

## Image Orthicons

## MAGNETIC FOCUS

## MAGNETIC DEFLECTION

For Color Pickup at Light Levels of Studios Equipped for Black-and-White Pickup. Two 4415's for the Red and Green Channels and One 4416 for the Blue Channel are Supplied as a Specially Selected Set having High Sensitivity for Simultaneous-Pickup Color TV Cameras.

## DATA

## General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC) . . . . .	6.3 ± 10%	volts
Current at 6.3 volts. . . . .	0.6	amp
Direct Interelectrode Capacitance:		
Anode to all other electrodes . . . . .	12	μf
Maximum Target-to-Mesh Spacing. . . . .	0.0008	inch
Photocathode, Semitransparent:		
Response:		
Type 4415 . . . . .		S10
Type 4416 . . . . .		S11
Wavelength of maximum response:		
Type 4415 . . . . .	4500 ± 300	angstroms
Type 4416 . . . . .	4400 ± 500	angstroms
Rectangular image (4 x 3 aspect ratio):		
Useful size of. . . . .	1.8" max.	diagonal
Note: 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.		
Orientation of. . . . . 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 start at the corner of the raster nearest pin 6 of the shoulder base.		
Focusing Method . . . . .		Magnetic
Deflection Method . . . . .		Magnetic
Overall Length. . . . .	15.20" ± 0.25"	
Greatest Diameter of Bulb . . . . .	3.00" ± 0.06"	
Minimum Deflecting-Coil Inside Diameter . . . . .	2-3/8"	
Deflecting-Coil Length. . . . .	5"	
Focusing-Coil Length. . . . .	10"	
Alignment Coil:		
Length. . . . .	15/16"	
Position on neck. . . . . Centerline of coil located 8.5" from the flat area of the jumbo annular base		
Photocathode Distance Inside End of Focusing Coil . . . . .	1/2"	
Operating Position. . . . .	See <i>Operating Considerations</i>	
Weight (Approx.). . . . .	1 lb 6 oz	



# 4415, 4416

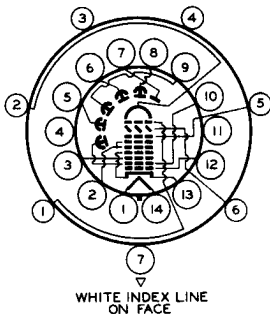
Shoulder Base. . . . . Keyed Jumbo Annular 7-Pin  
 BOTTOM VIEW

- |  |  |
|--|--|
| Pin 1 - Grid No.6                      | Pin 5 - Grid No.5                      |
| Pin 2 - Photocathode                   | Pin 6 - Target                         |
| Pin 3 - Internal Connection—Do Not Use | Pin 7 - Internal Connection—Do Not Use |
| Pin 4 - Internal Connection—Do Not Use |  |

End Base . . . . . Small-Shell Diheptal 14-Pin  
 (JEDEC Group 5, No.B14-45)  
 BOTTOM VIEW

- Pin 1 - Heater  
 Pin 2 - Grid No.4,  
 Field-Mesh Grid  
 Pin 3 - Grid No.3  
 Pin 4 - Internal Connection—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 - Internal Connection—Do Not Use  
 Pin 12 - Grid No.1  
 Pin 13 - Cathode,  
 Suppressor Grid  
 Pin 14 - Heater

DIRECTION OF LIGHT:  
 PERPENDICULAR TO  
 LARGE END OF TUBE



**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  $G_u$  (grid No.4).

**Maximum and Minimum Ratings, Absolute-Maximum Values:**

<b>PHOTOCATHODE:</b>		
Voltage . . . . .	-550 max.	volts
Illumination . . . . .	50 max.	fc
<b>OPERATING TEMPERATURE:</b>		
Of any part of bulb . . . . .	50 max.	°C
Of bulb at large end of tube (Image section). . . . .	35 min.	°C
<b>TEMPERATURE DIFFERENCE:</b>		
Between image section and any part of bulb hotter than image section. . .	5 max.	°C
<b>GRID-No.6 VOLTAGE.</b> . . . . .	-550 max.	volts
<b>TARGET VOLTAGE:</b>		
Positive value . . . . .	10 max.	volts
Negative value . . . . .	10 max.	volts
<b>GRID-No.5 VOLTAGE.</b> . . . . .	150 max.	volts
<b>GRID-No.4 VOLTAGE.</b> . . . . .	300 max.	volts
<b>GRID-No.3 VOLTAGE.</b> . . . . .	400 max.	volts



GRID-No.2 & DYNODE-No.1 VOLTAGE. . . . .	350 max.	volts
GRID-No.1 VOLTAGE:		
Negative-bias value. . . . .	125 max.	volts
Positive-bias value. . . . .	0 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	10 max.	volts
ANODE-SUPPLY VOLTAGE <sup>a</sup> . . . . .	1350 max.	volts
VOLTAGE PER MULTIPLIER STAGE . . . . .	350 max.	volts

### Typical Operating Values:

Photocathode Voltage (Image focus) <sup>b</sup> . . .	-400 to -540	volts
Grid-No.6 Voltage (Accelerator)—		
Approx. 65% of photocathode voltage. .	-260 to -350	volts
Target-Cutoff Voltage <sup>c</sup> . . . . .	-3 to +1	volts
Grid-No.5 Voltage (Decelerator). . . . .	0 to 125	volts
Grid-No.4 Voltage (Beam focus) <sup>b</sup> . . . . .	140 to 180	volts
Grid-No.3 Voltage <sup>d</sup> . . . . .	225 to 330	volts
Grid-No.2 & Dynode-No.1 Voltage. . . . .	300	volts
Grid-No.1 Voltage for picture cutoff . .	-45 to -115	volts
Dynode-No.2 Voltage. . . . .	600	volts
Dynode-No.3 Voltage. . . . .	800	volts
Dynode-No.4 Voltage. . . . .	1000	volts
Dynode-No.5 Voltage. . . . .	1200	volts
Anode Voltage. . . . .	1250	volts
Target-Temperature Range . . . . .	35 to 45	°C
Minimum Peak-to-Peak Blanking Voltage. .	5	volts
Field Strength at Center of Focusing Coil <sup>e</sup> .	75	gausses
Field Strength of Alignment		
Coil (Approx.) . . . . .	0 to 3	gausses

### Performance Data:

*With conditions shown under Typical Operating Values and with picture highlights at the "knee" of the light-transfer characteristic*

*Min. Average Max.*

#### Type 4415:

Cathode Radiant Sensitivity			
at 4500 angstroms. . . . .	-	0.028	- $\mu\text{a}/\mu\text{W}$
Signal-Output Current			
(Peak-to-Peak) . . . . .	4	-	30 $\mu\text{a}$
Ratio of Peak-to-Peak Highlight			
Video-Signal Current to RMS Noise			
Current for Bandwidth of 4.5 Mc. .	30:1	37:1	-

#### Type 4416:

Cathode Radiant Sensitivity			
at 4400 angstroms. . . . .	-	0.04	- $\mu\text{a}/\mu\text{W}$
Signal-Output Current			
(Peak-to-Peak) . . . . .	4	-	30 $\mu\text{a}$
Ratio of Peak-to-Peak High-			
light Video-Signal Current			
to RMS Noise Current for			
Bandwidth of 4.5 Mc. . . . .	30:1	37:1	-



# 4415, 4416

- a Ratio of dynode voltages is shown under *Typical Operating Values*.
- b Within this range, the actual focusing-voltage value will not differ by more than 2% from that for any other tube when all other operating conditions are held constant, i.e., when different tubes are operated in the same camera with the same deflecting yoke, with fixed focusing-field current, with grid-No.6 voltage at a fixed percentage of the photocathode voltage, and with all other voltages held constant.
- c Normal setting of target voltage is +2 volts from target cutoff. The target supply voltage should be adjustable from -3 to +5 volts.
- d Adjust to give the most uniformly shaded picture near maximum signal.
- e 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.

## OPERATING CONSIDERATIONS

The *operating position* of these types should preferably be such that any loose particles in the neck of the tubes will not fall down and strike or become lodged on the target. Therefore, it is recommended that these tubes never be operated in a vertical position with the Diheptal-base end up nor in any other position where the axis of the tubes with base up makes an angle of less than  $20^{\circ}$  with the vertical.

## PERFORMANCE CHARACTERISTICS

Because of the high sensitivity of the 4416 in the blue channel, cameras employing the 4415-4416 set will have greatly increased overall sensitivity. Color reproduction will also be excellent. With a lens opening of  $f/8$ , the set is capable of producing high-quality color pictures when scenes illuminated by incandescent light provide scene-luminance levels of approximately 100 footlamberts.

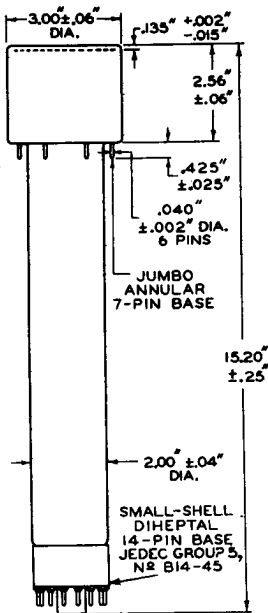
## INSTALLATION PRECAUTION

The 4416 has S-11 response and is specifically intended for use in the blue channel. Its sensitivity to blue light is nearly twice that of the 4415's. However, its low green response and negligible red response restrict its use to this channel only. Either of the 4415's, which have the panchromatic S-10 response, may be used in the green or red channels. Improved performance is obtained, however, if the most sensitive of the 4415's is placed in the least sensitive of these two channels.

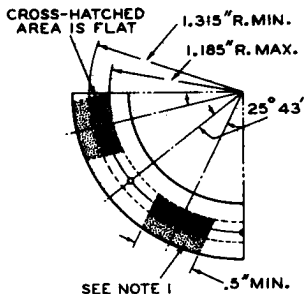
If a replacement tube is desired for any given set of tubes, reference should be made in the replacement order to the serial numbers of the remaining tubes in the set.

**SPECTRAL-SENSITIVITY CHARACTERISTICS  
OF PHOTSENSITIVE DEVICES HAVING S-10 OR S-11 RESPONSE  
are shown at front of this Section**





## DETAIL OF BOTTOM VIEW OF JUMBO ANNULAR BASE

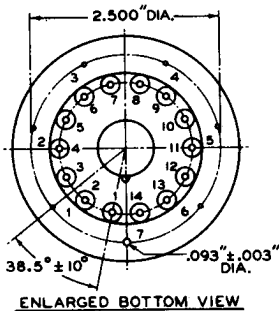


NOTE 1: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL-BASE END OF TUBE BY 0.060" MAX.

## ANNULAR-BASE GAUGE

ANNULAR 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 FLAT-PLATE GAUGE WITH:

- SIX HOLES HAVING DIAMETER OF  $0.065" \pm 0.001"$  AND ONE HOLE HAVING DIAMETER OF  $0.150" \pm 0.001"$ . ALL HOLES HAVE DEPTH OF  $0.265" \pm 0.001"$ . THE SIX  $0.065"$  HOLES ARE ENLARGED BY  $45^\circ$  TAPER TO DEPTH OF  $0.047"$ . ALL HOLES ARE SPACED AT ANGLES OF  $51^\circ 26' \pm 5'$  ON CIRCLE DIAMETER OF  $2.500" \pm 0.001"$ .
- SEVEN STOPS HAVING HEIGHT OF  $0.187" \pm 0.001"$ , CENTERED BETWEEN PIN HOLES, TO BEAR AGAINST FLAT AREAS OF BASE.
- RIM EXTENDING OUT A MINIMUM OF  $0.125"$  FROM  $2.812"$  DIAMETER AND HAVING HEIGHT OF  $0.126" \pm 0.001"$ .
- NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF  $2.200" \pm 0.001"$ .



92CM-10154R1

