

Nov. 3, 1944



IP25 VIEWING TUBE

Spectral Response S-1

Red — Infra-Red Sensitive

Phosphor No.1

(TENTATIVE DATA)

INSTALLATION

The RCA-IP25 is a new form of tube which, in combination with suitable optical systems, permits the viewing of a scene by radiant energy of low visual efficiency. It consists of a photocathode at the large end of the tube on which the scene to be viewed is imaged by means of an optical objective. The image on the photocathode is focused on the screen at the small end of the tube by electron-optical methods to form a reduced fluorescent image which can be viewed by the use of an optical magnifier. The objective may consist of a Schmidt optical system or a conventional objective lens. At the small end of the tube, a lens is built in as a part of the tube. This lens forms the front element of the optical magnifier.

Features of the IP25 are its good spectral response to infra-red radiation, a face plate having high optical quality, an integral screen lens, and small size.

GENERAL

SPECTRAL RESPONSE	S-1
FOCUS	Electrostatic
PHOSPHOR	No. 1
FLUORESCENCE	Green
PERSISTENCE	Medium
OVERALL LENGTH	4-7/16" $\pm 1/8$ "
DIAMETER OF LARGE CYLINDER	1-5/8" $\pm 1/16$ " -3/32"
DIAMETER OF SMALL CYLINDER	7/8" $\pm 1/32$ " -3/32"
MINIMUM USEFUL PHOTOCATHODE DIAMETER	1-1/8"
MINIMUM USEFUL SCREEN DIAMETER	1-1/2"
BASE	Medium Annular 7-Pin
MOUNTING POSITION	Any

Maximum Ratings Are Absolute Values

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS for Observations at Eye Threshold

GRID No. 4 (High-voltage Collector- Grid Electrode) VOLTAGE	4500 max. Volts
GRID No. 3 (Accelerating Electrode) VOLTAGE	800 max. Volts
GRID No. 2 (Focusing Electrode) VOLTAGE	250 max. Volts
GRID No. 1 (Accelerating Electrode) VOLTAGE	15 max. Volts
PHOTOCATHODE ILLUMINATION	50 max. Foot- Candles
AMBIENT TEMPERATURE	50 max. °C
TYPICAL OPERATION:	
Grid No. 4 Voltage	4100 Volts
Grid No. 3 Voltage	575 Volts
Grid No. 2 Voltage*	100 □ Volts
Grid No. 1 Voltage	10 Volts

* Supply should be adjustable to $\pm 55\%$ of value shown.
□ This value is for a photocathode illumination of approximately 10 foot-candles. For extremely low light levels, this voltage should be reduced by about 20%.

The *terminal pins* of the IP25 require the use of a special 7-pin socket which may be mounted to hold the tube in any position. The socket should have floating contacts which will prevent strains on the metal-to-glass seals. It should be made of good insulating material; a type having insulating baffles between contacts provides an additional factor of safety.

The *bulb* of the IP25, except for the photocathode and screen ends, should be enclosed in a grounded metal case. If an iron or steel case is used to minimize the effects of extraneous fields on tube operation, care should be taken in its construction to insure that the case is completely demagnetized.

The shielding case may be so designed, if desired, to include an annular end piece to position the tube properly in the optical system. For this purpose, the circle of the end piece bearing against the face plate should lie inside a circle of 5/8-inch radius, concentric with the axis of the large cylinder, to insure contact with the uniform surface of the face.

The *fluorescent screen* employs phosphor No. 1 which fluoresces to produce a green luminescence. It has good visual and photographic qualities as well as high luminous efficiency. The spectral energy characteristic of phosphor No. 1 is given in Fig. 1.

The *photocathode* has good response to radiant energy in the infra-red region up to about 12000 angstroms. The spectral response of the IP25 is identified as S-1, and is shown in the curve of Fig. 2.

The *maximum ambient temperature* rating should not be exceeded because too high a bulb temperature may cause the volatile cathode surface to evaporate with consequent decrease in life and sensitivity of the surface.

Exposure to intense light, such as direct sunlight, may temporarily decrease the tube's sensitivity even though there is no voltage applied. The magnitude and duration of this decrease depend on the length of exposure. Permanent damage to the tube may result if it is exposed to radiant energy so intense as to cause excessive heating of the cathode.



The d-c supply voltages for the electrodes may be obtained conveniently from a vacuum-tube rectifier. Since the tube requires very little current, the rectifier system can be of either the half-wave or the voltage-doubler type. A 0.5 to 2 μ f condenser will ordinarily provide sufficient filtering. It is recommended that the tube be operated with grid No.4 at ground potential.

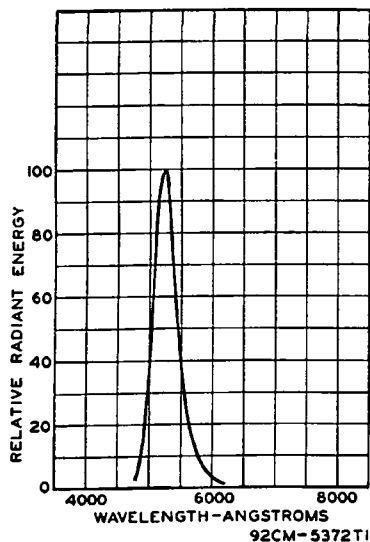


Fig. 1 - Spectral energy characteristic of phosphor No. 1.

The high voltages at which the 1P25 is operated are very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with these high voltages. Precautions must include safeguards which eliminate all hazards to personnel. All circuit parts which may be at high potential should always be enclosed and interlock switches should be used to break the input circuit of the high-voltage power supply when access to the equipment is required.

In the use of high-voltage tubes, such as the 1P25, it should always be remembered that high voltages may appear at normally low-potential points in the circuit because of condenser breakdown or incorrect circuit connections. Before any part of the circuit is touched, the power-supply switch should be turned off and both terminals of any charged condensers grounded.

APPLICATION

When the 1P25 is operated under conditions of eye-threshold phosphor brightness, the maximum ratings given in the tabulated data should not be exceeded.

Under conditions where higher than eye-threshold phosphor brightness exists and where operation at low brightness levels is not contemplated

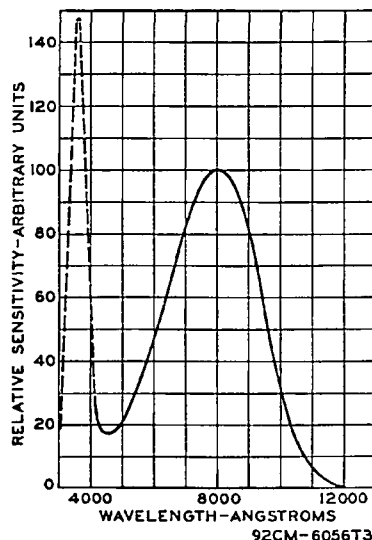
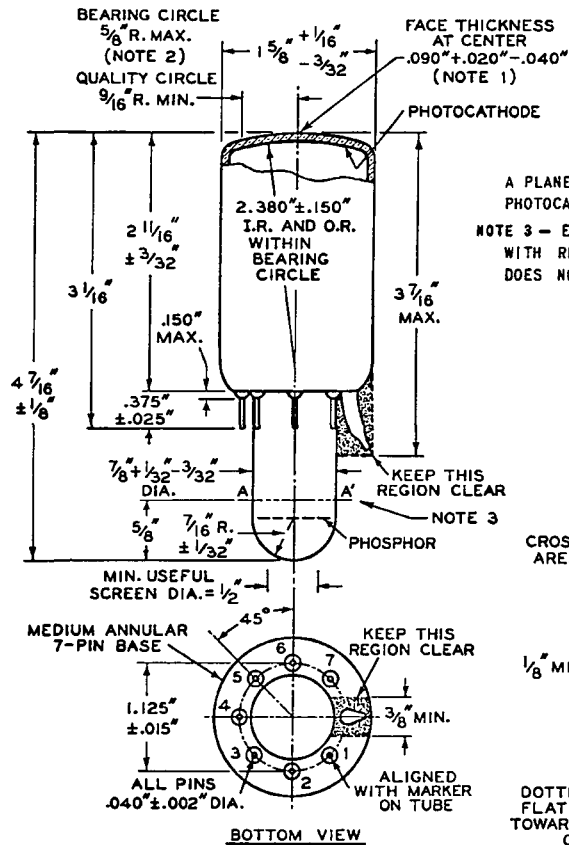


Fig. 2 - Spectral sensitivity characteristic of Type 1P25 having S-1 spectral response for equal values of radiant flux at all wavelengths.

during the life of the tube, it may be operated under the following absolute maximum ratings: Grid No.4, 5500 volts; grid No.3, 900 volts; grid No.2, 300 volts; grid No.1, 15 volts; photocathode illumination, 50 foot-candles; and ambient temperature, 50°C. Suggested typical operating conditions are: Grid No.4, 5000 volts; grid No.3, 700 volts; grid No.2, 115 volts (supply should be adjustable to 50% of this value); grid No.1, 10 volts. When the 1P25 is operated at these higher voltages, the image brightness and the resolution of the tube are increased. Although the background level of fluorescence is also increased, it does not interfere with observations at high levels of phosphor brightness. Under such high-voltage operating conditions, the tube may show an occasional discharge, but such discharges do not prevent continued operation of the tube.

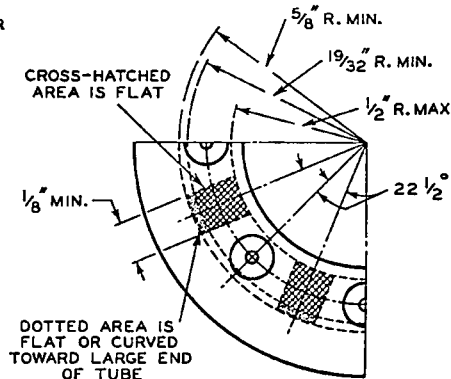


NOTE 1 - ON ANY TUBE, FACE THICKNESS
AT PERIPHERY OF MAXIMUM BEARING
CIRCLE DOES NOT VARY MORE THAN
0.030" DUE TO PRISM.

NOTE 2 - VARIATION OF THE DISTANCE FROM ANY OUTSIDE PERIPHERAL POINT ON THE MAXIMUM BEARING CIRCLE TO THE TUBE AND NORMAL TO AXIS OF CYLINDER DOES NOT EXCEED 0.025".

NOTE 3 - ECCENTRICITY OF PHOSPHOR CYLINDER AT AA' WITH RESPECT TO AXIS OF PHOTOCATHODE CYLINDER DOES NOT EXCEED 0.040".

DETAIL OF BOTTOM
VIEW OF BASE



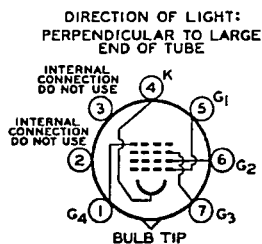
ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF PHOSPHOR CYLINDER WITH RESPECT TO PHOTOCATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND PHOSPHOR CYLINDER WILL FIT GAUGE WITH:

- a. SEVEN PIN HOLES HAVING DIAMETER OF $0.0650" \pm 0.0655"$ ENLARGED TO DIAMETER OF $0.093"$ FOR A DEPTH OF $0.093"$ AND SPACED AT ANGLES OF $45^\circ \pm 5'$ ON CIRCLE DIAMETER OF $1.125" \pm 0.0005"$.
- b. SIX STOPS HAVING HEIGHT OF $0.156" \pm 0.001"$, CENTERED BETWEEN PIN HOLES, TO BEAR AGAINST FLAT AREAS OF BASE.
- c. PHOSPHOR-CYLINDER CLEARANCE HOLE HAVING DIAMETER OF $0.925" \pm 0.001"$.

THE SOCKET DESIGN SHOULD BE SUCH THAT CIRCUIT WIRING CAN NOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. THE POINT OF BEARING OF THE SOCKET CONTACTS ON THE BASE PINS SHOULD NOT BE CLOSER THAN 0.050" FROM ENDS OF BASE-PIN BOSSES.

92CM- 6453RI

Bottom View of Socket Connections



G_1 - Grid No.1 G_3 - Grid No.3
 G_2 - Grid No.2 G_4 - Grid No.4
 K - Photocathode