflects the beam approximately towards Base Key	
Bulb Contact Alignment	
Bulb Contacts align with D3D4 trace	± 10 Degrees
Bulb Contact is on the same side as the Base Key	
Trace Alignment	
D1D2 trace aligns with D3D4 trace	90 ± 1 Degrees
Corresponding traces align within	1 Degree

MAXIMUM RATINGS—(Design Center Values)

Post Accelerator Voltage	10,500 Max. Volts D-C
Accelerator Voltage (Note 2)	3,500 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 3)	3.0 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

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	4,000 Volts
For Accelerator Voltage of (Note 4)	2,000 Volts
Focusing Voltage	400 to 684 Volts
Grid No. 1 Voltage (Note 5)	-87 to -53 Volts
Modulation Factor (Note 6)	45 Volts Max.
Line Width (Note 7) .....	.030 Inches Max.
P1 Light Output (Note 7)	20 Ft. L. Min.

Deflection Factors:

D1 and D2	54 to 66 Volts D-C/Inch
D3 and D4	43 to 53 Volts D-C/Inch
Deflection factor uniformity (Note 8)	2% Max.
Useful Scan (Note 9)	
D1D2	4 Inches*
D3D4	4 Inches*
Pattern Distortion @ 75% of useful scan (Note 10)	2½% Max.
Tracking Error (Note 11)	2% Max.
Interaction Factor (Note 12)	0.000014 Inches/Volt D-C Max.
Spot Position (Undelected) (Note 9)	Within a 5/16-inch radius circle

* ± 2 " minimum from tube face center

CIRCUIT DESIGN VALUES

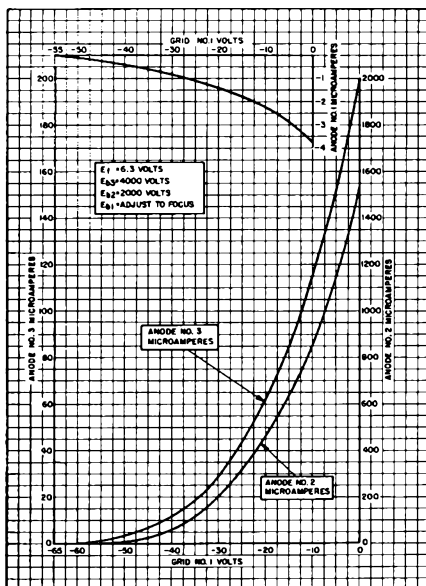
Focusing Voltage	200 to 342 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid No. 1 Voltage (Note 5)	-44 to -26 Volts per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Deflection Factors:	
Ratio Post-Accelerator Voltage to Accelerator Voltage	2.0
D1 and D2	27 to 33 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	24 to 30 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting-Electrode Circuit (Note 13)	5.0 Max. Megohms

NOTES

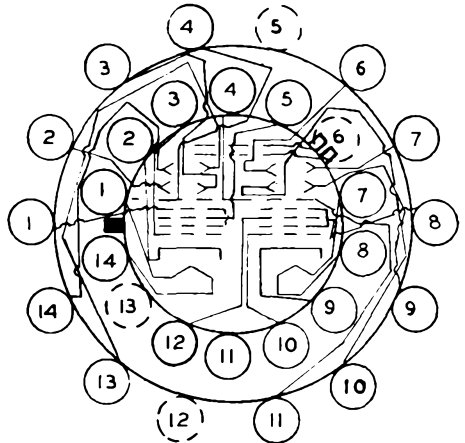
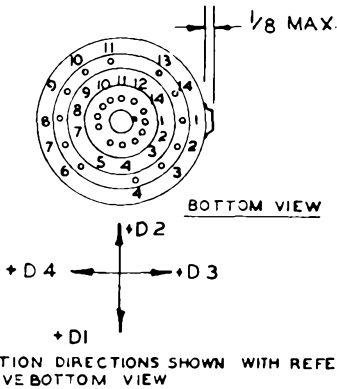
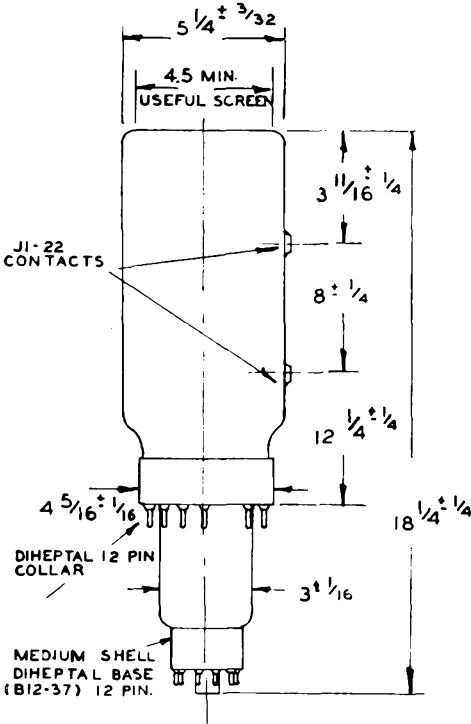
1. Values are for each unit unless otherwise stated.
2. Accelerator power input (Avg.) should be limited to 6 Watts.
3. This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 2.0. Operation at other ratios of Eb3/Eb2 may result in increased deflection (non) uniformity, pattern distortion and tracking error.

4. Grid No. 4 and Grid No. 2 are connected internally and referred to herein as accelerator. The shield electrode and the accelerator electrodes are connected together in the normal operating condition. However, the accelerators as well as the first ring of the post-deflection accelerating system may be operated at different potentials if desired and the shield potential should then be adjusted for optimum performance.
5. Visual extinction of the focused, undeflected spot.
6. The increase in Grid No. 1 voltage from cutoff to produce an Ib3 of 25 μ ADC.
7. Measured in accordance with MIL-E-1 specifications using an Ib3 of 25 μ ADC.
8. 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.
9. Centered with respect to the tube face and with the tube shielded.
10. The edges of a raster pattern, whose mean dimensions are the indicated percentage of useful scan, will not deviate from the mean dimension by more than the specified amount.
11. 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 the deflection.
12. 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.
13. Deflection electrode circuit resistances should be equal.
14. The ratio of the deflection factors of corresponding deflection electrodes will not exceed 1.15.
15. Deflection accuracy may be computed from the angle between traces, deflection factor (non) uniformity and pattern distortion characteristics. In general, for deflections less than those indicated the accuracy will improve.
16. The deflection errors including those from pattern distortion and deflection factor (non) uniformity but not including that from angle between traces will not exceed 3.5% of the deflection.

TYPE 5AFP- AVERAGE CHARACTERISTICS



TYPE 5AFP-



BASE AND COLLAR CONNECTIONS
COLLAR PIN NO. ELEMENT

BEAM A	14	DEFLECTOR D1
	13	DEFLECTOR D2
	2	ACCELERATOR G2 & 4
	3	DEFLECTOR D3
BEAM B	4	DEFLECTOR D4
	6	SHIELD
	7	DEFLECTOR D1
	8	DEFLECTOR D2
	9	ACCELERATOR G2 & 4
	10	DEFLECTOR D4
	11	DEFLECTOR D3
	11	SHIELD

BASE PIN NO ELEMENT

BEAM A	1 & 14	HEATER
	2	CATHODE
	3	GRID NO1
	4	INTERNAL CONNECTION
	5	ANODE NO1
BEAM B	7 & 8	HEATER
	9	CATHODE
	10	GRID NO1
	11	INTERNAL CONNECTION
	12	ANODE NO1

NOTE: SHIELD (COLLAR PINS NO 4 & 11); 5 COMMON TO BOTH BEAMS
 J1-22 CONTACTS, COLLAR PIN NO1, AND BASE KEY EACH ALIGN WITH THE 3D4 TRACE ± 10."

TYPE 5AHP-, 5AHP-A CATHODE-RAY TUBE

The Type 5AHP- is a 5-in electrostatic focus and magnetic deflection cathode-ray tube suitable for radar applications. A low-voltage electrostatic focus lens is employed, designed to operate at or near cathode potential to afford substantially automatic focus, independent of accelerator voltage variations. In addition, the 5AHP- employs the Du Mont high-resolution electron gun. Spot size of the Self-focus Type 5AHP- is materially better than that of magnetically focused types, with a gain of approximately 20% in resolution over the magnetically focused types. Little sacrifice in internal light output is observed and weight and space are saved by the elimination of the focus coil.

The Type 5AHP-A utilizes an aluminized screen for greater light output and to minimize screen charging effects; it is otherwise identical to the 5AHP-. If a P19 screen is selected, the aluminized version should be used.



GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts		
Heater Current	0.6±10% Ampere		
Focusing Method	Electrostatic		
Deflecting Method	Magnetic		
Deflecting Angle (approx.)	53 Degrees		
Phosphor	No. 7	No. 14	No. 19
Fluorescence	Blue	Blue	Orange
Phosphorescence	Yellow	Orange	Orange
Persistence	Long	Medium-long	Long
Direct Interelectrode Capacitances, Approx.			
Cathode to all other electrodes	5	μμf.	
Grid No. 1 to all other electrodes	6	μμf.	

Mechanical

Overall Length	11 1/8 ± 1/4 Inches
Greatest Diameter of Bulb	4 5/16 ± 3/32 Inches
Minimum Useful Screen Diameter	4 1/4 Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Medium-Shell Octal 8-Pin)	B8-65 or B8-11
Basing	8EF
Bulb Contact Alignment	
J1-22 Contact aligns with pin No. 5	±10 Degrees

MAXIMUM RATINGS—(Design Center Values)

Accelerator Voltage	10,000 Max. Volts D-C
Focusing Electrode Voltage	-500 to +1000 Max. Volts D-C
Grid No. 2 Voltage	700 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	180 Max. Volts D-C
Positive Bias Value ¹	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

TYPICAL OPERATING CONDITIONS

Accelerator Voltage ²	5,000	7,000	Volts D-C
Focusing Electrode Voltage ³	0 to 200	0 to 250	Volts D-C
Focusing Electrode Current	-15 to +15	-15 to +15	μA. D-C
Grid No. 2 Voltage	300	300	Volts D-C
Grid No. 1 Voltage ⁴	-28 to -72	-28 to -72	Volts D-C
Line Width A ⁵ .....	.010	.009	Inch Max.
Spot Position (Undelected) ⁶	5/8	5/8	Inch
Alignment Magnet Field Strength	0-4	0-4	Gausses

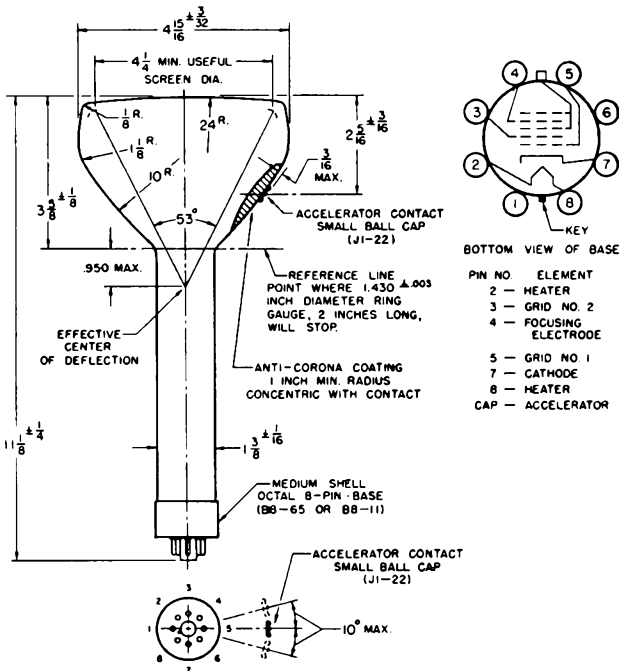
MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance 1.5 Max. Megohms

NOTES

1. At or near this rating, the effective resistance of the accelerator supply should be adequate to limit the accelerator input power to 6 watts. The screen of the 5AHP19-A can be permanently damaged should the current density be permitted to rise too high. To prevent burning, minimum beam current densities should be employed.
2. Brilliance and definition decrease with decreasing accelerator voltage. In general, accelerator voltage should not be less than 5,000 volts, except for the 5AHP19-A. For this type, the accelerator voltage should not be less than 7,000 volts.
3. With Grid No. 1 voltage adjusted to produce an accelerator current of 100 μ A., with the pattern adjusted for best overall focus. Measured with a 525-line interlaced and synchronized $2\frac{3}{4} \times 3\frac{3}{4}$ -inch pattern, with interlaced line blanking (current measured before applying blanking).
4. Visual extinction of focused $2\frac{3}{4} \times 3\frac{3}{4}$ -inch raster pattern.
5. Measured with a 525-line interlaced and synchronized pattern with interlaced line blanking. Pattern width adjusted to 90% of minimum useful screen diameter. $I_b = 100 \mu$ A., measured before applying blanking. Line width is the merged raster height divided by the number of lines (262.5) (measured in center of tube face).
The 5AHP19-A should be checked at 7,000 volts. To avoid damage to the screen, it is recommended that the screen current be not more than 50 μ A. when measuring line width. The line width under these conditions will be .009 inch maximum (current measured before applying blanking).
6. The center of the undeflected, focused spot will fall within a circle of $\frac{5}{16}$ -inch radius concentric with the center of the tube face, with the tube shielded.
7. For optimum quality of the focussed spot, the use of a beam alignment magnet is recommended. This may be obtained by the use of an adjustable magnet of the specified strength located approximately $5\frac{1}{8}$ inches from the reference line.

TYPE 5AHP-



NOTE:
1- DO NOT HANDLE TUBE BY THE PART OF THE BULB HAVING THE ANTI-CORONA COATING.

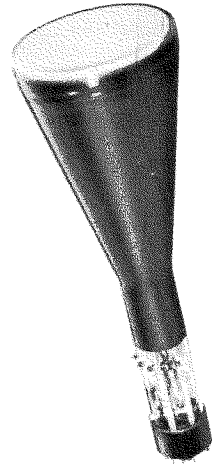
5AMP- CATHODE-RAY TUBES

The Du Mont Type 5AMP- is a tight-tolerance 5-inch cathode-ray tube employing the mono-accelerator principle of beam acceleration. Electrostatically focused and deflected, the Type 5AMP- features high deflection sensitivity, exceptional deflection linearity and a flat faceplate.

The usable screen area of the Type 5AMP- measures 2.5 x 4 inches, designed this way to provide very high deflection sensitivity in the Y-axis. This sensitivity considerably reduces the output amplitude requirements of wide-band amplifiers and consequently reduces the cost of such amplifiers.

The mono-accelerator principle requires that all electron stream acceleration take place *before* the beam enters the deflection system. Under this arrangement, exceptional spot uniformity and deflection linearity are achieved.

Deflection-plate connections are provided at the tube neck rather than through the tube base to appreciably reduce lead inductance and capacitance to these electrodes.



GENERAL CHARACTERISTICS

Electrical Data

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	Min.	Max.	
Cathode to all other electrodes	2.7	4.9	μμf
Grid No. 1 to all other electrodes	2.9	5.5	μμf
D1 to D2	2.1	3.9	μμf
D3 to D4	1.3	2.5	μμf
D1 to all other electrodes	4.3	7.9	μμf
D2 to all other electrodes	4.0	7.4	μμf
D3 to all other electrodes	2.9	5.5	μμf
D4 to all other electrodes	2.6	4.8	μμf

Mechanical Data

Overall Length	17 ⁵ / ₈ ± 1/4 Inches
Greatest Diameter of Bulb	5 ¹ / ₄ ± 3/32 Inches
Minimum Useful Screen Diameter	4 ¹ / ₂ Inches
Neck Contacts (Small Ball Caps)	J1-25
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14U
Base Alignment:	
D1D2 trace aligns with Pin No. 5 and tube axis	± 10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin No. 5	
Positive voltage on D3 deflects beam approximately toward Pin No. 2	
Angle between D3D4 and D1D2 traces	90 ± 1 Degrees

MAXIMUM RATINGS (Design Center Values)

Accelerator Voltage ¹	6,000 Max. Volts D-C
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
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 Deflection Electrode	1,200 Max. Volts

TYPICAL OPERATING CONDITIONS

For Accelerator Voltage of	2,500 Volts D-C
Focusing Voltage	0 to 300 Volts D-C
Grid No. 1 Voltage ²	-34 to -56 Volts D-C
P1 Light Output ³	15 Ft. L. Min.
Modulation ³	45 Max. Volts D-C
Line Width A ³ .....	.032 Inch Max.
Accelerator Current ²	800 Max. Microamperes D-C
Deflection Factors:	
D1 and D2	40 to 50 Volts D-C per Inch
D3 and D4	20 to 25 Volts D-C per Inch
Deflection Factor Uniformity ⁴	1% Max.
Useful Scan	
D1 and D2	4.00 (± 2.00 min. from tube face center) Inches
D3 and D4	2.50 (± 1.25 min. from tube face center) Inches
Pattern Distortion @ 90% of useful scan ⁵	2% Max.
Spot Position	Within a 5/16-inch radius circle ⁷

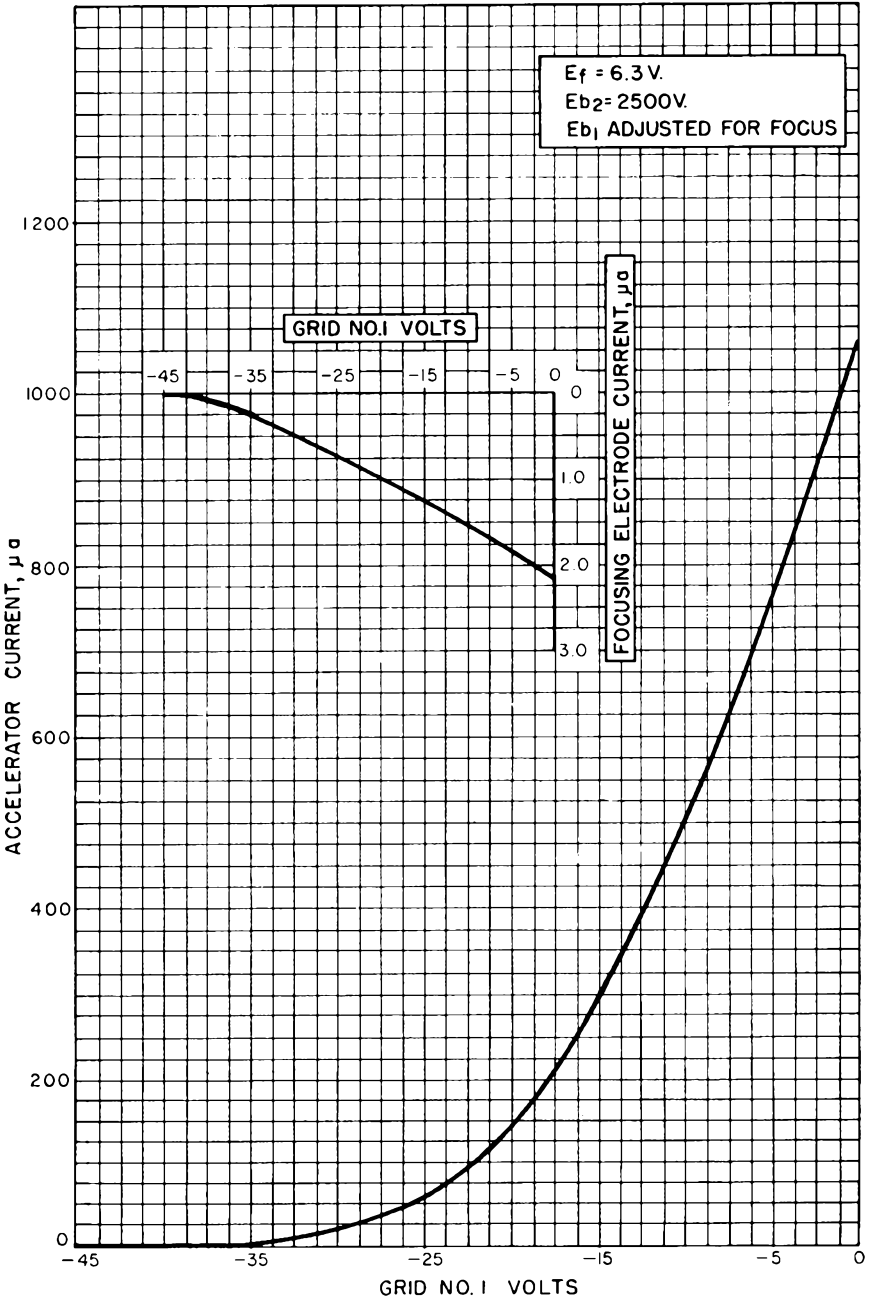
CIRCUIT DESIGN VALUES

Focusing Current for any operating condition	-15 to +15 Microamperes D-C
Grid No. 1 Voltage ²	-13.6 to -22.4 Volts D-C per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Deflection Factors:	
D1 and D2	16 to 20 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	8 to 10 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting Electrode Circuit ⁸	1 Max. Megohm

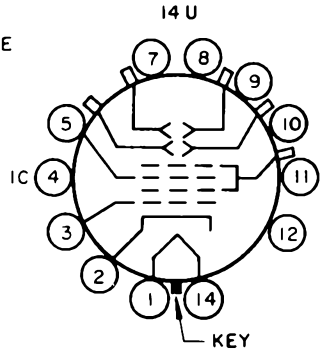
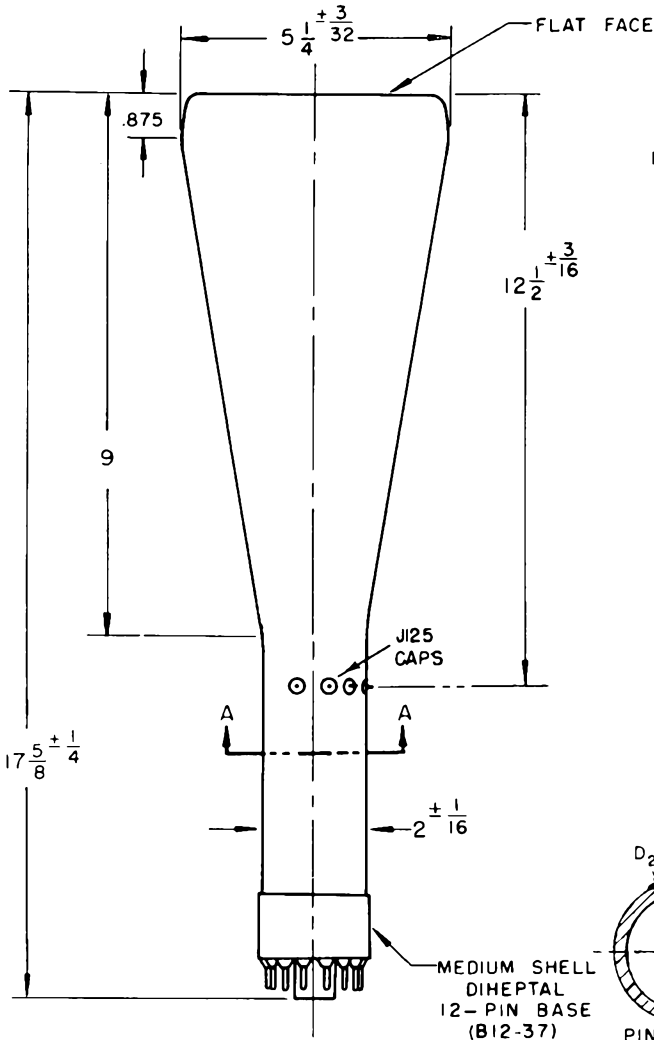
NOTES

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. 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.
5. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 2.295 x 3.672-inch rectangle, will fall within the area bounded by the 2.295 x 3.672-inch rectangle and an inscribed 2.205 x 3.528-inch rectangle.
6. Deflection accuracy may be obtained by combining angle between traces, deflection factor uniformity and pattern distortion characteristics. In general, for deflections less than those indicated, the accuracy will improve.
7. When the tube is operated at typical operating conditions ($E_h = 6.3$ V., $E_{b2} = 2500$ V., E_{b1} at focus); E_{c1} 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, the spot will fall within a 5/16-inch radius circle, centered on the tube face.
Under stable operating conditions, the position of the spot will not shift with changes in intensity by more than .025 inch.
8. It is recommended that the deflecting electrode circuit resistances be approximately equal.
9. An adjustable D.C. potential between the accelerator and the deflection plates may be used to secure best overall focus.

5AMP
AVERAGE CHARACTERISTICS



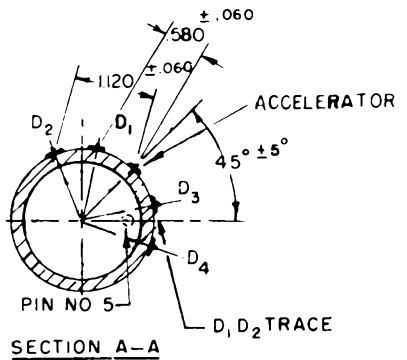
TYPE 5AMP-



BOTTOM VIEW OF BASE

PIN NO. ELEMENT

- 1 - HEATER
- 2 - CATHODE
- 3 - GRID NO. 1
- 4 - INTERNAL CONNECTION
- 5 - FOCUSING ELECTRODE
- 14 - HEATER

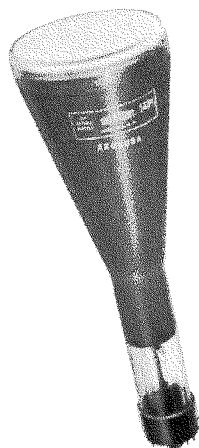


5AQP- CATHODE-RAY TUBES

The new Du Mont Type 5AQP- is a flat-faced, tight-tolerance mono-accelerator cathode-ray tube employing electrostatic focus and deflection. Scanning is limited in both axes to 4 inches to afford high deflection sensitivities. This simplifies the output requirements of low- and medium-frequency deflection amplifiers for which these tubes are intended.

The mono-accelerator principle requires that all beam acceleration occur before the beam enters the deflection system and consequently, field distortion effects on the beam are virtually eliminated. This results in excellent deflection linearity.

Since the Type 5AQP- is intended for low- and medium-frequency applications, all electrode leads are wired through the tube base to simplify the mechanical design of the equipment in which the tube is used. For high-frequency tubes, see Types 5AMP- and 5ATP-.



GENERAL CHARACTERISTICS

Electrical Data

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	Min.	Max.	
Cathode to all other electrodes	2.7	5.0	μμf.
Grid No. 1 to all other electrodes	3.7	6.9	μμf.
D1 to D2	2.4	4.5	μμf.
D3 to D4 .....	.8	1.6	μμf.
D1 to all other electrodes	5.0	9.3	μμf.
D2 to all other electrodes	5.0	9.3	μμf.
D3 to all other electrodes	3.3	6.3	μμf.
D4 to all other electrodes	3.3	6.3	μμf.

Mechanical Data

Overall Length	16¾ ± 3/16 Inches
Greatest Diameter of Bulb	5¼ ± 3/32 Inches
Minimum Useful Screen Diameter	4½ Inches
Base (Medium Shell Diheptal 12-pin)	B12-37
Basing	14G

Base Alignment

D1D2 trace aligns with Pin No. 5 and Tube Axis	± 10 Degrees
Positive voltage on D1 deflects beam approximately toward pin No. 5	
Positive voltage on D3 deflects beam approximately toward pin No. 2	
Angle between D3D4 and D1D2 traces	90 ± 1 Degrees

MAXIMUM RATINGS (Design Center Values)

Accelerator Voltage ¹	4,000 Max. Volts D-C
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
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 Deflection Electrode	1,200 Max. Volts

TYPICAL OPERATING CONDITIONS

For Accelerator Voltage of	2,500 Volts D-C
Focusing Voltage	0 to 300 Volts D-C
Grid No. 1 Voltage ²	-34 to -56 Volts D-C
P1 Light Output ³	15 Ft. L. Min.
Modulation ⁴	40 Max. Volts D-C
Line Width A ³ .....	.030 Inches Max.
Accelerator Current ³	400 Max. Microamperes D-C
Deflection Factors:	
D1 and D2	40 to 50 Volts D-C per Inch
D3 and D4	31.5 to 38.5 Volts D-C per Inch
Deflection Factor Uniformity ⁴	1% Maximum
Useful Scan	
D1D2	4 Inches*
D3D4	4 Inches*
Pattern Distortion @ 90% of useful scan ⁵	2% Maximum
Spot Position	Within a 5/16-inch radius circle ⁷

CIRCUIT DESIGN VALUES

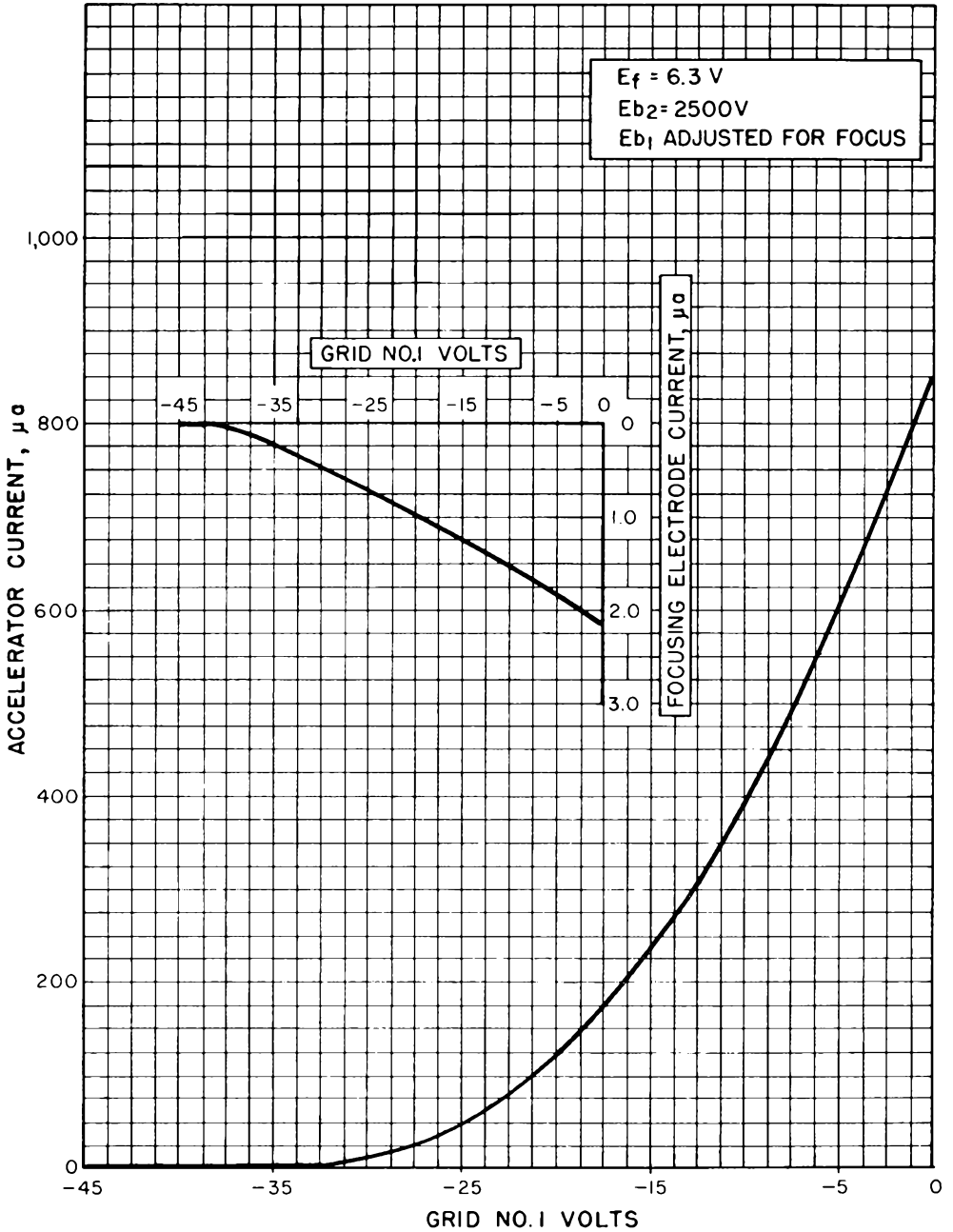
Focusing Current for any operating condition	-15 to +15 Microamperes D-C
Grid No. 1 Voltage ²	13.6 to 22.4 Volts D-C per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting-Electrode Circuit ⁸	1 Max. Megohm
Deflection Factors	
D1 and D2	16 to 20 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	12.6 to 15.4 Volts D-C/Inch/KV of Accelerator Voltage

* $\pm 2''$ minimum from tube face center

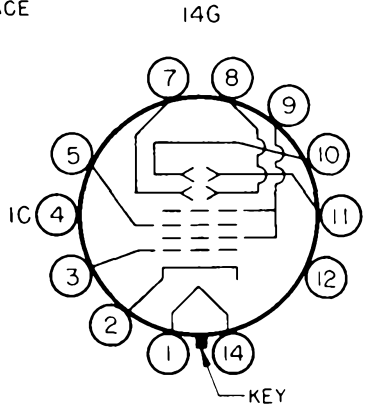
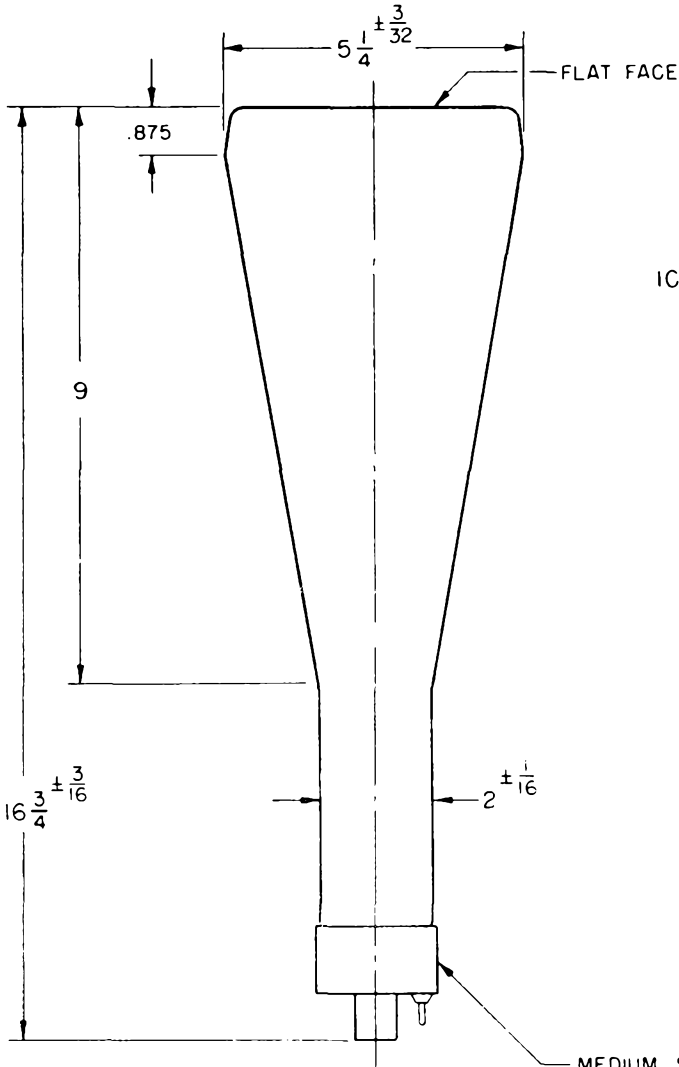
NOTES

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. 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.
5. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 3.672-inch square, will fall within the area bounded by the 3.672-inch square and an inscribed 3.528-inch square.
6. Deflection accuracy may be obtained by combining angle between traces, deflection factor uniformity and pattern distortion characteristics. In general, for deflections less than those indicated, the accuracy will improve.
7. When the tube is operated at typical operating conditions ($E_h = 6.3$ V., $E_{b2} = 2500$ V., E_{b1} at focus); E_{c1} 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, the spot will fall within a 5/16-inch radius circle, centered on the tube face.
Under stable operating conditions, the position of the spot will not shift with changes in intensity by more than .025 inch.
8. It is recommended that the deflecting electrode circuit resistances be approximately equal.
9. An adjustable D.C. potential between the accelerator and the deflection plates may be used to secure best overall focus.

TYPE 5AQP-
AVERAGE CHARACTERISTICS



TYPE 5AQP-



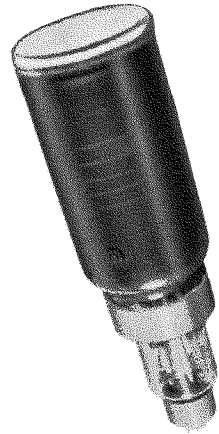
BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
1	HEATER
2	CATHODE
3	GRID NO 1
4	INTERNAL CONNECTION
5	FOCUSING ELECTRODE
7	DEFLECTING ELECTRODE D ₃
8	DEFLECTING ELECTRODE D ₄
9	ACCELERATOR
10	DEFLECTING ELECTRODE D ₂
11	DEFLECTING ELECTRODE D ₁
14	HEATER

5ARP- CATHODE-RAY TUBE

The Type 5ARP- is a two-gun electrostatic deflection and focus monoaccelerator cathode-ray tube, with each gun having similar electrical characteristics to the Type 5AQP-. The two guns are independent of each other with the exception of the accelerators and pattern adjustment electrodes. Both accelerators and the internal shielding are connected together.

The deflection plates, astigmatism control, accelerator, and pattern adjustment electrode connections for each gun are brought out to a special ring base located at the upper end of the bulb neck. This allows for minimum deflection plate capacitance and maximum voltage insulation without resorting to individual bulb contacts.



GENERAL CHARACTERISTICS

Electrical Data

Focusing Method	Electrostatic
Deflecting Method	Electrostatic
Direct Interelectrode Capacitances, Approx. (for each unit)	
Cathode to all other electrodes	3.6 $\mu\mu\text{f.}$
Grid #1 to all other electrodes	4.4 $\mu\mu\text{f.}$
D1 to D2	2.0 $\mu\mu\text{f.}$
D3 to D4	1.4 $\mu\mu\text{f.}$
D1 to all other electrodes	4.2 $\mu\mu\text{f.}$
D2 to all other electrodes	4.2 $\mu\mu\text{f.}$
D3 to all other electrodes	3.5 $\mu\mu\text{f.}$
D4 to all other electrodes	3.5 $\mu\mu\text{f.}$

Optical Data

Phosphor Number	No. 1	No. 2	No. 7	No. 11
Fluorescent Color	Green	Green	Blue	Blue
Phosphorescent Color	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

Mechanical Data

Overall Length	18½ ± ¼ Inches
Greatest Diameter of Bulb	5¼ ± 3/32 Inches
Minimum Useful Screen Diameter	4½ Inches
Bases	B12-37
Basing	Special Ring Base

B12-37 Base Alignment (for each unit):

D1D2 trace aligns with Pin #4 and tube axis	± 10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin #11	
Positive voltage on D3 deflects beam approximately toward Pin #8	
Angle between D3D4 and D1D2 traces	90 ± 1 Degrees

Trace Alignment.

Corresponding traces of each gun are within 1.0 degree of each other, in center of tube

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

Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	0.6 ± 10% Ampere
Accelerator Voltage	6000 Max. Volts D-C
Astigmatism Control Electrode Voltage	6000 Max. Volts D-C
Accelerator Input	6 Max. Watts
Astigmatism Control Electrode Input	6 Max. Watts
Focusing Electrode Voltage	1500 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
Peak Heater-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	1100 Max. Volts
Peak Voltage between Accelerator and Pattern Adjustment Electrode	280 Max. Volts

TYPICAL OPERATING CONDITIONS (Values are for each unit unless otherwise indicated)

Accelerator Voltage ²	2500 Volts D-C
Astigmatism Control Voltage ²	2500 Volts D-C
Focusing Electrode Voltage	0 to 300 Volts D-C
Grid #1 Voltage ³	-34 to -56 Volts D-C
P1 Light Output ⁴	15 Ft. L. Min.
Modulation ⁴	40 Max. Volts D-C
Line Width A ⁴	0.030 Inch Max.
Deflection Factors:	
D1D2	45 to 55 Volts D-C per Inch
D3D4	31.5 to 38.5 Volts D-C per Inch
Deflection Factor Uniformity ³	1.5% Max.
Useful Scan:	
D1D2	4 Inches*
D3D4	3.3 Inches*
Pattern Distortion ⁶	
Tracking Error ⁷	0.050 Inch Max.
Spot Position ⁸	Within a 5/16-inch radius circle

CIRCUIT DESIGN VALUES (For each unit)

Focusing Electrode Current for any operating condition	-15 to +15 μ a.
Grid #1 Voltage ³	-13.6 to -22.4 Volts/Kilovolt of Accelerator Voltage
Grid #1 Circuit Resistance	1.5 Max. Megohms
Deflection Factors:	
D1D2	18 to 22 Volts D-C per Inch per Kilovolt of Accelerator
D3D4	12.6 to 15.4 Volts D-C per Inch per Kilovolt of Accelerator
Resistance in any Deflecting-Electrode Circuit ⁹	1 Max. Megohm

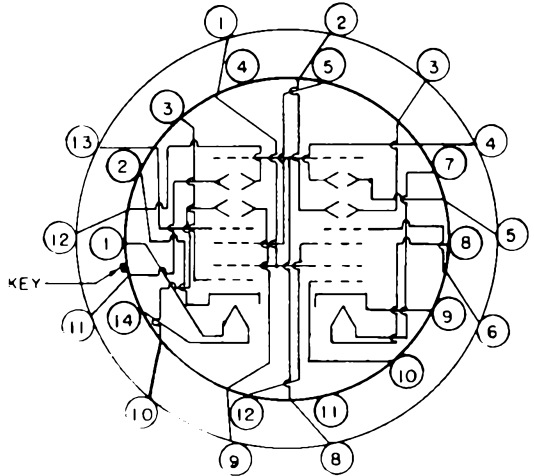
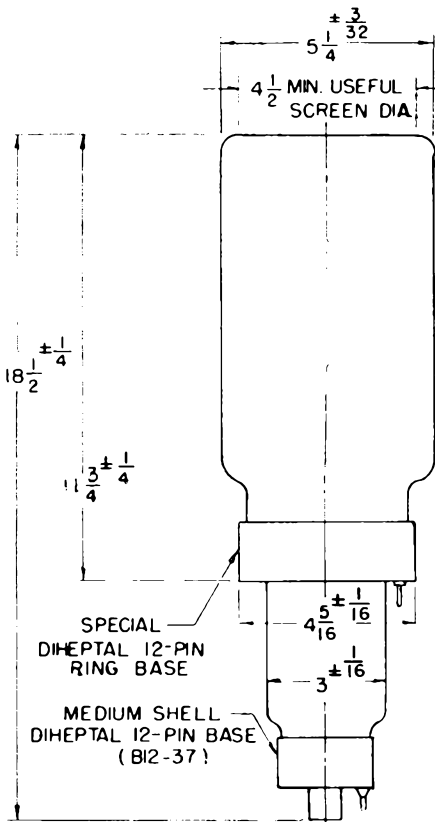
* centered

NOTES

1. Values given are for balanced deflection voltages. These values are measured with the accelerator, astigmatism control, and pattern adjustment electrodes connected together.
2. Deflection uniformity, tracking error, or pattern distortion may be improved by the use of a difference potential applied between accelerator and pattern adjustment electrodes.
When this difference potential is used, slight changes may be noted in deflection factors, grid cut-off voltage, light output and line width.
The astigmatism control electrode voltage should be adjusted to obtain optimum spot shape.
3. Visual extinction of undeflected focused spot.
4. Measured in accordance with MIL-E-1 specifications.
5. The deflection factor (for both D1D2 and D3D4 plate pairs, separately) for any deflection of less than 90% of the useful scan will not differ from the deflection factor for a deflection at 30% of the useful scan by more than the indicated value.
6. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 3.672 x 3.060-inch rectangle, will fall within the area bounded by the 3.672 x 3.060-inch rectangle and an inscribed 3.528 x 2.940-inch rectangle.

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 value within 90% of the useful scan dimensions.
 8. When the tube is operated at typical operating conditions ($E_h = 6.3$ V., $E_{b2} = 2500$ V., E_{b1} at focus); E_{c1} 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.
 9. The distance between each spot will be no greater than $5/16$ inch.
- The distance between each spot will be no greater than $5/16$ inch.
- It is recommended that the deflecting electrode circuit resistances be approximately equal.

TYPE 5ARP-



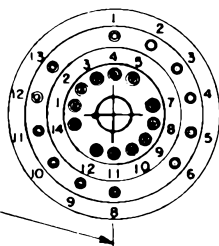
BASING

RING BASE

- | | |
|---------|---------------------------------|
| PIN NO. | ELEMENT |
| 1 | - ACCELERATOR, SHIELD |
| 8 | - PATTERN ADJUSTMENT ELECTRODE |
| GUN "B" | |
| 2 | - DEFLECTING ELECTRODE D_4 |
| 3 | - DEFLECTING ELECTRODE D_3 |
| 4 | - DEFLECTING ELECTRODE D_2 |
| 5 | - DEFLECTING ELECTRODE D_1 |
| 6 | - ASTIGMATISM CONTROL ELECTRODE |
| GUN "A" | |
| 9 | - DEFLECTING ELECTRODE D_3 |
| 10 | - DEFLECTING ELECTRODE D_4 |
| 11 | - DEFLECTING ELECTRODE D_1 |
| 12 | - DEFLECTING ELECTRODE D_2 |
| 13 | - ASTIGMATISM CONTROL ELECTRODE |

BI2-37 BASE

- | | | | |
|---------|----------------------|---------|----------------------|
| GUN "A" | | GUN "B" | |
| PIN NO. | ELEMENT | PIN NO. | ELEMENT |
| 1 | - HEATER | 7 | - HEATER |
| 2 | - CATHODE | 8 | - HEATER |
| 3 | - GRID NO. 1 | 9 | - CATHODE |
| 5 | - FOCUSING ELECTRODE | 10 | - GRID NO. 1 |
| 14 | - HEATER | 12 | - FOCUSING ELECTRODE |



BOTTOM VIEW OF TUBE

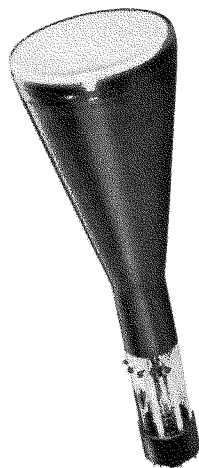
5 ATP- CATHODE-RAY TUBES

The Du Mont Type 5ATP- are high-voltage, tight-tolerance electrostatically focused and deflected cathode-ray tubes operating on the new mono-accelerator principle.

Mono-accelerator construction provides a considerable improvement in the performance of cathode-ray tubes with no sacrifice in spot size, trace brilliance or deflection sensitivity. In the radically new electron gun, all beam acceleration takes place *before* the beam enters the deflection system. Under this arrangement, the beam path is such that field distortion is virtually non-existent. This distortion eliminated, excellent deflection linearity is achieved as well as uniform spot size and intensity over the entire scanned area.

The 5ATP- is designed for accelerating potentials up to 6000 volts. At this voltage, screen illumination comparable to other tube designs, operating at voltages up to 60% higher, is obtained with much greater deflection sensitivity. The deflection sensitivity is further increased through location of the deflection plates so that the useful screen area measures 2.5 x 4 inches, with the shorter dimension in the Y-axis. Critical tolerances of mono-accelerator design only possible through Du Mont pioneered tight-tolerance construction.

Deflection-plate connections are brought out through the tube wall at the neck to minimize lead inductance and capacitance. A flat faceplate reduces measurement error owing to parallax between screen and scale. These features, combined with the high degree of accuracy inherent in the tight-tolerance design make the Type 5ATP- particularly well suited for accurate analysis of high frequencies and rapidly occurring pulses and transients.



GENERAL CHARACTERISTICS

Electrical Data

Focusing Method			Electrostatic
Deflecting Method			Electrostatic
Direct Interelectrode Capacitances	Min.	Max.	
Cathode to all other electrodes	3.3	6.1	$\mu\text{f.}$
Grid #1 to all other electrodes	5.8	11.0	$\mu\text{f.}$
D1 to D2	2.1	3.9	$\mu\text{f.}$
D3 to D4	1.5	2.7	$\mu\text{f.}$
D1 to all other electrodes	5.0	9.2	$\mu\text{f.}$
D2 to all other electrodes	4.9	9.1	$\mu\text{f.}$
D3 to all other electrodes	3.7	6.9	$\mu\text{f.}$
D4 to all other electrodes	3.2	6.0	$\mu\text{f.}$

Optical Data

Phosphor Number	No. 1	No. 2	No. 7	No. 11
Fluorescent Color	Green	Green	Blue	Blue
Phosphorescent Color	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

Mechanical Data

Overall Length	17 $\frac{3}{8}$ \pm $\frac{1}{4}$ Inches
Greatest Diameter of Bulb	5 $\frac{1}{4}$ \pm $\frac{3}{32}$ Inches
Minimum Useful Screen Diameter	4 $\frac{1}{4}$ Inches
Bulb Number	J42P1
Neck Contacts	J1-25
Base	B12-37
Basing	14V

Base Alignment

D1D2 trace aligns with Pin #5 and tube axis	± 10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin #5	
Positive voltage on D3 deflects beam approximately toward Pin #2	
Angle between D3D4 and D1D2 traces	90 ± 1 Degrees

MAXIMUM RATINGS (Design Center Values)

Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	$0.6 \pm 10\%$ Ampere
Accelerator Voltage	10,000 Max. Volts D-C
Grid #2 Voltage	700 Max. Volts D-C
Accelerator Input	$4\frac{1}{2}$ Max. Watts
Focusing Electrode Voltage	-500 to +1000 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
Peak Heater-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	2000 Max. Volts

TYPICAL OPERATING CONDITIONS

Accelerator Voltage	6000 Volts D-C
Grid #2 Voltage	300 Volts D-C
Focusing Electrode Voltage	0 to 700 Volts D-C
Grid #1 Voltage ¹	-34 to -56 Volts D-C
P11 Light Output ²	100 Min. Ft. L.
Modulation ²	40 Max. Volts D-C
Line Width "A" ² .....	.035 Max. Inch
Accelerator Current ²	750 Max. Microamperes D-C
Deflection Factors:	
D1D2	94 to 116 Volts D-C per Inch
D3D4	34 to 42 Volts D-C per Inch
Deflection Factor Uniformity ³	1% Max.
Useful Scan:	
D1D2	3.50 (± 1.75 min. from tube face center) Inches
D3D4	1.60 ($\pm .80$ min. from tube face center) Inches
Pattern Distortion @ 90% of Useful Scan ⁴	2% Max.
Focusing Electrode Current for any operating condition	-15 to +15 Microamperes
Spot Position (undeflected)	Within a 5/16-inch radius circle ⁵

CIRCUIT DESIGN VALUES

D1D2 Deflection Factor	15.6 to 19.3 Volts D-C per Inch per Kilovolt of Accelerator
D3D4 Deflection Factor	5.7 to 7.0 Volts D-C per Inch per Kilovolt of Accelerator

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting-Electrode Circuit ⁷	1 Max. Megohm

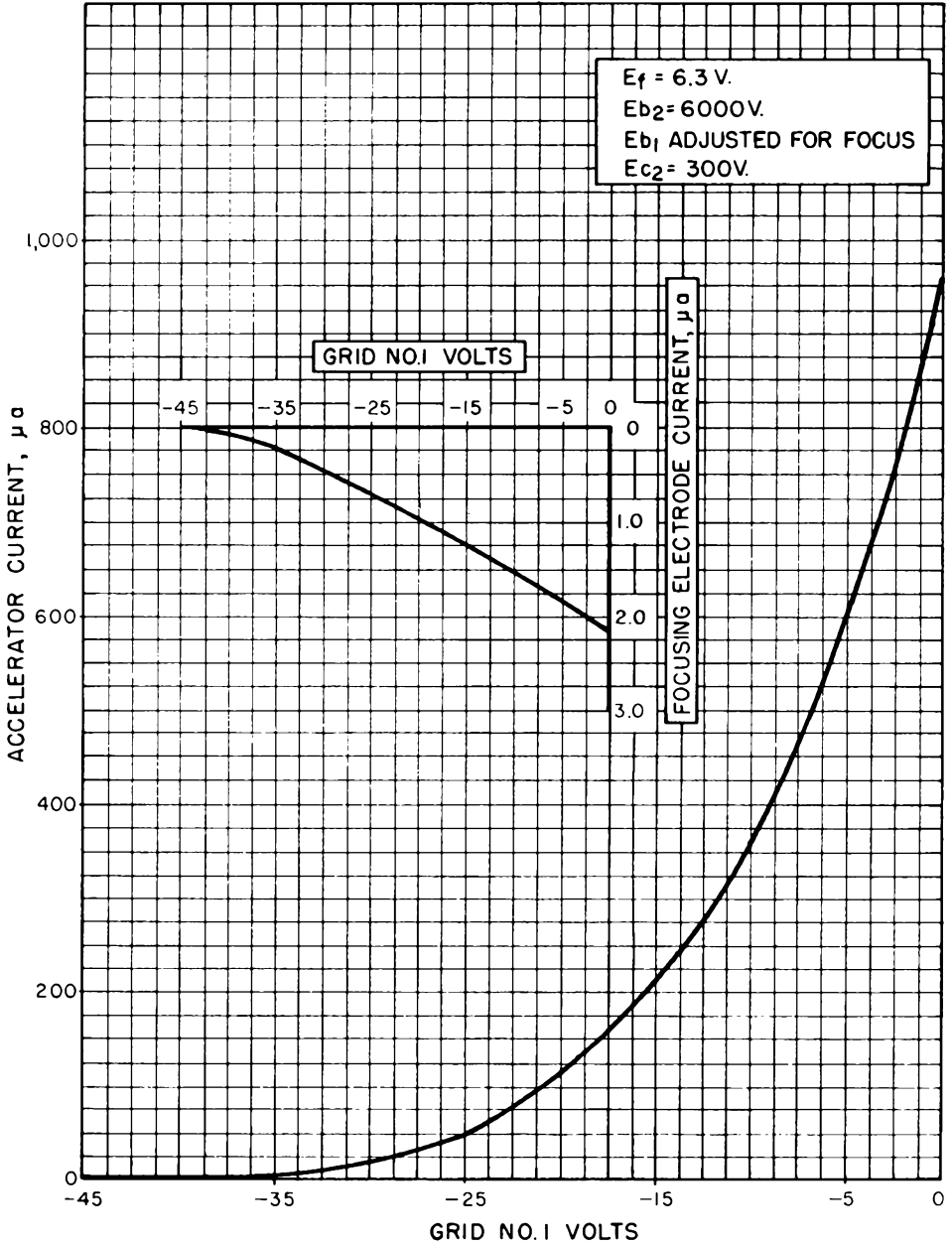
NOTES

1. Visual extinction of undeflected focused spot.
2. Measured in accordance with MIL-E-1 specifications. Light output measured with Type 3 Photronic Cell without eye correction.
3. 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.
4. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 1.469 x 3.213-inch rectangle, will fall within the area bounded by the 1.469 x 3.213-inch rectangle and an inscribed 1.411 x 3.087-inch rectangle.
5. Deflection accuracy may be obtained by combining angle between traces, deflection factor uniformity and pattern distortion characteristics. In general, for deflections less than those indicated the accuracy will improve.
6. When the tube is operated at typical operating conditions ($E_h = 6.3$ V., $E_{b2} = 6000$ V., E_{b1} at focus, $E_{c2} = 300$ V.); E_{c1} 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, the spot will fall within a 5/16-inch radius circle, centered on the tube face.
- 7.

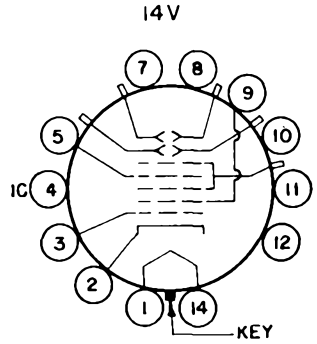
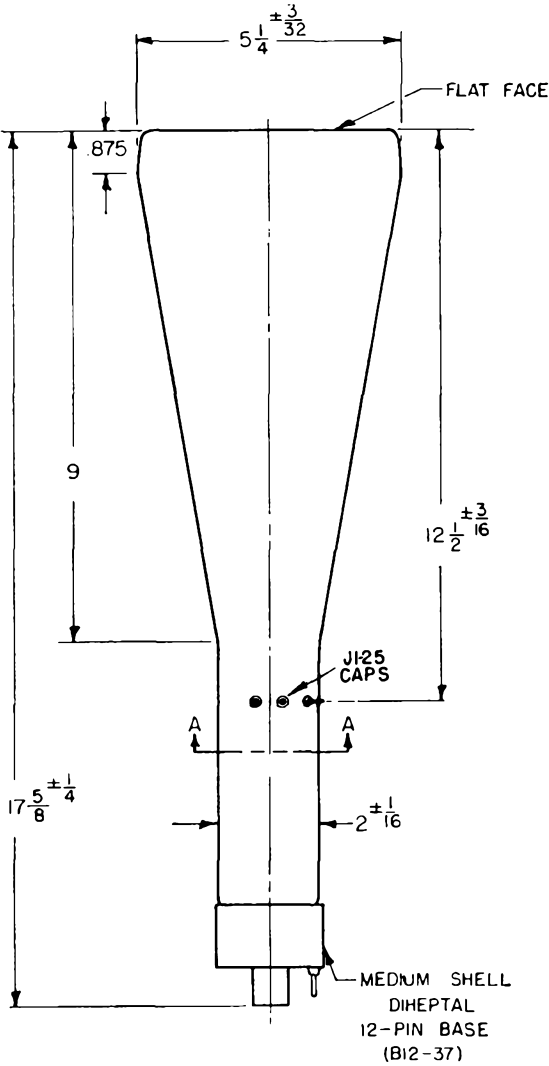
Under stable operating conditions, the position of the spot will not shift with changes in intensity by more than .025 inch.

- It is recommended that the deflecting electrode circuit resistances be approximately equal.
- An adjustable D.C. potential between the accelerator and the deflection plates may be used to secure best overall focus.

5ATP- AVERAGE CHARACTERISTICS

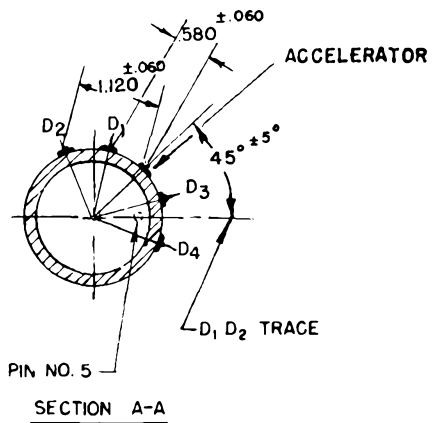


TYPE 5ATP-



BOTTOM VIEW OF BASE

- | PIN NO. | ELEMENT |
|---------|---------------------|
| 1 | HEATER |
| 2 | CATHODE |
| 3 | GRID NO 1 |
| 4 | INTERNAL CONNECTION |
| 5 | FOCUSING ELECTRODE |
| 9 | GRID NO. 2 |
| 14 | HEATER |



TYPE 5AWP- CATHODE-RAY TUBES

The Du Mont Type 5AWP- Cathode-ray Tubes are high voltage tubes which incorporate an intensifier subdivided into several steps. This feature permits the use of much higher overall accelerating voltages with deflection sensitivities only slightly less than heretofore obtainable in low voltage cathode-ray tubes. This tube has a flat face, cylindrical body, special deflection structure for minimum defocusing, and the deflection plate and anode connections are made through the neck instead of through the base. Low capacity deflection plate leads facilitate high frequency operation. The gun is designed to draw negligible focusing electrode current. To prevent film-fogging, and for maximum brightness and stability in performance, all screens are provided with a highly reflective metal backing. The 5AWP- is one of the line of Du Mont Tight-tolerance Cathode-ray Tubes.



GENERAL CHARACTERISTICS

Electrical Data

Focusing Method Electrostatic
 Deflecting Method Electrostatic

Direct Interelectrode Capacitances	Min.	Max.	
Cathode to all	3.0	4.1	$\mu\mu f$
Grid No. 1 to all	3.5	5.0	$\mu\mu f$
D1 to D2	1.4	2.2	$\mu\mu f$
D3 to D4	0.9	1.5	$\mu\mu f$
D1 to all	4.4	5.4	$\mu\mu f$
D2 to all	4.8	6.1	$\mu\mu f$
D3 to all	3.5	4.5	$\mu\mu f$
D4 to all	3.0	3.9	$\mu\mu f$

Optical Data

Phosphor Number	1	2	7	11
Fluorescent Color	Green	Green	Blue	Blue
Phosphorescent Color	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

Mechanical Data

Overall Length	16 $\frac{3}{4}$ \pm $\frac{1}{4}$ Inches
Greatest Diameter of Bulb	5 $\frac{1}{4}$ \pm $\frac{3}{32}$ Inches
Minimum Useful Screen Diameter	4 $\frac{1}{2}$ Inches
Bulb Number	J42L1
Bulb Contacts — Recessed Small Ball Caps	J1-22
Neck Contacts — Small Ball Caps	J1-25
Base — Medium Shell Diheptal, 12 Pin	B12-37
Basing	14P
Base Alignment	
D3D4 trace aligns with Pin No. 5 and tube axis	\pm 10 Degrees
Positive voltage on D1 deflects beam approximately toward Base Pin No. 8	
Positive voltage on D3 deflects beam approximately toward Base Pin No. 5	
Bulb Contact Alignment	
J1-22 contacts align with D3D4 trace	\pm 10 Degrees
J1-22 contacts on same side as Pin No. 5	
Trace Alignment	
Angle between D3D4 and D1D2 traces	90 \pm 1 Degrees

MAXIMUM RATINGS (Design Center Values)

Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	0.6 ± 10% Ampere
Post-Accelerator Voltage (Note 1)	15000 Max. Volts D-C
Accelerator Voltage (Note 1)	3500 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 2)	4.5
Accelerator Input (Avg.)	6.0 Max. Watts
Focusing Electrode 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
Peak Heater-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	1200 Max. Volts

TYPICAL OPERATING CONDITIONS

Post-Accelerator Voltage (Note 1)	10300 Volts
Accelerator Voltage (Note 1)	2300 Volts
Focusing Electrode Voltage for all values of Ib3	500 to 730 Volts
Grid No. 1 Voltage (Note 3)	-33 to -55 Volts
Deflection Factors: (Note 4)	
D1 and D2	113 to 128 Volts D-C per Inch
D3 and D4	113 to 128 Volts D-C per Inch
Deflection Factory Uniformity (Note 5)	2% Max.
Deflection Defocusing (Note 6)	1:2 Ratio
Useful Scan (Note 7)	
D1 and D2	4 (± 2 from tube face center) Min. Inches
D3 and D4	4 (± 2 from tube face center) Min. Inches
Pattern Distortion (Note 8)	
Modulation (Note 9)	35 Max. Volts D-C
Line Width "A" (Note 9) .....	.016 Max. Inches
Focusing Electrode current for any operating condition	-15 to +10 μA
Spot Position (focused and undeflected) (Note 10)	Within a 15 mm Square
For Accelerator Voltage not shown in the preceding table, the following can be used as a guide:	
Focusing Electrode Voltage	21% to 32% of Accelerator Volts
Grid No. 1 Voltage (Note 3)	1.4% to 2.4% of Accelerator Volts
Ratio Post-Accelerator to Accelerator Voltage	4.5
D1 and D2	49 to 56 Volts D-C per Inch per Kilovolt of Accelerator
D3 and D4	49 to 56 Volts D-C per Inch per Kilovolt of Accelerator

MAXIMUM CIRCUIT VALUES

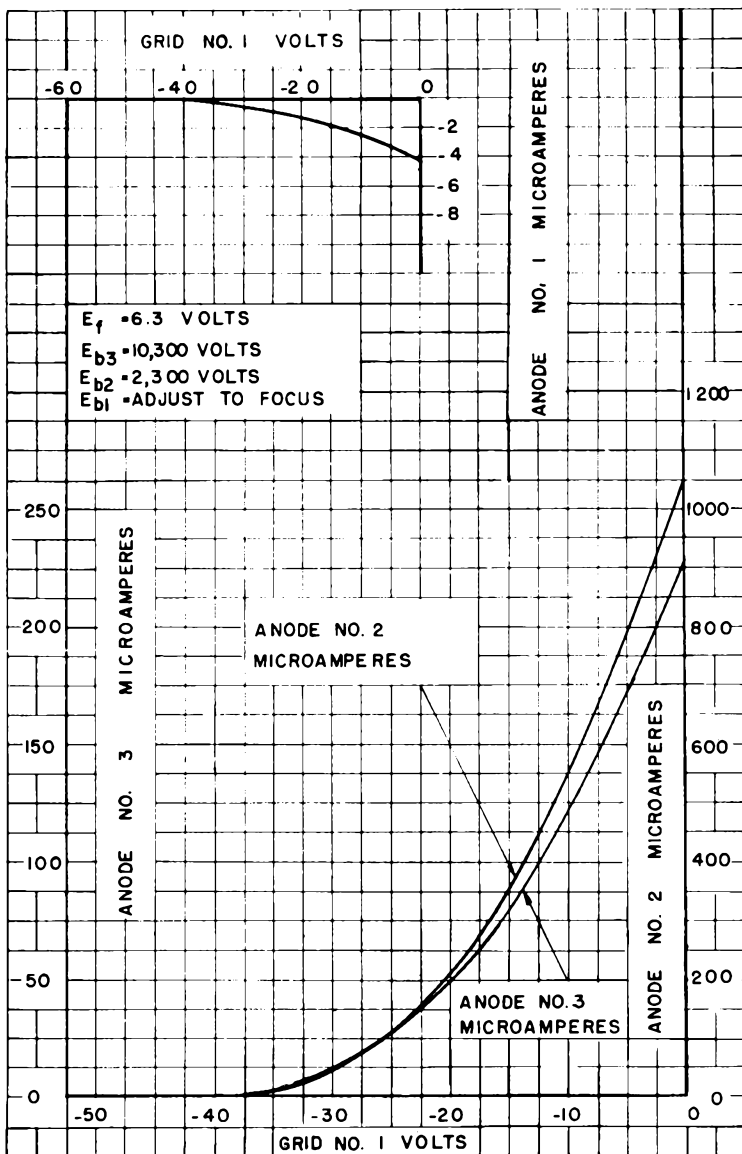
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting Electrode Circuit (Note 11)	1.0 Max. Megohm

NOTES

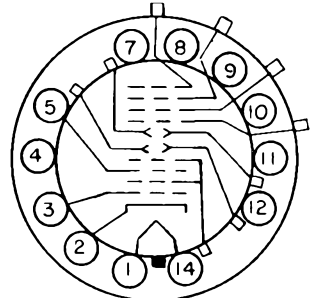
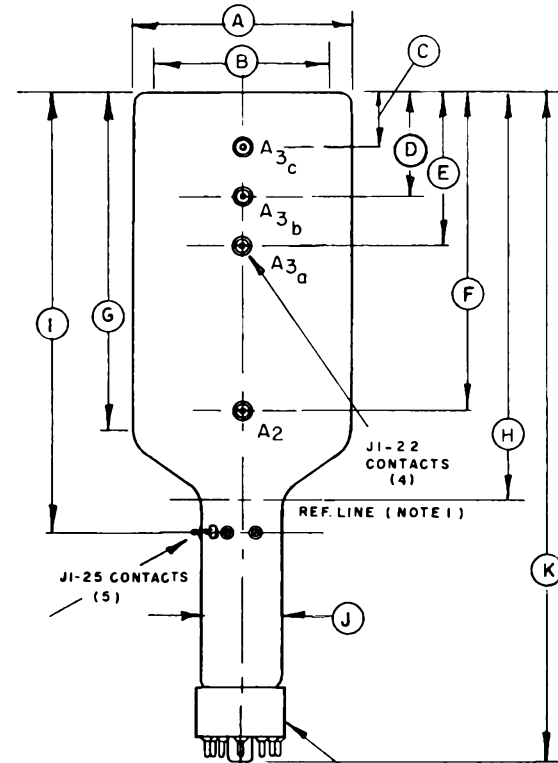
1. Accelerator to final intensifier electrode voltage equally divided over the three intensifier electrodes by 25 megohm resistors connected between each intensifier and the accelerator.
2. This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 4.5. Operation at other ratios of Eb3/Eb2 may result in changes in deflection uniformity and pattern distortion.
3. Visual extinction of undeflected focused spot.
4. D1D2 deflection factor within 8 volts of D3D4.
5. The deflection factor (for both D1D2 and D3D4 plate pairs, separately) for a deflection of 25% of the useful scan will not differ from the deflection factor for a deflection at 75% of the useful scan by more than the indicated value.
6. The ratio of the line width of a 4 inch long trace, adjusted for best center focus, to the line width measured on the faceplate axis when the trace is deflected perpendicularly ± 2 inches from the face center by a balanced D-C voltage, will not be greater than the specified value.
7. Reduction in useful scan when Post-Accelerator voltage is greater than Accelerator voltage is determined by the ratio of these voltages measured with respect to cathode. Values shown are therefore applicable to any operating condition with the same voltage ratios.

8. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 3.040 inch square, will fall within the area bounded by the 3.040 inch square and an inscribed 2.960 inch square.
9. For an Ib3 of 25 μ ADC measured in accordance with MIL-E-1 specifications.
10. Centered with respect to the tube face and with the tube shielded. Connect free deflecting electrodes to accelerator.
11. It is recommended that the deflection electrode circuit resistances be one megohm or less and approximately equal, otherwise beam shift at high drives can be expected. Higher resistance values up to five megohms may be used for low beam current operation.

**TYPE 5AWP-
AVERAGE CHARACTERISTICS**



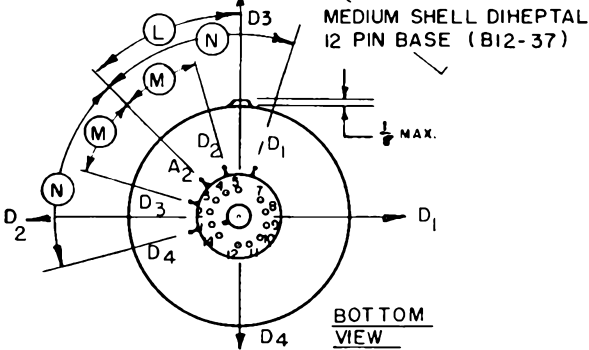
TYPE 5AWP-



14P BOTTOM VIEW	
PIN NO.	ELEMENT
1	HEATER
2	CATHODE
3	GRID NO.1
4	INTERNAL CONNECTION
5	FOCUSING ELECTRODE
7-12	NO CONNECTION
14	HEATER

NOTE: 1. REFERENCE LINE, POINT WHERE RING GAUGE 2.063^{+0.001} I.D. 1/2" LONG WILL STOP.
-0.000

2. THE BULB SHALL BE J42LI WITHOUT BUTTONS.



REF.	DIMENSION
A	5 1/4 ± 3/32 DIA.
B	4 1/2 MIN. SCREEN
C	1 7/16 ± 3/16
D	2 9/16 ± 3/16
E	3 11/16 ± 3/16
F	8 3/16
G	8 1/2 NOM.
H	10 1/4 ± 3/16
I	11 ± 1/4
J	2 ± 1/16 0.0
K	16 3/4 ± 1/4
L	45 ° ± 10°
M	30 ° ± 5°
N	60 ° ± 5°

TYPE 5BDP- CATHODE-RAY TUBES

The Du Mont Type 5BDP- is a five inch, flat-faced, electrostatically focused and deflected Cathode-ray Tube with two independently controlled beams and incorporating an intensifier sub-divided into several steps. This feature permits operation at high voltages and ratios of intensifier to second anode voltage resulting in a high writing rate. The deflector leads are brought out directly through the bulb wall in order to minimize lead inductance and capacitance. To prevent film-fogging, and for maximum brightness and stability in performance, all screens are provided with a highly reflective metal backing.

Metallized screen types other than those listed below are available on special order.



GENERAL CHARACTERISTICS (Note 1)

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		Min.	Max.	
Cathode to all		3.4	4.4	μμf
Grid No. 1 to all		3.1	4.1	μμf
D1 to D2		1.8	2.7	μμf
D3 to D4		1.3	2.1	μμf
D1 to all		5.3	6.8	μμf
D2 to all		5.3	6.8	μμf
D3 to all		4.5	5.8	μμf
D4 to all		4.5	5.8	μμf

Mechanical Data

Overall Length	18 1/4 ± 1/4 Inches
Greatest Diameter of Bulb	5 1/4 ± 3/32 Inches
Minimum Useful Screen Diameter	4 1/4 Inches
Bulb Contacts — Recessed Small Ball Cap	J1-22
Neck Contacts — Skirted Miniature	C1-2
Base — Medium Shell Diheptal, 12 pin	B12-37
Basing	14AB
Base Alignment	
Base Key aligns with the D1D2 trace	± 10 Degrees
Positive voltage on D2 deflects the beam approximately towards Base Key	
Positive voltage on D3 deflects the beam approximately towards Base Pin No. 4	
Bulb Contact Alignment	
Bulb Contacts Align with D3D4 trace	± 10 Degrees
Bulb Contacts on same side as Base Pin No. 4	
Trace Alignment	
D1D2 trace aligns with D3D4 trace	90 ± 2 Degrees
Corresponding traces of each gun align within	± 2 Degrees

MAXIMUM RATINGS (Design Center Values)

Post-Accelerator Voltage	25,500 Max. Volts D-C
Accelerator Voltage (Note 2)	3,500 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage	10 Max.
Focusing Voltage	1,550 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	1,200 Max. Volts

TYPICAL OPERATING CONDITIONS

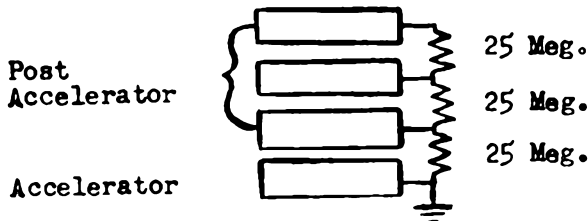
For Post-Accelerator Voltage of (Note 3)	14,000 Volts
For Accelerator Voltage of (Note 3)	2,000 Volts
Focusing Voltage	400 to 630 Volts
Grid No. 1 Voltage (Note 4)	-45 to -75 Volts
Modulation (Note 5)	45 Max. Volts
Line Width "A" (Note 5)	.020 Max. Inches
Line Width "B" (Note 5)	.024 Max. Inches
Interaction Factor: (Note 6)	14 x 10 ⁻⁸ In./Volt D-C Max.
Deflection Factors:	
D1 and D2	130 to 160 Volts D-C/Inch
D3 and D4	111 to 133 Volts D-C/Inch
Spot Position (Undelected) (Note 7)	Within a 16 mm Square
Useful Scan (Note 8)	
Pattern Distortion (Note 9 & 10)	

CIRCUIT DESIGN VALUES

Focusing Voltage	200 to 315 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating conditions	-15 to +10 Microamperes
Grid No. 1 Voltage (Note 4)	-22.5 to -37.5 Volts per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting-Electrode Circuit (Note 11)	1.0 Max. Megohm

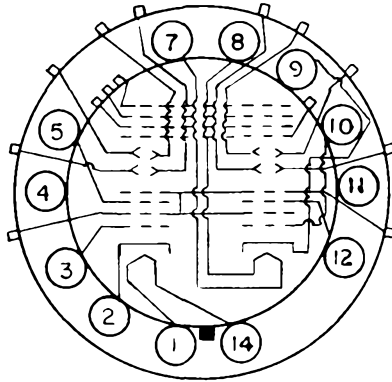
NOTES

1. Values are for each unit unless otherwise stated.
2. Accelerator power input (Avg.) should be limited to six watts. At 100 μ A D-C beam current, the cathode current shall not exceed 2 mA D-C. To protect tube against damage this measurement should be taken by pulsing the grid from cutoff to the specified beam current at a 10% cycle and multiplying the current meter readings by 10.
3. Equally divided over the three intensifier electrodes.
Suggested method of connection:



4. Visual extinction of undeflected focused spot.
5. For an I_{b3} of 50 μ A D-C.
6. 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 specified value.
7. With the tube shielded against external influences, $E_{b3} = 14,000$ volts, $E_{b2} = 2,000$ volts, and E_{b1} adjusted for focus centered with respect to the tube face.

8. Minimum useful scan diameter is limited at high ratios of Eb3/Eb2 to 4 inches at 5:1, 3.5 inches at 7:1 and 2.5 inches at 10:1.
9. The total vertical movement of the upper edge of a 3 inch vertical trace, (centered with respect to the tube face), deflected horizontally 1.5 inches to the left and right of the center of the tube face, shall not exceed 0.12 inch. The total vertical movement of the lower edge of the 3 inch trace also shall not exceed 0.12 inch. The D3D4 trace shall be considered vertical.
10. The sum of the total horizontal movement of the left and right edges of a 3 inch horizontal trace, (centered with respect to the tube face), deflected vertically 1.5 inches above and below the center of the tube face, shall not exceed 0.12 inch. The D1D2 trace shall be considered horizontal.
11. It is recommended that the deflecting electrode circuit resistances be approximately equal. Higher resistance values up to 5.0 megohms may be used for low beam current operation.



BOTTOM VIEW

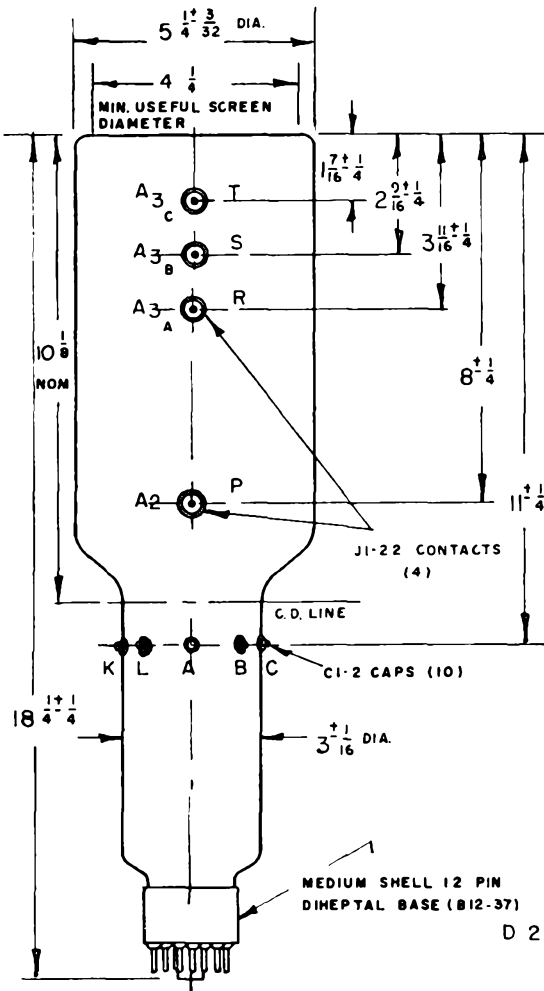
<u>PIN NO.</u>	<u>ELEMENT</u>
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1	HEATER
2	CATHODE
3	GRID NO. I
4	NO CONNECTION
5	FOCUSING ELECTRODE
14	HEATER

<u>PIN NO.</u>	<u>ELEMENT</u>
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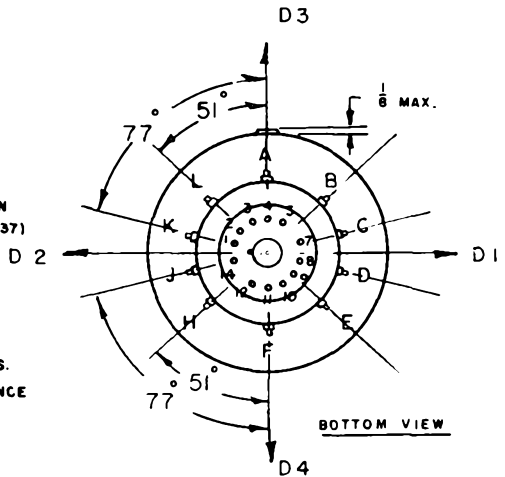
7	HEATER
8	HEATER
9	CATHODE
10	GRID NO. I
11	NO CONNECTION
12	FOCUSING ELECTRODE

TYPE 5BDP-

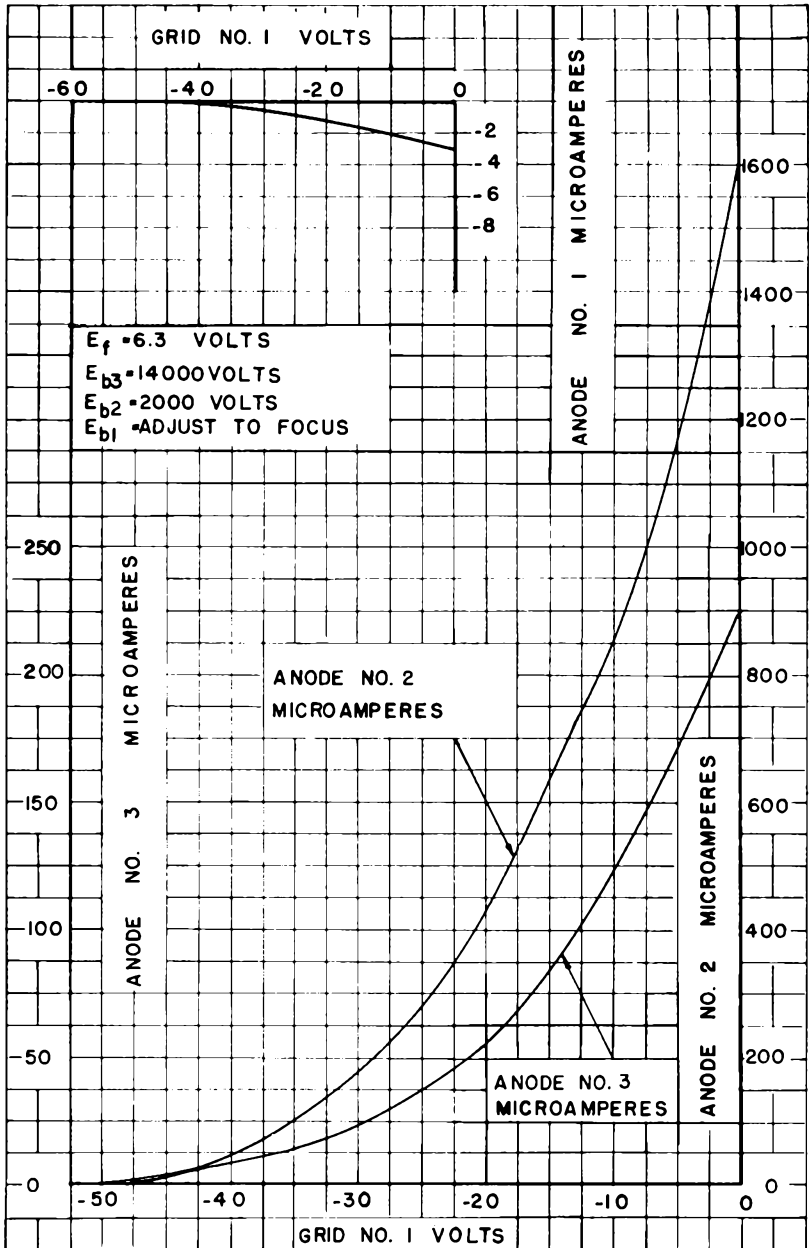


ENVELOPE TERMINALS	CORRESPONDING INTERNAL ELEMENTS
A	ACCELERATOR-GUNS ABB GUN - B
B	RIGHT HORIZ. DEFL. PLATE
C	LEFT HORIZ. DEFL. PLATE
D	UPPER VERT. DEFL. PLATE
E	LOWER VERT. DEFL. PLATE
F	ACCELERATOR-GUNS ABB GUN - A
H	LEFT HORIZ. DEFL. PLATE
J	RIGHT HORIZ. DEFL. PLATE
K	LOWER VERT. DEFL. PLATE
L	UPPER VERT. DEFL. PLATE
P	FIRST BAND-ACCELERATOR
R	POST ACCELERATOR-3A (INTENSIFIER) LOWER POTENTIAL
S	POST ACCELERATOR-3B (INTENSIFIER) MEDIUM POTENTIAL
T	POST ACCELERATOR-3C (INTENSIFIER) HIGHEST POTENTIAL

- NOTE 1- BULB CONTACTS AND BASE PIN NO. 4 ALIGN WITH D3 D4 TRACE ± 10 DEGREES.
 2- ANGULAR DIMENSIONS HAVE A TOLERANCE OF ± 5 DEGREES.
 3. THE BULB SHALL BE A TYPE J 42- M1 WITHOUT CONTACTS.



TYPE 5BDP-
AVERAGE CHARACTERISTICS



5BP-A CATHODE-RAY TUBES

The Type 5BP-A Cathode-ray Tubes are electrostatically focussed and deflected cathode-ray tubes with four free deflection plates for balanced deflection. Employing low accelerating voltages, the Type 5BP-A Cathode-ray Tubes are designed for applications where the use of an intensifier is not essential. The electron gun is designed to draw negligible focusing electrode current.

The Type 5BP-A is recommended for replacement only.



GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts
Heater Current	0.6 \pm 10% Ampere
Focusing Method	Electrostatic
Deflecting Method	Electrostatic

Phosphor	No. 1	No. 11
Fluorescence	Green	Blue
Persistence	Medium	Short

Direct Interelectrode Capacitances, Nominal

Grid No. 1 to all other electrodes	8.0 $\mu\mu\text{f}$.
D1 to D2	1.4 $\mu\mu\text{f}$.
D3 to D4	1.2 $\mu\mu\text{f}$.
D1 to all other electrodes except D2	8.0 $\mu\mu\text{f}$.
D2 to all other electrodes except D1	7.5 $\mu\mu\text{f}$.
D3 to all other electrodes except D4 ..	10.0 $\mu\mu\text{f}$.
D4 to all other electrodes except D3	7.5 $\mu\mu\text{f}$.

Mechanical

Overall Length	16 $\frac{3}{4}$ \pm $\frac{3}{8}$ Inches
Greatest Diameter of Bulb	5 $\frac{1}{4}$ + 1/16, Inches -3/32 Inches
Minimum Useful Screen Diameter	4 $\frac{1}{2}$ Inches
Base	Medium Magnal
Basing	11N
Base Alignment	
3D4 trace aligns with Pin No. 1 and tube axis	\pm 10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin No. 4.	
Positive voltage on D3 deflects beam approximately toward Pin No. 1.	
Angle between 3D4 and 1D2 traces	90 \pm 3 Degrees

MAXIMUM RATINGS—(Design Center Values)

Anode No. 2 Voltage	2000 Max. Volts D-C
Anode No. 1 Voltage ¹	1000 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	125 Max. Volts D-C
Positive Bias Value	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts
Peak Voltage between Anode No. 2 and any Deflection Electrode	500 Max. Volts

TYPICAL OPERATING CONDITIONS

For Anode No. 2 Voltage of	1500	2000	Volts
Anode No. 1 Voltage for focus	253 to 422	338 to 562	Volts
Grid No. 1 Voltage ²	-15 to -45	-20 to -60	Volts

Deflection Factors:

D1 and D2	52 to 74	70 to 98	Volts D-C per Inch
D3 and D4	47 to 67	63 to 89	Volts D-C per Inch

Anode No. 1 Voltage for focus	16.9% to 28.1% of Eb2 Volts
Grid No. 1 Voltage ²	1% to 3% of Eb2 Volts
Anode No. 1 Current for any operating condition	-50 to +10 Microamperes

Deflection Factors:

D1 and D2	35 to 49 Volts D-C per Inch per Kilovolt of Eb2
D3 and D4	31.5 to 44.5 Volts D-C per Inch per Kilovolt of Eb2

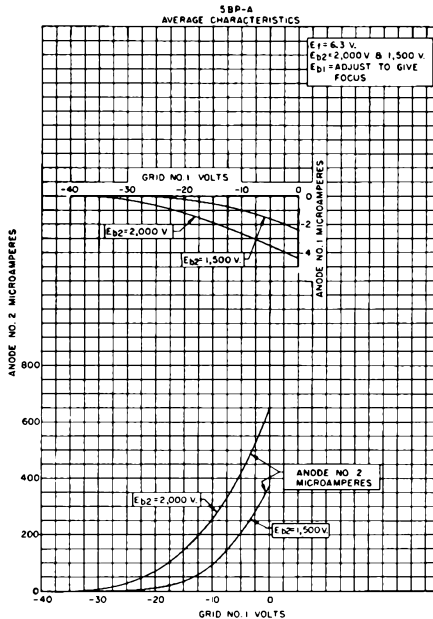
Spot Position (Undelected)³ Within 15 Millimeters square

MAXIMUM CIRCUIT VALUES

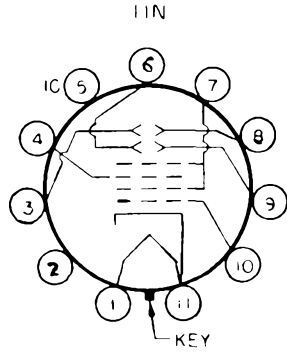
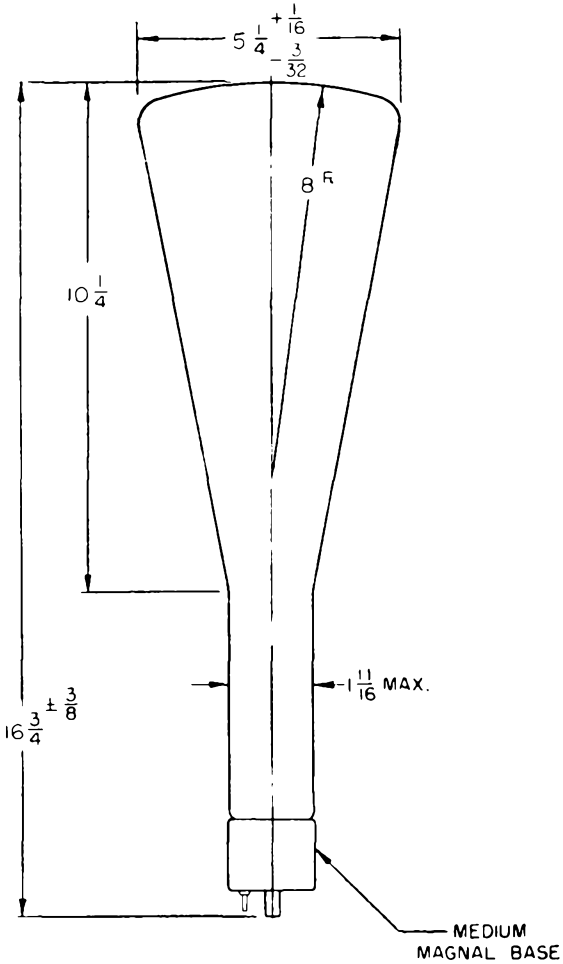
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting Electrode Circuit ⁴	5 Max. Megohms

NOTES

1. Anode No. 2 and Grid No. 2, which are connected together within the tube, are referred to herein as Anode No. 2.
2. Visual extinction of undeflected focused spot.
3. With Eb2=1500 volts and Eb1 adjusted for focus.
4. It is recommended that the deflecting electrode circuit resistances be approximately equal.
5. For optimum focus the average potentials of the deflection plates and second anode should be the same.



TYPE 5BP-A



BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
1	HEATER
2	NO CONNECTION
3	DEFLECTING ELECTRODE D ₁
4	ANODE NO. 1
5	INTERNAL CONNECTION
6	DEFLECTING ELECTRODE D ₄
7	ANODE NO. 2, GRID NO. 2
8	DEFLECTING ELECTRODE D ₂
9	DEFLECTING ELECTRODE D ₃
10	GRID NO. 1
11	HEATER AND CATHODE

5CP-A CATHODE-RAY TUBES

The Type 5CP-A Cathode-ray Tubes are designed for oscillographic applications. The intensifier principle is used to provide a maximum deflection sensitivity for a given final accelerating voltage. A glass envelope has been designed to provide great mechanical strength and the tube base design provides adequate insulation between electrode leads for high altitude installation. The gun is designed to draw negligible focusing electrode current.

The four types differ only in the characteristics of the fluorescent screens. Other screen types may be obtained on special order.



GENERAL CHARACTERISTICS

Electrical

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

Cathode to all other electrodes $9 \mu\text{f.}$
 Grid No. 1 to all other electrodes $8 \mu\text{f.}$
 D1 to D2 $2 \mu\text{f.}$
 D3 to D4 $2 \mu\text{f.}$
 D1 to all other electrodes except D2 $7 \mu\text{f.}$
 D2 to all other electrodes except D1 $7 \mu\text{f.}$
 D3 to all other electrodes except D4 $5 \mu\text{f.}$
 D4 to all other electrodes except D3 $6 \mu\text{f.}$

Mechanical

Overall Length $16\frac{3}{4} \pm \frac{3}{8}$ Inches
 Greatest Diameter of Bulb $5\frac{1}{4} \pm \frac{3}{32}$ Inches
 Minimum Useful Screen Diameter $4\frac{1}{2}$ Inches
 Bulb Contact J1-22
 Base B12-37
 Basing 14J

Base Alignment:

D1D2 trace aligns with Pin No. 5 and tube axis ± 10 Degrees
 Positive voltage on D1 deflects beam approximately toward Pin No. 5.
 Positive voltage on D3 deflects beam approximately toward Pin No. 2.
 Angle between D3D4 and D1D2 traces 90 ± 3 Degrees

Bulb contact alignment:

J1-22 contact aligns with D1D2 trace ± 10 Degrees
 J1-22 contact on same side as Pin No. 5

MAXIMUM RATINGS—(Design Center Values)

Anode No. 3 Voltage (Accelerator High-Voltage Electrode)	4000 Max. Volts D-C
Anode No. 2 Voltage ¹	2000 Max. Volts D-C
Ratio Anode No. 3 Voltage to Anode No. 2 Voltage	2.3 Max.
Anode No. 1 Voltage	1000 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	2 Max. Volts
Peak Heater-Cathode Voltage	
Heater Negative with respect to Cathode	125 Max. Volts D-C
Heater Positive with respect to Cathode	125 Max. Volts D-C
Peak Voltage between Anode No. 2 and any Deflection Electrode	500 Max. Volts

TYPICAL OPERATING CONDITIONS

For Anode No. 3 Voltage of	2000	3000	4000 Volts
For Anode No. 2 Voltage of	2000	1500	2000 Volts
Anode No. 1 Voltage for focus	375 to 690	280 to 515	375 to 690 Volts
Grid No. 1 Voltage ²	-30 to -90	-22.5 to -67.5	-30 to -90 Volts
Deflection Factors:			
D1 and D2	62 to 84	58 to 80	78 to 106 D-C V/in.
D3 and D4	54 to 74	50 to 68	66 to 90 D-C V/in.
Anode No. 1 Voltage for focus	18.7% to 34.5% of Eb2 Volts		
Grid No. 1 Voltage ²	1.5% to 4.5% to Eb2 Volts		
Anode No. 1 Current for any operating condition	-15 to +10 Microamperes		
Deflection Factors:			
No 3rd Anode or Eb3 = Eb2			
D1 and D2	31 to 42 Volts D-C per inch per Kilovolt of Eb2		
D3 and D4	27 to 37 Volts D-C per inch per Kilovolt of Eb2		
Eb3 = Twice Eb2			
D1 and D2	39 to 53 Volts D-C per inch per Kilovolt of Eb2		
D3 and D4	33 to 45 Volts D-C per inch per Kilovolt of Eb2		
Spot Position (Undelected) ³	Within 25 Millimeters square		

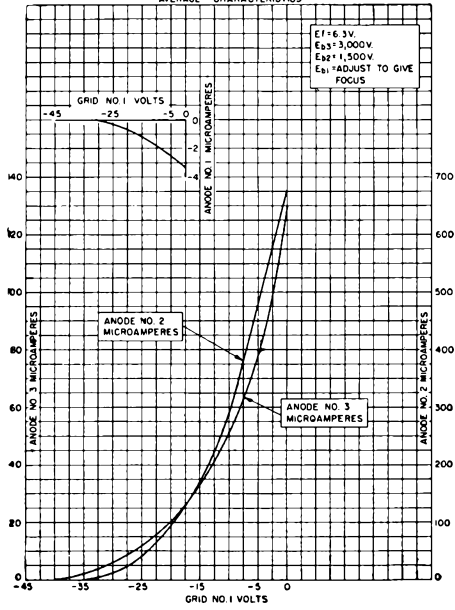
MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting-Electrode Circuit ⁴	5 Max. Megohms

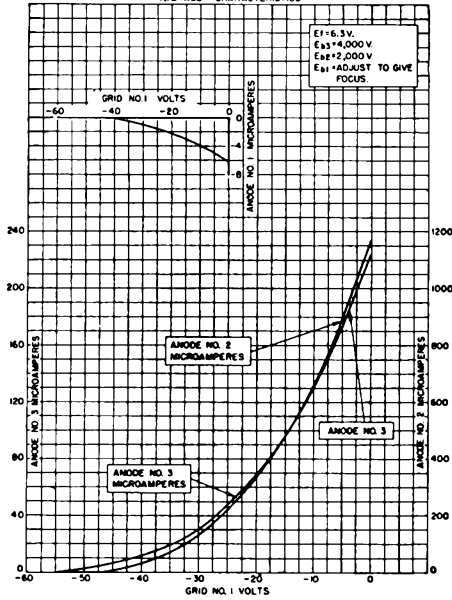
NOTES

1. The product of Anode No. 2 voltage and average Anode No. 2 current should be limited to 6 watts.
2. Visual extinction of undeflected focused spot.
3. When the tube is operated at (1) normal heater voltage; (2) Eb3 = 3000 volts; (3) Eb2 = 1500 volts; (4) Eb1 adjusted for focus; (5) Ec1 set at such a value as will avoid damage to the screen; (6) with each of the deflecting electrodes connected to Anode No. 2; and (7) with the tube shielded against external influences:
The spot will fall within a 25 mm. square, the center of which coincides with the geometric center of the tube face and the sides of which are parallel to the traces produced by deflecting electrodes D1 and D2 and by deflecting electrodes D3 and D4 respectively.
4. It is recommended that the deflecting electrode circuit resistances be approximately equal.
5. For optimum focus the average potentials of the deflection plates and second anode should be the same.

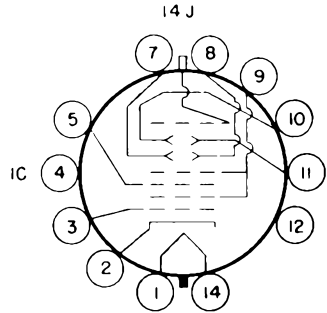
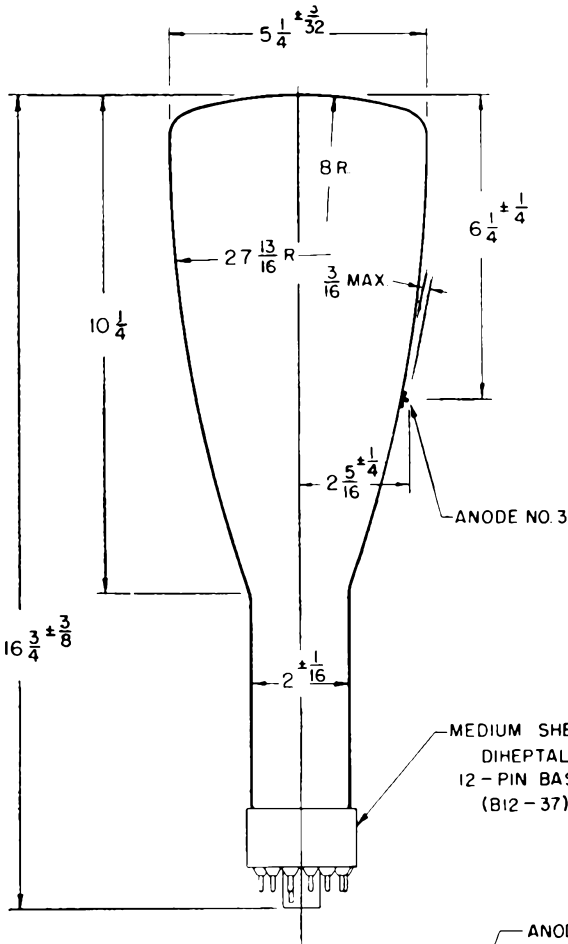
5CP-A
AVERAGE CHARACTERISTICS



5CP-A
AVERAGE CHARACTERISTICS

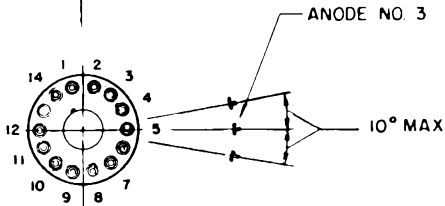


TYPE 5CP-A



BOTTOM VIEW OF BASE

PIN NO	ELEMENT
1	HEATER
2	CATHODE
3	GRID NO 1
4	INTERNAL CONNECTION
5	ANODE NO. 1
7	DEFLECTING ELECTRODE D ₃
8	DEFLECTING ELECTRODE D ₄
9	ANODE NO. 2, GRID NO. 2
10	DEFLECTING ELECTRODE D ₂
11	DEFLECTING ELECTRODE D ₁
14	HEATER



5FP- CATHODE-RAY TUBES

The Types 5FP- Cathode-ray Tubes are magnetically focussed and deflected cathode-ray tubes with a relatively large and flat screen area. Primarily designed for radar indicator applications, the Type 5FP- features an electron gun with a limiting aperture to produce a sharp, round spot at high screen currents.

The Type 5FP- Cathode-ray Tubes are similar to the 7-inch 7BP-, the 10-inch 10KP-, and the 12-inch 12SP-. Selection of one of these radar-type tubes would be determined by the screen size desired and the exact electrical characteristics needed to fit the application.



GENERAL CHARACTERISTICS

Electrical

Heater Voltage 6.3 Volts
 Heater Current $0.6 \pm 10\%$ Ampere
 Focusing Method Magnetic
 Deflecting Method Magnetic
 Deflecting Angle (Approx.) 53 Degrees

Phosphor	No. 5	No. 7	No. 14
Fluorescence	Blue	Blue	Blue
Phosphorescence	—	Yellow	Orange
Persistence	Short	Long	Medium-long

Direct Interelectrode Capacitances, Approx.

Cathode to all other electrodes $5 \mu\text{f.}$
 Grid No. 1 to all other electrodes $8 \mu\text{f.}$

Mechanical

Overall Length $11\frac{1}{8} \pm \frac{3}{8}$ Inches
 Greatest Diameter of Bulb $4\text{-}15/16 \pm 3/32$ Inches
 Minimum Useful Screen Diameter $4\frac{1}{4}$ Inches
 Bulb Contact (Recessed Small Ball Cap) J1-22
 Base (Medium-Shell Octal 8-Pin) B8-65 or B8-11
 Basing 5AN
 Bulb Contact Alignment J1-22 Contact aligns with Pin No. 5 ± 10 Degrees

MAXIMUM RATINGS—(Design Center Values)

Anode Voltage 8,000 Max. Volts D-C
 Grid No. 2 Voltage 700 Max. Volts D-C
 Grid No. 1 Voltage
 Negative Bias Value 180 Max. Volts D-C
 Positive Bias Value¹ 0 Max. Volts D-C
 Positive Peak Value 2 Max. Volts
 Peak Heater-Cathode Voltage
 Heater Negative with respect to Cathode 125 Max. Volts D-C
 Heater Positive with respect to Cathode 125 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

Anode Voltage	4,000	7,000	Volts D-C
Grid No. 2 Voltage	250	250	Volts D-C
Grid No. 1 Voltage ²	-25 to -70	-25 to -70	Volts D-C
Focusing Coil Current ³	75 to 102	99 to 135	Ma. D-C
Spot Position (Undelected) ⁴	9	—	mm.

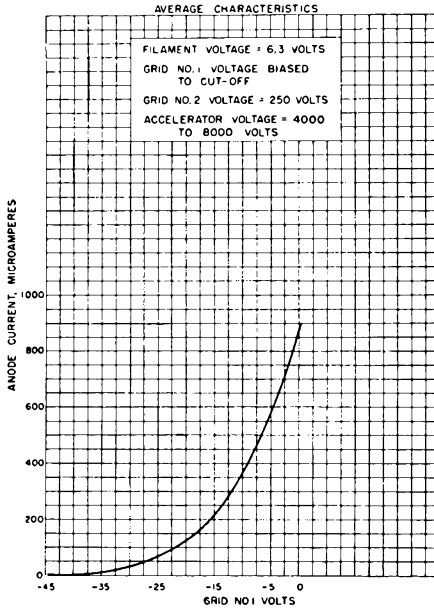
MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance 1.5 Max. Megohms

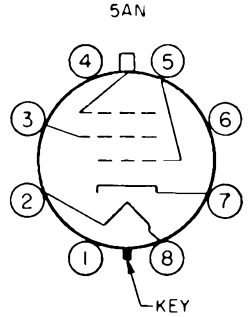
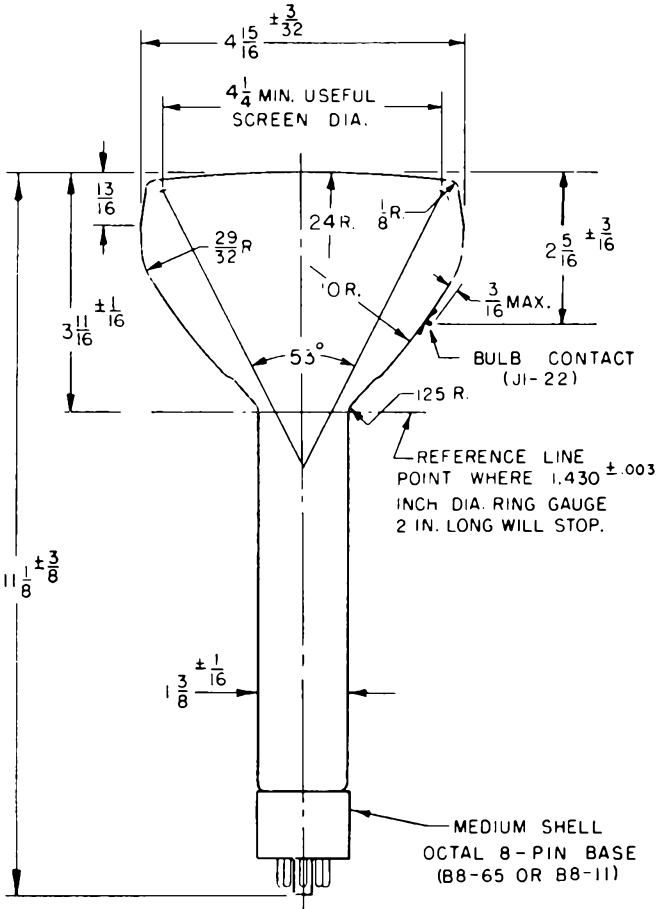
NOTES

1. At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.
2. Visual extinction of undeflected focused spot.
3. For JETEC standard focus coil No. 106, or equivalent, with the grid No. 1 voltage adjusted to produce an anode current of 200 microamperes and with distance (D) from reference line to center of air gap equal to 2.75 inches.
4. The center of the undeflected, unfocused spot will fall within a circle of 9 mm. radius concentric with the center of the tube face.

5FP-

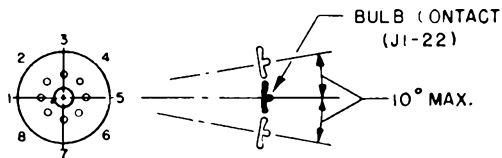


TYPE 5FP-



BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
2	HEATER
3	GRID NO 2
5	GRID NO. 1
7	CATHODE
8	HEATER
CAP	ACCELERATOR

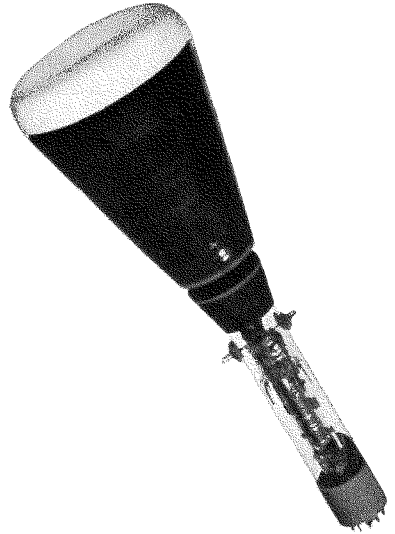


BOTTOM VIEW OF TUBE

5JP-A CATHODE-RAY TUBES

The Type 5JP-A Cathode-ray Tubes are designed for oscillographic applications where low deflection plate capacitances are essential. The deflection plate leads are short and direct, terminating in caps on the wall of the tube rather than in the tube base. The intensifier principle is used to provide a maximum deflection sensitivity for a given final accelerating voltage. The gun is designed to draw negligible focusing electrode current.

The four types differ only in the characteristics of the fluorescent screens. Other screen types may be obtained on special order.



GENERAL CHARACTERISTICS

Electrical

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

Grid No. 1 to all other electrodes	.....	8 μ f.
D1 to D2	.....	1.5 μ f.
D3 to D4	.....	1.5 μ f.
D1 to all other electrodes except D2	.....	2.5 μ f.
D2 to all other electrodes except D1	.....	3 μ f.
D3 to all other electrodes except D4	.....	2.5 μ f.
D4 to all other electrodes except D3	.....	2.5 μ f.

Mechanical

Overall Length $16\frac{3}{4} \pm \frac{3}{8}$ Inches
 Greatest Diameter of Bulb $5\text{-}5/16 \pm 1/16$ Inches
 Minimum Useful Screen Diameter $4\frac{1}{2}$ Inches
 Bulb Contact (Anode No. 3) Small Cap (C1-1)
 Bulb Contacts (Deflection Plate) Miniature Cap (C1-2)
 Base Medium Magnal
 Basing 11S

Base Alignment

D3D4 trace aligns with Pin No. 6 and tube axis ± 10 Degrees
 Positive voltage on D1 deflects beam approximately toward Pin No. 3.
 Positive voltage on D3 deflects beam approximately toward locating key.
 Angle between D3D4 and D1D2 traces 90 ± 3 Degrees

Bulb Contact Alignment

Anode No. 3 contact aligns with D3D4 trace ± 10 Degrees
 Anode No. 3 contact on same side as locating key
 Deflection Plate contacts are within 10 degrees of the plane through the tube axis and their respective traces.

MAXIMUM RATINGS—(Design Center Values)

Anode No. 3 Voltage (Accelerator High Voltage Electrode)	4000 Max. Volts D-C
Anode No. 2 Voltage ^{1, 2}	2000 Max. Volts D-C
Ratio Anode No. 3 Voltage to Anode No. 2 Voltage	2.0 Max.
Anode No. 1 Voltage	1000 Max. Volts D-C
 Grid No. 1 Voltage	
Negative Bias Value	125 Max. Volts D-C
Positive Bias Value	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts
Peak Voltage between Anode No. 2 and any Deflection Electrode	500 Max. Volts

TYPICAL OPERATING CONDITIONS

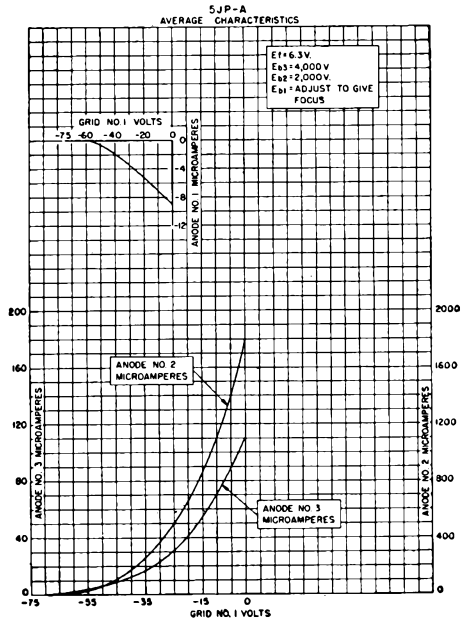
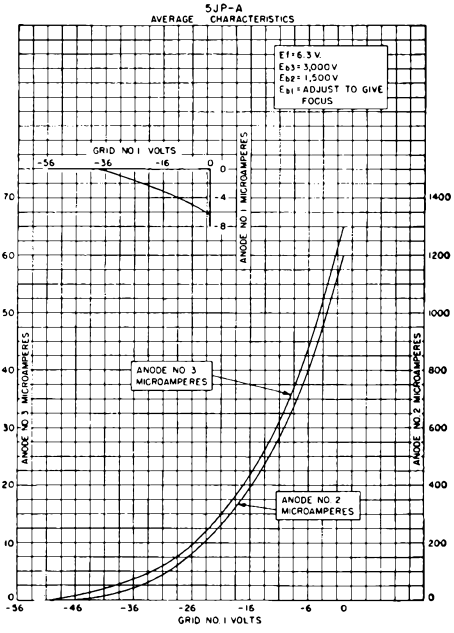
For Anode No. 3 Voltage of	3000	4000	Volts
For Anode No. 2 Voltage of	1500	2000	Volts
Anode No. 1 Voltage for focus	250 to 472	333 to 630	Volts
Grid No. 1 Voltage ³	-34 to -79	-45 to -105	Volts
 Deflection Factors:			
D1 and D2	58 to 86	77 to 115	Volts D-C per Inch
D3 and D4	58 to 86	77 to 115	Volts D-C per Inch
 Anode No. 1 Voltage for focus			
			16.6% to 31.5% of Eb2 Volts
Grid No. 1 Voltage ³			
			2.3% to 5.3% of Eb2 Volts
Anode No. 1 Current for any operating condition			
			-50 to +10 Microamperes
 Deflection Factors:			
No 3rd Anode or Eb3 = Eb2			
D1 and D2	34 to 50 Volts D-C per inch per Kilovolt of Eb2		
D3 and D4	34 to 50 Volts D-C per inch per Kilovolt of Eb2		
Eb3 = Twice Eb2			
D1 and D2	38 to 58 Volts D-C per inch per Kilovolt of Eb2		
D3 and D4	38 to 58 Volts D-C per inch per Kilovolt of Eb2		
Spot Position (Undelected)			
			Within a 7.5 millimeter radius circle ⁴

MAXIMUM CIRCUIT VALUES

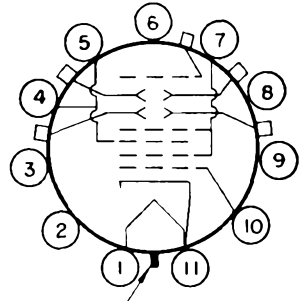
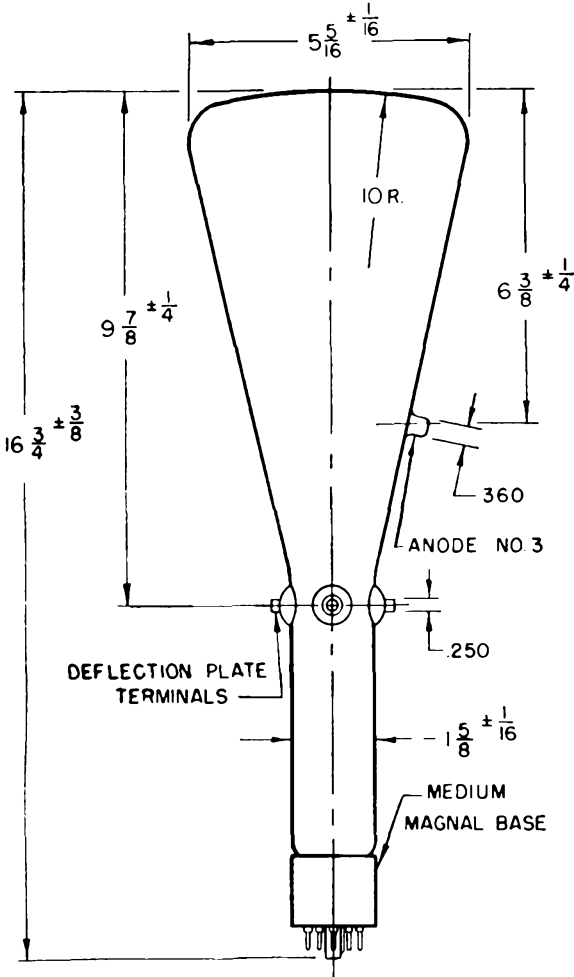
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting Electrode Circuit ⁵	5 Max. Megohms

NOTES

1. Anode No. 2 and Grid No. 2, which are connected together within the tube, are referred to herein as Anode No. 2.
2. The product of Anode No. 2 voltage and Average Anode No. 2 current should be limited to 6 watts.
3. Visual extinction of undeflected focused spot.
4. Centered with respect to the tube face with the tube shielded.
5. It is recommended that the deflecting electrode circuit resistances be approximately equal.
6. For optimum focus the average potentials of the deflection plates and second anode should be the same.

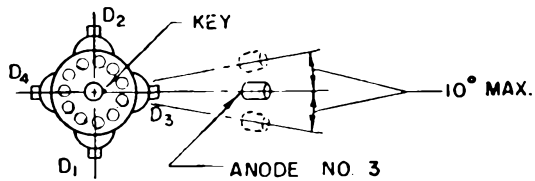


TYPE 5JP-A



BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
1	HEATER
4	ANODE NO 1
5	INTERNAL CONNECTION
7	ANODE NO 2, GRID NO. 2
10	GRID NO. 1
11	HEATER & CATHODE



5LP-A CATHODE-RAY TUBES

The Type 5LP-A cathode-ray tubes are designed for oscillographic applications. The intensifier principle is used to provide a maximum deflection sensitivity for a given final accelerating voltage. The gun is designed to draw negligible focusing electrode current.

The Type 5LP-A is recommended for replacement only.



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, Nominal				
Grid No. 1 to all other electrodes	9 μf.			
D1 to D2	2 μf.			
D3 to D4	1.5 μf.			
D1 to all other electrodes except D2	8 μf.			
D2 to all other electrodes except D1	8 μf.			
D3 to all other electrodes except D4	6 μf.			
D4 to all other electrodes except D3	7 μf.			

Mechanical

Overall Length	16¾ ± ⅜ Inches
Greatest Diameter of Bulb	5-5/16 ± 1/16 Inches
Minimum Useful Screen Diameter	4½ Inches
Bulb Contact (Anode No. 3)	Small Cap (C1-1)
Base	Medium Magnal
Basing	11T
Base Alignment	
D3D4 trace aligns with Pin No. 6 and tube axis	± 10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin No. 3	
Positive voltage on D3 deflects beam approximately toward locating key.	
Angle between D3D4 and D1D2 traces	90 ± 3 Degrees
Bulb Contact Alignment:	
Anode No. 3 Contact aligns with D3D4 trace	± 10 Degrees
Anode No. 3 Contact on same side as locating key.	

MAXIMUM RATINGS—(Design Center Values)

Anode No. 3 Voltage (Accelerator High Voltage Electrode)	4000 Max. Volts D-C
Anode No. 2 Voltage ^{1,2}	2000 Max. Volts D-C
Ratio Anode No. 3 Voltage to Anode No. 2 Voltage	2 Max.
Anode No. 1 Voltage	1000 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	125 Max. Volts D-C
Positive Bias Value	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts
Peak Voltage between Anode No. 2	
and any Deflection Electrode	550 Max. Volts

TYPICAL OPERATING CONDITIONS

For Anode No. 3 Voltage of	3000	4000	Volts
For Anode No. 2 Voltage of	1500	2000	Volts
Anode No. 1 Voltage for focus	282 to 475	375 to 632	Volts
Grid No. 1 Voltage ³	-22.5 to -67.5	-30 to -90	Volts

Deflection Factors:

D1 and D2	62 to 93	82 to 124	Volts D-C per Inch
D3 and D4	54 to 81	73 to 109	Volts D-C per Inch
Anode No. 1 Voltage for focus	18.8% to 31.6% of Eb2 Volts		
Grid No. 1 Voltage ³	1.5% to 4.5% of Eb2 Volts		
Anode No. 1 Current for any operating condition	-50 to +10 Microamperes		

Deflection Factors:

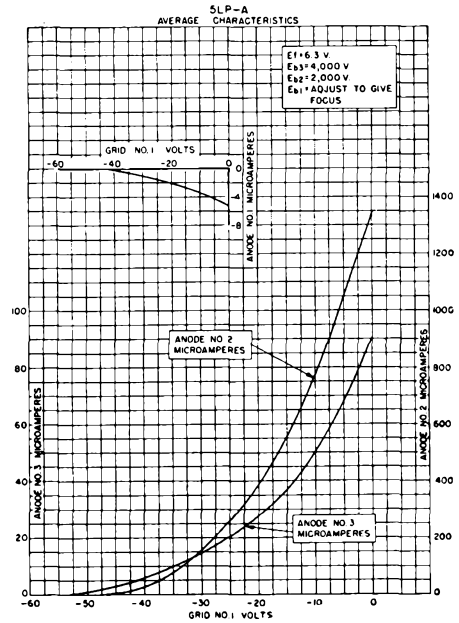
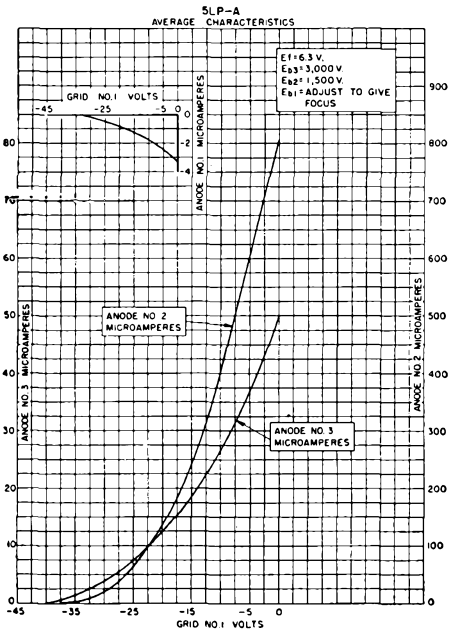
No 3rd Anode or Eb3 = Eb2			
D1 and D2	33 to 51	Volts D-C per Inch per Kilovolt of Eb2	
D3 and D4	31 to 45	Volts D-C per Inch per Kilovolt of Eb2	
Eb3 = Twice Eb2			
D1 and D2	41 to 62	Volts D-C per Inch per Kilovolt of Eb2	
D3 and D4	36 to 54	Volts D-C per Inch per Kilovolt of Eb2	
Spot Position (Undelected)	Within a 10 millimeter radius circle ⁴		

MAXIMUM CIRCUIT VALUES

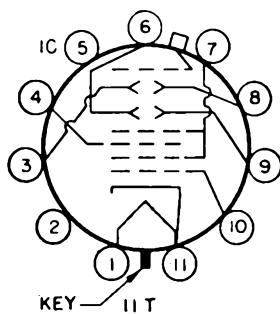
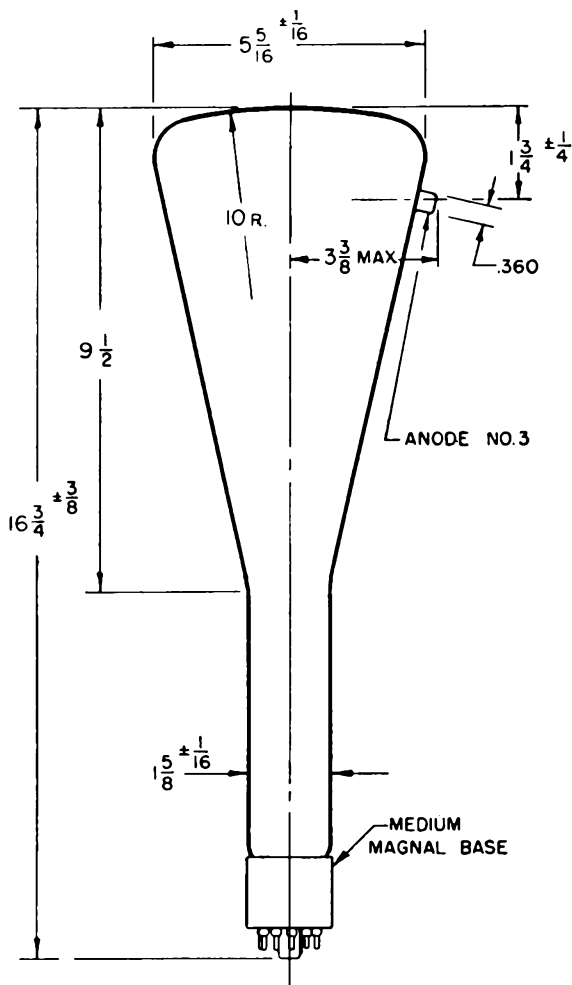
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting Electrode Circuit ⁵	5 Max. Megohms

NOTES

1. Anode No. 2 and Grid No. 2, which are connected together within the tube, are referred to herein as Anode No. 2.
2. The product of Anode No. 2 Voltage and Average Anode No. 2 current should be limited to 6 watts.
3. Visual extinction of undeflected focused spot.
4. Centered with respect to the tube face, with the tube shielded.
5. It is recommended that the deflecting electrode circuit resistances be approximately equal.
6. For optimum focus the average potentials of the deflection plates and second anode should be the same.



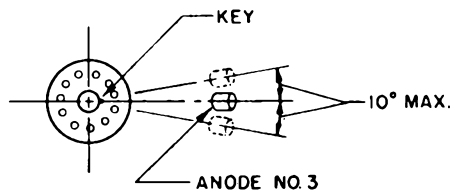
TYPE 5LP-A



BOTTOM VIEW OF BASE

PIN NO. ELEMENT

- 1 - HEATER
- 3 - DEFLECTING ELECTRODE D₁
- 4 - ANODE NO. 1
- 5 - INTERNAL CONNECTION
- 6 - DEFLECTING ELECTRODE D₄
- 7 - ANODE NO. 2, GRID NO. 2
- 8 - DEFLECTING ELECTRODE D₂
- 9 - DEFLECTING ELECTRODE D₃
- 10 - GRID NO. 1
- 11 - HEATER & CATHODE



5RP-A CATHODE-RAY TUBES

The Type 5RP-A Cathode-ray Tubes are high-voltage tubes which incorporate an intensifier subdivided into several steps. This feature permits the use of much higher overall accelerating voltages with deflection sensitivities only slightly less than heretofore obtainable in low-voltage cathode-ray tubes. Operation with intensifier to second anode voltage ratios as high as 10:1 are made possible by the multiband feature. The tube has a flat face and a cylindrical body. The deflection plate and anode connections are made through the neck of the tube instead of through the base. Low-capacity deflection plate leads facilitate high-frequency operation. The gun is designed to draw negligible focusing electrode current.

The four types differ only in the characteristics of the fluorescent screens. Other screen types may be obtained on special order.

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, Nominal

Cathode to all other electrodes	5 μf.
Grid No. 1 to all other electrodes	5 μf.
D1 to D2	2 μf.
D3 to D4	2 μf.
D1 to all other electrodes except D2	2.5 μf.
D2 to all other electrodes except D1	2 μf.
D3 to all other electrodes except D4	2.5 μf.
D4 to all other electrodes except D3	2 μf.

Mechanical

Overall Length	16¾ ± ⅜ Inches
Greatest Diameter of Bulb	5¼ ± 3/32 Inches
Minimum Useful Screen Diameter	4¼ Inches
Bulb Contacts (Recessed Small Ball Caps)	J1-22
Neck Contacts (Small Ball Caps)	J1-25
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14P

Base Alignment

D1D2 trace aligns with Pin No. 5 and tube axis	± 10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin No. 5	
Positive voltage on D3 deflects beam approximately toward Pin No. 2	
Angle between D3D4 and D1D2 traces	90 ± 2 Degrees

Bulb Contact Alignment:

J1-22 contacts align with D1D2 trace	± 10 Degrees
J1-22 contacts on same side as Pin No. 5.	

MAXIMUM RATINGS—(Design Center Values)

Anode No. 3 Voltage (Accelerator High Voltage Electrode)	25,500 Max. Volts D-C
Anode No. 2 Voltage ^{1,2}	3,500 Max. Volts D-C
Ratio Anode No. 3 Voltage to Anode No. 2 Voltage	10 Max.
Anode No. 1 Voltage	1,550 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	2 Max. Volts

Peak Heater Cathode Voltage

Heater Negative with respect to Cathode	125 Max. Volts D-C
Heater Positive with respect to Cathode	125 Max. Volts D-C

Peak Voltage between Anode No. 2 and any Deflection Electrode 1,200 Max. Volts

TYPICAL OPERATING CONDITIONS

For Anode No. 3 Voltage ³ of	10,000	20,000	Volts
For Anode No. 2 Voltage of	2,000	2,000	Volts
Anode No. 1 Voltage for focus	362 to 695	362 to 695	Volts
Grid No. 1 Voltage ¹	-30 to -90	-30 to -90	Volts

Deflection Factors:

D1 and D2	102 to 154	140 to 210	Volts D-C per Inch
D3 and D4	97 to 145	131 to 197	Volts D-C per Inch

Anode No. 1 Voltage for focus 18.1% to 34.8% of Eb2 Volts

Grid No. 1 Voltage⁴ 1.5% to 4.5% of Eb2 Volts

Anode No. 1 Current for any operating condition -50 to +10 Microamperes

Deflection Factors:

No 3rd Anode or Eb3 = Eb2

D1 and D2	30 to 45 Volts D-C per inch per Kilovolt of Eb2
D3 and D4	30 to 45 Volts D-C per inch per Kilovolt of Eb2

Eb3 = Twice Eb2

D1 and D2	36 to 54 Volts D-C per inch per Kilovolt of Eb2
D3 and D4	36 to 54 Volts D-C per inch per Kilovolt of Eb2

Spot Position (Undelected) Within a 10 Millimeter radius circle⁵

MAXIMUM CIRCUIT VALUES

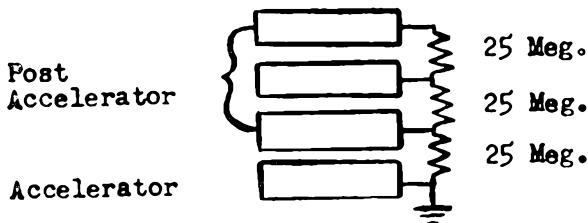
Grid No. 1 Circuit Resistance 1.5 Max. Megohms

Resistance in any Deflecting Electrode Circuit⁶ 5 Max. Megohms

NOTES

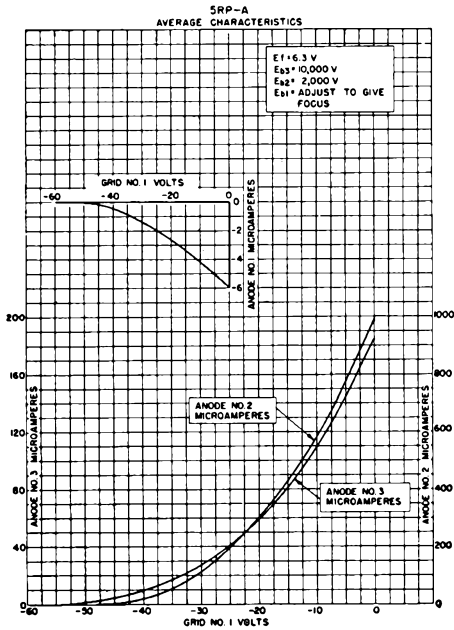
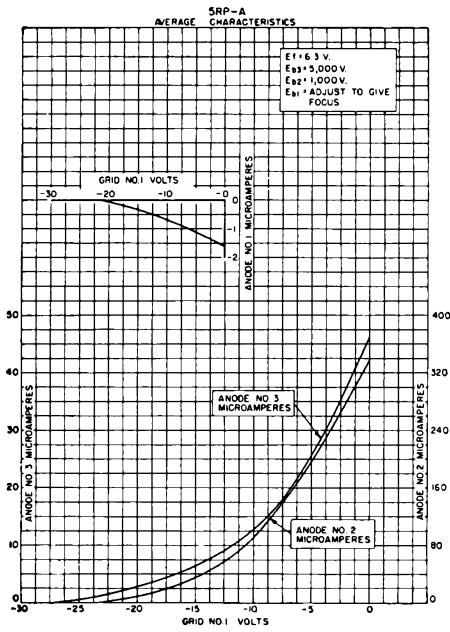
1. Anode No. 2 and Grid No. 2, which are connected together within the tube, are referred to herein as Anode No. 2.
2. The product of Anode No. 2 voltage and average Anode No. 2 current should be limited to 6 watts.
3. Anode No. 2 to final intensifier electrode voltage equally divided over the three intensifier electrodes.

Suggested Method of Intensifier Connection

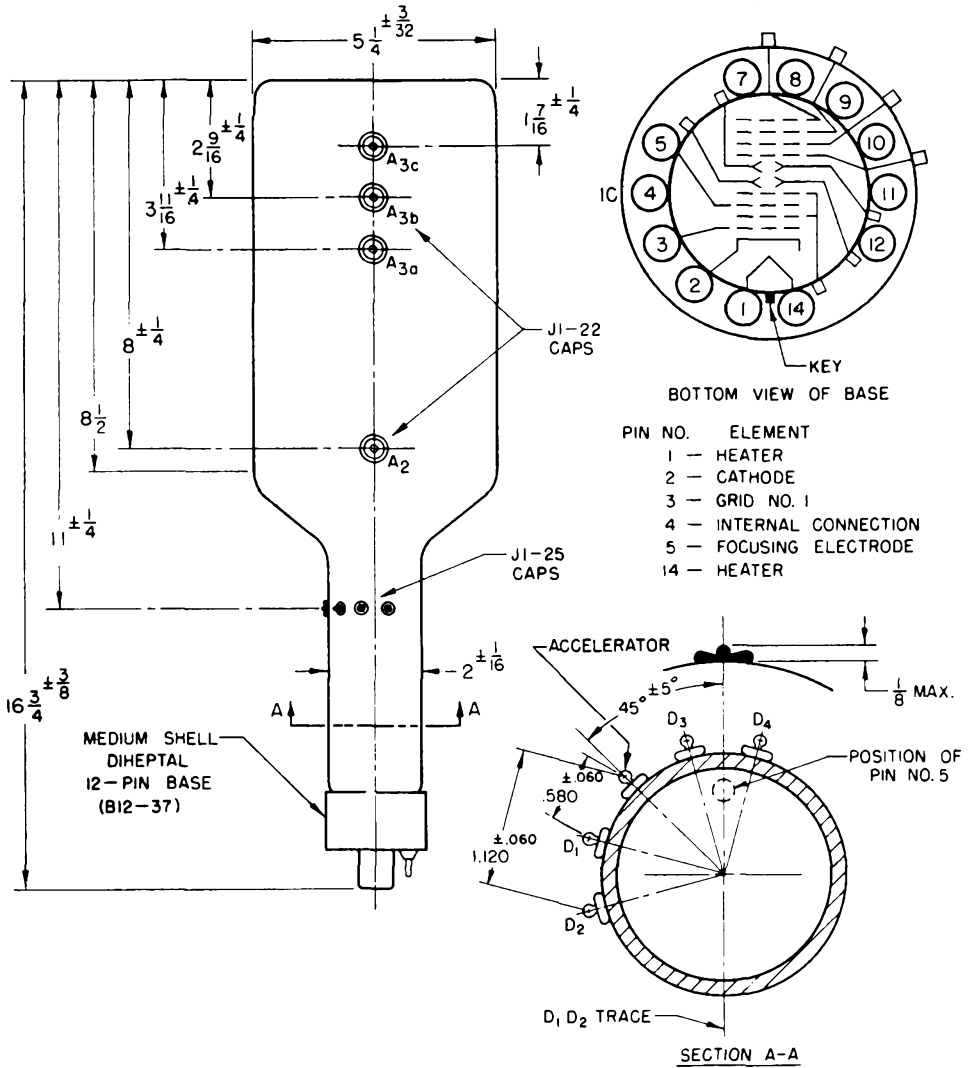


The two accelerator terminals must be connected together.

4. Visual extinction of undeflected focused spot.
5. Centered with respect to the tube face with the tube shielded.
6. It is recommended that the deflecting electrode circuit resistances be approximately equal.
7. For optimum focus the average potentials of the deflection plates and second anode should be the same.



TPPE 5RP-A



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	Min. Max.
(for each unit)	
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 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 ¹			
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

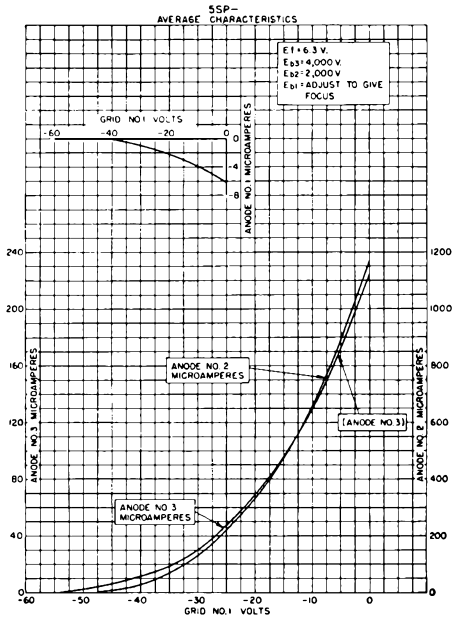
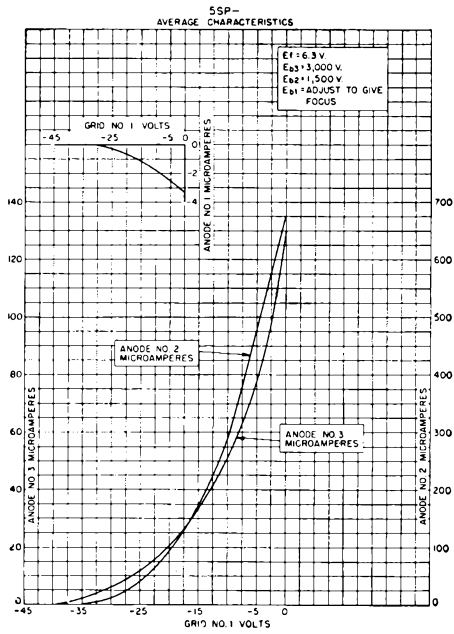
Deflection Factors⁴:

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

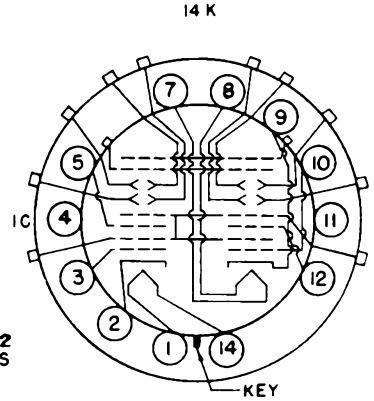
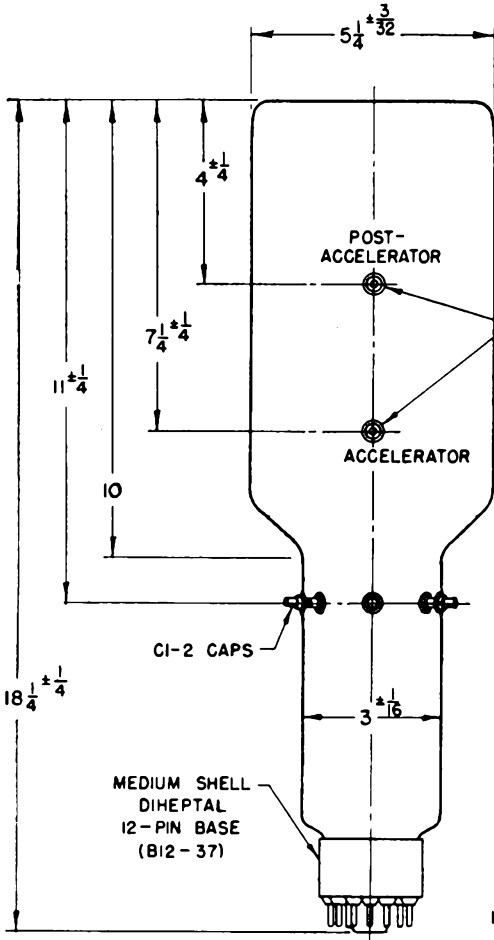
NOTES

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.

* Useful scan is equal to the useful screen diameter.

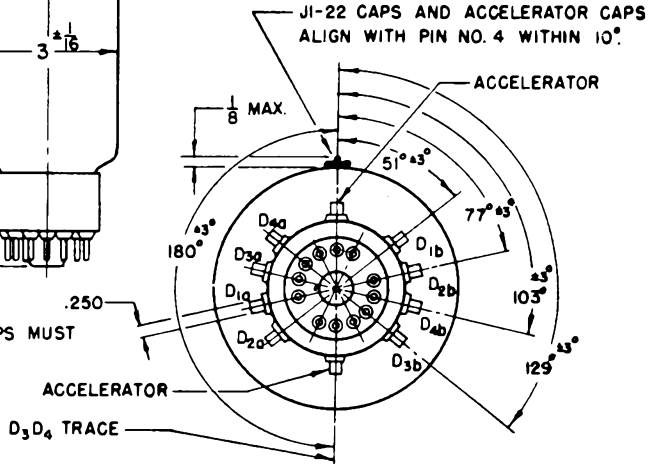


TYPE 5SP-A



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		

NOTE:
THE THREE ACCELERATOR CAPS MUST BE CONNECTED TOGETHER



5XP-A CATHODE-RAY TUBES

The Types 5XP-A Cathode-ray Tubes are tight-tolerance, electrostatically focused and deflected cathode-ray tubes containing very high sensitivity D3D4 deflection plates and an intensifier sub-divided into several steps for operation at high voltages and at high ratios of intensifier to second anode voltage.

High D3D4 sensitivity is achieved by using long deflection plates and limiting the D3D4 scan to a useful portion of the full screen diameter. Capacitances are low, being comparable to other types such as the 5JP-A and 5RP-A where deflection connections are made through the neck instead of the base.

Manufacturing tolerances have been reduced considerably in the Type 5XP-A. Deflection factors are held to within 10%, and the angle alignment between the D1D2 and D3D4 traces is held to within 1°. Grid cut-off tolerance has been halved to 25%.

Although the Type 5XP-A Cathode-ray Tubes are particularly useful for wide-band oscillographs, they are suitable for any application requiring high precision, high D3D4 deflection plate sensitivity, and the high writing rate capabilities of multi-band tubes.



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. 11
Fluorescence	Green	Green	Blue
Phosphorescence	—	Green	—
Persistence	Medium	Long	Short
Direct Interelectrode Capacitances			

Min. Max.

Cathode to all other electrodes	3.1	5.8 μμf.
Grid No. 1 to all other electrodes	3.3	6.2 μμf.
D1 to D2	1.0	2.0 μμf.
D3 to D4	1.0	2.0 μμf.
D1 to all other electrodes except D2 ..	1.4	2.8 μμf.
D2 to all other electrodes except D1 ..	1.4	2.8 μμf.
D3 to all other electrodes except D4 ..	1.1	2.3 μμf.
D4 to all other electrodes except D3 ..	1.1	2.3 μμf.

Mechanical

Overall Length	17 ⁵ / ₈ ± 1/4 Inches
Greatest Diameter of Bulb	5 ¹ / ₄ ± 3/32 Inches
Minimum Useful Screen Diameter	4 ¹ / ₄ Inches
Bulb Contacts (Recessed Small Ball Caps)	J1-22
Neck Contacts (Small Ball Caps)	J1-25
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14P
Base Alignment:	

D1D2 trace aligns with Pin No. 5 and tube axis ±10 Degrees
 Positive voltage on D1 deflects beam approximately toward Pin No. 5

Positive voltage on D3 deflects beam approximately toward Pin No. 2	
Angle between D3D4 and D1D2 traces	90 ± 1 Degrees
Bulb Contact Alignment:	
J1-22 contacts align with D1D2 trace	± 10 Degrees
J1-22 contacts on same side as Pin No. 5	

MAXIMUM RATINGS—(Design Center Values)

Post Accelerator Voltage	25,500 Max. Volts D-C
Accelerator Voltage ¹	3,650 Max. Volts D-C
Ratio Post Accelerator Voltage to Accelerator Voltage ²	10 Max.
Focusing Voltage	1,550 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 Deflection Electrode	1,200 Max. Volts

TYPICAL OPERATING CONDITIONS

For Post Accelerator Voltage ³ of	12,000 Volts
For Accelerator Voltage of	2,000 Volts
Focusing Voltage	362 to 695 Volts
Grid No. 1 Voltage ⁴	-45 to -75 Volts
Modulation ⁵	52 Volts Max.
Line Width A ⁵ .....	.020 Inch Max.
P1 Light Output ⁶ (at Ib3 = 10 ua.)	20 Ft. L. Min.
Deflection Factors:	
D1 and D2	130 to 159 Volts D-C per Inch
D3 and D4	42 to 52 Volts D-C per Inch
Deflection Factor Uniformity ⁹	5% Maximum
Useful Scan⁷	
D1 and D2	4.25 Inches*
D3 and D4	1.60 Inches**
Pattern Distortion at 75% of Useful Scan ^{2,8}	2% Maximum
Frequency for 10% reduction in D3D4 deflection amplitude due to transit time¹⁰	
Spot Position (Undelected)	200 mc.
Spot Position (Undelected)	Within a 5/16-inch radius circle ¹¹

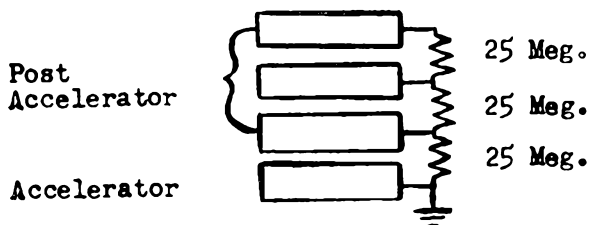
CIRCUIT DESIGN VALUES

Focusing Voltage	181 to 348 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid No. 1 Voltage ⁴	22.5 to 37.5 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	38 to 46 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	12 to 15 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting Electrode Circuit ¹²	5 Max. Megohms
* ± 2.125" minimum from tube face center.	
** ± .8" minimum from tube face center.	

NOTES

1. The product of Accelerator Voltage and average Accelerator Current should be limited to 6 watts.
2. It is recommended that Post Accelerator to Accelerator Voltage ratio be not more than 6 to 1 in applications where minimum pattern distortion is required.
3. Accelerator to final intensifier electrode voltage equally divided over the three intensifier electrodes.

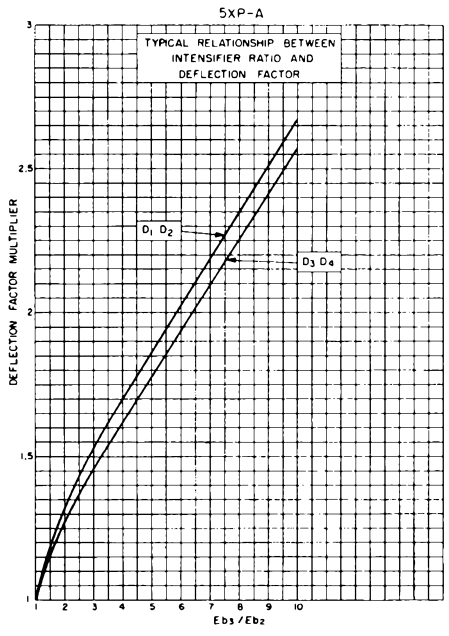
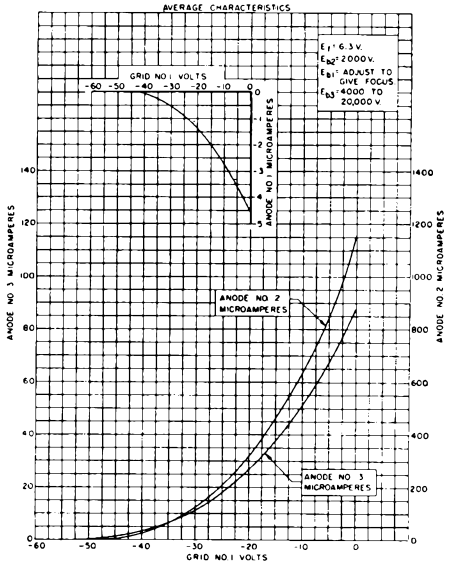
Suggested Method of Intensifier Connection



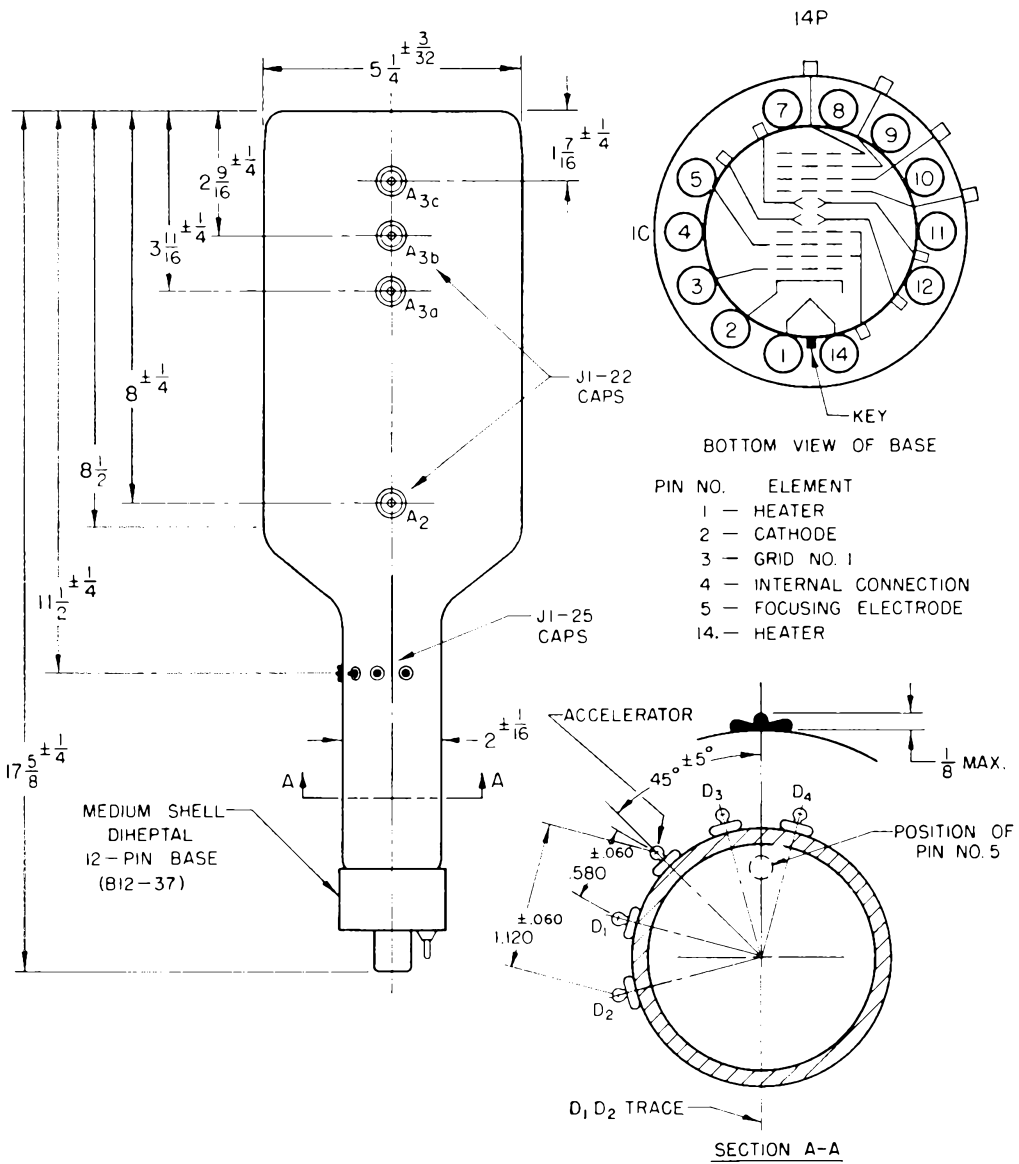
The two accelerator terminals
must be connected together.

4. Visual extinction of undeflected focused spot.
5. Measured in accordance with MIL-E-1 specifications at $I_{b3} = 25 \text{ ua}$.
6. The deflection factor (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. Reduction in useful scan when Post Accelerator voltage is greater than Accelerator voltage is determined by the ratio of these voltages measured with respect to cathode. Values shown are therefore applicable to any operating condition with the same voltage ratios.
8. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 1.275 x 3.060-inch rectangle, will fall within the area bounded by the 1.275 x 3.060-inch rectangle and an inscribed 1.225 x 2.940-inch rectangle.
9. Deflection accuracy may be obtained by combining angle between traces, deflection factor uniformity and pattern distortion characteristics. In general, for deflections less than those indicated the accuracy will improve.
10. Computed.
11. When the tube is operated at typical operating conditions ($E_h = 6.3 \text{ V.}$, $E_{b3} = 12,000 \text{ V.}$, $E_{b2} = 2,000 \text{ V.}$, E_{b1} at focus); with E_{c1} 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, the spot will fall within a 5/16-inch radius circle, centered on the tube face.
Under stable operating conditions, the position of the spot will not shift with changes in intensity by more than .025 inch.
12. It is recommended that the deflecting electrode circuit resistances be approximately equal.
13. For optimum focus the average potentials of the deflection plates and second anode should be the same.

5XP1-A, 5XP2-A, 5XP11-A



TYPE 5XP-A



5XP-B CATHODE-RAY TUBES

The Types 5XP-B Cathode-ray Tubes are identical to the Types 5XP-A Cathode-ray Tubes, except for the addition of a metallized screen.

In the study of high frequency signals of low repetition rates, or single transients, the use of a metallized screen is a significant advantage. Metallization increases the light output of the screen, which is very desirable in these high frequency applications, and also prevents the building up of spurious charges on the screen by successive transients. Under some circumstances, these spurious charges may distort succeeding transients.

Film-fogging, a problem encountered when photo-recording with high-speed cameras, is also minimized by metallization. This fogging, partly caused by cathode glow passing through an unmetallized screen, may occur when the shutter is held open for a time, awaiting a single transient. In the Type 5XP-B Cathode-ray Tube, cathode glow cannot be transmitted through the metallized layer, thereby eliminating film fogging from this cause.



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. 11
Fluorescence	Green	Green	Blue
Phosphorescence	—	Green	—
Persistence	Medium	Long	Short

Direct Interelectrode Capacitances	Min.	Max
Cathode to all other electrodes	3.1	5.8 μf.
Grid No. 1 to all other electrodes	3.3	6.2 μf.
D1 to D2	1.0	2.0 μf.
D3 to D4	1.0	2.0 μf.
D1 to all other electrodes except D2	1.4	2.8 μf.
D2 to all other electrodes except D1	1.4	2.8 μf.
D3 to all other electrodes except D4	1.1	2.3 μf.
D4 to all other electrodes except D3	1.1	2.3 μf.

Mechanical

Overall Length	17 ⁵ / ₈ ± 1/4 Inches
Greatest Diameter of Bulb	5 ¹ / ₄ ± 3/32 Inches
Minimum Useful Screen Diameter	4 ¹ / ₄ Inches
Bulb Contacts (Recessed Small Ball Caps)	J1-22
Neck Contacts (Small Ball Caps)	J1-25
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14P

Base Alignment:

D1D2 trace aligns with Pin No. 5 and tube axis	± 10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin No. 5	
Positive voltage on D3 deflects beam approximately toward Pin No. 2	
Angle between D3D4 and D1D2 traces	90 ± 1 Degrees

Bulb Contact Alignment:

J1-22 contacts align with D1D2 trace	± 10 Degrees
J1-22 contacts on same side as Pin No. 5	

MAXIMUM RATINGS—(Design Center Values)

Post Accelerator Voltage	25,500 Max. Volts D-C
	5,000 Min. Volts D-C
Accelerator Voltage ¹	3,650 Max. Volts D-C
Ratio Post Accelerator Voltage to Accelerator Voltage ²	10 Max.
Focusing Voltage	1,550 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 Deflection Electrode	1,200 Max. Volts

TYPICAL OPERATING CONDITIONS

For Post Accelerator Voltage ³ of	12,000 Volts
For Accelerator Voltage of	2,000 Volts
Focusing Voltage	362 to 695 Volts
Grid No. 1 Voltage ⁴	-45 to -75 Volts
Modulation ⁵	52 Volts Max.
Line Width A ⁵ .....	.020 Inch Max.
P1 Light Output ⁶ (at Ib3 = 10 ua.)	40 Ft. L. Min.
Deflection Factors:	
D1 and D2	130 to 159 Volts D-C per Inch
D3 and D4	42 to 52 Volts D-C per Inch
Deflection Factor Uniformity ⁶	5% Maximum
Useful Scan ⁷	
D1 and D2	4.25 Inches*
D3 and D4	1.60 Inches**
Pattern Distortion at 75% of Useful Scan ^{2,8}	2% Maximum
Frequency for 10% reduction in D3D4 deflection amplitude due to transit time ¹⁰	200 mc.
Spot Position (Undelected)	Within a 5/16-inch radius circle ¹¹

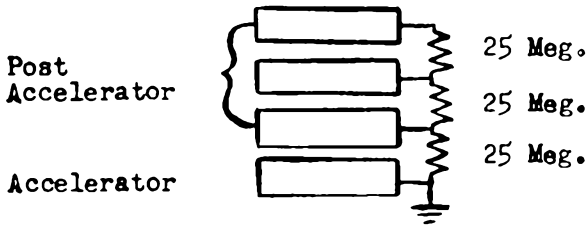
CIRCUIT DESIGN VALUES

Focusing Voltage	181 to 348 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid No. 1 Voltage ⁴	22.5 to 37.5 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	38 to 46 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	12 to 15 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting Electrode Circuit ¹²	5 Max. Megohms
* $\pm 2.125''$ minimum from tube face center	
** $\pm .8''$ minimum from tube face center	

NOTES

1. The product of Accelerator Voltage and average Accelerator Current should be limited to 6 watts.
2. It is recommended that Post Accelerator to Accelerator Voltage ratio be not more than 6 to 1 in applications where minimum pattern distortion is required.
3. Accelerator to final intensifier electrode voltage equally divided over the three intensifier electrodes.

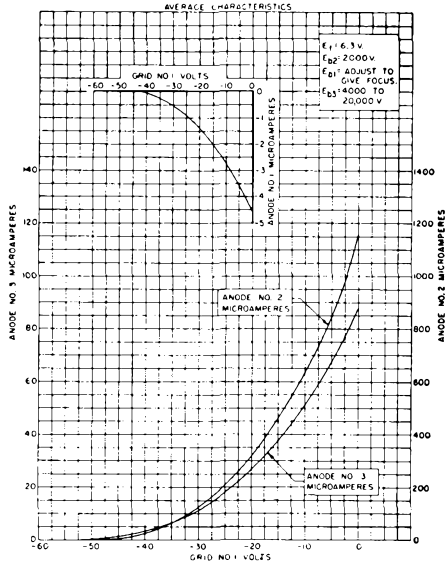
Suggested Method of Intensifier Connection



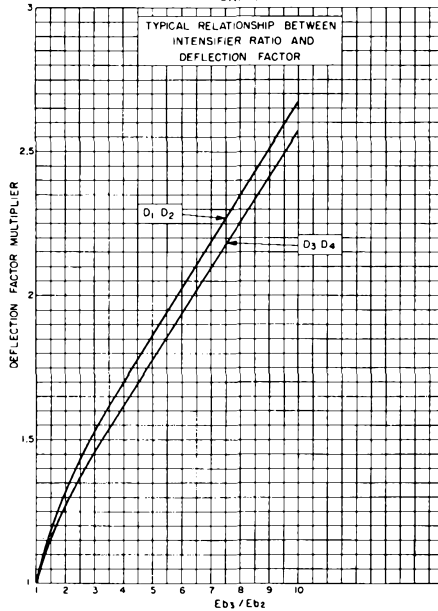
The two accelerator terminals
must be connected together.

4. Visual extinction of undeflected focused spot.
5. Measured in accordance with MIL-E-1 specifications at $I_{b3} = 25 \text{ ua}$.
6. The deflection factor (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. Reduction in useful scan when Post Accelerator voltage is greater than Accelerator voltage is determined by the ratio of these voltages measured with respect to cathode. Values shown are therefore applicable to any operating condition with the same voltage ratios.
8. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 1.275 x 3.060-inch rectangle, will fall within the area bounded by the 1.275 x 3.060-inch rectangle and an inscribed 1.225 x 2.940-inch rectangle.
9. Deflection accuracy may be obtained by combining angle between traces, deflection factor uniformity and pattern distortion characteristics. In general, for deflections less than those indicated the accuracy will improve.
10. Computed.
11. When the tube is operated at typical operating conditions ($E_h = 6.3 \text{ V.}$, $E_{b3} = 12,000 \text{ V.}$, $E_{b2} = 2,000 \text{ V.}$, E_{b1} at focus); with E_{c1} 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, the spot will fall within a 5/16-inch radius circle, centered on the tube face.
Under stable operating conditions, the position of the spot will not shift with changes in intensity by more than .025 inch.
12. It is recommended that the deflecting electrode circuit resistances be approximately equal.
13. For optimum focus the average potentials of the deflection plates and second anode should be the same.

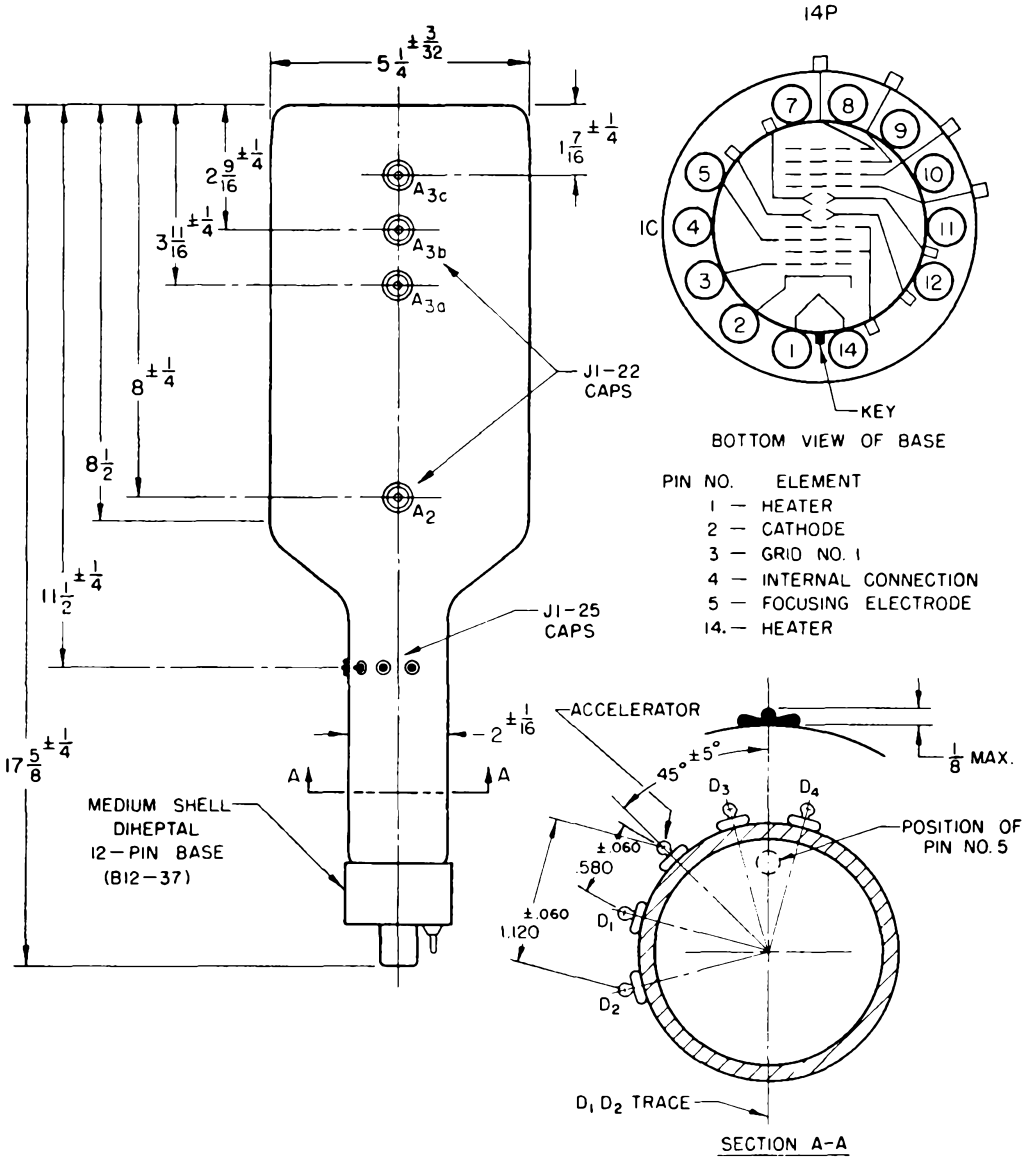
5XP1-B, 5XP2-B, 5XP11-B



5XP-B AND 5XP-A



TYPE 5XP-B



5YP- CATHODE-RAY TUBES

The Type 5YP- is an electrostatic focus and deflection cathode-ray tube, with very high sensitivity D3D4 deflection plates, featuring an intensifier for increased brightness and writing rate, with a minimum loss in deflection sensitivity.

The high D3D4 sensitivity is achieved by using long deflection plates and limiting the D3D4 scan to a useful portion of the full screen diameter. Capacitances are low, being comparable to other types such as the 5JP-A and 5RP-A, where deflection connections are made through the neck instead of the base.

The 5YP- is particularly useful for wide band oscillographs and for any application requiring high D3D4 deflection plate sensitivity.

GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts
Heater Current	$0.6 \pm 10\%$ 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, Approx.	
Cathode to all other electrodes	$5 \mu\text{f.}$
Grid No. 1 to all other electrodes	$5 \mu\text{f.}$
D1 to D2	$2 \mu\text{f.}$
D3 to D4	$2 \mu\text{f.}$
D1 to all other electrodes except D2	$2.5 \mu\text{f.}$
D2 to all other electrodes except D1	$2.5 \mu\text{f.}$
D3 to all other electrodes except D4	$2 \mu\text{f.}$
D4 to all other electrodes except D3	$2 \mu\text{f.}$

Mechanical

Overall Length	$17\frac{7}{8} \pm \frac{3}{8}$ Inches
Greatest Diameter of Bulb	$5\frac{1}{4} \pm \frac{3}{32}$ Inches
Minimum Useful Screen Diameter	$4\frac{1}{4}$ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Neck Contacts (Small Ball Caps)	J1-25
Base (Medium Shell Diheptal 12-Pin)	B12-37
Basing	14Q
Base Alignment:	
D1D2 trace aligns with Pin No. 5 and tube axis	± 10 Degrees
Positive voltage on D1 deflects beam approximately toward Pin No. 5	
Positive voltage on D3 deflects beam approximately toward Pin No. 2	
Angle between D3D4 and D1D2 traces	90 ± 2 Degrees
Bulb Contact Alignment:	
J1-22 contact aligns with D1D2 trace	± 10 Degrees
J1-22 contact on same side as Pin No. 5	

MAXIMUM RATINGS—(Design Center Values)

Post Accelerator Voltage	8,000 Max. Volts D-C
Accelerator Voltage ¹	3,500 Max. Volts D-C
Ratio Post Accelerator Voltage to Accelerator Voltage	2.3 Max.
Focusing Voltage	1,550 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	
Deflection Electrode	1,200 Max. Volts

TYPICAL OPERATING CONDITIONS

For Post Accelerator Voltage of	4,000 Volts
For Accelerator Voltage of	2,000 Volts
Focusing Voltage	362 to 695 Volts
Grid No. 1 Voltage ²	-30 to -90 Volts
Modulation ³	52 Volts Max.
Line Width A ³ .....	.032 Inch Max.
P1 Light Output ³	15 Ft. L. Min.
Deflection Factors:	
D1 and D2	72 to 108 Volts D-C per Inch
D3 and D4	24 to 36 Volts D-C per Inch
Deflection Factor Uniformity ⁴	2% Max.
Useful Scan ⁵ :	
D1 and D2	4.25 (± 2.125 from tube face center) Inches
D3 and D4	2.50 (± 1.25 from tube face center) Inches
Pattern Distortion at 75% of useful scan ⁶	2½% Max.
Frequency for 10% reduction in D3D4 deflection amplitude	
due to transit time ⁷	200 mc.
Spot Position (Focused and Undelected)	Within a 5/16-inch radius circle ⁸

CIRCUIT DESIGN VALUES

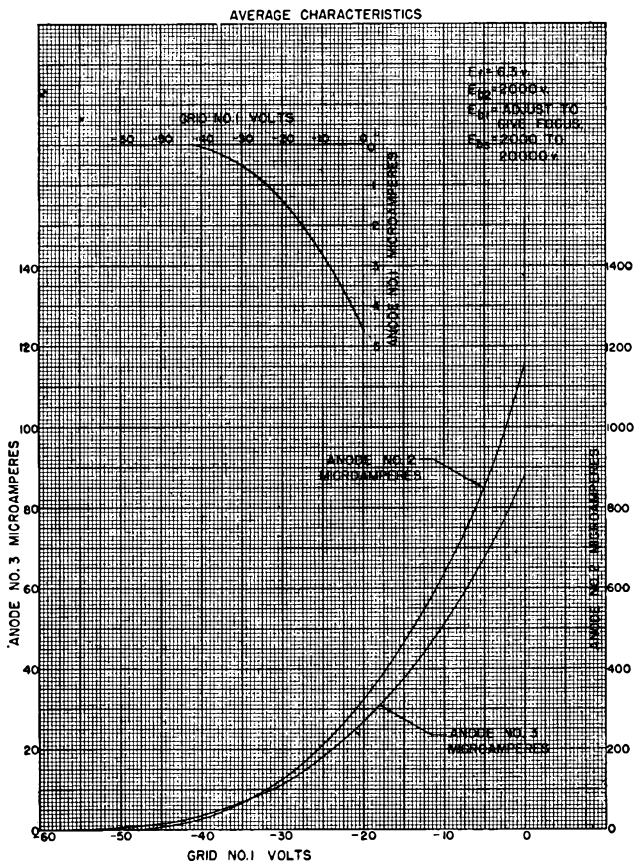
Focusing Voltage	181 to 348 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid No. 1 Voltage ²	15 to 45 Volts per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Deflection Factors:	
Post Accelerator Voltage = Accelerator Voltage	
D1 and D2	30 to 45 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	9.5 to 14.5 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting Electrode Circuit ¹⁰	5 Max. Megohms

NOTES

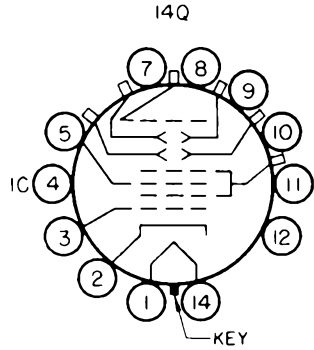
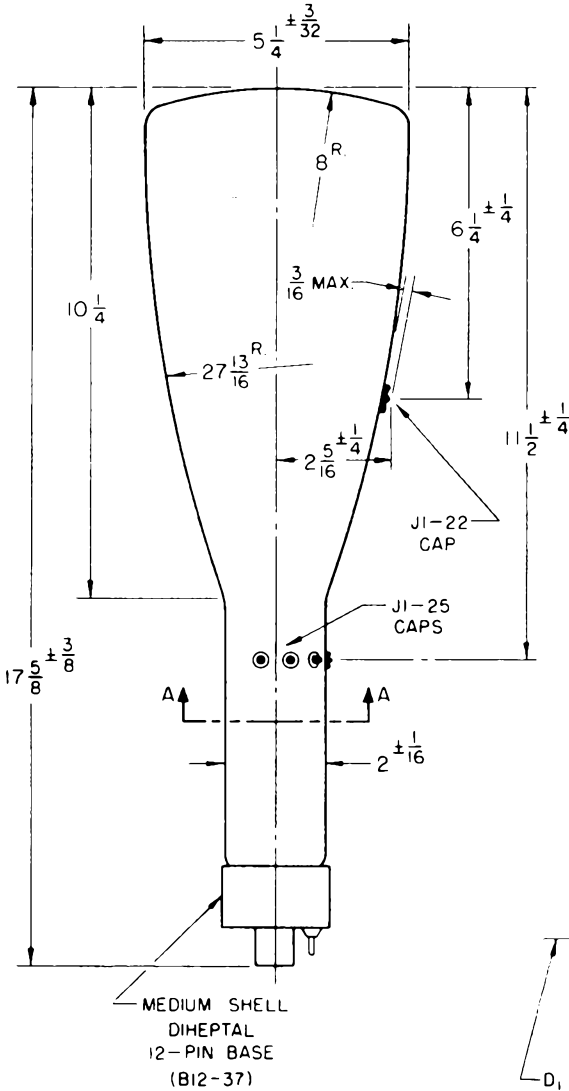
1. The product of accelerator voltage and average accelerator current should be limited to 6 watts.
2. Visual extinction of undeflected focused spot.
3. Measured in accordance with JAN-1A Specifications at a post accelerator current of 25 ua.
4. The deflection factor (for both D1D2 and D3D4 plate pairs, 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.
5. Reduction in useful scan when post accelerator voltage is greater than accelerator voltage is determined by the ratio of these voltages measured with respect to cathode. Values shown are therefore applicable to any operating condition with the same voltage ratios.
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. Computed.

8. Deflection accuracy may be obtained by combining angle between traces, deflection factor uniformity and pattern distortion characteristics. In general, for deflections less than those indicated, the accuracy will improve.
9. Centered with respect to the tube face with the tube shielded.
10. It is recommended that the deflecting electrode circuit resistances be approximately equal.
11. For optimum focus the average potentials of the deflection plates and second anode should be the same.

5YP1, 5YP2, 5YP11

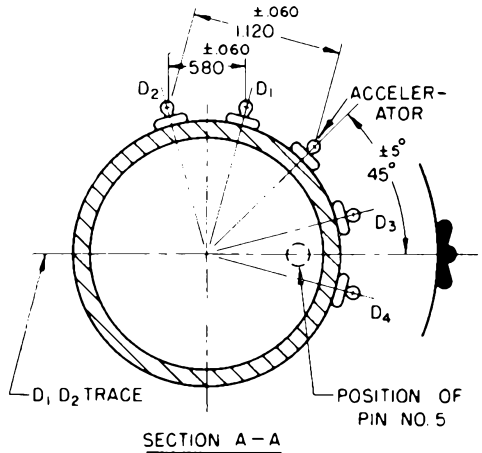


TYPE 5YP-



14Q
BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
1	HEATER
2	CATHODE
3	GRID NO 1
4	INTERNAL CONNECTION
5	FOCUSING ELECTRODE
14	HEATER



SECTION A-A

TYPE 7ABP-, 7ABP-A CATHODE-RAY TUBES

The Type 7ABP- Cathode-ray Tube is electrostatically focused and magnetically deflected and employs a high-resolution electron-gun. The Type 7ABP- is designed for radar systems requiring good resolution and high-brightness displays. Three long persistence screens, the P7, P14 and P19 screens, are recommended for use with the Type 7ABP-.

To afford substantially automatic focus independent of accelerator voltage variations, a low-voltage electrostatic lens is supplied which is designed to be operated at or near the potential of the cathode. This feature eliminates the necessity for a front panel focus control in equipment design.

The Type 7ABP-A utilizes an aluminized screen for greater light output and to minimize screen charging effects; it is otherwise identical to the 7ABP-. If a P19 screen is selected, the aluminized version should be used.

GENERAL CHARACTERISTICS

Electrical

Heater Voltage 6.3 Volts
 Heater Current $0.6 \pm 10\%$ Ampere
 Focusing Method Electrostatic
 Deflecting Method Magnetic
 Deflecting Angle (Approx.) 50 Degrees

Phosphor	No. 7	No. 14	No. 19
Fluorescence	Blue	Blue	Orange
Phosphorescence	Yellow	Orange	Orange
Persistence	Long	Medium-long	Long

Direct Interelectric Capacitances, Approx.

Cathode to all other electrodes $5 \mu\text{f}$.
 Grid No. 1 to all other electrodes $6 \mu\text{f}$.

Mechanical

Overall Length $13\frac{1}{4} \pm \frac{1}{4}$ Inches
 Greatest Diameter of Bulb $7\text{-}3\frac{1}{16} \pm \frac{1}{8}$ Inches
 Minimum Useful Screen Diameter 6 Inches
 Bulb Contact (Recessed Small Cavity Cap) J1-21
 Base (Small Shell Duodecal 6-Pin) B6-63
 Basing 12M
 Bulb Contact Alignment
 J1-21 Contact aligns with vacant pin position No. 3 ± 10 Degrees

MAXIMUM RATINGS—(Design Center Values)

Accelerator Voltage 10,000 Max. Volts D-C
 Focusing Electrode Voltage -500 to $+1000$ Max. Volts D-C
 Grid No. 2 Voltage 700 Max. Volts D-C
 Grid No. 1 Voltage
 Negative Bias Value 180 Max. Volts D-C
 Positive Bias Value¹ 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

TYPICAL OPERATING CONDITIONS

Accelerator Voltage ²	7,000	Volts D-C
Focusing Electrode Voltage ³	0 to 250	Volts D-C
Focusing Electrode Current	-15 to $+15$	μA . D-C
Grid No. 2 Voltage	300	Volts D-C
Grid No. 1 Voltage ⁴	-28 to -72	Volts D-C
Line Width A ⁵	.012	Inch Max.
Spot Position (undeflected) ⁵	$\frac{3}{8}$	Inch
Alignment Magnet Field Strength	0-4	Gausses

MAXIMUM CIRCUIT VALUES

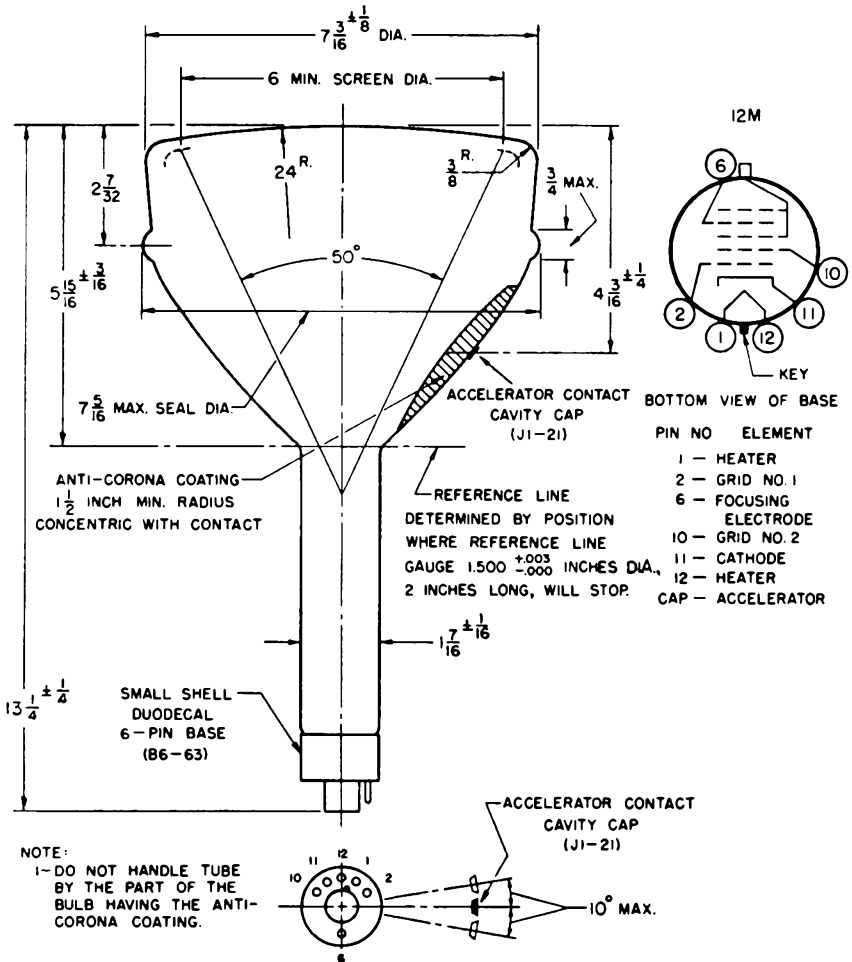
Grid No. 1 Circuit Resistance 1.5 Max. Megohms



NOTES

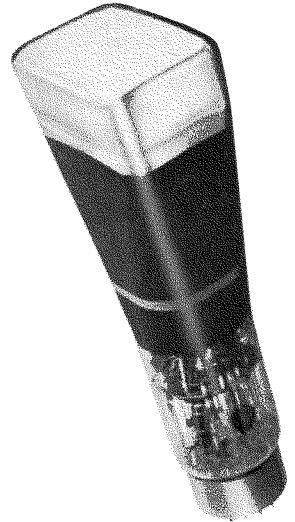
1. At or near this rating, the effective resistance of the accelerator supply should be adequate to limit the accelerator input power to 6 watts. The screen of the 7ABP19 can be permanently damaged should the current density be permitted to rise too high. To prevent burning, minimum beam current densities should be employed.
2. Brilliance and definition decrease with decreasing accelerator voltage. In general, accelerator voltage should not be less than 5,000 volts, except for the 7ABP19. For this type, the accelerator voltage should not be less than 7,000 volts.
3. With Grid No. 1 voltage adjusted to produce an accelerator current of 100 μ A. with the pattern adjusted for best overall focus. Measured with a 525-line interlaced and synchronized $4\frac{1}{4} \times 5\frac{3}{4}$ -inch pattern, with interlaced line blanking (current measured before applying blanking).
4. Visual extinction of focused $4\frac{1}{4} \times 5\frac{3}{4}$ -inch raster pattern.
5. Measured with a 525-line interlaced and synchronized pattern with interlaced line blanking. Pattern width adjusted to 90% of minimum useful screen diameter. $I_b = 100 \mu$ A. measured before applying blanking. Line width is the merged raster height divided by the number of lines (262.5) (measured in center of tube face). To avoid damage to the screen of the 7ABP19, it is recommended that the screen current be not more than 50 μ A. when measuring line width. The line width under this condition will be .011 inch maximum (current measured before applying blanking).
6. The center of the undeflected, focused spot will fall within a circle of $\frac{3}{8}$ -inch radius concentric with the center of the tube face, with the tube shielded.
7. For optimum quality of the focused spot, the use of a beam alignment magnet is recommended. This may be obtained by the use of an adjustable magnet of specified strength, located approximately $5\frac{1}{4}$ inches from the reference line.

TYPE 7ABP-



7ACP- CATHODE-RAY TUBE

The Du Mont Type 7ACP- is a 4 x 6 inch rectangular, three beam, electrostatic focus and deflection cathode-ray tube. Each beam is independent of the other except for accelerating potentials and heater connections. Post-acceleration is used to obtain maximum deflection sensitivity with high brightness. The electron gun structures are so designed as to require no appreciable focusing current. As many of the electrode connections as is 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. For maximum brightness and stability in performance, all screens are provided with a highly reflective metal backing.



GENERAL CHARACTERISTICS (Note 1)

Electrical Data

Heater Voltage	6.3 Volts
Heater Current (All units)	1.8 ± 10% Amperes
Focusing Method	Electrostatic
Deflecting Method	Electrostatic

Phosphor	No. 2	No. 7	No. 19
Fluorescence	Green	Blue	Orange
Phosphorescence	Green	Yellow	Orange
Persistence	Long	Long	Long

Direct Interelectrode Capacitances	Min.	Max.	
Cathode to all other electrodes	5.0	7.0	μμf
Grid No. 1 to all other electrodes	5.0	7.0	μμf
D1 to D2	2.2	4.0	μμf
D3 to D4	1.4	2.8	μμf
D1 to all other electrodes	9.5	13.2	μμf
D2 to all other electrodes	9.3	13.2	μμf
D3 to all other electrodes	8.0	11.0	μμf
D4 to all other electrodes	8.0	11.0	μμf

Mechanical Data

Overall Length	17 ³ / ₄ ± ³ / ₈ Inches
Greatest Bulb Dimension (Diagonal)	6 ⁵ / ₈ ± 1/16 Inches
Minimum Screen Dimensions (Along Tube Axes)	3 ¹ / ₄ x 5 ¹ / ₄ Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (25 Pin)	B25-139
Basing	Special

Base Alignment	
D3D4 trace aligns with Base Key and Tube Axis	± 10 Degrees
Positive voltage on D1 deflects beam approximately towards Pin No. 18	
Positive voltage on D3 deflects beam approximately towards Base Key	

Bulb Contact Alignment	
Bulb contact located on tube center line	± ¹ / ₄ Inch
Bulb contact on same side as Base Key	

Trace Alignment	
Angle between D1D2 and D3D4 traces	90 ± 2 Degrees
Corresponding traces of each gun align within	± 2 Degrees
D3D4 trace aligns with Bulb Side Wall	± 3 Degrees

MAXIMUM RATINGS (Design Center Values)

Post-Accelerator Voltage	10,500 Max. Volts D-C
Accelerator Voltage (Note 2)	3,500 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 3)	3.0 Max.
Focusing Voltage	2,700 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	300 Max. Volts D-C
Positive Bias Value	0 Max. Volts D-C
Positive Peak Value	0 Max. Volts
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	1,000 Volts

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	9,000 Volts D-C
For Accelerator Voltage of	3,000 Volts D-C
Focusing Voltage	595 to 1020 Volts D-C
Grid No. 1 Voltage (Note 4)	-67 to -112 Volts D-C
	Phosphors Nos. 2 & 7 No. 19
Modulation	15 (Note 5) 20 (Note 6) Max. Volts D-C
Line Width "A" .....	.036 (Note 7) .024 (Note 8) Max. Inches
Light Output (Note 9)	100 (P2) Min. Ft. Lamberts
Deflection Factors:	
D1 and D2	86 to 130 Volts D-C/Inch
D3 and D4	84 to 126 Volts D-C/Inch
Useful Scan (Note 10)	
Spot Position (Note 11)	Within 15 mm Square

CIRCUIT DESIGN VALUES

Focusing Voltage	198 to 340 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid No. 1 Voltage (Note 4)	-37.5 to -22 Volts per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Deflection Factors:	
Ratio Post-Accelerator Voltage to Accelerator Voltage	1.0
D1 and D2	19 to 29 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	19.5 to 30 Volts D-C/Inch/KV of Accelerator Voltage
Ratio Post-Accelerator Voltage to Accelerator Voltage	3.0
D1 and D2	28.5 to 43.5 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	28 to 42 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflection Electrode Circuit (Note 12)	1.0 Max. Megohms

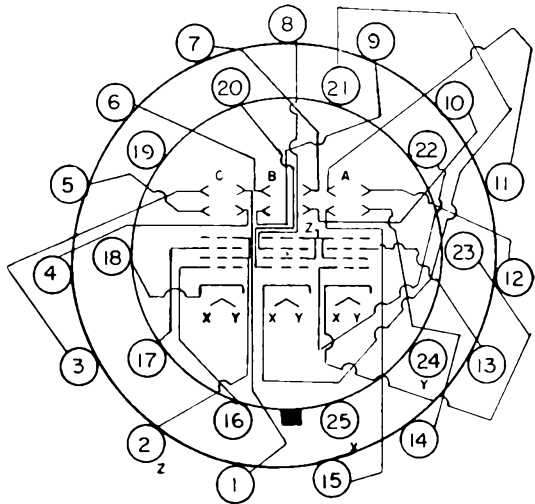
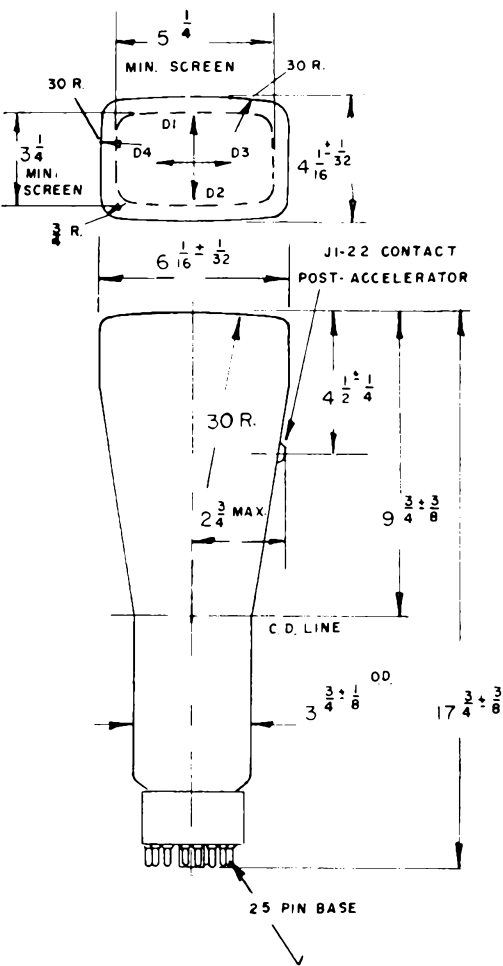
NOTES

1. All tests to be made on each gun separately. Values are for each unit unless otherwise stated.
2. Accelerator power input (Avg.) should be limited to six watts. The P19 screen can be permanently damaged if the current density is permitted to rise too high. To prevent burning, minimum beam current densities should be employed.
3. This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 3.0. Operation at other ratios of Eb3/Eb2 may result in changes in deflection uniformity and pattern distortion.
4. For visual extinction of the focused undeflected spot.
5. The increase in Grid No. 1 voltage from cut-off to produce an Ib3 of 50 μ AD-C.
6. The increase in Grid No. 1 voltage from cut-off to produce an Ib3 of 5 μ AD-C.
7. Measured in accordance with MIL-E-1 specifications using an Ib3 of 50 μ AD-C.
8. Measured in accordance with MIL-E-1 specifications using an Ib3 of 5 μ AD-C.
9. P2 and P7 Light Output — Measured in accordance with MIL-E-1 specifications with an Ib3 of 50 μ AD-C.
10. The minimum useful scan of Guns A and C is:
D1D2 = 3.0 inches and D3D4 = 2.25 inches.
The minimum useful scan of Gun B is:
D1D2 = 3.0 inches and D3D4 = 3.0 inches.
11. When the tube is operated at typical operating conditions, and with (1) Eb1 adjusted for focus, (2) Ecl set at such a value as will avoid damage to the screen, (3) each of the deflecting electrodes connected to the accelerator, and (4) the tube shielded against external influences; the spots will fall within 15 mm squares, the

centers of which are 1.5 inches from the geometric center of the tube face towards the bulb contact for guns A and C and 1.0 inch from the geometric center of the tube face away from the bulb contact for gun B, and the sides of which are parallel to the traces produced by deflecting electrodes D3 and D4 respectively.

12. It is recommended that the deflection electrode circuit resistances be approximately equal. Higher resistance values up to 5 megohms may be used for low beam current operation.

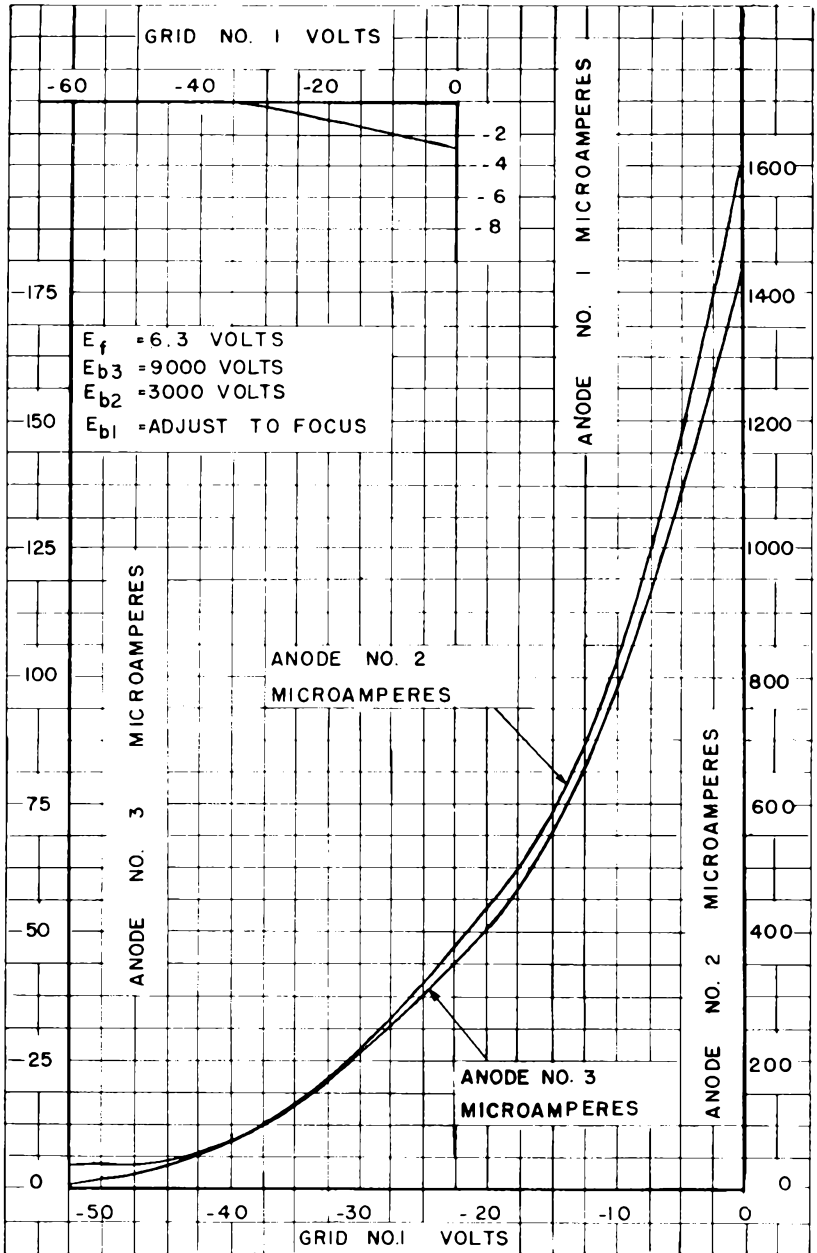
TYPE 7ACP-



BOTTOM VIEW

PIN NO.	ELEMENT
2	ACCELERATOR COMMON (Z)
24	HEATER COMMON (Y)
25	HEATER COMMON (X)
11	DEFLECTOR D1
12	DEFLECTOR D2
13	FOCUSING ELECTRODE
14	DEFLECTOR D3
15	DEFLECTOR D4
22	GRID NO. 1
23	CATHODE
6	DEFLECTOR D1
7	DEFLECTOR D2
8	FOCUSING ELECTRODE
9	DEFLECTOR D4
10	DEFLECTOR D3
20	GRID NO. 1
21	CATHODE
1	DEFLECTOR D2
3	DEFLECTOR D1
4	DEFLECTOR D3
5	DEFLECTOR D4
16	GRID NO. 1
17	FOCUSING ELECTRODE
18	CATHODE

TYPE 7ACP- AVERAGE CHARACTERISTICS



TYPE 7AEP- CATHODE-RAY TUBES

The Du Mont Type 7AEP- is a 7 inch diameter, single beam, post-accelerator, electrostatic focus and deflection cathode-ray tube employing a flat face plate to reduce parallax error. Tolerances are tightly controlled and feature: angle between D1D2 and D3D4 traces held to $90^\circ \pm 1^\circ$, deflection factors held to within 10% with low pattern distortion, and grid cutoff bias is maintained to within 25%. The gun employed draws negligible focusing electrode current.

The inherently higher sensitivity of this line of "Tight-Tolerance" cathode-ray tubes, such as the 5AFP-, over previously available commercial tubes permits smaller, lower cost amplifiers, while tight tolerances afford greater freedom in cathode-ray and radar equipment design.



GENERAL CHARACTERISTICS

Electrical Data

Focusing Method	Electrostatic		
Deflecting Method	Electrostatic		
Direct Interelectrode Capacitances	Min.	Max.	
Cathode to all	2.9	4.5	$\mu\mu\text{f}$
Grid No. 1 to all	3.7	6.4	$\mu\mu\text{f}$
D1 to D2	1.7	2.7	$\mu\mu\text{f}$
D3 to D4	1.0	1.8	$\mu\mu\text{f}$
D1 to all	5.4	7.6	$\mu\mu\text{f}$
D2 to all	5.4	7.6	$\mu\mu\text{f}$
D3 to all	3.4	5.5	$\mu\mu\text{f}$
D4 to all	3.4	5.5	$\mu\mu\text{f}$

Optical Data

Phosphor Number	1	2	7	11
Fluorescent Color	Green	Green	Blue	Blue
Phosphorescent Color	—	Green	Yellow	—
Persistence	Medium	Long	Long	Short

Mechanical Data

Overall Length	$15\frac{1}{2} \pm \frac{1}{4}$ Inches
Greatest Diameter of Bulb	$7 \pm \frac{3}{32}$ Inches
Minimum Useful Screen Diameter	$6\frac{1}{8}$ Inches
Bulb Number	J56Y1
Bulb Contact — Recessed Small Ball Cap	J1-22
Base — Medium Shell Diheptal, 12 Pin	B12-37
Basing	14J
Base Alignment	
D1D2 trace aligns with Pin No. 5 and tube axis	0 ± 10 Degrees
Positive voltage on D1 deflects beam approximately toward Base Pin No. 5	
Positive voltage on D3 deflects beam approximately toward Base Pin No. 2	
Bulb Contact Alignment	
J1-22 contact aligns with D1D2 trace	0 ± 10 Degrees
J1-22 contact on same side as Pin No. 5	
Trace Alignment	
Angle between D3D4 and D1D2 traces	90 ± 1 Degrees

MAXIMUM RATINGS (Design Center Values)

Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	0.6 ± 10% Ampere
Post-Accelerator Voltage	8000 Max. Volts D-C
Accelerator Voltage	4000 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 1)	2.0
Accelerator Input	6.0 Max. Watts
Focusing Electrode Voltage	1250 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
Heater positive with respect to cathode	180 Max. Volts
Peak Voltage between Accelerator and any Deflection Electrode	750 Max. Volts

TYPICAL OPERATING CONDITIONS

Post-Accelerator Voltage	4000 Volts
Accelerator Voltage	2000 Volts
Focusing Electrode Voltage	380 to 620 Volts
Grid No. 1 Voltage (Note 2)	-45 to -75 Volts
Deflection Factors:	
D1 and D2	81 to 101 Volts D-C per Inch
D3 and D4	67 to 83 Volts D-C per Inch
Deflection Factor Uniformity (Note 3)	3% Max.
Pattern Distortion (Note 4)	2½% Max.
Modulation (Note 5)	37 Max. Volts D-C
Line Width "A" (Note 5) .....	.022 Max. Inches
Light Output (Note 5) Phosphor #1	20 Foot Lamberts Min.
Focusing Electrode Current for any operating condition	-15 to +10 µA
Spot Position (focused and undeflected) (Note 6)	Within a 15 mm Square
For Accelerator Voltage not shown in the preceding table, the following can be used as a guide:	
Focusing Electrode Voltage	19% to 31% of Accelerator Volts
Grid No. 1 Voltage	2.2% to 3.8% of Accelerator Volts
Ratio Post-Accelerator to Accelerator Voltage	1.0
D1 and D2	33 to 40 Volts D-C per Inch per Kilovolt of Accelerator Voltage
D3 and D4	27 to 33 Volts D-C per Inch per Kilovolt of Accelerator Voltage
Ratio Post-Accelerator to Accelerator Voltage	2.0
D1 and D2	40 to 52 Volts D-C per Inch per Kilovolt of Accelerator Voltage
D3 and D4	33 to 42 Volts D-C per Inch per Kilovolt of Accelerator Voltage

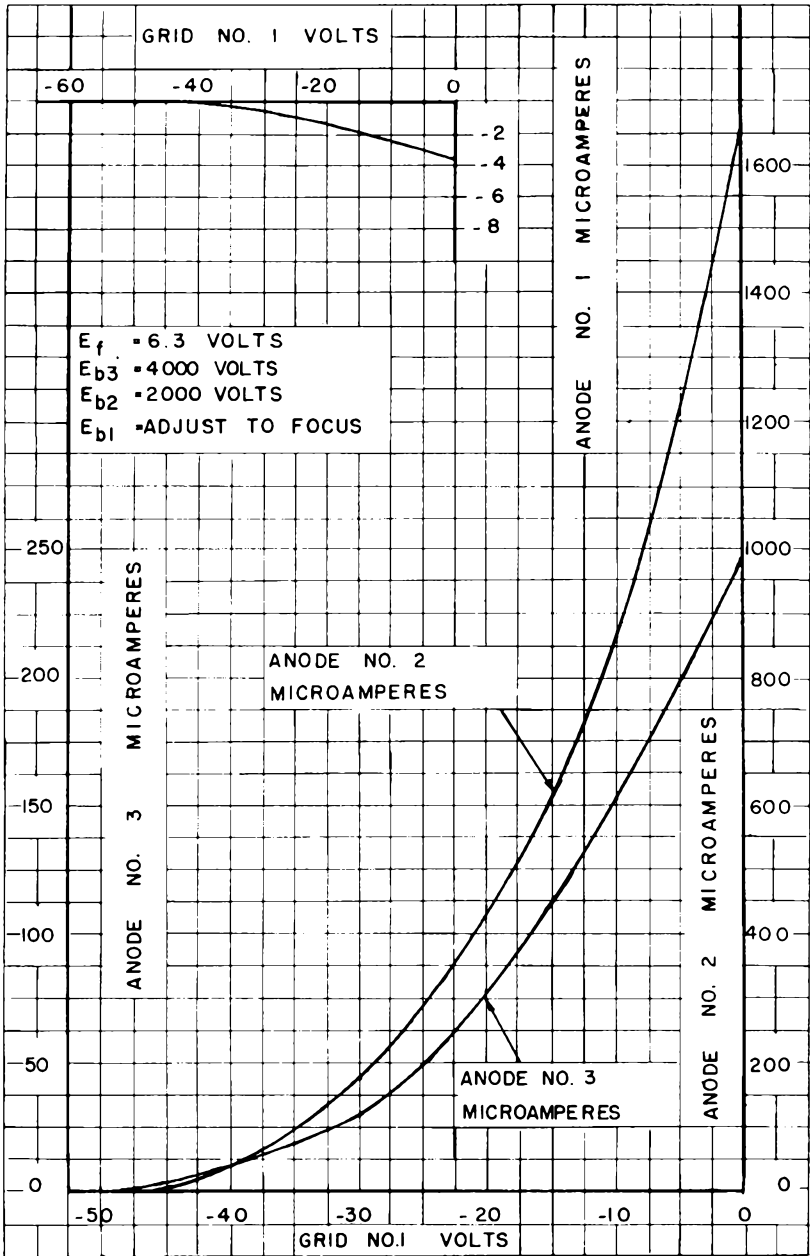
MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Resistance in any Deflecting Electrode Circuit (Note 7)	1.0 Max. Megohms

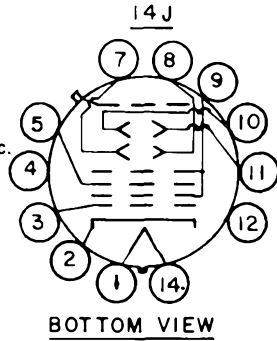
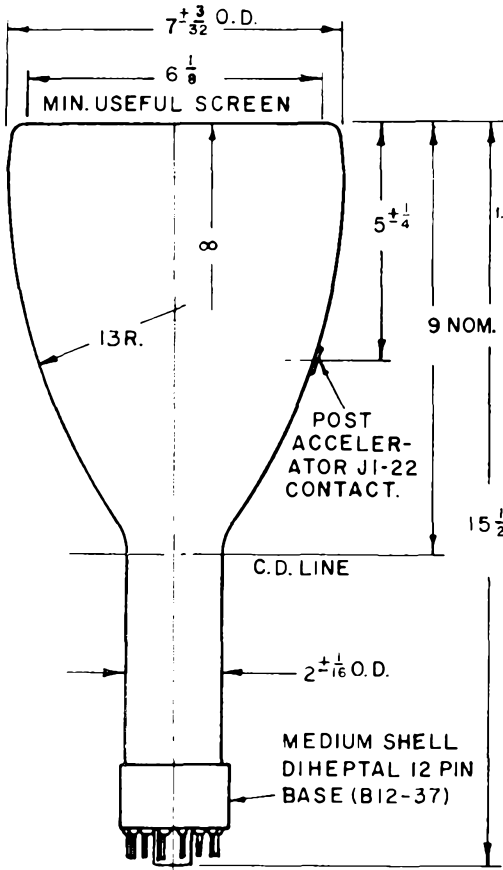
NOTES

1. This tube is designed for optimum performance when operating at an Eb3/Eb2 ratio of 2.0. Operation at other ratios of Eb3/Eb2 may result in changes in deflection uniformity and pattern distortion.
2. Visual extinction of undeflected focused spot.
3. As per MIL-E-1 specifications.
4. All portions of a raster pattern, adjusted so its widest points just touch the sides of a 4.100 inch square will fall within the area bounded by the 4.100 inch square and an inscribed 3.900 inch square.
5. For an Ib3 of 25 µADC measured in accordance with MIL-E-1 specifications.
6. Centered with respect to the tube face and with the tube shielded. Connect free deflecting electrodes to accelerator.
7. It is recommended that the deflecting-electrode circuit resistance be approximately equal. Higher resistance values up to five megohms may be used for low beam current operation.

TYPE 7AEP-
AVERAGE CHARACTERISTICS

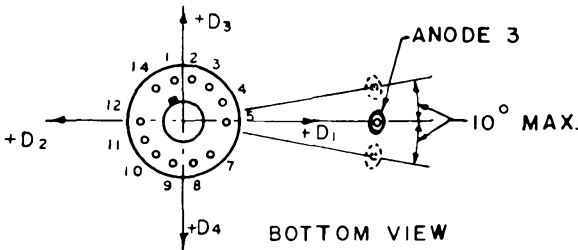


TYPE 7AEP-



PIN NO.	ELEMENT
1	HEATER
14	HEATER
2	CATHODE
3	GRID NO. 1
5	FOCUSING ELECTRODE
11	DEFLECTOR D ₁
10	DEFLECTOR D ₂
7	DEFLECTOR D ₃
8	DEFLECTOR D ₄
9	ACCELERATOR
4	INTERNAL CONNECTION

NOTE:
1. THE BULB SHALL BE A J56YI TYPE.



7BP- CATHODE-RAY TUBES

The Types 7BP- Cathode-ray Tubes are 7-inch magnetically focussed and deflected cathode-ray tubes primarily designed for radar indicator and other applications requiring a relatively large, flat screen area and a long persistence screen. The Type 7BP- is very similar to the Type 7MP-, the chief difference being in bulb shape. Other typical radar tubes include the Types 5FP-, 10KP- and 12SP-.

GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts
Heater Current	$0.6 \pm 10\%$ Ampere
Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (Approx.)	53 Degrees
Phosphor	No. 7
Fluorescence	Blue
Phosphorescence	Yellow
Persistence	Long
Direct Interelectrode Capacitances, Approx.	
Cathode to all other electrodes	5 μ f.
Grid No. 1 to all other electrodes	3.5 μ f.
Grid No. 2 to all other electrodes	7 μ f.



Mechanical

Overall Length	$13\frac{1}{4} \pm \frac{3}{8}$ Inches
Greatest Diameter of Bulb	$7 \pm \frac{1}{8}$ Inches
Minimum Useful Screen Diameter	6 Inches
Bulb Contact (Recessed Small Ball Cap)	J1-22
Base (Medium-Shell Octal 8-Pin)	B8-65
Basing	5AN
Bulb Contact Alignment J1-22 Contact aligns with pin No. 5	± 10 Degrees

MAXIMUM RATINGS—(Design Center Values)

Anode Voltage	8,000 Max. Volts D-C
Grid No. 2 Voltage	700 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	125 Max. Volts D-C
Positive Bias Value ¹	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts
Peak Grid No. 1 Drive from Cut-off	65 Max. Volts
Peak Heater-Cathode Voltage	
Heater Negative with respect to cathode	125 Max. Volts D-C
Heater Positive with respect to cathode	125 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

Anode Voltage	4,000	7,000	Volts D-C
Grid No. 2 Voltage	250	250	Volts D-C
Grid No. 1 Voltage ²	-25 to -70	-25 to -70	Volts D-C
Focusing Coil Current ³	75 to 102	99 to 135	Ma. D-C
Spot Position ⁴	12	—	mm.

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance 1.5 Max. Megohms

MINIMUM CIRCUIT VALUES

When the output capacitor of the power supply is capable of storing more than 250 micro-coulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

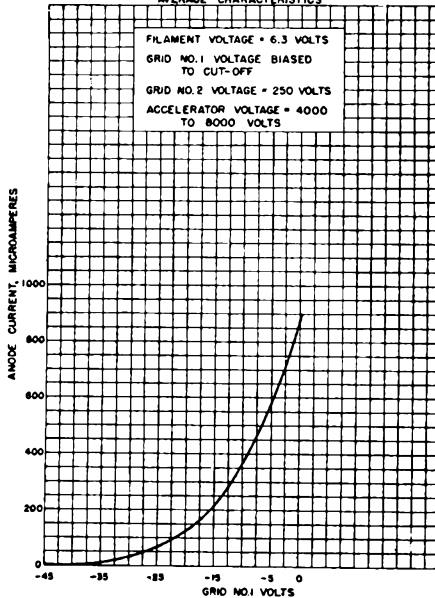
Grid No. 1 Circuit Resistance 150 Min. Ohms
 Grid No. 2 Circuit Resistance 820 Min. Ohms
 Anode Circuit Resistance 9,100 Min. Ohms

NOTES

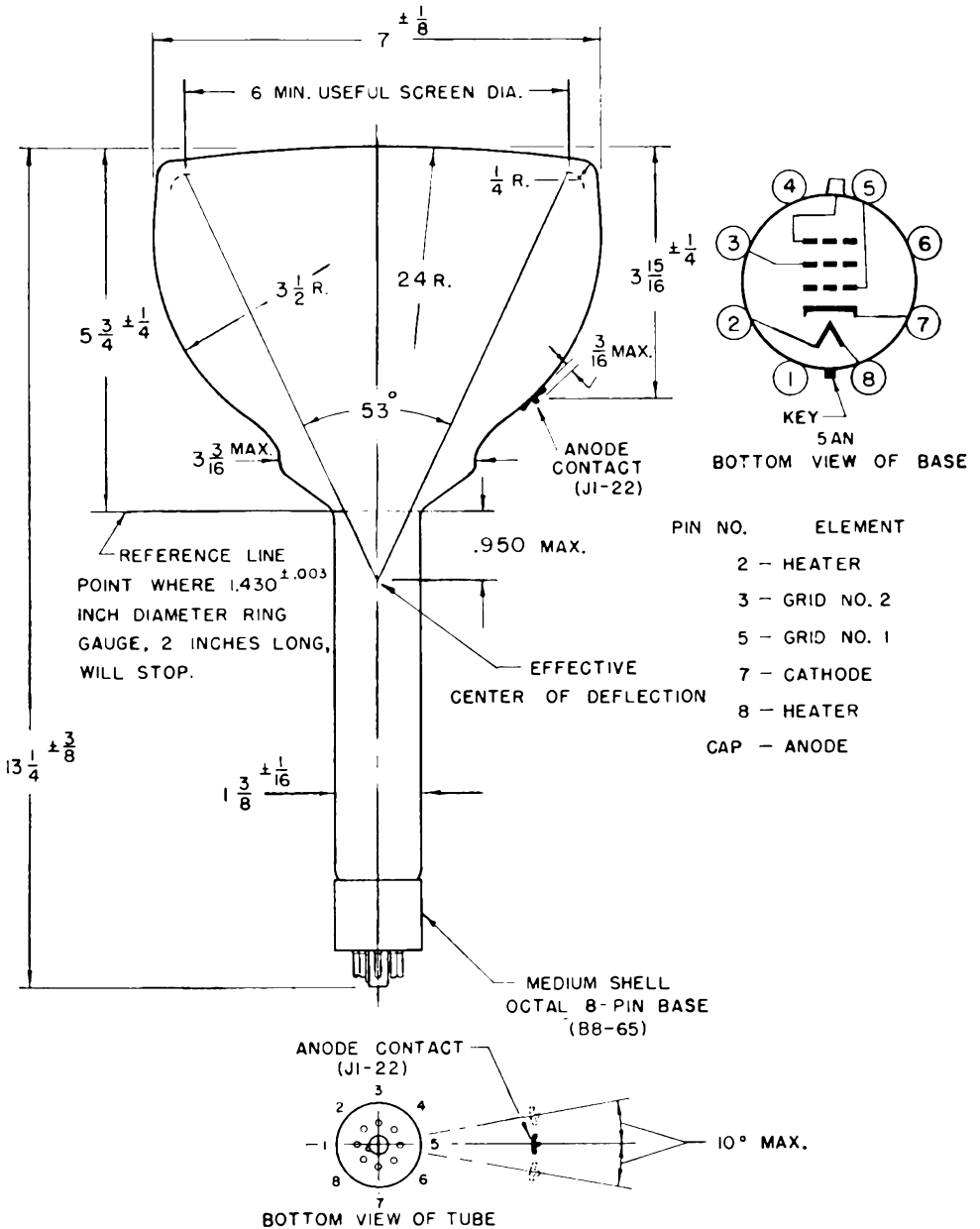
1. At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.
2. Visual extinction of undeflected focused spot.
3. For JETEC standard focus coil No. 106, or equivalent, with the grid No. 1 voltage adjusted to produce an anode current of 200 microamperes and with distance (D) from reference line to center of air gap equal to 2.75 inches.
4. The center of the undeflected, unfocused spot will fall within a circle of 12 mm. radius concentric with the center of the tube face.

7BP-

AVERAGE CHARACTERISTICS



TYPE 7BP-



7MP- CATHODE-RAY TUBES

Highly similar to the Type 7BP- Cathode-ray Tubes, except in bulb shape, are the Type 7MP- Cathode-ray Tubes. These are magnetically focussed and deflected cathode-ray tubes primarily designed for radar indicator and other applications requiring a relatively large, flat screen area and a long persistence screen. Among the other radar-type tubes which may be ordered from Du Mont are the Types 5FP-, 10KP- and 12SP-.

GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts
Heater Current	$0.6 \pm 10\%$ Ampere
Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (Approx.)	50 Degrees
Phosphor	No. 7
Fluorescence	Blue
Phosphorescence	Yellow
Persistence	Long
Direct Interelectrode Capacitances, Approx.	
Cathode to all other electrodes	$5 \mu\mu\text{f.}$
Grid No. 1 to all other electrodes	$6 \mu\mu\text{f.}$



Mechanical

Overall Length	$12\frac{3}{4} \pm \frac{3}{8}$ Inches
Greatest Diameter of Bulb	$7\text{-}3/16 \pm 1/8$ Inches
Minimum Useful Screen Diameter	6 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Small Shell Duodecal 5-Pin)	B5-57
Basing	12D
Bulb Contact Alignment	
J1-21 Contact aligns with vacant pin position No. 3	± 10 Degrees

MAXIMUM RATINGS—(Design Center Values)

Anode Voltage	8,000 Max. Volts D-C
Grid No. 2 Voltage	-180 to +700 Max. Volts D-C or Peak A-C
Grid No. 1 Voltage	
Negative Bias Value	180 Max. Volts D-C
Positive Bias Value ¹	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts
Peak Grid No. 1 Drive from Cut-off	65 Max. Volts
Peak Heater-Cathode Voltage	
Heater Negative with respect to cathode	125 Max. Volts D-C
Heater Positive with respect to cathode	125 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

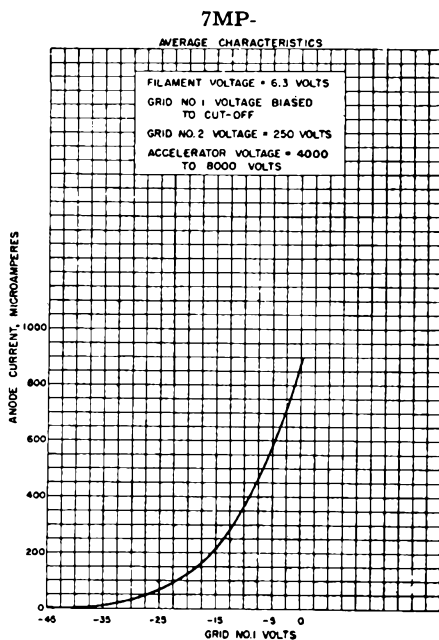
Anode Voltage	4,000	7,000	Volts D-C
Grid No. 2 Voltage	250	250	Volts D-C
Grid No. 2 Current	-15 to +15	-15 to +15	ua. D-C
Grid No. 1 Voltage ²	-27 to -63	-27 to -63	Volts D-C
Focusing Coil Current ³	$64 \pm 15\%$	$85 \pm 15\%$	Ma. D-C
Spot Position ⁴	12	—	mm

MAXIMUM CIRCUIT VALUES

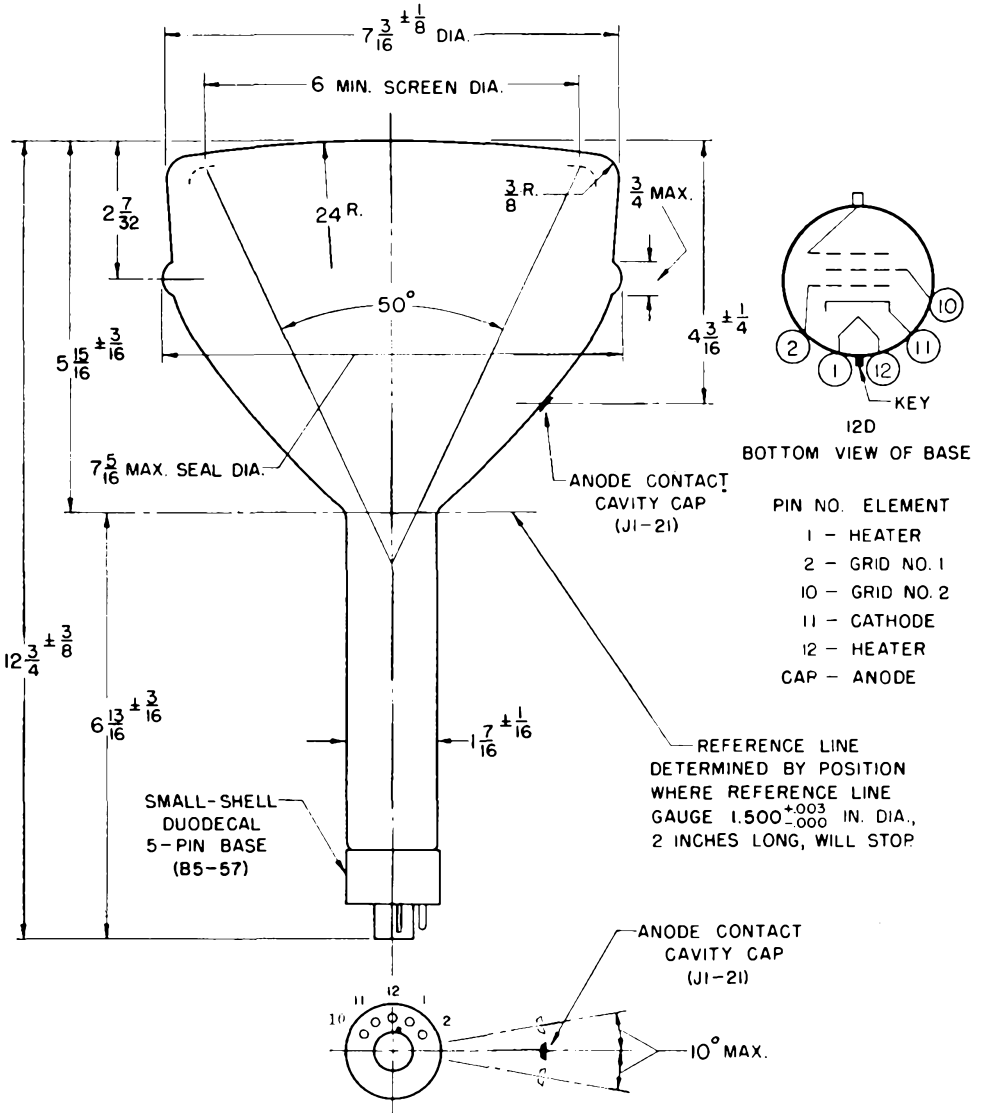
Grid No. 1 Circuit Resistance 1.5 Max. Megohms

NOTES

1. At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.
2. Visual extinction of undeflected focused spot.
3. For JETEC standard focus coil No. 109, or equivalent, with the Grid No. 1 voltage adjusted to produce an anode current of 200 microamperes and with distance (D) from reference line to center of air gap equal to 2.75 inches.
4. The center of the undeflected, unfocused spot will fall within a circle of 12 mm. radius concentric with the center of the tube face.

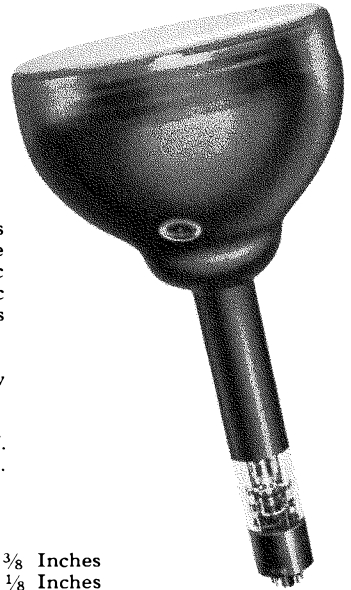


TYPE 7MP-



7UP7 CATHODE-RAY TUBE

The Type 7UP7 is a 7-inch magnetic focus and deflection cathode-ray tube with a relatively large and flat screen area. It is designed for applications requiring a long persistent type screen. The screen is metal-backed.



GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 Volts
Heater Current	0.6 ± 10% Ampere
Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (Approx.)	53 Degrees
Phosphor	No. 7
Fluorescence	Blue
Phosphorescence	Yellow
Persistence	Long
Direct Interelectrode Capacitances, Approx.	
Cathode to all other electrodes	5 μmf.
Grid No. 1 to all other electrodes	8.5 μmf.

Mechanical Data

Overall Length	13 ¹ / ₄ ± ³ / ₈ Inches
Greatest Diameter of Bulb	7 ± ¹ / ₈ Inches
Minimum Useful Screen Diameter	6 Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21
Base (Long Medium-Shell Octal 8-Pin or)	B8-65 or
(Long Medium-Shell Octal 5-Pin)	B5-80
Basing	5AN
Bulb Contact Alignment	
J1-21 Contact aligns with Pin No. 5	± 10 Degrees

MAXIMUM RATINGS (Design Center Values)

Accelerator Voltage	10,000 Max. Volts D-C
Grid No. 2 Voltage	700 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	180 Max. Volts D-C
Positive Bias Value ¹	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts
Peak Heater-Cathode Voltage	
Heater Negative with respect to cathode	
During warm-up period not to exceed 15 seconds	410 Max. Volts D-C
After equipment warm-up period	180 Max. Volts D-C
Heater Positive with respect to cathode	180 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

Accelerator Voltage	7,000 Volts D-C
Grid No. 2 Voltage	250 Volts D-C
Grid No. 1 Voltage ²	-25 to -70 Volts D-C
Focusing Coil Current ³	99 to 135 Ma. D-C

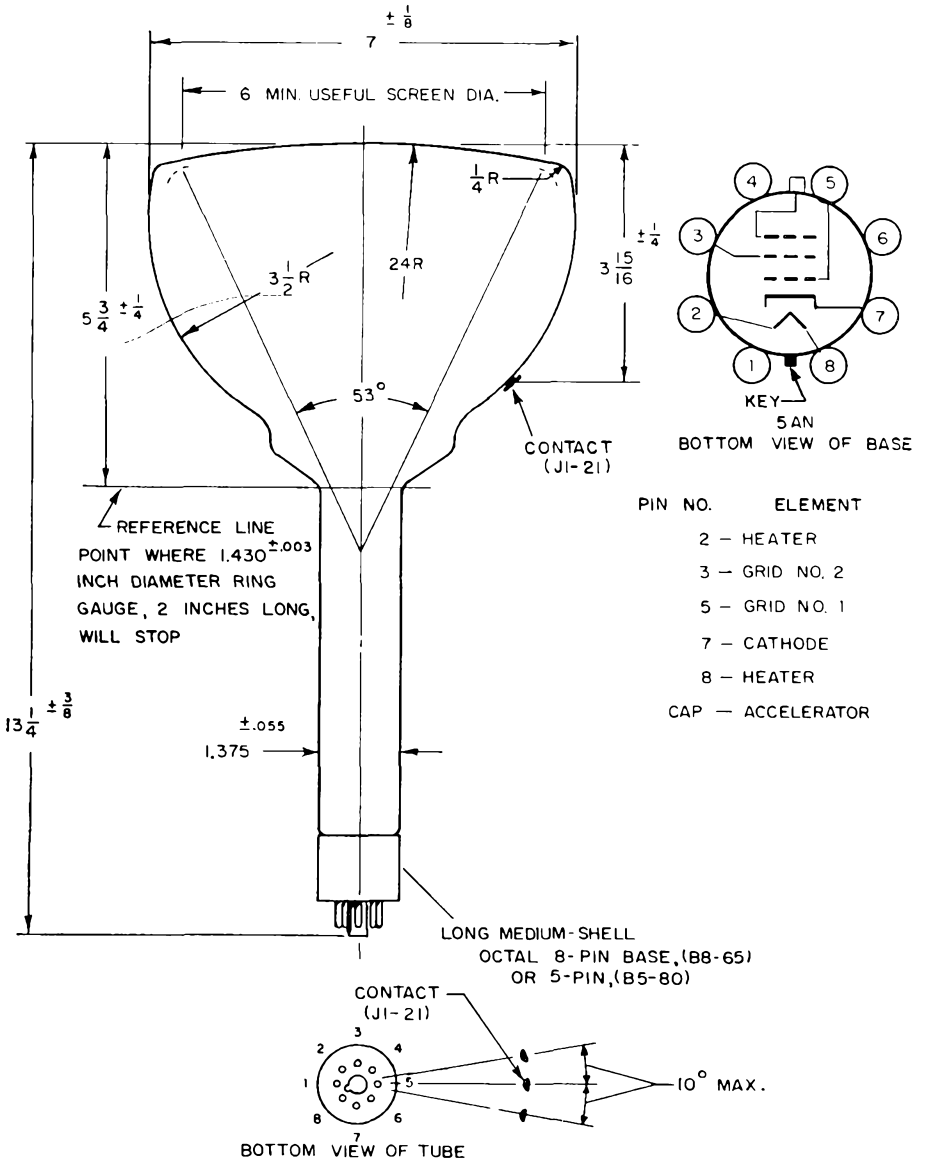
MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Max. Megohms
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NOTES

1. At or near this rating, the effective resistance of the accelerator supply should be adequate to limit the accelerator input power to 6 watts.
2. Visual extinction of undeflected focused spot.
3. For JETEC standard focus coil No. 106, or equivalent, with the grid voltage adjusted to produce an accelerator current of 200 microamperes and with distance (D) from reference line to center of air gap equal to 2.75 inches.

TYPE 7UP-



7YP- CATHODE-RAY TUBE

The Du Mont Type 7YP- is a seven-inch diagonal, square-faced flat-faced, electrostatically deflected and focused cathode-ray tube containing five electron-guns in a single glass envelope. Each electron beam may be independently focused, deflected and intensity-modulated. The single post-accelerator is common to all the electron-guns. The Type 7YP- is one of the line of Du Mont tight-tolerance cathode-ray tubes.



The Type 7YP- is utilized in those applications requiring the display of five independent phenomena on a single cathode-ray tube screen for comparison and observation. Each of the electron guns is positioned to scan adjacent separate areas of the screen and the 3D4 scan of each is limited to provide maximum sensitivity on this axis. The deflection electrode and accelerator connections are brought out through the bulb wall to minimize lead inductance and capacity and to improve insulation. A collar or ring-base provides easy connections to these leads.

GENERAL CHARACTERISTICS (Note 1)

Electrical

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	Min.	Max.	
Cathodes to all other electrodes	3.5	6.5	μμf
Grid No. 1 to all other electrodes	4.0	7.0	μμf
D1 to D2	1.3	2.7	μμf
D3 to D4	1.6	3.2	μμf
D1 to all other electrodes	5.5	8.1	μμf
D2 to all other electrodes	5.5	8.0	μμf
D4 to all other electrodes	5.2	7.8	μμf
D3 to all other electrodes	5.2	7.8	μμf

Mechanical

Overall Length	18½±⅓ 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)	B25-139
Basing	Special
Collar and Base Alignment	

Collar Pin No. 1 and Base Key each aligns with the D3D4 trace ±10 Degrees
 Positive voltage on D3 deflects the beam towards the index pin of the Ring Base
 Positive voltage on D1 deflects the beam approximately towards Pin 6 of the Ring Base

Bulb Contact Alignment

Bulb Contact Aligns with D3D4 trace	± 10 Degrees
Bulb Contact on same side as Base Key and Collar Pin No. 1	$\pm \frac{1}{4}$ Inch
Bulb Contact located on tube center line	± 3 Degrees
Bulb Wall (wih Contact) Aligns with D1D2 Trace	

Trace Alignment

D1D2 trace aligns with D3D4 trace	90 ± 2 Degrees
Corresponding traces align within	2 Degrees

MAXIMUM RATINGS—(Design Center Values)

Post-Accelerator Voltage	7,000 Max. Volts D-C
Accelerator Voltage (Note 3)	3,500 Max. Volts D-C
Ratio Post-Accelerator Voltage to Accelerator Voltage (Note 4)	2.0 Max.
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
Heater Positive with respect to Cathode	180 Max. Volts
Peak Voltage between Accelerator and any deflection electrode	1,250 Volts

TYPICAL OPERATING CONDITIONS

For Post-Accelerator Voltage of	4,000 Volts D-C
For Accelerator Voltage of	2,000 Volts D-C
Focusing Voltage	450 to 650 Volts D-C
Grid No. 1 Voltage (Note 5)	-50 to -90 Volts D-C
Modulation Factor (Note 6)	55 Max. Volts D-C
Line Width "A" (Note 7) .....	.026 Max. Inches
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 9)	2% Max.
Useful Scan (Note 10)	
D1 and D2	4.5 Min. Inches
D3 and D4	1.5 Min. Inches
Interaction Factor (Note 11) .....	.00001 Max. Inches/Volt

CIRCUIT DESIGN VALUES

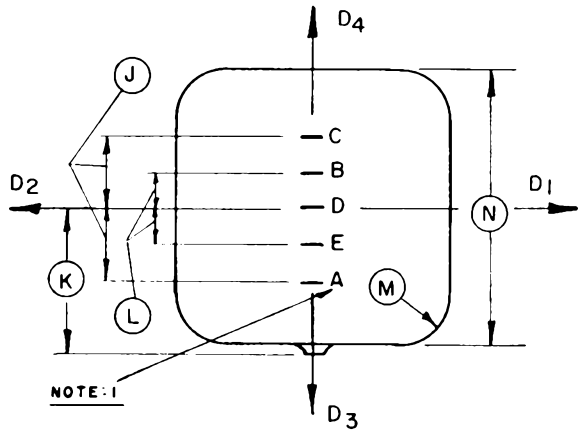
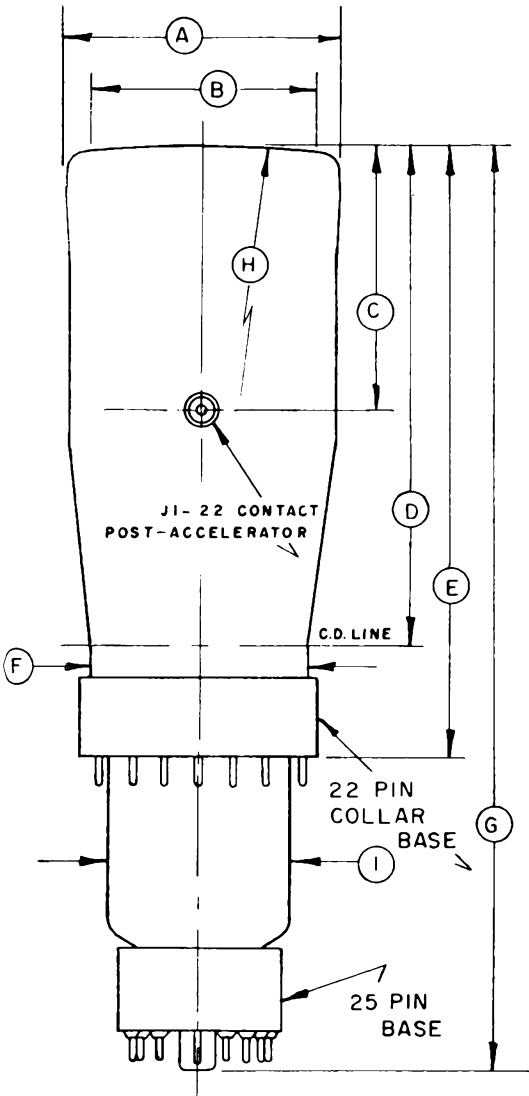
Focusing Voltage	225 to 325 Volts per Kilovolt of Accelerator Voltage
Focusing Current for any operating condition	-15 to +10 Microamperes
Grid No. 1 Voltage for (Note 5) ..	-25 to -45 volts per Kilovolt of Accelerator Voltage
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
Deflection Factors:	
Ratio Post-Accelerator Voltage to Accelerator Voltage	1.0
D1 and D2	25 to 33 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	11 to 16 Volts D-C/Inch/KV of Accelerator Voltage
Ratio Post-Accelerator Voltage to Accelerator Voltage	2.0
D1 and D2	34 to 42 Volts D-C/Inch/KV of Accelerator Voltage
D3 and D4	13.5 to 18.5 Volts D-C/Inch/KV of Accelerator Voltage
Resistance in any Deflecting-Electrode Circuit (Note 12)	1.0 Max. Megohms

NOTES

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 Eb3/Eb2 ratio of 2.0. Operation at other ratios of Eb2/Eb2 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 cut-off to produce an Ib3 of 50 μ ADC.
7. Measured in accordance with MIL-E-1 specification using an Ib3 of 25 μ ADC.

8. The deflection in this direction is limited to $\pm .75$ Min. Inches from the undeflected spot position.
9. Measured in accordance with MIL-E-1 specification.
10. Centered about normal undeflected spot positions.
11. The deflection of one beam when balanced D-C Voltages are applied to the deflection electrodes of the other will not be greater than the indicated value.
12. It is recommended that the deflecting electrode circuit resistances be approximately equal.

TYPE 7YP-

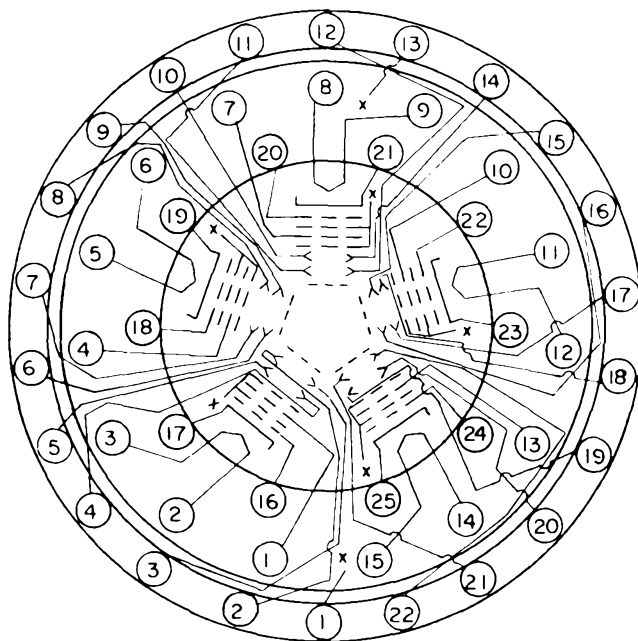


FACE VIEW

NOTE: 1 BEAM A CENTERS ON POSITION A, ETC. WITHIN $\frac{5}{16}$ RADIUS CIRCLE. INDEX PIN, KEY AND BULB CONTACT EACH ALIGN WITH D3D4 TRACE $\pm 10^\circ$

REF.	DIMENSIONS
A	$5.5 \pm \frac{.03}{.06}$ DIA.
B	4.5 MIN SCREEN
C	$5 \frac{1}{4} \pm \frac{1}{4}$
D	10 NOM.
E	$12 \frac{1}{4} \pm \frac{1}{8}$
F	$4 \frac{13}{32} \pm \frac{3}{32}$ DIA.
G	$18 \frac{1}{2} \pm \frac{3}{8}$
H	40 R.
I	$3 \frac{3}{4} \pm \frac{1}{16}$ O.D.
J	1 $\frac{1}{2}$ NOM.
K	2.797 MAX.
L	$\frac{3}{4}$ NOM.
M	1 R.
N	$5.5 \pm \frac{.03}{.06}$ DIA.

TYPE 7YP-



BOTTOM VIEW

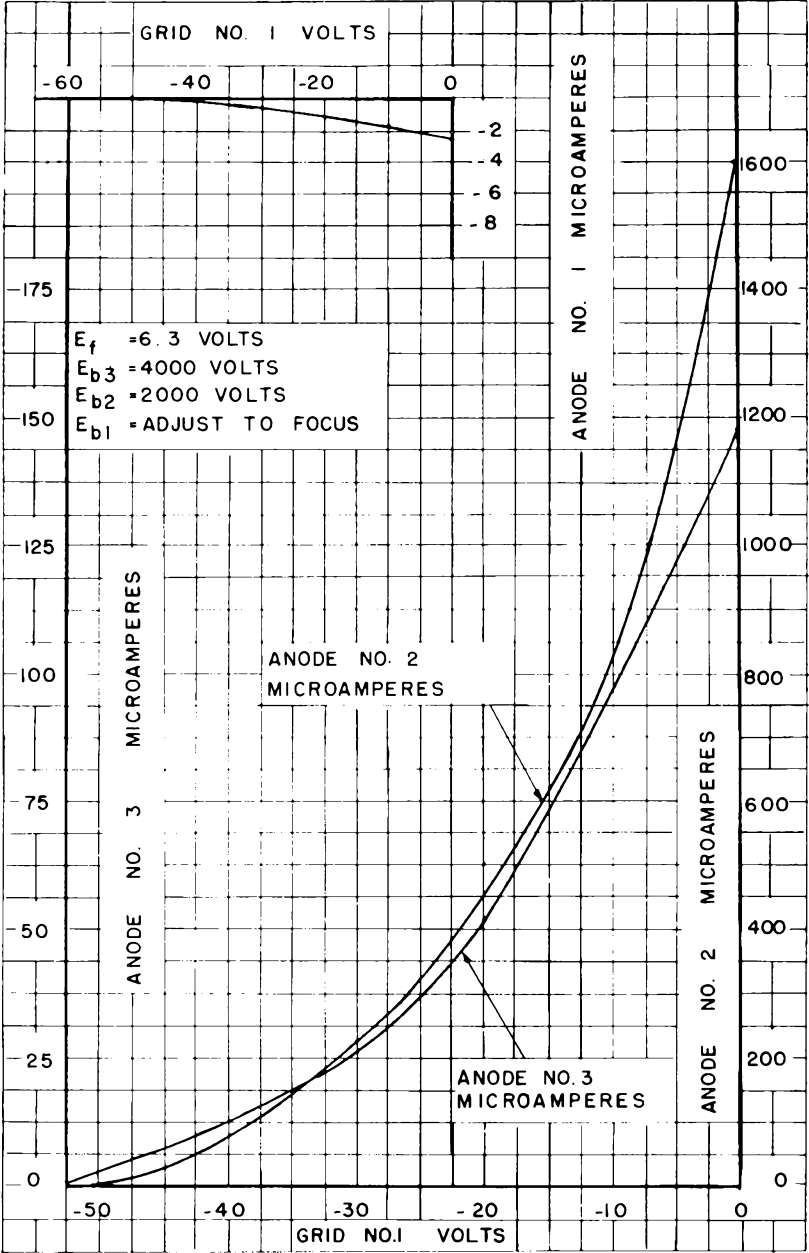
22 PIN COLLAR BASE

<u>PIN NO.</u>	<u>ELEMENT</u>	<u>BEAM</u>
1	ACCELERATOR	
2	DEFLECTOR D2	A
3	DEFLECTOR D1	A
4	DEFLECTOR D3	A
5	DEFLECTOR D4	A
6	DEFLECTOR D1	B
7	DEFLECTOR D3	B
8	DEFLECTOR D4	B
9	DEFLECTOR D2	B
10	DEFLECTOR D3	C
11	DEFLECTOR D1	C
12	DEFLECTOR D2	C
13	ACCELERATOR	
14	DEFLECTOR D4	C
15	DEFLECTOR D1	D
16	DEFLECTOR D2	D
17	DEFLECTOR D4	D
18	DEFLECTOR D3	D
19	DEFLECTOR D4	E
20	DEFLECTOR D3	E
21	DEFLECTOR D2	E
22	DEFLECTOR D1	E

25 PIN BASE

<u>PIN NO.</u>	<u>ELEMENT</u>	<u>BEAM</u>
1	FOCUSING ELECTRODE	A
2	HEATER	A
3	HEATER	A
4	FOCUSING ELECTRODE	B
5	HEATER	B
6	HEATER	B
7	FOCUSING ELECTRODE	C
8	HEATER	C
9	HEATER	C
10	FOCUSING ELECTRODE	D
11	HEATER	D
12	HEATER	D
13	FOCUSING ELECTRODE	E
14	HEATER	E
15	HEATER	E
16	GRID NO.1	A
17	CATHODE	A
18	GRID NO.1	B
19	CATHODE	B
20	GRID NO.1	C
21	CATHODE	C
22	GRID NO.1	D
23	CATHODE	D
24	GRID NO.1	E
25	CATHODE	E

TYPE 7YP-
AVERAGE CHARACTERISTICS



10KP- CATHODE-RAY TUBES

The Type 10KP- Cathode-ray Tubes are magnetically focussed and deflected cathode-ray tubes designed for radar systems and special applications requiring long persistence and large screen size. This tube is typical of the radar-type tubes available from Du Mont.

Radar types similar to the Type 10KP- include the 5-inch 5FP-, the 7-inch 7BP- and the 12-inch 12SP-. Selection of a tube of this type would be determined by the screen size desired and the exact electrical characteristics needed to fit the application.



GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts
Heater Current	$0.6 \pm 10\%$ Ampere
Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (Approx.)	50 Degrees
Phosphor	No. 7
Fluorescence	Blue
Phosphorescence	Yellow
Persistence	Long
Direct Interelectrode Capacitances, Approx.	
Cathode to all other electrodes	5 <i>u</i> pf.
Grid No. 1 to all other electrodes	6.5 <i>u</i> pf.

Mechanical

Overall Length	$17\frac{3}{8} \pm \frac{3}{8}$ Inches
Greatest Diameter of Bulb	$10\frac{1}{2} \pm \frac{1}{8}$ Inches
Minimum Useful Screen Diameter	9 Inches
Bulb Contact (Recessed small cavity cap)	J1-21
Base (Small shell duodecal 7-pin)	B7-51
Basing	12D
Bulb Contact Alignment J1-21 contact aligns with vacant pin position No. 3 ..	± 10 Degrees

MAXIMUM RATINGS—(Design Center Values)

Anode Voltage	10,000 Max. Volts D-C
Grid No. 2 Voltage	700 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	180 Max. Volts D-C
Positive Bias Value ¹	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts
Peak Grid No. 1 Drive from Cut-off	65 Max. Volts
Peak Heater-Cathode Voltage	
Heater Negative with respect to cathode	150 Max. Volts D-C
Heater Positive with respect to cathode	150 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

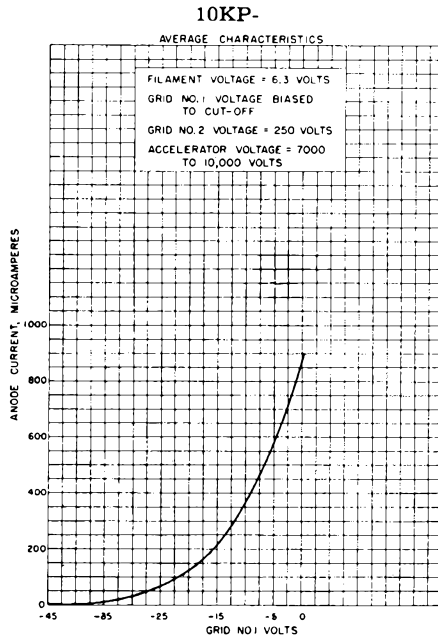
Anode Voltage	9,000 Volts D-C
Grid No. 2 Voltage	250 Volts D-C
Grid No. 1 Voltage ²	-27 to -63 Volts D-C
Focusing Coil Current ³	105 Approx. Ma. D-C

MAXIMUM CIRCUIT VALUES

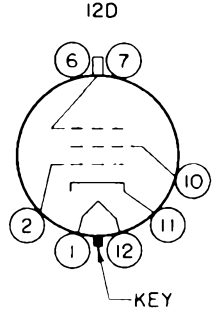
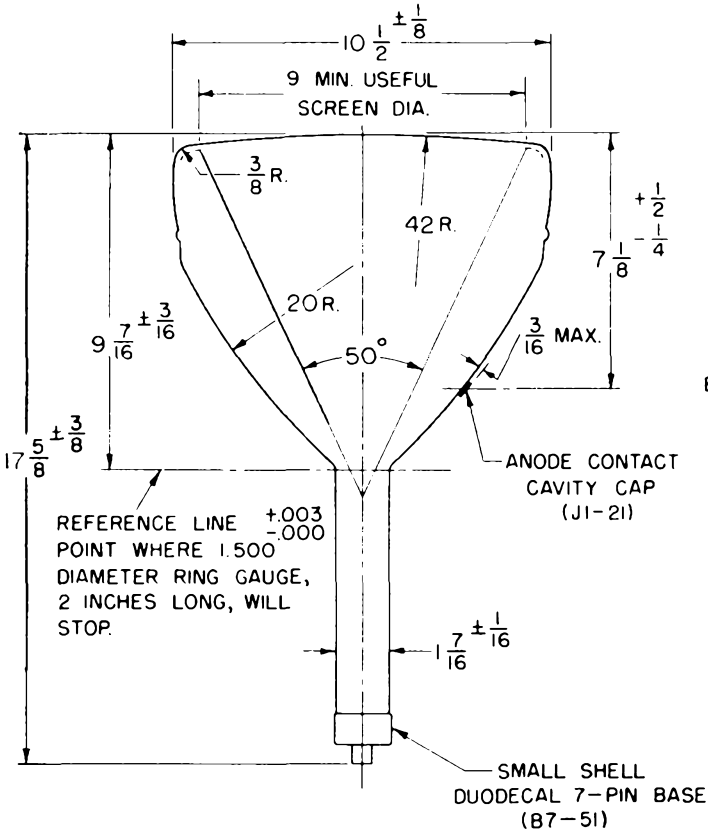
Grid No. 1 Circuit Resistance 1.5 Max. Megohms

NOTES

1. At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.
2. Visual extinction of undeflected focused spot.
3. For JETEC standard focus coil No. 106, or equivalent, with the Grid No. 1 voltage adjusted to produce an anode current of 200 microamperes and with distance (D) from reference line to center of air gap equal to 3.25 inches.

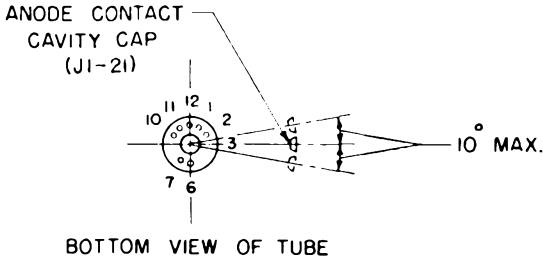


TYPE 10KP-



BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
1	HEATER
2	GRID NO. 1
10	GRID NO. 2
11	CATHODE
12	HEATER
CAP	ANODE



BOTTOM VIEW OF TUBE

TYPE 10WP- CATHODE-RAY TUBES

The Type 10WP- is a 10-inch electrostatic focus and magnetic deflection cathode-ray tube suitable for radar applications. A low-voltage electrostatic focus lens is employed, designed to operate at or near cathode potential to afford substantially automatic focus, independent of accelerator voltage variations. In addition, the 10WP- employs a high resolution electron gun.

The Type 10WP-A utilizes an aluminized screen for greater light output and to minimize screen charging effects; it is otherwise identical to the 10WP. If a P19 screen is selected, the aluminized version should be used.



GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Ampere
Focusing Method	Electrostatic	
Deflecting Method	Magnetic	
Deflecting Angle (Approx.)	50	Degrees
Phosphor	No. 7	No. 14
Fluorescence	Blue	Blue
Phosphorescence	Yellow	Orange
Persistence	Long	Medium-long
Direct Interelectrode Capacitances, Approx.		
Cathode to all other electrodes	5	μmf.
Grid No. 1 to all other electrodes	6	μmf.

Mechanical

Overall Length	16-15/16 ± 3/8	Inches
Greatest Diameter of Bulb	10 1/2 ± 1/8	Inches
Minimum Useful Screen Diameter	9	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-pin)	B6-63	
Basing	12M	
Bulb Contact Alignment		
J1-21 Contact aligns with vacant pin position No. 3	±10	Degrees

MAXIMUM RATINGS—(Design Center Values)

Accelerator Voltage	12,000	Max. Volts	D-C
Focusing Electrode Voltage	-500 to +1000	Max. Volts	D-C
Grid No. 2 Voltage	700	Max. Volts	D-C
Grid No. 1 Voltage			
Negative Bias Value	180	Max. Volts	D-C
Positive Bias Value ¹	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

TYPICAL OPERATING CONDITIONS

Accelerator Voltage ²	10,000	Volts	D-C
Focusing Electrode Voltage ³	0 to 300	Volts	D-C
Focusing Electrode Current	-15 to +15	μA.	D-C
Grid No. 2 Voltage	300	Volts	D-C
Grid No. 1 Voltage ⁴	-28 to -72	Volts	D-C
Line Width A ⁵ .....	.017	Inch	Max.
Spot Position (Undelected) ⁶	1/2	Inch	
Alignment Magnet Field Strength	0-4	Gausses	

MAXIMUM CIRCUIT VALUES

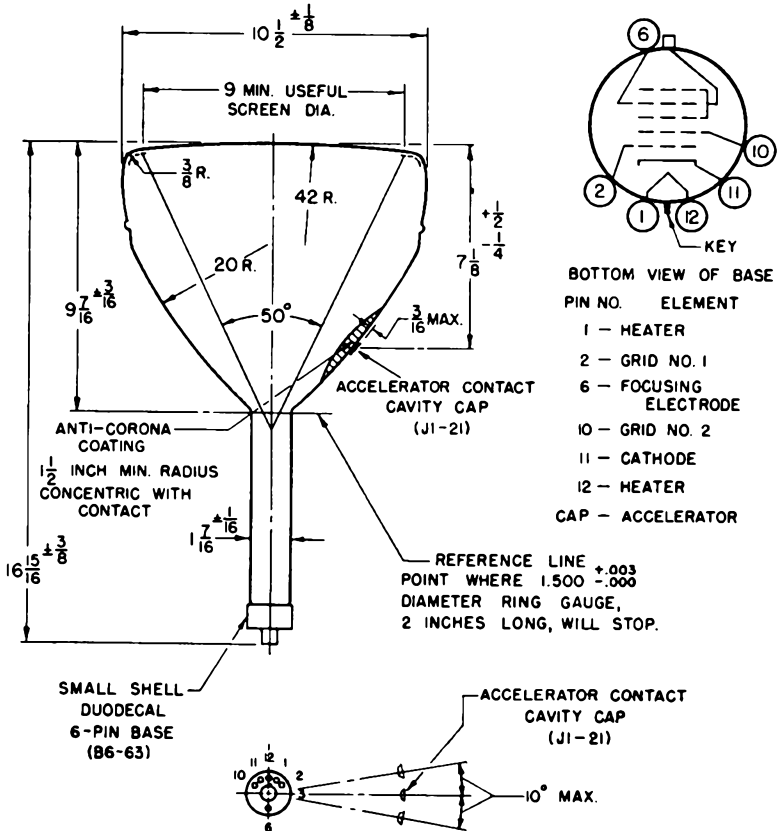
Grid No. 1 Circuit Resistance	1.5	Max. Megohms
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NOTES

1. At or near this rating, the effective resistance of the accelerator supply should be adequate to limit the accelerator input power to 6 watts. The screen of the 10WP19 can be permanently damaged should the current density be permitted to rise too high. To prevent burning, minimum beam current densities should be employed.
2. Brilliance and definition decrease with decreasing accelerator voltage. In general, accelerator voltage should not be less than 7,000 volts.
3. With Grid No. 1 voltage adjusted to produce an accelerator current of 100 μ A. with the pattern adjusted for best overall focus. Measured with a 525-line interlaced and synchronized 6 x 8-inch pattern, with interlaced line blanking (current measured before applying blanking).
4. Visual extinction of focused 6 x 8-inch raster pattern.
5. Measured with a 525-line interlaced and synchronized pattern with interlaced line blanking. Pattern width adjusted to 90% of minimum useful screen diameter. $I_b = 100 \mu$ A., measured before applying blanking. Line width is the merged raster height divided by the number of lines (262.5) (measured in center of tube face). To avoid damage to the screen of the 10WP19, it is recommended that the screen current be not more than 50 μ A. when measuring line width. The line width under this condition will be .016 inch maximum (current measured before applying blanking).
6. The center of the undeflected, focused spot will fall within a circle of $\frac{1}{2}$ -inch radius concentric with the center of the tube face, with tube shielded.
7. For optimum quality of the focused spot the use of a beam alignment magnet is recommended. This may be obtained by the use of an adjustable magnet of the specified strength, located approximately 5-7/16 inches from the reference line.

TYPE 10WP-

12 M



NOTE: BOTTOM VIEW OF TUBE
1-DO NOT HANDLE TUBE BY THE PART OF THE BULB HAVING THE ANTI-CORONA COATING.

TYPE 12ABP-, 12ABP-A CATHODE-RAY TUBES

The Type 12ABP- is a 12-inch electrostatic focus and magnetic deflection cathode-ray tube suitable for radar applications. A low-voltage electrostatic focus lens is employed, designed to operate at or near cathode potential to afford substantially automatic focus, independent of accelerator voltage variations. In addition, the 12ABP- employs a high resolution electron gun. The face plate is of gray filter glass.

The Type 12ABP-A utilizes an aluminized screen for greater light output and to minimize screen charging effects; it is otherwise identical to the 12ABP-.



GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3 Volts		
Heater Current	0.6 ± 10% Ampere		
Focusing Method	Electrostatic		
Deflecting Method	Magnetic		
Deflecting Angle (Approx.)	55 Degrees		
Phosphor	No. 7	No. 14	No. 19
Fluorescence	Blue	Blue	Orange
Phosphorescence	Yellow	Orange	Orange
Persistence	Long	Medium-long	Long
Direct Interelectrode Capacitances, Approx.			
Cathode to all other electrodes	5	μf.	
Grid No. 1 to all other electrodes	6	μf.	

Mechanical Data

Overall Length	18 ± 3/8 Inches
Greatest Diameter of Bulb	12-7/16 ± 1/8 Inches
Minimum Useful Screen Diameter	11 Inches
Bulb Contact (Recessed small cavity cap)	J1-21
Base (Small shell duodecal 6-Pin)	B6-63
Basing	12M
Bulb Contact Alignment	
J1-21 contact aligns with vacant pin position No. 3	± 10 Degrees

MAXIMUM RATINGS (Design Center Values)

Accelerator Voltage	12,000 Max. Volts D-C
Focusing Electrode Voltage	-500 to +1000 Max. Volts D-C
Grid No. 2 Voltage	700 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	180 Max. Volts D-C
Positive Bias Value ¹	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

TYPICAL OPERATING CONDITIONS

Accelerator Voltage ²	10,000 Volts D-C
Focusing Electrode Voltage ³	0 to 300 Volts D-C
Focusing Electrode Current	-15 to +15 μa. D-C
Grid No. 2 Voltage	300 Volts D-C
Grid No. 1 Voltage ⁴	-28 to -72 Volts D-C
Line Width A ⁵ .....	.019 Inch
Spot Position (Undelected) ⁶	5/8 Inch
Alignment Magnet Field Strength ⁷	0 to 4 Gauss

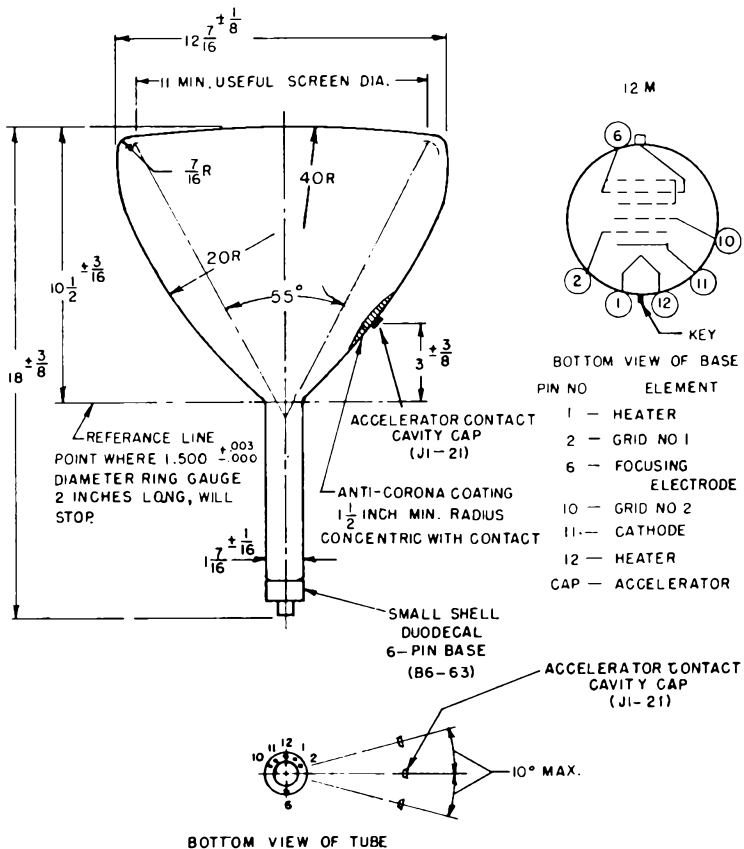
MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Max. Megohms
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NOTES

1. At or near this rating, the effective resistance of the accelerator supply should be adequate to limit the accelerator input power to 6 watts. The screen of the 12ABP19 can be permanently damaged should the current density be permitted to rise too high. To prevent burning, minimum beam current densities should be employed.
2. Brilliance and definition decrease with decreasing accelerator voltage. In general, accelerator voltage should not be less than 8,000 volts.
3. With Grid No. 1 voltage adjusted to produce an accelerator current of 100 μ A. with the pattern adjusted for best overall focus. Measured with a 525-line interlaced and synchronized $7\frac{1}{2}$ x 10-inch pattern, with interlaced line blanking (current measured before applying blanking).
4. Visual extinction of focused $7\frac{1}{2}$ x 10-inch raster pattern.
5. Measured with a 525-line interlaced and synchronized pattern with interlaced line blanking. Pattern width adjusted to 90% of minimum useful screen diameter. $I_b = 100 \mu$ A., measured before applying blanking. Line width is the merged raster height divided by the number of lines (262.5). (Measured in center of tube face.)
To avoid damage to the screen of the 12ABP19, it is recommended that the screen current be not more than 50 μ A. when measuring line width. The line width under this condition will be .018 inch maximum (current measured before applying blanking).
6. The center of the undeflected, focused spot will fall within a circle of $\frac{5}{8}$ -inch radius concentric with the center of the tube face, with the tube shielded.
7. For optimum quality of the focused spot, the use of a beam alignment magnet is recommended. This may be obtained by the use of an adjustable magnet of the specified strength, located approximately 5-7/16 inches from the reference line.

TYPE 12ABP-



NOTE.
1- DO NOT HANDLE TUBE BY THE PART OF THE BULB HAVING THE ANTI-CORONA COATING.

12DP-A CATHODE-RAY TUBES

The Type 12DP-A Cathode-ray Tubes are 12-inch magnetically focussed and deflected cathode-ray tubes, primarily designed for radar indicator applications. They feature a large screen area and a long persistence screen (although screens with any persistence characteristic may be ordered).

The Type 12DP-A is recommended only for replacement purposes.



GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts
Heater Current	$0.6 \pm 10\%$ Ampere
Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (Approx.)	50 Degrees
Phosphor	No. 7
Fluorescence	Blue
Phosphorescence	Yellow
Persistence	Long
Direct Interelectrode Capacitances, Approx.	
Cathode to all other electrodes	6 μ mf.
Grid No. 1 to all other electrodes	9 μ mf.
Grid No. 2 to all other electrodes	7.5 μ mf.

Mechanical

Overall Length	$19\frac{5}{8} \pm \frac{1}{2}$ Inches
Greatest Diameter of Bulb	$12 \pm \frac{3}{16}$ Inches
Minimum Useful Screen Diameter	10 Inches
Bulb Contact (Medium Cap)	C1-5
Base (Medium-Shell Octal 8-Pin)	B8-65
Basing	5AN
Bulb Contact Alignment C1-5 cap aligns with pin No. 5	± 10 Degrees

MAXIMUM RATINGS—(Design Center Values)

Anode Voltage	10,000 Max. Volts D-C
Grid No. 2 Voltage	700 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	125 Max. Volts D-C
Positive Bias Value ¹	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts
Peak Grid No. 1 Drive from Cut-off	65 Max. Volts
Peak Heater-Cathode Voltage	
Heater Negative with respect to cathode	125 Max. Volts D-C
Heater Positive with respect to cathode	125 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

Anode Voltage	4,000	7,000	Volts D-C
Grid No. 2 Voltage	250	250	Volts D-C
Grid No. 1 Voltage ²	-25 to -70	-25 to -70	Volts D-C
Focusing Coil Current ³	75 to 102	99 to 135	Ma. D-C
Spot Position ⁴	20	—	mm.

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance 1.5 Max. Megohms

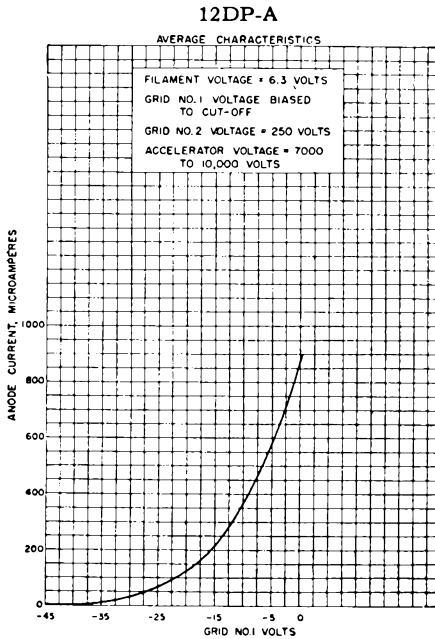
MINIMUM CIRCUIT VALUES

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in the circuit between the indicated electrode and the output capacitor should be as follows:

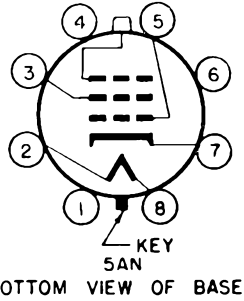
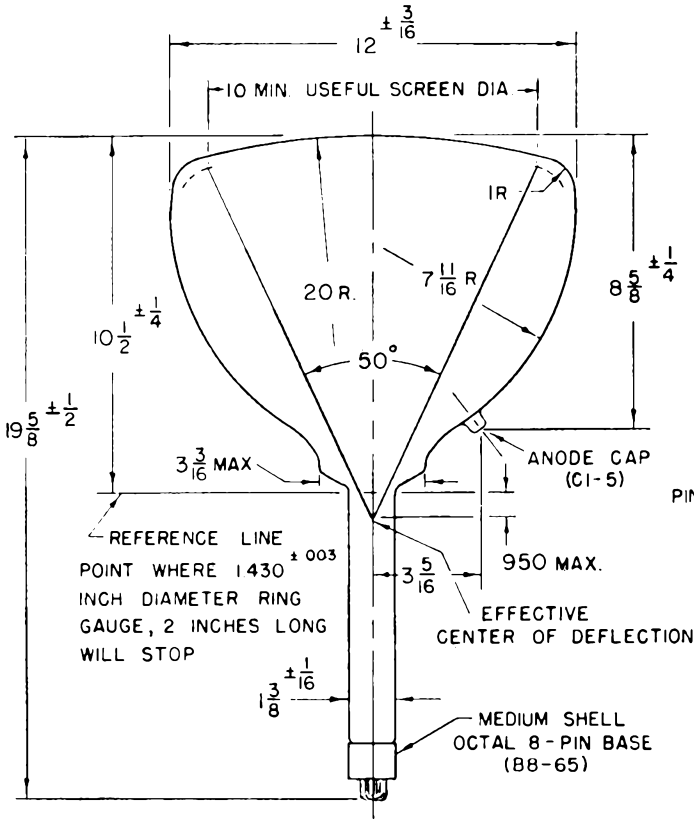
Grid No. 1 Circuit Resistance 150 Min. Ohms
Grid No. 2 Circuit Resistance 820 Min. Ohms
Anode Circuit Resistance 11,000 Min. Ohms

NOTES

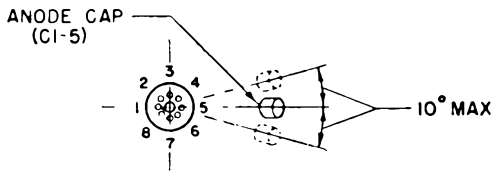
1. At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.
2. Visual extinction of undeflected focused spot.
3. For JETEC standard focus coil No. 106, or equivalent, with the Grid No. 1 voltage adjusted to produce an anode current of 200 microamperes and with distance (D) from reference line to center of air gap equal to 4.125 inches.
4. The center of the undeflected, unfocused spot will fall within a circle of 20 mm. radius concentric with the center of the tube face.



TYPE 12DP-A



PIN NO	ELEMENT
2	HEATER
3	GRID NO 2
5	GRID NO 1
7	CATHODE
8	HEATER
CAP	ANODE



BOTTOM VIEW OF TUBE

12SP-, 12SP-B CATHODE-RAY TUBES

The Type 12SP- Cathode-ray Tubes are 12-inch magnetically focussed and deflected cathode-ray tubes for radar applications requiring a long persistence screen. The Type 12SP-, designed to be operated at an overall accelerating potential of approximately 9000 volts, produces a brilliant trace with good resolution. In addition, the Type 12SP- features an improved bulb design with grey filter face plate, which combines a minimum of length with a maximum of useful screen diameter. The Type 12SP- is similar to the 5-inch 5FP-, the 7-inch 7BP-, the 10-inch 10KP-, and the 12-inch 12SP-.

The Type 12SP-B utilizes an aluminized screen for greater light output and to minimize screen charging effects; it is otherwise identical to the 12SP-. If a P19 screen is selected, the aluminized version should be used.



GENERAL CHARACTERISTICS

Electrical

Heater Voltage	6.3 Volts
Heater Current	$0.6 \pm 10\%$ Ampere
Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflecting Angle (Approx.)	55 Degrees
Phosphor	No. 7
Fluorescence	Blue
Phosphorescence	Yellow
Persistence	Long
Direct Interelectrode Capacitances, Approx.	
Cathode to all other electrodes	5 μ f.
Grid No. 1 to all other electrodes	6 μ f.

Mechanical

Overall Length	$18\frac{3}{4} \pm \frac{3}{8}$ Inches
Greatest Diameter of Bulb	$12\text{-}7/16 \pm \frac{1}{8}$ Inches
Minimum Useful Screen Diameter	11 Inches
Bulb Contact (Recessed small cavity cap)	J1-21
Base (Small shell duodecal 7-Pin)	B7-51
Basing	12D
Bulb Contact Alignment J1-21 contact aligns with vacant pin position No. 3	± 10 Degrees

MAXIMUM RATINGS—(Design Center Values)

Anode Voltage	10,000 Max. Volts D-C
Grid No. 2 Voltage	500 Max. Volts D-C
Grid No. 1 Voltage	
Negative Bias Value	125 Max. Volts D-C
Positive Bias Value	0 Max. Volts D-C
Positive Peak Value	2 Max. Volts
Peak Heater-Cathode Voltage	
Heater negative with respect to cathode	
During warm-up period not to exceed 15 seconds	410 Max. Volts D-C
After equipment warm-up period	180 Max. Volts D-C
Heater Positive with respect to cathode	180 Max. Volts D-C

TYPICAL OPERATING CONDITIONS

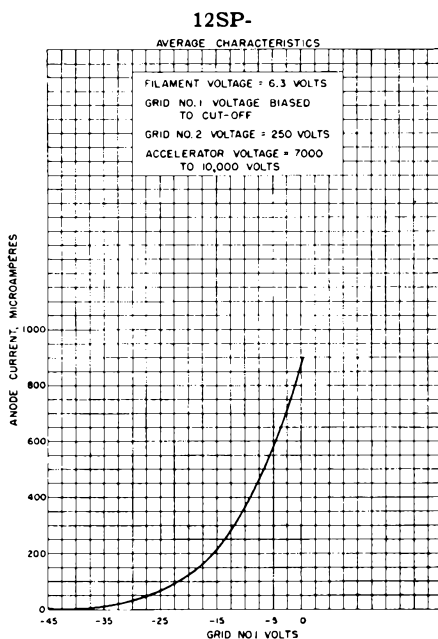
Anode Voltage	9,000 Volts D-C
Grid No. 2 Voltage	250 Volts D-C
Grid No. 1 Voltage ¹	-27 to -63 Volts D-C
Focusing Coil Current ²	105 Approx. Ma. D-C

MAXIMUM CIRCUIT VALUES

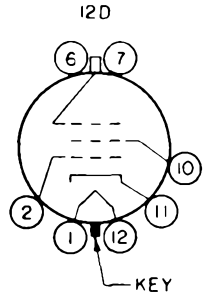
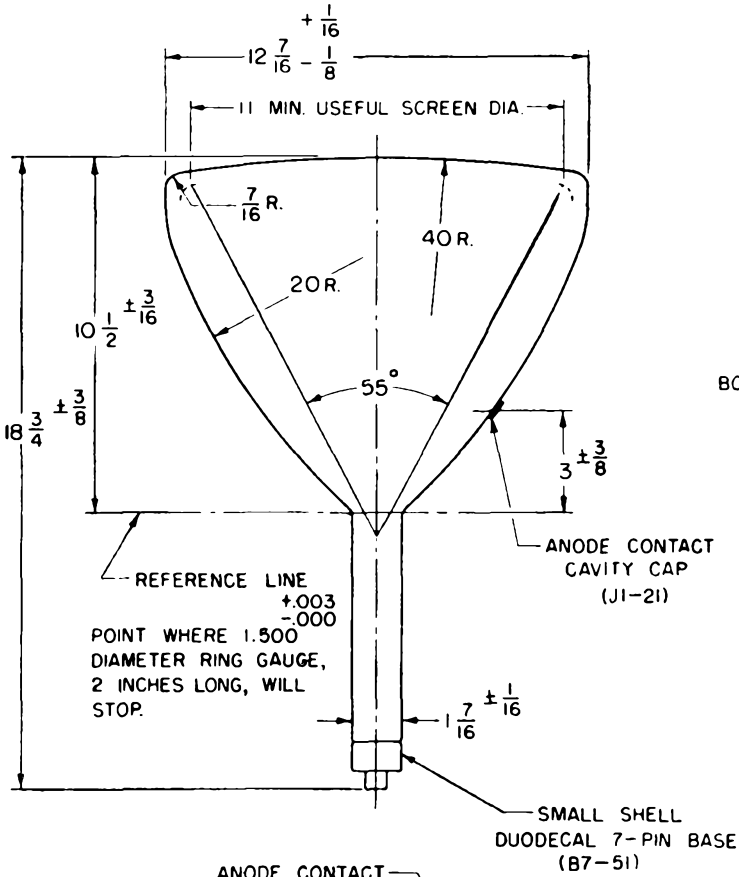
Grid No. 1 Circuit Resistance	1.5 Max. Megohms
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NOTES

1. Visual extinction of undeflected focused spot.
2. For JETEC standard focus coil No. 106, or equivalent, with the Grid No. 1 voltage adjusted to produce an anode current of 200 microamperes and with distance (D) from reference line to center of air gap equal to 3.25 inches.

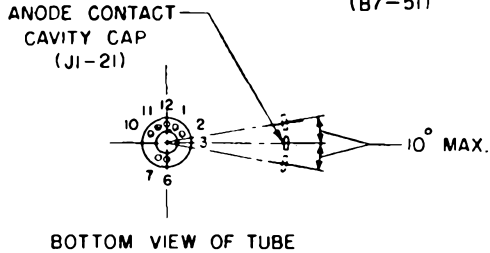


TYPE 12SP-



BOTTOM VIEW OF BASE

PIN NO.	ELEMENT
1	HEATER
2	GRID NO. 1
10	GRID NO. 2
11	CATHODE
12	HEATER
CAP	ANODE



DU MONT
GAS TRIODES
AND SPECIAL
CATHODE-RAY TUBES

DU MONT GAS TRIODES

Types 2B4 and 6Q5G

Mechanical Dimensions, Basing, and Average Operating Characteristics

The Types 2B4 and 6Q5G Gas Triodes are intended for use in Du Mont Cathode-ray Oscillographs for sweep oscillator service. They are also designed for applications where a gas triode is required for control and counter circuits and where a wide frequency range is desired for sweep oscillators.

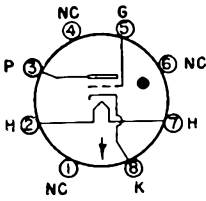
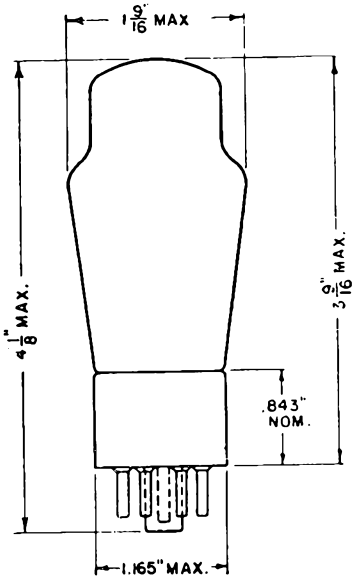
CHARACTERISTICS

Heater	6Q5G	2B4
Voltage (A-C or D-C)	6.3	2.5 volts
Current	0.6	1.4 ampere
Direct Interelectrode Capacitances (Nominal)		
Grid to anode		2.8 $\mu\text{mf.}$
Grid to cathode		1.7 $\mu\text{mf.}$
Anode to cathode		2.0 $\mu\text{mf.}$
Tube Voltage Drop		19 volts approx.
Maximum Overall Length	4 $\frac{1}{8}$ "	4-3/16"
Maximum Diameter	1-9/16"	1-9/16"
Bulb	ST12	ST12
Base	Small shell	Small
	Octal 8 pin	5 pin
Basing—RMA Basing Designation	6Q	5A

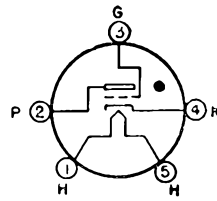
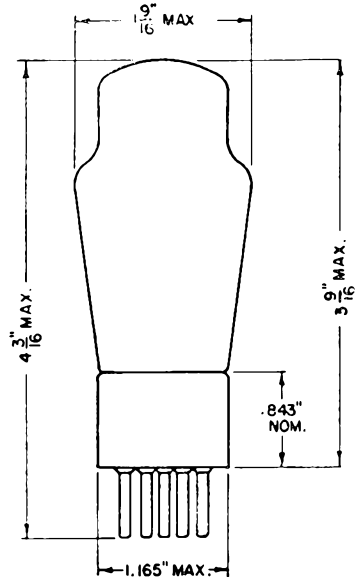
SWEEP-CIRCUIT OSCILLATOR SERVICE

Anode Voltage (Instantaneous)	300 volts (max.)
Peak Anode Current	300 milliamperes (max.)
Average Anode Current	1 milliampere (max.)
Grid Resistance	{ 10,000 ohms (min.)
	{ 100,000 ohms (max.)
Frequency Range:	
2B4	1-30,000 cps
6Q5G	1-50,000 cps

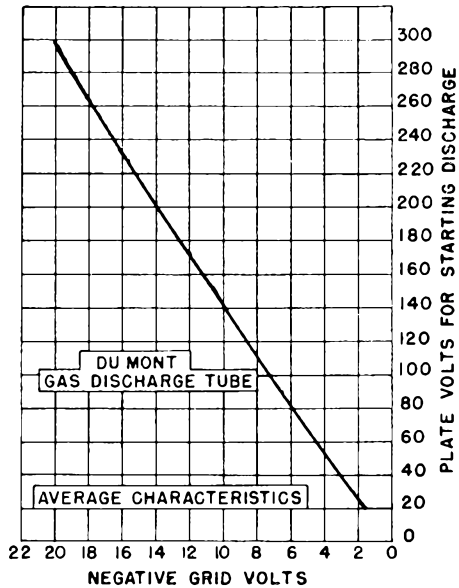
Mechanical Dimensions, Basing, and Average Operating Characteristics



6-Q
 Type 6Q5G



5-A
 Type 2B4



DU MONT SPECIAL CATHODE-RAY TUBES

Great care is taken in the line of Du Mont cathode-ray tubes to assure broad coverage of standard laboratory and production-line applications. However, in those instances where requirements are beyond the capabilities of standard tubes, Allen B. Du Mont Laboratories, Inc., offers the facility to design, develop and produce highly specialized cathode-ray tubes.

The services offered by Du Mont are unique in the industry. The research, engineering, and production facilities are prepared to undertake *any* special cathode-ray tube problem. Whether the requirement is for a simple modification of a well-established cathode-ray tube design, or for a wholly new design, Allen B. Du Mont Laboratories is prepared to tackle the job and **PRODUCE** — to take a special tube problem from the idea stage and carry it through to a practical working model. Moreover, after having met requirements with initial samples, we are equipped to follow through with large production quantities. Whether the order is for one tube or for quantity lots, each tube is manufactured with the same built-in precision and quality that characterize the hand-made sample.

Wall Charts of typical Cathode-ray Tubes are available and may be obtained by requesting them from the Industrial Tube Sales Department, 2 Main Avenue, Passaic, New Jersey on your company letterhead.

J. T. HILL COMPANY
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4-10 Ware Road
Hoddedson, Herts, England

Claude Lyons, Ltd.
180-182A Tottenham Court Road
London W.1, England

Mr. S. Alperi
Oy Control Ab
Kaisaniemenkatu 1 B
Helsinki, Finland

FRANCE

Mr. Paul Fabricant
Ets. Radiophon
50, Rue Du Faubourg-Poissonniere
Paris 10, France

Mr. Benjamin Markman
Radiophon Corporation
509 Madison Ave.
New York 22, N. Y.

GERMANY

Mr. Eric Adler
Schneider & Henley, G.M.B.H.
Gross-Nabasstrasse 11
Munich, Germany

Mr. J. Kevin Leahy
Henley & Co., Inc.
27 Spruce Street
New York City, N. Y.

GREECE

Mr. Kostas Karavannis
K. Karavannis & Co.
Karitsi Square
Athens, Greece

HOLLAND

Mr. J. M. van Steeden
Hulsewe Ingenieursbureau
Rokin 65-67
Amsterdam, Holland

INDIA

Mr. V. G. Motwane, Mgr.
Eastern Elec. & Engr. Co.
127 Mahatma Gandhi Road
Post Box 459, Fort
Bombay 1, India

ISRAEL

Mr. Joseph Giveon
92 Allenby Road
Tel Aviv, Israel

ITALY

Ing. S. & Dr. Guido Belotti
Piazza Trento 8
Milan, Italy

JAPAN

Mr. Hiroshi Shiga, Mgr. Dir.
Yaou Denki Kabushiki Kaisha
2776 001-Sakashita-cho
Shinagawa-ku
Tokyo, Japan

NEW ZEALAND

Mr. A. Marr
P. O. Box 3250
Auckland, New Zealand

NORWAY

Mr. G. Hammerik, Sales Engr.
Maskin-Aktiesselskapet ZETA
Drammensveien 26
Oslo, Norway

PORTUGAL

Mr. Manuel Cardoso, Director
Sociedade Comercial Romar, Ltda
Apartado 326
Rua da Boavista 83-1°
Lisbon, Portugal

SOUTH AFRICA

F. H. Flanter & Co.
4, Buitencingle Street
Cape Town, South Africa

SPAIN

Union Comerciales Hispano Americano,
S.A.
Victor Pradera 48
Madrid, Spain

Mr. Manuel Zapico Moran
Elcmin Products Corp.
238 West 52nd Street
New York City, N. Y.

SWEDEN

John C. Lagercrantz
Vartavagen 57
Stockholm, Sweden

SWITZERLAND

Mr. Juerg Keller
Sevffer & Co., Inc.
Badenstrasse 265
Zurich, Switzerland

TURKEY

Ets Mehmet Vashi
P. O. Box Istanbul 143
Istanbul, Turkey

URUGUAY

M. Gonzalez del Rio
Casilla de Correo 228
Montevideo, Uruguay

YUGOSLAVIA

Mr. Sanford De Brun
77-15 113th Street
Forest Hills, L.I., N. Y.

CARIBBEAN REPRESENTATIVE

Mr. Erich Gompertz
Allen B. Du Mont Labs., Inc.
Security Bldg., Room 1001
117 N.E. First Avenue
Miami, Florida
Cable Address
ALBFEDU Miami

EUROPEAN REPRESENTATIVE

Mr. James Segre
Corso Venezia 51
Milan, Italy
Cable Address
ALBFEDU Milano

Mr. A. Longchamp
130 W. 42nd St.
New York 36, N. Y.

NEW YORK OFFICE

Mr. Robert I. Gaines, Asst. Director
Miss M. E. Lenox

International Division
515 Madison Avenue
New York 22, N. Y.

Cable Address
ALBFEDU New York

DU MONT

Cathode-ray Tubes

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INDUSTRIAL TUBE SALES DEPARTMENT

2 MAIN AVENUE, PASSAIC, N. J.