RCA-8134
VIDICON

Low-Power Heater Requiring Only 0.6 Watt

Electrostatic-Focus, Magnetic-Deflection Type For Compact, Lightweight, Transistorized TV Cameras

1"-Diameter Precision Bulb 6.25" Length

RCA-8134 is a small, 1-inch diameter vidicon type of camera tube employing electrostatic focus, magnetic deflection, a precision outer-diameter glass bulb, and a low-power heater requiring only 0.6 watt. It is intended for compact, lightweight, transistorized TV cameras in industrial and other closed-circuit TV systems. It is well suited for black-and-white or color pickup at either slow or standard TV scanning rates.

The weight, size, and power requirements of TV cameras employing this tube are substantially less than those of cameras using conventional magnetic-focus, magnetic-deflection vidicons of comparable size. The 8134 requires negligible electrostatic focusing power; deflection power is reduced by a factor of 6; and, camera size and weight are automatically reduced by elimination of the magnetic focusing coil. In addition, the precision outer-diameter bulb of the 8134 permits the use of low-power, close-fitting deflecting yokes of small size and low impedance. A third reduction in required camera power is effected by use of the 0.6 watt heater.

An additional design feature of this tube is a separate connection for grid No.6 which facilitates beam landing adjustment for the most uniform signal output from the entire scanned area of the target. Grid No.6 is connected internally to grid No.3 for overall optimum performance.

Control of alignment fields for optimum focus uniformity and the use of magnetic shielding to prevent external fields from impairing the resolving capability of the 8134 are required.

Resolution of the 8134 is about 600 TV lines per picture height when operated with a grid-No.6 & 3 voltage of 300 volts and a grid-No.5 voltage of 180 volts. A resolution capability of about 750 TV lines is obtained when the 8134 is operated with a grid-No.6 & 3 voltage of 500 volts and a grid-No.5 voltage of 300 volts.

The 8134 utilizes a highly-sensitive, low-lag photoconductor of uniform thickness. Because of its uniform thickness, a constant voltage gradient and uniform dark current are obtained across the entire scanned area. The resulting picture background that is produced is free of "flare", "port-holing", and other unwanted signals. The uniform thickness of the photoconductive surface of the 8134 also results in substantially uniform sensitivity over the entire scanned area. Therefore, the 8134 exhibits a degree of uniformity of characteristics from tube to tube that makes it possible to obtain excellent color uniformity and balance when used in three-vidicon color cameras.

Other features of the 8134 are use of non-magnetic materials in the front end, an extremely flat faceplate free from optical distortion, and an envelope without a side tip.

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current at 6.3 volts	0.095	amp
Direct Interelectrode Capacitance:[a]		
Target to all other electrodes	5.0	pf
Spectral Response		See *Fig.7*
Photoconductive Layer:		
Maximum useful diagonal of rectangular image (4 x 3 aspect ratio)	0.62	inch

Orientation of quality rectangle—Proper orientation is obtained when the horizontal scan is essentially parallel to the straight sides of the masked portions of the faceplate. The straight sides are parallel to the plane passing through the tube axis and short index pin.

Focusing Method	Electrostatic
Deflection Method	Magnetic
Overall Length	6.25" ± 0.10"
Greatest Diameter	1.125" ± 0.010"
Bulb	T-8
Bulb Diameter	1.025" ± 0.003"
Base	Small-Button Ditetrar 8-Pin, (JEDEC No. E8-11)
Socket	Cinch[b] No. 133-98-11-015, or equivalent
Deflecting-Alignment Assembly	Cleveland Electronics[c] No. VYA-300, or equivalent
Operating Position	Any
Weight (Approx.)	2.8 oz

Maximum Ratings, *Absolute-Maximum Values:*[d]

For scanned area of 1/2" x 3/8"

GRID-No.6 & GRID-No.3 VOLTAGE[e]	750 max.	volts
GRID-No.5 VOLTAGE[e]	750 max.	volts
GRID-No.4 VOLTAGE	200 max.	volts
GRID-No.2 VOLTAGE	750 max.	volts
GRID-No.1 VOLTAGE:		
Negative bias value	300 max.	volts
Positive bias value	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	125 max.	volts
Heater positive with respect to cathode	10 max.	volts
TARGET VOLTAGE	100 max.	volts
DARK CURRENT	0.2 max.	μa
PEAK TARGET CURRENT[f]	0.4 max.	μa
FACEPLATE:		
Illumination	1000 max.	fc
Temperature	71 max.	°C

Typical Operation and Performance Data:

For scanned area of 1/2" x 3/8"
Faceplate Temperature of 30° to 35° C

	Low-Voltage Operation	*High-Voltage Operation*	
Grid-No.6 (Decelerator) & Grid-No.3 Voltage	300	500	volts
Grid-No.5 Voltage	180	300	volts
Grid-No.4 (Beam-Focus Electrode) Voltage	0 to 60	50 to 100	volts
Grid-No.2 (Accelerator) Voltage	300	300	volts
Grid-No.1 Voltage for Picture Cutoff[g]	-45 to -100	-45 to -100	volts
Typical Electrode Currents:			
Grid No.6 & 3	1.2	2.0	μa
Grid No.5	0.015	1.5	μa
Grid No.4	0.001	0.0015	μa
Grid No.2	300	300	μa
Lag—Per Cent of Initial Value of Signal-Output Current 1/20 Second after Illumination is Removed:[h]			
Maximum value	20	20	%
Typical value	15	15	%
Average "Gamma" of Transfer Characteristic for Signal-Output Current between 0.02 μa and 0.2 μa	0.65	-	
Minimum Peak-to-Peak Blanking Voltage:			
When applied to grid No.1	75	-	volts
When applied to cathode	20	-	volts
Limiting Resolution at Center of Picture	600	750	TV Lines
Amplitude Response to a 400 TV Line Square-Wave Test Pattern at Center of Picture	15	25	%
Alignment Coil	(j)	(j)	

Average-Sensitivity Operation

(Under typical operating conditions specified for either low- or high-voltage operation)

Faceplate Illumination (Highlight)	1.0	fc
Target Voltage[km]	20 to 40	volts
Dark Current[n]	0.02	μa
Signal-Output Current[p]	0.2	μa

High-Sensitivity Operation

(Under typical operating conditions specified for either low- or high-voltage operation)[q]

Faceplate Illumination (Highlight)	0.1	fc
Target Voltage[km]	30 to 60	volts
Dark Current[n]	0.10	μa
Signal-Output Current[p]	0.10	μa

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[a] This capacitance, which effectively is the output impedance of the 8134, is increased when the tube is mounted in the deflecting-yoke assembly. The resistive component of the output impedance is in order of 100 megohms.

[b] Made by Cinch Manufacturing Company, 1026 S. Homan Ave., Chicago 24, Illinois.

[c] Made by Cleveland Electronics Inc., 1974 East 61st St., Cleveland, Ohio.

[d] The *maximum ratings* in the tabulated data are established in accordance with the following definition of the *Absolute-Maximum Rating System* for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum

value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

e The maximum voltage difference between grids No.6 & 3 and No.5 should not exceed 300 volts.

f Video amplifiers must be designed properly to handle peak target currents of this magnitude to avoid amplifier overload or picture distortion.

g With no blanking voltage on grid No.1.

h For initial signal-output current of 0.2 microampere and a dark current of 0.02 microampere.

j The alignment coil should be located on the tube so that its center is at a distance of 4-15/16 inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube and the deflecting yoke.

k Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.

m The target voltage for each 8134 must be adjusted to that value which gives the desired operating dark current.

n The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in scanning velocity produces a black-level error in direct proportion to the change in scanning velocity.

p Defined as the component of the highlight target current after the dark-current component has been subtracted.

q Operation at this higher sensitivity level will result in a decrease in the resolution capability of the 8134.

OPERATING CONSIDERATIONS

The *target connection* may be made by a suitable spring-finger contact bearing against the edge of the metal ring at the face end of the tube.

The *front end of the deflecting-alignment assembly* should be positioned 3/4-inch to the rear of the tube faceplate as shown in Fig. 1. Positioning the assembly further to the rear of the tube faceplate increases deflection sensitivity but impairs corner focus.

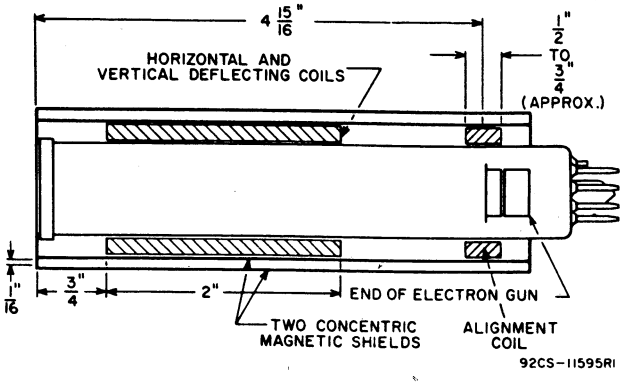


Fig. 1 - Recommended Location of Deflecting Yoke and Alignment Coil to obtain Optimum Geometry and Optimum Output Signal Uniformity.

Magnetic shielding of the 8134 is required to minimize the effects of extraneous fields on tube performance. AC fields are particularly objectionable in that they seriously impair the resolution of the 8134. A suitable shield for the 8134 consists of two 0.005-inch thick concentric cylinders of shielding material such as Conetic AA, MuMetal, or equivalent, separated by a 1/16-inch insulating layer. The shield should extend from the faceplate of the tube to the end of the electron gun.

Control over *beam landing* is effected by adjustment of grid No.6 & 3 and grid-No.5 voltages. A ratio of 1.67 between grid-No.6 & 3 voltage and grid-No.5 voltage should be maintained for most uniform signal output. When the proper voltage ratio between these electrodes is employed, beam-landing error is minimized and extremely good uniformity of sensitivity and focus over the entire scanned target area is obtained. The voltage relationship between grid No.6 & 3 and grid No.5 should be determined by the camera designer and should not be a camera operating adjustment.

Provisions should be made in the camera installation to hold the faceplate temperature of the 8134 at a *steady value* within the recommended range. Dark current increases with increasing temperature. It is highly desirable to operate the 8134 at a steady temperature to maintain dark current at a preselected value. This mode of operation ensures both optimum and stable day-to-day performance. If such provisions cannot be made, changes in target voltage may be required from time to time to maintain the desired picture quality.

As *target voltage* is increased, dark current also increases. The range of target voltage for various dark current levels of different 8134's is shown in Fig. 2. It should be noted that the range of target voltage to produce a given dark current, and therefore a given sensitivity, is very narrow for the 8134. Individual 8134's will therefore *have substantially identical performance characteristics when operated with an identical value of dark current.* For proper adjustment of the target voltage on each 8134 see SET-UP PROCEDURE on pages 6 and 7.

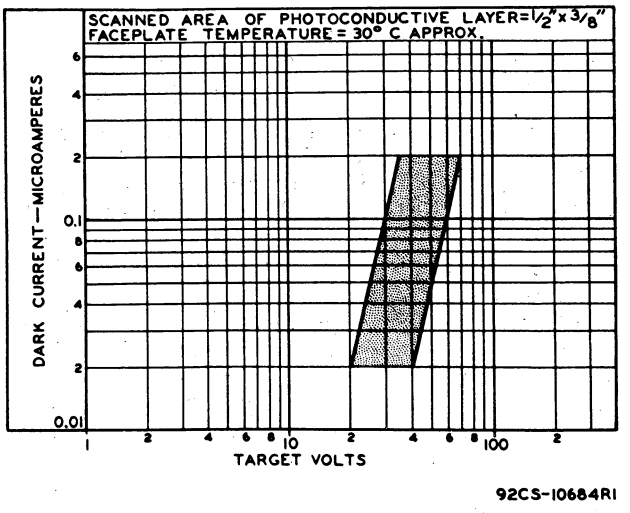


Fig. 2 - Range of Dark Current for Type 8134.

The *temperature of the faceplate* should not exceed 71° C (160° F), either during operation or storage of the 8134. Operation with a faceplate temperature in the range from about 25° to 35° C (77° to 95° F) is recommended. The temperature of the faceplate is determined by the combined heating effects of the incident illumination on the faceplate, the associated components, and the tube itself. To reduce these heating effects and permit operation in the preferred temperature range under conditions of extremely high light levels, the use of an infrared filter between the object and the camera lens is recommended.

Persistence or lag of the photoconductive layer is given in Fig. 3 for two values of dark current. Each curve shows the decay in signal-output current from an initial value of 0.2 microampere after the illumination is cut off.

Definition, focus uniformity, and picture quality decrease with decreasing grid-No. 6 & 3 and grid-No. 5 voltage. In general, grid No. 6 & 3 and grid-No. 5 should be operated at or above 300 and 180 volts, respectively. As shown in Fig. 4, a substantial increase in both limiting resolution and in amplitude response is obtained by operating the 8134 with higher voltages applied to these electrodes. It is to be noted that deflection current requirements of the 8134 increase with increasing grid-No. 6 & 3 voltage, as shown in Fig. 5.

For *pickup involving low illumination levels*, a good picture can be obtained with a highlight illumination of less than 0.1 footcandle on the faceplate of the 8134. Under such low-level illumination conditions, the lag will be somewhat greater and the black-level uniformity will be somewhat poorer than for pickup conditions with higher faceplate illumination and lower dark current.

When the 8134 is used with illumination levels of 1 to 5 footcandles on the faceplate, a dark current of 0.02 microampere or less is required.

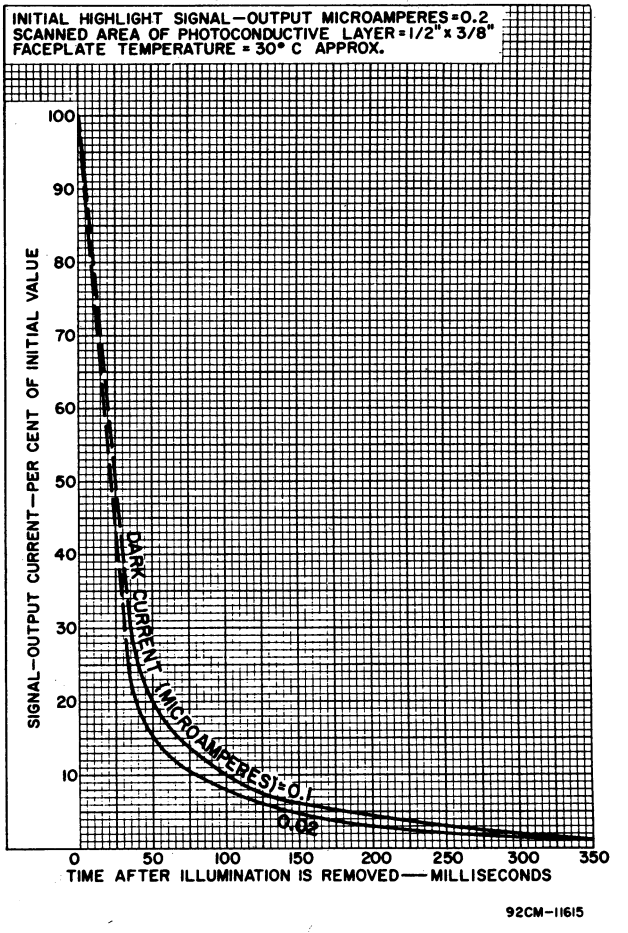


Fig. 3 - Typical Persistence Characteristics of Type 8134.

The exact value of target voltage to give the required dark current will depend on the individual tube and on the temperature at which its faceplate is operated. It is important that the tube be allowed to reach a stable operating temperature before the operating dark current is determined; otherwise, the dark current will change as the temperature of the tube changes.

Signal Output and Light Transfer Characteristics. Typical signal output as a function of uniform 2870° K tungsten

illumination on the photoconductive layer for different values of dark current is shown in Fig. 6. It is to be noted that these curves are for a typical 8134 under the conditions indicated. From these curves, it will also be noted that the illumination must be increased about

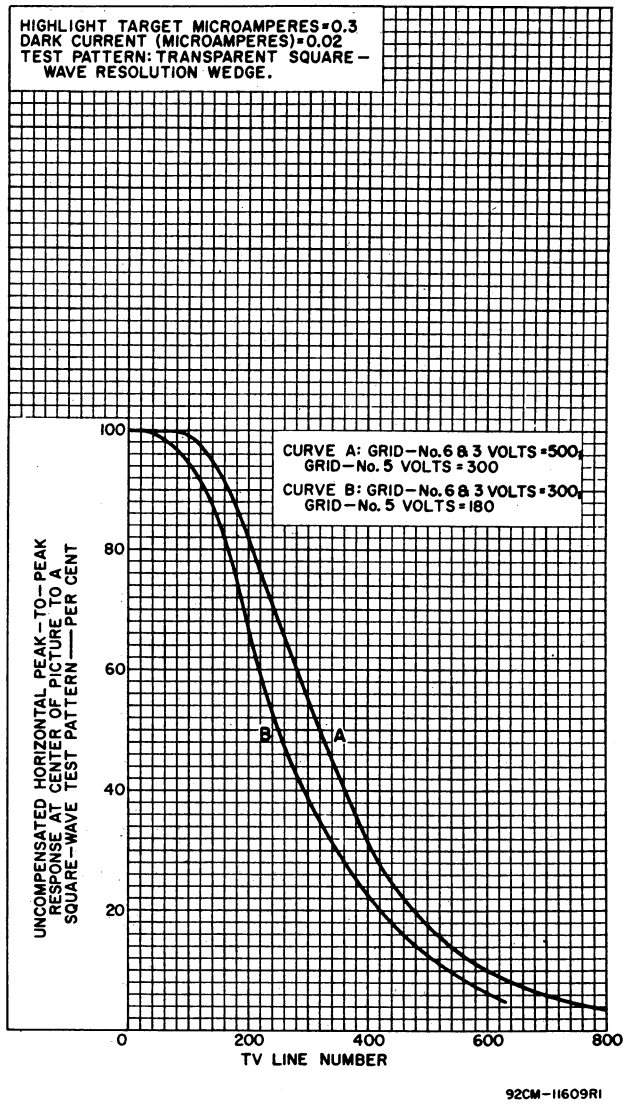


Fig. 4 - Curves Showing Typical Uncompensated Horizontal Square-Wave Response of Type 8134.

30 times to produce an increase of 10 times in signal-output current for any given value of dark current.

The average "gamma", or slope, of the light transfer characteristic curves shown in Fig. 6 is approximately 0.65. This value is relatively constant over an adjustment range of 4 to 1 in target voltage, or 50 to 1 in dark current, for a signal-output current range between 0.01 and 0.3 microampere. Close uniformity in the value of gamma between individual 8134's is maintained to insure satisfactory operation of color cameras in which the signal-output currents of the three 8134's must match closely over a wide range of scene illumination. Because its transfer characteristic is approximately the complement of the transfer characteristic of a picture tube, the 8134 can produce a picture having proper tone rendition.

The *spectral response* of the 8134 is shown in Fig. 7.

Full-size scanning of the photoconductive target area should always be used to obtain maximum sensitivity and maximum resolution. It should be noted that overscanning the photoconductive layer produces a smaller-than-normal picture on the monitor.

Underscanning of the photoconductive layer, i.e., scanning an area of the layer less than 1/2" x 3/8", should never be permitted. This condition which produces a larger-than-normal picture on the monitor, not only causes sacrifice in sensitivity and resolution, but also may cause permanent change in sensitivity and dark current of the underscanned area. An underscanned area showing such a change will be visible in the picture when full-size scanning is restored.

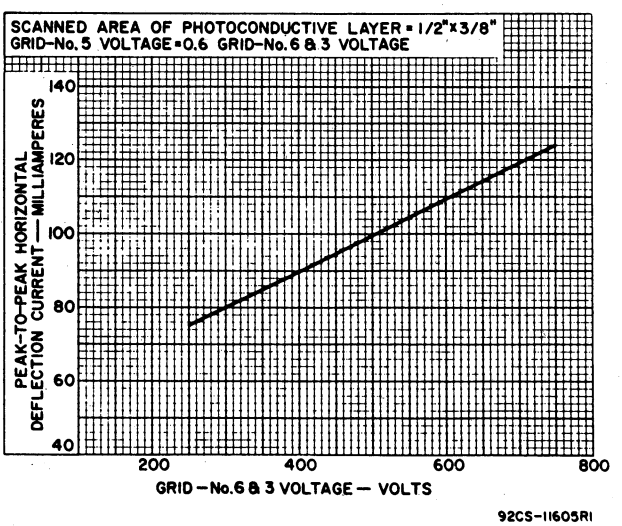


Fig. 5 - Deflection Current as a Function of Grid-No. 6 & 3 Voltage.

SET-UP PROCEDURE

The *sequence of adjustments* in operating the 8134 is as follows: With the Grid-No.1 Voltage Control set for maximum negative bias (beam cutoff), Target Voltage Control set for the minimum voltage shown under *Typical Operation*, and Deflection Controls set for maximum overscan, apply other voltages to the 8134 as indicated under *Typical Operation*.

Next, with a 1/2" x 3/8" mask centered on the face of the tube, and with the iris set for minimum opening, decrease the grid-No.1 bias to just bring out the highlight details of the picture on the monitor. Adjust the Beam-Focus Voltage Control, the lens stop, and the optical focus to obtain the best picture. Reduce horizontal and vertical scanning so that the edges of the image extend just outside the scanned area on the monitor. Then adjust the alignment field so that the center of the picture does not move as the beam-focus voltage is varied. Some readjustment of horizontal and vertical centering may be necessary after alignment.

For high-sensitivity operation of the 8134 the following procedure should be used; with no illumination on the face of the tube, increase the target voltage until non-uniformities in dark current become objectionable. Then reduce the

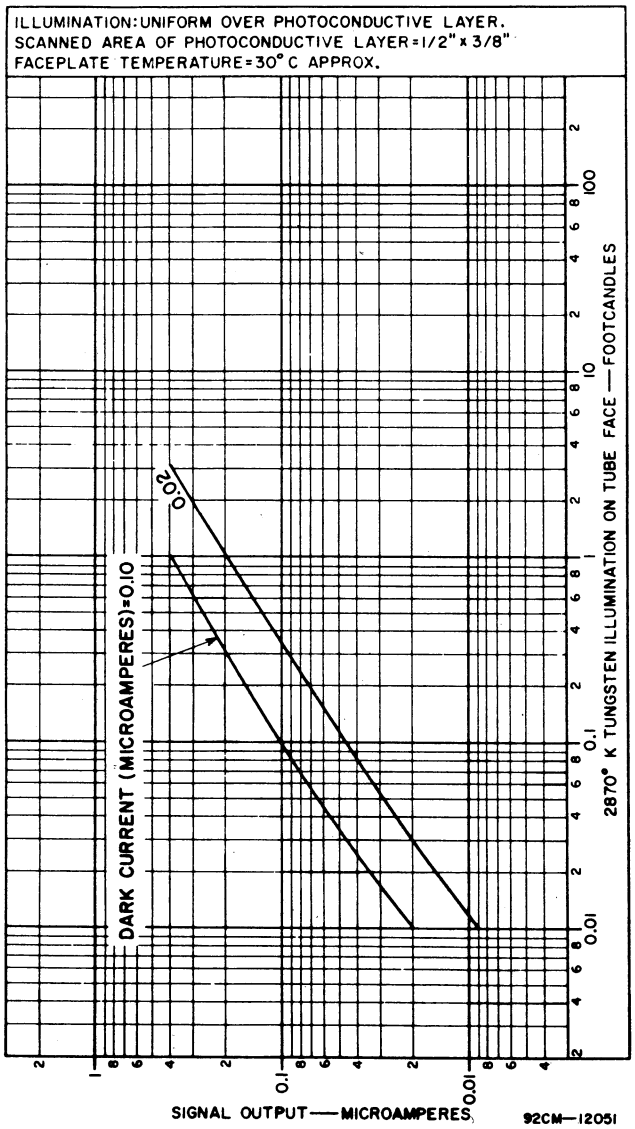


Fig. 6 - Light Transfer Characteristics of a Typical 8134 Vidicon.

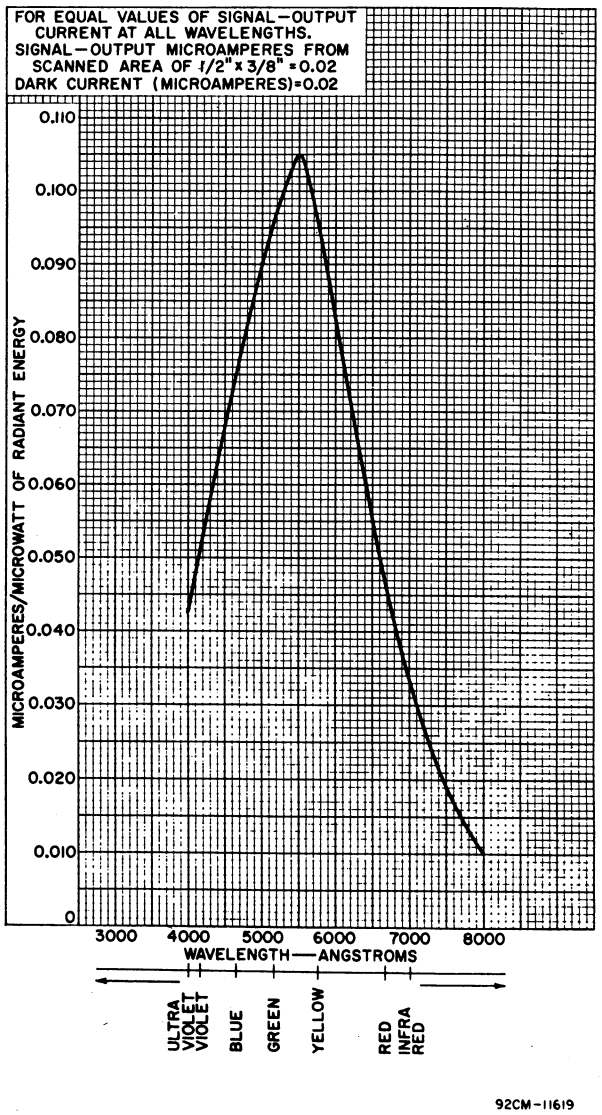


Fig. 7 - Typical Spectral Sensitivity Characteristic of Type 8134.

target voltage slightly until the dark current becomes uniform.

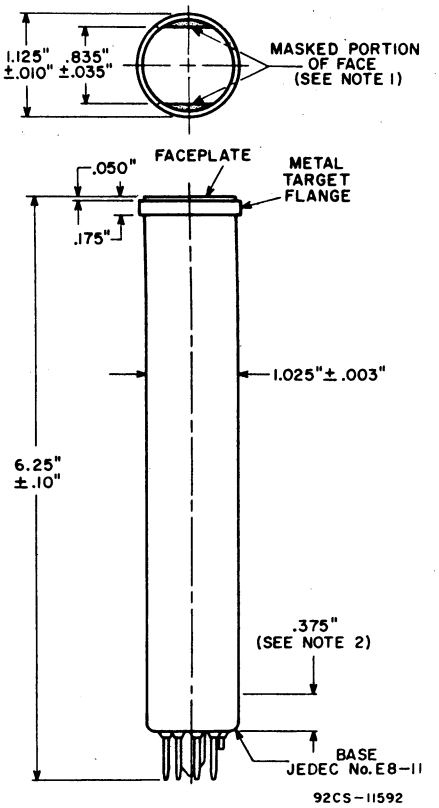
Next open the lens and adjust the aperture to obtain a picture of the desired quality and depth of focus. Adjust the grid-No.1 bias voltage so that the highlights are just discharged. If the beam current is too high, a picture of poor resolution and poor quality will result. If the highlights cannot be discharged or the picture quality is unsatisfactory, it may be an indication that the target voltage is too high. In this case the target voltage should be reduced and the grid-No.1 bias voltage again adjusted until the highlights are just discharged.

For average-sensitivity operation of the 8134 where more than the usual amount of room lighting is available, the adjustments are the same as those used for high-sensitivity operation except that target voltage is increased with the lens capped until the background picture viewed on the monitor just begins to become brighter. This method of operating the 8134 results in decreased lag in the picture.

For operation at high light levels—such as bright sunlight—the camera adjustments are similar to those shown for average-sensitivity operation. The target voltage is decreased so that scene highlights are just discharged and a picture of satisfactory quality is obtained.

Proper adjustment of the dark current, the peak signal-output current, and the grid-No.1 bias, will result in a picture of good quality with a minimum smearing of moving objects.

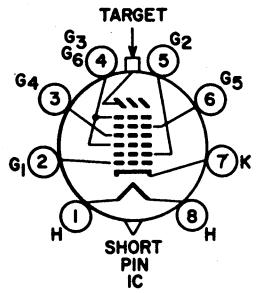
DIMENSIONAL OUTLINE



NOTE 1: STRAIGHT SIDES OF MASKED PORTIONS ARE PARALLEL TO THE PLANE PASSING THROUGH TUBE AXIS AND SHORT INDEX PIN.

NOTE 2: WITHIN THIS DISTANCE, DIAMETER OF BULB IS 1.025" + 0.003" −0.030".

BASING DIAGRAM
Bottom View



DIRECTION OF LIGHT:
INTO FACE END OF TUBE

8LN

PIN 1: HEATER
PIN 2: GRID No.1
PIN 3: GRID No.4
PIN 4: GRIDS No.3 & No.6
PIN 5: GRID No.2
PIN 6: GRID No.5
PIN 7: CATHODE
PIN 8: HEATER
FLANGE: TARGET
SHORT INDEX PIN:
INTERNAL CONNECTION—MAKE NO CONNECTION