

Image Orthicon

MAGNETIC FOCUS

2-INCH DIAMETER

MAGNETIC DEFLECTION

*For Portable, Broadcast, Scientific, or Industrial
TV Pickup Service*

GENERAL

Heater, for Unipotential Cathode

Voltage (AC or DC) $6.3 \pm 10\%$ V
Current at 6.3 volts 0.095 A

Direct Interelectrode Capacitance

Anode to all other electrodes. 8 pF

Target-to-Mesh

Spacing. 0.001 in (0.0254 mm)
Capacitance. 75 pF

Spectral Response. See Typical Spectral Sensitivity

Window Material. Corning^a No.7056, or equivalent
Photocathode Material. Bialkali (Cs-K-Sb)

Photocathode, Semitransparent

Rectangular image (4 x 3 aspect ratio)^b
Useful size of^c. 0.6 in (15.2 mm) max. diagonal

Focusing Method. Magnetic

Deflection Method. Magnetic

Maximum Overall Length 10.25 in (260.4 mm)

Maximum Diameter of Bulb 2.10 in (53.4 mm)

Shoulder Base. Special Annular 11-Pin
(JEDEC No.E11-96)End Base Special 15-Pin
(JEDEC No.E15-95)Socket Alden^d Part No.216SBA, or equivalent

Storage and Operating Position The tube should never
be placed in a vertical position with the base end up nor
in any other position where the axis of the tube with the
base up makes an angle of less than 20° with the vertical.

Weight (Approx.) 8 oz (227g)

Minimum Deflecting-Coil Inside Diameter. . 1.55 in (39.4 mm)

Deflection, Focus, and Alignment Coil Assemblies^e

For transistor-drive amplifier circuits—

Celco^f, Part No.C2060-2, or equivalent:

Horizontal—250 μ H; Vertical—30 mH

Cleveland^g, Part No.2DA-1063, or equivalent:

Horizontal—800 μ H; Vertical—40 mH

For tube-drive amplifier circuits—

Celco^f, Part No.C2060-1, or equivalent:

Horizontal—4 mH; Vertical—30 mH

Cleveland^g, Part No.2DA-1059, or equivalent:

Horizontal—6 mH; Vertical—125 mH

ABSOLUTE-MAXIMUM VALUES

*Voltages are with respect to thermionic cathode
unless otherwise specified*

Photocathode

Voltage. -1150 V



Photocathode (cont'd)Illumination (See *Caution*) . . .50 lm/ft² (footcandles) -538 lux**Operating Temperature^h**

Any part of bulb 50 °C

Of bulb at large end of tube (Image section) . . . 35 min °C

Temperature Difference

Between image section and any part of bulb

hotter than image section. 5 °C

Grid-No.6 Voltage. -625 V**Target Voltage**

Positive value 10 V

Negative value 10 V

Field-Mesh Voltage^j. 25 V**Grid-No.5 Voltage.** 325 V**Grid-No.4 Voltage.** 325 V**Grid-No.3 Voltage.** 325 V**Grid-No.2 & Dynode-No.1 Voltage.** 350 V**Grid-No.1 Voltage**

Negative bias value. 125 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

Anode-Supply Voltage^k. 1700 V**Voltage Between Consecutive Dynodes.** 625 V**Voltage Between Anode and Dynode No.5.** 300 V**TYPICAL OPERATING VALUES****Heater Voltage** 6.3 V**Photocathode Voltage (Image Focus)^m.** -750 to -1050 V**Grid-No.6 Voltage (Accelerator) -**

Approx. 55% of Photocathode Voltage -410 to -580 V

Target Voltage Above Cutoffⁿ 3 V**Field-Mesh Voltage^j.** 15 V**Grid-No.5 Voltage (Decelerator).** 100 to 200 V**Grid-No.4 Voltage (Beam Focus)** 100 to 200 V**Grid-No.3 Voltage^p** 240 to 280 V**Grid-No.2 & Dynode-No.1 Voltage.** 280 V**Grid-No.1 Voltage for Picture Cutoff** -30 to -90 V**Dynode-No.2 Voltage.** 575 V**Dynode-No.3 Voltage.** 600 to 850 V**Dynode-No.4 Voltage.** 1125 V**Dynode-No.5 Voltage.** 1400 V**Anode Voltage.** 1500 V**Recommended Target Temperature Range^h.** . . . 35 to 45 °C**Peak-to-Peak Blanking Voltage.** 5 V**Field Strength of Focusing Coil:^q**

At center of scanning section. 68 G

In plane of photocathode 180 G

In region of grid No.3 (7.38 inches

behind faceplate) 10 G

Field Strength of Alignment Coil 0 to 4 G

PERFORMANCE CHARACTERISTICS RANGE VALUES

With conditions shown under Typical Operating Values, camera lens set to bring picture highlights to the "knee" of the light transfer characteristic, 525 line scanning, interlaced 2:1, frame time of 1/30 second, and 0.6 inch diagonal with 4 x 3 aspect ratio.

	Min	Typ	Max	
Cathode Radiant Sensitivity at 4000 angstroms.	-	0.06	-	A/W
Cathode Luminous Sensitivity (2870° K) ^r	40	75	-	μA/lm
Anode Current (DC).	-	15	-	μA
Signal-Output Current (Peak to Peak) ^s	1.5	4	-	μA
Signal-to-Noise Ratio ^t	-	30:1 (29.5 dB)	-	
Photocathode Illumination at 2870° K Required to Bring High- lights to the "knee" of Light Transfer Characteristic.	-	0.075	0.1 lm/ft ² (fc)	
Amplitude Response at 400 TV Lines per Picture Height (per cent of large-area black to large-area white) ^u	20	25	-	%
Limiting Center Resolution.	-	600	-	TV lines/ picture height

^a Made by Corning Glass Works, Corning, N.Y.

^b Proper orientation is obtained when the vertical scan is essentially parallel to the plane passing through the guide pin of the shoulder base and the major tube axis. The horizontal and vertical scan should preferably start at the corner of the raster nearest pin 4 of the shoulder base.

^c The size of the optical image focused on the photocathode should be adjusted so that its maximum diagonal does not exceed the specified value. The corresponding electron image on the target should have a size such that the corners of the rectangle just touch the target ring.

^d Made by Alden Products Co., 9140 N. Main St., Brockton 64, Mass.

^e The yoke must be shielded with a cylindrical high-permeability material enclosing the alignment-coil portion of the assembly to reduce the magnetic field intensity in the region of grid No. 3 to approximately 10 gauss.

^f Made by Constantine Engineering Laboratories Co., 70 Constantine Drive, Mahwah, N.J.

^g Made by Cleveland Electronics, Inc., 2000 Highland Road, Twinsburg, Ohio 44087.

^h Operation outside of the Recommended Target Temperature Range shown under Typical Operating Values will not damage the 8685 provided the Maximum Temperature Ratings of the tube are not exceeded. Optimum performance, however, is only obtained when the tube is operated within the Recommended Target Temperature Range.

^j With respect to grid No. 4.

^k Dynode-voltage values are shown under Typical Operating Values.

^m Adjust for best focus.

ⁿ Normal setting of target voltage is 3 volts from target cutoff. The target supply voltage should be adjustable from -3 to +5 volts.

^p Adjust to give the most uniformly shaded picture near maximum signal.

^q Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil, with indicator located outside of and at the image end of the focusing coil. The faceplate of the tube must be in mechanical contact with the faceplate coil.

^r Under the following conditions: The light source is a tungsten-filament lamp having a lime-glass envelope. It is operated at a color temperature of 2870° K. The value of light flux is 1 x 10⁻⁴ lumen and -90 to -175 volts is applied between photocathode and grounded grid No. 6 and target assembly. Voltage is not applied to the other tube electrodes.

^s With a dynode-No. 3 voltage of 725 volts.



^t With a noise equivalent bandwidth of 4.5 MHz. Peak signal output is measured with respect to "capped" black. Signal-to-noise ratio is dependent upon tube operating conditions and on the method of measurement. Significant factors affecting this ratio include target voltage, bandwidth, system line number and frame time, amount of beam current employed, and the choice of reference signal black level.

^u Measured with amplifier having flat frequency response.

Dos and Don'ts on Use of RCA-8685

Dos

1. Allow the 8685 to warm up prior to operation.
2. Hold temperature of the 8685 within operating range.
3. Make sure alignment coil is properly adjusted.
4. Adjust beam-focus control for best usable resolution.
5. Condition spare 8685's by operating several hours once each month.
6. Determine proper operating point with target voltage adjusted to exactly 3 volts above target cutoff.
7. Uncap lens before voltages are applied to the 8685.
8. Turn off the camera or the image-section high voltage supply if the lens turret or the yoke and 8685 must be "swung out" to clean the lens of the tube faceplate.

Don'ts

1. Don't force the 8685 into its shoulder socket.
2. Don't operate the 8685 without scanning.
3. Don't operate an 8685 having an ion spot.
4. Don't use more beam current than necessary to discharge the highlights of the scene.
5. Don't turn off beam while voltages are applied to photocathode, grid No. 6, target, dynodes, and anode during warmup or standby operation.
6. Don't remove the lens turret or lens when the camera is turned on, or when voltages are applied to the image section of the 8685, unless the light level incident on the tube can be reduced below 50 footcandles.

CAUTION

Care should be taken to avoid operating the camera with the lens turret removed, or swinging the tube and focusing coil away from the optical system of the camera, when voltages are applied to the tube. Excessive illumination for short periods of time under these conditions may damage the photocathode of the 8685.

OPERATING TECHNIQUES

With lens uncapped and the lens iris opened, proper voltages should be applied to the 8685 and the grid-No. 1 voltage should immediately be adjusted to produce a small amount of beam current. This prevents the mesh from being electrostatically pulled into contact with the glass disc. Adjust the deflection



circuits so that the beam "overscans" the target, i.e., so that the area of the target scanned is greater than its sensitive area. Note that overscanning the target results in a smaller-than-normal picture on the monitor. The lens should be capped and the tube should be allowed to warm up for 10 minutes before use or before adjustments are made.

Next, uncapp the lens and partially open the lens iris. Increase the target voltage until information appears on the monitor. Then adjust beam focus, image focus, and optical focus until detail can be discerned in the picture. Adjust alignment-coil-current controls until picture response is maximum. If picture appears in negative contrast, increase the beam current. Further adjust the alignment-coil current so that the center of the picture does not move when the beam-focus control (grid No. 4) is varied, but simply goes in and out of focus. During alignment of the beam, and also during operation of the tube, always keep the beam current as low as possible to give the best picture quality and also to prevent excessive noise.

Next, focus the camera on a test pattern. The camera-to-test pattern distance should be set so that the corners of the test-pattern image just touch the inside of the target ring. The deflection circuits are next adjusted so that the entire test pattern just fills the TV raster. The target voltage is then advanced or reduced to the point where a reproduction of the test pattern is just discernible on the monitor. This value of target voltage is known as the "target-cutoff voltage". The target voltage should then be raised exactly two volts above the cutoff-voltage value, and the beam-current control adjusted to give just sufficient beam current to discharge the highlights.

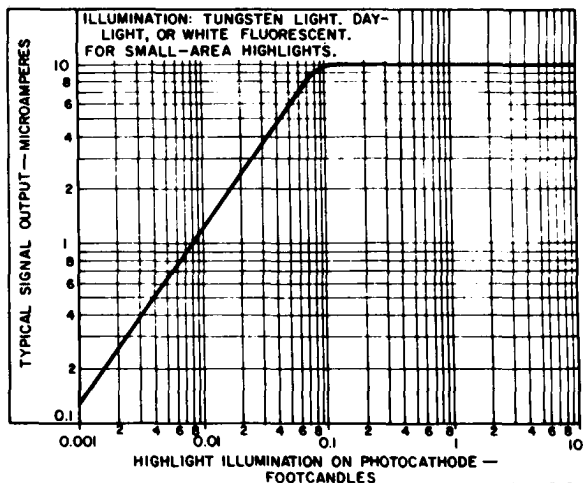
Then adjust the lens to produce best optical focus, and the voltage on the photocathode as well as the voltage on grid No. 4 to produce the sharpest picture. Grid No. 4 should be adjustable within the range of 100 to 200 volts. There are several voltage values outside of this range which will provide beam focus. However, such focus modes are not recommended.

At this point, attention should be given to the grid-No. 5, grid-No. 3, and the grid-No. 6 controls. Grid-No. 5 and grid-No. 6 controls should be adjusted to produce the best center-to-edge focus and the best picture geometry. Both the grid-No. 6 and grid-No. 5 controls produce a rotation of the edges of the picture, and influence the uniformity of focus from center to the edges of the picture. It is necessary to adjust these two controls successively to arrive at the best combination of focus and picture geometry. While changing grid-No. 6 and grid-No. 5 voltages, it will also be necessary to refocus the image section by adjusting the photocathode-voltage control. After the above mentioned controls are properly adjusted, the grid-No. 3 control should be adjusted for maximum signal output. The deflecting yoke and the 8685 should be rotated, if necessary, so that the horizontal scanning of the camera is parallel to the horizontal plane of the scene.



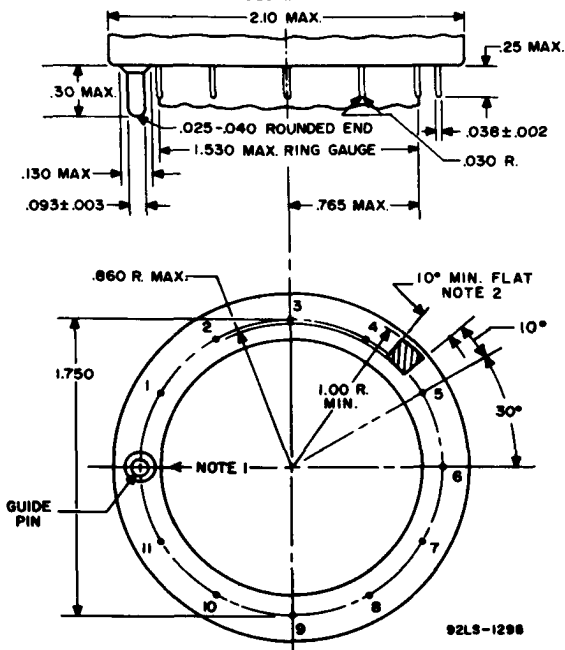
Finally, readjust the target voltage so that it is accurately set to 3 volts above target cutoff. The lens opening should be set to meet the requirements of the particular operating mode. This setting typically places scene highlights at the knee or one stop over the knee of the light transfer characteristic.

Basic Light Transfer Characteristic



DETAIL OF SPECIAL SHOULDER BASE

JEDEC No. E11-96



DIMENSIONS IN INCHES

Note 1: White guide line on faceplate is on this radius.

Note 2: 12 flat areas between each pair of pins.

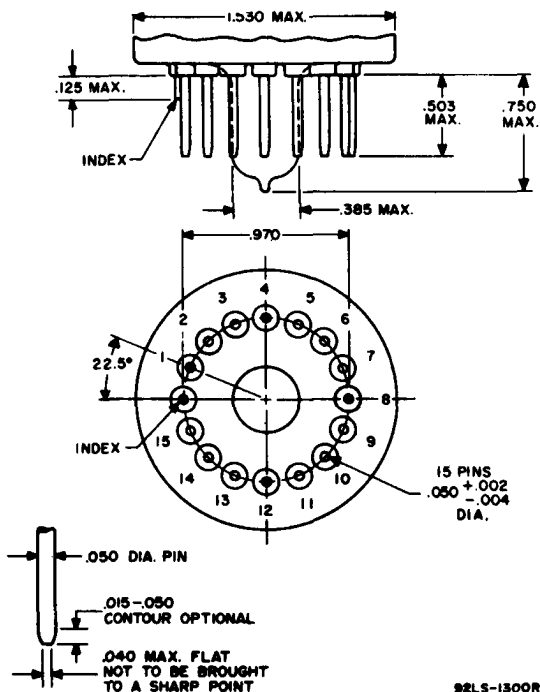
Pin 1 - Field Mesh
 Pin 2 - Internal Connection—
 Do Not Use
 Pin 3 - Photocathode
 Pin 4 - Internal Connection—
 Do Not Use
 Pin 5 - Grid No. 5
 Pin 6 - Internal Connection—
 Do Not Use

Pin 7 - Grid No. 6
 Pin 8 - Internal
 Connection—
 Do Not Use
 Pin 9 - No Connection
 Pin 10 - Internal
 Connection—
 Do Not Use
 Pin 11 - Target
 Guide Pin - No Internal
 Connection



DETAIL OF SPECIAL END BASE

JEDEC No. E15-95



DIMENSIONS IN INCHES

Pin 1 - Heater
 Pin 2 - Grid No.1
 Pin 3 - Grid No.3
 Pin 4 - Grid No.4
 Pin 5 - Internal Connection—
 Do Not Use
 Pin 6 - Dynode No.1,
 Grid No.2
 Pin 7 - Dynode No.2
 Pin 8 - Dynode No.4

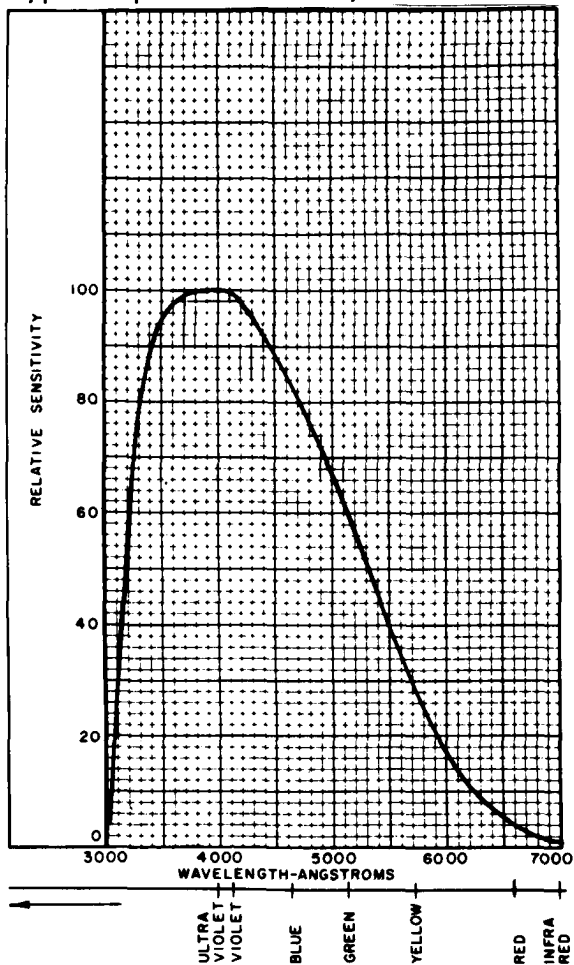
Pin 9 - Anode
 Pin 10 - Dynode No.5
 Pin 11 - Dynode No.3
 Pin 12 - Internal
 Connection—
 Do Not Use
 Pin 13 - Internal
 Connection—
 Do Not Use
 Pin 14 - Cathode
 Pin 15 - Heater



RADIO CORPORATION OF AMERICA
 Electronic Components and Devices
 Harrison, N. J.

DATA 5
 2-67

Typical Spectral Sensitivity Characteristic



92LM-155OR1

