HOW TO CONVERT COLOR TV RECEIVERS FOR VIDEO DRIVE

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Many television stations have acquired a collection of color television receivers whose usefulness is sometimes limited by the difficulty encountered in securing a high-quality signal, free from multipath effects. Studios in metropolitan areas may have difficulty in placing the television receiving antenna so as to produce a signal free from interference and reflections.

A reflection with a path length difference of ½-wavelength multiples of 3.58 mc may cause cancellation of the color subcarrier, just as some reflections may cause picture-carrier cancellation and loss of sync in the receiver. This is particularly true at those stations whose studio and transmitter are combined, because of direct signal pickup by the r-f distribution system.

These receivers may be converted to dual-purpose instruments, capable of receiving a telecast off the air or from video line drive. Their usefulness is greatly increased because they may be used as an emergency or spare monitor. Cost of the conversion, including labor and materials, is usually less than $50. The receivers to be discussed are the RCA models CT-100, 21CT-55 and 21CT-660 series. However, many others with similar circuitry may be converted in the same way.

Video Preamplifier for CT-100 and 21CT-55

In the CT-100 and 21CT-55 receivers, a composite color video signal of approximately 5 volts peak-to-peak, sync negative, is needed at the grid of the 1st video amplifier, shown in Fig. 1, to provide adequate contrast. Because the picture bandwidth and delay characteristics are excellent, a simple video preamplifier with frequency response flat to 4.5 mc is suitable, see Fig. 2.

Since the agc circuit is not disabled, it is necessary to restore d-c at the output of the preamplifier to prevent B+ surging with changes in video level. The d-c restoration also serves to remove any hum in the signal. In connection with this circuit, since the negative voltage available in the CT-100 is −30 volts and in the 21CT-55 only −12 volts, the 0.25 μfd 200-volt capacitor and 82,000 ohm resistor marked with asterisks, Fig. 2, must be changed to 10 μfd, 25 volts and 33,000 ohms respectively, to provide the correct bias for the video amplifier in the 21CT-55 receiver.

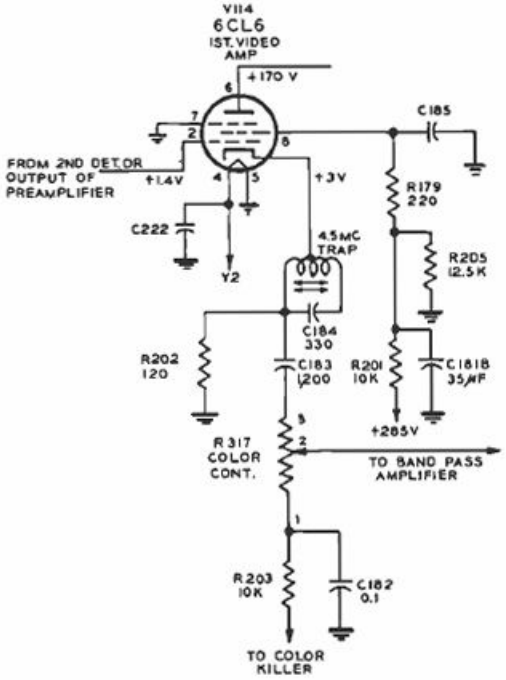


FIG. 1. Input to grid of 1st video amplifier is switched between 2nd detector output and preamplifier.

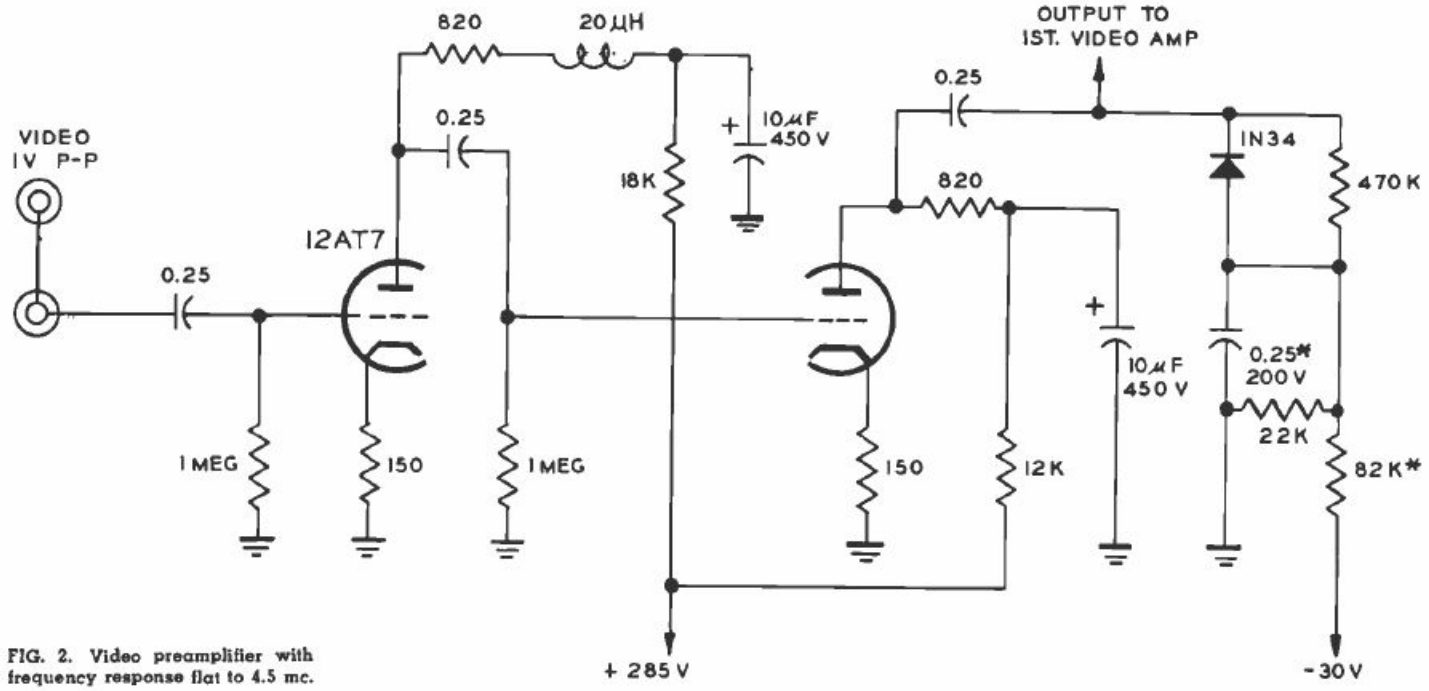


FIG. 2. Video preamplifier with frequency response flat to 4.5 mc.

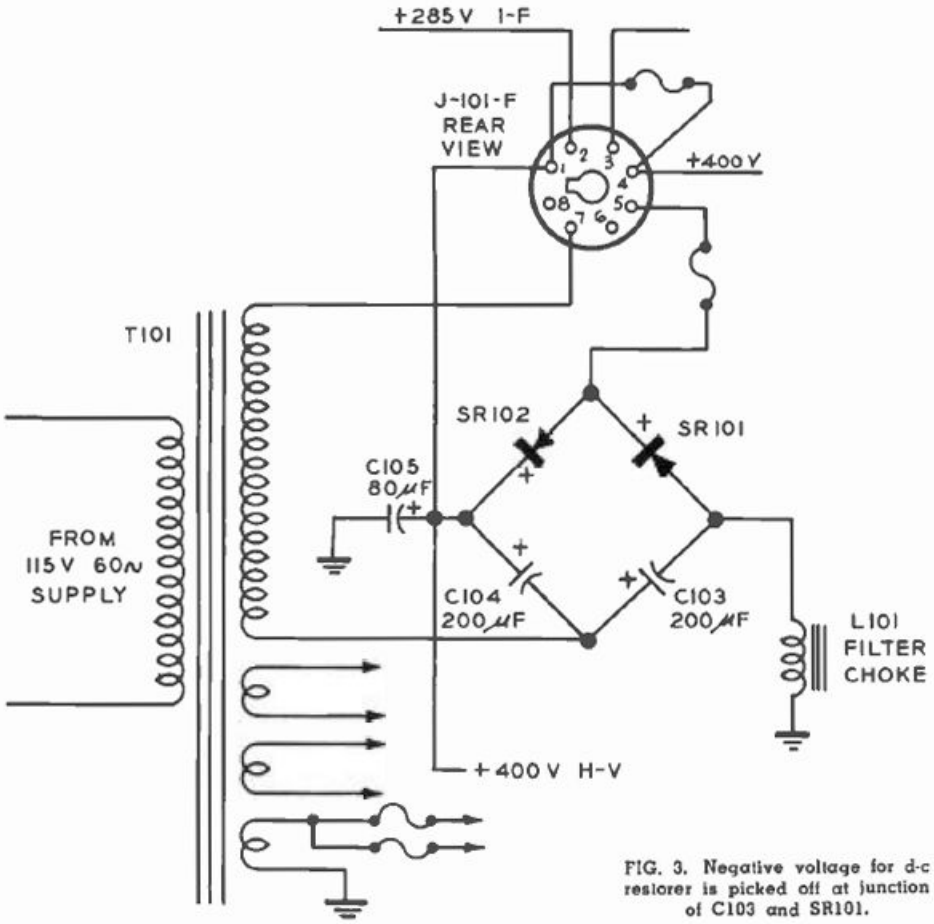


FIG. 3. Negative voltage for d-c restorer is picked off at junction of C103 and SR101.

Be careful to connect the positive terminal of the 10 μfd electrolytic to chassis ground. In either case, the negative voltage is picked off at the junction of SR101 and C103 in Fig. 3.

The preamplifier is best constructed on a sheet of aluminum 5 by 6 inches with a ½-inch right-angle apron on one side, bent along the 6-inch dimension. The angle is drilled to correspond to the Parker-Kalon screws in the corner of the high-voltage compartment and the amplifier is mounted to it as shown in Fig. 4.

Preamplifier Hookup

Two methods of connecting the preamplifier to the receiver are available. The first would be to install a switch, such as the Centralab No. 1462, on a small bracket near V114, the first video amplifier shown in Fig. 5. An insulated shaft is then run through the front apron of the receiver chassis. This would place the switch knob under the removable panel covering the concealed controls. This is used to switch pin 2 of V114 to either terminal F of T113 or the output of the preamplifier shown in Fig. 6.

The heater connection is made at the socket of V114, the +285-volt connection is made at the terminal board which supplies V114 and the negative voltage is obtained at the junction of SR101 and C103 in Fig. 3.

The second method uses a nine-prong miniature adaptor illustrated in Fig. 6, such as the Vector T9N or the Alden nine-pin adaptor, to make the connection to the grid of V114. Heater and ground connections are taken from the adaptor.

The +285-volt lead is fitted with a small insulated Mueller clip and attached to the No. 1 terminal of the rear section of the contrast control. A similar clip is fitted to the −30-volt lead and attached to the junction of SR101 and C103. This connection is made accessible by removing the rectifier cover. In this way, installa-

FIG. 4. The preamplifier is shown mounted in the 21CT-55 color TV receiver.

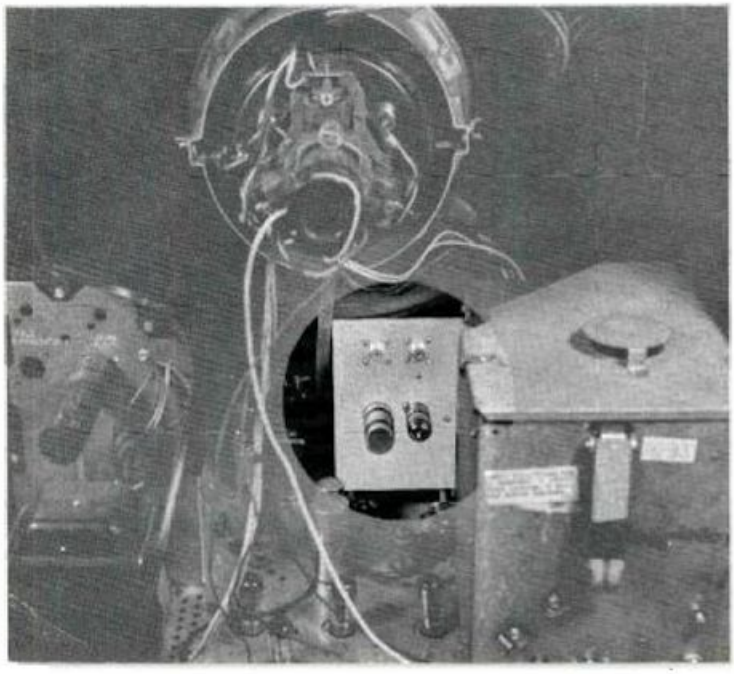
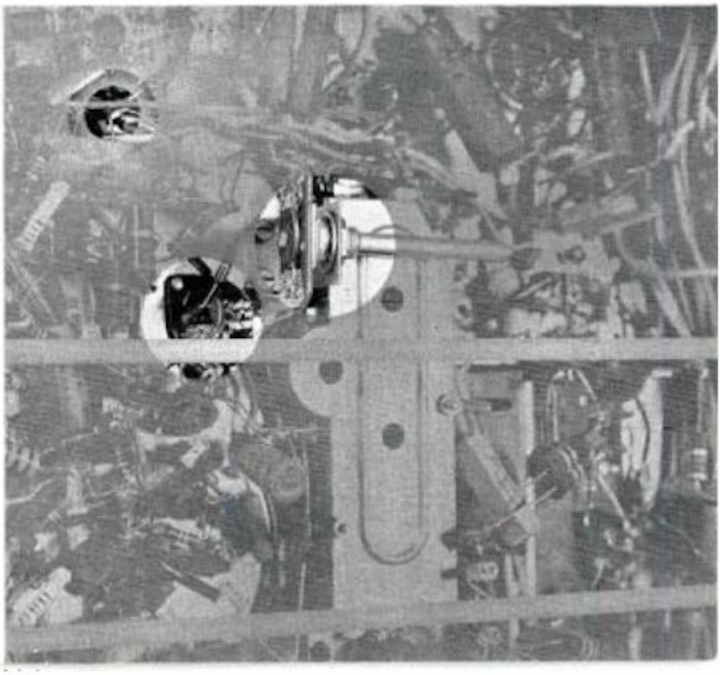


FIG. 5. Bottom chassis view of the CT-100/21CT-55 receiver. Circle (left) indicates B+ terminal; center circle locates video amplifier V114 socket and switch is shown immediately to the right.



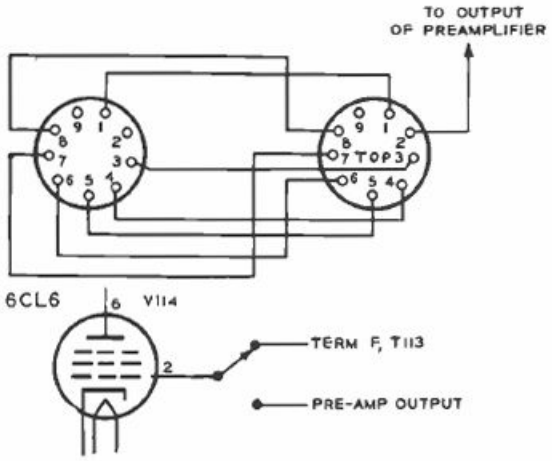


FIG. 6. Adaptor and switch used in alternate conversion method.

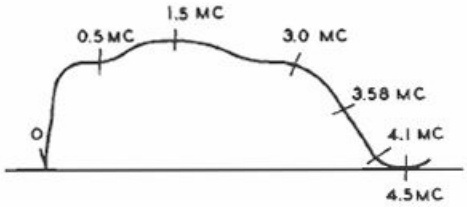


FIG. 7. Response showing 20-db roll-off from 3.0 to 4.1 mc.

tion time is reduced to one-half hour and the chassis does not have to be removed.

Modification of 21CT-660 Series

The 21CT-660 series receivers use a conventional picture i-f system and the color video signal, as demodulated at the picture detector, has a 20-db roll-off from 3.0 to 4.1 mc as shown in the curve of Fig. 7. The first video stage in the receiver is a peaking stage, Fig. 8, with a 20-db rising characteristic from 3.0 to 4.1 mc to complement this roll-off. A signal amplitude of about 16 volts peak-to-peak, sync negative, is needed to obtain adequate contrast. Because of these conditions, a video preamplifier that will drive the receiver properly must provide the same amplitude and delay characteristics as the picture i-f in order to provide proper color reproduction and registration. Two video amplifier circuits will be shown.

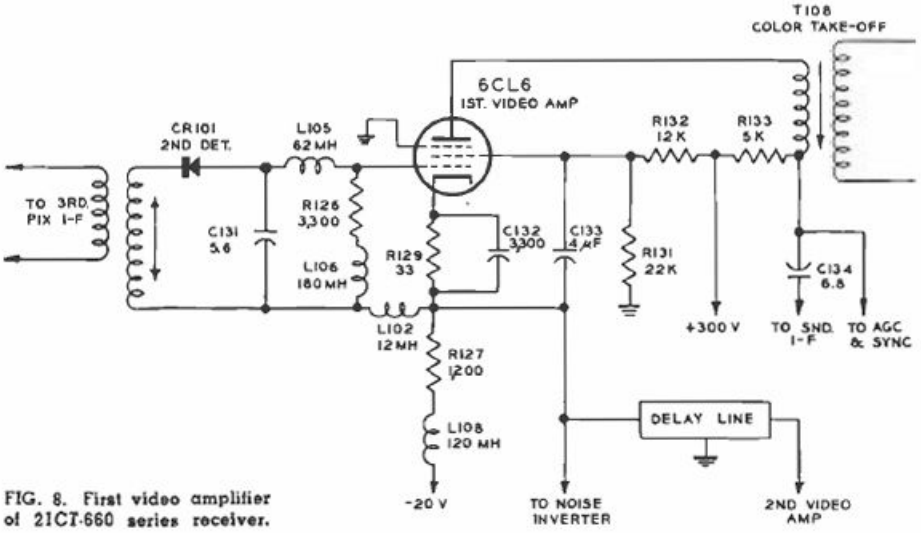
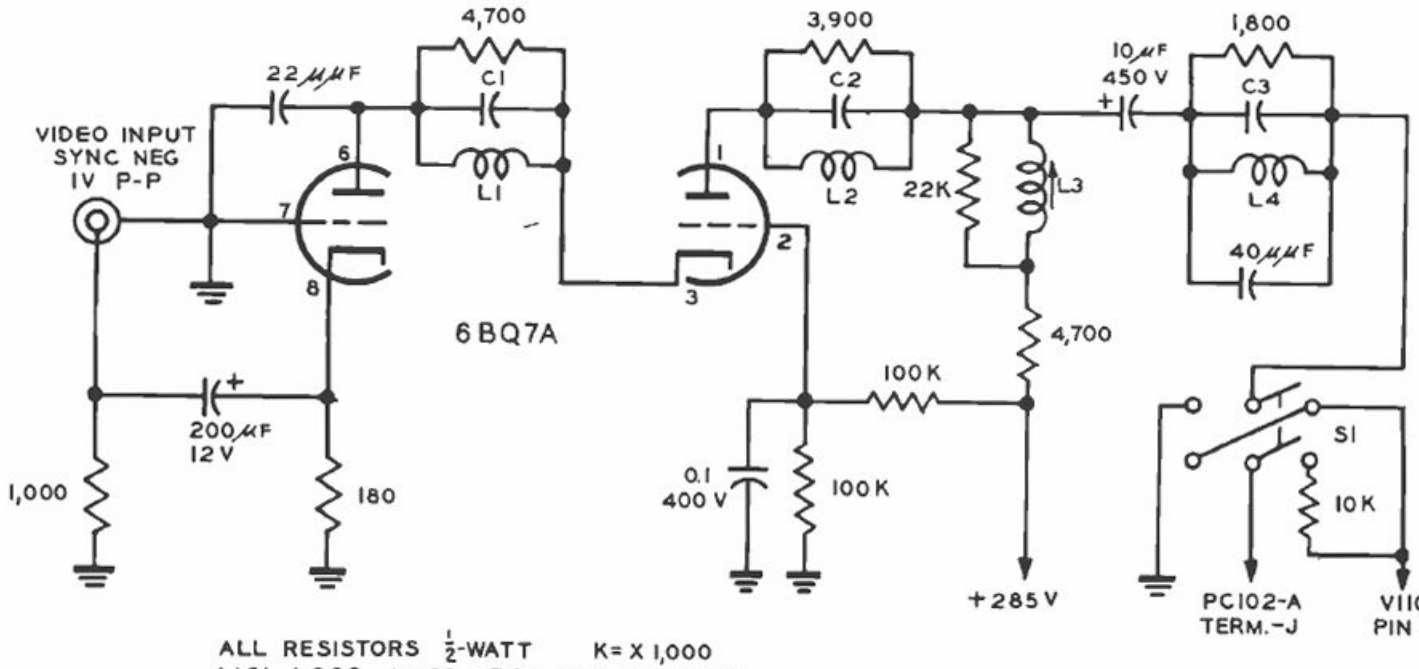


FIG. 8. First video amplifier of 21CT-660 series receiver.

The first circuit, shown in Fig. 9, may be built into the receiver chassis itself, with the 6BQ7 socket mounted in the chassis adjacent to V110. Cut the tube socket hole next to V110 by moving the terminal strip for the delay line under one foot of L120. Install a CRL No. 1462 dpdt switch on a 2-inch "L" bracket between V110 and the socket hole just cut. Extend the shaft through the rear apron of the chassis and install the coax receptacle adjacent to it, also on the rear apron. Mount a knob on the switch shaft, label the switch positions and cut a hole in the cabinet back for the switch knob and the coax receptacle. Figure 10 shows the parts location.

Since the response of these preamplifiers is very important to proper function-



ALL RESISTORS ½-WATT K=X 1,000
L1C1, L2C2, L4C3 - RCA STK. NO. 75251
L3 - NORTH HILLS COIL NO. 120 I
S1 - D.P.D.T. CRL. NO. 1462

FIG. 9. Direct-coupled in-phase preamplifier may be built into the receiver chassis.

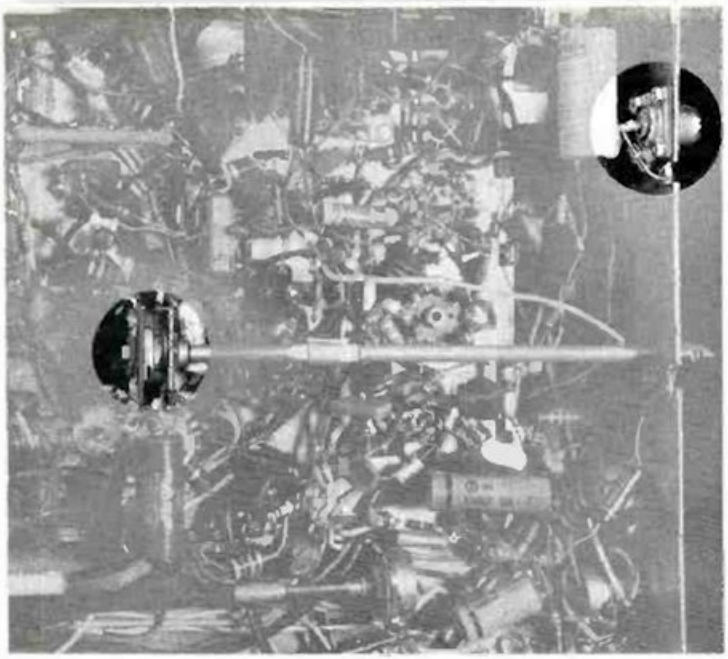


FIG. 10. 21CT-660 receiver showing video input receptacle and (right) video-rf switch.

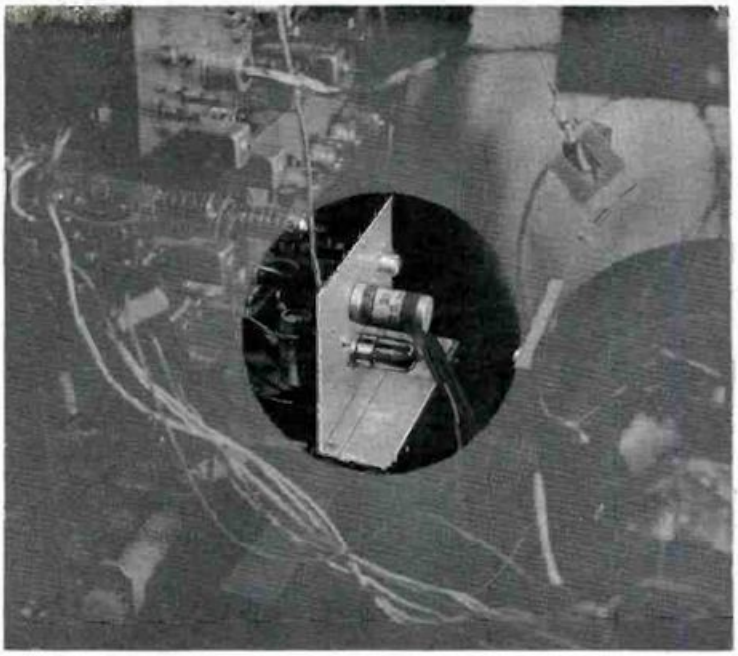


FIG. 11. Line-bridging preamplifier mounted on high-voltage compartment.

ing, it is imperative that they be checked with a sweep generator and oscilloscope after construction. Connect the oscilloscope to the junction of R127 and R129 in the receiver, Fig. 8.

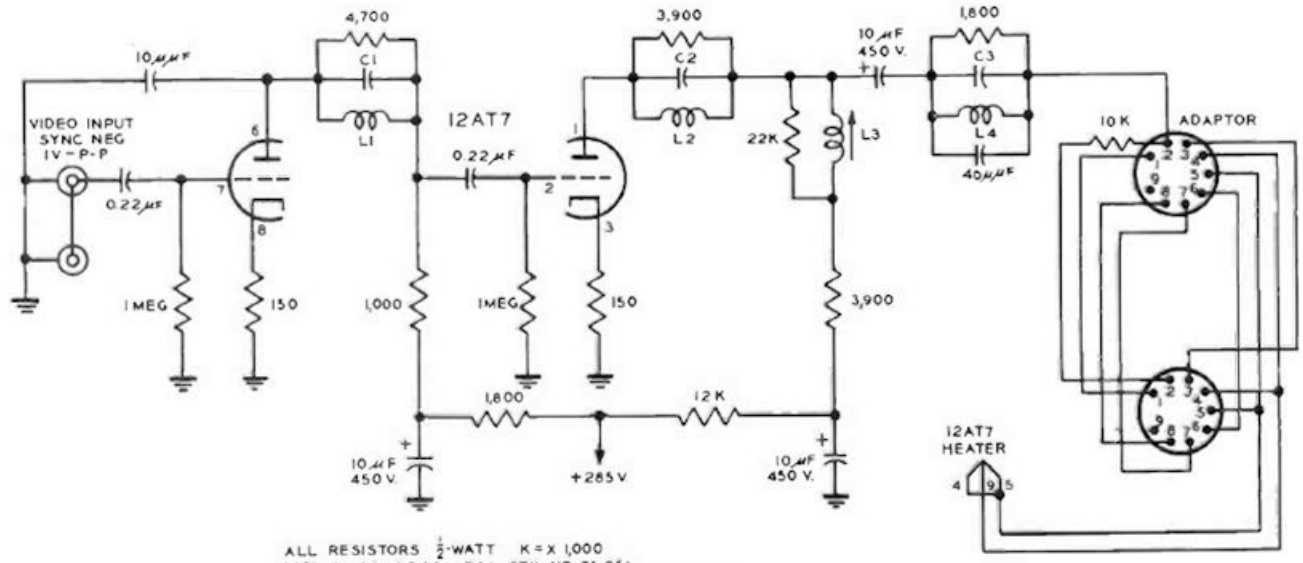
Adjust peaking coil L3 in Fig. 9 for proper response around 1.5 mc. The 22-$\mu\mu$fd capacitor from pin 6 of the 6BQ7A to ground adjusts the attenuation at 4.5 mc and beyond. Depending upon the wiring capacitance associated with a given parts layout, its value may be changed to keep the 4.5-mc point approximately 20 db below the response at 3.0 mc.

This amplifier is a direct coupled in-phase amplifier and uses a minimum of parts. One thing must be kept in mind, the cathode impedance of the 6BQ7A is 75 ohms, which makes it a line terminating device that must be driven from a distribution amplifier or other source of video.

The second preamplifier is a line-bridging type using a 12AT7 dual triode. The increased number and size of the components makes it impractical to mount them in the receiver chassis. Therefore, they are built on a piece of aluminum measuring 5 by 6 inches and fastened to the high-voltage compartment shown in Fig. 11. A schematic is shown in Fig. 12.

An adaptor may be used to connect the preamplifier to the receiver as shown in Fig. 12. The wires connecting pins 2 and 9 from base to socket are removed. A 10,000-ohm ½-watt resistor is installed between pin 2 on the base and pin 2 on the socket. The preamplifier output is connected to pin 2 of the adaptor socket. The heater connection is made to pin 4 of the adaptor socket. The +285-volt connection may be made on pin 5 of the r-f terminal board.

Thus, these color TV receivers may be modified for video line feed by the use of preamplifiers constructed as separate units or built into the receiver chassis itself—depending upon the permanence of installation desired.



ALL RESISTORS ½-WATT K=X 1,000
L1C1, L2C2, L3C3 - RCA STK. NO. 75 251
L3-NORTH HILLS COIL NO.120 I SET AT 400 MU-H
ADAPTOR-HYTRON SH-29 OR VECTOR T9-N

FIG. 12. Line-bridging preamplifier —adaptor is shown at right.