5527

ICONOSCOPE

Electrostatic Deflection
Electrostatic Focus

High Deflection Sensitivity
250-Line Resolution Capability

Mosaic Diameter, 1.4"
Maximum Length, 9-1/4"

TENTATIVE DATA

RCA-5527 is a small, television camera tube intended for use in industrial applications, for television experimentation in laboratories, and for demonstrating television principles in schools. It is designed so that it can be operated with equipment which is simple and relatively inexpensive. The resolution capability of the 5527 is approximately 250 lines.

Having greater sensitivity and signal output than previously available in an iconoscope of this size, the 5527 can provide a satisfactory picture when the incident light level on the subject to be televised is 500 to 1000 foot-candles. The increased sensitivity has been achieved by an improved technique of processing the mosaic which results in greater transmission of light to the photosensitive surface. The greater signal output with better low-frequency response, has been obtained by increasing the capacitance of the mosaic, i.e., the capacitance between the signal electrode and the photosensitive surface, and by utilizing direct connection between signal electrode and external bulb terminal instead of capacitive coupling. The spectral response of the photosensitive surface covers the entire visible spectrum as shown in the accompanying curve.

The 5527 is designed with an improved electron gun which has a grid No.2 operated at a constant high voltage so that the beam current will not be affected by changes in grid-No.3 voltage. As a result of this feature, the spot can be sharply focused on the mosaic and remains sharp when beam current is varied over a wide range.

The equipment required for operation of the 5527 is relatively simple and inexpensive in comparison with that needed for the larger types of camera tubes. Because electrostatic deflection is used, the need for costly magnetic deflection coils and circuits is avoided; because the mosaic is perpendicular to the axis of the electron gun, keystoning circuits are not required; and because the mosaic has a small area, shading circuits are not necessary to give a satisfactory picture, and an inexpensive short-focal-length lens can be used in the camera unit. A 35-mm lens (f:3.5 or greater) as used in movie or still cameras is satisfactory.

The 5527 supersedes the type 1847, but is not directly interchangeable with it. Use of the 5527 in equipment designed for the 1847 requires change in the socket and perhaps the mounting arrangement.

DATA

General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	Volts
Current	0.6	Ampere
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to All Other Electrodes	7.5	μμf

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5527-2-47
Photolithographed in U.S.A.

General (Cont'd):

Signal Electrode to All Other Electrodes and External Shield	5	μμf
Focusing Method	Electrostatic	
Deflection Method	Electrostatic	
Image Size (4 x 3 aspect ratio)	1.4" Diagonal	
Overall Length	9" ± 1/4"	
Seated Length	8-1/4" ± 1/4"	
Maximum Diameter	2-1/4"	
Cap	Recessed Small Cavity	
Base	Medium-Shell Diheptal 12-Pin	
Mounting Position	Any	

Maximum Ratings, Design-Center Values:

SIGNAL-ELECTRODE VOLTAGE	900 max.	Volts
GRID-No.4 & GRID-No.2 VOLTAGE	900 max.	Volts
GRID-No.3 VOLTAGE	450 max.	Volts
GRID-No.1 VOLTAGE:		
Negative bias value	100 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
AMBIENT TEMPERATURE	40 max.	°C
MOSAIC ILLUMINATION	50 max.	Foot-candles

Typical Operation:

Signal-Electrode Voltage	800	Volts
Grid-No.4 & Grid-No.2 Voltage	800	Volts
Grid-No.3 Voltage for Focus	125 to 250	Volts
Grid-No.1 Voltage	Adjust for best picture	
Max. Grid-No.1 Voltage for Picture Cutoff	-75	Volts
Max. Deflecting Voltages (Peak to Peak): *		
DJ_1 & DJ_2 (Vertical)	120	Volts
DJ_3 & DJ_4 (Horizontal)	100	Volts
Min. Peak-to-Peak Blanking Voltage	30	Volts
Signal-Output Current (Approx.)	0.025	Microampere
Output Resistor (Approx.)	1	Megohm

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1 max.	Megohm
Resistance in Any Deflecting-Electrode Circuit**	5 max.	Megohms

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° With external shield.

* To scan picture of 1.4" diagonal (4 x 3 aspect ratio).

** It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

INSTALLATION

The base pins of the 5527 fit the diheptal socket which may be installed to operate the tube in any position. The socket should be rotatable through approximately 20° so that the tube can be oriented to make beam deflections exactly horizontal and vertical. Orientation of the tube is approximately correct when base pins 5 and 12 are in a vertical line.

Shielding of the 5527 is usually required to prevent stray electric and magnetic fields from deflecting and defocusing the electron beam, and to prevent stray light from striking the mosaic through the transparent section of the bulb side-wall. When an iron or steel shield is used, it should have very little residual magnetism. Also, the signal-electrode terminal and the video amplifier should be shielded from the sweep circuits. If this shielding is not provided, the sweep circuits may cause interference in the video output.

The heater is designed to be operated at 6.3 volts. The transformer winding supplying the heater power should be designed to operate the heater at the rated voltage under average line-voltage conditions. If the circuit design is such as to cause a high voltage between heater winding and ground, the heater transformer should be adequately insulated to withstand the high voltage. The mid-tap or one side of the heater winding should preferably be connected to the cathode. If necessary, the heater may be operated with a bias of not more than 125 volts negative, or 10 volts positive, with respect to the cathode.

In the usual circuit arrangement for the 5527, the heater is several hundred volts negative with respect to ground. Insulation of the heater winding should be adequate to withstand this voltage. Any leakage current between heater and cathode, such as that caused by leakage in the heater-supply transformer, will introduce a hum bar in the picture. This effect can easily be filtered out by the use of a suitable bypass capacitor from the cathode of the 5527 to ground.

The cathode is connected to base pin 2 to which the various grid returns should be made. It is recommended that the cathode be operated at high negative potential with respect to ground, as explained in the next paragraph.

Grids No.4 and No.2 are connected within tube to pin 9. It is recommended that these grids be grounded in order that the deflecting electrodes and the circuit leads thereto may be operated at ground potential. With this arrangement, which places the heater and cathode at high negative potential with respect to ground, the dangerous voltages can more easily be made inaccessible, and the video signal can more easily be fed to the grid of the first amplifier tube.

Grid-No.3 voltage should be adjustable and should be set at the value giving best focus.

Grid-No.1 bias voltage should be adjustable so that beam current can be controlled. Increasing the beam current increases the video output voltage but also increases the spurious output voltage known as "dark spot" signal. Because the ratio of spurious signal to desired signal increases with increasing beam current, the control-electrode (grid No.1) bias should be set at the largest negative value which provides sufficient video output.

The dc voltages for the 5527 may be obtained either with a conventional vacuum-tube rectifier circuit, or from a high-frequency power supply. It should have an output-current capability of about one milliampere. The voltage-divider system should be designed so that not more than 2.5 megohms is included in the grid-No.4 circuit.

The high voltages at which the 5527 is operated are very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltages. Precautions include the enclosing of high-potential terminals and the use of inter-locking switches to break the primary circuit of the power supply when access to the equipment is desired. In most applications, it is recommended that the grids-No.4-and-No.2 terminal be grounded as indicated above.

In the use of camera tubes, it should always be remembered that high voltages may appear at normally low-potential points in the circuit due to capacitor breakdown or to incorrect circuit connections. Therefore, before any part of the circuit is touched, the power-supply switch should be turned off and both terminals of any charged capacitors grounded.

APPLICATION

Two pairs of electrostatic deflecting electrodes, producing fields at right angles, are used to deflect the electron beam. The electrostatic field of each pair of deflecting electrodes causes deflection of the electron beam in the direction of the gradient lines of the field and perpendicular to the plane of the deflecting electrodes; therefore, the deflections caused by the two fields are at right angles within a few degrees. Each pair of deflecting electrodes is designed to have high deflection sensitivity. Consequently, the low deflection voltage required to scan the mosaic in either direction can be generated by a single twin-triode.

Each of the deflecting electrodes has its own base-pin connection to permit use of balanced vertical and horizontal deflection. This feature in combination with the small, sharply focused spot, gives increased picture definition.

Each pair of deflecting electrodes is normally operated at an average potential the same as that of grids No.4 and No.2. Each electrode of each pair is connected through a resistor of not more than 5 megohms to the grids-No.4-and-No.2 socket terminal. Under operating conditions involving high beam current or scanning beyond the limits of the mosaic, a small amount of current is collected by the deflecting electrodes. If the circuit resistance between each deflecting electrode and grids No.4 and No.2 is high, the current collected by the deflecting electrodes produces negative potentials on the deflecting electrodes. Such potentials cause undesirable deflections of the beam. These effects can be minimized by reducing equally the resistances of the deflecting-electrode circuits, by reducing the scanning width, by reducing the beam current, or by applying a small and equal dc compensating voltage to the deflecting electrodes DJ_3 and DJ_4. This voltage should be positive with respect to grids No.4 and No.2.

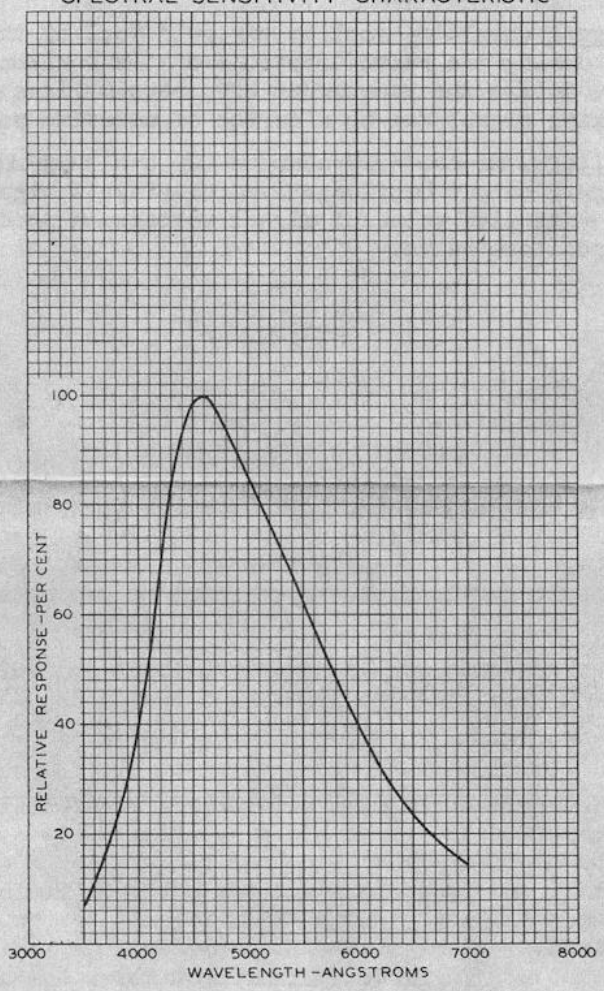
The mosaic may be burned by the electron beam if the scanning spot is not kept in motion over a large area of the mosaic. The electron beam, therefore,

should never be focused on the mosaic unless the horizontal and vertical deflecting circuits are both in operation. The mosaic should not be exposed to light or infrared radiation of excessive intensity because such exposure may cause the mosaic to lose sensitivity. Care should be taken to avoid focusing the image of high-power lamps, or of the sun, on the mosaic. The lens should be covered with a cap when the 5527 is not in operation. When the tube is stored, it should not be subjected to excessive heat from radiators or steam pipes.

A blanking signal should be applied to grid No.1 of the 5527 to cut off the electron beam during the return portions of the horizontal- and vertical-deflecting cycles. Unless the beam is cut off, return lines will appear in the picture. The blanking signal can be a series of negative voltage pulses.

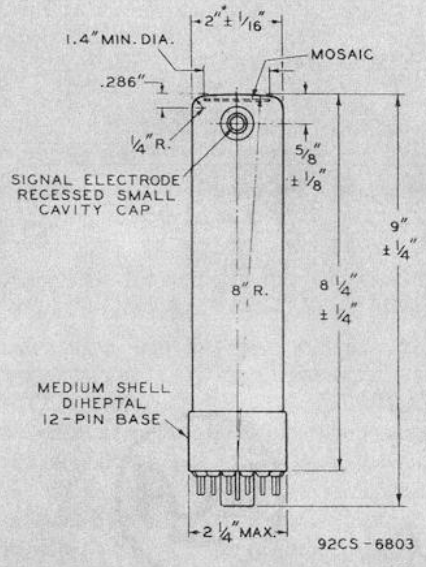
The output voltage of the 5527 changes in the negative direction, and, therefore, the signal output is of negative polarity. A highlight in the image is represented by a negative value of signal voltage; a shadow in the image is represented by a positive value.

SPECTRAL SENSITIVITY CHARACTERISTIC



92CM-6404

DIMENSIONAL OUTLINE



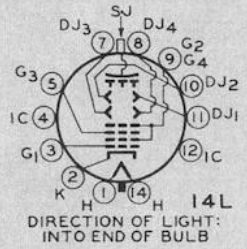
℄ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

THE PLANE THROUGH THE TUBE AXIS AND BASE-PLUG KEY MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND SIGNAL-ELECTRODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT TUBE AXIS) OF 20°. SIGNAL-ELECTRODE TERMINAL IS ON SAME SIDE AS BASE-PLUG KEY.

DJ1 AND DJ2 ARE NEARER THE MOSAIC; DJ3 AND DJ4 ARE NEARER THE BASE. WITH DJ1 POSITIVE WITH RESPECT TO DJ2, THE SPOT IS DEFLECTED TOWARD PIN 5. WITH DJ3 POSITIVE WITH RESPECT TO DJ4, THE SPOT IS DEFLECTED TOWARD PINS 1 AND 2. WITH DJ1 AND DJ2 USED FOR VERTICAL DEFLECTION, THE VERTICAL AXIS OF THE SCANNED AREA OF THE MOSAIC IS PARALLEL TO VERTICAL PLANE THROUGH PINS 5 AND 12 WITHIN ±15°. THE ANGLE BETWEEN THE SCANNING DIRECTION PRODUCED BY DJ3 AND DJ4 AND THE SCANNING DIRECTION PRODUCED BY DJ1 AND DJ2 IS 90° ± 3°.

SOCKET CONNECTIONS
Bottom View

PIN 1: HEATER
PIN 2: CATHODE
PIN 3: GRID No. 1
PIN 4: INTERNAL CONNECTION-DO NOT USE
PIN 5: GRID No. 3
PIN 7: DEFLECTING ELECTRODE DJ_3
PIN 8: DEFLECTING ELECTRODE DJ_4



DIRECTION OF LIGHT: INTO END OF BULB

PIN 9: GRID No. 4, GRID No. 2
PIN 10: DEFLECTING ELECTRODE DJ_2
PIN 11: DEFLECTING ELECTRODE DJ_1
PIN 12: INTERNAL CONNECTION-DO NOT USE
CAP: SIGNAL ELECTRODE SJ


RCA