

Vidicon

**Ruggedized, Magnetic-Focus, Magnetic-Deflection
Type Having Separate-Mesh Connection for Compact
TV Cameras Where Severe Shock and Vibration
Conditions Exist**

GENERAL

Heater, for Unipotential Cathode:

Voltage (AC or DC) $6.3 \pm 10\%$ V

Current at 6.3 volts 0.3 A

Direct Interelectrode Capacitance:^a

Target to all other electrodes 4.6 pF

Spectral Response See *RCA Type II Spectral
Response* at front of this section

Photoconductive Layer:

Maximum useful diagonal of
rectangular image (4 x 3
aspect ratio) 0.62 in

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. The masking is for orientation
only and does not define the proper scanned area of the
photoconductive layer.

Focusing Method Magnetic

Deflection Method Magnetic

Overall Length $5.12" + 0.13"-0.06"$ Greatest Diameter $1.125" \pm 0.010"$

Bulb T8

Bulb Diameter $1.025" \pm 0.003"$

Base Small-Button Ditetra 8-Pin, (JEDEC No.E8-11)

Socket Cinch^b No.54A18088, or equivalent

Deflecting Yoke-Focusing Coil-

Alignment-Coil Assembly Cleveland Electronics^{c,d}
VYFA-355-2, or equivalent

Operating Position Any

Weight (Approx.) 2 oz

ABSOLUTE MAXIMUM RATINGS*For scanned area of $1/2" \times 3/8"$* Grid-No.4 Voltage^f 1000 max. VGrid-No.3 Voltage^f 1000 max. V

4503A

Grid-No.2 Voltage	350 max.	V
Grid-No.1 Voltage:		
Negative bias value	150 max.	V
Positive bias value	0 max.	V
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode	125 max.	V
Heater positive with respect to cathode	10 max.	V
Target Voltage	100 max.	V
Dark Current	0.25 max.	μA
Peak Target Current ^g	0.75 max.	μA
Faceplate:		
Illumination ^h	5000 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 and

Standard TV Scanning Rate

	Low- Voltage Mode	High- Voltage Mode	
Grid-No.4 (Decelerator) Voltage ^f	500	900	V
Grid-No.3 (Beam-Focus Electrode) Voltage ^f	300	540	V
Grid-No.2 (Accelerator) Voltage	300	300	V
Grid-No.1 Voltage for Picture Cutoff ⁱ	-65 to-100	-65 to-100	V
Average "Gamma" of Transfer Characteristic for signal- output current between 0.02 μA and 0.2 μA	0.65	0.65	
Visual Equivalent Signal-to- Noise Ratio (Approx.) ^k	300:1	300:1	
Lag-Per Cent of Initial Value of Signal-Output Current 1/20 Second After Illumination is Removed ^m	20	20	%
Minimum Peak-to-Peak Blanking Voltage:			
When applied to grid No.1	75	75	V
When applied to cathode	20	20	V

Limiting Resolution:			
At center of picture	1000	1100	TV lines
At corner of picture	600	700	TV lines
Amplitude Response to a 400 TV Line Square-Wave Test Pattern at Center of Picture			
	50	60	%
Field Strength at Center of Focusing Coil ⁿ			
	40 ± 4	58 ± 4	G
Peak Deflecting-Coil Current:			
Horizontal	350	480	mA
Vertical	20	28	mA
Field Strength of Adjustable Alignment Coil ^p			
	0 to 4	0 to 4	G
<i>High-Sensitivity Operation—0.1 Footcandle on Faceplate</i>			
Faceplate Illumination (Highlight)			
		0.1	fc
Target Voltage ^{q,r}		30 to 60	V
Dark Current ^s		0.1	μA
Signal-Output Current: [†]			
Typical		0.1	μA
<i>Average-Sensitivity Operation—1.0 Footcandle on Faceplate</i>			
Faceplate Illumination (Highlight)			
		1.0	fc
Target Voltage ^{q,r}		20 to 40	V
Dark Current ^s		0.02	μA
Signal-Output Current: [†]			
Typical		0.20	μA
<i>High-Light Level Operation—10 Footcandles on Faceplate</i>			
Faceplate Illumination (Highlight)			
		10	fc
Target Voltage ^{q,r}		10 to 22	V
Dark Current ^s		0.005	μA
Signal-Output Current: [†]			
Typical		0.3	μA

Environmental Performance Data

The 4503A is designed to withstand the following operational and non-operational environmental tests.

Rejection Criteria: After completion of all tests, the tube will meet the performance characteristics specified under Typical Operation and Performance Data. However, the number of spots specified under the Spurious Signal

Test may increase slightly if the tube is subjected to the maximum shock and vibration levels specified below. During the vibration test the tube is positioned so that its major axis is parallel to the surface of the earth.

Operational Tests. The tube is operated as shown under the Typical Low-Voltage Mode in the tabulated data.

1. Low-Frequency Sinusoidal Vibration. The tube is subjected to 10 g peak sinusoidal vibration, 5 to 500 Hz, per MIL-STD-810A, Equipment Class 3, Equipment Mounting A, Curve C of **Figure 514-1**. The vidicon will show no loss in resolution and the amplitude of any generated spurious signals will not exceed 20 per cent of the maximum white-signal level.
2. High-Frequency Sinusoidal Vibration. The tube is subjected to 10 g peak sinusoidal vibration, 5 to 2000 Hz, per MIL-STD-810A, Equipment Class 3, Equipment Mounting A, Curve C of **Figure 514-3**. The vidicon will maintain a minimum resolution of 500 TV lines throughout this test. The amplitude of any generated spurious signals will not exceed 75 per cent of the maximum white-signal level.
3. Random Vibration. The tube is subjected to 12 g, RMS, 20 to 2000 Hz, per MIL-STD-810A, Equipment Class 3, Equipment Mounting A, Curve D of **Figure 514-4**. The vidicon will show no loss in resolution and the amplitude of any generated spurious signals will not exceed 50 per cent of the maximum white-signal level.

Non-Operational Tests

1. Shock. The tube is subjected per MIL-STD-810A, method 516.1, **Figure 516-1**, procedure V, to a 100 g, 6 millisecond terminal peak sawtooth shock pulse in each of three orthogonal axes, one of which is parallel to the major axis of the tube. A total of 18 impact shocks are applied.
2. Vibration
 - a. Sinusoidal — The tube is subjected to 15 g peak

sinusoidal vibration, 5 to 2000 Hz per MIL-STD-810A, Equipment Class 3, Equipment Mounting A, Curve D on **Figure 514-3**.

- b. Random — The tube is subjected to 25 g, RMS, 20 to 2000 Hz, per MIL-STD-810A, Equipment Class 3, Equipment Mounting A, Curve G on **Figure 514-4**.
3. Temperature-Pressure (Altitude) Tests. The vidicon and associated components are subjected, per MIL-E-5400A* par.3.2.20, 3.2.20.1, and 3.2.20.1.1, to the separate and combined effects of varying temperature of 0° to +55° C and to varying barometric pressure of 30" to 3.4" of mercury. The pressure corresponds to sea level and to an altitude of 50,000 feet, respectively.
4. Temperature-Humidity Tests. The vidicon is subjected, per MIL-E-5400A* par.3.2.30.2B, to relative humidities up to and including 95 per cent at temperatures up to and including +50° C.

* 1 January 1956

- a This capacitance, which effectively is the output impedance of the tube, is increased when the tube is mounted in the deflecting-yoke and focusing-coil assembly. The resistive component of the output impedance is in the order of 100 megohms.
- b Made by Cinch Manufacturing Corporation, 1501 Morse Ave., Elk Grove Village, Ill. 60007.
- c Made by Cleveland Electronics Inc., 2000 Highland Road, Twinsburg, Ohio 44087.
- d This component is chosen to provide tube operation with minimum beam-landing error and is used to evaluate tube performance data. The Environmental Performance Data are obtained using a Cleveland Electronics assembly No.VYFA-164-2, or equivalent. When the tube is to be operated in severe environments, this or other suitably ruggedized components should be used to take full advantage of the environmental capabilities of the tube.
- f Grid-No.4 voltage must always be greater than grid-No.3 voltage. The maximum voltage difference between these electrodes, however, should not exceed 600 volts. The recommended ratio of grid-No.3 to grid-No.4 voltage is 6/10 to

5/10; best geometry being provided when the ratio is 6/10, and most uniform signal output when the ratio is 5/10. The operator should select the ratio within this range which provides the desired performance.

- ^g Video amplifiers must be designed properly to handle target currents of this magnitude to avoid amplifier overload or picture distortion.
- ^h For conditions where "white light" is uniformly diffused over entire tube face.
- ⁱ With no blanking voltage on grid No.1.
- ^k Measured with high-gain, low-noise, cascode-input-type amplifier having bandwidth of 5 MHz and a peak signal-output current of 0.35 microampere. Because the noise in such a system is predominately of the high-frequency type, the visual equivalent signal-to-noise ratio is taken as the ratio of the highlight video-signal current to rms noise current, multiplied by a factor of 3.
- ^m For initial signal-output current of 0.3 microampere and a dark current of 0.02 microampere.
- ⁿ The polarity of the focusing coil should be such that a north-seeking pole is attracted to the image end of the focusing coil, with the indicator located outside of and at the image end of the focusing coil.
- ^p The alignment coil should be located on the tube so that its center is at a distance of 3-11/16 inches from the face of the tube, and be positioned so that its axis is coincident with the axis of the tube, the deflecting yoke, and the focusing coil.
- ^q Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.
- ^r The target voltage for each tube must be adjusted to that value which gives the desired operating signal current.
- ^s 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.
- ^t Defined as the component of the highlight target current after the dark-current component has been subtracted.

Spurious Signal Test

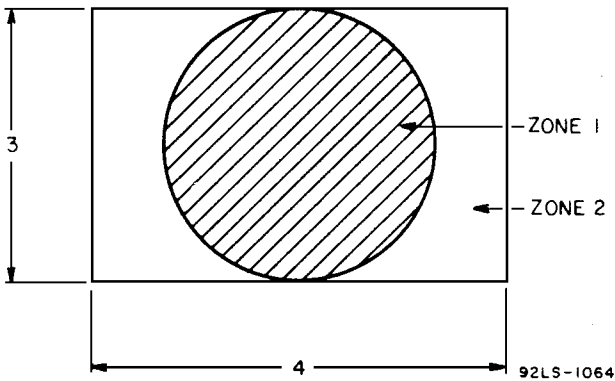


Fig. 1

This test is performed using a uniformly diffused white test pattern that is separated into two zones as shown in **Figure 1**. The 4503A is operated under the conditions specified under Typical Operation and Performance Data with the lens adjusted to provide a target current of 0.3 microampere. The tubes are adjusted to provide maximum picture resolution. Spurious signals are evaluated by size which is represented by equivalent numbers of raster lines in a 525 TV line system. Allowable spot size for each zone is shown in Table 1. To be classified as a spot, a contrast ratio of 1.5:1 must exist for white spots and 2:1 for black spots. Smudges, streaks, or mottled and grainy background must have a contrast ratio of 1.5:1 to constitute a reject item.

Table 1 For scanned area of $1/2'' \times 3/8''$

Equivalent Number of Raster Lines	Zone 1 Allowed Spots	Zone 2 Allowed Spots
over 4	0	0
4 but not including 3	0	1
3 but not including 1	2	3
1 or less	■	■

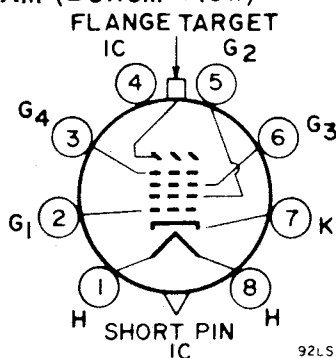
Minimum separation between any 2 spots greater than 1 raster line is limited to 16 raster lines.

■ Spots of this size are allowed unless concentration causes a smudged appearance.

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TERMINAL DIAGRAM (Bottom View)

Pin 1: Heater
 Pin 2: Grid No.1
 Pin 3: Grid No.4
 Pin 4: Internal
 Connection —
 Do Not Use
 Pin 5: Grid No.2
 Pin 6: Grid No.3
 Pin 7: Cathode

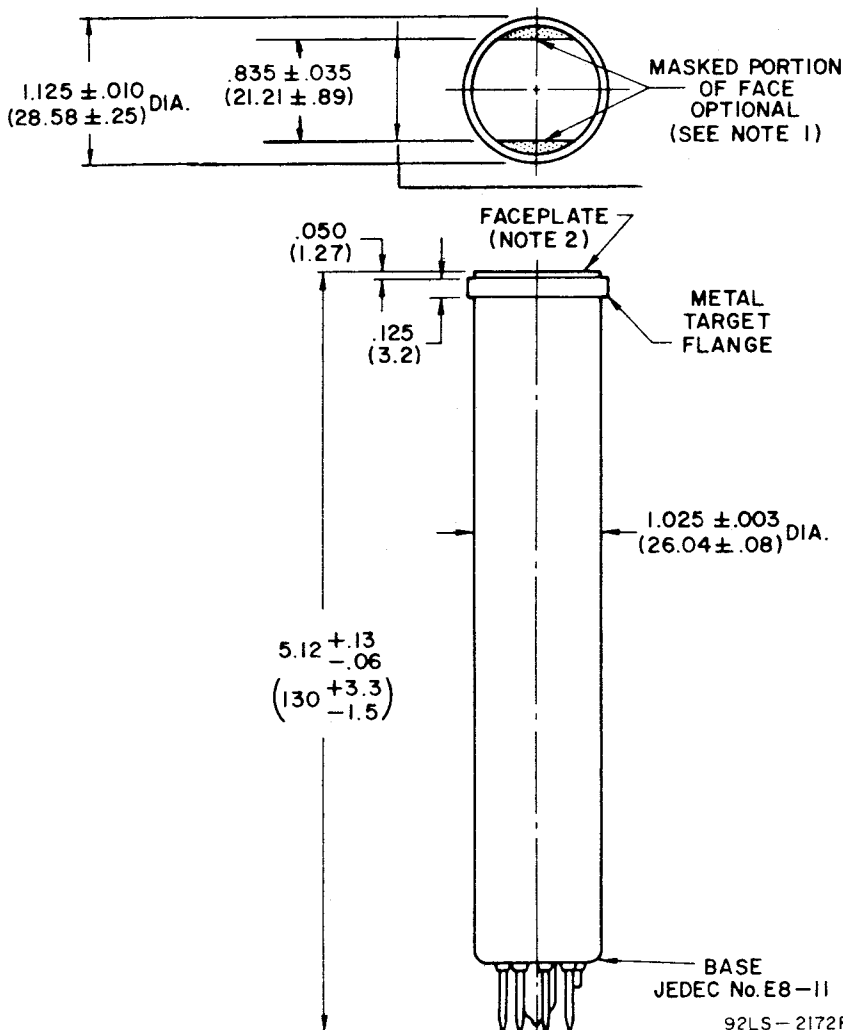


Pin 8: Heater
 Flange: Target
 Short Index Pin:
 Internal Connection — Make No
 Connection

DIRECTION OF LIGHT:
 INTO FACE END
 OF TUBE

92LS-2177

DIMENSIONAL OUTLINE - Dimensions in Inches (mm)

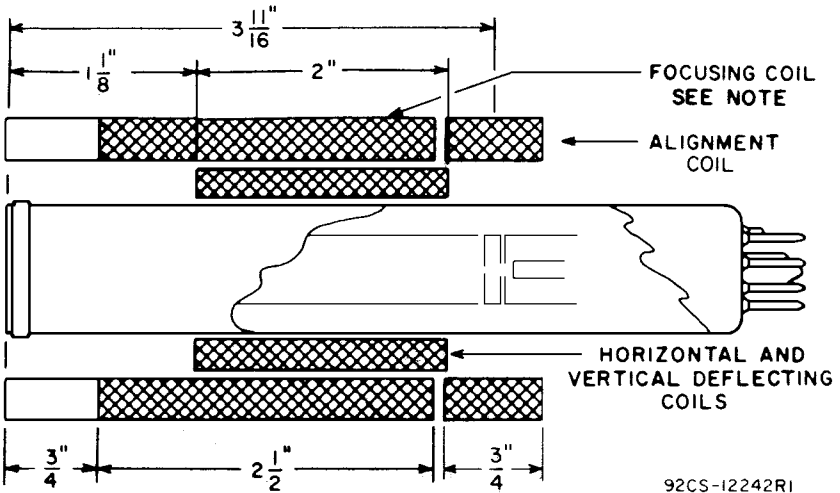


Note 1: Straight sides of masked portions are parallel to the plane passing through tube axis and short index pin.

Note 2: Faceplate glass is Corning No.7056 having a thickness of $0.094" \pm 0.012"$.

RECOMMENDED LOCATION AND LENGTH OF DEFLECTING, FOCUSING, AND ALIGNMENT COMPONENTS

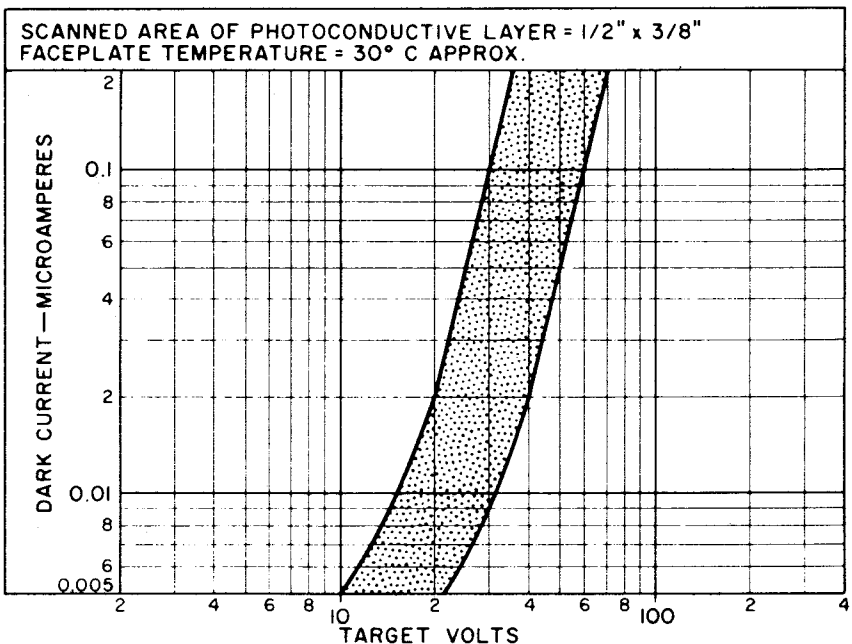
To Obtain Minimum Beam-Landing Error



92CS-12242R1

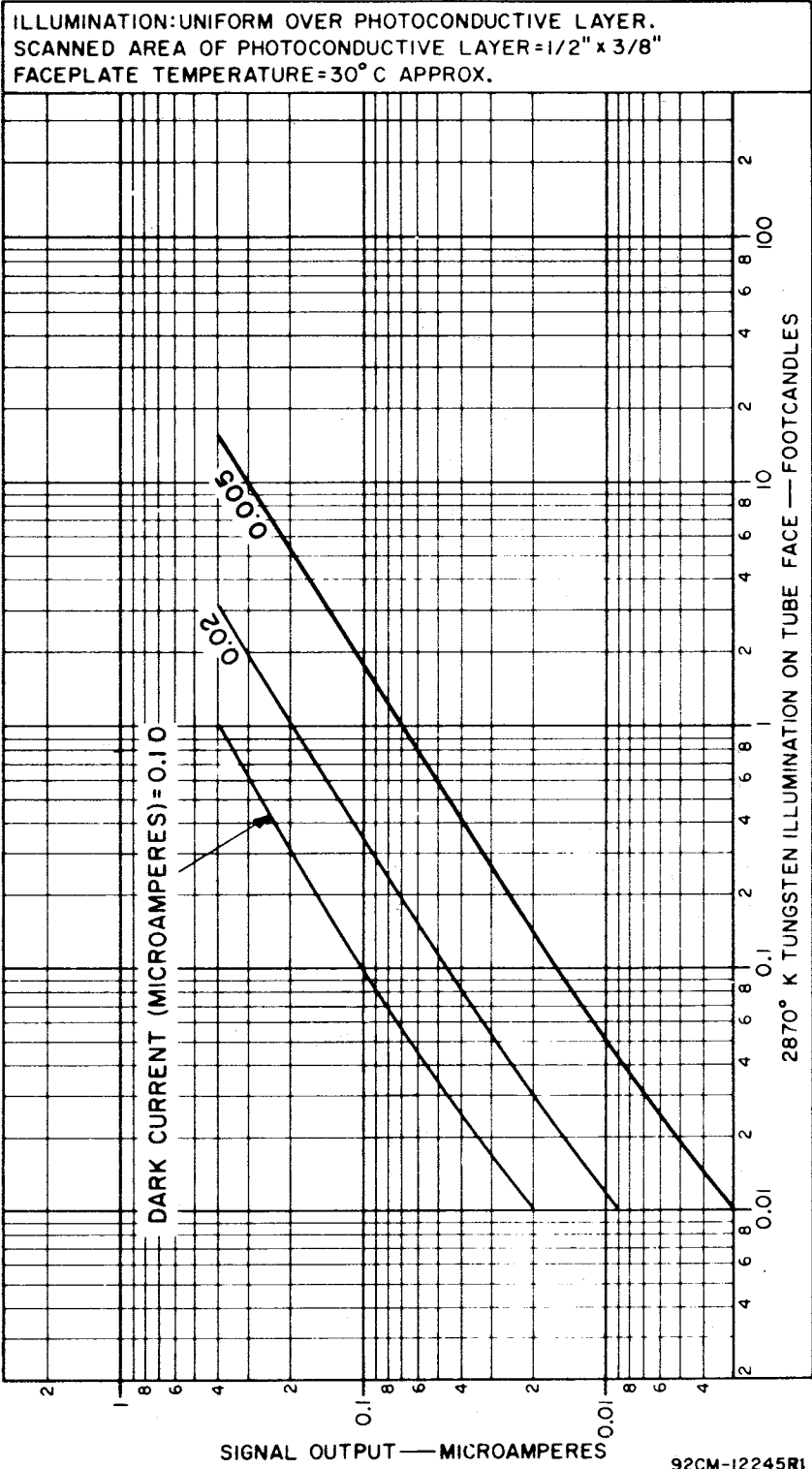
Note: Cross-hatching indicates wound portion of focusing coil.

RANGE OF DARK CURRENT



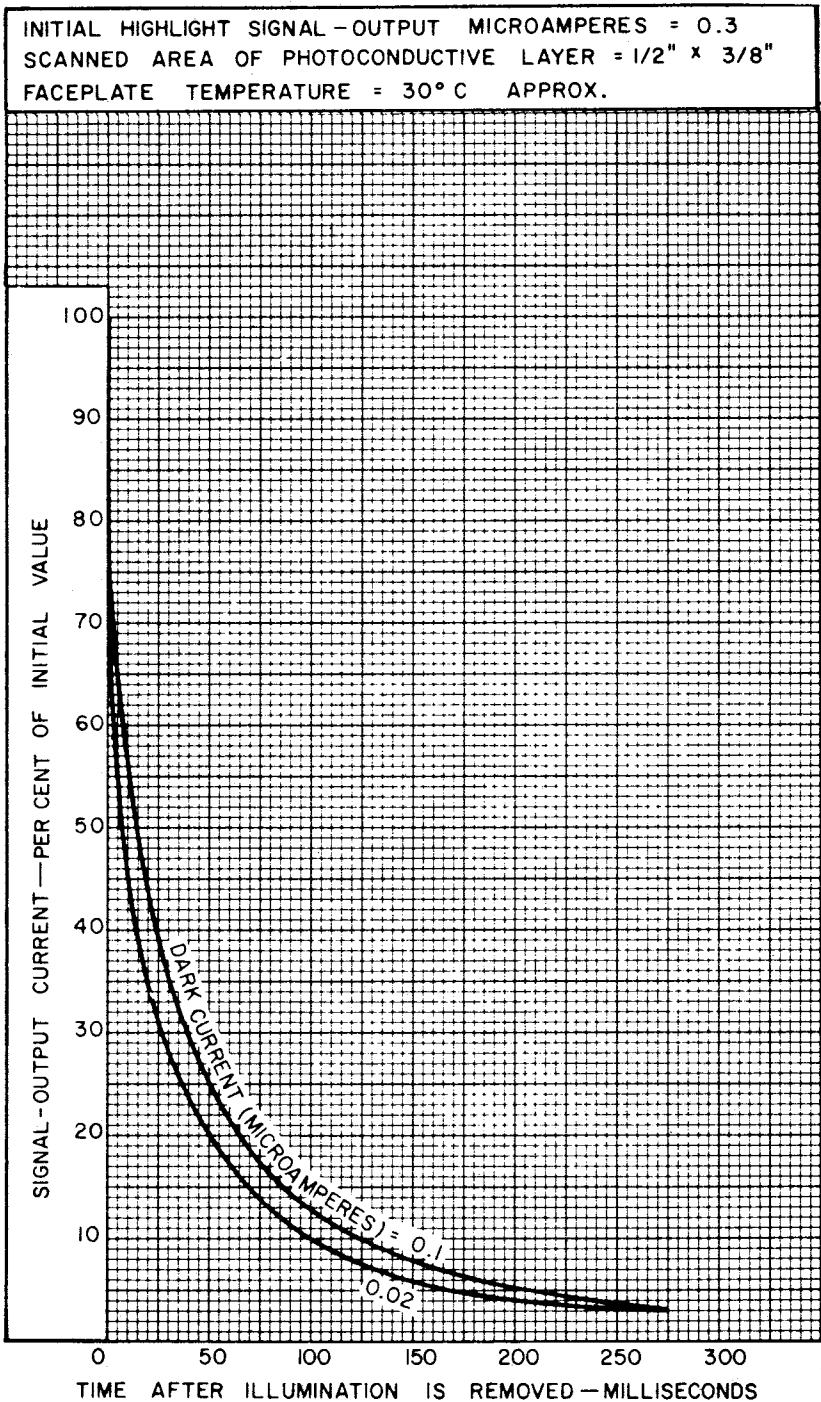
92CS-12235

LIGHT TRANSFER CHARACTERISTICS



92CM-12245R1

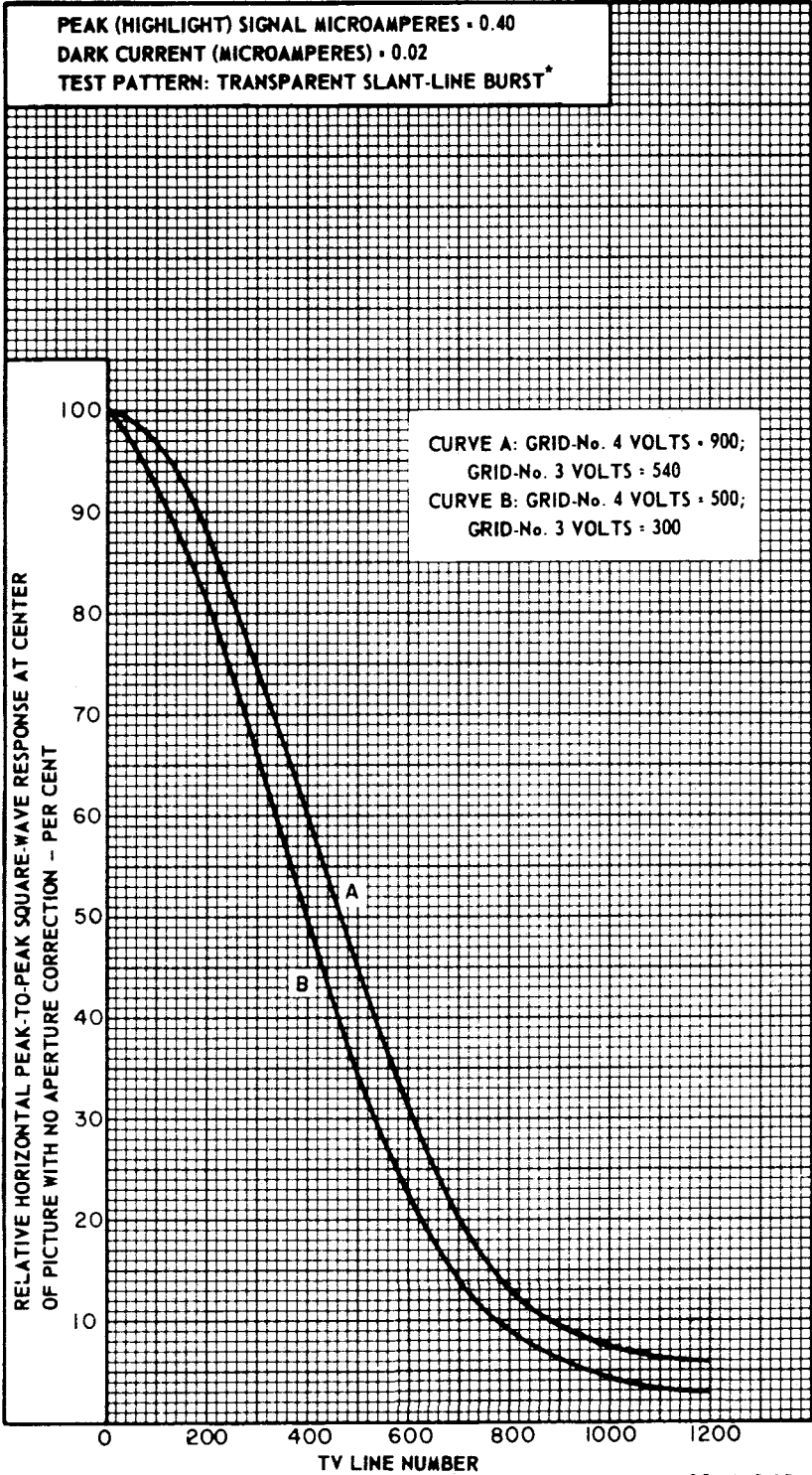
TYPICAL PERSISTENCE CHARACTERISTICS



92LM-2171

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HORIZONTAL SQUARE-WAVE RESPONSE



92LM-2195

*Amplitude response measured using the RCA P200 slant-line burst pattern with horizontal center response balanced on the 400 line chevrons.