

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 16BRP4 is a 16"-114° banded cathode ray tube with a 4 1/8" neck length. This tube has electrostatic focus, magnetic deflection, a straight gun which requires no ion trap, and a 600 milliampere 6.3 volt filament.

ELECTRICAL DATA

Focusing 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	1500 Max. uuf
	1000 Min. uuf
Heater Current at 6.3 Volts	600 +30 ma
Heater Warm-up Time	11 Seconds

OPTICAL DATA

Phosphor number JEDEC designation	P4 Aluminized
Light Transmittance	53 Percent

MECHANICAL DATA

Overall Length	10 9/32 $\pm$ 5/16 Inches
Greatest Diameter of Tube	
Greatest Dimensions of Tube	
Diagonal	
Width	13 15/16 Max. Inches
Height	11 11/32 Max. Inches
Minimum Useful Screen Diameter (Projected)	
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 1/8 $\pm$ 1/8 Inches
Bulb EIA designation or equivalent (including shield designation)	J125-B1
Bulb Contact	JEDEC Designation J1-21
Base	JEDEC Designation 8HR
Basing	JEDEC Designation B7-208
Bulb Contact Alignment	
J1-21 contact aligns with pin position #2	$\pm$ 30 degrees.

RATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive and measured with respect to Cathode

Maximum Anode Voltage	18,000 Volts
Minimum Anode Voltage	10,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -500
Maximum Grid #2 Voltage	550 Volts
Minimum Grid #2 Voltage	200 Volts
Grid #1 Voltage	
Maximum Negative Value	155 Volts DC
Maximum Negative Peak Value	220 Volts
Maximum Positive Value	0 Volts DC
Maximum Positive Peak Value	2 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.8 Volts
Maximum Heater-Cathode Voltage	
Heater negative with respect to cathode	
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 CONDITIONSCATHODE DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to Cathode

Anode Voltage	15,000 Volts DC
Grid #4 Voltage (Focusing Electrode)	
(Notes 2 & 3)	250 Volts DC
Grid #2 Voltage	400 Volts DC
Grid #1 Voltage (Note 1)	-46 to -94 Volts DC

MAXIMUM CIRCUIT VALUES

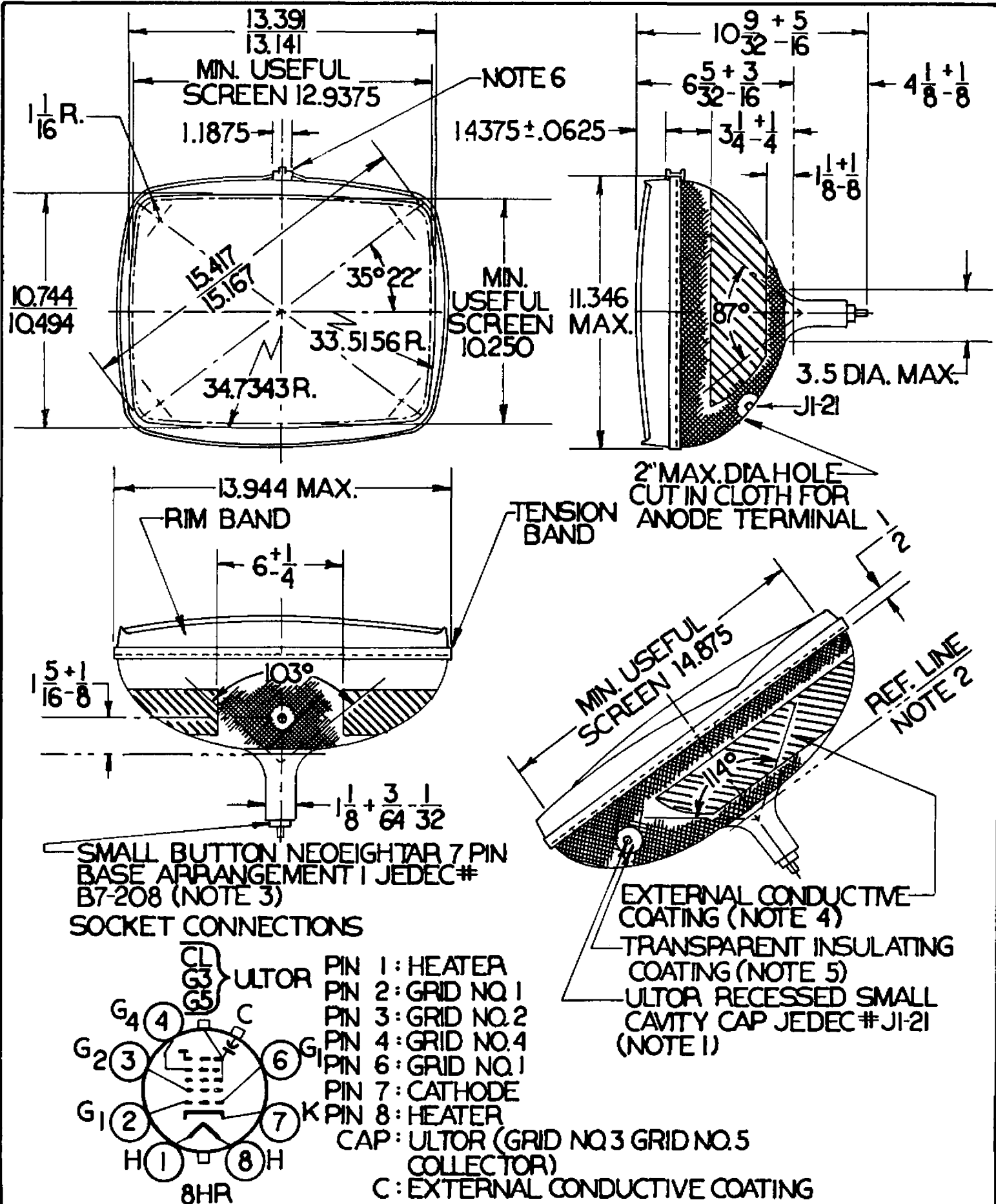
Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

Tube outline with essential dimensions and tolerances.

Pin Connections:

Pin 1	Heater	Pin 6	Grid No. 1
Pin 2	Grid No. 1	Pin 7	Cathode
Pin 3	Grid No. 2	Pin 8	Heater
Pin 4	Grid No. 4		



DRAWN BY	SCALE	EFFECTIVE	DISTRIBUTION	DRAWING NO.
A.L. PRIBYL		8-15-63		16BRP4

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 100 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 400 volts.

NOTES FOR DIMENSIONAL OUTLINE

1. The plane through the tube axis and Pin No. 2 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of $\pm 30^\circ$. Ultor terminal is on same side as Pin No. 2.
2. With tube neck inserted through flared end of reference-line gauge JEDEC No. G-126 and with tube seated in gauge, the reference-line is determined by the intersection of the plane CC' of the gauge with the glass funnel.
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 base wafer will fall within a circle concentric with bulb axis and having a diameter of 1 3/4".
4. External conductive coating must be grounded.
5. To clean this area, wipe only with soft dry lint-less cloth.
6. Tension band clip may extend an additional .075" from dimensions specified.

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 16BSP4 is a 16"-114° banded tube with coated funnel and a 4 3/8" neck length. This tube has a 450 milliamper, 6.3 volt filament, a straight gun which requires no ion trap, and 50 volt G₂ for cathode drive design.

ELECTRICAL DATA

Focusing 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	1500 Max. uuf
	1000 Min. uuf
Heater Current at 6.3 Volts	450 $\pm$ 30ma
Heater Warm-up Time	11 Seconds

OPTICAL DATA

Phosphor number JEDEC Designation	P4-Aluminized
Light Transmittance at Center, Approximate	53 Percent

MECHANICAL DATA

Overall Length	10 17/32 $\pm$ 5/16 Inches
Greatest Diameter of Tube	
Greatest Dimensions of Tube	
Diagonal	
Width	13 15/16 Max. Inches
Height	11 11/32 Max. Inches
Minimum Useful Screen Diameter (Projected)	
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 $\pm$ 1/8 Inches
Bulb EIA designation or equivalent (including shield designation)	J125-B1
Bulb Contact	J1-21
Base	8HR
Basing	B7-208
Bulb Contact Alignment	
J1-21 contact aligns with pin position #2 $\pm$ 30 Degrees	

RATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive and measured with respect to Grid #1.

Maximum Anode Voltage	18,000 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -500
Maximum Grid #2 Voltage	60 Volts
Minimum Grid #2 Voltage	25 Volts
Cathode Voltage	
Maximum Negative Value	0 Volts DC
Maximum Negative Peak Value	2 Volts
Maximum Positive Value	100 Volts DC
Maximum Positive Peak Value	150 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.8 Volts
Maximum Heater-Cathode Voltage	
Heater negative with respect to cathode	
During warm-up period not to exceed 15 sec.	450 Volts
After equipment warm-up period	200 Volts
Heater positive with respect to cathode	200 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 DC
Grid #4 Voltage (Focusing Electrode)	
(Notes 2 & 3)	250 Volts DC
Grid #2 Voltage	50 Volts DC
Cathode Voltage (Note 1)	35 to 55 Volts DC

MAXIMUM CIRCUIT VALUES

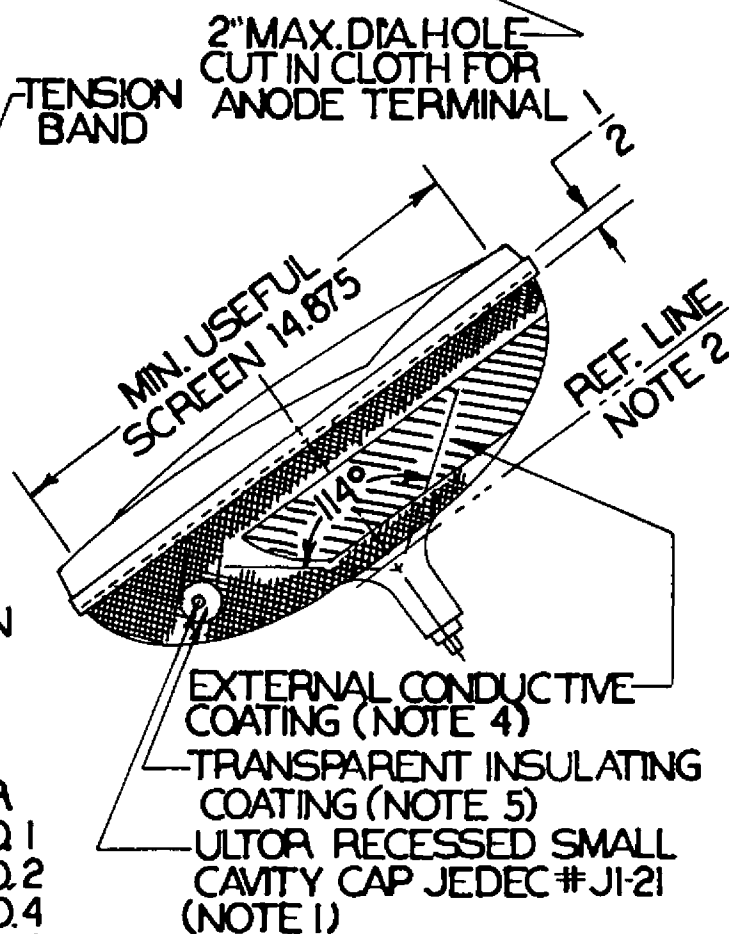
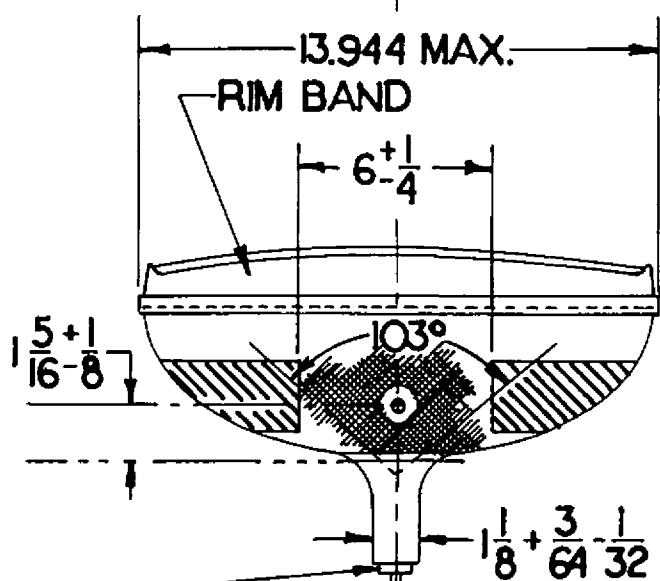
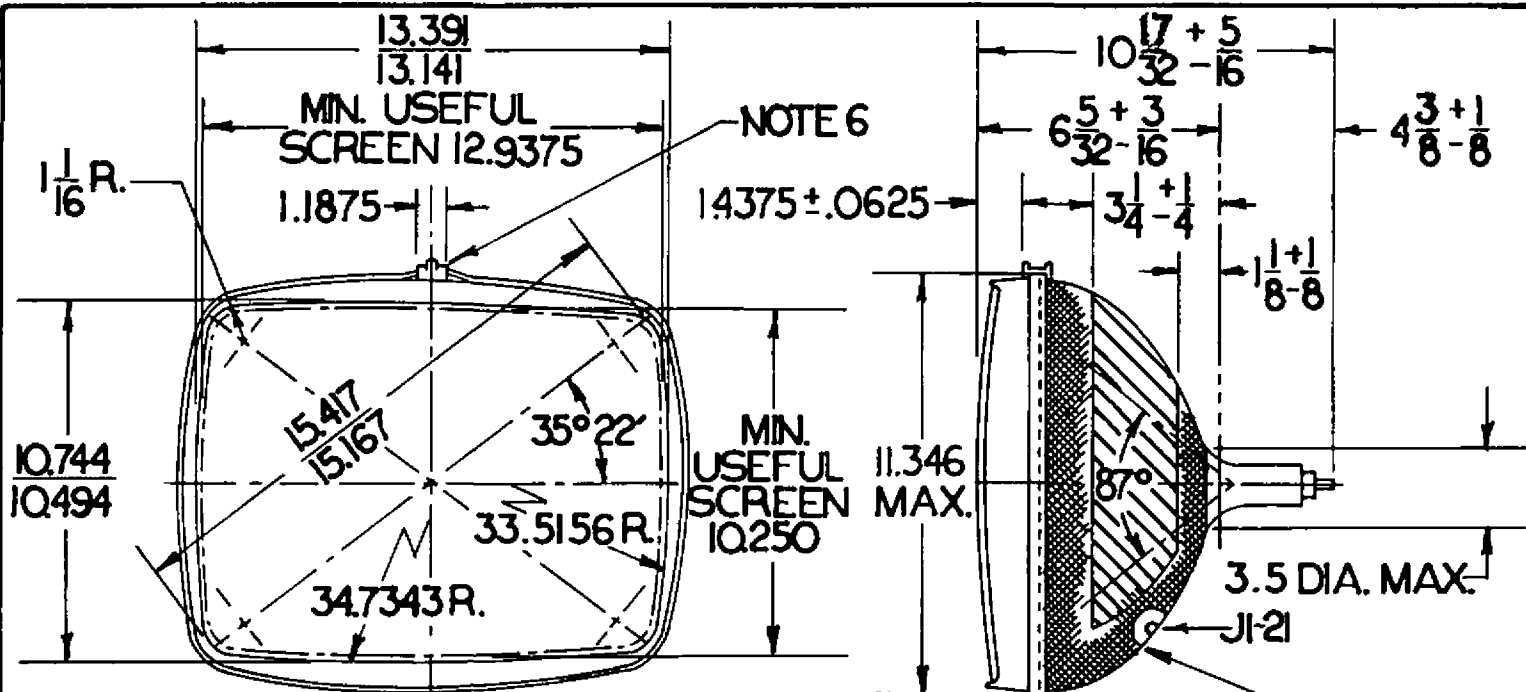
Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

Tube Outline with essential dimensions and tolerances.

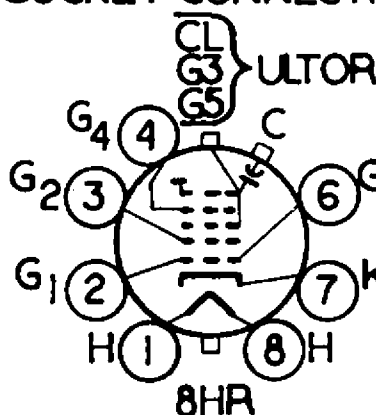
Pin Connections:

Pin 1	Heater	Pin 6	Grid No. 1
Pin 2	Grid No. 1	Pin 7	Cathode
Pin 3	Grid No. 2	Pin 8	Heater
Pin 4	Grid No. 4		



SMALL BUTTON NEOEIGHTAR 7 PIN
BASE ARRANGEMENT 1 JEDEC#
B7-208 (NOTE 3)

SOCKET CONNECTIONS



PIN 1: HEATER
PIN 2: GRID NO. 1
PIN 3: GRID NO. 2
PIN 4: GRID NO. 4
PIN 6: GRID NO. 1
PIN 7: CATHODE
PIN 8: HEATER

CAP: ULTOR (GRID NO. 3 GRID NO. 5
COLLECTOR)

C: EXTERNAL CONDUCTIVE COATING

EXTERNAL CONDUCTIVE
COATING (NOTE 4)
TRANSPARENT INSULATING
COATING (NOTE 5)
ULTOR RECESSED SMALL
CAVITY CAP JEDEC # J1-21
(NOTE 1)

DRAWN BY	SCALE	EFFECTIVE	DISTRIBUTION	DRAWING NO.
A.L. PRIBYL		8-15-63		16BSP4

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 100 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 400 volts.

NOTES FOR DIMENSIONAL OUTLINE

1. The plane through the tube axis and Pin No. 2 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of $\pm 30^\circ$. Ultor terminal is on same side as Pin No. 2.
2. With tube neck inserted through flared end of reference-line gauge JEDEC No. G126 and with tube seated in gauge, the reference-line is determined by the intersection of the plane CC' of the gauge with the glass funnel.
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 base wafer will fall within a circle concentric with bulb axis and having a diameter of 1 3/4".
4. External conductive coating must be grounded.
5. To clean this area, wipe only with soft dry lint-less cloth.
6. Tension band clip may extend an additional .075" from dimensions specified.

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The type 17CW_{P4} is an electrostatic focus and magnetic deflection direct view picture tube. It has an all glass, rectangular bulb designed for 110° deflection and the spherical faceplate is made of filter glass. It has an external conductive coating. A 4 1/2" neck is made possible by a short electrostatic gun of the straight type which does not require an ion trap.

GENERAL CHARACTERISTICS

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angle (Approx.)	Horizontal	105 Degrees
	Vertical	87 Degrees
	Diagonal	110 Degrees
Face Plate Light Transmission (Neutral Density Filter)		77% Approx.
Phosphor	P ₄	
Fluorescence	White	
Persistence	Short - 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. uuf
	1000	Min. uuf

MECHANICAL DATA

Overall Length	11 5/8 ± 5/16	Inches
Greatest Dimensions of Bulb:		
Diagonal	16 9/16 ± 1/8	Inches
Width	15 5/8 ± 1/8	Inches
Height	12 3/4 ± 1/8	Inches
Minimum Useful Screen Dimensions (Max. Assured)		
Screen Area	155	Sq. Inches
Diagonal	15 3/4	Inches
Width	14 3/4	Inches
Height	11 11/16	Inches
Bulb Contact	J1-21	
Base	B7-183	
Basing	8HR	
Bulb No.	J132 1/2 A1	
Bulb Contact Alignment		
Bulb contact J1-21 aligns with pin position #1	± 30	Degrees
Weight	10	Lbs.

MAXIMUM RATINGS Design Center Values

Heater Voltage	6.3	Volts
Heater Current	0.6	Amperes
Anode Voltage	16,000	Volts
Grid No. 4 Voltage ¹	-500 to +1,000	Volts
Grid No. 2 Voltage	500	Volts
Grid No. 1 Voltage		
Negative Peak Value	200	Max. Volts
Negative Bias Value	140	Max. Volts
Positive Bias Value	0	Max. Volts
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	Volts
After equipment warm-up	180	Volts
Heater positive with respect to cathode	180	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	14,000	Volts
Grid No. 4 Voltage ²	-50 to +350	Volts
Grid No. 2 Voltage	400	Volts
Grid No. 1 Voltage ³	-36 to -92	Volts

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Max. Megohms
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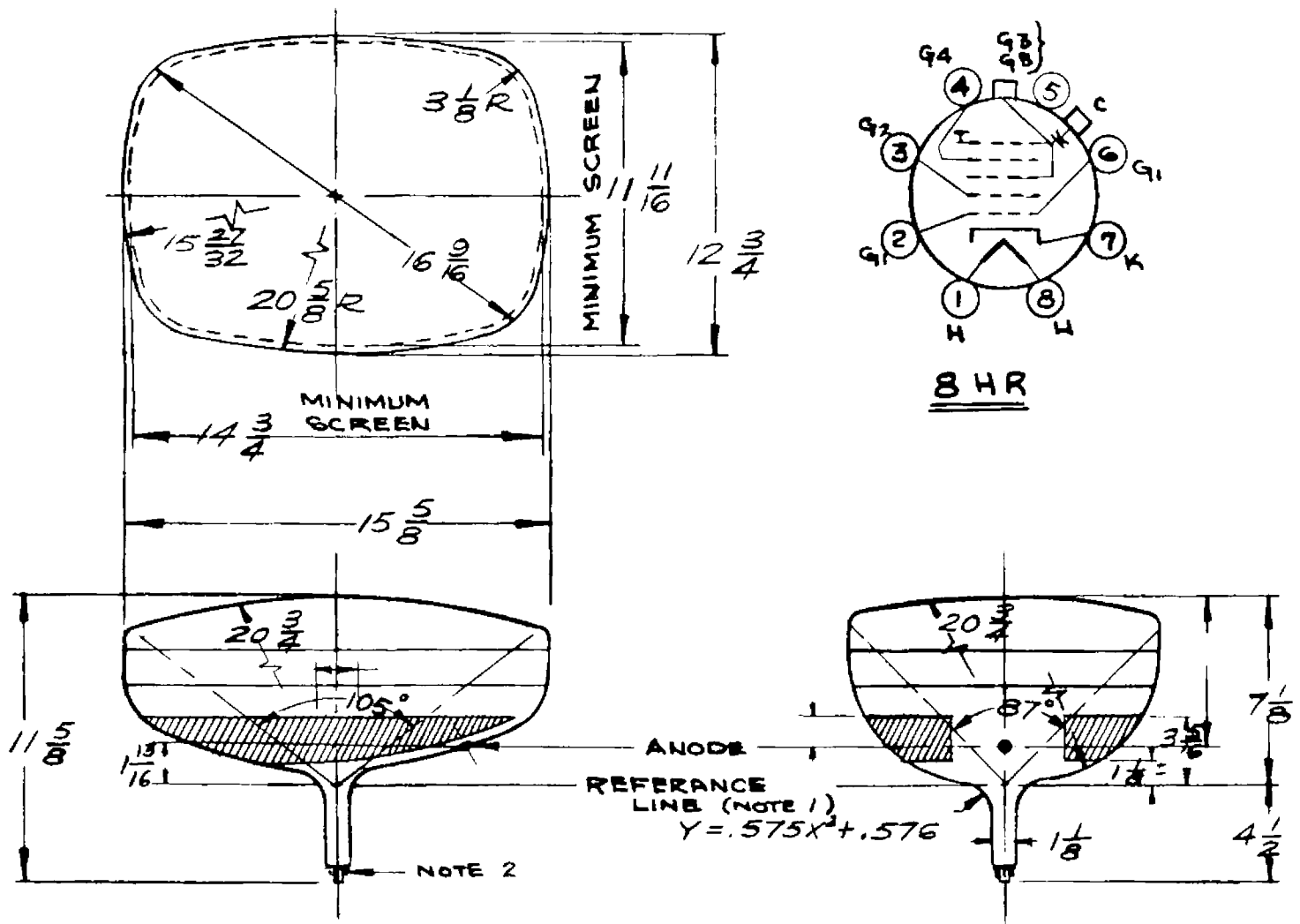
NOTES

¹Grid number four in this tube is the focus electrode.

²With the combined grid No. 1 bias voltage and video signal adjusted to produce an anode current of 100 ua on a 11 11/16 x 14 3/4 inch picture adjusted for best overall focus. For other anode voltages, the focus voltage will be from -0.4% to +2.5%.

³Visual extinction of focused raster.

17CWP4



NATIONAL VIDEO CORP.
CHICAGO 32. ILL.

SUPERSEDES	ORIGINAL	DRAWING N°
DRAWN BY	SCALE	EFFECTIVE
R. LARSON	1" - 8"	1-24-58
DISTRIBUTION		

NOTES

NOTE 1: Reference line is determined by plane C-C' of JETEC No. 126 Reference line gauge when the gauge is seated against the bulb.

NOTE 2: Pin No. 4 aligns with anode contact (J1-21) within $\pm 30^\circ$.

17DZP4

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 17DZP4 is a 3 9/16" neck length, electrostatic focus, magnetic deflection picture tube. The tube has a metal backed screen, a straight gun which requires no ion trap and a 450 milliampere, 6.3 volt filament.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	105 Degrees
Vertical	87 Degrees
Diagonal	110 Degrees
External Conductive Coating to Anode	1500 Max. uuf
	1000 Min. uuf
Heater Current at 6.3 Volts	0.45 $\pm$ 10% Ma

OPTICAL DATA

Phosphor Number	No. 1 Aluminized
Light Transmittance at Center, Approximate	78 Percent

MECHANICAL DATA

Overall Length	10 11/16 $\pm$ 1/4	Inches
Greatest Dimensions of Tube		
Diagonal	16 9/16 $\pm$ 1/8	Inches
Width	15 5/8 $\pm$ 1/8	Inches
Height	12 3/4 $\pm$ 1/8	Inches
Minimum Useful Screen Dimensions (Projected)		
Diagonal	15 3/4	Inches
Horizontal axis	14 3/4	Inches
Vertical axis	11 11/16	Inches
Area	155	Sq. Inches
Neck Length	3 9/16 $\pm$ 1/8	Inches
Bulb No.	J132 1/2A1/B1	
Bulb Contact	J1-21	
Base	B7-208	
Basing	8HR	

RATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive and measured with respect to cathode.

Maximum Anode Voltage	17,600	Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1000 -500	
Maximum Grid #2 Voltage	550	Volts
Grid #1 Voltage		
Maximum Negative Value	155	Volts DC
Maximum Negative Peak Value	220	Volts
Maximum Positive Value	0	Volts DC
Maximum Positive Peak Value	2	Volts
Maximum Heater Voltage	7.0	Volts
Minimum Heater Voltage	5.6	Volts
Maximum Heater-Cathode Voltage		
Heater negative 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 CONDITIONSGRID DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to cathode.

Anode Voltage	14,000	Volts DC
Grid #4 Voltage (Focusing Electrode) (Notes 2 and 3)	0 to 400	Volts DC
Grid #2 Voltage	300	Volts DC
Grid #1 Voltage (Note 1)	-28 to -72	Volts DC

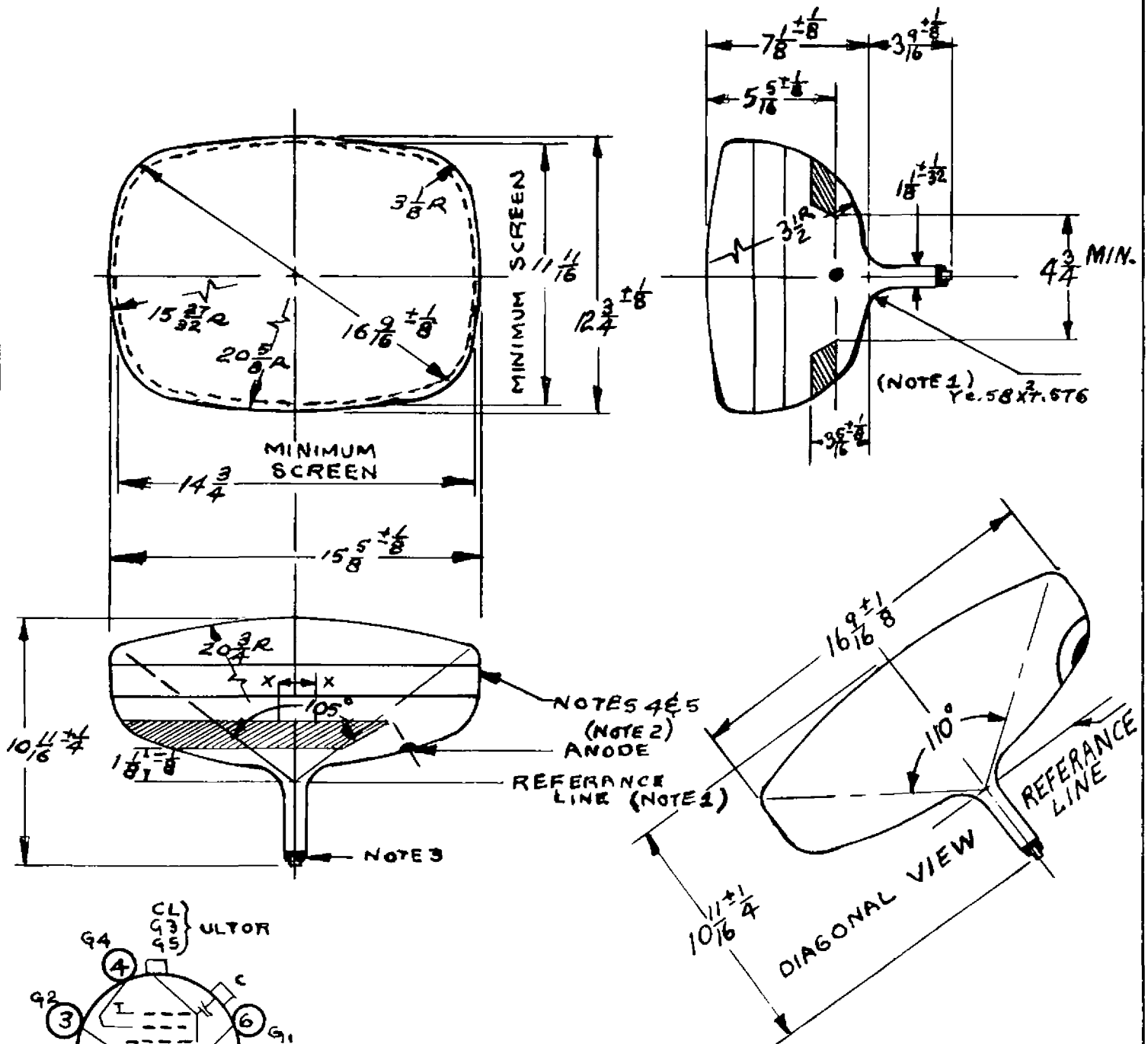
Pin Connections

Pin 1	Heater	Pin 6	Grid No. 1
Pin 2	Grid No. 1	Pin 7	Cathode
Pin 3	Grid No. 2	Pin 8	Heater
Pin 4	Grid No. 4	Bulb Contact	Ultor

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 100 microamperes on a 11 11/16 x 14 3/4" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and 450 volts.

17DZP4



NATIONAL VIDEO CORP.
CHICAGO 32. ILL.

SUPERSEDES ORIGINAL DRAWING NO 17DZP4

DRAWN BY SCALE EFFECTIVE DISTRIBUTION

S. KRUEGER 1" = 8" 1-20-60 A, B, C, D, E, F, G, H

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.
4. Bulge at splice line seal may increase the indicated maximum value for envelope width, diagonal and height by not more than $1/8"$; however, the bulge will not protrude more than $1/16"$ beyond the mold match line at any point.
5. Undisturbed area between the mold match line and the panel side of the seal bulge will be a minimum of $3/4"$.

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.

NATIONAL VIDEO CORPORATION
4300 W 47 TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 17EHP4 is a 17"-110° cathode ray tube, with a 4 3/8" neck length. This tube has a straight gun, which requires no ion trap, a 600 milliampere, 6.3 volt filament, and 50 volt G2 for cathode drive design.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	105 Degrees
Vertical	87 Degrees
Diagonal	110 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	1500 max. uuf
	1000 min. uuf
Heater Current at 6.3 volts	600 ± 30ma
Heater Warm-up Time	11 Seconds

OPTICAL DATA

Phosphor Number JEDEC designation,	P4 Aluminized
Light Transmittance at Center, Approximate	78%

MECHANICAL DATA

Overall Length	11 1/2 ± 3/16 Inches
Greatest Diameter of Tube	
Greatest Dimensions of Tube	
Diagonal	16 9/16 ± 1/8 Inches
Width	15 5/8 ± 1/8 Inches
Height	12 3/4 ± 1/8 Inches
Minimum Useful Screen Diameter (Projected)	
Minimum Useful Screen Dimensions (Projected)	
Diagonal	15 3/4 Inches
Horizontal Axis	14 3/4 Inches
Vertical Axis	11 11/16 Inches
Area	155 Sq. Inches
Neck Length	4 3/8 ± 1/8 Inches
Bulb EIA designation or equivalent (Including shield designation)	J-132 1/2-A1
Bulb Contact	J1-21
Base	B7-208
Basing	8HR
Bulb Contact Alignment	
J1-21 contact aligns with pin position #4 ± 30 Degrees	

RATINGS (Design Maximum System)

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

Maximum Anode Voltage	20,000 Volts
Minimum Anode Voltage	10,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -500 Volts
Maximum Grid #2 Voltage	60 Volts
Minimum Grid #2 Voltage	25 Volts
Cathode Voltage	
Maximum Negative Value	0 Volts DC
Maximum Negative Peak Value	2 Volts
Maximum Positive Value	100 Volts DC
Maximum Positive Peak Value	150 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.8 Volts
Maximum Heater-Cathode Voltage	
Heater negative with respect to cathode	
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 CONDITIONSCATHODE DRIVE SERVICE

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

Anode Voltage	16,000 Volts DC
Grid #4 Voltage (Focusing Electrode)	
(Notes 2 & 3)	250 Volts DC
Grid #2 Voltage	50 Volts DC
Cathode Voltage (Note 1)	35 to 55 Volts DC

MAXIMUM CIRCUIT VALUES

Maximum Grid #1 Circuit Resistance	1.5 Megohms
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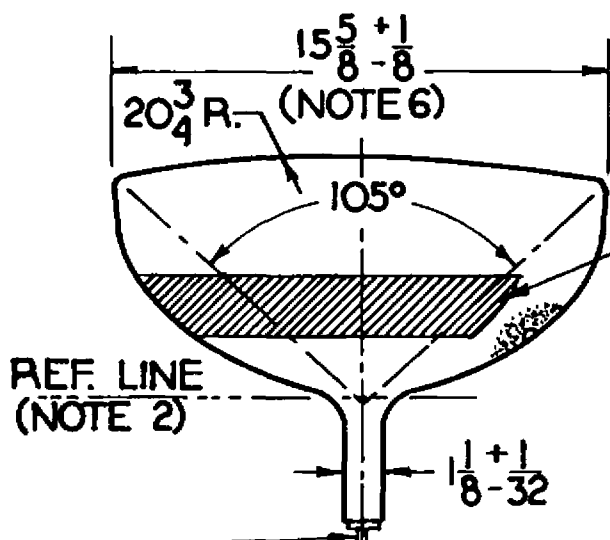
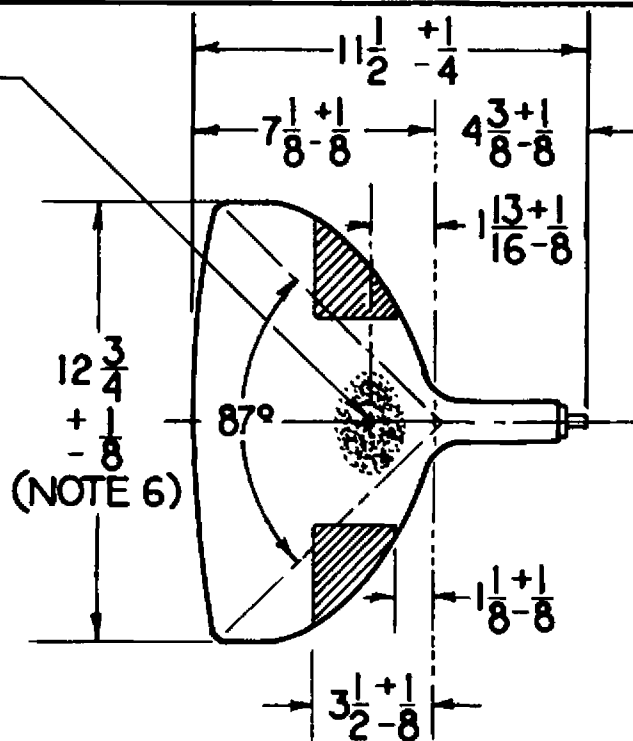
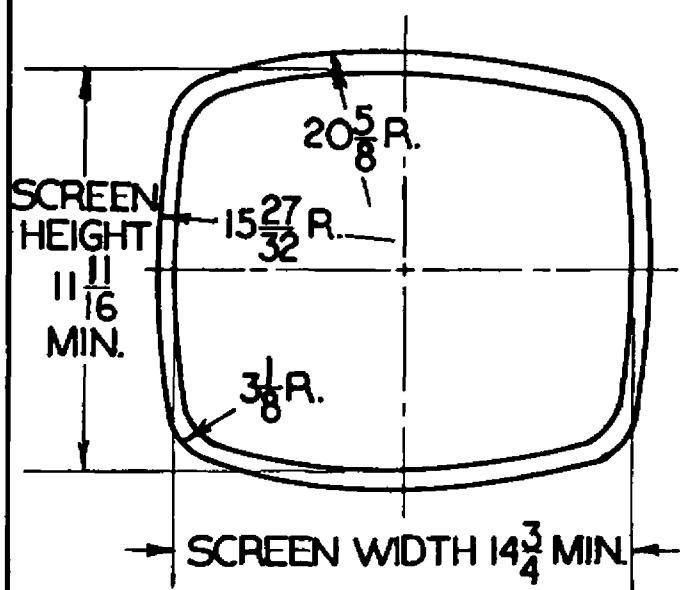
GRAPHS AND DRAWINGS

Tube Outline with essential dimensions and tolerances.

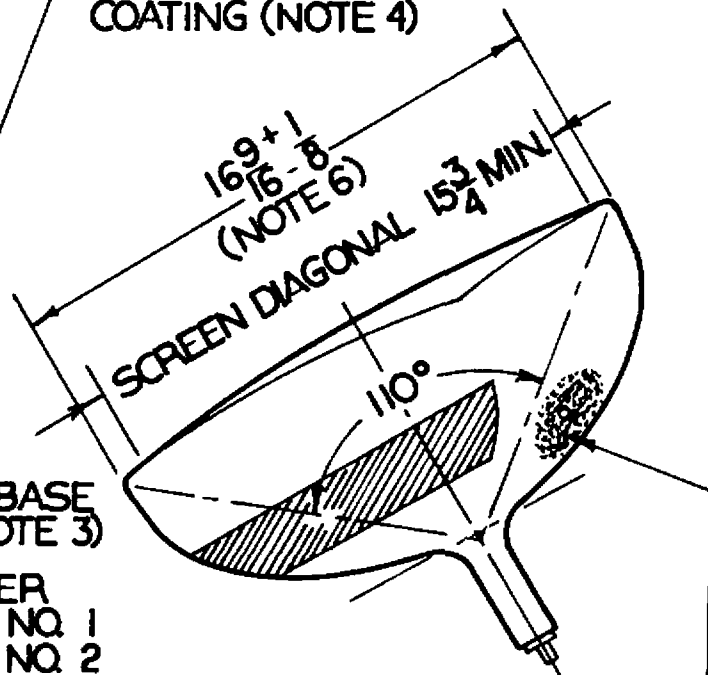
Pin Connections:

Pin 1	Heater	Pin 6	Grid No. 1
Pin 2	Grid No. 1	Pin 7	Cathode
Pin 3	Grid No. 2	Pin 8	Heater
Pin 4	Grid No. 4		

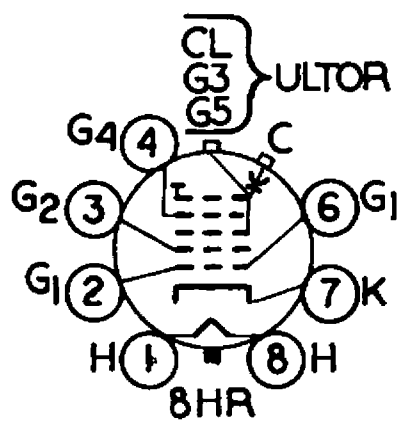
ULTOR RECESSED SMALL CAVITY
CAP JEDEC # J1-21 (NOTE 1)



EXTERNAL CONDUCTIVE
COATING (NOTE 4)



SMALL BUTTON NEEIGHTAR 7-PIN BASE
ARRANGEMENT JEDEC # B7-208 (NOTE 3)



- PIN 1 : HEATER
- PIN 2 : GRID NO. 1
- PIN 3 : GRID NO. 2
- PIN 4 : GRID NO. 4
- PIN 6 : GRID NO. 1
- PIN 7 : CATHODE
- PIN 8 : HEATER

CAP : ULTOR (GRID NO. 3 GRID
NO. 5 COLLECTOR)
C : EXTERNAL CONDUCTIVE
COATING

TRANSPARENT
INSULATING
COATING
(NOTE 5)

DRAWN BY	SCALE	EFFECTIVE	DISTRIBUTION	DRAWING NO.
A.L. PRIBYL		3-14-63		17EHP4

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 100 microamperes on a 14 3/4" x 11 11/16" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and 400 volts.

NOTES FOR DIMENSIONAL OUTLINE

1. The plane through the tube axis and pin No. 4 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of $\pm 30^\circ$. Ultor terminal is on same side as Pin No. 4.
2. With tube neck inserted through flared end of reference-line gauge JEDEC No. G-126 and with tube seated in gauge, the reference line is determined by the intersection of the Plane CC' of the gauge with the glass funnel.
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 base wafer will fall within a circle concentric with bulb axis and having a diameter of 1 3/4".
4. External conductive coating must be grounded.
5. To clean this area, wipe only with soft dry lint-less cloth.
6. Measured at the mold-match line.

OPERATING CONSIDERATIONS

Shatter-Proof Cover Over the Tube Face:

Following conventional picture tube practice. It is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 17EHP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 17EAP4 is a 7 1/2" neck length, electrostatic focus and magnetic deflection picture tube using a rectangular glass envelope with an aluminized screen providing a picture area of 150 square inches. The electron gun features a newly developed focus system which automatically focuses the tube. The G₁ focus electrode is tied to filament lead Pin 1. No external connection for focus is required as the tube maintains focus over its entire operating range. The electron gun is designed to be used with a single external magnetic field for the elimination of ion spot blemishes.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	65 Degrees
Vertical	50 Degrees
Diagonal	70 Degrees
External Conductive Coating to Anode	1500 Max. uuf
	1000 Min. uuf
Heater Current at 6.3 Volts	0.6 ± 10% Ma

OPTICAL DATA

Phosphor Number	No. 4	Aluminized
Light Transmittance at Center, Approximate	74	Percent

MECHANICAL DATA

Overall Length	19 1/4 ± 3/8	Inches
Greatest Dimensions of Tube		
Diagonal	16 5/8 ± 1/8	Inches
Width	15 3/8 ± 1/8	Inches
Height	12 1/4 ± 1/8	Inches
Minimum Useful Screen Dimensions (Projected)		
Diagonal	15 9/16	Inches
Horizontal axis	14 5/16	Inches
Vertical axis	11 1/8	Inches
Area	150	Sq. Inches
Neck Length	7 1/2 ± 3/16	Inches
Bulb No.	J133B1/D1	
Bulb Contact	J1-21	
Base	B5-57	
Basing	12AT	

RATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive and measured with respect to cathode.

Maximum Anode Voltage	17,600	Volts
Maximum Grid #2 Voltage	550	Volts
Grid #1 Voltage		
Maximum Negative Value	155	Volts DC
Maximum Negative Peak Value	220	Volts
Maximum Positive Value	0	Volts DC
Maximum Positive Peak Value	2	Volts
Maximum Heater Voltage	7.0	Volts
Minimum Heater Voltage	5.6	Volts
Maximum Heater-Cathode Voltage		
Heater negative 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

GRID DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to cathode.

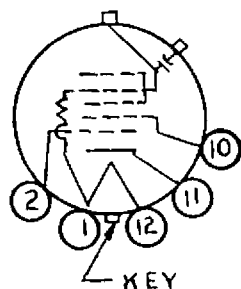
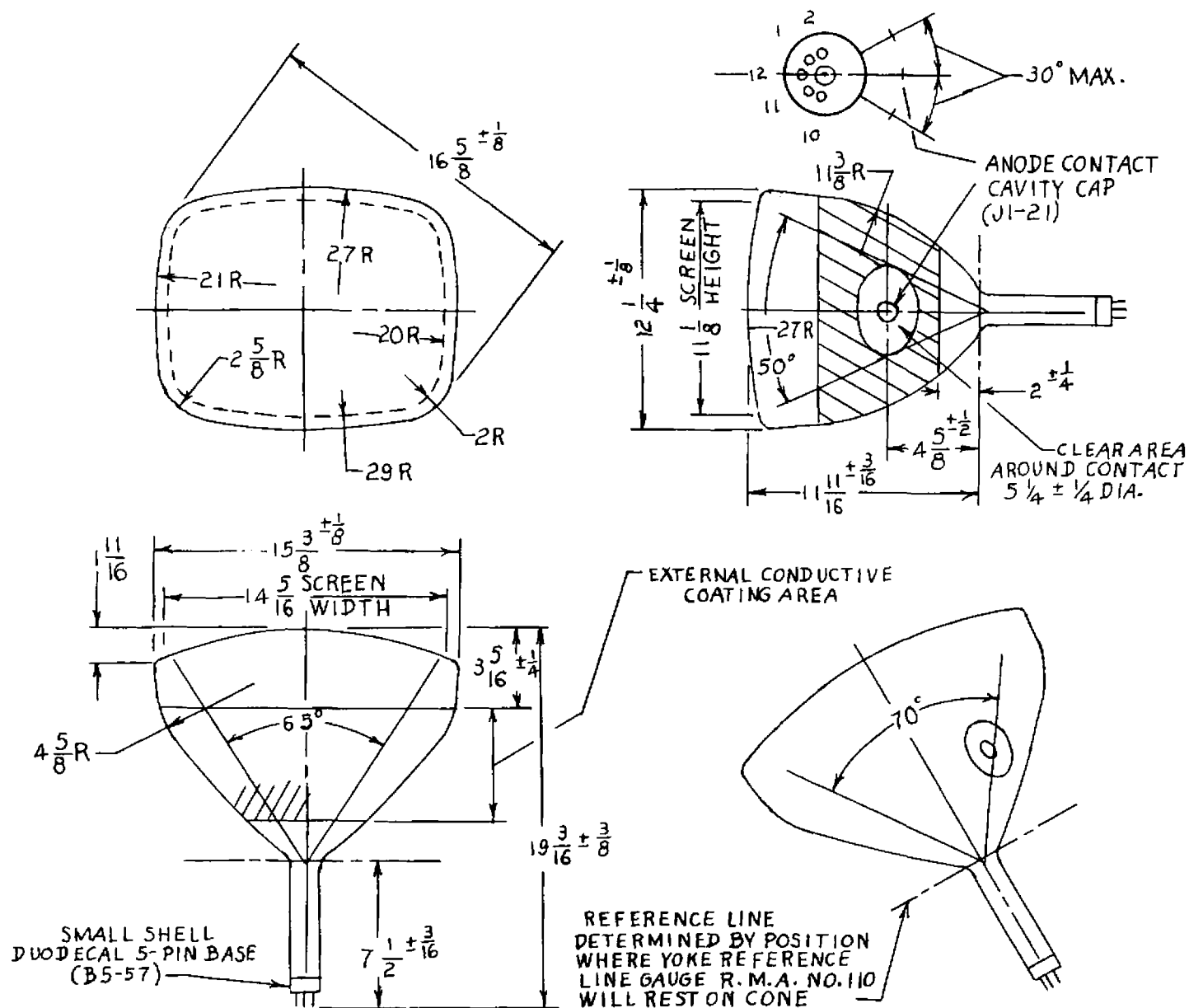
Anode Voltage	12,000	Volts DC
Grid #2 Voltage	300	Volts DC
Grid #1 Voltage (Note 1)	-28 to -72	Volts DC
Ion Trap Current JEDEC Coil #RMA111 (Note 2)	40 $\pm$ 50%	Ma DC

Pin Connections

Pin 1	Heater, focus electrode	Pin 12	Heater
Pin 2	Grid No. 1	Bulb Contact	Ultor
Pin 10	Grid No. 2		
Pin 11	Cathode		

NOTES

1. Visual extinction of focused raster.
2. Ion trap positioned with trailing edge of pole pieces over the G1-G2 gap and oriented to give maximum brightness.



BOTTOM VIEW OF BASE 12 AT

PIN NO. ELEMENT
 1 - HEATER, FOCUS ELECTRODE
 2 - GRID NO. 1
 10 - GRID NO. 2
 11 - CATHODE,

12 - HEATER
 CAP - ANODE

NATIONAL VIDEO CORP.
 CHICAGO 32, ILL.

NOTE:
 EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED

SUPERSEDES		DRAWING NO.	17EAP4
DRAWN BY	SCALE	EFFECTIVE	DISTRIBUTION
STAROSTA	1-8"	12-3-59	

MECHANICAL NOTES

1. The reference line is determined by reference line gauge JEDEC #110.
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 allowed to move freely.

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.

19AEP4

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 19AEP4 is a low voltage, electrostatic focus, magnetic deflection picture tube with a 4 3/8" neck length. The tube has a metal back screen and uses a straight gun which requires no ion trap. This tube operates at 100 volts G₂ and uses a 12.6 volt, 150 milliamperes filament.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	103 Degrees
Vertical	86 Degrees
Diagonal	114 Degrees
External Conductive Coating to Anode	1500 Max. uuf
	1000 Min. uuf
Heater Current at 12.6 volts	150 $\pm$ 5% Ma

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 Dimensions 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	
Bulb Contact	J1-21	
Base	B7-208	
Basing	8HR	

RATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive and measured with respect to cathode.

Maximum Anode Voltage	17,600	Volts
Maximum Grid (Focusing Electrode) Voltage	~~500~~ -200	
Maximum Grid #2 Voltage	250	Volts
Grid #1 Voltage		
Maximum Negative Value	155	Volts DC
Maximum Negative Peak Value	220	Volts
Maximum Positive Value	0	Volts DC
Maximum Positive Peak Value	2	Volts
Maximum Heater Voltage	13.8	Volts
Minimum Heater Voltage	11.4	Volts
Maximum Heater-Cathode Voltage		
Heater negative with respect to cathode		
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 CONDITIONSCATHODE DRIVE SERVICE

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

Anode Voltage	14,000	Volts DC
Grid Voltage (Focusing Electrode) (Notes 2 and 3)	-100 to ~~100~~	Volts DC
Grid #2 Voltage	100	Volts DC
Cathode Voltage (Note 1)	~~32~~ to ~~47~~	Volts DC

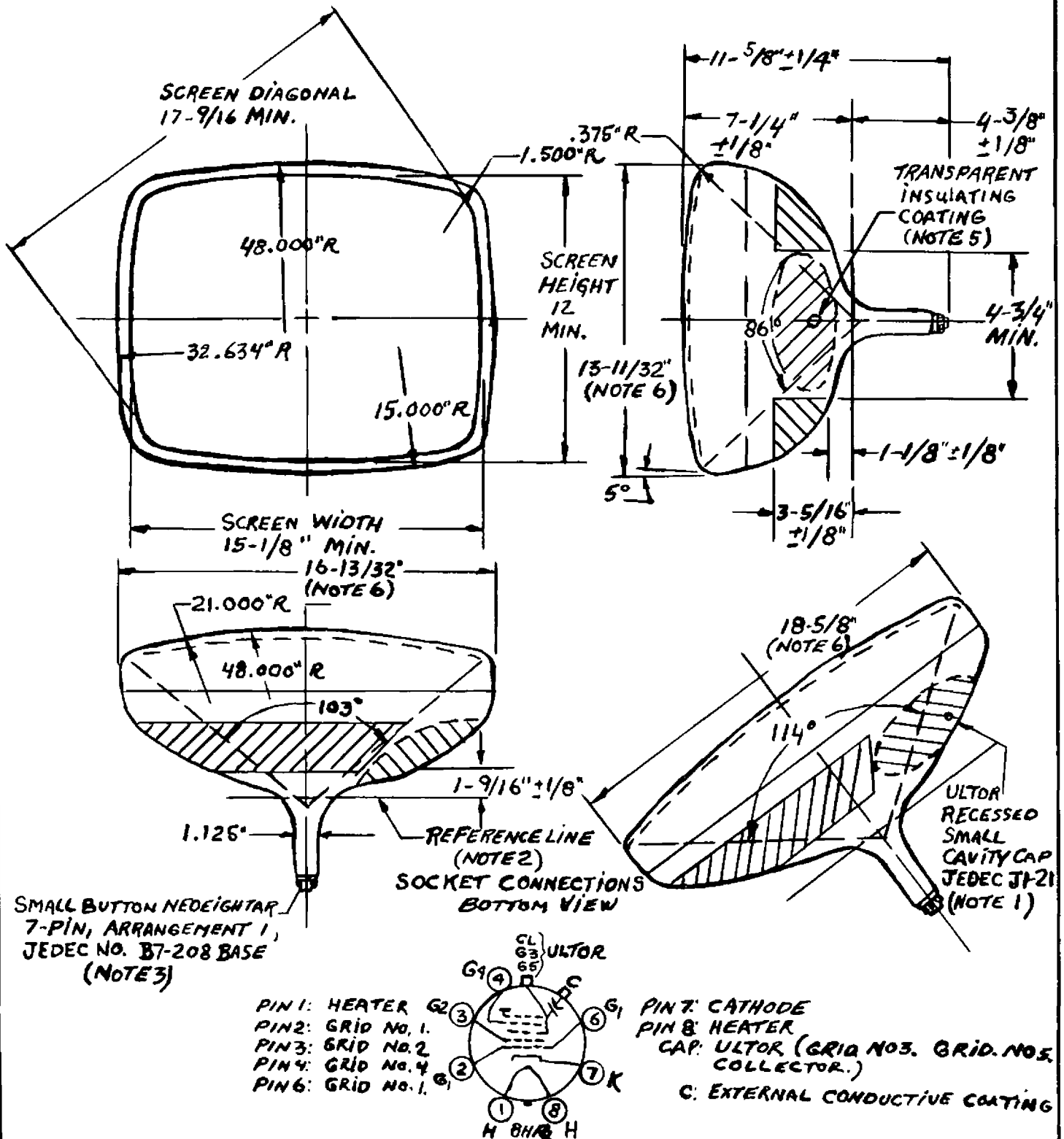
Pin Connections

Pin 1	Heater	Pin 6	Grid #1
Pin 2	Grid #1	Pin 7	Cathode
Pin 3	Grid #2	Pin 8	Heater
Pin 4	Grid #4	Bulb Contact	Ultor

NOTES

1. Visual extinction of focused raster.
2. With combined grid #1 bias voltage and video-signal voltage adjusted to give an anode current of 100 microamperes on a 12 x 15 1/8" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between -100 and ~~100~~ volts.

NATIONAL VIDEO CORP. CHICAGO 32, ILL



SUPERSEDES

DRAWING NO. 19AEP4

DRAWN BY

SCALE

EFFECTIVE

DISTRIBUTION

S KRUEGER

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.
4. Bulge at splice line seal may increase the indicated maximum value for envelope width, diagonal and height by not more than 1/8"; however, the bulge will not protrude more than 1/16" beyond the mold match line at any point.
5. Undisturbed area between the mold match line and the panel side of the seal bulge will be a minimum of 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.

19AQP4

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 19AQP4 is a 4 1/8" neck length, electrostatic focus picture tube. The tube has a metal back screen, a straight gun which requires no ion trap and a 300 milliamper, 6.3 volt filament.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	114 Degrees
Vertical	103 Degrees
Diagonal	86 Degrees
External Conductive Coating to Anode	1500 Max. uuf
	1000 Min. uuf
Heater Current at 6.3 Volts	0.30 $\pm$ 5% Ma

OPTICAL DATA

Phosphor Number	P4 Aluminized
Light Transmittance at Center, Approximate	78 Percent

MECHANICAL DATA

Overall Length	11 3/8 $\pm$ 1/4	Inches
Greatest Dimensions 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 1/8 $\pm$ 1/8	Inches
Bulb	J-149	
Bulb Contact	J1-21	
Base	B7-208	
Basing	8HR	

RATINGS

Unless otherwise specified, voltage values are positive and measured with respect to cathode.

Maximum Anode Voltage	20,000	Volts
Maximum Grid (Focusing Electrode) Voltage	~~1000~~ -500	
Maximum Grid #2 Voltage	550	Volts
Grid #1 Voltage		
Maximum Negative Value	155	Volts DC
Maximum Negative Peak Value	220	Volts
Maximum Positive Value	0	Volts DC
Maximum Positive Peak Value	2	Volts
Maximum Heater Voltage	7.0	Volts
Minimum Heater Voltage	5.7	Volts
Maximum Heater-Cathode Voltage		
Heater negative 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 CONDITIONSGRID DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to cathode.

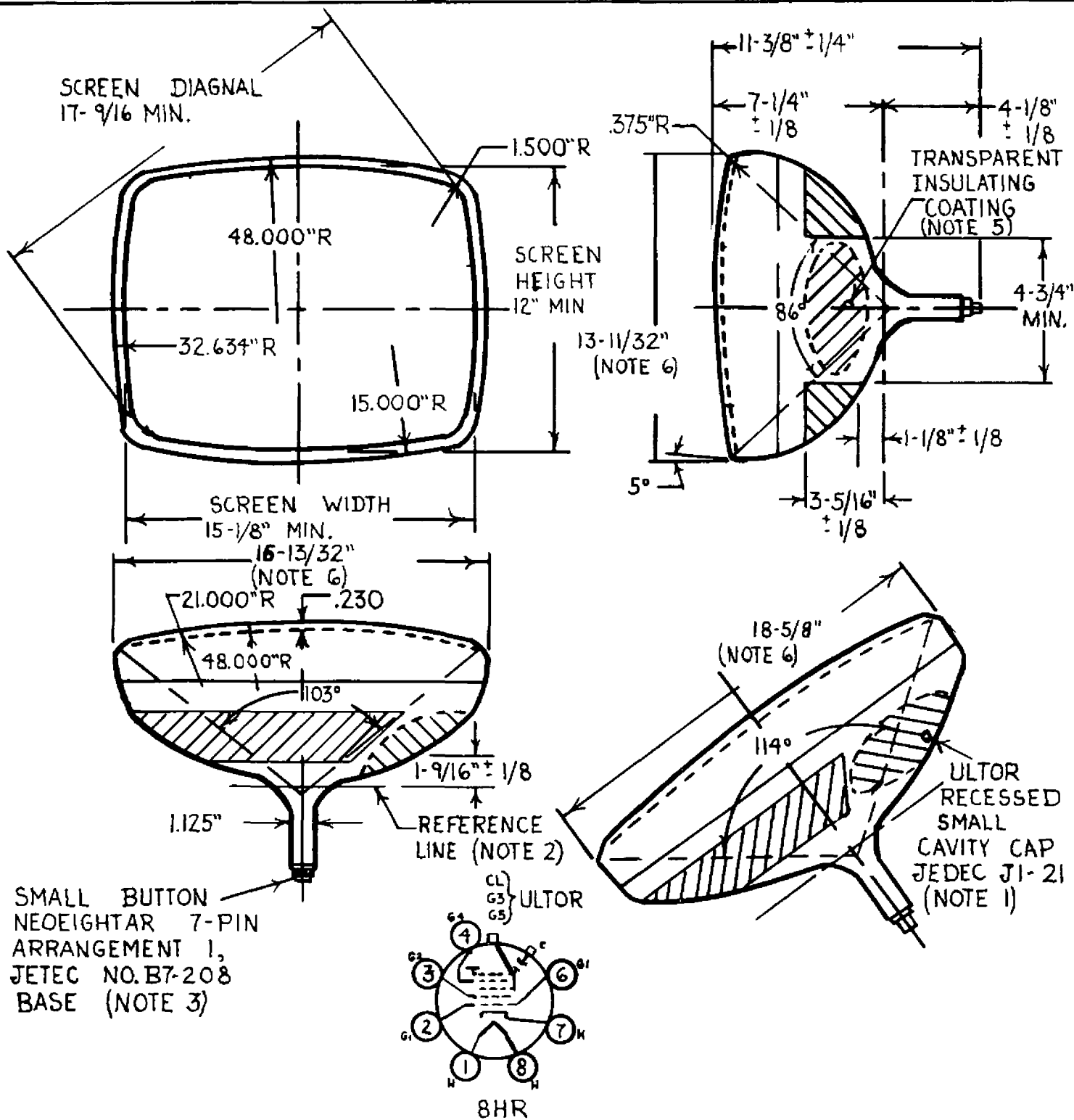
Anode Voltage	16,000	Volts DC
Grid #4 Voltage (Focusing Electrode) (Notes 2 and 3)	0 - 400	Volts DC
Grid #2 Voltage	300	Volts DC
Grid #1 Voltage (Note 1)	-38 to -72	Volts DC

Pin Connections

Pin 1	Heater	Pin 6	Grid #1
Pin 2	Grid #1	Pin 7	Cathode
Pin 3	Grid #2	Pin 8	Heater
Pin 4	Grid #4	Bulb Contact	Ultor

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 100 microamperes on a 12 x 15 1/8" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and 400 volts.



NATIONAL VIDEO CORP.
CHICAGO 32, ILL

SUPERSEDES		DRAWING NO	19AQP4
DRAWN BY	SCALE	EFFECTIVE	DISTRIBUTION
A. L. PRIBYL			

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.
4. Bulge at splice line seal may increase the indicated maximum value for envelope width, diagonal and height by not more than $1/8"$; however, the bulge will not protrude more than $1/16"$ beyond the mold match line at any point.
5. Undisturbed area between the mold match line and the panel side of the seal bulge will be a minimum of $3/4"$.

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.

19BRP4

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 19BRP4 is a 19" 114° lightweight Cathode Tube, laminated with a Pittsburgh facepanel, 4 3/8" neck length. This tube has electrostatic focus, magnetic deflection and a metal backed screen with a straight gun which requires no ion trap and a 600 milliampere, 6.3 volt filament.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, approximate	
Horizontal	102 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	1500 max. uuf 1000 min. uuf
Heater Current at 6.3 Volts	600 $\pm$ 5%ma
Heater Warm-up time	11 Seconds

OPTICAL DATA

Phosphor Number JEDEC Designation	P4 Aluminized
Light Transmittance at Center, approximate	52%

MECHANICAL DATA

Overall Length	11 7/8 $\pm$ 6/16 inches
Greatest Diameter of Tube	
Greatest Dimensions of Tube	
Diagonal	18 5/8 +3/32 -1/32 inches
Width	16 13/32 +3/32 -1/32 inches
Height	13 11/32 +3/32 -1/32 inches
Minimum Useful Screen Diameter (Projected)	
Minimum Useful Screen Dimensions (Projected)	
Diagonal	17 3/4 inches
Horizontal axis	15 5/16 inches
Vertical axis	12 1/16 inches
Area	174 sq. inches
Neck Length	4 3/8 $\pm$ 1/8 inches
Bulb EIA designation or equivalent (including shield designation)	C-149 Exp. #5 or Equiv. J1-21
Bulb Contact	JEDEC Designation J1-21
Base	JEDEC Designation B7-208
Basing	JEDEC Designation 8HR

MECHANICAL DATA (Cont'd)

Weight, approximate laminated
Implosion Panel

18 Lbs.
FP149A1

RATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive
and measured with respect to cathode

Maximum Anode Voltage	23,000 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -550
Maximum Grid #2 Voltage	550 Volts
Minimum Grid #2 Voltage	
Grid #1 Voltage	
Maximum Negative Value	155 Volts DC
Maximum Negative Peak Value	220 Volts
Maximum Positive Value	0 Volts DC
Maximum Positive Peak Value	2 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.7 Volts
Maximum Heater-Cathode Voltage	
Heater negative with respect to cathode	
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 CONDITIONSGRID DRIVE SERVICE

Unless otherwise specified, all voltage values
are positive with respect to cathode.

Anode Voltage	16,000 Volts DC
Grid #4 Voltage (Focusing Electrode)	
(Notes 3 & 4)	0 to +400 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note 1)	+35 to +72 Volts DC

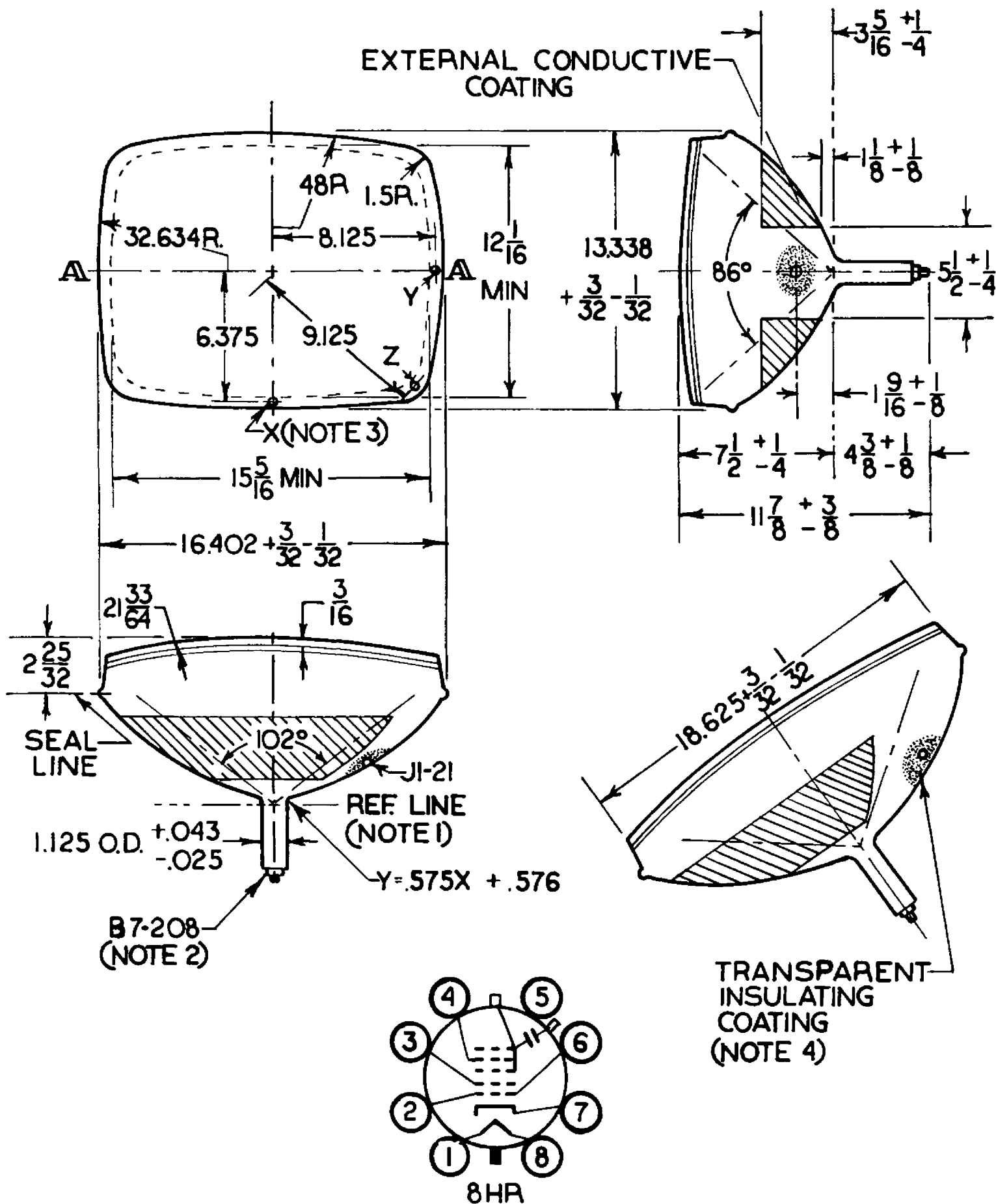
MAXIMUM CIRCUIT VALUES

Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

Tube Outline with essential dimensions and tolerances.
Pin Connections

Pin 1	Heater	Pin 6	Grid #1
Pin 2	Grid #1	Pin 7	Cathode
Pin 3	Grid #2	Pin 8	Heater
Pin 4	Grid #4		Bulb Contact Ultor



DRAWN BY	SCALE	DISTRIBUTION	EFFECTIVE	DRAWING NO.
A.L. PRIBYL			9-20-61	19BRP4

NOTES

1. Visual extinction of focuses raster.
2. For JEDEC Focus coil #____, or equivalent, with the combined grid #1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of ____ foot lamberts on a ____" X ____" picture size. Distance from reference line to center of air gap on focus coil shall be ____ inches.
3. With the combined grid #1 bias voltage and video-signal voltage adjusted to give an anode current of 100 microamperes on a 12 1/16" X 15 5/16" pattern from RCE 2F21 Monoscope or equivalent.
4. Individual tubes will have satisfactory focus at some value between 0 and +400 Volts.
5. Ion trap positioned with trailing edge of pole pieces over the G1 - G2 gap and oriented to give maximum brightness.

DIAGRAM NOTES

1. Reference line is determine by plane C-C' of JEDEC No. 126 Reference Line gauge, when the gauge is seated against the bulb.
2. Base Pin No. 4 aligns with horizontal centerline (A-A') within 30° and is on same side as anode contact, J1-21.
3. 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" Nominal
 Plane of X to Plane of Y = .429" $\pm$.030"
 Plane of X to Plane of Z = .749" $\pm$.030"
4. The area around the button is covered with an insulating coating.

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.

NATIONAL VIDEO CORPORATION

4300 W. 47TH STREET CHICAGO 32, ILLINOIS

CLIFFSIDE 4-5600

The 19CYP4 is a 19"-114° cathode ray tube. This tube has a 3 5/8" neck length, electrostatic focus, magnetic deflection, and metal backed screen. A straight gun which requires no ion trap and a .600 milliampere, 6.3 volt filament.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	102 degrees
Vertical	85 degrees
Diagonal	114 degrees
Direct Interelectrode Capacitances	
Cathode to all other electrodes, approx.	5 uuf
Grid #1 to all other electrodes, approx.	6 uuf
External Conductive Coating to Anode	1,500 max. uuf
	1,000 min. uuf
Heater Current at 6.3 volts	600 ± 30 ma
Heater Warm-up Time	11 Seconds

OPTICAL DATA

Phosphor Number JEDEC Designation, Indicate if aluminized	P4-Aluminized
Light Transmittance at Center, Approximate	78%

MECHANICAL DATA

Overall Length	10 7/8 ± 1/4 Inches
Greatest Diameter of Tube	
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 Diameter (Projected)	
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	3 5/8 ± 1/8 Inches
Bulb EIA designation or equivalent (including shield designation)	J-149-A1
Bulb Contact	JEDEC Designation J1-21
Base	JEDEC Designation B7-208
Basing	JEDEC Designation 8HR

MECHANICAL DATA (Cont'd)

Bulb Contact Alignment

J1-21 contact aligns with pin position #4 ± 30 degreesRATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive
and measured with respect to cathode

Maximum Anode Voltage	23,000 Volts
Minimum Anode Voltage	15,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1000 -500
Maximum Grid #2 Voltage	550 Volts
Minimum Grid #2 Voltage	200 Volts
Grid #1 Voltage	
Maximum Negative Value	154 Volts DC
Maximum Negative Peak Value	220 Volts
Maximum Positive Value	0 Volts DC
Maximum Positive Peak Value	2 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.7 Volts
Maximum Heater-Cathode Voltage	
Heater Negative with respect to cathode	
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 CONDITIONSGRID DRIVE SERVICE

Unless otherwise specified all voltage values
are positive with respect to cathode.

Anode Voltage	20,000 Volts DC
Grid #4 Voltage (Focusing Electrode)	
(Notes 2 & 3)	0 to +400 Volts DC
Grid #2 Voltage	400 Volts DC
Grid #1 Voltage (Note 1)	-36 to -94 Volts DC

MAXIMUM CIRCUIT VALUES

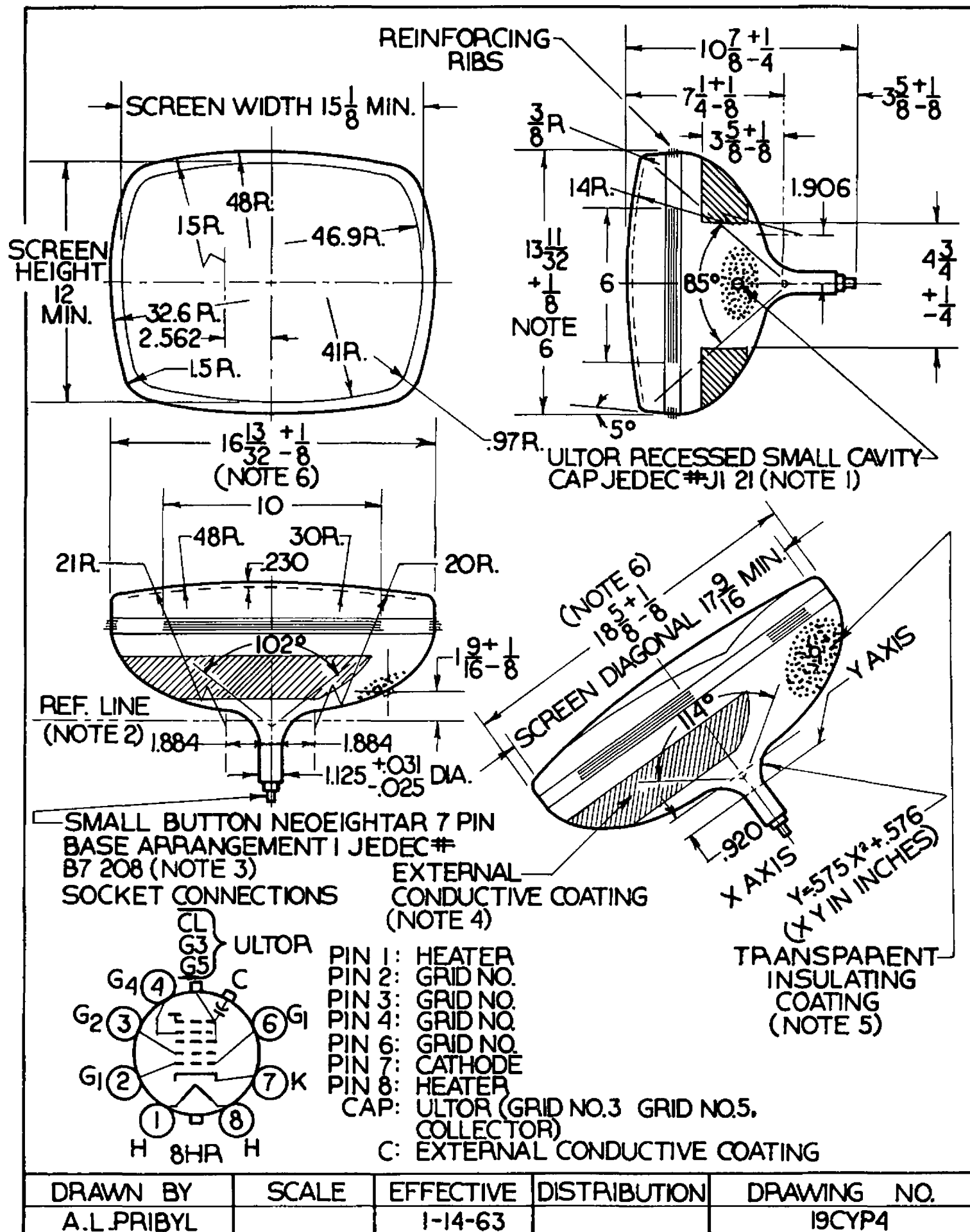
Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

Tube Outline with essential dimensions and tolerances.

Pin Connections

Pin 1 - Heater	Pin 6 - Grid No. 1
Pin 2 - Grid No. 1	Pin 7 - Cathode
Pin 3 - Grid No. 2	Pin 8 - Heater
Pin 4 - Grid No. 4	



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 100 microamperes on a 15 1/8" X 12" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and +400 volts.

NOTES FOR DIMENSIONAL OUTLINE

1. The plane through the tube axis and pin No. 4 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of +30°. Ultor terminal is on same side as Pin No. 4.
2. With tube neck inserted through flared end of reference-line gauge JEDEC No. G-126 and with tube seated in gauge, the reference line is determined by the intersection of the Plane CC' of the gauge with the glass funnel.
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 base wafer will fall within a circle concentric with bulb axis and having a diameter of 1 3/4".
4. External conductive coating must be grounded.
5. To clean this area, wipe only with soft dry lint-less cloth.
6. Measured at the mold-match line.

OPERATING CONSIDERATIONS

Shatter-Proof Cover Over the Tube Face:

Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 19CYP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide x-ray protection when required.

NATIONAL VIDEO CORPORATION
4300 W 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 19DCP4 is a 19"-114° banded picture tube with a 4 3/8" neck length. This tube has a electrostatic focus, magnetic deflection, and a metal backed screen with a straight gun, which requires no ion trap and a 600 milliamper, 6.3 volt filament.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	102 Degrees
Vertical	85 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	1500 max. uuf
	1000 min. uuf
Heater Current at 6.3 volts	600 ± 30 ma
Heater Warm-up Time	11 Seconds

OPTICAL DATA

Phosphor Number JEDEC designation	P4 Aluminized
Light Transmittance at Center, Approximate	49%

MECHANICAL DATA

Overall Length	11 5/8 ± 1/4 Inches
Greatest Diameter of Tube	
Greatest Dimensions of Tube	
Diagonal	18 7/8 max. Inches
Width	16 11/16 max. Inches
Height	13 39/64 max. Inches
Minimum Useful Screen Diameter (Projected)	
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 ± 1/8 Inches
Bulb EIA designation or equivalent (Including shield designation)	J=149-F1
Bulb Contact	J1-21
Base	B7-208
Basing	8HR
	JEDEC Designation
	JEDEC Designation
	JEDEC Designation

MECHANICAL DATA (Cont'd)

Bulb Contact Alignment

J1-21 contact aligns with pin position #4 $\pm$ 30 degreesRATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive and measured with respect to cathode

Maximum Anode Voltage	20,000 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1000 -500
Maximum Grid #2 Voltage	550 Volts
Minimum Grid #2 Voltage	200 Volts
Grid #1 Voltage	
Maximum Negative Value	154 Volts DC
Maximum Negative Peak Value	220 Volts
Maximum Positive Value	0 Volts DC
Maximum Positive Peak Value	2 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.7 Volts
Maximum Heater-Cathode Voltage	
Heater Negative with respect to cathode	
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 CONDITIONSGRID DRIVE SERVICE

Unless otherwise specified all voltage values are positive with respect to cathode.

Anode Voltage	16,000 Volts DC
Grid #4 Voltage (Focusing Electrode)	
(Notes 2 & 3)	0 to +400 Volts DC
Grid #2 Voltage	400 Volts DC
Grid #1 Voltage (Note 1)	-39 to -94 Volts DC

MAXIMUM CIRCUIT VALUES

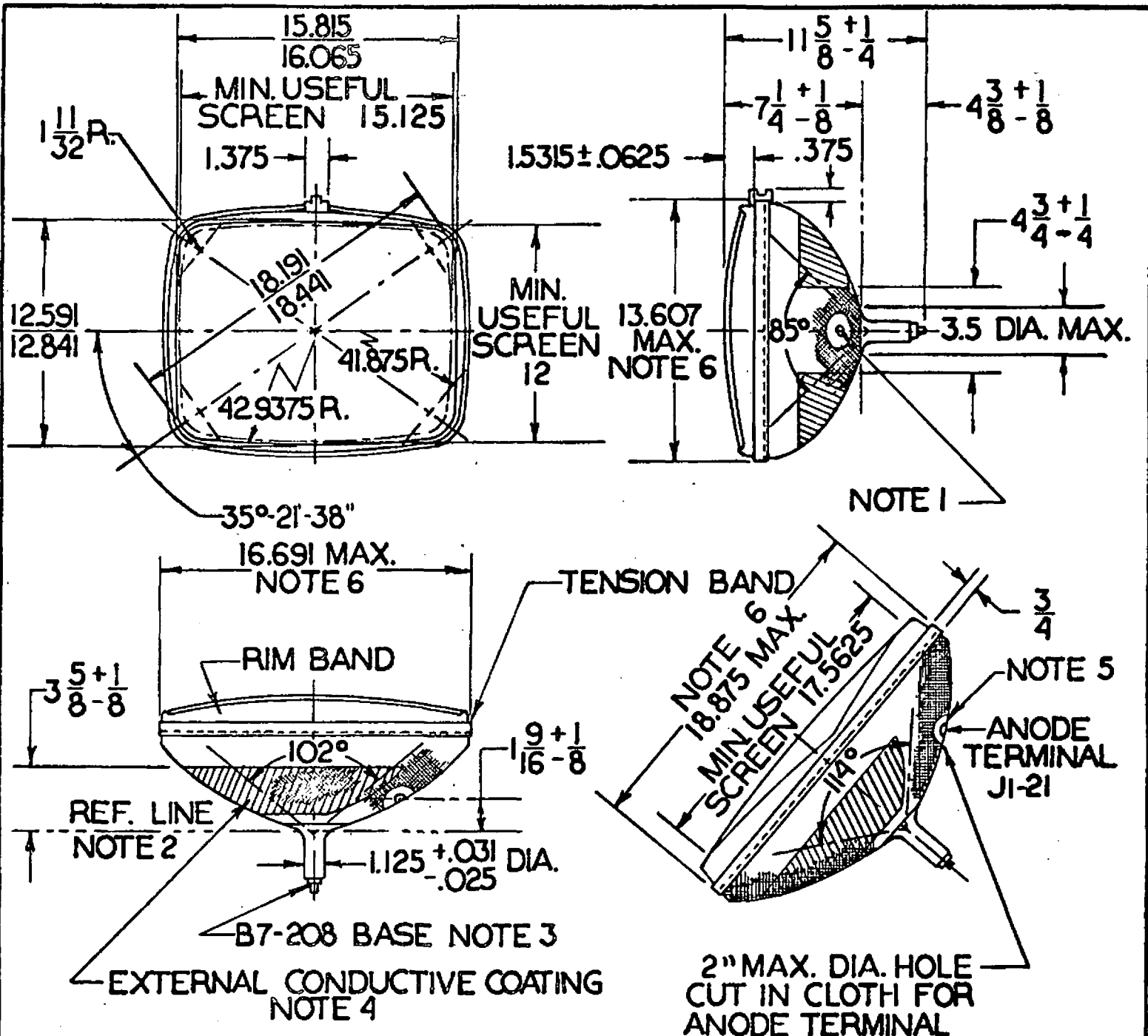
Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

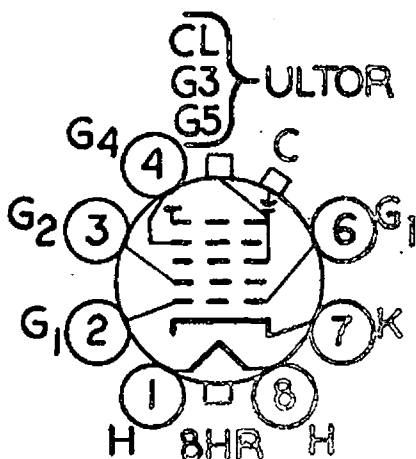
Tube Outline with essential dimensions and tolerances.

Pin Connections:

Pin 1 - Heater	Pin 6 - Grid No. 1
Pin 2 - Grid No. 1	Pin 7 - Cathode
Pin 3 - Grid No. 2	Pin 8 - Heater
Pin 4 - Grid No. 4	



SOCKET CONNECTIONS



- PIN 1: HEATER
- PIN 2: GRID NO. 1
- PIN 3: GRID NO. 2
- PIN 4: GRID NO. 4
- PIN 6: GRID NO. 1
- PIN 7: CATHODE
- PIN 8: HEATER
- CAP: ULTOR (GRID NO. 3 GRID NO. 5 COLLECTOR)
- C: EXTERNAL CONDUCTIVE COATING

DRAWN BY

A.L. PRIBYL

SCALE

EFFECTIVE

3-21-63

DISTRIBUTION

DRAWING NO.

19DCP4

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 100 microamperes on a 15 1/8" x 12" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and +400 volts.

NOTES FOR DIMENSIONAL OUTLINE

1. The plane through the tube axis and pin No. 4 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of $\pm 30^\circ$. Ultor terminal is on same side as Pin No. 4.
2. With tube neck inserted through flared end of reference-line gauge JEDEC No. G-126 and with tube seated in gauge, the reference line is determined by the intersection of the Plane CC' of the gauge with the glass funnel.
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 base wafer will fall within a circle concentric with bulb axis and having a diameter of 1 3/4".
4. External conductive coating must be grounded.
5. To clean this area, wipe only with soft dry lint-less cloth.
6. Measured to include rim band and tension strap.

NATIONAL VIDEO CORPORATION
4300 W. 47 TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 19DHP4 is a 19"-114° banded tube with a 4 3/8" neck length. This tube has a 600 milliamper, 6.3 volt filament, a straight gun which requires no ion trap, and 50 volt G₂ for cathode drive design.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	102 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	1500 Max. uuf
	1000 Min. uuf
Heater Current at 6.3 Volts	600 ± 30 Ma
Heater Warm-up Time	11 Seconds

OPTICAL DATA

Phosphor Number JEDEC Designation	P4 Aluminized
Light Transmittance at Center, Approximate	49 Percent

MECHANICAL DATA

Overall Length	11 5/8 ± 1/4 Inches
Greatest Diameter of Tube	
Greatest Dimensions of Tube	
Diagonal	18 7/8 Max. Inches
Width	16 11/16 Max. Inches
Height	13 39/64 Max. Inches
Minimum Useful Screen Diameter (Projected)	
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 ± 1/8 Inches
Bulb EIA Designation or equivalent (including shield designation)	J-149-F1
Bulb Contact	JEDEC Designation J1-21
Base	JEDEC Designation B7-208
Basing	JEDEC Designation 8HR
Bulb Contact Alignment	
J1-21 contact aligns with pin position #4 ± 30 Degrees	

RATINGS (Design Maximum System)

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

Maximum Anode Voltage	20,000 Volts
Minimum Anode Voltage	10,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -500
Maximum Grid #2 Voltage	60 Volts
Minimum Grid #2 Voltage	25 Volts
Cathode Voltage	
Maximum Negative Value	0 Volts DC
Maximum Negative Peak Value	2 Volts
Maximum Positive Value	100 Volts DC
Maximum Positive Peak Value	150 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.8 Volts
Maximum Heater-Cathode Voltage	
Heater negative with respect to cathode	
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

CATHODE DRIVE SERVICE

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

Anode Voltage	16,000 Volts DC
Grid #4 Voltage (Focusing Electrode)	
(Notes 2 & 3)	250 Volts DC
Grid #2 Voltage	50 Volts DC
Cathode Voltage (Note 1)	35 to 55 Volts DC

MAXIMUM CIRCUIT VALUES

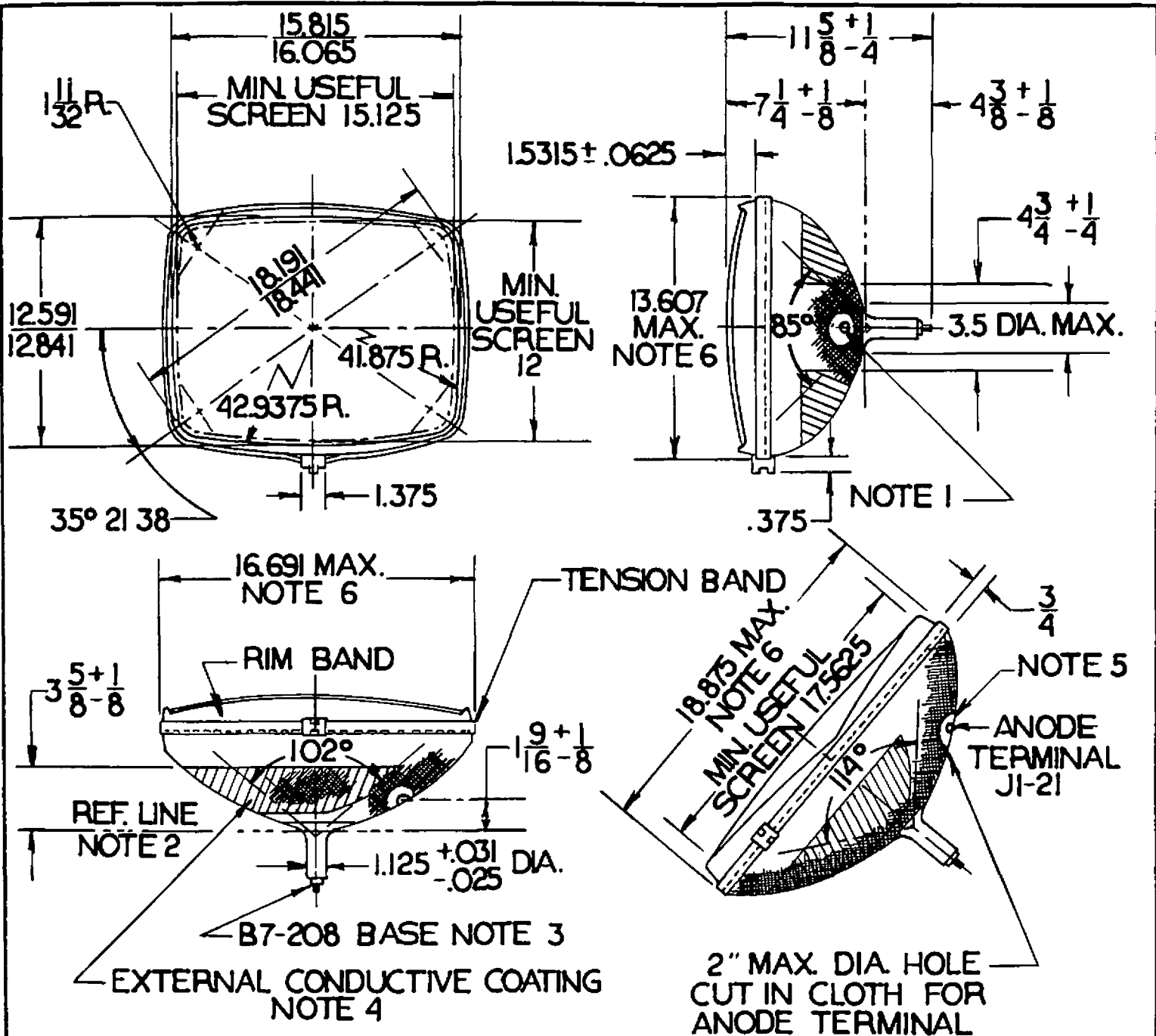
Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

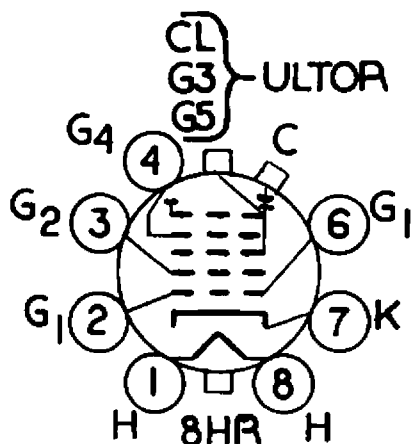
Tube Outline with essential dimensions and tolerances.

Pin Connections:

Pin 1 - Heater	Pin 6 - Grid No. 1
Pin 2 - Grid No. 1	Pin 7 - Cathode
Pin 3 - Grid No. 2	Pin 8 - Heater
Pin 4 - Grid No. 4	



SOCKET CONNECTIONS



- PIN 1: HEATER
 PIN 2: GRID NO. 1
 PIN 3: GRID NO. 2
 PIN 4: GRID NO. 4
 PIN 6: GRID NO. 1
 PIN 7: CATHODE
 PIN 8: HEATER
 CAP: ULTOR (GRID NO. 3, GRID NO. 5, COLLECTOR)
 C: EXTERNAL CONDUCTIVE COATING

DRAWN BY	SCALE	EFFECTIVE	DISTRIBUTION	DRAWING NO.
A.L. PRIBYL		3-23-63		19DHP4

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 100 microamperes on a 15 1/8" X 12" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and +400 volts.

NOTES FOR DIMENSIONAL OUTLINE:

1. With tube neck inserted through flared end of reference-line gauge JEDEC No. G-126 and with tube seated in gauge, the reference-line is determined by the intersection of the Plane CC' of the gauge with the glass funnel.
2. The plane through the tube axis and Pin No. 4 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of $\pm 30^\circ$. Ultor terminal is on the same side as Pin No. 4.
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 base wafer will fall within a circle concentric with bulb axis and having a diameter of 1 3/4".
4. External conductive coating must be grounded.
5. To clean this area, wipe only with soft dry lint-less cloth.
6. Measured to include rim band and tension strap.

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-3600

The 19DLP4 is a 19"-1140 cathode ray tube with 49% light transmission and a 4 3/8" neck length. This tube has a straight gun, which requires no ion trap, a 600 milliamperes, 6.3 volt filament, and 50 volt G2 for cathode drive design.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	102 Degrees
Vertical	85 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	1500 max. uuf
	1000 min. uuf
Heater Current at 6.3 Volts	600 $\pm$ 30ma
Heater Warm-up Time	11 Seconds

OPTICAL DATA

Phosphor Number JEDEC designation	P4 Aluminized
Light Transmittance at Center, Approximate	49%

MECHANICAL DATA

Overall Length	11 5/8 $\pm$ 1/4 Inches
Greatest Diameter of Tube	
Greatest Dimensions 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 Diameter (Projected)	
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 EIA designation or equivalent (Including shield designation)	J-149-F1
Bulb Contact	JEDEC designation J1-21
Base	JEDEC designation B7-208
Basing	JEDEC designation 8HR
Bulb contact alignment	
J1-21 contact aligns with pin position #4 $\pm$ 30 Degrees	

RATINGS (Design Maximum System)

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

Maximum Anode Voltage	20,000 Volts
Minimum Anode Voltage	10,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -500 Volts
Maximum Grid #2 Voltage	60 Volts
Minimum Grid #2 Voltage	25 Volts
Cathode Voltage	
Maximum Negative Value	0 Volts DC
Maximum Negative Peak Value	2 Volts
Maximum Positive Value	100 Volts DC
Maximum Positive Peak Value	150 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.8 Volts
Maximum Heater Cathode Voltage	
Heater negative with respect to cathode	
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 CONDITIONSCATHODE DRIVE SERVICE

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

Anode Voltage	16,000 Volts DC
Grid #4 Voltage (Focusing Electrode)	
(Notes #2 & #3)	250 Volts DC
Grid #2 Voltage	50 Volts DC
Cathode Voltage (Note 1)	35 to 55 Volts DC

MAXIMUM CIRCUIT VALUES

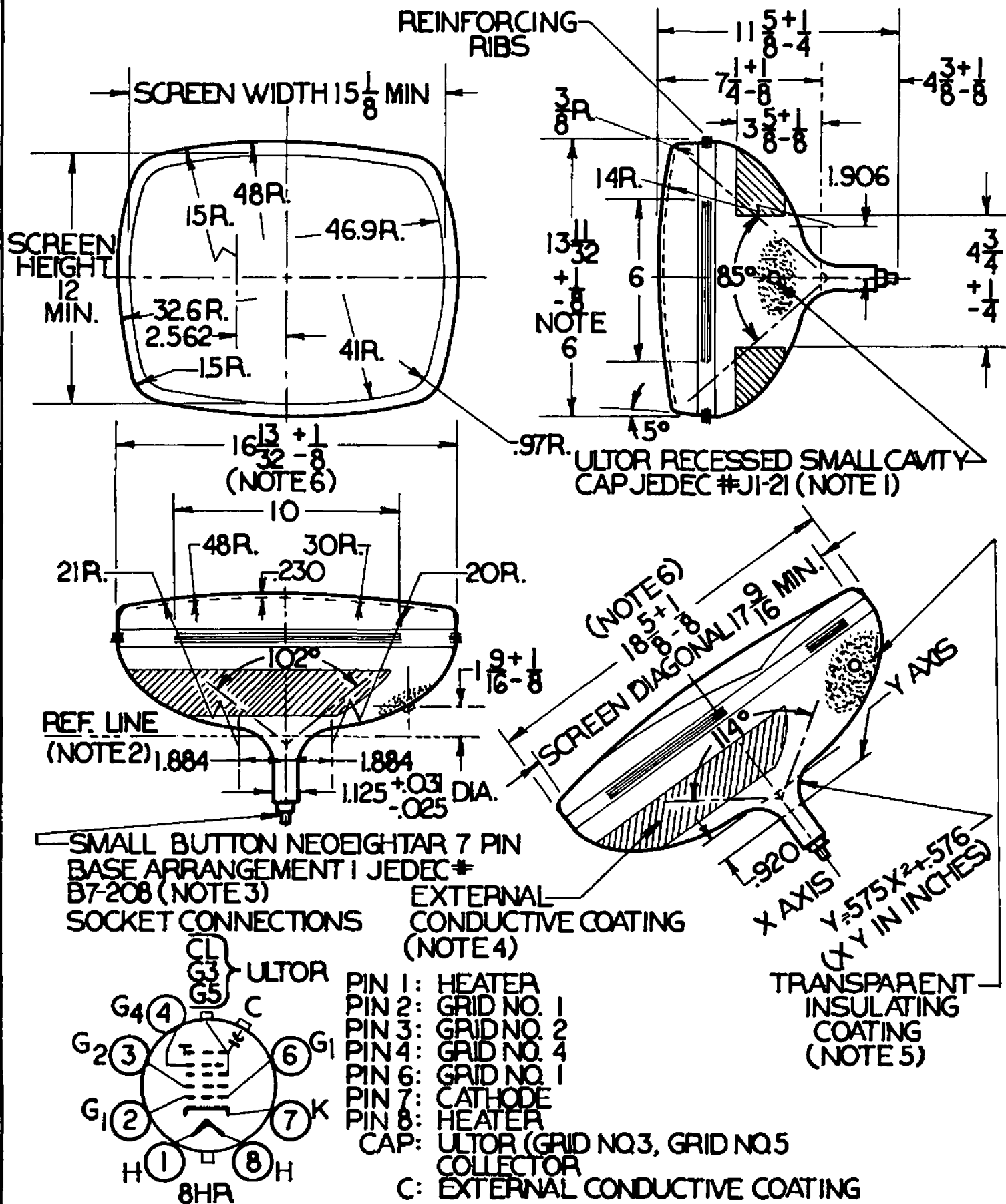
Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

Tube Outline with essential dimensions and tolerances.

Pin Connections:

Pin 1	Heater	Pin 6	Grid No. 1
Pin 2	Grid No. 1	Pin 7	Cathode
Pin 3	Grid No. 2	Pin 8	Heater
Pin 4	Grid No. 4		



DRAWN BY
A.L. PRIBYL

SCALE

EFFECTIVE
8-16-63

DISTRIBUTION

DRAWING NO.
19DLP4

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 100 microamperes on a 15 1/8" X 12" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and +400 volts.

NOTES FOR DIMENSIONAL OUTLINE

1. The plane through the tube axis and pin No. 4 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of +30°. Ultor terminal is on same side as Pin No. 4.
2. With tube neck inserted through flared end of reference-line gauge JEDEC No. G-126 and with tube seated in gauge, the reference-line is determined by the intersection of the Plane CC' of the gauge with the glass funnel.
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 base wafer will fall within a circle concentric with bulb axis and having a diameter of 1 3/4".
4. External conductive coating must be grounded.
5. To clean this area, wipe only with soft dry lint-less cloth.
6. Measured at the mold-match line.

OPERATING CONSIDERATIONS

Shatter-Proof Cover Over the Tube Face:

Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 19DLP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

CATHODE RAY TUBE TYPE 21AMP23A

The tube type 21AMP23A is a magnetic focus and magnetic deflection direct view picture tube. It has an all glass rectangular bulb designed for 90° deflection. The faceplate is of gray glass and has a spherical contour. It has an electron gun designed to be used with an ion-trap magnet. It has an external conductive coating. It has a metal-backed screen to increase light output.

GENERAL CHARACTERISTICS

Focusing Method	Magnetic	
Deflection Method	Magnetic	
Deflection Angle (Approx) Horizontal	85	Degrees
Diagonal	90	Degrees
Face Plate Light Transmission (Neutral Density Filter)	71%	Approx.
Phosphor	No. 23	
Fluorescence	Brown (Sepia)	
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	750	Max. uuf
	500	Min. uuf

MECHANICAL DATA

Overall Length	20 ± 7/16	Inches
Greatest Dimensions of Bulb:		
Diagonal	21-3/8 ± 1/8	Inches
Width	20-1/4 ± 1/8	Inches
Height	16-3/8 ± 1/8	Inches
Minimum Useful Screen Dimensions	15 x 19-1/8	Inches
Bulb Contact	J1-21	
Base	B5-57	
Basing	12N	
Bulb Contact Alignment		
J1-21 Contact Aligns with Pin Position #6	± 30	Degrees

RATINGS Design Center Values

Heater Voltage	6.3	Volts
Heater Current	0.6 ± 10%	Amperes
Anode Voltage ¹	18,000	Max. Volts D.C.
Grid No. 2 Voltage	500	Max. Volts D.C.
Grid No. 1 Voltage		
Negative Bias Value	125	Max. Volts D.C.
Positive Bias Value	0	Max. Volts D.C.
Positive Peak Value	2	Max. Volts

Peak Heater-Cathode Voltage

Heater negative with respect to cathode	
during warm-up period not to exceed 15 seconds	410 Max. Volts D.C.
After equipment warm-up	180 Max. Volts D.C.
Heater positive with respect to cathode	180 Max. Volts D.C.

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000 Volts D.C.
Grid No. 2 Voltage	300 Volts D.C.
Grid No. 1 Voltage ²	-33 to -77 Volts D.C.
Focusing Coil Current ³	102 ± 20% Ma. D.C.
Ion-Trap Magnet Current ⁴	95 ± 50% Ma. D.C.

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5 Max. Megohms
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NOTES

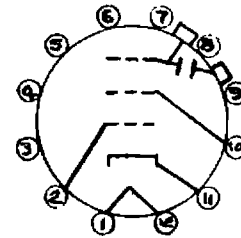
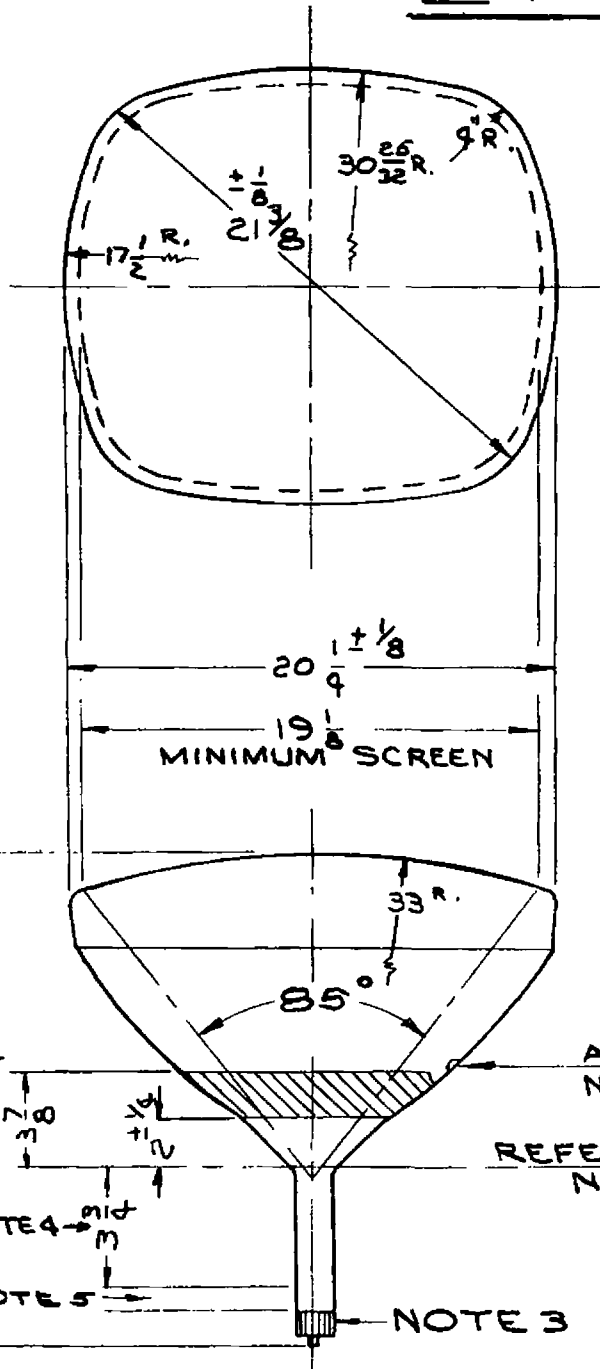
¹Because the rating of the tube permits anode voltages as high as 19.8 kilovolts (absolute maximum), shielding of x-ray radiation from the tube may be necessary. This precaution should be observed when the anode is operated in excess of 16 kilovolts.

²Visual extinction of undeflected, focused spot.

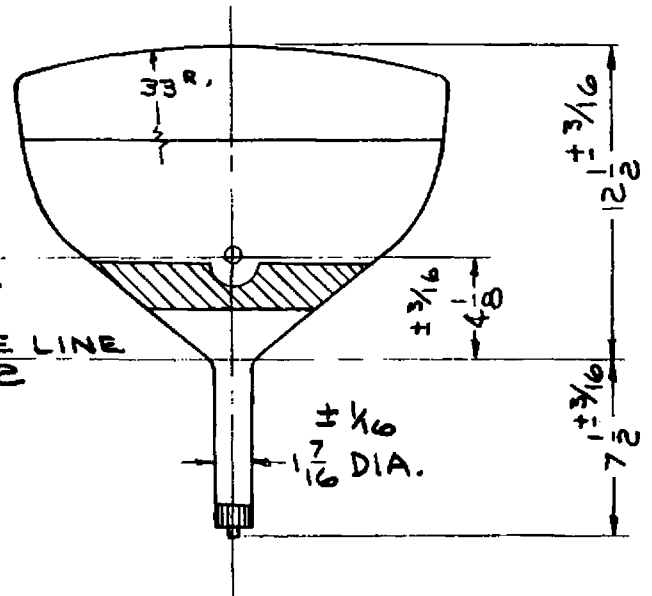
³For JETEC standard focus coil #109 with a combined grid 1 bias and video signal voltage adjusted to produce a highlight brightness of 30 foot lamberts on a picture area of 15 x 19-1/8 inches. Distance from reference line of bulb to center of focus coil air gap equal to 3 inches.

⁴For JETEC #111 single-field ion-trap magnet at optimum position.

21AMP23A



12N BASING



NATIONAL VIDEO CORP.

CHICAGO 32, ILLINOIS

9.1.21AMP23A			
DRAWN BY	SCALE	EFFECTIVE	SUPERSEDES
F. TOMS	1" = 8"	4-21-54	ORIGINAL
DISTRIBUTION			
A, B, C, D, E, G, H			

NOTES

- NOTE 1: The plane through the tube axis and vacant pin position 6 aligns with the anode contact $\pm 30^\circ$.
- NOTE 2: Reference line is determined by the plane where the standard JETEC reference line gauge #116 will stop against the bulb.
- NOTE 3: Socket for this base should not be rigidly mounted. It should have flexible leads and be free to move.
- NOTE 4: Location of deflection yoke and focusing device must be within this space.
- NOTE 5: Keep this space clear for ion-trap magnet.

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The type 21DMP4 is an electrostatic focus 110° magnetic deflection direct view, lightweight picture tube. The faceplate is made of gray filter glass and has a spherical contour. It also has an aluminized screen and an external conductive coating. No ion trap is required for this 4 1/2" neck length tube.

GENERAL CHARACTERISTICS

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle (Approx.) Horizontal	105 Degrees
Vertical	87 Degrees
Diagonal	110 Degrees
Face Plate Light Transmission (Neutral Density Filter)	76% Approx.
Phosphor	P4
Fluorescence	White
Persistence	Short - 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	2500 Max. uuf 2000 Min. uuf

MECHANICAL DATA

Overall Length	13 3/4 ± 3/8	Inches
Greatest Dimensions of Bulb:		
Diagonal	21 3/8 ± 1/8	Inches
Width	20 1/4 ± 1/8	Inches
Height	16 3/8 ± 1/8	Inches
Minimum Useful Screen Dimensions (Max. Assured)		
Screen Area	262	Sq. Inches
Diagonal	20 1/4	Inches
Width	19 1/16	Inches
Height	15 1/16	Inches
Bulb Contact	J1-21	
Base	E7-183	
Basing	8HR	
Bulb No.	J 17101	
Weight (Approx.)	20	Lbs.

MAXIMUM RATINGS Design Center Values

Heater Voltage	6.3	Volts
Heater Current	0.6 + 5%	Amperes
Anode Voltage	20,000	Volts D.C.
Grid No. 4 Voltage	-500 to +1,000	Volts D.C.
Grid No. 2 Voltage	500	Volts D.C.
Grid No. 1 Voltage		
Negative Peak Value	200	Volts
Negative Bias Value	140	Volts D.C.
Positive Bias Value	0	Volts D.C.
Positive Peak Value	2	Volts
Peak Heater-Cathode Voltage		
Heater negative with respect to cathode		
during warm-up period not to exceed 15 seconds	410	Volts D.C.
After equipment warm-up	180	Volts
Heater positive with respect to cathode	180	Volts

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts D.C.
Grid No. 4 Voltage for focus ¹	-50 to +350	Volts D.C.
Grid No. 2 Voltage	400	Volts D.C.
Grid No. 1 Voltage required for cut-off ²	-36 to -92	Volts D.C.

MAXIMUM CIRCUIT VALUES

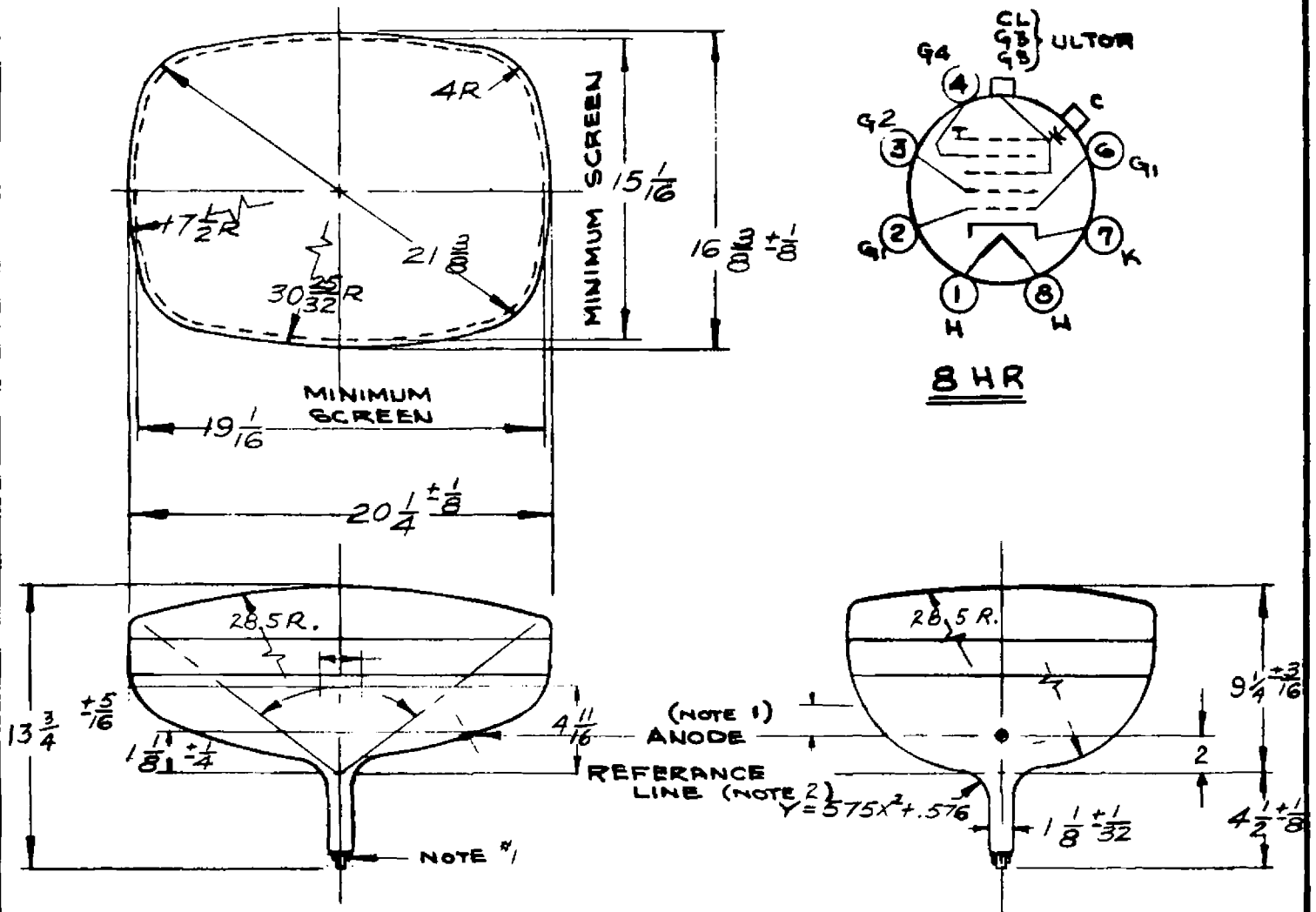
Grid No. 1 Circuit Resistance	1.5	Max. Megohms
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NOTES

¹With the combined grid No. 1 bias voltage and video signal adjusted to produce an anode current of 100 ua on a 15 1/16 x 19 1/16 inch picture adjusted for best overall focus. For other anode voltages, the focus voltage will be from -0.4% to +2.2%.

²Visual extinction of focused raster. Extinction of stationary focused spot will require that these values be about 5 volts more negative.

21DMP4



NATIONAL VIDEO CORP.
CHICAGO 32. ILL.

SUPERSEDES	ORIGINAL	DRAWING N°	
DRAWN BY	SCALE	EFFECTIVE	DISTRIBUTION
R. LARSON	1" - 8"	1 - 24 - 58	A, B, C, D, E, F, G, H

NOTES

NOTE 1: The plane through the tube axis and pin position 4 aligns with the anode contact $\pm 30^\circ$.

NOTE 2: Reference line is determined by plane CC' of JETEC No. 126 reference line gauge when the gauge is seated against the bulb.

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 voltages higher than 16,000 volts.

21DRP4

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The type 21DRP4 is an electrostatic focus and magnetic deflection direct view picture tube. It has an all glass rectangular bulb with a grey filter glass spherical contour faceplate. The lightweight faceplate has a special spherical contour. The screen is aluminized for increased light output and the electron gun is the straight type which does not require an ion trap.

GENERAL CHARACTERISTICS

Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle (Approx.) Horizontal	85 Degrees
Diagonal	90 Degrees
Face Plate Light Transmission (Neutral Density Filter)	74% Approx.
Phosphor	No. 4
Fluorescence	White
Persistence	Short - 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	2500 Max. uuf
	2000 Min. uuf

MECHANICAL DATA

Overall Length	18 1/4 ± 3/8	Inches
Greatest Dimensions of Bulb:		
Diagonal	21 3/8 ± 1/8	Inches
Width	20 1/4 ± 1/8	Inches
Height	16 3/8 ± 1/8	Inches
Minimum Useful Screen Dimensions (Max. Assured)		
Screen Area	262	Sq. Inches
Diagonal	20 1/4	Inches
Width	19 1/16	Inches
Height	15 1/16	Inches
Bulb Contact	J1-21	
Base	B6-63	
Basing	12L	
Bulb Contact Alignment		
J1-21 Contact aligns with pin position #6	± 30	Degrees

MAXIMUM RATINGS Design Center Values

Heater Voltage	6.3	Volts
Heater Current	.6 + 10%	Amperes
Anode Voltage ¹	20,000	Max. Volts D.C.
Grid No. 4 Voltage (Focus Electrode)	-500 to +1,000	Max. Volts D.C.
Grid No. 2 Voltage	500	Max. Volts D.C.
Grid No. 1 Voltage		
Negative Peak Value	200	Max. Volts D.C.
Negative Bias Value	140	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	180	Max. Volts D.C.
Heater positive with respect to cathode	180	Max. Volts D.C.

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts D.C.
Grid No. 4 Voltage	0 to 450	Volts D.C.
Grid No. 2 Voltage	300	Volts D.C.
Grid No. 1 Voltage ²	-28 to -72	Volts D.C.

MAXIMUM CIRCUIT VALUES

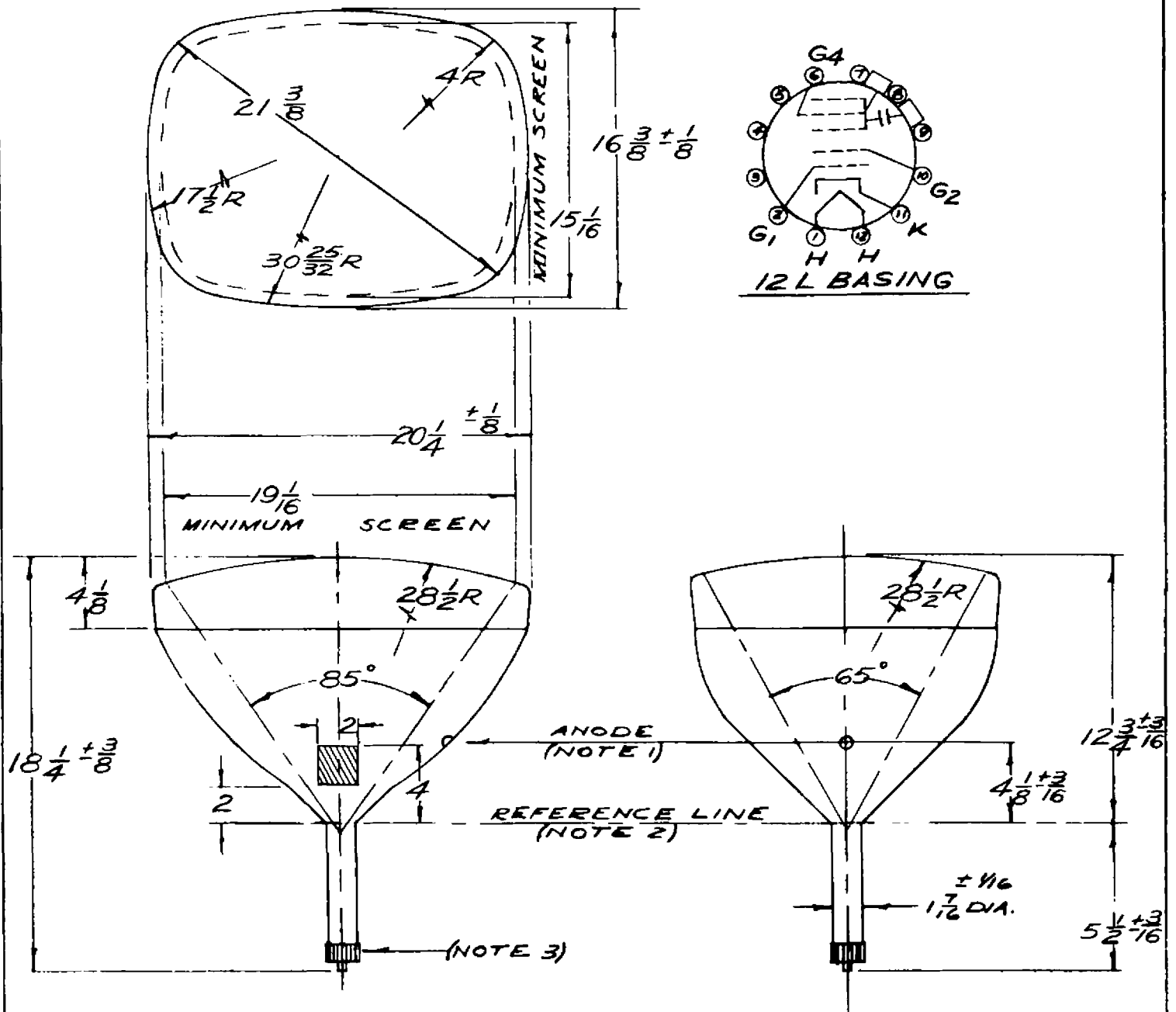
Grid No. 1 Circuit Resistance	1.5	Max. Megohms
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NOTES

¹Because the rating of the tube permits anode voltages as high as 22 kilovolts (absolute maximum), shielding of x-ray radiation from the tube may be necessary. This precaution should be observed when the anode is operated in excess of 16 kilovolts.

²Visual extinction of focused raster.

21DRP4



NATIONAL VIDEO CORP.
CHICAGO 32, ILLINOIS

DRAWN BY	SCALE	EFFECTIVE	SUPERSEDES	DISTRIBUTION
J.E. KUS	8" = 1"	3-4-50	ORIGINAL	A, B, C, D, E, F, G, H

NOTES

- NOTE 1: The plane through the tube axis and vacant pin position #6 aligns with the anode contact $\pm 30^\circ$.
- NOTE 2: Reference line is determined by the plane where the standard JETEC reference line gauge #116 will stop against the bulb.
- NOTE 3: Socket for this base should not be rigidly mounted. It should have flexible leads and be free to move.

NATIONAL VIDEO CORPORATION

CATHODE RAY TUBE TYPE 21FP4C

Rel 1231 21FP4C

The type 21FP4C is a low voltage electrostatic focus and magnetic deflection, direct view picture tube for television applications. It has an all glass, rectangular bulb. The faceplate has a cylindrical contour, and is made of gray glass. The electron gun is designed to be used with an external ion-trap magnet. The tube has a metal backed screen to increase light output and an outer conductive coating which serves as a high voltage filter capacitor when grounded.

GENERAL CHARACTERISTICS

Electrical Data

Heater Voltage	6.3	Volts
Heater Current	0.6 $\pm$ 10%	Ampere
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angle (Approx.) Horizontal	65	Degrees
Diagonal	70	Degrees
Face Plate Light Transmission (Neutral Density Filter)	71%	Approx.
Phosphor	No. 4	
Fluorescence	White	
Persistence	Medium	
Direct Inter-electrode Capacitances (Approx.)		
Cathode to all other electrodes	5	uuf
Grid No. 1 to all other electrodes	6	uuf
External Conductive Coating to Anode	750	Max. uuf
	500	Min. uuf

MECHANICAL DATA

Overall Length	23 $\pm$ 3/8	Inches
Greatest Dimensions of Bulb:		
Diagonal	21-3/16 $\pm$ 3/16	Inches
Width	20-1/4 $\pm$ 3/16	Inches
Height	15-9/16 $\pm$ 3/16	Inches
Screen Size	19-1/8 x 13 -7/8	Inches
Bulb Contact	J1-21	
Base	E6-63	
Basing	12L	
J1-21 Contact aligns with pin position 6	$\pm$ 30	Degrees

MAXIMUM RATINGS Design Center Values

Anode Voltage ¹	18,000	Max. Volts D.C.
Grid No. 4 Voltage	-500 to + 1,000	Max. Volts D.C.
Grid No. 2 Voltage	500	Max. Volts D.C.
Grid No. 1 Voltage		
Negative Bias Value	125	Max. Volts D.C.
Positive Bias Value	0	Max. Volts D.C.
Positive Peak Value	2	Max. Volts

Peak Heater-Cathode Voltage

Heater negative with respect to cathode

during warm-up period not to exceed 15 seconds

410 Max. Volts D.C.

After equipment warm-up

180 Max. Volts D.C.

Heater positive with respect to cathode

180 Max. Volts D.C.

TYPICAL OPERATING CONDITIONS

Anode Voltage

14,000 Volts D.C.

Grid No. 4 Voltage²-56 to $\pm$ 310 Volts D.C.

Grid No. 2 Voltage .

300 Volts D.C.

Grid No. 1 Voltage³

-28 to -72 Volts D.C.

Ion-Trap Magnet Current ⁴ (Approx.)

75 Ma. D.C.

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance

1.5 Max. Megohms

NOTES

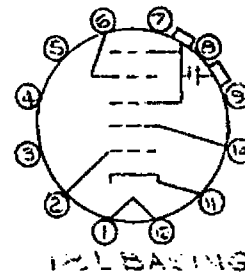
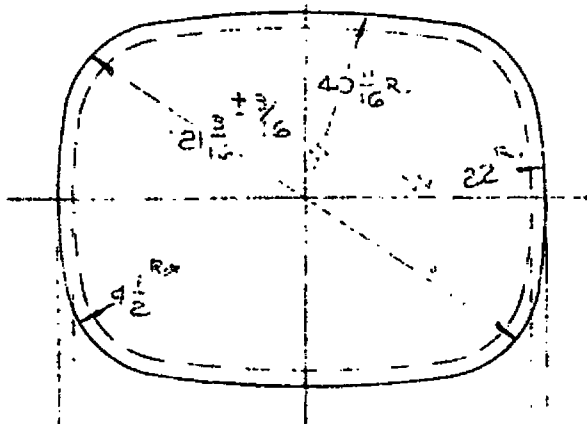
¹Because the rating of the tube permits anode voltages as high as 19.8 kilovolts (absolute maximum), shielding of X-radiation from the tube may be necessary. This precaution should be observed when the anode is operated in excess of 16 kilovolts.

²With the combined grid 1 bias and video signal voltage adjusted to produce an anode current of 100 ua on a 17 x 12-3/4 inch picture adjusted for best overall focus. For other anode voltages, the focus voltage will be from -0.4 to $\pm$ 2.2% of the anode voltage.

³Visual extinction of focused raster. Visual extinction of undeflected, focused spot is in general 5 volts more negative.

⁴For JETEC #111 single-field ion-trap magnet at optimum position.

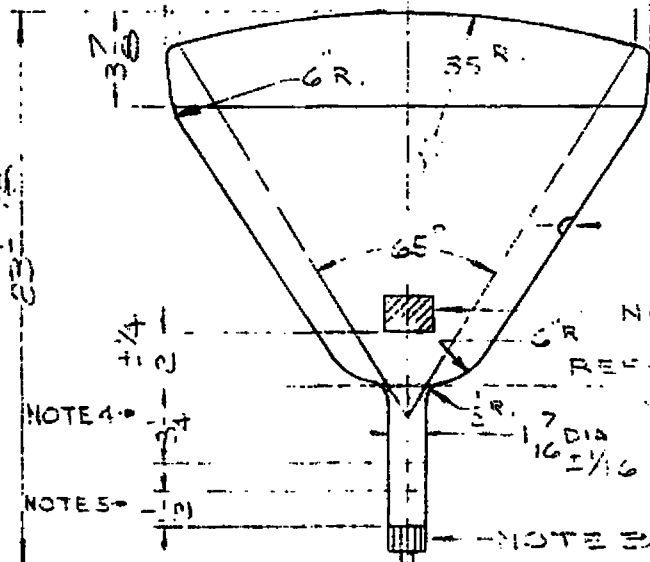
21FP4C



PIN 1-HEATER
PIN 2-GRID #1
PIN 6-GRID #4
PIN 10-GRID #2
PIN 11-CATHODE
PIN 12-HEATER
CAP-GRID #3
GRID #5, COLLECTOR

SCREEN WIDTH

SCREEN HEIGHT



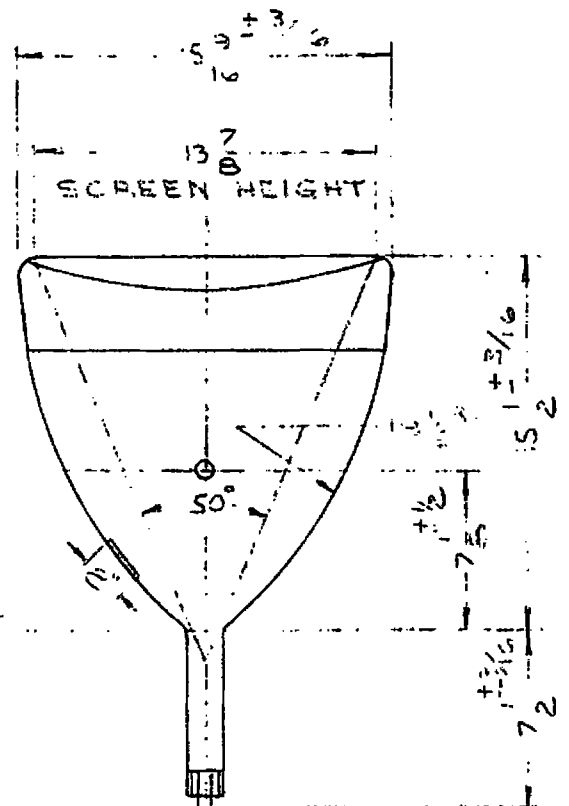
NOTE 1

NOTE 2

NOTE 3

NOTE 4

NOTE 5



NATIONAL VIDEO CORP.

CHICAGO 32, ILLINOIS

DRAWN BY	SCALE	EFFECTIVE	SUPERSEDED	9.1.21FP4C.1
F.TOMS	1"=8"	6-30-52	ORIGINAL	DISTRIBUTION
				A, B, C, D, E, F, G, H

NOTES

- NOTE 1: The plane through the tube axis and vacant pin position 6 aligns with the anode contact $\pm 30^\circ$.
- NOTE 2: Reference line is determined by the plane where the standard JETEC reference line gauge #110 will stop against the bulb.
- NOTE 3: Socket for this base should not be rigidly mounted. It should have flexible leads and be free to move.
- NOTE 4: Location of deflection yoke and centering device must be within this space.
- NOTE 5: Keep this space clear for ion-trap magnet.
- NOTE 6: Configuration of outer conductive coating optional, but must contain the 2 x 2 inch contact area as shown on drawing.

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 23BXP4 is a 23"-92° cathode ray tube laminated with a P.P.G. panel. This tube has a 5 1/2" neck length with a straight gun, which requires no ion trap and a 600 milliampere 6.3 volt filament.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	81 Degrees
Vertical	66 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	2500 max. uuf
	2000 min. uuf
Heater Current at 6.3 Volts	600 $\pm$ 30 ma
Heater Warm-up Time	11 Seconds

OPTICAL DATA

Phosphor Number JEDEC Designation	P4 Aluminized
Light Transmittance at Center, Approximate	40 Percent

MECHANICAL DATA

Overall Length	18 1/4 $\pm$ 1/4 Inches
Greatest Diameter of Tube	
Greatest Dimensions of Tube	
Diagonal	23 7/16 $\pm$ 5/64
	-1/8 Inches
Width	20 1/2 $\pm$ 3/32
	-5/64 Inches
Height	16 1/2 $\pm$ 1/8
	-1/16 Inches
Minimum Useful Screen Dimensions (Projected)	
Diagonal	22 5/16 Inches
Horizontal Axis	19 5/16 Inches
Vertical Axis	15 1/4 Inches
Area	282 Sq. Inches
Neck Length	5 1/2 $\pm$ 1/8 Inches

MECHANICAL DATA (Con't.)

Bulb EIA designation or equivalent (including shield designation)	FP 187A1
Bulb Contact JEDEC Designation	J1-21
Base JEDEC Designation	B6-203
Basing JEDEC Designation	12L
Bulb Contact Alignment	
J1-21 contact aligns with pin position #4 ± 30 Degrees	

RATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive and measured with respect to cathode

Maximum Anode Voltage	22,000 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -550
Maximum Grid #2 Voltage	550 Volts
Minimum Grid #2 Voltage	200 Volts
Grid #1 Voltage	
Maximum Negative Value	155 Volts DC
Maximum Negative Peak Value	220 Volts
Maximum Positive Value	0 Volts DC
Maximum Positive Peak Value	2 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.7 Volts
Maximum Heater-Cathode Voltage	
Heater negative with respect to cathode	
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 CONDITIONSGRID DRIVE SERVICE

Unless otherwise specified, all voltage values are positive with respect to cathode

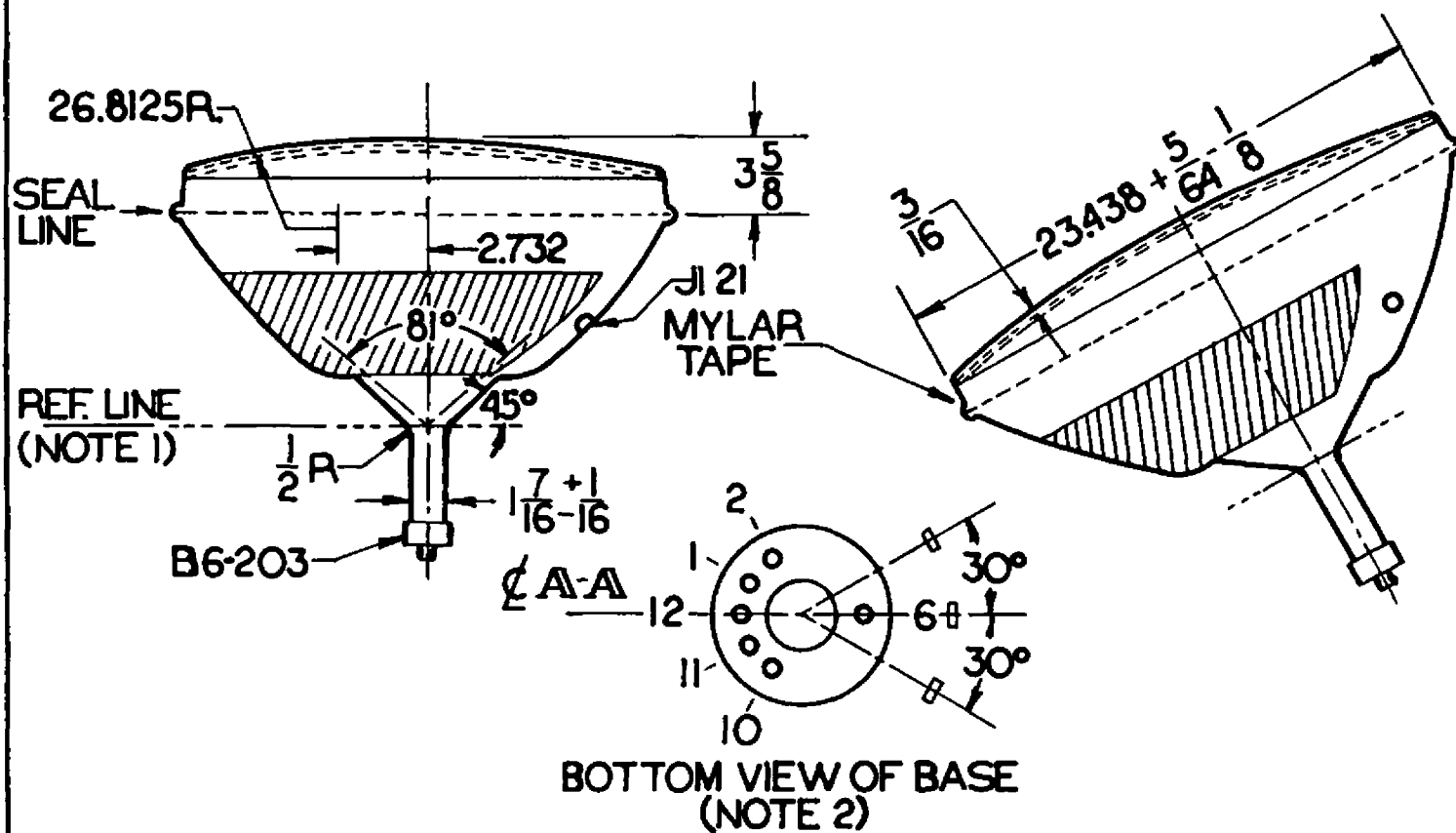
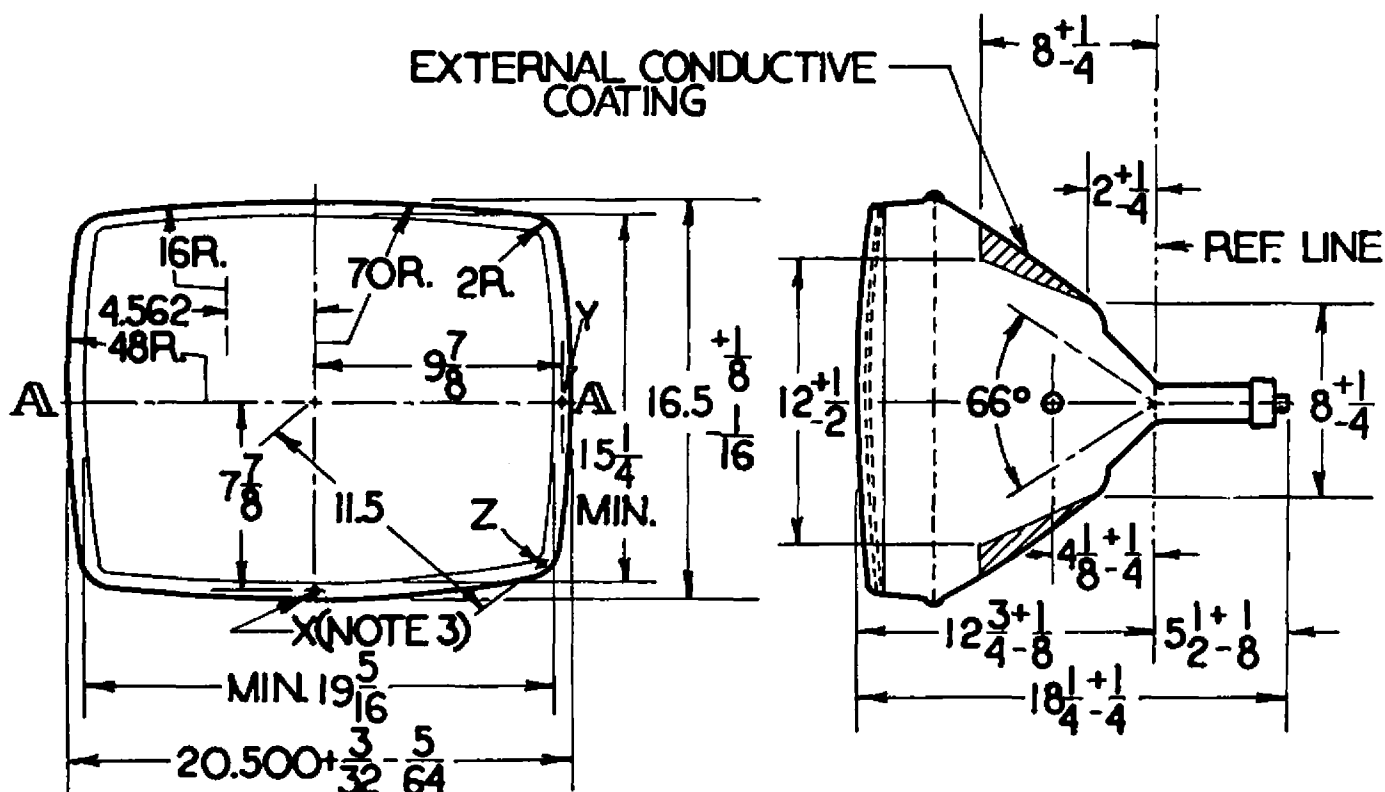
Anode Voltage	16,000 Volts DC
Grid #4 Voltage (Focusing Electrode)	
(Notes 2 & 3)	200 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note 1)	-35 to -72 Volts DC

MAXIMUM CIRCUIT VALUES

Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

Tube Outline with essential dimensions and tolerances.



DRAWN BY
A.L. PRIBYL

SCALE

EFFECTIVE
8-14-63

DISTRIBUTION

DRAWING NO.
23BXP4

GRAPHS AND DRAWINGS (Con't.)

Pin Connections:

Pin 1	Heater	Pin 11	Cathode
Pin 2	G ₁ Grid	Pin 12	Heater
Pin 6	G ₄ Grid		
Pin 10	G ₂ Grid		

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 100 microamperes on a 19 5/16" X 15 1/4" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus at some value between 0 and +400 volts.

NOTES FOR DIMENSIONAL OUTLINE

1. The plane through the tube axis and pin No. 6 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of $\pm 30^\circ$. Ultor terminal is on same side as Pin No. 6.
2. With tube neck inserted through flared end of reference-line gauge JEDEC No. G-116 and with tube seated in gauge, the reference-line is determined by the intersection of the Plane CC' of the gauge with the glass funnel.
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 base wafer will fall within a circle concentric with bulb axis and having a diameter of 2 3/4".
4. External conductive coating must be grounded.
5. To clean this area, wipe only with soft dry lint-less cloth.
6. Measured at the mold-match line.

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 23GP4 is a 5 1/8" neck length, electrostatic focus, magnetic deflection picture tube. The tube has a metal back screen and an implosion faceplate sealed to the tube. A straight gun which requires no ion trap and a 600 milliampere, 6.3 volt filament are used.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflecting Method	Magnetic
Deflection Angle, Approximate	
Horizontal	99 Degrees
Vertical	82 Degrees
Diagonal	110 Degrees
Direct Interelectrode Capacitances, Approximate	
Cathode to all other electrodes	5 uuf
Grid #1 to all other electrodes	6 uuf
External Conductive Coating to Anode	2500 Max. uuf 2000 Min. uuf

ELECTRICAL CHARACTERISTICS

Heater current at 6.3 volts	600 $\pm$ 30 ma
Grid #1 voltage (Note 1) (Grid Drive Service)	
at 300 volts G ₂ to cathode	-28 to -72 Volts DC
Grid #4 voltage (Focusing Electrode) (Note 2)	-100 to 500 Volts DC

OPTICAL DATA

Phosphor Number	P4
Bulb and Faceplate	
Light Transmission at Center, Approximate	37 Percent

MECHANICAL DATA

Overall Length	15 3/16 $\pm$ 1/4	Inches
Greatest Dimensions of Panel		
Diagonal	24 45/64 $\pm$ 1/8	Inches
Width	21 5/16 $\pm$ 1/8	Inches
Height	17 5/16 $\pm$ 1/8	Inches
Minimum Useful Screen Dimensions		
Diagonal	22 5/16	Inches
Horizontal axis	19 5/16	Inches
Vertical axis	15 1/4	Inches
Area	282	Square Inches

Neck Length	5 1/8 + 1/8	Inches
Bulb No.	J-187A1	
Faceplate No.	FP-198A1	
Bulb Contact	J1-21	
Base	B7-208	
Basing	8HR	
Bulb Contact Alignment		
J1-21 contact aligns with pin position #4	+ 30	Degrees

RATINGS (Absolute Maximum Values)

Grid Drive Service - Unless otherwise specified voltage values are positive with respect to cathode.

Maximum Heater Voltage	7.0	Volts
Minimum Heater Voltage	5.6	Volts
Maximum Anode Voltage	20,000	Volts
Maximum Grid #4 Voltage	2,000	Volts DC
Minimum Grid #4 Voltage	-500	Volts DC
Maximum Grid #2 Voltage	550	Volts DC
Grid #1 Voltage		
Maximum Negative Value	0	Volts DC
Maximum Negative Peak Value	2	Volts DC
Maximum Positive Value	155	Volts DC
Maximum Positive Peak Value	220	Volts
Maximum Heater-Cathode Voltage		
Heater negative 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

Anode Voltage	16,000	Volts DC
Grid #4 Voltage (Focusing Electrode) (Note 2)	0 to 400	Volts DC
Grid #2 Voltage	300	Volts DC
Grid #1 Voltage (Note 1)	-20 to -72	Volts DC

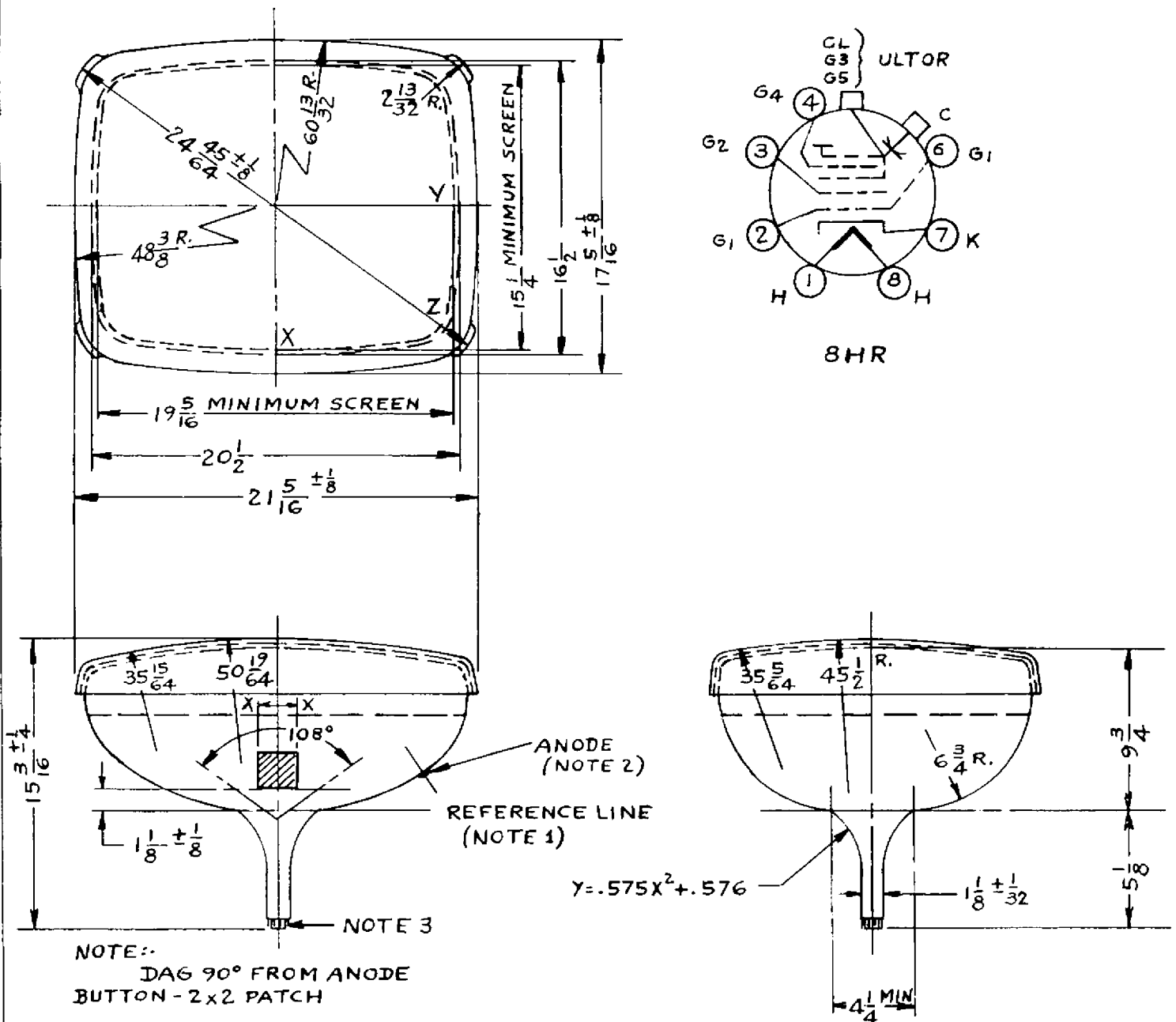
MAXIMUM CIRCUIT VALUES

Grid #1 Circuit Resistance	1.5	Max. Megohms
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CATHODE RAY TUBE CHARACTERISTICSNOTES

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 100 microamperes on a 19 5/16 x 15 1/4 inch picture size.

23GP4



NATIONAL VIDEO CORP.
CHICAGO 32, ILL.

SUPERSEDES		DRAWING NO.	23GP4
DRAWN BY	SCALE	EFFECTIVE	DISTRIBUTION
F.H.LUBOCKY	1" = 8"	6-10-59	

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.
4. Undisturbed area between the mold match line and the panel side of the seal bulge will be a minimum of $3/4$ ".
5. From the mechanical center of the faceplate, the X, Y, Z dimensions are:

X - $7 \frac{7}{8}$ at 00
Y - $9 \frac{7}{8}$ at .436
Z - $11 \frac{1}{2}$ at .970

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.

24AWP4

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The type 24AWP4 is a low voltage electrostatic focus, magnetic deflection picture tube for television applications. It has a short, non-ion trap type gun in a 4 1/2" neck. It also has a rectangular glass bulb with a gray glass faceplate and the screen is aluminized for increased light output.

GENERAL CHARACTERISTICS

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angle (Approx.)	Horizontal	105 Degrees
	Diagonal	110 Degrees
	Vertical	87 Degrees
Face Plate Light Transmission (Neutral Density Filter)		74% Approx.
Phosphor	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	2500	Max. uuf
	2000	Min. uuf

MECHANICAL DATA

Overall Length	14 7/8 ± 3/8	Inches
Greatest Dimensions of Bulb:		
Diagonal	24	Inches
Width	22 11/16	Inches
Height	18 1/2	Inches
Screen Dimensions:		
Diagonal	22 13/16	Inches
Width	21 7/16	Inches
Height	16 7/8	Inches
Screen Area	332	Sq. Inches
Bulb Contact	J1-21	
Bulb No.	J192C1	
Base	B7-183	
Easing	8HR	
Bulb Contact Alignment		
J1-21 Contact aligns with Pin Position No. 4	± 30	Degrees

MAXIMUM RATINGS Design Center Values

Heater Voltage	6.3	Volts
Heater Current	.6	Amperes
Anode Voltage ¹	20,000	Max. Volts D.C.
Grid No. 4 Voltage	-500 to +1,000	Max. Volts D.C.
Grid No. 2 Voltage	500	Max. Volts D.C.
Grid No. 1 Voltage		
Negative Bias Value	140	Max. Volts D.C.
Positive Bias Value	0	Max. Volts D.C.
Positive Peak Value	2	Max. Volts D.C.

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	180	Max. Volts D.C.
Heater positive with respect to cathode	180	Max. Volts D.C.

TYPICAL OPERATING CONDITIONS

Anode Voltage ²	16,000	Volts D.C.
Grid No. 4 Voltage ³	0 to 400	Volts D.C.
Grid No. 2 Voltage	300	Volts D.C.
Grid No. 1 Voltage ⁴	-28 to -72	Volts D.C.

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Max. Megohms
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NOTES

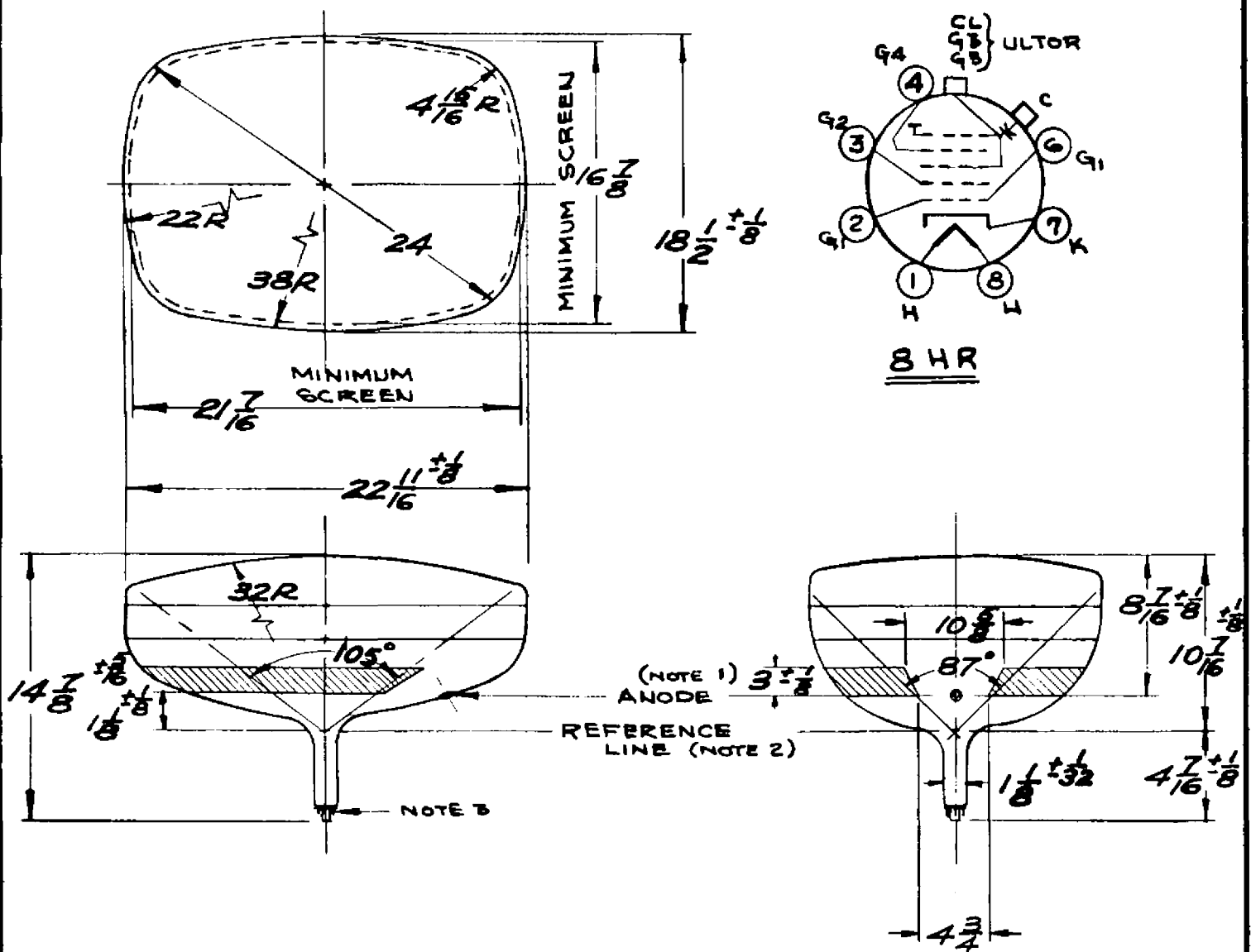
¹Grid No. 5, Grid No. 3, and the collector are connected together within the tube, are referred to herein as anode.

²This tube will not provide satisfactory performance at anode voltage below 12 KV.

³For focus with anode current of 100 ua and 21 7/16" x 16 7/8" raster.

⁴Visual extinction of focused raster.

24AWP4



NATIONAL VIDEO CORP.
CHICAGO 32. ILL.

SUPERSEDES	ORIGINAL	DRAWING N ^o
DRAWN BY	SCALE	EFFECTIVE DISTRIBUTION
R. LARSON	1" = 8"	5-21-58

NOTES

- NOTE 1: The plane through the tube axis and pin No. 4 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of $\pm 30^\circ$. Ultor terminal is on the same side as pin No. 4.
- NOTE 2: With the tube neck inserted through flared end of reference line gauge JETEC No. 126 and with the tube seated in gauge, the reference line is determined by the intersection of the plane CC' of the gauge with the glass funnel.
- NOTE 3: Socket for this base should not be rigidly mounted; it should have flexible leads and be free to move.
- NOTE 4: External conductive coating must be grounded.

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 27ABP4 has a 5 1/8" Neck Length, electrostatic focus, magnetic deflection. The tube has a metal back screen and a Pittsburgh type implosion faceplate sealed to the tube. A straight gun which requires no ion trap and a 600 milliamperere, 6.3 volt filament is used.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	106°Degrees
Vertical	86°Degrees
Diagonal	110°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	2500 max. uuf
	2000 min. uuf
Heater Current at 6.3 volts	600 + 300 ma
Heater Warm-up Time	11 Seconds

OPTICAL DATA

Phosphor Number	JEDEC Designation	P4 Aluminized
Light Transmittance at Center, Approximate		48%

MECHANICAL DATA

Overall Length		17 1/8 ± 3/8 Inches
Greatest Diameter of Tube		
Greatest Dimensions of Tube		
Diagonal		26 13/16 ± 1/8 Inches
Width		25 9/32 ± 1/8 Inches
Height		20 7/32 ± 1/8 Inches
Minimum Useful Screen Diameter (Projected)		
Minimum Useful Screen Dimensions (Projected)		
Diagonal		25 3/4 Inches
Horizontal axis		24 1/4 Inches
Vertical axis		18 5/8 Inches
Area		425 Sq. Inches
Neck Length		5 1/8 ± 3/16 Inches
Bulb EIA designation or equivalent (Including shield designation)		C214 1/2 Exp. #13
Panel		Pittsburgh FP214 1/2 A1
Bulb Contact	JEDEC designation	J1-21
Base	JEDEC designation	B7-208
Basing	JEDEC designation	8HR

MECHANICAL DATA (Cont'd)

Bulb Contact Alignment

J1-21 contact aligns with pin position #4 $\pm$ 30 Degrees

Weight (Approx.) Bulb 41 lbs.

Weight (Approx.) Laminated 52 lbs.

RATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive
and measured with respect to cathode

Maximum Anode Voltage	22,000 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -550
Maximum Grid #2 Voltage	550 Volts
Minimum Grid #2 Voltage	200 Volts
Grid #1 Voltage	
Maximum Negative Value	155 Volts DC
Maximum Negative Peak Value	220 Volts
Maximum Positive Value	0 Volts DC
Maximum Positive Peak Value	2 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.7 Volts
Maximum Heater-Cathode Voltage	
Heater negative with respect to cathode	
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 CONDITIONSGRID DRIVE SERVICE

Unless otherwise specified, all voltage values
are positive with respect to cathode.

Anode Voltage	18,000 Volts DC
Grid #4 Voltage (Focusing Electrode) (Notes 3 & 4)	0 to +400 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note #1)	-35 to -72 Volts DC

MAXIMUM CIRCUIT VALUES

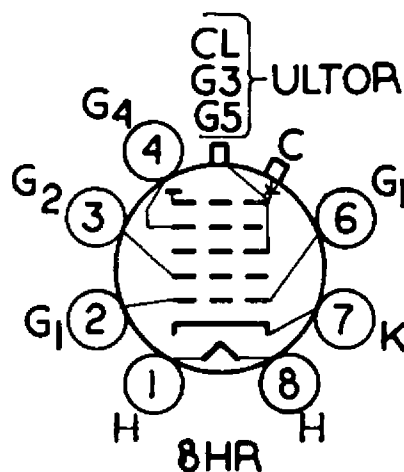
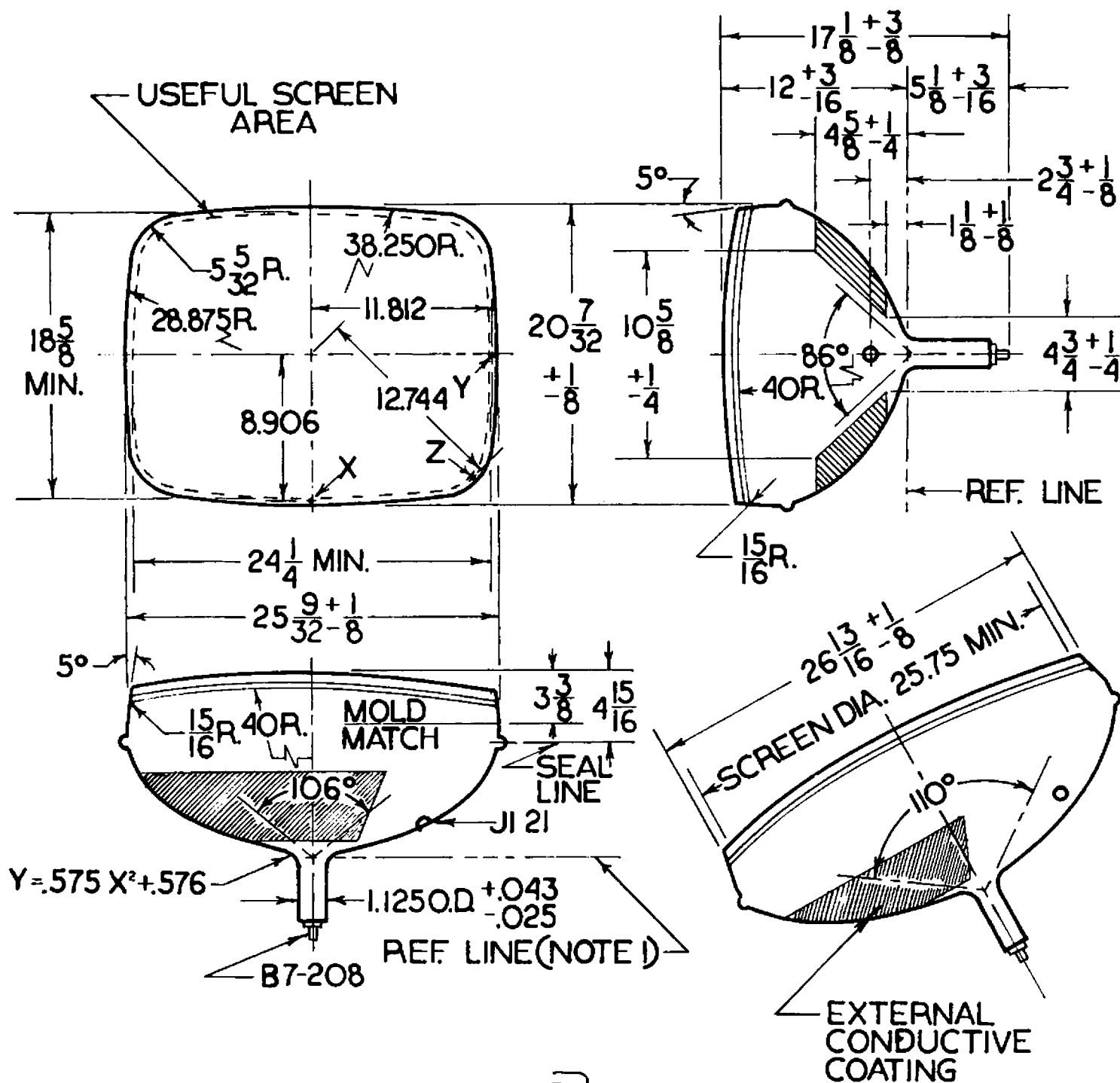
Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

Tube Outline with essential dimensions and tolerances.

Pin Connections

Pin 1 - Heater	Pin 6 - G ₁ Grid
Pin 2 - G ₁ Grid	Pin 7 - Cathode
Pin 3 - G ₂ Grid	Pin 8 - Heater
Pin 4 - G ₄ Grid	Bulb Contact - Ultor



DRAWN BY
A.L. PRIBYL

SCALE

EFFECTIVE
3-17-62

DRAWING NO.
27ABP4

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 100 microamperes on a 18 1/2" X 24" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus as some value between 0 to +400 volts.
4. Ion trap positioned with trailing edge of pole pieces over the G₁-G₂ gap and oriented to give maximum brightness.

DIAGRAM NOTES

1. The plane through the tube axis and pin #4 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of 30°. Ultor terminal is on same side as pin #4.
2. External conductive coating must be grounded.
3. Insulating coating around cavity contact: to clean use only a soft dry lint-free cloth.
4. Bulge at splice line may increase the indicated values for envelope width, diagonal, and height by not more than 1/8" but at any point around the seal, the bulge will not protrude more than 1/16" beyond the envelope surface at the mold-match line.
5. Distance between mold-match line and seal bulge is 11/16" minimum. This should be the maximum width of a tube support band. Support mechanisms must be spaced from the tube by cushioning pads of asphalt impregnated felt or equivalent.

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.

NATIONAL VIDEO CORPORATION
4300 W. 47 TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 27AGP4 has a 5 1/8" neck length, electrostatic focus, magnetic deflection. The tube has a metal back screen and a Pittsburgh type implosion faceplate sealed to the tube. A straight gun which requires no ion trap and a 600 milliamperes, 6.3 volt filament is used.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	106 Degrees
Vertical	86 Degrees
Diagonal	110 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	2500 max. uuf
	2000 min. uuf
Heater Current at 6.3 volts	600 $\pm$ 30ma
Heater Warm-up Time	11 Seconds

OPTICAL DATA

Phosphor Number	JEDEC Designation	P4 Aluminized
Light Transmittance at Center, Approximate		48%

MECHANICAL DATA

Overall Length	17 1/8 $\pm$ 3/8 Inches	
Greatest Diameter of Tube		
Greatest Dimensions of Tube		
Diagonal	26 13/16 $\pm$ 1/8 Inches	
Width	25 9/32 $\pm$ 1/8 Inches	
Height	20 7/32 $\pm$ 1/8 Inches	
Minimum Useful Screen Diameter (Projected)		
Minimum Useful Screen Dimension (Projected)		
Diagonal	25 3/4 Inches	
Horizontal Axis	24 1/4 Inches	
Vertical Axis	18 5/8 Inches	
Area	425 Sq. Inches	
Neck Length	5 1/8 $\pm$ 3/16 Inches	
Bulb EIA designation or equivalent (Including shield designation)	J214 1/2 B1	
Panel	FP214 1/2 A1 Etched	
Bulb Contact	JEDEC designation	J1-21
Base	JEDEC designation	B7-208
Basing	JEDEC designation	8HR

MECHANICAL DATA (Cont'd)

Bulb Contact Alignment

J1-21 contact aligns with pin position #4 +30 degrees

Weight (Approx.) Laminated

52 lbs.

RATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive
and measured with respect to cathode

Maximum Anode Voltage	22,000 Volts
Minimum Anode Voltage	12,000 Volts
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -550
Maximum Grid #2 Voltage	550 Volts
Minimum Grid #2 Voltage	200 Volts
Grid #1 Voltage	
Maximum Negative Value	155 Volts DC
Maximum Negative Peak Value	220 Volts
Maximum Positive Value	0 Volts DC
Maximum Positive Peak Value	2 Volts
Maximum Heater Voltage	6.9 Volts
Minimum Heater Voltage	5.7 Volts
Maximum Heater-Cathode Voltage	
Heater negative with respect to cathode	
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 CONDITIONSGRID DRIVE SERVICE

Unless otherwise specified, all voltage values are
positive with respect to cathode.

Anode Voltage	18,000 Volts DC
Grid #4 Voltage (Focusing Electrode) (Notes 2 & 3)	0 to +400 Volts DC
Grid #2 Voltage	300 Volts DC
Grid #1 Voltage (Note 1)	-35 to -72 Volts DC

MAXIMUM CIRCUIT VALUES

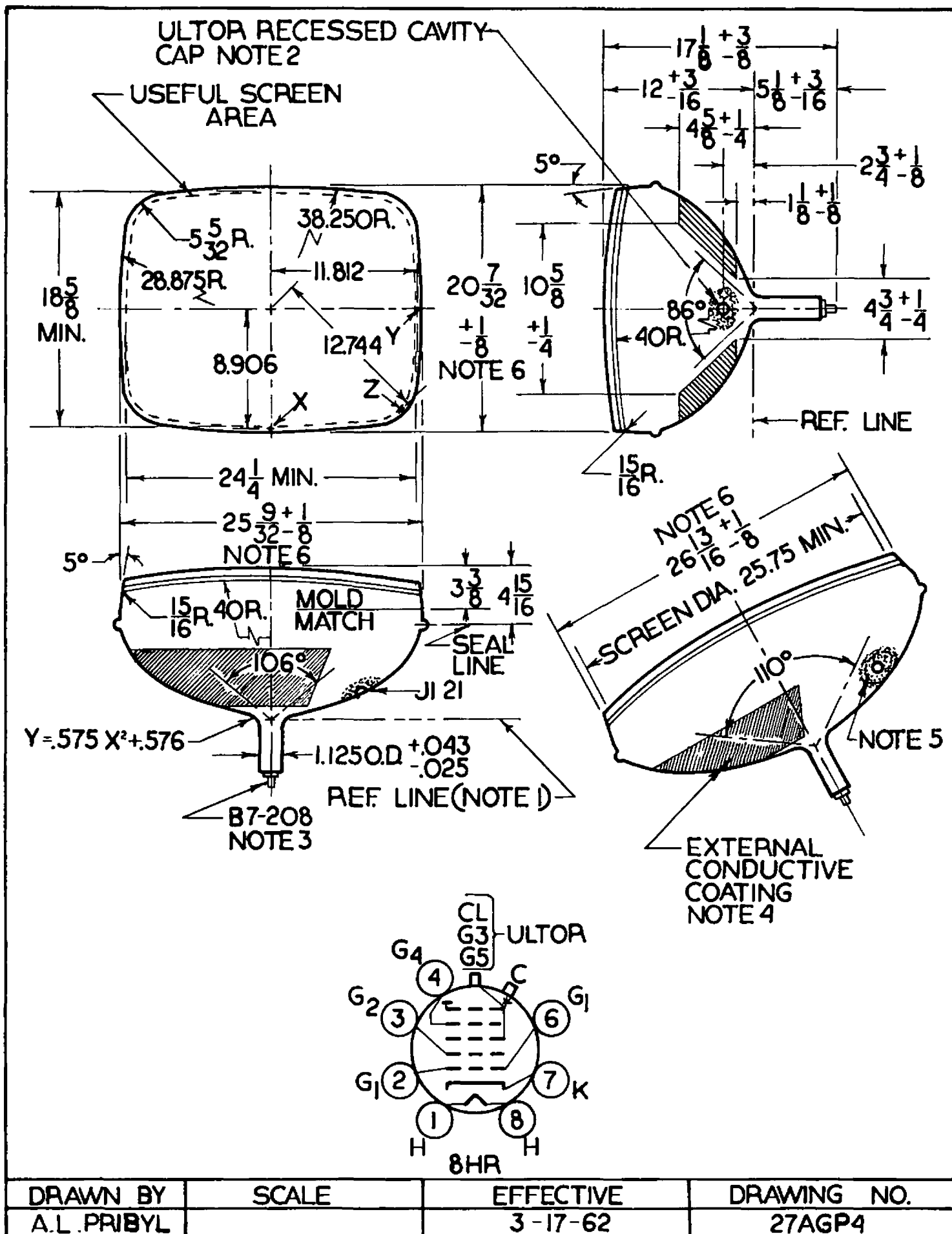
Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

Tube Outline with essential dimensions and tolerances.

Pin Connections:

Pin 1 - Heater	Pin 6 - G ₁ Grid
Pin 2 - G ₁ Grid	Pin 7 - Cathode
Pin 3 - G ₂ Grid	Pin 8 - Heater
Pin 4 - G ₄ Grid	Bulb Contact - Ultor



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 100 microamperes on a 18 1/2 " x 24" pattern from RCA 2F21 Monoscope or equivalent.
3. Individual tubes will have satisfactory focus as some value between 0 to +400 volts.

DIAGRAM NOTES

1. With tube neck inserted through flared end of reference line gauge JEDEC No. G-126 and with tube seated in gauge, the reference line is determined by the intersection of the Plane CC' of the gauge with the glass funnel.
2. The plane through the tube axis and pin No. 4 may vary from the plane through the tube axis and ultor terminal by angular tolerance (measured about the tube axis) of $\pm 30^\circ$. Ultor terminal is on same side as Pin No. 4.
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 base wafer will fall within a circle concentric with bulb axis and having a diameter of 1 3/4".
4. External conductive coating must be grounded.
5. To clean this area, wipe only with soft dry lint-less cloth.
6. Measured at the mold-match line.

NATIONAL VIDEO CORPORATION

CATHODE RAY TUBE TYPE 27UP₄

The tube type 27UP₄ is an electrostatic focus and magnetic deflection direct view picture tube. It has an all glass, rectangular bulb designed for 90° deflection. The faceplate is of gray glass and has a spherical contour. The electron gun is designed to be used with an external ion-trap magnet.

GENERAL CHARACTERISTICS

Heater Voltage	6.3	Volts
Heater Current	0.6	Ampere
Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angle (Approx.) Horizontal	85	Degrees
Diagonal	90	Degrees
Face Plate Light Transmission (Neutral Density Filter)	68%	Approx.
Phosphor	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	750	uuf Max.
	500	uuf Min.

MECHANICAL DATA

Overall Length	23 1/16 ± 3/8	Inches
Greatest Dimensions of Bulb:		
Diagonal	26 13/16 ± 3/16	Inches
Width	25 9/32 ± 3/16	Inches
Height	20 7/32 ± 3/16	Inches
Minimum Useful Screen Size	24 x 18 1/2	Inches
Bulb Contact	J1-21	
Base	B6-63	
Basing	12L	
Bulb contact alignment		
J1-21 Contact aligns with pin position 6	+30	Degrees

MAXIMUM RATINGS

Anode Voltage ¹	20,000	Max. Volts D.C.
Grid No. 2 Voltage	500	Max. Volts D.C.
Grid No. 1 Voltage		
Negative Bias Value	125	Max. Volts D.C.
Positive Bias Value	0	Max. Volts D.C.
Positive Peak Value	2	Max. Volts

Peak Heater-Cathode Voltage

Heater negative with respect to cathode during warm-up
period not to exceed 15 seconds

After equipment warm-up

Heater positive with respect to cathode

410 Max. Volts D.C.
180 Max. Volts D.C.
180 Max. Volts D.C.

TYPICAL OPERATING CONDITIONS

Anode Voltage

Grid No. 4 Voltage³

Grid No. 2 Voltage

Grid No. 1 Voltage⁴

Ion-Trap Magnet

16,000 Volts D.C.
0 to +396 Volts D.C.
300 Volts D.C.
-28 to -72 Volts D.C.
40 gauss

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance

1.5 Max. Megohms

NOTES

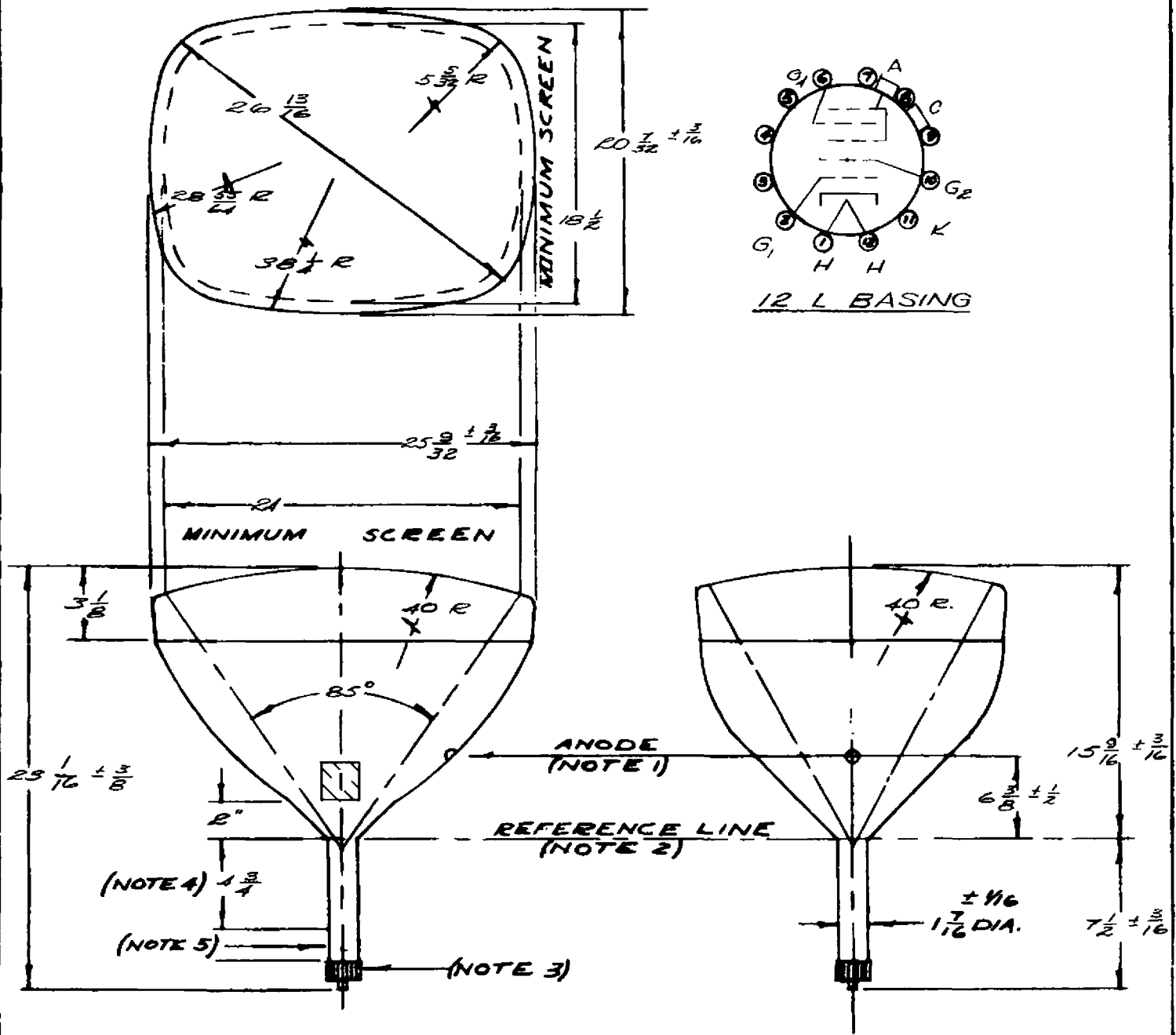
¹Because the rating of this tube permits anode voltages as high as 20 kilovolts (absolute maximum), shielding of x-ray radiation from the tube may be necessary. This precaution should be observed when the anode is operated in excess of 16 kilovolts.

²Grid number four in this tube is the focus control electrode.

³With the combined grid No. 1 bias voltages and video signal voltage adjusted to produce an anode current of 100 ua on a 24 x 18 1/2 inch picture adjusted for best overall focus. For other anode voltages, the focus voltage will be from -0.4% to +2.2% of the anode voltage.

⁴Visual extinction of undeflected, focused raster.

27UP4



NATIONAL VIDEO CORP.

CHICAGO 32, ILLINOIS

9.1.27UP4

DRAWN BY	SCALE	EFFECTIVE	SUPERSEDES	DISTRIBUTION
J.E. KUS	8" = 1"	21 DEC. 54	ORIGINAL	A, B, C, D, E, F, G, H

A, B, C, D, E, F, G, H

NOTES

- NOTE 1: The plane through the tube axis and vacant pin position 6 aligns with the anode contact +30°.
- NOTE 2: Reference line is determined by the plane where the standard JETEC reference line gauge #116 will stop against the bulb.
- NOTE 3: Socket for this base should not be rigidly mounted. It should have flexible leads and be free to move.
- NOTE 4: Location of deflection yoke and centering device must be within this space.
- NOTE 5: Keep this space clear for ion-trap magnet.
- NOTE 6: Configuration of outer conductive coating optional, but must contain the 2 x 2 inch contact area as shown on drawing.

27VP4

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The tube type 27VP4 is an electrostatic focus and magnetic deflection direct view picture tube. It has an all glass, rectangular bulb designed for 90° deflection. The faceplate is of gray glass and has a spherical contour. The short electron gun is designed to be used with no ion-trap. A metal backed screen is used to increase light output.

GENERAL CHARACTERISTICS

Focusing Method	Electrostatic	
Deflection Method	Magnetic	
Deflection Angle (Approx.) Horizontal	85	Degrees
Diagonal	90	Degrees
Face Plate Light Transmission (Neutral Density Filter)	72%	Approx.
Phosphor	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	2500	Max. uuf
	2000	Min. uuf

MECHANICAL DATA

Overall Length	21 1/16 ± 3/8	Inches
Greatest dimensions of bulb:		
Diagonal	26 13/16 ± 3/16	Inches
Width	25 9/32 ± 3/16	Inches
Height	20 7/32 ± 3/16	Inches
Minimum Useful Screen Dimensions (Max. Assured)		
Area	425	Sq. Inches
Width	24 1/4	Inches
Height	18 5/8	Inches
Diagonal	25 3/4	Inches
Bulb Contact	J1-21	
Base	B6-63	
Basing	12L	
Bulb Contact Alignment		
J1-21 Contact aligns with pin position 6	± 30	Degrees

MAXIMUM RATINGS Design Center Values

Heater Voltage	6.3	Volts
Heater Current	0.6	Ampere
Anode Voltage ¹	18,000	Max. Volts D.C.
Grid No. 2 Voltage	500	Max. Volts D.C.
Grid No. 1 Voltage		
Negative Peak Value	200	Max. Volts
Negative Bias Value	140	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	180	Max. Volts D.C.
Heater positive with respect to cathode	180	Max. Volts D.C.

TYPICAL OPERATING CONDITIONS

Anode Voltage	16,000	Volts D.C.
Grid No. 4 Voltage ²	-72 to +396	Volts D.C.
Grid No. 2 Voltage	300	Volts D.C.
Grid No. 1 Voltage ³	-28 to -72	Volts D.C.

MAXIMUM CIRCUIT VALUES

Grid No. 1 Circuit Resistance	1.5	Max. Megohms
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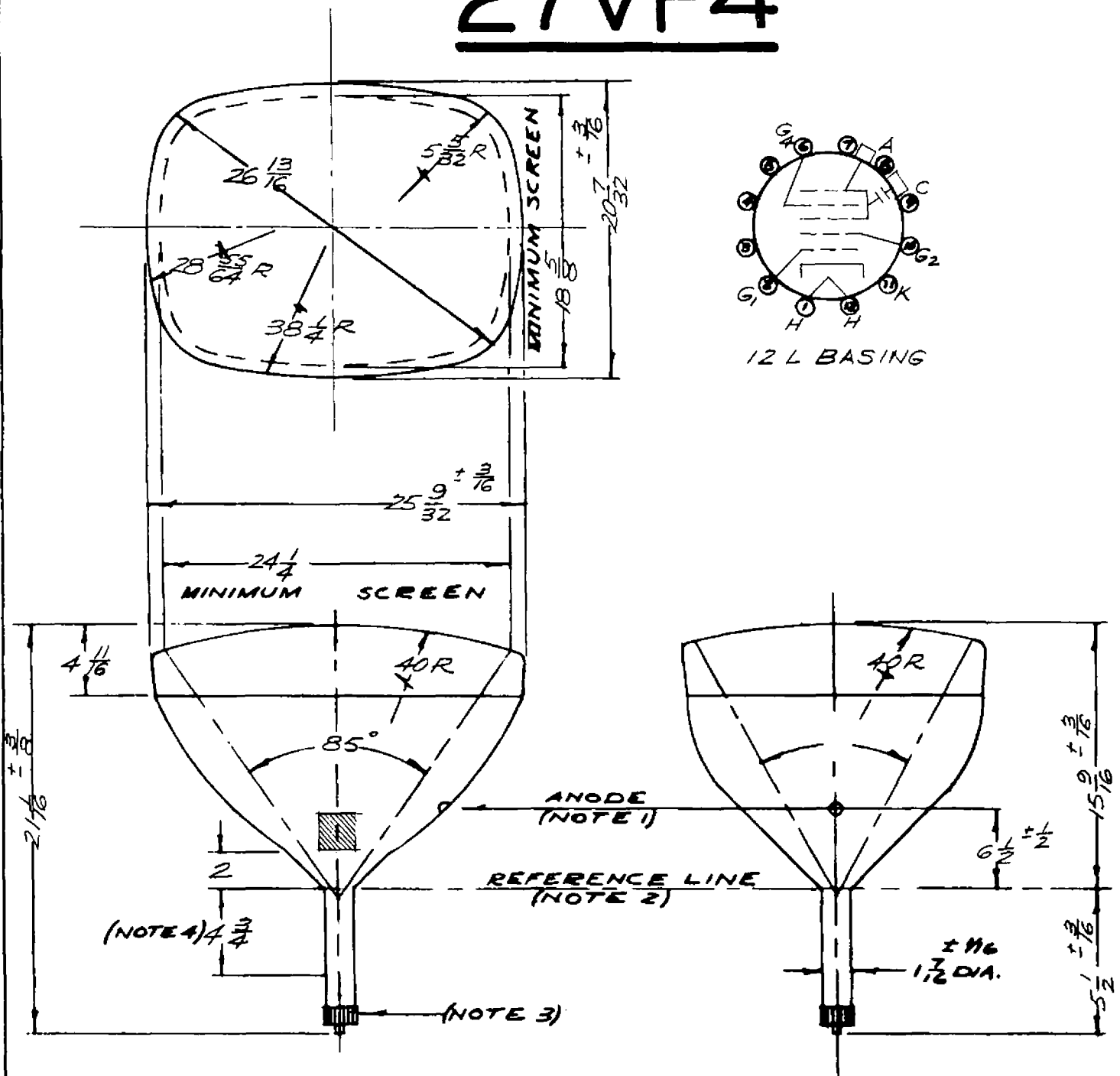
NOTES

¹Because the rating of this tube permits anode voltages as high as 19,800 volts (absolute maximum), shielding of x-ray radiation from the tube may be necessary. This precaution should be observed when the anode is operated in excess of 16 kilovolts.

²With the combined grid No. 1 bias voltage and video signal voltage adjusted to produce an anode current of 100 ua on a 24 1/4 x 18 5/8 inch picture adjusted for best overall focus. For other anode voltages, the focus voltage will be from -0.4% to +2.2% of the anode voltage.

³Visual extinction of undeflected, focused raster.

27VP4



NATIONAL VIDEO CORP.
CHICAGO 32, ILLINOIS

DRAWN BY	SCALE	EFFECTIVE	SUPERSEDES	DISTRIBUTION
J. E. KUS	8" = 1"	8-20-57	ORIGINAL	A, B, C, D, E, F, G, H

NOTES

NOTE 1: The plane through the tube axis and vacant pin position 6 aligns with the anode contact $\pm 30^\circ$.

NOTE 2: Reference line is determined by the plane where the standard JETEC #116 reference line gauge will stop against the bulb.

NOTE 3: Socket for this base should not be rigidly mounted. It should have flexible leads and be free to move.

NOTE 4: Location of deflection yoke and centering device must be within this space.

NOTE 5: Configuration of outer conductive coating optional, but must contain the 2" x 2" contact area as shown on drawing.

National Video Corporation

4300 W. 47TH STREET CHICAGO 32, ILLINOIS
CLIFFSIDE 4-5600

The 27YP4 is a 5 3/4" neck length, electrostatic focus, magnetic deflection picture tube. The tube has a metal back screen and a Pittsburgh type implosion faceplate sealed to the tube. A straight gun which requires no ion trap and a 600 milliampere, 6.3 volt filament is used.

ELECTRICAL DATA

Focusing Method	Electrostatic
Deflection Angles, Approximate	
Horizontal	85 degrees
Vertical	68 degrees
Diagonal	90 degrees
Direct Interelectrode Capacitances	
Cathode to all other electrodes, approx.	5 uuf
Grid #1 to all other electrodes, approx.	6 uuf
External Conductive Coating to Anode	2500 max. uuf
	2000 min. uuf
Heater Current at 6.3 Volts	600 $\pm$ 30 ma
Heater Warm-up time	11 Seconds

OPTICAL DATA

Phosphor Number JEDEC Designation, indicate if aluminized	P4 Aluminized
Light Transmittance at Center, Approximate	48%

MECHANICAL DATA

Overall Length	21 9/16 $\pm$ 3/8 Inches
Greatest Diameter of Tube	
Greatest Dimensions of Tube	
Diagonal	26 13/16 $\pm$ 1/8 Inches
Width	25 9/32 $\pm$ 1/8 Inches
Height	20 7/32 $\pm$ 1/8 Inches
Minimum Useful Screen Diameter (Projected)	
Minimum Useful Screen Dimensions (Projected)	
Diagonal	25 3/4 Inches
Horizontal axis	24 1/4 Inches
Vertical axis	18 5/8 Inches
Area	425 Sq. Inches
Neck Length	5 3/4 $\pm$ 3/16 Inches
Bulb EIA designation or equivalent (Including shield designation)	J-214 - 1/2 A2
Panel	Pittsburgh - FP-214 1/2 A1
Bulb Contact	J-21
Base	B6-63
Basing	12L
	JEDEC Designation
	JEDEC Designation
	JEDEC Designation

MECHANICAL DATA (Cont'd)

Bulb Contact Alignment

J1-21 contact aligns with pin position #6 $\pm$ 30 Degrees

Weight (Approx.) Bulb	44 lbs.
Weight (Approx.) Tube Laminated	54 lbs.

RATINGS (Design Maximum System)

Unless otherwise specified, voltage values are positive
and measured with respect to cathode

Maximum Anode Voltage	25,000 Volts	
Minimum Anode Voltage	11,000 Volts	
Maximum Grid #4 (Focusing Electrode) Voltage	+1100 -550	
Maximum Grid #2 Voltage	550 Volts	
Minimum Grid #2 Voltage	200 Volts	
Grid #1 Voltage		
Maximum Negative Value	154 Volts	DC
Maximum Negative Peak Value	220 Volts	
Maximum Positive Value	0 Volts	DC
Maximum Positive Peak Value	2 Volts	
Maximum Heater Voltage	6.9 Volts	
Minimum Heater Voltage	5.7 Volts	
Maximum Heater-Cathode Voltage		
Heater negative with respect to cathode		
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 CONDITIONSGRID DRIVE SERVICE

Unless otherwise specified, all voltage values
are positive with respect to cathode.

Anode Voltage	18,000 Volts	DC
Grid #___ Voltage (Focusing Electrode)		
(Notes 2 & 3)	0 to +450 Volts	DC
Grid #2 Voltage	300 Volts	DC
Grid #1 Voltage (Note 1)	-28 to -72 Volts	DC

MAXIMUM CIRCUIT VALUES

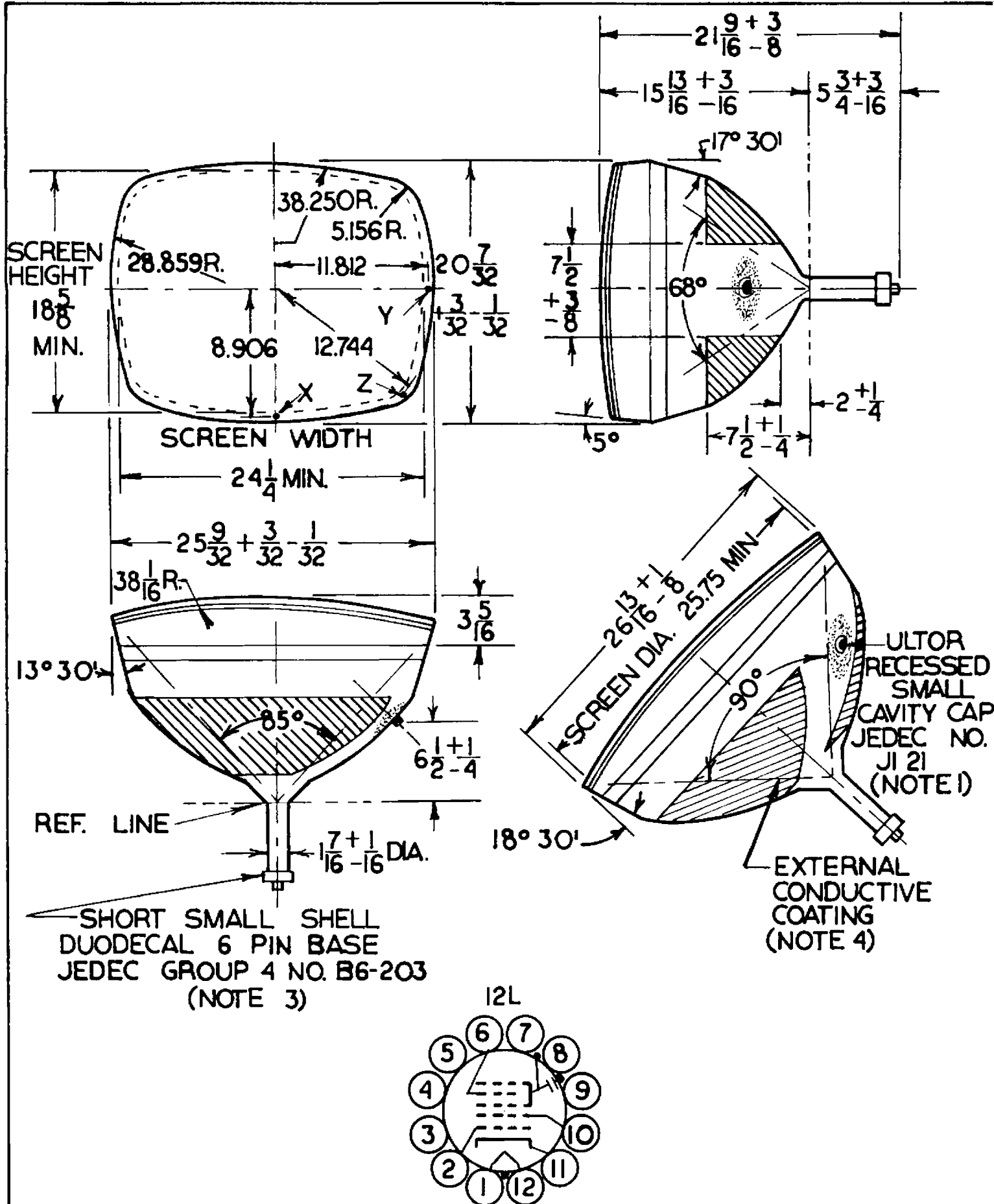
Maximum Grid #1 Circuit Resistance	1.5 Megohms
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GRAPHS AND DRAWINGS

Tube Outline with essential dimensions and tolerances.

Pin Connections

Pin 1 - Heater	Pin 11 - Cathode
Pin 2 - G ₁	Pin 12 - Heater
Pin 6 - G ₄	Bulb Contact - Ultor
Pin 10 - G ₂	



DRAWN BY	SCALE	DISTRIBUTION	EFFECTIVE	DRAWING NO.
A.L. PRIBYL			8-19-61	27YP 4

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 100 microamperes on a 24 1/4" X 18 5/8" pattern from RCA 2F21 Monoscope or equivalent.
3. Socket for this base should not be rigidly mounted. It should have flexible leads and be free to move.
4. Location of deflection yoke and centering device must be within this space.
5. Individual tubes will have satisfactory focus at some value between 0 to +400 Volts.
6. Reference line is determined by the plane where the standard JETEC #116 reference line gauge will stop against the bulb.