

Application Considerations for RCA Separate-Mesh Vidicons

by

R.E. Johnson

The construction of RCA separate-mesh vidicons is identical in all respects to that of conventional vidicons except for a separate connection to the mesh electrode. In conventional vidicons, this electrode is connected directly to the focusing electrode, grid No.3. The use of a separate connection for the mesh electrode permits the separate-mesh types to provide higher resolution, more uniform resolution, and more uniform signal output when operated at high voltage than conventional vidicons of similar size which do not utilize such separate connections.

Although conventional vidicons can be operated at increased final-electrode voltages to provide a substantial improvement in center resolution, such operation produces a serious non-uniformity in signal (port-holing) across the target area. This non-uniformity can usually be satisfactorily compensated for by the application of parabolic voltage waveforms of appropriate amplitude to the other electrodes, but this technique introduces more complicated circuits in the camera. Furthermore, operation of these vidicons at higher-than-normal voltage requires stronger electromagnetic focusing and deflection fields. Consequently, the power required to operate the tubes under these conditions is greatly increased as compared to normal operating levels. Higher power, more complicated vidicon adjustment, and the possibility of poorer signal uniformity unavoidably detract from the advantages of increased performance, resolution, and picture sharpness that can be gained.

Performance of Separate-Mesh Vidicons

Unlike conventional vidicons, the separate-mesh types can be operated at high voltage to capitalize on maximum performance capabilities with virtually no compromise of other operating parameters. When positioned properly in recommended deflection and focusing coils, the separate-mesh vidicons can be operated at final-electrode voltages from 300 to 1000 volts with essentially no deterioration in signal uniformity. At all points of operation, the signal uniformity of these types is better than that of similar conventional vidicons, and no parabolic correction is required.

For approximately equal deflection and focusing power, separate-mesh vidicons can be operated with a mesh-electrode voltage of 500 volts, as compared to a value of 300 volts for conventional types. The improved performance of three separate-mesh vidicons with respect to that of similar conventional types under these conditions is shown in Table I. Further improvements in performance can be achieved by operation of the separate-mesh types at even higher potentials, as shown by the data for 750 volts in Table I. However, there is no readily apparent advantage in operating the tubes beyond 1000 volts. If still better resolution and picture sharpness are desired, larger (1-1/2-inch-diameter) vidicons such as the 8480 and the 8521 are recommended.

There are no known disadvantages in the operation of the separate-mesh types as compared to conventional types when the separate-mesh types are properly used. Although the initial unit cost of separate-mesh vidicons is slightly more, the increase in cost per operating hour is negligible.



RCA Vidicon Tube Types	Mesh- Electrode Volts	Focus- Electrode Volts	Focus- Coil Gauss	Deflection Milliamperes		Amplitude Response	
				Horiz.	Vert.	400 TV Lines	800 TV Lines
8507, 8572, and 8573	750	450	50	220	40	50	15
	500	300	40	180	33	40	8
	300	180	32	150	28	30	2
7735A, 7038 and 7262A	300	300	40	170	30	30	0

Table I: Relative performance of RCA vidicon camera-tube types 8507, 8572, and 8573 as compared to predecessor-types 7735A, 7038, and 7262A.

Considerations for New Camera Design

The improved performance shown in Table I for the separate-mesh vidicons can be achieved with the standard components recommended for conventional vidicons. However, the target-contact spacer element must be cut down so that the deflection coils can be positioned closer to the vidicon tube face, as shown in Fig.1, and a voltage of the proper value must be supplied to the mesh electrode through base pin 3. The mesh electrode (grid No.4) and the focusing electrode (grid No.3) can most conveniently be operated from a common bleeder supply so that they track each other. For optimum operation, the grid-No.3 voltage should be approximately 60 per cent of the grid-No.4 voltage. With this semi-fixed voltage relationship, focusing of the vidicon beam for best resolution can also be conveniently accomplished by varying the main focusing field above or below the typical values shown in Table I.

Conversion of Conventional Cameras

Cameras designed for conventional vidicons can be converted to use separate-mesh types by rearrangement of the standard recommended components, as shown in Fig.1. The voltage (300 volts) ordinarily available for

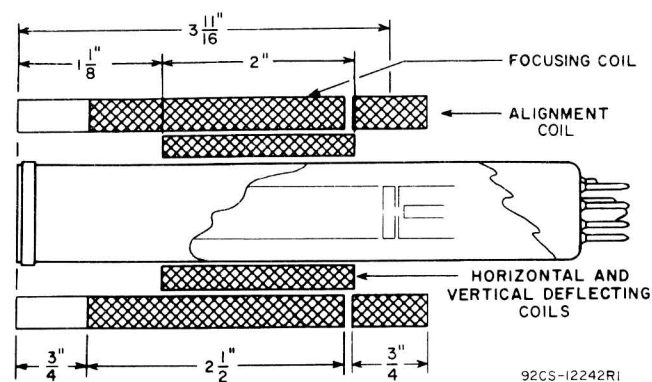


Fig.1 - Component positioning for RCA vidicon types 8507, 8572, and 8573. Position of deflecting coils behind faceplate for combined-electrode types is approximately 1-3/4 inches.

grid No.3 (base pin 6) can then be applied to grid No.4 (base pin 3). By means of a suitable bleeder arrangement from this same supply, a voltage of 180 volts can be obtained for grid No.3. The separate-mesh types can then be operated with no sacrifice in performance as compared to conventional types, and probably with some improvement in corner resolution and signal uniformity. Focus-coil current and deflection power must be reduced for operation of the separate-mesh vidicons in this mode. It is important, therefore, that controls in the camera have sufficient range to accommodate the changes required to permit this type of operation.

An alternate operating condition for separate-mesh vidicons uses fixed voltages for both grid No.3 and grid No.4. A voltage of 450 to 500 volts is supplied to grid No.4 (mesh electrode), and grid No.3 (focusing electrode) is connected to its conventional voltage supply and adjusted to a maximum value of 270 to 300 volts. This mode of operation has the advantage of maintaining required focus and deflection currents in the same approximate range required for conventional vidicon operation. Several suggested methods for obtaining suitable voltages in the 450-to-500-volt range are shown in Figs.2, 3, and 4. In Fig.2, voltage is obtained from another supply source already built into the camera. In the circuit of Fig.3, the horizontal drive pulse is used to generate additional high voltage. In cases where neither of these alternatives is feasible, a low-frequency oscillator power supply can be built to provide the voltage required, as shown in Fig.4.

The separate-mesh vidicons can, of course, be conveniently operated as conventional types if desired. Base pin 6 is then connected directly to base pin 3, and both electrodes are operated at the same potential.

For new camera designs, operation of the separate-mesh types at 750 or 1000 volts should be considered for maximum performance. In many cases, conversion of existing cameras for such operation might involve too much change in existing power and deflection facilities. Furthermore, the built-in limitations of the

video amplifier or the television system as a whole might prevent the practical realization of maximum performance capability. However, if these obstacles are

not present or can be easily overcome, such modification could offer even more substantial performance gain than is possible at lower voltages.

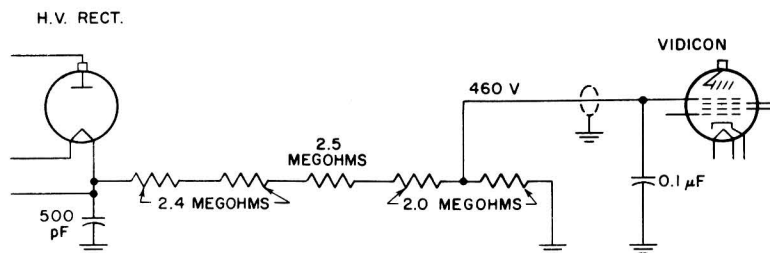


Fig.2 - Conversion method utilizing existing high-voltage supply in television camera.

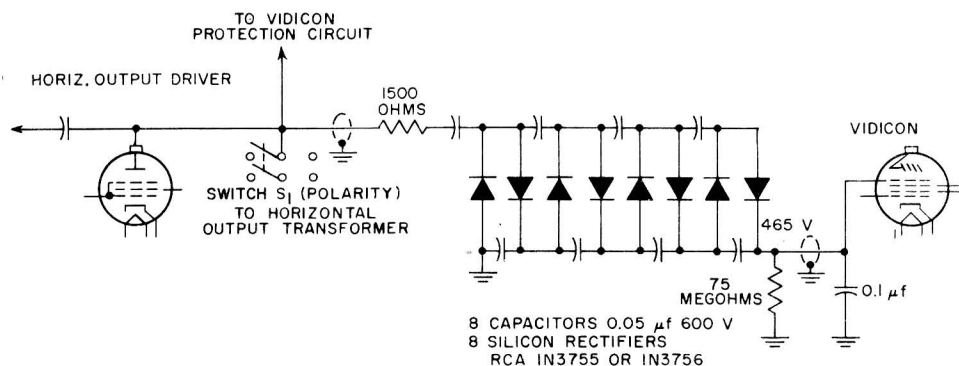


Fig.3 - Conversion method using horizontal drive pulse to generate DC voltage required.

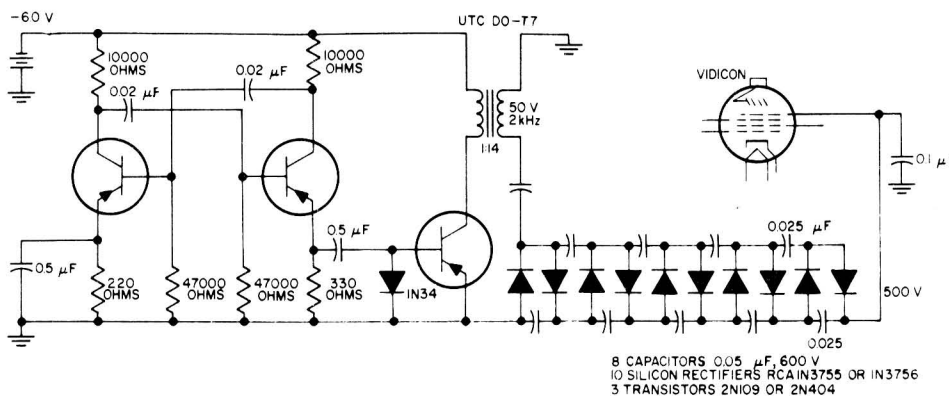


Fig.4 - Low-frequency oscillator power supply.

Summary

Separate-mesh vidicon types 8507, 8572, and 8573 can provide several advantages over their combined-electrode prototypes 7735A, 7038, and 7262A in both existing and new camera designs. These advantages can be summarized as follows:

1. At equivalent voltage levels, the separate-mesh types offer greater signal uniformity, better geometrical accuracy, and higher, more uniform resolution with lower power consumption than can be obtained from the earlier vidicons.

2. At higher voltage levels than those originally recommended for the 7735A, 7038, and 7262A, the amplitude response (resolution) of the separate-mesh types is 50 to 100 per cent better than that of the earlier types operated at low voltages. Power con-

sumption is retained at a relatively low level, signal uniformity is improved, and geometrical distortions are reduced.

3. Ordinarily, no new components are required for operation of the separate-mesh types. However, some slight repositioning of components is required, and an additional voltage in some form is usually required for the field mesh electrode.

4. The separate-mesh types can also be operated as conventional types in a standard camera with essentially identical performance, provided the separate grid-No.3 and grid-No.4 electrodes are connected together at the socket. (This connection, pin 6 to pin 3, is sometimes already made in existing cameras to accommodate the vidicon type 6326.)

Information furnished by RCA is believed to be accurate and reliable. However, no responsibility is assumed by RCA for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of RCA.