8541, 8541A

Vidicons

- **High Resolution – 1100 TV Lines (Typical at 900 Volts)**
- **High Amplitude Response – 60% (Typical at 900 Volts)**
- **Separate Mesh Connection**
- **High Signal Output – 200 Nanoamperes 1 Footcandle on Tube Face and Target Voltage of 30 Volts (Typical)**
- **Low Lag – 20% of Initial Signal Output After 50 Milliseconds**
- **0.6 Watt "Dark Heater"**

General Data

Heater, for Unipotential Cathode:

Voltage (AC or DC)	6.3 ± 10%	V
Current at 6.3 volts	0.1	A

Direct Interelectrode Capacitance:[a]

Target to all other electrodes	4.6	pF

Spectral Response ..... See **Figure 5**

Photoconductive Layer:

Maximum useful diagonal of rectangular image ..... 0.63 in (16 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 photoconductive layer.

Focusing Method	Magnetic
Deflection Method	Magnetic
Dimensions	See Dimensional Outline
Bulb	T8
Base	Small-Button Ditetrar 8-Pin, (JEDEC No.E8-11)
Socket	Cinch[b] 8VT (133-98-11-015), or equivalent
Deflecting Yoke-Focusing Coil-Alignment Coil Assembly	Cleveland Electronics[c,d] No.VYFA-355-2, or equivalent
Operating Position	Any
Weight (Approx.)	2 oz (56.6 g)

Maximum Ratings, Absolute-Maximum Values[e]

For scanned area of 1/2" x 3/8" (12.8 x 9.6 mm^2)

Grid-No.4 Voltage[f]	1000	V
Grid-No.3 Voltage[f]	1000	V
Grid-No.2 Voltage	750	V
Grid-No.2 Dissipation	1	W
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	100	V
Dark Current	250	nA
Peak Target Current[g]	750	nA
Faceplate:		
Illumination[h]	50,000	lx
	5000	fc
Temperature	71	°C

Typical Operation and Performance Data

For scanned area of 1/2" x 3/8" (12.8 x 9.6 mm^2)

Faceplate temperature of 30° to 35° C and Standard TV Scanning Rate in VYFA-355-2 Coil Assembly

	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
Field Strength at Center of Focusing Coil[p]	40±4	58±4	G
Peak Deflecting-Coil Current:			
Horizontal	350	480	mA
Vertical	20	28	mA

	Low Voltage Mode	High Voltage Mode	
Field Strength of Adjustable Alignment Coil[q]	0 to 4	0 to 4	G
Minimum Peak-to-Peak Blanking Voltage:			
When applied to grid No. 1	75	75	V
When applied to cathode	20	20	V
Grid-No. 1 Voltage for Picture Cutoff[l]:			
8541A	−65 to −100	−65 to −100	V
8541	−40 to −100	−40 to −100	V
Average "Gamma" of Transfer Characteristic for Signal-Output Current Between 20 nA and 200 nA	0.65	0.65	
Lag—Per Cent of Initial Value of Signal-Output Current 1/20 Second After Illumination is Removed[m]:			
Typical	20	20	%
Maximum:			
8541A	25	25	%
8541	30	30	%
Limiting Resolution:			
At center of picture (Typ.)	1000	1100	TV lines
At center of picture (Min.)	950	–	TV lines
At corner of picture (Typ.)	600	700	TV lines
Amplitude Response to a 400 TV Line Square-Wave Test Pattern at Center of Picture[n]:			
Typical	50	60	%
Minimum:			
8541A	45	–	
8541	35	–	

Sensitivity:

See "Light Transfer Characteristics" (**Figure 7**)

Performance Tests:

Test conditions ..... { 1.0 fc on Faceplate; 20 nA Dark Current }

Limit values:

	Min.	Max.	
Target voltage:			
8541A	20	40	V
8541	10	70	V
Signal current:			
8541A	150	–	nA
8541	120	–	nA

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, IL 60007.

c Made by Cleveland Electronics Inc., 14500 Darley Rd., Cleveland, OH 44110.

d These components are chosen to provide tube operation with minimum beam-landing error when mounted in the recommended position along the tube axis as shown in **Figure 2.**

e A description of the Absolute-Maximum Rating is given in the General Section, titled Rating Systems for Electron Tubes.

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.

[m] For initial signal-output current of 300 nanoamperes and a dark current of 20 nanoamperes.

[n] Amplitude response is the signal amplitude from a given TV line number (fine picture detail) 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.

[p] 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.

[q] 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.

[r] The target voltage for each tube must be adjusted to that value which gives the desired operating dark current.

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

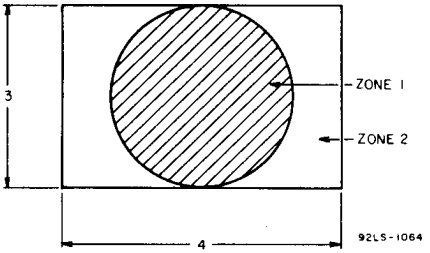
[t] The deflecting circuits must provide extremely linear scanning for good black-level reproduction. Dark-current signal is proportional to the scanning velocity. Any change in scanning velocity produces a black-level error in direct proportion to the change in scanning velocity.

[u] Defined as the component of the highlight target current after the dark-current component has been subtracted.

Spurious Signal

This test is performed using a uniformly diffused white test pattern that is separated into two zones as shown in **Figure 1.** The tubes are operated under the conditions specified under Typical Operation and Performance Data and the lens adjusted to provide a target current of 300 nanoamperes. 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.

Figure 1 – Spurious Signal Test Pattern



Allowable spot size for each zone is shown in Table I for the 8541A and Table II for the 8541. 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. Minimum separation between any 2 spots greater than 1 raster line is limited to 16 raster lines.

Table I – 8541A
For scanned area of 1/2" x 3/8" (12.8 mm x 9.6 mm)

Blemish Size (Equivalent Number of Raster Lines)	Zone 1 Allowed Spots	Zone 2 Allowed Spots
over 4	0	0
over 3	0	1
over 1	2	4
1 or less	■	■

Table II – 8541
For scanned area of 1/2" x 3/8" (12.8 mm x 9.6 mm)

Blemish Size (Equivalent Number of Raster Lines)	Zone 1 Allowed Spots	Zone 2 Allowed Spots
over 6	0	0
over 4	0	2
over 1	3	6
1 or less	■	■

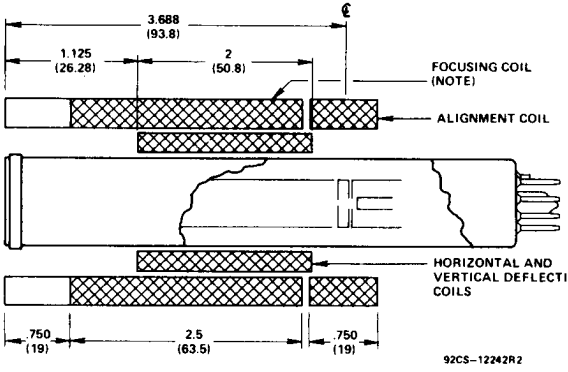
■ Spots of this size are allowed unless concentration causes a smudged appearance.

Operating Considerations

The target connection is made by a suitable spring contact bearing against the edge of the metal ring at the face end of the tube.

The temperature of the faceplate should not exceed 71° C (160° F), either during operation or storage of these tubes. Operation with a faceplate temperature in the range from about 25° to 35° C (77° to 95° F) is recommended.

Figure 2 — Recommended Location and Length of Deflecting, Focusing, and Alignment Components to Obtain Minimum Beam-Landing Error



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

Provisions should also be made in the camera installation to hold the faceplate temperature at a steady value within the recommended range. Dark current increases with increasing temperature. It is highly desirable to operate the tube at a steady temperature to maintain dark current at a preselected value. This mode of operation insures 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 tubes is shown in **Figure 3.** 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 these tubes. Individual tubes 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 tube see Set-Up Procedure.

Persistence or lag of the photoconductive layer is given in **Figure 4** for two values of dark current. Each curve shows the decay in signal-output current from an initial value of 300 nanoamperes after the illumination is cut off.

The spectral response of the 8541 and 8541A is shown in **Figure 5.**

As shown in **Figure 6,** a substantial increase in both limiting resolution and amplitude response of the tubes may be obtained by increasing the operating voltages of grid No.4 and grid No.3. The focusing-coil field strength must be increased and more deflecting power is required at higher electrode voltages as indicated under Typical Operation and Performance Data. Very little additional beam-landing error is introduced at the higher voltages provided the recommended operating voltages are used and the associated components are positioned as shown in **Figure 2.**

The power dissipation at grid No.2 should not exceed one watt, a condition normally met when the tube is operated at the specified maximum grid-No.2 rating and when the specified peak target current rating is not exceeded. However, if the tubes are operated continuously with grid-No.1 voltage near or approaching zero bias, grid-No.2 voltage should not exceed 350 volts dc maximum.

Signal-Output and Light Transfer Characteristics

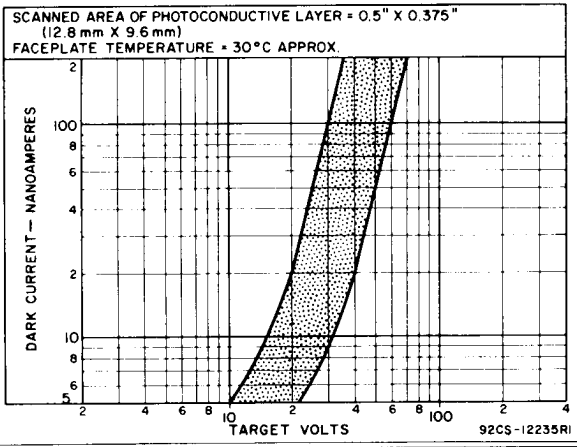
Typical signal output as a function of uniform 2854° K tungsten illumination on the photoconductive layer for different values of dark current is shown in **Figure 7.**

The average "gamma", or slope, of the light transfer characteristic curves shown in **Figure 7** 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 10 and 300 nanoampere.

Uniformity of the photoconductive layer of the tubes is excellent. When operated with the recommended focus and deflection components, signal output over the entire picture area is also very uniform. When other components are employed, beam-landing errors at the target may contribute to poor signal uniformity or "shading" characteristics in the generated picture. In such instances, compensation for the beam-landing errors to achieve uniform sensitivity can be obtained by supplying a modulating voltage of a suitable waveform to the cathode of the 8541 and 8541A. The desired waveform is parabolic in shape and of such a polarity that the cathode voltage is lowered as the beam approaches the edges of the scanned area.

Proper-size scanning of the photoconductive target area should always be used. Both overscanning and underscanning impair performance.

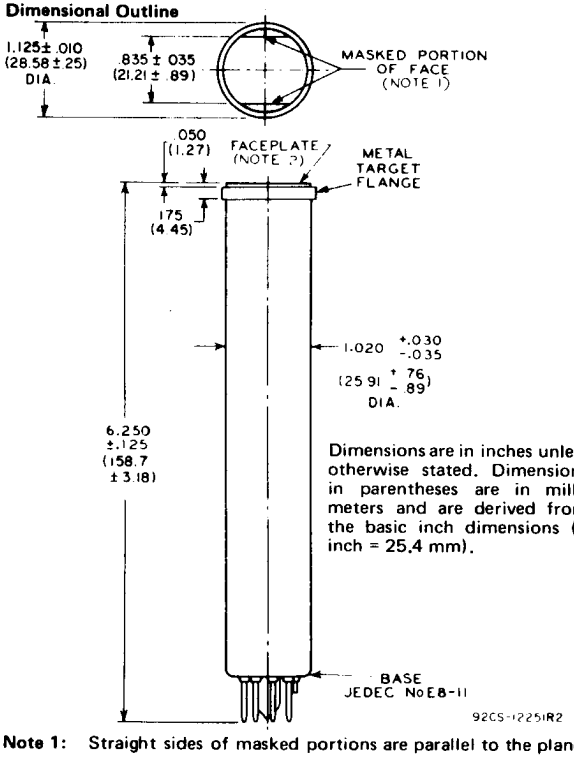
Figure 3 — Range of Dark Current



Failure of scanning even for a few seconds may permanently damage the photoconductive layer. The damaged area shows up as a spot or line in the picture during subsequent operation. To avoid damage during scanning failure, it is necessary to prevent the scanning beam from reaching the layer.

The scanning beam can conveniently be prevented from reaching the layer by increasing the grid-No.1 voltage to cutoff, biasing the target negatively, or removing grid-No.4, grid-No.3, and grid-No.2 electrode voltages.

Dimensional Outline

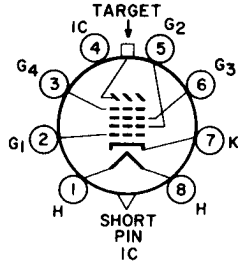


Dimensions are in inches unless otherwise stated. Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions (1 inch = 25.4 mm).

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 ± 0.012 in (2.4 ± 0.3).

Basing 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

Figure 4 — Typical Persistence Characteristics

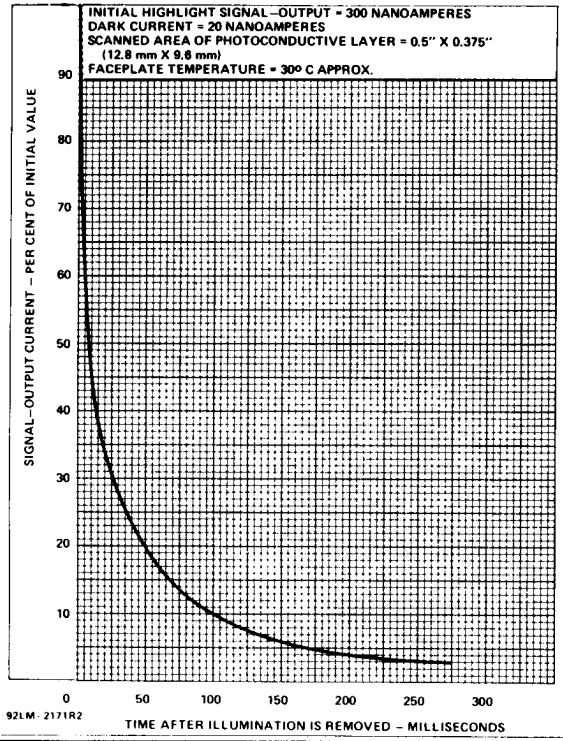


Figure 5 – Typical Spectral Response

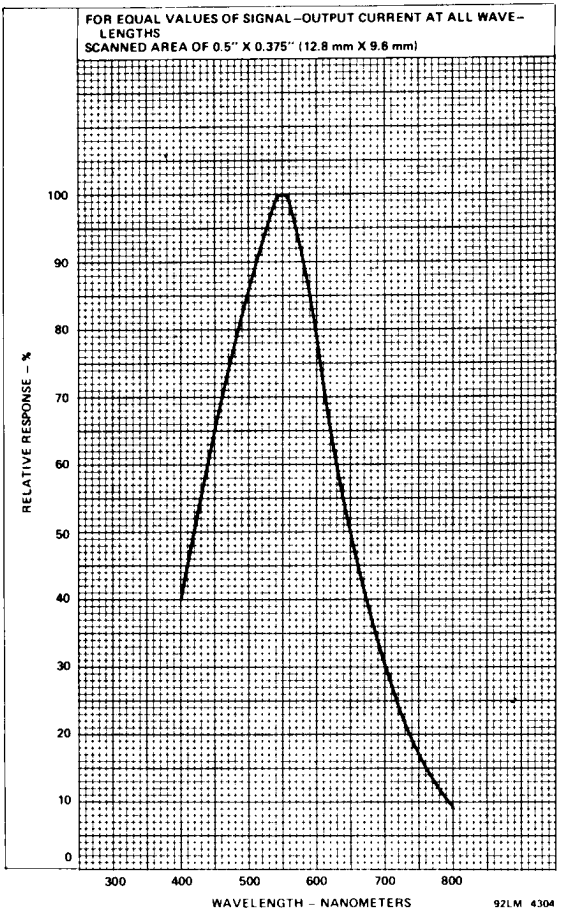
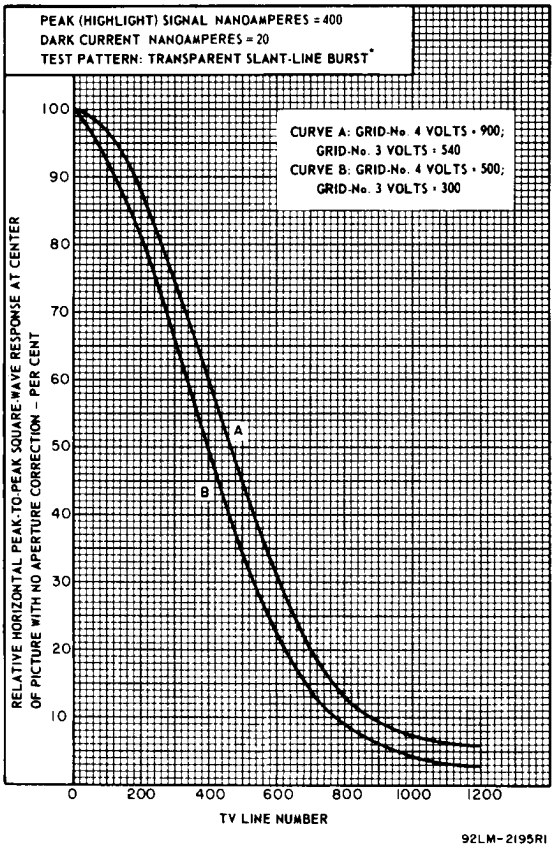
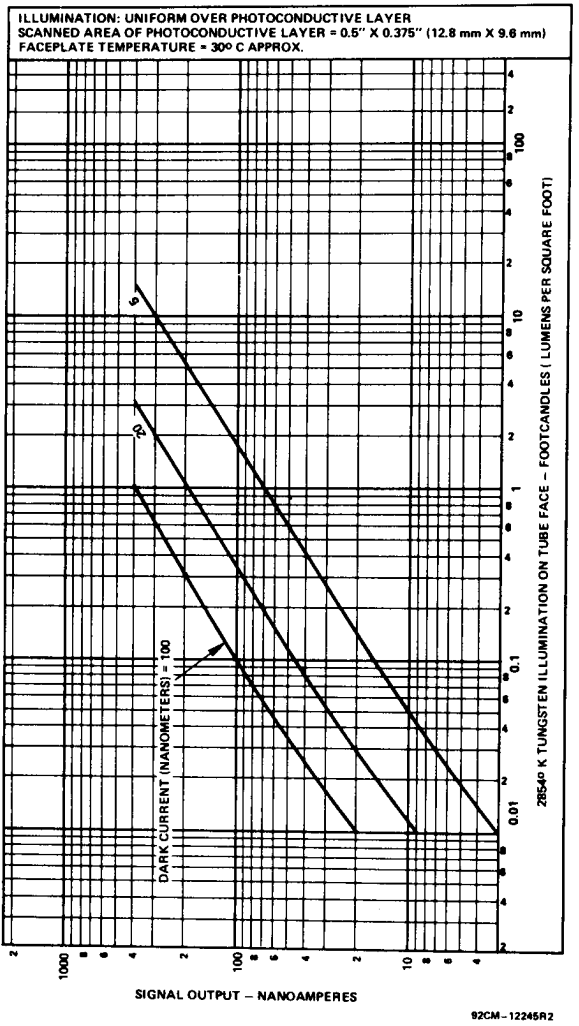


Figure 6 — Horizontal Square-Wave Response



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

Figure 7 – Light Transfer Characteristics



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