

## Vidicon

MAGNETIC FOCUS  
1-INCH DIAMETERMAGNETIC DEFLECTION  
HIGH SENSITIVITY

*For Use in Applications Where Scene Motion is  
Limited and for Slow-Scan TV Pickup Service*

## GENERAL

## Heater, for Unipotential Cathode

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

Current at 6.3 V . . . . . 0.6 A

Direct Interelectrode Capacitance<sup>a</sup>

Target to all other electrodes . . . . . 4.6 pF

## Spectral Response. . . . . See Typical Spectral Response

## Photoconductive Layer. . . . . 0.62 inch

Maximum useful diagonal of rectangle  
image (4 x 3 aspect ratio)<sup>b</sup>

## Focusing Method. . . . . Magnetic

## Deflection Method. . . . . Magnetic

Overall Length . . . . .  $6.25 \pm 0.25$  inch

Greatest Diameter. . . . .  $1.125 \pm 0.010$  inch

Operating Position . . . . . Any

Weight (Approx.) . . . . . 2 oz

Bulb . . . . . T8

Focusing Coil. . . . . Cleveland Electronics<sup>c, d</sup> No. VF-115-5,  
or equivalent

Deflecting Yoke. . . . . Cleveland Electronics<sup>c, d</sup> No. VY-111-3,  
or equivalent

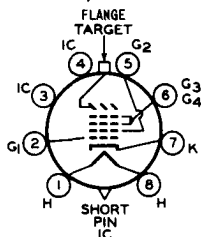
Alignment Coil . . . . . Cleveland Electronics<sup>c, d</sup> No. VA-118,  
or equivalent

Socket . . . . . Cinch® No. 54A18088, or equivalent

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

## BASING DIAGRAM (Bottom View)

- Pin 1 - Heater
- Pin 2 - Grid No. 1
- Pin 3 - Internal Connection-  
Do Not Use
- Pin 4 - Internal Connection-  
Do Not Use
- Pin 5 - Grid No. 2
- Pin 6 - Grids No. 3 and No. 4
- Pin 7 - Cathode
- Pin 8 - Heater
- Flange - Target
- Short Index Pin - Internal  
Connection-  
Make no Connection



DIRECTION OF LIGHT:  
INTO FACE END OF TUBE



## ABSOLUTE-MAXIMUM VALUES

*For scanned area of 1/2 x 3/8 inch*

|                                                  |           |         |
|--------------------------------------------------|-----------|---------|
| Grid-No.3 & Grid-No.4 Voltage. . . . .           | 1000      | V       |
| Grid-No.2 Voltage. . . . .                       | 750       | V       |
| Grid-No.1 Voltage                                |           |         |
| Negative bias value. . . . .                     | 300       | V       |
| Positive bias value. . . . .                     | 0         | V       |
| Peak Heater-Cathode Voltage                      |           |         |
| Heater negative with respect to cathode. . . . . | 125       | V       |
| Heater positive with respect to cathode. . . . . | 10        | V       |
| Target Voltage . . . . .                         | 60        | V       |
| Dark Current . . . . .                           | 0.1       | $\mu$ A |
| Peak Target Current <sup>f</sup> . . . . .       | 0.6       | $\mu$ A |
| Faceplate                                        |           |         |
| Illumination <sup>g</sup> . . . . .              | 1000      | fc      |
| Temperature Range                                |           |         |
| Storage. . . . .                                 | -20 to 70 | °C      |
| Operating. . . . .                               | -10 to 55 | °C      |

## TYPICAL OPERATION AND PERFORMANCE DATA

For Standard TV Scan Rates

*For scanned area of 1/2 x 3/8 inch. Faceplate temperature of 30°C.*

|                                                                                   | Low-<br>Voltage<br>Operation | High-<br>Voltage<br>Operation |               |
|-----------------------------------------------------------------------------------|------------------------------|-------------------------------|---------------|
| Grid-No.4 (Decelerator) &<br>Grid-No.3 (Beam-Focus<br>Electrode) Voltage. . . . . | 250 <sup>h</sup> to 300      | 750                           | V             |
| Grid-No.2 (Accelerator)<br>Voltage . . . . .                                      | 300                          | 300                           | V             |
| Grid-No.1 Voltage for<br>Picture Cutoff <sup>j</sup> . . . . .                    | -45 to -100                  | -45 to -100                   | V             |
| Average "Gamma" of Transfer<br>Characteristic. . . . .                            | 0.7                          | 0.7                           |               |
| Signal-output current be-<br>tween 0.02 $\mu$ A & 0.2 $\mu$ A                     |                              |                               |               |
| Visual Equivalent Signal-to-<br>Noise Ratio (Approx.) <sup>k</sup> . . . . .      | 300:1                        | 300:1                         |               |
| Lag <sup>m</sup>                                                                  |                              |                               |               |
| Typical value. . . . .                                                            | 55                           | 55                            | %             |
| Minimum Peak-to-Peak Blanking<br>Voltage                                          |                              |                               |               |
| When applied to grid No.1 . . . . .                                               | 75                           | 75                            | V             |
| When applied to cathode. . . . .                                                  | 20                           | 20                            | V             |
| Limiting Resolution at Center<br>of Picture                                       |                              |                               |               |
| Typical value. . . . .                                                            | 600                          | 700                           | { TV<br>Lines |
| Amplitude Response to a 400 TV<br>Line Square-Wave Test Pattern                   | 20                           | 30                            | %             |
| At center of picture                                                              |                              |                               |               |
| Field Strength at Center of<br>Focusing Coil <sup>n</sup> . . . . .               | 40                           | 60                            | G             |



|                                                             | Low-<br>Voltage<br>Operation | High-<br>Voltage<br>Operation |    |
|-------------------------------------------------------------|------------------------------|-------------------------------|----|
| <b>Peak Deflecting-Coil Current</b>                         |                              |                               |    |
| Horizontal . . . . .                                        | 185                          | 375                           | mA |
| Vertical . . . . .                                          | 25                           | 43                            | mA |
| <b>Field Strength of Adjustable Alignment Coil. . . . .</b> | 0 to 4                       | 0 to 4                        | G  |

*Average-Light-Level Operation—1.0 Footcandle on Faceplate*

|                                                     |         |    |
|-----------------------------------------------------|---------|----|
| <b>Faceplate Illumination (Highlight) . . . . .</b> | 1       | fc |
| <b>Target Voltage<sup>p,q</sup> . . . . .</b>       | 7 to 25 | V  |
| <b>Dark Current<sup>r</sup> . . . . .</b>           | 0.005   | μA |
| <b>Signal-Output Current<sup>s</sup></b>            |         |    |
| Typical. . . . .                                    | 0.4     | μA |

*Low-Light-Level Operation—0.1 Footcandle on Faceplate*

|                                                     |          |    |
|-----------------------------------------------------|----------|----|
| <b>Faceplate illumination (Highlight) . . . . .</b> | 0.1      | fc |
| <b>Target Voltage<sup>p,q</sup> . . . . .</b>       | 15 to 45 | V  |
| <b>Dark Current<sup>r</sup> . . . . .</b>           | 0.02     | μA |
| <b>Signal-Output Current<sup>s</sup></b>            |          |    |
| Typical. . . . .                                    | 0.16     | μA |

**TYPICAL OPERATION AND PERFORMANCE DATA**

**For Slow-Scan Applications**

|                                         |                  |         |
|-----------------------------------------|------------------|---------|
| <b>Typical Target Voltage . . . . .</b> | 30               | V       |
| <b>Typical Dark Current . . . . .</b>   | 8                | nA      |
| <b>Typical Exposure . . . . .</b>       | 0.25 footcandle- | seconds |

**Typical Signal Output**

At frame time of

|                     |     |    |
|---------------------|-----|----|
| 1 second . . . . .  | 160 | nA |
| 2 seconds. . . . .  | 70  | nA |
| 4 seconds. . . . .  | 30  | nA |
| 6 seconds. . . . .  | 19  | nA |
| 10 seconds. . . . . | 10  | nA |

|                                                     |          |         |
|-----------------------------------------------------|----------|---------|
| <b>Lag, or Residual Signal-Time to reach 5 per-</b> |          |         |
| <b>cent level. . . . .</b>                          | .5 to 10 | frames  |
| <b>Amplitude Response to 400 TV Lines . . . . .</b> | 50       | %       |
| <b>Signal Storage—Time to decay to 50 per-</b>      |          |         |
| <b>cent level. . . . .</b>                          | 80       | seconds |

<sup>a</sup> This capacitance which effectively is the output impedance of the 4500, 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.

<sup>b</sup> Orientation of quality rectangle 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 pin. The masking is for orientation only and does not define the proper scanned area of the photoconductive layer.

<sup>c</sup> Made by Cleveland Electronics Inc., 1974 East 61st St., Cleveland Ohio.

<sup>d</sup> These components are chosen to provide tube operation with minimum beam-landing error.

<sup>e</sup> Made by Cinch Manufacturing Corporation, 1026 S. Homan Ave., Chicago 24, Illinois.

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



- g For conditions where "white light" is uniformly diffused over entire tube face.
- h Definition, focus uniformity, and picture quality decrease with decreasing grid-No.4 and grid-No.3 voltage. In general, grid-No.4 and grid-No.3 should be operated above 250 volts.
- j With no blanking voltage on grid No.1.
- k Measured with high gain, low-noise, cascode-input-type amplifier having bandwidth of 5 Mc/s 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 Defined as the per cent of initial value of signal-output current 1/20 second after illumination is removed. Values shown are 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 target voltage for each 4500 must be adjusted to the value which gives the desired operating signal current.
- q Indicated range for each type of service serves only to illustrate the operating target-voltage range normally encountered.
- r 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.
- s Defined as the component of the highlight target current after the dark-current component has been subtracted.

## OPERATING CONSIDERATIONS

*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.

*Faceplate-temperature* should not exceed 55°C (131°F), either during operation or storage of the 4500. Operation at a faceplate temperature of about 30°C (86°F) is recommended. The 4500 should be operated at a steady temperature to maintain dark current at a preselected level and thereby insure optimum and stable day-to-day operation. If temperature control cannot be made in the camera installation, changes in target voltage may be required from time to time. The range of target voltage for various dark current levels is shown in *Range of Dark Current*. Individual 4500's will have substantially identical performance characteristics when operated with an identical value of dark current.

Operation at higher electrode voltages may introduce additional beam-landing errors that may be partially compensated for by repositioning the deflecting components. Full compensation may require the application of a modulating voltage of suitable waveform, at both horizontal and vertical scan rates, to the cathode, grid-No.1, and grid-No.2 of the 4500.

## Dos and Don'ts on Use of RCA-4500

### Dos

1. Adjust camera scanning to utilize maximum useful area of photoconductive layer.
2. Orient the vidicon so that horizontal scan is essentially parallel to the plane passing through tube axis and short index pin.



**Dos and Don'ts on Use of RCA-4500****Dos**

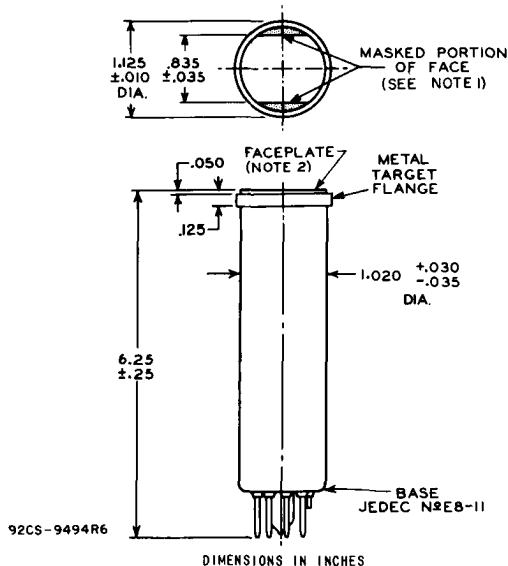
3. Align electron beam.
4. With lens capped, adjust target voltage for each individual vidicon to the highest value that will still give uniform background.
5. Match any visible raster pattern on photoconductive layer with new scan by reorienting the vidicon as required.
6. Use only sufficient beam current to bring out picture highlights.
7. Open lens iris or increase the scene illumination to obtain the "snappiest" picture without noticeable smear from moving objects. Target voltage should be reduced if light on the tube and/or resultant signal is excessive.
8. Always cap lens when transporting camera (see "Don'ts" 5).

**Don'ts**

1. Don't underscan the photoconductive layer.
2. Don't change camera size and centering controls once the scanned area of photoconductive layer has been properly positioned.
3. Don't rotate vidicon from its original operating position in deflecting yoke.
4. Don't turn beam of vidicon on without normal scanning or remove scanning before beam of vidicon is turned off.
5. DON'T ALLOW IMAGE OF THE SUN OR OTHER VERY INTENSE SOURCE OF ILLUMINATION TO BE FOCUSED ON PHOTOCONDUCTIVE LAYER AT ANY TIME.



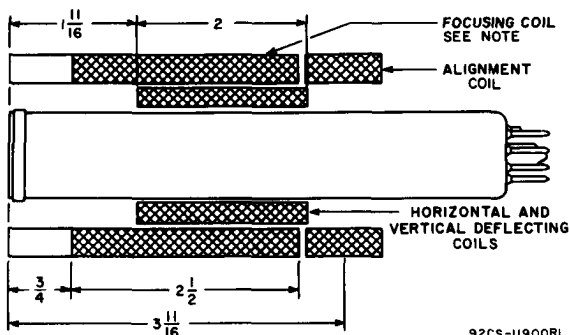
## DIMENSIONAL OUTLINE



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

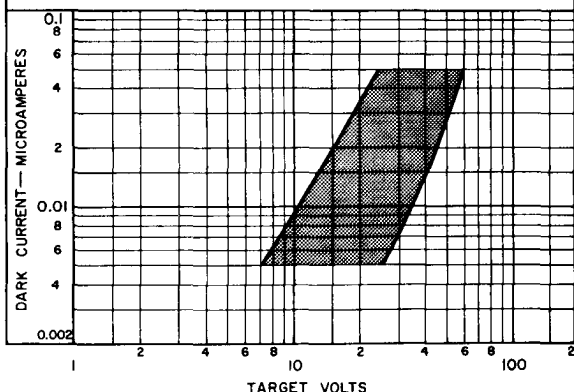
Note 2: Faceplate glass is Corning No.7056 having a thickness of  $0.094 \pm 0.012$  inch.

## COMPONENT LOCATIONS



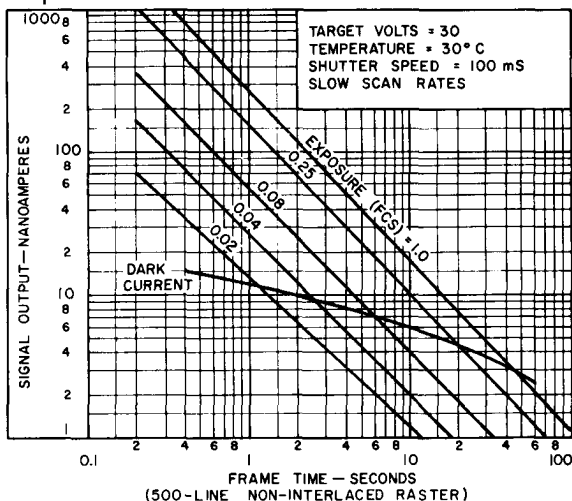
## Range of Dark Current

SCANNED AREA OF PHOTOCONDUCTIVE LAYER =  $1/2" \times 3/8"$   
 FACEPLATE TEMPERATURE =  $30^{\circ}\text{C}$  APPROX.  
 STANDARD TV SCAN RATE



92LS-1535

Signal Output as a Function of Scan  
 Speed for Several Values of Illumination



92LS-1534

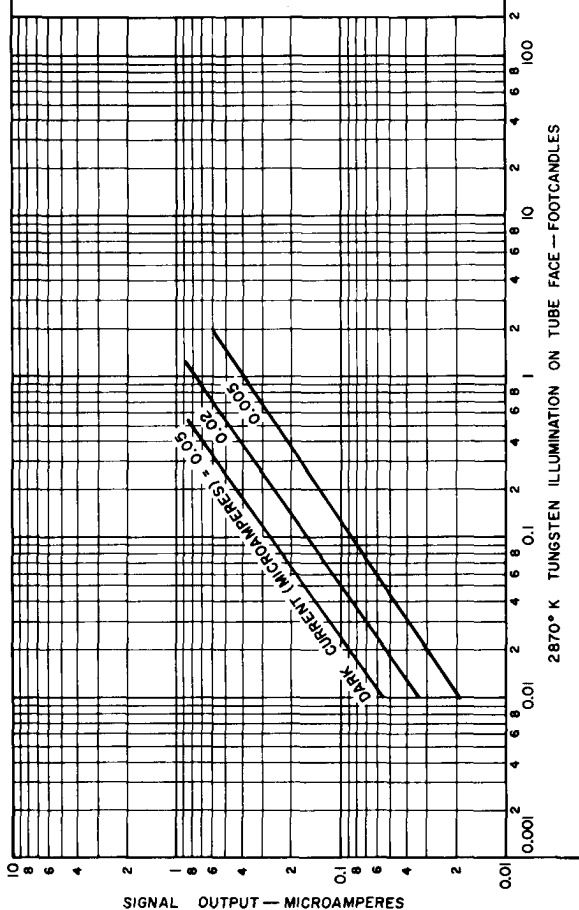


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## Light Transfer Characteristics

ILLUMINATION: UNIFORM OVER PHOTOCONDUCTIVE LAYER.  
 SCANNED AREA OF PHOTOCONDUCTIVE LAYER =  $1/2" \times 3/8"$   
 FACEPLATE TEMPERATURE =  $30^{\circ}\text{C}$  APPROX.  
 STANDARD TV SCAN RATE

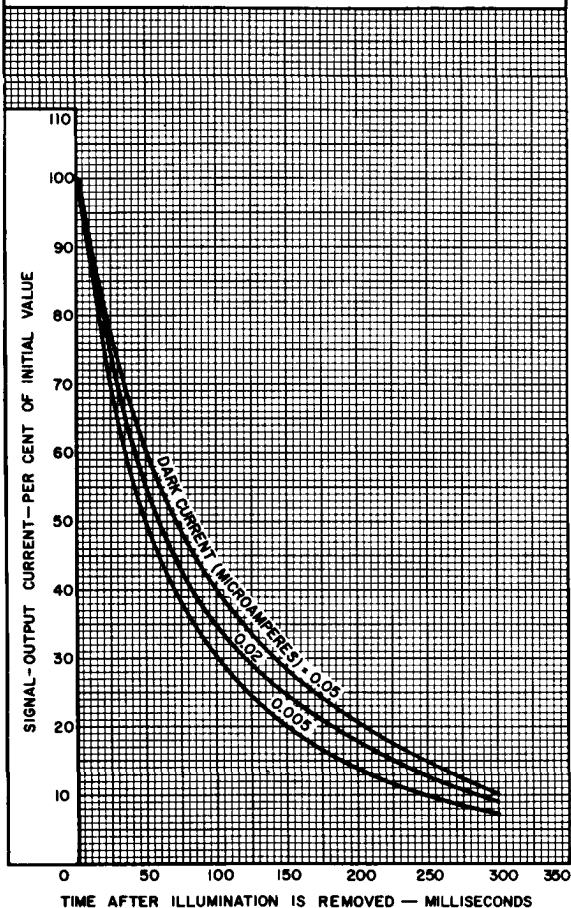


92LM-1536



## Typical Persistence Characteristics

INITIAL HIGHLIGHT SIGNAL—OUTPUT MICROAMPERES = 0.3  
SCANNED AREA OF PHOTOCONDUCTIVE LAYER =  $1/2" \times 3/8"$   
FACEPLATE TEMPERATURE =  $30^{\circ}\text{C}$  APPROX.  
STANDARD TV SCAN RATE



92LM-1532



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# Uncompensated Horizontal Square-Wave Response

HIGHLIGHT TARGET MICROAMPERES = 0.30

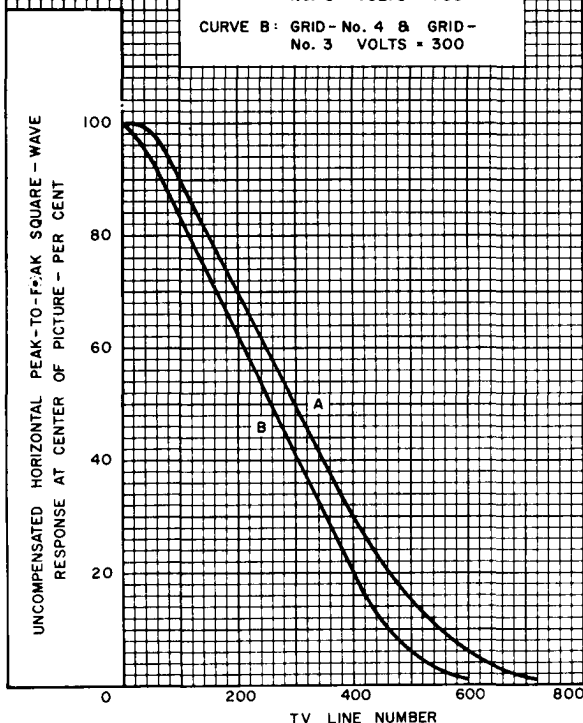
DARK CURRENT (MICROAMPERES) = 0.02

TEST PATTERN: TRANSPARENT SQUARE-WAVE RESOLUTION WEDGE

STANDARD TV SCAN RATE

CURVE A: GRID - No. 4 & GRID -  
No. 3 VOLTS = 750

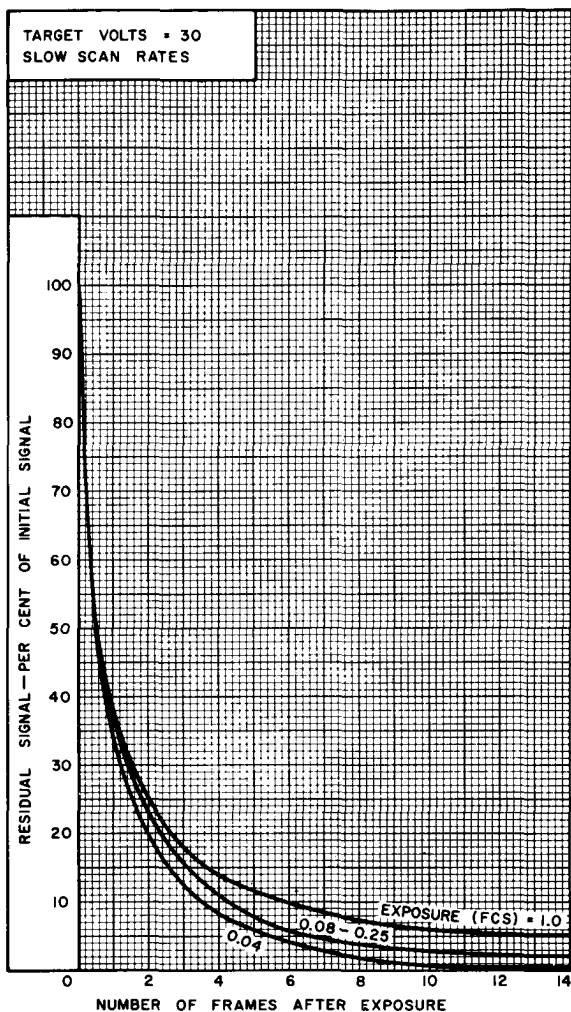
CURVE B: GRID - No. 4 & GRID -  
No. 3 VOLTS = 300



92LM-1533



## Typical Persistence Characteristics



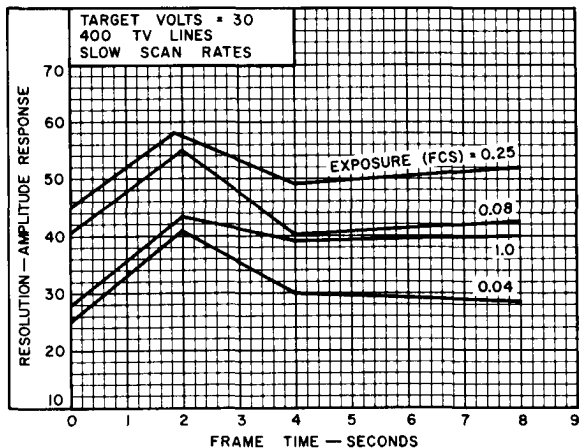
92LM-1537



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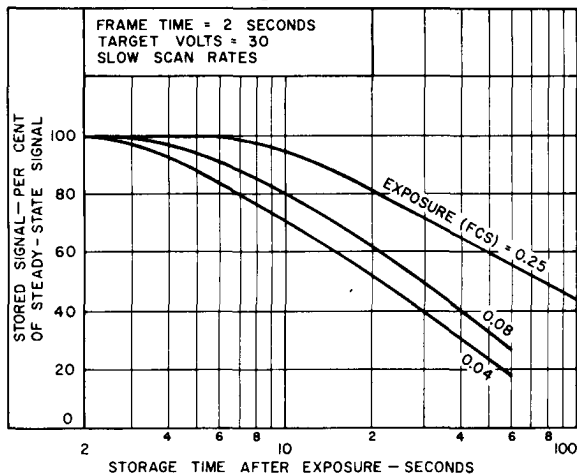
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## Typical Response to 400 TV Line Information



92LS-1538

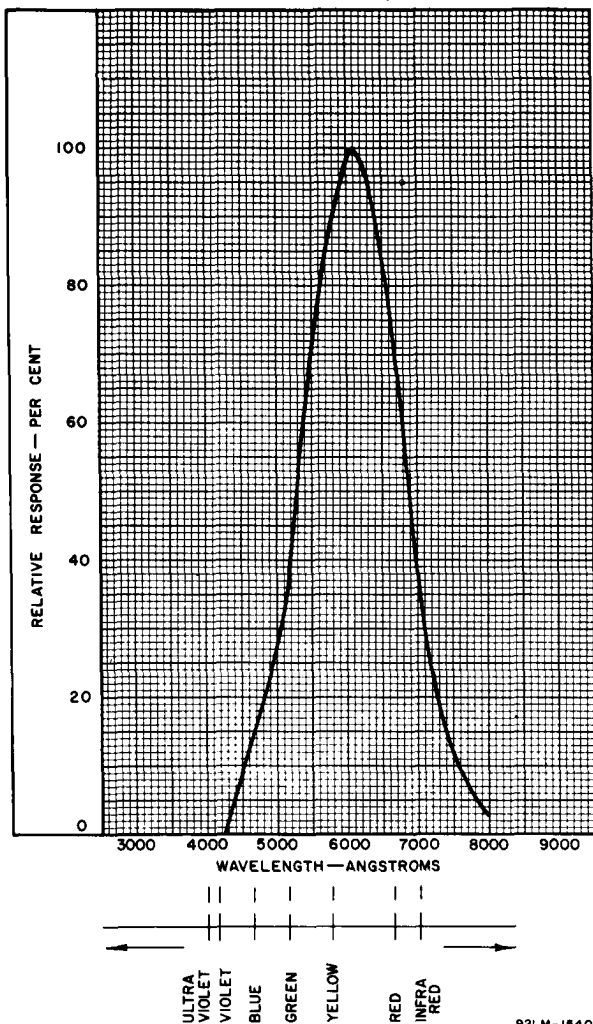
## Typical Storage Characteristics



92LS-1539



## Typical Spectral Response



92LM-1540



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