GENERAL ELECTRIC
POWER TUBE DEPARTMENT
Schenectady 5, N. Y.

OBJECTIVE
TECHNICAL INFORMATION

These ratings represent the design objective for this tube.

DEVELOPMENTAL TYPE

Z-5395
OTI-10
Page 1
9-30-59

IMAGE ORTHICON

Focus – Magnetic Deflection – Magnetic

The Z-5395 is an image orthicon with a wide-spaced high-gain thin film target and an S-1 photosurface. The good sensitivity of the S-1 photosurface to radiation in the red and near infra red regions makes the tube suitable for detection and televising of scenes which are illuminated with or consist of infra red sources.

By appropriate choice of infra red filtered light sources for illumination, scenes which appear to be in total visual darkness can easily be televised. In addition, useful pictures of objects at elevated temperatures which are not visibly hot can be obtained.

The very low sideways leakage characteristics of the thin film target adapts the tube to applications where the signal is stored for a very long period before being read out. This permits the attainment of additional sensitivity by the use of low frame rates or beam pulsing.

Additional advantages due to the unique construction of the Z-5395 target are high amplitude response, reduction in redistribution of target secondary electrons, and minimized possibility of permanent burn-in damage from stationary image highlights.

Future design objectives for the tube are primarily in the areas of increased ruggedness, minimization of microphonics, increased red sensitivity, and improved temperature, sensitivity and stability relationships.

GENERAL		
Electrical		
Cathode - Unipotential		
Heater Voltage, AC or DC	6.3 ± 10%	Volts
Heater Current	0.6	Amperes
Photocathode - Semi-Transparent		
Rectangular Image, 4 by 3 Aspect Ratio		
Useful Size, Maximum Diagonal	1.8	Inches
Orientation - Proper orientation is obtained when the vertical scan is essentially parallel to the plane passing through the center of the face-plate and pin- No. 7 of the shoulder base.		
Focusing Method - Magnetic		
Deflecting Method - Magnetic		
Direct Interelectrode Capacitance		
Anode to all Other Electrodes	12	μμf
Mechanical		
Over-all Length	15.20 ± 0.25	Inches
Greatest Diameter of Bulb	3.00 ± 0.06	Inches
Minimum Deflecting Coil Inside Diameter	2 3/8	Inches
Deflecting Coil Length	5	Inches
Focusing Coil Length	10	Inches
Alignment Coil Length	15/16	Inches
Photocathode Distance Inside End of Focusing Coil	1/2	Inches
Weight, approximate	1.4	Pounds
Operating Position - Any. Except with diheptal base up and the tube axis at an angle of less than 20 degrees from vertical.		

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

Maximum Ratings, Absolute Values

Photocathode Voltage	-550	Max Volts
Photocathode Current #, maximum	10	Microamperes
Photocathode Illumination	20	Max Foot-Candles
Anode Supply Voltage*	1350	Max Volts
Grid-No. 1 Voltage		
Negative Bias Value	125	Max Volts
Positive Bias Value	0	Max Volts
Grid-No. 2 and Dynode-No. 1 Voltage	350	Max Volts
Grid-No. 3 Voltage	400	Max Volts
Grid-No. 4 Voltage	300	Max Volts
Grid-No. 5 Voltage	150	Max Volts
Grid-No. 6 Voltage	-550	Max Volts
Voltage per Multiplier Stage	350	Max Volts
Target Voltage		
Positive Voltage	2	Max Volts
Negative Voltage	10	Max Volts
Peak Heater Cathode Voltage		
Heater Negative with Respect to Cathode	125	Max Volts
Heater Positive with Respect to Cathode	10	Max Volts
Operating Temperature of Any Part of Bulb §	50	Max C
Operating Temperature 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	Max C

Typical Operation

Photocathode Voltage, image focus	-400 - -500	Volts
Grid-No. 1 Voltage for Picture Cut-off, beam	45 - -115	Volts
Grid-No. 2 and Dynode-No. 1 Voltage	300	Volts
Grid-No. 3 Voltage, multiplier focus +	225 - 330	Volts
Grid-No. 4 Voltage, beam focus	140 ‡ 180	Volts
Grid-No. 5 Voltage, decelerator	0 - 125	Volts
Grid-No. 6 Voltage, accelerator 75 Percent of Photocathode Voltage, approximate	-300 - -405	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
DC Anode Current	3	Microamperes
Target Voltage, without blanking voltage	0 - 2.0	Volts
Peak to Peak Blanking Voltage	5 - 20	Volts
Target Temperature Range	15 - 55	C
Field Strength at Center of Focusing ‡	75	Gausses
Field Strength of Alignment Coil, approximate	0 - 3	Gausses

Characteristic Values	Minimum	Bogey	Maximum	
Sensitivity				
Photocathode, luminous with 2870 K tungsten light source	8	12	...	Microamperes
Photocathode ¶, percentage of infra red response with stock thickness, Corning #2540 and 2870 K tungsten light source	2.0	5.0	...	Percent

* Ratio of dynode voltages is shown under Typical Operation.

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

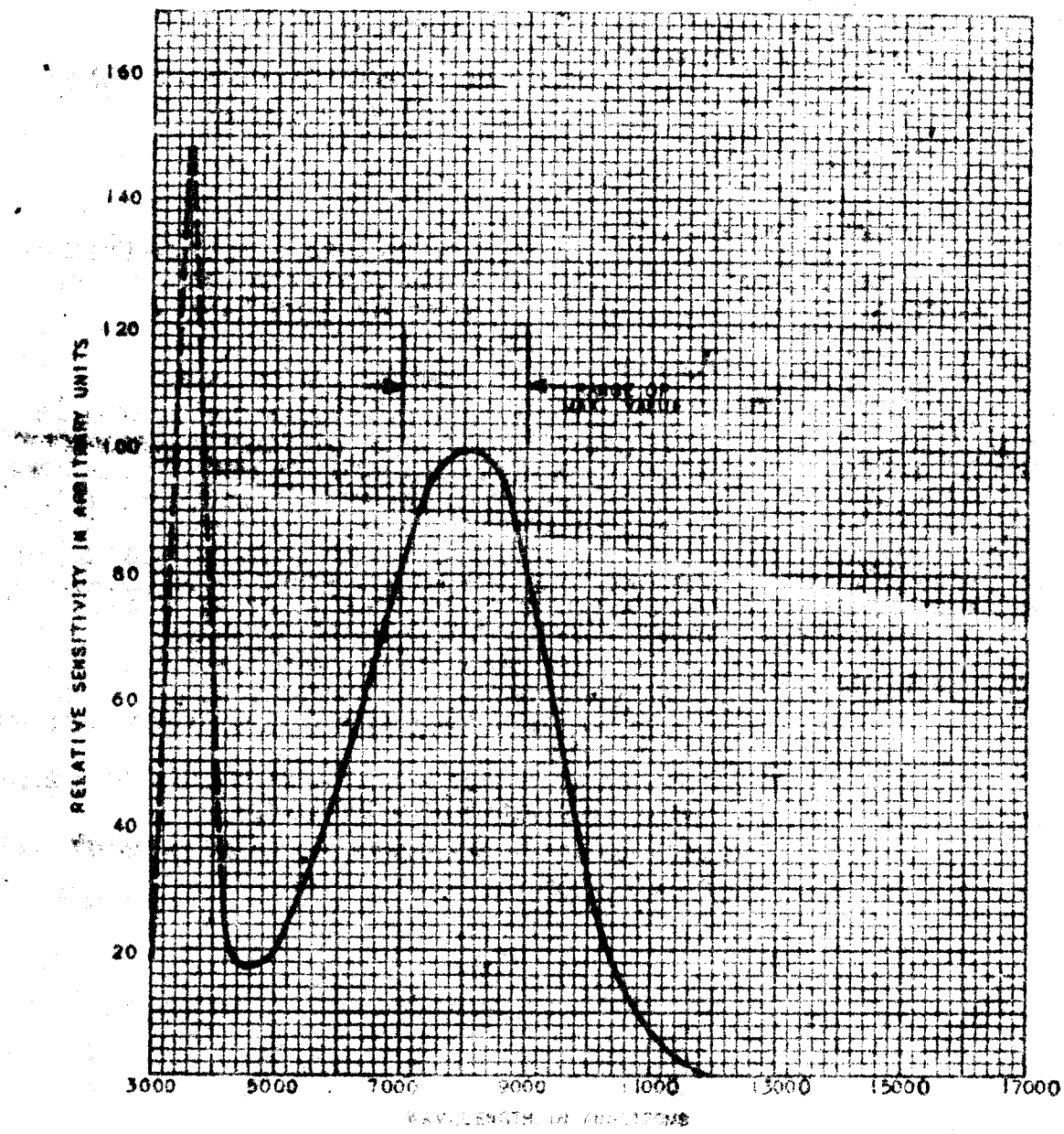
‡ Direction of current should be such that a north-seeking pole is attracted to the image end of the focusing coil with the indicator located outside of and at the image end of the focusing coil.

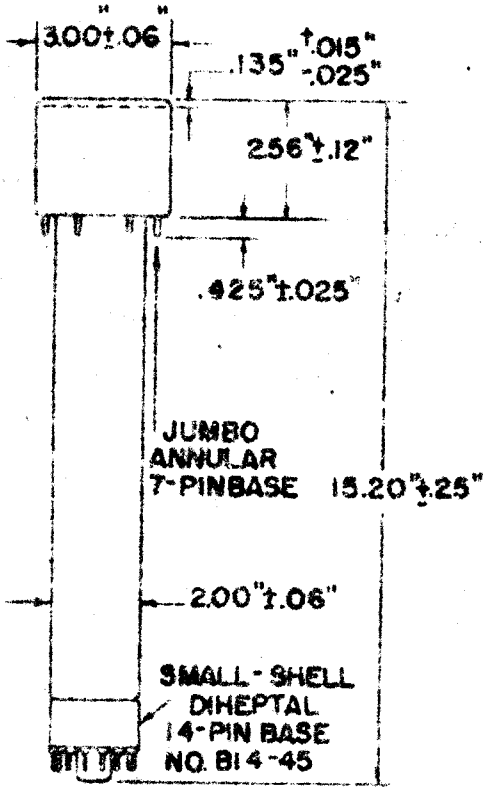
§ The maximum temperature rating should not be exceeded since too high a bulb temperature may cause the more volatile components of the photocathode and dynode surfaces to redistribute with consequent decrease in life and sensitivity of the tube. The use of a fan on the tube is recommended.

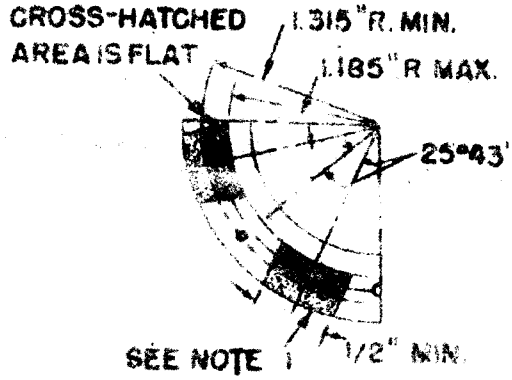
¶ A small temporary loss of infra red sensitivity may occur after long periods of operation. This sensitivity should recover almost completely during idle periods.

For most stable operation, the use of the average photocathode current below the maximum rated value of 10 microamperes is recommended. Maximum life and most stable sensitivity characteristics will be obtained by using the lowest values of average photocathode current which are consistent with good picture quality.

SPECTRAL SENSITIVITY CHARACTERISTIC
S-1 PHOTOSURFACE
For Equal Values of Radiant Flux at All Wavelengths

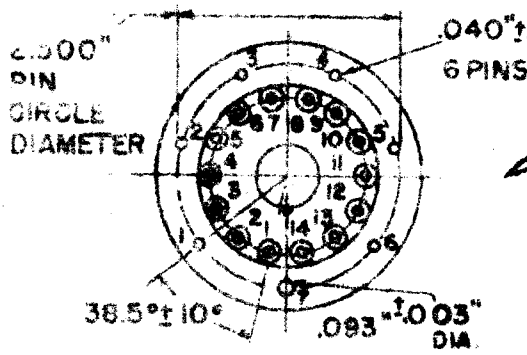






DETAIL OF BOTTOM VIEW OF JUMBO ANNULAR BASE

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



ENLARGED BOTTOM VIEW

ANNULAR BASE GAGE

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 FLAT-PLATE GAGE WITH:

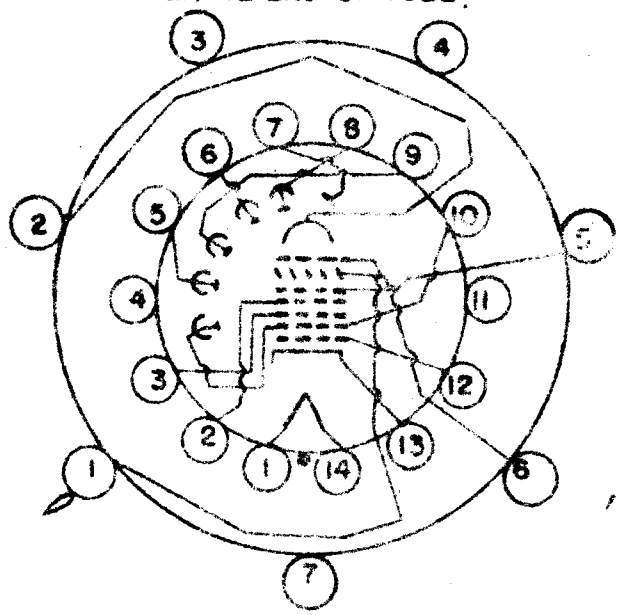
a. SIX HOLES HAVING DIAMETER OF 0.065"± 0.001" AND ONE HOLE HAVING DIA. OF 0.150+0.001". ALL HOLES HAVE DEPTH OF 0.265"±0.001". THE SIX 0.065" HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF 0.047". ALL HOLES ARE SPACED AT ANGLES OF 51°26'±5' ON CIRCLE DIAMETER OF 2.500"± 0.001"

b. SEVEN STOPS HAVING HEIGHT OF 0.187"± 0.001", CENTERED BETWEEN PIN HOLES, TO BEAR AGAINST FLAT AREAS OF BASE.

c. RIM EXTENDING OUT OF A MINIMUM OF 0.125" FROM 2 9/2" DIAMETER AND HAVING HEIGHT OF 0.126"±0.001".

d. NECK-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF 2.200"± 0.001".

DIRECTION OF LIGHT: PERPENDICULAR TO LARGE END OF TUBE.



WHITE INDEX LINE ON FACE

BASING DIAGRAM

SMALL-SHELL DIHEPTAL 14-PIN BASE

PIN 1: HEATER
PIN 2: GRID NO. 4
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
PIN 14: HEATER

KEYED JUMBO ANNULAR 7-PIN BASE

PIN 1: GRID NO. 6
PIN 2: PHOTOCATHODE
PIN 3: INTERNAL CONNECTION-DO NOT USE
PIN 4: INTERNAL CONNECTION DO NOT USE
PIN 5: GRID NO. 5
PIN 6: TARGET
PIN 7: INTERNAL CONNECTION DO NOT USE