

THE RAULAND CORPORATION

Cathode-Ray Tube 10FP4 -- Description and Rating

The 10FP4 is a ten-inch cathode-ray tube with a direct-view screen and semi-flat face for television receiving applications. Features of this tube are a metal-backed screen to prevent screen burning by ions and to increase light output, and an outside conductive coating which when grounded serves as a filter capacitor.

GENERAL DESIGN

Electrical

Heater Voltage

6.3 $\pm$ 10% Volts

Heater Current

0.6 $\pm$ 10% Amperes

Focusing Method - Magnetic

Deflecting Method - Magnetic

Maximum Deflecting Angle

50 Degrees

Phosphor - P4

Fluorescence - White

Persistence - Medium

Direct Interelectrode Capacitances, Nominal

Cathode to All Other Electrodes

8 μ f

Grid #1 to All Other Electrodes

9 μ f

External Conductive Coating to Anode No.2

{ 2500 Max. μ f

{ 500 Min. μ f

Mechanical

Overall Length

17 5/8 $\pm$ 3/8 Inches

Greatest Diameter of Bulb

10 1/2 $\pm$ 1/8 Inches

Minimum Useful Screen Diameter

9 Inches

Bulb Contact Recessed Small-Cavity Cap

Base

Small-Shell Duodecal 7 Pin

Length of Deflection Coil from Reference Line

2 Inches Max.

MAXIMUM RATINGS Design Center Values

Anode Voltage

10,000 Max. Volts D-C

Grid No.2 Voltage

410 Max. Volts D-C

Negative-Bias Value

125 Max. Volts D-C

Positive-Bias Value

2 Max. Volts D-C

Peak Heater-Cathode Voltage *

Heater Negative With Respect to Cathode

125 Max. Volts D-C

Heater Positive With Respect to Cathode

125 Max. Volts D-C

Heater Negative With Respect to Cathode

During warm-up Period Not Exceeding 15 seconds

410 Max. Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage

9000 Volts D-C

Grid No.2 Voltage

250 Volts D-C

-2-

TYPICAL OPERATING CONDITIONS (Continued)

Grid No.1 Voltage**	-45 Volts D-C
Focusing Coil Current*** D-C Approximate	100 Milliamperes

MAXIMUM CIRCUIT VALUES

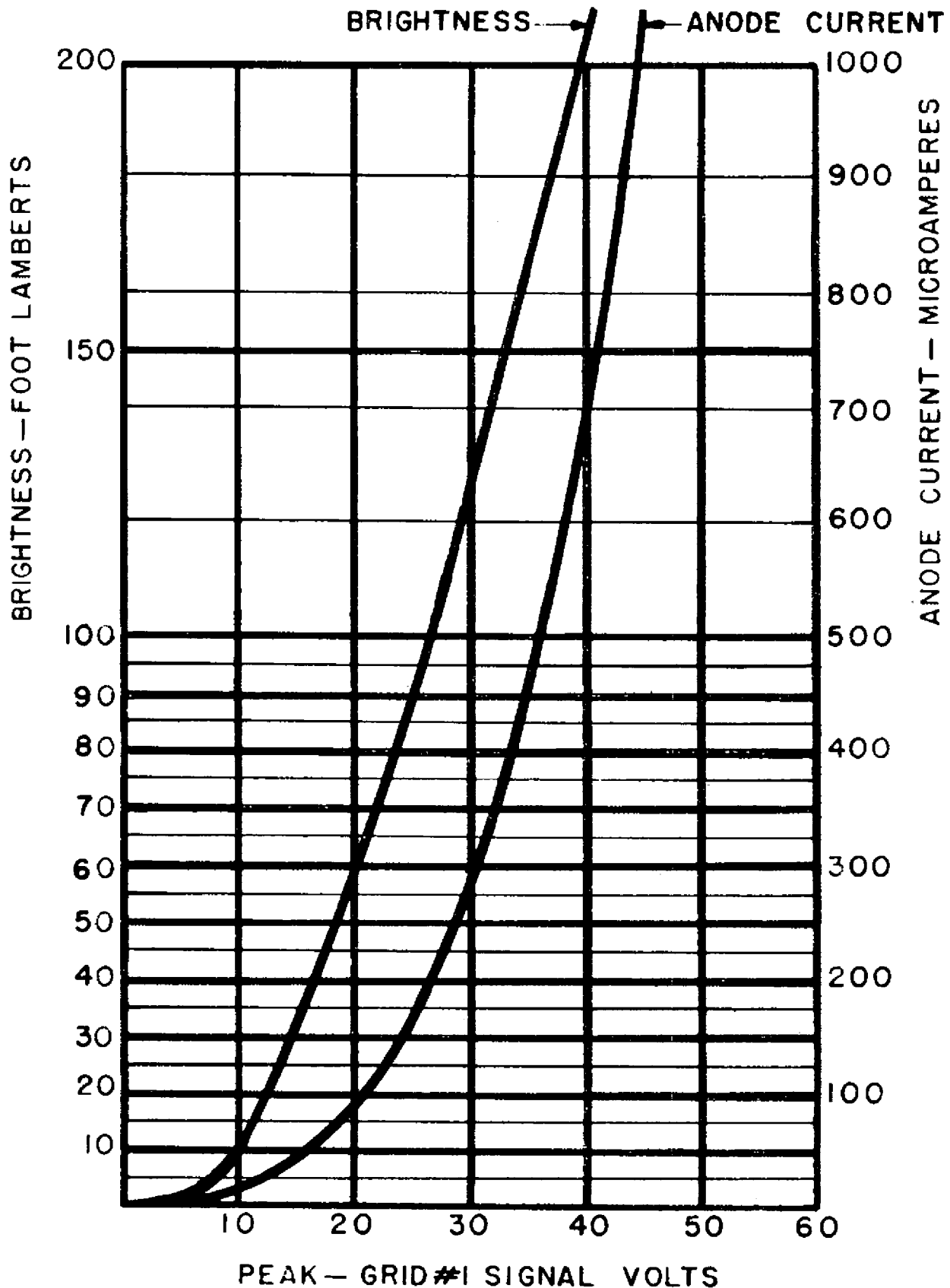
Grid No.1 Circuit Resistance	1.5 Max. Megohms
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- * Cathode should be returned to one side or to the mid-tap of the heater transformer winding.
- ** Visual extinction of undeflected focused spot. Supply should be adjustable to $\geq$ 40 percent of indicated value.
- *** For standard focus coil or equivalent, with the combined grid-No.1 - bias voltage and video-signal voltage adjusted to produce a highlight brightness of 12 foot-lamberts on a 6" x 8" picture area. Distance (D) shall be 2 $\frac{3}{4}$ inches.

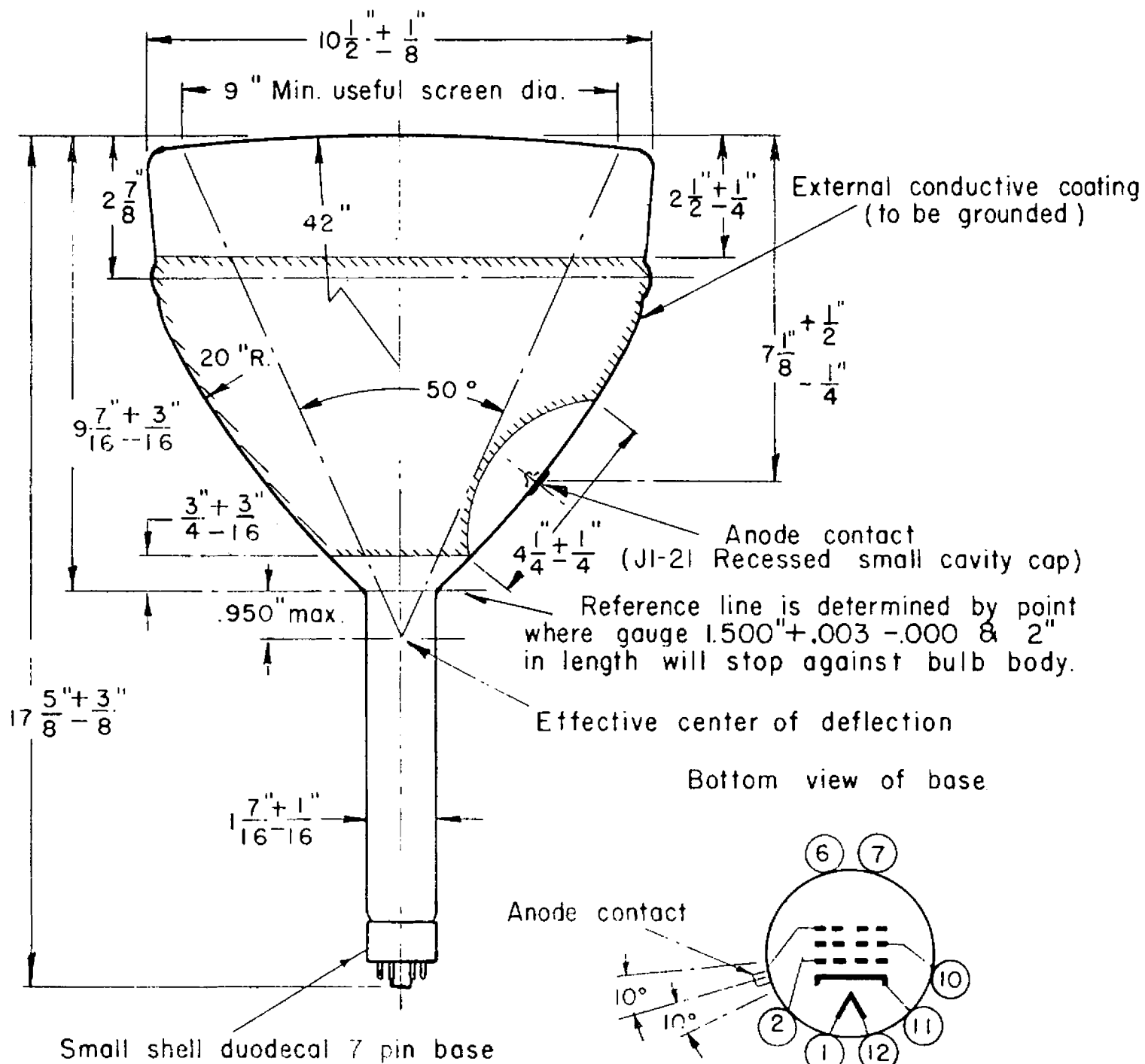
April 14, 1947

AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS
ANODE VOLTS = 9000
GRID No. 2 VOLTS = 250
GRID No. 1 BIASED TO CUTOFF
RASTER SIZE 6" X 8" (FOCUSED)



10FP4 / R6025



Pin No. 1	Heater	Pin No. 10	Grid No. 2
Pin No. 2	Grid No. 1	Pin No. 11	Cathode
Pin No. 6	No connection	Pin No. 12	Heater
Pin No. 7	No connection	Cap	Anode

THE RAULAND CORP.
ENGINEERS

4245 N. KNOX AVE., CHICAGO

EX-12075

Cathode-Ray Tube Type 10RP4

The 10RP4 is an all glass, electrostatic focus and magnetic deflection direct view picture tube for television applications. The focusing voltage required is from -0.4% to $\pm$ 2.2% of the anode voltage. It has a clear-glass faceplate and a metal-backed screen to prevent screen burning by ions and to increase light output. An external conductive coating serves as a filter capacitor when grounded.

GENERAL CHARACTERISTICS

Electrical Data

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

Focusing Method	Electrostatic	
Deflecting Method	Magnetic	
Deflecting Angle (Approx.)	50	Degrees

Phosphor ¹	No. 4
Fluorescence	White
Persistence	Medium

Direct Interelectrode Capacitances, Approx.

Cathode to all other electrodes	5	uuf
Grid No.1 to all other electrodes	6	uuf
External Conductive Coating to Anode	(1500 Max. 750 Min.)	uuf uuf

Mechanical Data

Overall Length	16 1/2 $\pm$ 1/4	Inches
Greatest Diameter of Bulb	10 1/2 $\pm$ 1/8	Inches
Minimum Useful Screen Diameter	9 1/8	Inches
Bulb Contact (Recessed Small Cavity Cap)	J1-21	
Base (Small Shell Duodecal 6-pin)	B6-63	
Basing	12L	
Bulb Contact Alignment		
J1-21 Contact Aligns with Vacant Pin Position #3	$\pm$ 30	Degrees

MAXIMUM RATINGS Design Center Values

Final Anode Voltage ²	16,000 Max.	Volts D-C
Grid No.4 (Focusing Electrode) Voltage Range ³	-64 to $\pm$ 350	Max. Volts D-C
Grid No.4 Voltage ⁴	-500 to $\pm$ 1000	Max. Volts D-C
Grid No.2 Voltage	500 Max.	Volts D-C
Grid No.1 Voltage		
Negative-Bias Value	125 Max.	Volts D-C
Positive-Bias Value	0 Max.	Volts D-C
Positive-Peak Value	2 Max.	Volts
Peak Heater-Cathode Voltage:		
Heater Negative with Respect to Cathode		
During Warm-up Period Not to Exceed 15 seconds	410 Max.	Volts D-C
After Equipment Warm-up Period	180 Max.	Volts D-C
Heater Positive with Respect to Cathode	180 Max.	Volts D-C

The Rauland Corporation

Chicago 41, Ill.

Cathode-Ray Tube Type 10RP4

JETEC COMPARATIVE CONDITIONS

Final Anode Voltage	12,000 Volts D-C
Grid No.4 Voltage Range ³	-48 to /260 Volts D-C
Grid No.4 Current	-15 to /25 uamp D-C
Grid No.2 Voltage	300 Volts D-C
Grid No.1 Voltage ⁵	-28 to -72 Volts D-C

RECOMMENDED OPERATING CONDITIONS

Final Anode Voltage	14,000 Volts D-C
Grid No.4 Voltage Range ³	-55 to /300 Volts D-C
Grid No.4 Current	-15 to /25 uamp D-C
Grid No.2 Voltage	300 Volts D-C
Grid No.1 Voltage ⁵	-28 to -72 Volts D-C

MAXIMUM CIRCUIT VALUES

Grid No.1 Circuit Resistance	1.5 Max.Megohms
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NOTES

1. Suitable for both black and white and CBS color television
2. Grid No.3, Grid No.5 and the Collector are connected internally and are referred to herein as "Final Anode."
3. Measured at 100 ua final anode current and equal vertical and horizontal resolution.
4. The focus electrode may be modulated to improve overall focus.
5. Visual extinction of the focused raster.

R A U L A N D

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

The type 12AFP- is a 12" magnetic focus and magnetic deflection round metal envelope cathode ray tube, suitable for radar application.

It features an almost completely flat-face, which minimizes parallax error, a straight magnetic gun (no Ion Trap needed) and a gray filter glass (luxide) face to increase contrast. It has a long persistence screen.

The type 12AFP-A tube utilizes a metal backed (aluminized) screen for greater light output and to minimize screen charging effects. It is otherwise identical to the 12AFP-.

TENTATIVE CHARACTERISTICSGENERALElectrical Data

Heater voltage	6.3		Volts
Heater current	0.6 $\pm$ 10%		Amperes
Heater warm-up time (approx.)	11		Seconds
Focusing method	Magnetic		
Deflecting method	Magnetic		
Deflecting angle (approx.)	54		Degrees
Phosphor	No. 7	No. 14	No. 19
Fluorescence	Blue	Blue	Orange
Phosphorescence	Yellow	Orange	Orange
Persistence	Long	Mid-long	Long

Face Plate - Gray Filter Glass

Light Transmission (Approx.) 66%

Direct Interelectrode Capacitances, Approx.

Cathode to all other electrodes	5	uuf.
Grid #1 to all other electrodes	6	uuf.

Mechanical Data

Overall length	17 7/8 $\pm$ 7/16	Inches
Greatest diameter of envelope	12 7/16 $\pm$ 1/8	Inches
Minimum useful screen diameter	11 3/8 Dia.	Inches
Face Radius	125	Inches
Anode contact	Metal cone lip	
Base (small shell Duodecal ~~4~~ -pin)	B5-57	
Basing connections	12D	

R A U L A N D

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

MAXIMUM RATINGS Design Center Values

Accelerator voltage ¹	14,000	Max. Volts D-C
Grid #2 voltage	±1000	Max. Volts D-C
Grid #1 voltage (control electrode)		
Negative bias value	-125	Max. Volts D-C
Positive bias value	0	Max. Volts D-C
Positive peak value	±2	Max. Volts
Peak Heater-Cathode Voltage ²		
Heater negative with respect to cathode	180	Max. Volts D-C
Heater positive with respect to cathode	180	Max. Volts D-C
Heater negative with respect to cathode during warm-up period, not to exceed 15 sec.	410	Max. Volts D-C

Typical Operating Conditions

Accelerator voltage ³	12,000	Volts D-C
Grid #2 voltage	±500	Volts
Grid #1 voltage ⁴	-33 to ±77	Volts
Spot Position (Undelected) ⁵	20	mm
Field strength of adjustable centering magnet	0 to 8	Gausses
Focusing coil current (approx.) ⁶	110 M.A. ± 20%	

Maximum Circuit Values

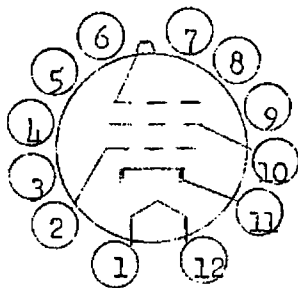
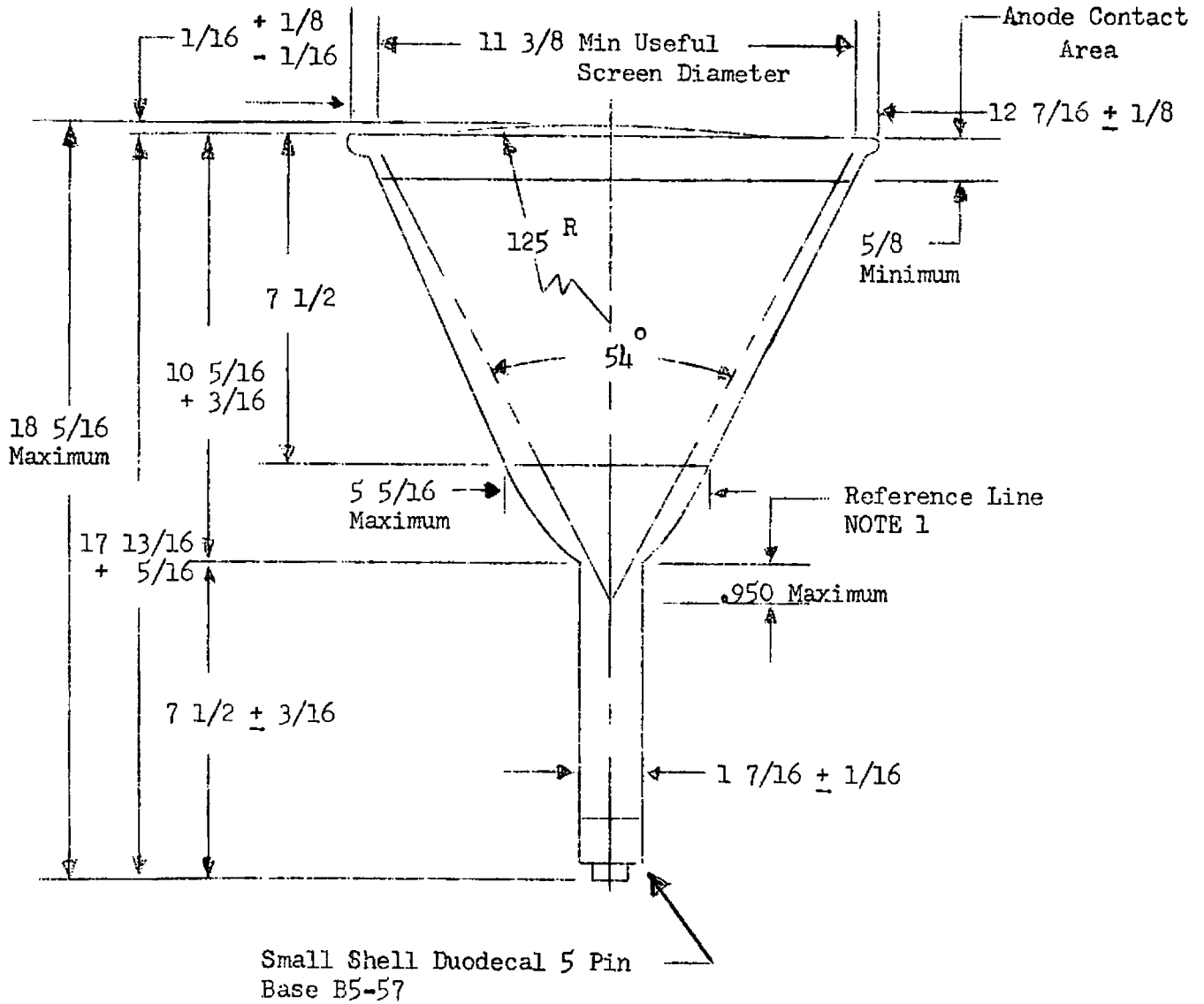
Grid #1 circuit resistance	1.5	Max. Megohms
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- Note 1: At or near this rating, the effective resistance of the accelerator supply should be adequate to limit the accelerator input power to six watts. The screen of the 12AFP- can be permanently damaged should the current density be permitted to rise too high. To prevent burning, minimum beam current densities should be employed.
- Note 2: Cathode should be returned to one side or to the mid-tap of the heater transformer windings.
- Note 3: Brilliance and definition decrease with decreasing accelerator voltage. In general, accelerator voltage should not be less than 8000 volts.
- Note 4: Visual extinction of undeflected focused spot.
- Note 5: The center of the undeflected, focused spot will fall within a circle of 20 mm radius concentric with the center of the tube face.
- Note 6: For standard focusing coil RTMA No. 106 or equivalent with a grid No. 1 bias to produce a 7-3/4" x 10-1/2" raster area. The coil to reference line (distance D) shall be 3-1/4 inches.

12AFP7 12AFP7A

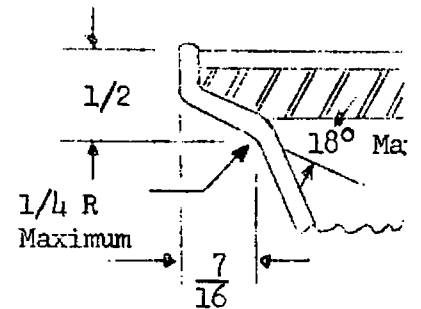
12AFP14 12AFP14A

12AFP19 12AFP19A



NOTE 1

Reference line determined by position where reference line gauge JETEC #112 will rest on glass funnel.



THE RAULAND CORPORATION
4245 North Knox Avenue
Chicago 41, Illinois

R A U L A N D

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

The type 12AGP- is a 12" electrostatic focus and magnetic deflection round metal envelope cathode-ray tube, suitable for radar applications. A low voltage electrostatic focus lens is employed, designed to operate at or near cathode potential to afford substantially automatic focus, independent of accelerator voltage variation.

It features an almost completely flat face which minimizes parallax error, electrostatic straight gun (no Ion Trap needed) and a gray filter glass (luxide) face to increase contrast. It has a long persistence screen.

The type 12AGP-A tube utilizes a metal backed (aluminized) screen for greater light output and to minimize screen charging effects. It is otherwise identical to the 12AGP-.

TENTATIVE CHARACTERISTICSGENERALElectrical Data

Heater Voltage	6.3	Volts
Heater Current	0.6 $\pm$ 10%	Amper
Heater warm-up time (approx.)	11 seconds	
Focusing Method	Electrostatic (low voltage)	
Deflecting method	Magnetic	
Deflecting angle (Approx.)	54	Degree
Phosphor	No. 7	No. 14
Fluorescence	Blue	Blue
Phosphorescence	Yellow	Orange
Persistence	Long	Medium-long
Face Plate - Gray Filter Glass		
Light Transmission (Approx. 66%)		
Direct Interelectrode Capacitances, Approx.		
Cathode to all other electrodes	5	uuf.
Grid No. 1 to all other electrodes	6	uuf.

Mechanical Data

Overall Length	17-7/8 $\pm$ 7/16	Inches
Greatest diameter of envelope	12 7/16 $\pm$ 1/8	Inches
Minimum useful screen diameter	11 3/8 Dia.	Inches
Radius (Face Plate)	125	Inches
Anode contact	Metal cone lip	
Base (small shell Duodecal 6 pin)	E6-63	
Basing connections	12M	

R A U L A N D

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

MAXIMUM RATINGS Design Center Values

Accelerator voltage ¹ & 2	14,000	Max. Volts D-C
Grid #4 voltage (focus anode)	-500 to ± 1000	Max. Volts D-C
Grid #2 voltage	± 1000	Max. Volts D-C
Grid #1 voltage (control electrode)		
Negative bias value	-125	Max. volts D-C
Positive bias value	0	Max. volts D-C
Positive peak value	± 2	Max. volts
Peak Heater Cathode Voltage ³		
Heater negative with respect to cathode	180	Max. volts D-C
Heater positive with respect to cathode	180	Max. volts D-C
Heater negative with respect to cathode during warm-up period, not to exceed 15 sec.	410	Max. volts D-C

TYPICAL OPERATING CONDITIONS

Accelerator Voltage ⁴	12,000	Volts D-C
Grid #4 voltage	-0.4 to $\pm 2.2\%$ of E_{anode}	
Grid #4 current	-15 to ± 25	ua. D-C
Grid #2 voltage ⁵	± 500	Volts
Grid #1 voltage ⁵	-33 to -77	Volts
Spot Position (Undelected) ⁶	20	MM
Field strength of adjustable centering magnet	0 to 8	Gausses

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Max. Megohms
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Note 1: Accelerator and Grid #3, which are connected together within the tube, are referred to herein as Accelerator.

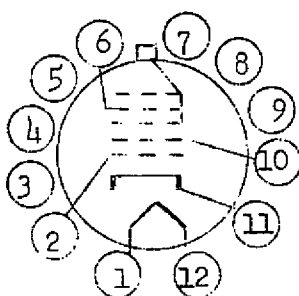
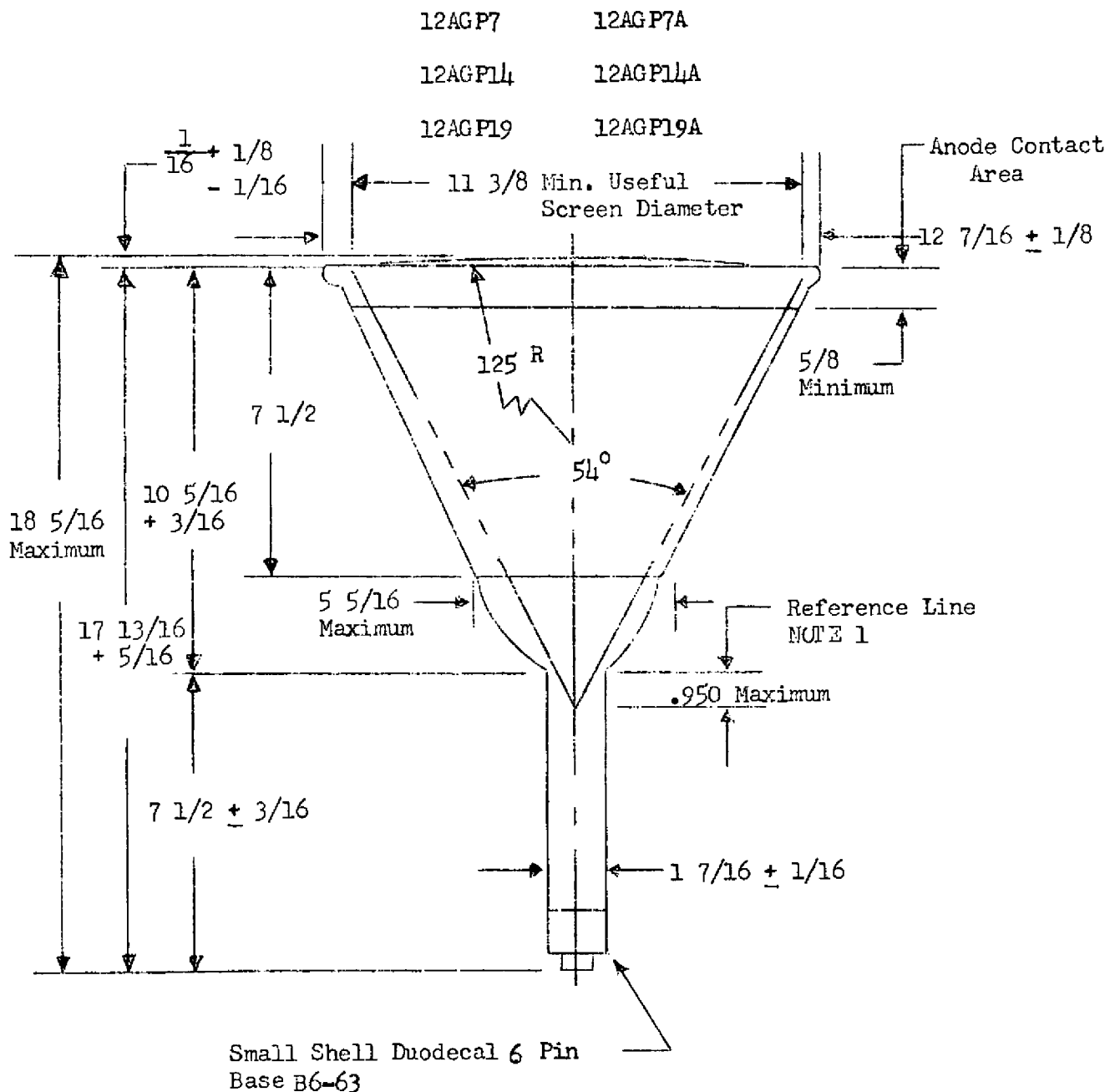
Note 2: At or near this rating, the effective resistance of the accelerator supply should be adequate to limit the accelerator input power to six watts. The screen of the 12AGP- can be permanently damaged should the current density be permitted to rise too high. To prevent burning, minimum beam current densities should be employed.

Note 3: Cathode should be returned to one side or to the mid-tap of the heater transformer windings.

Note 4: Brilliance and definition decrease with decreasing accelerator voltage. In general, accelerator voltage should not be less than 8000 volts.

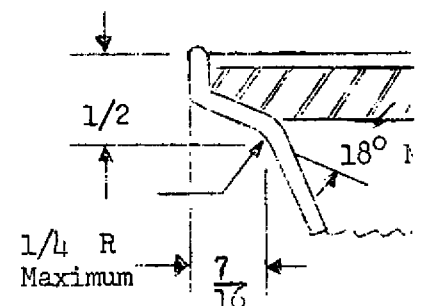
Note 5: Visual extinction of undeflected focused spot.

Note 6: The center of the undeflected focused spot will fall within a circle of 20 MM radius concentric with the center of the tube's face.



NOTE 1

Reference line determined by position where reference line gauge
JETEC #112 will rest on glass funnel.



THE RAULAND CORPORATION
4245 North Knox Avenue
Chicago 41, Illinois

Cathode-Ray Tube Type 14AUP4

The 14AUP4 is a 14" 90° rectangular, electrostatic focus and magnetic deflection direct-view picture tube specifically intended for cathode drive television applications. It has a maximum spot cut-off of 50 volts and a minimum cathode current of 1000 microamperes when operated in cathode drive at a Grid No.2 voltage of 50 volts. Other features of this tube are a short overall length, spherical gray filter glass faceplate, metal-backed screen, a construction which does not require an external ion trap magnet, and a high capacity external conductive coating, which when grounded serves as a filter capacitor and aids in the suppression of radiation. This tube is intended for series string operation and has a heater current of 450 milliamperes.

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmission (approx.)	79%

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.450 $\pm$ 5% Amperes
Heater Warm-up Time ¹	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 uuf
Grid No.1 to All Other Electrodes	6 uuf
External Conductive Coating to Anode ²	1500 uuf Max. 1000 uuf Min.

MECHANICAL DATA

Overall Length	13 3/16 $\pm$ 5/16 Inches
Greatest Bulb Dimensions	
Diagonal	14 $\pm$ 1/8 Inches
Width	13 1/16 $\pm$ 1/8 Inches
Height	10 9/16 $\pm$ 1/8 Inches
Neck Length	5 1/2 $\pm$ 3/16 Inches
Minimum Useful Screen Dimensions (Maximum Assured)	9 1/2 x 12 1/16 Inches
Minimum Useful Screen Area	104 Sq.Inches
Bulb Contact - Recessed Small Cavity Cap	J1-21
Base - Small Shell Duodecal 6-pin	B6-63
Basing	12L
Bulb Contact Alignment - J1-21 Contact Aligns with Pin Position No.6 $\pm$ 30 Degrees	

MAXIMUM RATINGS (Absolute Maximum Values)

Final Anode Voltage ³	16,500 Volts dc
Grid No.4 Voltage (Focusing Electrode) ⁴	-500 to 1,100 Volts dc
Grid No.2 to Grid No.1 Voltage	70 Volts dc

Cathode-Ray Tube Type 14AUP4

MAXIMUM RATINGS (Absolute Maximum Values)

Cathode to Grid No.1 Voltage	
Positive Bias Value	150 Volts
Negative Peak Value	0 Volts
Peak Heater-Cathode Voltage	
During Warm-up Period Not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	12,000 Volts dc
Grid No.4 to Grid No.1 Voltage for Focus at 100 ua Cathode Current	0 to / 350 Volts dc
Grid No.2 to Grid No.1 Voltage	50 Volts dc
Cathode to Grid No.1 Voltage for cut-off ⁵	30 to 50 Volts dc

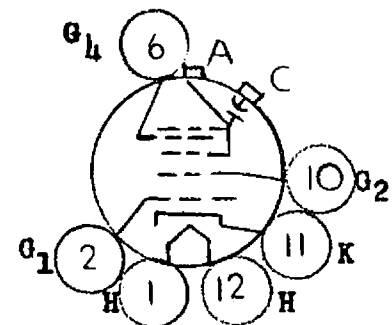
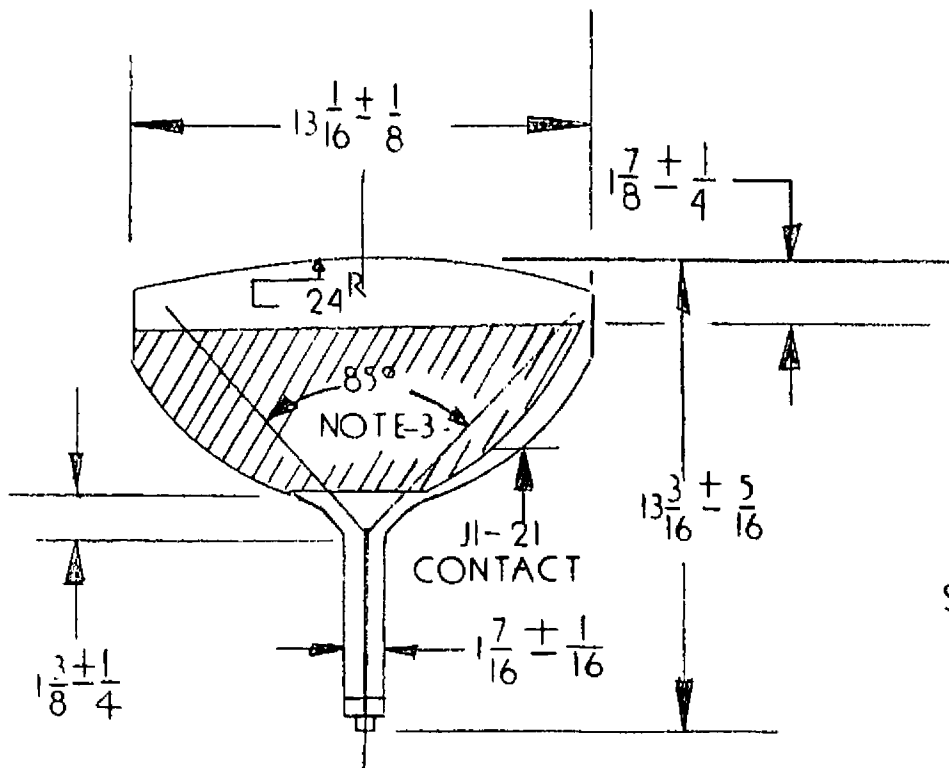
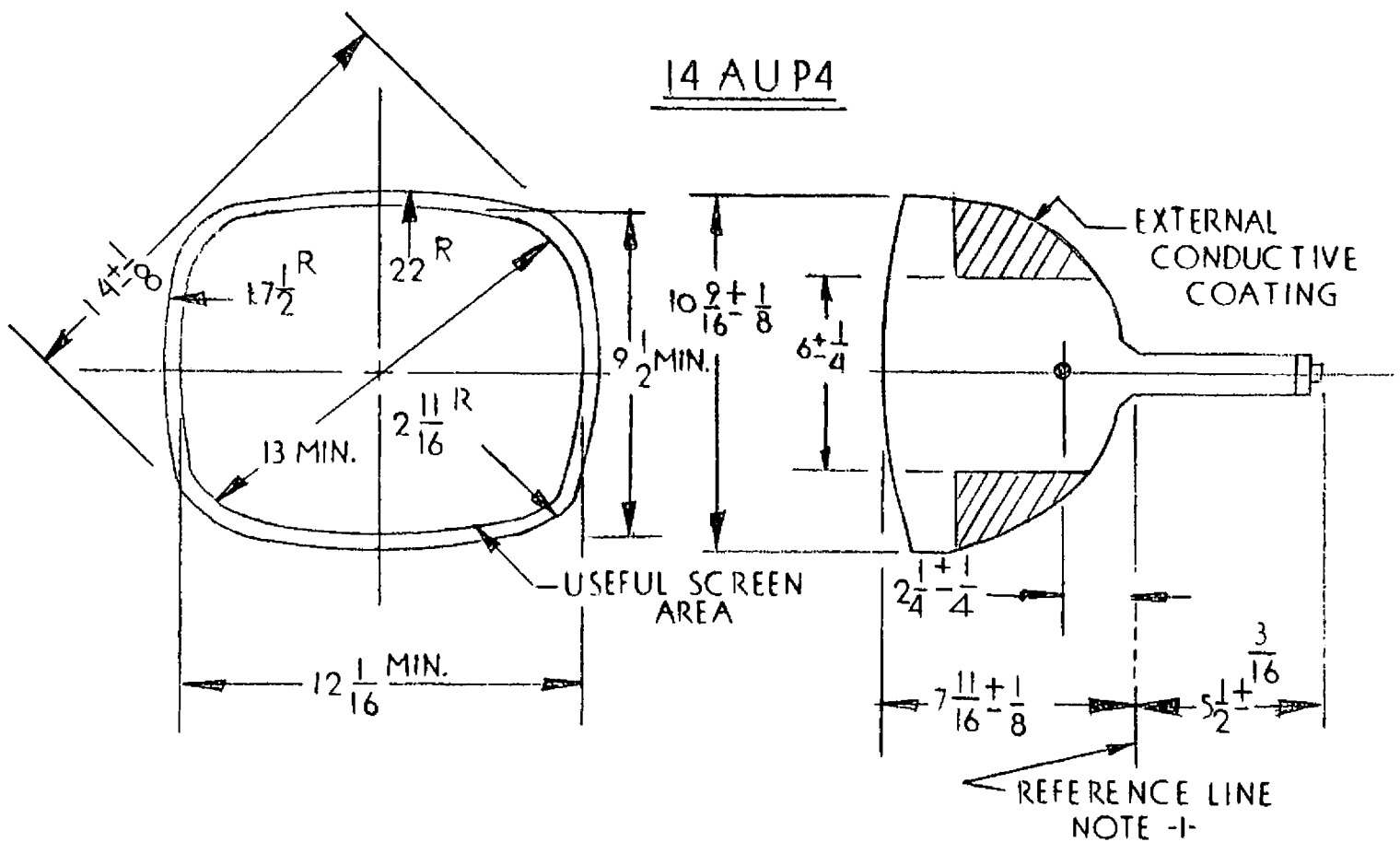
CIRCUIT VALUES

Grid No.1 Circuit Resistance	1.5 Max.Megohms
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NOTES

1. Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 42 ohms.
2. External conductive coating must be grounded.
3. Grid No.3, Grid No.5 and the Collector are connected internally and are referred to herein as "Final Anode".
4. The focus electrode may be modulated to improve overall focus.
5. For visual extinction of focused raster. Extinction of stationary focused spot will require that these values be increased approximately 5 volts. The cut-off voltage will change by approximately 2% with 1 KV change of anode voltage.

14 AUP4



SMALL SHELL DUODECAL
6 PIN BASE B6-63-NOTE-2-

NOTES :

1. REFERENCE LINE AS DETERMINED BY PLANE C-C' of REFERENCE LINE GAUGE RETMA #116.
2. PIN POSITION No. 6 TO BE ALIGNED WITH ANODE BUTTON $\angle 30^{\circ}$
3. DIAGONAL DEFLECTION ANGLE IS 90°

THE RAULAND CORP.
CHICAGO 47,
ILL.



CORPORATION

16AVP4

5600 WEST JARVIS AVENUE

CHICAGO 48, ILLINOIS

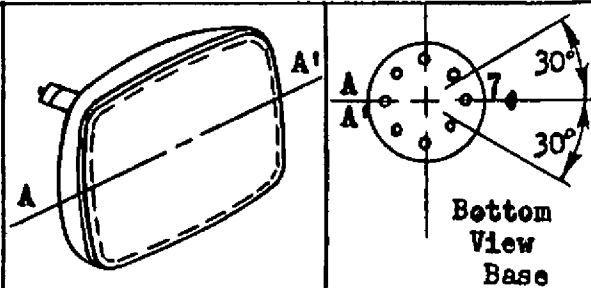
TELEPHONE MULBERRY 5-5000

TELETYPE 312-265-1293

DESCRIPTION

16" Direct View
 Rectangular Glass Envelope
 Spherical Faceplate
 Gray Filter Glass
 Aluminized Screen
 6.3 Volt, 450 Ma. Heater
 Bonded Implosion Panel

Low G₂ Voltage (35 V.)
 Cathode Drive Design
 114° Magnetic Deflection
 Electrostatic Focus
 External Conductive Coating
 No Ion Trap

ELECTRICAL DATAFocusing Method

Electrostatic

Deflection Angles, Approximate

Horizontal

103 Degrees

Vertical

87 Degrees

Diagonal

114 Degrees

Direct Interelectrode Capacitances

Cathode to all other electrodes, approximate

5 uuf

Grid #1 to all other electrodes, approximate

6 uuf

External Conductive Coating to Anode

1400 max. uuf

900 min. uuf

Heater Current at 6.3 Volts

450 + 10% ma.

Heater Warm-up Time

11 Seconds

OPTICAL DATAPhosphor Number

P4 Aluminized

Light Transmittance at Center, Approximate

59 Percent

MECHANICAL DATAOverall Length

10 11/16 ± 5/16 Inches

Greatest Dimensions of Tube

Diagonal

15 5/8 ± 1/8 Inches

Width

13 23/32 ± 1/8 Inches

Height

11 3/32 ± 1/8 Inches

Minimum Useful Screen Dimensions (Projected)

Diagonal

14 7/8 Inches

Horizontal Axis

12 15/16 Inches

Vertical Axis

10 1/4 Inches

Area

125 Sq. Inches

Neck Length

4 3/8 ± 1/8 Inches

Bulb

J125A1-A or equivalent

Implosion Panel

FP125A1 or equivalent

Bulb Contact

J1-21

Base

B6-214

Basing

7FA

Bulb Contact Alignment

Anode contact aligns with pin position #7

± 30 Degrees

RATINGS (Design Maximum System)

Unless otherwise specified, voltages are positive and measured with respect to Grid #1

Maximum Anode Voltage	17,600 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -500 Volts
Maximum Grid #2 Voltage	60 Volts
Minimum Grid #2 Voltage	25 Volts
Cathode Voltage	100 Volts
Maximum Heater Voltage	7 Volts
Minimum Heater Voltage	5.8 Volts
Maximum Heater-Cathode Voltage	
Heater negatives with respect to cathode	
During warm-up period not to exceed 15 seconds	-410 Volts
After equipment warm-up period	-180 Volts
Heater positive with respect to cathode	180 Volts

TYPICAL OPERATING CONDITIONS

CATHODE DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to Grid #1

Anode Voltage	15,000 Volts
Grid #4 Voltage (Focusing Electrode) 2, 3	250 Volts
Grid #2 Voltage	35 Volts
Cathode Voltage 1	25 to 50 Volts

MAXIMUM CIRCUIT VALUES

Maximum Grid #1 Circuit Resistance	1.5 Megohms
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NOTES

1. Visual extinction of focused raster.
2. With the combined Grid #1 bias voltage and video-signal voltage adjusted to give an anode current of 125 microamperes on a 12 15/16 x 10 1/4 pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and 500 volts.

THE



CORPORATION

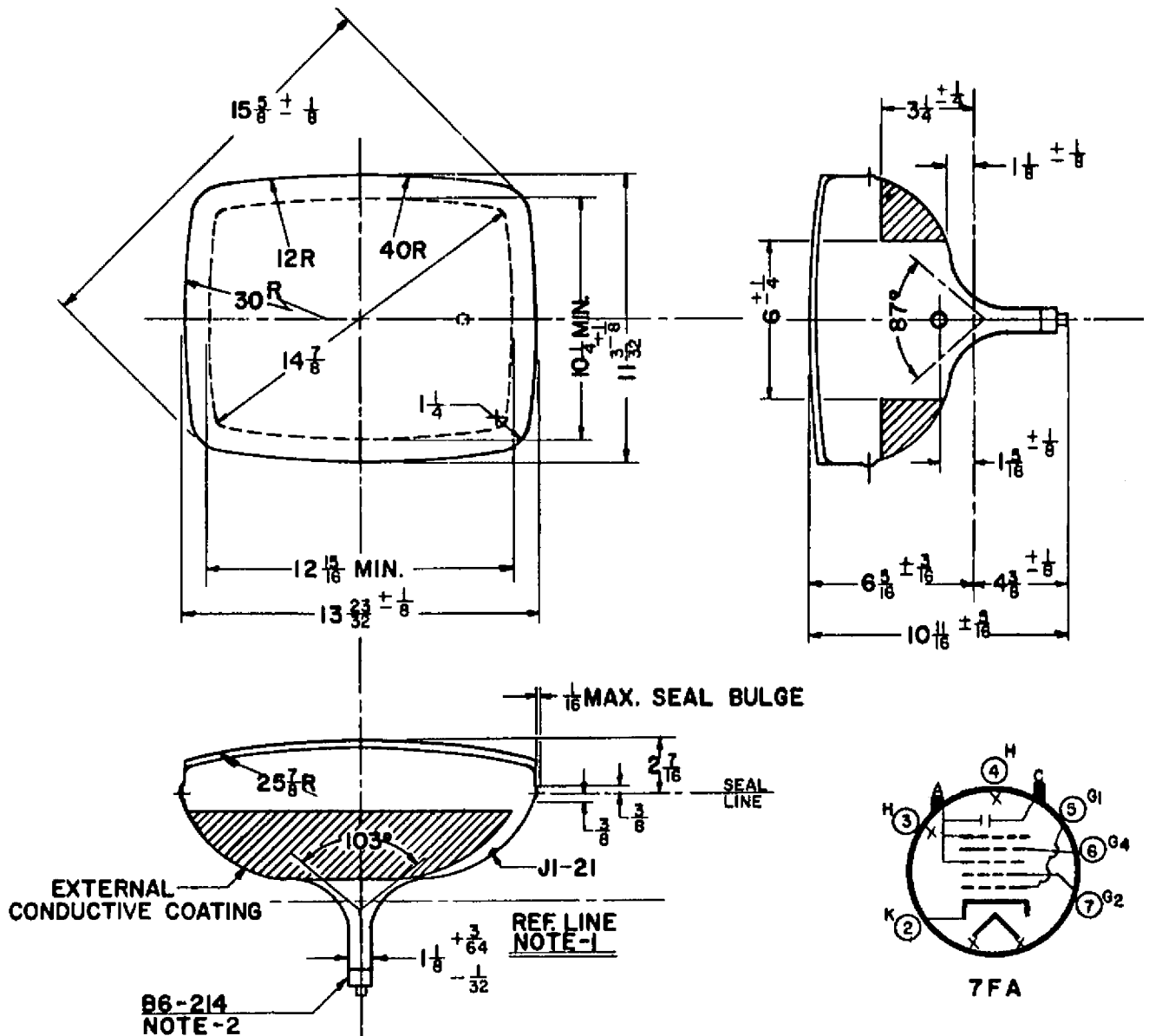
16AVP4

5600 WEST JARVIS AVENUE

CHICAGO 48, ILLINOIS

TELEPHONE MULBERRY 5-5000

TELETYPE 312-265-1293



NOTES:

1. REFERENCE LINE AS DETERMINED BY PLANE C-C' OF J.E.D.E.C. REFERENCE LINE GAUGE NO.126.
2. BASE PIN NO.7 ALIGNS WITH ANODE CONTACT WITHIN 30° .

Cathode-Ray Tube Type 17CLP4

The 17CLP4 is a short neck 17" 90° rectangular, electrostatic focus and magnetic deflection direct-view picture tube. It has a filter glass faceplate, metal-backed screen, and an external ion trap magnet of the single field type. The tube has a high capacity external conductive coating, which when grounded serves as a filter capacitor, and aids in the suppression of radiation.

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmission (approx.)	74%

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 $\pm$ 10% Amperes
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 uuf
Grid No.1 to All Other Electrodes	6 uuf
External Conductive Coating to Anode ¹	2300 uuf Max. 1800 uuf Min.

MECHANICAL DATA

Overall Length	15 5/8 $\pm$ 3/8 Inches
Greatest Bulb Dimensions	
Diagonal	16 5/8 $\pm$ 1/8 Inches
Width	15 3/8 $\pm$ 1/8 Inches
Height	12 9/32 $\pm$ 1/8 Inches
Minimum Useful Screen Dimensions (Max. assured)	11 1/8 x 14 5/16 Inches
Minimum Useful Screen Area	149 Sq.In.
Bulb Contact - Recessed Small Cavity Cap	J1-21
Base - Small Shell Duodecal 6-pin	B6-63
Basing	12L
Bulb Contact Alignment - J1-21 Contact Aligns with Pin Position No.6 $\pm$ 30 degrees	

MAXIMUM RATINGS (Absolute Maximum Values)

Final Anode Voltage ²	17,600 Volts dc
Grid No.4 Voltage (Focusing Electrode) ³	-550 to $\pm$ 1,100 Volts dc
Grid No.2 Voltage	550 Volts dc
Grid No.1 Voltage	
Negative Bias Value	155 volts dc
Negative Peak Value	220 Volts dc
Positive Peak Value	2 volts
Positive Bias Value	0 Volts

Cathode-Ray Tube Type 17CLP4

MAXIMUM RATINGS (Absolute Maximum Values) cont'd

Peak Heater-Cathode Voltage:

Heater Negative with Respect to Cathode	
After Warm-up Period Not to Exceed 15 Seconds	450 Volts dc
After Equipment Warm-up Period	200 Volts dc
Heater Positive with Respect to Cathode	200 volts dc

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts dc
Grid No.4 Voltage for Focus	-48 to $\pm$ 264 Volts dc
Grid No.2 Voltage	300 Volts dc
Grid No.1 Voltage Required for Cutoff ⁴	-35 to -72 Volts dc
Field Strength of PM Ion Trap Magnet ⁵	35 Gauss

CIRCUIT VALUES

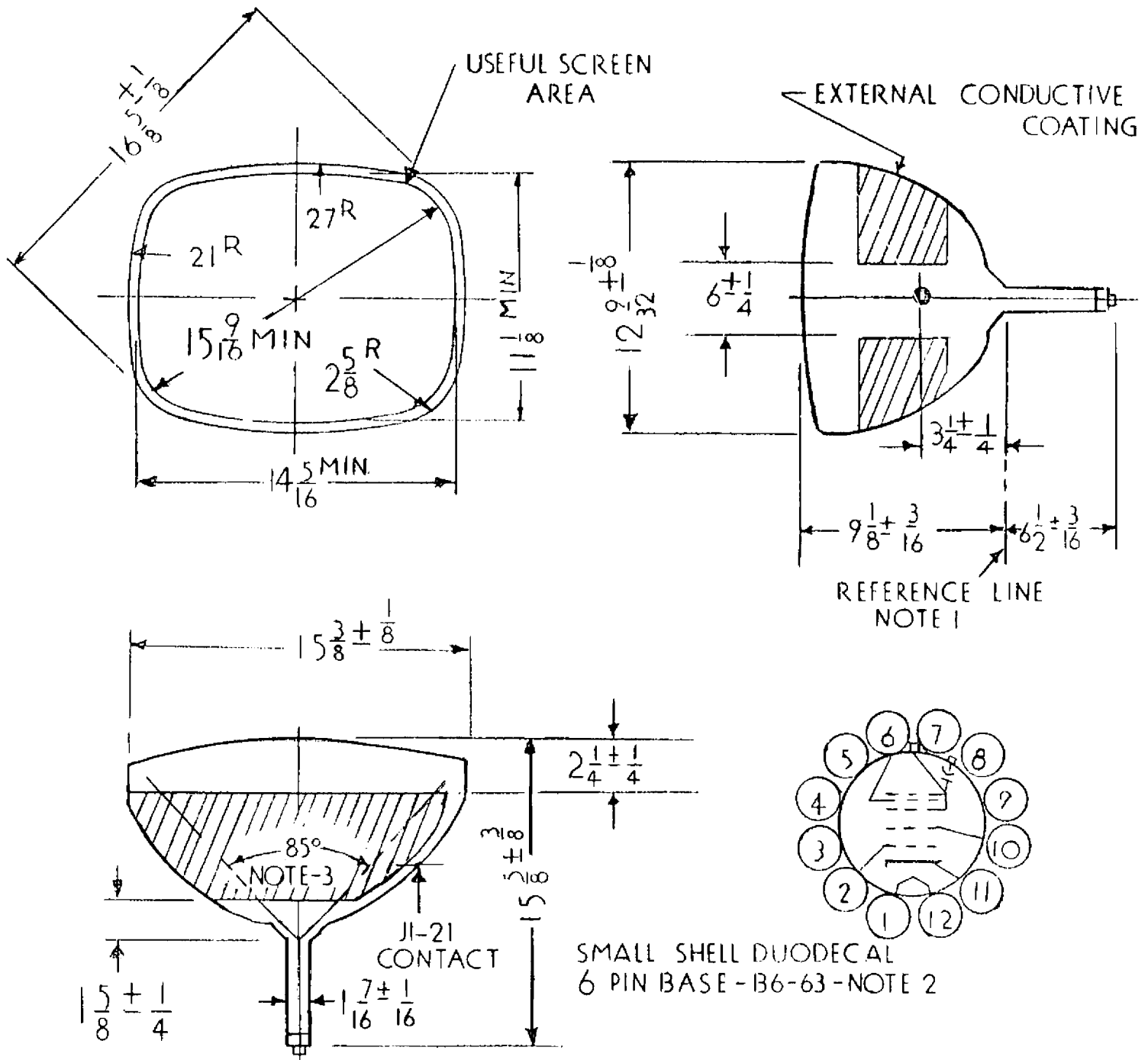
Grid No.1 Circuit Resistance	1.5 Max.Megohms
------------------------------	-----------------

NOTES

1. External conductive coating must be grounded.
2. Grid No.3, Grid No.5 and the Collector are connected internally and are referred to herein as "Final Anode".
3. The focus electrode may be modulated to improve overall focus
4. Visual extinction of focused raster.
5. For typical PM ion trap magnet with field strength tolerance of $\pm$ 3 gauss.

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 voltage in excess of 16,000 volts.



NOTES:

1. REFERENCE LINE AS DETERMINED BY PLANE C-C' of REFERENCE LINE GAUGE RETMA #116.
2. PIN POSITION No.6 TO BE ALIGNED WITH ANODE BUTTON $\pm 30^\circ$.
3. DIAGONAL DEFLECTION ANGLE IS 90° .

Cathode-Ray Tube Type 17CRP4

The 17CRP4 is a 17" 90° rectangular, electrostatic focus and magnetic deflection direct-view picture tube specifically intended for cathode drive television applications. It has a maximum spot cut-off of 50 volts and a minimum cathode current of 1000 microamperes when operated in cathode drive at a Grid No.2 voltage of 50 volts. Other features of this tube are a short overall length, spherical gray filter glass faceplate, metal-backed screen, a construction which does not require an external ion trap magnet, and a high capacity external conductive coating, which when grounded serves as a filter capacitor and aids in the suppression of radiation. This tube is intended for series string operation and has a heater current of 450 milliamperes.

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmission (approx.)	74%

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.450 $\pm$ 5% Amperes
Heater Warm-up Time ¹	11 Seconds
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 uuf
Grid No.1 to All Other Electrodes	6 uuf
External Conductive Coating to Anode ²	2300 uuf Max. 1800 uuf Min.

MECHANICAL DATA

Overall Length	14 5/8 $\pm$ 3/8 Inches
Greatest Bulb Dimensions	
Diagonal	16 5/8 $\pm$ 1/8 Inches
Width	15 3/8 $\pm$ 1/8 Inches
Height	12 9/32 $\pm$ 1/8 Inches
Neck Length	5 1/2 3/16 Inches
Minimum Useful Screen Dimensions (Maximum assured)	11 1/8 x 14 5/16 Inches
Minimum Useful Screen Area	149 Sq.In.
Bulb Contact - Recessed Small Cavity Cap	J1-21
Base - Small Shell Duodecal 6-pin	B6-63
Basing	12L
Bulb Contact Alignment - J1-21 Contact Aligns with Pin Position No.6 $\pm$ 30 degrees	

MAXIMUM RATINGS (Absolute Maximum Values)

Final Anode Voltage ³	17,600 Volts dc
Grid No.4 Voltage (Focusing Electrode) ⁴	-550 to $\pm$ 1,100 Volts dc
Grid No.2 to Grid No.1 Voltage	70 Volts dc

Cathode-Ray Tube Type 17CRP4

MAXIMUM RATINGS (Absolute Maximum Values)

Cathode to Grid No.1 Voltage	
Positive Bias Value	150 Volts dc
Negative Peak Value	0 Volts
Peak Heater-Cathode Voltage	
During Warm-up Period Not to Exceed 15 Seconds	450 Volts
After Equipment Warm-up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000 Volts dc
Grid No.4 to Grid No.1 Voltage for Focus	
at 100 ua Cathode Current	0 to / 350 Volts dc
Grid No.2 to Grid No.1 Voltage	50 Volts dc
Cathode to Grid No.1 Voltage for cut-off ⁵	30 to 50 Volts dc

CIRCUIT VALUES

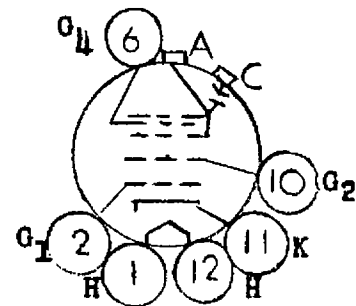
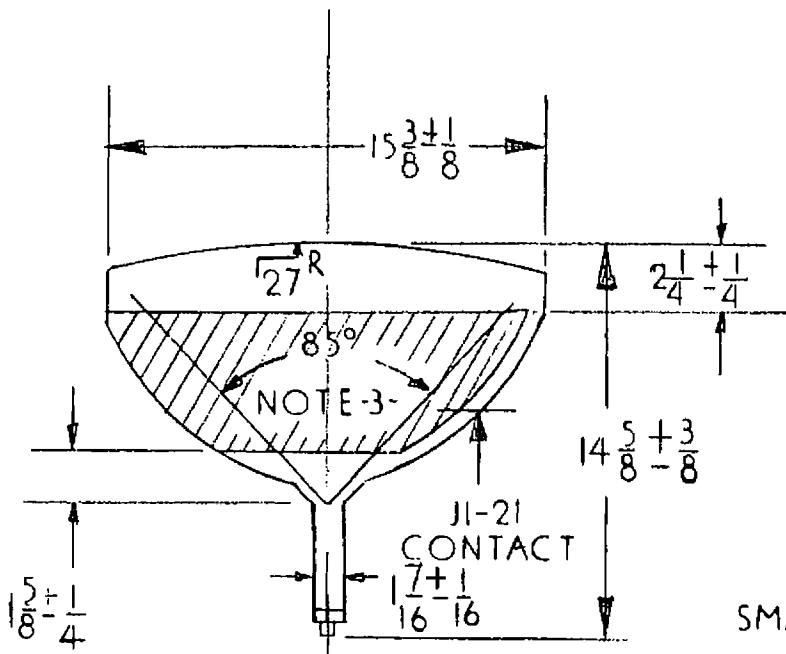
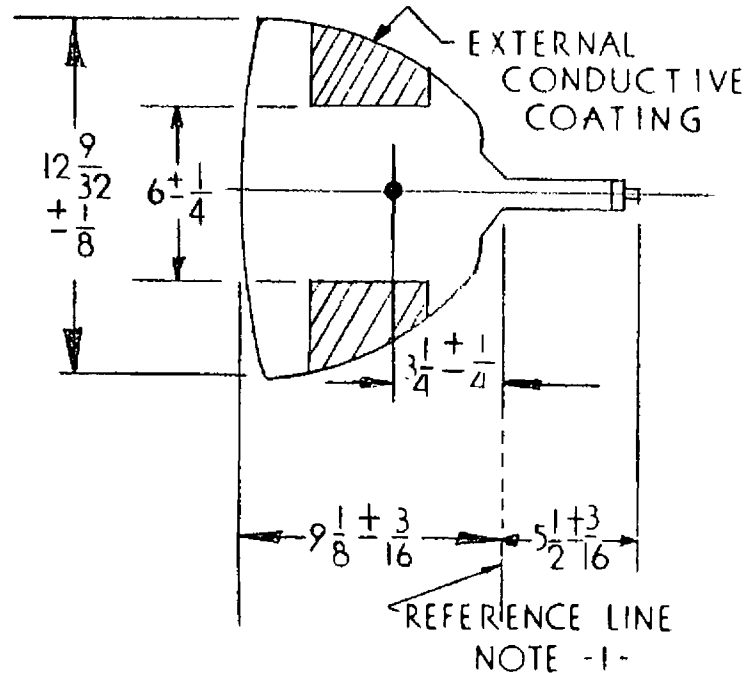
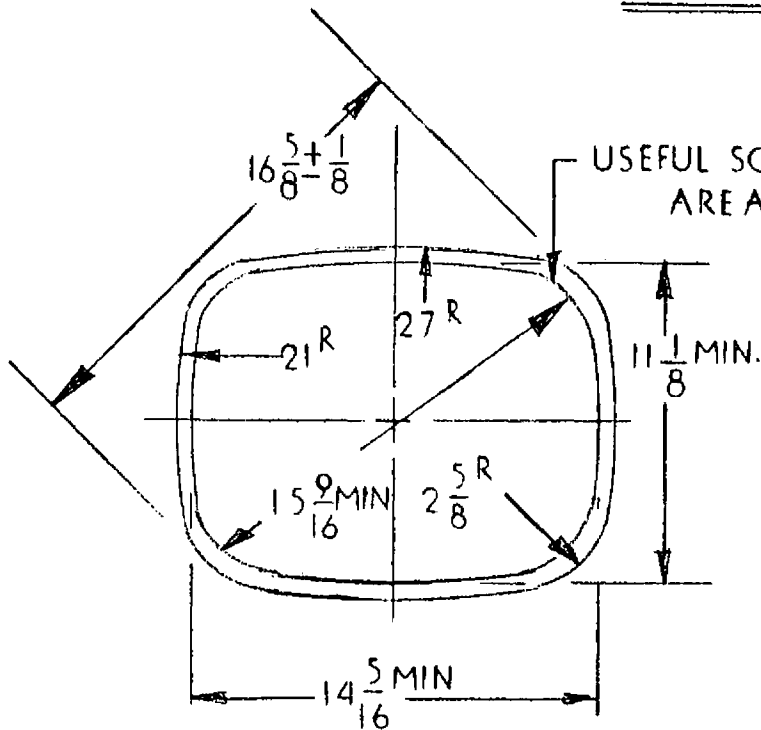
Grid No.1 Circuit Resistance	1.5 Max.Megohms
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NOTES

1. Heater warm-up time is the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, with E = 25 volts and series R = 42 ohms.
2. External conductive coating must be grounded.
3. Grid No.3, Grid No.5 and the Collector are connected internally and are referred to herein as "Final Anode".
4. The focus electrode may be modulated to improve overall focus.
5. For visual extinction of focused raster. Extinction of stationary focused spot will require that these values be increased approximately 5 volts. The cut-off voltage will change by approximately 2% with 1 KV change of anode voltage.

from JETEC release #2091, Jan. 27, 1958

17CRP4



SMALL SHELL DUODECAL
6 PIN BASE B6-63-NOTE-2-

NOTES:

1. REFERENCE LINE AS DETERMINED BY PLANE C-C' OF REFERENCE LINE GAUGE RETMA #116.
2. PIN POSITION No. 6 TO BE ALIGNED WITH ANODE BUTTON $\pm 30^\circ$
3. DIAGONAL DEFLECTION ANGLE IS 90°

THE RAULAND CORP.
CHICAGO, 41,
ILL.



CORPORATION

19CDP4

4245 NORTH KNOX AVE.

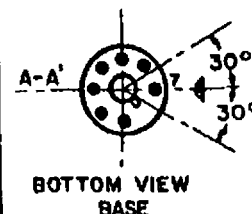
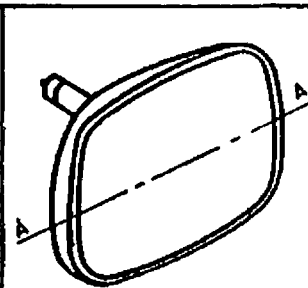
CHICAGO 41, ILLINOIS

TELEPHONE MULBERRY 5-5000

TELETYPE CG 2790

DESCRIPTION

19" Direct View	Low G ₂ Voltage (50V.)
Rectangular Glass Envelope	Cathode Drive Design
Spherical Faceplate	114° Magnetic Deflection
Gray Filter Glass	Electrostatic Focus
Aluminized Screen	External Conductive Coating
6.3 Volt, 600 Ma. Heater	No Ion Trap

ELECTRICAL DATA

Focusing Method

Electrostatic

Deflection Angles, Approximate

Horizontal

103 Degrees

Vertical

86 Degrees

Diagonal

114 Degrees

Direct Interelectrode Capacitances

Cathode to all other electrodes, approximate

5 uuf

Grid #1 to all other electrodes, approximate

6 uuf

External Conductive Coating to Anode

1900 max. uuf

1400 min. uuf

Heater Current at 6.3 volts

600 $\pm$ 10% Ma

Heater Warm-up time

11 Seconds

OPTICAL DATA

Phosphor Number

P4, Aluminized

Light Transmittance at Center, Approximate

78 Percent

MECHANICAL DATA

Overall Length

11 5/8 $\pm$ 1/4 Inches

Greatest Diameter of Tube

Diagonal

18 5/8 $\pm$ 1/8 Inches

Width

16 13/32 $\pm$ 1/8 Inches

Height

13 11/32 $\pm$ 1/8 Inches

Minimum Useful Screen Dimensions (Projected)

Diagonal

17 9/16 Inches

Horizontal Axis

15 1/8 Inches

Vertical Axis

12 Inches

Area

172 Sq. Inches

Neck Length

4 3/8 $\pm$ 1/8 Inches

Bulb

J 149 A1 or equivalent

Bulb Contact

J1-21

Base

B6-214

Basing

7FA

Bulb Contact Alignment

Anode contact aligns with pin position #7

 $\pm$ 30 Degrees

Dec., 1961

Page 1 of 3

RATINGS (Design Maximum System)

Unless otherwise specified, voltages are positive and measured with respect to Grid #1

Maximum Anode Voltage	19,800	Volts
Minimum Anode Voltage	12,000	Volts
Maximum Grid #4 (Focusing Electrode) Voltage	± 1100 -500	Volts
Maximum Grid #2 Voltage	70	Volts
Minimum Grid #2 Voltage	40	Volts
Cathode Voltage	100	Volts
Maximum Heater Voltage	7	Volts
Minimum Heater Voltage	5.8	Volts
Maximum Heater-Cathode Voltage		
Heater negatives with respect to cathode		
During warm-up period not to exceed 15 seconds	-410	Volts
After equipment warm-up period	-180	Volts
Heater positive with respect to cathode	180	Volts

TYPICAL OPERATING CONDITIONS

CATHODE DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to Grid #1

Anode Voltage	16,000	Volts
Grid #4 Voltage (Focusing Electrode) 2, 3	250	Volts
Grid #2 Voltage ₁	50	Volts
Cathode Voltage	35 to 50	Volts

MAXIMUM CIRCUIT VALUES

Maximum Grid #1 Circuit Resistance	1.5	Megohms
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NOTES

1. Visual extinction of focused raster.
2. With the combined grid #1 bias voltage and video-signal voltage adjusted to give an anode current of 150 microamperes on a 15 1/8 x 12 pattern from 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and 500 volts.

THE



CORPORATION

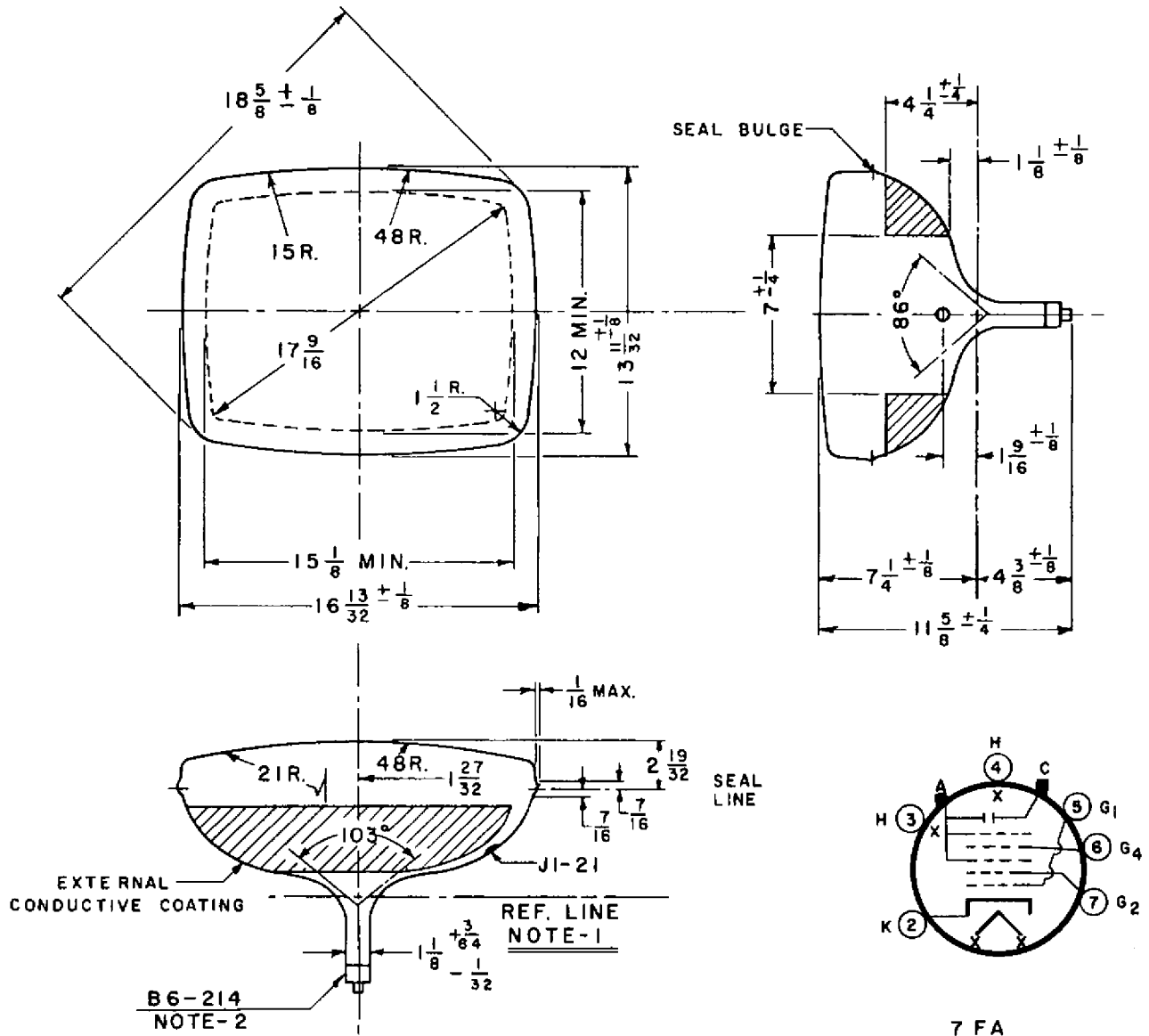
19CDP4

4245 NORTH KNOX AVE.

CHICAGO 41, ILLINOIS

TELEPHONE MULBERRY 5-5000

TELETYPE CG 2790



NOTE:

1. REFERENCE LINE AS DETERMINED BY PLANE C-C' OF J.E.D.E.C. REFERENCE LINE GAUGE NO. 126
2. BASE PIN NO. 7 ALIGNS WITH ANODE CONTACT WITHIN 30°



CORPORATION

4245 NORTH KNOX AVE.

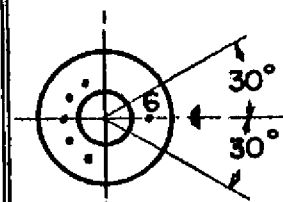
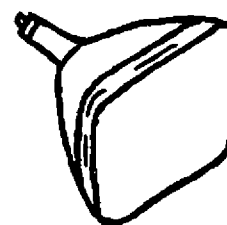
CHICAGO 41, ILLINOIS

TELEPHONE MULBERRY 5-5000

TELETYPE CG 2790

DESCRIPTION

19" Direct View	Low G ₂ Voltage (35V)
Rectangular Glass Envelope	Cathode Drive Design
Spherical Faceplate	92° Magnetic Deflection
Gray Filter Glass	Electrostatic Focus
Aluminized Screen	External Conductive Coating
6.3 Volt, 600 Ma Heater	No Ion Trap



**BOTTOM VIEW
BASE**

ELECTRICAL DATA

Focusing Method

Electrostatic

Deflection Angles, Approximate

Horizontal

80 Degrees

Vertical

65 Degrees

Diagonal

92 Degrees

Direct Interelectrode Capacitance

Cathode to all other electrodes, approximate

5 uuf

Grid #1 to all other electrodes, approximate

6 uuf

External Conductive Coating to Anode

2,000 max. uuf

1,500 min. uuf

Heater Current at 6.3 volts

600 ± 10% Ma

Heater Warm-up time

11 Seconds

OPTICAL DATA

Phosphor Number

P4 Aluminized

Light Transmittance at Center, Approximate

78 Percent

MECHANICAL DATA

Overall Length

15 1/4 ± 3/8 Inches

Greatest dimensions of tube

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 (Projected)

Diagonal

17 9/16 Inches

Horizontal Axis

15 1/8 Inches

Vertical Axis

12 Inches

Area

172 Sq. Inches

Neck Length

5 1/2 ± 3/16 Inches

Bulb

J149B1 or equivalent

Bulb Contact

J1 - 21

Base

B6- 203

Basing

12L

Bulb Contact Alignment

Anode Contact aligns with pin position #6

±30 Degrees

FEB., 1962

Page 1 of 3

RATINGS (Design Maximum System)

Unless otherwise specified, voltages are positive and measured with respect to Grid #1

Maximum Anode Voltage	19,800 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	±1100 - 500 Volts
Maximum Grid #2 Voltage	40 Volts
Minimum Grid #2 Voltage	25 Volts
Cathode Voltage	100 Volts
Maximum Heater Voltage	7 Volts
Minimum Heater Voltage	5.8 Volts
Maximum Heater-Cathode Voltage	
Heater negatives with respect to cathode	
During warm-up period not to exceed 15 seconds	-410 Volts
After equipment warm-up period	-180 Volts
Heater positive with respect to cathode	180 Volts

TYPICAL OPERATING CONDITIONS

CATHODE DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to Grid #1

Anode Voltage	2,3	14,500 Volts
Grid #4 Voltage (Focusing Electrode)		250 Volts
Grid #2 Voltage ₁		35 Volts
Cathode Voltage		25 to 40 Volts

MAXIMUM CIRCUIT VALUES

Maximum Grid #1 Circuit Resistance	1.5 Megohms
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NOTES

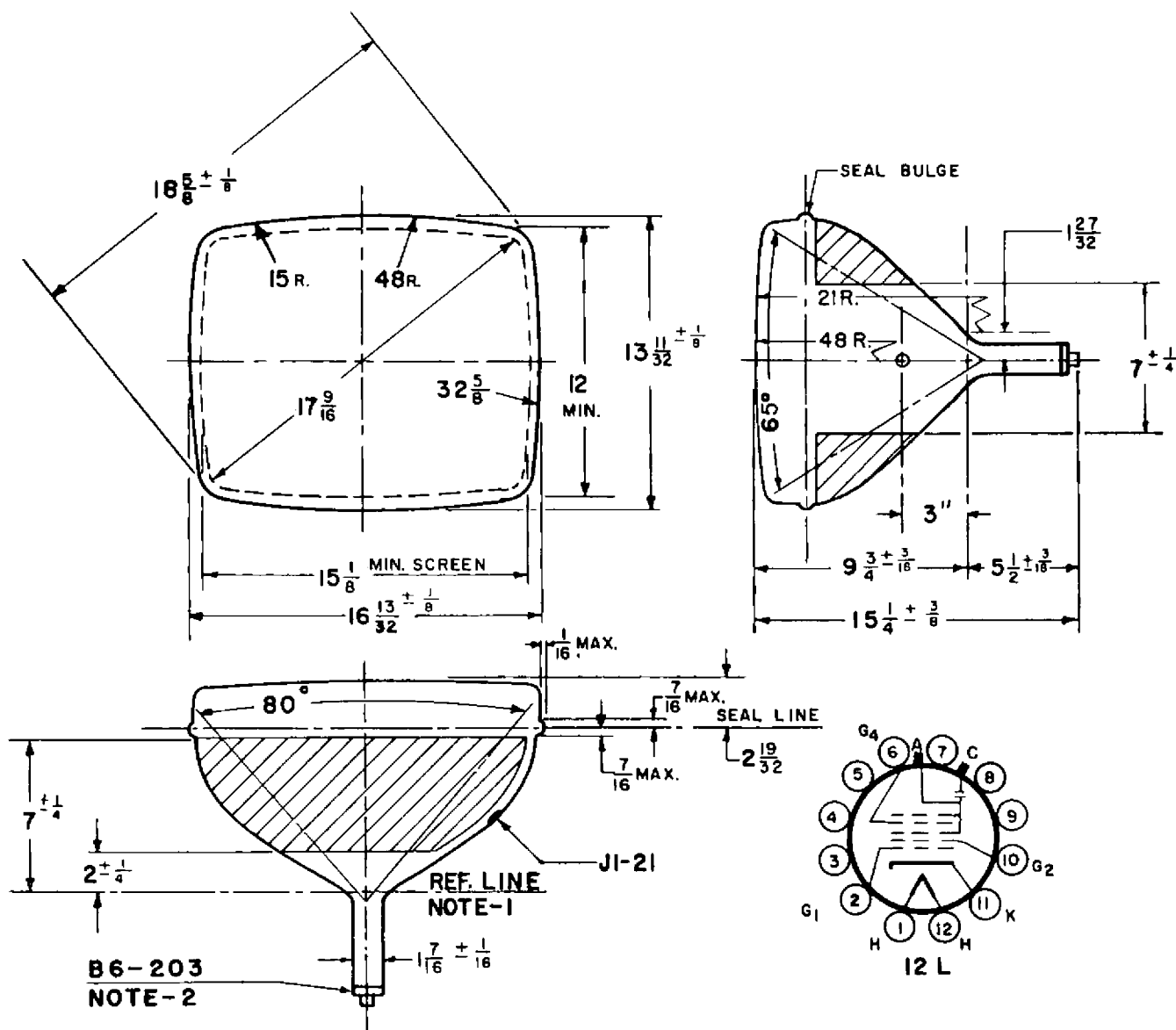
1. Visual extinction of focused raster.
2. With the combined grid #1 bias voltage and video-signal voltage adjusted to give an anode current of 150 microamperes on a 15 1/8 x 12 pattern from 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and 500 Volts.

4245 NORTH KNOX AVE.

CHICAGO 41, ILLINOIS

TELEPHONE MULBERRY 5-5000

TELETYPE CG 2790



NOTE: I. REFERENCE LINE AS DETERMIND BY PLANE C-C OF JEDEC REFERENCE LINE GAUGE 116

2. BASE PIN NO.6 ALIGNS WITH ANODE CONTACT WITHIN 30°



19CQP4

5600 WEST JARVIS AVENUE

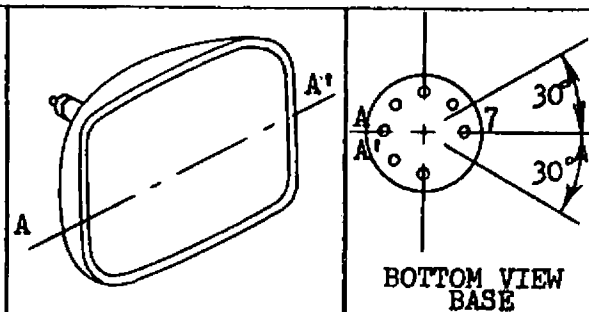
CHICAGO 48, ILLINOIS

TELEPHONE MULBERRY 5-5000

TELETYPE 312-265-1293

DESCRIPTION

19" Direct View	Low G_2 Voltage (35V.)
Rectangular Glass Envelope	Cathode Drive Design
Spherical Faceplate	114° Magnetic Drive Design
Gray Filter Glass	Electrostatic Focus
Aluminized Screen	External Conductive Coating
6.3 Volt, 600 Ma. Heater	No Ion Trap

ELECTRICAL DATA

Focusing Method

Deflection Angles, Approximate

Horizontal

Vertical

Diagonal

Direct Interelectrode Capacitances

Cathode to all other electrodes, approximate

Grid #1 to all other electrodes, approximate

External Conductive Coating to Anode

Heater Current at 6.3 volts

Heater Warm-up Time

Electrostatic

103 Degrees

86 Degrees

114 Degrees

5 uuf

6 uuf

1900 max. uuf

1400 min. uuf

600+ 10% Ma.

11 Seconds

OPTICAL DATA

Phosphor Number

Light Transmittance at Center, Approximate

P4 Aluminized

78 Percent

MECHANICAL DATA

Overall Length

Greatest Dimensions of Tube

Diagonal

Width

Height

11 5/8 ± 1/4 Inches

18 5/8 ± 1/8 Inches

16 13/32 ± 1/8 Inches

13 11/32 ± 1/8 Inches

Minimum Useful Screen Dimensions (Projected)

Diagonal

Horizontal Axis

Vertical Axis

Area

17 9/16 Inches

15 1/8 Inches

12 Inches

172 Sq. Inches

Neck Length

Bulb

Bulb Contact

Base

Basing

Bulb Contact Alignment

Anode contact aligns with pin position #7

4 3/8 ± 1/8 Inches

J 149 A1 or equivalent

J1-21

B6-214

7FA

± 30 Degrees

RATINGS (Design Maximum System)

Unless otherwise specified, voltages are positive and measured with respect to Grid #1

Maximum Anode Voltage	19,800 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+ 1100 -500 Volts
Maximum Grid #2 Voltage	60 Volts
Minimum Grid #2 Voltage	25 Volts
Cathode Voltage	100 Volts
Maximum Heater Voltage	7 Volts
Minimum Heater Voltage	5.8 Volts
Maximum Heater-Cathode Voltage	
Heater negatives with respect to cathode	
During warm-up period not to exceed 15 Seconds	-410 Volts
After equipment warm-up period	-180 Volts
Heater positive with respect to cathode	180 Volts

TYPICAL OPERATING CONDITIONS

CATHODE DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to Grid #1

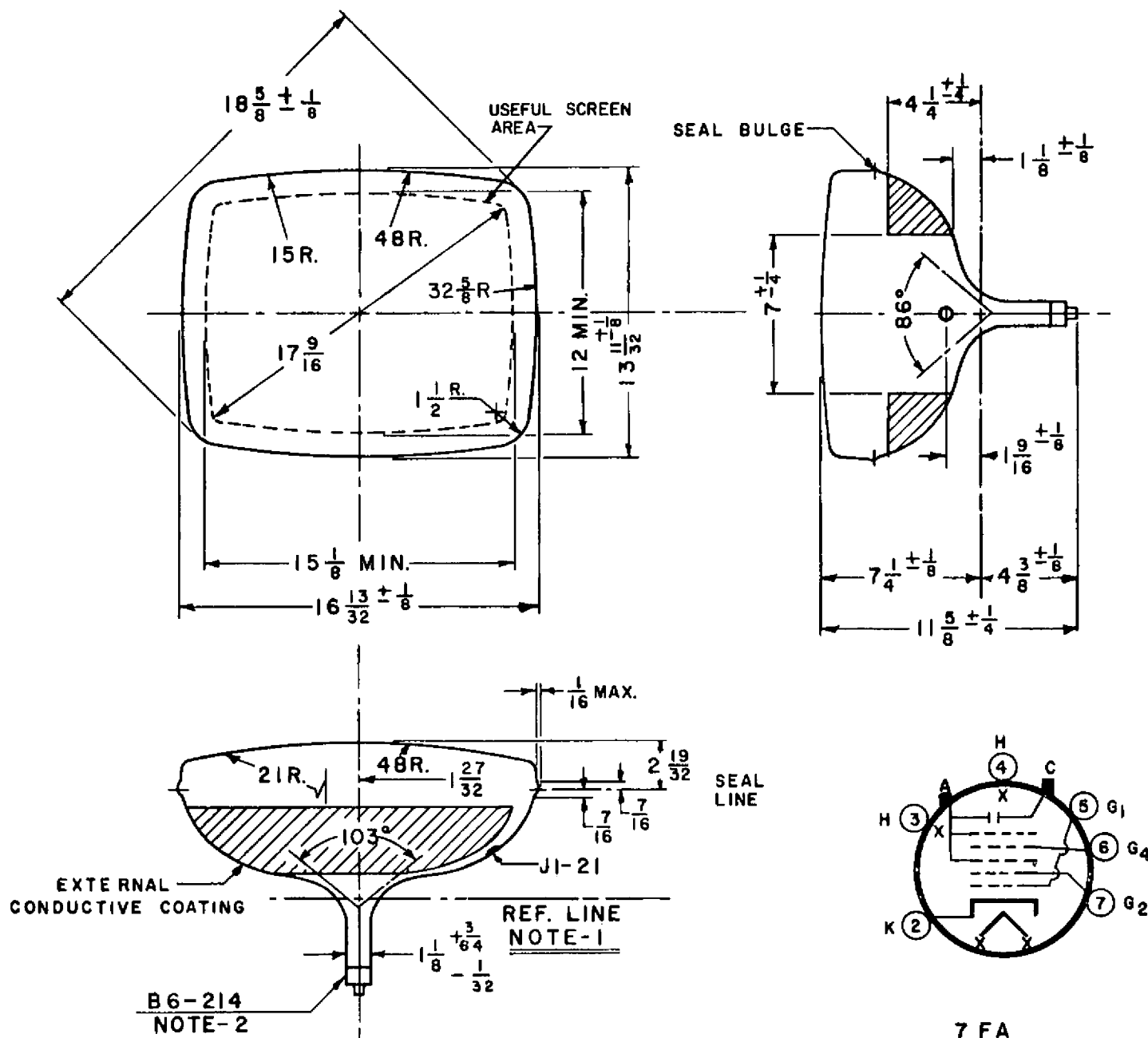
Anode Voltage	16,000 Volts
Grid #4 Voltage (focusing electrode) 2, 3	250 Volts
Grid #2 Voltage	35 Volts
Cathode Voltage 1	25 to 50 Volts

MAXIMUM CIRCUIT VALUES

Maximum Grid #1 Circuit Resistance	1.5 Megohms
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NOTES

1. Visual extinction of focused raster.
2. With the combined grid #1 bias voltage and video-signal voltage adjusted to give an anode current of 150 microamperes on a 15 1/8 x 12 pattern from 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and 500 Volts.



NOTE:

1. REFERENCE LINE AS DETERMINED BY PLANE C-C' OF J.E.D.E.C. REFERENCE LINE GAUGE NO. 126

2. BASE PIN NO. 7 ALIGNS WITH ANODE CONTACT WITHIN 30°



5600 WEST JARVIS AVENUE

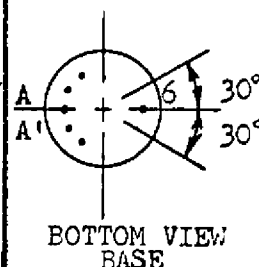
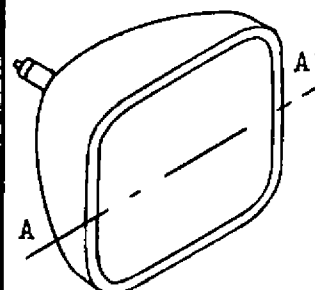
CHICAGO 48, ILLINOIS

TELEPHONE MULBERRY 5-5000

TELETYPE 312-265-1293

DESCRIPTION

19" Direct View	Low G ₂ Voltage (35V.)
Rectangular Glass Envelope	Cathode Drive Design
Spherical Faceplate	92° Magnetic Deflection
Gray Filter Glass	Electrostatic Focus
Aluminized Screen	External Conductive Coating
6.3 Volt, 600 Ma. Heater	No Ion Trap

ELECTRICAL DATA

Focusing Method

Electrostatic

Deflection Angles, Approximate

Horizontal

80 Degrees

Vertical

65 Degrees

Diagonal

92 Degrees

Direct Interelectrode Capacitances

Cathode to all other electrodes, approximate

5 uuf

Grid #1 to all other electrodes, approximate

6 uuf

External Conductive Coating to Anode

2,000 max. uuf

1,500 min. uuf

Heater Current at 6.3 volts

600 ± 10% Ma.

Heater Warm-up Time

11 Seconds

OPTICAL DATA

Phosphor Number

P₄ Aluminized

Light Transmittance at Center, Approximate

78 Percent

MECHANICAL DATA

Overall Length

15 1/4 ± 3/8 Inches

Greatest Dimensions of Tube

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 (Projected)

Diagonal

17 9/16 Inches

Horizontal Axis

15 1/8 Inches

Vertical Axis

12 Inches

Area

172 Sq. Inches

Neck Length

5 1/2 ± 3/16 Inches

Bulb

J1149B1 or Equivalent

Bulb Contact

J1-21

Base

B6-203

Basing

12L

Bulb Contact Alignment

Anode contact aligns with pin position #6

± 30 Degrees

I9CRP4

RATINGS (Design Maximum System)

Unless otherwise specified, voltages are positive and measured with respect to Grid #1

Maximum Anode Voltage	22,000 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+ 1100 - 500 Volts
Maximum Grid #2 Voltage	60 Volts
Minimum Grid #2 Voltage	25 Volts
Cathode Voltage	100 Volts
Maximum Heater Voltage	7 Volts
Minimum Heater Voltage	5.8 Volts
Maximum Heater-Cathode Voltage	
Heater negatives with respect to cathode	
During warm-up period not to exceed 15 Seconds	-410 Volts
After equipment warm-up period	-180 Volts
Heater positive with respect to cathode	180 Volts

TYPICAL OPERATING CONDITIONS

CATHODE DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to Grid #1

Anode Voltage	16,000 Volts
Grid #4 Voltage (Focusing Electrode) ^{2, 3}	250 Volts
Grid #2 Voltage	35 Volts
Cathode Voltage ¹	25 to 50 Volts

MAXIMUM CIRCUIT VALUES

Maximum Grid #1 Circuit Resistance	1.5 Megohms
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NOTES

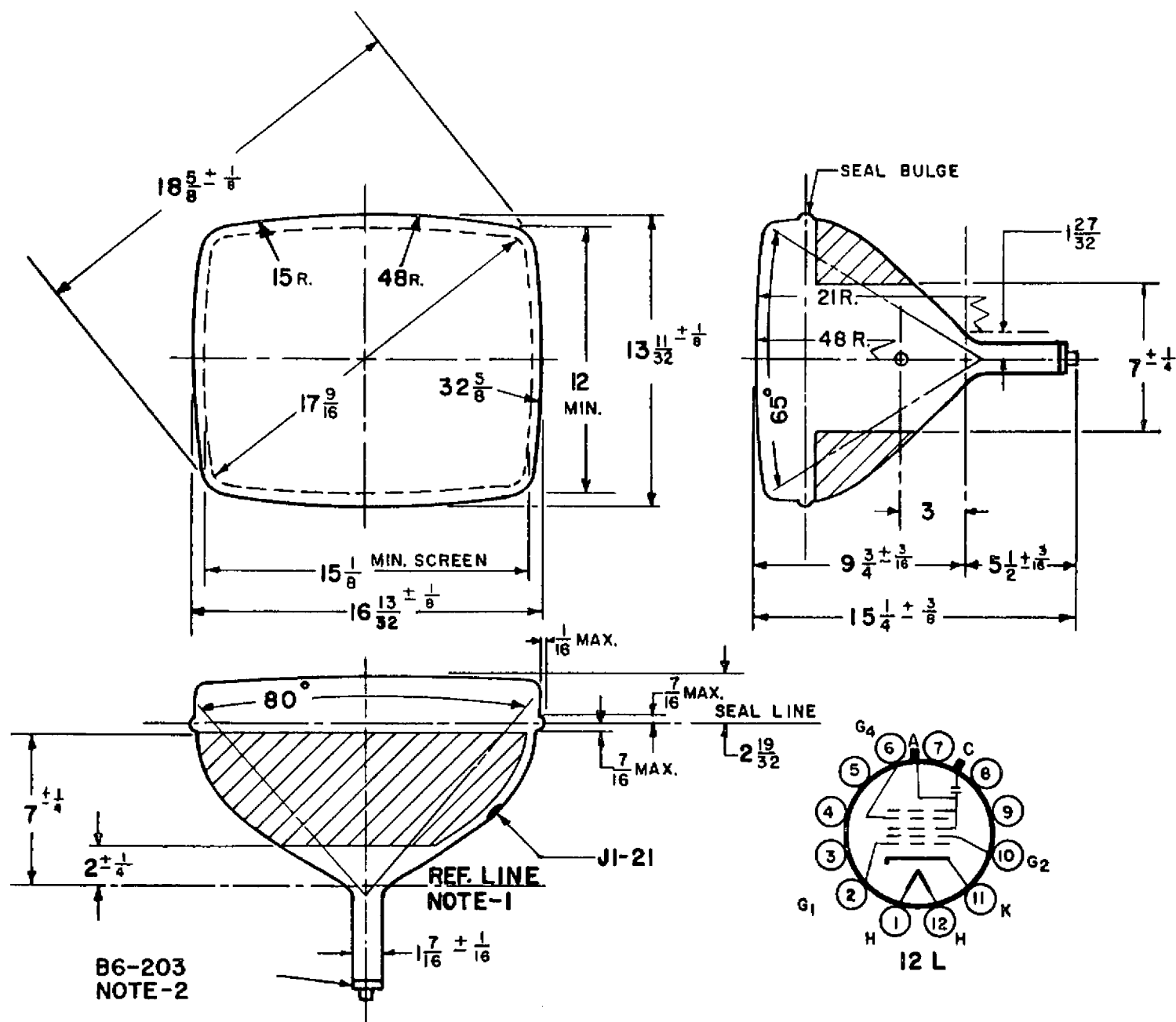
1. Visual extinction of focused raster.
2. With the combined grid #1 bias voltage and video-signal voltage adjusted to give an anode current of 150 microamperes on a 15 1/8 x 12 pattern from 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and 500 Volts.

5600 WEST JARVIS AVENUE

CHICAGO 48, ILLINOIS

TELEPHONE MULBERRY 5-5000

TELETYPE 312-265-1293



NOTE: 1. REFERENCE LINE AS DETERMIND BY PLANE C-C OF JEDEC REFERENCE LINE GAUGE 116

2. BASE PIN NO.6 ALIGNS WITH ANODE CONTACT WITHIN 30°

A SUBSIDIARY OF **ZENITH** RADIO CORPORATION—CHICAGO

Rauland

CORPORATION

600 WEST JARVIS AVENUE

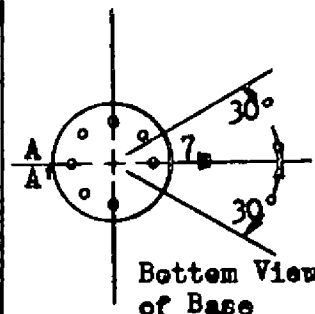
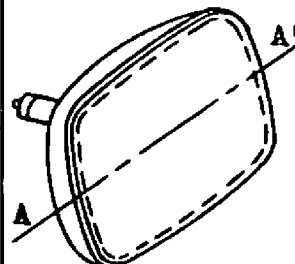
CHICAGO 48, ILLINOIS

TELEPHONE MULBERRY 5-5000

TELETYPE 312-265-1293

19DBP4DESCRIPTION

19" Direct View	Low G ₂ Voltage (40V.)
Rectangular Glass Envelope	Cathode Drive Design
Spherical Faceplate	11 $\frac{1}{4}$ " Magnetic Deflection
Gray Filter Glass	Electrostatic Focus
Aluminized Screen	External Conductive Coating
6.3 Volt, 450 Ma. Heater	No Ion Trap
Bonded Implosion Panel	

SPECIAL CHARACTERISTICSAnode Penetration Current¹150 μ a max.ELECTRICAL DATA

Focusing Method

Electrostatic

Deflection Angles, Approximate

Horizontal

103 Degrees

Vertical

86 Degrees

Diagonal

11 $\frac{1}{4}$ Degrees

Direct Interelectrode Capacitances

Cathode to all other electrodes, approximate

5 uuf

Grid #1 to all other electrodes, approximate

6 uuf

External Conductive Coating to Anode

1900 max. uuf

1400 min. uuf

Heater Current at 6.3 volts

450 $\pm$ 10% Ma.

Heater Warm-up Time

11 Seconds

OPTICAL DATA

Phosphor Number

P4 Aluminized

Light Transmittance at Center, Approximate

48 Percent

MECHANICAL DATA

Overall Length

11 $\frac{13}{16}$ $\pm$ $\frac{5}{16}$ Inches

Greatest Dimensions of Tube

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 (Projected)

Diagonal

17 $\frac{9}{16}$ Inches

Horizontal Axis

15 $\frac{1}{8}$ Inches

Vertical Axis

12 Inches

Area

172 Sq. Inches

Neck Length

4 $\frac{3}{8}$ $\pm$ Inches

Bulb

J149C1

Implosion Panel

FP149B2

Bulb Contact

J1-21

Base
Basing
Bulb Contact Alignment
Anode contact aligns with pin position #7

B6-214
7FA
 ± 30 Degrees

RATINGS (Design Maximum System)

Unless otherwise specified, voltages are positive and measured with respect to Grid #1

Maximum Anode Voltage	19,800 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -500 Volts
Maximum Grid #2 Voltage	60 Volts
Minimum Grid #2 Voltage	25 Volts
Cathode Voltage	100 Volts
Maximum Heater Voltage	7 Volts
Minimum Heater Voltage	5.8 Volts
Maximum Heater-Cathode Voltage	
Heater negatives with respect to cathode	
During warm-up period not to exceed 15 seconds	-410 Volts
After equipment warm-up period	-180 Volts
Heater positive with respect to cathode	180 Volts

TYPICAL OPERATING CONDITIONS

CATHODE DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to Grid #1

Anode Voltage	16,000 Volts
Grid #4 Voltage (Focusing Electrode) ^{2, 3}	250 Volts
Grid #2 Voltage	40 Volts
Cathode Voltage ¹	35 to 50 Volts

MAXIMUM CIRCUIT VALUES

Maximum Grid #1 Circuit Resistance	1.5 Megohms
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NOTES

1. Visual extinction of focused raster.
2. With the combined Grid #1 bias voltage and video-signal voltage adjusted to give an anode current of 150 microamperes on a 15 1/8 x 12 pattern from 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and 500 Volts.
4. This is the maximum beam current with 19,800 volts (design max.) applied to Anode, zero voltage applied to Cathode, Grid #1 and Grid #2; all other elements to have nominal voltages.



Rauland

5600 WEST JARVIS AVENUE

CHICAGO 48, ILLINOIS

TELEPHONE MULBERRY 5-5000

TELETYPE 312-265-1293

19DBP4



1. Reference line as determined by plane C-C' of J. E. D. E. C. reference line gauge No. 126
2. Base pin No. 7 aligns with anode contact within 30°

A SUBSIDIARY OF **ZENITH** RADIO CORPORATION—CHICAGO



RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

Release No. 398

February 20, 1945

sponsored by
The Rauland Corp.

TYPE 1P35*

(Gas filled Phototube;
2 Electrodes)

General Characteristics

Electrical

Cathode Photo-Surface	S1
Luminous Sensitivity at 90 volts, 0 cycles	125 ua/Lumen
Max. gas amplification	10
Interelectrode Capacitances	1.5 - 4 uuf
Maximum dark current at 90 volts	0.1 ua
Wave length of maximum response	8500 A
Sensitivity at maximum response	0.012 ua/uwatt

Mechanical

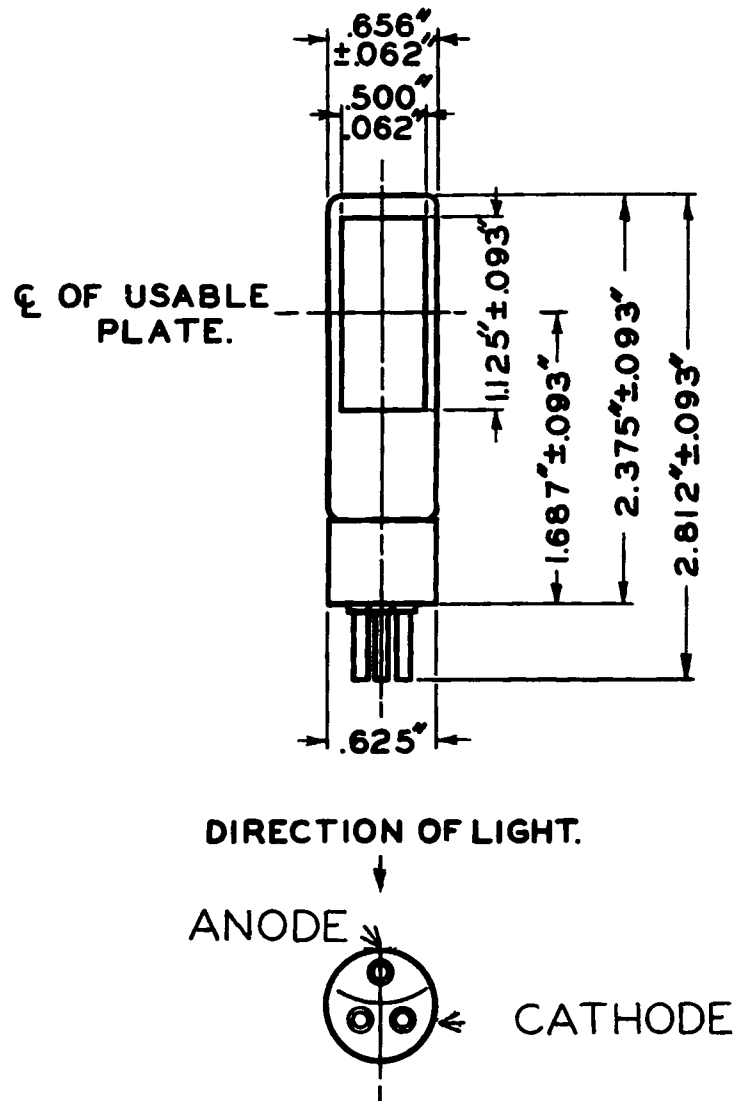
Window Dimensions	1.1" x 0.5"
Seated Height to Center of Useful Cathode Area	1.69 in.
Maximum Overall Height	2.90 in.
Maximum Seated Height	2.47 in.
Maximum Diameter	0.72 in.
Base	Peewee 3-pin
Permissible Mounting Position	Any
Base Connections	2F

Maximum Ratings (absolute)

Anode Voltage (DC or Peak AC)	90 volts
Cathode Current Density for 0.2 sq. in. sensitive cathode area	10 ua/in
Average Cathode Current	2 ua
Ambient Temperature	100°C.

February 20, 1945

RMA TYPE IP35





RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

sponsor:
Rauland Corp.

Release No. 404

April 20, 1945

TYPE 1P36*

(Gas filled Phototube; two
electrodes)

General Characteristics

Electrical

Cathode Photo-Surface	S1
Luminous Sensitivity at 90 volts, 0 cycles	125 ua/Lumen
Max. gas amplification	10
Interelectrode Capacitances	1.5 - 4 uuf
Maximum dark current at 90 volts	0.1 ua
Wave length of maximum response	8000 A
Sensitivity at maximum response	0.012 ua/uwatt

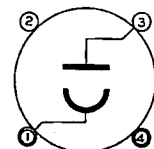
Mechanical

Window Dimensions	0.875" x 0.562"
Seated Height to Center of Useful Cathode Area	1.688 in.
Maximum Overall Height	3.22 in.
Maximum Seated height	2.62 in.
Maximum Diameter	1.17 in.
Base	Tapered Small or Dwarf 4-pin.
Permissible Mounting Position	Any
Base Connections	2G

Maximum Ratings (absolute)

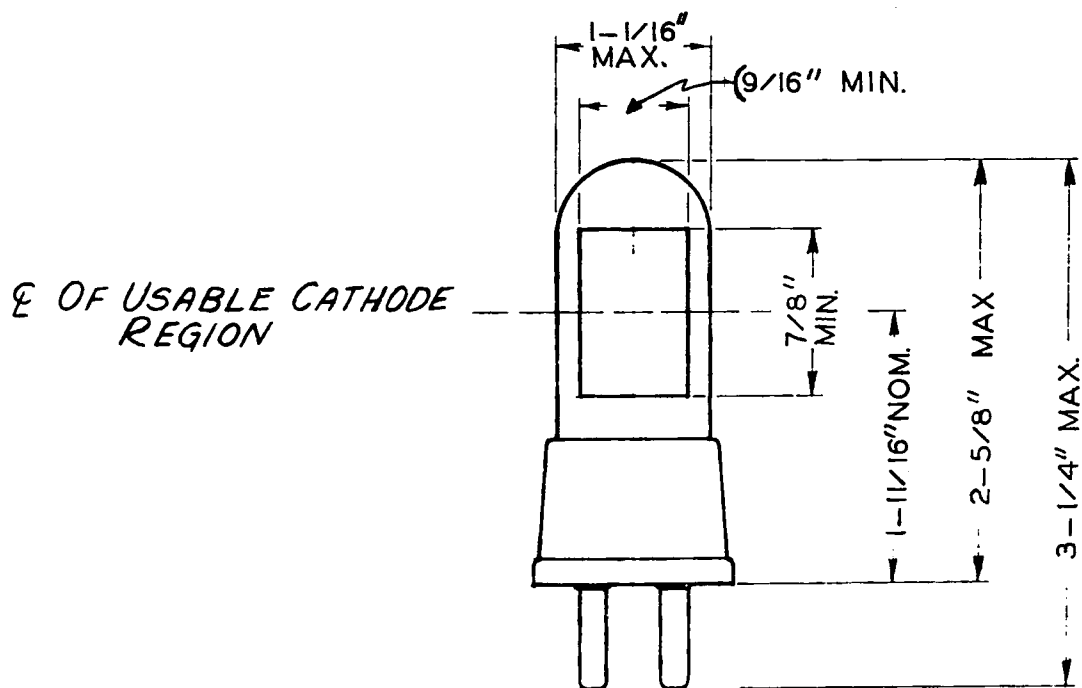
Anode Voltage (DC or Peak AC)	90 volts
Cathode Current Density for 0.2 sq. in. sensitive cathode area	100 ua/in ²
Average Cathode Current	20 ua
Ambient Temperature	100°C.

2G

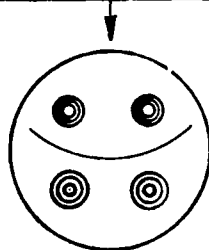


April 20, 1945

TYPE IP34 PHOTOTUBE



DIRECTION OF LIGHT



TAPERED SMALL OR DWARF 4-PIN BASE

Cathode-Ray Tube Type 21CXP4

The 21CXP4 is a 21" 90° rectangular, electrostatic focus and magnetic deflection direct-view picture tube specifically intended for cathode drive television applications. It has a maximum spot cut-off of 50 volts and a minimum cathode current of 1000 microamperes when operated in cathode drive at a Grid No.2 voltage of 50 volts. Other features of this tube are a short overall length, spherical gray filter glass faceplate, metal-backed screen, a construction which does not require an external ion trap magnet, and an external conductive coating which serves as a filter capacitor when grounded and has a minimum of 3 additional contact areas for the suppression of radiation.

GENERAL DATA

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (approx.)	
Horizontal	85 Degrees
Diagonal	90 Degrees
Phosphor	Aluminized P4
Fluorescence	White
Persistence	Medium
Faceplate	Gray Filter Glass
Light Transmittance (approx.)	74 Percent

ELECTRICAL DATA

Heater Voltage	6.3 Volts
Heater Current	0.6 $\pm$ 10% Amperes
Direct Interelectrode Capacitances (approx.)	
Cathode to All Other Electrodes	5 uuf
Grid No.1 to All Other Electrodes	6 uuf
External Conductive Coating to Anode ¹	2500 uuf Max. 2000 uuf Min.

MECHANICAL DATA

Overall Length	18 $\pm$ 3/8 Inches
Greatest Bulb Dimensions	
Diagonal	21 3/8 $\pm$ 1/8 Inches
Width	20 1/4 $\pm$ 1/8 Inches
Height	16 3/8 $\pm$ 1/8 Inches
Neck Length	5 1/2 $\pm$ 3/16 Inches
Minimum Useful Screen Dimensions (Maximum Assured)	19 1/16 x 15 1/16 Inches
Minimum Useful Screen Area	262 Sq. inches
Bulb Contact - Recessed Small Cavity Cap	J1-21
Base - Small Shell Duodecal 6-pin	B6-63
Basing	12L
Bulb Contact Alignment - J1-21 Contact Aligns with Pin Position No.6 $\pm$ 30 Degrees	

MAXIMUM RATINGS (Absolute Maximum Values)

Final Anode Voltage ²	22,000 Volts dc
Grid No.4 Voltage (Focusing Electrode) ³	-550 to $\pm$ 1,100 Volts dc
Grid No.2 to Grid No.1 Voltage	70 Volts dc

Cathode-Ray Tube Type 21CXP4

MAXIMUM RATINGS (Absolute Maximum Values)

Cathode to Grid No.1 Voltage	
Positive Bias Value	150 Volts
Negative Peak Value	0 Volts
Peak Heater-Cathode Voltage	
During Warm-up Period not to Exceed 15 Seconds	450 Volts
After Equipment Warm-Up Period	200 Volts
Heater Positive with Respect to Cathode	200 Volts

TYPICAL OPERATING CONDITIONS

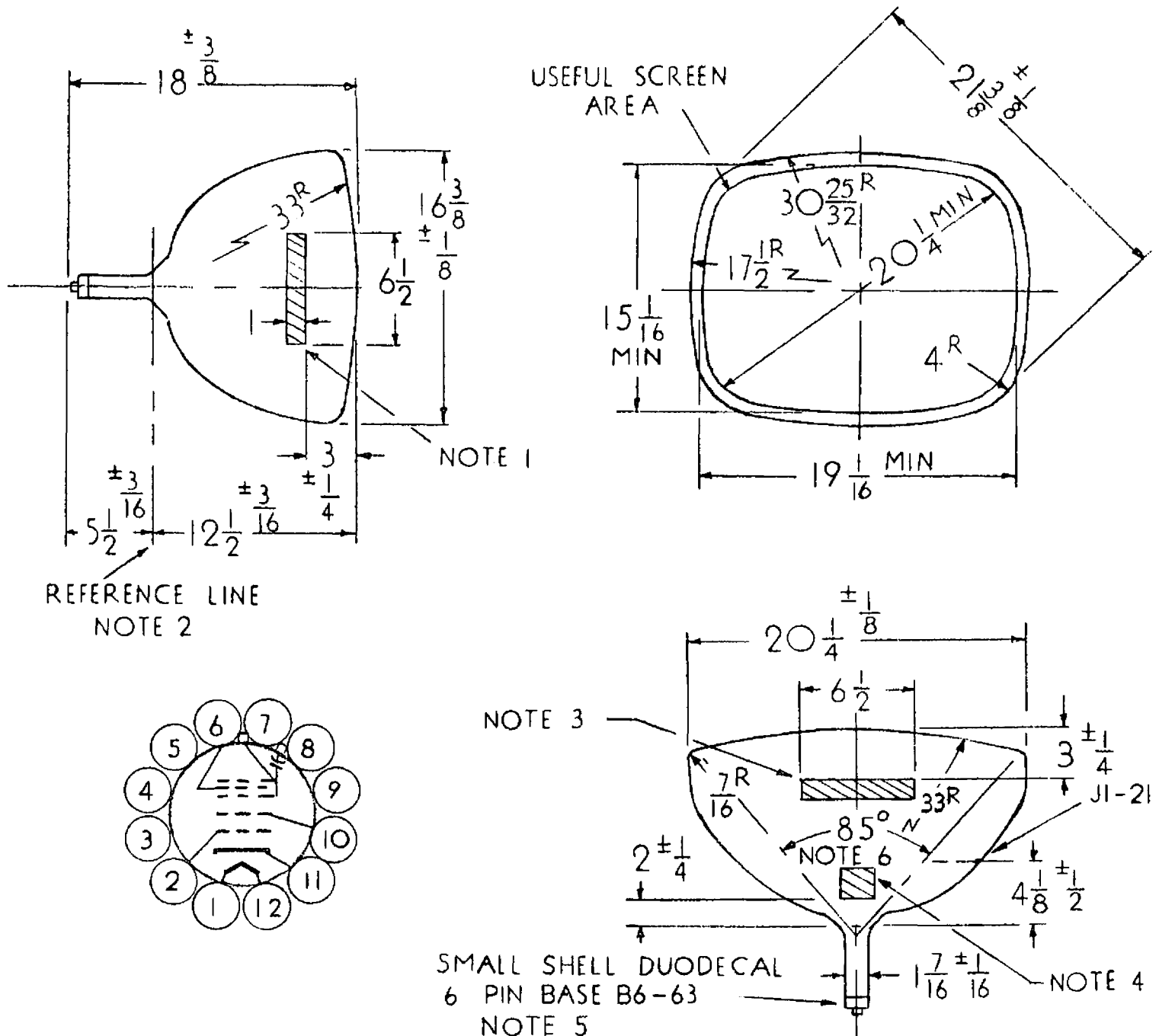
Anode Voltage	18,000 Volts dc
Grid No.4 to Grid No.1 Voltage for Focus at 100 ua Cathode Current	0 to 350 Volts dc
Grid No.2 to Grid No.1 Voltage	50 Volts dc
Cathode to Grid No.1 Voltage for cut-off ⁴	35 to 50 Volts dc

CIRCUIT VALUES

Grid No.1 Circuit Resistance	1.5 Max.Megohms
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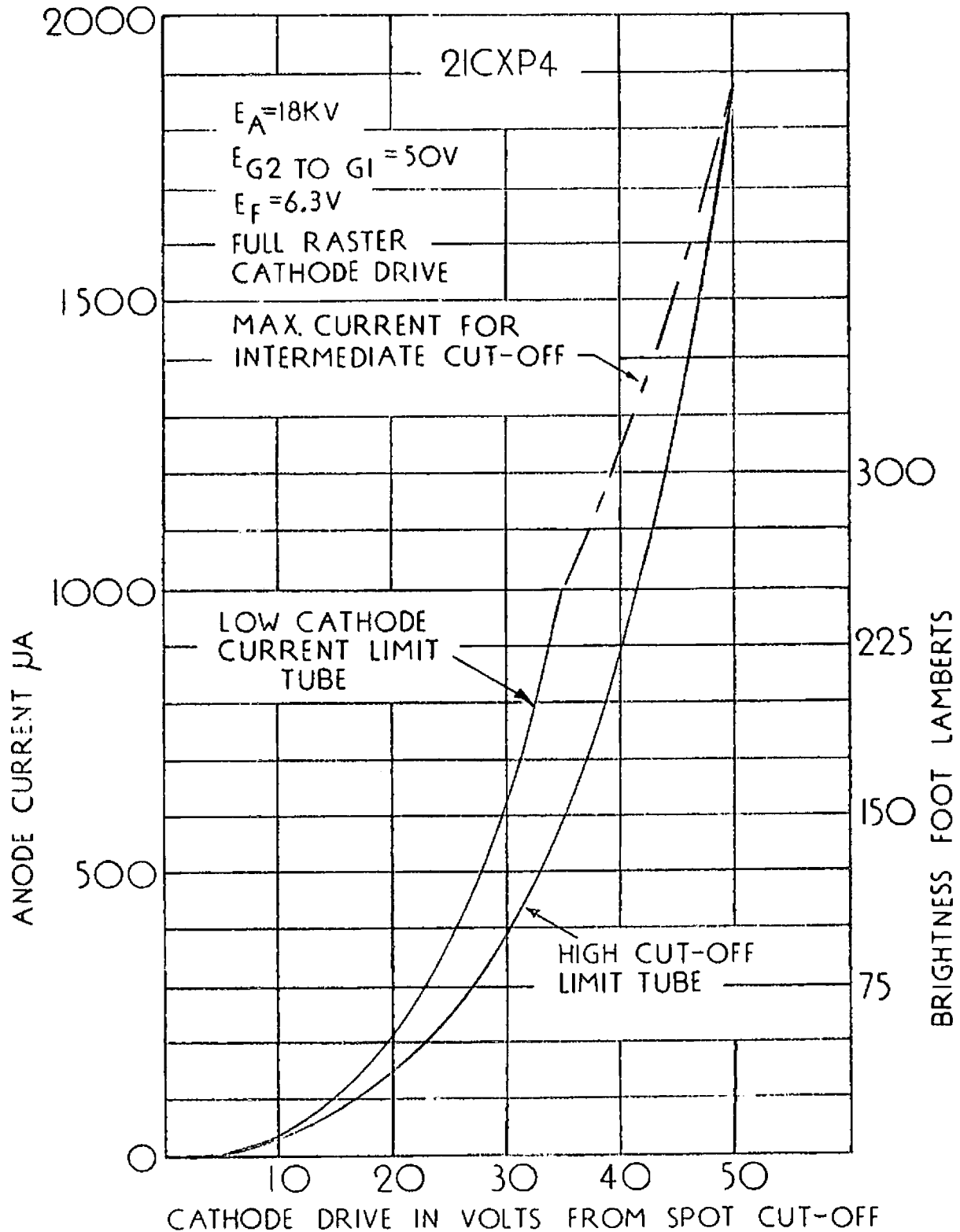
NOTES

1. External conductive coating must be grounded.
2. Grid No.3, Grid No.5 and the Collector are connected internally and are referred to herein as "Final Anode".
3. The focus electrode may be modulated to improve overall focus.
4. For visual extinction of the undeflected focused spot. The cut-off voltage will change by approx. 2% with 1 KV change of anode voltage.

NOTES

1. 6 1/2" MIN. x 1" MIN. CONTACT AREA ON AT LEAST ONE SHORT SIDE OF BULB.
2. REFERENCE LINE AS DETERMINED BY PLANE C-C' OF REFERENCE LINE GAUGE RETMA #116.
3. 6 1/2" MIN. x 1" MIN. CONTACT AREA ON BOTH LONG SIDES OF BULB.
4. 2x2" MIN. CONTACT AREA LOCATED 90° COUNTERCLOCKWISE FROM ANODE BUTTON AS VIEWED LOOKING AT BASE OF TUBE.
5. PIN POSITION No. 6 TO BE ALIGNED WITH ANODE BUTTON $\pm 30^\circ$.
6. DIAGONAL DEFLECTION ANGLE IS 90°.

TYPICAL DRIVE CHARACTERISTICS CURVES



R A U L A N D

TYPES 22CP7, 22CP14, 22CP19, 22CP25 CATHODE RAY TUBES

The type 22CP7, 22CP14, 22CP19 and 22CP25 tubes are 22" magnetic focus and magnetic deflection, round metal envelope cathode ray tubes, suitable for radar application.

They feature an almost completely flat face, which minimizes parallax error and they have a long persistence screen.

TENTATIVE CHARACTERISTICSGENERALElectrical Data

Heater Voltage	6.3	Volts		
Heater Current	0.6 $\pm$ 10%	Amperes		
Heater Warm-up time (approx.)	11	Seconds		
Focusing Method	Magnetic			
Deflecting Method	Magnetic			
Deflecting Angle (approx.)	70	Degrees		
Phosphor	No. 7	No. 14	No. 19	No. 25
Fluorescence	Blue	Blue	Orange	Orange
Phosphorescence	Yellow	Orange	Orange	Orange
Persistence	Long	Med.Long	Long	Long
Face Plate -- clear glass				
Direct Interelectrode Capacitances, (approx.)				
Cathode to all other electrodes		5		uuf
Grid No. 1 to all other electrodes		6		uuf

Mechanical Data

Overall Length	21-5/8 $\pm$ 7/16	Inches
Greatest diameter of envelope	21-3/4 $\pm$ 1/8	Inches
Minimum useful screen diameter	20-1/4	Inches
Radius (face plate) (approx.)	165	Inches
Anode contact	Metal cone lip	
Base (Small Shell Duodecal 5-pin)	B5-57	
Basing Connections	12D	

The Rauland Corporation
Chicago, Illinois

R A U L A N D

TYPE 22CP7, 22CP14, 22CP19, 22CP25 CATHODE RAY TUBESMaximum Ratings - Design Center Values

Accelerator Voltage ¹	16,000	Max. volts DC
Grid #2 Voltage	±1,000	Max. volts DC
Grid #1 voltage (control electrode)		
Negative bias value	-125	Max. volts DC
Positive bias value	0	Max. volts DC
Positive peak value	± 2	Max. volts

Peak Heater - Cathode voltage²

Heater Negative with Respect to Cathode	180	Max. volts DC
Heater Positive with Respect to Cathode	180	Max. volts DC
Heater Negative with Respect to Cathode during warm-up period, not to exceed 15 seconds	410	Max. volts DC

Typical Operating Conditions

Accelerator Voltage ³	12,000	Volts	DC
Grid #2 Voltage	±300	Volts	DC
Grid #1 Voltage ⁴	-33 to -77	Volts	
Spot Position (Undelected) ⁵	20	MM	
Field Strength of Adjustable Centering Magnet	0 to 8	Gauss	
Focusing Coil Current (Approx) ⁶	95 ± 20%	MA.	

Maximum Circuit Values

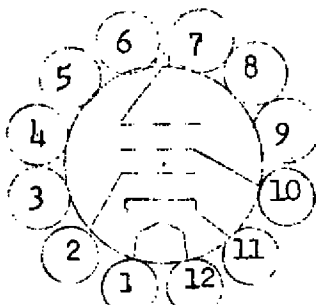
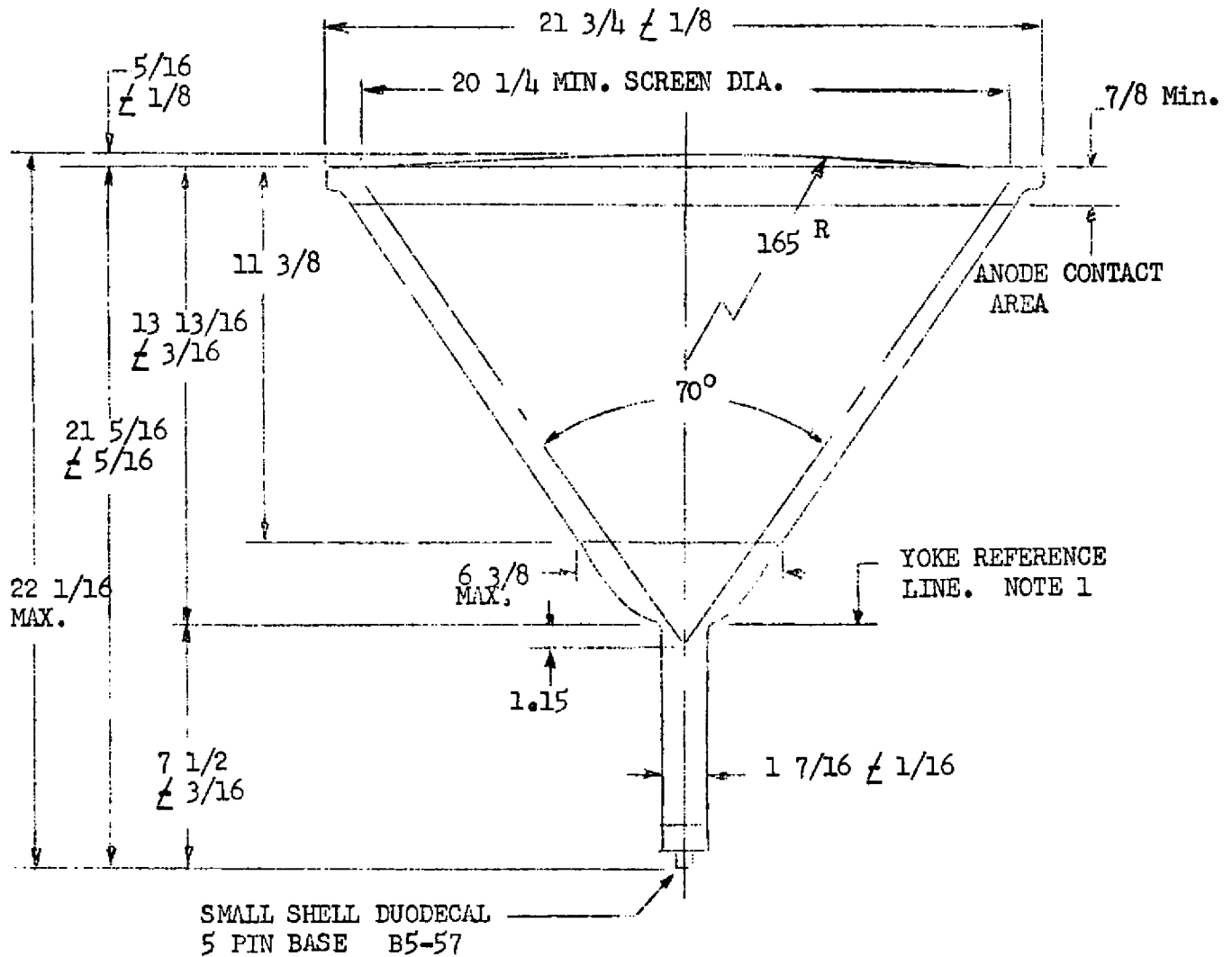
Grid #1 Circuit Resistance	1.5	Max. Megohms
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NOTES

1. At or near this rating, the effective resistance of the accelerator supply should be adequate to limit the accelerator input power to 6 watts. The screen of the 22CP- can be permanently damaged should the current density be permitted to rise too high. To prevent burning, minimum beam current densities should be employed.
2. Cathode should be returned to one side or to the mid-tap of the heater transformer windings.
3. Brilliance and definition decrease with decreasing accelerator voltage. In general, accelerator voltage should not be less than 8000 Volts.
4. Visual extinction of undeflected focused spot.
5. The center of the undeflected focused spot will fall within a circle of 20 MM radius concentric with the center of the tube face.
6. For standard focusing coil RTMA No. 106 or equivalent, with the combined grid No. 1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 10 foot-lamberts on a 7 3/4" x 10 1/2" area. The coil air gap center line to reference line (distance D) shall be 3-1/4 inches.

22CP19

22CP25



NOTE 1 - REFERENCE LINE DETERMINED BY POSITION WHERE REFERENCE LINE GAUGE #110 WILL REST ON GLASS FUNNEL.

THE RAULAND CORPORATION

CHICAGO 41, ILLINOIS

