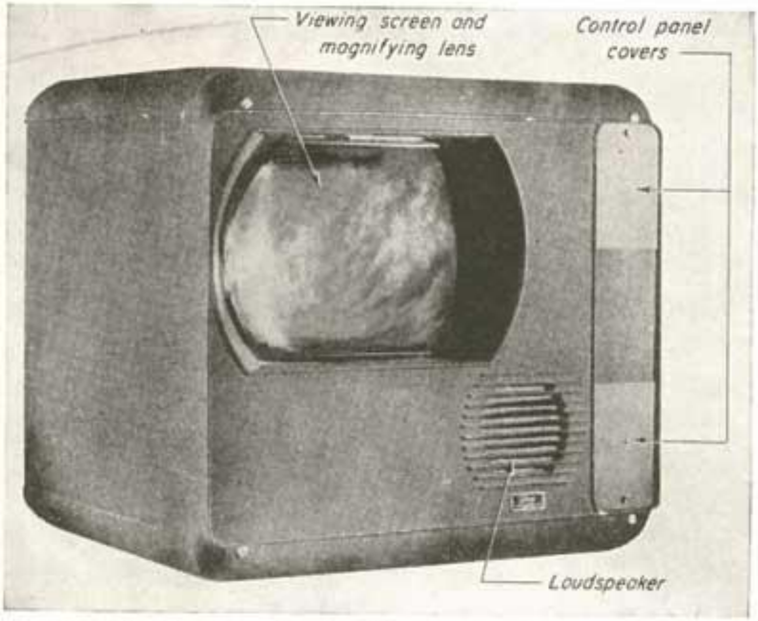


FIG. 17-13. A professional-type color-picture monitor.

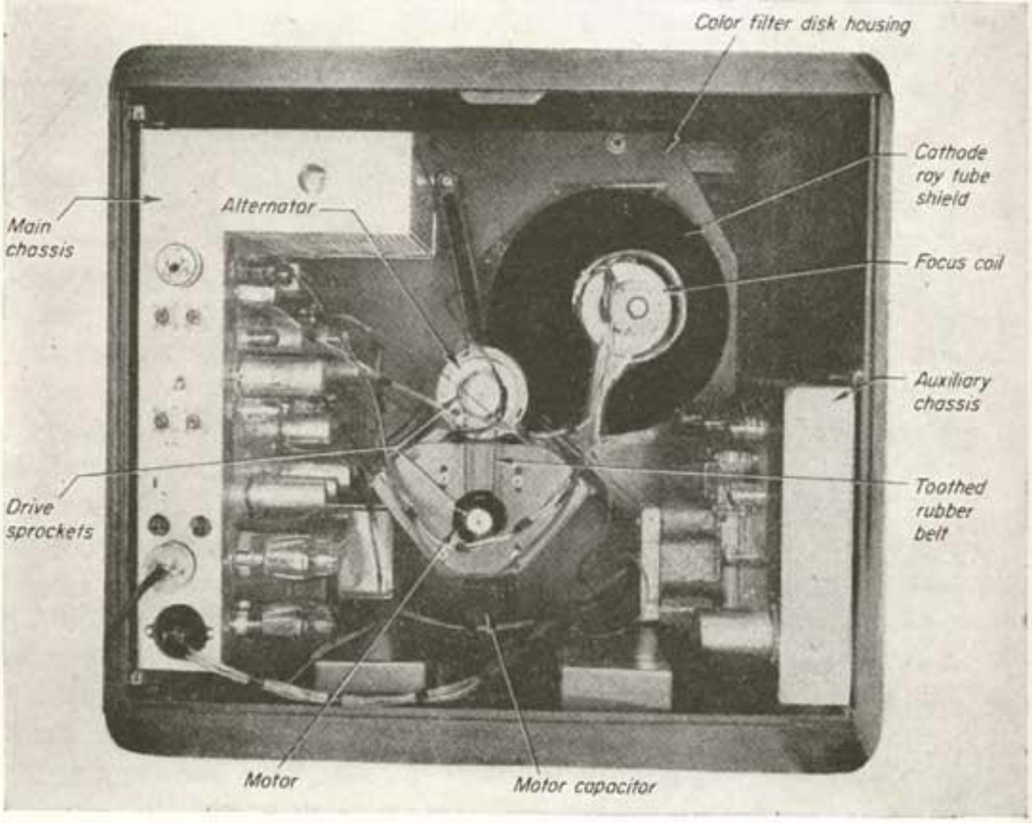


FIG. 17-14. Rear view of a color-picture monitor.

Clamper Keying Pulses. The keying pulses required for the operation of the red, blue, and green clamper tubes *V*4, *V*5, and *V*6, respectively, are derived from horizontal pulses, as shown in Fig. 17–12. Negative, horizontal driving pulses from a synchronizing waveform generator are differentiated by a resistor-capacitor network and applied to the grid of *V*1A. The amplified pulses from the plate circuit of this tube are applied through a lumped-constant delay line to the grid of a clipper stage *V*1B. The output of this tube, which consists only of the negative pulses, is applied to the input of clamper keying tube *V*2. By virtue of equal plate and cathode load resistors, this tube produces equal amplitude keying pulses of both positive and negative polarity. The duration of these pulses, which are applied to the red, blue, and green clamper tubes, *V*4, *V*5 and *V*6, is approximately 1.5 microseconds, and they are delayed about 2 microseconds after the start of the horizontal driving pulses which initiate them.

17–9. Color-picture Monitor.

Color-picture reproduction from a standard field sequential color-television signal can be accomplished, for the most part, by techniques and circuitry similar to those employed for the reproduction of monochrome pictures. If a conventional monochrome picture tube is used for the purpose, the only new feature is the method of obtaining a color picture from the monochrome display of the picture tube.

A color-television picture monitor in which color is provided by interposing optical color filters between the tube face and the viewer, in a synchronous manner, is shown in Figs. 17–13 and 17–14. This particular color monitor employs a color filter disk which rotates synchronously in front of the picture tube. Other types of color-picture monitors employ color filters mounted on the surface of a cylinder whose diameter is larger than the picture tube is long. The picture tube is then mounted within the cylinder or drum with the axis of the tube at right angles to the axis of the cylinder.

Tricolor picture tubes rather than monochrome tubes may be used in color-picture monitors thereby eliminating the need for a rotating color filter disk. At the present state of the art, however, color-picture tubes are not only relatively expensive but are unable to reproduce the range of colors possible when optical color filters are employed. Furthermore, the use of color-picture tubes requires the use of additional circuitry for their operation.

Video Circuits. A schematic block diagram of the circuits employed in the color-picture monitor shown in the photographs is given in Fig. 17–15 and a circuit diagram shown in Fig. 17–16. The general arrangements of the video circuits are very similar to those employed in mono-

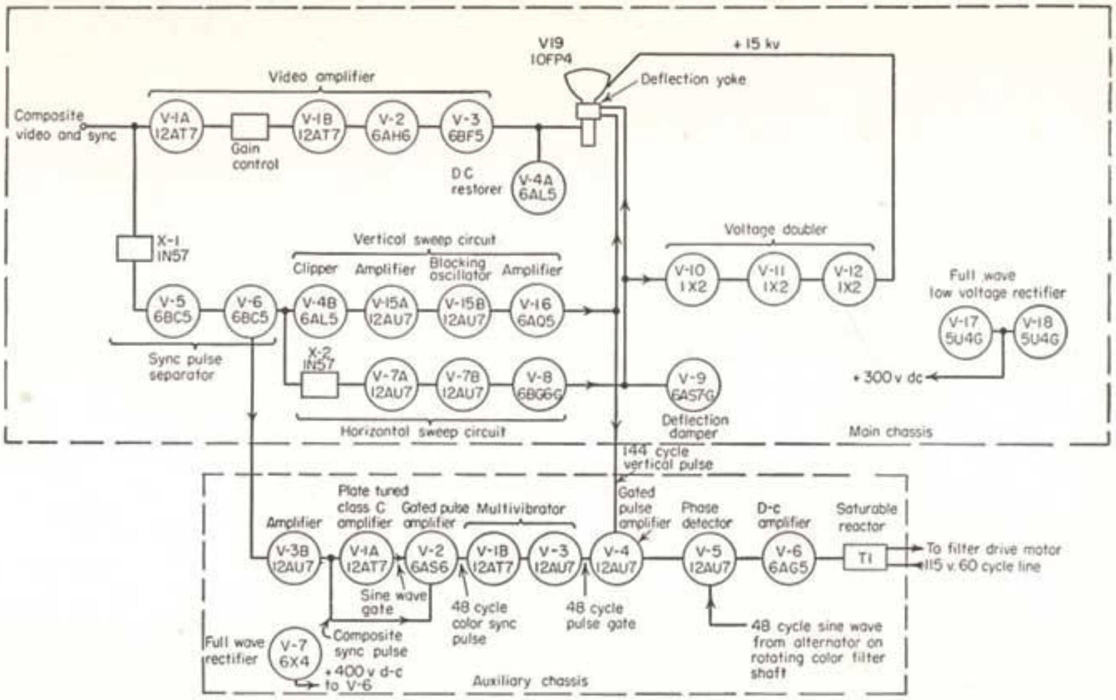


FIG. 17-15. Schematic block diagram of a color-picture monitor. The circuits contained on the main chassis are similar to those found in a monochrome monitor while those on the auxiliary chassis provide a means for automatically obtaining correct color phasing of the color filter disk.

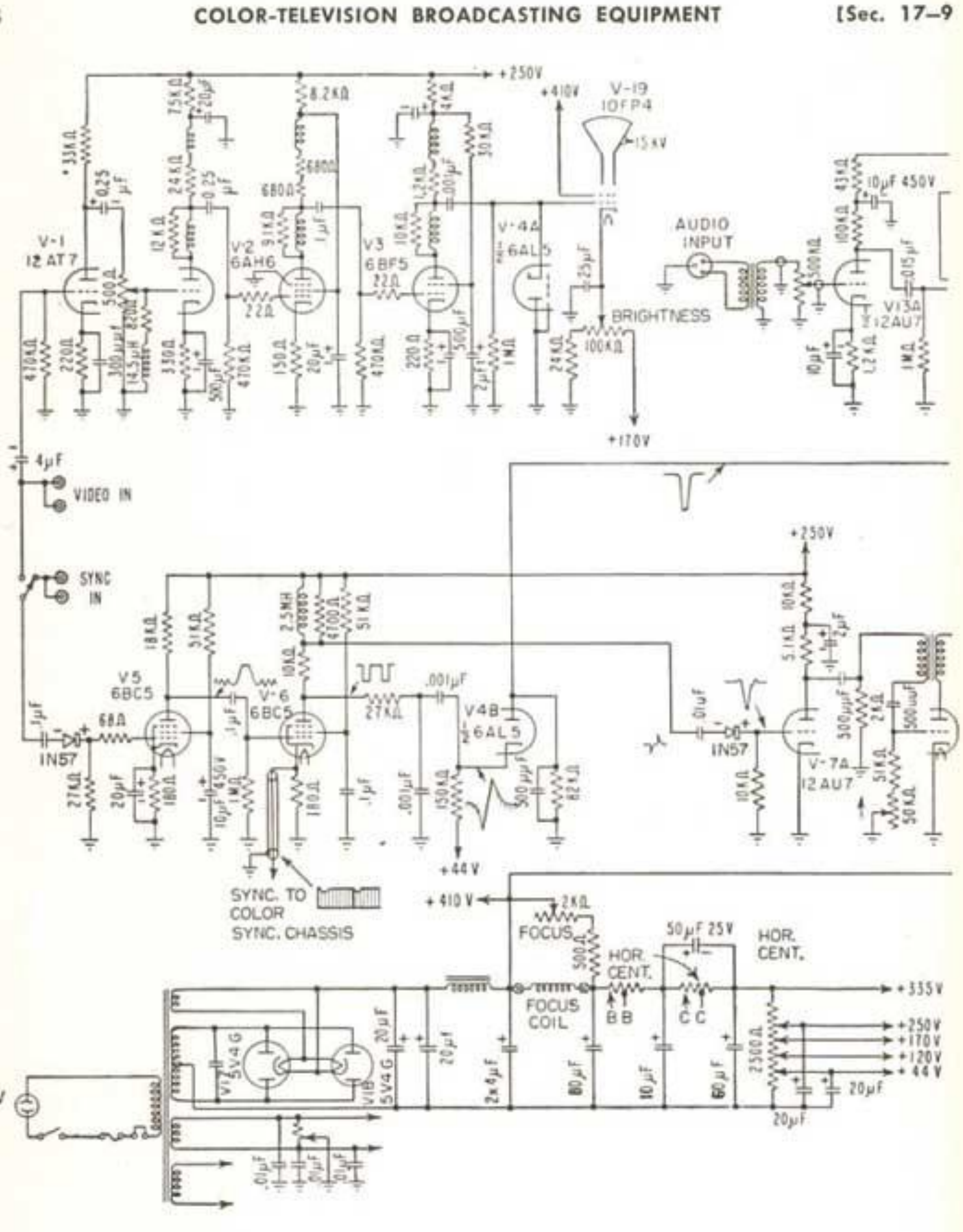
chrome picture monitors of the type used for professional applications. These circuits are contained in the main chassis visible at the left of the rear view of the monitor given in Fig. 17–14.

The video amplifier, *V*1, *V*2, and *V*3, employed in this picture monitor is designed to have its input terminated by a standard 75-ohm one-side-grounded load and provides sufficient gain to operate with input signals ranging from 0.5 to 4 volts, peak to peak. A combination of series- and shunt-peaked interstage coupling circuits provides a video bandwidth in excess of 7 Mc. Maintenance of black level under conditions of varying video signal information is accomplished by a diode d-c restorer *V*4A coupled to the grid of the 10-in. picture tube *V*19.

A potential of 15,000 volts d-c, for the cathode-ray tube anode is obtained from a three-tube voltage-doubler rectifier *V*10, *V*11, and *V*12, operating from the positive pulse present in the horizontal sweep amplifier plate circuit during horizontal retrace time. This voltage, although somewhat higher than that normally employed for monochrome applications involving a tube of this size, ensures a picture bright enough to compensate for the losses in the optical color filters.

Color Disk Synchronizing System. The video circuits described above produce a monochrome image from a color-television signal. Color is added to this image by rotating over the face of the picture tube a series of primary-color optical filters mounted on a plastic disk. The speed of the disk is maintained synchronous with the color signal by variation of the 60-cps voltage applied to the drive motor from control circuits in an auxiliary chassis. Since the operation is rather unusual and not similar to any of the more familiar monochrome circuits, it is described at length below.

Color synchronizing pulses from the main chassis are amplified by *V*3B on the auxiliary chassis and then applied to the self-biased class C amplifier V1A (Figs. 17–15 and 17–17). A resonant circuit consisting of a coil and two condensers in the plate circuit of tube V1A is tuned to a frequency equal to the repetition rate of the equalizing pulses (58.32 kc). Thus, when V1A is driven from conduction to cutoff by a positive grid pulse, its plate voltage will rise sinusoidally at a 58.32-kc rate and reach a maximum at time intervals corresponding to points exactly midway between equalizing pulses. This sine wave is used to gate the suppressor grid of *V*2. Simultaneously, synchronizing pulses are also fed from *V*3B to the grid of *V*2. The grid bias of V2 is adjusted to a value which will allow the tube to conduct only during the time of maximum suppressor voltage, *i.e.*, only during the interval between equalizing pulses. Therefore, the color pulse, which occupies this position, will be amplified by *V*2, and all other pulses in the synchronizing waveform will be rejected.



The narrow (same width as equalizing pulses) color synchronizing pulses thus selected occur at a 48-cps rate and are used to trigger a monostable multivibrator V1B and V3A which produces a considerably wider pulse. This wider 48-cps pulse is used to bias a triode V4 to cutoff for the duration of the pulse. Both sections of the dual triode V4 are connected in parallel, and its plate resistance serves as a variable element in a voltage divider consisting of a 150,000-ohm resistor (on main chassis) in series with the plate circuits of V4 and a 100,000-ohm resistor (on auxiliary chassis) in parallel. Vertical rate pulses (144 cps) obtained from ampli-

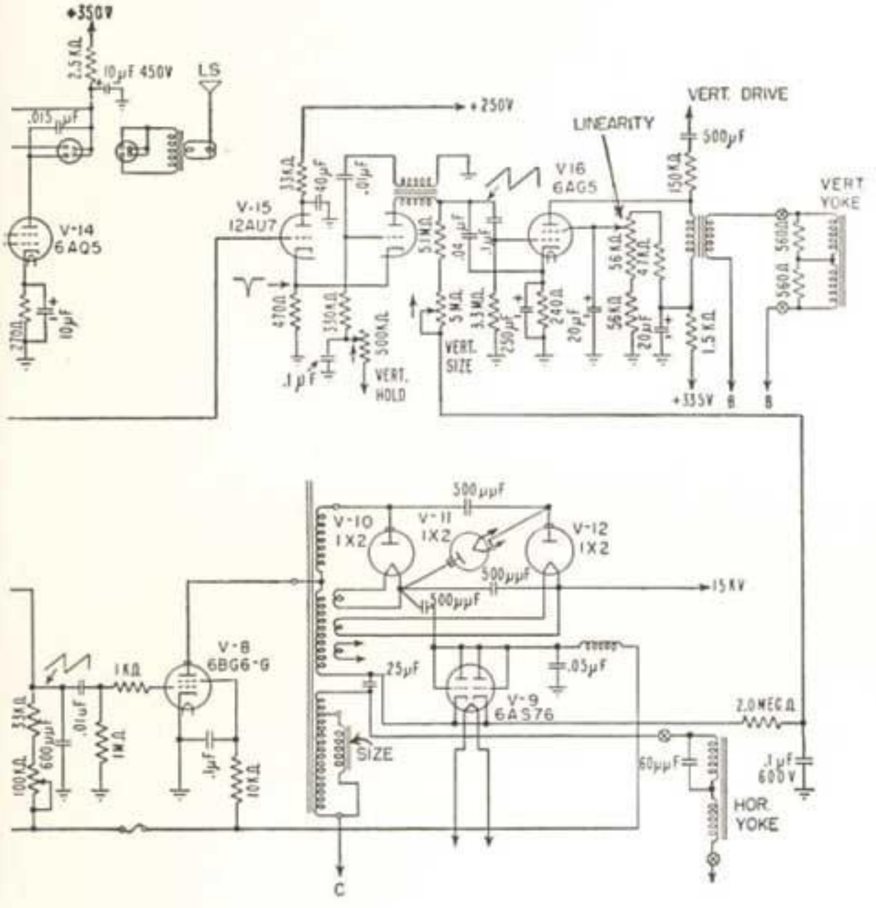


FIG. 17-16. Circuit diagram of a color-picture monitor.

fier V16 on the main chassis are applied across this voltage divider. However, since V4 is maintained at full conduction, except when momentarily driven to cutoff by the 48-cps color pulse, its shunting action prevents the appearance of any significant amount of 144-cps voltage across the 100,000-ohm resistor. On the other hand, when V4 is driven to cutoff, once every $\frac{1}{48}$ second, a single 144-cps pulse will appear across the 100,000-ohm resistor. Thus every third vertical pulse (or 48 per second) appears across the resistor from whence it is applied to the grid of the dual triode phase detector V5.

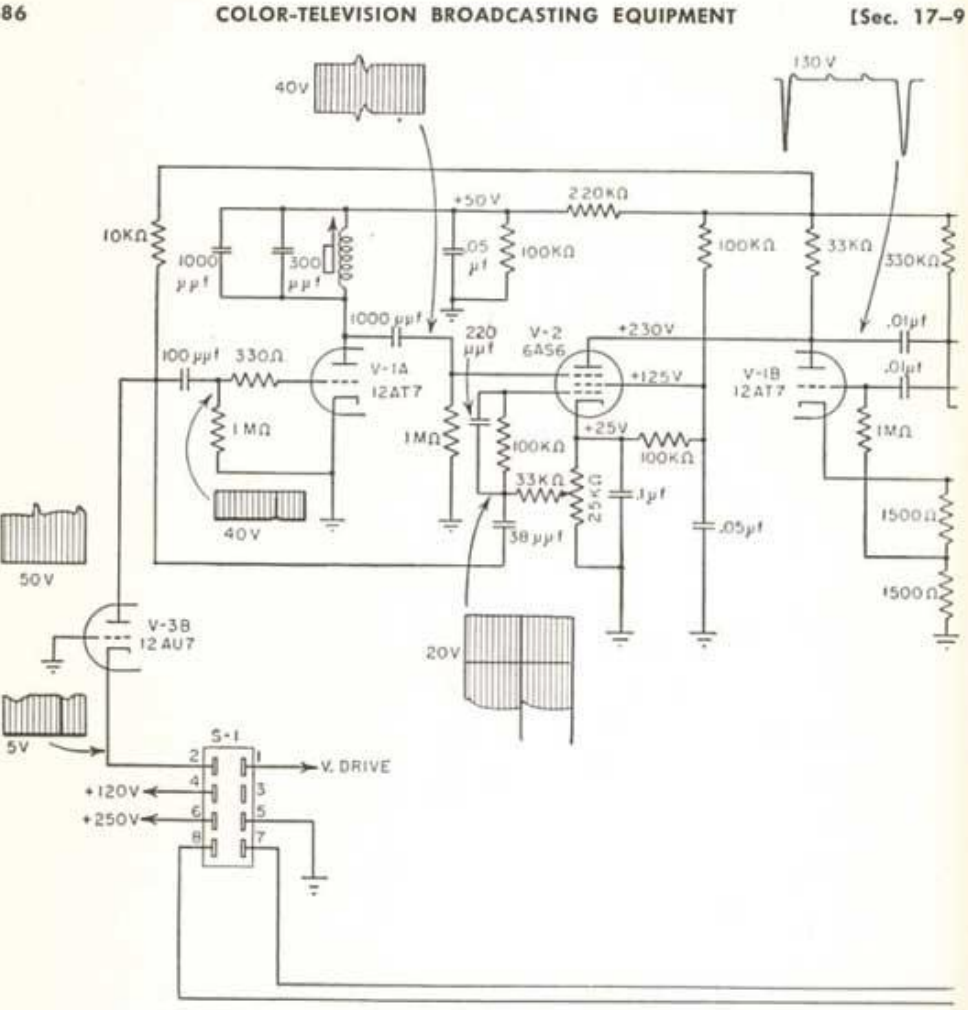
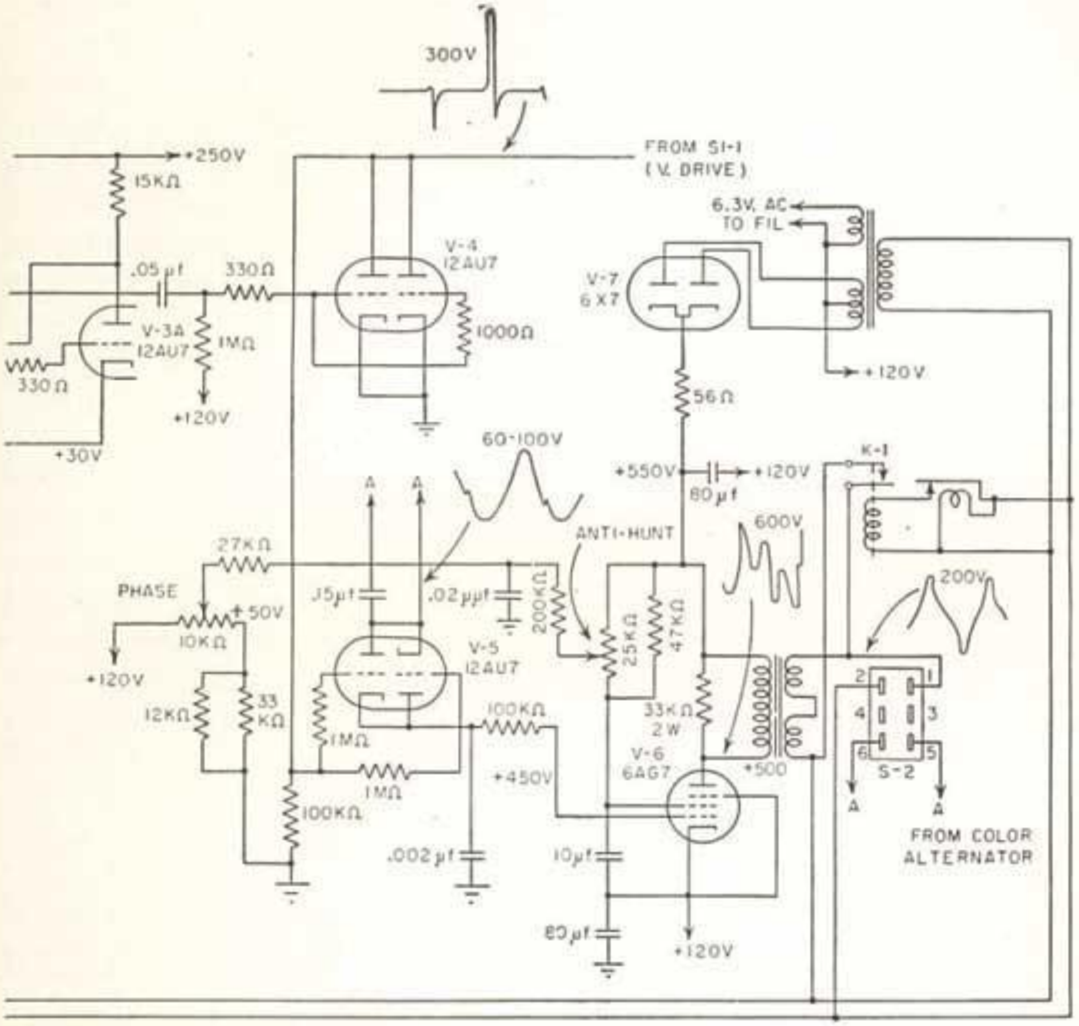


FIG. 17-17. Circuit diagram of the automatic color

The plates and cathodes of phase detector *V*5 are fed with a 48-cps reference sine wave derived from a small alternator mounted on the color filter shaft. *V*5 operates to detect the phase difference, if any, between the alternator voltage wave and the afore-mentioned 48-cps pulses. A 10,000-ohm potentiometer determines the operating point upon the alternator voltage wave. If a phase difference occurs between this operating point and the 48-cps clamping applied to the grids of *V*5, a voltage will be produced at the grid of *V*6. Such a change in grid bias of *V*6 will produce a change in direct current in the primary of a saturable reactor. This, in turn, produces a change in the reactance presented by the secondary winding of the unit. Since the secondary of the reactor is connected in series with the color filter disk drive motor, any change in its reactance will change the speed of the induction motor involved. The



phasing portion of a color-picture monitor.

polarity of connections is made such that changes in motor speed occur in the direction that brings the resultant alternator sine wave into the desired phase relationship with the color synchronizing pulse. Since the alternator generating the reference voltage is on the same shaft as the color filter disk, correct filter disk speed and phase are thus maintained.

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