

# 4532, 4532A

## Vidicons

Silicon-Diode Array Camera Tubes for all Conventional TV Pickup Systems. Cameras Employing the 8507A or 8541A can be Readily Adapted to Use the 4532A or 4532.

- Silicon Photoconductor Having Broad Spectra Range — 380 to 1100 nm
- Extremely High Sensitivity — 4350  $\mu\text{A}/\text{lm}$
- Extremely Low Lag
- Excellent Discharge Capability
- Very Low Dark Current
- No Burn-In

### ELECTRICAL

Heater Voltage:

|                                                      |       |
|------------------------------------------------------|-------|
| Operational                                          | 6.3 V |
| For standby with no other electrode voltages applied | 3.0 V |

AC or DC Heater Current at 6.3 Volts  
(nominal value) 0.10 A

Focusing Method Magnetic

Deflection Method Magnetic

Direct Interelectrode Capacitance:<sup>a</sup>

|                                |        |
|--------------------------------|--------|
| Target to all other electrodes | 4.6 pF |
|--------------------------------|--------|

### OPTICAL

Optical Distance  $0.113 \pm 0.020$  in  
( $2.87 \pm 0.51$  mm)

Spectral Response RCA Type V

Target:

Maximum useful diagonal of  
rectangular image 0.62 in (15.7 mm)

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 target.

### MECHANICAL

Overall Length  $6.250 \pm 0.125$  in ( $158.7 \pm 3.18$  mm)

Greatest Diameter  $1.125 \pm 0.010$  in ( $28.58 \pm 0.25$  mm)

Bulb Diameter  $1.020 + 0.030 - 0.035$  in  
( $25.9 + 0.76 - 0.89$  mm)



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Base . . . . . Small-Button Ditetrar 8-Pin, (JEDEC No.E8-11)  
 Socket . . . . . Cinch<sup>b</sup> No.8VT (133-98-11-015),  
 or equivalent  
 Deflecting Yoke — Focusing Coil — Alignment  
 Coil — Assembly . . . . Cleveland Electronics,<sup>c,d</sup> No.VYLFA-959,  
 (See Figure 2) Penn Tran,<sup>c,d</sup> No.1465, or equivalent  
 Operating Position . . . . . Any  
 Weight (approx.) . . . . . 2 oz

## MAXIMUM AND MINIMUM RATINGS, ABSOLUTE-MAXIMUM VALUES

|                                          | Min. | Max.              |                    |
|------------------------------------------|------|-------------------|--------------------|
| Heater-Voltage Tolerance . . . . .       | —5   | +5                | %                  |
| Grid-No.4 Voltage <sup>f</sup> . . . . . | —    | 350               | V                  |
| Grid-No.3 Voltage <sup>f</sup> . . . . . | —    | 350               | V                  |
| Grid-No.2 Voltage . . . . .              | —    | 350               | V                  |
| Grid-No.1 Voltage . . . . .              | —150 | 0                 | V                  |
| Heater-Cathode Voltage . . . . .         | —125 | 10                | V                  |
| Target Voltage . . . . .                 | —    | 300               | V                  |
| Peak Target Current . . . . .            | —    | 750               | nA                 |
| Faceplate:                               |      |                   |                    |
| Illumination <sup>g</sup> . . . . .      | { —  | 6x10 <sup>7</sup> | lm/ft <sup>2</sup> |
| Temperature:                             |      | 6x10 <sup>8</sup> | lux                |
| Operating and Storage . . . . .          | —    | 90                | °C                 |

## TYPICAL OPERATION

With tube operated in a Cleveland Electronics Assembly Type VYLFA-959, or equivalent; scanned area of 1/2" x 3/8" (12.7 mm x 9.5 mm); faceplate temperature of 30° ± 3° C; and standard CCIR "M", or EIA, TV scanning rate (525 lines, interlaced 2:1, frame time 1/30 second).

|                                                                            |        |    |
|----------------------------------------------------------------------------|--------|----|
| Grid-No.4 (Decelerator) Voltage <sup>f</sup> . . . . .                     | 340    | V  |
| Grid-No.3 (Beam-Focus Electrode) Voltage <sup>f</sup> . . . . .            | 290    | V  |
| Grid-No.2 (Accelerator) Voltage . . . . .                                  | 300    | V  |
| Peak-to-Peak Blanking Voltage:                                             |        |    |
| When applied to grid No.1 . . . . .                                        | 75     | V  |
| When applied to cathode . . . . .                                          | 20     | V  |
| Target Voltage <sup>h</sup> . . . . .                                      | 8      | V  |
| Focusing-Coil Current <sup>j</sup> . . . . .                               | 43 ± 2 | mA |
| Peak-to-Peak Deflecting-Coil Current:                                      |        |    |
| Horizontal . . . . .                                                       | 185    | mA |
| Vertical . . . . .                                                         | 15     | mA |
| Field Strength of Each Adjustable<br>Alignment Coil <sup>k</sup> . . . . . | 0 to 3 | G  |

**TYPICAL PERFORMANCE DATA**

Under the conditions shown under Typical Operation

|                                                                                                             |             |      |
|-------------------------------------------------------------------------------------------------------------|-------------|------|
| Peak Radiant Responsivity<br>(At 710 nanometers) . . . . .                                                  | 380         | mA/W |
| Grid-No.1 Voltage for Picture Cutoff <sup>m</sup> . . . . .                                                 | -60 to -100 | V    |
| Dark Current . . . . .                                                                                      | 7           | nA   |
| Average "Gamma" of Transfer Characteristic for a<br>Signal-Output Current between 4 nA and 400 nA . . . . . | 1           |      |
| Visual Equivalent Signal-to-Noise Ratio<br>(Approx.) <sup>n</sup> . . . . .                                 | 300:1       |      |

|                                                                                                                                 |   |   |
|---------------------------------------------------------------------------------------------------------------------------------|---|---|
| Lag — Per Cent of Initial Value of Signal-Output<br>Current 1/20 Second After Illumination is<br>Removed <sup>p</sup> . . . . . | 8 | % |
|---------------------------------------------------------------------------------------------------------------------------------|---|---|

Limiting Resolution:

|                                                                                                              |     |          |
|--------------------------------------------------------------------------------------------------------------|-----|----------|
| At center of picture . . . . .                                                                               | 700 | TV lines |
| At corner of picture . . . . .                                                                               | 600 | TV lines |
| Amplitude Response to a 400 TV Line Square-<br>Wave Test Pattern at Center of Picture <sup>q</sup> . . . . . | 40  | %        |

**Sensitivity to Tungsten Light Source<sup>r</sup>***Conditions*

|                                              |     |                            |
|----------------------------------------------|-----|----------------------------|
| Faceplate Illumination (Highlight) . . . . . | 0.1 | lm/ft <sup>2</sup><br>(fc) |
|----------------------------------------------|-----|----------------------------|

*Performance*

|                                                        |      |       |
|--------------------------------------------------------|------|-------|
| Sensitivity . . . . .                                  | 4350 | μA/lm |
| Typical Signal-Output Current <sup>s,t</sup> . . . . . | 565  | nA    |

**Sensitivity to Visible Light<sup>u</sup>***Conditions*

|                                                                                                                   |     |                            |
|-------------------------------------------------------------------------------------------------------------------|-----|----------------------------|
| Illumination from 2854 <sup>o</sup> K Light Source Incident<br>on Infrared Absorbing Filter (Highlight) . . . . . | 0.3 | lm/ft <sup>2</sup><br>(fc) |
|-------------------------------------------------------------------------------------------------------------------|-----|----------------------------|

*Performance*

|                                                        |     |       |
|--------------------------------------------------------|-----|-------|
| Sensitivity . . . . .                                  | 910 | μA/lm |
| Typical Signal-Output Current <sup>s,t</sup> . . . . . | 350 | nA    |

**Sensitivity to Infrared Light<sup>v</sup>***Conditions*

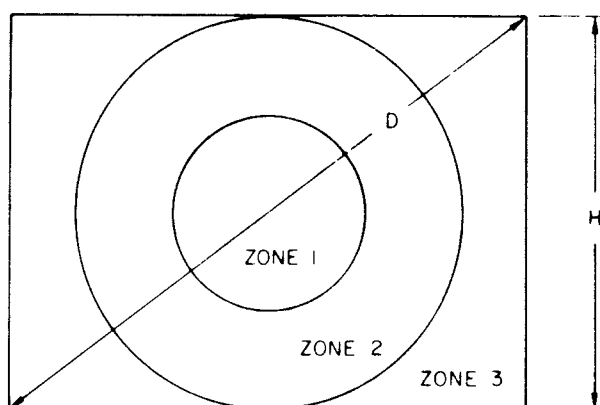
|                                                                                                                  |     |                            |
|------------------------------------------------------------------------------------------------------------------|-----|----------------------------|
| Illumination from 2854 <sup>o</sup> K Light Source Incident<br>on Visible Absorbing Filter (Highlight) . . . . . | 1.0 | lm/ft <sup>2</sup><br>(fc) |
|------------------------------------------------------------------------------------------------------------------|-----|----------------------------|

*Performance*

|                                                        |     |    |
|--------------------------------------------------------|-----|----|
| Typical Signal-Output Current <sup>s,t</sup> . . . . . | 540 | nA |
|--------------------------------------------------------|-----|----|

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## SPURIOUS SIGNAL TEST PATTERN



**FIGURE 1**

92LS-3224

- D — Active Target Diameter
- H — Raster Height (4 x 3 Aspect Ratio)
- Zone 1 — Diameter =  $H/2$ , Area  $\approx 15\%$
- Zone 2 — Diameter =  $H$ , Area  $\approx 45\%$
- Zone 3 — Peripheral Area  $\approx 40\%$

## SPURIOUS SIGNAL TEST

This test is performed with the tube viewing a uniformly diffused white test pattern that identifies the three zones shown in **Figure 1**. The tube is operated under the conditions specified under Typical Operating Values and is illuminated to provide a peak highlight signal current of 300 nanoamperes. The tube is 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 I for type 4532A and in Table II for type 4532. To be classified as a spot, the spurious signal amplitude must be at least 10% of the peak white signal under either highlight or capped conditions. Smudges, streaks, or mottled and grainy background must have a spurious signal amplitude of at least 3% to constitute a reject item.

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**Table I — Type 4532A**

| Blemish Size<br>(Equivalent<br>TV Lines) | Zone 1<br>Allowed Spots |       | Zone 2<br>Allowed Spots |       | Zone 3<br>Allowed Spots |       |
|------------------------------------------|-------------------------|-------|-------------------------|-------|-------------------------|-------|
|                                          | White                   | Black | White                   | Black | White                   | Black |
| Over 6                                   | 0                       | 0     | 0                       | 0     | 0                       | 0     |
| Over 4                                   | 0                       | 0     | 0                       | 1     | 0                       | 3     |
| Over 1                                   | 0                       | 2     | 2                       | 7     | 2                       | 9     |
| 1 or smaller                             | 0                       | *     | 0                       | *     | *                       | *     |

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.

**Table II — Type 4532**

| Blemish Size<br>(Equivalent<br>TV Lines) | Zone 1<br>Allowed Spots |       | Zone 2<br>Allowed Spots |       | Zone 3<br>Allowed Spots |       |
|------------------------------------------|-------------------------|-------|-------------------------|-------|-------------------------|-------|
|                                          | White                   | Black | White                   | Black | White                   | Black |
| Over 8                                   | 0                       | 0     | 0                       | 0     | 0                       | 0     |
| Over 6                                   | 0                       | 0     | 0                       | 2     | 0                       | 2     |
| Over 4                                   | 0                       | 0     | 0                       | 6     | 0                       | 6     |
| Over 1                                   | 1                       | 5     | 2                       | 16    | 3                       | 21    |
| 1 or smaller                             | 5                       | *     | *                       | *     | *                       | *     |

\*Spots of the size are allowed unless concentration causes a smudged appearance.

- 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 Company, 1501 Morse Avenue, Elk Grove Village, IL 60007.

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- c The magnetic component No.VYLFA-959 is made by Cleveland Electronics Inc., 2000 Highland Road, Twinsburg, OH 44087; the magnetic component No.1465, by Penn-Tran Inc., 1155 Zion Road, Bellefonte, PA
- d These components, when mounted along the tube axis as shown in **Figure 2**, will provide minimum beam landing error (maximum signal uniformity) at the recommended grid No.3/grid No.4 operating voltage ratio of 0.85. This ratio is determined by the electro-optical characteristics of the target-mesh region which are significantly different from those of the typical vidicon configuration.
- f Grid-No.4 voltage must always be greater than grid-No.3 voltage. The grid-No.3/grid-No.4 ratio of 0.85 provides optimum performance with regard to dark current uniformity, signal discharge uniformity and geometrical accuracy with the recommended deflection-coil assemblies. Cameras designed for the RCA vidicon types 8507A and 8541A can be modified to operate the 4532A and 4532 by providing a fixed target voltage of the proper value and the selection of suitable electrode voltages within the maximum ratings. (The 4532A and 4532 cannot be operated with conventional vidicon automatic signal control circuits operating on the target voltage.)
- g The tube can withstand the illumination contained in a focused image of the sun without damage.
- h This target voltage provides an optimum operating point consistent with maximum target discharge capability and optimizes other performance characteristics such as dark current uniformity and lag.
- j 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.
- k 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.
- m With no blanking voltage on grid No.1.

- n** Measured with high-gain, low-noise, cascode-input-type amplifier having bandwidth of 5 MHz and a peak signal-output current of 350 nanoamperes. 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.
- p** For an initial signal-output current of 200 nanoamperes and at recommended target voltage.
- q** Amplitude response is the signal amplitude from a given TV line number expressed as a per cent of the signal amplitude from a very-low-frequency (large-area) picture element. In practice, the large-detail reference is usually 15 TV lines with signal amplitude set equal to 100 per cent. The TV line numbers are determined by the number of equal-width black and white lines that will fit into the physical height of the image focused on the camera-tube faceplate.
- r** Light source is a tungsten-filament lamp having a lime-glass envelope. The lamp is operated at a color temperature of 2854° K.
- s** The deflecting circuits must provide extremely linear scanning for good signal reproduction. Signal current is dependent upon the scanning velocity. Any change in scanning velocity produces a signal error in 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.
- u** With the same light source specified in footnote (r) except an infrared absorbing filter (Schott Jena<sup>er</sup> KG-3, 5.5 mm thick, available from Fish-Schurman Corporation, 70 Portland Road, New Rochelle, NY 10802) is interposed between the light source and the faceplate of the tube.

For sharper infrared cutoff, the Kodak Series 305 Infrared Rejection Filter may be used. This series is available from Eastman Kodak Co., Special Products Sales, Rochester, NY 14650.

- v** With the same light source specified in footnote (r) except an infrared transmitting filter (Corning C.S. No.7-56, 2540 glass—available from the Corning Glass Works, Corning, NY 14830) is interposed between the light source and the faceplate of the tube.

Kodak filters Nos.87 or 87C may be preferred for some applications.

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## WARNING

Failure to observe the maximum dc electrode voltage ratings can drastically reduce the life expectancy of these tubes. When operated within ratings with the recommended deflection-focusing coil assemblies, the full performance capabilities of the silicon-diode array target will be easily realized. Normally, a tube life expectancy of many thousands of hours of useful service can be obtained when the tube is operated within the specified maximum ratings.

## RECOMMENDED LOCATION AND LENGTH OF DEFLECTING, FOCUSING, AND ALIGNMENT COMPONENTS TO OBTAIN MINIMUM BEAM-LANDING ERROR

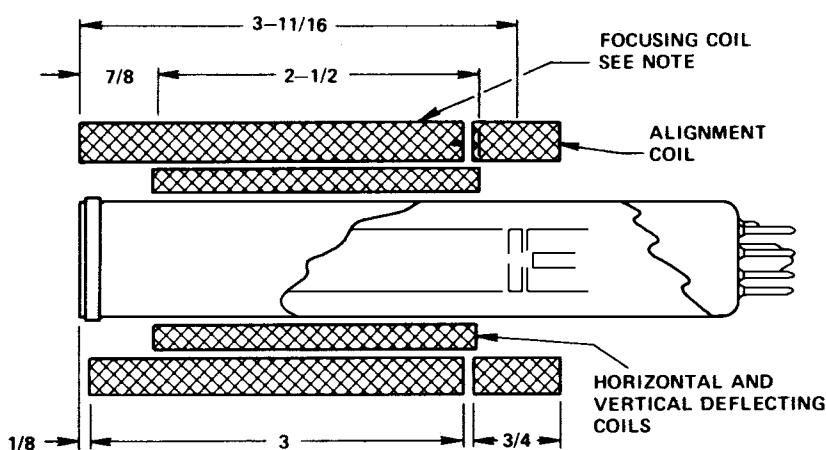
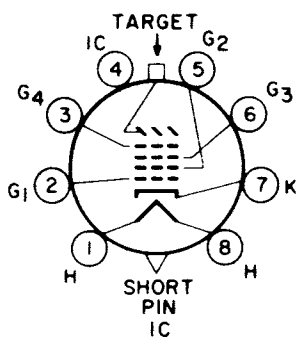


FIGURE 2

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

## TERMINAL DIAGRAM (Bottom View)



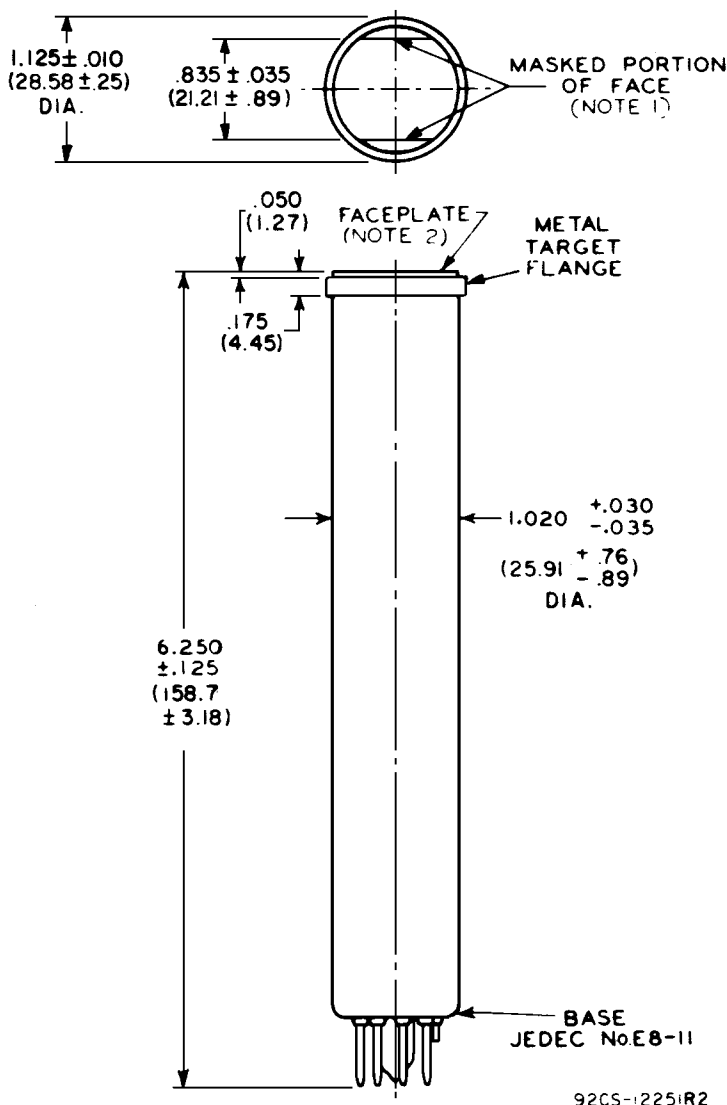
DIRECTION OF LIGHT:  
INTO FACE END OF TUBE

8ME

- |                   |                                             |
|-------------------|---------------------------------------------|
| Pin 1—            | Heater                                      |
| Pin 2—            | Grid No.1                                   |
| Pin 3—            | Grid No.4                                   |
| Pin 4—            | Internal Connection—<br>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 —<br>Make No Connection |



## DIMENSIONAL OUTLINE

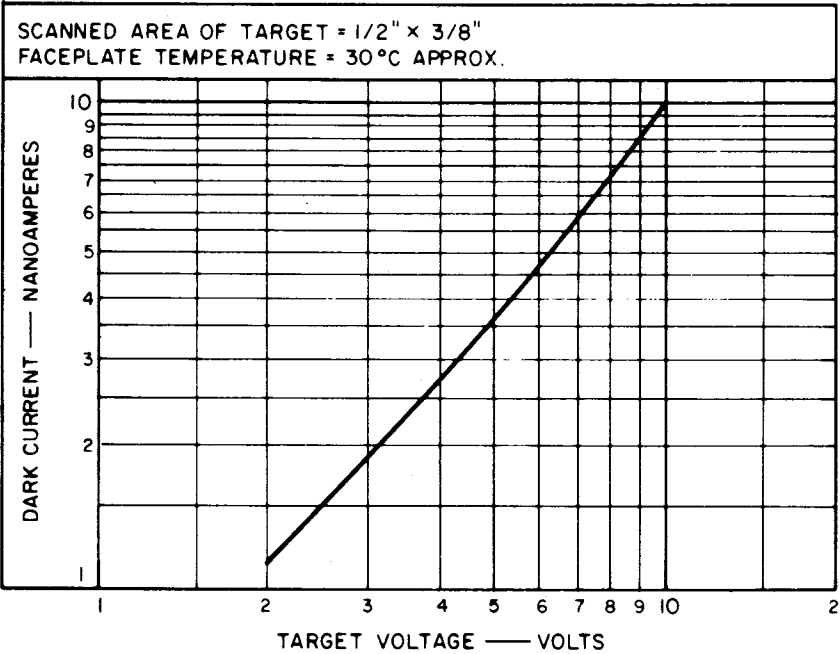


**Note 1**— Straight sides of masked portions are parallel to the plane passing through tube axis and short index pin.

**Note 2**— Faceplate glass is Corning No.7056 having a thickness of  $0.094'' \pm 0.012''$ .

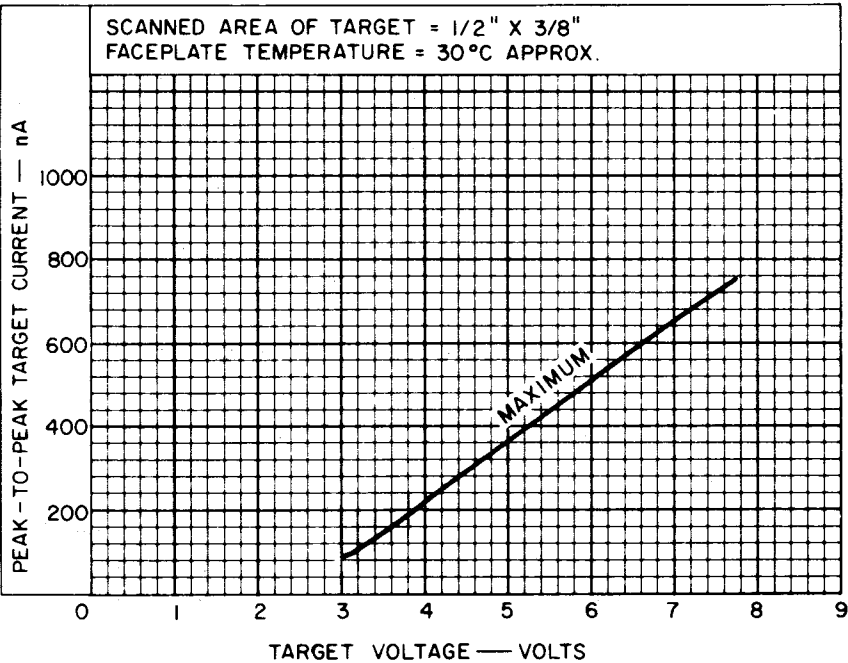
**Note 3**— Optical distance (from faceplate front to target plane) =  $0.113'' \pm 0.02''$ . This distance is the nominal faceplate thickness of  $0.94''$  divided by the index of refraction of Corning No.7056 glass (1.487) plus the space between the inner surface of faceplate and the nominal target focal plane ( $0.05''$ ).

TYPICAL DARK CURRENT CHARACTERISTIC



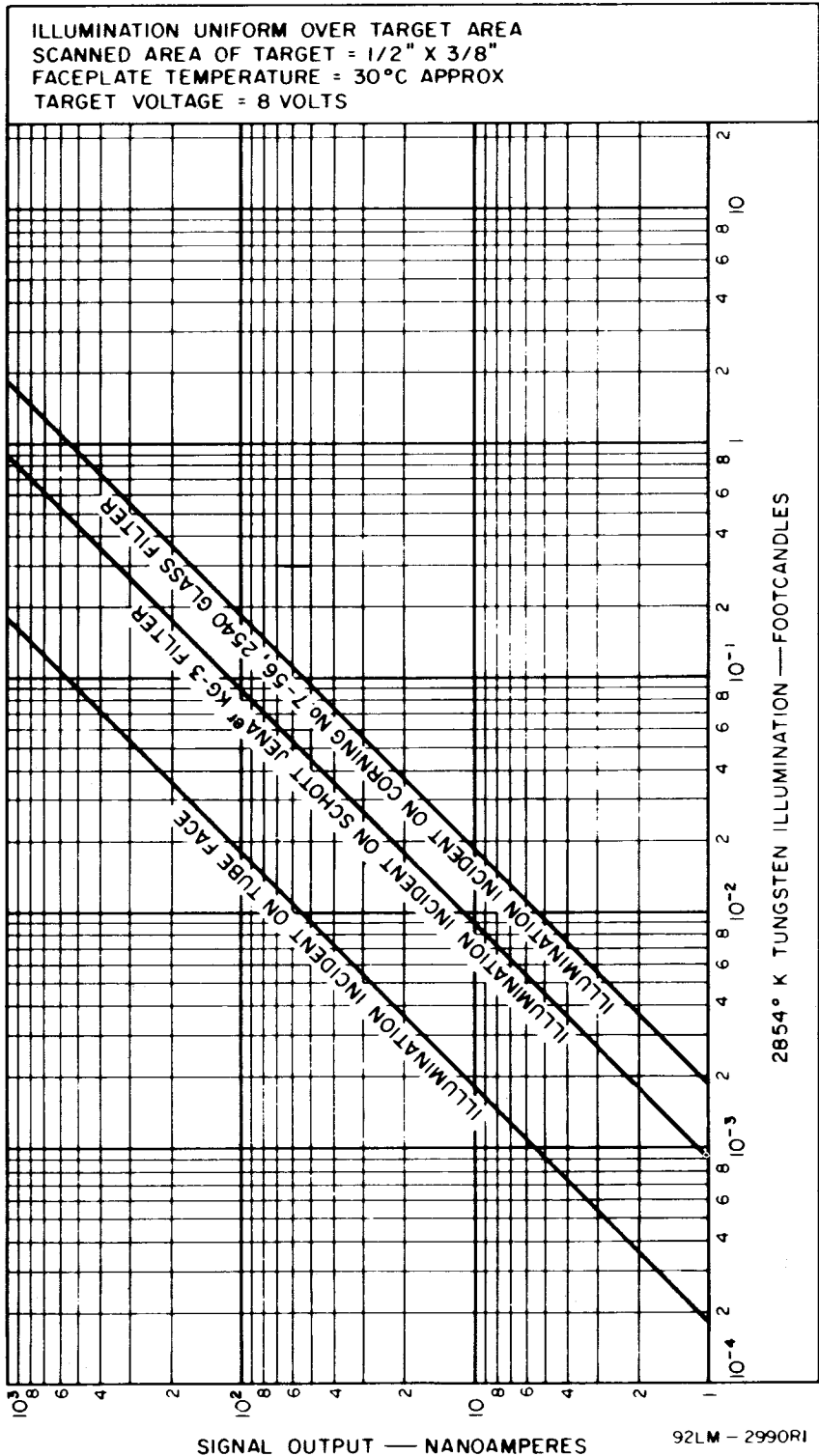
92LS-2991

TYPICAL SATURATION TARGET CURRENT CHARACTERISTIC



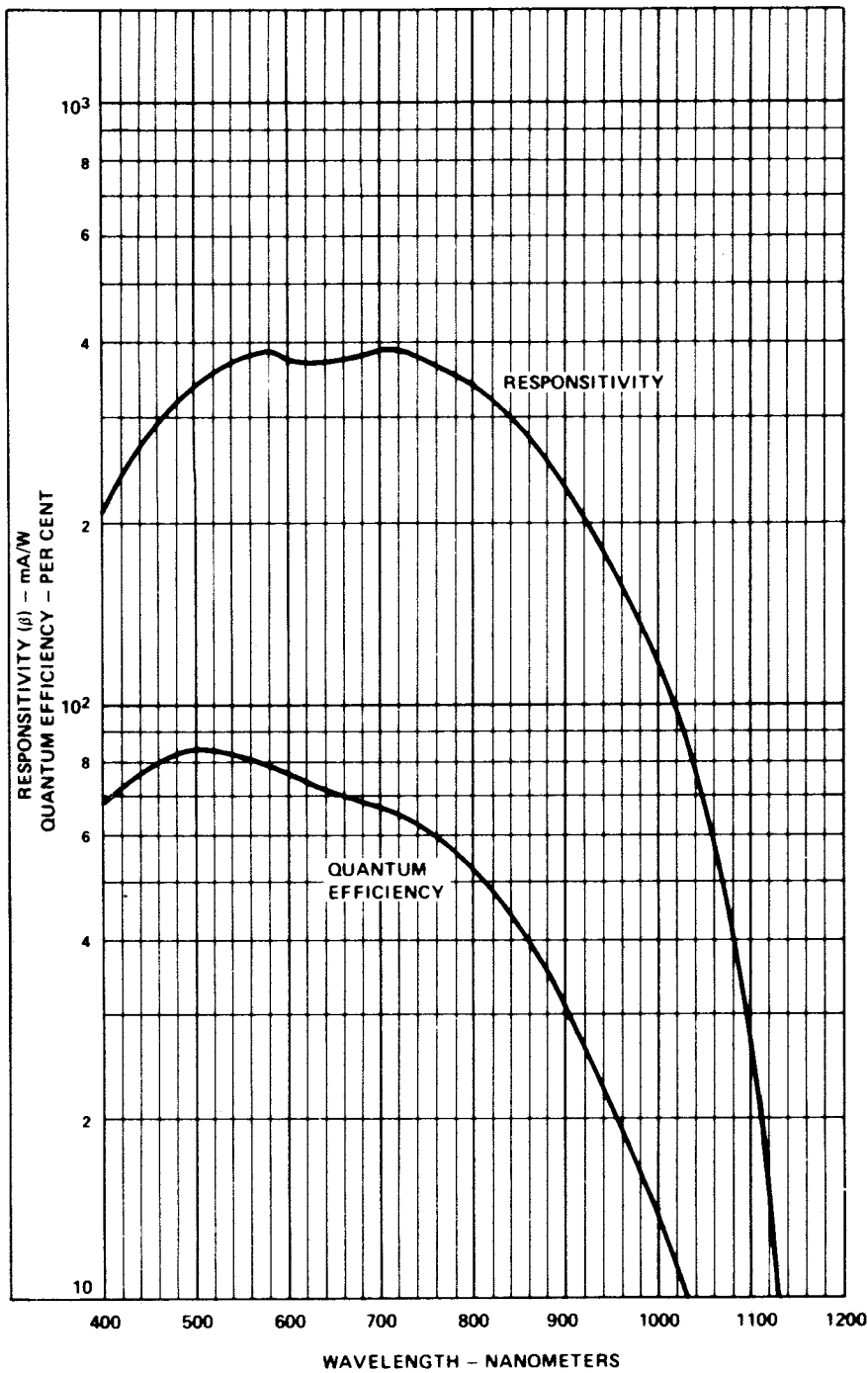
92LS-3342

## TYPICAL LIGHT TRANSFER CHARACTERISTICS



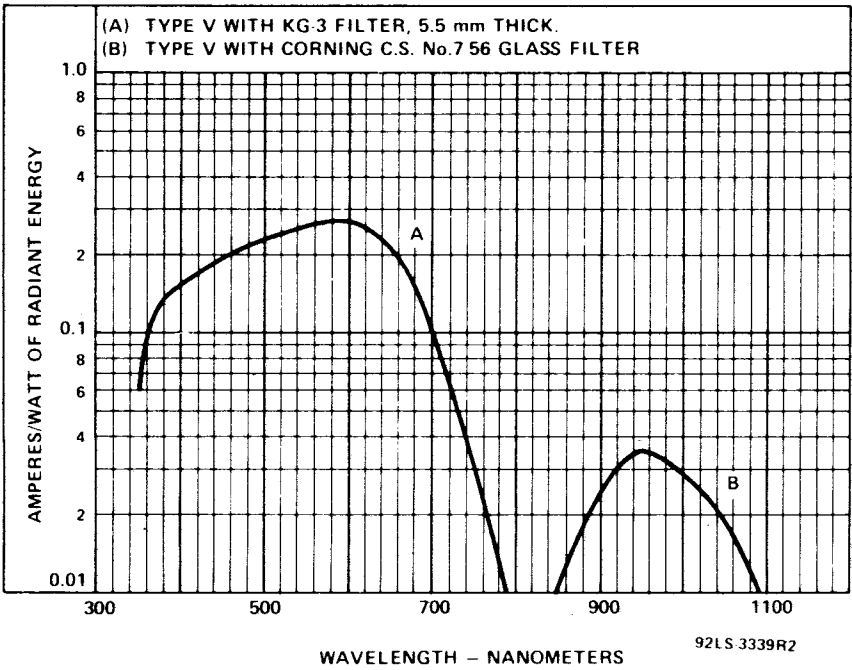
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## TYPICAL RCA TYPE V SPECTRAL RESPONSE CHARACTERISTICS



92LM-2993R2

## TYPICAL RCA TYPE V SPECTRAL RESPONSE CHARACTERISTICS AS MODIFIED BY THE FILTER CHARACTERISTICS OF FIGURES 3 AND 4



## TYPICAL TRANSMISSION OF SCHOTT (JENA<sup>ER</sup>) KG-3 INFRA-RED ABSORBING FILTER, THICKNESS: 5.55 MM

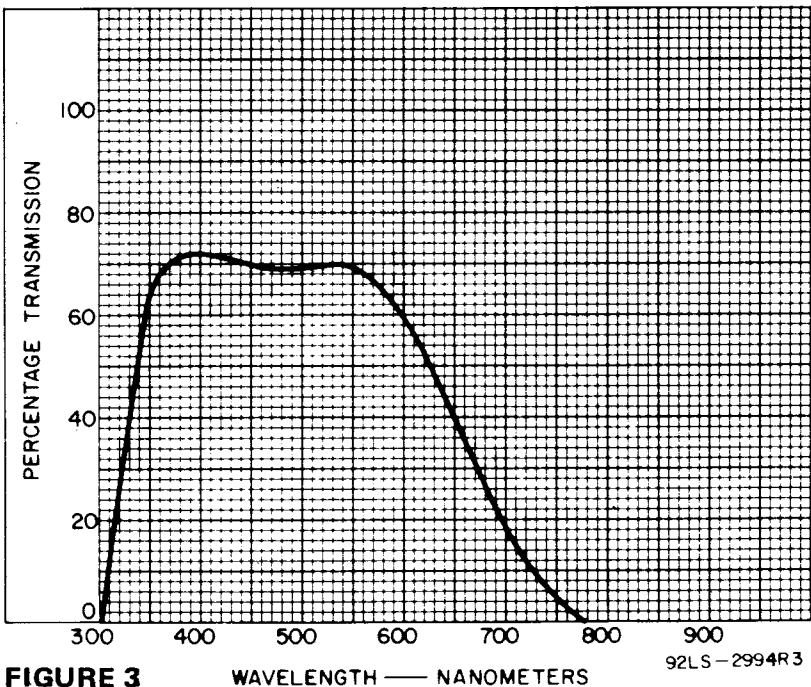
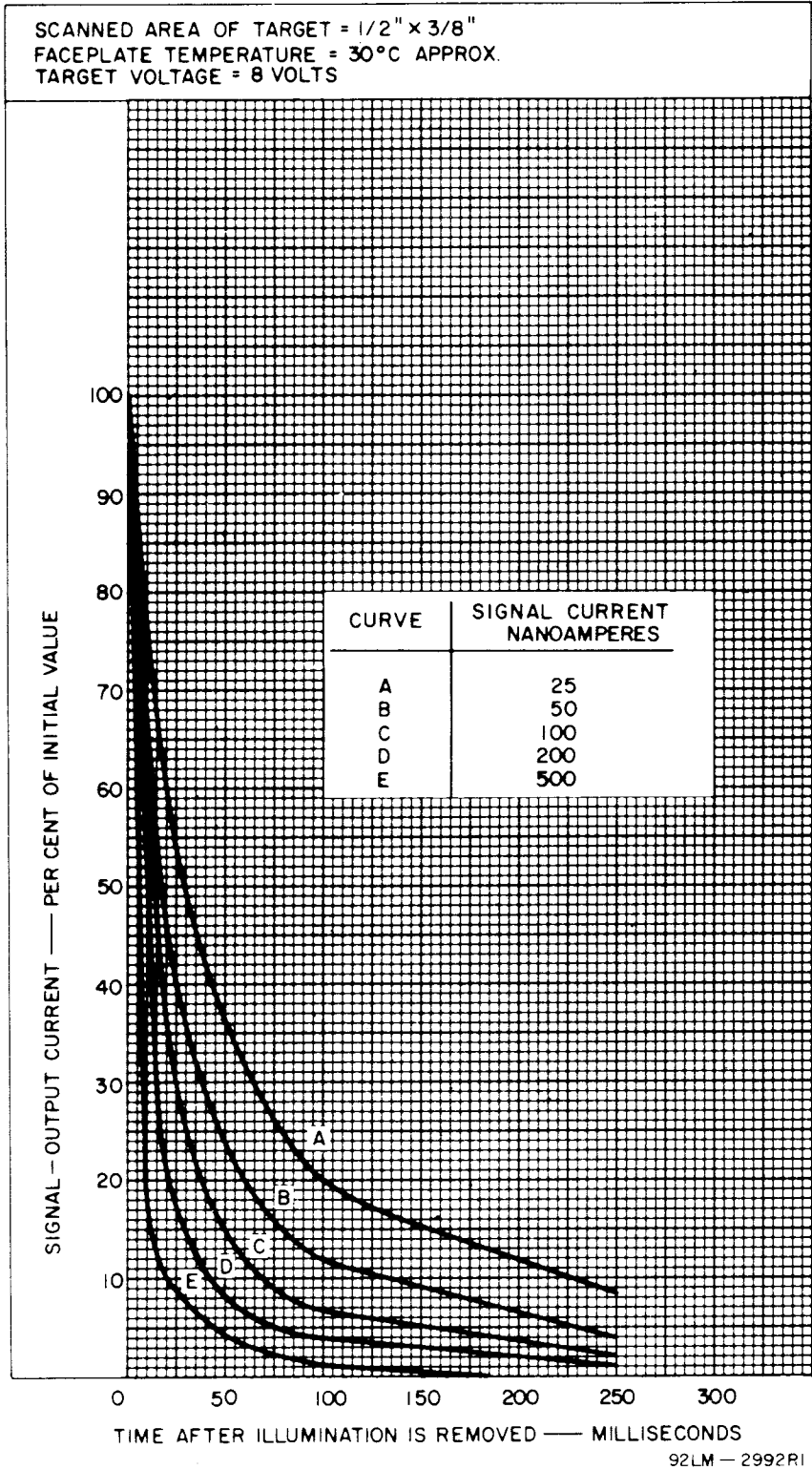


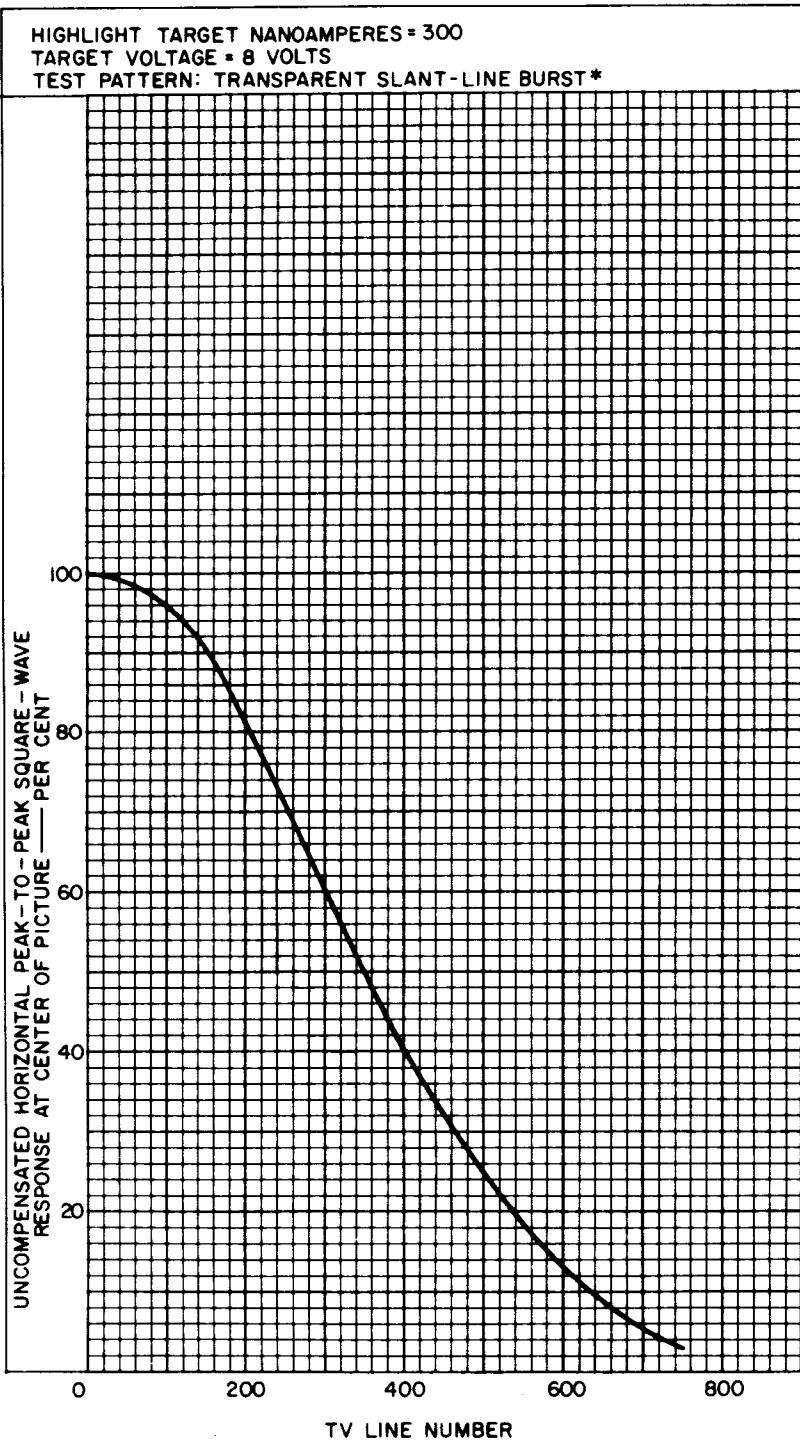
FIGURE 3

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## TYPICAL PERSISTENCE (LAG) CHARACTERISTICS



## TYPICAL HORIZONTAL SQUARE-WAVE RESPONDS



92LM - 2996R2

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

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TYPICAL TRANSMISSION OF CORNING C.S. NO. 7-56 (2540 GLASS) VISIBLE ABSORBING FILTER

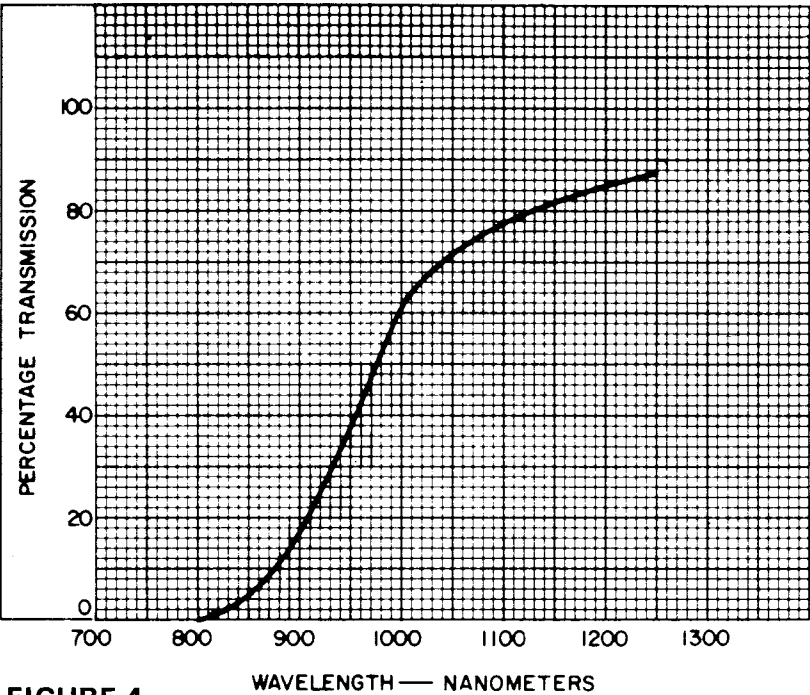


FIGURE 4

92LS-2995R3