technical data

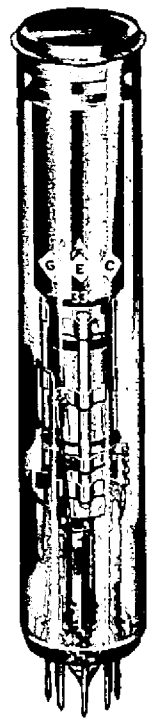
GEC 7336 VIDICON

The GEC 7336 Vidicon has been primarily designed for televising live scenes in broadcast applications. This camera tube features high sensitivity, excellent lag characteristics at low light levels and provision for dynamic focus. Optimum pictures may be obtained by adjustment of signal electrode voltage without limiting restrictions on dark current. The GEC improved internal construction allows the tube to be operated in any position.

DATA

GENERAL:

Operating Position	Any
Focusing Method	Magnetic
Deflection Method	Magnetic
Max. Useful Diagonal of Rectangular Image (4 x 3 Aspect Ratio)	0.625 in.
Orientation of Image....Horizontal Scan should be essentially parallel to a plane passing through tube axis and the short index pin.	



ELECTRICAL CHARACTERISTICS:

Heater	
Voltage (AC or DC)	6.3 V ±10%
Current	.60 A ±10%
Direct Interelectrode Capacity (Signal Electrode to all other Electrodes)	3.1 uuf
Spectral Response (See Figure 4)	S-18

ABSOLUTE MAXIMUM RATINGS:

Anode Voltage	350 V
Grid No. 3 Voltage	350 V
Grid No. 2 Voltage	750 V
Grid No. 1 Voltage	
Negative Bias Values	125 V
Positive Bias Values	0 V
Heater - Cathode Peak Values	
Heater Negative with Respect to Cathode	125 V
Heater Positive with Respect to Cathode	10 V

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ELECTRONIC TUBE DIVISION
GENERAL ELECTRODYNAMICS CORPORATION, GARLAND, TEXAS

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ABSOLUTE MAXIMUM RATINGS, Continued:

Faceplate	
Illumination	500 ft-c
Temperature	71° C.
Signal Electrode Current	.60 uA

TYPICAL OPERATION WITH STATIC FOCUSING:

* Scanned Area	0.500 x 0.375"
Faceplate Temperature	30° to 35° C.
** Optimum Signal-Output Current	
For uniform 2870° K Tungsten illumination on faceplate down to .5 ft-c	.2 uA
For uniform 2870° K Tungsten illumination on faceplate from .2 ft-c to .5 ft-c	.14 to .2 uA
Signal Electrode Voltage	
For 5 ft-c faceplate illumination and signal-output current of .2 uA	10 to 50 V
For .2 ft-c faceplate illumination and signal-output current of .14 uA	40 to 100 V
Average Gamma of Transfer Characteristic over Signal-Output Current operating range of .05 to .2 uA	.55
Anode Voltage	200 to 300 V
Grid No. 3 Voltage	200 to 300 V
Grid No. 2 Voltage	300 V
Grid No. 1 Voltage (For picture cut-off with no blanking voltage on Grid No. 1)	-45 to -100 V
Minimum Peak-to-Peak Blanking Voltage	
When applied to Grid No. 1	30 V
When applied to Cathode	10 V
Magnetic Field Intensity at Center of Focusing Device	40 gauss
Magnetic Field Intensity of Adjustable Alignment Coil	0 to 4 gauss

TYPICAL OPERATION WITH DYNAMIC FOCUSING:

Grid No. 3 used separately as dynamic focusing electrode	
Values for operation are the same as those shown under Typical Operation with Static Focusing with the exception of the following:	
Grid No. 3 Voltage - DC Value	200 to 300 V
Grid No. 3 Parabolic Voltage Peak-to-Peak Value	60 V (approx)

* A scanned area of 0.500 x 0.375" was used to obtain all data and characteristic curves.

** Signal-Output Current equals signal electrode current minus dark current.

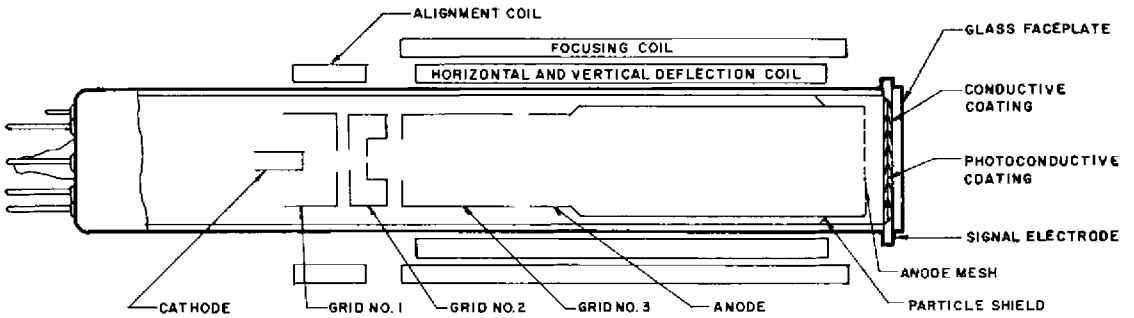

FIG. 1

PRINCIPLES OF OPERATION

The operation of the GEC 7336 Vidicon is based on the principle of photoconductivity. This effect produces a change in electrical conductivity with variations in incident light intensity.

The inside surface of the Vidicon faceplate is coated with a transparent conductive coating as shown in Figure 1. Over this is deposited a layer of photoconductive material. This material, when dark, is a reasonably good insulator. The electron beam is made to scan the back surface of this photoconductive surface.

In operation, the front surface of the photoconductor is held at a potential of some 30V, more or less, positive with respect to the cathode, by the application of this voltage to the transparent conductive coating. The scanning electron beam deposits a negative charge on the back surface of the photoconductor. Where the photoconductor is dark, and its resistance therefore high, the negative charge accumulates until this back surface is at the same potential as the cathode; any further electrons will be turned away. The dark portions of the photoconductor thus become charged in the manner of a capacitor. Dark current is slight electrical leakage through the dark areas.

But where light falls on the photoconductor, from the image of the scene, the conductivity of the material is substantially increased. The resulting leakage of the charge leaves a "hole" in the pattern of negative charge at any illuminated point. Upon its next trip across this point, then, the scanning beam will deposit electrons into this "hole"; this movement of charge calls for a corresponding flow of current into the transparent conductive coating, and the resulting voltage across the load resistor is the output video signal.

The Vidicon thus has the ability to "store" the image for an entire scanning cycle; the image is "photographed" in the pattern of negative charge on the back surface of the photoconductive material, and is accumulated there for the time of one complete frame. This process allows the improved GEC Vidicon to produce usable output from scenes which are dimly lighted.

The end of the anode nearest the faceplate is covered by a very fine mesh screen. The purpose of this screen is to establish a uniform decelerating field in the vicinity of the photoconductive surface, so that the electrons will arrive perpendicular to this surface and with low velocity. The fine-mesh screen simply provides a conducting plane through which electrons can readily pass.

Focusing, deflection and alignment are accomplished by means of external coils as shown in Figure No. 1.

OPERATING CONSIDERATIONS

DARK CURRENT:

Dark current increases with signal electrode voltage. In normal operation, dark current does not present a problem unless it is non-uniform across the photoconductive surface. The GEC 7336 has extremely uniform dark current, which eliminates the problems of edge flare, shading, and graininess present in earlier type vidicons. This permits the 7336 to be operated at higher values of dark current.

OPTIMUM SIGNAL ELECTRODE CURRENT:

The GEC 7336 is not limited in its operation by dark current restrictions, as explained above. Therefore, best picture quality can be obtained by adjusting for optimum signal electrode current as shown in Figure 2. The resulting dark current is also shown in Fig. 2 as an aid in circuit design. Signal output is the difference between signal electrode current and dark current and therefore can be obtained directly from Fig. 2.

LIGHT TRANSFER CHARACTERISTICS:

Typical signal output current as a function of faceplate illumination is shown in Figure 3. The slope of the curve gives the average gamma of the tube.

SENSITIVITY:

Vidicon sensitivity is a function of the photoconductive coating characteristics as well as signal electrode voltage. The GEC 7336 has an improved photoconductive surface with higher inherent sensitivity than previous vidicons. At the same time, photoconductive surface uniformity permits operation at higher signal electrode voltages without dark current limitations. Therefore, higher effective sensitivity from higher signal electrode voltage is added to the improved inherent sensitivity.

Figure 3 also shows the variation of sensitivity with dark current. For example, at 1 foot candle and .02 uA dark current the signal output is .15 uA. Increasing the dark current to .2 uA increases the signal output to .31 uA. Since dark current increases with signal electrode voltage, this curve demonstrates the variation of sensitivity with signal electrode voltage.

PERSISTENCE:

The GEC 7336 Vidicon has improved persistence characteristics as a result of its new photoconductive surface. Figure 6 shows these characteristics.

OPERATING TEMPERATURES:

No damage will result from operation of the tube at a temperature as high as 71^{o} C (159.8^{o} F); however, dark current does increase at these higher temperatures.

DYNAMIC FOCUS:

The GEC 7336 has provision for application of dynamic focusing to the electron beam. This permits the tube to be adjusted for improved edge focus.

Dynamic focus is obtained by supplementing the Grid No. 3 DC voltage with a parabolic waveform AC voltage. Grid No. 3 DC voltage is maintained at the same value as the anode.

CHARACTERISTIC CURVES

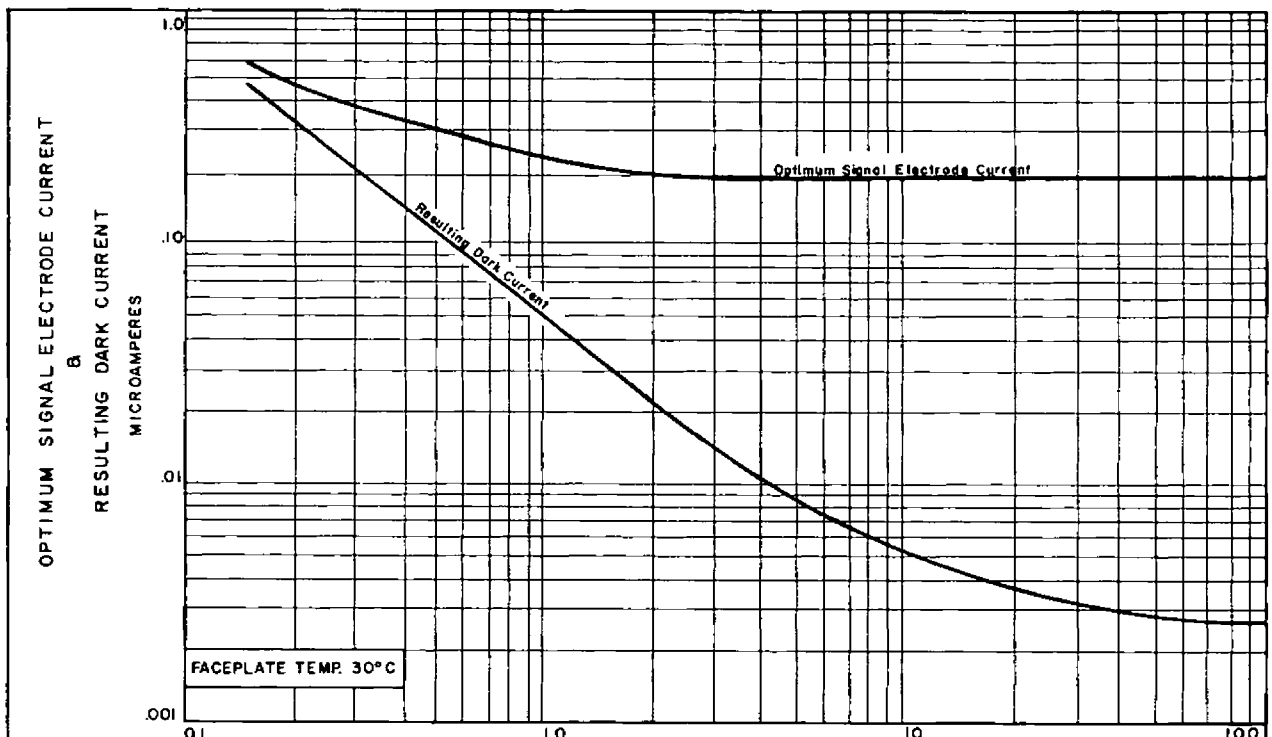

FIG.2 OPTIMUM SIGNAL ELECTRODE CURRENT

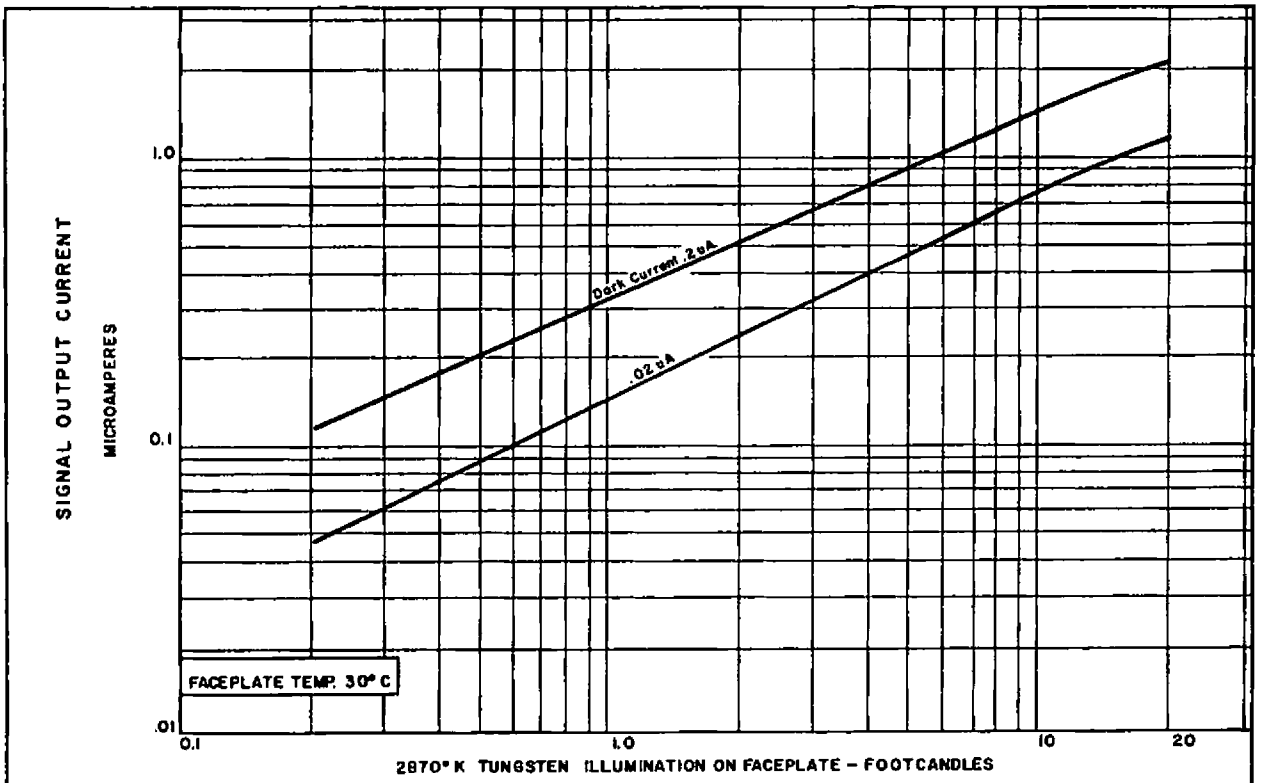

FIG. 3 TYPICAL LIGHT TRANSFER CHARACTERISTIC

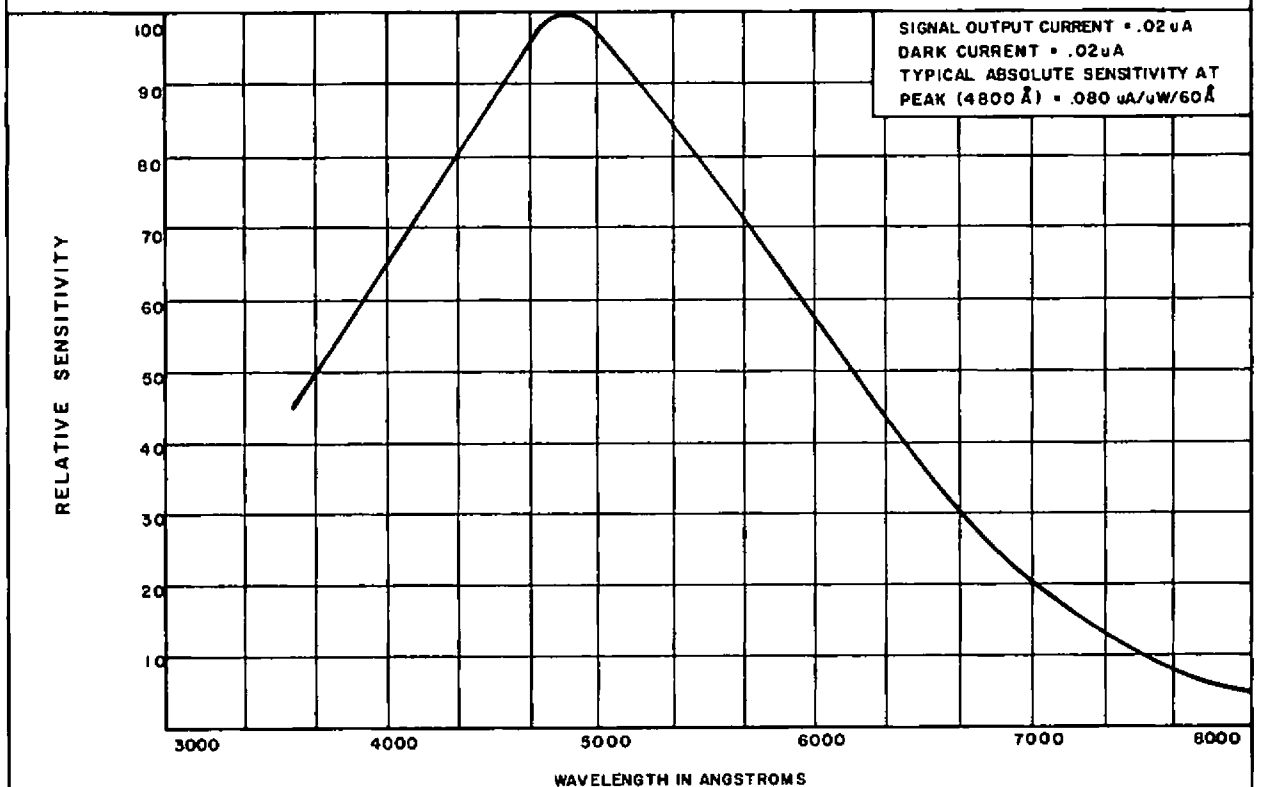

FIG. 4 SPECTRAL RESPONSE

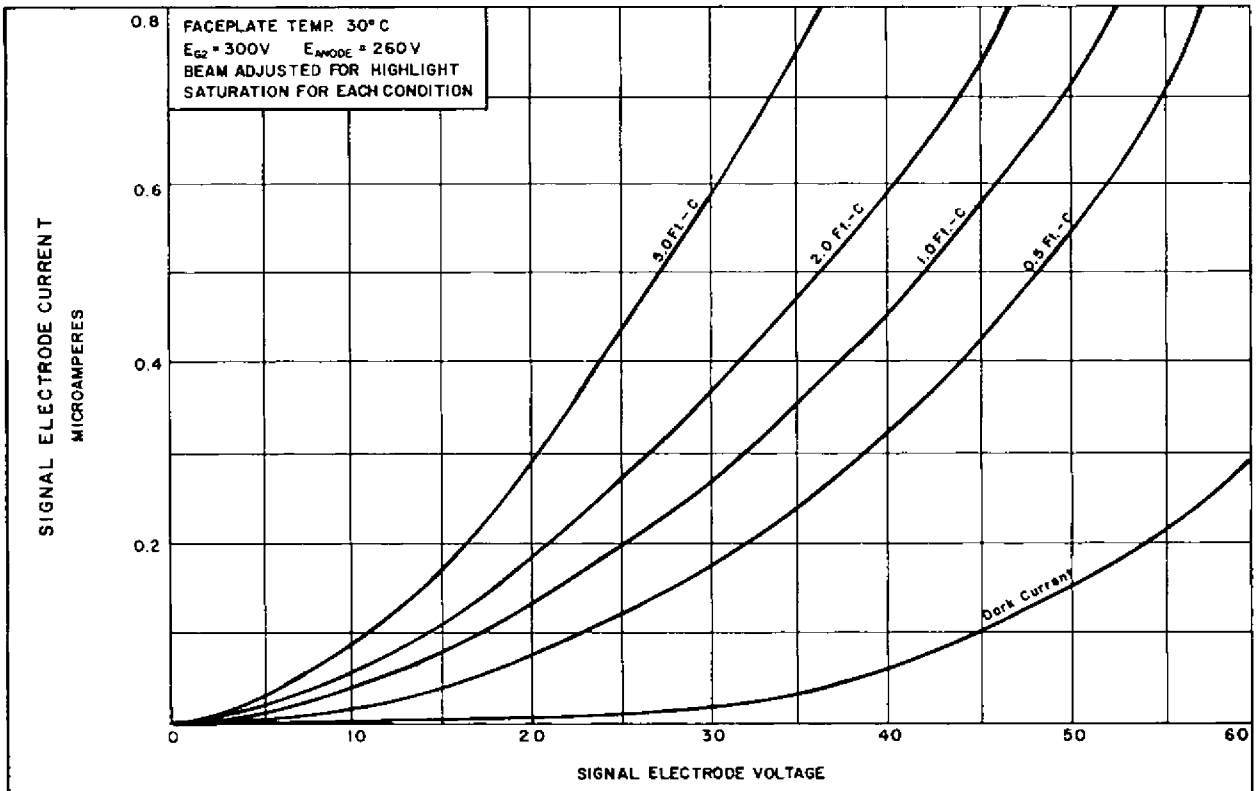

FIG. 5 SIGNAL ELECTRODE VOLTAGE – CURRENT CHARACTERISTICS

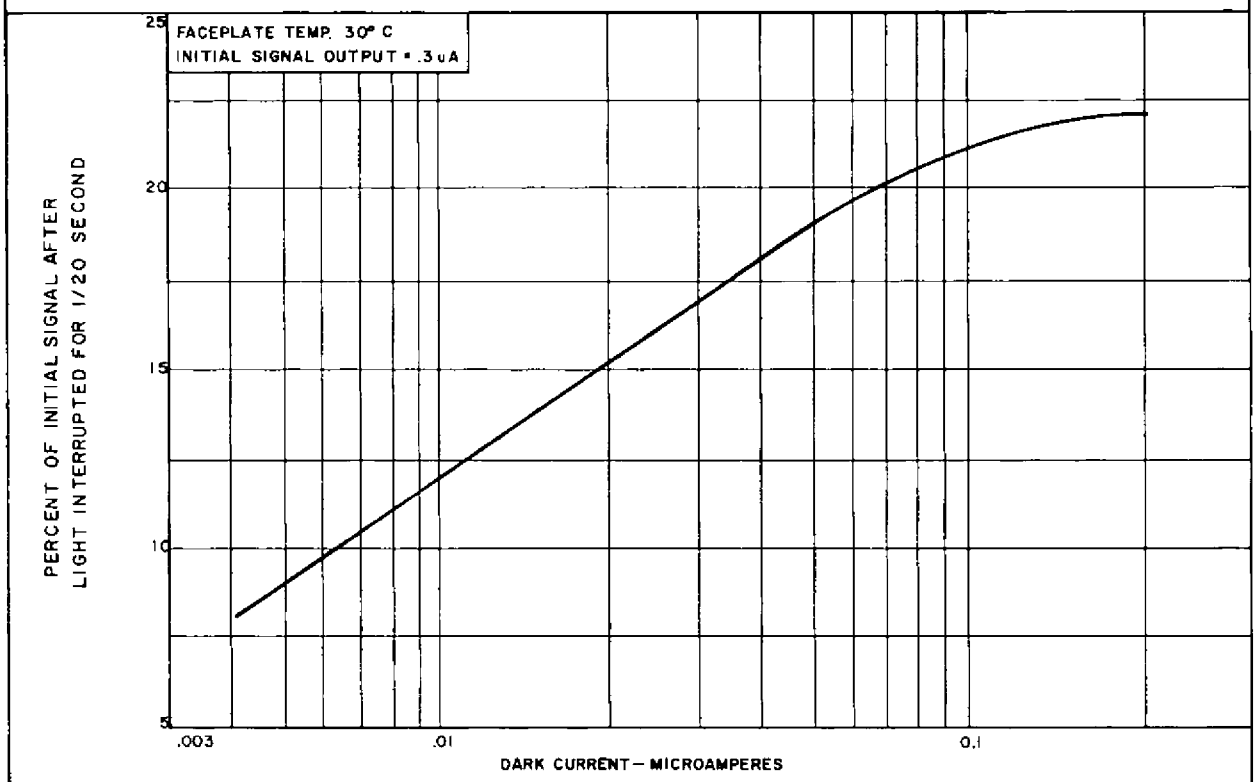

FIG. 6 TYPICAL PERSISTENCE CHARACTERISTICS

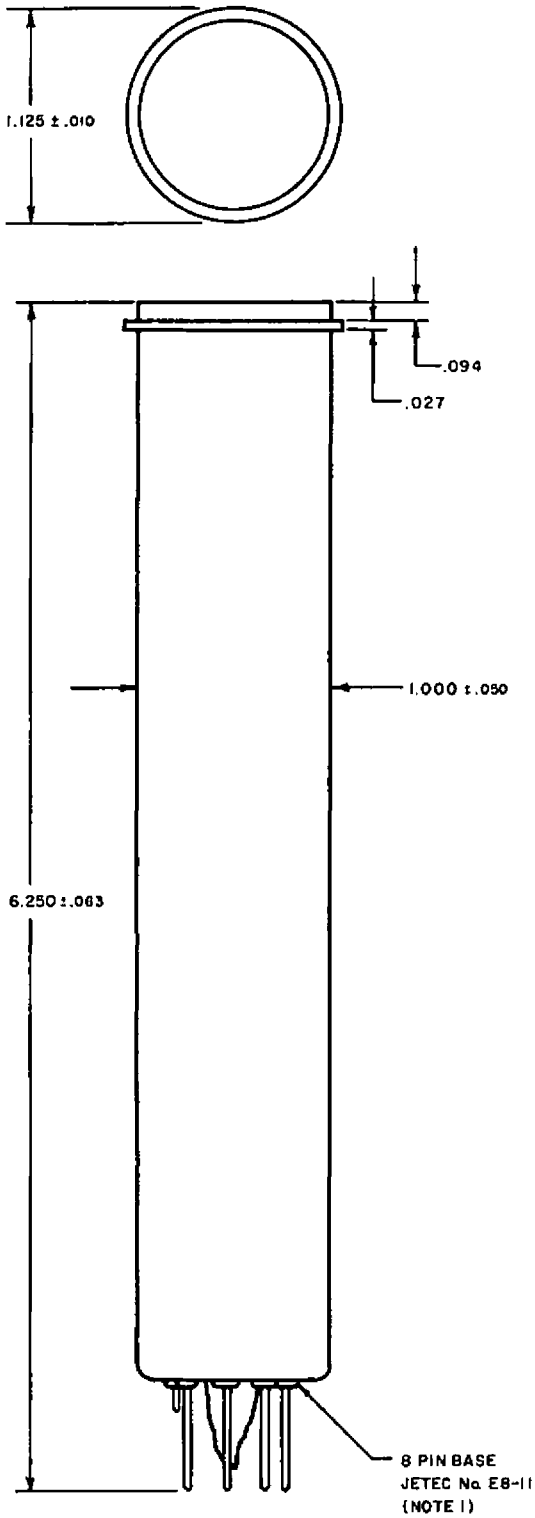

FIG. 7

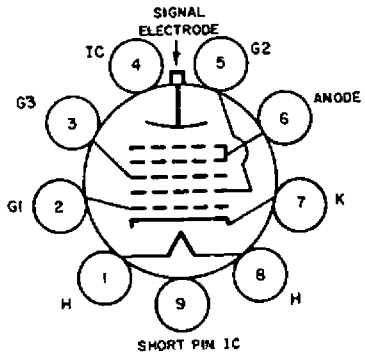

FIG. 8

PIN 1: HEATER
PIN 2: GRID No. 1
PIN 3: GRID No. 3
PIN 4: INTERNAL CONNECTION--DO NOT USE
PIN 5: GRID No. 2
PIN 6: ANODE
PIN 7: CATHODE
PIN 8: HEATER
FLANGE: SIGNAL ELECTRODE
SHORT INDEX PIN: INTERNAL CONNECTION--DO NOT USE

NOTES

1. Base-pin positions fit 0.25 inch thick, 10-hole flat-plate gage with holes located as follows: 9 holes, 0.0550 (±0.0005) inch diameter equally spaced, 0.2052 (±0.0005) inch apart on a circle, 0.6000 (±0.0005) inch diameter, plus a center hole, 0.300 (±0.001) in. diameter, concentric with 9-hole circle.

2. All dimensions are shown in inches.

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