4820

Projection Kinescope

5"-Diameter Electrostatic-Focus, Magnetic-Deflection Type

- For Monochrome Television Projectors
- Designed for Use with Schmidt Reflective Optics
- High Picture Luminance – 3000 fL at 300 μA
- High Resolution – 600 TV Lines at 300 μA
- Forced-Air Cooled
- Rare Earth (White) Phosphor
- Fine Screen Texture
- Color Temperature – 7800° K + 70 MPCD

General Data

Electrical:

Heater Current at 6.3 Volts	0.6 A
Focusing Method	Electrostatic
Deflection Method[a]	Magnetic
Deflection Angle (Approx.)	50°
Direct Interelectrode Capacitances (Approx.):	
Grid No.1 to all other electrodes	8 pF
Cathode to all other electrodes	5 pF

Optical:

Faceplate, Spherical	Clear, Browning-Resistant Glass
Radius of curvature (inner radius)	7.10 ± 0.20 in
Minimum Useful Screen Diameter	4.50 in
Minimum Optical-Quality-Circle Diameter	4.25 in
Refractive Index of Faceplate	1.519
Phosphor, Aluminized	P45 Rare Earth
C.I.E. coordinates (x,y)	0.290, 0.361
Luminescence	White
Color temperature	7800° K + 70 M.P.C.D.
Persistence	Medium

Mechanical:

Tube Dimensions:	
Overall length	12.19 + 0.37 −0.38 in
Greatest diameter of bulb (Excluding cable)	5.00 ± 0.12 in
Base	Small-Shell Duodecal 7-Pin, JEDEC No.B7-51

Anode Lead	Molded-on, Insulated Cable, 48 in long
Bulb	J40H1
Operating Position	Any
Weight (Approx.)	1-1/2 lbs

Maximum and Minimum Ratings, Absolute-Maximum Values[b]

Average Anode Power:			
Without forced-air cooling of faceplate	9	max.	W
With forced-air cooling of faceplate	12	max.	W
Air Flow to Face[c] when Average Anode Power Exceeds 9 Watts	40		cfm
Anode-to-Cathode Voltage	42	max.	kV
Grid-No.3-to-Cathode Voltage	9	max.	kV
Grid-No.2-to-Cathode Voltage	400	max.	V
Grid-No.1-to-Cathode Voltage:			
Negative bias value	150	max.	V
Positive bias value	0	max.	V
Peak positive value	2	max.	V
Anode Current, Long-Term Average (for 4" x 3" TV raster)	300	max.	μA
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	175	max.	V
Heater positive with respect to cathode	10	max.	V
Heater Voltage (ac or dc)[d]	6.9	max.	V
	5.7	min.	V

Recommended Operating Values[e]

Raster Size	4" x 3"	
Anode Voltage	40	kV
Anode Current, Long-Term Average	300	μA
Grid-No.3 Voltage for Focus at an Anode Current of 300 μA	7.4 to 9	kV
Grid-No.2 and Grid-No.1 Voltages for Visual Extinction of Focused Spot	See **Figure 1**	
Heater Voltage	6.3	V

Typical Performance Data

At Recommended Operating Values:

Center Resolution[f]	600	TV Lines
Luminance at 300 μA	3000	fL
	10300	nits

Luminous Flux	250	lumens
Grid-No.3 Current (Total)[9]	±10	μA
Grid-No.2 Current	±15	μA

Circuit Requirements

High-Voltage Circuits:

In order to minimize the possibility of damage to the tubes and adjacent circuits caused by a momentary internal arc, it is recommended that the high-voltage power supply and the grid-No.3 power supply be of the limited-energy type. An external spark gap must be provided at the grid-No.3 terminal. The following resistor and voltage values are mandatory.

Anode-Circuit Resistance (unbypassed)	0.5	min.	MΩ
Grid-No.3 Circuit Resistance (unbypassed)	0.1		MΩ
Grid-No.3 Spark-Gap Firing Voltage	12		kV
Low-Voltage Circuits:			
Grid-No.2 Circuit Resistance (bypassed)	10		kΩ
Grid-No.1 Circuit Resistance (unbypassed)	1		kΩ
Effective Grid-No.1-to-Cathode Circuit Resistance	1.5	max.	MΩ

[a] Sharp corners on the yoke assembly in the vicinity of the tube neck should be avoided. Insulation between the yoke winding and/or the core and the tube neck should be capable of withstanding at least 10 kV and preferably 15 kV.

[b] A description of the Absolute Maximum Ratings is given in the General Section, titled Rating System for Electron Tubes.

[c] The specified air flow should be delivered perpendicularly from a nozzle having a diameter of about 2 inches onto the face of the tube while it is in operation. In a typical system with air filter, the total system static pressure is approximately 0.25 inch of water. The cooling air must not contain water, dust, or other foreign matter. The air-cooling system should be electrically interconnected with the anode power supply to prevent operation of the tube without cooling.
Cooling of the tube by a tangential flow of air across its face is not recommended because the temperature gradient produced across the face may result in immediate or delayed cracking of the face.

[d] For maximum cathode life, it is recommended that the heater supply be regulated at 6.3 volts.

[e] This tube may be operated at reduced anode voltage and/or anode current. At reduced anode voltage, center resolution will decrease. At reduced anode voltage and/or anode current, lumi-

nance will decrease. The grid-No.3 voltage for focus will be reduced in proportion to the reduction in anode voltage. Other performance characteristics may also be affected.

f Determined for a 3-inch high TV resolution test pattern with tube operating at a screen current of 300 microamperes.

g Grid-No.3 current is normally low, as indicated in the data, when the tube is operated under recommended conditions. Lower grid-No.3 voltage (as required for focus if anode voltage is reduced) and/or higher grid-No.2 voltages can lead to a grid-No.3 current level approaching that measured in the anode circuit. Note that the fraction of available current intercepted by the grid-No.3 electrode is not constant, but increases with increasing anode current.

Safety Precautions

X-Radiation Warning

Although X-radiation is generated primarily at the face of the tube when it is operated, the X-rays are emitted in all directions.

These rays can constitute a health hazard unless the tube is adequately shielded. Make sure that the shielding provides the required protection against personal injury.

On the neck of the tube itself the following warning appears and should be strictly adhered to:

X-RAY WARNING

This tube in operation produces X-Rays which can constitute a health hazard unless the tube is adequately shielded for radiation.

In normal operation, this tube produces more x-radiation than the Tube Type 5AZP4 which it may replace. Make sure that shielding is adequate.

High Voltage

The high voltages at which this type is operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltages. Precautions include the enclosing of high-potential terminals and the use of interlocking switches to

break the primary circuit of the power supply when access to the equipment is required.

In the use of this tube it should always be remembered that high voltages may appear at normally low-potential points in the circuit because of capacitor breakdown or incorrect circuit connections, and that the tube surface maintains a static charge for some time after the power has been turned off. Therefore, before any part of the circuit or the tube is touched, the power-supply switch should be turned off, both terminals of high-voltage capacitors should be grounded, and the terminals of the high-voltage power supply should be grounded.

After these steps have been taken and before touching the tube, discharge the anode terminal, the surface of the faceplate, and the coated surface of the cone by use of a suitable wand which is connected to ground. It is to be noted that the entire surface of the cone and of the faceplate will not be discharged by touching the wand to a single point on either surface, because the surfaces have high resistance. Therefore, to discharge each surface, it will be necessary to sweep over the entire surface with the wand.

Tube Handling

Wear "Safety" Goggles with side shields, when handling tube to prevent possible injury from flying glass in case of tube breakage. Do not strike or scratch tube. Never subject it to more than moderate pressure when installing in or removing from equipment. Always Handle Tube with Extreme Care. Ground anode contact before touching after power is off.

Operating Considerations

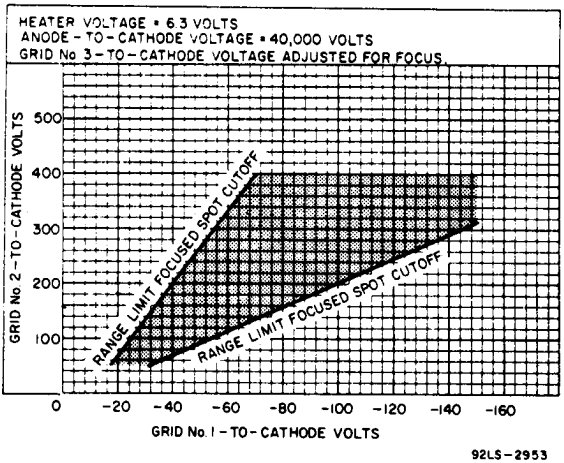
Humidity Considerations. When humidity is high, a continuous film of moisture may form on untreated glass. If a high-voltage gradient is present, this film may permit sparking to take place over the glass surface. In order to minimize the formation of a continuous moisture film, the glass cone is treated with a **transparent moisture-repellent insulating coating.** This coating must not be scratched, and must be

kept clean and free from contamination such as fingerprints. The coating may be washed with a solution of a mild soapless detergent and water. After the surface is washed, it should be rinsed with clean water and be dried immediately. Any damage to the coating or any contamination on the surface may result in sparking over the cone of the bulb.

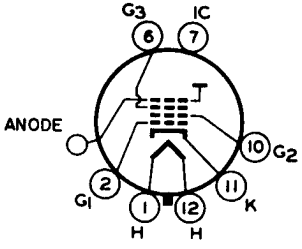
Dust Considerations. The high voltage applied to the tube increases the rate at which dust is precipitated on the surface of the tube. The rate of precipitation is further accelerated in the presence of corona. Such dust not only decreases the insulation of the bulb coating but also reduces the amount of radiation transmitted through the bulb face. The dust usually consists of fibrous materials and may contain soluble salts. The fibers absorb and retain moisture; the soluble salts provide electrical leakage paths that increase in conductivity as the humidity increases. Because a film of dust can nullify the protection provided by the insulating coating on the bulb, the tube should be protected as much as possible from dust and should be cleaned, when necessary, as described under **Humidity Considerations.**

Corona Considerations. A high-voltage system may be subject to corona, especially when the humidity is high, unless suitable precautions are taken. Corona, which is an electrical discharge appearing on the surface of a conductor when the voltage gradient exceeds the breakdown value of air, causes deterioration of organic insulating materials, induces arc-over at points and sharp edges, and forms ozone, a gas which is deleterious to many insulating materials. Sharp points or other irregularities on any part of the high-voltage system may increase the possibility of corona and should be avoided. Instead, rounded contours and surfaces should be used.

Cutoff Design Chart



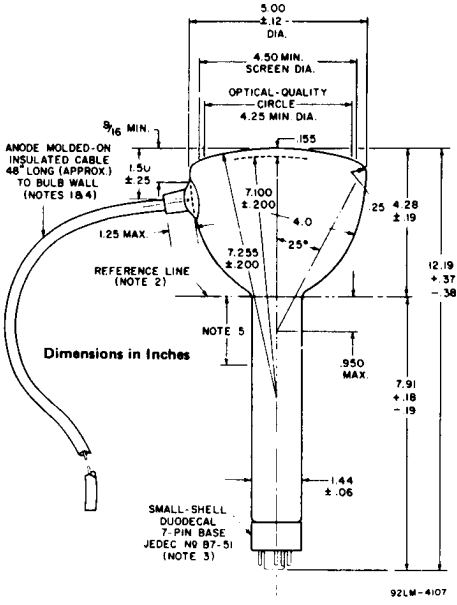
Basing Diagram, Bottom View



Pin 1: Heater
Pin 2: Grid No.1
Pin 6: Grid No.3
Pin 7: Internal Connection — Do not use
Pin 10: Grid No.2
Pin 11: Cathode
Pin 12: Heater
Flexible Cable: Anode

Note: Socket contacts for vacant pin positions No.3, 4, 5, 8, and 9 should be removed so that maximum insulation is provided for pins No.6 and 7.

Dimensional Outline



Note 1 – The plane through the tube axis and vacant pin position No.3 may vary from the plane through the tube axis and anode-cable connection at bulb wall by angular tolerance (measured about the tube axis) of ±20°. Anode-cable connection is on same side as vacant pin position No.3.

Note 2 – Reference line is determined by position where gauge 1.500" +0.003" –0.000" I.D. and 2" long will rest on bulb cone.

Note 3 – Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. Socket contacts corresponding to vacant pin positions No.3, 4, 5, 8 and 9 should be removed in order to provide maximum insulation for pins No.6 and 7.

Note 4 – Anode cable should not be sharply bent within 3" of bulb wall.

Note 5 – To avoid excessive interaction between the deflecting and focusing fields, the windings of the deflecting yoke should not extend more than 2 inches from the reference line toward the base.