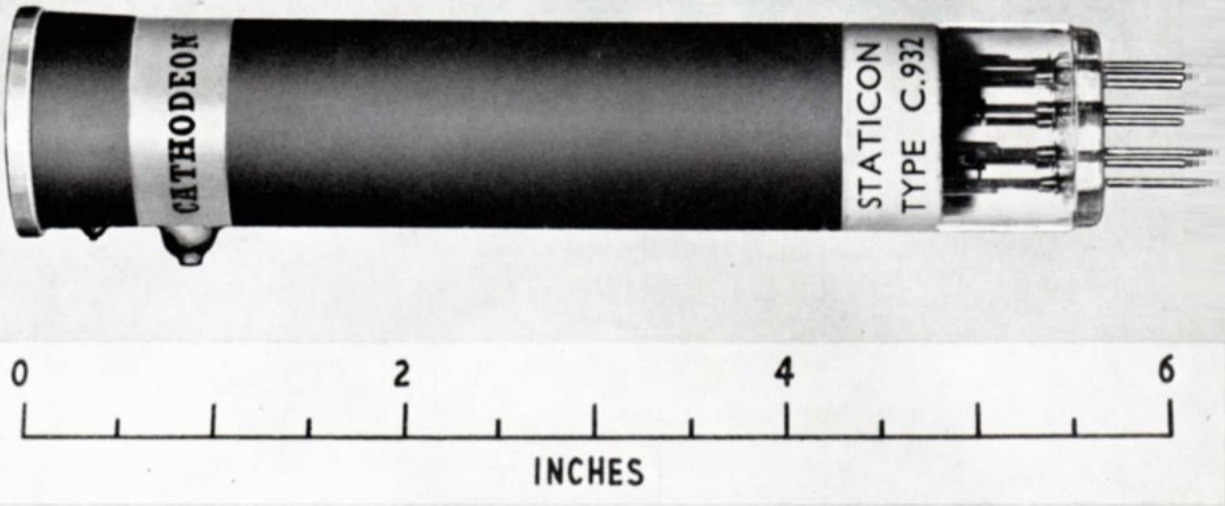
CATHODEON

'STATICON'

Miniature Television Camera Tubes

PYE

GROUP OF COMPANIES



This is a full-size illustration of the Cathodeon STATICON Miniature Television Camera Tube.

Cathodeon
"STATICON"
Miniature Television Camera Tube
Type C932

The STATICON C932 is a small size television pick-up tube intended primarily for industrial applications. The tube utilizes standard 16 mm. ciné type camera lenses and this feature, combined with the small tube dimensions, permits the construction of very compact light-weight cameras which should find wide application in the industrial, commercial and scientific fields.

The tube is about 1 inch in diameter and approximately 6½ inches in length, having a photoconductive sensitive layer and operating on the low velocity scanning principle.

Two types of STATICON C932 are available, the Green Label tube for normal industrial purposes and the Red Label tube for producing higher quality pictures for specialized industrial uses and broadcast purposes.

The electrical and mechanical specifications for the two types of tube are identical. The Red Label tube differs from the Green Label tube in having a photoconductive layer processed to higher standards of evenness, freedom from blemishes, etc.

For details of STATICON tubes intended specifically for television film scanning, see Technical Publication No. 642.

Technical Data
STATICON tube type C932

General

Heater Voltage ... ... 6·3V.

Heater Current ... ... 0·35A. or 0·6A.

Interelectrode Capacitance :

Between Signal Plate and all other electrodes ... ... 5 $\mu\mu$F approx.

Spectral Response :

Has characteristics similar to panchromatic film.

Photoconductive layer :

Using a rectangular image with an aspect ratio of 4 : 3, the maximum useful diagonal is 16 mm.

Image Orientation :

Correct orientation is indicated by the mask on the tube face.

Method of Focusing

Method of Focusing ... ... Magnetic.

(Routine adjustments to beam focus are normally effected by variation of G3 potential).

Method of Deflection ... ... Magnetic.

Maximum length ... ... 6½ inches.

Maximum Diameter (Excluding exhaust pip) ... ... 1·135 inch.

Maximum Radius (Including exhaust pip) ... ... 0·807 inch.

Tube Base Type ... Small Button Ditetrar 8-pin.

Operating Position:

All positions except face downwards.

Maximum Ratings

Signal Plate Voltage	125 V.
G3, G4 Voltage	350 V.
G2 Voltage	350 V.
G1 Voltage:	
Negative	125 V.
Positive	0 V.
Peak Heater-Cathode Voltage:	
Heater positive with respect to cathode	10 V.
Heater negative with respect to cathode	125 V.
Maximum Face Plate Temperature ...	60°C.

Typical Operating Conditions

Scanned Area	12·7 mm. x 9·5 mm.
Signal Plate Voltage (for dark current of 0·02 μA)	10 to 60 V.
G3 (Beam Focus) and G4 (Mesh) Voltage	200 to 300V.
G2 (Accelerator) Voltage	300V.
G1 Voltage (for picture cut-off)...	–30 to –100V.
Signal Output Current:	
Normal operating range ...	0·1 to 0·2 μA.
Minimum Blanking Voltage:	
When applied to G1	... 50V p – p.
When applied to Cathode ...	... 25V p – p.
Field Strength at Centre of Focusing Coil	40 gauss.

The Cathodeon STATICON Type C932 Principles of Operation

The C932 STATICON consists basically of an evacuated tube, containing at one end a semi-transparent photoconductive layer. The image of the subject to be televised is focused optically upon this photolayer which is scanned by a low velocity electron beam.

The photolayer comprises an extremely thin film of photoconductive material which is, substantially, an electrical insulator in the dark. When receiving the optical image of the subject each element of the photolayer surface becomes conductive to a degree proportionate to the relative brightness of each corresponding section of the optical image. Each target element therefore, behaves similarly to a charged capacitor with leaky insulation, with one plate at a fixed potential and the other plate 'floating.' This causes the target surface potential to rise toward the signal plate potential to a degree relative to the individual illumination of each picture element.

During the scanning process, the electron beam deposits electrons on the target surface sufficient to return each surface element to cathode potential. This action constitutes a current flow in the signal plate circuit proportional to the rate of scan and to the surface potential of each individual element undergoing scanning.

The polarity of this signal swings negatively for illuminated areas of the target.

The electron beam is generated by a gun assembly comprising a heated cathode, a control grid (G1) and an accelerating grid (G2). Focusing of the beam is achieved by the magnetic field from an external focusing coil in conjunction with the focusing electrode G3. Routine beam focus adjustments are made by variation of the potential of this electrode.

A fine mesh screen (G4) is internally connected to G3 and is located immediately in front of the scanned surface of the photolayer. G4 operates at the same potential as G3 and this establishes a uniform electrostatic field between the electrode and the photolayer. This field, in conjunction with the uniform magnetic field provided by the focusing coil insures that the scanning beam approaches the photolayer at an angle normal with respect to the target plane, a condition essential for returning the surface elements to cathode potential uniformly.

Operating Instructions

The following instructions apply when a camera is being set up for operation under conditions differing from those under which it was previously used. If the camera is being used repeatedly on the same scene under similar lighting conditions, then once the camera has been set up in accordance with the instructions, it will be sufficient to switch off, leaving the controls as set, and to switch on again when required.

It is recommended that the lens be capped when the camera is not in use, particularly if there is any possibility of a bright light being shone directly into the lens, as this may result in shortening the life of the Staticon camera tube.

The instructions given below may appear rather complicated as set out in detail, but a little experience will show that they are in fact quite simple. It is strongly recommended that the operating instructions be closely followed in the interest of obtaining the best performance from the equipment and the longest life from the Staticon tube.

1. Check that the camera lens is capped and that the " Target Bias " and " Beam Current " controls are set to minimum. The " Beam Focus " control should be set at about the mid position.
2. Switch on the camera equipment and monitor and allow a 2–3 minutes warming-up period.
3. Adjust the monitor so that a faint raster is seen on the screen.
4. Direct the camera at the scene to be viewed.
5. If the scene illumination is approximately 50 ft. lamberts the lens iris should be set at f2·8. It the illumination is appreciably higher adjust the iris to a higher numerical setting.
6. Uncap the lens.
7. Turn the " Beam Current " slowly to maximum.
8. Turn the " Target Bias " control slowly until a faint image appears on the monitor screen. This image will probably be very blurred owing to being out of focus, but will show as a change of brightness of different parts of the monitor raster.
9. Adjust alignment field until the image rotates about its centre on varying the focus.
10. Adjust optical focus and " Beam Focus " alternately until the picture is the best that can be obtained at this stage.
11. Rotate tube in scanning coils until the mask is aligned with the scanning lines. Re-adjust these controls as required while making the following further adjustments, so that the best focused picture is obtained at each stage.
12. Reduce the " Beam Current " until the picture appears more sharply defined. If this is reduced too far the picture will begin to " wash out ", particularly in the brighter parts. The tube **must not** be allowed to operate under these conditions.
13. At this stage the picture will probably appear rather weak. If so, increase the " Beam Current " and " Target Bias " alternately, a little at a time until:
    (*a*) a picture of satisfactory contrast is obtained, or until
    (*b*) further increase of target bias causes the background signals to become objectionably high.

Care should be taken in making these adjustments that the condition of " washed out " bright areas in the picture is not permitted to remain longer than is necessary to increase the beam current to counteract this effect.

14. If condition (*a*) is obtained, try closing the lens iris (increasing the numerical setting) and re-adjusting " Target Bias " and " Beam Current " until the most satisfactory picture is obtained.
15. If condition (*b*) is obtained, try opening the lens iris (decreasing the numerical setting) and re-adjusting the " Target Bias " and " Beam Current ".
16. Make final adjustments to all the controls to ensure that the best possible pictures are being obtained.

IMPORTANT. It cannot be stressed too strongly that whatever the settings of the other controls, the beam current must be adjusted so that the " washed out " bright areas are just cleared. Failure to maintain sufficient beam current may result in permanent " burn-in " on the photosensitive layer.

Blanking Signal

The scanning beam should be suppressed during the horizontal and vertical scan retrace periods, otherwise the return lines will be superimposed upon the image. The necessary suppression is effected by the application of blanking voltage pulses of rectangular waveform and suitable duration, of negative polarity when applied to G1 or positive when applied to cathode.

Raster Size

The scanned area of the photolayer tends to exhibit increased sensitivity and higher dark current following some hours of operation. Subsequent increase in raster size or change of centring will, therefore, reveal the edge of the previously scanned area.

Signal Plate Voltage

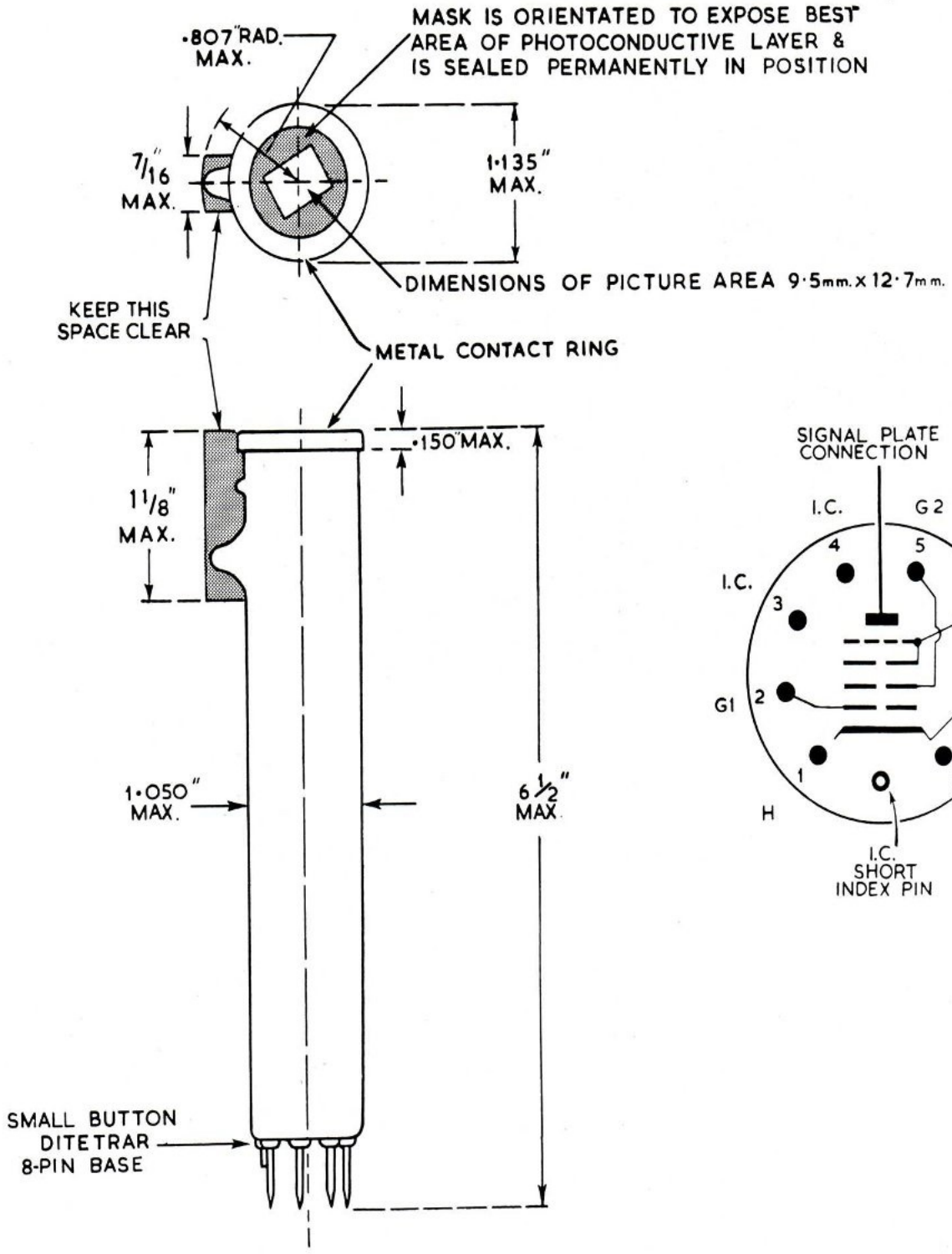
For a given photolayer illumination and within certain limits, the signal output from the C932 increases in proportion to the applied signal plate voltage. The upper limit is reached when the dark current begins to rise more rapidly than the signal current, eventually reaching a point where non-uniformity of the dark current background becomes intolerable.

Operation at Low Light Levels

At low levels of photolayer illumination an image persistence occurs which is usually known as " lag." This effect can cause blurring of rapidly moving images and can only be prevented by increasing the scene illumination to an adequate value.

Alternatively, a wider lens aperture may be employed.

Staticon Tube Type C932



Dimensional outline

Tube base connections