8674

Image Orthicon

3-INCH DIAMETER MAGNETIC FOCUS — **LONG-LIFE, HIGH-SENSITIVITY TYPE MAGNETIC DEFLECTION**

For Superior Studio or Remote TV Pickup at Light Levels Available in Black-and-White TV Studios

The 8674 is designed to replace types 4415, 4416, 7293, 7293A, and 7293A/L.

GENERAL

Heater, for Unipotential Cathode	
Voltage (AC or DC)	6.3 ± 10% V
Current at 6.3 V	0.600 A
Direct Interelectrode Capacitance	
Anode to all other electrodes	12 pF
Target-to-Mesh Spacing	0.002 in (0.051 mm)
Spectral Response	See *Typical Spectral Sensitivity Characteristic*
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[c]	1.8-inch max. diagonal
Focusing Method	Magnetic
Deflection Method	Magnetic
Overall Length	15.2 in (386 mm) ± 0.25in
Greatest Diameter of Bulb	3.00 in (76.2 mm) ± 0.06 in
Minimum Deflecting-Coil Inside Diameter	2-3/8 in
Deflecting Coil	Cleveland Electronics, OV-Series,[d] or equivalent
Deflecting-Coil Length	5 in
Focusing Coil	Cleveland Electronics, OF-Series,[d] or equivalent
Focusing-Coil Length	10 in
Alignment Coil	Cleveland Electronics, OA-Series,[d] or equivalent
Length	15/16 in
Location	Axially centered 11 inches to rear of tube faceplate
Photocathode Distance Inside End of Focusing Coil	1/2 in

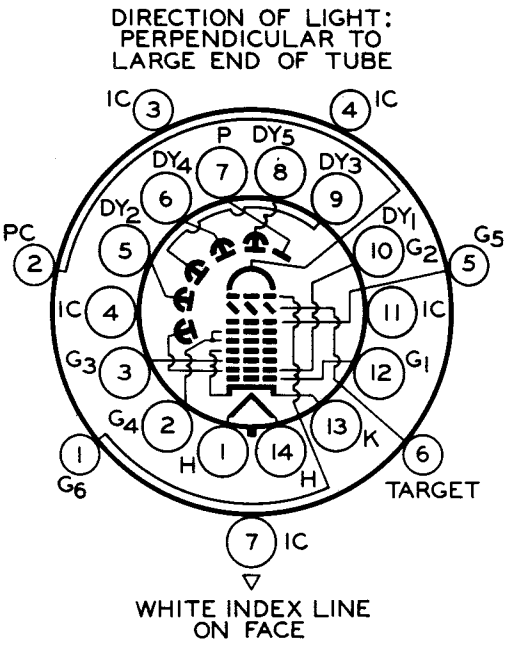
Operating Position — The tube should never be operated in a vertical position with the diheptal-base end up nor in any other position where the axis of the tube with base up makes an angle of less than 20° with the vertical.

Socket — Cinch Part No.3M14,[e] or equivalent

Weight (Approx.) — 1 lb 6 oz (600 g)

TERMINAL DIAGRAM (Bottom View)

Shoulder Base: Keyed Jumbo Annular 7-Pin



Pin 1 – Grid No.6
Pin 2 – Photocathode
Pin 3 – Do Not Use
Pin 4 – Do Not Use
Pin 5 – Grid No.5
Pin 6 – Target
Pin 7 – Do Not Use

End Base: Small-Shell Diheptal 14-Pin (JEDEC No.B14-45)

Pin 1 – Heater
Pin 2 – Grid No.4 & Field Mesh
Pin 3 – Grid No.3
Pin 4 – Do Not Use
Pin 5 – Dynode No.2
Pin 6 – Dynode No.4
Pin 7 – Anode
Pin 8 – Dynode No.5
Pin 9 – Dynode No.3
Pin 10 – Dynode No.1, Grid No.2
Pin 11 – Do Not Use
Pin 12 – Grid No.1
Pin 13 – Cathode & Suppressor Grid
Pin 14 – Heater

NOTE: In the tube symbol, the suppressor grid connected to the cathode, and the field-mesh grid connected to grid No.4, are intentionally without numbers to avoid upsetting industry practice of associating functional camera control knobs with specific grid numbers. For example, beam-focus control is generally associated with knob identified as G_4 (grid No.4).

ABSOLUTE-MAXIMUM RATINGS

Voltages are with respect to thermionic cathode unless otherwise specified

Photocathode		
Voltage	-600	V
Illumination	50	fc (538 lux)
Operating Temperature		
Of any part of bulb	50	°C
Of bulb at large end of tube (Target section)	35 min	°C
Temperature Difference between target section and any part of bulb hotter than target section	5	°C
Grid-No.6 Voltage	-550	V

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Target Voltage		
Positive value	10	V
Negative value	10	V
Grid-No.5 Voltage	200	V
Grid-No.4 Voltage	300	V
Grid-No.3 Voltage	400	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	0	V
Anode-Supply Voltage	1350	V
Voltage Between Consecutive Dynodes	400	V

TYPICAL OPERATING VALUES

Photocathode Voltage (Image focus)[f]	-400 to -540	V
Grid-No.6 Voltage (Accelerator)—		
Approx. 59% to 60% of photocathode voltage[g]	-235 to -325	V
Target Voltage above Cutoff[h]	2	V
Grid-No.5 Voltage (Decelerator)	0 to 150	V
Grid-No.4 Voltage (Beam focus)	140 to 180	V
Grid-No.3 Voltage[g]	260 to 300	V
Grid-No.2 & Dynode-No.1 Voltage	300	V
Grid-No.1 Voltage for Picture Cutoff	-45 to -115	V
Dynode-No.2 Voltage	600	V
Dynode-No.3 Voltage	800	V
Dynode-No.4 Voltage	1000	V
Dynode-No.5 Voltage	1200	V
Anode Voltage	1250	V
Target-Temperature Range	35 to 45	°C
Peak-to-Peak Target Blanking Voltage	6	V
Field Strength at Center of Focusing Coil (Approx.)[k]	75	G
Field Strength of Alignment Coil (Approx.)	0 to 3	G

PERFORMANCE DATA

With conditions shown under Typical Operating Values, picture highlights at the "knee" of the light-transfer characteristic, 525-line scanning, interlaced 2:1, frame time of 1/30 second, and 1.8-inch picture diagonal with 4x3 aspect ratio. Characteristics are measured in an RCA Model TK-31A camera, or equivalent.

	Min	*Typ*	*Max*	
Cathode Radiant Sensitivity at 4000 angstroms	-	0.08	-	μA/μW
Cathode Luminous Sensitivity[m]	60	100	-	μA
Signal-Output Current (Peak to Peak)	5	-	32	μA

	Min	Typ	Max	
Signal-to-Noise Ratio[n] . . .	35:1 (31 dB)	40:1 (32 dB)	-	
Photocathode Illumination at 2870°K Required to Reach "Knee" of Light-Transfer Characteristic	-	-	0.022	fc(lm/ft²)
Amplitude Response at 400 TV Lines per Picture Height (Per cent of large-area black to large-area white)[p]	40	60	-	%
Uniformity				
Ratio of Shading (Background) Signal to Highlight Signal. . . .	-	-	0.15	
Variation of Highlight Signal (Per cent of maximum highlight signal)[q].	-	-	25	%

[a] Made by Corning Glass Works, Corning, New York.

[b] Proper orientation is obtained when the vertical scan is essentially parallel to the plane passing through center of faceplate and pin 7 of the shoulder base. The horizontal and vertical scan should preferably start at the corner of the raster nearest pin 6 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 size such that the corners of the rectangle just touch the target ring; a condition that may be achieved in some camera designs with a 1.6-inch diagonal image on the photocathode.

[d] Made by Cleveland Electronics Inc., 1974 East 61st St., Cleveland, Ohio.

[e] Made by Cinch Manufacturing Company, 1026 South Homan Ave., Chicago 24, Ill.

[f] Adjust for best focus.

[g] For minimum highlight flare or "ghost" the grid-No.6 voltage should be 59% of the photocathode voltage.

[h] Normal setting of target voltage is +2 volts from target cutoff. The target supply voltage should be adjustable from -3 volts to +5 volts.

[j] Adjust to give the most uniformly shaded picture near maximum signal.

[k] Direction of current 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.

[m] 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 are applied between photocathode and grounded grid No.6 and target.

[n] With a noise equivalent bandwidth of 4.5 MHz. Peak signal output is measured with respect to "picture" 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, and the choice of reference signal black level.

[p] Measured with amplifier having flat frequency responses.

[q] Variation of response over scanned area.

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OPERATING TECHNIQUES

With lens uncapped and lens iris opened, proper voltages should be applied to the 8674, and the grid-No.1 voltage should immediately be adjusted to produce a small amount of beam current. 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. The lens should be capped and the tube should be allowed to warm up for 10 minutes before used or before adjustments are made.

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 a color camera, when voltages are applied to the tube. Excessive illumination for short periods of time under these conditions may damage the photocathode of the 8674.

Next, uncap 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 in the range of 140 to 180 volts. There are several voltage values outside of this range which will provide beam focus. However, such focus modes are not recommended.

Proper adjustment for suppression of highlight flare or "ghost" and proper geometry is obtained when the grid-No.6 voltage is accurately set at 59 per cent of the photocathode voltage. This adjustment may be effected by positioning a small bright spot of light on the edge of the field to be viewed and then adjusting the grid-No.6 voltage so that the "ghost" that appears on the viewing monitor disappears as the image section is brought into sharpest focus. Improper

adjustment is evident when a light spot that is observed on the right edge of the viewing monitor produces a "ghost" that appears above the spot and when a light spot observed on the left edge of the viewing monitor produces a "ghost" that appears below the spot.

Grid No.5 should then be adjusted to produce best uniformity of signal, i.e., the absence of dark corners. Such uniformity is best obtained while viewing a uniform white card, or test pattern, with the exposure on the tube well above the knee and with the picture monitor adjusted for low brightness.

After adjustment of the image section voltages, grid-No.3 voltage should be set for maximum signal output. The deflecting yoke and the 8674 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 2 volts above target cut-off. In black-and-white service, the lens iris should be opened to 1/2 or 1 lens stop beyond the point where the highlights of the scene reach the knee of the light transfer characteristic. In color camera service, each tube should be operated with white-scene highlights at the knee.

Dos and Don'ts on Use of RCA-8674

Dos

1. Allow the 8674 to warm up prior to operation.
2. Hold temperature of the 8674 within operating range.
3. Make sure alignment coil is properly adjusted.
4. Adjust beam-focus control for best usable resolution.
5. Condition spare 8674's by operating several hours once each month.
6. Determine proper operating point with target voltage adjusted to exactly 2 volts above target cutoff.
7. Uncap lens before voltages are applied to the 8674.
8. Turn off the camera or the image-section high voltage supply if the lens turret or the yoke and 8674 must be "swung out" to clean the lens of the tube faceplate.

Don'ts

1. Don't force the 8674 into its shoulder socket.
2. Don't operate the 8674 without scanning.
3. Don't operate the 8674 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.

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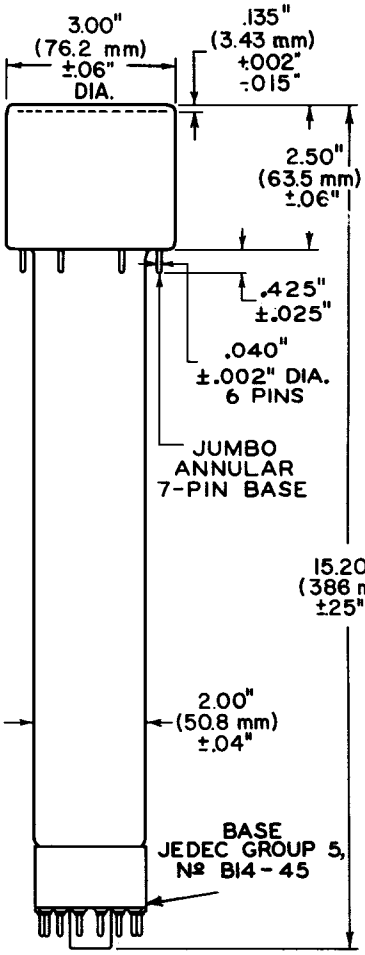
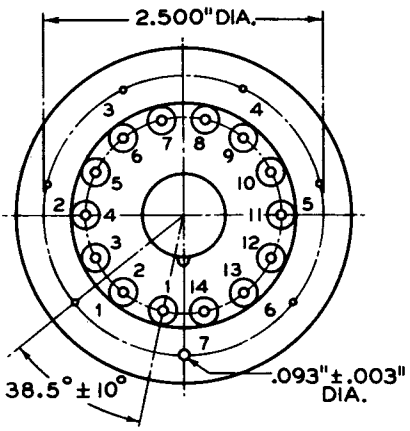
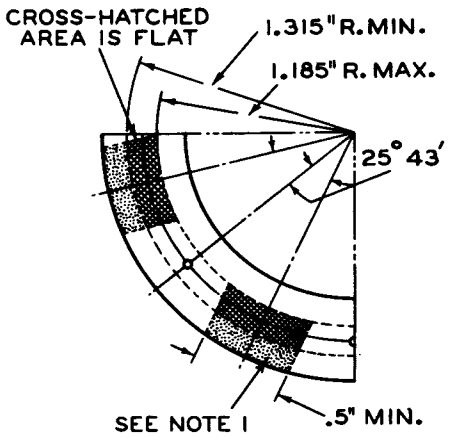
6. Don't remove the lens turret or lens when the camera is turned on, or when voltages are applied to the image section of the 8674, unless the light level incident on the tube can be reduced below 50 footcandles.





ENLARGED BOTTOM VIEW

DETAIL OF BOTTOM VIEW
OF JUMBO ANNULAR BASE



Note 1: Dotted area is flat or extends toward diheptal-base end of tube by 0.060 inch max.

ANNULAR BASE GAUGE

Angular variations between pins as well as eccentricity of neck cylinder with respect to photocathode cylinder are held to tolerances such that pins and neck cylinder will fit flatplate gauge with:

a. Six holes having diameter of 0.065 ± 0.001 inch and one hole having diameter of 0.150 ± 0.001 inch. All holes have depth of 0.265 ± 0.001 inch. The six holes are enlarged by 45° taper to depth of 0.047 inch. All holes are spaced at angles of 51° 26' ± 5' on circle diameter of 2.500 ± 0.001 inches

b. Seven stops having height of 0.187 ± 0.001 inch, centered between pin holes, to bear against flat areas of base.

c. Rim extending out a minimum of 0.125 inch from 2.812 inch diameter and having height of 0.126 ± 0.001 inch.

d. Neck-cylinder clearance hole having diameter of 2.200 ± 0.001 inches

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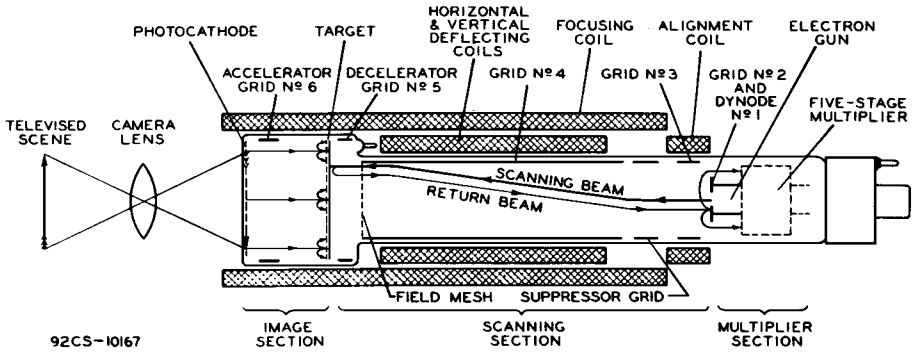
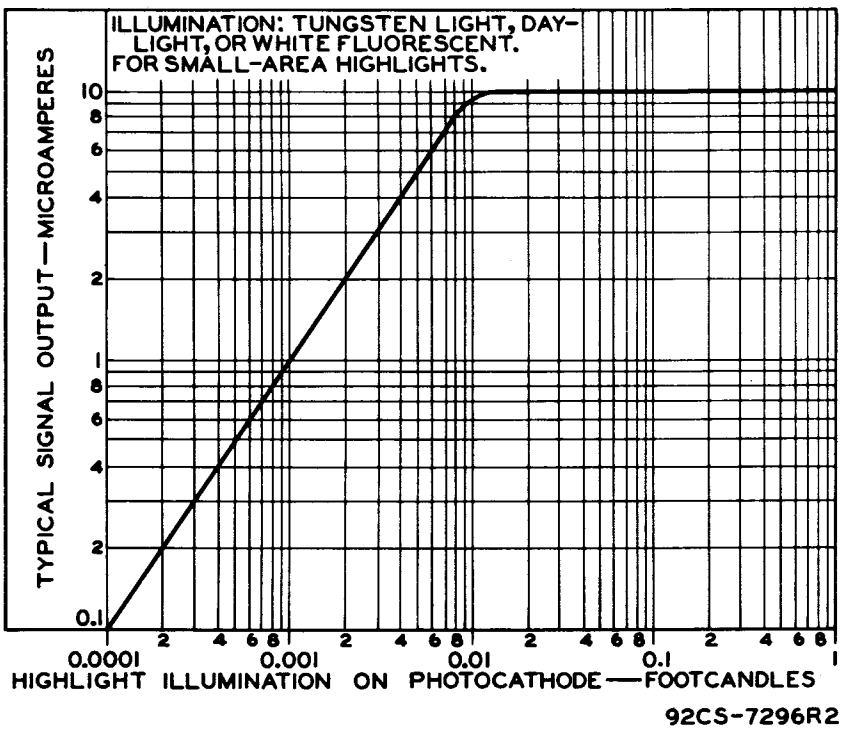
SCHEMATIC ARRANGEMENT OF TYPE 8674



Basic Light Transfer Characteristic



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Typical Spectral Sensitivity Characteristic