

PHILCO RADIO & TELEVISION CORPORATION

6-8-38

Type 1A5G
Power Output Pentode
Final Ratings & Characteristics

Filament Voltage	1.40	volts
Filament Current	.050	amp.
Grid #1 Voltage	-4.5	volts
Grid #2 Voltage	85.	volts
Plate Voltage	85.	volts
Grid #2 Current	.70	ma.
Plate Current	3.5	ma.
Mutual Conductance	800.	μmhos
Power Output	100.	m watts
Distortion	10.	%
Load Resistance	25,000.	ohms

Base - Small shell octal seven pin
Bulb - T-9
Maximum Overall Length - 4"

Basing

Pin #1 - No connection	Pin #5 - Grid #1
Pin #2 - Positive Filament	Pin #6 - Omitted
Pin #3 - Plate	Pin #7 - Neg. Fil. & Grid #3
Pin #4 - Grid #2	Pin #8 - No connection

PHILCO RADIO & TELEVISION CORPORATION

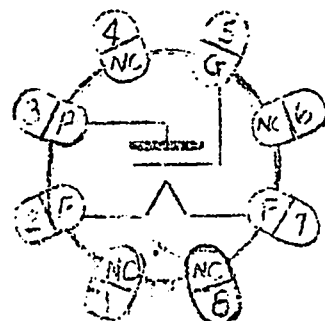
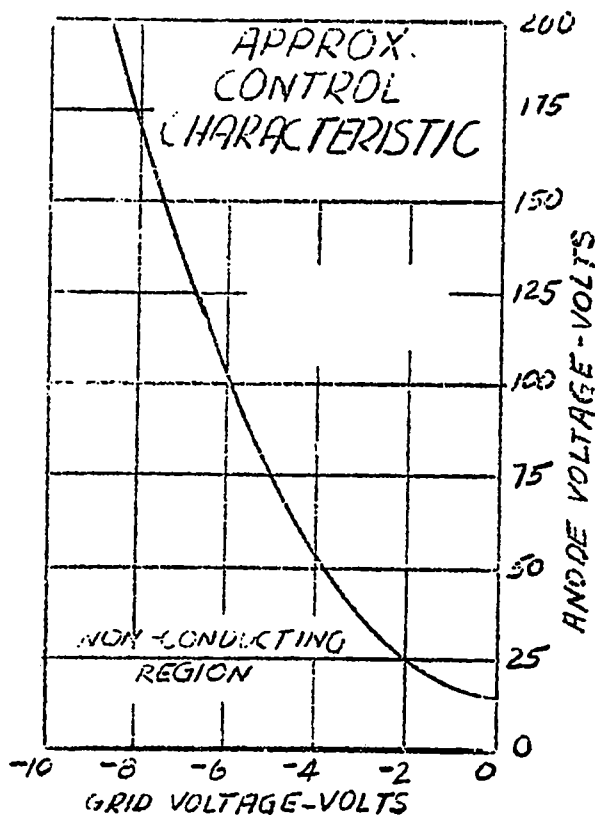
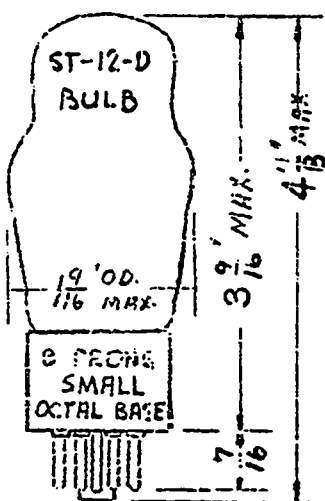
Type 2A4G

Thyratron

Final Ratings & Characteristics

The 2A4G is a hot cathode, argon filled, single grid, thyratron tube particularly useful in applications where constancy of characteristics is necessary even with large variations in ambient temperature.

Filament Voltage	2.5	volts
Filament Current	2.5	amp.
Max. Anode Voltage (Instantaneous)		
Forward	200	volts
Inverse	200	volts
Max. Voltage between any two Electrodes	250	volts
Max. Anode Current		
Peak	1.25	amp.
Average	0.10	amp.
Max. Averaging Time	45	sec
Tube Voltage Drop	15	volts
Cold Starting Time	2	sec.



BOTTOM VIEW OF SOCKET

Busing S-S.

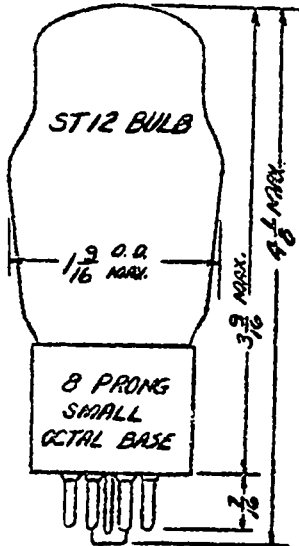
~~RX-202~~
2A4G

RAYTHEON

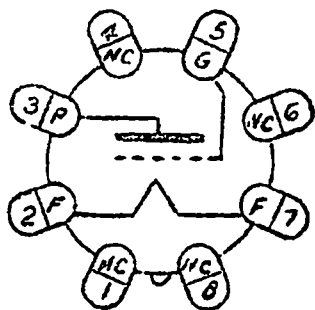
~~RX-202~~
2A4G

ARGON FILLED THYRATRON

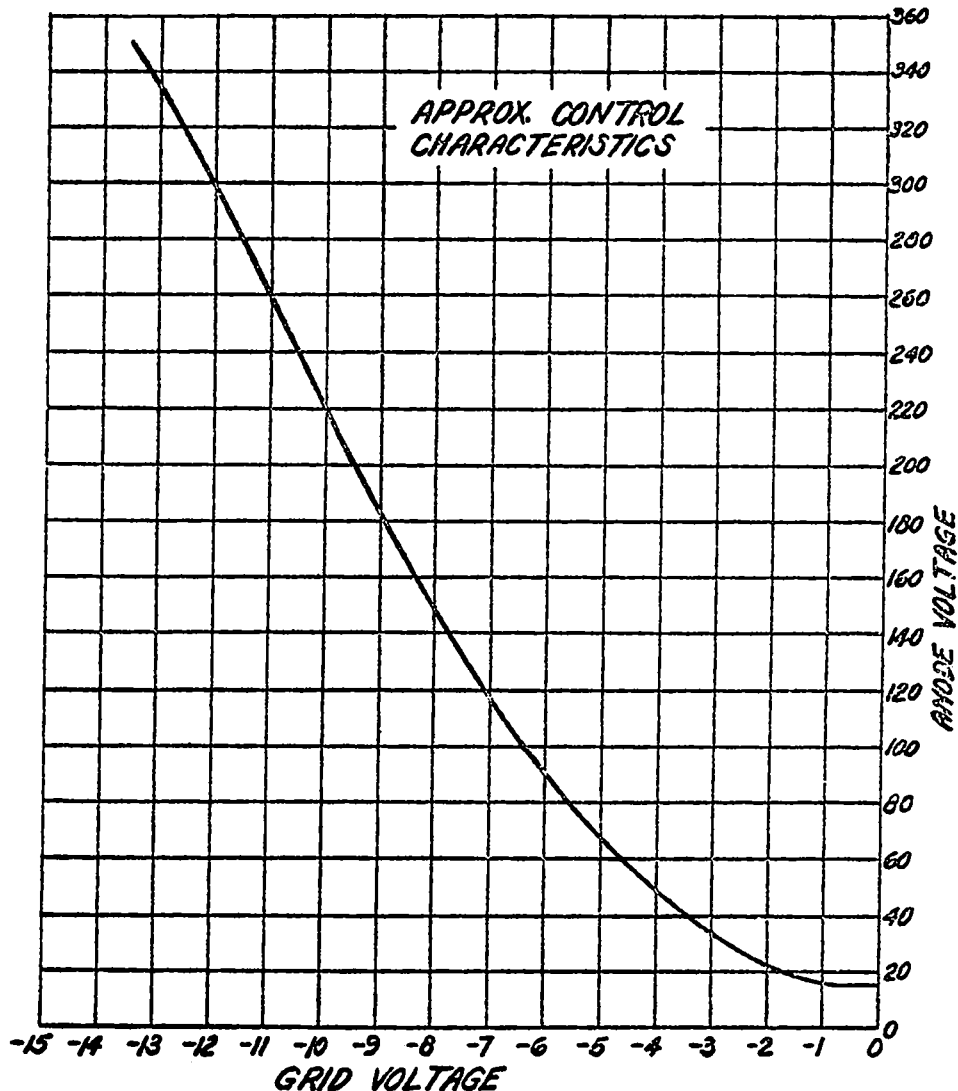
DIRECT HEATED CATHODE



FILAMENT RATING	2.5	volts
	2.5	amps
ANODE CURRENT	1.250	amp. peak
	.100	amp. avg.
MAX. AVERAGING TIME	45	seconds
MAX. ANODE VOLTS	350	Forward
	350	Inverse
GRID CURRENT	0.2	Microamps
VOLTAGE DROP	15	volts
COLD STARTING TIME	2	seconds



BOTTOM VIEW OF SOCKET



PHILCO

RECEIVING TUBE

DATA SHEET

TENTATIVE

DESCRIPTION

Type 2EN5 is a double diode tube with common cathode, designed for service in television receivers as a phase comparator. It is intended for use with a series heater connection, and has the controlled heater warm-up characteristic. It is particularly suitable for use where low heater input is required.

MECHANICAL DATA

Cathode	Coated Unipotential
Outline Drawing	5-2
Bulb	T-5½
Base	E7-1 Small Button Miniature
Maximum Diameter	¾ inch
Maximum Overall Length	2⅛ inches
Maximum Seated Height	1⅞ inches
Basing	7FL
1—No Connection	5—Cathode
2—Diode #2	6—Internal Shield
3—Heater	7—Diode #1
4—Heater	
Mounting Position	Any

ELECTRICAL DATA

Direct Interelectrode Capacitances

	Unshielded	Shielded*
Diode Input: p to (h + k + I.S.) each unit	3.7	3.8 μμf
Coupling: Plate to Plate 1P to 2P (max)	1.3	3.8 μμf

*External shield #316 connected to pin #6

Heater Characteristics

Heater Voltage	2.1 volts
Heater Current	450 ma (±6%)
Heater Warm-up Time (Note 1)	11 sec

Maximum Ratings (Design-Maximum Rating System) (Note 2)

Diode Current for Continuous Operation (Each Plate) 5.0 ma

Heater-Cathode Voltage

Heater Negative with Respect to Cathode (Total DC and Peak)	200 volts
Heater Positive with Respect to Cathode (Total DC and Peak)	200 volts
(DC)	100 volts

Typical Operating Conditions and Characteristics

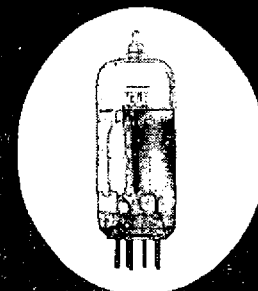
Diode Voltage Drop (Approx) for $I_b = 20$ ma each plate 5.0 volts

(Over)

2EN5

DOUBLE

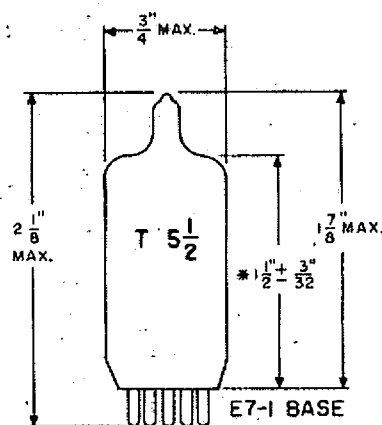
DIODE TUBE



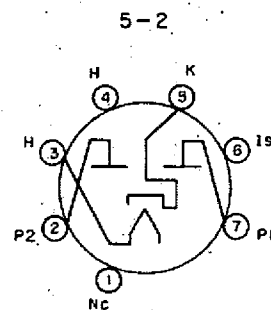
GENERAL DESCRIPTION

Miniature double diode for TV phase comparator applications.

DIMENSIONAL OUTLINE AND MECHANICAL SPECIFICATIONS



* MEASURED FROM BASE SEAT TO BULB-TOP LINE
AS DETERMINED BY RING GAUGE OF $\frac{7}{16}$ I.D.



BASING DIAGRAM
Bottom View of Base

NOTE 1—Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four times the rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three times the rated heater voltage divided by the rated heater current.

NOTE 2—Design-maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions. The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics. The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

PHILCO CATHODE RAY TUBE DATA SHEET

TENTATIVE

DESCRIPTION

The 2EP4 is an electrostatic focus and magnetic deflection picture tube specifically intended for portable television applications using special optical viewing systems. Special features of this tube are its low drive voltage and low heater power, permitting use in transistorized portable television sets. Other features of the tube are controlled aluminum thickness for operation at moderate anode voltages, a straight gun requiring no ion trap magnet and external conductive coating.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, Approximate	30 Degrees
Direct Interelectrode Capacitance	
Cathode to all	5.0 max. μmf
Grid #1 to all	5.0 max. μmf
External Coating Capacitance	300 min. μmf
	500 max. μmf
Heater Voltage	6.0 Volts
Heater Current	$0.145 \pm 10\%$ Amperes

OPTICAL DATA

Phosphor Number	P-4
Fluorescent Color	White
Persistence	Medium

MECHANICAL DATA

Overall Length	$8\frac{1}{4} \pm \frac{1}{4}$ Inches
Greatest Diameter of Bulb	$2\frac{0}{-1/16}$ Inches
Minimum Useful Screen Diameter (Maximum Assured Diameter)	$1\frac{5}{8}$ Inches
Bulb	J16D1
Base	B7-208
Basing	8JK
Anode Contact	J1-21
Anode Contact Aligns with Center Line Between Pins #1 and #8 $\pm 30^\circ$	

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 1)	11,000 Max. Volts DC
Grid #4 Voltage	-550 to +1100 Max. Volts DC
Grid #2 Voltage	550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value	155 Max. Volts DC
Negative-Peak Value	250 Max. Volts
Positive-Bias Value	0 Max. Volts DC
Positive-Peak Value	2 Max. Volts
Peak Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed 15 sec.	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage (Note 1)	9000 Volts DC
Grid #4 Voltage for Focus	-50 to +350 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note 2)	-20 to -30 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Meg.
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NOTES

1. The 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.

WARNING

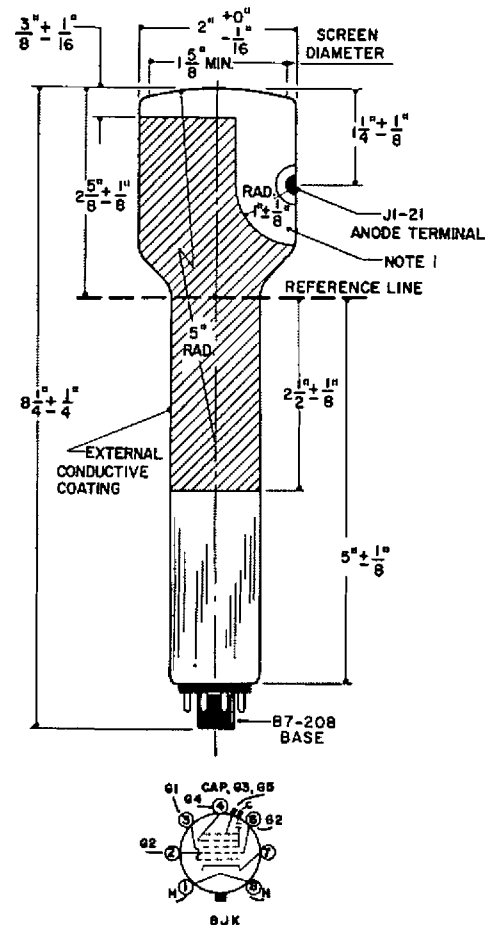
X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages in excess of the maximum ratings.

from JEDEC release #2626, Nov. 9, 1959

2EP4 TELEVISION PICTURE TUBE

GENERAL DESCRIPTION

2" cathode ray tube intended for portable television applications using special optical viewing systems.



MECHANICAL NOTES

1. The area around the button is covered with an insulating coating.
2. The reference line is determined by reference line gauge JEDEC #136.
3. The socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. The bottom circumference of the base wafer will fall within a circle concentric with the bulb axis and having a diameter of $1\frac{3}{4}$ inches.

REGIONAL OFFICES

Headquarters Sales:

Lansdale Tube Company
Lansdale, Pennsylvania
ULysses 5-4681

New England:

43 Bay State Road
Boston, Massachusetts
COMmonwealth 6-1008

Midwest:

1100 Merchandise Mart Plaza
Chicago 54, Illinois
WHitehall 4-1850

New York:

Office #404
205 Harrison Street
Syracuse, New York
HArrison 2-1623

Southwest:

1445 East Thomas Road
Phoenix, Arizona
CRestwood 7-6112

New York City and Long Island:

209 Willis Avenue
Mineola, New York
Pioneer 7-0545

Southern California:

1435 South La Cienega Boulevard
Los Angeles 35, California
OLeander 5-7505

Middle Atlantic:

Room 225
Benson East
100 Old York Road
Jenkintown, Pennsylvania

Northern California and Northwest:

3875 Fabian Way
Palo Alto, California
DAvenport 6-4350

Washington, D.C. and South:

1707 H Street, N.W.
Washington 6, D. C.
EXecutive 3-1500

Canada:

Philco Corp. of Canada Ltd.
Don Mills Road
Don Mills, Ontario
Hlckory 4-2541

Dayton and South:

Talbot Building
First and Ludlow Streets
Dayton 2, Ohio
BAldwin 4-6578

Export:

Philco International Corp.
C and Tioga Streets
Philadelphia 34, Pennsylvania
NEbraska 4-5100

PHILCO CORPORATION
LANSDALE TUBE COMPANY DIVISION
LANSDALE, PENNSYLVANIA



Lansdale, Pa.

June 21, 1950

4BP15

The 4BP15 type is a magnetic focus and magnetic deflection cathode-ray tube intended primarily for use as the scanner in a flying-spot video-signal generator.

The 4BP15 features an extremely uniform phosphor screen so applied as to be practically free of graininess.

The tube has a face plate optical quality which will not limit the performance of a high quality objective lens normally needed in flying-spot applications. The 20 inch radius of curvature has been found to be an excellent compromise between electron optic and light optic requirements so as to provide good resolution to the edge of the screen area.

Other features include (1) an external conductive coating on the neck which should be grounded to prevent corona between the yoke and neck, and (2) an external insulating coating on the bulb cone to reduce arcing over the bulb under high humidity conditions.

GENERAL CHARACTERISTICSElectrical

Heater Voltage	6.3		Volts
Heater Current	0.6	± 10%	Amperes
Focusing Method	Magnetic		
Deflecting Method	Magnetic		
Approximate Deflecting Angle	50		Degrees
Phosphor	P15		
Fluorescence	Blue Green		
Persistence	Very Short		
Direct Interelectrode Capacitances, Approx.			
Cathode to all other electrodes	3.5		uuf
Grid #1 to all other electrodes	4.0		uuf
External Conductive Coating to Anode Capacitance	500	Max	uuf
	100	Min	uuf

Mechanical

Overall Length	13-1/16 ± 5/16		Inches
Greatest Diameter of Bulb	4 ± 1/16		Inches
Minimum Useful Screen Diameter	3-5/8		Inches
Bulb Contact	J1-21		
Base	Medium long-shell octal		
Basing	4AE		
Bulb Contact Alignment			
J1-21 contact aligns with Pin #5	±10		Degrees

Page #2.
June 21, 1950MAXIMUM RATINGS Design Center Values

Anode Voltage ¹	25,000	Max	Volts DC
Grid #1 Voltage			
Negative-Bias Value	350	Max	Volts DC
Positive-Bias Value	0	Max	Volts DC
Positive-Peak Value	2	Max	Volts DC
Peak Heater-Cathode Voltage ²			
Heater Negative with respect to cathode			
During warm-up period not to exceed 15 seconds	410	Max	Volts DC
After equipment warm-up period	175	Max	Volts DC
Heater Positive with respect to cathode	175	Max	Volts DC

TYPICAL OPERATING CONDITIONS

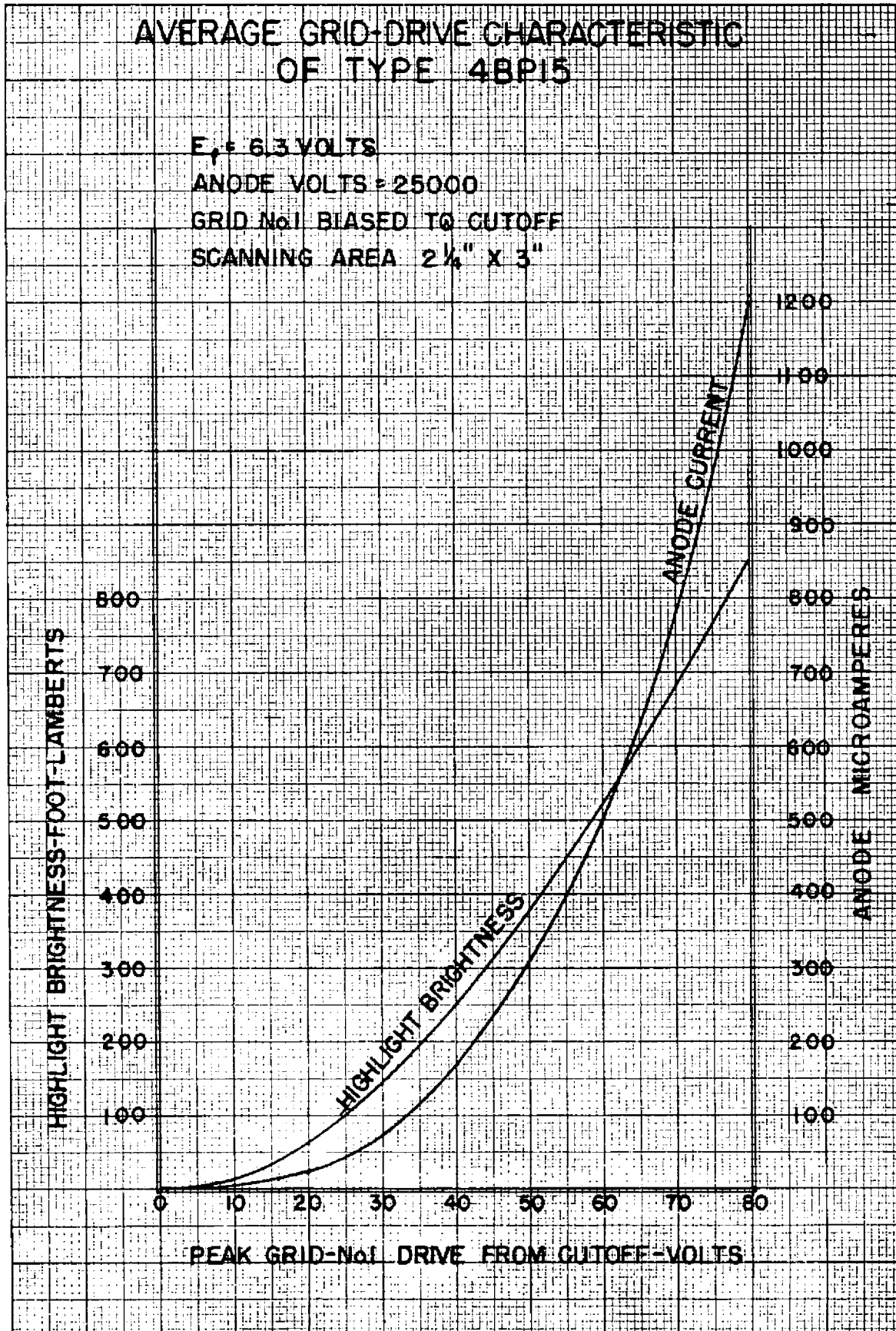
Anode Voltage	25,000		Volts DC
Grid #1 Voltage ³	-75 to -175		Volts DC
Focusing Coil Current ⁴	11.0	Approx	Ma DC
Spot Position (undeflected)	15	Max	MM

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5	Max	Megohms
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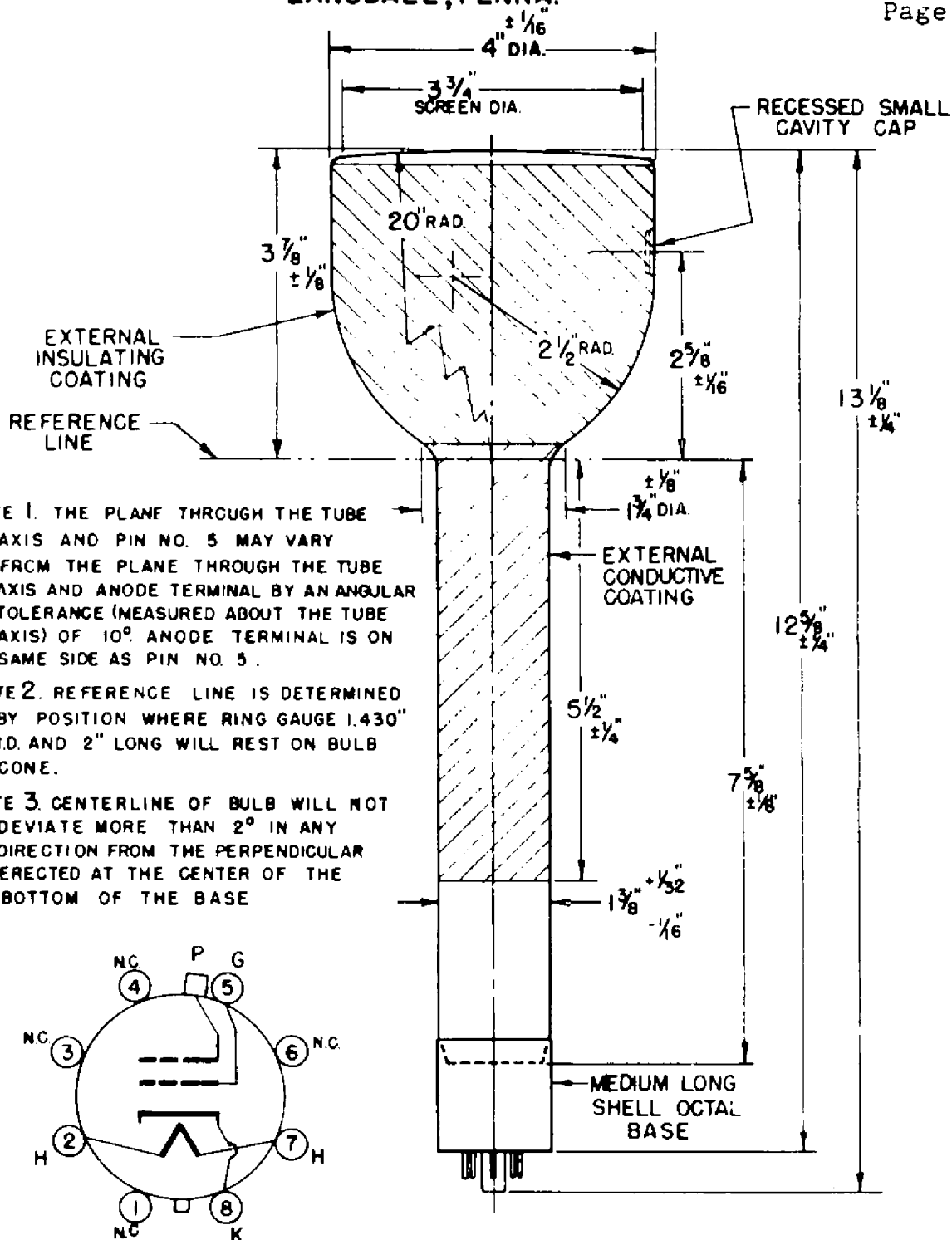
NOTES

1. Anode and Grid #2, which are connected together within the tube, are referred to herein as anode.
2. Cathode should be returned to one side or to the mid-tap of the heater transformer winding.
3. Visual extinction of undeflected focused spot.
4. For standard focus coil #106 or equivalent, with the combined Grid #1 bias voltage and video signal voltage adjusted for 150 microamperes of anode current.



PHILCO TUBE LABORATORY
LANSDALE, PENNA.

Rel 888
7/17/50
Page 4



TUBE TYPE 4BP15

Dwn By H.E.G.
Date 6/22/50

4WP11 - 4WP16

Ultra-High Resolution

Cathode Ray Tube

PHILCO CORPORATION - LANSDALE DIVISION

CATHODE RAY TUBE

DATA SHEET

Tentative

Description

The Philco type 4WP- is an ultra-high resolution cathode ray tube of the magnetic focus and magnetic deflection type. It features an ultra-high resolution spot which is essentially constant over a radius of 0.75 inch. The tube is capable of resolving 3500 lines per inch.

The optical quality, non-browning, flat faceplate, combined with an essentially blemish-free, metal backed screen, makes it suitable for photo-oscillographic applications. The high quality settled screen results in considerably more light output than other types of high resolution screens.

Electrical Data

Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angle, approximate	46.5°
Heater Voltage	6.3 Volts
Heater Current	0.60 ±10% Ampere
Direct Interelectrode Capacitance (Maximum)	
Cathode to All Other Electrodes	6.0uuf
Grid #1 to All Other Electrodes	6.0uuf

Optical Data

Phosphor Number	P11	P16
Fluorescent Color	Blue	Bluish Purple
Phosphorescence	Blue	Bluish Purple
Persistence	Medium Short	Very Short
Faceplate		
Optical Quality, Flat, Gray, Non-browning		

Mechanical Data

Overall Dimensions

Length	12 $\pm$ 1/4 Inches
Greatest Bulb Diameter	3 3/4 $\pm$ 3/32 Inches
Minimum Useful Screen Diameter	2.8 Inches
Base	B5-57
Anode Contact	J1-21

Maximum Ratings

Anode Voltage (Note #1)	22,000 Volts DC
Grid No. 1	
Negative Bias Value	100 Volts DC
Positive Bias Value	0 Volts
Positive Peak Value	0 Volts
Heater-Cathode Voltage (Note #2)	$\pm$ 180 Volts DC
Grid No. 1 Circuit Resistance.	1.0 megohm

Typical Operating Conditions

Anode Voltage	20,000 Volts
Grid #1 Voltage (Note #3)	-20 to -50 Volts
Line Width "A" (Note #4)	0.0003 Inch
Spot Size (Note #5)	0.0007 Inch

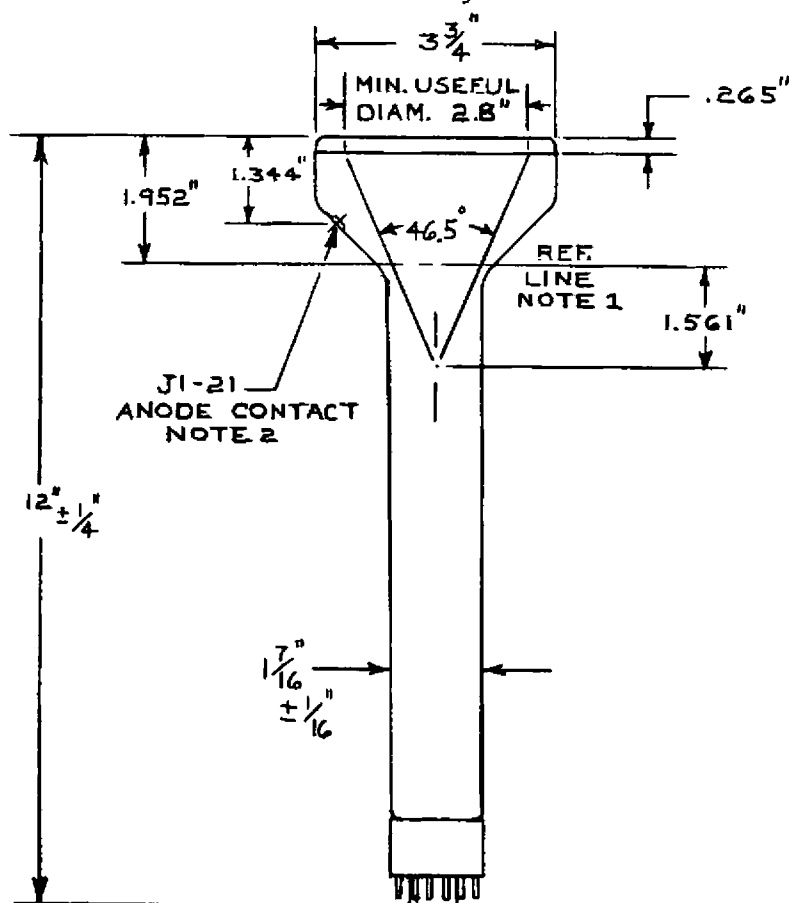
Notes

1. Anode and Grid #2 are connected together within the tube and are referred to herein as anode.
2. Cathode should be returned to one side or to the mid-tap of the heater transformer winding.
3. For visual extinction of the undeflected focused spot.
4. Measured with a 525 line pattern adjusted to 90% of minimum useful screen diameter at $I_k = 1.0\text{ua}$. The line width is the merged raster height divided by the number of lines (500) (measured in the center of tube face).
5. Measured to the half-brightness point at center of face with $I_k = 1.0\text{ua}$.

PHILCO CORPORATION - LANSDALE DIVISION

Outline Drawing
4WP11 - 4WP16

Ultra-High Resolution
Cathode Ray Tube



Base lug aligns
with anode button

MECHANICAL NOTES

1. Reference line is determined by a 1.937" $\pm$.002" diameter ring gauge 2 inches long.
2. Anode button is aligned with base lug $\pm$ 10°.

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts.

The information, diagrams, or any other data included herein are believed to be accurate and reliable. However, the Philco Corporation, Lansdale Division, assumes no responsibility or liability whatsoever for the application, interpretation or use made of such information, diagrams or data especially insofar as the use of said information, diagrams or data affects any patent, trademark or proprietary data rights.

PHILCO CATHODE RAY TUBE DATA SHEET

TENTATIVE

DESCRIPTION

The 5AKP tubes are magnetic focus and deflection cathode ray tubes intended primarily for use in flying spot scanner applications. These tubes particularly feature extremely small spot size. Other features include a metal backed screen for high brightness, an external conductive coating on the neck which should be grounded to prevent corona between the yoke and the neck, and an external insulating coating on the bulb cone to reduce arcing over the bulb.

ELECTRICAL DATA

Focusing Method	Magnetic
Deflecting Method	Magnetic
Deflection Angle, approximate	50 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to all	3.5 μ f
Grid #1 to all	4.0 μ f
External Coating Capacitance	100 min. μ f
	500 max. μ f

OPTICAL DATA

Phosphor Number	P15	P24
Fluorescent Color	Blue-Green	Light Green
Persistence	Very Short	Extremely Short

MECHANICAL DATA

Overall Length	12 $\frac{9}{16}$ $\pm$ $\frac{1}{4}$ Inches
Greatest Diameter of Bulb	5 $\pm$ $\frac{1}{8}$ Inches
Minimum Useful Screen Diameter (maximum assured diameter)	4 $\frac{1}{4}$ Inches
Base	B5-57
Basing	12 G
Anode Contact	J1-21
Anode Contact Aligns with Vacant Pin #3	$\pm 10^\circ$

MAXIMUM RATINGS (Design Center Values)

Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	60 $\pm$ 10% Amperes
Anode Voltage (Note #1)	40,000 Max. Volts DC
Grid #1 Voltage	
Negative Bias Value	350 Max. Volts DC
Positive Peak Value	2 Max Volts
Positive Bias Value	0 Max. Volts DC
Peak Heater-Cathode Voltage (Note #2)	
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

TYPICAL OPERATING CONDITIONS

Anode Voltage	30,000 Volts
Grid #1 Voltage (Note #3)	-80 to -140 volts
Focusing Coil Current, approximate (Note #4)	250 Ma.

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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NOTES

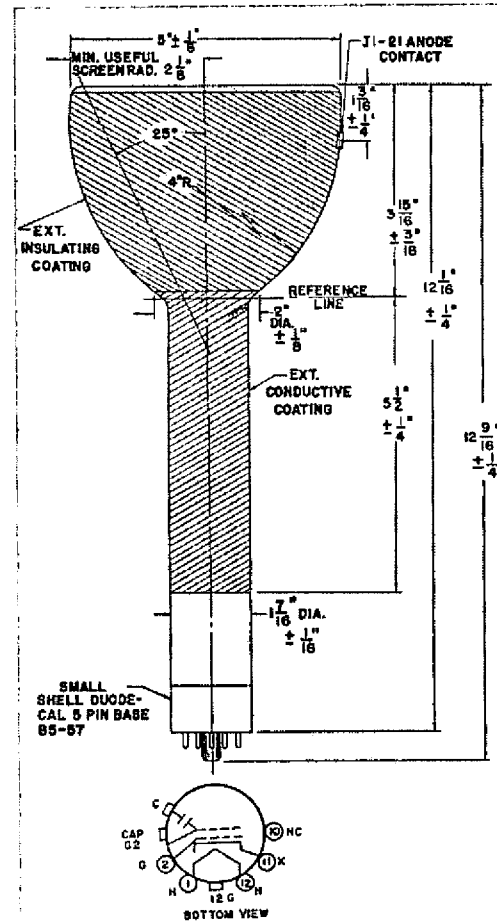
1. Anode and Grid #2 are connected together within the tube and are referred to herein as anode.
2. Cathode should be returned to one side or to the mid-tap of the heater transformer winding.
3. For visual extinction of the undeflected focused spot.
4. For standard focus coil JETEC #106 or equivalent, with the combined Grid #1 bias voltage and video signal voltage adjusted for 200 microamperes of anode current.

from JETEC release #2038, Nov. 4, 1957

5AKP15 5AKP24 FLYING SPOT SCANNER TUBES

GENERAL DESCRIPTION

5" cathode ray tubes intended as flying spot light sources. The 5AKP24 is particularly adapted for use in color film scanners.

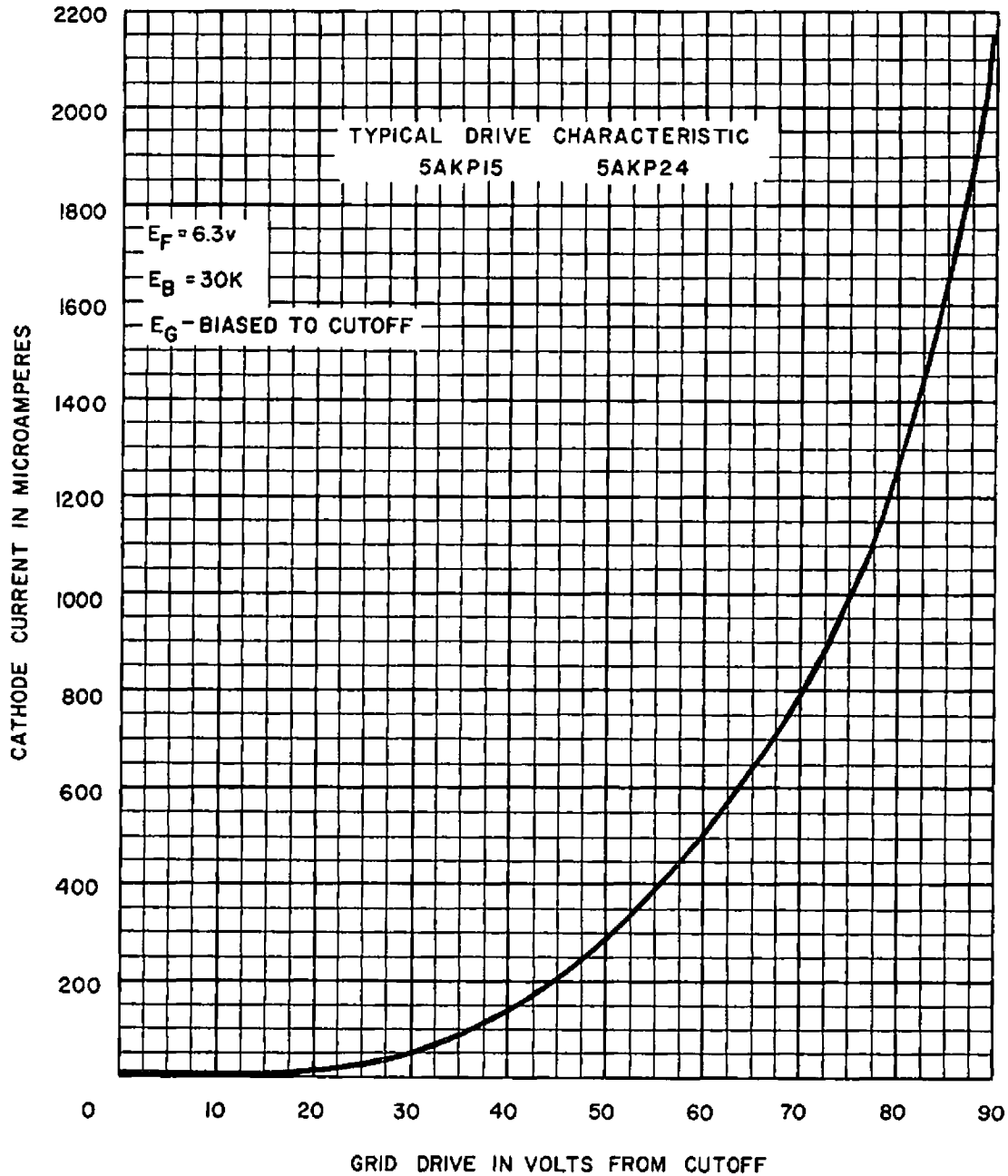


MECHANICAL NOTES

1. The reference line is determined by the position where reference line gauge JETEC #112 rests against the funnel.
2. The anode contact aligns with vacant pin position #3 $\pm 10^\circ$.
3. External conductive coating must be grounded.
4. Center line of bulb will not deviate more than 2° in any direction from the perpendicular erected at the center of the bottom of the base.

APPLICATION NOTE

At or near maximum anode potential suitable precautions should be taken to prevent arcing between the anode button and the deflection yoke during high humidity conditions. A corona shield such as Lansdale #007-9174 affixed to the bulb around the button will prevent any arcing along the outside of the bulb.



WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range when this tube is operated at recommended anode voltages.

RMA Release # 289

TYPE # 6AH5G

RESERVATION # _____ DATE _____ REGISTRATION # _____ DATE _____

SPONSOR: Philco Radio and Television Corporation

TYPE CLASSIFICATION: Beam Power Amplifier

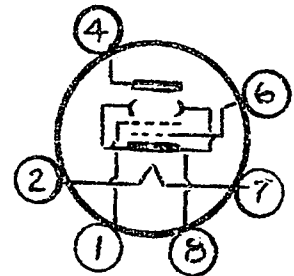
PHYSICAL SPECIFICATIONS:

TYPE CATHODE: Unipotential

PIN CONNECTIONS:

- Pin 1 - Screen Grid
- " 2 - Heater
- " 4 - Plate
- " 6 - Control Grid
- " 7 - Heater
- 2 8 - Cathode and Beam Plates

(Pins #3 and 5 removed)



6AP

BASE-BOTTOM VIEW

BASING DESIGNATION: 6AP

TYPE OF BASE: Medium Octal 6-pin (special)
 TYPE OF BULB: ST-16
 MAX. DIAMETER: 2-1/16"
 MAX. OVERALL LENGTH: 5-5/16"
 MAX. SEATED HEIGHT: 4-3/4"
 MOUNTING POSITION: Any

RATINGS:

Heater Voltage AC or DC	6.3 volts
Heater Current	.9 amp.
Max. Plate Voltage DC	350 volts
Max. Screen Voltage DC	250 volts
Max. Plate Dissipation	18.5 watts
Max. Peak Plate Voltage	volts
Max. Screen Dissipation	2.7 watts

TYPICAL OPERATION:

BEAM TETRODE CLASS A1

TRIODE CLASS A1 SCREEN TO PLATE

Heater Voltage	6.3	6.3 volts
Plate Voltage	350	250 volts
Screen Voltage	250	- volts
Grid Voltage	-18	-20 volts
Peak AF Signal	18	20 volts
Transconductance	5,200	4,700 umhos
Amplification Factor	-	8.0
Plate Resistance	33,000	1,700 ohms

TYPICAL OPERATION - Cont.

BEAM TETRODE
CLASS A1

TRIODE CLASS A1
SCREEN TO PLATE

Zero Signal Plate Current	54	40	ma.
Zero Signal Screen Current	2.5	-	ma.
Max. Signal Plate Current	6.6	44	ma.
Max. Signal Screen Current	7.0	-	ma.
Load Resistance	4,200	5,000	ohms
Power Output	10.8	1.4	watts
Total Harmonic Distortion	15	5	%

COMMENTS:

Electrical characteristics are identical with Type 6L6G. The Stem and basing of Type 6AH5G have been arranged to obtain a high breakdown-voltage between plate and other elements for use in television circuits.

F H I L C O

RECEIVING TUBE

DATA SHEET

October 26, 1960

6FD7, 10FD7, 13FD7

DESCRIPTION

Types 6FD7, 10FD7, and 13FD7 are dissimilar section double triodes intended to serve the combined functions of the vertical deflection oscillator and amplifier. They feature the T-9 bulb with integral wafer base which fits the standard 9-pin miniature socket. The T-9 bulb has the advantage of increasing the heat dissipation safety margin over the 9-pin miniature tubes utilizing the T-6 1/2 bulb.

MECHANICAL DATA

Bulb	Special, T-9
Base	9-Pin, same as E9-1, Except bulb diameter
Outline	9-77
Basing	9HF
Cathode	Coated Unipotential
Mounting Position	Any

ELECTRICAL DATA

Heater Characteristics

	<u>6FD7</u>	<u>10FD7</u>	<u>13FD7</u>	
Heater Voltage	6.3 ¹	9.7	13.0	Volts
Heater Current	925	600 ²	450 ²	Ma
Heater Warm-up Time ³		11	11	Seconds
Maximum Heater Voltage Range ⁴	5.7-6.9			Volts
Maximum Heater Current Range ⁴		560-640	420-480	Ma
Heater-Cathode Voltage				
(Design Maximum Values) ⁴				
Heater Negative with Respect to Cathode				
Total DC and Peak	200	200	200	Volts Max.
Heater Positive with Respect to Cathode				
DC	100	100	100	Volts Max.
Total DC and Peak	200	200	200	Volts Max.

Direct Interelectrode Capacitances (Unshielded)

	<u>Section No. 1</u>	<u>Section No. 2</u>	
Grid to Plate	4.5	10.0	$\mu\mu\text{F}$
Input: g to (h + k)	2.2	6.5	$\mu\mu\text{F}$
Output: p to (h + k)	0.40	1.2	$\mu\mu\text{F}$

Ratings (Design Maximum Values)⁴

Vertical Deflection Oscillator and Amplifier⁵

	Section ⁷ No. 1 <u>Oscillator</u>	Section ⁷ No. 2 <u>Amplifier</u>	
Plate Voltage.	330	330	Volts Max.
Peak Positive Pulse Plate Voltage.		1500	Volts Max.
Peak Negative Pulse Grid Voltage.	400	250	Volts Max.
Plate Dissipation ⁶	1.5	10.0	Watts
Average Cathode Current.	20	50	Ma
Peak Cathode Current	70	175	Ma
Grid Circuit Resistance			
Self Bias.	2.2	2.2	Megohms

Average Characteristics

	Section ⁷ No. 1 <u></u>	Section ⁷ No. 2 <u></u>	
Plate Voltage.	250	150	Volts
Grid No. 1 Voltage	-3.0	-17.5	Volts
Plate Current.	1.4	40.0	Ma
Transconductance	1600	7500	μmhos
Amplification Factor	64	6.0	
Plate Resistance (Approx.)	40000	800	Ohms
E _c for I _b = 10 μa (Approx.)	-5.5		Volts
E _c for I _b = 100 μa (Approx.)		-40.0	Volts
Transconductance at I _b = 1.0 Ma.		500	μmhos
I _b at E _c = -25 Vdc		6.0	Ma
I _b with E _b = 60 V and E _c = 0 V		95	Ma
(Instantaneous Value)			

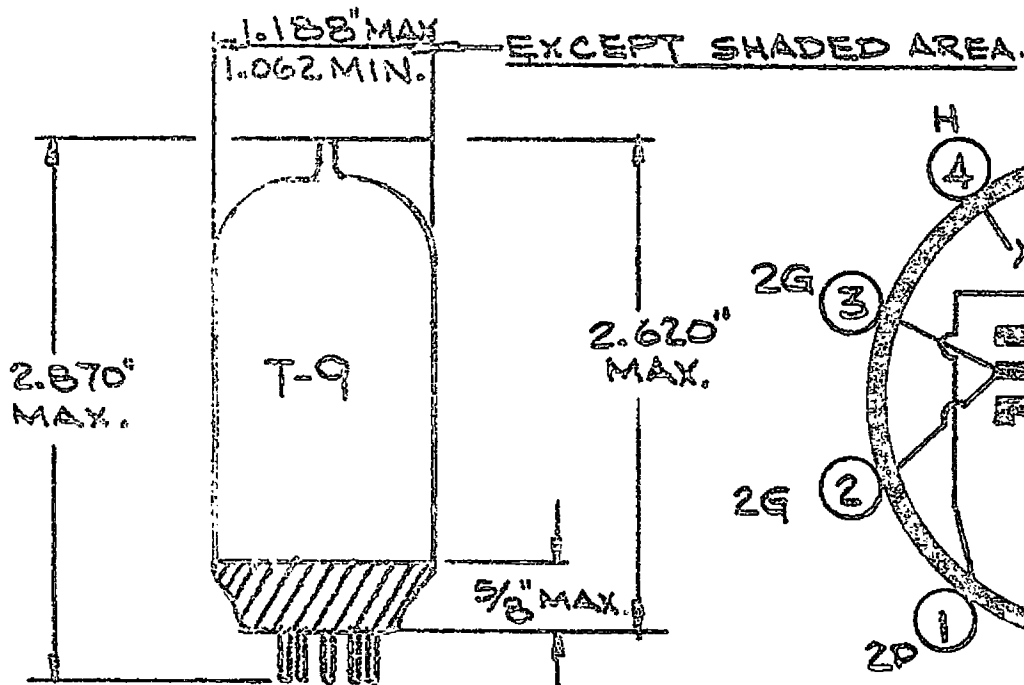
NOTES:

1. For parallel heater operation, equipment should be so designed so that at normal supply voltage bogie tubes will operate at this value of heater voltage.
2. For series heater operation, equipment should be so designed so that at normal supply voltage bogie tubes will operate at this value of heater current.
3. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of the rated heater voltage after applying four (4) times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three (3) times the rated heater voltage divided by the rated heater current.
4. Design-Maximum Ratings are limiting values of operating and environmental conditions applicable to a bogie electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

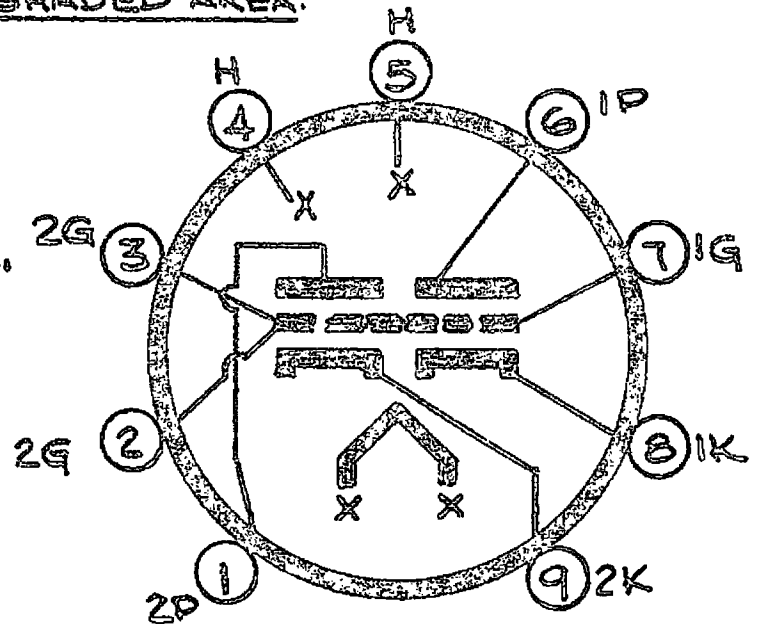
The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogie device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

5. For operation in a 525 line, 30 frame system as described in "Standards of Good Engineering Practice for Television Stations; Federal Communications Commission". The duty cycle of the voltage pulse must not exceed 15% of one scanning cycle.
6. In stages operating with grid leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.
7. Section No. 1 connects to Pins 6, 7 and 8. Section No. 2 connects to Pins 1, 2, 3 and 9.



OUTLINE



BASING DIAGRAM

RMA Release # 289

TYPE # 6Y3G

RESERVATION # _____ DATE _____ REGISTRATION # _____ DATE _____

SPONSOR: Philco Radio and Television Corporation

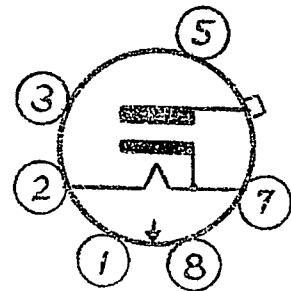
TYPE CLASSIFICATION: Half Wave High Vacuum Rectifier

PHYSICAL SPECIFICATIONS:

TYPE CATHODE: Unipotential

PIN CONNECTIONS:

Pin 1 - No Connection
" 2 - Heater
" 3 - No Connection
" 5 - No Connection
" 7 - Heater and Cathode
" 8 - No Connection
Cap - Plate



BASING DESIGNATION: 4AC

4AC
BASE-BOTTOM VIEW

TYPE OF TOP CAP: Miniature
TYPE OF BASE: Small Octal 6-pin
TYPE OF BULB: ST-12
MAX. DIAMETER: 1-9/16"
MAX. OVERALL LENGTH: 4-15/32"
MAX. SEATED HEIGHT: 3-29/32"
MOUNTING POSITION: Any

RATINGS:

Heater Voltage	6.3 volts
Heater Current	.70 amp.
Max. Peak Inverse Voltage	14,000 volts
Max. Peak Plate Current	100 ma.
Heating Time	25 seconds

TYPICAL OPERATION: - Half Wave

(Either choke or condenser input circuit. With condenser input the condenser should be limited to 0.5 MFD maximum.)

AC Plate Voltage (RMS)	5,000 volts max.
DC Output Current	7.5 ma. max.

COMMENTS:

Type 6Y3G is a half-wave rectifier for use in cathode ray and television circuits where high voltage and low current are required.

PHILCO

RECEIVING TUBE

DATA SHEET

TENTATIVE

9BR7

12BR7A

DOUBLE DIODE-TRIODE TUBES

DESCRIPTION

The 9BR7 and 12BR7A receiving tubes contain two high perveance diodes and a general purpose, medium mu triode. The diodes have a common cathode and are electrically independent of the triode. The 9BR7 and 12BR7A are identical to the 12BR7 except for heater ratings and warm-up time.

MECHANICAL DATA

Cathode	Coated Unipotential
Outline Drawing	6-2
Bulb	T6 1/2 Glass
Base	E9-1 Small Button Miniature
Maximum Diameter	7/8 inch
Maximum Overall Length	2 3/16 inches
Maximum Seated Height	1 15/16 inches
Basing	9PM 9CF

1—Triode Plate	6—Diode #2
2—Triode Grid	7—Diode #1
3—Triode Cathode	8—Diode Cathode and Internal Shield
4—Heater	9—Heater Center Tap
5—Heater	

ELECTRICAL DATA

Direct Interelectrode Capacitances

	Unshielded	Shielded*
Grid to Plate (g to p)	1.9	1.9 μf
Input, g to (h+k+i.s.)	2.6	2.8 μf
Output, p to (h+k+i.s.)	0.3	1.0 μf
Diode Input (each unit) d to (h+k+i.s.)	1.8	2.0 μf

*External shield #315 connected to pin #8

Heater Characteristics

	12BR7A	9BR7	
Heater Voltage	6.3/12.6	4.7/9.4	volts
Heater Current	450/225 $\pm 6\%$	600/300 $\pm 6\%$	ma
Heater Warm-up Time (Note 1)	11	11	sec

Maximum Ratings (Design-Center Rating System)

Plate Voltage	300	300	volts
DC Grid Voltage	-50	-50	volts
Plate Dissipation	2.5	2.5	watts
Peak Inverse Diode Voltage	300	300	volts
Peak Diode Current (each unit)	60	60	ma

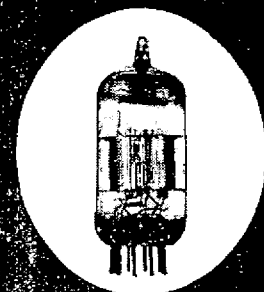
Heater-Cathode Voltage

Heater Negative with Respect to Cathode

(Total DC and Peak)	300	300	volts
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Heater Positive with Respect to Cathode

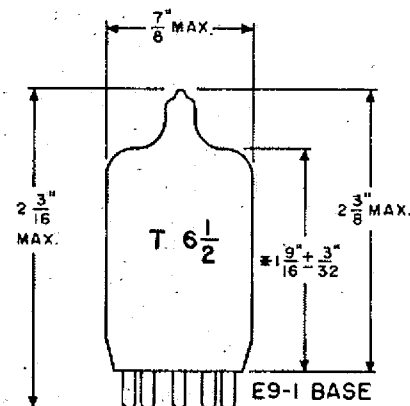
DC	100	100	volts
Total DC and Peak	200	200	volts



GENERAL DESCRIPTION

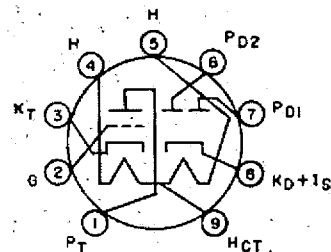
Jumbo miniature double high perveance diodes, medium mu triode.

DIMENSIONAL OUTLINE AND MECHANICAL SPECIFICATIONS



* MEASURED FROM BASE SEAT TO BULB-TOP LINE
AS DETERMINED BY RING GAUGE OF 7/16 I.D.

6-2



9 PM

BASING DIAGRAM
Bottom View of Base

**Typical Operating Conditions and Characteristics—
Class A Amplifier**

	12BR7A	9BR7	
Plate Voltage	100	250	volts
Cathode Bias Resistor	270	200	ohms
Plate Resistance (approximate) ..	15000	10900	ohms
Transconductance	4000	4000	μ mhos
Amplification Factor	60	60	
Plate Current	3.7	10	ma
Grid Voltage (approximate) for 10 μ a plate current	-5	-12	volts

**Typical Operating Conditions and Characteristics—
Diode Section**

Average Diode Current, Each Plate at 5 v DC.....17 ma

NOTE 1—Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four times the rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three times the rated heater voltage divided by the rated heater current.

PHILCO

RECEIVING TUBE

DATA SHEET

TENTATIVE

DESCRIPTION

Type 12AE7 is a jumbo miniature low- μ dissimilar double triode intended for use as a driver tube for the audio output stage of hybrid automobile radios. Both heater and plate are designed for 12 volt operation.

MECHANICAL DATA

Cathode Coated Unipotential
 Outline Drawing 6-2
 Bulb T6 $\frac{1}{2}$
 Base E9-1 Small Button 9-pin
 Maximum Diameter $\frac{7}{8}$ inch
 Maximum Overall Length $2\frac{3}{16}$ inches
 Maximum Seated Height $1\frac{15}{16}$ inches
 Basing 9A

1—#2 Plate	6—#1 Plate
2—#2 Grid	7—#1 Grid
3—#2 Cathode	8—#1 Cathode
4—Heater	9—Heater Center Tap
5—Heater	

Mounting Position Any

ELECTRICAL DATA

Direct Interelectrode Capacitance (without shield)

Grid to Plate (Triode 1)	3.9 μ f
Grid to Plate (Triode 2)	3.4 μ f
Input (Triode 1)	4.7 μ f
Input (Triode 2)	4.2 μ f
Output (Triode 1)	0.75 μ f
Output (Triode 2)	0.85 μ f

Heater Characteristics

Heater Voltage	12.6 volts
Heater Current	0.45 amp ($\pm 10\%$)
Maximum Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	16.0 volts
Heater Positive with Respect to Cathode	16.0 volts

Maximum Ratings (Design-Center Rating System) (Note 1)

Plate Voltage	16.0 volts
Positive DC Grid Voltage	0 volts
Plate Dissipation	1.0 watt
Grid Circuit Resistance	1.5 megohms

Typical Operating Conditions and Characteristics

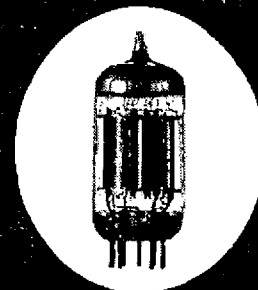
Plate Voltage (each triode)	12.6 volts
Grid Leak Resistor	
Triode 1	1.5 megohms
Triode 2	1.0 megohm

(Over)

12AE7

DISSIMILAR

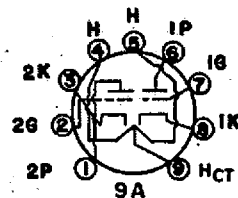
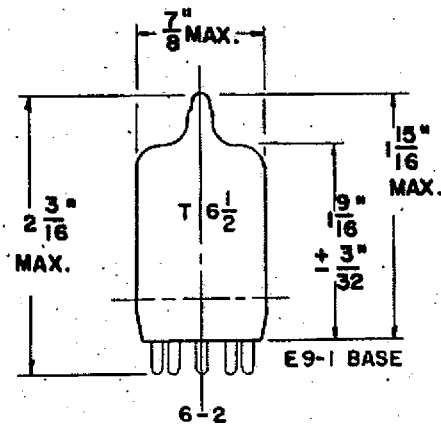
DUO-TRIODE TUBE



GENERAL DESCRIPTION

Jumbo miniature dissimilar duo-triode for hybrid auto radio driver applications.

DIMENSIONAL OUTLINE AND MECHANICAL SPECIFICATIONS



BASING DIAGRAM
Bottom View of Base

Plate Current	
Triode 1	1.9 ma
Triode 2	7.5 ma
Transconductance	
Triode 1	4000 μ mhos
Triode 2	6500 μ mhos
Amplification Factor	
Triode 1	13.0
Triode 2	6.4
Plate Resistance	
Triode 1	3150 ohms
Triode 2	985 ohms

NOTE

1. Ratings apply to each section unless otherwise stated.

PHILCO

RECEIVING TUBE

DATA SHEET

TENTATIVE

DESCRIPTION

Type 12DW8 is a diode-dissimilar duo-triode designed to function as a combined second detector, first audio stage, and transistor driver stage in 12 volt hybrid automobile radios. Triode #1 is the first audio stage, triode #2 is the driver. The principal feature of the 12DW8 is its ability to operate with a 12 volt plate supply.

MECHANICAL DATA

Cathode	Coated Unipotential
Outline Drawing	6-2
Bulb	T6 $\frac{1}{2}$
Base	E9-1 Small Button Miniature
Maximum Diameter	$\frac{7}{8}$ inch
Maximum Overall Length	$2\frac{3}{16}$ inches
Maximum Seated Height	$1\frac{15}{16}$ inches
Basing	9JC

1—Triode #2 Plate	6—Triode #1 Plate
2—Triode #2 Grid	7—Triode #1 Grid
3—Triode #2 Cathode	8—Triode #1 and Diode Cathode
4—Heater	9—Diode Plate
5—Heater	
Mounting Position	Any

ELECTRICAL DATA

Direct Interelectrode Capacitances

	Shielded*	Unshielded
Triode #1:		
Grid to Plate (g to p)	1.8	1.8 $\mu\mu\text{f}$
Input: g to (h + k)	2.9	1.6 $\mu\mu\text{f}$
Output: p to (h + k)	1.4	0.7 $\mu\mu\text{f}$
Diode Plate to Triode #1 Grid (Maximum)	0.4	0.4 $\mu\mu\text{f}$

Triode #2:		
Grid to Plate (g to p)	3.5	3.2 $\mu\mu\text{f}$
Input: g to (h + k)	4.4	4.4 $\mu\mu\text{f}$
Output: p to (h + k)	2.1	0.7 $\mu\mu\text{f}$

*With external shield #315 connected to pin #8

Heater Characteristics

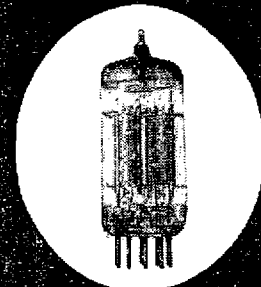
Heater Voltage	12.6 volts
Heater Current	450 ma
Maximum DC Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	16.0 volts
Heater Positive with Respect to Cathode	16.0 volts

Maximum Ratings (Design Maximum Rating System) (Note 1)

	Triode #1	Triode #2	Diode
Plate Voltage	16.0	16.0	volts
Positive DC Grid Voltage	0	0	volts
Plate Dissipation	0.5	0.5	0.5 watts
Grid Circuit Resistance	1.5	1.5	megohm

12DW8

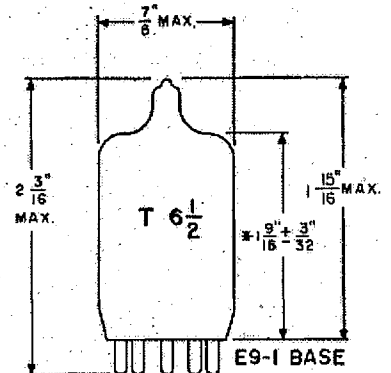
DIODE, DISSIMILAR DUO-TRIODE TUBE



GENERAL DESCRIPTION

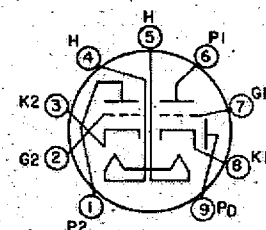
Diode, dissimilar duo-triode for use in hybrid auto radios.

DIMENSIONAL OUTLINE AND MECHANICAL SPECIFICATIONS



* MEASURED FROM BASE SEAT TO BULB-TOP LINE
AS DETERMINED BY RING GAUGE OF $\frac{7}{16}$ I.D.

6-2



9JC
BASING DIAGRAM
Bottom View of Base

Typical Operating Conditions and Characteristics

	Triode #1	Triode #2	Diode
Plate Supply Voltage	12.6	12.6	volts
Transconductance	2700	6500	μ mho
Amplification Factor	9.5	6.4	
Plate Current	1.9	7.5	ma
Average Diode Current @ 10 v....			20 ma
Grid Voltage	0	0	volts
Grid Resistor	1.5	1.0	megohms
Plate Voltage Dropping Resistor ...	100	100	ohms

NOTE 1—Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions. The device manufacturer chooses these values to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in device characteristics. The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, and environmental conditions.

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

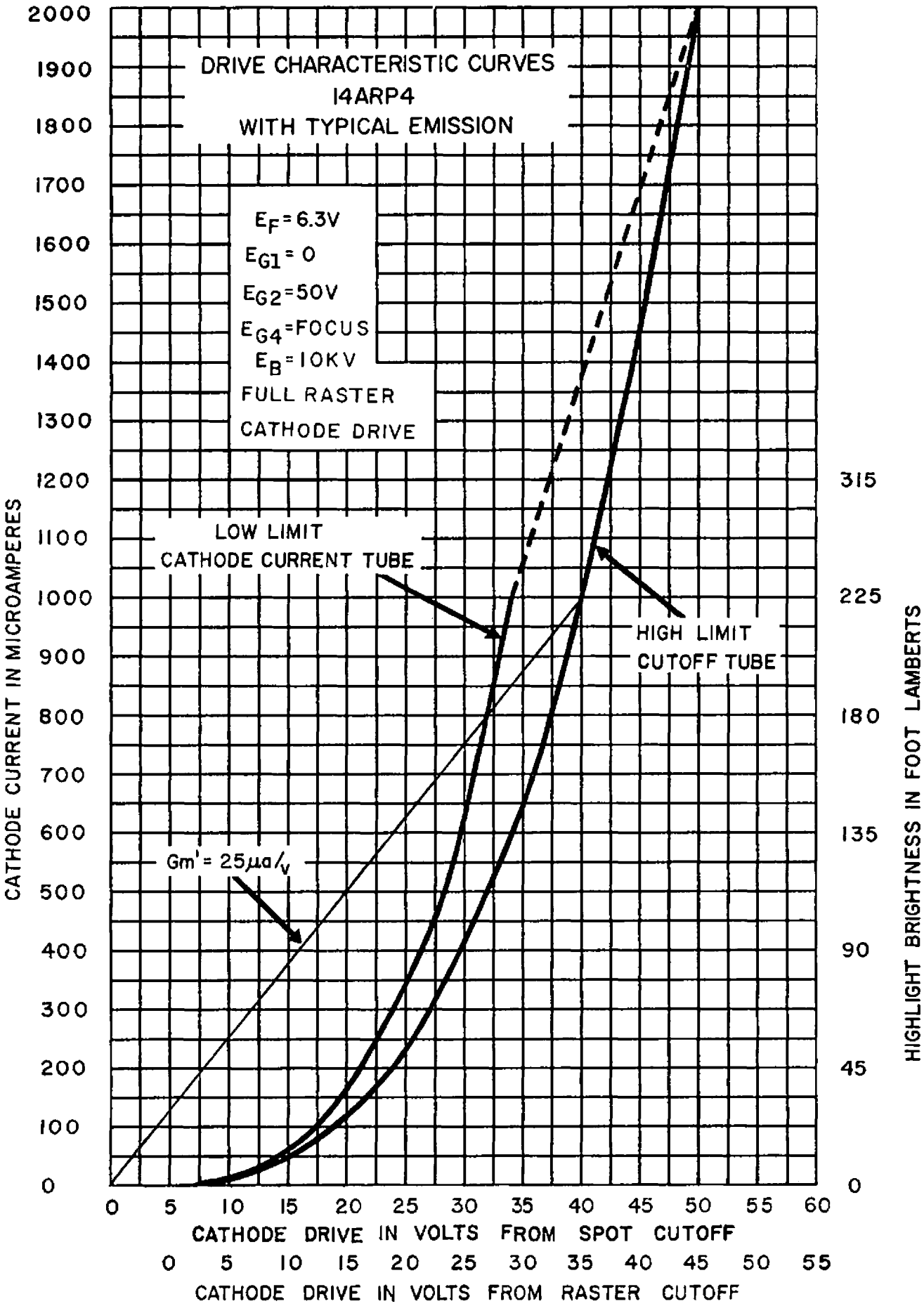
MECHANICAL DATA

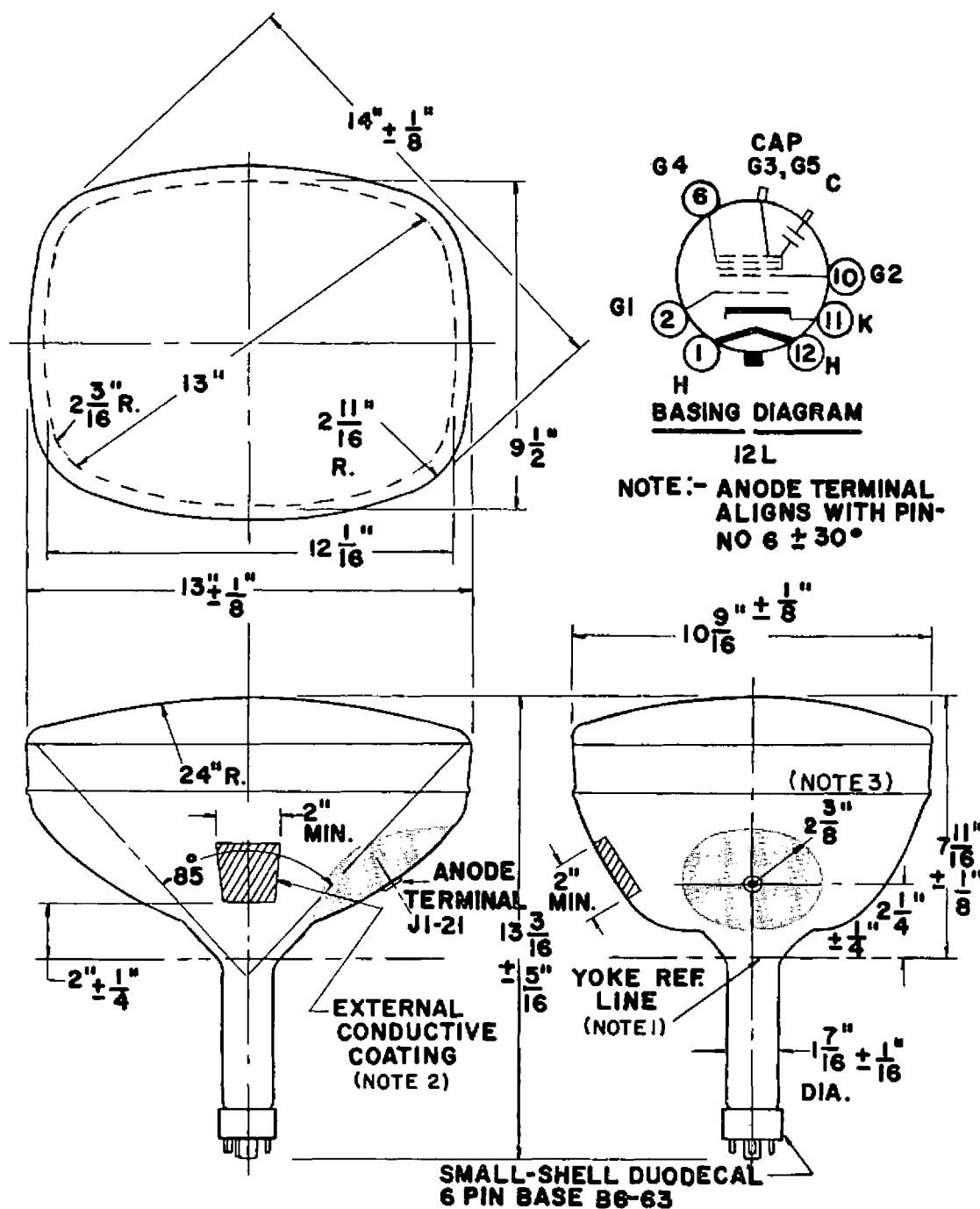
Overall Length	13-3/16 ± 5/16 Inches
Neck Length	5-1/2 ± 3/16 Inches
Greatest Dimensions of Bulb	
Diagonal	14 ± 1/8 Inches
Width	13 ± 1/8 Inches
Height	10-9/16 ± 1/8 Inches
Minimum Useful Screen Dimensions (maximum assured dimensions)	
Diagonal	13 Inches
Width	12-1/16 Inches
Height	9 1/2 Inches
Bulb 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

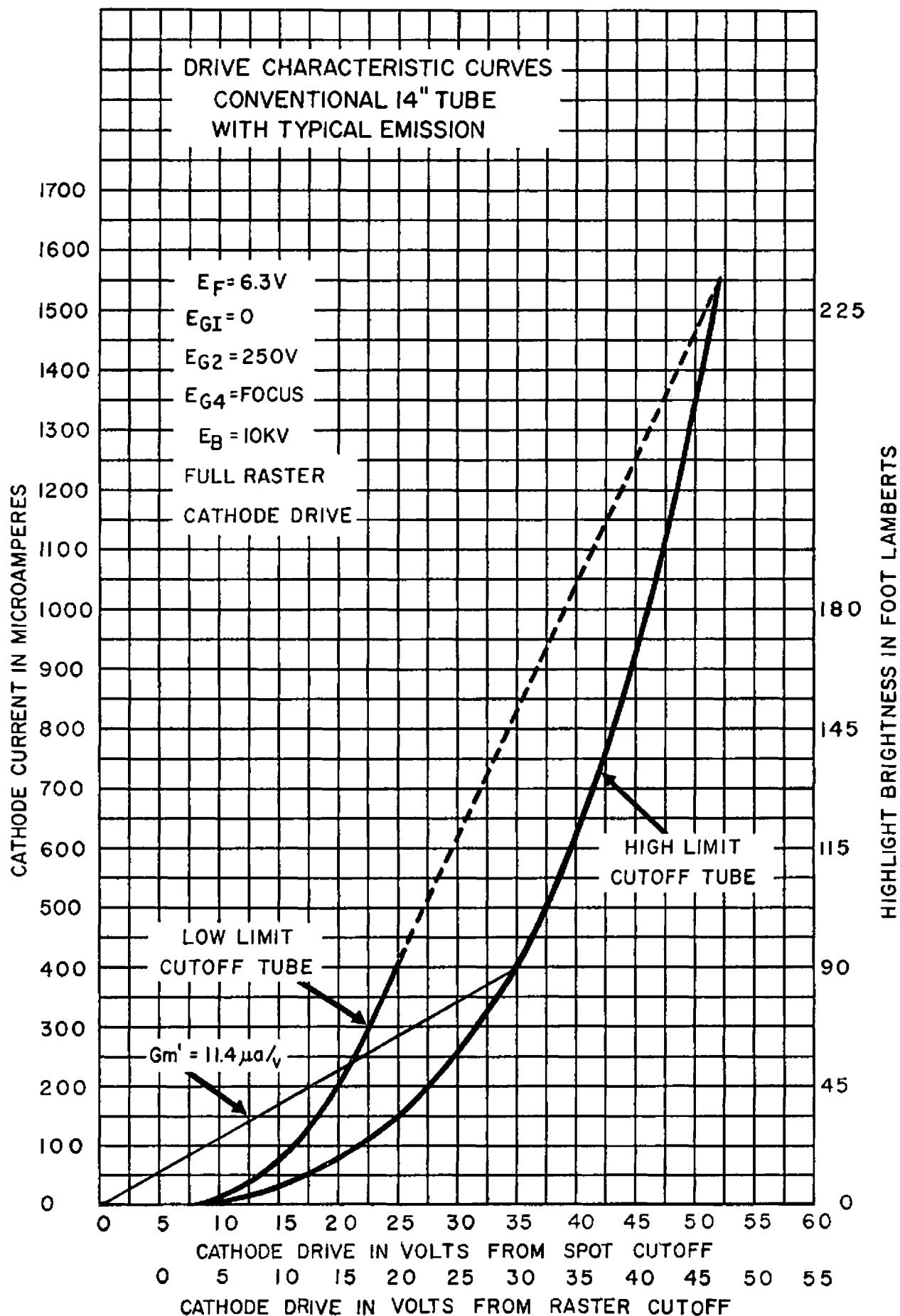
14ARP4





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.

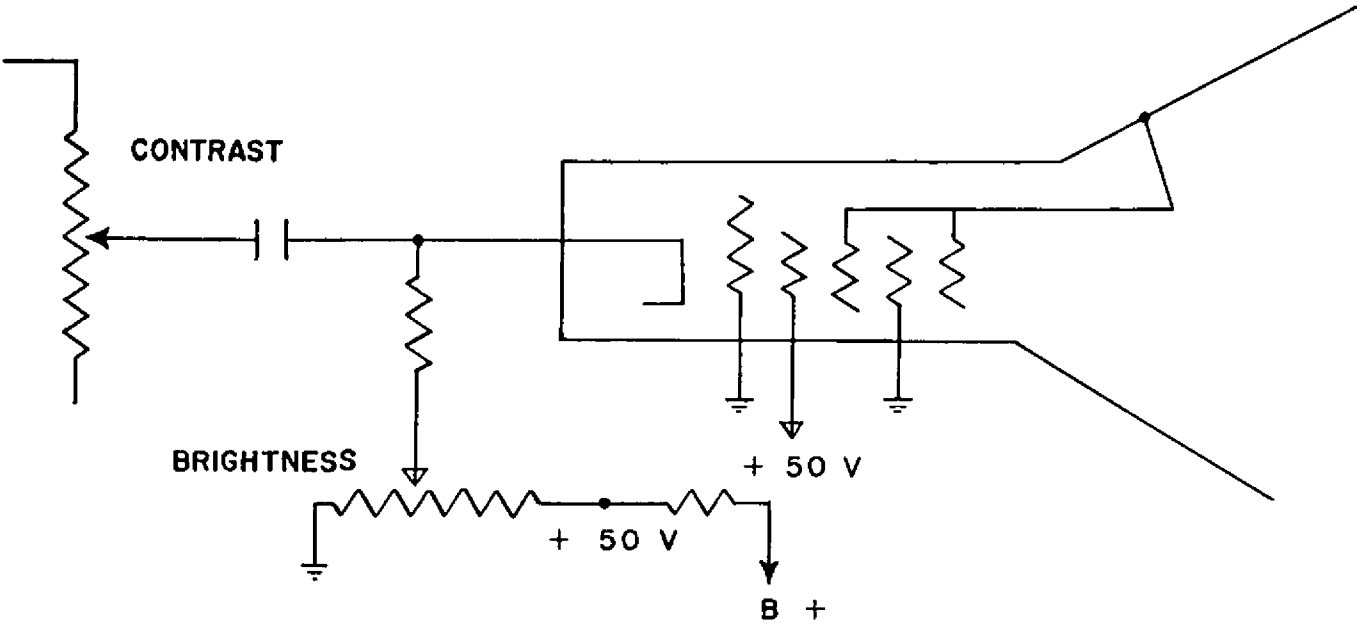


FIGURE 1

16ASP4
Television Picture Tube

PHILCO - LANSDALE DIVISION

CATHODE RAY TUBE

DATA SHEET

Tentative

Description

The 16ASP4 is a 16" - 114° direct view rectangular Cathode Ray Tube employing a sagged glass twin safety panel. The tube incorporates an aluminized screen, non ion trap gun and is designed to operate with electrostatic focus and magnetic deflection.

The electron gun provides an exceptionally small spot size resulting in sharp picture resolution. The tube base is short and provides straight through leads oriented by an indexing lug.

Electrical Data

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle, approximate	
Horizontal	102 Degrees
Vertical	85 Degrees
Diagonal	114 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	4 uuf
Grid #1 to All	5 uuf
External Coating Capacitance	1000 Min. uuf 1500 Max. uuf
Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	0.45 ±5% Amperes
Heater Warm-up Time (Note 1)	11 Seconds

Optical Data

Phosphor Number	Aluminized P4
Fluorescent Color	White
Persistence	Medium Short
Faceplate (Bonded Shield)	FP125
Light Transmission at Center, approximate	60 Percent

Mechanical Data

Overall Length	10 13/32 +1/4-3/16 Inches
Neck Length	4 1/8 +1/8-1/16 Inches
Greatest Dimensions of Bulb	
Diagonal	15 5/8 +3/32-1/32 Inches
Width	13 45/64 +3/32-1/32 Inches
Height	11 3/32 +3/32-1/32 Inches

Minimum Useful Screen Dimensions	125 Sq. Inches
(maximum assured dimensions)	
Diagonal	14 7/8 Inches
Width.	12 15/16 Inches
Height	10 1/4 Inches
Bulb	J125A1
Base	B7-208
Basing	8HR
Anode Contact.	J1-21
Anode Contact Aligns with Pin #4 $\pm$ 30°	

Grid Drive Service

Voltages are positive with respect to Cathode unless indicated otherwise.

Maximum Ratings (Absolute Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage.	-550 Min. to +1100 Max. Volts DC
Grid #2 Voltage.	550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value	154 Max. Volts DC
Negative-Peak Value	220 Max. Volts
Positive-Bias Value	0 Max. Volts DC
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	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

Typical Operating Conditions

Anode Voltage	15,000 Volts DC
Grid #4 Voltage for Focus	-100 to +300 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note 3)	-43 to -70 Volts

Maximum Circuit Values

Grid #1 Circuit Resistance	1.5 Max. Megs
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Cathode Drive Service

Voltages are positive with respect to Grid #1 unless indicated otherwise.

Maximum Ratings (Absolute Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage	-400 Min. to +1250 Max. Volts DC
Grid #2 Voltage	700 Max. Volts DC

Cathode Voltage
 Positive-Bias Value 154 Max. Volts DC
 Positive-Peak Value 220 Max. Volts
 Negative-Bias Value 0 Max. Volts DC
 Negative-Peak Value 2 Max. Volts
 Peak-Heater-Cathode Voltage
 Heater Negative with Respect to Cathode
 During Warm-up Period not to Exceed
 15 Seconds 450 Max. Volts
 After Equipment Warm-up Period 200 Max. Volts
 Heater Positive with Respect to Cathode 200 Max. Volts

Typical Operating Conditions

Anode Voltage 15,000 Volts DC
 Grid #4 Voltage for Focus -100 to +300 Volts DC
 Grid #2 Voltage 300 Volts DC
 Grid #1 Voltage 0 Volts DC
 Cathode Voltage (Note 3) +38 to +59 Volts DC

Maximum Circuit Values

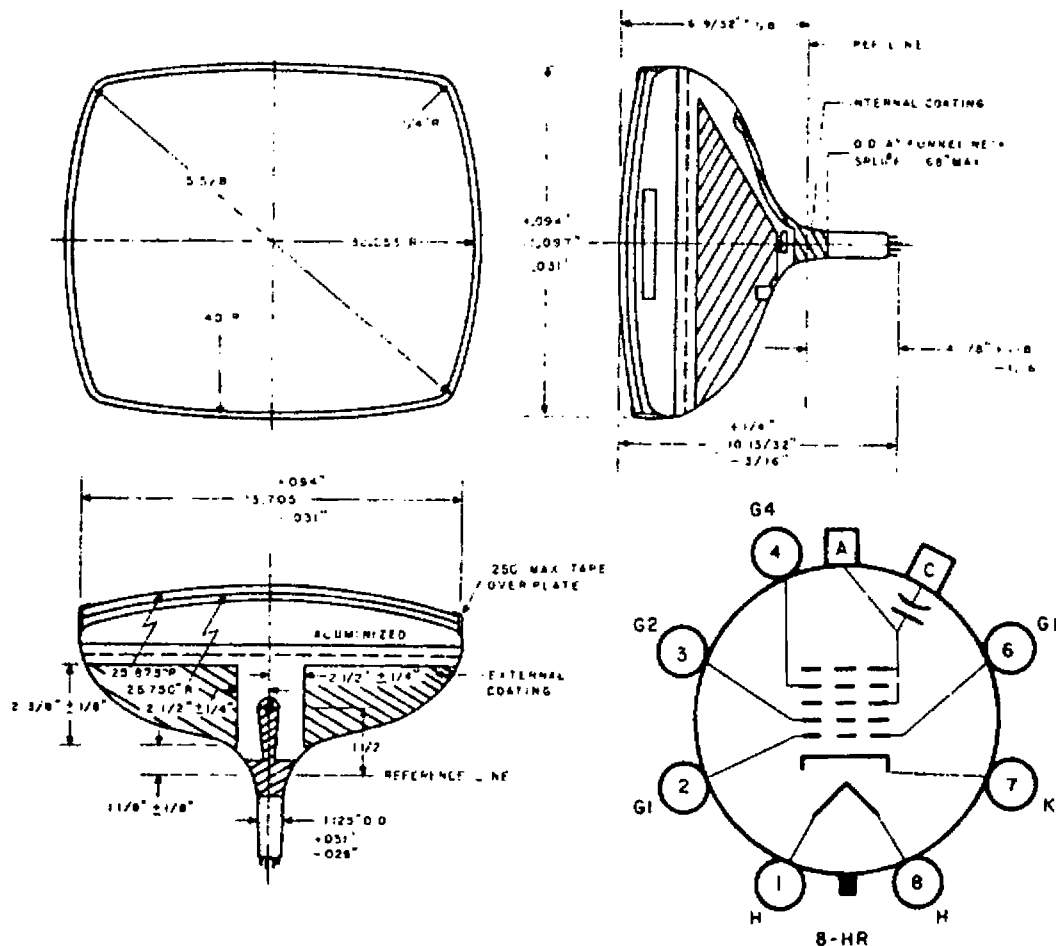
Grid #1 Circuit Resistance 1.5 Max. Megs.

Notes:

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3, and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.

PHILCO CORPORATION - LANSDALE DIVISION

Outline Drawing
16ASPL₄
Television Picture Tube



MECHANICAL NOTES

1. The reference line is determined by reference line gauge JEDEC #126.
2. The area around the button is covered with an insulating coating.
3. Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. Bottom circumference of the base wafer will fall within a circle concentric with bulb axis and having a diameter of $1.3/4$ ".

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 18,000 volts.

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PHILCO CATHODE RAY TUBE DATA SHEET

TENTATIVE

17DAP4/SF17 TELEVISION PICTURE TUBE

DESCRIPTION

The 17DAP4/SF17 is an extremely short electrostatic focus and magnetic deflection, direct view picture tube specifically intended for television applications. Special features of the tube are its very short overall length and unusually low heater power. The heater is a 450 milliamperere 2.68 volt design with controlled warm-up time for series string application. Other features of the tube are a metal backed screen, a new straight gun requiring no ion trap magnet, external conductive coating, and a new short integral glass-button base having straight thru leads and an indexing lug.

GENERAL DESCRIPTION

17" rectangular extremely short cathode ray tube intended for direct view television applications requiring low heater power.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal	105 Degrees
Vertical	87 Degrees
Diagonal	110 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	3.65 μf
Grid #1 to All	4.15 μf
External Coating Capacitance	900 Min. μf 1400 Max. μf
Heater Voltage	2.68 $\pm$ 5% Volts
Heater Current at 2.68 Volts	0.45 Amperes
Heater Warm-up Time (Note 1)	11 Seconds

OPTICAL DATA

Phosphor Number	P4
Fluorescent Color	White
Persistence	Medium
Faceplate	
Light Transmission at Center, approximate	77 Percent

MECHANICAL DATA

Overall Length	10 $\frac{11}{16}$ $\pm$ $\frac{3}{16}$ Inches
Neck Length	3 $\frac{9}{16}$ $\pm$ $\frac{1}{16}$ Inches
Greatest Dimensions of Bulb	
Diagonal	16 $\frac{9}{16}$ $\pm$ $\frac{1}{8}$ Inches
Width	15 $\frac{5}{8}$ $\pm$ $\frac{1}{8}$ Inches
Height	12 $\frac{3}{4}$ $\pm$ $\frac{1}{8}$ Inches
Minimum Useful Screen Dimensions (maximum assured dimensions)	
Diagonal	15 $\frac{3}{4}$ Inches
Width	14 $\frac{3}{4}$ Inches
Height	11 $\frac{11}{16}$ Inches
Base	B7-208
Basing	.8JK
Anode Contact	J1-21
Anode Contact Aligns with Center	
Line between Pin #6 and #7	$\pm$ 30°

GRID DRIVE SERVICE

Voltagess are positive with respect to cathode unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 2)	17,600 Max. Volts DC
Grid #4 Voltage	- 700 to + 950 Max. Volts DC
Grid #2 Voltage	550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value	155 Max. Volts DC
Negative-Peak Value	220 Max. Volts
Positive-Bias Value	0 Max. Volts DC
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	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts DC
Grid #4 Voltage for Focus	100 to 500 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note 3)	- 35 to - 72 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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CATHODE DRIVE SERVICE

Voltagess are positive with respect to Grid #1 unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 2)	17,600 Max. Volts DC
Grid #4 Voltage	- 550 to + 1100 Max. Volts DC
Grid #2 Voltage	700 Max. Volts DC
Cathode Voltage	
Positive-Bias Value	155 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed	
15 Seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

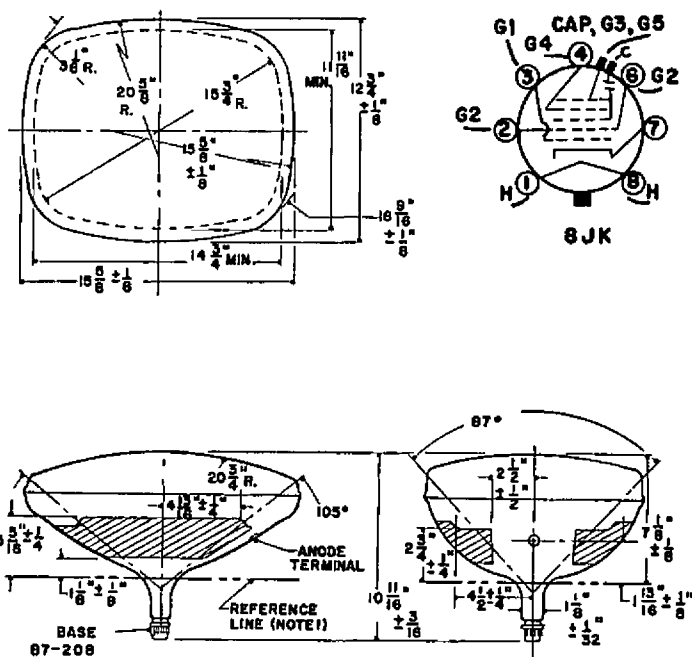
Anode Voltage	14,000 Volts DC
Grid #4 Voltage for Focus	150 to 550 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage	0 Volts DC
Cathode Voltage (Note #3)	+34 to +60 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance 1.5 Max. Megs.

NOTES

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3 and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of the undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.



MECHANICAL NOTES

1. The reference line is determined by reference line gauge JETEC #126.
2. The area around the button is covered with an insulating coating.
3. Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. Bottom circumference of the base wafer will fall within a circle concentric with bulb axis and having a diameter of 1 3/4".

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts.

PHILCO CATHODE RAY TUBE DATA SHEET

TENTATIVE

17DRP4 TELEVISION PICTURE TUBE

from JEDEC release #2586, Sept. 14, 1959

DESCRIPTION

The 17DRP4 is an extremely short electrostatic focus and magnetic deflection, direct view picture tube specifically intended for television applications. The tube incorporates internal magnetic shielding in the gun design so that, in spite of the very short neck length, deflecting yokes without special magnetic shields may be used. Another feature of the tube is its unusually low heater power. The heater is a 450 milliamperere, 2.68 volt design with controlled warm-up time for series string applications. Other features of the tube are a metal backed screen, a straight gun requiring no ion trap magnet and a short integral glass-button base having straight through leads and an indexing lug. The distinctive yellow base identifies the 17DRP4 as having internal magnetic shielding.

GENERAL DESCRIPTION

17" rectangular extremely short cathode ray tube intended for direct view television applications requiring low heater power.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal	105 Degrees
Vertical	87 Degrees
Diagonal	110 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	3.65 $\mu\mu\text{f}$
Grid #1 to All	4.15 $\mu\mu\text{f}$
External Coating Capacitance	900 Min. $\mu\mu\text{f}$ 1400 Max. $\mu\mu\text{f}$
Heater Voltage	2.68 $\pm$ 10% Volts
Heater Current at 2.68 Volts	0.45 Amperes
Heater Warm-up Time (Note 1)	11 Seconds

OPTICAL DATA

Phosphor Number	P4
Fluorescent Color	White
Persistence	Medium
Faceplate	
Light Transmission at Center, approximate	77 Percent

MECHANICAL DATA

Overall Length	10 $\frac{13}{16}$ $\pm$ $\frac{3}{4}$ Inches
Neck Length	3 $\frac{1}{16}$ $\pm$ $\frac{1}{16}$ Inches
Greatest Dimensions of Bulb	
Diagonal	16 $\frac{9}{16}$ $\pm$ $\frac{1}{8}$ Inches
Width	15 $\frac{5}{8}$ $\pm$ $\frac{1}{8}$ Inches
Height	12 $\frac{3}{4}$ $\pm$ $\frac{1}{8}$ Inches
Minimum Useful Screen Dimensions (maximum assured dimensions)	
Diagonal	15 $\frac{3}{4}$ Inches
Width	14 $\frac{3}{4}$ Inches
Height	11 $\frac{11}{16}$ Inches
Bulb	J132 $\frac{1}{2}$ A1
Base	B7-208
Basing	8JK
Anode Contact	J1-21
Anode Contact Aligns with Center	
Line between Pin #6 and #7	$\pm$ 30°

GRID DRIVE SERVICE

Voltages are positive with respect to cathode unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 2)	17,600 Max. Volts DC
Grid #4 Voltage	-700 to +950 Max. Volts DC
Grid #2 Voltage	550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value	155 Max. Volts DC
Negative-Peak Value	400 Max. Volts
Positive-Bias Value	0 Max. Volts DC
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	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts DC
Grid #4 Voltage for Focus	100 to 500 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note 3)	-35 to -72 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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CATHODE DRIVE SERVICE

Voltages are positive with respect to Grid #1 unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 2)	17,600 Max. Volts DC
Grid #4 Voltage	-550 to +1100 Max. Volts DC
Grid #2 Voltage	700 Max. Volts DC
Cathode Voltage	
Positive-Bias Value	155 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed	
15 Seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

17DRP4

TYPICAL OPERATING CONDITIONS

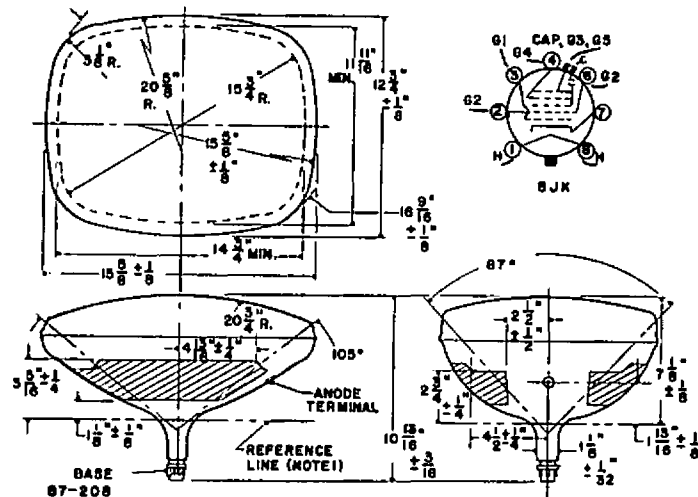
Anode Voltage	14,000 Volts DC
Grid #4 Voltage for Focus	150 to 550 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage	0 Volts DC
Cathode Voltage (Note #3)	+34 to +60 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance 1.5 Max. Megs.

NOTES

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3 and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of the undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.



MECHANICAL NOTES

1. The reference line is determined by reference line gauge JETEC #126.
2. The area around the button is covered with an insulating coating.
3. Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. Bottom circumference of the base wafer will fall within a circle concentric with bulb axis and having a diameter of $1\frac{3}{4}$ ".

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts.

PHILCO CORPORATION
LANSDALE TUBE COMPANY DIVISION
LANSDALE, PENNSYLVANIA



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CATHODE RAY TUBE

DATA SHEET

TENTATIVE

19BLP4

TELEVISION

PICTURE

TUBE

DESCRIPTION

The 19BLP4 is a directly viewed, rectangular glass picture tube having an aluminized screen. Other features include a relatively flat envelope, compound radius faceplate, a special internal contouring in the deflection yoke region to obtain 114° deflection with 110° components.

A short improved electron gun requiring no ion trap magnet and which also improves edge focus quality is also incorporated as well as external conductive coating and a new short integral glass button base having straight thru leads and an indexing lug.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal	102 Degrees
Vertical	85 Degrees
Diagonal	114 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	4 μ f
Grid #1 to All	5 μ f
External Coating Capacitance	1300 Min. μ f 1700 Max. μ f
Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	600 $\pm$ 30 Ma.
Heater Warm-up Time (Note 1)	11 Seconds

OPTICAL DATA

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

MECHANICAL DATA

Overall Length	11 $\frac{5}{16}$ + $\frac{1}{4}$ - $\frac{3}{16}$ Inches
Neck Length	4 $\frac{1}{8}$ + $\frac{1}{16}$ - $\frac{1}{8}$ Inches
Greatest Dimensions of Bulb	
Diagonal	18 $\frac{5}{8}$ $\pm$ $\frac{1}{8}$ Inches
Width	16 $\frac{13}{32}$ $\pm$ $\frac{1}{8}$ Inches
Height	13 $\frac{11}{32}$ $\pm$ $\frac{1}{8}$ Inches
Minimum Useful Screen Dimensions	172 Sq. Inches
(maximum assured dimensions)	
Diagonal	17 $\frac{9}{16}$ Inches
Width	15 $\frac{1}{8}$ Inches
Height	12 Inches
Bulb	J149A2
Base	B7-208
Basing	8HR
Anode Contact	J1-21
Anode Contact Aligns with Pin #4	$\pm$ 30°

GRID DRIVE SERVICE

Voltag es are positive with respect to cathode unless indicated otherwise

MAXIMUM RATINGS (Design Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage	- 550 Min. to + 1100 Max. Volts DC
Grid #2 Voltage	200 Min. to 550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value	154 Max. Volts DC
Negative-Peak Value	220 Max. Volts
Positive-Bias Value	0 Max. Volts DC
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	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts DC
Grid #4 Voltage for Focus	0 to 400 Volts DC
Grid #2 Voltage	400 Volts DC
Grid #1 Voltage (Note 3)	- 36 to - 94 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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CATHODE DRIVE SERVICE

Voltag es are positive with respect to Grid #1 unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage	- 400 Min. to + 1250 Max. Volts DC
Grid #2 Voltage	350 Min. to 700 Max. Volts DC
Cathode Voltage	
Positive-Bias Value	154 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed	
15 Seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

19BLP4

TYPICAL OPERATING CONDITIONS

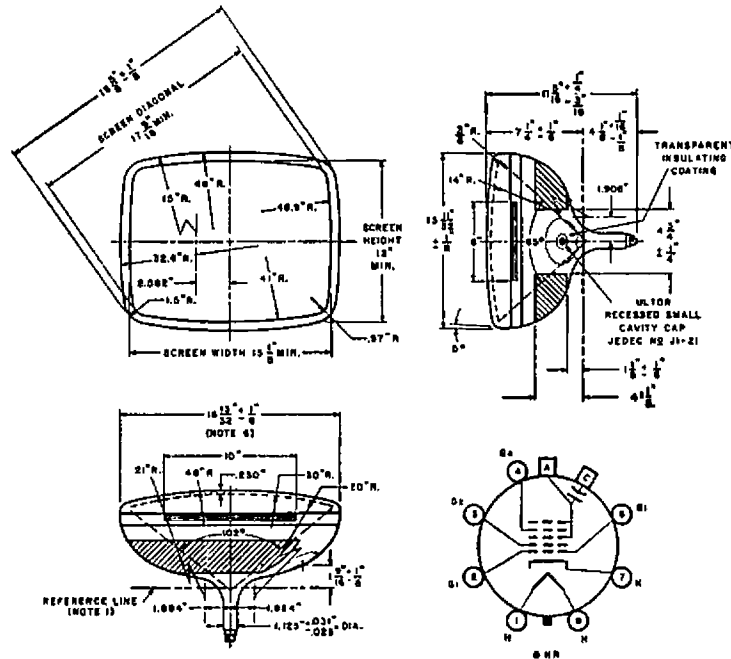
Anode Voltage	16,000 Volts DC
Grid #4 Voltage for Focus	0 to 400 Volts DC
Grid #2 Voltage	400 Volts DC
Grid #1 Voltage	0 Volts DC
Cathode Voltage (Note #3)	+36 to +78 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance 1.5 Max. Megs.

NOTES

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3 and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of the undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.



MECHANICAL NOTES

1. The reference line is determined by reference line gauge JEDEC #126.
2. The area around the button is covered with an insulating coating.
3. Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. Bottom circumference of the base wafer will fall within a circle concentric with bulb axis and having a diameter of $1\frac{3}{4}$ ".

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts.

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CATHODE RAY TUBE

DATA SHEET

TENTATIVE

19BMP4

TELEVISION

PICTURE

TUBE

DESCRIPTION

The 19BMP4 is a directly viewed, rectangular glass picture tube. The tube is electrically identical to the 19BLP4.

It incorporates a short improved electron gun requiring no ion trap magnet and which also improves edge focus quality. The tube is externally coated and features the new short integral glass button base having straight thru leads and an indexing lug.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal	102 Degrees
Vertical	86 Degrees
Diagonal	114 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	4 μ f
Grid #1 to All	5 μ f
External Coating Capacitance	1300 Min. μ f
	1700 Max. μ f
Heater Voltage	6.3 Volts
Heater Current at 2.68 Volts	0.600 $\pm$.030 Amperes
Heater Warm-up Time (Note 1)	11 Seconds

OPTICAL DATA

Phosphor Number	Aluminized P4
Fluorescent Color	White
Persistence	Medium Short
Faceplate (Bonded Shield)	FP159A2
Light Transmission at Center, approximate	44 Percent

MECHANICAL DATA

Overall Length	11 $\frac{1}{16}$ $\pm$ $\frac{1}{4}$ Inches
Neck Length	4 $\frac{1}{16}$ $\pm$ $\frac{1}{16}$ Inches
Greatest Dimensions of Bulb	
Diagonal	19.856 $\pm$.094 Inches
Width	17.264 $\pm$.094 Inches
Height	14.090 $\pm$.094 Inches
Minimum Useful Screen Dimensions	172 Sq. Inches
(maximum assured dimensions)	
Diagonal	17 $\frac{3}{4}$ Inches
Width	15 $\frac{5}{16}$ Inches
Height	12 $\frac{1}{16}$ Inches
Bulb	J149-C1
Base	B7-208
Basing	8HR
Anode Contact	J1-21
Anode Contact Aligns with Pin #4 $\pm$ 30°	

GRID DRIVE SERVICE

Voltag es are positive with respect to cathode unless indicated otherwise.

MAXIMUM RATINGS (Design Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage	-550 Min. to +1100 Max. Volts DC
Grid #2 Voltage	200 Min. to 550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value	154 Max. Volts DC
Negative-Peak Value	220 Max. Volts
Positive-Bias Value	0 Max. Volts DC
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	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts DC
Grid #4 Voltage for Focus	0 to +400 Volts DC
Grid #2 Voltage	400 Volts DC
Grid #1 Voltage (Note 3)	-36 to -94 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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CATHODE DRIVE SERVICE

Voltag es are positive with respect to Grid #1 unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage	-400 Min. to +1250 Max. Volts DC
Grid #2 Voltage	350 Min. to 700 Max. Volts DC
Cathode Voltage	
Positive-Bias Value	154 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed	
15 Seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

from JEDEC release #3336, July 10, 1961

19BMP4

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts DC
Grid #4 Voltage for Focus	0 to 400 Volts DC
Grid #2 Voltage	400 Volts DC
Grid #1 Voltage	0 Volts DC
Cathode Voltage (Note #3)	+36 to +78 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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NOTES

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3 and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of the undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.

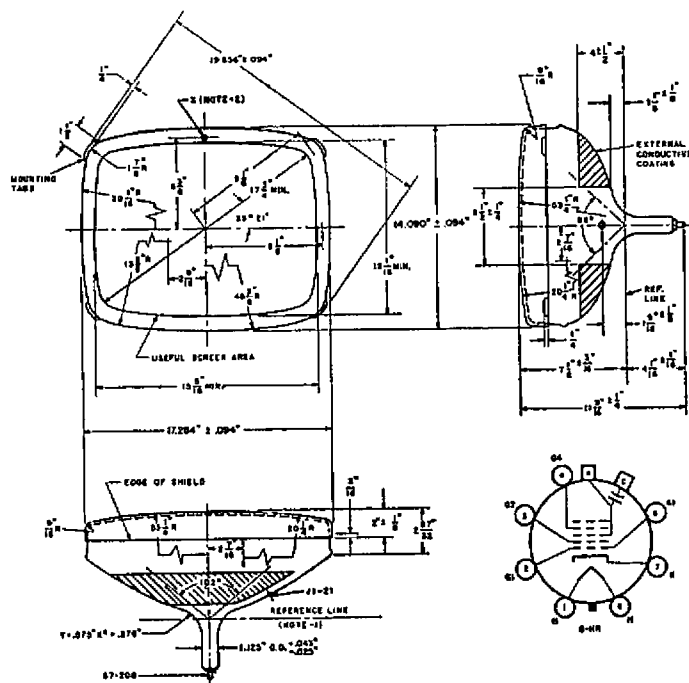


DIAGRAM NOTES:

1. Reference line is determined by plane C-C' of JEDEC #126 Reference Line Gauge, when the gauge is seated against the bulb.
2. Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:
 Plane tangent to crown of face to plane of X: 0.500" Nom.
 Plane of X to plane of Y = .429" ± .030".
 Plane of X to plane of Z = .749" ± .030".

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts.

The information, diagrams, or any other data included herein are believed to be accurate and reliable. However, the Philco Corporation, Lansdale Division, assumes no responsibility or liability whatsoever for the application, interpretation or use made of such information, diagrams or data especially insofar as the use of said information, diagrams or data affects any patent, trademark or proprietary data rights.

PHILCO®

CATHODE RAY TUBE

DATA SHEET

TENTATIVE

19BUP4

TELEVISION

PICTURE

TUBE

DESCRIPTION

The 19BUP4 is a 19"—114° direct view, rectangular glass, cathode ray tube employing both electrostatic focus and magnetic deflection for television applications. The heater-cathode package is designed to operate at less than 1/4 watt with the heater rated at 2.2 volts and 102 milliamperes. With this low power requirement rating, the picture tube reaches an acceptable brightness level at only a fraction of the time required of conventional picture tubes. Other design features include a straight electron gun requiring no ion trap, metal backed screen for improved contrast and light output, a neck terminated in a hard lead stem and an indexing lug adapted to a short base. It has a relatively flat envelope, compound radius faceplate, a special internal contouring in the deflection yoke region to obtain 114° deflection with 110° components.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal	102 Degrees
Vertical	85 Degrees
Diagonal	114 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	1.2 μf
Grid #1 to All	5.5 μf
External Coating Capacitance	1300 Min. μf 1700 Max. μf
Heater Voltage	2.2 $\pm$ 10% Volts
Heater Current at 2.2 Volts	102 Ma.

MECHANICAL DATA

Overall Length	11 $\frac{5}{8}$ $\pm$ $\frac{3}{16}$ Inches
Neck Length	4 $\frac{3}{8}$ $\pm$ $\frac{1}{8}$ Inches
Greatest Dimension of Bulb	
Diagonal	18 $\frac{5}{8}$ $\pm$ $\frac{1}{8}$ Inches
Width	16 $\frac{13}{32}$ $\pm$ $\frac{1}{8}$ Inches
Height	13 $\frac{11}{32}$ $\pm$ $\frac{1}{8}$ Inches
Minimum Useful Screen Dimensions	172 Sq. Inches (maximum assured dimensions)
Diagonal	17 $\frac{9}{16}$ Inches
Width	15 $\frac{1}{8}$ Inches
Height	12 Inches
Bulb	J149A1
Base	B7-208
Basing	.8HR
Anode Contact	J1-21
Anode Contact Aligns with Pin # 4 $\pm$ 30°	

OPTICAL DATA

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

CATHODE DRIVE SERVICE

Voltages are positive with respect to Grid # 1 unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 1)	18,750 Max. Volts DC
Grid #4 Voltage	-200 Min. to +500 Max. Volts DC
Grid #2 Voltage	250 Max. Volts DC
Cathode Voltage	
Positive-Bias Value	154 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed	
15 Seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

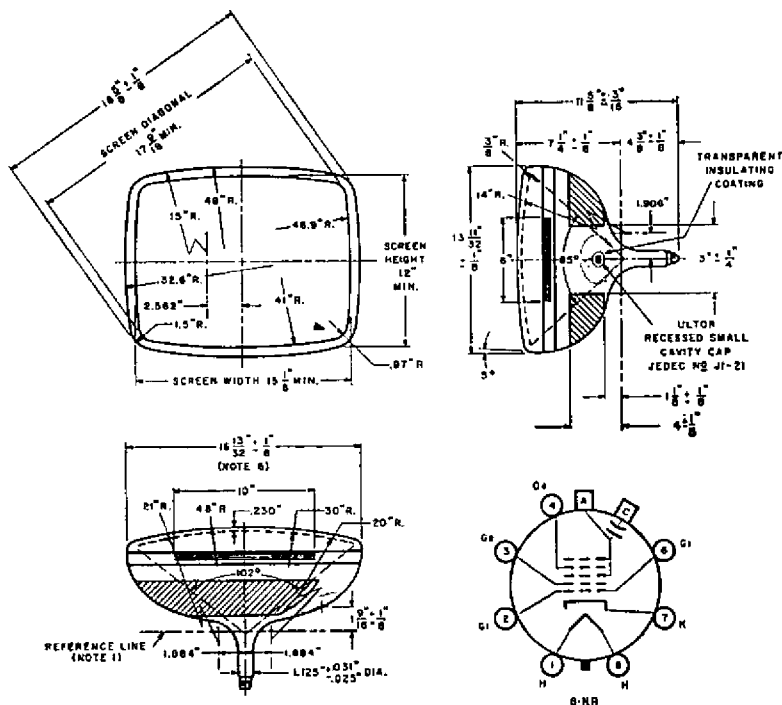
Anode Voltage	14,000 Volts DC
Grid #4 Voltage for Focus	0 to 400 Volts DC
Grid #2 Voltage	100 Volts DC
Grid #1 Voltage	0 Volts DC
Cathode Voltage (Note 2)	+45 to +60 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance 1.5 Max. Megs.

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 focused raster. For cutoff of the undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 3 volts.



MECHANICAL NOTES

1. The reference line is determined by reference line gauge JEDEC #126.
2. The area around the button is covered with an insulating coating.
3. Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. Bottom circumference of the base wafer will fall within a circle concentric with bulb axis and having a diameter of 13 3/4 inches.

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts

The information, diagrams, or any other data included herein are believed to be accurate and reliable. However, the Philco Corporation, Lansdale Division, assumes no responsibility or liability whatsoever for the application, interpretation or use made of such information, diagrams or data especially insofar as the use of said information, diagrams or data affects any patent, trademark or proprietary data rights.

LANSDALE DIVISION

PHILCO

A SUBSIDIARY OF *Ford Motor Company*

19CJP4

Television Picture Tube

PHILCO CORPORATION - LANSDALE DIVISION

CATHODE RAY TUBE

DATA SHEET

Tentative

Description

The 19CJP4 is a directly viewed, rectangular glass picture tube having an aluminized screen. Other features include a relatively flat envelope, compound radius faceplate, a special internal contouring in the deflection yoke region to obtain 114° deflection with 110° components.

A short improved electron gun requiring no ion trap magnet and which also improves edge focus quality is also incorporated as well as external conductive coating and a new short integral glass button base having straight thru leads and an indexing lug.

Electrical Data

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal.	102 Degrees
Vertical.	85 Degrees
Diagonal.	114 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All.	4 uuf
Grid #1 to All.	5 uuf
External Coating Capacitance.	1300 Min. uuf
	1700 Max. uuf
Heater Voltage.	6.3 Volts
Heater Current at 6.3 Volts	600±30 ma.
Heater Warm-up Time (Note 1)	11 Seconds

Optical Data

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

Mechanical Data

Overall Length	11 5/16+1/4-3/16 Inches
Neck Length.	4 1/8+1/16-1/8 Inches
Greatest Dimensions of Bulb	
Diagonal	18 5/8 ⁺ 1/8 Inches
Width.	16 13/32 ⁺ 1/8 Inches
Height	13 11/32 ⁺ 1/8 Inches
Minimum Useful Screen Dimensions	172 Sq. Inches
(maximum assured dimensions)	
Diagonal	17 9/16 Inches
Width	15 1/8 Inches
Height	12 Inches
Bulb	J149A2
Base	B7-208
Basing	8HR
Anode Contact.	J1-21
Anode Contact Aligns with Pin #4 $\pm$ 30°	

GRID DRIVE SERVICE

Voltages are positive with respect to cathode unless indicated otherwise.

Maximum Ratings (Design Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage.	-550 Min. to +1100 Max. Volts DC
Grid #2 Voltage.	200 Min. to 550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value.	154 Max. Volts DC
Negative-Peak Value.	220 Max. Volts
Positive-Bias Value.	0 Max. Volts DC
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	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode.	200 Max. Volts

Typical Operating Conditions

Anode Voltage	16,000 Volts DC
Grid #4 Voltage for Focus.	0 to 400 Volts DC
Grid #2 Voltage.	400 Volts DC
Grid #1 Voltage (Note 3)	-65 to -105 Volts DC

Maximum Circuit Values

Grid #1 Circuit Resistance	1.5 Max. Megs
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CATHODE DRIVE SERVICE

Voltages are positive with respect to Grid #1 unless indicated otherwise.

Maximum Ratings (Absolute Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage	-400 Min. to +1250 Max. Volts DC
Grid #2 Voltage	.350 Min. to 700 Max. Volts DC
Cathode Voltage	
Positive-Bias Value	154 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed	
15 Seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

Typical Operating Conditions

Anode Voltage	.16,000 Volts DC
Grid #4 Voltage for Focus	0 to 400 Volts DC
Grid #2 Voltage	400 Volts DC
Grid #1 Voltage	0 Volts DC
Cathode Voltage (Note #3)	+56 to +84 Volts DC

Maximum Circuit Values

Grid #1 Circuit Resistance	1.5 Max. Megs
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Notes

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3 and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of the undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.

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19CUP4

Television Picture Tube

PHILCO - LANSDALE DIVISION

CATHODE RAY TUBE

DATA SHEET

Tentative

Description

The 19CUP4 is a 19" - 114° direct view rectangular glass picture tube having an aluminized screen, spherical faceplate, non ion trap gun, internal shielding and is designed to operate with electrostatic focus and magnetic deflection.

It is a "HiGm" tube designed to operate in cathode drive service under low G2 voltage conditions. The tube base is short and provides straight through leads oriented by an indexing lug.

Electrical Data

Focusing Method.	Electrostatic
Deflection Method.	Magnetic
Deflection Angle, approximate	
Horizontal	102 Degrees
Vertical	85 Degrees
Diagonal	114 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	4.0uuf
Grid #1 to All	6.0uuf
External Coating Capacitance	1300 Min. uuf
	1700 Max. uuf
Heater Voltage	6.3 Volts
Heater Current at 6.3 Volts	0.45±5% Amperes
Heater Warm-up Time (Note 1).	11 Seconds

Optical Data

Phosphor Number.	Aluminized P4
Fluorescent Color.	White
Persistence.	Medium Short
Faceplate	
Light Transmission at Center, Approximate.	77 Percent

Continued:

-2-

Mechanical Data

Overall Length	11 5/8±1/4-3/16 Inches
Neck Length	4 3/8±1/8-1/16 Inches
Greatest Dimensions of Bulb	
Diagonal	18 5/8±1/8 Inches
Width	16 13/32±1/8 Inches
Height	13 11/32±1/8 Inches
Minimum Useful Screen Dimensions	172 Sq. Inches
(maximum assured dimensions)	
Diagonal	17 9/16 Inches
Width	15 1/8 Inches
Height	12 Inches
Bulb	J149A2
Base	B7-208
Basing	8HR
Anode Contact	J1-21
Anode Contact Aligns with Pin #4 ±30°	

CATHODE DRIVE SERVICE

Voltages are positive with respect to Grid #1 unless indicated otherwise.

Maximum Ratings (Design Maximum Values)

Anode Voltage (Note 2)	22,000 Volts DC
Grid #4 Voltage	-550 Min. to +1100 Max. Volts DC
Grid #2 Voltage	80 Volts DC
Cathode Voltage	
Positive-Bias Value	154 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to exceed	
15 seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to	
Cathode	200 Max. Volts

Continued:

-3-

Typical Operating Conditions

Anode Voltage	16,000 Volts DC
Grid #4 Voltage for Focus	-100 Volts to +300 Volts DC
Grid #2 Voltage	65 Volts DC
Cathode Voltage (Note 3)	+41 to +56 Volts DC

Maximum Circuit Values

Grid #1 Circuit Resistance 1.5 Max. Megs.

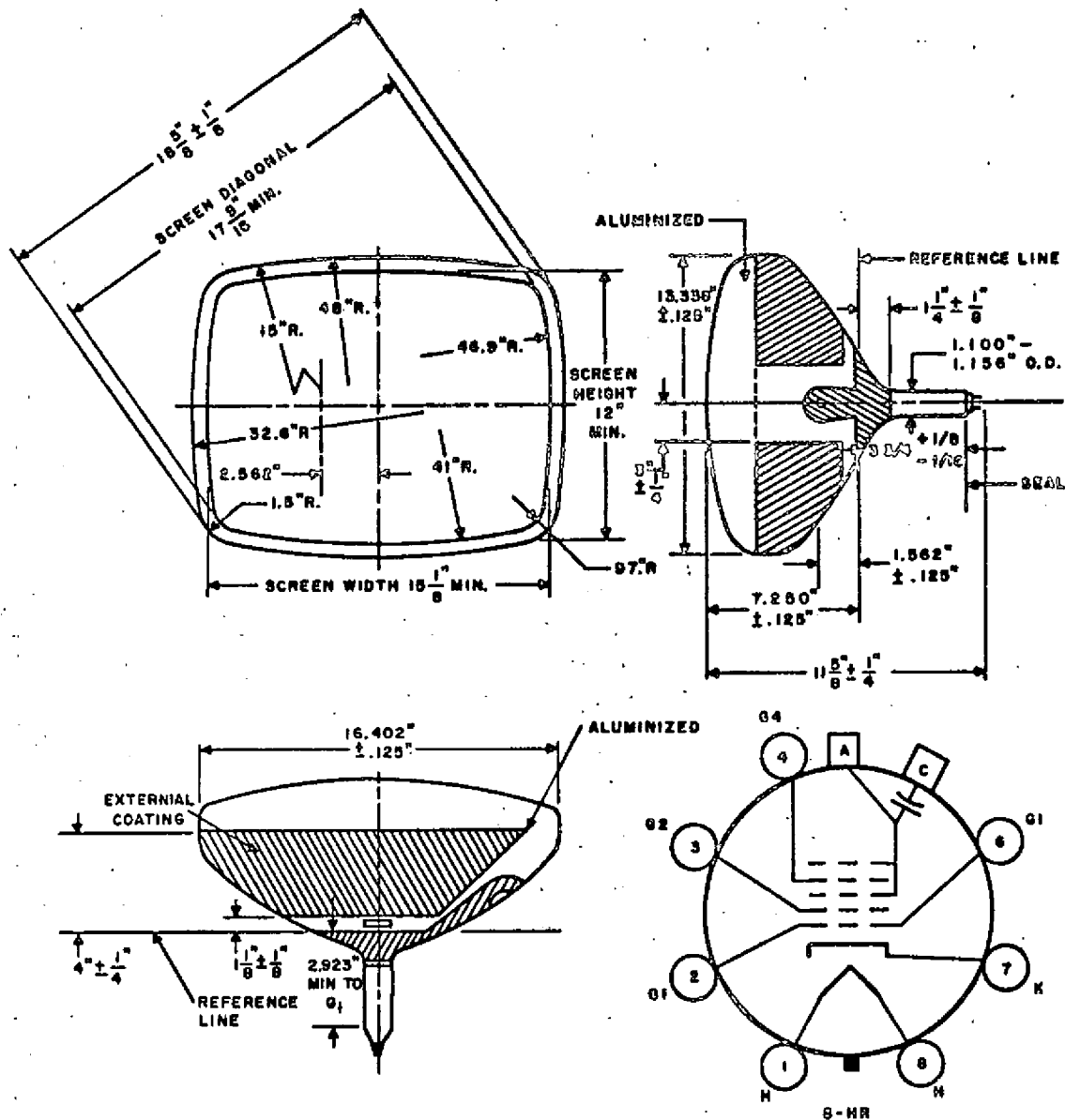
Notes

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3, and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff. Undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 4 volts.

March 1963

PHILCO CORPORATION - LANSDALE DIVISION

Outline Drawing 19CUP4 Television Picture Tube



MECHANICAL NOTES

1. The reference line is determined by reference line gauge JEDEC #126.
2. The area around the button is covered with an insulating coating.
3. Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. Bottom circumference of the base wafer will fall within a circle concentric with bulb axis and having a diameter of $1\frac{3}{4}''$.

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 10,000 volts.

19DFP4

Television Picture Tube

PHILCO CORPORATION - LANSDALE DIVISION

CATHODE RAY TUBE

DATA SHEET

Tentative

Description

The 19DFP4 is a 19" - 114⁰ direct view rectangular glass picture tube having an aluminized screen, spherical faceplate, non ion trap gun, internal shielding and is designed to operate with electrostatic focus and magnetic deflection.

It is a "HiGm" tube designed to operate in cathode drive service under low G2 voltage conditions. The tube base is short and provides straight through leads oriented by an indexing lug.

Electrical Data

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle, approximate	
Horizontal.	102 Degrees
Vertical.	85 Degrees
Diagonal.	114 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All.	4.0uuf
Grid #1 to All.	6.0uuf
External Coating Capacitance.	1300 Min. uuf
	1700 Max. uuf
Heater Voltage.	6.3 Volts
Heater Current at 6.3 Volts	0.60 ±5% Amperes
Heater Warm-up Time (Note 1)	11 Seconds

Optical Data

Phosphor Number	Aluminized P4
Fluorescent Color	White
Persistence	Medium Short
Faceplate	
Light Transmission at Center, Approximate	77 Percent

Continued:

-2-

Mechanical Data

Overall Length	11 11/16-3/16+1/4 Inches
Neck Length.	4 7/16-1/16+1/8 Inches
Greatest Dimensions of Bulb	
Diagonal	18.750 Inches
Width.	16.531 Inches
Height	13.468 Inches
Minimum Useful Screen	172 Sq. Inches
(maximum assured dimensions)	
Diagonal	17 9/16 Inches
Width.	15 1/8 Inches
Height	12 Inches
Bulb	J149A2
Base	B7-208
Basing	8HR
Anode Contact.	J1-21
Anode Contact Aligns with Pin #4 $\pm 30^\circ$	

CATHODE DRIVE SERVICE

Voltages are positive with respect to Grid #1 unless indicated otherwise.

Maximum Ratings (Design Maximum Values)

Anode Voltage (Note 2)	22,000 Volts DC
Grid #4 Voltage.	-550 Min. to +1100 Max. Volts DC
Grid #2 Voltage.	80 Volts DC
Cathode Voltage	
Positive-Bias Value.	.154 Max. Volts DC
Positive-Peak Value.	220 Max. Volts
Negative-Bias Value.	0 Max. Volts DC
Negative-Peak Value.	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to exceed	
15 seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to	
Cathode.	200 Max. Volts

Continued:

-3-

Typical Operating Conditions

Anode Voltage	16,000 Volts DC
Grid #4 Voltage for Focus	-100 to +300 Volts DC
Grid #2 Voltage	65 Volts DC
Cathode Voltage (Note 3)	+41 to +56 Volts DC

Maximum Circuit Values

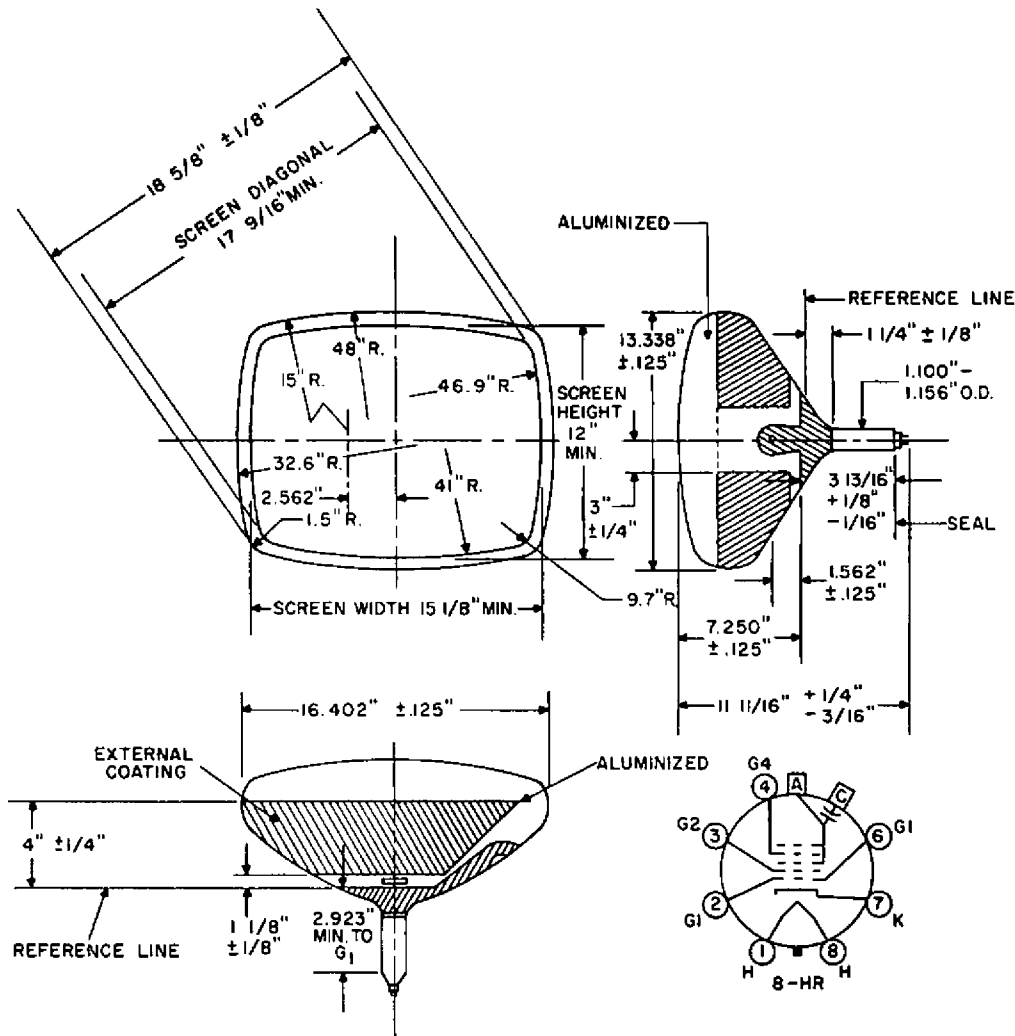
Grid #1 Circuit Resistance	1.5 Max. Megs
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Notes

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3, and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 4 volts.

PHILCO CORPORATION - LANSDALE DIVISION

Outline Drawing
19DFP4
Television Picture Tube



MECHANICAL NOTES

1. The reference line is determined by reference line gauge JEDEC #126.
2. The area around the button is covered with an insulating coating.
3. Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. Bottom circumference of the base wafer will fall within a circle concentric with bulb axis and having a diameter of $1 \frac{3}{4}''$.

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts.

PHILCO CATHODE RAY TUBE DATA SHEET

TENTATIVE

21EAP4/SF21A TELEVISION PICTURE TUBE

DESCRIPTION

The 21EAP4/SF21A is an extremely short electrostatic focus and magnetic deflection, direct view picture tube specifically intended for television applications. Special features of this tube are its very short overall length and unusually low heater power. The heater is a 600 milliamperere, 2.34 volt design with controlled warm-up time for series string applications. Other features of the tube are a metal backed screen, a new straight gun requiring no ion trap magnet, external conductive coating, and a new short integral glass-button base having straight through leads and an indexing lug.

GENERAL DESCRIPTION

21" rectangular extremely short cathode ray tube intended for direct view television applications requiring low heater power.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal	105 Degrees
Vertical	87 Degrees
Diagonal	110 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	3.65 μmf
Grid #1 to All	4.15 μmf
External Coating Capacitance	2000 min. μmf 2500 max. μmf
Heater Voltage	2.34 $\pm 5\%$ Volts
Heater Current at 2.34 Volts	0.60 Amperes
Heater Warm-up Time (Note 1)	11 Seconds

OPTICAL DATA

Phosphor Number	P4
Fluorescent Color	White
Persistence	Medium
Faceplate	
Light Transmission at Center, approx.	73 Percent

MECHANICAL DATA

Overall Length	12 $\frac{5}{16}$ $\pm$ $\frac{1}{4}$ Inches
Neck Length	3 $\frac{11}{16}$ $\pm$ $\frac{1}{16}$ Inches
Greatest Dimensions of Bulb	
Diagonal	21 $\frac{3}{8}$ $\pm$ $\frac{1}{8}$ Inches
Width	20 $\frac{1}{4}$ $\pm$ $\frac{1}{8}$ Inches
Height	16 $\frac{3}{8}$ $\pm$ $\frac{1}{8}$ Inches
Minimum Useful Screen Dimensions (maximum assured dimensions)	
Diagonal	20 $\frac{1}{4}$ Inches
Width	19 $\frac{1}{16}$ Inches
Height	15 $\frac{1}{16}$ Inches
Base	B7-208
Basing	8JK
Anode Contact	J1-21
Anode Contact Aligns with Center Line between Pin #6 and #7 $\pm 30^\circ$	

GRID DRIVE SERVICE

Voltag es are positive with respect to cathode unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage	- 700 to + 950 Max. Volts DC
Grid #2 Voltage	550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value	155 Max. Volts DC
Negative-Peak Value	220 Max. Volts
Positive-Bias Value	0 Max. Volts DC
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	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts DC
Grid #4 Voltage for Focus	100 to 500 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note 3)	- 35 to - 72 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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CATHODE DRIVE SERVICE

Voltag es are positive with respect to Grid #1 unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage	- 550 to + 1100 Max. Volts DC
Grid #2 Voltage	700 Max. Volts DC
Cathode Voltage	
Positive-Bias Value	155 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode During Warm-up Period not to exceed 15 Seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

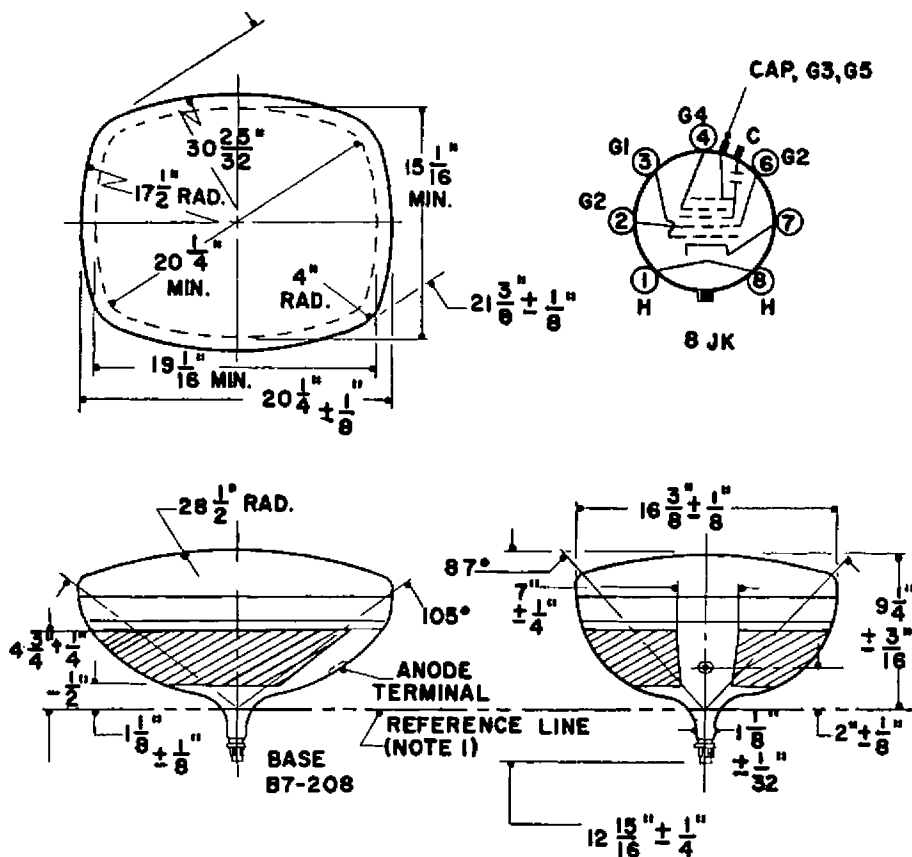
Anode Voltage	16,000 Volts
Grid #4 Voltage for Focus	150 to 550 Volts
Grid #2 Voltage	300 Volts
Grid #1 Voltage	0 Volts
Cathode Voltage (Note 3)	+34 to +60 Volts

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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NOTES

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3 and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of the undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.



MECHANICAL NOTES

1. The reference line is determined by reference line gauge JETEC #126.
2. The area around the button is covered with an insulating coating.
3. Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. Bottom circumference of the base wafer will fall within a circle concentric with bulb axis and having a diameter of 13 $\frac{1}{4}$ ".

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts.

PHILCO CATHODE RAY TUBE DATA SHEET

TENTATIVE

21EVP4 TELEVISION PICTURE TUBE

DESCRIPTION

The 21EVP4 is an extremely short electrostatic focus and magnetic deflection, direct view picture tube specifically intended for television applications. The tube incorporates internal magnetic shielding in the gun design so that, in spite of the very short neck length, deflecting yokes without special magnetic shields may be used. Another feature of the tube is its unusually low heater power. The heater is a 450 milliampere, 2.68 volt design with controlled warm-up time for series string applications. Other features of the tube are a metal backed screen, a straight gun requiring no ion trap magnet and a short integral glass-button base having straight through leads and an indexing lug. The distinctive yellow base identifies the 21EVP4 as having internal magnetic shielding.

GENERAL DESCRIPTION

21" rectangular extremely short cathode ray tube intended for direct view television applications requiring low heater power.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal	105 Degrees
Vertical	87 Degrees
Diagonal	110 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	3.65 μ f
Grid #1 to All	4.15 μ f
External Coating Capacitance	1500 min. μ f
	2000 max. μ f
Heater Voltage	2.68 $\pm$ 10% Volts
Heater Current at 2.68 Volts	0.45 Amperes
Heater Warm-up Time (Note 1)	11 Seconds

OPTICAL DATA

Phosphor Number	P4
Fluorescent Color	White
Persistence	Medium
Faceplate	
Light Transmission at Center, approx.	75.5 Percent

MECHANICAL DATA

Overall Length	12 $\frac{15}{16}$ $\pm$ $\frac{1}{4}$ Inches
Neck Length	3 $\frac{1}{16}$ $\pm$ $\frac{1}{16}$ Inches
Greatest Dimensions of Bulb	
Diagonal	21 $\frac{3}{8}$ $\pm$ $\frac{1}{8}$ Inches
Width	20 $\frac{1}{4}$ $\pm$ $\frac{1}{8}$ Inches
Height	16 $\frac{3}{8}$ $\pm$ $\frac{1}{8}$ Inches
Minimum Useful Screen Dimensions (maximum assured dimensions)	
Diagonal	20 $\frac{1}{4}$ Inches
Width	19 $\frac{1}{16}$ Inches
Height	15 $\frac{1}{16}$ Inches
Bulb	J171G1
Base	B7-208
Basing	8JK
Anode Contact	J1-21
Anode Contact Aligns with Center Line between Pin #6 and #7 $\pm$ 30°	

GRID DRIVE SERVICE

Voltag es are positive with respect to cathode unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage	-700 to +950 Max. Volts DC
Grid #2 Voltage	550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value	155 Max. Volts DC
Negative-Peak Value	400 Max. Volts
Positive-Bias Value	0 Max. Volts DC
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	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts DC
Grid #4 Voltage for Focus	100 to 500 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note 3)	-35 to -72 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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CATHODE DRIVE SERVICE

Voltag es are positive with respect to Grid #1 unless indicated otherwise.

MAXIMUM RATINGS (Absolute Maximum Values)

Anode Voltage (Note 2)	20,000 Max. Volts DC
Grid #4 Voltage	-550 to +1100 Max. Volts DC
Grid #2 Voltage	700 Max. Volts DC
Cathode Voltage	
Positive-Bias Value	155 Max. Volts DC
Positive-Peak Value	250 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to exceed	
15 Seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

21EVP4

TYPICAL OPERATING CONDITIONS

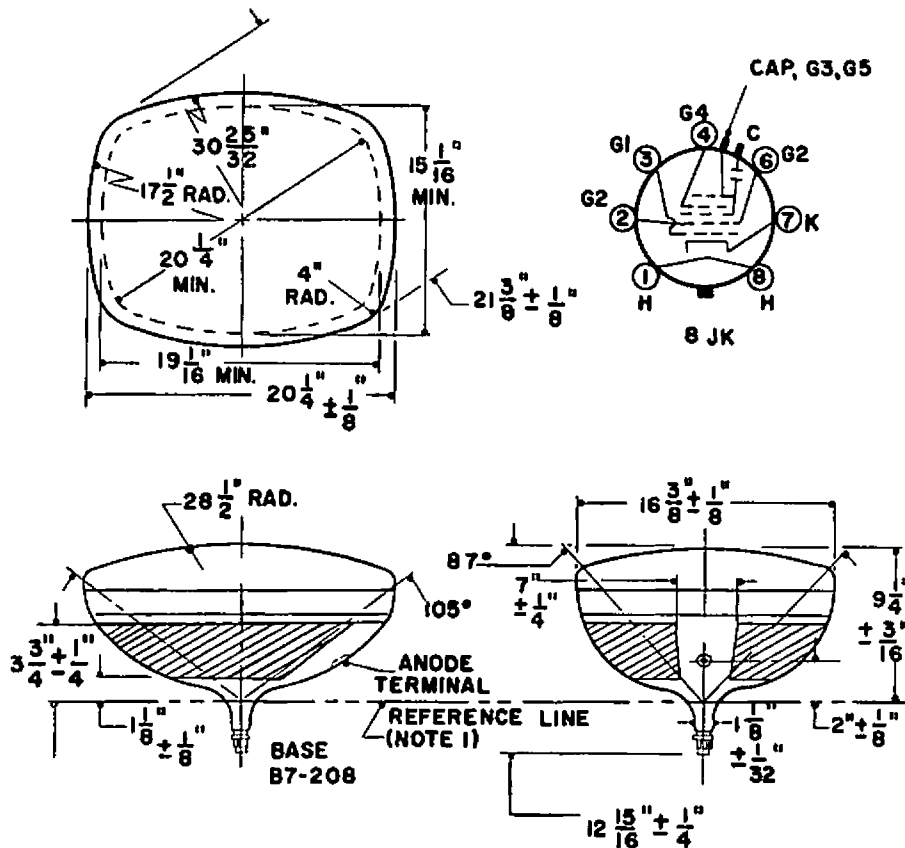
Anode Voltage	16,000 Volts
Grid #4 Voltage for Focus	150 to 550 Volts
Grid #2 Voltage	300 Volts
Grid #1 Voltage	0 Volts
Cathode Voltage (Note 3)	+34 to +60 Volts

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance 1.5 Max. Megs.

NOTES

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3 and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of the undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.



MECHANICAL NOTES

1. The reference line is determined by reference line gauge JETEC #126.
2. The area around the button is covered with an insulating coating.
3. Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. Bottom circumference of the base wafer will fall within a circle concentric with bulb axis and having a diameter of 13 1/4 inches.

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts.

PHILCO®

CATHODE RAY TUBE

DATA SHEET

TENTATIVE

23BNP4

TELEVISION

PICTURE

TUBE

DESCRIPTION

The 23BNP4 is a 23" directly viewed rectangular glass type cathode ray tube with an aluminized screen. Other features include a spherical faceplate, bonded shield, grey filter glass, internal shielding, electrostatic focus, 110° magnetic deflection, and no ion trap.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal	99 Degrees
Vertical	82 Degrees
Diagonal	110 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	5.0 μf
Grid #1 to All	6.0 μf
External Coating Capacitance	2000 Min. μf 2500 Max. μf
Heater Voltage	6.3 Volts
Heater Current	0.60 $\pm$ 5% Amperes
Heater Warm-up Time (Note 1)	11 Seconds

OPTICAL DATA

Phosphor Number	Aluminized P4
Fluorescent Color	White
Persistence	Medium Short
Faceplate (Bonded Shield)	FP198A1
Light Transmission at Center, approximate	40 Percent

MECHANICAL DATA

Overall Length	15 $\frac{3}{16}$ $\pm$ $\frac{3}{8}$ Inches
Neck Length	5 $\frac{1}{8}$ $\pm$ $\frac{1}{8}$ Inches
Minimum Useful Screen Dimensions (maximum assured dimensions)	
Diagonal	22 $\frac{5}{16}$ Inches
Width	19 $\frac{5}{16}$ Inches
Height	15 $\frac{1}{4}$ Inches
Area (Projected)	282 Sq. Inches
Bulb	J187A1 or Equiv.
Base	B7-208
Basing	8HR
Anode Contact	J1-21
Anode Contact Aligns with Center	
Line through Pin #4 $\pm$ 30°	

GRID DRIVE SERVICE

Voltag es are positive with respect to cathode unless indicated otherwise.

MAXIMUM RATINGS (Design Maximum Values)

Anode Voltage (Note 2)	22,000 Max. Volts DC
Grid #4 Voltage	- 550 Min. to + 1100 Max. Volts DC
Grid #2 Voltage	550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value	155 Max. Volts DC
Negative-Peak Value	220 Max. Volts
Positive-Bias Value	0 Max. Volts DC
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	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	18,000 Volts DC
Grid #4 Voltage for Focus	- 100 to + 300 Volts DC
Grid #2 Voltage	400 Volts DC
Grid #1 Voltage (Note 3)	- 60 to - 110 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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CATHODE DRIVE SERVICE

Voltag es are positive with respect to Grid #1 unless indicated otherwise

MAXIMUM RATINGS (Design Maximum Values)

Anode Voltage (Note 2)	22,000 Max. Volts DC
Grid #4 Voltage	- 400 Min. to + 1250 Max. Volts DC
Grid #2 Voltage	700 Max. Volts DC
Cathode Voltage	
Positive-Bias Value	155 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed	
15 Seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	18,000 Volts DC
Grid #4 Voltage for Focus	150 to 500 Volts DC
Grid #2 Voltage	400 Volts DC
Grid #1 Voltage	0 Volts DC
Cathode Voltage (Note 3)	+54 to +90 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance 1.5 Max. Megs.

NOTES

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3 and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of the undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.

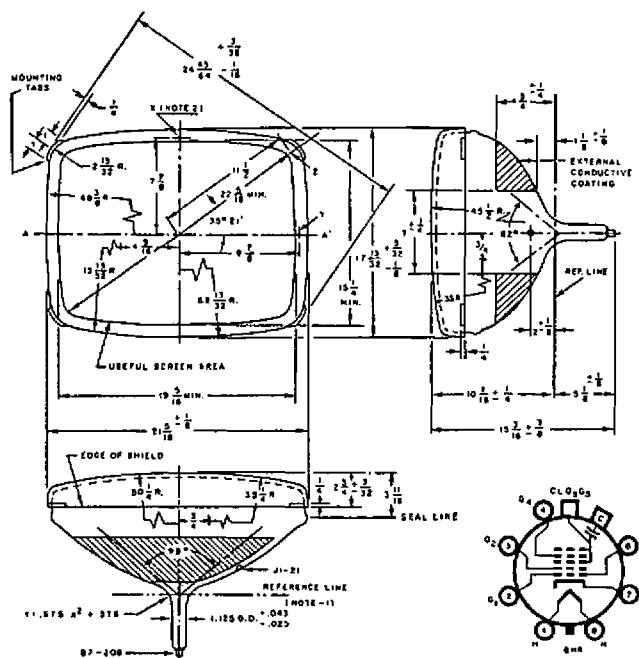


DIAGRAM NOTES:

126

1. Reference line is determined by plane C-C' of JEDEC No. Reference Line Gauge, when the gauge is seated against the bulb.
2. Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:
 Plane tangent to crown of face to plane of X: .758" Nom.
 Plane of X to plane of Y = .463" $\pm$.030"
 Plane of X to plane of Z = .970" $\pm$.030"
3. Dimensions are shown in inches.

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 18,000 volts.

The information, diagrams, or any other data included herein are believed to be accurate and reliable. However, the Philco Corporation, Lansdale Division, assumes no responsibility or liability whatsoever for the application, interpretation or use made of such information, diagrams or data especially insofar as the use of said information, diagrams or data affects any patent, trademark or proprietary data rights.

PHILCO[®]

CATHODE RAY TUBE

DATA SHEET

TENTATIVE

23BVP4

TELEVISION

PICTURE

TUBE

DESCRIPTION

The 23BVP4 is a 23" directly viewed rectangular glass type cathode ray tube with an aluminized screen. Other features include a spherical faceplate, bonded shield, grey filter glass, electrostatic focus, 92° magnetic deflection, and no ion trap.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, approximate	
Horizontal	81 Degrees
Vertical	66 Degrees
Diagonal	92 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	5.0 μ f
Grid #1 to All	6.0 μ f
External Coating Capacitance	2000 Min. μ f
	2500 Max. μ f
Heater Voltage	6.3 Volts
Heater Current	0.60 $\pm$ 5% Amperes
Heater Warm-up Time (Note 1)	11 Seconds

OPTICAL DATA

Phosphor Number	Aluminized P4
Fluorescent Color	White
Persistence	Medium Short
Faceplate (Bonded Shield)	FP198A1
Light Transmission at Center, approximate	40 Percent

MECHANICAL DATA

Overall Length	18 $\frac{13}{16}$ $\pm$ $\frac{7}{16}$ Inches
Neck Length	6 $\pm$ $\frac{3}{16}$ Inches
Minimum Useful Screen Dimensions (maximum assured dimensions)	
Diagonal	22 $\frac{5}{16}$ Inches
Width	19 $\frac{5}{16}$ Inches
Height	15 $\frac{1}{4}$ Inches
Area (Projected)	282 Sq. Inches
Bulb	J187D1 or Equiv.
Base	B6-203
Basing	12L
Anode Contact	J1-21
Anode Contact Aligns with Center	
Line through Pin #6 $\pm$ 30°	

GRID DRIVE SERVICE

Voltages are positive with respect to cathode unless indicated otherwise.

MAXIMUM RATINGS (Design Maximum Values)

Anode Voltage (Note 2)	25,000 Max. Volts DC
Grid #4 Voltage	- 550 Min. to +1100 Max. Volts DC
Grid #2 Voltage	550 Max. Volts DC
Grid #1 Voltage	
Negative-Bias Value	155 Max. Volts DC
Negative-Peak Value	220 Max. Volts
Positive-Bias Value	0 Max. Volts DC
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	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	20,000 Volts DC
Grid #4 Voltage for Focus	0 to 400 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note 3)	- 35 to - 72 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
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CATHODE DRIVE SERVICE

Voltages are positive with respect to Grid #1 unless indicated otherwise

MAXIMUM RATINGS (Design Maximum Values)

Anode Voltage (Note 2)	25,000 Max. Volts DC
Grid #4 Voltage	- 400 Min. to +1250 Max. Volts DC
Grid #2 Voltage	700 Max. Volts DC
Cathode Voltage	
Positive-Bias Value	155 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to Exceed	
15 Seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to Cathode	200 Max. Volts

23BVP4

TYPICAL OPERATING CONDITIONS

Anode Voltage	20,000 Volts DC
Grid #4 Voltage for Focus	150 to 500 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage	0 Volts DC
Cathode Voltage (Note 3)	+34 to +60 Volts DC

MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5 Max. Megs.
----------------------------------	----------------

NOTES

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3 and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of the undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 5 volts.

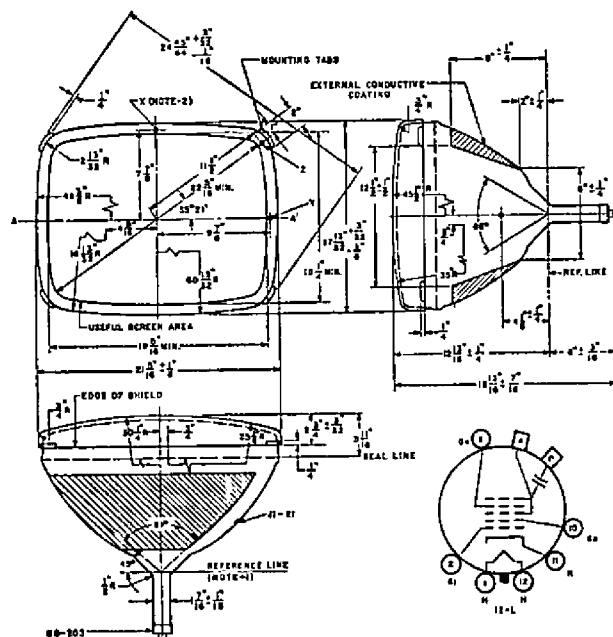


DIAGRAM NOTES:

1. Reference line is determined by plane C-C' of JEDEC No. 116 Reference Line Gauge, when the gauge is seated against the bulb.
2. Planes perpendicular to tube axis and passing through points X, Y and Z are located as follows:

Plane tangent to crown of face to plane of X: .758" Nom.

Plane of X to plane of Y = .463" $\pm$.030"

Plane of X to plane of Z = .970" $\pm$.030"

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts.

The information, diagrams, or any other data included herein are believed to be accurate and reliable. However, the Philco Corporation, Lansdale Division, assumes no responsibility or liability whatsoever for the application, interpretation or use made of such information, diagrams or data especially insofar as the use of said information, diagrams or data affects any patent, trademark or proprietary data rights.

23DQP4

Television Picture Tube

PHILCO CORPORATION - LANSDALE DIVISION

CATHODE RAY TUBE

DATA SHEET

Tentative

Description

The 23DQP4 is a 23" - 92° direct view rectangular glass picture tube having an aluminized screen, spherical faceplate, bonded shield, non ion trap gun, internal shielding and is designed to operate with electrostatic focus and magnetic deflection.

It is a "HiGm" tube designed to operate in cathode drive service under low G2 voltage conditions. The tube base is short and provides straight through leads oriented by an indexing lug.

Electrical Data

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle, approximate	
Horizontal.	81 Degrees
Vertical	66 Degrees
Diagonal	92 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All	4.0uuf
Grid #1 to All	8.0uuf
External Coating Capacitance	2000 Min. uuf
	2500 Max. uuf
Heater Voltage	6.3 Volts
Heater Current at 6.3 volts	0.60 ⁺ 5% Amperes
Heater Warm-up Time (Note 1)	11 Seconds

Optical Data

Phosphor Number	Aluminized P4
Fluorescent Color	White
Persistence	Medium Short
Faceplate (Bonded Shield)	FP198A1
Light Transmission at Center, approximate	40 Percent

Continued:

-2-

Mechanical Data

Overall Length	18 11/16±3/8 Inches
Neck Length	5 7/8±1/8 Inches
Greatest Dimensions of Bulb	
Diagonal	24.797 Inches
Width	21.438 Inches
Height	17.500 Inches
Minimum Useful Screen Dimensions	282 Sq. Inches
(maximum assured dimensions)	
Diagonal	22 5/16 Inches
Width	19 5/16 Inches
Height	15 1/4 Inches
Bulb	J187D1
Base	B7-208
Basing	8HR
Anode Contact	J1-21
Anode Contact Aligns with Pin #4 ±30°	

CATHODE DRIVE SERVICE

Voltages are positive with respect to Grid #1 unless indicated otherwise.

Maximum Ratings (Design Maximum Values)

Anode Voltage (Note 2)	25,000 Volts DC
Grid #4 Voltage	-550 Min. to +1100 Max. Volts DC
Grid #2 Voltage	80 Volts DC
Cathode Voltage	
Positive-Bias Value	154 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to exceed	
15 seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to	
Cathode	200 Max. Volts

Continued:

-3-

Typical Operating Conditions

Anode Voltage	20,000 Volts DC
Grid #4 Voltage for Focus	-100 to +300 Volts DC
Grid #2 Voltage	65 Volts DC
Cathode Voltage (Note 3)	+41 to +56 Volts

Maximum Circuit Values

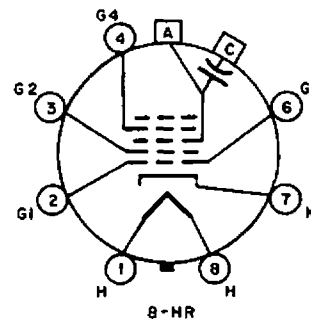
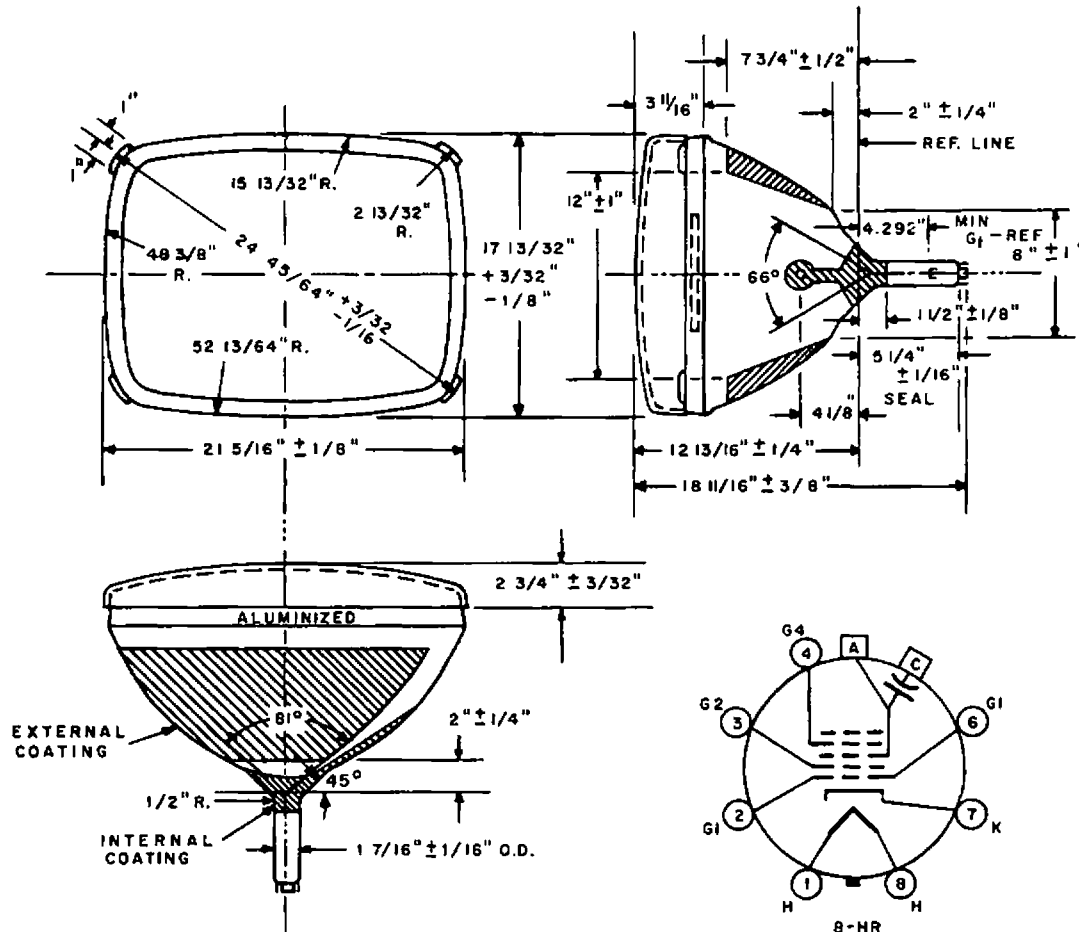
Grid #1 Circuit Resistance	1.5 Max. Megs
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Notes

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3, and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of undeflected focus spot, and absolute value of the bias between cathode and grid will increase by about 4 volts.

PHILCO CORPORATION - LANSDALE DIVISION

Outline Drawing
23DQP4
Television Picture Tube



MECHANICAL NOTES

1. The reference line is determined by reference line gauge JEDEC #116.
2. The area around the button is covered with an insulating coating.
3. Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins. Bottom circumference of the base wafer will fall within a circle concentric with bulb axis and having a diameter of $1 \frac{3}{4}"$.

WARNING

X-ray radiation shielding may be necessary to protect against possible danger of personal injury from prolonged exposure at close range if this tube is operated at anode voltages higher than 16,000 volts.

23DSP4

Television Picture Tube

PHILCO CORPORATION - LANSDALE DIVISION

CATHODE RAY TUBE

DATA SHEET

Tentative

Description

The 23DSP4 is a 23" - 92° direct view rectangular glass picture tube having an aluminized screen, spherical faceplate, non ion trap gun, internal shielding and is designed to operate with electrostatic focus and magnetic deflection.

It is a "HiGm" tube designed to operate in cathode drive service under low G2 voltage conditions. The tube base is short and provides straight through leads oriented by an indexing lug. Implosion protection is provided by means of a tension band, rim band and coated funnel.

Electrical Data

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle, approximate	
Horizontal	81 Degrees
Vertical	66 Degrees
Diagonal	92 Degrees
Direct Interelectrode Capacitance, approximate	
Cathode to All.	4.0uuf
Grid #1 to All.	8.0uuf
External Coating Capacitance	2000 Min. uuf
	2500 Max. uuf
Heater Voltage	6.3 Volts
Heater Current at 6.3 volts	0.60 ⁺ 5% Amperes
Heater Warm-up Time (Note 1)	11 Seconds

Optical Data

Phosphor Number	Aluminized P4
Fluorescent Color	White
Persistence	Medium Short
Light transmission at Center, approximate	42 Percent

Continued:

-2-

Mechanical Data

Overall Length	18 3/8 $\pm$ 5/16 Inches
Neck Length	5 7/8 $\pm$ 1/8 Inches
Greatest Dimensions of Bulb (including banding)	
Diagonal	23.640 Inches
Width	21.255 Inches
Height	16.750 Inches
Minimum Useful Screen Dimensions	282 Sq. Inches
(maximum assured dimensions)	
Diagonal	22 5/16 Inches
Width	19 5/16 Inches
Height	15 1/4 Inches
Bulb	J187-J1
Base	B7-208
Basing	8HR
Anode Contact	J1-21
Anode Contact Aligns with Pin #4 $\pm$ 30°	

CATHODE DRIVE SERVICE

Voltages are positive with respect to Grid #1 unless indicated otherwise.

Maximum Ratings (Design Maximum Values)

Anode Voltage (Note 2)	25,000 Volts DC
Grid #4 Voltage	-550 Min. to +1100 Max. Volts DC
Grid #2 Voltage	80 Volts DC
Cathode Voltage	
Positive-Bias Value	154 Max. Volts DC
Positive-Peak Value	220 Max. Volts
Negative-Bias Value	0 Max. Volts DC
Negative-Peak Value	2 Max. Volts
Peak-Heater-Cathode Voltage	
Heater Negative with Respect to Cathode	
During Warm-up Period not to exceed	
15 seconds	450 Max. Volts
After Equipment Warm-up Period	200 Max. Volts
Heater Positive with Respect to	
Cathode	200 Max. Volts

Continued:

-3-

Typical Operating Conditions

Anode Voltage	18,000 Volts DC
Grid #4 Voltage for Focus	-100 to +300 Volts DC
Grid #2 Voltage	65 Volts DC
Cathode Voltage (Note 3)	+41 to +56 Volts DC

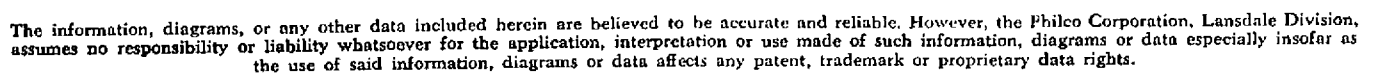
Maximum Circuit Values

Grid #1 Circuit Resistance	1.5 Max. Megs
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Notes

1. Heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current.
2. Anode, Grid #3, and Grid #5 are connected together within the tube and are referred to herein as anode.
3. For visual extinction of the focused raster. For cutoff of undeflected focus spot, the absolute value of the bias between cathode and grid will increase by about 4 volts.

Outline Drawing
23DSP4
Television Picture Tube



PHILCO CORPORATION

Philco Tube Development Laboratory
 Church Road
 Lansdale, Penna.

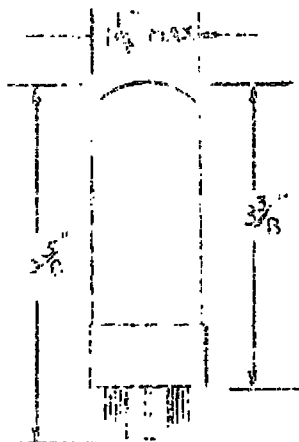
6325

Description and Rating
 Full-wave Rectifier

Preliminary Data

Cathode	Coated Unipotential
Heater Voltage (AC or DC)	6.3 volts
Heater Current	2.7 amps
Envelope	T-9 glass
Base	Short shell low loss barrier
Mounting Position	Any type metal

Physical Dimensions

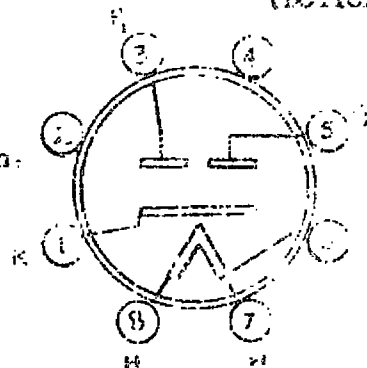


Terminal Connections

Pin 1	K
Pin 2	-
Pin 3	P ₁
Pin 4	-
Pin 5	P ₂
Pin 6	Int. Conn.
Pin 7	H
Pin 8	H

Basing Diagram

(BOTTOM VIEW)



8 M A

Absolute Maximum Values

Max. Heater Cathode Voltage	500 volts
Max. Steady State Peak Plate Current	550 ma/plate
Max. D. C. Output Current	250 ma.
Max. Peak Inverse Voltage	2200 V.
Tube Drop (approx. at 150 ma) plate	22 V. max.
R-M S. Voltage per plate	780 V.
Hot-Switching Transient Plate Current	
for Duration of 0.2 Second Max.	2.0 amp max.

6325

<u>Life Test Conditions</u>	<u>Condenser Input</u>	<u>Choke Input</u>
AC Plate Voltage (RMS) (60 cycle)	350 volts	780 volts
Filter Input Capacitor	4 uf	4 uf
D.C. Output Current (per plate)	125 ma	75 ma
D.C. Output Voltage	285 V.	650 v.
Peak Plate Current (per plate)	550 ma	
Filter Input Inductance		4.5 henry
Peak Inverse Voltage with full load	975 volts	2200 volts
Plate Series Resistance/plate	250 ohms	
Ambient Temperature	125°C	125°C
500 hour Life Test Expectancy	90% min.	90% min.
1000 hour Life Test Expectancy	80% min.	80% min.

Note: Filament voltage is to be applied one minute before application of plate voltage.

Ruggedization: Tubes withstand impact snock of 450g (Hammer Angle = 30°) as tested in both vertical and horizontal mounting planes on Taft-Pierce Shock Tester. Tubes shall not show shorts during test, nor tap or permanent shorts or open circuits after shock test.

The type 6690 is a short subminiature medium-mu double triode capable of operation in the video region. This type is characterized by stable performance under severe environmental conditions. It is designed for service where extreme conditions of mechanical shock, vibration, and acceleration are to be encountered.

MECHANICAL DATA

GENERAL

Style	subminiature	Maximum Diameter	0.400 inch
Cathode	coated unipotential	Maximum overall bulb length	1.000 inch
Bulb	T-3	Minimum Lead Length	1.500 inches
Base	ES-10; Subminiature Button Flexible Leads	Mounting Position	any
Outline		<u>RATINGS (1)</u>	
Baseing	30°C		

Connections

Lead 1 - #2 plate Lead 5 - #1 plate
Lead 2 - #2 grid Lead 6 - heater
Lead 3 - heater Lead 7 - #1 grid
Lead 4 - #2 cathode Lead 8 - #1 cathode

Maximum Impact Acceleration (2)	880 g
Maximum acceleration parallel to axis of the tube (3)	10,000 g
Maximum acceleration perpendicular to axis of the tube (4)	1500 g
Maximum vibration acceleration	15 g
Maximum bulb temperature	250°C

ELECTRICAL DATA

GENERAL

Direct Intraelectrode Capacitance (5)

	Min	Max
Grid to Plate (each section)	1.5	2.1 μ f
Input (each section)	2.0	3.2 μ f
Output		
Section 1	1.0	1.8 μ f
Section 2	1.2	2.2 μ f

Heater Voltage (a.c. or d.c.)	6.3 volts
Heater Current	100 ma

RATINGS (1) Absolute Values

Heater Voltage (7)	6.3 $\pm$ 10% volts
Max. Plate Voltage (dc)	120 volts
Max. Plate dissipation (each section)	1.1 watts
Max. Heater-Cathode voltage	$\pm$ 350 Vdc

CHARACTERISTICS (each section)

Conditions	
Heater Voltage	6.3 volts
Plate voltage	100 volts
Cathode Bias Resistor	100 ohms
Plate Current	8.0 ma
Transconductance	4800 μ mhos
Amplification Factor	35
Maximum Grid Voltage for 30 μ a Plate Current	-10.5 volts
Noise Output voltage (sections connected in parallel) (8) max.	100 mv post centrifuge

Life Expectancy

30°C Ambient Temperature	500 hours
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from JETEC release #1445,
April 18, 1955

NOTES

- (1) Limitations beyond which normal tube performance and tube life may be impaired.
- (2) Forces in any direction as applied by the Navy Type High-Impact (Fly weight) Shock Machine for Electronic Devices, or equivalent (Hammer angle = 60°).
- (3) Forces as produced in a centrifuge with bases of the tube toward or away from the center of rotation. Maximum force to be applied within 20 seconds.
- (4) Forces as produced in a centrifuge at a one inch radius, 7500 rpm, for a duration of 3 min.
- (5) Vibrational forces in any direction at 40 cycles per second.
- (6) With external shield of 0.405 inch diameter connected to cathode of section under test.
- (7) Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center-rated value of 6.3 volts.
- (8) Across plate resistor of 2,000 ohms with applied vibrational acceleration of 15g at 40 cycles per second. CK = 100 μ f; RK = 100 ohms; Plate supply impedance not to exceed that of a 40 μ f capacitor.

PHILCO

SPECIAL PURPOSE TUBE

DATA SHEET

TENTATIVE

6931

CORONA

DISCHARGE

REGULATOR TUBE

DESCRIPTION

The 6931 is a gas filled, corona discharge, voltage regulator tube designed for operation as a shunt regulator or voltage reference tube. The tube provides a regulated output of 3,000 volts over a range of 50 to 500 microamperes with exceptional stability of the output voltage throughout its operating life.

The 6931 finds application where a stable 3,000 volt potential difference is desired. An outstanding example is its use as a high voltage regulator in the high voltage supply of an Ionitron.*

MECHANICAL DATA

Mounting Position Any
 Maximum Overall Length 4 1/4 inches
 Maximum Seated Height 3 5/8 inches
 Envelope T9
 Base 4 Pin Short Intermediate Shell Octal
 Basing
 1—No Connection
 2—Cathode
 4—Cathode
 7—Anode

ELECTRICAL DATA

Nominal Voltage at
 275 μ a 3,000 $\pm$ 150 volts
 Voltage Regulation per
 100 μ a 0.7 percent
 Operating Range 50-500 μ a

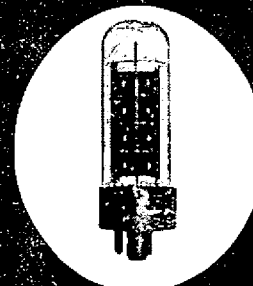
DESIGN CONSIDERATIONS

It is important that the tube current be maintained within the operating range. At low currents the corona discharge may not be self sustaining, while at high currents relaxation oscillations may occur. The rate of voltage rise in the corona voltage region should be limited to 4 or 5 volts per millisecond or the tube may go into relaxation oscillations.

Although the 6931 is constructed for arc-free operation, provision must be made for a suitable environment to prevent arcing induced by strong magnetic or electric fields.

The performance of corona regulators is affected by temperature. The regulated voltage increases as the temperature increases. Typically, the output voltage of the 6931 will increase about 40 volts for an increase in temperature from 25° C to 70° C. Generally the tube will operate satisfactorily in the temperature range 0 to 140° C.

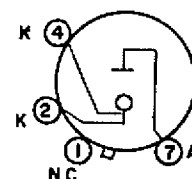
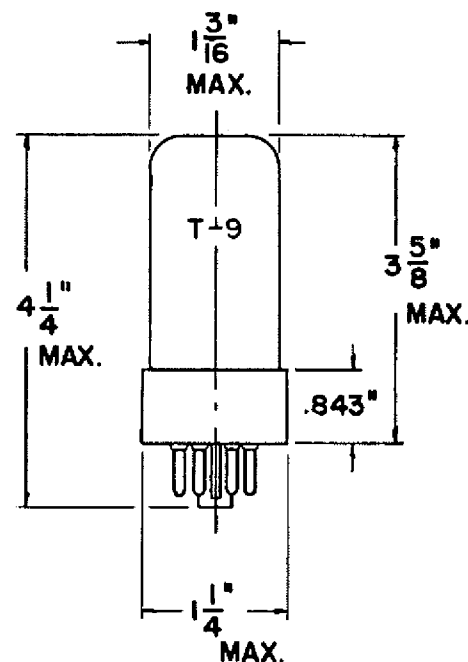
* Registered Trade Mark



GENERAL DESCRIPTION

3 KV corona discharge regulator tube

DIMENSIONAL OUTLINE AND MECHANICAL SPECIFICATIONS



BASING DIAGRAM
 Bottom View of Base

