

PHILCO CATHODE RAY TUBE DATA SHEET

TENTATIVE

14ARP4 TELEVISION PICTURE TUBE

from JETEC release #1871, March 11, 1957

DESCRIPTION

The 14ARP4 is a 14" 90°, rectangular, electrostatic focus and magnetic deflection, direct view picture tube specifically intended for cathode drive television applications. The 14ARP4 has a maximum spot cutoff of 50 volts and a minimum cathode current of 1000 microamperes when operated with cathode drive at a Grid #2 voltage of 50 volts. The gun is especially designed to provide extreme uniformity of characteristics so that a lower limit tube will provide a highlight brightness of at least 200 foot lamberts when operated at an anode voltage of 10 kilovolts, and yet an upper limit tube will require not more than 50 volts drive to reach zero bias. Other features of the tube are a metal backed screen, short overall length and construction which does not require an external ion trap magnet.

GENERAL DESCRIPTION

14" rectangular cathode ray tube specifically designed for cathode drive television application.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal	85 Degrees
Vertical	68 Degrees
Diagonal	90 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to all	5 uuf
Grid #1 to all	6 uuf
External Coating Capacitance	800 min. uuf 1200 max. uuf

OPTICAL DATA

Phosphor Number	P4
Fluorescent Color	White
Persistence	Medium
Faceplate	
Light Transmission at Center, approximate	78 Percent

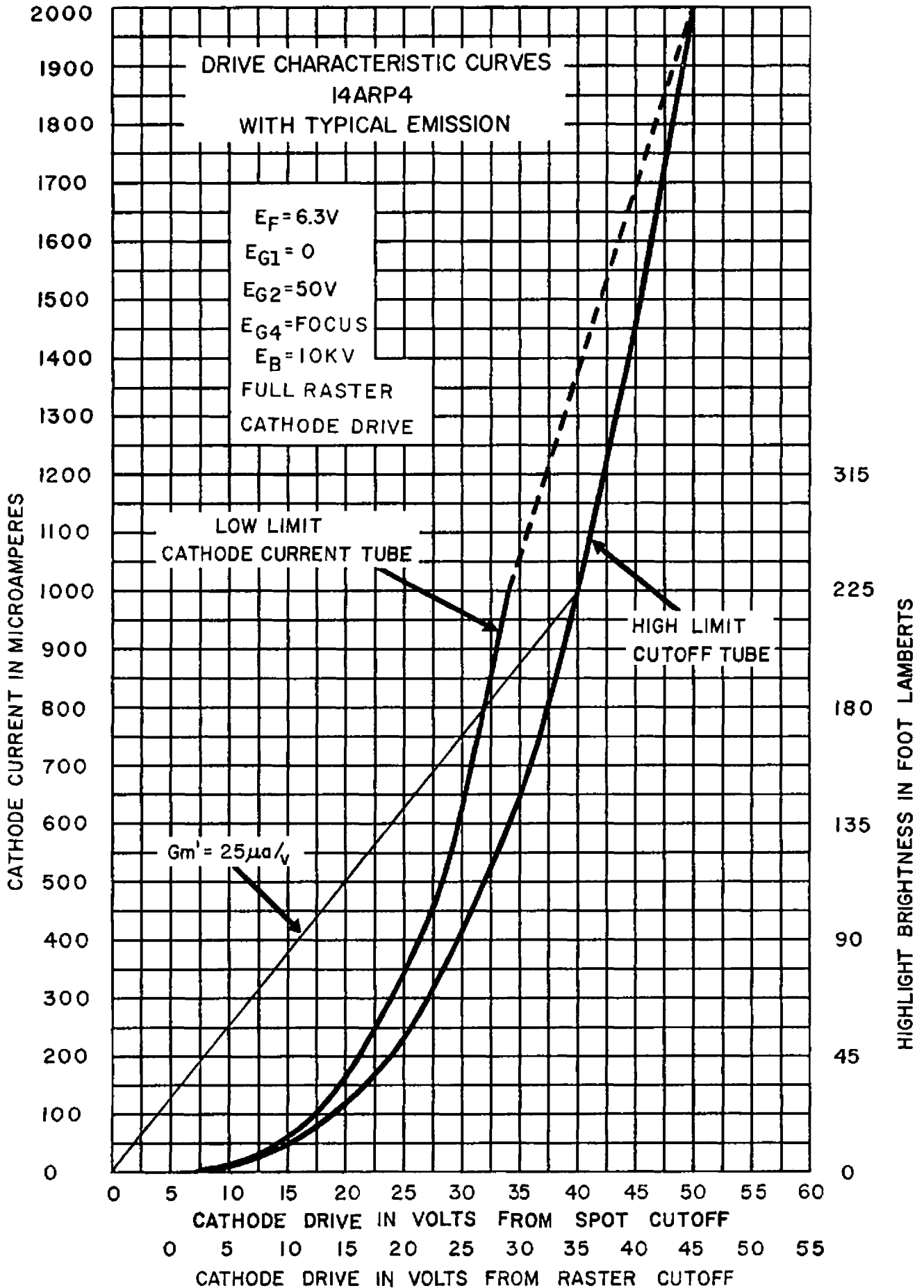
MECHANICAL DATA

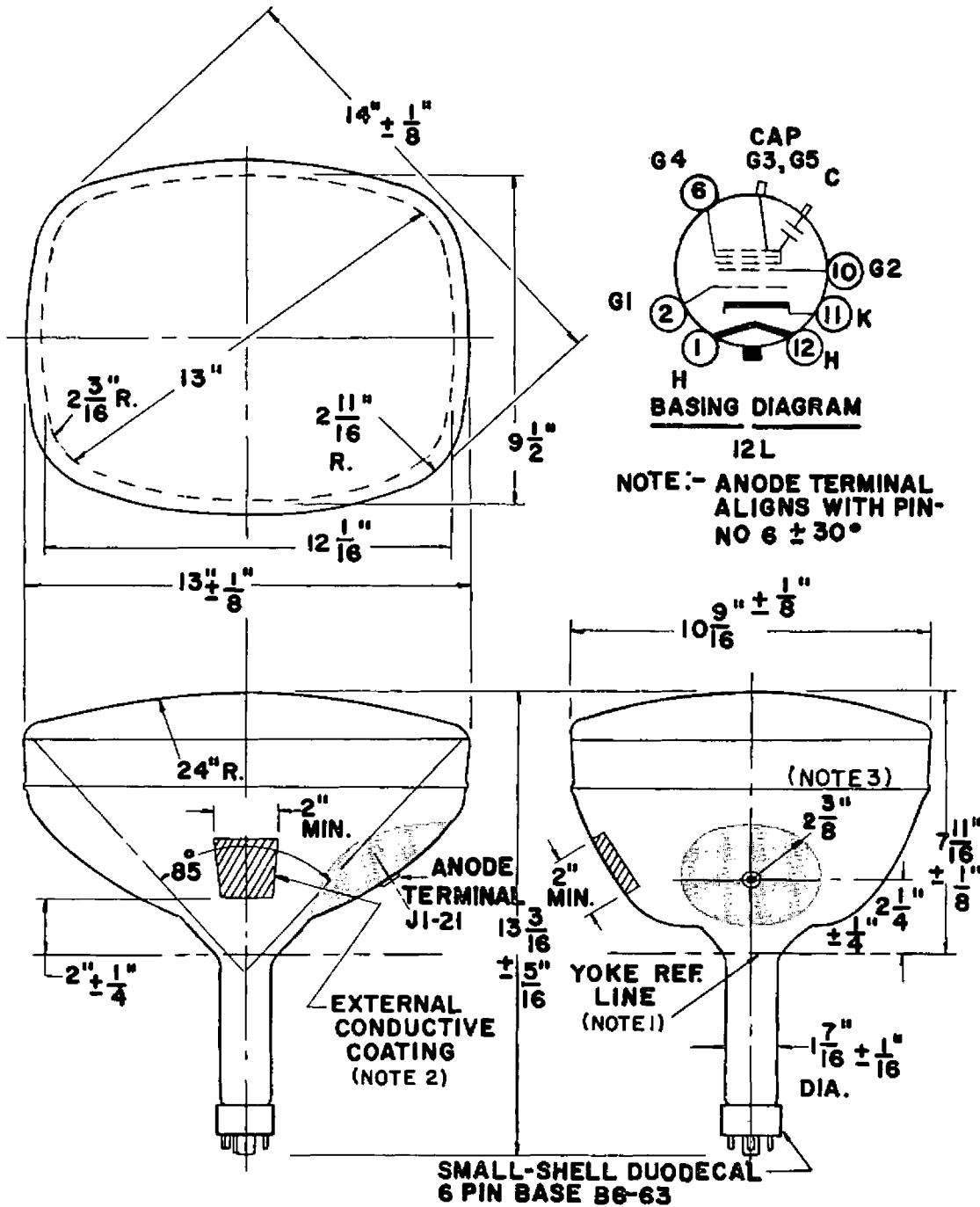
Overall Length	13-3/16 ± 5/16 Inches
Neck Length	5-1/2 ± 3/16 Inches
Greatest Dimensions of Bulb	
Diagonal	14 ± 1/8 Inches
Width	13 ± 1/8 Inches
Height	10-9/16 ± 1/8 Inches
Minimum Useful Screen Dimensions (maximum assured dimensions)	
Diagonal	13 Inches
Width	12-1/16 Inches
Height	9 1/2 Inches
Bulb Number	J112A1
Base	B6-63
Basing	12 L
Anode Contact	J1-21
Anode Contact Aligns with Pin #6	±30°

MAXIMUM RATINGS (Design Center Values)

Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	.60 ± 10% Amperes
Anode Voltage (Note #1)*	14,000 Max. Volts DC
Grid #4 Voltage*	1,000 Max. Volts DC

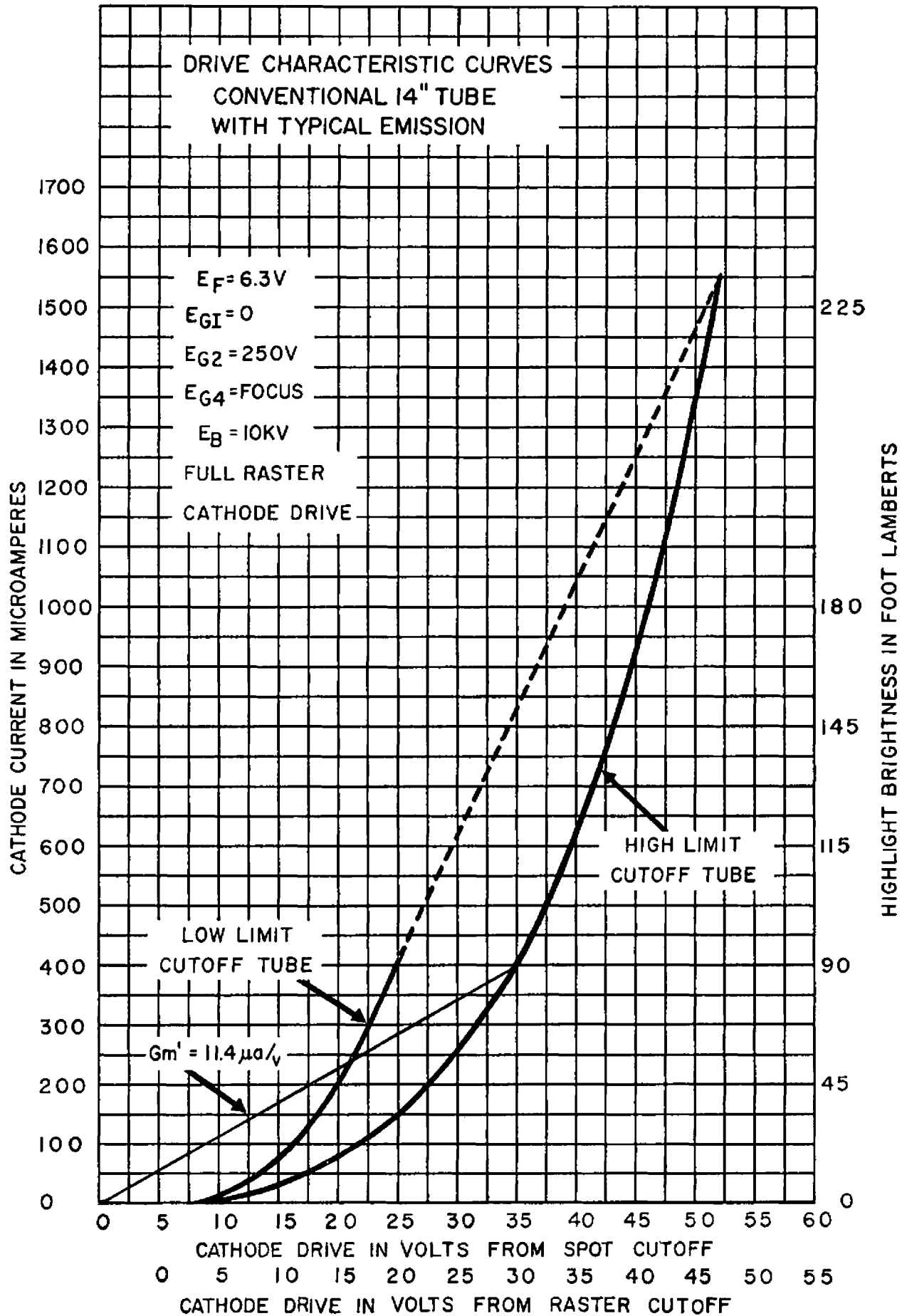
14ARP4





MECHANICAL NOTES

1. The reference line is determined by reference line gauge R.E.T.M.A. #116.
2. The minimum size and location of the contact area to the external conductive coating is shown in the drawings. The actual area of the coating will be large enough to provide the specified capacitance. This external conductive coating must be grounded.
3. The area around the button is covered with an insulating coating.



APPLICATION CONSIDERATIONS

The 14ARP4 is designed to give increased highlight brightness in television sets using cathode drive. For the purpose of specifying the performance of a particular type of cathode ray tube, it is convenient to define a specific transconductance which we shall call Gm' .

$$Gm' = \frac{I_{KO \text{ Min.}}}{E_{S \text{ Max.}}}$$

where $I_{KO \text{ Min.}}$ is the lowest zero bias cathode current of any tube that meets the specification, and $E_{S \text{ Max.}}$ is the largest drive voltage required to drive any tube of the type from cutoff to $I_{KO \text{ Min.}}$. Since $I_{KO \text{ Min.}}$ is a measure of the minimum assured highlight brightness and since a drive of $E_{S \text{ Max.}}$ will always give this brightness or more, Gm' is a measure of the minimum large signal transconductance of the given type.

The 14ARP4 is designed for cathode drive service with the grid operated at ground and the screen grid operated at a small positive voltage. A typical connection for the tube is shown in Figure #1. Vertical flyback blanking may be applied either to the grid or the screen grid. With 50 volts applied to the screen grid, Gm' is more than double that of conventional types of cathode ray tubes operated with a screen grid voltage of 250 volts and cathode drive. The use of the 14ARP4 will insure that more than twice the peak highlight brightness and contrast ratio will be available with essentially the same maximum drive voltage requirements of other types. This increase is illustrated in the curves of cathode current versus drive for the 14ARP4 and a conventional tube. These curves are plotted for cutoff limit tubes with typical emission.

Tubes with less than typical emission will have reduced cathode current for the same drive so that Gm' will be lower. The Gm' of the 14ARP4 for a low limit emission tube is implicit in the specification and is equal to:

$$Gm'_{(14ARP4)} = \frac{I_{KO \text{ Min.}}}{E_{S \text{ Max.}}} = \frac{1000 \text{ ua}}{50 \text{ v}} = 20 \text{ ua/v},$$

since the maximum drive will be the drive required to swing the tube to zero bias, and this will be equal to the cutoff voltage which is 50 volts or less.

The Gm' of a conventional cathode ray tube, assuming the zero bias cathode current is only 70% of that of the typical tube, may be derived from the typical I_K versus E_K curve. The Gm' will be given by:

$Gm'_{(\text{conventional tube})} =$

$$\frac{.7 I_{KO \text{ Min.}}}{E_{S \text{ Max.}}} = \frac{.7 (410) \text{ ua}}{35 \text{ v}} = 8.2 \text{ ua/v}$$

where $I_{KO \text{ Min.}}$ and $E_{S \text{ Max.}}$ are derived from limit tubes with typical emission. A comparison of the Gm' s of the two types is given below:

Type	Gm' Typical Emission	Gm' Low Limit Emission
14ARP4	25 ua/v	20 ua/v
Conventional tube	11.4 ua/v	8.2 ua/v

14ARP4

Grid #2 Voltage*	70 Max. Volts DC
Cathode Voltage*	
Positive-Bias Value	150 Max. Volts DC
Negative-Peak Value	0 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warmup Period Not to Exceed 15 Sec.	410 Max. Volts
After Equipment Warmup Period	180 Max. Volts
Heater Positive with Respect to Cathode	180 Max. Volts

*Voltage Positive with Respect to Grid #1 unless Otherwise Specified.

TYPICAL OPERATING CONDITIONS (Cathode Drive Service Only)

Anode Voltage	10,000 Volts
Grid #4 Voltage for Focus with Anode Current of 100 ua.	-50 to +350 Volts
Grid #2 Voltage	50 Volts
Grid #1 Voltage	0 Volts
Cathode Voltage (Note #2)	50 Max. Volts
Cathode Current at Zero Bias	1,000 Min. ua.

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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NOTES

1. Anode, Grid #3 and Grid #5 are connected together within the tube and are referred to herein as anode.
2. For visual extinction of the undeflected focused spot.

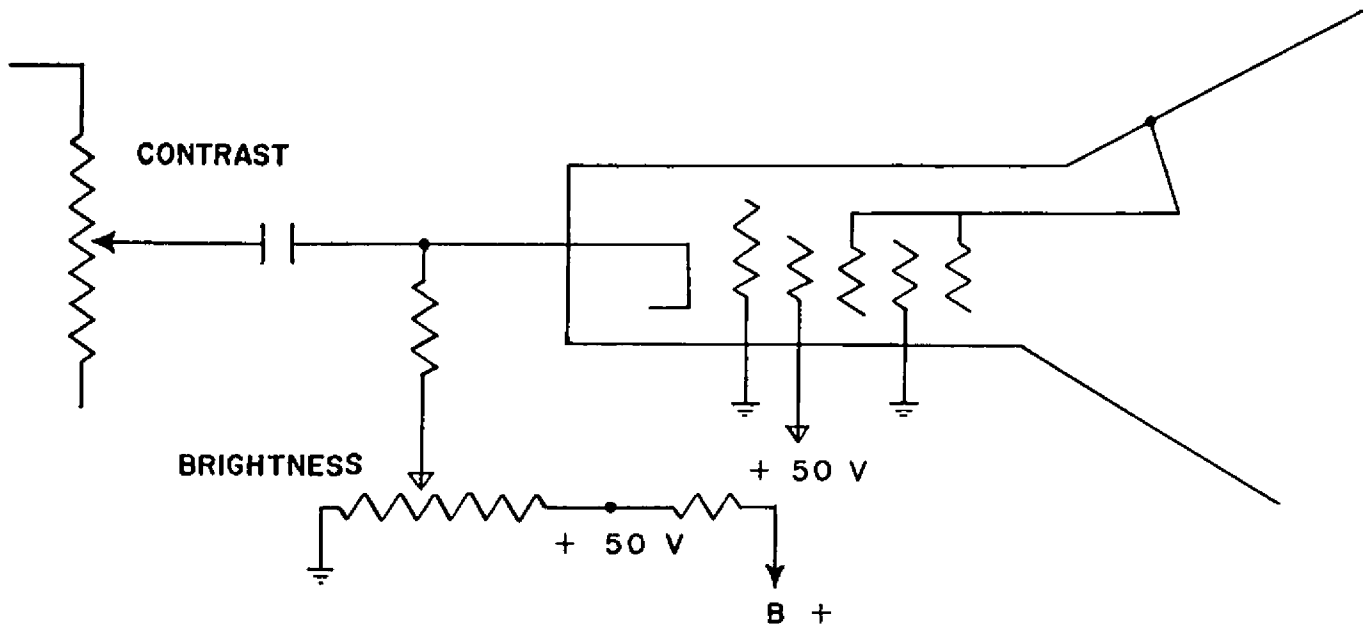


FIGURE 1