COLOR TV TROUBLE FACTBOOK

NEW 4th EDITION

—Problems & Solutions

By the Editors of Electronic Technician/Dealer

Color TV Trouble Factbook —Problems & Solutions

FOURTH EDITION

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ELECTRONIC TECHNICIAN/DEALER

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Admiral

Color TV Chassis G11/G13/H12/K15 —Loss of Blue or Red

For correction of this problem, check for failure of phase coils L506 and L507, 73B55-26 (replacemtnt for 73B55-12). Failure of spark gaps in the CRT leads is a possible cause for failure of these coils.

Two types of spark gaps have been used. Late production uses a "Gap Cap"; early production uses a twin-lead gap. Some of these early spark gaps have been found with the insulation protruding past the ends of the wires. The ends of the wires must be exposed in order for the gap to operate. Trim the twin-lead insulation until the ends of the wires extend very slightly beyond the insulation. The exposed ends must not be moved from their original spacing.

Replacement of either L506 or L507 without checking the spark gaps may result in repeat failures.

Vertical Oscillator/Output Tube Again Changed in Admiral G13 and H12 Color-TV Chassis

Admiral indicates that the 6LU8 vertical oscillator/output tube was changed to a 6JZ8 for run 38 only on the G13 series and for run 15 only on the H12 series. The run that followed in each series returned to the 6LU8 originally used. Since these tubes are not interchangeable, they should be replaced only with the same tube type originally used in the particular set which you may be servicing at any given time.

Admiral Master Screen Control

Three color TV chassis in the G11 series are introduced in the 1966 Admiral Television Line: 1G11, 2G11 and 3G11. These are basically the same as the G11. Chassis have a MASTER SCREEN control on the rear apron which changes the tracking procedure as follows:

The purpose of this adjustment is to obtain good B/W reproduction at the normal useable range of CONTRAST & BRIGHTNESS controls.

To adjust, tune in a channel with a B/W telecast displaying an adequate range of contrast levels, with both light gray and black objects.

1. Set the COLOR FIDELITY and TINT controls to midrange and the COLOR control to minimum.
2. Turn the BRIGHTNESS control to 90 percent of full rotation and the CONTRAST control to produce a normal picture.
3. Turn the MASTER SCREEN control to 75 percent of full rotation.
4. Alternately adjust the BLUE, RED AND GREEN BACKGROUND controls to produce a B/W picture with maximum brightness but without blooming.
5. Check for B/W picture at various settings of BRIGHTNESS control. If picture lacks detail at high brightness levels, increase MASTER SCREEN control slightly; if retrace lines appear, reduce MASTER SCREEN control slightly
6. Reduce brightness to slightly below normal. If any one color is predominant, reduce that background control slightly. If you cannot get proper tracking, proceed to step 7.

7. It may be necessary to relocate the red, green or blue picture tube cathode wires on the pins provided if a B/W raster cannot be obtained with the BACKGROUND controls. The cathode wires are identified by the red, green or blue tracer on a yellow wire. If one color is predominant, its cathode wire should be connected to pin P (low drive). The other two wires should be connected to either of the N (medium drive) or M (high drive) positions which gives the best B/W picture at all useable settings of the BRIGHTNESS control.

Admiral G13 Convergence Yokes

You may encounter some early Admiral G13 convergence yokes on which the static convergence magnet sticks or becomes intermittent when the thumb-wheel is rotated. In such cases the magnet may be stuck to the coil impregnating wax or may be binding against the bronze clip core spring under the magnet wheel.

To correct this condition, loosen the clamp and remove the convergence yoke from the CRT neck. Disassemble the three pole-piece exciters. To remove the cover from the pole-piece exciter, carefully insert a screwdriver or knife blade between the plastic cover and the back near one of the four heat sealed pins. Pry the two pieces apart gently at each of the four pins and remove the cover by first separating the two pieces at the end opposite the thumb-wheel until the iron pole-shoes are cleared, then separate the thumb-wheel end and remove cover completely. Take care not to lose the spring washer from the top of the thumb-wheel. Remove the thumb-wheel assembly which consists of the round magnet, spring washer and plastic thumb-wheel.

Examine the round magnet for a copper color on the core-contacting surface. If this color shows on the magnet, then press the bronze clip core spring into the case until it is below the surface of the ferrite core to prevent rubbing. If the core shows excessive wax on the surface where the round magnet fits, remove the excess with a cleaning fluid that will not damage plastic.

Re-glue the round magnet to the thumb-wheel with a vinyl or epoxy resin cement. Before you apply the cement, check to be sure that the side of the round magnet which will contact the pole-piece has the greatest attraction to it — apply the cement to the weak side. Also be sure that the cement doesn't run down the side or the centerhole of the magnet and interfere with the fit of the magnet to the core. Allow to dry.

Replace the thumb-wheel assembly in position on the pole-piece core and assemble the unit in the reverse order of disassembly. As the cover is placed over the iron pole-shoes, guide the thumb-wheel into its socket. Press the cover and back together and reseal the four posts with a hot soldering iron.

Assemble the three pole-piece exciters so that the clamp is on the left side of the unit with blue up and facing the thumb-wheel.

Admiral Service Hints
G13 Color Chassis

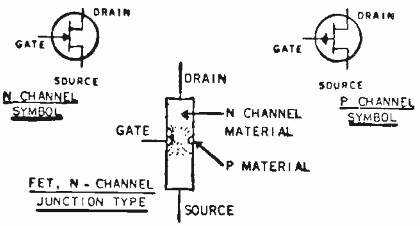
Audio output tube. Alternate audio output tubes were used to facilitate early production. The 6Y10 and 6AD10 tubes are not interchangeable because circuit components and voltages differ. Always replace with same type originally used even though both numbers are stamped on chassis. **Damper tube.** The 6CD3 damper tube used in early G11 and G13 chassis will be replaced by a 6CG3. These two tubes are interchangeable. **Verti-**

cal bar interference. A vertical stripe may appear on nearby sets as some early G13 chassis operate. This condition is corrected when a 470pf, 1000v ceramic capacitor (part number 65-D10-350) is added across CR702. **Center convergence range.** If additional center convergence range is needed, transfer the end of R616 (a 5.6K 3w resistor on back of board) from point "T" to ground (next terminal to the right, viewing the back of the convergence board).

Color Chassis K10 – Field Effect Transistor

Field Effect Transistors (FET) have three internal elements called: Source (emitter of electrons), Drain (collector of electrons) and Gate (electron flow control). An FET is easier to understand if one imagines a garden hose with water flowing through it – this would be equivalent to electron flow from Source to Drain. By stepping on the hose, you would restrict or shut off the flow of water. Similarly, by applying a reverse bias to the Gate, which is a ring of the opposite type material, you would restrict the electron flow by creating an internal electrostatic shield.

FET channels can be made of N or P type material. The schematic symbol



arrow points in on the Gate for the N-channel type. FETs normally operate with reverse bias like a vacuum tube. The amount of reverse bias required to stop electron flow through the FET is called the Pinch-Off Voltage.

The Reactance Control stage, Q17, for the 3.58MHz color sub-carrier oscillator in the K10 color chassis is an N-channel, J (junction) FET. In servicing this type of transistor, check for the dc operating voltages given on the schematic. Check for a dc correction voltage at the Gate when the 3.58MHz oscillator is thrown off frequency.

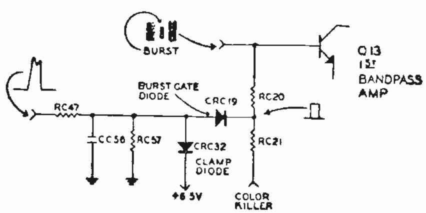
Remember that this type of transistor can be damaged by a static discharge or an arc, and that its amplification can decrease like that of a vacuum tube.

Color TV Chassis K10 – Description of Color Circuits

Burst Assurance

The first bandpass amplifier Q13 must be turned on during each horizontal blanking pulse (retrace) of a B/W program so the set will automatically sense the presence of a 3.58MHz burst signal when it is transmitted. When a chroma signal is received, burst will be passed on to the burst amplifier base.

The circuit consists of a burst gating diode CRC19 and clamping diode CRC32. These diodes operate with a positive pulse from the horizontal out-



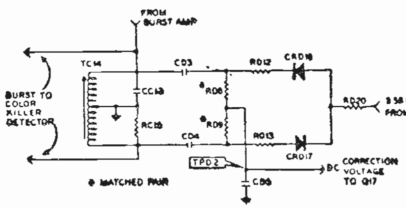
put transformer. The positive pulse will forward bias CRC19. CRC32 has its cathode connected to a 6.5vdc source causing horizontal pulses over 6.6v to forward bias it. The pulse amplitude above 6.6v is clipped off and is not passed by CRC19. The pulse that gets to the base of the 1st bandpass amplifier is sufficient to turn on the transistor.

Burst Amplifier

The burst amplifier, Q12, conducts only during the latter part of the horizontal retrace time. If a color burst signal is present, it will be amplified. Horizontal pulses are provided by the horizontal section and burst signal is provided by the first bandpass collector. TC14 (burst transformer) in the collector circuit is tuned to 3.58MHz, the burst frequency, to prevent the unwanted horizontal pulse from reaching the collector circuit.

Color Phase Detector

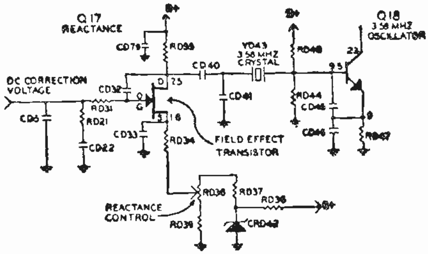
Because the color demodulators operate as precise electronic switches, the subcarrier must be re-established



to provide precise timing. Burst from the station is picked off by sampling the horizontal blanking pedestal with the keyed burst amplifier, Q12. When burst is present, it is amplified and drives phase detectors CRD16, CRD17. At this point, the incoming burst is compared in quadrature with the returning 3.58MHz sinewave from feedback amplifier, Q19. Any unequal conduction of these diodes will produce a dc correction voltage for the reactance control stage, Q17.

3.58MHz Reactance Control

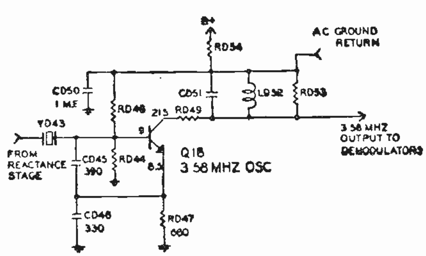
Q17 is an N-channel junction-type field-effect transistor operating as a



reactance stage to synch the phase and frequency of the 3.58MHz subcarrier oscillator with that of the station. As with any reactance stage, the device appears as a parasite on the main resonant circuit, in this case, the 3.58MHz crystal circuit. Varying either the feedback correction voltage from the color phase detector or the reactance control, RD38, will vary the conduction of Q17 and alter the "tuning" of this apparently resonant circuit. Thus, the oscillator's phase will be automatically corrected.

3.58MHz Reference Oscillator

A 3.58MHz sinewave signal of the exact phase and frequency as that of the transmitted signal is produced by the oscillator stage, Q18, and timed by crystal YD43.



The inductance of the crystal itself with CD41, CD45 and CD46 forms an oscillator tank circuit which resonates at 3.58MHz. Working together, these components comprise a step-up effect between emitter and base. Since the base-emitter circuit of Q18 behaves as an oscillator, the emitter-collector circuit will amplify the 3.58MHz base signal.

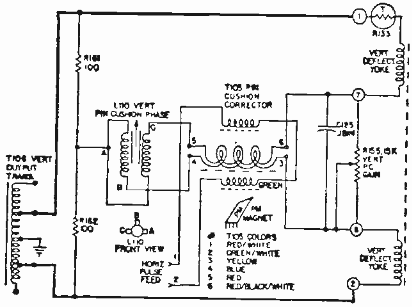
The oscillator operates continuously on B/W and color programs.

Admiral Pin-Cushion Circuits

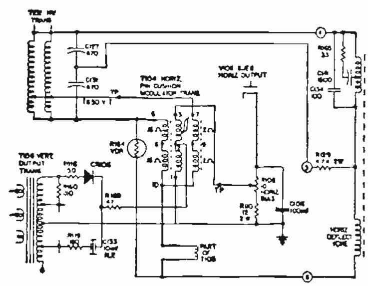
With the 23 and 25 in. CRTs being used in the Admiral G12 chassis, a condition known as "pin-cushioning" arises. That is, the edges of the raster on all sides tend to bow inward near the "center," while the corners fill out to points. This natural condition is corrected by cross-feeding a small amount of properly shaped horizontal and vertical output current into the deflection yokes.

Vertical Dynamic Pin-Cushion Correction is added to the vertical deflection yoke to correct for horizontal line distortion at the top and bottom of the raster. R161 and R162 are the damping resistors and R133 is a thermistor in the vertical yoke for temperature compensation. The correction current is injected in series with the two vertical yoke coils which are connected in series. Each half of the yoke is in a series connection with one winding on L110 and one winding on T105. The horizontal pulses for the correction are derived from the horizontal output section and fed to T105. The proper waveform is obtained by biasing T105 with a permanent magnet strapped to its core. Since C125 and L110 form part of a resonant circuit at the horizontal frequency, adjusting the inductance of L110 affects the phase of the correction signal. Notice that R115 is across the total correction circuitry. With this control in the minimum (CCW) position, the correction is effectively out of the circuit and the vertical yoke operates without correction current.

Horizontal Dynamic Pin-Cushion Correction is added to the horizontal deflection yoke to correct for vertical line distortion at the sides of the raster. Both horizontal yokes are in series with the *Horizontal Pin-Cushion Modulator Transformer* T104. In addition to C127, C131, and R129;



Vertical Pin cushion circuit Admiral G12 chassis.



Horizontal pin cushion circuit Admiral G12 chassis.

C141 and R165 are used for sweep linearity correction.

R108 feeds a dc current into the control winding of this transformer and establishes the proper hysteresis (magnetic) bias, just as the permanent magnet did in T105 in the vertical section.

The source for this dc current is the cathode of the *Horizontal Output Tube,* thus the bias for T104 tends to adjust automatically for changes in horizontal output current. The correction signal is fed to the center tap of the control winding, and is developed equally across each half. Since the correction signal is varying the fixed bias at an ac rate, it is "modulating" the hysteresis curve of the transformer and producing an AM modulated current in the yoke coils.

The ac correction control current supplied to the control winding is derived from the *Vertical Output Transformer* through the isolating resistors R116 and R119. CR106 and C133 shape the waveform to the proper shape for modulating transformer T104. With the vertical and horizontal correction properly set, the raster will produce straight vertical and horizontal lines over the entire face of the picture tube.

Automatic Frequency Control for Admiral 4H12 Color-TV Chassis

The Admiral 4H12 color-TV chassis features an automatic frequency control system which completes the fine tuning once the customer has 'roughed it in.' Its operation is similar to the AFC used on FM tuners.

The discriminator section samples the IF signal through a 0.47pf capacitor, C704. Capacitor C801 couples the signal to input coil L801. All of the capacity relating to L801 forms the resonant circuit. Capacitor divider C802/C803 delivers a low input impedance to transistor Q801 while at the same time decoupling the transistor input resistance and capacitance from L801.

After amplification in Q801, the signal is driven into the FM discriminator primary coil, L802. The output of Q801 is also sent to the junction of C807 and C808; these capacitors perform essentially the same function as the ratio detector tertiary coil.

Each detector diode is detecting the ac sum of two signals. The first signal is coupled from the output of transistor Q801 through C807 and C808 to their respective diodes. The second is derived by magnetic coupling between L802 and L803. Notice the coils are not wound on the same form and are lightly coupled. At 45.75MHz both diodes are detecting equal signals. The diode load resistors are connected adding their outputs; therefore, the AFC correction voltage will be zero at correct fine tuning, 45.75MHz.

If the channel is not tuned in carefully or if the tuner drifts, a phase shift change at L803 would occur. If the picture carrier changed to 45.25MHz, diode CR801 would conduct more and CR802 would conduct less, resulting in a negative voltage appearing on the AFC line. If the carrier shifted upward, diode action would be opposite, resulting in a positive voltage on the AFC line.

Because separate VHF and UHF tuners are used, each must have its own AFC components. In the VHF tuner, AFC voltage is applied to the base of an NPN transistor. The emitter is left disconnected and the collector is connected to the oscillator tank. This collector-to-base function serves as the AFC diode. As the AFC voltage varies, the transistor acts as a capacitor. The correction voltage changes the capacity of the junction and thus corrects the oscillator error. In the UHF tuner the AFC diode performs a similar function. As with FM AFC the correct way to tune in a TV channel is with the AFC switch on the control panel in the OFF position then switch it to ON for drift free, correctly tuned color programs.

Admiral Color TV Service Information

To increase reliability in the HV section of the G13 and early H10 color chassis, it is suggested that you use Admiral 6KD6 tubes bearing EIA Code 312 as replacement horizontal output tubes. Tubes coded either 188 or 312 may be used to replace the 6KD6 in H12 series chassis.

If a condition is encountered where the VERTICAL CENTERING control acts like a VERTICAL LINEARITY control on the G13 and H12 chassis, look for a cold solder connection at the pin in the B+ foil pattern on PW500 (chroma board). There is a red lead connected from this pin to one end of the vertical centering control. The B+ voltages will check normal but a resistance check from the control end of the red wire to B+ will not measure zero ohms as it should. Resoldering the connection will correct this condition.

Field Adjustment of AFC Circuit In Admiral 4H12 Color Chassis

1. Remove cabinet back and power with cheater cord.

2. Properly adjust preset fine tuning for each active VHF channel. (Fine tune until you observe familiar "diamond" pattern color/sound beat, then back off until pattern just disappears. This is the only correct fine tuning point.

3. Turn on AFC — if AFC is not properly adjusted, receiver will detune, do not try to retune.

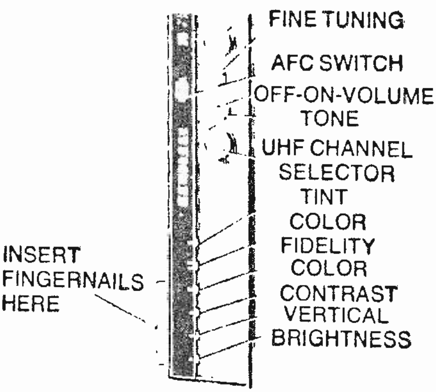
4. The AFC subassembly is located below the chassis, between power transformer and IF strip. However, adjustments can be made from top of chassis through adjustment holes in chassis pan. Secondary coil L803 is the AFC coil having a yellow form.

5. Adjust L803 slightly (no more than 1/8 turn) until detuning ceases. Do not adjust any other coil in this area. If AFC will not respond with this slight adjustment, do not attempt further adjustment — repair is indicated. If L803 is not severely misadjusted it will be easy to restore proper operation when the trouble is found and repaired.

6. Check operation of AFC on UHF channels, if any, in a similar manner (tune with AFC off — turning AFC on should not detune). It may be necessary to compromise L803 adjustment slightly between VHF and UHF.

Color TV Chassis 4H12 — Control Cluster Removal

In models using the NC2570-1, -2, -51 and NC2596-1 tuner clusters, removal of the auxiliary control cluster



can be simplified by snapping out the lower portion of the long narrow plastic crystal that covers the knobs (see illustration). Insert fingernails under the left edge of the crystal at the bottom; press toward the right and pull upward. Lift the crystal far enough to permit removal of color fidelity knob. Then proceed with cluster removal from the back by taking out the two mounting screws, disconnecting the leads and working the assembly out past the escutcheon boss and the CRT.

When reassembling, replace knob then insert right edge of crystal carefully to avoid damage to escutcheon, then snap in left edge.

Video Buzz or Hum In Admiral Color TV Audio

When encountering the conditions mentioned, try replacing the sound IF tube (6BN11 or 6EW6). If this makes no improvement, put the original tube back and try touching up the sound alignment as outlined below:

1. Disconnect outside antenna, short antenna terminals together if necessary, to reduce signal to low level. Properly adjust fine tuning to avoid weakening audio.
2. Disregard any distortion at this point.
3. Check schematic diagram and locate the plate slug of the sound IF (usually the lower slug in the sound transformer).
4. Adjust until noise is minimum and audio signal stands out.
5. Center the slug in this area.
6. Reconnect antenna and tune properly to strong local station. Make sure you avoid AGC overload.
7. Turn up treble control — set volume high in a quiet surrounding.
8. Adjust quadrature coil to a point where highs are received with maximum clarity.

If hum still persists — replace 6AD10 (or 6HZ6).

Color TV Remote Control 11A9N/ S376AN — Circuit Description and Operation

The 11A9N color TV remote unit consists of two chassis. The first is a 3A9N preamp the second is the 8A9N relay control chassis. A S376 AN hand-held electronic transmitter (actuator) generates any one of seven available frequencies in the 17 to 22kHz range when a push button is depressed. Each push button applies power to the electronic oscillator and selects a proper frequency determining trimmer capacitor. These constant-carrier signals are doubled in the output transducer (M2), thus radiating ultrasonic signals ranging from 35kHz to 44kHz.

Radiated ultrasonic signals from the transmitter are received and reconverted to electrical signals by a microphone located in the front grill of the TV receiver. Because the microphone is dc biased, it has high sensitivity and linear operation. Two preamp stages are provided in the 3A9N with an emitter-follower output. Because horizontal frequency harmonics fall in the range of the remote frequencies, extensive shielding, mounting the premaplifier chassis integral with the microphone and "floating" the preamplifier are necessary. Bandpass selection is determined by the resistor-capacitor values and by the microphone. Since the remote signals are unmodulated, AGC is unnecessary. Variable emitter degeneration is provided, however, in the 2nd preamp stage. This allows gain adjustment when triggering is encountered from ultrasonic sources outside the system such as coins, keys, etc.

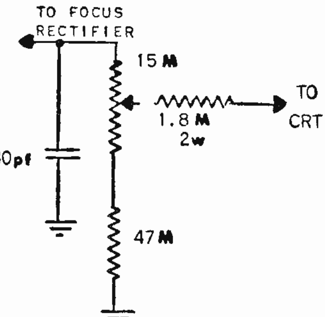
Amplified signals from the preamp are fed to the 8A9N chassis. Input transformer L1 improves the skirt selectivity of the bandpass and equalizes the gain (or tilt) across the spectrum. Its collector load consists of seven sampling windings of the input transformers and a noise rejection resistor, R25.

The seven sampling windings are parts of seven sharply tuned input transformers. When an ultrasonic electrical signal of the same frequency as one of the transformers, for example L4, is fed into the driver stage, Q4, a large signal will be developed across that transformer.

When a signal from the transformer is fed into the base of the keyer stage, Q7, base rectification will occur. This results in pulsating collector current which is filtered by the collector bypass electrolytic, C25. The dc current then trips the relay, RL3, completing the circuit to operate the color intensity control motor clockwise. The collector of the stage is protected from back-EMF transients by its collector capacitor, C25. Additional protection from adjacent channel triggering is provided by the common emitter circuit. When a transistor (Q7) conducts, the emitter current produces a voltage drop across the common-emitter resistance, R26 and R27. This increases the reverse bias on the other transistors.

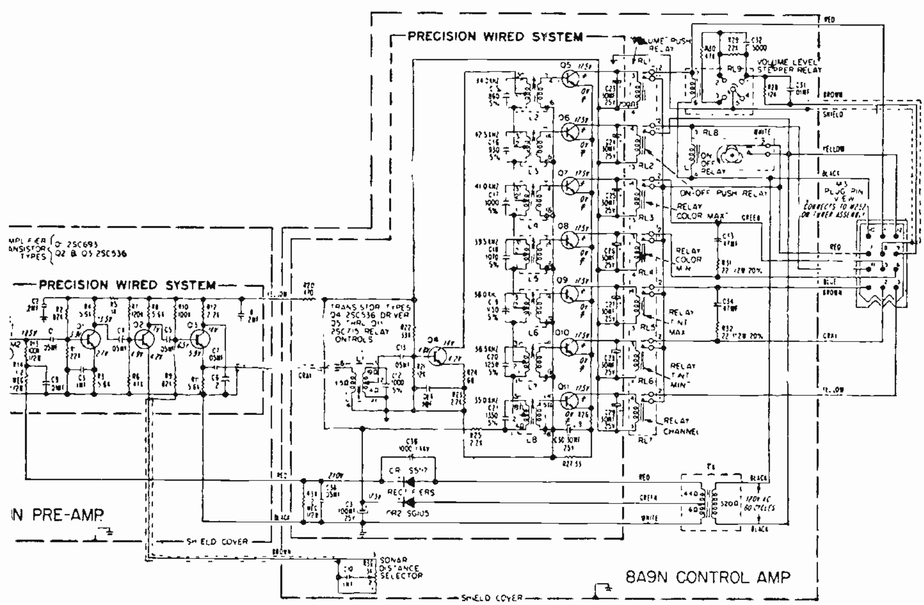
A sealed transformer on the relay control chassis provides a source for the two power supplies. A 210v supply biases the microphone. The low voltage supply provides 17.5v to the relay control chassis and preamp.

Three types of devices are used to perform the actual functions. A four stepper relay, RL9, provides four loudness positions. A bistable stepper relay, RL8, provides the on/off function. The stepper coil has two copper alloy washers for delay to prevent erratic triggering. A two-pole motor and transmission assembly using an



EARLY PRODUCTION

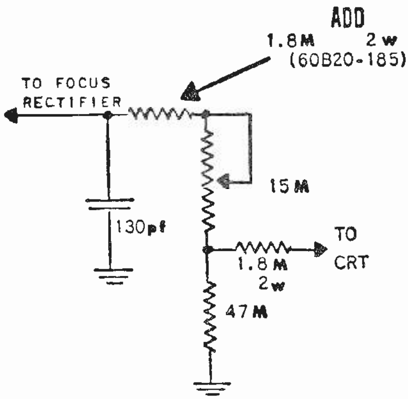
armature thrust-clutch drives the channel selector. Two capacitor-as-



sisted reversible ac motors drive color and tint controls through directional clutches and transmissions. Manual control of the stepper and on/off relays are provided by push-button switches on the volume control.

Color TV Chassis H10/H12 Series— Focus Control Modification

The focus control, in present production of H10 and H12 series color chassis, is wired as a rheostat instead



CURRENT PRODUCTION

of a potentiometer. A 1.8M resistor has also been added. This change has been made to improve reliability. It is suggested that you make this modification whenever you replace the focus control in a G11, G13 H10 or H12 chassis. If the set does not have adequate focus range after modification, try a lower value resistor (1M for instance) but keep the value as high as possible.

The 75C108-1, -2, -3 are electrically interchangeable, differing only mechanically. All three can be used for replacement. The -1 does not have a shaft, -2 -3 both have shafts but have slightly different terminal lug arrangements.

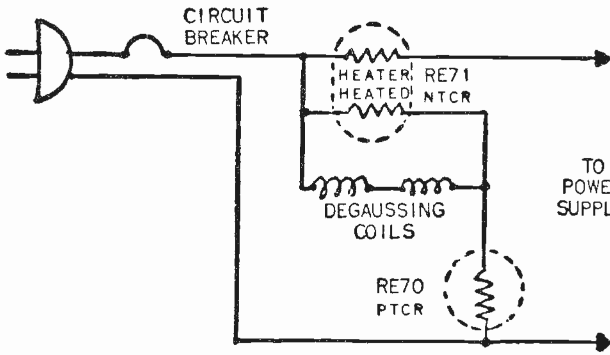
Replacing Rubber Bushings on Admiral Color TV Tuning Motor

If the motor will not disengage to permit manual tuning on power tuned Admiral color TV sets using the 91C76-1 tuning motor the condition can be caused by the following: On early production sets the bushings may become warped by oil or heat, preventing the motor from pulling far enough out to disengage. The bushings should be replaced with part No. 91C76-52. The bushings are specially treated to prevent recurrence of this condition.

Color TV Chassis 4K10—Automatic Degaussing Circuit

The degaussing coils in the 4K10 chassis are automatically "turned off" as the picture comes on by two special thermistor units: RE70 (61C52-1) and RE71 (61C53-2). Thermistor RE70 has a positive temperature coefficient; its resistance increases as its temperature increases. RE71 has a negative temperature coefficient; its resistance decreases as its temperature increases. RE71 is actually two NTC thermistors thermally connected so the heat generated by current flowing through one heats the other, causing the resistance of the heated unit to decrease.

When the set is first switched on, RE70 has low resistance, allowing high current to flow through the degaussing coils. As RE70 heats up and its resistance increases, the current through the coils decreases. At the same time, but at a slower rate, the RE71 unit in the power supply cir-



cuit is heating the unit connected across the coils, lowering its resistance and shunting the current around the coils.

The combination of decreased resistance in parallel with the coils and increased resistance in series with them effectively stops current flow through the degaussing coils as the picture comes on.

Color TV Chassis 4K10—Color TV High Voltage Tubes

Well over a year ago, Admiral announced new HV rectifier and shunt regulator tubes and specified that they were to be used exclusively as field replacements for earlier types. The 3BT2 HV rectifier must always be used to replace the 3AT2 and 3BS2 types. In the same manner, the 6EL4 shunt regulator must always be used to replace the earlier 6BK4, 6BK4A and 6BK4B regulators.

All Recent Tube Type Color Chassis—Color CRT Drive Alignment

All recent tube-type Admiral color chassis are equipped with "drive pins" for adjusting the picture tube cathode drive on all three guns. The cathode leads are yellow with red, green or blue tracers for the respective picture tube cathodes. There are three different drive levels which are labeled P for low, N for medium and M for high drive. If you are unable to get a black and white picture without a tint with the normal setup procedures, then try different pin combinations.

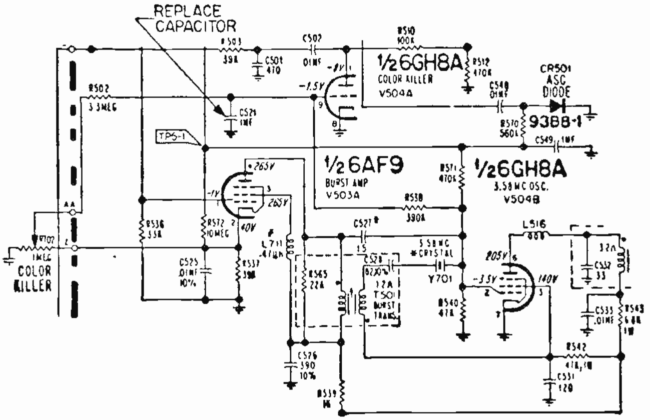
Experience has shown that it is usually best to start with the blue and green cathode leads on pin N and the red cathode lead on M. If you have a residual tint or haze over the gray areas after normal tracking, you can connect the leads to a different combination: for example, if you have a blue haze, move the blue cathode lead to a higher level tap and readjust the background controls.

All Recent Tube Type Color Chassis—Master Screen Control

The master screen control must not be confused with a CRT bias or master brightness control; they are entirely different controls. When tracking, set the master screen control at ⅓ open to start. When you are nearly finished with the setup, set the master screen control just below the point where the blackest blacks begin to wash out. Finally, reset backgrounds to give the proper maximum brightness just below blooming. The idea here is to keep the master screen control as high as possible without washed-out blacks.

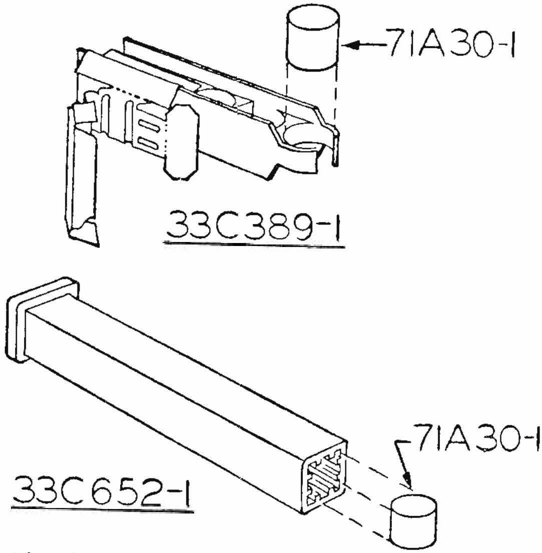
Color TV Chassis G11/G13/H10/H12/K15 Series—Weak or No Color

This problem can be caused by failure of disc capacitor C521 (.1μf, 50v). Failure of this capacitor permits a negative voltage to be produced at the plate (pin 9) of the color killer which will bias off the 2nd bandpass amplifier. Substitute this capacitor to determine if it has failed. Measuring it with an ohmmeter may not reveal a defective capacitor. Replace with a .1μf of higher working voltage such as 64C53-98 (.1μf, 200v) which is now used in production.



Color Convergence Magnets

The replacement parts pictured are available to replace the nylon slider (magnet holder) used on the convergence



assembly of earlier color TV models. Order the type shown in the drawing. The magnet (71A30-1) is not included with either type. The mounting clip shown with 33C389-1 is included.

Color TV Chassis G11/G13/H10/H12—Wrong Colors

If you encounter a complaint of chartreuse (yellow green) flesh colors which turn blue when the tint control is rotated, check the ECO transformer. Using the incorrect transformer will cause the 3.58MHz to be applied to the color demodulators 180deg out of phase. A keyed rainbow from a color bar generator will show the blue and red bars reversed. They will also roll toward or away from each other when the tint control is rotated, instead of shifting to one side together.

The correct ECO transformer for the G11, G13 and H12 series chassis is 72B285-1. The correct transformer for the H10 series chassis is 72B285-2. Be sure you use the correct replacement—they look alike!

Color TV—Service Hint
Sound But No Picture, Except Briefly When Set Is Turned Off

We have had several reports of this unusual condition which is not actually a fault but it can generate a service call. If the brightness control is accidently used to try to turn the set off, the next time the customer turns it on with the regular on-off switch, he will get sound but no picture. If he then turns the set off, the picture will come on briefly and fade out. This causes him to think something is wrong when all he needs to do is turn the brightness up!

This condition occurs in models with the spot eliminator circuit. These models have an extra switch on the ON-OFF switch which causes the picture tube to conduct at full brightness as the set is turned off. This drains off the high voltage rapidly and prevents a lingering spot on the face of the picture tube.

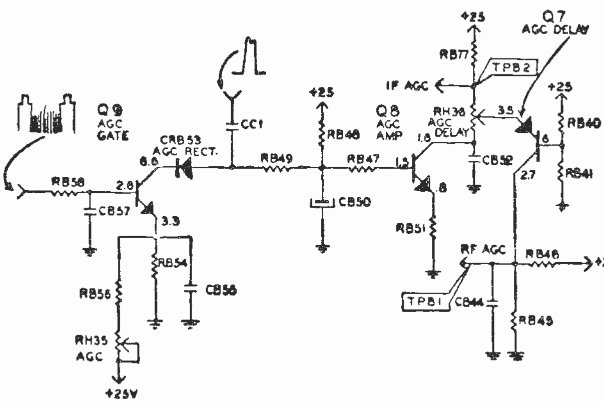
Color TV Chassis K-10—Service Note

Before removing or installing an 8AC10 or 12AC10 color amplifier tube in the current 12, 14 and 16in. hybrid color television models, pull the ac cord! If you don't, transistor Q20 or Q21 is almost sure to be ruined. Make a habit of disconnecting power before making or breaking any connections on transistorized equipment. Surges, arcs and transients can instantly ruin transistors. Please note this information in your S1225 service manual.

Color TV Chassis K-10—Keyed AGC Circuit

The AGC system employs three transistors and one rectifier; two NPN transistors are used for the AGC gate and AGC amplifier, and a PNP for the RF delayed AGC. The chassis has a "keyed forward" type of AGC applied to the RF amplifier and first IF.

A composite signal is taken from the emitter of the first video amplifier and fed to the base of transistor Q9 through



an RC isolating network. The base emitter junction is reverse biased but the sync pulses are of sufficient positive amplitude to drive the base positive and cause the transistor to conduct.

The sync pulses are directly proportional to the strength of the signal and using them as the source for AGC control will give control of the IF and RF sections proportional to the signal strength at the first video amplifier stage.

The emitter of AGC gate transistor, Q9, is attached to the 25v B+ by the 2K AGC control. Adjusting this control varies the positive voltage across the emitter resistor which in turn controls the conduction of Q9 during sync time and reverse biases it during scan time.

The collector receives a positive-going, horizontal pulse through rectifier CRB53. Transistor Q9 conducts in direct proportion to the signal blanking pulse on the base. Rectifier CRB53 conduction builds up on capacitor CC1 and charging capacitor CB50. A positive voltage is also present at CB50 through resistor RB48 from a 25v source. The balance is at a voltage lower than the positive 25v, depending on the signal strength. This voltage is applied to the base of Q8.

IF AGC: Assuming the signal level has increased, the following will occur. As the voltage is decreased on the base of Q8, it decreases the current flow through the collector which reduces the voltage drop across the load resistor RB77. This increases the AGC voltage applied to the base of transistor Q1 causing an increased flow of current through it. This in turn does two things: (1) It increases the voltage drop across the extra high resistor RA17, thus lowering the voltage of the collector of Q1 and reducing the amplification. (2) It changes the impedance relationship of LA20 and LA2 to Q1 causing an impedance mismatch further reducing the stage gain.

RF AGC: The collector of the AGC delay transistor Q7 is connected to ground through RB45. With no current flow through Q7, a residual bias supplied through RB46 keeps the RF amplifier at maximum gain. The base of the AGC delay transistor Q7 is supplied by a voltage divider network, consisting of RB40 from the 25v positive voltage supply and RB41 to ground. This holds the base to about 6v positive.

The emitter of the AGC transistor Q7 is connected to the positive power supply through resistor RB77 and the control RH36. As the incoming signal strength increases, the dc amplifier Q8 will conduct less. The collector voltage will become more positive and this potential will be applied to the emitter of Q7. With very weak signals, the AGC delay control RH36 is adjusted so that the base emitter junction of Q7 is reverse biased. To make this stage conduct, increase the voltage drop between the base and the emitter until it reaches its conduction voltage (emitter 6.5v). It will be increasing the emitter voltage in a positive direction. This would be equivalent to moving the base voltage in a more negative direction. Notice that this is a PNP operating inverted. Once forward bias is established, it will induce collector current flow through RB45.

The over-all effect will be seen as an increasing positive voltage at its collector which is the RF AGC source. This positive voltage will forward bias the RF transistor Q51 and the over-all gain of the system will be reduced. For weak signals, the RF amplifier is biased to full efficiency through RB46.

Color TV Chassis G11/G13—Horizontal Output Transformer and Tube Replacement

When replacing the horizontal output transformer in a G11 or G13 series color TV chassis, it is very important that you also replace the horizontal output tube with a new Admiral branded 6KD6. The transformer failure usually damages the output tube so replacement is necessary to avoid a callback. The transformer replacement kit has been revised to include a 6KD6 tube and the part number has been changed to 98A131-3 from -2.

Some of these chassis used a pair of 6JM6s. You can either replace with new 6JM6s or a single 6KD6 (clip off the extra plate cap).

Do not return the set to the customer without setting the high voltage at 26.0kv (at zero beam current) and measuring the horizontal current which should be between 235ma and 250ma.

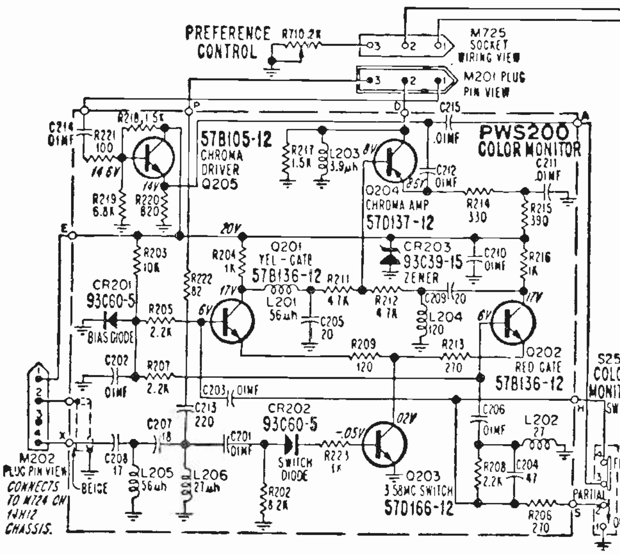
Color TV—Color Purity Information

This revised procedure applies to all recent tube type color TV sets and is more important on new models using the extra bright picture tubes.

Place the set in position where it will be used. If the set is portable and will be moved around, the purity adjustments should be made with the set facing north or south.

(1) Let the set operate for at least 15 minutes at high brightness level but below blooming before setting purity. (2) Careful degaussing with a manual coil is recommended and may be required on installation. Do not turn set off while still in the degaussing coil's field. (3) Check for correct location of neck components. (4) Rough-in center dot convergence as explained in the static convergence procedure. (5) Loosen deflection yoke clamp and slide yoke back to convergence assembly. (6) Set both round purity tabs on top. (7) Remove 3rd IF tube (6JC6A). (8) Turn green and blue background controls to minimum or pull

cathode leads from drive pins. Turn red background control up if necessary to get red raster. (9) Slowly rotate purity rings and at the same time spread tabs apart to adjust for a uniform red field around center area of screen. Never place the two round tabs 180 degrees apart. (10) Slowly move deflection yoke forward on neck of picture tube while observing entire screen area. Position yoke for best overall red screen without shadow or purity error at outer edges of screen. (11) Check green raster and blue raster by turning down other two background controls as explained in step 8. If necessary, touch up purity rings and deflection yoke until fields are pure. (12) Tighten yoke ring securely but not overly tight. (13) Replace 3rd IF tube. Adjust blue and green background controls for white raster. The yoke and purity tabs can be moved slightly to provide a uniform white raster if each field purity is maintained.



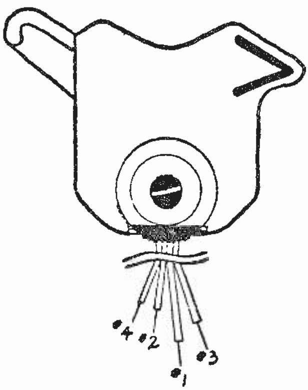
Color Monitor Chassis 14H12—Service Hint

All of the color signal passes through transistors Q204 and Q205 regardless of the position in which the COLOR MONITOR switch is set. Therefore, if the picture has no color, the trouble could be in the color monitor circuit. You can determine whether or not the color monitor is at fault by unplugging the M725 three wire socket and placing a short jumper between positions one and two. The set should function normally without the color monitor in the circuit.

The schematic packed with the sets did not show the voltages at the transistor connections in the color monitor section. The schematic shown is complete with transistor voltages.

Color TV Models 94D303-59,-60,-61—Convergence Coil Replacement

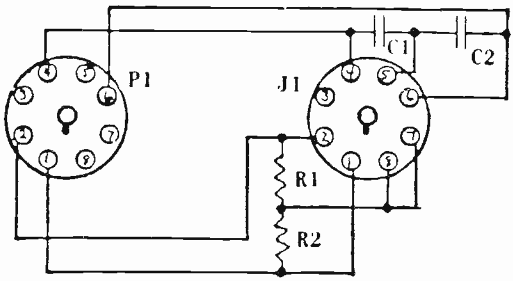
The cable from these convergence coil assemblies consists of four color coded wires bonded together as a flat conductor cable. The inside wires of the cable are connected to the vertical coils; the outside wires are connected to the horizontal coils.



The color coding of the replacement may differ from that of the original either in color or sequence or both. We suggest that you compare the replacement with the original before you remove the original. If they differ in any way, ignore the color coding when wiring the replacement. Connect the wires in the same physical sequence as the original (be sure that you view both original and replacement from the same side).

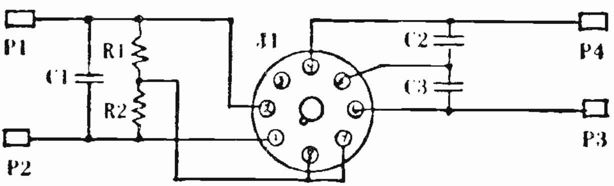
Color TV Receivers—Deflection Yoke Adapter

The adapter illustrated will enable you to use a bench test jig incorporating a seven lead yoke to test current color-TV chassis with four lead yokes. Plug P1 fits chassis 3H10 and higher plus 11H12 and higher. Socket J1 fits yokes 94A-304-1, -2, -3, -4; 94A275-1 and 94A306-1.



	Parts List	
C1,2	65A10-212	100pf, 4kv
R1,2	60A14-271	270Ω 10% 1w
P1	88A23-6	Plug
J1	87A84-2	Socket

To connect the "round CRT" chassis to the "rectangular CRT" yoke, make an adapter using a BP193 adapter cable and the circuit illustrated.



	Parts List	
C1	64A32-33	0.47μf, 200v
C2,3	65A10-372	470pf, N1500, 2.5kv
R1,2	60A8-391	390Ω, 10%, ½w
P1-4	BP193	Extension Cable
J1	87A84-2	Socket

These cables will save you time and dollars! You will work more efficiently because you can see what you are doing and do it more comfortably and precisely. Most important, the color picture tube, all neck components and convergence adjustments are left undisturbed.

Color TV Chassis K10—AGC Troubleshooting

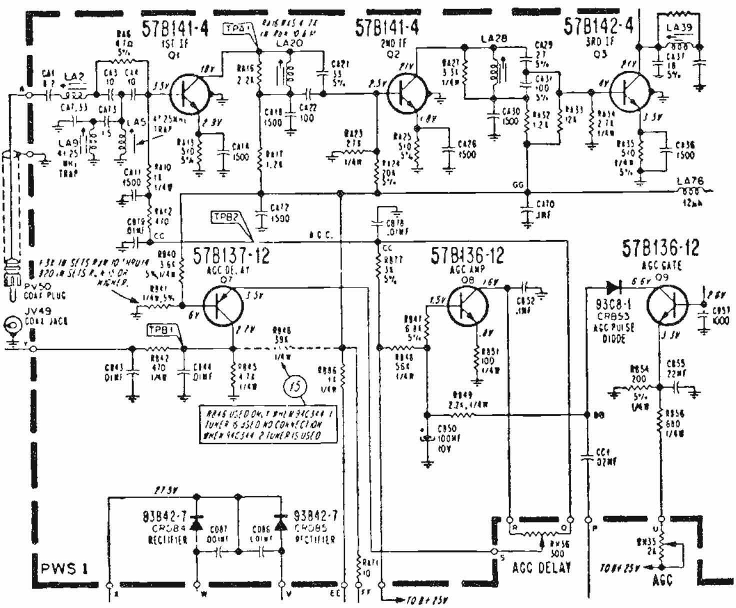
The following service procedure can be used to isolate circuit defects related to the VHF Tuner, IF section, first Video Amplifier or AGC section used in all K10 Series color TV chassis.

From the block diagram you can see that a problem could occur in any one of nine circuits, none of which is independent of the others. Consequently, it could be difficult to identify the specific component or even the circuit causing the problem.

This procedure will help you quickly isolate the trouble to one circuit where further tests will help identify the specific fault. The following test equipment is required: Bias Box, VTVM, Oscilloscope and AM Signal Generator.

I Test Setup

(A) Set VHF or UHF Tuner to receive local station and power the set through an isolation transformer. (B) Apply +7.0v bias to TPB2 (IF AGC) with set on.



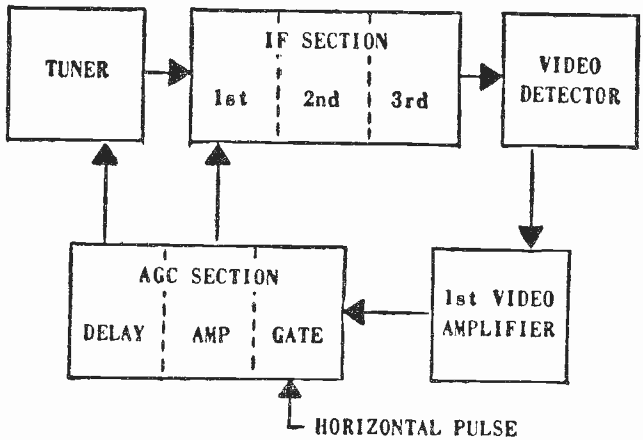
II Circuit Testing

Slowly vary TPB2 (IF AGC) bias between 5v and 9v. If you can get a picture, the problem is related to the AGC section—proceed to III. If you cannot get a picture, the trouble is probably in the Tuner, IF or first Video stage. Set the bias to +7.0v and proceed to IV.

III Checking AGC Circuit

(A) Remove bias connection from TPB2. Apply +1v bias to positive end of capacitor CB50. Slowly vary bias from 0v to +2v while checking for video on CRT. If video is not restored, the problem is most likely in transistor Q8 (AGC Amp) or transistor Q7 (AGC Delay). Make routine voltage and resistance checks of transistors Q7, Q8 and related components. (B) If video is restored, leave the bias connected to CB50, set for best video. The problem is

BLOCK DIAGRAM
K10 AGC SYSTEM



most likely in the transistor Q9 AGC Gate circuit. (1) Check rectifier CRB53 and transistor Q9. With the scope sweep rate set at 60Hz, check for a composite video signal at the base of transistor Q9. With the scope sweep rate set at 15kHz, check for an AGC horizontal pulse at CC1. (2) Check CB50 for open.

IV Checking Tuner, IF and First Video Stages

(A) To eliminate the possibility of IF failure, disconnect the IF Input Cable at the VHF Tuner and inject a 44MHz AM signal with audio modulation at the plug of the cable. If horizontal dark bars are now visible on the CRT, the IF and first Video Amp should be okay and the VHF Tuner is probably at fault. (B) If you do not get the horizontal dark bars in A above, the problem is in the IF or first Video Amp. (1) To check the first Video Amp, inject a 400Hz to 1000Hz signal at TPB3 (Base of first Video Amp). If you do not get dark horizontal bars on the CRT, the trouble is in this section. (2) To check the IF section, inject a 44MHz signal with audio modulation at each transistor to isolate the stage. Make voltage and resistance measurements to identify the defective part.

Part Number Information

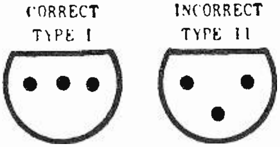
In Admiral's electronics part numbering system, the letters A, B, C, D & E within the number have no service significance. Regardless of which letter is used in the number, the parts are the same if the remainder of the number is the same. The letter identifies the engineering drawing size, which may change without affecting the parts specified.

Color TV Chassis K10—Transistor Q17 Replacement

Replacement transistor 57A149-12 should have the base configuration illustrated as Type I. Admiral received some from the supplier with the Type II configuration and may have shipped some into the field. Only the Type I will perform satisfactorily in the transistor Q17 application of the K10 chassis.

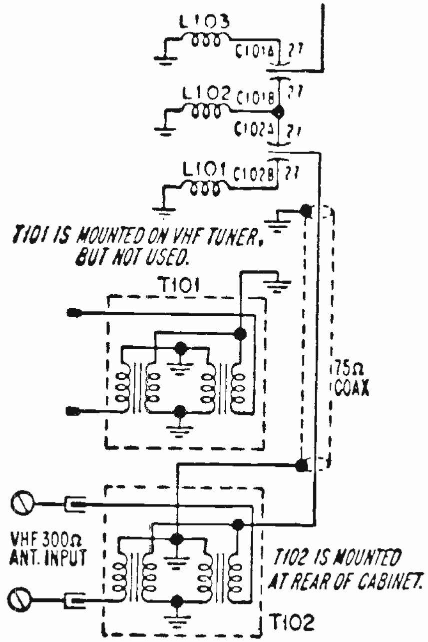
If you have any of the Type II 57A149-12 transistors, return them to your distributor for replacement.

Note that transistors 57A149-12 and 57A150-12 are used alternately as transistor Q-17 in production. Either part can be used for field replacement; however, the basing configuration differs so you will have to interchange leads when replacing one with the other. The base diagrams for both are shown on the K10 schematic.



94A286-10 & 94A330-3—Tuner Replacement

When you replace the above tuners in 1971 color TV sets, check the antenna terminal board on the cabinet back. If it has a VHF Balun attached, you must disconnect and ground the Balun on the replacement tuner. Then connect the 75Ω coax from the terminal board to the replacement tuner in the same manner as the original tuner was connected. The schematic shows this arrangement.

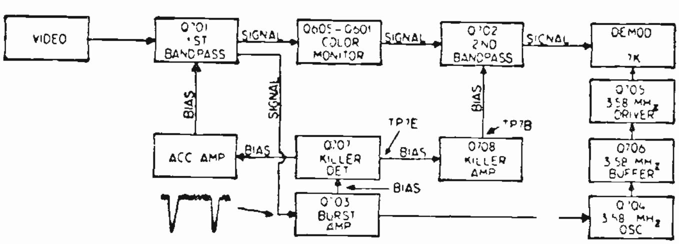


If you do not make this correction on the replacement tuner when an external balun is used, you will cause partial loss of signal and ghosting.

An instruction sheet will be included with these tuners in the future.

Color TV Chassis K20—Troubleshooting For No Color

As shown in the block diagram, the chroma section of the K20 series color-TV chassis has 10 transistor stages. Of these, six circuits function as ac amplifiers and four circuits function as dc control switches. The following procedure



will help you to quickly isolate a defective stage for "no color" after which normal troubleshooting will isolate the defective part.

1. Apply color bar signal to VHF tuner terminals (a color program can be used).
2. Set Color control to mid-range.
3. Set Color Threshold control fully clockwise.

Test Procedure

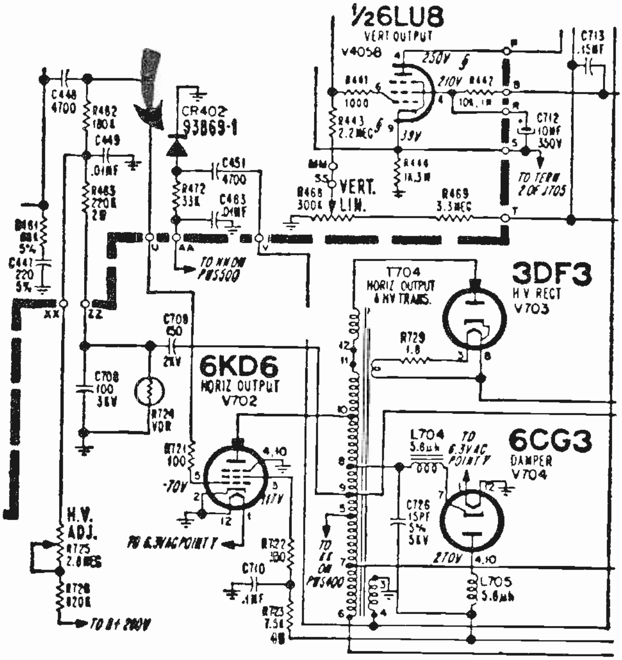
1. Connect scope to point 7K (Pin 2 of 6BV11 tube) and check for a 3.58MHz signal. (Test point 7K is the pin to the left of the word "7K" printed on the board—do not use the pin directly above the printed 7K.)
   a. If a 3.58MHz signal is not present, the problem is in the buffer, driver or color oscillator circuit. Proceed to step 2.
   b. If a 3.58MHz signal is present, proceed to step 3.
2. Using an AM generator, inject approximately a 3.58MHz signal at the base element of transistor Q706. Leave the scope at point 7K and watch for the 3.58MHz signal. Use the same procedure in checking transistors Q704 and Q705. After you have isolated the stage that does not produce a signal at point 7K, use a VTVM to locate the faulty component. Do not overlook the crystal circuit.
3. Connect the jumper from the 25v supply (red wire) to TP7B (Collector of transistor Q708, the killer amplifier) on the circuit board.
   a. If the color does not appear on the CRT, the problem is in the Color Monitor (if used) or in the first or second bandpass amplifier. Continue to step 4.
   b. If color does appear, the problem is in the Killer amplifier, Killer Detector or Burst amplifier. Proceed to step 5.
4. To check the Color Monitor, disconnect the wire from point 6F on the monitor board and connect it to point 6H.
   a. If color is now present, the problem is in the Color Monitor. Check the stages containing transistors Q601 and Q605.
   b. If color does not appear, the problem is in the first or second bandpass amplifier. Use the VTVM to check.
5. Disconnect the jumper to point TP7B that was added in step 3.
6. To check the Killer amplifier, connect a 68K resistor from TP7E to ground (collector of transistor Q707). If color now appears, the Killer amplifier is okay. Remove the resistor.
7. To check the Killer detector, short the base element to ground. The collector voltage should rise to approximately 22v. Remove the base short and the collector voltage should

decrease to approximately 17.5v. If the stage voltages are okay, proceed to step 8.

8. If the Burst amplifier is at fault, there should be color on the CRT during step 3 but it is probably out of sync.

Color TV Chassis K16—Service Hints

Complaint: No control of brightness. Possible Cause: Defective diode CR402 (93B69-1). Check for presence of negative voltage at the anode of this diode; it should be approximately −130 to −160v. This diode and associated



components provide the negative voltage for controlling brightness through the master brightness control and for the background controls. This circuit is not used for HV regulation in the K16 chassis as it was in some previous chassis. Diode 93A60-3 may be used in place of 93A69-1.

Color-TV Chassis K16/K17/K18/K20—New HV Rectifier Tube

Effective June 1, 1971, TV receivers produced must meet the new X-radiation regulation set forth by the Department of Health, Education and Welfare.

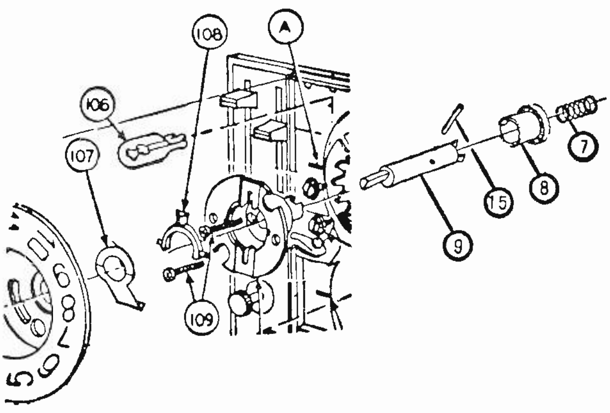
The new regulation requires that the TV receiver may not exceed 0.5 milliroentgen per hour limit under fault conditions; i.e., this limit must not be exceeded even with receiver-component failure.

In line with these regulations, a new high-voltage rectifier tube is now being used in some color-TV receivers. A 3DF3A tube is used in place of the 3DF3 tube in the K16, K17, K18, and K20 chassis. This new tube has a lower X-radiation specification.

Any TV receiver coming from the factory with the 3DF3A high-voltage rectifier tube should be replaced with the same tube type.

Color-TV Chassis K20—Service Hint

After early production models, the following changes were made to eliminate the possibility of the VHF tuner and the channel indicator disc getting one-half turn out of step.



• Spring No. 107 was changed from 19A384-1 to a heavier spring No. 19A384-2 (or two 19A384-1). See illustration.

• Compression spring No. 7 in the VHF fine tuning shaft was changed from 19A248-2 to a heavier spring, 19A248-1. This spring is already in sets using the 94C381-5 VHF tuner.

Color-TV Monitor Chassis 12K20—Set-Up Procedure

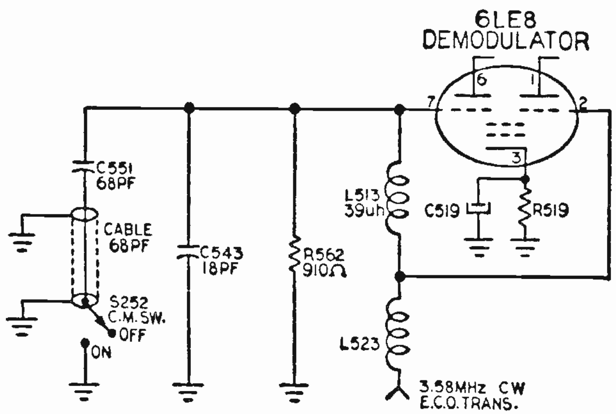
Should you find it necessary to readjust the color monitor in new models using the 12K20 chassis, the following sequence of adjustments will insure proper color registration and monitor action:

- FINE-TUNING, BRIGHTNESS, CONTRAST and COLOR-LEVEL controls must be set properly.
- Turn the color monitor OFF.
- Set the TINT control for proper or desired fleshtones.
- Turn the color monitor ON.
- Adjust the COLOR PREFERENCE control to produce a slightly pink fleshtone. This control is located in the back of the TV set on the chassis apron and should be set slightly to the right of center.

Color-TV Chassis K16 Series—Color-Monitor Circuit

The color-monitor function of the color-TV K16 chassis is obtained by widening the demodulation angle to increase the fleshtone range.

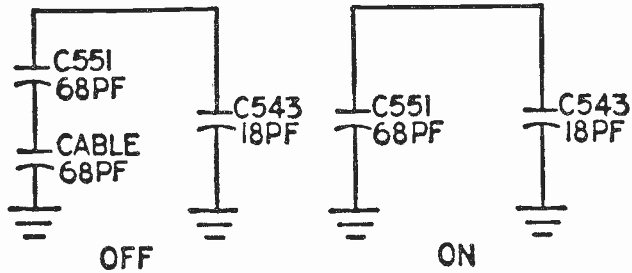
The angle of demodulation is produced by a 39μh coil, L513, in conjunction with a 910Ω resistor, R562, and capacitance to ground. This capacitance to ground consists



principally of the following: A 18pf capacitor C543 and a 68pf capacitor C551 in series with the known capacitance of a coaxial cable connected between the COLOR-MONITOR switch and C551. The length of cable used provides a capacitance value of 68pf.

The shield of the coaxial cable is grounded and the COLOR-MONITOR switch either grounds or ungrounds the center conductor (i.e., C551). When the color monitor is OFF, the total capacitance to ground is 52pf, corresponding to a demodulation angle of about 90°. This demodulation angle provides a range of about 20° for acceptable flesh tones.

When the color monitor is ON, the capacitance to ground totals 86pf. This additional capacitance adds about 15° to



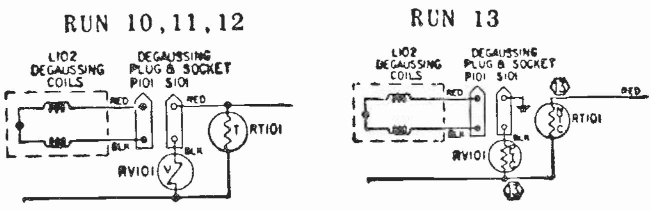
each side of the normal demodulation angle, increasing it to about 120°, which provides a fleshtone range of about 70°.

Color-TV Chassis K-18—Automatic Degaussing Circuit

The automatic degaussing circuit used in the K18 series chassis, Run 10 through Run 12, is not the same as that used in Run 13. The two circuits are shown in the illustrations.

Part List Correction

RV101	VDR, Run 10-12 (Degauss)	61A62-1
	PTC, Run 13 and up (Degauss)	61A52-3
RV102	VDR	61A46-13

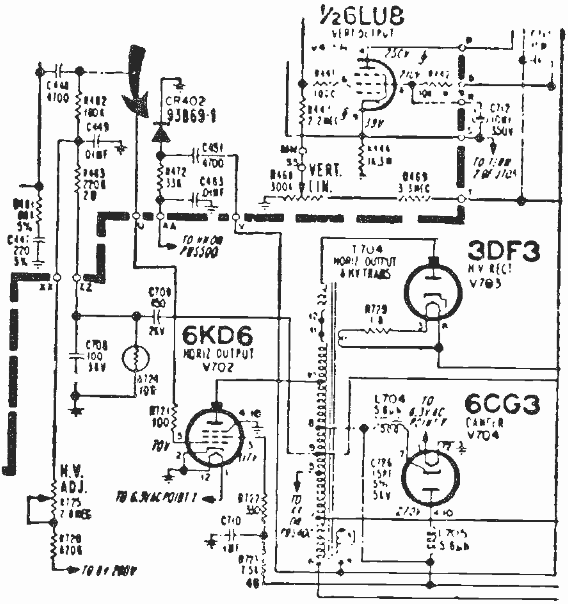


Color-TV Chassis K16 Series—No Control Of Brightness

This problem can be caused by defective diode CR402 (93A69-1). Check for the presence of a negative voltage at the anode of this diode, it should be approximately −130v to −160v.

This diode and associated components provide the negative voltage for the BRIGHTNESS control through the MASTER BRIGHTNESS control and for the BACKGROUND controls. The circuit is not used for high voltage regulation in this chassis, as it was in some previous chassis.

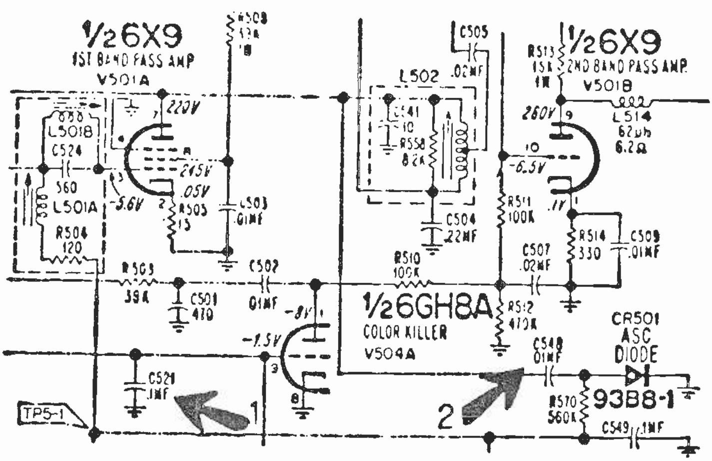
This diode can also be replaced by Part No. 93A60-3.



Color-TV Chassis G11/G13/H10/H12/K15/K16 Series—Weak Or No Color

A weak or no color complaint can be caused by defective capacitor C521.

Failure of this capacitor permits a negative voltage to be produced at the plate (Pin 1) of the color killer tube, which will bias off the second bandpass amplifier. Check

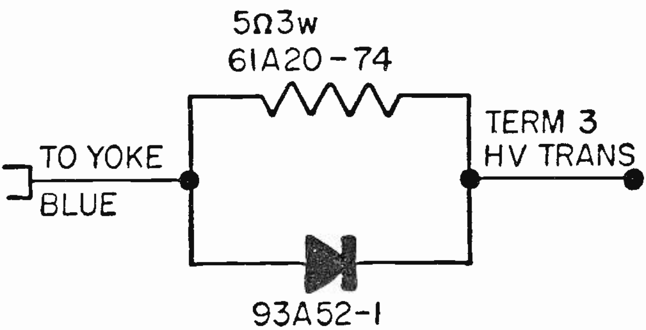


this capacitor by substitution since measuring it with an ohmmeter may not reveal a defective capacitor. Replace it with a 0.1μf of higher working voltage capacitor such as a

Part No. 64A53-98 capacitor which was used in later production models.

Another possible cause of a weak or no color complaint is leaky capacitor C540 in the H10 and K16 chassis, and capacitor C548 in the H12 and K15 chassis. Low plate voltage on the first bandpass amplifier probably identifies the leaky capacitor as the cause.

Color-TV Chassis G11—Installing Replacement High-Voltage Transformer



When you install a 98A131-5 replacement HV transformer kit (79A148-1 transformer) in the G11 chassis, you may find some sets which require horizontal centering.

Horizontal centering can be accomplished by adding a diode, with parallel resistor, in series with the blue lead to the deflection yoke at Terminal 3 of the transformer.

The polarity of the diode determines the direction that the picture shifts. Diode polarity shown in the illustration will shift the picture to the left. A special diode is not required, a 500ma with 600PIV being satisfactory.

The amount of picture shift is determined by the value of the resistor. A 5Ω resistor will shift the picture approximately 1 in. (do not exceed 10Ω).

Color-TV Chassis K20—No sound

When you check out a dead audio complaint on these chassis and find that the 57C29-2 audio IC has failed; before replacing the IC, check the ground point of the TONE control capacitor (.022μf). This capacitor must be grounded to the shield braid at the VOLUME control. If, instead, it is grounded on the tuner cluster bracket, change it before you put in the new IC.

Color-TV Chassis K20—Service Hint

There have been reports of an unusual condition in the M20 chassis that can result from the failure of a fuse in the low-voltage power supply. You would not expect to find an open fuse causing excessive brightness, washed out video and no control of the brightness condition. However, an open fuse—F904, ½a pigtail, Part No. 84A7-16—on the power supply module is a probable cause. This fuse is found in the power transformer secondary ac supply to the 400v B+ circuit. Because of the power supply configuration, 285v remains on the 400v line when this fuse is open—the reduced voltage to the picture tube cathodes resulting in excessive brightness.

Check the circuits supplied by the 400v B+ source and the components in the supply. When repairs have been made, replace the open fuse.

Color-TV Chassis K18—Two-Function Remote Control

The two-function remote control models, 18TS121C and 19TS341C, covered in Admiral's manual S1275C have an outboard relay in addition to the relays on the remote control chassis. This relay, Power ON/OFF (83A56-1) is mounted on a separate bracket and has Molex connectors which plug into the remote amplifier and the tuner cluster.

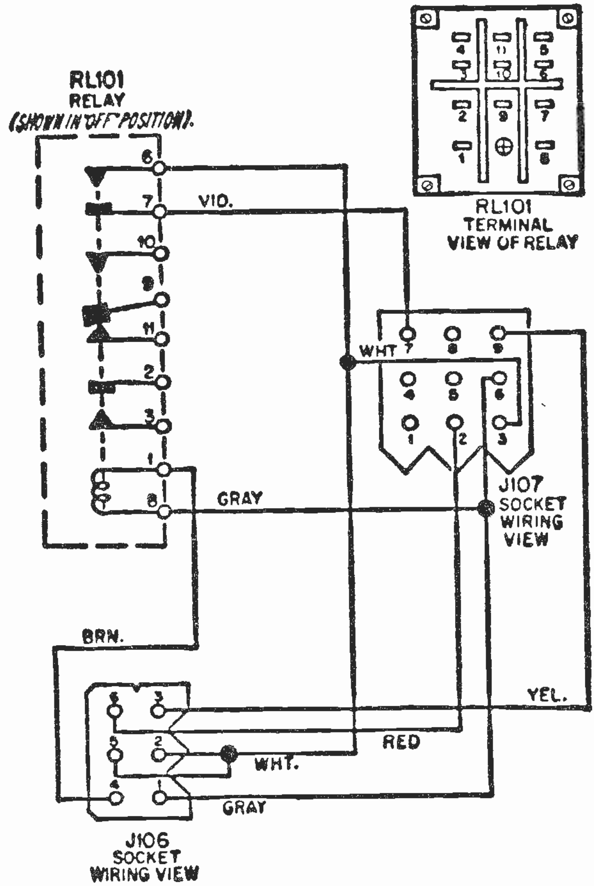
The wiring diagram for the Power ON/OFF relay assembly, which is shown in illustration above, was not included in the service manual.

Color-TV Chassis K19 Series—Failure of Horizontal Oscillator Tube, 5JW8

Preliminary investigation of reports of cracked 5JW8 (horizontal oscillator tube) envelopes in the K19 series chassis has revealed that a small metal prong located between pins 1 and nine on the socket is the probable cause of breakage. This prong by contacting the glass envelope of the tube causes a temperature difference which results in a crack in the glass envelope. This prong was originally added to the socket to ground a shield but is not used for this in the K19 chassis. It should be bent back so that it does not contact the tube.

Color-TV Chassis K18/K19—Service Hints

There has been reports of slight video bend or tear with changes in the CONTRAST level on some models that use the K18 and K19 series chassis. The following hints should enable you to correct such problem:



Chassis K-18—Run 16 and below: Redress the orange lead away from the delay line. This lead connects between resistor R538, 120K, 3w and resistor R529, 68K, ½w.

Chassis K-18—Run 17 and higher: Redress the orange lead as above. Also change the value of capacitor C201 from 120pf to 47pf.

Chassis K-19—Change the value of capacitor C201, from 120pf to 47pf (note upper left of this month's Tekfax Schematic No.1461). No lead dress change is required because a different oscillator is used.

Color-TV Chassis K19—Failure of VOLUME Control

Occasional failure of the VOLUME control on the K19 color-TV chassis has been traced to an arc in the 10T10 audio output tube. Damage to the control may be eliminated by adding a 100K, ½w resistor between pin 8 of the 10T10 and the wiper of the control (which connects to pin 13 of P101).

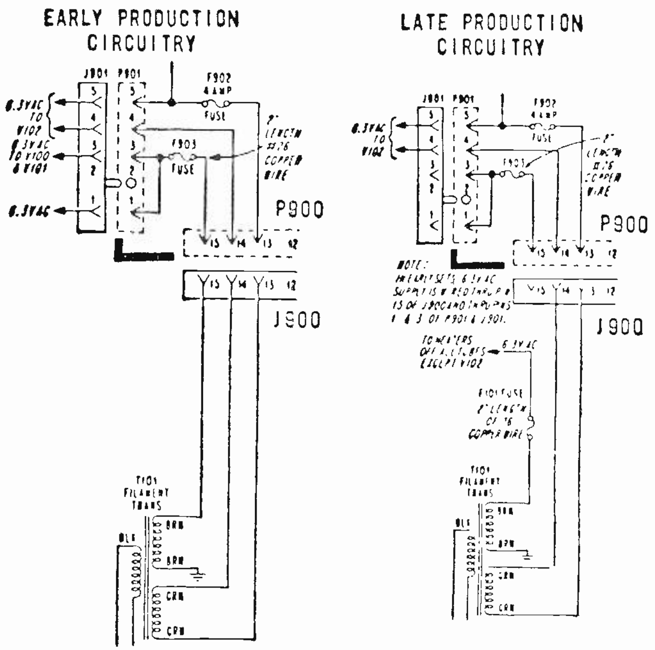
Color-TV Chassis M20—Filament Fuse

There have been several reports of intermittent operation of the receiving-tube filament fuse in early M20 chassis. The problem usually occurs at the Molex connector J900.

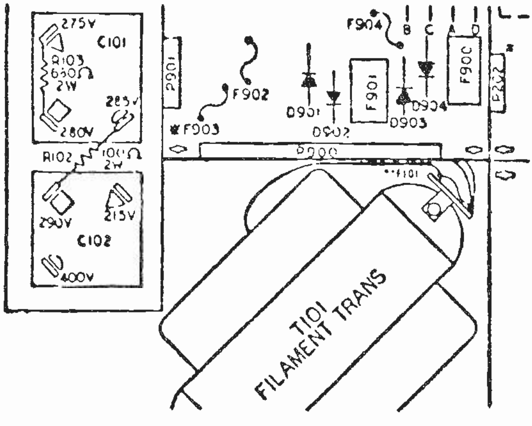
After the beginning of production, the fuse for the 6.3v ac receiving-tube filament circuit was moved from the Power Supply Module (M900) to a terminal strip on the chassis. This fuse on the module is symbol F903; on the chassis it became symbol F101.

All M900 Power Supply Modules contain the F903 fuse; on later production chassis, it is simply wired out of the circuit by a change in connector wiring.

You can change early chassis by adding a terminal strip and fuse and by transferring the filament circuit leads from the Molex connectors to the terminal strip. The components required for this change, plus instructions, are available as part number 98A136-6.



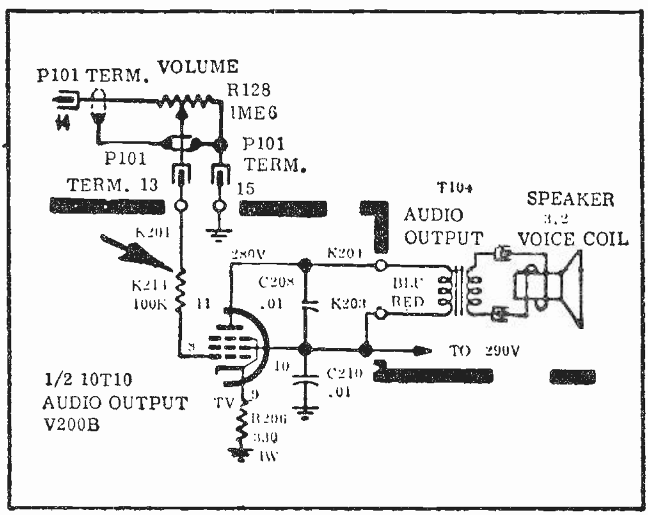
TOP VIEW OF CHASSIS SHOWING LOCATION OF TERMINAL STRIP.



Color-TV Chassis K-19—Defective VOLUME Control

Occasional failure of the VOLUME control on the K19 color-TV chassis has been traced to an arc in the 10T10 audio detector and output tube as a possible cause.

Damage to the control may be eliminated by adding a 100K, ½w resistor between pin 8 of the 10T10 tube socket and the wiper of the control, which connects to pin 13 of P101.



Also when installing this resistor, it must be placed at the circuit board. Because of the capacity of the audio cable, if the resistor were installed at the control, it would level at minimum setting of the VOLUME control. Remove the foil pattern between pin 8 of the 10T10 tube socket and K201 on the circuit board. Keep the resistor leads short and make a good mechanical connection, then solder. Check the cathode resistor R206 because it may have been overheated. The 180Ω, ½w resistor may be replaced with a 330Ω, 1w resistor as used in later production.

Color-TV Chassis K20—Failure of Audio IC

Failure of the audio IC, Part No. 57A29-2, can cause a condition of "No Audio"—usually reported following a thunder/lightning storm. This condition can be caused by an arc from the high-voltage or the picture-tube circuits.

If you encounter a K20 chassis with an IC failure, check the wiring of capacitor C134 (.022μf) TONE control capacitor on the tuner cluster. The ground side of this capacitor should be connected to the shield braid at the VOLUME control and not the tuner cluster bracket. Reconnect if necessary.

Improved reliability of the IC can be achieved by inserting an 8.2K, ½w resistor between pin 7 of the IC and the junction of capacitors C212, C213 and resistor R203.

Cut and remove the foil pattern between 7 and the junction of C212, C213 and R203. Keep the resistor leads short and make a good mechanical connection, then solder.

Color-TV Chassis M20—Service Hint

A problem of UHF channels detuning when BRIGHTNESS, COLOR or CONTRAST control settings are changed—found only in models with varactor UHF tuners—can probably be caused by a defective dc regulator diode.

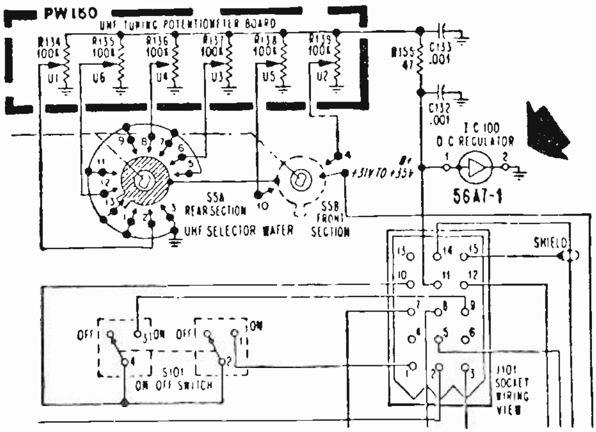
This diode, IC100, Part No. 56A7-1, regulates the 35v supplied to the preset UHF tuning controls. If the regulator is not functioning, a very small change in the B+ supply voltage will change the tuning of the varactor tuner.

To correct this condition, replace the diode, which is mounted on a terminal strip on the rear of the UHF tuner.

Color-TV Chassis K20—Service Hint

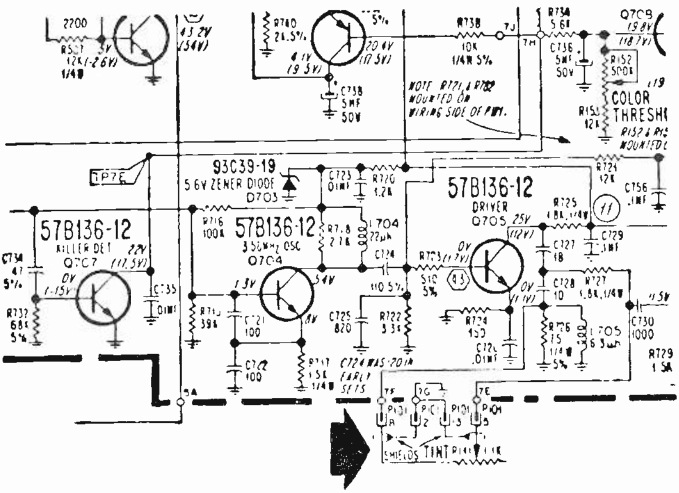
When a problem of greenflesh tones is found in the color picture and the TINT control has no effect, a probable cause is a poor connection at the TINT control leads in the Molex connector.

ADMIRAL



PARTIAL SCHEMATIC OF UHF TUNER SHOWING IC100

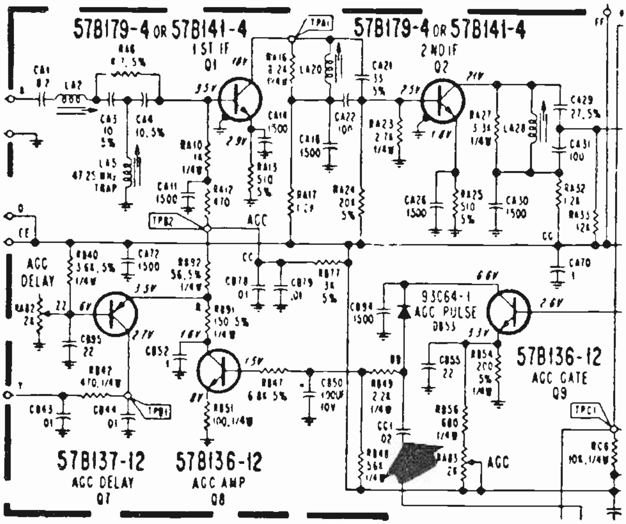
To correct this condition, locate the leads from the TINT control at the Molex connector. Remove the pins in both the chassis plug and the plug on the control cluster. Solder the crimped connections and reinsert pins, making sure that they seat firmly.



K20 TINT CONTROL CONNECTORS

Color TV Chassis T15K10/T41K10 Series—Intermittent or No Video and No Sound with White Raster

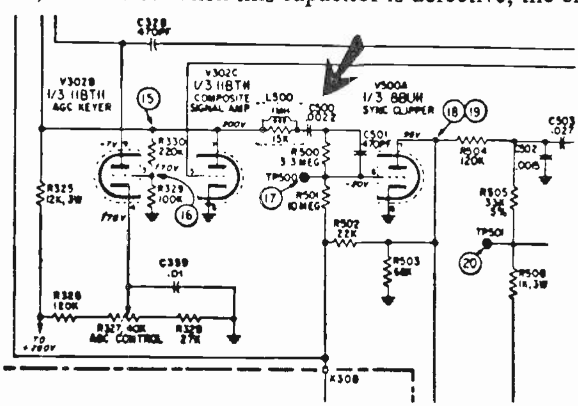
One possible cause for this problem is a leaky or shorted CC1 capacitor (.02μf); replace with Admiral Part No. 65A422-203-3.



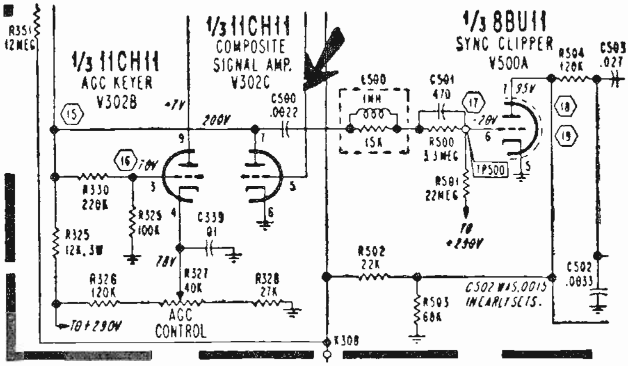
Intermittent failure of this capacitor has been reported in cases in which the set operated for a few minutes or a few hours before the loss of picture and sound occurred. When the AGC section malfunctions, the AGC voltage to the base of the 1st IF transistor increases, shutting off the transistor.

Color TV Chassis K18, K19 Series—Horizontal Bending or Pulling in Picture

This condition may be caused by a leaky capacitor, C500, .0022mfd. When this capacitor is defective, the effect



SECTION OF K18 SCHEMATIC SHOWING C500 AND SYNC CLIPPER



SECTION OF K19 SCHEMATIC SHOWING C500 AND SYNC CLIPPER

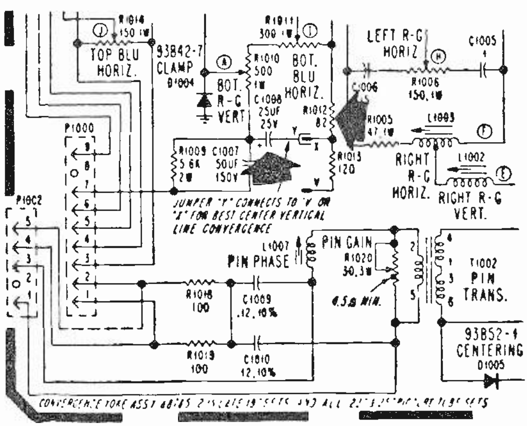
on the picture may be similar to another problem which caused bending in the picture and which was corrected by redressing the orange lead away from the delay line. This problem is similar—video in the sync circuits—but with capacitor C500 defective, the condition can be more severe.

Observe the waveform at the plate (pin 7) of the sync clipper tube. If any video information appears with the sync information, capacitor C500 is probably defective; replace it with 65A417-222-1.

Color TV Chassis 3K19—Service Hint

If you encounter a symptom of insufficient or no vertical sweep, resistor R1012 overheated, and capacitor C1008 with the end blown out, the possible cause is as follows:

You will likely find filament-to-cathode leakage in the 10GF7A vertical-output tube. (Output section; pin 3 to pins 4 and 5).



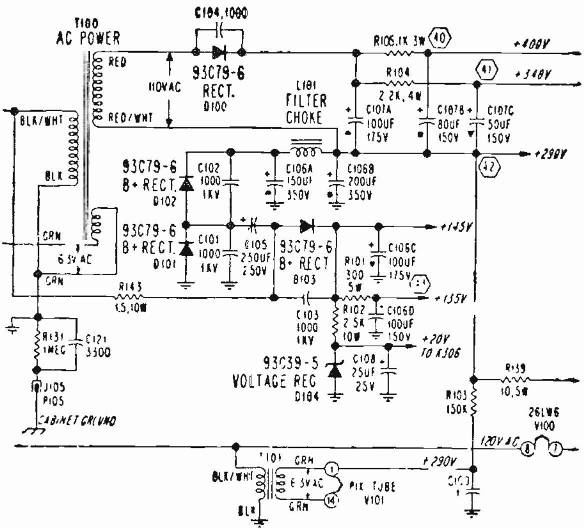
SECTION OF 3K19 CONVERGENCE BOARD SCHEMATIC

With filament-to-cathode leakage in this tube, AC voltage is connected into the convergence assembly.

Replace the 10GF7A tube, resistor R1012 (82 ohm, ½ w) and capacitor C1008 (25 mfd, 25 v). The replacement should be made with Part No. 67A200-250-7.

Color TV Chassis K19 Series—Hum Bar in Picture at 60 Hz Rate

The possible cause of an hum bar in the picture can be



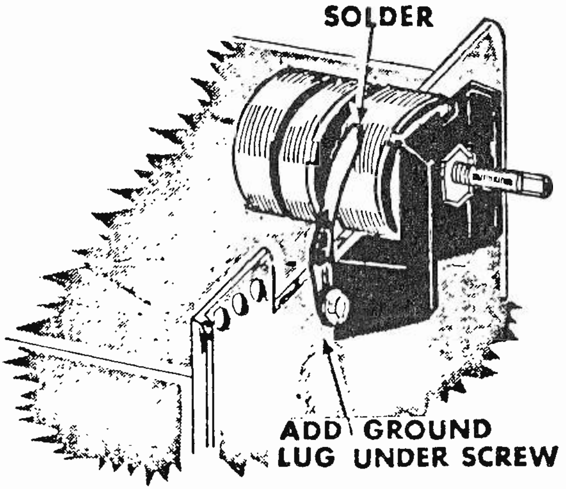
an open electrolytic capacitor on the 20v B+ supply—Part No. 67A200-250-4.

If you encounter a set with this problem, the ripple on the higher B+ supplies will appear normal. Checking the waveform at the plate (pin 2) of the Video Amplifier tube, 11CH11, will confirm the defective capacitor; you will observe 60 Hz on the video signal.

Color TV Models 5L5851, 5L5853, 5L5855—Loss of Sound

There has been a few reports of loss of sound in color TV Models 5L5851, 5L5853 and 5L5855 which are equipped with the 8T9A, 8-track tape player. The TV sound signal in these models is amplified by the left channel amplifier of the tape player, so component failure in the audio section of the tape player can also cause loss of TV sound.

Investigation of these reports showed that the sets were,



in most cases, being operated in carpeted rooms and that a static discharge was noted as the controls were touched.

Component failures that may occur as a result of a strong static discharge include one or more of the following transistors: Q7, Q9, Q11, Q13 or the equivalent right-channel parts.

In the 5L5850 series models, the on/off/volume control is mounted to the tuner by a plastic bracket. We recommend grounding the control case to eliminate this problem.

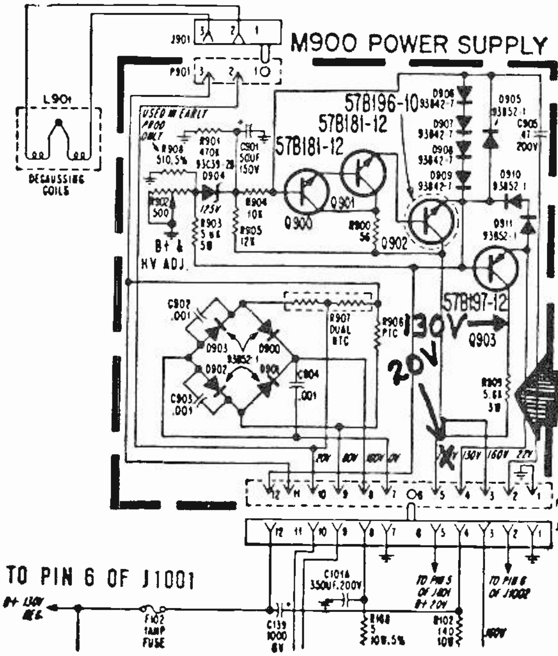
Add a 9A207-2 ground lug under the screw on the tuner bracket, position the other end of the lug against the control case and solder it (see illustration). This is the only approved method of grounding the control case. Do not add this ground lug to any models other than the 5L5851, 5L5853 or 5L5855.

Power Supply Module M900 (A8926-1)

The DC voltage at pin 5 of the contact terminals P900, located on the power supply module M900, should be 20v.

All M25 production power supply modules include resistor R909 (5.6K, 3w).

The voltage to pin 5 of contact terminals J801 should be 20v (not 130v as shown on early schematics). The voltage at pin 5 of contact terminals J800 is 130v; this voltage is received from the 130v regulated supply originating in the M900 power supply and fused by F102 (1 amp). You can trace this back through coil L104, the windings of T103, resistor R113 and pin 7 of J1001. The jumper between pins 2 and 3 of J1003 provides an interlock to protect circuit components in the event that the set is operated without the L101 yoke plugged in.

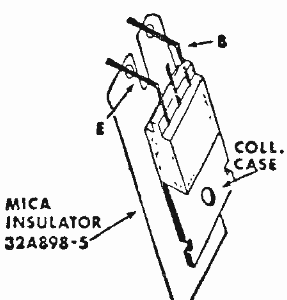


Do not overlook checking Q102, the horizontal-output transistor, and damper diode D101. They are mounted on the heat sink adjacent to the T103 HV transformer.

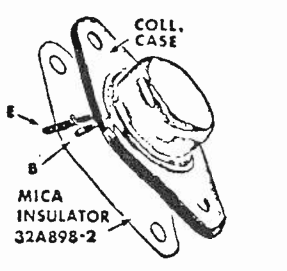
Color TV Chassis M24/M25/M30—Vertical-Output Transistors

Vertical-output transistors with two different case styles were used interchangeably in production of the M24, M25 and M30 chassis. There is no electrical difference between the case styles; either may be used to replace the other.

The mica insulator packed with the replacement must be used when replacing one case style with the other. Be



NPN PNP
57A205-14 & 57A206-14



NPN PNP
57A244-14 & 57A245-14

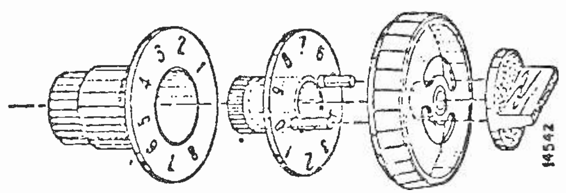
sure to apply silicone grease to both sides of the new insulator to insure maximum heat transfer to the sink. Make sure that the insulator is undamaged and that there are no burrs or foreign particles on any of the mating surfaces that might damage the insulator or prevent proper seating of the transistor.

It is also important that the mounting screw(s) be tightened sufficiently to position the transistor in firm contact with the insulator and, in turn, with the heat sink.

The above precautions apply to all power transistors which are mounted on heat sinks.

Current TV Models—70 Detent UHF Tuner Selector Knobs

In the parts lists for models using the 70-detent UHF tuners, all four parts of the UHF selector are listed as knobs. Actually, as shown in the illustration, there are two knobs and two indicators. Notice that the *tens indicator*



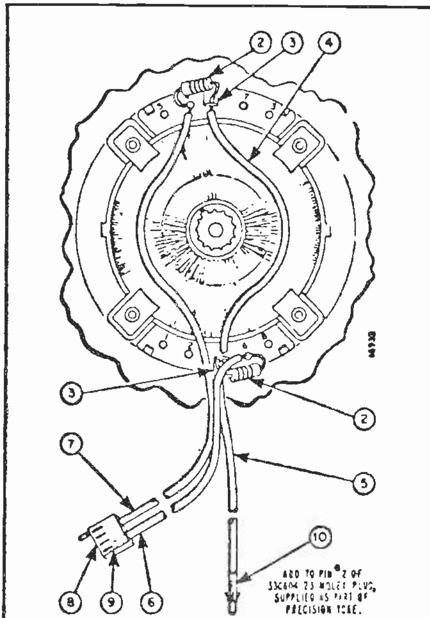
has numbers 1-8 for the tens digit of channel numbers 14-83, while the *units indicator* has numbers 0-9 for the *units digit* of the UHF channel numbers.

The UHF channel selector knob should never be forced past the ends of the band (14 and 83). It is possible not only to break off the posts on the units indicator, but also to break the tuner stops.

Color TV Chassis M10—Picture Tube/Deflection Yoke Replacement

The picture tube used in color TV receivers employing the M10 chassis have a precision yoke permanently bonded to the CRT. Replacement of the picture tube or deflection yoke requires changing the complete assembly. The replacement picture tube, as supplied by the manufacturer, comes complete with the deflection yoke and wiring harness, except for the parts shown in the accompanying illustration.

When you replace the CRT assembly, remove the parts shown in the illustration and reinstall them on the re-



YOKE WIRING DIAGRAM
(Viewed from rear of set)

placement CRT after it has been mounted in the cabinet.

The CRT you return for warranty adjustment must be complete with exactly the same items that come with the replacement CRT you install in its place.

NOTE: Use a Molex pin extractor to remove the pin (Item 10) from the 12-pin Molex connector.

Do not attempt to reposition or remove the deflection yoke from the CRT, because it is permanently bonded to it and serious damage can occur.

The replacement CRT is supplied completely readjusted (purity and convergence) by the tube manufacturer and does not require these adjustments when installed.

Color TV Chassis M10—Brightness and Contrast Control Adjustment

The type of brightness control circuitry employed in this chassis includes a black level clamp circuit. This circuit provides DC restoration, and the clamp level adjustment sets the peak limit of black video information. This, in turn, sets the minimum limit of picture tube beam current. It operates in conjunction with the brightness limiter circuit, which provides regulation of high-level picture tube beam current. The result is a stabilized brightness-to-contrast ratio during variations of scene intensity.

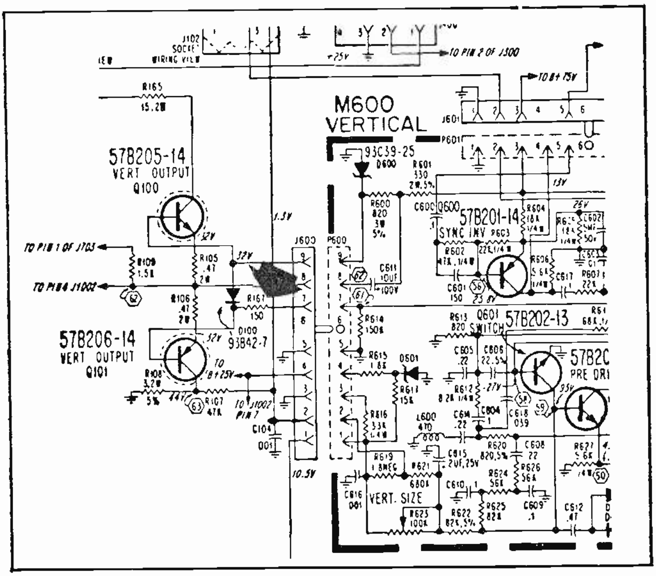
Correct operation of the clamp and brightness limit circuitry depends on proper adjustment of the black-and-white tracking controls.

Although the BRIGHTNESS control affects the overall picture tube brightness, it also sets the black clamp level. The CONTRAST control not only affects the amount of video drive, but also sets the brightness level of white information that is contained in the picture.

The complete procedure, including the clamp level brightness and contrast adjustments, is as follows:

1) Apply power to the TV set and allow it to warm up for 15 minutes.

2) Perform the black-and-white tracking procedure, if needed.



3) Switch *off* the COLOR MASTER control, if used.

4) Tune the TV receiver to a strong local station.

5) Rotate the COLOR control fully counterclockwise, to remove all color information from the TV screen.

6) Rotate the CONTRAST control fully counterclockwise to its *minimum* position.

7) Rotate the BRIGHTNESS control fully clockwise to its *maximum* position.

8) While observing the darkest areas in the picture, rotate the BRIGHTNESS control counterclockwise until the darkest areas just turn black. (Note: This adjusts the oper-

ating point of the black clamp level circuit.)

9) Rotate the CONTRAST control clockwise for the desired brightness-to-contrast ratio and the most desirable black-and-white picture.

10) This same procedure should be followed to adjust both the main and the PRESET BRIGHTNESS and CONTRAST controls.

11) Repeat for PRESET control adjustment with COLOR MASTER switch on, if used.

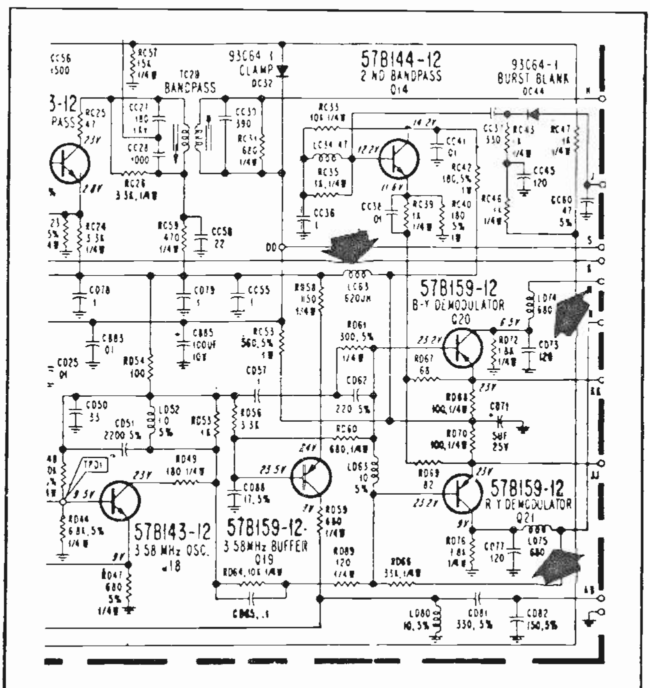
Color TV Chassis M24, M25, M30—Vertical-Output Transistors

Whenever you replace vertical-output transistors 57A-205-14 and 57A206-14 in an M24, M25 or M30 color TV chassis, a 150-ohm, 10%, ½ w resistor should be added between pin 7 of J600 and the base of transistor Q101, as shown in the accompanying partial schematic.

It is imperative that a silicon heat transfer compound be used when mounting these transistors.

Color TV Chassis K10—No Color

A problem of no color can possibly be caused by an open coil, LC63 (620 mh). If this coil is open, we will



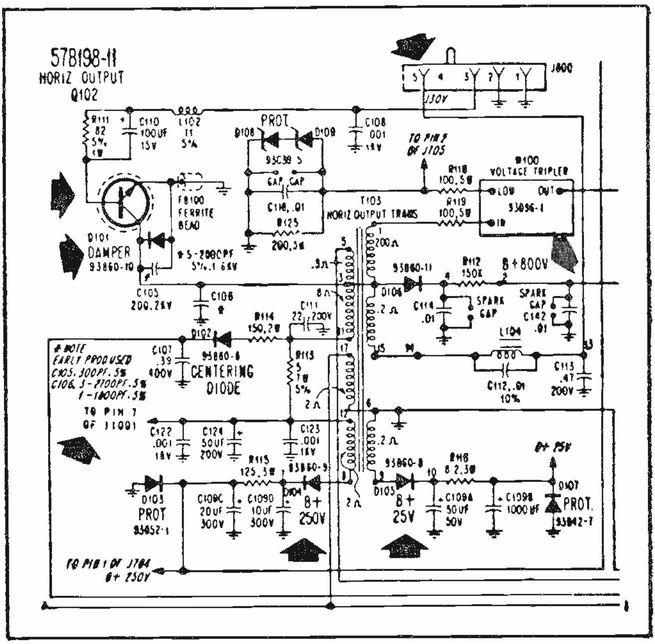
not have voltage at the collector of the 2nd Bandpass transistor, Q14. Replace the defective coil with Part No. 73A55-48.

If we lack some colors in the TV picture, it possibly can be caused by an open coil LD74 or LD75 (680 mh). With LD74 open, blue will be missing; with LD75 open, red will be missing. Replace the open coil with Part No. 73A55-17.

Horizontal Oscillator Module M800 (A8924-1)

The DC voltage at pin 5 of contact terminals J800 should be 20v. The M25 production horizontal oscillator modules did not use R809 (5.6K, 3w). This resistor is on the power supply module as R909.

In earlier schematics the arrow above C122 pointed to pin 6 of J1001; it should be pin 7.



The 25v, 250v and 800v supplies are derived from the horizontal pulse produced by the high voltage transformer. When the horizontal system is inoperative, the 25v supply will be missing and the 250v and 800v supplies will read approximately 130v.

Color TV Chassis M24/M25/M30—Convergence Extension Cable

Your Admiral distributor can supply a cable assembly to extend the leads from the chassis to the convergence assembly on the M24, M25, and M30 color TV chassis.

Note that this is an extension cable, not an adaptor cable. It will not adapt these chassis to a bench setup made for tube - type chassis.

The part number of this cable assembly is BP276; the suggested user price is $11.25.

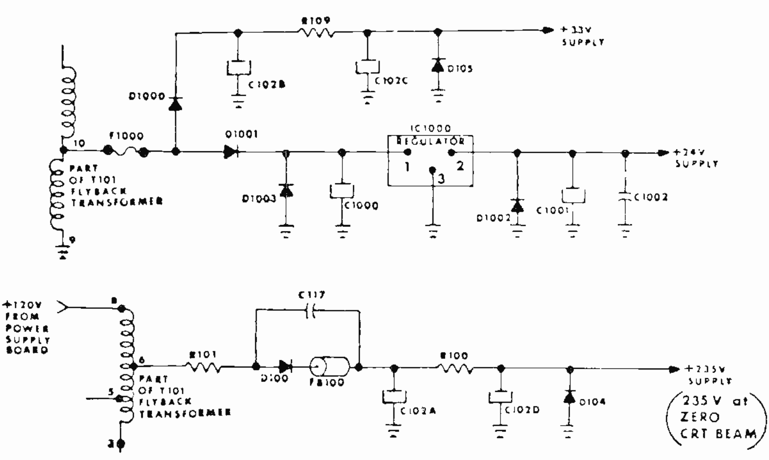
Color TV Chassis M10 — Scan Derived Power Supplies

This chassis employs three scan derived DC power supplies: 33 volt, 24 volt and 235 volt. The 33 volt and 24 volt supplies are protected by F1000, a 1.5 amp fuse.

Positive horizontal pulses from terminal 10 of the flyback transformer are coupled through F1000 to the anodes of D1000 and D1001. The pulse is rectified by D1000, filtered by C102B, C102C and R109, to become the B+ 33 volt supply. Diode D105 is used for protection which decouples any negative transient energy to ground. This provides protection to the solid state components connected to the 33 volt supply.

The same pulse is rectified by D1001 and filtered by C1000, producing a 35 volt supply which is dropped by IC1000 to become the B+ 24 volt supply. Diodes D1002 and D1003 act as protector diodes for transient protection in the same manner as D105. Further filtering of the B+ 24 volt line is provided by C1001 and C1002. Integrated circuit IC1000, the B+ 24 volt regulator circuit, maintains this supply at 24 volts during normal load variations.

The third scan derived supply is provided by the D100 circuit. A positive horizontal pulse from terminal six of the flyback is coupled to D100 by R101. This supply is unique in that the horizontal pulse is "stacked" on the B+ 120 volt supply from the power supply board and therefore, only requires a half - wave rectifier to achieve 235 volts of B+.



SCAN DERIVED POWER SUPPLIES

The pulse at the D100 anode is rectified by the diode where the derived voltage is added to the B+ 120v reference supply and becomes the B+ 235 volt source. Diode D104 provides transient protection in the same manner as D105, D1002 and D1003. Filtering is provided by C102A, C102D and R100.

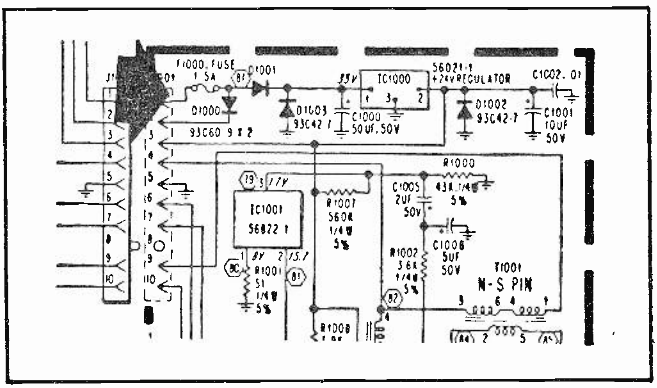
All of the scan derived B+ supplies are dependent on correct operation of the power supply board. This is the case because the pulse amplitude in the flyback transformer (from which all three derive) is a function of the B+ 120 volt regulated supply as well as proper horizontal circuit operation.

Color TV Chassis M10 — Service Hint

If the symptom is no vertical sweep (thin line across) and a raspy buzz coming from the high voltage section of the chassis, the probable cause a open F1000 fuse (1.5a, 84A4-7).

This fuse is located on the component side of the Pincushion board.

As noted in the circuit diagram, the B+ 33 volt and 24 volt supplies are fused by F1000. When the fuse is open, the



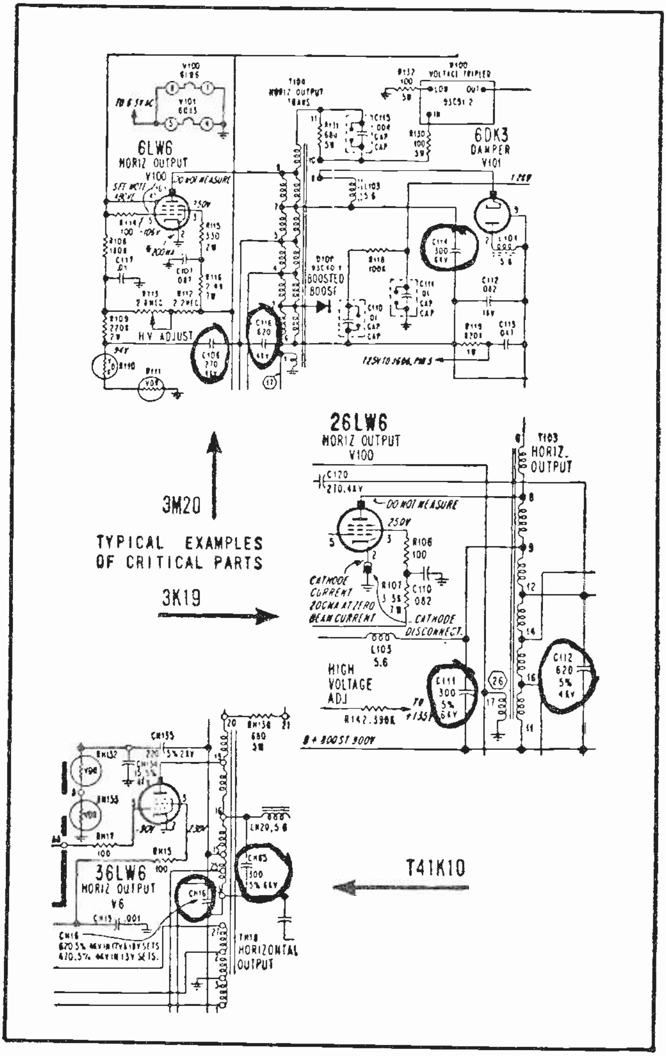
lack of source voltages will result in no vertical sweep and no sound, except for the buzz mentioned above.

You may find that replacement of the fuse restores operation and that there is no apparent problem in the Pincushion board. In some cases the manufacturer found that the blown fuse was caused by excessive current in the vertical output transistors. If you find this condition, check resistor R632 on the M600 Vertical Module; if it is 75 ohms, replace it with 61A172-560 (56 ohms, 5%, ¼ watt). In some early chassis, you may find that R632 is 39 ohms; 56 ohms is the ideal value. Also note that the R632 symbol may not appear on early M600 boards — look for D603. A diode originally planned for this location was replaced by R632, but the board printing change was delayed.

Color TV Chassis 3M20/3K19/T41K10 — Overheating Replacement HV Capacitor

If you find that after replacing a high voltage capacitor and it begins to overheat, the possible cause may be that it was not replaced with the exact replacement part.

The manufacturer received several complaints of overheating replacement capacitors in the high voltage section — usually a part mounted on the high voltage transformer.



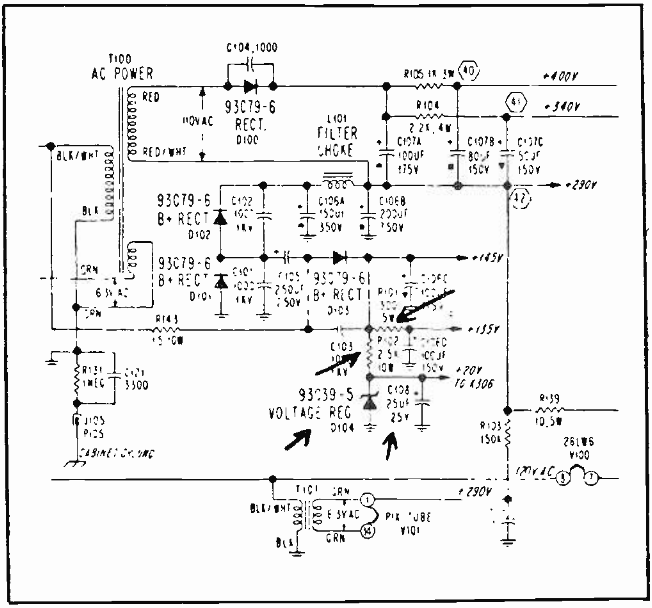
Investigation of these complaints has revealed that, in almost every case, the culprit was a general replacement capacitor which did not have the proper temperature coefficient specified for that function.

The manufacturer strongly urges the use of exact Admiral replacement parts. Refer to the service manual for the model being serviced to be sure that you get the correct replacement part.

Color TV Chassis K19—Raster, But No Sound Or Video

If you encounter a symptom of raster, but no sound or video, the possible cause could be a defective component in the low voltage B+ supply.

A defective component in the low voltage B+ supply such



as an open R101 (300 ohm, 5 watt resistor, Part No. 61A59-301-150) or open R102 (2.5 K, 10 watt resistor, Part No. 61A20-8) or shorted Zener diode D104, Part No. 93A39-5).

Check the +135 volt and +20 volt supply voltages. When a defective component is found, check all associated components and circuits to avoid repeated failure.

If you encounter a 60 Hz hum symptom with a hum bar floating up through the picture, the possible cause could be an open electrolytic capacitor C108 (25 mfd, 25 volt, Part No. 67A200-250-4).

With capacitor C108 open, the 60 Hz sinewave can be seen at the plate of the 11CH11 Video Amplifier tube with an oscilloscope.

Color TV Chassis M24/M25/M30/1M30—Service Hint

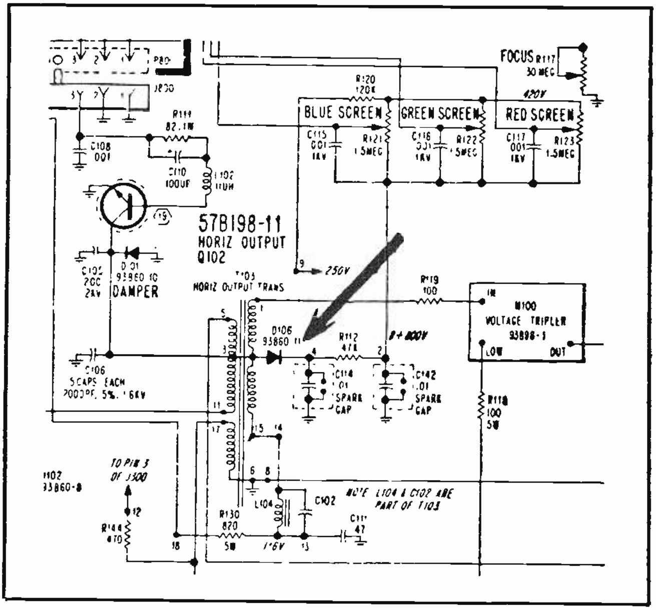
A symptom of low brightness, video smear and the screen controls may work backwards, can be caused by a defective diode in the horizontal output section of the chassis.

A defective D106 diode, located on the high voltage transformer, can cause the 800 volt supply to the high side of screen controls to read low.

Since these same symptoms, low brightness and video smear, could be caused by a defect in the RGB module, check for the failure of diode D106 by measuring the 800 volt supply. Diode D106 provides the 800 volts by rectifying the horizontal pulses.

If the diode is defective, you will measure some B+ on the high side of the screen controls, usually between 130 volts and 250 volts, depending on whether the diode is open or shorted. The screen controls will have no effect if the diode is completely open. If it is not completely open, the screen intensity will decrease as the control is increased—the reverse of normal operation.

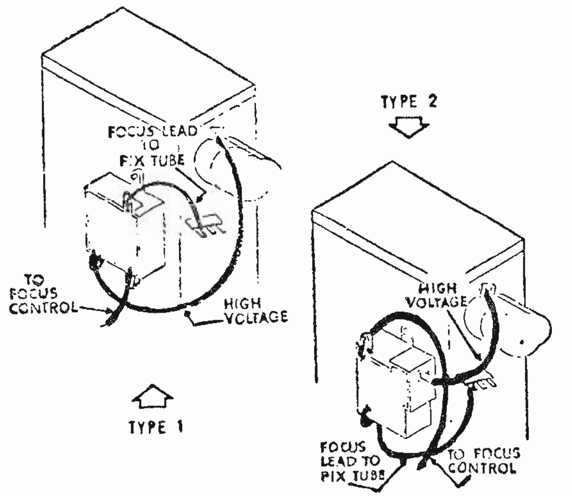
Replace the defective diode with the exact Admiral replacement Part No. 93A60-11.



The schematic shown is for the 1M30. If you are servicing the other solid state chassis mentioned, refer to the appropriate service manuals; the terminal numbers for the diode and the 800 volt test point are not the same.

Color TV Chassis K18—Replacement Focus Module 61A66-2

Two different types of 61A66-2 focus modules were used in the K18 chassis; they are electrically identical but differ in their lead arrangements. The type 2 which Admiral



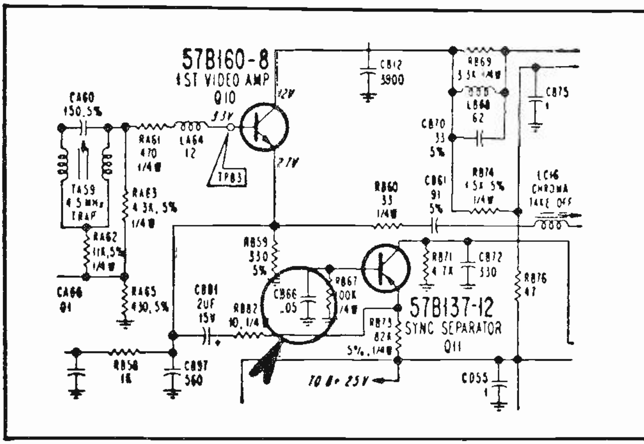
currently supply for replacement must be mounted with the high voltage lead at the upper right as shown in the drawing, to provide adequate lead length.

Color TV Chassis T15K10/16K10—Loss Of Vertical Or Horizontal Sync

A symptom of no vertical or horizontal sync, or horizontal weave in the picture can be caused by a defective CB66 capacitor (.05 mfd, 50 v).

In some cases, the sync problem may only appear when the set is first turned on; as the set warms up, the sync improves.

To correct the problem replace capacitor CB66, .05 mfd ceramic disc, with a .047 polyester film capacitor, part number 64A43-11 as used in later production models.

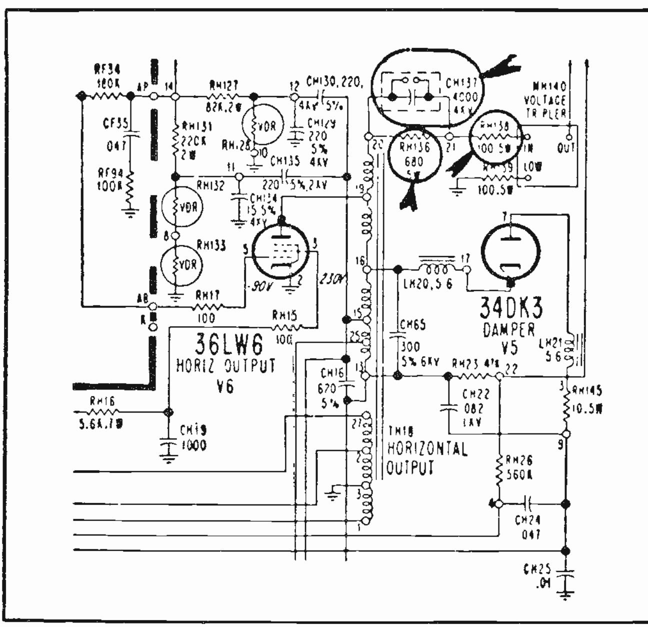


Color TV Chassis T40K10 Series—Horizontal Tearing And/Or Poor Sync

A symptom of horizontal tearing and/or poor horizontal sync can be caused by improper second anode lead dress.

The second anode lead can be dressed too near to the components on the high voltage transformer; namely, resistors RH136 and RH138, and capacitor CH137.

The set may lock in satisfactorily on a strong signal but



not on a weaker channel—the horizontal oscillator may be off frequency.

ADMIRAL

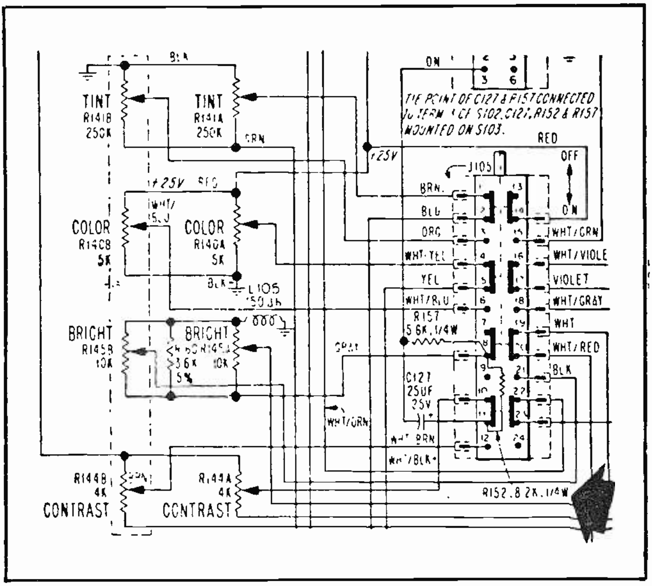
To correct the problem redress the second lead away from the mentioned components.

Color TV Chassis M24, M25, M30—Service Hint

A symptom of insufficient brightness and the *brightness limiter* control has very little effect, can be caused by resistor R152 (8.2 K ¼ w) having increased in value.

This resistor is located on the *Color Master* switch.

Since there are many other things that can cause brightness problems, a few preliminary checks should be made



before pulling the control cluster to measure resistor R152.

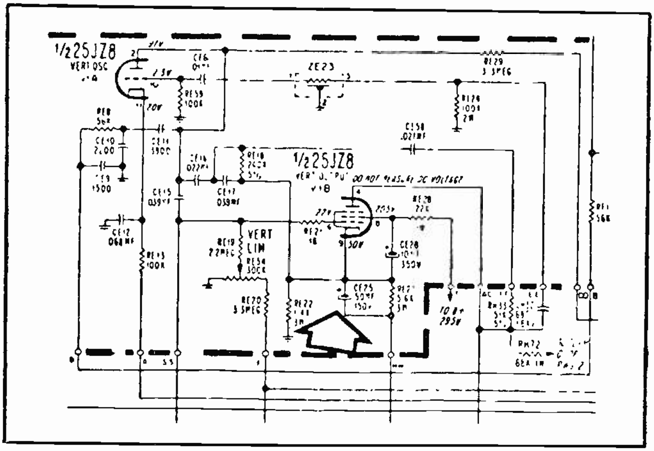
For example, substitute the RGB/Chroma module; also, check the 800 volt B+ supply for the CRT screen elements.

An 8.2 K, ½ watt resistor for the replacement of R152 is available under Admiral Part No. 60A102-822.

Color TV Chassis K10—Insufficient Vertical Sweep

A symptom of insufficient vertical sweep in the K10 color chassis can possibly be caused by an open CE25 capacitor (50 mfd, 150 volts). This capacitor is in the cathode circuit of the vertical output tube. Replace it with Part No. 67A27-8.

Some K10 chassis use the 25LU8 tube instead of the 25JZ8 as shown in the schematic diagram, however, the CE25 capacitor is used in the circuit regardless of the type of tube used.



Color TV Chassis M10—Service Hint

Loss of color sync, snowy picture, hum in sound and dark band across the picture, can be caused by a defect on the M1000 Pincushion module.

The defective component would be associated with the 24 volt scan-derived B plus supply. The symptoms may be intermittent and/or appear only after the set warms up.

Color TV Chassis M10—Service Hint

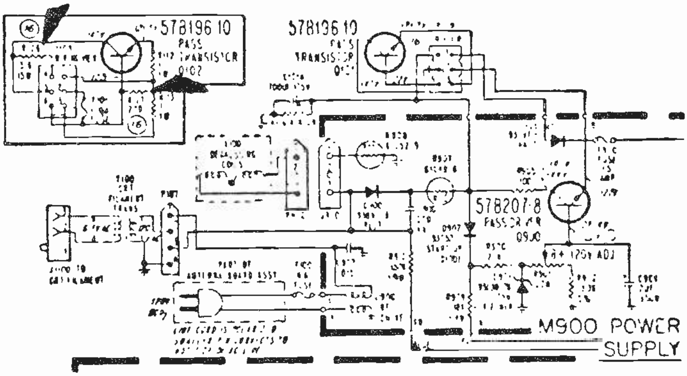
A symptom of high voltage shutdown circuit triggering, which causes pulsating audio and flashing (on-off) of the raster at a once per second rate, can possibly be caused by increased 120 volt B+ line voltage. The increase can be possibly caused by a defective pass transistor Q101 and/or Q102. The above problem can be comfirmed by measuring the regulated 120 volt B+ supply line at fuse F900. This voltage is adjustable by the B+ 120 volt *Adjust* control, R901, on the power supply board. You should be able to vary it slightly above and below 120 volts. Leaky or shorted pass transistors can cause this voltage to increase to 140 or 150 volts. If you have too much voltage on the 120 volt line, the problem is in the power supply. Increased B+ will result in the horizontal system trying to produce excessive high voltage and the high voltage shutdown circuit will activate.

If the set continues to operate with high B+ voltage, F900 (120 volt B+ fuse) and F101 (1/16 amp fuse) in the pass transistor circuit may open. This may be the result of the horizontal output transistor Q103 failing. If transistor Q103 shorts, it will cause F900 to open immediately when the TV set turned on. This transistor can be temporarily removed if suspected of being defective.

ADMIRAL

The 120 volt B+ supply can be operated with F900 removed for checking or repairing that supply (with no load, the voltage will increase by 2 to 3 volts.)

Be sure to discharge the power supply through a resistor to ground before installing the fuse (use a 10 K, 1 watt



resistor). Grounding direct to the chassis will blow the 1/16 amp fuse, F101. Discharge both sides of the fuse holder because the capacitors in circuits beyond the fuse may be charged.

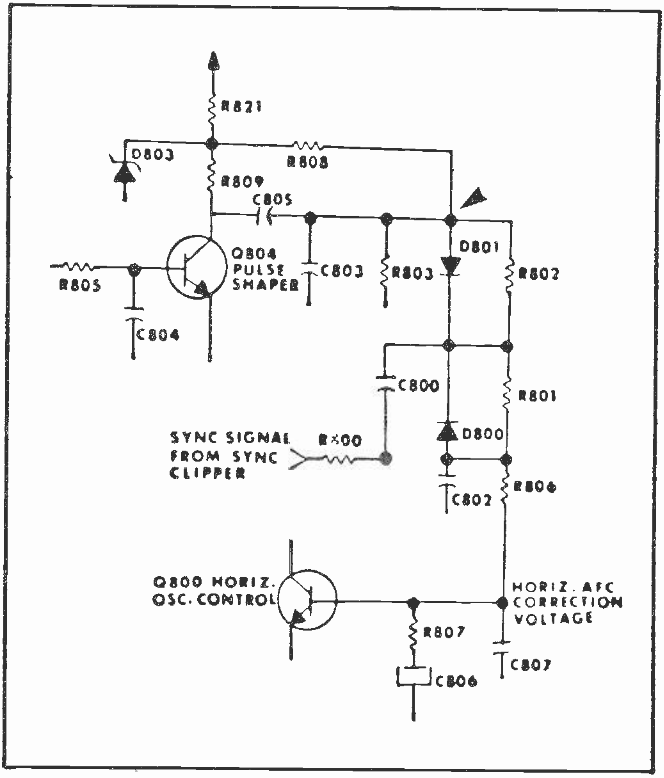
Be sure to adjust the B+ 120 volt supply adjustment to exactly 120 volts when the repairs have been completed.

Note: Resistors R126 (5.6 ohm, 15 watt) and R127 (220 ohm, ½ watt) added in RUN 16.

Color TV Chassis M10—Revised Horizontal Hold Adjustment

This new procedure differs from the original adjustment found in the M10 service manual, S1349, primarily in the "point" that is to be temporarily grounded during the adjustment. This procedure will insure a better setting of the Horizontal Hold Control.

1) Check the horizontal hold *pull-in* and *locking* by switching from station to station. If at first the picture has several slanted bars and takes several seconds to *lock in*, it requires adjustment. 2) The *Horizontal Hold* adjustment is available at the back of the cabinet. A limited range of horizontal frequency is available without removing the cabinet back. If this is inadequate, proceed to step 3. 3) Remove the cabinet back. Attach a short clip-on jumper from the junction of R803 and D801 as shown in illustration (in the middle of the chassis, behind the *green bias* control) to chassis ground, the T800 horizontal shield can. 4) This connection should aggravate the out of sync condition; the slanted lines should change angle or increase in number.



5) Bend the tabs of the horizontal oscillator coil top shield and pull the adjustment rod out slightly to permit full rotation. 6) Slowly turn the adjustment rod to produce a picture that is as close to stationary as possible. 7) Remove the temporary jumper installed in step 3. 8) Push the horizontal oscillator adjustment rod back in to its original position and bend the tabs down to hold it in place.

Servicing Modular Color TV Chassis

The MOD I kit (98A150-1) contains all of the modules required to service the M20 chassis. It can also be used to service the 3M20 chassis if you add to it the A8912-2 Signal Processor and A8916-2 Chroma modules.

The MOD II kit (98A150-2) contains all of the modules required to service the M25 chassis. It can also be used to service the M24 chassis by adding the following modules:

A8919-2 or −4	IF Module
A8926-2	Power Supply Module
A8927-2	Convergence Module
A8931-1	4.5 MHz Amplifier Module

To service the M30 chassis, add the following modules to the MOD II kit:

A8919-2 or −4	IF Module
A8926-3	Power Supply Module
A8927-3	Convergence Module
A8929-1	Pulse Processor Module
A8931-1	4.5 MHz Amplifier Module

To service the 1M30 chassis, add the following modules to the MOD II kit:

A8919-4	IF Module
A8926-3	Power Supply Module
A8927-3	Convergence Module
A8931-1	4.5 MHz Amplifier Module
A8932-1	Vertical Module
A8933-1	Horizontal Module
A8934-1	Chroma Module

To cover all of the above chassis you would need one each of the following items:

98A150-1	MOD I Kit (M20, 3M20)
98A150-2	MOD II Kit (M24, 25, 30; 1M30)
A8912-2	Signal Processor Module (3M20)
A8916-2	Chroma Module (3M20)
A8919-4	IF Module (M24, 25, 30; 1M30)
A8926-2	Power Supply Module (M24)
A8926-3	Power Supply Module (M30, 1M30)
A8927-2	Convergence Module (M24)
A8927-3	Convergence Module (M30, 1M30)
A8929-1	Pulse Processor Module (M30)
A8931-1	4.5 MHz Amplifier Module (M24, 25, 30; 1M30)
A8932-1	Vertical Module (1M30)
A8933-1	Horizontal Module (1M30)
A8934-1	Chroma Module (1M30)

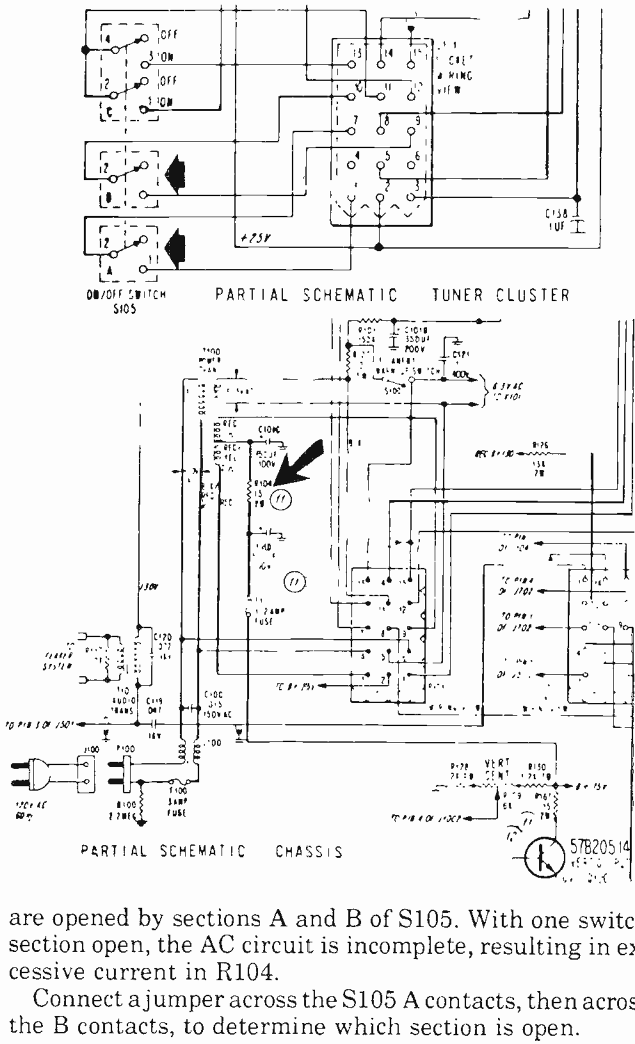
All of the above items are available through your Admiral distributor.

Color TV Chassis M10, M20, M24, M25, M30 1M30—Service Hint

When servicing any of the above chassis for a 'No sound' condition, keep in mind that the Volume control does not have an AC audio signal applied to it. The control varies a DC voltage within IC500 which, in turn, controls the AC signal level.

Color TV Chassis M25-Service Hint

A problem causing R104 (15 ohm, 2 watt) resistor to overheat, and found in the 75 volt power supply can be caused by an open contact in the on/off switch, S105. With the Instant Play feature found in the M25 chassis, the B+ circuit is opened when the on/off switch is in the off position. Both the start and finish of the secondary winding of T100

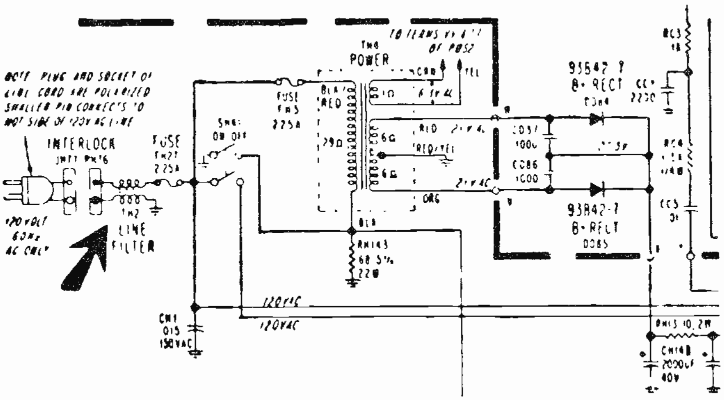


are opened by sections A and B of S105. With one switch section open, the AC circuit is incomplete, resulting in excessive current in R104.

Connect a jumper across the S105 A contacts, then across the B contacts, to determine which section is open.

Color TV Chassis K10—Hum In The Sound

A symptom of hum in the sound which is objectionable at low volume or with volume off. can be possibly caused by the TH2 line filter being placed too close to the audio transformer. Redress TH2 away from the audio transformer. Listen while carefully moving the filter choke to the position which gives the least hum. Keep in mind that TH2 is at line potential.



Color TV Chassis K20, M20, M25—84A28-10 Fuse Replacement

The 84A28-10 (3.0 Ampere) fuse used in the K20, M20 and M25 chassis is no longer available. However, Admiral has obtained engineering approval to substitute the 84A28-11 (3.1 Ampere) fuse for this application. The -11 is mechanically identical to the -10 except for the case color (tan) and will plug directly into the (red) socket on the chassis.

Admiral will automatically substitute the -11 on all orders for the 84A28-10 fuse.

Color TV Chassis M24, M25, M30—Service Hint

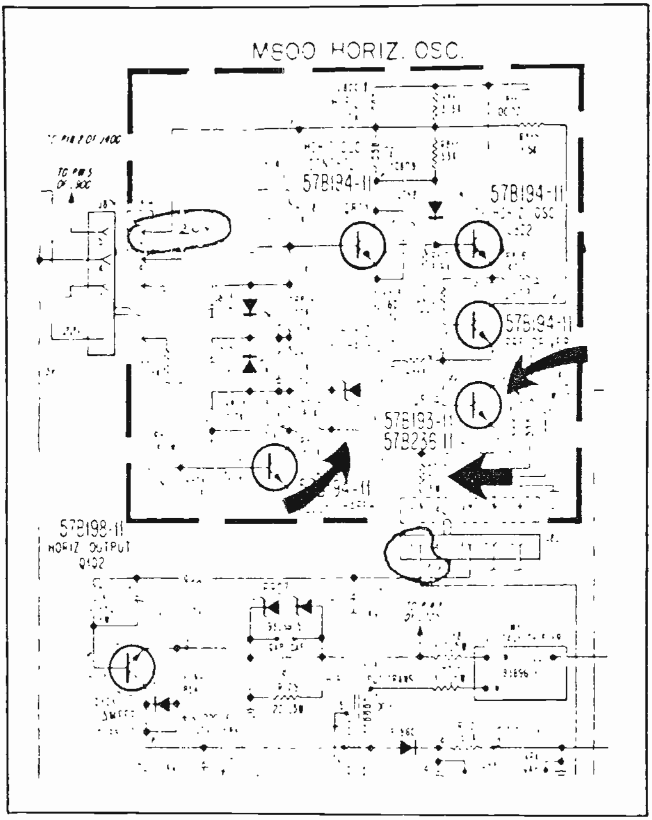
A symtom of no high voltage, or horizontal frequency problems related to the M800 horizontal oscillator module can be caused by a defective component in the M800 board (A8924-1).

The components most often found defective are: Capacitor C810 (10 mfd, 25 volts)—replace with 10 mfd at 50 volts, Part No. 67A200-100-7.

Resistor R819 (820 ohms, 3 watt)—replace with 820 ohms at 5 watts, Part No. 61A105-821.

Horizontal Driver Transistor Q804,—replace with Part No. 57A193-11.

To speed servicing, check for presence of 20 volts of B+ at pin 5 of P801 and for 130 volts at pin 5 of P800. Both voltages must be applied to the horizontal module to produce horizontal drive.

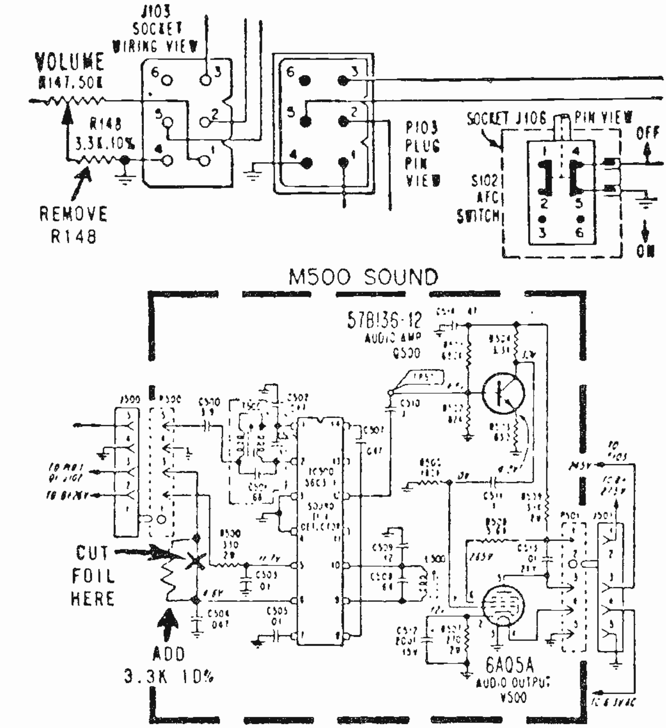


The 20 volt B+ source is the power supply module. The regulated 130 volts B+ is also taken from the power supply module. This supply is fused and connected to pin 5 or P800 through an interlock on the windings of the output transformer.

Color TV Chassis 3M20—Failure Of Sound IC

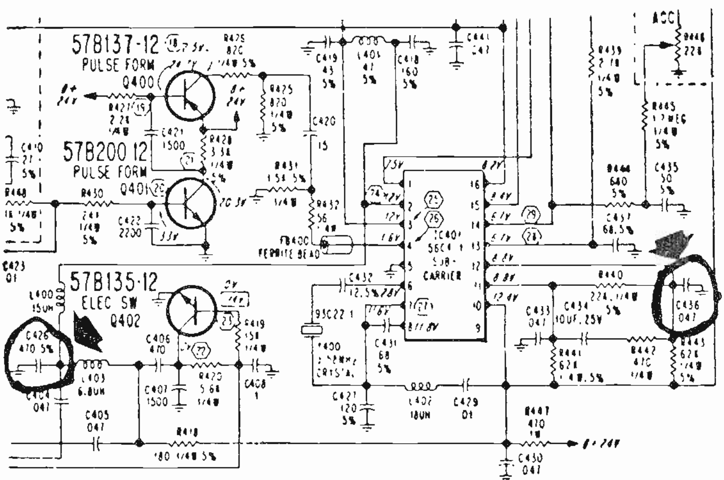
Failure of the Sound IC (56A3-1) during an electrical storm can be prevented from occurring again by making the following corrections.

Remove resistor R148 from the tuner cluster and ground the wiper of the *volume control* R147. Cut the foil between Pin 3 of P500 and terminal 6 of the IC on the A8911-1 sound board (M500). Add a 3.3K resistor across the gap you have created. Capacitor C504 is to be placed on the terminal 6 side of the added resistor. Keep the resistor leads short. Make good mechanical and electrical solder connections.



Color TV Chassis M10—No Or Poor Color Sync

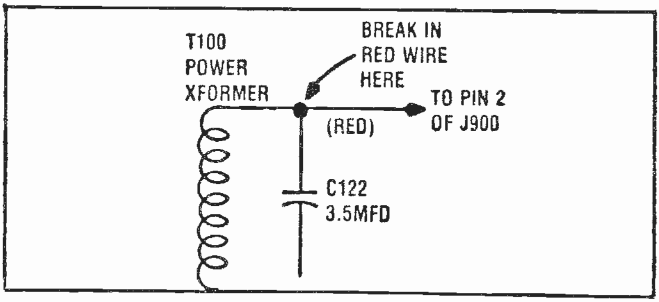
A symptom of no or poor color sync can be caused by a defective capacitor C426 or C436. Also, try substituting IC400 and/or IC401.



When servicing this chassis for color or color sync problems, check the 24-volt regulated supply. This supply is a scan-derived B+ voltage developed by D1001 and regulated by IC1000 (found on the Pincushion module). If this voltage is low, substitute the Pincushion module. Other likely causes of reduced voltage would be a leaky capacitor or other component on the 24-volt regulated line.

CHASSIS: Admiral 1M30B

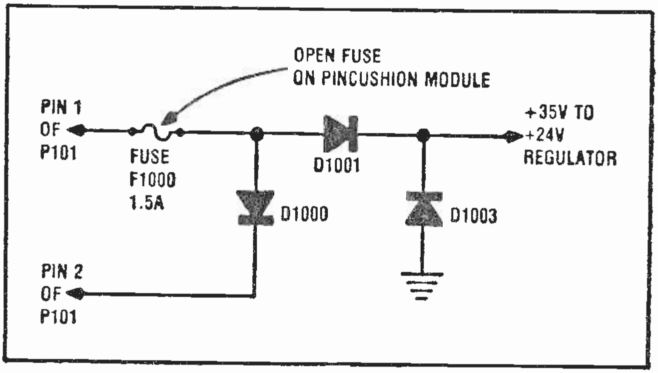
TROUBLE SYMPTOM: Raster pulls in from both sides as brightness is increased.



CAUSE: Break in small red wire in power transformer circuit at the point where capacitor C122 connects to it. This red wire, which is dressed in a bundle of other wires, connects C122 to pin 2 of J900. A break in this wire causes the regulated 130V B+ supply to decrease below 130V as the brightness level is increased.

CHASSIS: Admiral M10

TROUBLE SYMPTOM: Vertical sweep and sound missing (only a thin horizontal line displayed on screen) and a "raspy" buzz eminating from the high-voltage section of the chassis.

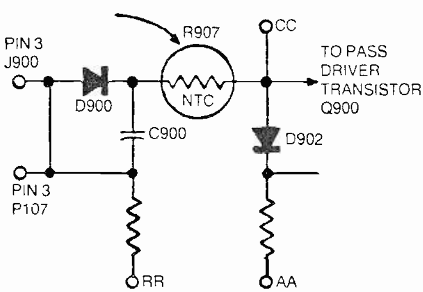


ADMIRAL

CAUSE: Open fuse F1000 (1.5A) on A8954-3 pincushion module. Opening of this fuse eliminates the 33- and 24-volt supplies, disabling the vertical sweep and sound sections. In some cases there is no apparent cause for the opening of fuse F1000 (Admiral part No. 84-A4-7), and replacing it restores both vertical sweep and sound. In other documented cases involving earlier runs of the M10 Chassis, the opening of fuse F1000 has been found to be caused by excessive current in the vertical output transistors, which is cured by replacing 75-ohm resistor R632, on the M600 vertical module, with a 56-ohm, 5%, ½-W type (Admiral part No. 61A172-560). (In some early runs of this chassis series, R632 is 39 ohms, but still should be replaced with the 56-ohm type. Also, the callout "R632" is not printed on some early versions of the M600 module because the resistor replaced a diode (D603) which originally had been planned for this location on the module; consequently, if you cannot find a resistor designated "R632," look for one with a callout "D603" and replace it with a 56-ohm type.

CHASSIS: Admiral M10 Series

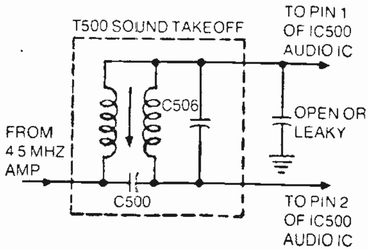
TROUBLE SYMPTOM: No raster or sound.



CAUSE: Open negative-temperature-coefficient (NTC) resistor R907 on the M900 power supply board. Two versions of this resistor were used in production runs of this chassis series; both were assigned an Admiral part number (61C49-6), but the color of one version is aqua (bluish) and that of the other is black. The aqua-colored version has a higher-than-normal failure rate. Admiral has requested that when any M10 series chassis is serviced, the color of resistor R907 be checked. If an aqua version is found, it should be replaced with a new black version of this resistor, Admiral part 61C49-7.

CHASSIS: Admiral M10 Series

TROUBLE SYMPTOM: Hissing or buzz-type noise in sound which is not changed by varying the volume controll setting.

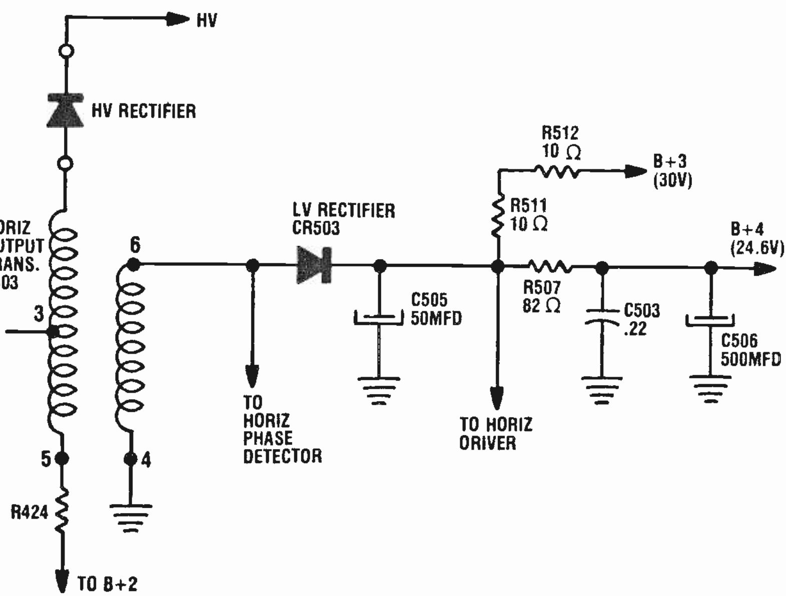


CAUSE: Open or leaky capacitor C507, which is connected to pin 1 of audio stage, IC500.

CHASSIS: Admiral K8

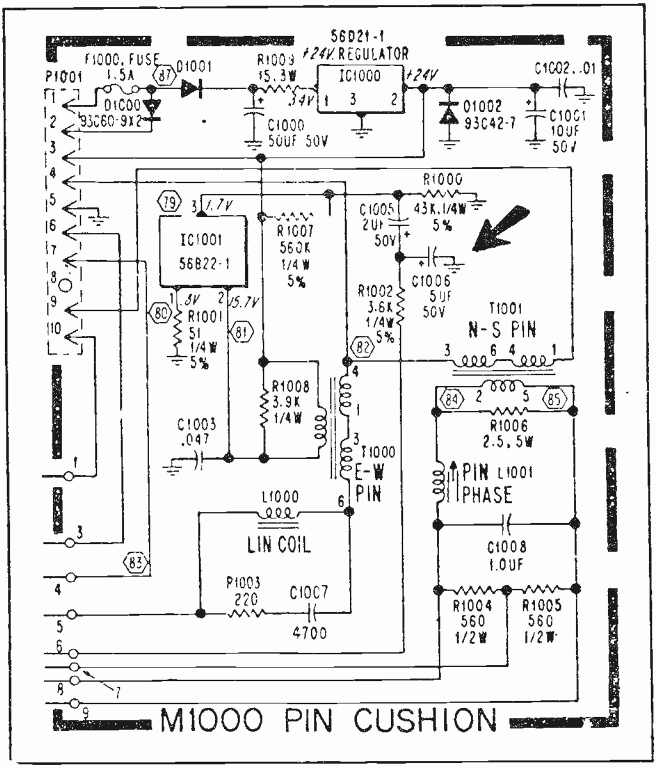
TROUBLE SYMPTOM: Raster, video and sound missing

CAUSE: Failure of the B+3/B+4 scan-derived power supply, which, driven off the horizontal-output transformer, provides B+ to the sound, vertical and video circuits of the K8 chassis. In addition to failure of low-voltage rectifier CR503 or capacitor C505, other probable causes of loss of raster, video and sound are failures in the horizontal sweep circuit, such as the horizontal oscillator, horizontal driver or horizontal-output transistors, which not only would eliminate the high voltage but also would remove B+ from the sound circuit. ■



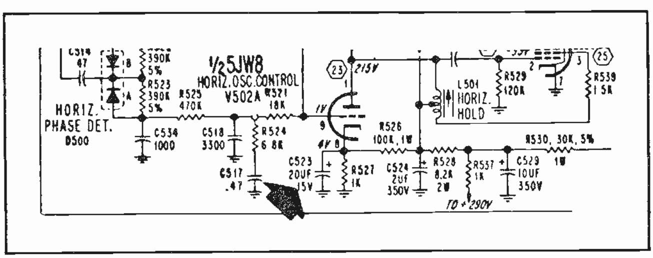
Color TV Chassis M10—No side pincushion correction & raster pulled in at sides

The possible cause of this symptom is a defective electrolytic capacitor (C1006, 5mfd, 50V), that is mounted on the pincushion board. Replace with Admiral part number 67A200-479-7 (4.7mfd, 50V).



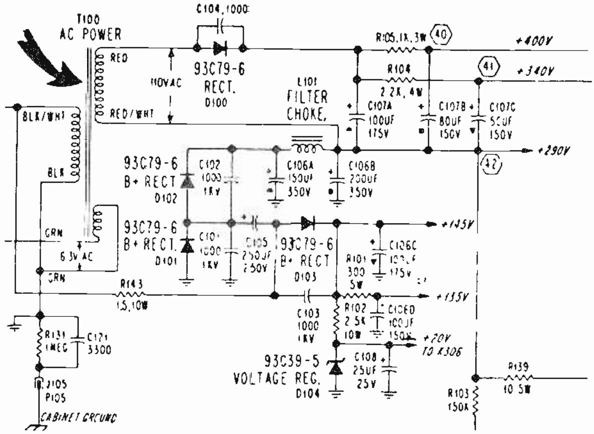
Color TV Chassis 3K19—Horizontal frequency drift

The possible cause of this drift is a defective electrolytic capacitor, C523 (20mfd, 15V). Replace with Admiral part no. 67A4-71.



Color TV Chassis 3K19—Weak video, vertical retrace lines & very little or no control of brightness.

The possible cause of this condition is an open secondary winding on the T100 power transformer (110VAC winding for 400V B+ supply.)

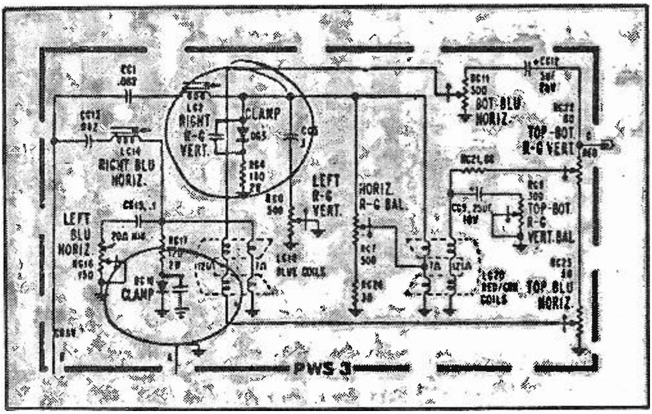


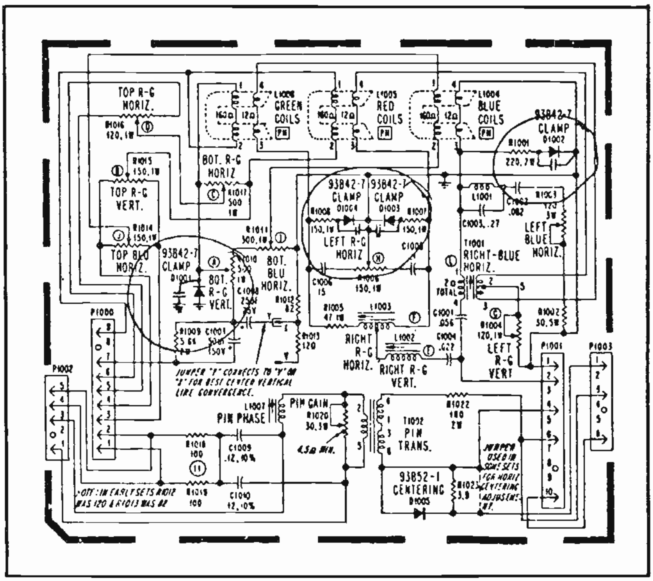
In this condition, the 400V B+ supply will be low, and you'll find the following supply voltages: 400V will measure 310V (low); 340V will measure 300V (low); and 290V will measure correct at 290V. The reduced B+ voltage to the plate (pin 2) of the 11CH11 video amplifier tube upsets the picture tube cathode bias. And the open winding may also cause failure of the C107 electrolytic capacitor. To correct, replace the power transformer with Admiral part number 80A116-3.

Color TV Chassis K10 & K19—One or two thin, dark, vertical interference bars from left to center of picture

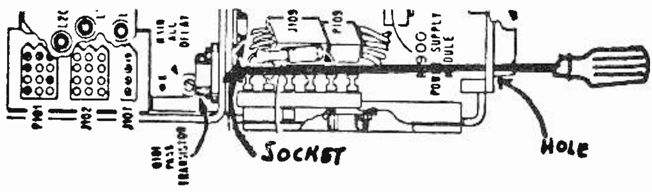
These bars, which are more prevalent on the low VHF channels, may only be noticeable on weak signals or when using a built-in antenna. The position of the bars changes when the horizontal dynamic controls on the convergence board are adjusted. This is not the same as 'snivets' which are caused by the horizontal output tube during UHF operation. The problem can be corrected by adding a 680pf 500V capacitor across each of the clamp diodes on the convergence assembly, as shown in drawings below. The top diagram is for the K10 chassis, and the bottom diagram for the K19 chassis. Keep the leads short.

ADMIRAL





Color TV Chassis M10—Service Hint for Replacing Transistor Q101
When replacing the forward pass transistor Q101 the transistor socket may slip out of its retainer while inserting the new transistor. Improper installation could be the result with failure, then, of Q101, blown fuses, etc. To avoid this problem, insert a blunt rod or tool through the lower of the two holes in the bottom left rear of the chassis shown below, and to the left of the power supply panel. Pressure can then be applied to hold the socket in its retainer while removing and inserting the new transistor.



Color TV Chassis 3M10/4M10—For all symptoms listed see diagram below

Symptom—Slow start up of horizontal oscillator.

Check value of R814. It should be 430 ohms, 5% ¼W.

Symptom—Poor horizontal sync, HV shutdown and/or "squeak" noise when turning receiver on or off.

Check lytic capacitor, C811, 10mfd, 25V. It could be leaky.

Symptom—No raster, no sound, and no collector voltage (19VDC) on Q801.

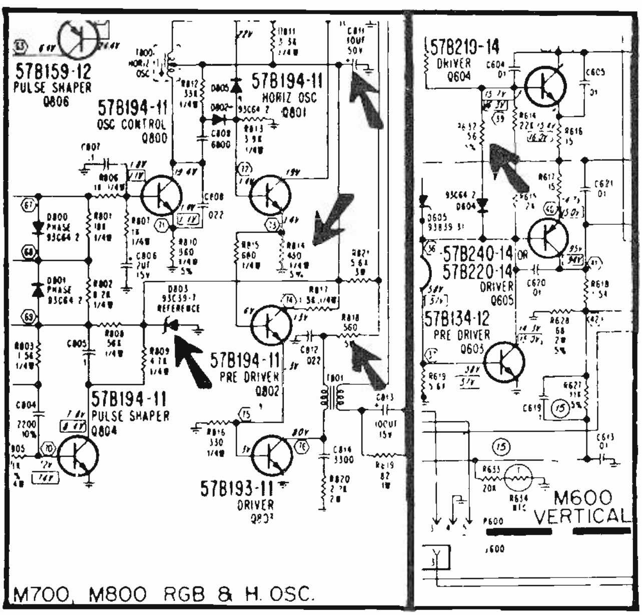
It is possible that the Zener reference diode, D803, is shorted.

Symptom—No raster, no sound.

Possibly, the Horizontal Driver, Q803, is shorted, which could also take out R818, 560 ohm, 3W.

Symptom—The horizontal scan line in the center of the picture is missing.

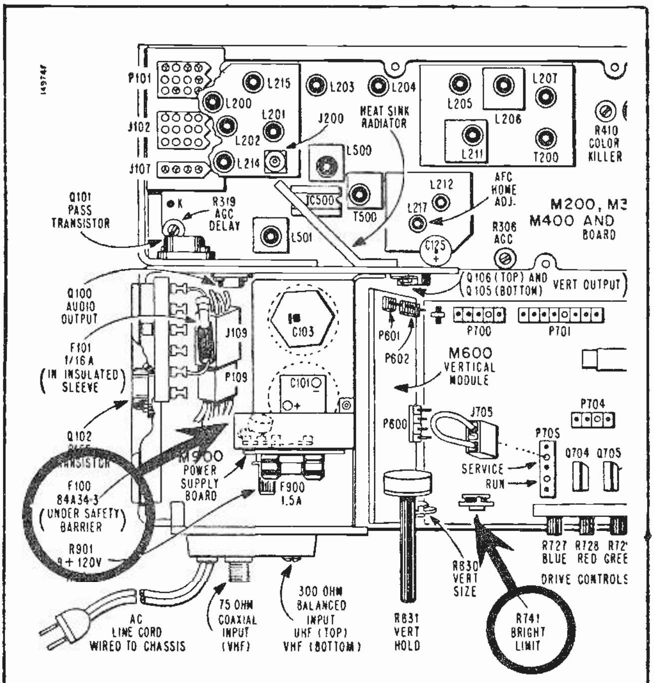
Check the value of R632. It should be 56 ohms, 5%, ¼W.



ADMIRAL

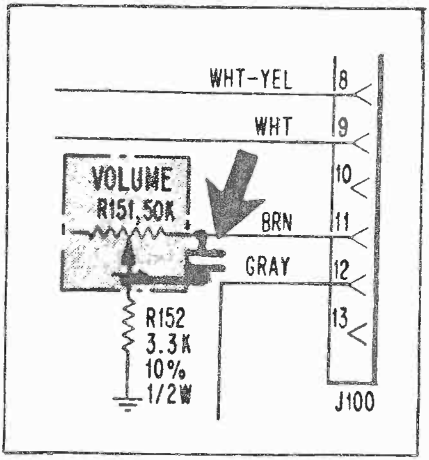
Color TV Chassis 4M10—After set has been on a while, fuse F100 opens for no apparent reason.

To solve problem, monitor input current with a current meter. After about 20 minutes of operation, set the Brightness & Contrast control to maxiumum and adjust the Brightness Limiter (R741) for a reading of from 1.6 to 1.8 amps. The reduction in current will reduce the brightness. Care must be taken not to reduce the brightness to the point where viewing is objectionable. Current should never be set above 2 amps. If correct setting cannot be obtained, replace Q711 (Brightness Limiter Transistor, 57A192-12) and readjust R741. Also be sure to use correct fuse replacement (84A34-3).

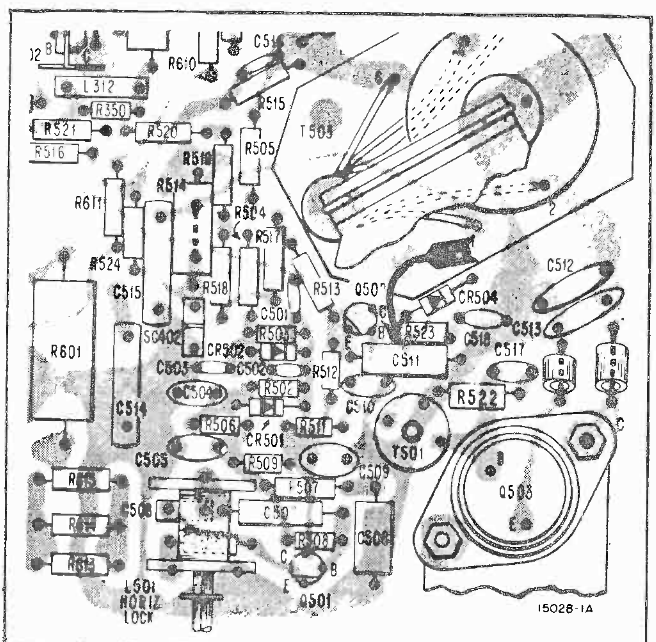


Color TV Chassis 9M50—Raspy audio when volume control is adjusted

A possible cure for this trouble is the addition of 4.7uf, 50 volt lytic (67A200-479-7) from the center tap on the volume control to the high side of the volume control. See drawing



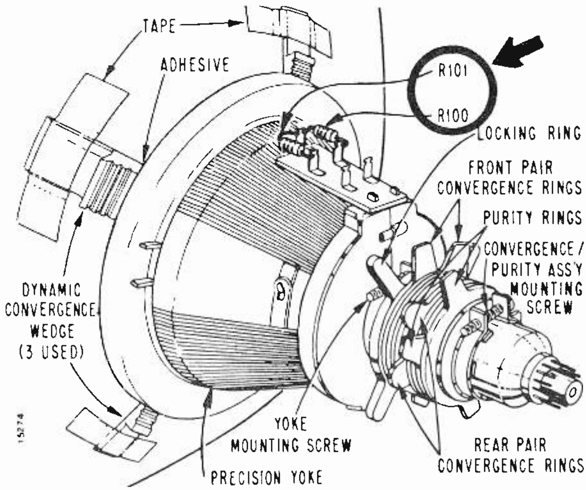
B/W TV Chassis TL6—Horizontal foldover in center of the picture The possible cause of this trouble is a leaky capacitor, C511 (5mfd, 25V), as shown in drawing. Replace capacitor. See drawing below.



ADMIRAL

Color TV Chassis M45—Picture tube and/or deflection yoke replacement

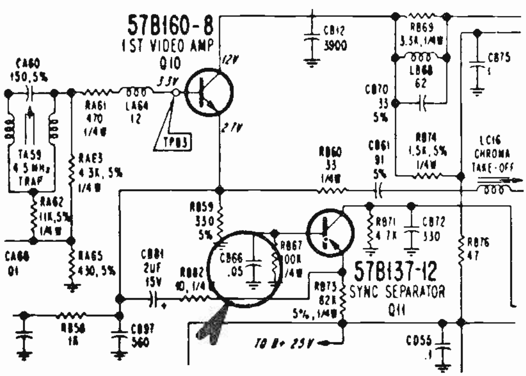
When replacing picture tube and deflection yoke, be sure to remove R100 and R101 from the terminal strip on the old yoke and solder them in place on the new yoke. These resistors DO NOT come as part of the new yoke assembly.



Color TV Chassis T15K10/16K10— Loss of Vertical or Horizontal Sync

The symptom of no vertical or horizontal sync, or horizontal weave in the picture can be caused by a defective CB66 capacitor (.05 mfd, 50 v). In some cases, the sync problem may only appear when the set is first turned on. Then, as the set warms up, the sync improves.

To correct the problem, replace capacitor CB66, .05 mfd ceramic disc, with a .047 polyester film capacitor, part number 64A43-11 as used in later production models.



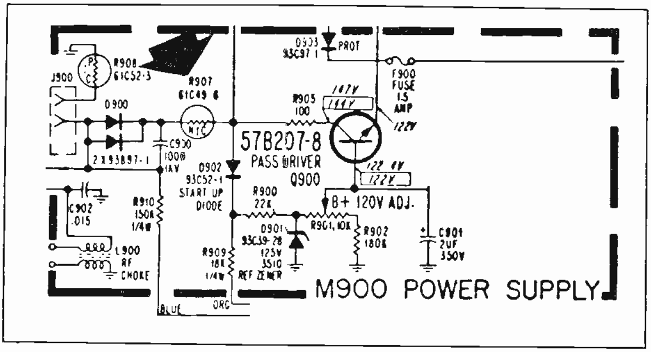
ADMIRAL

Color TV Chassis 4M10C — Snivets at right side of picture, ozone smell present

A possible cure of this problem is to redress the focus lead away from terminal #1 on the flyback transformer.

Color TV Chassis M10—NTC Resistor Failure

According to field reports, the R907 NTC resistor on the power supply board may fail prematurely. This pertains only to the aqua (blue) color resistors. Replace only with the black colored 61C49-6 resistor. It is located on the M900 Power Supply board. (see diagram)



Color TV Chassis M10—Troubleshooting techniques for horizontal sweep circuit.

There are three symptom categories for horizontal output troubles:

1) A B+ supply fuse blows and/or the HV shutdown circuit goes into operation.

2) B+ supply to horizontal is OK but there is no sweep action.

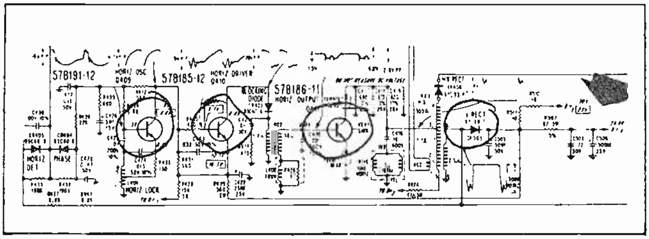
3) There is horizontal sweep action but it's abnormal.

In case of *blown fuses*, check for trouble in the horizontal sweep by removing the horizontal output transistor. If the fuse no longer blows, check for shorts or low resistance in the H/O transistor itself; also check from collector connection of H/O transistor to ground. If no low resistance is present, the problem is most likely to be a defective HV tripler. Disconnect the input of the tripler to confirm. If the H/O transistor was found shorted, check for open damper diode or defective tripler.

If the fuse continues to blow after removal of the H/O transistor, check for trouble in the horizontal oscillator-driver area. If the M10 HV shutdown circuit goes into operation (with H/O transistor in circuit) check the B+120V supply. If OK, suspect the shutdown circuit itself.

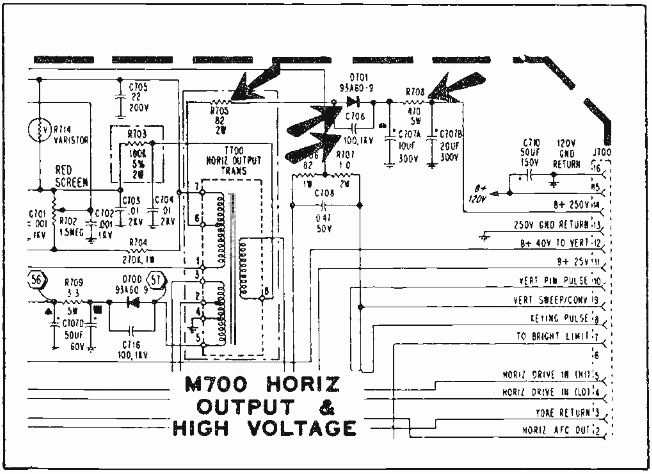
ADMIRAL

If there is *no sweep action,* but B+ supply is OK, check for square wave drive at the base of the H/O transistor with the transistor removed. If the drive is present, check for B+ at the collector lead of the transistor and for proper grounding of the emitter circuit.

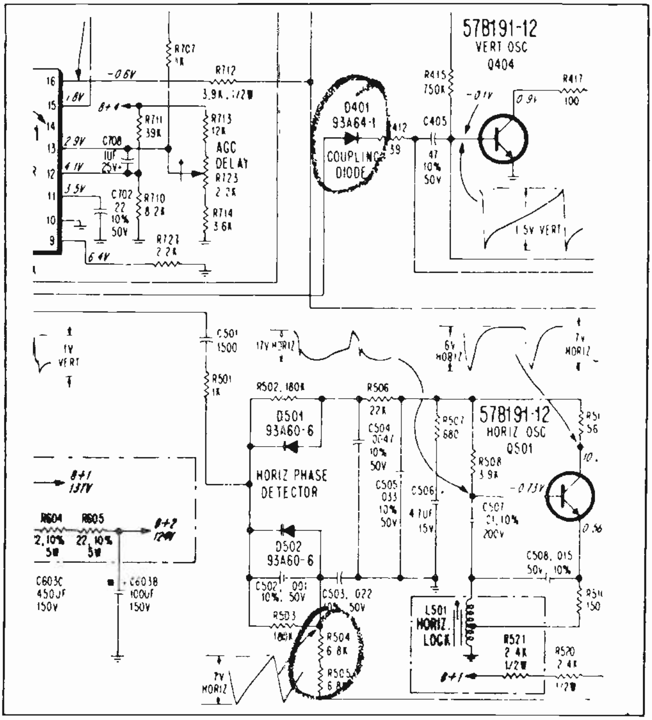


If there is *horizontal sweep action* but it is abnormal, check the flyback pulse at the collector of the H/O transistor for proper frequency and amplitude using a triggered scope with 10:1 or 100:1 probe. The flyback pulse must be about 12 microseconds wide at the base and more than 800V peak to peak. If the pulse width is incorrect, the trouble involves capacity or inductance in the sweep output circuitry. If only the amplitude is low, the circuit is oscillating but has insufficient B+ applied, or the trouble involves resistive loading on the horizontal output—most commonly one of the circuits that is fed from the horizontal output transformer.

Color Chassis 9M50—Loss of picture, no control of brightness, retrace lines, and loss of 250v Scan B+. Probable causes are: (a) open R705 (820Ω, 2 watt), (b) open R708 (740 Ω, 5 watt), (c) Shorted or leaky C706, 100 pfd 1kv, (d) shorted D701.



Chassis N3—Loss of horizontal and vertical sync.



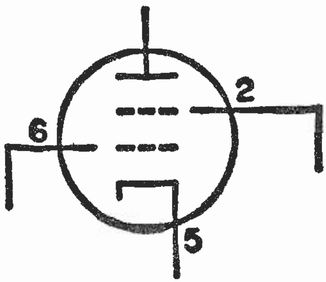
Replacement of IC701 does not correct problem. Voltages on IC701 are substantially different than schematic indicates. A probable cause is a defective D401, (sync coupling diode), and open R504 or R505, (horizontal pulse coupling resistors).

Canadian General Electric

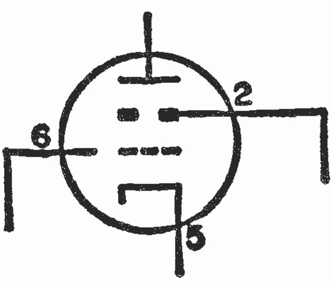
Canadian M678 Color Chassis 6EF4 Regulator Tube Explanation

The 6EF4 regulator tube has been shown in the M678 schematic with this base diagram. A technician would assume that this is a tetrode, but this is incorrect.

Tube element 2 is not a grid, but rather a high voltage shield. The shield



BASE DIAGRAM AS SHOWN IN SCHEMATIC



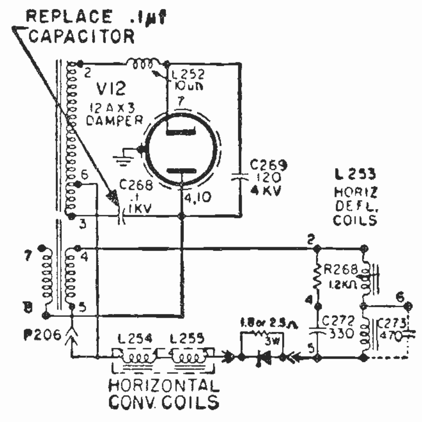
CORRECT BASE DIAGRAM

is used to minimize the effects of a momentary arc within the tube. The correct base diagram is shown here.

When the brightness control is set for minimum, it is normal for the plate of this tube to exhibit a dull red color at maximum dissipation. In addition, the 6EF4 may exhibit a bluish glow on the upper half of the bulb wall inner surface. This glow is the result of fluorescence and it should not be mistaken for gas.

Color TV Chassis M663—Vertical Green and Purple Stripes

Failure of C268 (.1µf 1kv - open) causes the appearance of a vertical green line approximately ¼in. wide



displaced from the left edge of the screen by roughly 1½in. Approximately in the center of the screen a faint purple line will also be seen.

This effect is more readily noticeable on a blank channel with the color control fully clockwise. This fault will also cause poor color rendition because of an improperly shaped flyback pulse appearing at the grid of the burst gate tube.

Color TV Chassis M678/M679 — Poor Color

Colorfax November 1967 covered checking the color demodulator and pointed out that the demodulation angle should be checked to insure that skin tones would be correct.

The importance of this has been minimized by some technicians and there are a number of complaints from dealers, customers and technicians regarding color quality.

1. If the demodulation is less than 90deg or more than 110deg, not only skin tones are affected but the entire color reproduction of the televised scene will be drastically changed from the original.

2. If the angle is less than 90deg, the tint control will be very critical in adjusting for skin tones and they will change from one camera to another.

If the angle is too wide (over 110deg), the skin tone range will be fairly broad but probably appear brownish.

A more important factor, however, is that color reproduction of light blues, pinks and greens, etc., will be very poor. Therefore, if a customer or dealer complains of poor color, the first logical step is to determine if the demodulation is correct.

3. When examining a 10-bar color pattern on the screen for a demodulation check, do not try to evaluate it with all three guns at the CRT switched on. To do so will invite confusion and inaccurate results. The reason for this is that the eye is too easily misled in determining the correct color of each bar. If the receiver's color control is set too high, overload of the receiver color circuit will occur causing misleading results.

For the technician who uses a three color bar type of generator, the following method may be employed:

1. Connect gun killer to CRT.
2. Switch off the blue and green gun.
3. Adjust tint control so that the middle bar blends into the red background.
4. Turn all guns on and adjust the B-Y coil until the third bar starts going very slightly bluish (cyan).
5. If more than slight adjustment (1/8 turn) was required, go back to step 2, and repeat if necessary.

Before aligning any color set be sure the set has operated one hour to minimize drift. It is strongly recommended that if the set is new, the customer should be advised running the set at least one day before set up, to compensate for any aging process.

Chassis Color Demodulator M678 Check

The demodulator axis is no longer in quadrature (90deg) but rather 110deg. The reason for this change is to compensate for poor flesh colors which may occur when the transmitting studio switches from one camera to another — when one camera shows good skin tone, the other, when switched, may go greenish. It has been found that several M678 chassis have not been accurately set to 110deg.

It is very important that each color receiver be checked, when installed, for good color demodulation.

To check, and if necessary, adjust the demodulation, this procedure should be followed:

1. Connect a standard 10-bar generator to the antenna terminals of the set. Adjust fine tuning for sharpest color bar display.

2. Connect gun killers to CRT grid leads. Switch off the blue and green grids. This will leave a red bar pattern on the screen.

3. Adjust the tint control to place the 3rd bar at maximum brightness and the 2nd and 4th bars for equal brightness. This may be set accurately by lowering the brightness or contrast

controls to the point where both the 2nd and 4th bars extinguish at the same time, leaving the 3rd bar visible.

4. After completing the aformentioned procedure, the tint control must not be readjusted during the following adjustments or checks

5. Note the physical location of the 3rd red bar. Switch off the red gun and switch on the blue gun. Adjust brightness and contrast if necessary for a viewable pattern. The 6th and 7th bars should be at almost equal brightness; the 7th bar not quite as bright as the 6th. If these conditions are met, the demodulation axis is 110deg or close enough.

6. If the 5th and 7th bars are equally bright and the 6th bar is brightest, the demodulation angle is 90deg. This should be corrected by adjusting T704's core by turning the core away from the board approximately 1/6 of a turn — to make the 6th and 7th bars of almost equal brightness. After any adjustment of T704, check the 3rd red bar to be sure that the reference point has not changed.

7. If the blue 4th and 6th bars are at equal brightness and the 5th is the brightest, the demodulation is less than 90deg. Then the 3.58MHz alignment must be followed as per the M678 chassis notes.

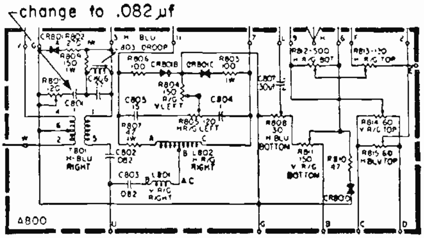
Note: It is important to use a weak or radiated signal when making color demodulator checks.

Servicing Information

Failure of R801, the blue-left convergence pot, is probably caused by over-loading which may occur in rare cases, because of tolerance build-up in other circuit components.

To correct this problem, when replacing R801, change the value of C801 from 0.1μf to 0.082μf $\pm$20% 200v. This corrects tolerance build-up and will reduce current through R801.

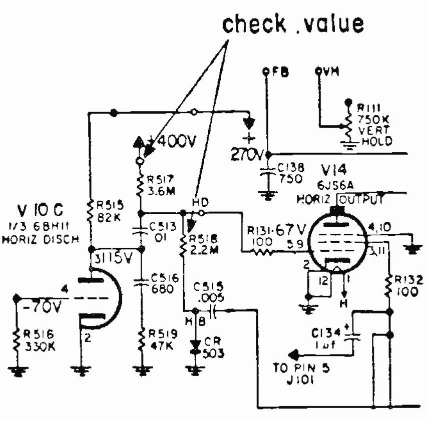
If you have an insufficient width problem, measure the horizontal out-



put tube, V14, grid voltage. This is normally about -67v $\pm$ 20%. If it reads higher than normal, sometimes as high as -100v, output will be substantially reduced.

To correct this problem, disconnect R517, a 3.6M and measure its value. If incorrect, sometimes as high as 6.0M, it must be replaced. While the resistor is disconnected, also check the value of R518 which should be 2.2M. Replace with correct value resistor.

When stiffness or drag is noted in fine tuning of R8531 or tuning gear



breakage is encountered, lubricate item No. 22 and 23 in the exploded view (M678 service manual, page 27).

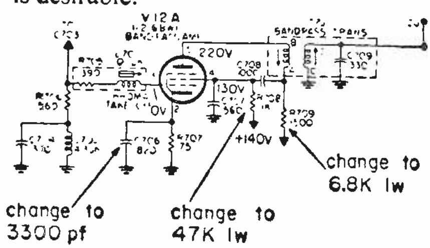
Apply to item (23), a small dot of

"Molycote" available through Housewares Renewal Parts, Cat. #XT104 (or equivalent containing Molybdenum Disulfide) which prevents seizing and galling. (Do not use tuner lube or oil, since excessive slipping will result.)

If the clutch is properly lubricated normal operation will be restored without stiffness or drag. Do not spread the spring clutch (item 22) or complete loss of fine tuning will result.

Increasing Chroma Gain on Canadian G-E M678/M679 Color Chassis

There may be instances, in some locations, where additional chroma gain is desirable.



The following modification has been developed which provides considerable additional chroma gain.

1. Change bandpass V12A cathode bypass capacitor, C706, 820pf to a 3300pf (ET22X127).

2. Change bandpass V12A screen resistor, R708 1K to 47K, 1w.

3. Change bandpass V12A plate resistor, R709 1.5K to 6.8K, 1w.

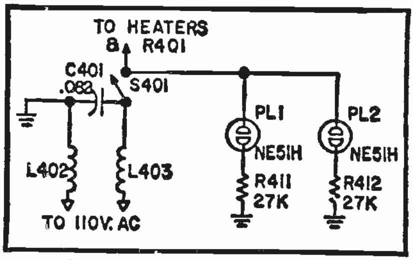
4. Connect dc supply to R708 from 140v to 270vdc. This can be accomplished by connecting the supply end of R708 to the supply end of R724 (junction of R724 and R709) on top of the board.

5. Make certain the CRT leads to pins 3, 7 and 12 are dressed vertically from the board. Excess length should be dressed forward underneath the yoke.

This is not intended as an instruction to rework sets, but is to be used as a cure if this complaint is encountered.

Replacing Incandescent Bulb With Neon Bulb in Canadian G-E Chassis

The "Portacolor" chassis has been slightly modified to use a standard



neon bulb, NE51H, in place of the currently used incandescent bulb, G-E #756. The circuit changes are only in the pilot light circuit of chassis code "V."

Bench Repair Hints for 21-, 23-, and 25-in. Canadian G-E Receivers

When a chassis is brought in for repairs, it is not necessary to have the convergence assembly plugged in to obtain a vertically linear picture.

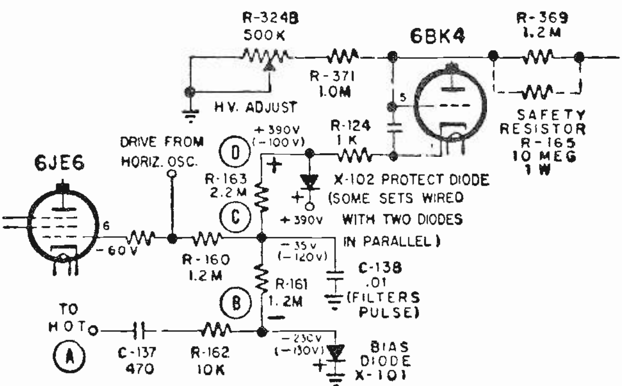
You can easily make up dummy loads for the vertical output transformer. Take an 8-pin plug (for 21-in. models) or a 9-pin plug (for 23- and 25-in. models) and connect a 120Ω resistor across pins 1 and 2. When inserted into the convergence socket, the vertical output transformer will be loaded and a linear display, with no foldover, will appear on the test CRT.

Dumont

Color TV Chassis 120957/958—HV Fail-Safe Circuit

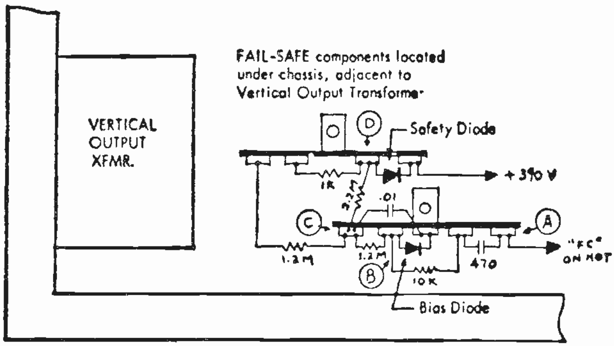
More and more significance is being attached to the possible emission of soft X-radiation from color TV receivers. Service notes contain warnings to servicemen with recommendations for safer bench procedures. High voltage settings are being given for various measured line voltages to reduce the possibility of a dangerous rise of high voltage should the setting be made under low line voltage conditions.

To provide even more protection, the models using chassis 120957 and 120958, Triangle Code "A" and up, are wired with a "Fail-Safe" circuit in the high voltage system. The purpose of this circuit is twofold: (1) to prevent the high voltage from rising above safe limits in the event of failure of the shunt regulator tube, and (2) to limit the maximum high voltage obtained by adjustment of the high voltage adjust control.

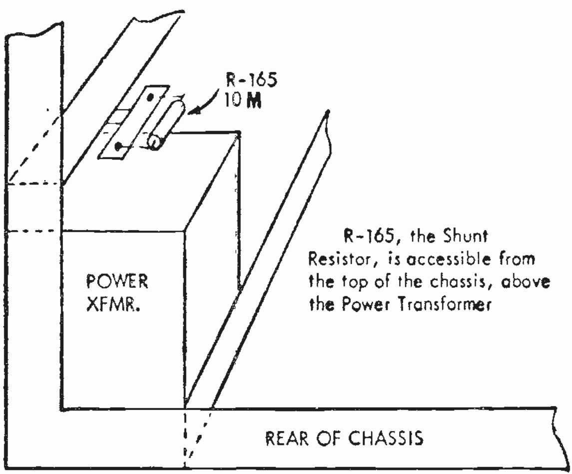


In the event of failure of the shunt regulator tube, this circuit develops a negative voltage which is applied to the grid of the horizontal output tube. This increased bias cuts down the output of the tube, which in turn reduces the high voltage.

Referring to the schematic, point "A" is connected to "FC" of the horizontal output transformer and couples a positive going pulse to the anode of Bias Diode X-101, which develops a negative voltage at point "B." When the shunt regulator is operating normally, safety Diode X-102 is a low impedance device in the cathode circuit so that the voltage at point "D" is virtually the same as the supply voltage, 390 volts. Should the shunt regulator fail, X-102 appears as a high impedance, isolating point "D" from the B+ supply.



In normal operation, the resultant voltage at point "C" is determined by the relative values of positive voltage at "D" and the negative voltage at "B." This voltage is applied to the grid of the horizontal output tube through R-160 in addition to the normal grid-leak bias already present. The circuit is designed to maintain normal bias when the shunt voltage at "B" then increases the bias applied to the horizontal output tube.



DUMONT

The action of the fail-safe circuit results in visual indications similar to those normally associated with a very weak horizontal output tube. The picture is very dim, focus is poor and width is insufficient. The picture may be too dim to see the sides of the raster and the high voltage reads about 12kv.

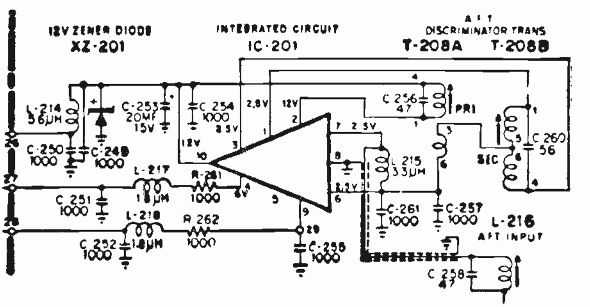
Limiting the range of the high voltage adjust control is effected by shunting R-369 with a 10M resistor. The high voltage adjust control and R-369 are part of a voltage divider network which determines the bias on the grid of the shunt regulator tube. As the shunt regulator is biased toward cutoff, the high voltage increases. Reducing the effective value of R-369 reduces the maximum high voltage obtainable by adjustment of the HV adjust control. Should this maximum value be less than 24kv or more than 1kv less than the specified setting, the shunt resistor is simply clipped out of the circuit. This will be done at the factory if necessary and should require attention in the field only when circuit values have changed due to aging or when tubes or components have been replaced.

Emerson

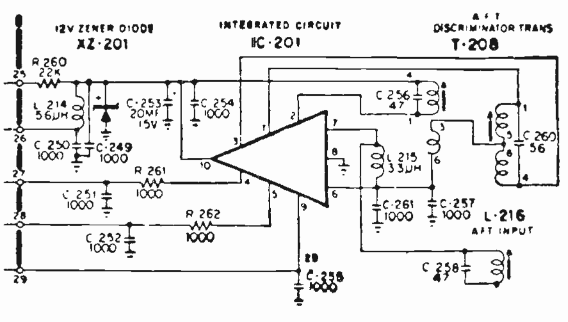
Color TV—Replacement of AFT Integrated Circuit

The AFT integrated circuit, Part No. 815215, has been redesigned and will no longer have a Pin 9 terminal. In the sets which use parallel filaments, the new version of IC 815215 is directly interchangeable with the old one.

In the chassis with series filaments, it will be necessary to check the printed board circuitry connected to the IC; and if the printed board wiring to Pin 5 is open, it will be necessary to connect a jumper between Pins 5 and 9 of the IC (see circuit diagram "A").



CIRCUIT DIAGRAM "A"



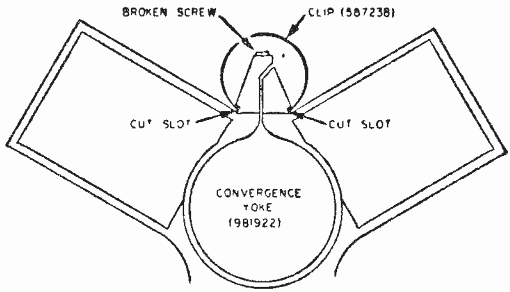
CIRCUIT DIAGRAM "B"

EMERSON

The new version of the IC 815215 can be used without modification if Pin 5 of the IC is connected to the AFT circuitry (see circuit diagram "B").

Color-TV Models 35P03,35P04—Repairing Convergence Yoke

Many Part No. 981922 convergence yokes have been replaced because of a broken plastic screw on the yoke

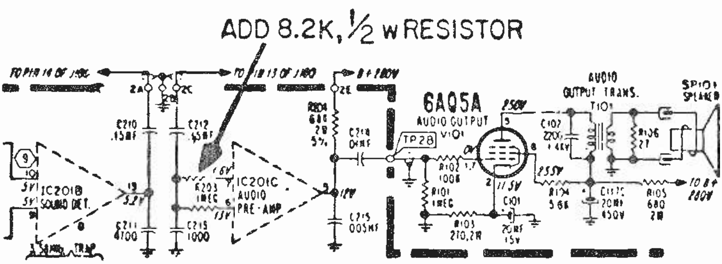


clamp. A spring clip, Part No. 587238, is now available so that these yokes may be repaired as shown in the illustration.

Color-TV Chassis K20—Failure of Sound IC

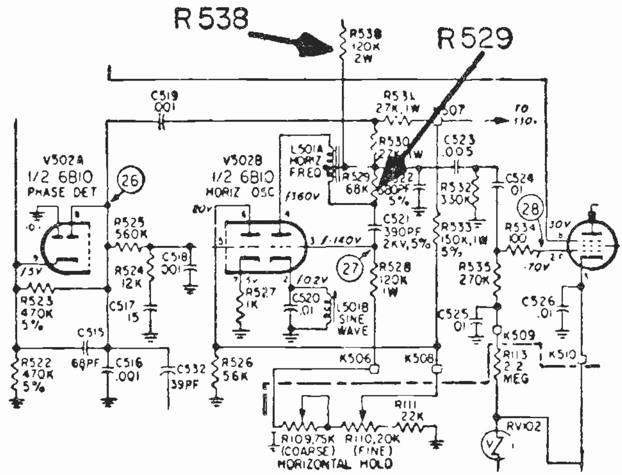
If failure of the sound IC in the K20 chassis is encountered, check the wiring of capacitor C134, .022μf. This capacitor should be connected to the shield braid of the leads going to the VOLUME control. If C134 is found to be grounded to the control bracket, it should be disconnected from the bracket and connected to the shield braid ground.

The production change now being incorporated in the K20 chassis protects the sound IC by connecting an 8.2K, ½w resistor between Pin 7 of the IC and the junction of capacitors C212 and C213 and resistor R203, as shown in the partial schematic. If the 8.2K resistor is installed in the field, it is necessary to cut the foil pattern and to keep the leads short.



Color-TV Chassis K17/K18 Run 16 and Under—"Snaking" in the Picture

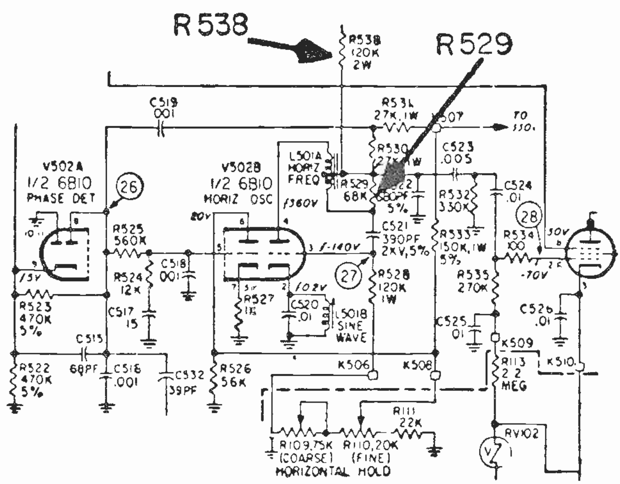
To reduce "snaking" in the picture (video bend) with changes in contrast level, redress the orange lead, which



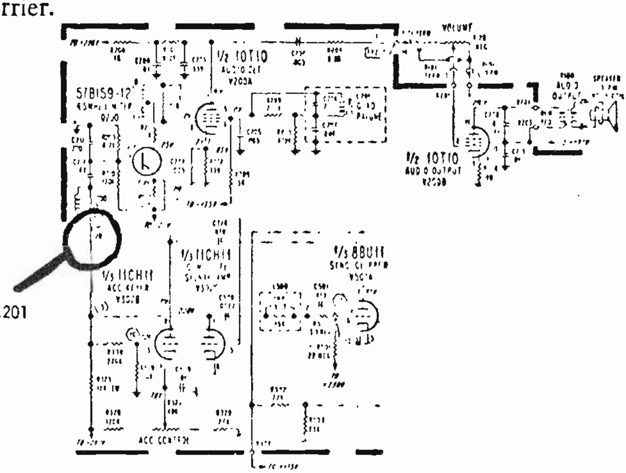
is connected between resistor R538 (120K, 3w) and resistor R529 (68K, ½w), away from the delay line.

Color-TV Chassis K17/K18 Run 17 and Higher—Sound Circuit Modification

A 4.5MHz transistorized limiter stage, transistor Q200, has been added to the sound IF circuitry as shown in the schematic. The limiter stage increases sound performance



and eliminates the possibility of buzz when the TV set is operating in deep fringe areas, or from a cable system which is transmitting a relatively low amplitude of sound barrier.

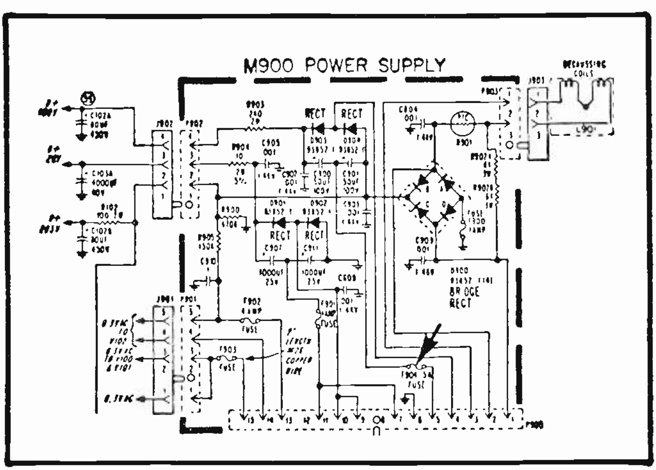


C201

If snaking appears in the picture (video bend) with changes in contrast level, dress the orange lead (lead between resistors R538 and R529) away from the delay line. Also change capacitor C201 from 120pf to 47pf.

Color-TV Chassis M20—Excessive Brightness, Washed Out Video and No BRIGHTNESS Control

There have been reports of an unusual condition in the M20 chassis which can result from failure of a fuse in the low-voltage power supply module. You would not expect an open fuse to cause this condition, but it does.



The problem can be caused by open fuse F904 which has a ½a pigtail, Part No. 84A7-16 on the power-supply module. The F904 fuse is in the secondary of the power transformer, supplying ac to the 400v B+ circuit. Because of the power supply design, 285v still remains on the 400v B+ line when the fuse opens. The reduction of B+ voltage to the cathodes of the picture tube will result in excessive brightness and no control of brightness.

Check the circuits supplied by the 400v B+ and associated components. When repairs have been made, replace the open fuse.

Color-TV Chassis M-20—Sound Okay, No Picture, Set Smokes

Examination of the M400 chroma processor module and/or M700 video chroma output shows burnt or damaged components. When either or both modules are replaced, the same components in the replacement module are immediately damaged.

Normally module problems are contained in the specific module showing a problem. However, in this instance, the fault is due to a defective component in an associated module. Capacitor C310 in the M300 signal processor module is shorted causing a much higher than normal horizontal pulse to be applied to the M400 chroma processor and the M700 video output module.

Repair the M300 signal processor, the M400 chroma processor, and the M700 video chroma output module as shown in the chain reaction information.

Module M300

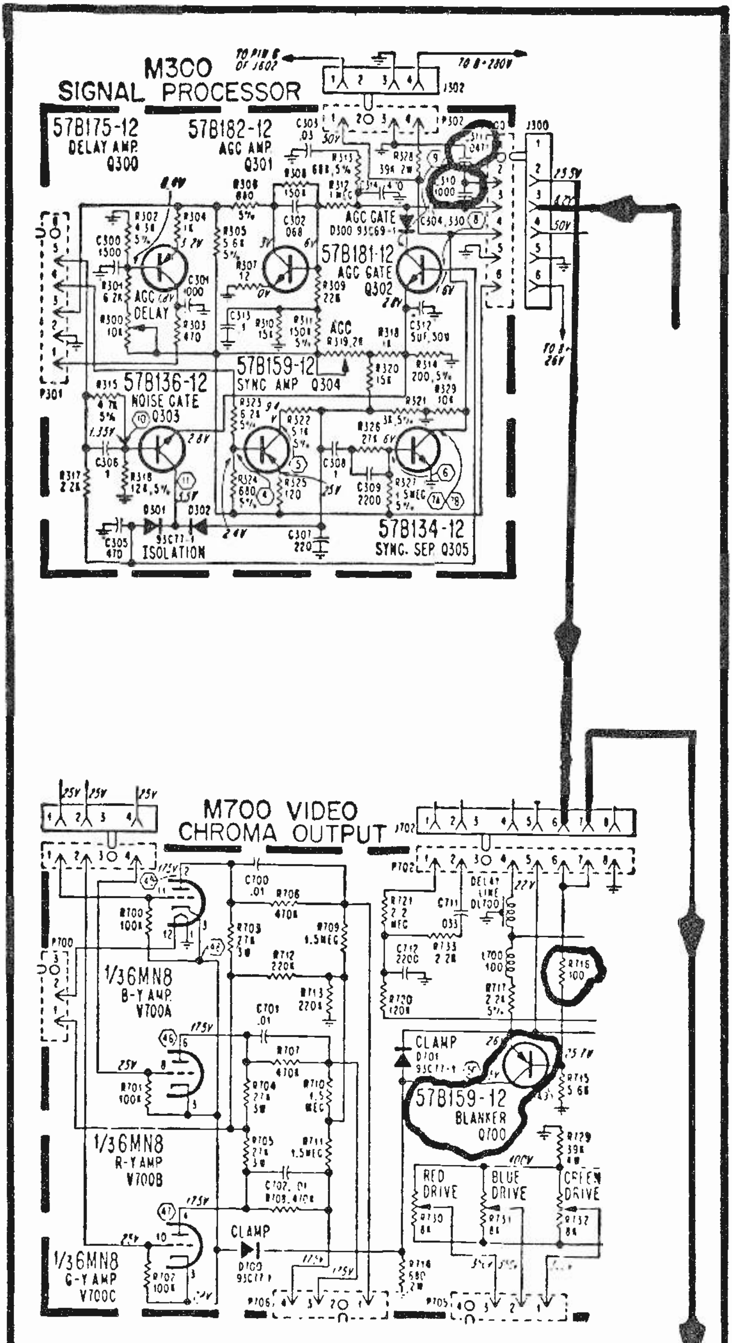
When capacitor C310 shorts, a much higher than normal pulse is applied to capacitor C311, causing this capacitor to split open.

Replace capacitor C310 and open capacitor C311.

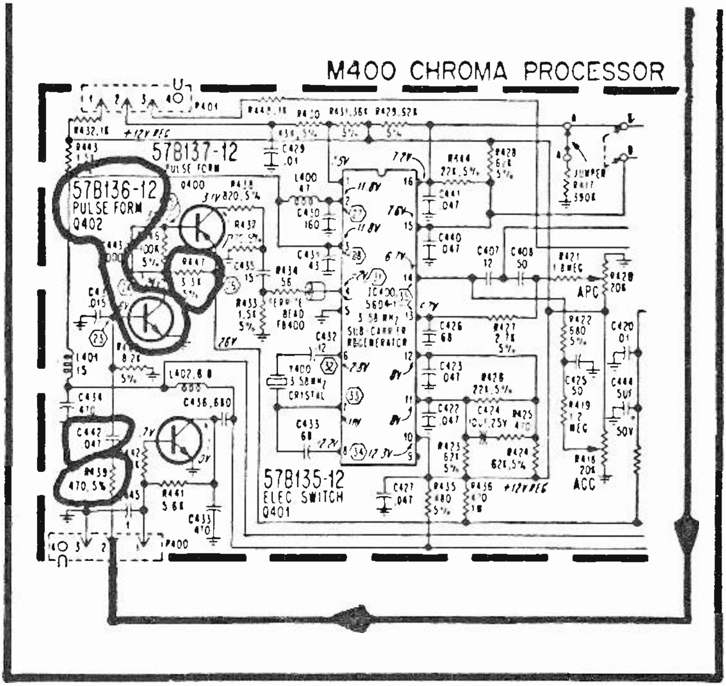
Module M700

When capacitor C310 shorts, a much higher than normal horizontal pulse is also fed to resistor R716, causing it to burn to an almost open condition and blanker transistor Q700 to split apart.

Replace burnt resistor R716 and damaged transistor Q700.


M300
SIGNAL PROCESSOR
57B175-12
DELAY AMP.
Q300
57B182-12
AGC AMP
Q301
AGC GATE
D300 93C69-1
57B181-12
AGC GATE
Q302
AGC DELAY
57B159-12
SYNC AMP Q304
57B136-12
NOISE GATE
Q303
57B134-12
SYNC. SEP. Q305
ISOLATION
TO PIN 8 OF J602
TO B+280V
TO B+ 26V
J302
P302
J300
P301
M700 VIDEO
CHROMA OUTPUT
J702
P702
P700
1/36MN8
B-Y AMP
V700A
1/36MN8
R-Y AMP
V700B
1/36MN8
G-Y AMP
V700C
CLAMP
D701
93C77-1
CLAMP
D700
93C77-1
57B159-12
BLANKER
Q700
DELAY LINE
DL700
RED DRIVE
BLUE DRIVE
GREEN DRIVE
P706
P705

continued



Module M400

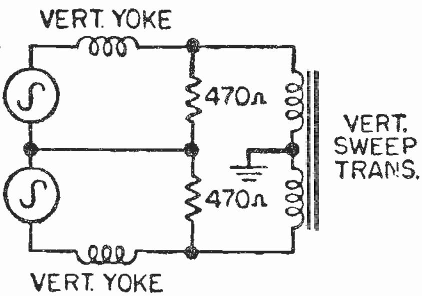
When capacitor C310 shorts, a much higher than normal horizontal pulse is fed also to module M400, causing resistor R439 to burn, capacitor C442 to short, and transistor Q402 to turn ON very hard and conduct heavily, resulting in damage to resistor R447.

Replace burnt resistor R439, shorted capacitor C442 and damaged resistor R447.

General Electric

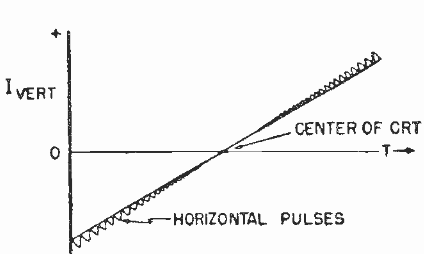
G-E CB Pincushion Correction

A deflection yoke will have a uniform magnetic field within its aperature when a linear current is flowing through its horizontal and vertical



windings. If it is used with a spherical face CRT a rectangular raster will be produced on the screen. If the same deflection yoke is placed on a flat face CRT a raster will be produced.

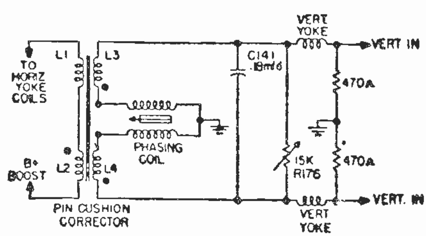
In a B/W TV receiver permanent magnets can compensate for this pin-



cushion effect. They are placed around the perimeter of the deflection yoke, and either push or pull the electron beam to produce the desired rectangular raster. In a monochrome CRT a single electron gun is used. In a color CRT there are three electron guns to be concerned with. Because of the geometric placement of the guns, a permanent magnet could not be placed in a position where it would have a uniform effect at the same time on all three electron guns and it would cause a misregistration problem. Therefore, another form of electrical compensation is used in conjunction with the deflection yoke, to correct the shape of the raster and eliminates the pin cushion effect.

Top and Bottom Correction Circuit

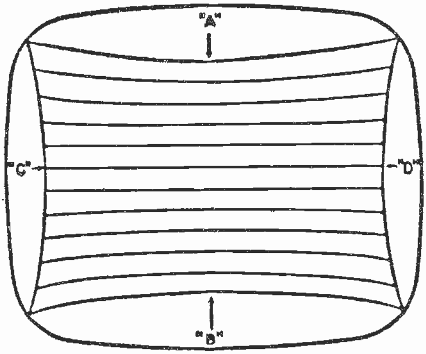
The largest amount of beam correction is needed at points "A" and "B"



toward the outer edges of the picture tube screen. The top- and bottom-pincushion corrector circuit consists of a two-current generator connected in series with the vertical coils of the deflection yoke.

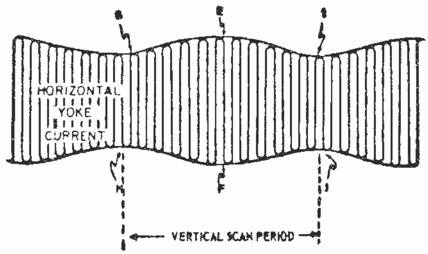
A composite current flows through

the vertical coils of the deflection yoke. The current consists of the normal ver-



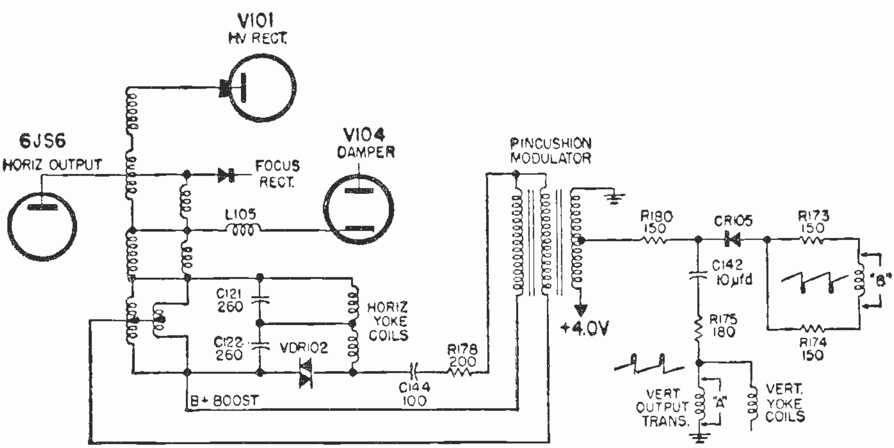
tical sweep current and a horizontal sinewave current supplied by the current generator. The amplitude of the correction current is highest at the beginning and end of the vertical scan period and will progressively decrease to zero as the vertical sweep current passes through zero — which is coincident with the center of the picture tube.

The current generator consists of a series-resonant circuit containing the entire secondary winding of T108, the phasing coil, C141 and R176. A horizontal flyback pulse is fed to the primary of T108 from the horizontal coils on the deflection yoke. This pulse is



inductively coupled to T108's secondary winding where it will shock excite the series resonant circuit, causing it to ring at 15,750 Hz. The correction voltage fed to the deflection yoke's vertical windings is the voltage that appears across C141 and R176. This ac voltage will cause the vertical yoke current to vary slightly at a horizontal rate.

The correction voltage's amplitude will be highest at the beginning and

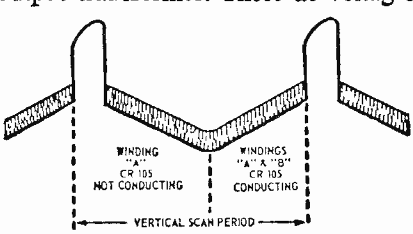


end of the vertical scan period and zero when the beam is sweeping through the center of the CRT screen. This action occurs because T108 functions somewhat like a saturable reactor. The correction voltage's amplitude across 13 and 14 will be proportional to the vertical yoke currents amplitude at any instant. The output correction voltage will be zero when the vertical yoke current is passing through zero. The output correction voltage will increase or decrease as the vertical yoke current increases or decreases.

Side Corrector Circuit

The side pincushion-corrector circuit straightens the sides of the bowed raster by modulating the horizontal deflection current at a vertical rate. This provides maximum horizontal deflection at points "C" and "D" and is accomplished by means of a modulation transformer which represents a changing load across the horizontal deflection yoke coils. Its impedance is maximum at points "E" and "F" and minimum at points "G," "H," and "J."

A dc bias voltage and a voltage waveform at the vertical rate are needed for this impedance change. The bias voltage is obtained from the cathode of the vertical output tube, and the vertical waveform is obtained from windings "A" and "B," of the vertical output transformer. These ac voltages



are 180° out of phase with one another.

The dc bias voltage and a vertical waveform from winding "A" is connected to the cathode and of CR105 and a vertical waveform from winding "B" is connected to its anode. When diode CR105 is conducting, voltages are received from windings "A" and "B." When it is not conducting a voltage is received from winding "A" only. These windings and their associated waveforms can be seen in the simplified circuit diagram.

The composite waveform and dc bias voltage are fed to the primary of T107 to change its impedance at a vertical rate.

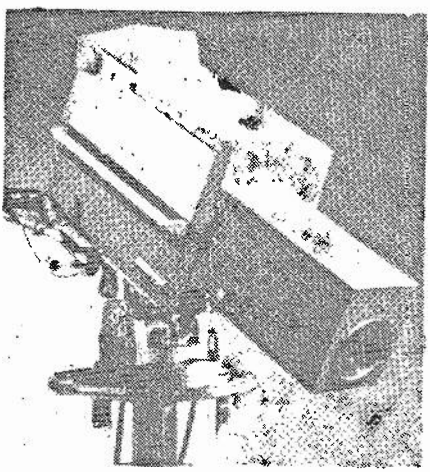
The saturated condition of T107 changes the load across the horizontal deflection coils and determines the amplitude of the horizontal sweep current flowing through them.

G-E CB Chassis — Fleshtone Color Reproduction

Some flesh tone problems have been experienced in the CB chassis with certain color transmissions. During these transmissions, flesh tone areas appear greenish in low light portions. This may also be described as greenish "blotches," or spots, in shadowed areas which will vary with program material.

This problem can be solved and more pleasing flesh tones obtained by opening the demodulation angle between R-Y and B-Y from 90 to 107 deg (± 3 deg). Starting with February 1966 production, the factory alignment incorporated this change.

It is recommended that whenever receivers built prior to Feb. '66 (Chassis Code 605 CB or earlier) require sub-carrier adjustment or have a complaint concerning flesh tones, the following procedure be followed: (1) Peak sub-carrier. (2) After completing sub-carrier peaking, remove the meter from the test point and readjust the B-Y tuning core of 1/6 of a turn *counter-clockwise.* This is the direction which moves the core up and away from the board. The R-Y, B-Y angle will then be 105-110-deg and within the new limits. (The angle must not be increased beyond this point.) (3) Carefully check for ac and dc balance. Unbalance on any of the three color-difference-amplifier grids must not exceed 0.05v (50 mv). Because of the adjustment accuracy required, you should set the VTVM either to center scale or to some arbitrary calibration above 0 before connecting to the test points. Using the lowest scale, this will permit an accurate reading for balance. As a final check, remove the meter probe from the test point, then reconnect it. There should not be any movement of the meter pointer if adjustments are correct. (4) As a final check on subcarrier and balance adjustments, a color bar signal should be used to determine the following conditions:



This fully transistorized color television camera manufactured by Marconi uses four plumbicon pickup tubes. The camera can be switched to either the 525 line or 625 line standards and will provide signals suitable for coding to any of the systems that have been proposed—NTSC, PAL or SECAM.

(a) All primary colors, red, blue and green, should be accurately reproduced. (b) The yellow bar or yellow-orange bar will be shifted very slightly toward orange. (c) The cyan bar will be shifted very slightly in the bluish direction. If the cyan bar is too blue the (R-Y)—(B-Y) angle has been increased a little too far. Close up (B-Y) adjustment slightly toward original setting.

CB Chassis
Video IF and Video Amplifiers

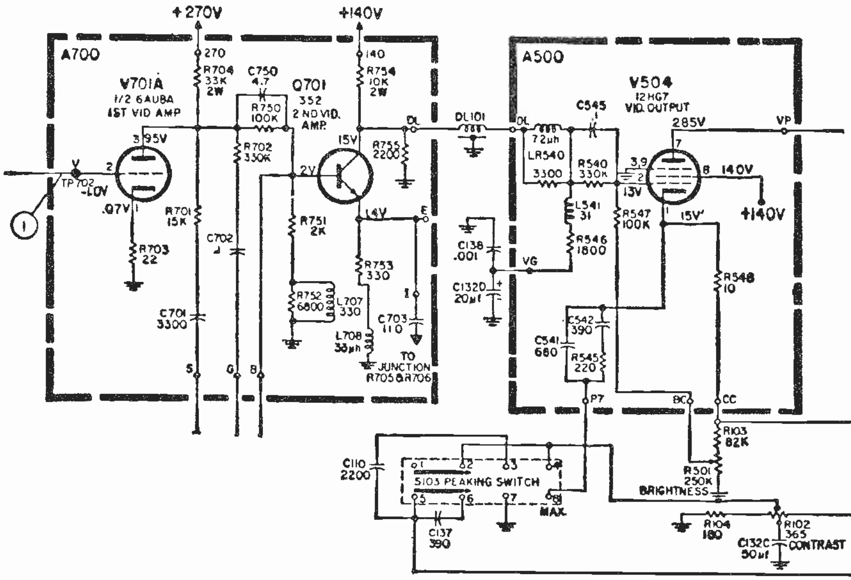
The output from the VHF tuner at 45MHz is coupled to the grid of the 1st IF tube, V301, through T301. C301 blocks dc from the tuner. The impedances of the primary and secondary bifilar windings to T301 are correctly matched by the adjustment of R301 across the primary. With the impedances correctly matched, maximum attenuation is attained with the 47.25MHz trap, L301. A small misadjustment of R301 would greatly decrease the attenuation of the trap. V301's grid is biased by the voltage developed at the AGC keyer, V501A. This voltage is proportional to the signal strength and is variable from about −4v (measured to ground) at maximum signal to approximately 20v at minimum signal. The voltage at the cathode is about 2v more than the grid on weak signals and about 8v more positive than the grid on strong signals. Therefore the net bias on the grid, as measured from grid to cathode, is variable from −2v on a weak signal to −8v on a strong signal. This is shown in the typical curve. The AGC voltage is connected to V301's grid through R303 and R302.

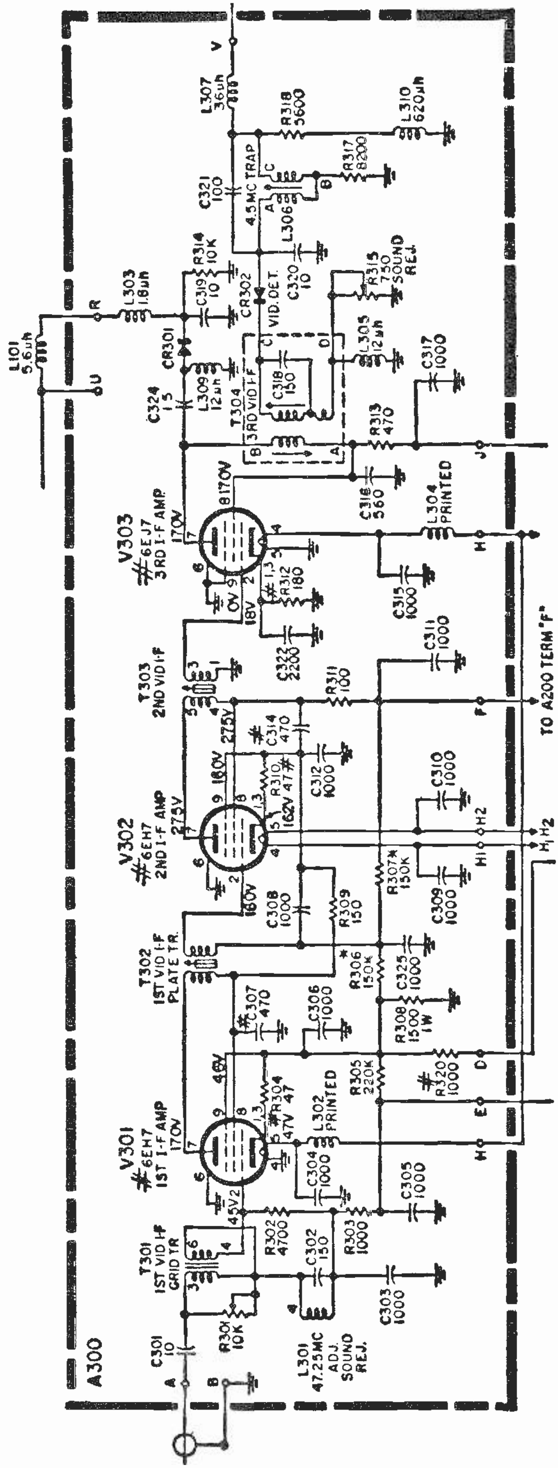
The plate of V301 is coupled to the grid of V302 through T302. The

1st and 2nd video IF amplifiers, V301 and V302, are stacked (in series) for B+ with R309. The plate of V301 is therefore at approximately the same voltage as the cathode of V302. The grid voltage of V302 is stabilized at about 10v less than the cathode and is derived from a matched pair of resistors, R306 and R307. These resistors are in series with B+ and R308. Because V301 and V302 are in series with B+, a change in V301 plate current caused by the AGC voltage will also cause a change in V302 plate current. Therefore, the gain of V302 is indirectly controlled by the AGC voltage on the grid of V301. T303 couples V302 to the grid of the 3rd IF amplifier, V303.

The 3rd IF amplifier, V303, is conventional with the primary of T304 in its plate circuit. The secondary of T304 is connected in series with L305. R315, in parallel with L305, produces a correct impedance match between the primary and secondary of T304. With impedance matching, 60db attenuation is attained at 41.25MHz by adjusting the 41.25-MHz trap on T304. This prevents harsh 920kc beats from appearing in the picture because of the mixing of 41.25MHz audio and 42.17MHz chroma information in the video detector diode, CR302. Because of the high order of 41.25MHz attenuation at the video detector, it is necessary to take off the 4.5MHz sound signal ahead of the video detector and 41.25MHz trap. The sound detector diode, CR301, accomplishes this. Although it would normally not make any difference, CR301 is connected in a polarity to produce positive audio information. This is done so the dc component of the audio can be used to provide a low positive dc voltage at the AGC keyer grid (V5011A).

L306, the 4.5MHz trap, is a bifilar wound coil which couples the video




A300
V301 6EH7 1ST I-F AMP
V302 6EH7 2ND I-F AMP
V303 6EJ7 3RD I-F AMP
T301 1ST VID I-F GRID TR
T302 1ST VID I-F PLATE TR.
T303 2ND VID I-F
T304 3RD VID I-F
CR302 VID. DET.
L306 4.5 MC TRAP
L301 47.25MC ADJ. SOUND REJ.
R315 750 SOUND REJ.
TO A200 TERM "F"

detector output (CR302) to the 1st video amplifier grid (701A). R317 terminates the coil with the correct impedance at point B and R318 terminates point C. R317 and R318 are in parallel for dc so their total resistance performs the diode load and V701A grid return functions. L102 suppresses tweets.

Video Amplifiers

Negative composite video information is dc coupled from the video detector circuit to the 1st video amplifier grid (V701A) by the tweet choke, L307. The positive composite video information which appears in the plate circuit of V701A is dc coupled to the base circuit of the 2nd video amplifier, Q701, by R750 and ac coupled through C750. R750, R751 and the parallel combination of R752 and L707 form a voltage divider circuit. The proper base voltage for Q701 is taken from the junction of R750 and R751.

The negative composite video information which appears in the collector circuit of Q701 is dc coupled to the grid circuit of V504 by the delay line DL101, the parallel combination of a resistor and peaking coil, L540 and R540, a 320K resistor. The collector end of DL101 is terminated by approximately 1800Ω which is made up of the parallel combination of R755 and the shunt resistance of Q701. The grid end of DL101 is terminated by R546 and the series capacitor, C132D. C545 provides the ac signal path from LR540 to the grid of V504, the 3rd video amplifier.

The positive composite video signal for the chroma bandpass amplifier is coupled from the emitter circuit of Q701 to the junction of R705 and R706 by C703.

The three-position video peaking switch, S103, is mounted vertically on the rear apron of the chassis. The switch allows three different video amplifier responses to be selected. The circuits and responses of the three positions are described here.

When the receiver is installed, the technician may demonstrate reception in each of three positions and select the position which produces a picture most pleasing to the customer.

Top Position: Accentuated overshoot. The RC network, C541, C542 and R545 is connected from the cathode of V504 to chassis by S103. S103 also connects C110 from the fixed tap on the contrast control to the junction of the contrast control and R548. *Middle Position:* Medium overshoot. The RC network, C541, C542 and R545 are not connected to chassis. C110 is connected the same as in the top position. S103 connects C137 from the chassis to the junction of the contrast control and R548. *Bottom Position:* No overshoot. S103 switches C137, C110, C541, C542 and R545 out of the circuit.

The negative composite video signal applied to the grid of V504, the 3rd video amplifier, will be amplified by the tube and appear in its plate circuit as positive-going video information. T201, in the plate circuit of V504, functions as a video peaking transformer. The brightness control is located in the cathode circuit of V504. Its function is to adjust the grid bias of this stage. The contrast control, R102, is also located in the cathode circuit of V504. A 50μf capacitor, C132, is connected from the arm of the contrast post to chassis. The voltage gain of the stage is varied by changing the amount of cathode degeneration. The gain of the stage will increase as the arm of the contrast control is moved closer to the cathode of V504, providing the least amount of cathode degeneration. The stage gain is lowered as the arm of the contrast control is moved closer to R104, providing increased cathode degeneration.

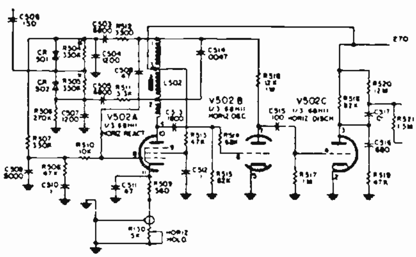
G-E CB Horizontal Oscillator

V502 is a 6BH11 compactron containing a reactance control pentode section, V502A a triode oscillator, V502B, and a horizontal discharge triode V502C.

The sinewave oscillator V502B has a balanced tank coil, L502, connected to the plate through R516 and to the grid through C513 and R514. The portion of L502 between terminals 1 and 2, in parallel with C514, is the balanced tank coil which determines the frequency of the oscillator. The center tap at terminal 3 is connected to ac ground at B+ 270v. The section of L502 between terminals 2 and 4 is autotransformer-coupled to the balanced tank coil and provides feedback to the grid to sustain oscillations.

The reactance pentode V502A is also connected across the balanced tank coil. C508 connects coil terminal 1 to the grid with a phase shift of 90° out of phase with the plate which makes V502A look like a reactance to L502. The plate of V502A is connected to terminal 2 of L502 through the oscillator feedback winding of the coil. This series inductance also prevents V502A from unbalancing the frequency-determining tank circuit.

The horizontal phase detector CR501-CR502, although balanced, functions in basically the same manner as in monochrome receivers. Sinewave reference voltages from terminals 1 and 2 of the coil are connected respectively to the anodes of CR501 and CR502. This action alone will produce a zero voltage output from the phase detector due to cancellation of equal but oppositely-polarized voltages across R504 and R505. In the same manner, a zero voltage will be produced if horizontal negative sync pulses alone from the sync separator through C506 are connected to the common cathodes of CR501 and CR502. Any change in the oscillator frequency will unbalance the phase detector and pro-



duce a correction voltage at the anode of CR501 which is fed to the grid of V502A in parallel with L502. The change in reactance returns the oscillator to the correct frequency. R508, C509 and C510 provide damping to prevent oscillator hunting. The RC networks C503, C504, R512 and C505, C507, R511 act as low-pass filters to prevent coupling of sync pulses to the oscillator circuit. R506 is the grid return to ground for V502A. R130 is the horizontal hold control which can vary the effective reactance of V502A.

Returning to the oscillator V502B, the waveform at the grid is a sinewave with the positive half-cycle clipped. This waveform, along with the shaping network R516, R517 and C515, produces a modified square wave at the plate of V502B and the grid of the horizontal discharge triode V502C.

The purpose of the discharge triode is to prevent oscillator phase shift due to variations in the output circuit of V103 which otherwise might cause such undesirable conditions as top curl in the picture. The waveform at the plate of V502C is shaped by C516 and R519 and coupled to the grid of V103 through C517 and R131.

G-E "CB" Tint and 3.58Mc Alignment

In performing 3.58Mc subcarrier alignment on General Electric "CB" chassis, it is very important that each coil or transformer is tuned to the proper peak as indicated on the meter connected to Test Point 701.

As the core in each coil or transformer is adjusted, two definite peaks (dips for T704) will be seen on the meter. Tune the coils and transformers as follows:

1. For T702 crystal filter and L705 crystal tuning, turn the core counterclockwise to the top of the shield can. Now rotate the core clockwise towards the chassis and the meter indication will increase to the first peak. If the clockwise rotation of the core is continued the meter indication will drop slightly and then increase to a second peak. The first peak is the correct tuning point.

2. For T703, the R-Y transformer, turn the core clockwise towards the circuit board and the bottom of the shield can. Now rotate the core counterclockwise until the meter indicates the first peak which is the correct one. Again, further adjustment in the same direction will indicate a second peak which is the incorrect one.

3. For T704, the B-Y transformer, rotate the core clockwise to the bottom of the shield can. Now rotate the

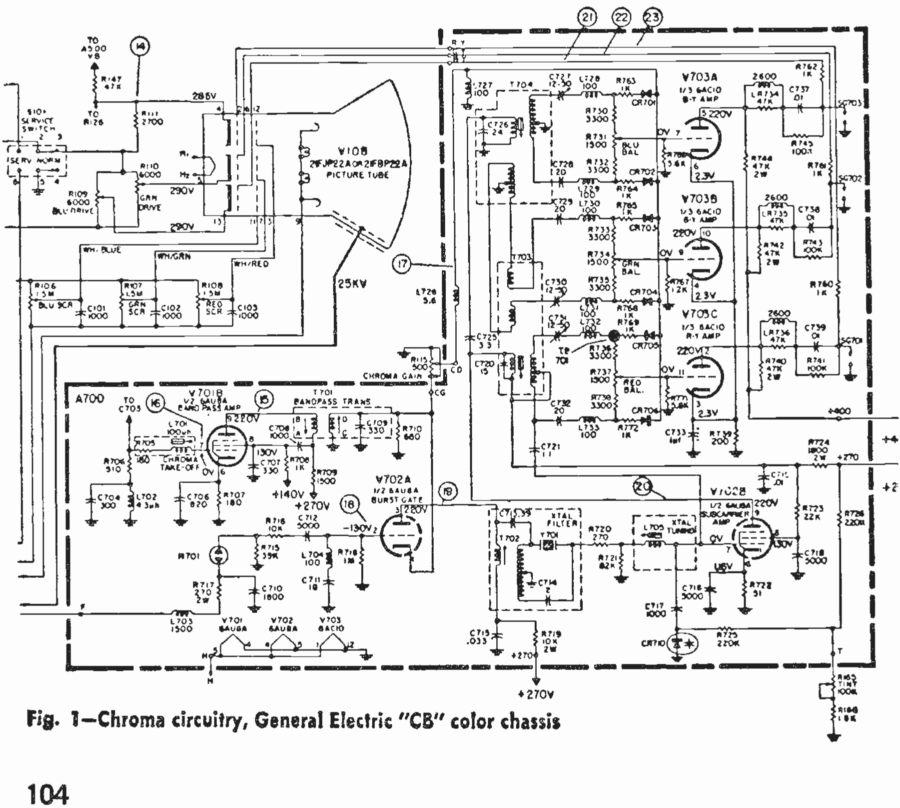


Fig. 1—Chroma circuitry, General Electric "CB" color chassis

core counterclockwise until a point of minimum voltage (dip) is indicated on the meter. If the counter clockwise rotation of the core is continued, the meter indication will rise slightly and then decrease to a second dip. The first dip from the bottom of the shield can is the correct tuning point.

In multi-channel areas a condition may exist, because of transmission difficulties, where the 3.58Mc burst phase of a particular station has been shifted sufficiently so that normal flesh tones are not attained. This would occur, of course, with the TINT control places at the end of its range for the nearest approach to correct fleshtones.

Using a hypothetical example of a three-channel area, the following conditions might exist.

One channel — Flesh tones at center of TINT control range. **Second channel** — Flesh tones ± 10 deg from center. **Third channel** — TINT control at end of range and flesh tones not attained. (flesh tones either green or magenta).

The cure for this condition would be to correctly tune in the third channel and preset the TINT control about ten deg in from the end of the control range which is nearest to flesh tones (turning toward the center of the range). Leave the TINT control in this position and realign the 3.58 Mc subcarrier channel using the offending station signal as a signal source. After realignment it should be possible to get correct flesh tones within the range of the TINT control for all of the above channels. Similar adjustments can be made if you have multi-channel peculiarities in your area.

The TINT control in the 21 in. and 25 in. "CB" Chassis was changed from a capacitor (C125) to a potentiometer (R165) beginning with chassis stamped "EN106." C720 (24pf) was also deleted at this time. (See Fig. 1.)

A special semiconductor diode (CR710) which, when reverse biased, acts like a capacitor. If the reverse bias applied to the diode is changed, the capacity of the diode will change. CR710 has a capacity range of approximately 5pf to 25pf when the applied reverse bias is changed from +90v to +2v. The capacitance is low when the voltage is high and vice versa. The function of the new TINT control R165 is to produce the change in voltage to vary the capacity of the diode CR710.

A voltage divider between B+270v and ground is formed by R726, R165 and R166, B+ is connected to the cathode of CR710 through R725. CR710 is connected to L705 and the grid of the subcarrier amplifier V702B through the dc blocking capacitor, C717. R725 isolates the grid circuit from the voltage divider to eliminate stray capacity effects.

Adjustment of the TINT control, R165, produces a change in voltage at point T and CR710 which changes the capacity of CR710. CR710 then acting as a variable capacitor, changes the phase of the subcarrier at the grid of V702B.

With the above change it was necessary to readjust the neutralization. C721 was changed to 1.1pf and the connections were reversed at the secondary of the R-Y transformer, T703. Since this reversed the phase of the subcarrier at the R-Y synchronous detectors, it was also necessary to reverse the polarity of the diodes CR705 and CR706.

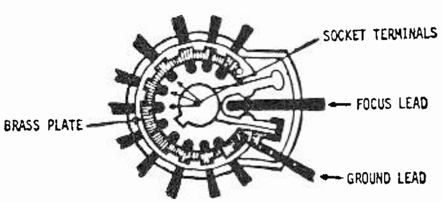
General Electric Color Chassis — 3.58Mc Crystals

Care should be exercised when selecting the proper replacement crystal for all G-E color chassis.

ET41X27 crystal should be used in CW, CX, FY, CY and CA chassis since a shunt resonant circuit is used in these chassis. **ET41X47** should be used in the CB and HB chassis since these chassis use a series resonant crystal circuit and require different crystal characteristics for proper operation. The two types became mixed in stock so you may have received either type on orders for ET41X27. It is recommended that you check any crystals for correct units and segregate by the drawing identification numbers which appear on the crystals. ET41X27 is marked either 126J370-1 or 1107 863-1. Use in CW CX, CY, FY or CA chassis. ET41-X47 is marked 210,067-2. Use in CB or HB chassis.

Color Chassis G-1 — CRT Socket with Built-in Spark Gap

The CRT socket used in the G-1 chassis color receiver contains a special built-in spark gap consisting of a ground brass plate placed close to the socket terminals (see sketch). An unusually high voltage on a socket terminal will arc to the brass plate rather than to an adjacent terminal, thus protecting the CRT and its associated



REAR VIEW OF SOCKET (COVER REMOVED)

components. This is normal, and does not necessarily mean the socket is defective, but usually indicates a problem in associated circuitry.

For example, there are cases of a continuous arcing condition in the CRT socket caused by an open 47M resistor (R284) in the focus voltage divider circuit. To obtain best focus, this resistor is connected through a wire jumper to one of three points — boost voltage, +280v or chassis ground. A bad solder connection at the jumper or an open R284 could cause the voltage on the focus anode terminal (Pin 9) to rise, causing an arc inside the CRT socket.

Should you be called upon to service a G-1 chassis receiver which has a continuously arcing CRT socket, compare the socket pin voltages to the voltages shown on the schematic diagram. The focus voltage (Pin 9) should be between +3kv and +5kv with respect to chassis ground. If it is more than 5kv, check for an open circuit somewhere between the focus control (R283) and the low potential end of the focus voltage divider circuit.

TV Chassis G1 — High Voltage Arcing

There have been a few reports of G1 chassis receivers arcing from the HV rectifier plate cap to the metal shield can. This could be the result of drawing an arc from the plate cap with a screwdriver when checking for presence of HV. The arc sometimes carbonizes the plate cap and reduces its insulating qualities.

The HV at the plate cap can be checked with a neon bulb taped to an insulated nonmetallic rod or a similar device. Under no circumstances should an arc be drawn from the cap.

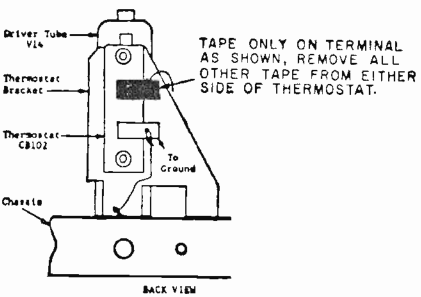
Caps which have already been carbonized can be repaired by covering them completely with corona seal. To accomplish this, first remove the cap from the HV rectifier tube and then pull it out of the HV compartment through the opening by the transformer terminals. Apply the corona seal and then replace the cap on the HV rectifier tube. Do not exert undue strain on the cap lead or you may loosen the connection at the transformer tertiary winding.

Color TV Chassis KD — Tape on Thermostat Surface

Some KD chassis have tape applied to the surface of the thermostat.

This tape should be removed, since it may result in cutout tripping when there is no problem in the set. The only tape required is around the top terminal, as illustrated, to prevent shock. The top terminal is at B+ potential when the cutout is open.

Whenever the cutout trips and no circuit trouble can be found, check



the following: (1) Is there any tape on either side of the cutout? (2) Space between the thermostat and a properly seated horizontal output tube V14 should be ¾ ± ⅛ in.

Color TV Chassis KC Model M278CWD — Loose Antenna

There have been a few reports of loose VHF antennas on this model.

If you encounter such a complaint, it may usually be corrected by pushing the barbed retaining clip up tight to the underside of the cabinet. This is best done by using a length of metal tubing which slides over the antenna cartridge and presses evenly against the retaining clip.

If the antenna is still loose, use another clip (catalog No. ET3X618) inserted on the top of the original one and pressed up tight against it.

TV Chassis H1 — New Damper Tube

Late production H1 chassis portable color receivers use a 17BW3 damper tube instead of a 12AX3. The 17BW3 is directly interchangeable with, and is a recommended replacement for, the 12AX3.

This will increase the total filament string voltage drop from 117.5v to 121.5v and should help improve reliability. If a damper tube fails in an HC or H1 Chassis, use a 17BW3 tube as a replacement.

Color TV Chassis H1 — Service Hints

High Voltage Compartment Doors. Late production H1 Chassis receivers contain a high voltage transformer which has the tertiary encased in RTV silicone rubber (ES77X2). These transformers, which are easily recognized by the white plastic cup around the tertiary, offer increased resistance to high temperature and humidity. To allow better air circulation around the transformer, the door on the high voltage can has been eliminated. This was made possible by the special properties of the new type transformer construction.

Receivers which are equipped with the older type, wax impregnated transformers (ES77X89) must have a door on the high voltage compartment. When servicing these receivers be sure that this door is securely fastened before reassembling the cabinet back.

GENERAL ELECTRIC

Do not install the old wax type transformer (ES77X89) in an H1 receiver which does not have a door on the HV compartment.

Intermittent Hum Bar. There have been some field reports of an intermittent hum bar in the 10in., H1 Chassis, color receivers. This condition may be caused by a poor ground connection at the black lead from the vertical output transformer.

On some sets, this lead is grounded at the same terminal board as the ac line choke. Poor contact with chassis ground because of a loose or stripped screw can cause ac to modulate the vertical sweep, producing intermittent hum in the picure.

Move and solder this black ground lead to the lance on the top right side of the high voltage transformer compartment. The black lead from the convergence assembly is also connected to this point. Check the terminal board screw for tightness. If stripped, replace with a larger diameter screw or solder the lug and screw to the high voltage cage. Be careful not to change the lead dress or damage any wire insulation in this area while soldering.

Color TV Chassis KC and CB — Impurity Problems

A few reports have been received of both CB and KC sets which do not maintain purity. In most cases this is a very severe impurity conditon and is repetitive.

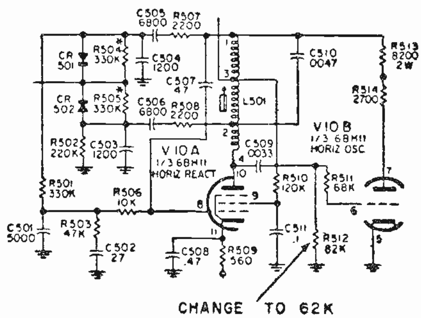
The impurity is corrected by manual degaussing, but if the set is allowed to cool thoroughly and then switched on, the impurity will return. The more times the receiver is switched off and on, the worse the impurity becomes.

This problem has been traced to the B+ power rectifiers which are used in a full wave bridge circuit. In every case reported an open rectifier or a cold solder joint has been found. This condition cannot be determined by measuring the B+ as it will drop only about 25-30v. The rectifiers should be checked with an ohmmeter and inspected for a cold solder connection on all terminals.

The problem results in unbalance of the bridge rectifier circuit and spurious pulses through the degaussing coil. Other minor defects may occur, but the impurity condition is the most pronounced.

Color TV Chassis KC — Service Hints

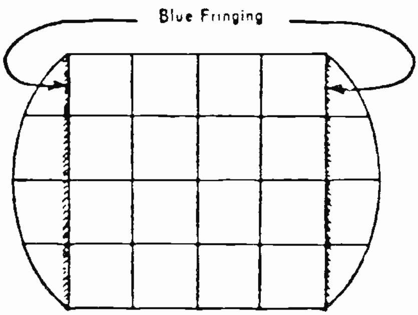
Correcting Horizontal Foldover. Change R512 from 82K to 62K. This is most easily done by shunting a 240K ½w across the existing 82K



resistor. The extra resistor may be added to the underside of the circuit board. Following this change, the horizontal oscillator should be readjusted for proper operation. This is not intended as an instruction to rework sets, but is used as a correction if this complaint is encountered.

B-Fuse F101. Some early production receivers, used a slo-blo fuse in the B-line. This was found to be unnecessary and deleted in early production. If a fuse failure occurs, it should be bridged with a plain buss wire. This will avoid callbacks resulting from fuse failure.

Filament Fuse F103. If a failure of filament fuse F103 should occur, it is important that it be replaced properly. Use either an ET10X33 fuse or a length of No. 22 bare copper wire. The most important point is to be sure it is run inside the 3in. fiber-glass tubing. This fuse is intended to burn off in the event of a filament circuit short in the chassis. The fiber-glass tubing contains the heat of burnoff and prevents other receiver damage. Therefore it is important that the proper gage of wire is used and run inside the tubing.



Using the Wide Blue Convergence Corrector (ET42X59). If a wide blue raster exists, we now have available a unit to correct this condition.

Before any correctors are installed, it should be determined that a wide blue problem actually exists. This is identified as follows:

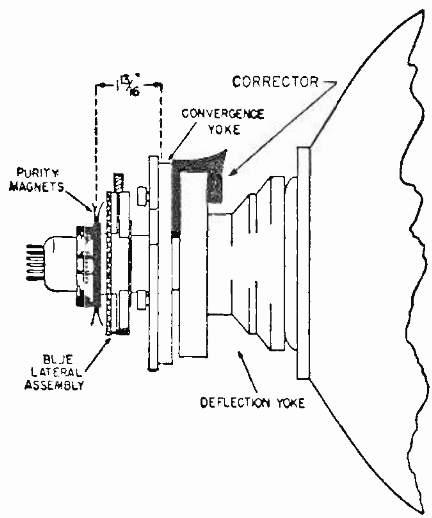
1. Adjust for proper center convergence.

2. Observe the vertical lines of a cross-hatch pattern. If blue fringing shows mainly on the outside as illustrated in drawing, this is defined as a wide blue raster.

Blue fringing may be corrected as follows:

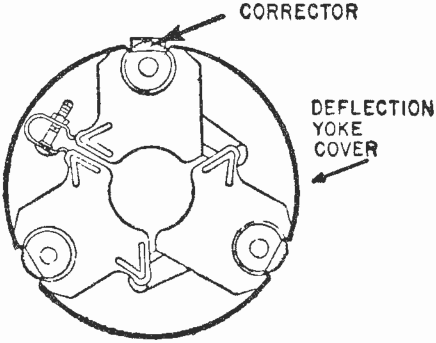
1. This condition may be caused by improper vertical positioning of the yoke, which must be corrected by tipping up the front of the yoke, to obtain a coaxial relationship with the tube neck. This may be done by loosening the wing nuts on the yoke clamp and tilting the yoke upward at the front. If this does not result in a coaxial condition with the tube neck, it may be necessary to raise the yoke retaining ring slightly on the bell of the tube.

2. If wide blue condition still exists, install corrector ET42X59 as follows: (a) Slide the corrector down vertically over the rear face of the deflection



yoke as shown in illustration. This is to be positioned directly above the blue gun and the top clip is to be pressed down firmly on the yoke body for the entire length of the clip. (b) If excessive correction is encountered (narrow blue), the clip should be raised slightly above the yoke body.

If the final position of the corrector is loose on the yoke, which might permit it to fall off and thus create a short



hazard, the degree of correction required is not sufficient to warrant using the corrector. Therefore, it should not be used.

The corrector must not be used in any other position, or for any other purpose than that outlined above.

Horizontal Output Transformer Coil Replacement in the General Electric Color TV Chassis KC

The KC chassis uses two different types of horizontal output transformer coils for T104. They are Cat. Nos. ET77X99 and ET77X102. The difference is in the type of wax used on the coil.

The KC chassis also uses two different types of high voltage compartments. One type is completely enclosed without ventilation. The other type has large ventilation holes located in three sides of the compartment, near the top, and also in the compartment bottom plate.

Special precaution must be observed, when replacing T104, to select the proper transformer coil for the type of high voltage compartment.

Cat. No. ET77X99 coil may be used only in the unventilated (no holes) high voltage compartment.

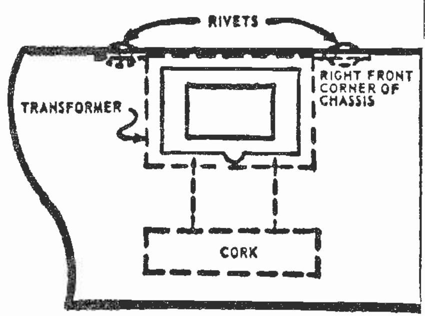
Cat. No. ET77X102 coil may be used in either the unventilated or ventilated compartments, according to the manufacturer.

For improved heat dissipation it is recommended that a coating of Silicone Compound, Cat. No. ET90X23, should be applied to the sides of the transformer core where contact is made with the high voltage compartment. Also make sure that the mounting nuts are then tightened in a thoroughly secure manner.

Low Volume Buzz in G-E KC Color Chassis

A few cases of low-volume buzz have been traced to the vertical output transformer.

This problem may be easily solved



TOP VIEW LOOKING
DOWN ON CHASSIS

by inserting a piece of cork gasket or other soft non-perishable packing between the vertical transformer core frame and the underside of the chassis as shown here.

Only those sets having a complaint of low volume buzz should have this packing added.

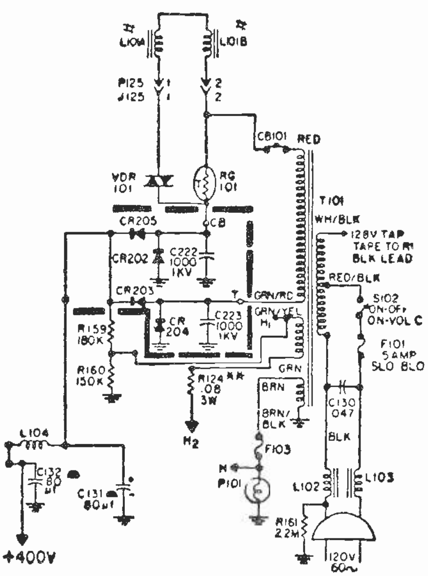
Color TV Chassis KC—High Line Voltage Tap on Power Transformer

All KC chassis power transformers are provided with a primary high voltage tap which is identified on the schematic diagram as "WH/BLK 128 VOLT TAP."

It has been determined, through recent tests, that for maximum reliability and minimum service, the high line voltage tap should be used whenever either of the following conditions exist.

1. Average line voltage equals or exceeds 123v.
2. Line voltage equals or exceeds 128v for a period of 15 minutes or more during normal viewing hours (even though the average may be less than 123v).

Whenever a KC chassis is serviced for any reason, measure the line voltage and change the primary tap if either of the above conditions exist.



Never attempt this on any KD chassis since the tap on the KD chassis transformer primary is for Insta-View and not high line voltage.

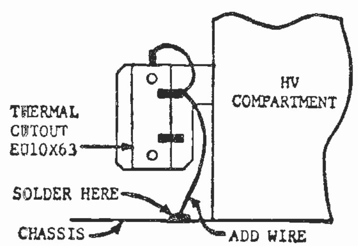
Procedures for Changing Primary Tap

1. Untape the White/Black transformer primary lead (this is the 128v tap which was taped to the Red/Black lead at the factory).
2. Clip the Red/Black lead from the terminal board and tape over the end of the lead.
3. Connect the White/Black lead to the terminal board lug previously occupied by the Red/Black lead.

Color TV Chassis KC/KD—New Horizontal Output Transformer Assembly

Horizontal output Transformer replacement coils ET/EU77X99, ET/EU77X102 and ET/EU77X 106 for the KC and KD chassis are obsolete. In the future when you order the above coils, you will receive catalog number EU77X5-High Voltage Assembly.

The new assembly is pretested and includes the latest features for



improved reliability such as a thermal protective switch for the horizontal output tube. All installation steps are thoroughly covered in an instruction sheet packed with each replacement unit.

Since starting production of the EU77X5 assembly unit, a direct wire has been added from the thermal cutout switch to the chassis to assure a better ground.

Some of the first production units do not have this ground wire to the chassis. If you receive any EU77X5 unit which does not have the wire, you should add it (see diagram) when installing the unit in a set.

Color TV Chassis G-1—New HV Rectifier Tube

Current production G-1 chassis 14in. color receivers use a 3DA3 HV rectifier tube. This new rectifier is a direct replacement for the 3CX3 tube previously used. The 3CX3 cannot be used to replace the 3DA3.

Beginning with chassis stamped EN326, the tube socket wiring was revised to accommodate only the 3DA3 tube. Filament leads are now connected to Pins 5 and 8 of the tube socket, instead of Pins 3 and 8. In the 3DA3 tube, Pins 3 and 5 are connected together enabling this tube to function in sockets wired for either a 3DA3 or a 3CX3.

When your present stock of 3CX3 tubes is depleted, we recommend using the 3DA3 tube as a replacement in G-1 chassis receivers.

Color Chassis H—High Voltage Check Points

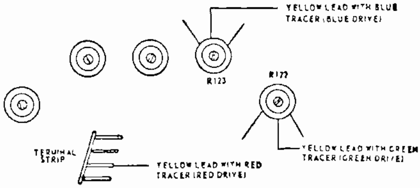
Certain areas in the high voltage and horizontal sweep section of the H Chassis 10in. color receiver should be inspected each time a set is serviced to reduce the possibility of corona and arcing problems.

(1.) Remove all pigtails and sharp solder points from the bottom of the horizontal output and damper tube sockets. (2.) Check to be sure there are no sharp solder points on the bottom of the circuit board in the area near the damper choke. Make sure the special insulating sleeve completely covers damper choke L252. (3.) Inspect the damper choke wire lead where it passes through the opening in the circuit board. If the insulation appears nicked, deteriorated or damaged in any way, replace the lead with high voltage anode lead wire. Be certain you make a smooth solder connection to the damper choke. Cover the solder joint with heat shrinkable tubing (EP50X1) or at least four layers of black plastic insulating electrical tape. (4.) Dress all wire leads connected to the high voltage transformer away from adjacent transformer terminals. Be sure the damper capacitor connected to Terminal 3 is dressed away from the metal chassis.

Color TV Chassis KC/KD—Using CRT 25XP22 To Replace 25AP22A

Color CRT type 25XP22 may be used to replace type 25AP22A in the KC and KD chassis. When this is done, the 25XP22 may not match the drive ranges in the chassis.

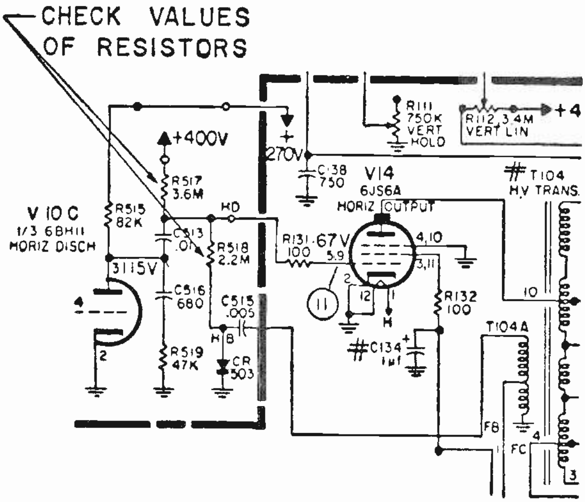
The 25XP22 is made to match the drive ranges in the KC and KD chas-



sis by interchanging the red cathode lead with either the blue or green cathode lead, when necessary.

The need to interchange leads is determined only after the CRT has been installed and the grey scale (color temperature) adjustments.

If the grey scale is incorrect after the adjustments have been completed,



interchange the leads according to the following rules:

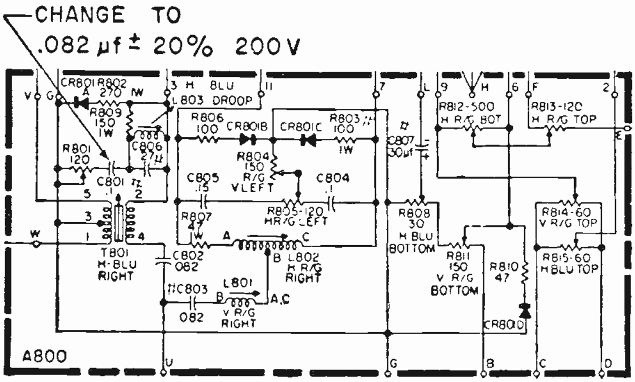
1. If the completed grey scale is yellowish in the highlight areas, interchange the red and blue cathode leads at the drive control bracket. In this instance the blue control adjusts the red drive and the blue drive is not adjustable. Green drive is normal.

2. If the completed grey scale is reddish-purple in the highlight areas, interchange the red and green cathode leads at the drive control bracket. In this instance the green control adjusts the red drive and the green drive is not adjustable. Blue drive is normal.

The illustration shows the rear view with drive leads normally connected.

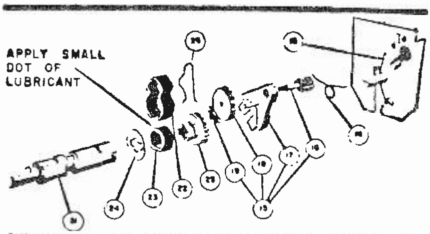
Color TV Chassis KC/KD — Service Information

Failure of R801 Blue-Left Convergence Potentiometer. Failure of this component will probably be caused by overloading which may occur in rare cases because of tolerance building up in other circuit components.



GENERAL ELECTRIC

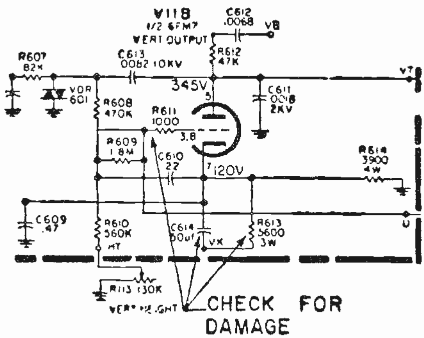
Correction: When replacing R801, change value of C801 from .1 to 0.082 μf ± 20%, 200v. This corrects tolerance build up and will reduce current through R801. **Insufficient Width:** Measure the horizontal output tube, V14, grid voltage. This is normally about −67v ±20%. If it reads higher than normal, sometimes as high as −100v, output will be substantially reduced. **Correction:** Disconnect R517, 3.6M and measure its value. If it is not correct, sometimes as high as 6M, it must be replaced. While disconnected, also check the value of R518 which should be 2.2M. Replace with correct value. **Excess Stiffness or Drag in Fine Tuning of ET86X263 and ET86X274 VHF Tuners.** If fine tuning shows excessive stiffness, item No. 22 and 23 in the exploded view, these items require lubrication. **Correction:** Apply



to item 23 a small dot of lubricant containing molybdenum disulfide, which prevents seizing and galling. (Do not use tuner lube or oil, since excessive slipping will result.)

Color TV Chassis KC/KD — Vertical Sweep Failures

You should be aware of secondary component damage which may occur in a color set when a 6FM7



vertical tube fails. The extent and nature of the secondary damage will vary, depending on the nature of the tube failure.

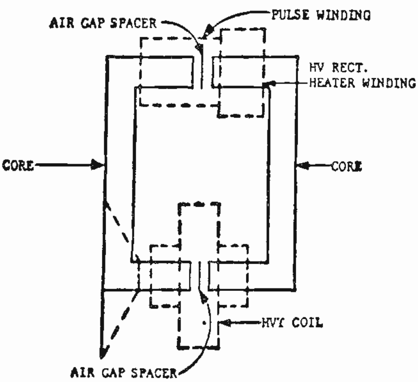
In case of a 6FM7 failure, the following components should be checked for damage and replaced if necessary.

1. R130, 680 may be overheated.
2. R611, 1K may be overheated.
3. R613, 5.6K may be overheated.
4. C614, 50 μf may be showing leakage at lugs.

In addition, it should be noted the CRT phosphor may be damaged in 3-4min. if the set is operated at high brightness without vertical sweep.

Color TV Chassis KC/KD—Core Spacers in HV Transformers

If the horizontal output transformer T104 becomes defective, the correct service procedure is to separate the ferrite core halves and replace the defective coil instead of replacing the complete transformer. In making the repair, certain precautions should be



taken to make sure the rebuilt transformer will operate properly and reliably, thus preventing callbacks.

It is absolutely essential that the air gap spacers are replaced when the transformer is reassembled.

If you lose the spacers, replace only with the correct spacers since the dimensions are critical. Order (GE No. ET41X52) spacer-air gap.

Failure to replace the air gap spacers will create the following problems:

1. The transformer will be mistuned and retrace timing will be incorrect.
2. Excessive heat will be generated.
3. The width of the picture may be too narrow.
4. A white vertical line or bar may appear in the center of the picture or raster.

After the transformer is reassembled, apply a coating of silicone grease (GE ET90X23) to the sides of the transformer core where contact is made with the metal high voltage compartment. This helps in dissipating heat to the outside of the compartment.

Tighten the mounting nuts securely, so the sides of the transformer core make good contact with the sides of the metal compartment (make sure the grease is applied). This dissipates the heat efficiently to the outside.

Finally, make a good ground connection to the ground end of the pulse winding T104A. If this connection is not made, there is a possibility of excessive high voltage if the HV regulator tube V17 should become defective.

Portable Color Model M235GWD-1 — 15MP22 CRT Modification

During early production of Model M235GWD-1 portable color receivers, a 15MP22 CRT was used which requires a potential of 640v on the red, blue and green screen grids.

Later, a 15MP22 with a modified gun assembly was introduced. This newer type tube requires a 450v potential on the screen grids.

Both types of CRTs are presently being used in production, but the early type is gradually being phased out.

When servicing a G-1 chassis receiver, it is important to apply the proper screen grid potential for the type of CRT in the set. Early and late CRTs are both designated 15MP22, but may be identified in the following manner.

Look at the neck of the CRT near the socket base. There are colored glass rods supporting the electron guns, inside the neck of the tube.

Early 15MP22 tubes have blue support rods — proper screen voltage setting is 640 volts.

Later 15MP22 tubes have green support rods — proper screen voltage setting is 450 volts.

Field replacement CRTs will be the later type 15MP22 with green support rods.

GENERAL ELECTRIC

Color TV Chassis KD — Thermostat Added

Beginning with chassis date code OA2E, the KD chassis features a new safety thermostat.

The thermostat, CB102, is mounted adjacent to the horizontal output tube V14 glass envelope and directly above the rear apron as illustrated.

The thermostat is connected in series with the grounded cathode lead of V14. The cathode is connected to the top terminal of CB102 and the bottom terminal is connected to chassis ground.

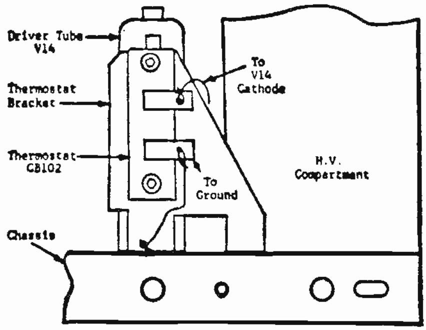
Abnormal heat from the glass envelope will cause the thermostat to open and V14 will become inoperative because of its open cathode circuit. Abnormal heat would be caused by excessive plate and/or screen current. This also could be caused by either a failure of V14 itself or a malfunction in its input or output circuits such as loss of grid drive from the horizontal oscillator, a defective regulator tube, sweep transformer, etc.

When the temperature of V14 returns to normal, the thermostat will close and activate the horizontal output circuit. The thermostat will continue to cycle on and off until the trouble in the horizontal circuits is corrected.

Observe the precautions and suggestions listed when troubleshooting a KD chassis that has a thermostat.

1. To keep V14 cathode circuit closed while troubleshooting, clip a jumper lead across the thermostat terminals. Do not try to reset an open thermostat manually, since this is a true thermostat and operates only on temperature changes. Any attempt to reset the thermostat manually will ruin the original temperature calibration and destroy the safety feature. Make sure the clip lead is removed after completing work on the set.

2. If an operating chassis is tipped up on its front edge, the thermostat will open since it will be oriented hori-



BACK VIEW

zontally above V14 and receiving its full heat, even on a correctly operating chassis. When this happens, clip a jumper lead across the thermostat terminals to activate the horizontal circuit. Make sure the clip lead is removed after completing work.

3. When the thermostat is open, the terminal connected to the cathode of V14 has a dc potential to ground of 200 to 300 volts. This terminal should be treated with the same respect given other B+ points in the chassis receive.

Two thermostats are used in the KD Chassis:

ET10X62 Thermal Cutout (Thermostat) in 22kv Chassis.

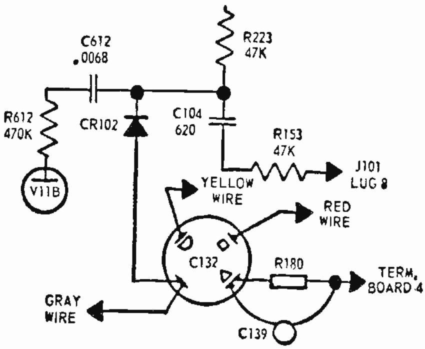
ET10X63 Thermal Cutout (Thermostat) in 25kv Chassis.

Neither thermostat should be substituted for the other.

Color TV Chassis KC/KD — Service Hints

You may have a few complaints ot raster shading in the KC or KD chassis. This shading usually appears during periods of no video modulation (camera changes, etc). The right half of the raster appears substantially darker than the left half, with a gradual shading from the center toward the right hand side.

This raster shading may or may not be accompanied by retrace "snake." In either case the following cure will be found very effective. (Refer to the schematic illustration.)



1. Change diode CR102 to an ET57X40 type. Move anode (ground) end of diode to + side (no code lug) of C132 electrolytic capacitor.
2. Disconnect end of R153 (47K) going to junction of C136 and C138. Now connect the open end of R153 to lug 8 of J101.

To correct complaints of vertical retrace lines, install the following changes:

1. Change R612 from 47K to 470K (½ w). Disconnect wire going from circuit board terminal VB (or C612) to R154 at R154 end.
2. Reconnect wire to cathode side of CR102.

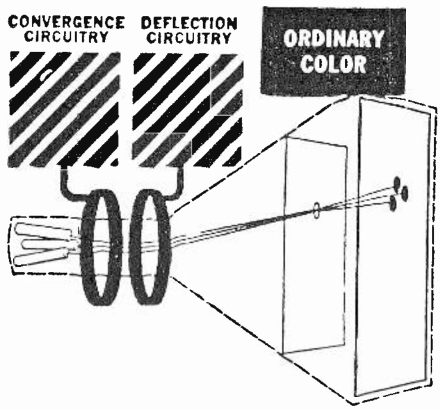
R154 is now excess and may be removed.

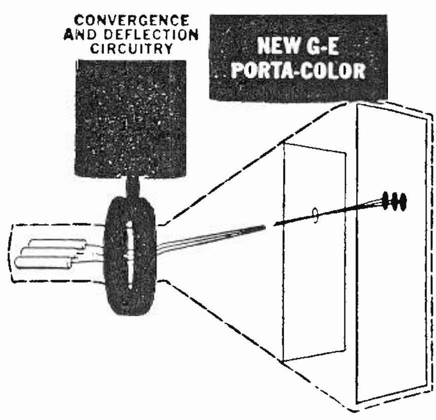
Care should be taken to insulate splices and prevent any lead dress shorts.

Porta-Color TV — New 14in. CRT

G-E's exclusive "in-line" CRT system will be employed in a new 14in. (picture diagonal) color TV soon to be introduced.

In announcing the new color portable, W. A. Estrabrook, general manager of the company's personal television department, predicted the "in-line" system would eventually ob-





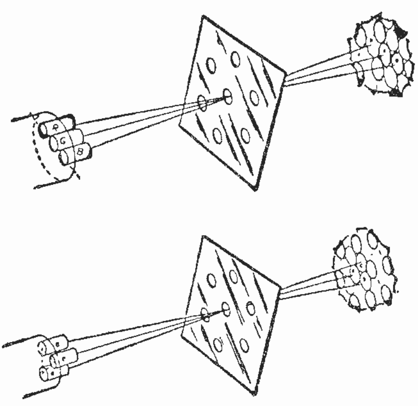
solete the now widely used "delta" system in color portables.

The in-line design — referring to the arrangement of the three cathode guns in the neck of the CRT — is substantially less complex than the triangular or delta systems used in other color picture tubes.

The three electron guns are placed in a horizontal row instead of a triangle. This means convergence can be accomplished in the horizontal axis — one of the axes used in deflection. Thus, the two functions of convergence and deflection can be handled by one set of circuits, eliminating much of the circuitry that ordinary color receivers require. Result — less weight, smaller size, lower cost.

11 in. Color CRT

The 11SP22 color CRT which G-E employes in its Porta Color TV uses the same principles as the standard aperture-mask color tube, but incorporates a different electron-gun arrangement. The three electron guns that produce the primary colors — red, green, and blue — are positioned in a straight line, instead of the "delta" or triangular arrangement used in the conventional tube. This switch to an "in-line" arrangement produces some far-reaching effect, according to the manufacturer. The convergence yoke, for example, is unnecessary and the remaining required convergence control is incorporated in the deflection yoke.



(Top) In-line gun arrangement of G-E 11SP4 color CRT. (Bottom) Gun arrangement in conventional color CRT

General Electric Improves Color CRT Brightness

Improved brightness for color CRTs is said to be provided by a new red phosphor which has been developed by G-E.

The new phosphor, a modified version of europium activated yttrium vanadate, is said to provide 20 percent higher brightness.

New Features in General Electric's 1968 Color TV Line

G-E's new line of large screen color TV receivers includes 23 models. One feature employed in the line is a new high definition CRT with no need for the etched faceplate. This tube is used in all 23in. models. A wireless remote control is used on selected sets and power tuning models.

Insta-View is included in 14 models. The picture appears almost immediately after the set is switched on.

All sets employ automatic fine tuning (AFT). After fine tuning control has been set for best reception on each VHF channel, the set automatically returns to the same optimum setting when it is switched on or when channels are changed.

"Meter-Guide" tuning will be featured in most 1968 models taking the guesswork out of fine tuning.

Large screen color sets have both 72 and 300 Ω antenna inputs.

G-E Service Notes

A peculiar problem which may be found in color receivers using any of the following chassis (CW, CX, CY, FY and CA) has been reported from the field. The usual complaint is poor or incorrect color and the hue control will not operate properly. The screen controls appear to operate on a different gun; for instance the red screen control may operate the green or blue gun.

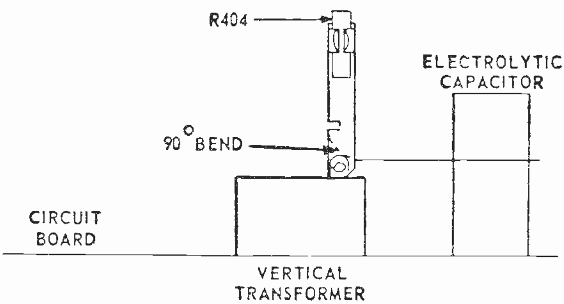
It has been determined that this problem is caused by nearby lightning strokes which magnetize the CRT aperature mask. The problem can be solved by degaussing the CRT.

TV Chassis SF—Vertical Buzz

Vertical buzz can be caused by the heat from resistor R404, causing the temperature of the vertical output transformer to rise sufficiently to soften the transformer wax. This allows the transformer laminations to vibrate, causing buzz.

To correct the problem remove resistor R404 from its bracket. Remove one screw and disassemble the bracket from the transformer and electrolytic capacitor. Then bend bracket 90° as shown in illustration and reassemble bracket and resistor. Allow transformer about one hour to cool off before applying power. This allows the wax to harden.

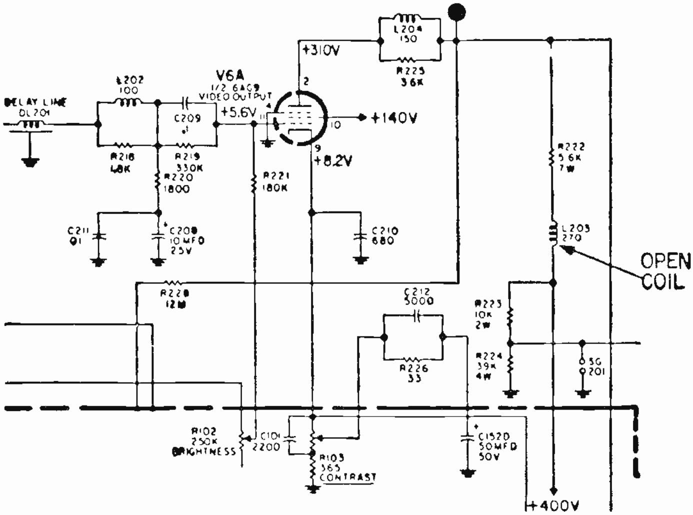
Maintain the following dimensions for the indicated receiver: In the SF1600 Series receivers, slide resistor R404 down in the clip to create at least a ½-in. space between it and the bottom of the VHF tuner cover. In the SF2200 Series receivers, maintain at least a 1-in. space between the resistor and the antenna terminal assembly.



Color TV Chassis KE—Open Video Peaking

An open video peaking coil L203, which feeds B+ to the video amplifier tube plate, V6A, may be caused by a shorted 6AG9 tube.

If L203 opens, the 320v B+ on the cathodes of the

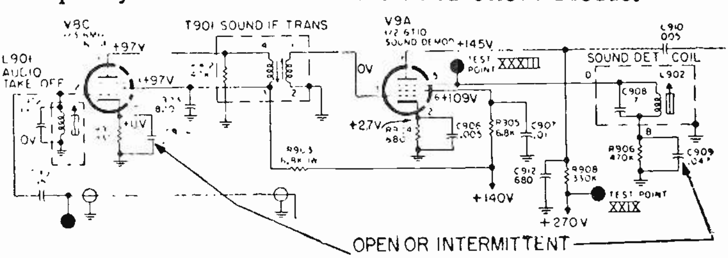


picture tube is reduced to a much lower level, which results in insufficient bias on the picture tube. This condition overloads V16, the high voltage rectifier, which usually fails. In addition the extra heat may damage the high voltage rectifier socket and cup.

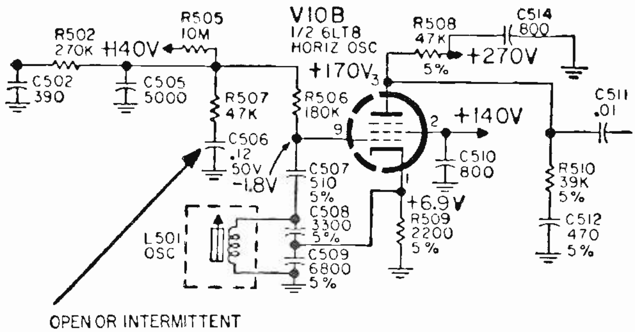
When encountering an open L203, check the condition of the HV rectifier and cup.

Color TV Chassis KE—Obscure Problems

The intermittent problem is one of the most difficult to troubleshoot. A few of those reported to have occurred infrequently in the KE chassis are listed below. Product



Service has verified the symptoms and cures and is passing them along to expedite repairs if these symptoms should occur. It should be understood, of course, that other components may also cause the same effects. Problem: Intermittent slight audio background buzz and distortion. Correction: Replace C904 (open or intermittent). Problem: Intermittent very weak audio and loud buzz. Correction: Replace C909 (open or intermittent). Problem: No HV, damper red hot, horizontal frequency very low. Correction: Replace C507 (open or intermittent). Problem: Intermittent gear tooth effect, pie-crust or horizontal pulling. Correction: Replace C506 (open or intermittent).

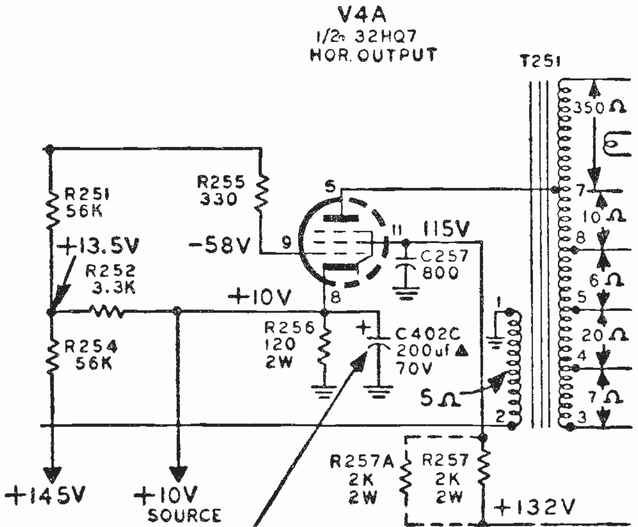


TV Chassis P—Improper Filtering

Troubles that seem to have no source can be difficult to pinpoint. An interesting case is the effective series resist ance (ESR) of an electrolytic. All electrolytic have this characteristic, which is usually of little consequence to the normal operation of a television receiver. But, we will examine a P chassis circuit in which this characteristic is quite critical.

ESR is related to the dissipation factor of electrolytics and should not be confused with leakage resistance. ESR is the sum of the resistances encountered in the electrolyte, leads and foils of the capacitor. This can be visualized as a resistor in series with the capacitor. In 200μf capacitors, ESR figures of 2Ω are not uncommon and generally present no problem at power line frequencies (60Hz).

Filtering of the 10vdc source in the P chassis is accomplished by C402C, a 200μf 70v electrolytic. In some sets where the ESR goes above 2Ω, some strange symptoms develop: picture contrast may vary from left to right (left being washed out, right being high contrast). Hori-



CHECK CAPACITOR

zontal tearing, vertical jitter and singing horizontal output transformers may also occur.

The troubleshooting procedure can be either waveform analysis using an oscilloscope, or bridging of the 10v line with a known good 200μf electrolytic. The VHF tuner 10v input terminal is a convenient test point. The oscilloscope pattern of a good electrolytic will show a 0.5v neg spike with a repetition rate of 15.75kHz. A defective unit will show something resembling a distorted 15.75kHz sinewave. As little as 0.3v P-P of this 15.75kHz sinewave component can cause problems in the picture. It is a good practice to bridge the replacement capacitor (ES31X7) into the circuit before removing the original unit to make sure the new unit will function satisfactorily.

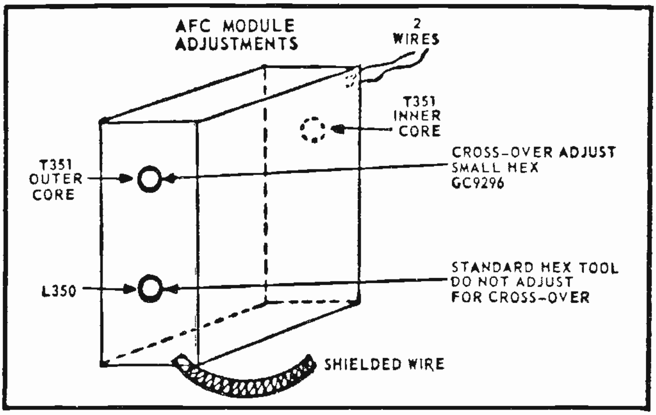
Replacement with a new electrolytic capacitor will normally cure the problem.

Color Chassis KE--Field Alignment of the AFC Module

A number of AFC modules have been received from the field in which coil L350 was misaligned, possibly because of mistaking this coil for the T351 cross-over adjustment.

We would like to re-emphasize that the T351 cross-over tuning core requires the use of a special small hex alignment tool (General Cement Co. GC9296 or equivalent). In contrast, L350 requires the standard hex alignment tool which is carried by all technicians.

Since the standard hex tool fits only L350, it is our feeling that this may account for the misalignment.



Color TV Chassis KE–HV Arcing to CRT Shield or Neck

When encountering a complaint of HV arcing from the CRT aquadag coating to the tube shield or through the neck to the guns, the CRT should not be replaced, unless it is defective for other reasons.

Correction of problem: (1) Inspect the grounding springs at points where they contact the aquadag coating. Aquadag will probably be burned enough to destroy contact. (2) Bend or reform ground springs to contact a fresh spot on the aquadag coating and be sure a good contact is made. (3) Replace the 6LJ6 regulator tube since arcing in this tube is usually responsible for the burned spots on the aquadag.

Failures of B + power supply rectifiers may also cause the arcing problems, since heavy transients always result from HV arcing.

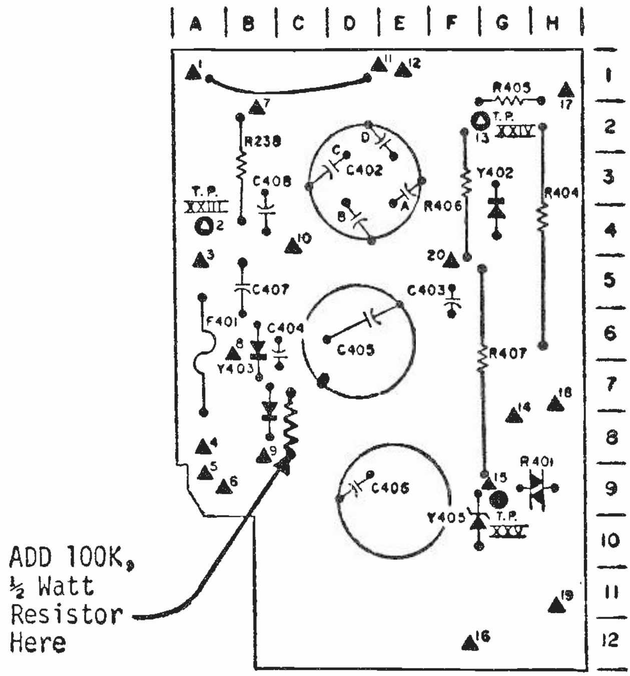
Color TV Chassis H-3—Adjusting High Voltage

The set should be allowed to warm up for 20 minutes or more before the final high voltage adjustment is completed. Reduce the brightness to minimum and adjust the HIGH VOLTAGE SET control to produce 17.2kv at second anode with 120v line input. Increase line voltage to 130v and make sure the second anode potential does not exceed 17.8kv.

Color TV Chassis C-1—Modification To Improve Degaussing Action

Inadequate degaussing action in some C-1 chassis receivers has been attributed to the charge remaining in electrolytic capacitor 2C405 when the receiver is switched off.

In current C-1 chassis production, a 100K, 1/2w carbon resistor has been added in parallel with 2C405 to provide



a discharge path to ground. Receivers bearing Serial No. 5D4 and higher are equipped with this resistor. It is physically located adjacent to rectifier Y404 on the power supply board.

To improve set performance, it is recommended that you add this resistor to any early production C-1 chassis when serviced.

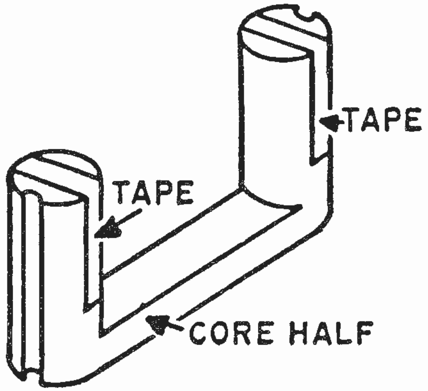
Color TV Chassis G-1—HV Voltage Transformer Squeal

There have been some complaints of high voltage transformer fundamental frequency squeal in G-1 chassis receivers. Current production receivers (EN433 and higher) are being manufactured with an increased HVT core air gap.

The air gap is controlled by special paper tape between the core halves. Originally, one thickness of tape was used to create this air gap. Now, two thicknesses of tape are used to create a 15 mil gap. The proper tape is Scotch Brand No. 280, which is available from your General Electric parts distributor under catalog number EP60X9.

To modify an early production receiver, dismantle the HVT and remove the original air gap tape from the core halves. There may be some versions with black plastic electrical tape used as pads between the core and high voltage cage. Remove these pieces of tape also. Use four pieces of new tape approximately 1 1/2 in. long. Attach tape to both ends of both core halves as shown in the drawing. Be careful that the tape does not wrinkle or have foreign material stuck to it, as this air gap dimension is critical.

The second part of the modification is the elimination of the pincushion correction circuit. Remove the brass screws securing the pincushion transformer assembly to the HVT cage and clip the transformer winding leads close to the terminal board. Discard the pincushion transformer, but salvage the terminal board and insulating strip. Securely mount the terminal board and the fish paper insulator



in the space formerly occupied by the transformer, using the same brass screws. Cut off any excess length of the screws. To restore continuity in the vertical yoke circuit, the green lead on the pincushion transformer terminal strip has to be moved one terminal to the rear which is a common ground point. This procedure leaves C275 (3μf) and R275 (22 Ω) out of the circuit on the power supply board. They can be left on the board or removed at your discretion.

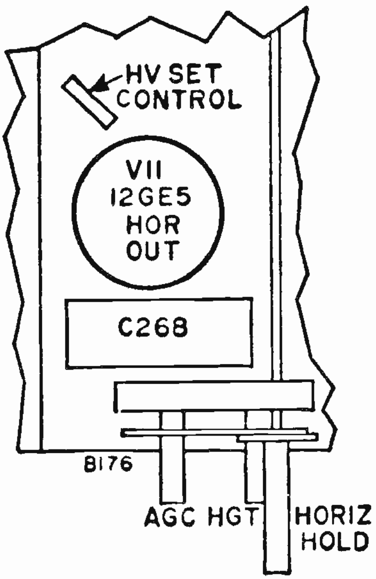
To insure proper performance of the set, it is essential that both steps of this procedure are performed. Eliminating the pincushion transformer will not adversely affect receiver performance, but will decrease the load on the horizontal output tube resulting in cooler operation and increased reliability.

Apply power to the receiver and reset the high voltage to 21kv at zero beam current (minimum brightness) with a line voltage of 120 vac.

Be sure to perform the safety check as specified in your G chassis service manual after reassembling the receiver.

Color TV Chassis H-3—High Voltage Regulation

In the H-3 chassis series of color television receivers, the high voltage is regulated by controlling the power delivered to the high voltage transformer. This power is controlled by the horizontal output tube plate current, which, in turn, is controlled by the horizontal output tube control grid bias voltage.



The high voltage regulating circuit monitors a voltage pulse from the high voltage transformer and automatically adjusts the control grid bias voltage according to the amplitude of this pulse.

A voltage dependent resistor (VDR), R272 and capacitor C275 are the principal components of the circuit. The VDR acts as a diode in series with a resistor. When the voltage across the VDR is high (700-1000v), its internal resistance is about 700K. At lower voltages this resistance increases to about 5M. From Pin 6 of the high voltage transformer, a positive going pulse is supplied to the regulation circuit. The amplitude of this pulse varies with the high voltage that is, as high voltage increases, pulse amplitude increases, and vice versa. This pulse, applied to the VDR through C275 and R274, causes the VDR to conduct and C275 becomes charged. Between pulses, C275 discharges through R274 and a parallel network made up of R265, R270 and R272, R273. The negative voltage developed by this discharge is coupled to the horizontal output tube control grid through R264.

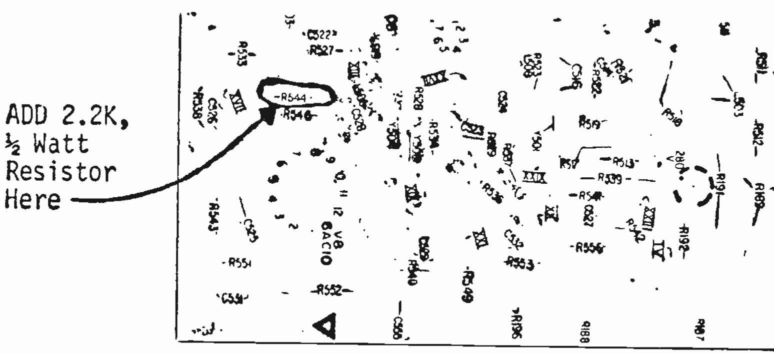
The charge developed across C275 can be increased by either raiding the pulse amplitude or reducing the resistance of the VDR. Because of the VDR's characteristics, both of these changes occur at the same time. The result is that larger voltage changes are developed from small pulse amplitude changes than would be the case if the VDR was a simple diode.

Should the pulse amplitude increase (indicating a rise in high voltage), C275 will receive a greater charge, and a more negative bias voltage will be developed and coupled to the control grid. Plate current through the horizontal output tube and the high voltage transformer will be reduced, and the high voltage will return to normal.

The high voltage set control, R273, limits the current flow through the regulation components and limits the charge impressed on C275. The control (shown in diagram) should be adjusted to produce 17.2kv at the CRT second anode when the brightness is at minimum and the receiver is operating with 130vac line input. Increasing the line voltage to 130vac should not cause the second anode voltage to exceed 17.8kv.

Color TV Chassis C-1—Chroma Noise

A change has been incorporated in late production C-1 chassis receivers to reduce chroma noise in weak signal locations. The value of the matrix resistor, 4R544, has been changed

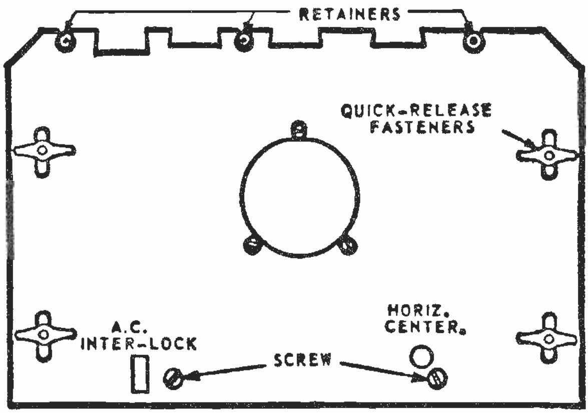


COPPER SIDE

from 2.7K to 1.2K to improve the signal-to-noise ratio in the G-Y color difference amplifier. If needed, this improvement can be incorporated in early production receivers by paralleling the 2.7K resistor with a 2.2K, 1/1w resistor. The 2.2K resistor can be placed on the bottom of the circuit board.

Color TV Chassis KE—Quick Removal of Cabinet Backs

In the near future it will be possible to quickly remove the masonite backs from KE line color television cabinets by removing only two screws instead of the usual nine. To accomplish this, the masonite cabinet backs have been redesigned to use four quick-release fasteners (two at each side) and three permanently positioned retainers at the



top rear of the cabinet. One screw is located adjacent to the ac interlock and the other screw is near the HORIZONTAL CENTERING control. To remove the back: (1) Remove the two screws. (2) Rotate the quick-release fasteners until they are vertical (parallel with opening). (3) Remove the masonite back by pulling out at the bottom to disconnect the ac interlock and then carefully pull down about ½ in. to release the top of the cabinet back from the three retainers. Now pull the back straight out and away from the cabinet. Precaution: ALWAYS HOLD THE CABINET BACK FIRMLY DURING DISASSEMBLY TO PREVENT THE BACK FROM DROPPING AND HITTING THE PICTURE TUBE NECK. THIS PRECAUTION APPLIES TO THE DISASSEMBLY OF ANY CABINET BACK. To replace the back: (1) Push the back under the three retainers at the top of the cabinet. (2) Push in at the bottom and connect the ac interlock. (3) Rotate the four quick-release fasteners to a horizontal position (across the holes). (4) Replace the two screws.

Color Chassis KE—Service Information
KE Chassis-Power Supply Diode Failures

Whenever a CR109 or CR110 power supply diode failure occurs, you should add .001μf, 1kv (ET22X58) capacitors across diodes CR109 and CR110. A capacitor is packed with each replacement diode. This provides added protection against voltage surges which may damage the diode.

These capacitors were added to production sets starting with Ser. No. OS4E.

Preset Fine Tuning Adjustment Shifts

Investigation has shown that some complaints of this nature are caused by interference between the channel selector and fine tuning knobs because of the selector knob being pushed on too far.

At present, the production line is adding a thin washer between these knobs to prevent interference. In later production, the knobs will be revised to prevent the condition and eliminate the washer.

The simplest solution is to pull the selector knob out slightly so that it does not rub on the fine tuning knob. You may be able to eliminate some service calls by instructing the customer to do this.

In the event that you find cases where the problem reoccurs, contact your General Electric television distributor for washers to be placed between the knobs.

Color TV Chassis KE—High Voltage Arcing

A few reports have been received concerning intermittent high voltage arcing in the KE chassis. In some cases this did not occur when the service man was present, then repeat calls were sometimes necessary to discover the defect.

If you should encounter such a condition, the receiver should be inspected for evidence of high voltage arcing in the most likely places such as defective spark gaps, spark gap capacitors C116 or C117 damaged, anode lead and connector, or arcing to the picture tube shield or neck. If no indication of a defect is found, the 6LJ6 high voltage regulator tube V17 should be replaced. Some cases of intermittent high voltage arcing have been traced to this tube.

After the problem has been rectified, it is very important that the high voltage be adjusted to the correct value for the particular receiver. If the high voltage cannot be adjusted, it is probable that the arcing has opened cathode resistor R132. The spark-gap capacitors C116 and C117 should also be checked for damage.

Color TV Chassis H-1—Intermittent Hum Bar

An intermittent hum bar in the 10 in. H-1 Color chassis receivers may be caused by a poor connection at the black ground lead from the vertical output transformer.

On some sets, this lead is grounded at the same terminal board as the AC line choke. Poor contact with chassis ground because of a loose or stripped screw can cause AC to modulate the vertical sweep, producing intermittent hum in the picture.

Move and solder this black ground lead to the lance located on the top right side of the high voltage transformer cage.

The black lead from the convergence assembly is also connected to this point. Check the terminal board screw for tightness. If stripped, replace with a larger diameter screw or solder the lug and screw to the high voltage cage. Be careful not to change the lead dress or damage any wire insulation in this area while soldering.

Etched Surface On Picture Tube Face-Plates

Some television picture tubes, both color and monochrome, have etched face-plates to minimize glare and reflections. The etching process produces random microscopic depressions in the face-plate surface. If any foreign adhesive material becomes embedded in the depressions of the etched surface, it is virtually impossible to remove. This will cause light refractions which will be noticed principally on color programs. It is very important, therefore, that the following cautions be observed.

Caution: Never stick tags, banners or labels to an etched face-plate with tape, glue or other means. In addition, never write or mark on the etched surface with any writing devices. These include wax crayons, felt-tipped marking pens and the common graphite pencils.

Returning Tuners for Repairs

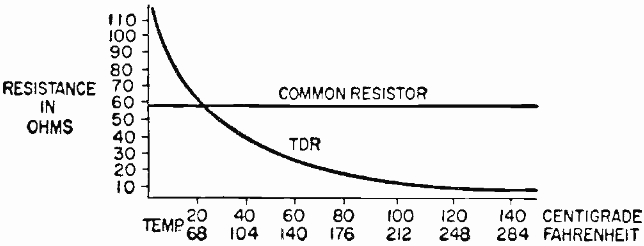
We wish to stress the importance of proper handling of VHF tuners (and UHF Tuners) which you return for repairs. Improper or careless handling and packing of tuners means additional work for the repair service plus the possible introduction of extra defects, including intermittents. Therefore, in the interest of improving the quality and prompt return of tuners from the repair service, the following points should always be observed: (1) Clip all wires at feed-through capacitors. (Unsoldering frequently damages the feed-through capacitor.) (2) Do not clip IF line cables. Unsolder carefully to preserve the cable length and prevent damage to tuner feed-through. (Unsolder at tuner end.)

Color TV Chassis KE—Obscure Problems

Problem: 1. Grayish hum bar floating vertically at low brightness. Cure: Replace C201 and/or C202 (either may be open). 2. No video, vertical retrace lines, no audio (short surge of normal audio immediately after set is turned off). Cure: Replace C202 (shorted) 3. Horizontal bending or pulling, black floating hum bar. Cure: Replace C152 ("B" section open).

Testing the TDR

The TDR is a non-linear resistor whose resistance is a function of temperature. The heat that influences the TDR can be externally applied or developed by the current passing through the device. Characteristics of a typical negative coefficient TDR are compared with an ordinary resistor in the graph shown.



TDR's were used initially in filament systems for controlling warm-up or limiting surges. They were commonly referred to in the past as "glow bars." Currently they are being used extensively in automatic degaussing circuits and deflection yoke circuits. In degaussing circuits they provide a fading effect which results in a gradually decreasing magnetic field that eliminates undesired magnetism. In deflection circuits they correct for the increased resistance of the windings as they heat up.

TDR's can usually be checked with an ohmmeter. To test a TDR, connect an ohmmeter to the device and apply a source of heat (such as a soldering iron or heat lamp). The resistance of the TDR will change as the temperature changes. For low ohmic values, the heating effects of the meter current will have to be allowed for.

Some of the TDR's currently being used include:

EP14X10	100Ω@25°C	(C chassis)
EU14X147	3.8Ω@25°C	(C chassis)
EP14X206	1.052M@25°C	(G chassis) (H chassis)
EP14X5	120Ω@25°C	(G chassis)
ES14X213	3000Ω@25°C	(TC/T--1 chassis)

25° C is assumed to be normal room temperature and all resistance figures are ±25 per cent.

Voltage Dependent Resistors (VDR-Varistors) and Temperature Dependent Resistors (TDR-Thermistors)

In modern television design, devices are being used in critical circuits to automatically adjust circuit parameters to maintain constant performance regardless of variables such as line voltage changes, component aging and thermal effects.

Two of these devices which are quite popular today are the VDR and TDR. Both are non-linear resistors. This means that doubling the voltage across them does not double the current through them. These non-linear resistors can be manufactured with either a positive or negative coefficient. A negative coefficient device is one whose resistance will decrease with an increase of the electrical or environmental conditions to which it is sensitive.

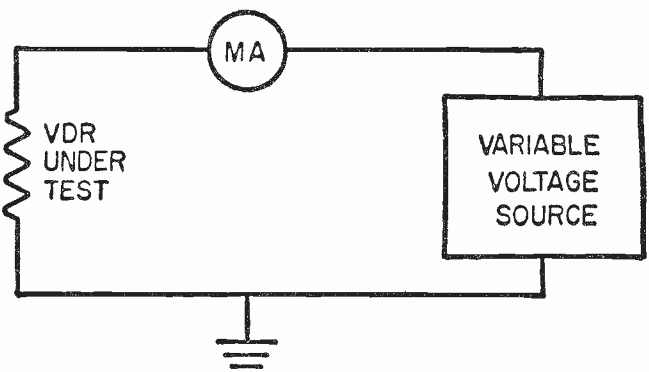
Checking a non-linear resistor requires some knowledge of how it functions. A simple ohmmeter check will not provide an accurate test. Most non-linear resistors can be checked in operational circuits using simple voltage measurements and observing circuit performance. The absolute ohmic value is not important—the device's reaction to environmental change is what must be determined.

Testing the VDR

The VDR is a non-linear resistor whose resistance is a function of voltage. VDR's currently used in General Electric portable TVs have a negative coefficient.

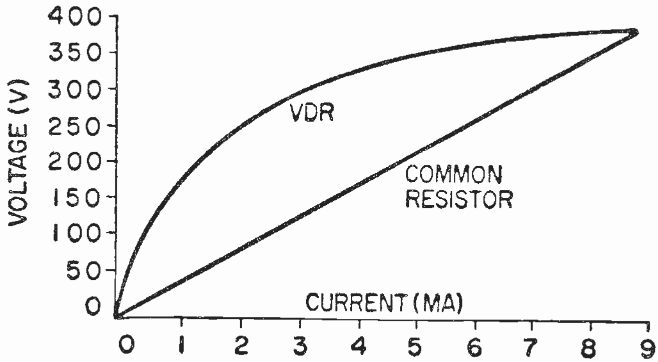
VDR's are used in high voltage regulator and boost voltage circuits and in degaussing circuits.

Most VDR's will read open when checked with a simple ohmmeter. Therefore, the VDR must be tested by applying a voltage to it and measuring the current through it. Such a test may be done with the VDR in the TV circuit or in a special bench test circuit. In either case, a milliammeter is placed in series with the VDR, and the voltage applied to it is varied.



Plotting a graph of voltage vs. current for the VDR shows its performance characteristics. Such a graph might look like the one shown.

VDR's come with many voltage and current ratings, so don't expect the values in the graph to exactly agree with the numbers on your graph. The important thing is for the



non-linearity of current change with voltage variations to be evident.

In most instances, suspected defective units can be verified by checking the current at the voltage specified in the parts list.

Some of the VDR's currently being used include:

EU14X196	65MA@20v±20%	(C chassis)
EP13X1	65MA@20v 20%	(G chassis)
EP13X2	1MA@850v±15%	(G chassis)
ES14X212	1MA@ 17v±15%	(TC/T-1 chassis)

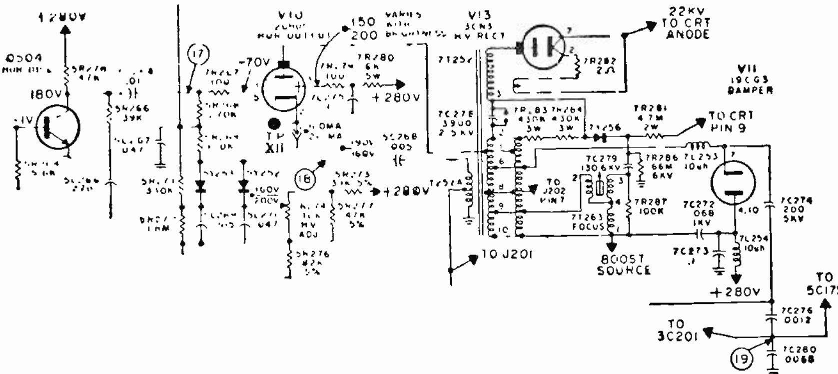
One precaution must be observed with this test procedure: Don't exceed the power rating of the VDR. Power ratings are similar to carbon resistors; that is, physical sizes are approximately the same. Also, note that VDR's have a negative thermal coefficient, so the readings should be taken quickly.

Color TV Chassis C-1—Troubleshooting "No High Voltage" Problems

"No High Voltage" problems in C-1 chassis receivers can be easily solved if a systematic troubleshooting procedure is used and one important point is remembered.

The point to remember is that the drive signal to the horizontal output tube grid cannot be measured with a dc voltmeter. The dc grid voltage is a combination of the voltage produced by grid rectification of the drive signal, and the feedback voltage developed by the high-voltage regulation system. A fault in the horizontal output stage may result in less feedback voltage and consequently less dc voltage on the grid. Therefore, using this dc voltage as a measure of drive signal can lead to false conclusions.

The easiest troubleshooting method is to systematically isolate the horizontal output stage from its various load circuits, making use of the plugs and sockets incorporated in the receiver design. During this procedure, connect a high-voltage meter to the CRT second anode to continuously monitor the high voltage. If disconnecting a component restores the high voltage, the trouble is obviously in that component or its associated circuitry.



Troubleshooting Procedure

- Change the tubes; V10, horizontal output; V11, damper; V13, HV rectifier.
- Disconnect the CRT socket. This checks the possibility of a shorted CRT. Leave the CRT socket disconnected while performing the following step. Otherwise, should the high voltage be restored with the yoke disconnected, the undeflected beams may permanently damage the CRT screen.
- Disconnect the yoke plug. With the yoke and CRT disconnected, the normal high voltage is 10 to 12kv. The boost voltage will remain normal at 750 to 860v. If the trouble is not in the yoke, reconnect the yoke, and CRT.
- Disconnect the convergence plug. If the problem is in the convergence assembly, all voltages will return to normal.

CONDITION	HORIZONTAL OUTPUT SIGNAL GRID P-P VOLTS	HORIZONTAL OUTPUT SIGNAL GRID DC VOLTS	HORIZONTAL OUTPUT SCREEN GRID DC VOLTS	B BOOST VOLTS	HV CRT SECOND ANODE	FOCUS VOLTS	JUNCTION 5C268 T252A, P-P VOLTS
Normal receiver	270	—70	150 to 200	740	22kv	4kv	560
Convergence plug disconnected	280	—82	155 to 200	680	20kv	4kv	560
Yoke plug disconnected	250	—54	70 to 75	860	10 to 12kv	3kv	380
Focus coil and rectifier disconnected	270	—76	160 to 200	725	25kv	68v	580
Junction 5C268, T252A shorted to chassis	220	—44	90	625	20kv	5kv	0
5C268 open	240	—46	90	720	26kv	4.5kv	600
5C268 shorted	240	—46	90	700	26kv	4kv	600
7C280 shorted	270	—88	160 to 200	750	22kv	4kv	560
7C276 shorted	270	—74	155 to 200	700	22kv	4kv	520

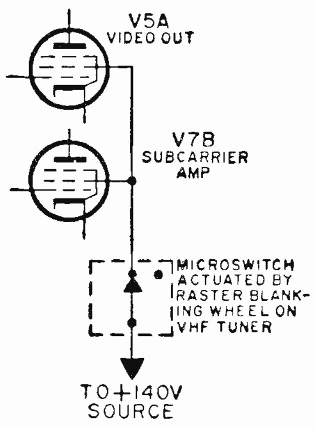
- Check the drive voltage to the horizontal output tube with a scope connected to the junction of 5C264. The P-P voltage should be 200v or more.
- Check the screen voltage of the horizontal output tube. Use a socket adaptor or measure at the terminal board adjacent to the socket. (The third terminal from the side of the receiver is the screen connection. It is accessible from the top of the chassis.) The voltage is normally 150 to 200v. It will drop to 70 to 90v if the yoke is disconnected or if the high-voltage regulation system is not operating.
- Unsolder the focus coil and the focus rectifier. If the problem is in this circuit, all voltages will return to normal, except there will be no focus voltage.

This procedure checks all the major components in the horizontal output circuit except for the high-voltage transformer. Before concluding that the transformer is defective, check the miscellaneous small components in the circuit—capacitors, resistors, choke coils, etc.

The voltages in the chart were taken at the points indicated, using a normal receiver with faults introduced as noted. It illustrates the effect that output circuit faults have upon horizontal-output-tube-screen and control-grid voltages and may be an additional aid in troubleshooting C-1 receivers.

Color TV Chassis C-1—Brightness Elimination

Channels on which the picture tube raster is to be blanked may be programmed for brightness elimination without removing the cabinet back as follows:

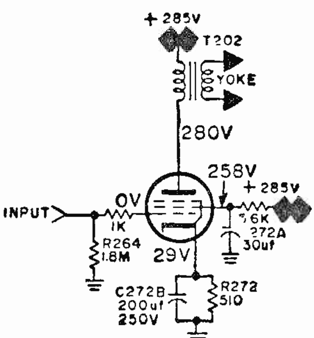


Remove the screw from the plastic cover plate on the cabinet back and swing the plate to one side, exposing the access hole. Turn the channel selector until the desired channel number can be seen through the hole, which affords a partial view of the numbered program wheel. Insert a long-bladed screwdriver through the hole and into the slot of the plastic program button nearest the selected channel number. When not in position for programming, the buttons normally lie lengthwise, forming a circle, with their round ends pointing clockwise. To place a button in the programmed position, turn it a quarter-turn counterclockwise until it detents with the rounded end pointing straight out from the wheel center.

Color TV Chassis N-1—Vertical Sweep Circuit

Modern sweep circuit design is becoming increasingly more sophisticated. New circuits have been developed to meet the more critical performance requirements of color television. Linearity must be better, efficiency must be better, and satisfactory performance must be delivered throughout the usable life of the components without re-adjustments.

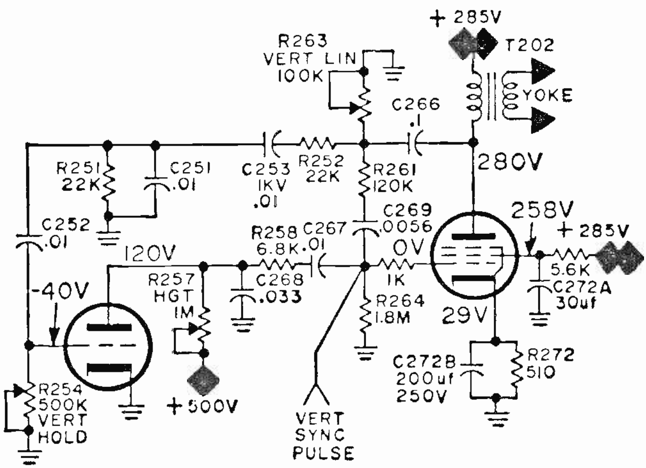
The N-1 chassis incorporates one of these advanced design concepts in its vertical deflection system. In effect, the circuit is said to automatically correct for the aging characteristics expected in vacuum tube amplifiers, maintaining satisfactory deflection throughout the life of the tube. The vertical circuit is oscillatory but more precisely, it is a Ramp (sawtooth) generator system.



VERTICAL OUTPUT STAGE

The vertical output stage is a conventional pentode power amplifier, class A operated, obtaining its bias from a standard RC cathode network. The output is taken through a transformer that matches the impedance of the output tube to the impedance of the yoke. The control grid receives three signals: A degenerative feedback signal is coupled from the plate to the grid through a low-pass filter made up of resistor R261, capacitor C269 and the other components in the grid system. Another signal, the generator ramp voltage, is coupled from tube V10A. The third signal applied to the grid is the vertical sync pulse from the sync separator.

To simplify the explanation, let's assume a dormant situation immediately prior to the arrival of a sync pulse. The pentode power amplifier (a high-gain device) is ready to react to whatever arrives on the control grid. Along comes the negative-going sync pulse, a comparatively high-frequency component; it is amplified and appears at the plate as a positive-going pulse. The amplified, positive-going sync pulse is coupled into the triode section of the vertical tube. Since the pulse is applied to the grid of this tube, the triode turns ON causing both grid and plate current to flow. Current flowing in the grid circuit charged capacitor C252 while the plate current discharges capacitor C268. As the sync pulse passes, capacitor C252 begins to discharge through the Vertical Hold control and resistor R251. The resulting voltage drop across the Hold control switches the triode OFF. The time constant of the Hold control and capacitor C252 is such that the triode will remain cut off for at least 1/60 of a second. The instant the triode was switched OFF, capacitor C268 started to charge through the Height control. The voltage across capacitor C268 is coupled to the power amplifier control grid and becomes the sweep-drive signal. The voltage on the vertical output tube grid is a modified sawtooth having a rounded bottom. The sweep current delivered to the yoke is sawtooth because of the transformer design.



VERTICAL CIRCUIT SIMPLIFIED

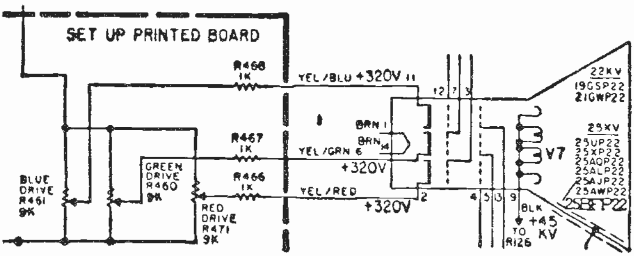
The three signals are applied to the control grid of the vertical output stage. The sync pulse and the generated ramp (sawtooth) voltage were just described. The third signal is the degenerative feedback signal from the plate circuit. Included in this feedback loop is the Linearity control and the automatic correction for the aging tube feature mentioned previously. By degenerative, it is meant that the signal is out of phase and tends to oppose the original signal appearing at the grid. A significant point about this signal is that it must be substantially attenuated or else the feedback signal would completely nullify the drive signal going to the amplifier. In addition to being attenuated, the feedback signal is altered by virtue of the low-pass nature of the feedback loop. The automatic correction feature results from the fact that as the feedback signal diminishes the ramp generator signal experiences less opposition: consequently, the amplifier is driven harder. The end result of all this is that a constant raster size is maintained throughout the life of the vertical output tube.

Vertical linearity control is included in this degenerative feedback signal. The technique of control may not be readily apparent. In effect, the Linearity control is a signal shunt and produces the desired results by shunting a portion of the feedback signal to ground.

Color TV Chassis KE—Red Drive Control on Set-up Board

Beginning with KE Chassis Serial Number OTIG, a 9K Red Drive Control, R471, was added to the set-up board. At the same time, Green Drive Control, R460, and Blue Drive Control, R461, were changed to 9K.

Potentiometer, R471, was added to provide a drive control for the red gun of the new picture tube, Type



25BFP22. Each control has a value of 9K so that the three controls in parallel provide a 3K load on the video output tube.

To make gray scale drive control adjustments in KE chassis models using picture tube types other than 25BFP22, rotate the Red Drive Control, R471, fully clockwise and leave it in this position. Now make the usual gray scale adjustments using the Green and Blue Drive Controls just as if the Red Drive Control were not present.

In chassis using picture tube type 25BFP22, rotate the Green Drive Control, R460, fully clockwise. Advance the Red Drive Control, R471, to produce a yellow background. If yellow cannot be attained with the Red Drive Control at its maximum clockwise position, then leave the Red Drive Control at maximum clockwise and retard the Green Drive Control (counterclockwise) to produce yellow. Adjust the Blue Drive Control, R461, to produce gray.

At the end of the gray scale adjustment procedure, either the green drive control or red drive control must be at its maximum clockwise position.

Color TV Chassis C-1—Focus Tracking Network—Arc and Raster Bloom

In the C-1 chassis receivers, arcing in the Focus-Tracking Network Spark Gap on capacitor 7C278 can be caused by problems in any of the following: video amplifier, CRT, HV rectifier, focus and focus tracking (see this month's TEKFAX Schematic No. 1353).

Since the focus-tracking network is in series with the high-voltage rectifier and the focus rectifier, any unusually large current through these circuits will cause a large voltage drop across the focus-tracking resistors and cause the spark gap to arc continuously. This lowers the CRT second anode voltage so that the raster blooms.

Use the following steps, in the sequence given, to determine which circuit is causing the arcing. If the arcing does not stop by applying the first step, replace the CRT socket, etc., so that the set is in operating condition before proceeding to the next step. Follow the same procedure with succeeding steps.

- Disconnect the CRT socket. If the arcing stops, the trouble is caused by wrong CRT bias voltages. This can be confirmed by checking the CRT cathode-to-control-grid voltages. The grids are normally —100 to —150v with respect to the cathodes. If this voltage should change to —50v or less, heavy current will flow through the focus-tracking resistors 7R283 and 7R284. Since the video amplifier is dc coupled from the video detector to the CRT, incorrect CRT bias voltages could be caused by any of the following: plate-to-cathode short in tube V5a; V5a cathode-to-chassis short; shorted capacitor 4C179; shorted transistor Q304; shorted transistor Q301; open resistor 3R169.
- Remove the HV rectifier tube, V13, and position the plate cap so that there is no danger of an arc from the cap to chassis ground. If the spark gap arcing stops with the rectifier tube out, check the rectifier tube, its filament winding on 7T252 and the CRT.
- Disconnect 7Y256 Focus Rectifier cathode from the focus circuit. If this stops the arcing, check the focus rectifier and the focus circuit components 7C279, 7T263, 7R281 and 7R286.
- Check Focus Tracking resistors 7R283 and 7R284. This can be most easily done by measuring the resistance between the focus rectifier anode and the plate cap of the

horizontal output tube, V10. The resistance should be 860K.

- Replace the spark gap capacitor.

Color TV Chassis N-2—Troubleshooting Guide

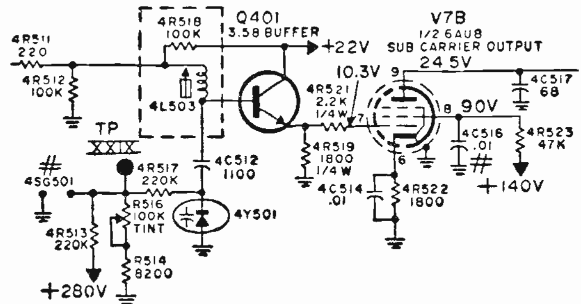
The N-2 chassis can be followed in May 1971 TEKFAX schematic No. 1357.

SYMPTOM	POSSIBILITIES
No raster	Defective tubes (Horizontal Output, Damper, High-Voltage Rectifier) 15v source out of order (open resistor R401 or shorted diode Y203). Transistor Q204 shorted base to emitter. NOTE: Anytime replacement of fuse F402 or F403 restores operation of the receiver, be suspicious of the horizontal output tube, 21LG6, it may be intermittently arcing.
Poor or intermittent focus	Resistors R241, R242, R243, or focus spark gap. The resistors can open or develop arc circuits to chassis ground through the focus module container walls. (Do not attempt to repair the focus module. Replace it!) Microscopic particles within the focus spark gap can produce corona, causing focus problems. Clean the gap with a soft rag or cotton-tipped applicator soaked in alcohol (with the receiver de-energized).
Continuous arcing of focus spark gap	Resistor R243—open
No sync	Capacitor C311—open
Negative picture with full contrast setting	Capacitor C159—shorted
No video	Delay line—open (usually broken leads at mounting terminals)
No vertical sweep	Capacitor C272—shorted
Intermittent or drifting horizontal oscillator	Capacitor C207—leaky or shorted
Driveline center of screen	Transistor Q204—excess leakage
Scallop pattern across top of raster	Capacitor C523—shorted (transistor Q502 functions as an amplifier)

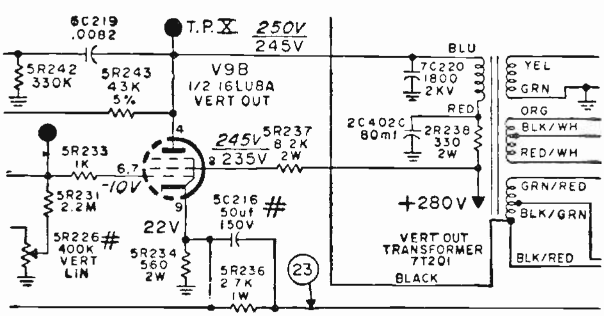
SYMPTOM	POSSIBILITIES
Vertical jitter (sensitive to line voltage fluctuation)	Change resistor R251 to 68K and capacitor C251 to 0.015μf/400v
AGC trouble	Check for cracked copper pattern in left front corner of signal board. (Keying pulse circuit.)
Blooming (slight) (N2 Chassis)	Diode Y155 (dc restoration) and/or diode Y156 (CRT cathode current limiting diode) may cause B+ fuse to fail.
Blown fuse F402	Check B+ input to UHF tuner for solder bridges.
Gray scale tracking	Check CRT emission.
Very low brightness (N2 Chassis)	Resistor R410 open. 15v line being energized by tube V5C video amplifier cathode.

Color TV Chassis C-1—Troubleshooting Guide

Symptom: Intermittent or weak color. Cause: Shorted 3.58 Buffer Transistor Q401.



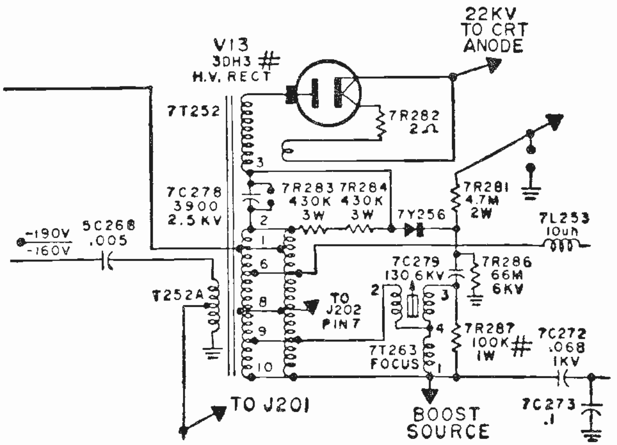
Symptom: No vertical sweep. Cause: Resistor 2R238 open. Check load side of resistor for short.



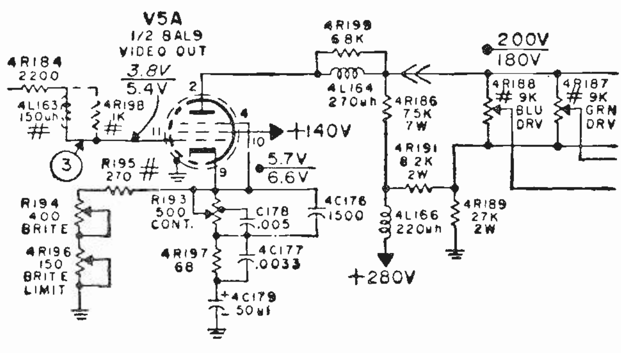
Symptom: Lacks vertical sweep and will not adjust with VERTICAL HEIGHT and LINEARITY controls. Cause: Electrolytic capacitor 5C216 open.

Symptom: Vertical foldover on bottom of raster. Cause: The vertical output transformer (7T201) has low inductance. The inductance may check with an ohmmeter.

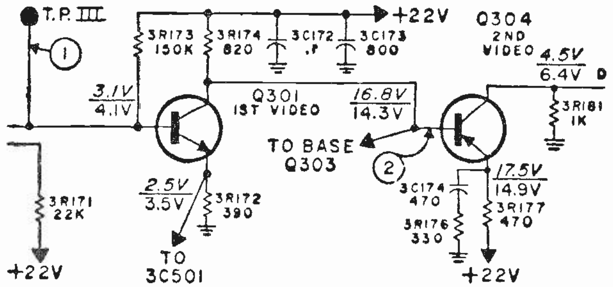
Symptom: Arcing in focus tracking network. Cause: Defective capacitor 7C278.



Symptom: Arcing in focus tracking network. Excessive CRT beam current creates a large voltage drop across focus tracking resistors, 7R283, 7R284, causing the protective spark-gap capacitor, 7C278 to arc continuously. Possible Causes: Video output tube 8AL9 shorted. Electrolytic capacitor 4C179 shorted. CONTRAST or BRIGHTNESS

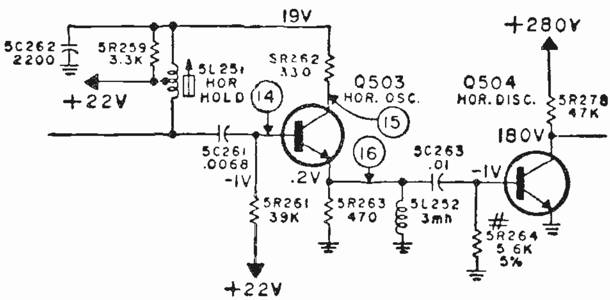


control wiring or terminal shorted to ground. The second video transistor Q304 shorted. The first video transistor Q301 shorted.



Symptom: Raster weave. Cause: Internal leakage in damper tube 19CG3.

Symptom: Arcing at HV rectifier socket. Cause: Leakage in corona seal. Remove corona seal, replace any damaged components, and install new corona seal, ET90X23.



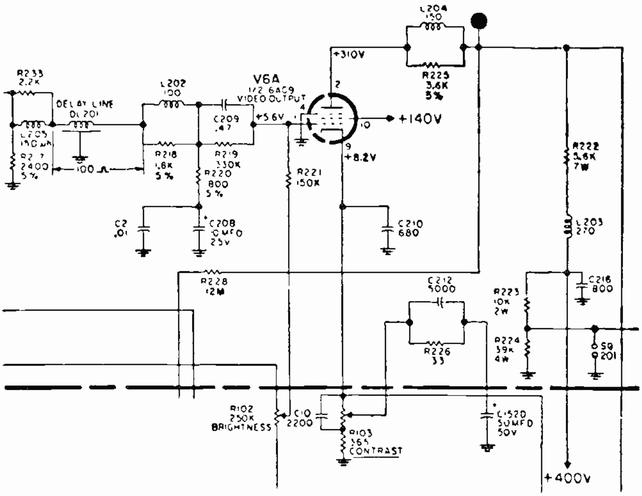
Symptom: Low level ac hum (mechanical and can be heard with VOLUME control down). The line chokes are dressed against chassis below ac interlock. Remedy: Dress line choke away from metal.

Symptom: Horizontal foldover in center of screen (drive line). Cause: Defective horizontal discharge transistor Q504.

Color-TV Chassis KE—Low-Resistance Contrast Control

In the KE and KE-II chassis there is a 6AG9 video amplifier tube (V6A) which upon failing can produce excessive cathode current. This may burn a spot on the CONTRAST control (R103) changing its resistance to 200Ω and 300Ω with a corresponding reduction in cathode bias.

Past practice has been to change only the 6AG9, since control R103 was not suspected of being defective. When only the 6AG9 is changed, the picture will bloom and pull in at the sides at maximum brightness and contrast—even with the picture tube bias at minimum. The pull-in is caused by the loss of high-voltage regulation. Even under these conditions, a reasonably good picture usually can be attained by readjusting the picture-tube bias and gray scale, but the adjustments are critical.



The correct procedure, when replacing the 6AG9 video amplifier tube, is to measure the value of the CONTRAST control (R103), replacing the control if it measures 290Ω or lower.

One possible cause of 6AG9 tube failure is the position of a wire support. A stiff steel wire support extends upward from the KE circuit board near Pin 12 of the 6AG9. This steel wire has a loop at the top which supports an insulated lead. In many cases the steel wire support touches the glass envelope of the 6AG9 and causes an extremely small hole in the glass, resulting in loss of vacuum. This type of failure may account for the excessive current through the 6AG9 and the burned spot on the CONTRAST control.

Whenever you service a KE color-TV chassis or replace a 6AG9, bend the steel wire support away from the 6AG9 so that no part of the support touches the glass envelope.

Remember a high-voltage power supply fault can create a problem similar to that caused by the defective CONTRAST control, with respect to blooming and picture pull-in or poor regulation. This of course can involve improper drive, the hold-down circuitry, poor regulator tube efficiency, high-voltage adjustment, and so on.

A good indication of the overall condition of the high-voltage power supply can be obtained by measuring the regulator cathode current and adjusting the high voltage to that recommended in the service manual. If the regulator cathode current is less than 0.9ma with the BRIGHTNESS, CONTRAST and CRT BIAS controls at minimum, then you can suspect that there is a problem in the high-voltage power supply.

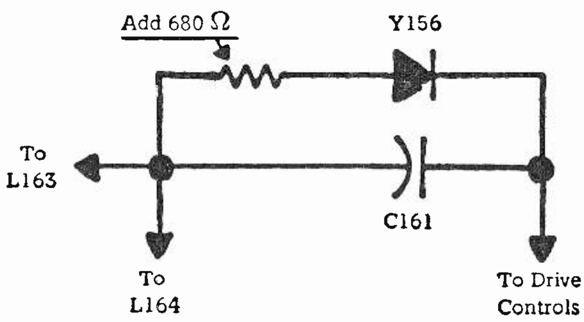
Color-TV Chassis N-2—One Color Missing

Remove the picture tube socket and check G-2 (Pins 2, 5, 12) and G-1 (Pins 3, 13, 16) socket voltages. If one voltage is much lower than the other two, this terminal may be shorted to ground (Pin 8) through the spark gap.

If the suspect terminal reads a very low resistance to ground, replace the socket with part no. EP34X12. Do not attempt socket repair. Check resistors R531, R532, R533 for changes in value.

Color-TV Chassis N-2—Blooming Picture

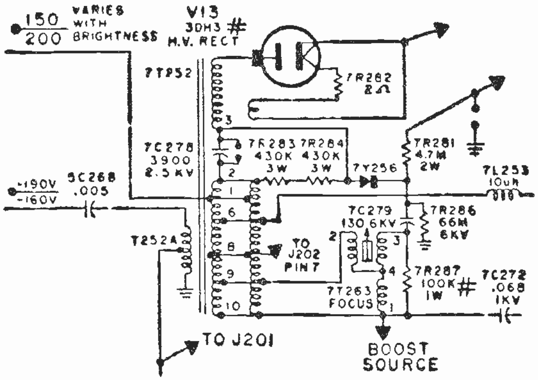
When either diode Y155 or Y156 fails, add a 680Ω, ½w, 10% resistor in series with the anode side of Y156, as shown in illustration. Splice the resistor to the anode side of



Y156 and insert the assembly into the circuit board where Y156 was removed. This will correct the problem, which is basically caused by internal arcing in the picture tube.

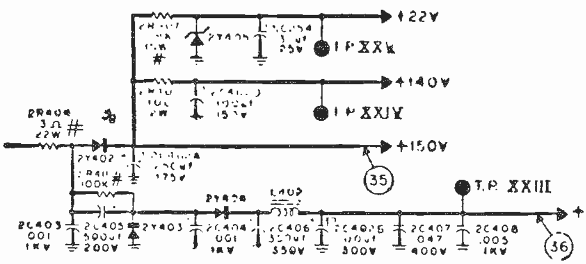
Color-TV Chassis C1/L1—Blooming—Excessive High Voltage and Poor Color Sync

To correct this problem, check for a cold solder joint at the ground end of the high-voltage pulse winding. (The pulse winding is located on the high-voltage transformer core at the rear of the high-voltage cage.) The ground wire is bare and is connected to a lug on the inside of the high-voltage can, forward and slightly below the pulse winding.



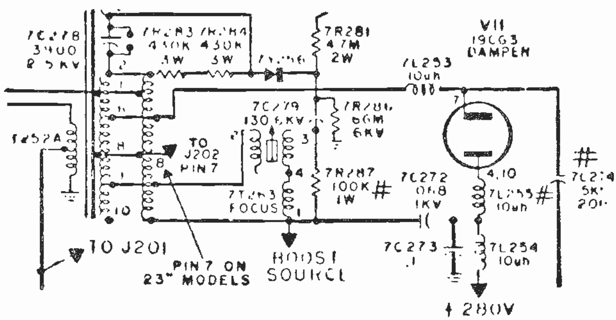
Color-TV Chassis C1/L1—Troubleshooting Guide

Symptoms of no raster or sound can be caused by an open resistor (2R406 or 2R404). In early production



models replace the 2Ω, 10w resistor with a 2Ω, 15w resistor, Part No. EP14X9. In later production models, replace the 3Ω, 15w resistor with a 3Ω, 22w resistor, Part No. EP14X24.

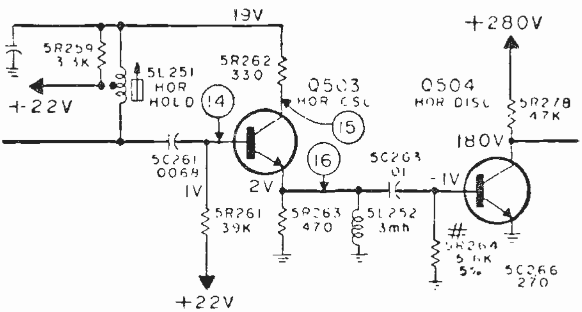
A no raster problem can be caused by an open resistor 2R407. The chassis will then not have the 22v B+ source voltage, which causes the horizontal output tube

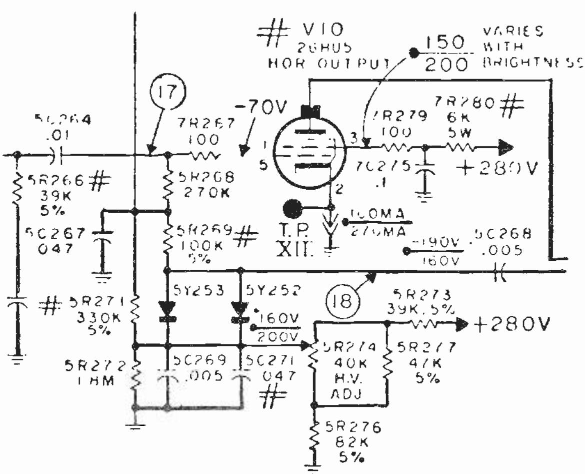


26HU5 to run hot, and the circuit breaker to trip. This same condition can also be caused by a shorted or low resistance zener diode 2Y405.

No raster or sound troubles can be caused by an open filament in damper tube 19CG3 and open coil 7L254. When the damper tube is replaced, the TV set will have sound but no raster until coil 7L254 is replaced.

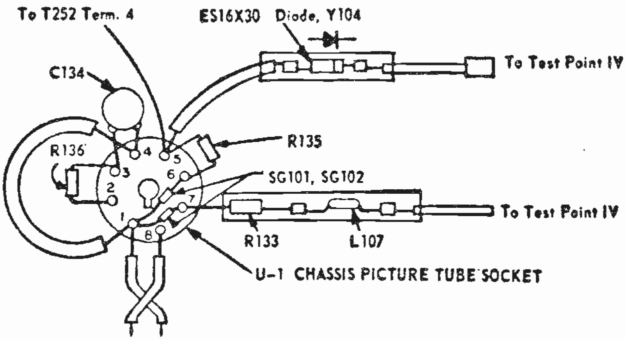
Other no raster symptoms can be caused by a shorted horizontal oscillator transistor, Q503, or a shorted horizontal discharge transistor, Q504. The shorted transistors will cause the 26HU5 tube to run hot and the circuit breaker will trip.





A dim raster condition can be caused by a shorted capacitor, 5C271. Replace this capacitor with one having a 400v rating, Part No. EP25X4 or equivalent.

GENERAL ELECTRIC



Color-TV Chassis JA—One Predominate Color with Retrace Lines

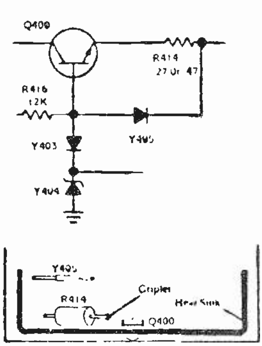
To correct this symptom check transistors Q600, Q604 and Q606. If any of them have failed, inspect resistors R624, R626 and R628 (6.8K) to see if they are the

rounded end type as shown (left) in the illustration. Stackpole or Allen-Bradley resistor replacements (right) are preferred in this application.

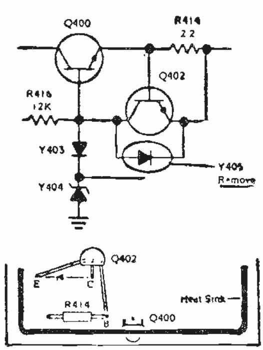
Color-TV Chassis JA—Low Brightness and Overload with Strong Signals

Low-brightness and overload with a strong signal symptom is often caused by the scan rectified 22v source not regulating properly. A possible correction to the problem is to modify the 22v regulator circuit in the following manner:

Remove diode Y405, resistor R414 and the griplet shown in the original simplified schematic. Replace, as shown in the modified circuit, resistor R414 with a 2.2Ω ½w resistor.



ORIGINAL CIRCUIT



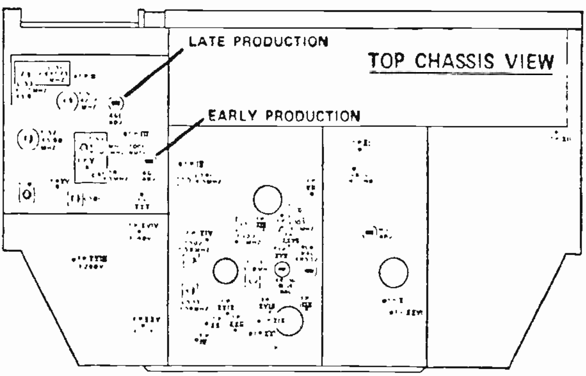
MODIFIED CIRCUIT

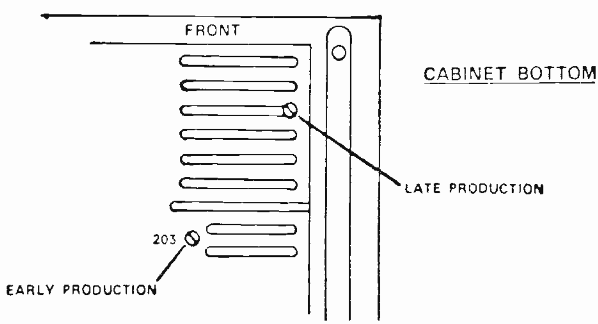
Replace diode Y405 with a Q402 transistor (EP15X1). A Q402 transistor and a 2.2Ω, ½w resistor are supplied with Q400 replacement transistors (EP15X11).

Color-TV Chassis C1/L1 and C2/L2—Chroma Gain

A definite increase in color gain and contrast can be achieved by setting the AGC control, R203, as high as possible without overload. Sets produced after December 1, 1972 (5Z1N) were factory adjusted to the higher AGC setting. Sets prior to this date can, in most cases, be improved by this AGC level increase.

If the set has been in service for a time, it may be advisable to check the 8CB11, 3rd IF tube. In some rare





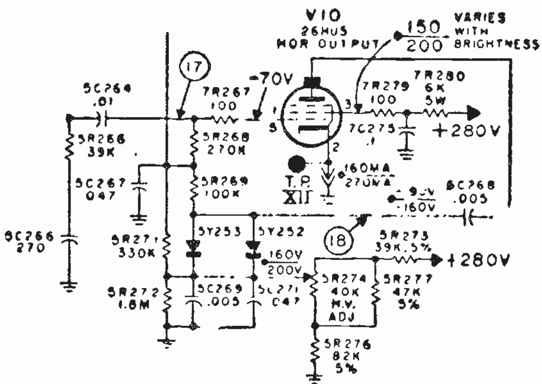
cases, the video alignment may also need to be checked.

On C chassis sets, the AGC control can be adjusted through a hole in the bottom of the early production TV sets, and through a cabinet bottom slot in later models. An insulated screw driver less than ⅛-in. in diameter is required. An excellent tool for this purpose is an EP69X32 HORIZONTAL HOLD control shaft that can be sharpened to a screw driver point. See illustrations for the AGC control location on early and late production models.

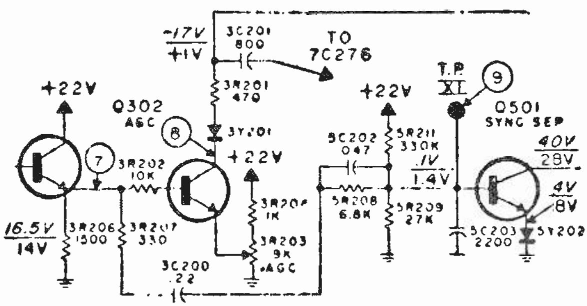
GENERAL ELECTRIC

Color-TV Chassis C-1—Troubleshooting Guide

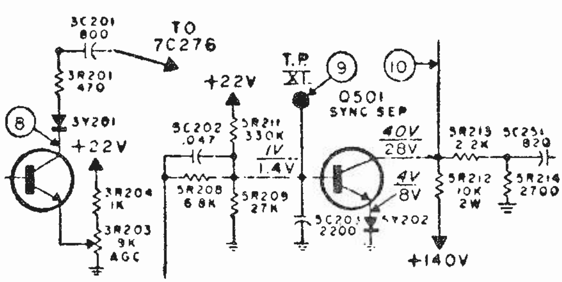
When encountering a dim raster symptom, capacitor



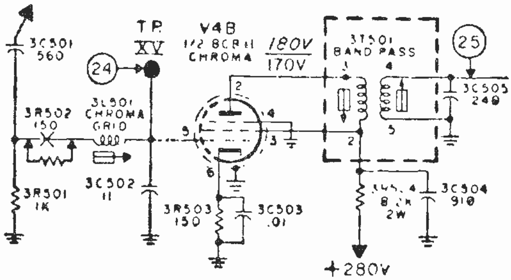
5C271 may be shorted. Replace this capacitor with one that is 400v rated, Part No. EP25X4.



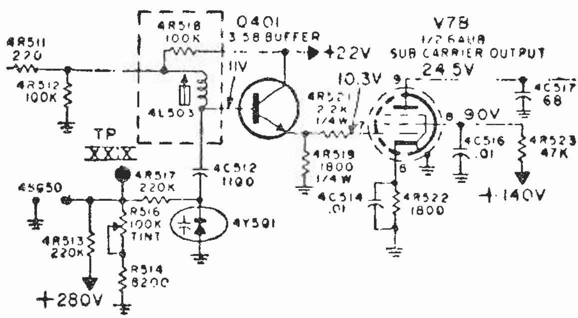
A no AGC symptom can be caused by open diode 3Y201.



A symptom of no horizontal or vertical sync can be caused by a shorted diode 5Y202.



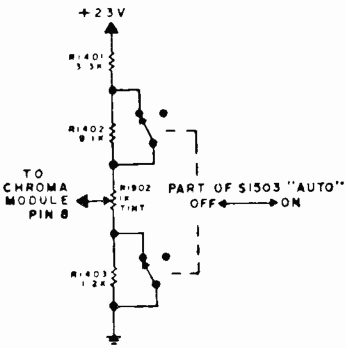
An intermittent color or no color can be caused by a burned resistor, R504, after its leads short to the bandpass transformer can.



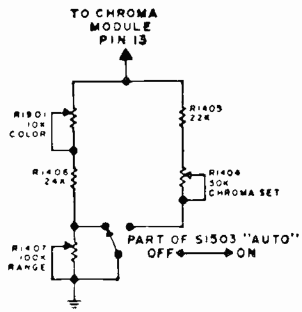
Intermittent or weak color can also be caused by a shorted buffer transistor, Q401.

Color-TV Chassis MA—Advanced One-Touch Color Systems

The improved one touch control circuit has two switch positions, MANUAL and AUTOMATIC, as in previous receivers. The AUTOMATIC position in the MA chassis, however, limits the ranges of the TINT and COLOR controls so that the customer always gets a reasonably good color picture when he pushes the AUTO button regardless of where the controls may have been set in the MANUAL position. In the AUTOMATIC position two resistors, R1402 and R1403, are connected in series with the TINT control, R1902. This reduces the effective range of the TINT control to about 40°. Resistors R1402 and R1403 are so proportioned that the average dc level is maintained as it was in the MANUAL position. This keeps the average tint level the same. In the chroma gain circuit resistor R1407 is connected in series with the COLOR control, R1901, to reduce the chroma gain range variation. At the same time, a shunting resistance, R1404, maintains the same average dc level as in MANUAL position. Both R1404 and R1407 are adjustable so that the desired gain characteristic may be obtained. In MANUAL position, resistors R1407, R1402 and R1403 are shorted out while R1404 is open circuited.



SIMPLIFIED TINT CONTROL CIRCUIT



SIMPLIFIED COLOR CONTROL CIRCUIT

In addition, the customer still has the ability to "trim" adjust the COLOR and TINT controls even when in the AUTO position. Thus he can adjust color and tint in either MANUAL or AUTO, although in AUTO the ranges are limited. As in the past, the AFC is defeated in the manual position. The AUTO position also switches on a neon indicator behind the AUTO button.

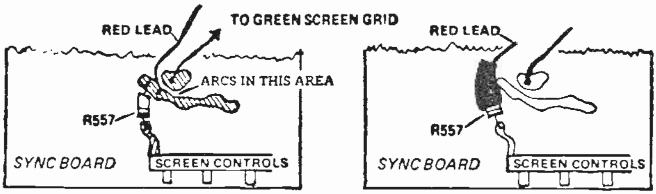
Color-TV Chassis MA—Dark Horizontal Line Rolling from Bottom to Top of Screen

In moderately weak signal locations, a dark horizontal line approximately 1/16-in. in width may be seen rolling from the bottom to the top of the screen when properly tuned and adjusted.

Capacitor C112 is a BPE (Bipolar Electrolytic) 2.2μf capacitor located between the tuner and the exterior wafer on the rear of the tuner. Leave this capacitor in place and add a 1μf, 50v polarized capacitor from either side of the BPE capacitor to ground, with the negative side connected to ground. Since a lead from the BPE capacitor connects to a terminal on the UHF tuner, this is a convenient mounting location. This capacitor is stocked as Part No. EP31X16.

Color-TV Chassis C2/CD, L2/LB—Power-Supply Diode Failure

Repeated failure of power supply diodes Y402, Y403, Y404 and Y405 may be caused by picture tube arcs, which are coupled into the B+ circuits through a secondary arc from the picture-tube green-screen-grid copper pad to the



copper pad for the B+ end of resistor R557 (on sync board) as shown in the illustration below.

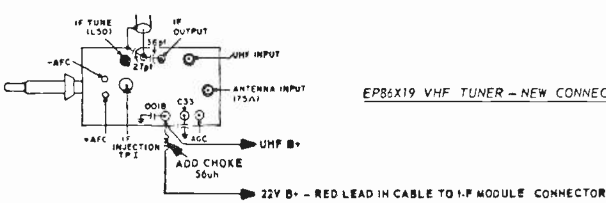
Remove the B+ end of resistor R557 and the red B+ lead from the board and reconnect by means of a "flying joint" covered with heat-shrinkable tubing (Cat. No. EP90X1).

Color-TV Chassis MA—MOSFET Failure in Tuner No. EP86X19

The symptom of a shorted MOSFET RF Amplifier transistor in the tuner may be difficult to evaluate and lead to unnecessary adjustments and improper repair unless the following procedure is followed:

With the "Auto" button OFF (light out) and the receiver properly fine tuned, an interference or slightly high noise level may be observed on one or more channels. A weak to moderate signal level may show little or no interference. Retuning won't clear the problem. The stronger the signal, the worse the condition. The interference may look similar to mistuning into sound, as might occur with AFC misadjusted. Severe cases appear as streaks, like cross modulation.

Test the tuner to determine if the MOSFET is shorted. This can be done by unsoldering the AGC lead from the tuner, discharging the AGC tuner terminal to ground and



EP86X19 VHF TUNER – NEW CONNECTIONS

then measuring the voltage at the open AGC terminal. If the voltage at this terminal is positive by more than a perceptible movement of the meter (the voltage should be zero), the MOSFET is shorted or partially shorted and the tuner should be replaced.

Another test is to adjust RF AGC. If the adjustment has little effect and AGC voltage at the tuner with a strong signal fails to drop below 9v positive, the MOSFET is defective and the tuner should be replaced.

To minimize a possible repeat of the problem, a small encased type choke coil (56μh EP36X33) should be soldered to the 22v B+ terminal on the tuner and in series with the red 22v B+ bus wire. This wire is the one in the cable group going to the IF module connector as shown in the illustration above.

New replacement tuners will have the choke coil and instructions included. Receivers manufactured with chassis code 5D4P and later have the choke.

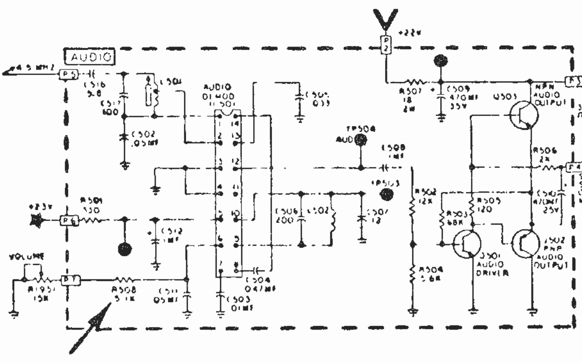
Color-TV Chassis MA—VOLUME Critical to Adjust

If the VOLUME control is critical to adjust with maximum audio attained within the first 30% of travel of the VOLUME control arm, make the following changes:

On audio modules exhibiting this condition, with Date Code before 5G2P, change resistor R508 from 5100Ω to 6200Ω. Beginning with Date Code 5G2P, the VOLUME control range has been optimized at the factory.

The position of the VOLUME control knob (slider) is determined by the audio output tolerance rating of IC501. With nominal audio output from IC501, the VOLUME control will function through its normal range.

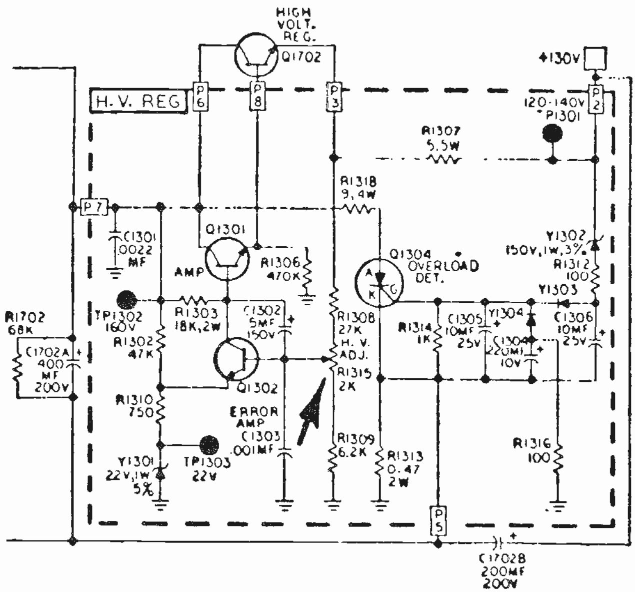
If the audio output from IC501 is near or at its maximum output tolerance rating, then the VOLUME control must be retarded more than usual to attenuate the greater output. This places the slider in a position on the control nearer to the left end, where a larger resistance change occurs over a shorter mechanical path and the control becomes critical to adjust.



Increasing the resistance of resistor R508 allows the slider to be repositioned so that the VOLUME control will operate over its normal range.

Color-TV Chassis MA—Circuit Breaker Tripping

Wait at least 45 sec. before resetting the circuit breaker. By design, resistor R1318 always heats prior to circuit



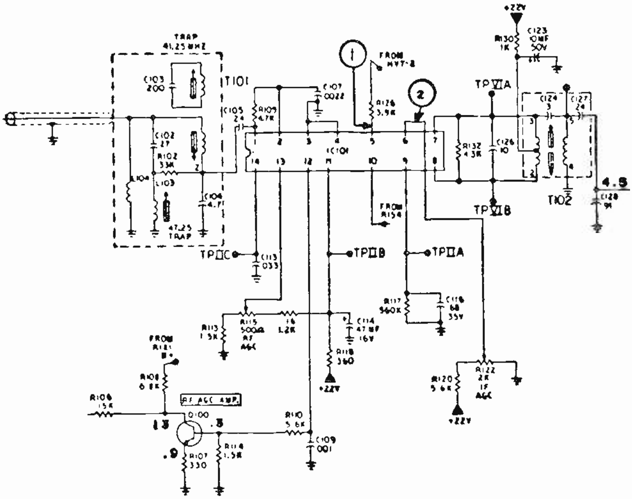
breaker tripping. Quick resetting or holding the circuit breaker will damage this resistor on the high-voltage regulator module. Tripping can be caused by control misadjustment, allowing the receiver to operate from a few minutes to many hours before tripping.

High-voltage Setting: Adjust BRIGHTNESS and CONTRAST controls fully counterclockwise (CCW). Adjust HIGH-VOLTAGE control R1315 on the high-voltage module for 26.5kv at the picture tube anode. This is at minimum beam current (black screen).

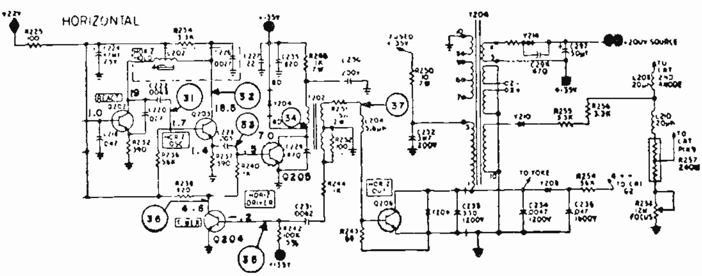
Color-TV Chassis JA—Repair Information

Symptom: Weak video—no snow between channels. **Repair:** Check the voltage at Pins 7 and 8 of IC101 (IF/AGC). If the voltage on either pin is less than 15.5v, then check for an open or short in Transformer T102.

Symptom: Gear tooth effect, or ragged edges on outlines because of random horizontal scan line displacement.



Varies with BRIGHTNESS/CONTRAST control. **Repair:** Damper diode Y206 may be open or there may be a poor solder joint at either end of Y206. In some cases the TV set may operate normally but transistor Q206 may draw more current than normal, causing unexplained failure. Diode Y206 can be checked in the circuit by measuring the resistance between the case (collector) of Q206 and the chassis ground. It should read about 7Ω in one direction and more than 1K in the other direction.

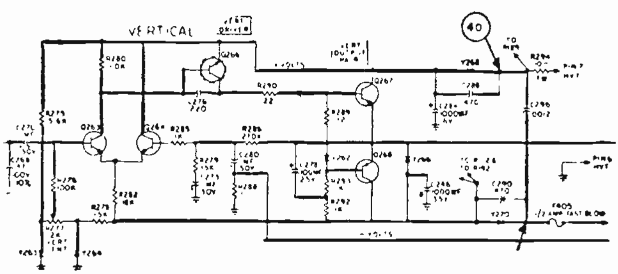


Symptom: Repeated failure of transistor Q206 (horizontal output). This symptom may be caused by an incorrect drive pulse to the base of Q206 which results in over dissipation of Q206. **Repair:** Check the voltage at the collector of the horizontal-drive transistor Q205. It should be 70v ± 10v. If it is incorrect (usually goes to about 120v), check transistor Q204 for opens or shorts. Check resistors R238, R240 and R244, and capacitor C231 and associated wiring for opens. Check especially for a poor solder connection on the wire jumper from the B+ end of resistor R238 to +22v. This jumper is under the horizontal oscillator coil shield can.

Symptom: Two vertical "drive" lines—one on each side of the screen. BRIGHTNESS control may vary width of the lines. **Repair:** Damper capacitor C234 may be open, or there may be a poor solder joint on either end of C234.

Symptom: Fuse F404 fails (19-in. JA only)—current reads normal about (400-550ma), and resistor R199 may be burned. **Repair:** Look for a discolored or melted spot on the back of the picture tube socket at pins 6, 2, or 11. This indicates that the picture tube has arced and caused shorting of one of the 1K resistors inside the socket in series with each cathode wire. This allows normal picture tube arcing during early life to bypass the spark gaps, causing damage to the above components. If the discoloration or melted spot is not noticed, check the resistance from the circuit board plugs to pins 6, 2 and 11 in the socket, which should be 1K. Change the socket if defective.

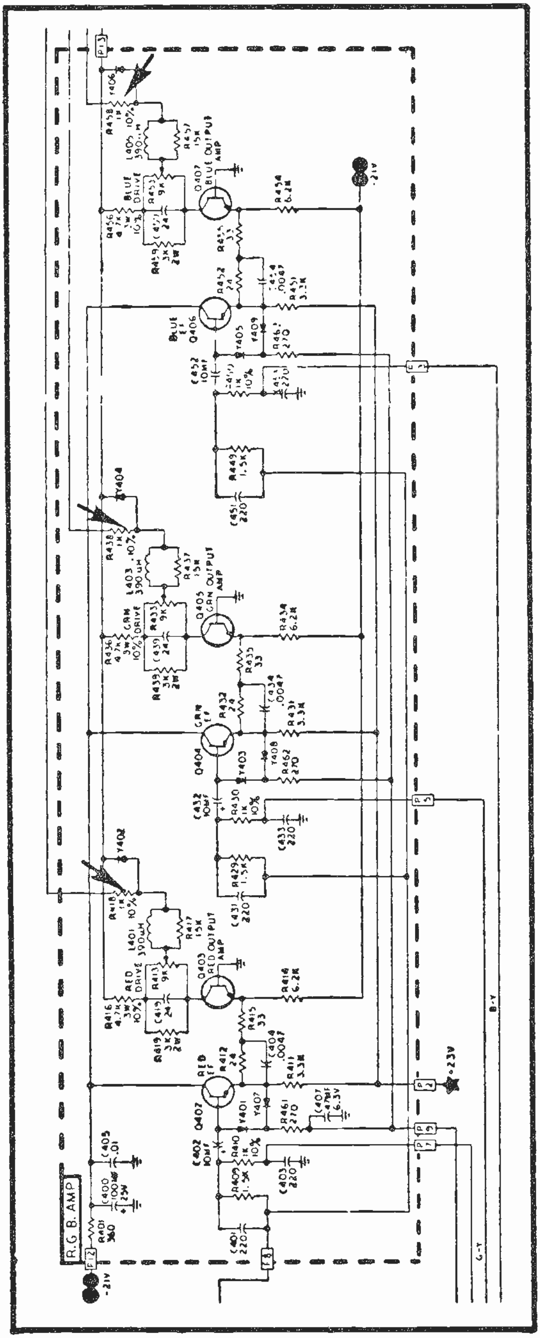
Symptom: Dim raster—no video or scan lines. Looks like poor focus or a picture tube. **Repair:** A shorted vertical output transistor (Q267 or Q268) may cause the raster to be deflected completely off the screen. Secondary emission in the picture tube causes the above stated symptom. Transistor Q267 can be checked for a short in circuit. Transistor Q268 must be unsoldered to be checked.



Color-TV Chassis MA—Intermittent Modules

The signal interconnect board in early production sets used bare wire leads in certain locations which when improperly dressed could touch connections on the module plugs and cause short circuits. To correct this problem, seat the modules well to assure clearance from wires on the signal interconnect board. Later production uses insulated leads to prevent this problem.

Often merely reseating a module will clear the intermittent. If a replacement module clears the problem, check the original again because it may also work. The reseating corrects for what was originally poor seating or cleans the pin connectors.



R.G.B. AMP
RED DRIVE
GRN DRIVE
BLUE DRIVE
RED OUTPUT AMP
GRN OUTPUT AMP
BLUE OUTPUT AMP
RED EF
GRN EF
BLUE EF
-21V
+23V
B-Y
G-Y

GENERAL ELECTRIC

Color-TV Chassis MA—Circuit Breaker Tripping

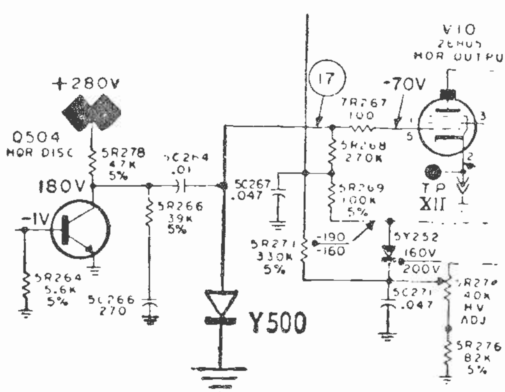
Tripping can be caused by control misadjustment, allowing the receiver to operate from a few minutes to many hours before tripping.

Adjust Beam Limiter: Rotate the BRIGHTNESS, CONTRAST and BRIGHTNESS LIMIT controls fully clockwise. Rotate the COLOR control fully counterclockwise (CCW). Push the AUTO button or ONE TOUCH button to OFF (unlighted). Adjust the BRIGHTNESS LIMIT control, R340, (on video low-level module) to produce a 0.5v measurement across resistor R418 on the RGB module. Measure voltages across resistors R438 and R458 on the RGB module. Add the three voltages across resistors R418, R438 and R458. The total should be 1.5v or less.

Tripping can also be caused by the horizontal output transistor Q1701 case being grounded. The tripping will be quick in this instance. The mica insulation under the transistor may be reversed or a burr on the transistor or the mounting plate may have punctured the mica and caused the short.

Color-TV Chassis C1/L1 and C2/L2—Horizontal Discharge Transistor Q504 Failure

After replacement of transistor Q504, add a clamp diode, Y500 (EP57X1), to the copper side of the Sync Cir-



cuit Board as shown in the schematic. The diode is easily added and will protect Q504 from high "turn-on" voltages.

Diode Y500 was incorporated into production sets beginning with Serial Number Code 5S40.

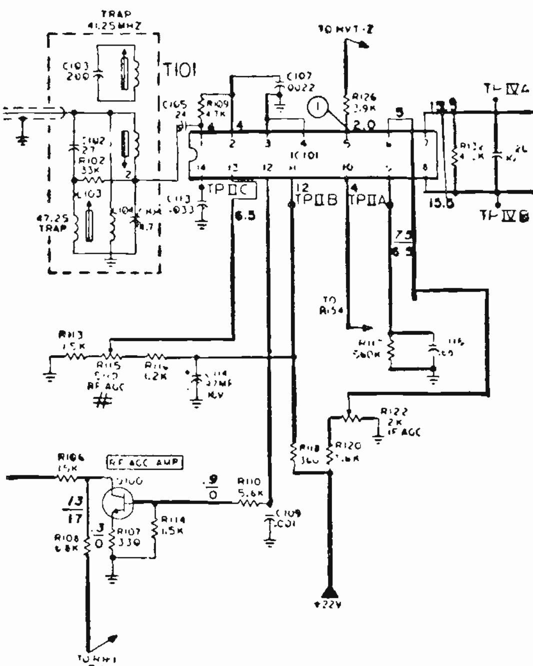
GENERAL ELECTRIC

Color-TV Chassis JA—Colored Raster with or without Video and Sound

Remove from the circuit and check transistors Q600, Q604 and Q606. Also check diodes Y600, Y602, Y604, Y606, Y608 and Y610. Their front-to-back ratio should be at least 3-to-1 in circuit. Visually check resistors R602, R606 and R610. Check resistor R408, located on the power supply board. Replace integrated circuit IC501 with the half circle code on the IC keyed to the number 1 on the circuit board. Ignore the Number 1 on the IC501 socket. Replace all other defective components found above. Integrated circuits and transistors should not be replaced while the TV receiver is ON. The integrated circuits and transistors can be damaged by power-supply surges.

Color-TV Chassis JA—Video Overload

Measure the dc voltage at pin 9 of integrated circuit IC101. This voltage should be +7.5v dc with signal and

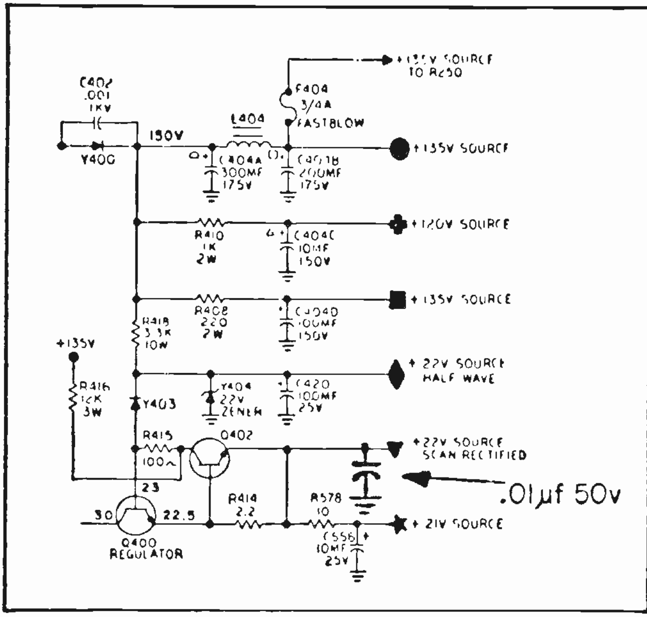


+6.5v dc with no signal. If the voltage is lower than normal, replace capacitor C116 (.68μf, 35v, EP25X39). This capacitor is very small and its polarity marking is hard to read. This has resulted in some capacitors being installed backward, causing early failure. The proper polarity is negative to ground.

Color-TV Chassis JA—Herringbone Interference

This interference is a vertically oriented herringbone pattern which varies in severity with the BRIGHTNESS or CONTRAST control settings. It is usually noticed on weak signals and in some cases is strong enough to blank out the video and cause interference in adjacent receivers.

To correct the problem modify the receiver as follows:



Remove one screw from the power-supply board and tilt it upward. Add a .01μf, 50v, disc ceramic capacitor, ES18X43 or equivalent, to the bottom of the circuit board as shown in the illustration.

Color-TV Chassis MA—Weak or No Color

If one color is missing, experience shows that in some cases one of the three picture tube cathode leads that plug into the RGB module are not fastened securely. Resolder the male connector since the solder may have broken and caused an intermittent.

The problem might also be solved by replacing integrated circuit IC602 on the chroma module.

Color-TV Vectors

In attempting to add or subtract two out-of-phase sine waves of equal frequency it becomes immediately apparent that a simpler method of manipulation would ease a difficult situation. For this reason, a method of sine wave addition was derived using vectors.

As shown in Fig. 1, a sine wave can be represented by a vector whose length is equal to the peak amplitude of the sine wave. This vector represents the sine wave by rotating about an axis at the sine wave frequency. When observed at some instant in time, such as at T = O, the vertical amplitude of the vector shows the value of the sine wave at that instant.

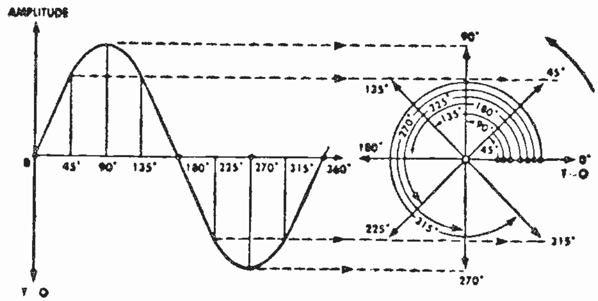


Fig. 1
Sine wave and its vector representation.

Now let us take two sine waves of the same frequency but 90° out of phase, as in Fig. 2. Wave A and vector A represent the wave previously observed in Fig. 1. Notice that sine wave B is maximum when sine wave A is equal to zero. To represent this wave vectorially at T = O we place vector B in a vertical direction.

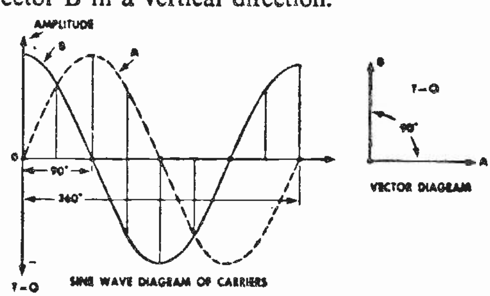


Fig. 2
Two sine waves and their vectors showing 90° phase relationship.

From the vector diagram it can easily be seen why we refer to wave B as being 90° out of phase with respect to wave A. It should be noted that the waves must have the same frequency to have this 90° relationship remain constant.

Now, what happens if these two waves are added, as shown in Fig. 3: The resultant sine wave C is a point-by-point addition of these two waves.

To add these two waves (A and B) vectorially, let us anticipate the solution and construct a parallelogram. Then, starting from the center point, run a vector diagonally to

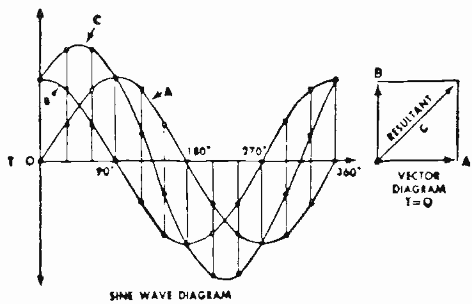


Fig. 3
Vector additional of two out-of-phase sine waves of equal amplitude.

form the resultant vector (C). The length of this vector is determined by the intersection of the two parallel lines.

Fig. 4 shows the addition of two sine waves (A and B) whose amplitudes are unequal. The resultant wave (C) is obtained by the same point-by-point addition of the two

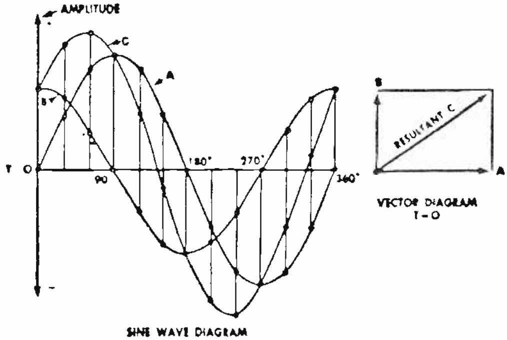


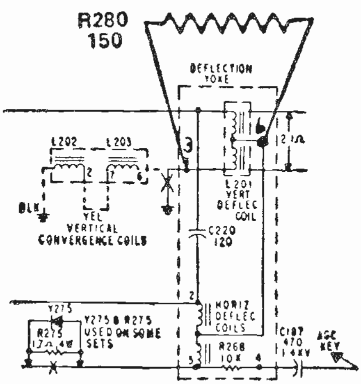
Fig. 4
Vector additional of two out-of-phase sine waves of unequal amplitude.

waves. The vector addition is also accomplished as before. Note that the resultant vector (C) indicates that the change in wave (B) has caused a phase shift towards vector A. It can be seen that this phase shift exists in the waveform diagram also.

We can see from these illustrations that by varying amplitudes and polarities of waves A and B any resultant phase can be obtained.

Color-TV Chassis HE—Striations (Vertical Shaded Lines)

To overcome these symptoms add an R280, 150Ω ½w resistor between terminals 3 and 6 of the yoke as shown in



the diagram. Resistor R280 was added in HE chassis production beginning with Serial Number Code 5L1P.

Color TV Chassis "C"—High Voltage "Ticking/Sizzling" Sounds

The "ticking/sizzling" sounds that are sometimes heard in the high voltage cage area of the "C" chassis are caused by static build-ups and discharges. The condition is not detrimental or an indication of a fault existing in the TV set. There have, however, been some customer complaints about these sounds. The following recommended procedure should be used to reduce and, in most cases, eliminate the noise.

Step 1—Measure the high voltage at minimum brightness and contrast. If it is high, adjust to correct level (with minimum illumination of screen) as follows: Sets with a focus rectifier should be set to maximum 26.0 kv. Sets with a focus divider resistor should be set to maximum 25.0 kv. If the high voltage cannot be adjusted as described, check the high voltage circuitry for a component failure (possibly the hold down diode). If this step does not correct the "ticking" problem, continue to the next step.

Step 2—Reduce the high voltage to the minimum setting (i.e., turn the *high voltage adjust* pot completely counterclockwise). Turn the brightness and contrast controls through their complete range from minimum to maximum to insure that there is no picture deterioration caused by lowering the high voltage. If picture deterioration exists, increase the high voltage until it is eliminated and a customer acceptable picture exists.

Step 3—With the *brightness* and *contrast* controls both set at maximum, increase the *brightness limit* control (i.e., clockwise direction) until picture tube spot blooming is seen. Reduce the brightness limit setting until the blooming is no longer evident.

Step 4—Remove and discard the strap that holds the 3DS3 tube in place during shipment.

If these steps fail to eliminate the problem in stubborn cases, the following items should be checked and/or corrected as indicated.

Disconnect the anode cap from the picture tube and inspect for corona/arcing damage. If the anode cap shows damage or deterioration, replace with a new cap. This may occur especially on sets that have been in use for a long time.

Wipe lightly around the anode connection of the picture tube with a soft cloth and distilled water to remove any contaminants. Clean the anode cap in the same manner. Allow sufficient time for complete drying of the anode cap and anode connection area on the picture tube before reconnecting the anode and applying power to the set.

Replace the high voltage rectifier with a brand new 3DS3 insuring that the tube is clean and has not been previously used.

Before installing the plate cap on the 3DS3, fill the plate cap with "Insulgrease" (EP90X9).

Remove and discard the duct seal (gray putty material) from the pins of the high voltage rectifier socket.

Replace the black cap on the high voltage cup with the new clear cap (EP60X16). Some sets produced in the last quarter of 1973 already have the new cap and it is not necessary to complete this step.

Inspect the 3DS3 socket connections insuring that no pigtails exist and that all connections are smooth and round. Inspect the cup area to insure no foreign material (such as solder balls or splashes, etc.) are in the cup.

Install new duct seal (EP90X24) in the high voltage cup so that the duct seal covers all of the pins in the cup completely and does not come in contact with the cover.

On sets that have focus dividers, excessive spark gap lead length protruding through the terminal board may cause arcing. Cut the leads on the backside of the board so that they are flush with the board. Resolder the connections to produce a smooth round solder joint.

On sets with a focus divider, clean the spark gap with a clean, soft cloth to remove any dust or oil built up in the gap (Note: Do not use sandpaper, files or other abrasives since they will leave sharp edges which will encourage spark gap breakdown).

Color TV Chassis C2/CD—920 Khz Beat in Picture

Effective Jan. 21, 1974 (5A4T) a production change was made to eliminate 920 KHz beat from the few sets exhibiting this condition. A 270 ohm, ½w, 5% resistor (3R502) was added to the 8CB11 chroma amplifier grid circuit as follows:

The jumper wire from the "low" end of 3L501 copper "pad" connected to 3C501 and 3R501 was replaced with resistor 3R502, 270 ohm, ½ w, 5% (board location M6).

If you encounter a problem with 920 KHz beat in the picture, proceed as follows:

1) Align the 41.25 MHz and 4.5 MHz traps per service manual instructions.

2) If trap alignment does not cure the problem, replace the 8CB11 tube It may be necessary to try two or three new 8 CB11 tubes before deciding that this is not the problem.

3) If the trap alignment plus a new 8CB11 tube fails to correct the problem, add the new resistor 3R502 as explained above.

4) Following the addition of the resistor, realign the chroma overall as shown in the service manual instructions.

Color TV Chassis C1/L1—Increasing Color Gain

The color gain in the "C" and "L" chassis can be increased substantially by making the following production change.

This production change was incorporated in all "CD" chassis starting with serial numbers 5S1P and later.

Move the gray wire connected to the emitter of transistor Q301 on the IF board to the emitter of Q303. There is an unused hole at the end of the copper island to which the emitter of Q303 is connected. This step effectively adds another stage of chroma amplification.

Check to insure the set does not exhibit a 920 KHz beat. Any 920 KHz beat problems should be corrected by adjusting the 41.25 MHz and 4.5 MHz traps.

Color TV Chassis CD—Improved Video Response (Sharpness)

If the TV set operates normally, but a critical customer may complain of poor focus or lack of detail, make the following changes.

1) Optimize the focus, high voltage, brightness limit, and AGC adjustment. If minimal improvement is noted and customer is still dissatisfied, proceed to the next step.

2) Replace capacitor C174 which is a 470pf, 10%, 500 volt capacitor with an EP22X5 680 pf, 10%, 500 volt capacitor.

3) Remove resistor R176, an 18K, ½ watt resistor, and install a buss wire in its place.

This change is incorporated in production starting with Serial Number 5R3T and higher.

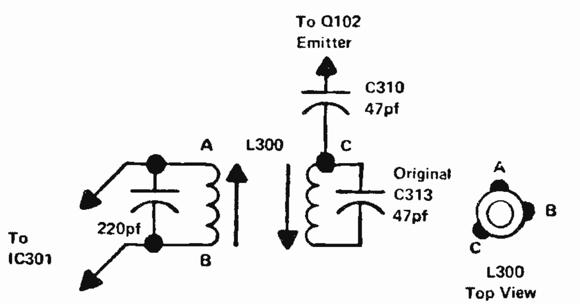
TV Chassis XA — Sound Distortion

If the XA TV chassis has a symptom of distorted sound on some stations, especially on cable installations and the alignment of coils L300 and 301 does not eliminate the problems make the following changes:

Replace coils L300 and capacitor C313 with the new ES36X129 sound take-off coil kit. The new kit will now include a new double tuned coil, a 220 pf capacitor, and an instruction sheet.

To make this change, proceed as follows:

1) Remove the original coil L300 and discard. 2) Remove capacitor C313 and install it across terminals C and B of the new coil (in parallel) on the coil form mounting lugs. 3) Install the 220 pf capacitor in the board where the original capacitor C313 was located. 4) Adjust both top and



NEW CIRCUITRY

bottom coils slugs for maximum undistored audio. Be sure to adjust on a weak signal by disconnecting antenna (or some equivalent).

Receivers with Serial Numbers beginning 5V2T and higher were built with this modification.

Color TV Chassis MC—No Raster, But Sound Normal

If you encounter a no raster problem, but the sound is normal, and resistor R1103 on the Buffer Module is overheated or open, inspect the assembly and make the following changes: 1) Remove the high voltage assembly mounting screw and turn the assembly to view the back side. Check for a broken wire to capacitor C1702B (can type electrolytic). In early production the wire was stretched tight and may have been broken in shipment. 2) Replace or redress the wire to provide slack, and resolder to C1702B. 3) Replace Resistor R1103 (EP14X63) if overheated or open. 4) If raster is not restored, check Q1702. If set was left on, it may have failed.

Color TV Chassis C2 and CD—Chroma Board

Check all channels for a chroma beat interference pattern exhibited as diagonal lines in the picture. If the interference is present, change 4R520 to a 15 μh choke and add C530 (36pf). The location for C530 is marked on the chroma board immediately adjacent to the present location of R520. When installed, C530 will be connected from the choke that replaced R520 to ground.

Color TV Chassis CD—Production Changes RGB Screen Control Circuit

TV sets with serial numbers beginning with 5Z1T——and later, contain a new triple pot screen control assembly which has 1 megohm wiper circuit resistances (R559, R562, R564) built into the control. No external 1 megohm

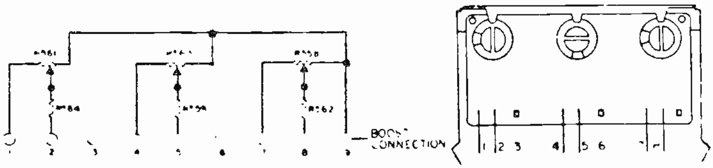


Figure 1

resistors are necessary with this type of control, shown in the illustration Fig. 1.

Each section of this triple pot has only two terminal legs which mount into the circuit board. The third leg of each potentiometer section has been removed. Interconnection between control sections is accomplished internally. The boost B+ line connect directly to a separate solder tab on the control. A piece of buss wire is inserted into the circuit board in place of each of the 1 megohm resistors R559, R562, R564, to provide circuit continuity. The electrical circuitry remains the same as in earlier C chassis receivers as shown in Fig. 2.

The catalog number for this new screen control is EP49X247. It should be used in all C chassis sets with serial numbers beginning with 5Z1T------and later.

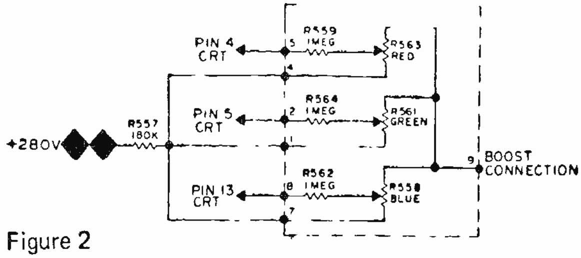


Figure 2

Model CCD7322 RGB Screen Control

For a short period during production (Serial Code 5S3T-----through 5V4T------), contract model CCD7322WD contained a special screen control assembly. This special assembly was actually a modified EP49X33 control. One terminal leg was removed from each control section, and jumper wires were soldered to the control terminals to provide interconnection between the sections. The boost voltage line was wired directly to the control. Wiper circuit resistors R559, R562, R564 (1M) were attached directly to their respective sections. The opposite end of each resistor was soldered into the circuit board.

Use an EP49X247 control to replace this special assembly and proceed as follows:

1) Remove the old screen control assembly and the three 1 megohm (R559, R562, R564) attached to it, and install the new EP49X247 control.

2) Insert and solder a piece of wire into the circuit board in place of each of these three resistors. This provides circuit continuity to the resistances built into the new control.

Color TV Chassis CB—Replacement Parts—EU77X16 High Voltage Transformer Assembly (Includes EU77X4, ET77X93, ET77X91) and EU77X15 High Voltage Transformer Coil and Pulse Windings (Includes EU77X3, ET77X88, EU77X88)

Some pulse windings in the above listed assemblies were wound in reverse. Installed in a set, they will create convergence and/or color sync problems because the pulse will be negative going rather than positive going. The assemblies in General Electric's present stock are wound correctly, but you may have one on the shelf which is wound in reverse. Using the following procedure, you can check the coil before installing it in a receiver. Refer to Fig. 1.

1) Place a small compass near the filament leads. 2) Connect the negative lead of a 1.5 volt battery to the metal frame of the high voltage transformer assembly. 3) Touch the blue pulse coil lead to the positive end of the battery.

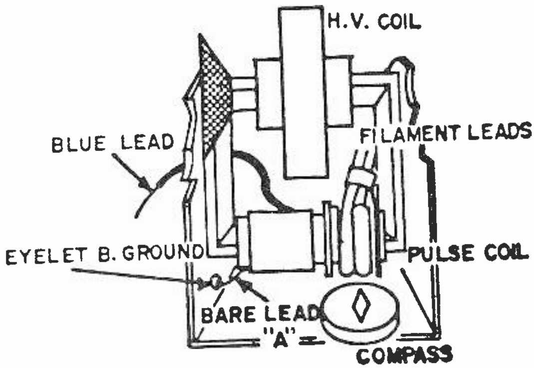


FIGURE 1

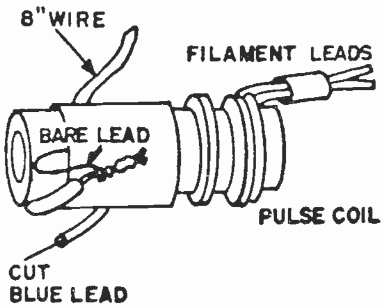


FIGURE 2

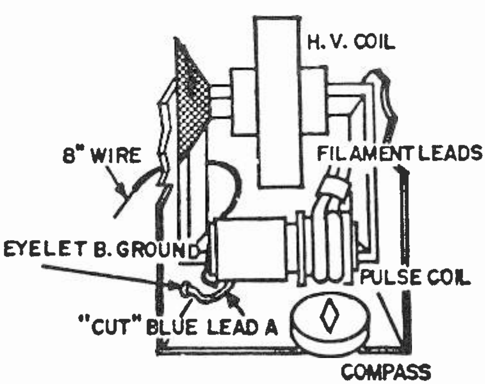


FIGURE 3

If the coil is wound correctly, the South end of the needle will point to the filament leads; if it is wound in reverse, the North end of the needle will point to the filament leads.

You can correct a reverse wound coil as follows (refer to Figures 2 and 3):

1) Unsolder the bare lead "A" from eyelet "B". 2) Cut the blue lead 1½ inches from the coil. Strip the end of the piece still attached to the coil and solder it to eyelet "B". 3) Connect an 8 inch piece of insulated wire to the bare lead "A". Solder the connection and press it close to the coil. Wrap several turns of electrical tape around the coil to keep the connection in place. 4) Route the lead under the coil so that it will be captivated by the ground lead. The coil can now be connected into the circuit.

Color TV Chassis MB-75—Power Supply Transformers and Assemblies

Power Supply Transformers for the MB-75 chassis are now stocked separately. Previously they were stocked as part of the Power Supply Assembly. If a transformer fails, repair costs will be much less if you replace only the transformer instead of the complete assembly. The transformer catalog number is EP88X4.

Since most of the transformer leads have crimped-on terminals for sockets and connectors, you will have to cut these leads and splice them. Be sure to cut them at a point that will allow a safe splice. Each splice must be twisted, soldered, and covered with heat shrinkable tubing. The tubing is packed with the transformer.

This information applies to MA, MB, and MB-75 chassis only. MC chassis use an entirely different transformer.

Color TV "M" Series Chassis—Power Supply Transformers

Power supply transformers are now in stock for all "M" series chassis (MA, MB, MC, MB-75, MC-2, MB-2, MH). Complete power supply assemblies are not available for any of these chassis.

Chassis	Power Transformer	Notes
MA	EP88X6	
MB (early)	EP88X6	Original Transformer stamped EP62X34 or EP62X43
MB (late)	EP88X4	Original Transformer stamped EP62X45
MB 75, MH, MB9200	EP88X4	
MB 2	EP88X4	Use with sets having separate filament transformer
MB 2	EP88X6	Use with sets having no filament transformer
MC	EP62X54	Use with sets having a separate filament transformer
MC	EP88X7	Use with sets having no filament transformer
MC 2	EP88X7	

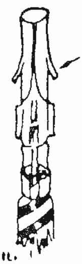
To determine which transformer to use for a specific chassis, consult the matrix shown:

Replacement transformers have crimped-on terminals on all leads which go to sockets or connectors. There are two types of terminals: round and flat. They are shown in Figures 1 and 2. With the illustrations, are instructions for removing and installing the terminals.

The other leads must be cut to proper length and soldered directly to their terminals. Do not splice any leads.

Removal And Installation

1) Cut the wire from the old transformer as close to terminal as possible. 2) With a small screwdriver, push the terminal (from the wire side) out of the front of the recepta-



cle. 3) Push the new terminal in from the wire side until it snaps into place. Shown in Fig. 1 is the round type terminal.

Removal And Installation

1) With a pair of pliers, grasp the wire from the old transformer close to the terminal and pull it out of the receptacle. 2) Push the new terminal into the receptacle until it snaps into place. Shown in Fig. 2 is the flat type terminal.

Color TV Chassis MC—Repeated Failure Of Y1141 On Buffer Module

Check pins 7 and 8 of the high voltage transformer. If a .005 µf capacitor is found there, remove it and install a .01 µf, 1 kv capacitor in its place. If there is no capacitor on the pins, install a .01 µf, 1 kv capacitor. The catalog number is EU22X89. Be sure the solder connections are smooth with no sharp points.

To improve reliability and help prevent callbacks, check for this capacitor whenever you replace a buffer module in an MC chassis.

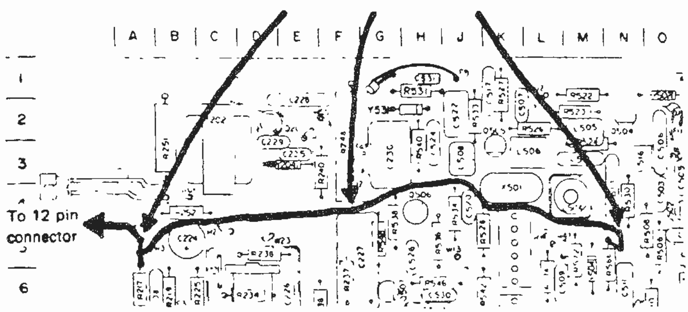
Color TV Chassis 19QB—HVT Pulse Coil Overheats

If the HVT Pulse Coil (EP36X96) overheats, most likely the grey lead is shorted to chassis ground. This lead has a

100 v p-p pulse voltage on it, and may not measure shorted with an ohmmeter. But there may be a solder splash, strand of wire, lead dress short, etc. which will arc and cause the coil to overheat when the set is turned on.

The best repair procedure is to make a good visual inspection of the grey lead and its connections on the circuit board. The lead from the coil connects to the 12 pin connector near C404. From the connector, it goes to the circuit

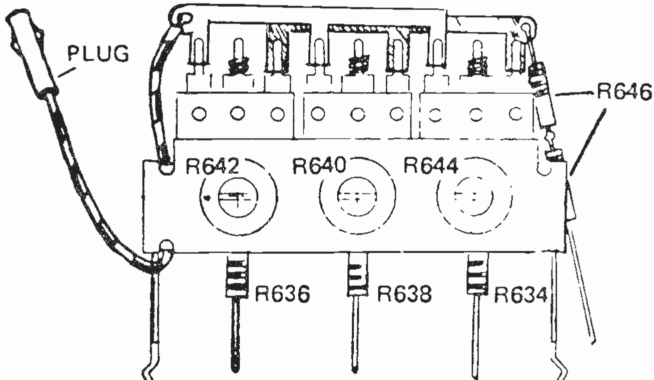
Check for shorts at islands and along grey wire.



board near resistor R217, and then another lead connects it to R566. Be sure to inspect the leads and both sides of the circuit board for foreign material, or dress shorts. The diagram shows the location of the leads on the circuit board.

Color TV Chassis 19QB—Vertical Retrace Lines

A symptom of vertical retrace lines at all brightness levels can be caused by resistor R646 increasing in value. In late production receivers, R646 consists of two 200 K resistors in series. Check the value of both resistors.



Color TV Chassis MC—No Raster

A symptom of no raster—sound normal, and resistor R1103, which is found the Buffer Module, is overheated or open, can be caused by the following problems: 1) Remove HV assembly mounting screw and turn the assembly to view the back side. Check for a broken wire to C1702B (can type electrolytic). In early production the wire was stretched tight and may break in shipping. 2) Replace or redress the wire to provide slack, and resolder to capacitor C1702B. 3) Replace resistor R1103 (EP14X63) if overheated or open. 4) If raster is not restored, check Q1702. If the set was left on, it may have failed.

CHASSIS: General Electric MB-75, MC (no illustration)

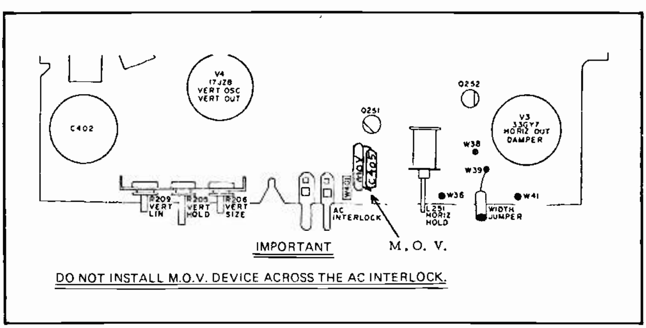
TROUBLE SYMPTOM: Adjacent-channel interference (higher channel stronger) evidenced by display of video and/or blanking bar of the adjacent higher channel

CAUSE: Need for slight readjustment of L202, the 39.75-MHz trap on the video IF module. Tune the receiver to a weak VHF channel below a strong channel; switch on AFC; rotate the slug of L202 *clockwise* to a position which eliminates or minimizes the adjacent-channel video and/or blanking bar, *but do not turn the slug of L202 more than 180 degrees.*■

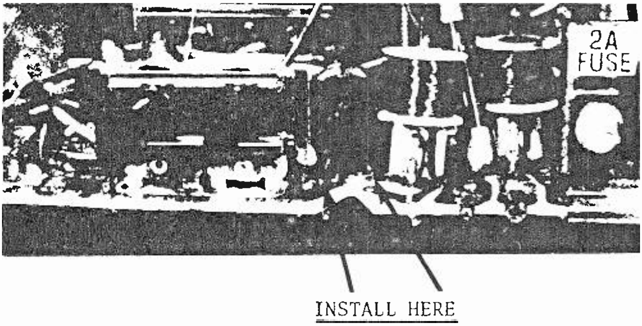
B&W Chassis SF and XB—Failures due to lightening

Due to high line transients in certain areas of the country, usually caused by frequent lightening storms, it may be desirable to protect the power supply from a repetitive failure by installing a BE 750 M.O.V. device.

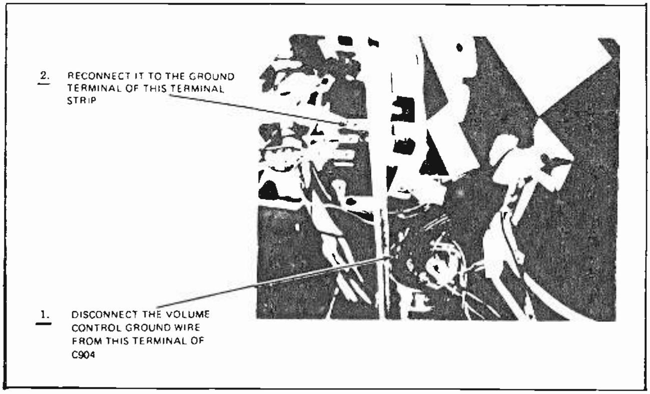
In the SF chassis, the M.O.V. may be installed across C405 (diagram below) by carefully wrapping and soldering the leads around the legs of 405. Dress the M.O.V. close to the capacitor on top of the circuit board. But do not install M.O.V. across the AC interlock.



In the XB Chassis, the M.O.V. may be installed from the switch side of L403 to ground. Physically, this is an unused hole marked C404 (toward the front of the set) and in the ground side griplet hole of C210. (see diagram below).



Color TV Chassis YA—Hum in the Audio
You should be able to get rid of the hum by relocating the ground wire for the Volume control as shown in the photo below.



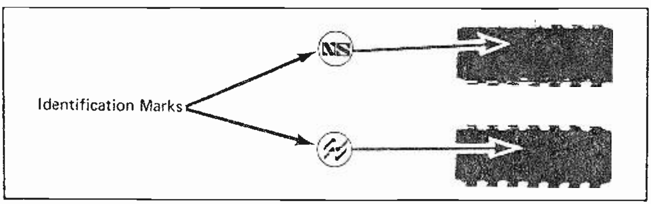
Color TV Chassis CD—Poor horizontal sync or no horizontal sync
This refers to sets serial coded 5T3T and later sets with stick HV rectifier. The cause is a decrease in value or an open with the 39K, ½ watt resistor, R251. The solution is to replace R251 with a 39K, 1 watt 10% carbon resistor.

Color TV Chassis MC & MB-75—When the grass is not green.
To solve this 'blue grass' problem, first, set up the fleshtone properly in both the auto and manual positions with the tint control. Then turn the core of L642 on the chroma

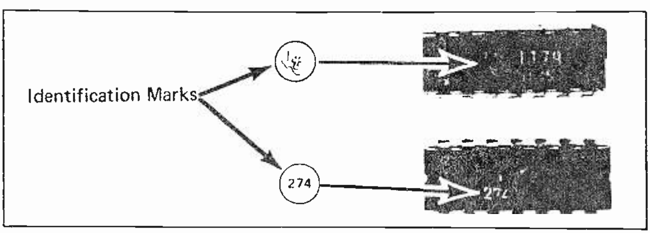
module clockwise one full turn. This reduces the demodulation angle by about 25 degrees. Next, check the tint control in the manual position to make sure that the fleshtone range is still wide enough. Then widen fleshtone range, if necessary, by turning L642 counterclockwise until the desired results are attained. This adjustment is only possible on EP93X41 modules. It is fixed on EP93X89 modules.

Color TV Chassis CD—Loss of color but sync O.K.
The cause is a leaky or shorted capacitor, C251. The solution is to replace C251 with an 820pf, 10%, 125V cap.

YM Chassis—Audio Hum
Some YM chassis sets manufactured between June and October 1977 can have an audio hum because of a peculiarity of certain audio IC's (IC190). These are shown below:



To repair, replace IC's shown above with the replacement IC's shown below:



The new catalog number is EP84X38.

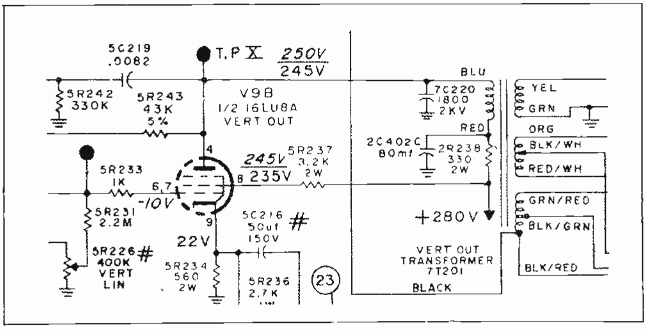
Color TV Chassis JA—Relocation of 22 volt Zener diode, Y404.
Diode Y404 was mounted on the power supply board in early production receivers. To reduce brightness changes during warm up, it was relocated adjacent to R402. R402 is on a terminal strip at the front, top, or back of the HVT can. Its location varies from model to model. In receivers with this change, Y404 should touch R402 to stabilize the characteristics of Y404. This will stabilize the 22 Volt line and reduce a tendency for brightness to drift.

Color TV Chassis MA/MB—Insufficient vertical sweep. Top and bottom of raster are short 1 inch. Vertical collapses in about 3 minutes.
Check for a short to ground on the connections to the service switch, S1601.

No vertical deflection. Replacing any module, including vertical, does not restore deflection.

A bare wire on the sweep interconnect mother board, between W17 and W18 (about 3 inches long) is likely touching the hex head ground screw.

Color TV Chassis C1/L1—No vertical sweep, or insufficient sweep.
Check for intermittent short in 16LU8, or an open 5R234, or open 5R237, or open 2R238 (check the load side for short), or an open 5C216. (see diagram below).



Color TV Chassis MA/MB—No raster, but a substitute buffer module restores the raster.
If Q1101 on the original module is mounted to the board with a screw, tighten the screw, then reinsert the module in the receiver. The screw connects the collector of Q1101 to the rest of the circuit. GE says a large number of returned modules have been repaired by tightening the screw.

YA Chassis, 13- and 17-inch—Bottom and/or Top Foldover
With bottom foldover, possible causes are: Yoke, with shorted vertical winding. Usually, R650 on vertical module will overheat; or, Convergence module (EP93X64) with a bridge circuit diode breaking down under load, or shorted. Usually R810 on the module overheats. In case of *bottom or top foldover,* the cause may be a defective horizontal output transformer. Due to outputs from pin 8 and 10 of the HVT not being equal. DC output from scan diodes (Y646 and Y642 on vertical module) should be approximately equal. Difference in outputs should not be greater than 2 volts.

GENERAL ELECTRIC

Color TV Chassis YM—Test Method for Tripped Circuit Breaker

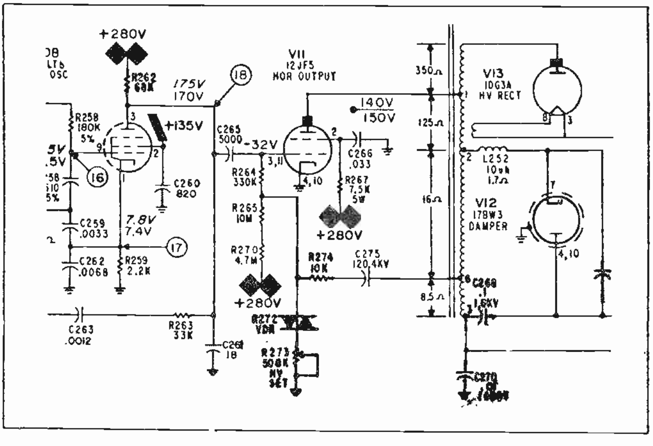
When you encounter a tripped circuit breaker because of a short in the vertical module, yoke or horizontal output and damper circuits, use the following procedure: (1) Set brightness control/picture control to minimum, (2) Unplug PG16 vertical yoke two-pin plug and PG800 convergence plug, reset circuit breaker and apply power. (If circuit breaker does not trip, problem is in yoke), (3) If circuit breaker trips, remove vertical module, reset circuit breaker and apply power. PG16 and PG800 must remain disconnected. (If breaker doesn't trip, problem is in vertical module. If breaker trips, problem is in horizontal output or damper circuits.) This procedure will eliminate 2 of 3 circuit faults quickly.

Color TV Chassis MB-2—Circuit breaker trips

The normal troubleshooting techniques do not correct this problem. To repair, disconnect the degaussing coil and apply power with all modules installed. If breaker does not trip, measure the resistance from degaussing coil to chassis. It should read almost infinity. A reading of up to 5K ohms indicates that the coil may be shorting to the CRT shield or other grounded part. Remove and inspect the degaussing coil. Remember that the breaker does not trip when the HV Regulator is removed.

Color TV Chassis HE—Picture shifted to right, color shifting or streaking, horizontal hold critical, and high voltage lower than normal.

Resistor R264 in horizontal output stage is probably changing value. It should read greater than 150K ohms. Replace with 330K, ½W, carbon resistor.



Color TV Chassis MB-75—A herringbone interference pattern.

First, check for good ground connections and short lead length on the lead from emitter of Q1701 (Hor.Output) to chassis ground, then,

1.) Add a special ferrite bead (EP12X2) to emitter lead if one isn't already there.

2.) Remove any other connections from emitter and connect them to chassis ground.

3.) Remove top cover of IF module.

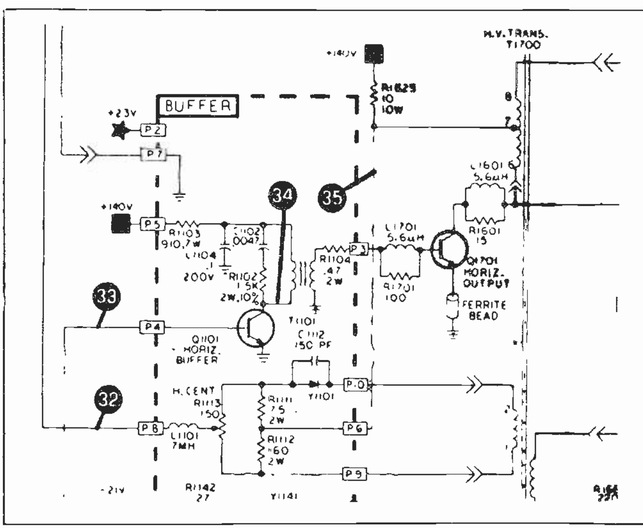
4.) Remove small cover over input circuit, on right side of module.

5.) Solder fold of inside shield to main internal shield which it is touching.

6.) Bend 'fingers' of top cover so they'll make positive contact with all internal shields.

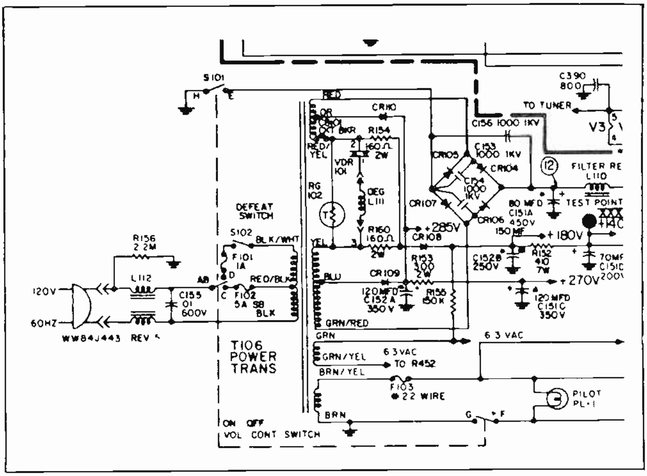
7. Reinstall small cover and top cover.

8.) Do not attempt to align any coils without alignment equipment, except the AFC coil.



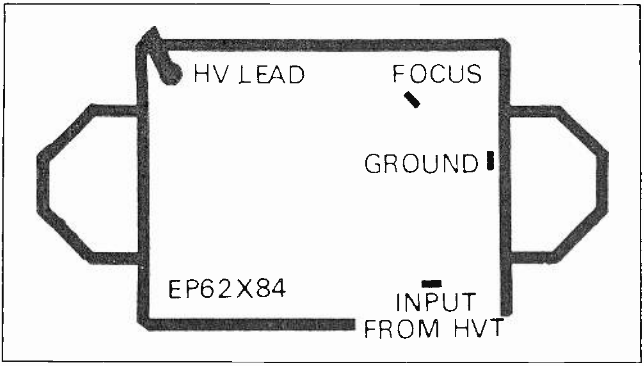
Color TV Chassis KE—Power supply diode failures.

Whenever a CR109 or CR110 Power Supply Diode failure occurs, check to see if there is a 1000pf capacitor across the diode. (Early production did not use these capacitors.) If there are no capacitors in these locations you should add an EP18X81 (1000pf, 1KV) across the replacement diode. The correct part number of these diodes is EP57X4. Addition of the capacitor will provide added protection against voltage surges which might result in future diode failures. Also, certain diodes operating without the added capacitor will develop "switching transients" which appear as a narrow black or gray horizontal bar, which floats up the screen.



Color TV Chassis MB-2—New high voltage multiplier (EP62X84).

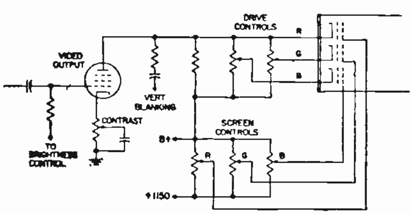
The new multiplier is a replacement for EP62X41, but, the terminal placement is slightly different and it doesn't have a connection diagram printed on the side. Connections should be made as shown below.



Magnavox

Bandpass Amplifier, Blanker and Killer Of Magnavox 45 and T904 Series

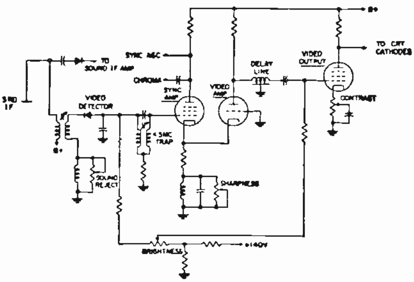
Color information exists in the form of sidebands that occupy a 0.5MHz control grids. The positive horizontal pulse on the blanker grid is amplified and inverted in the plate circuit. It is then coupled through the CRT bias control to the common cathode of the color-difference amplifiers. The bias adjustment controls the amplitude of the pulses reaching the cathodes. The cathode and grid elements in each color-difference amplifier acts as a diode when the negative pulse is applied. The resulting current charges the coupling capacitors in each CRT grid circuit. These coupling capacitors discharge slowly through their 1M grid resistors and establish a bias on the grids. When the bias control changes the amplitude of the blanking pulse, the CRT grid bias is also changed.



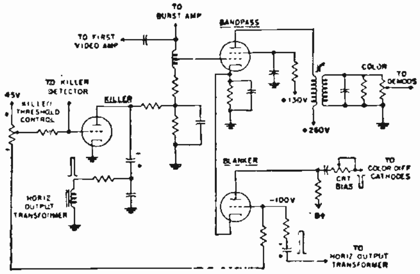
Each triode's dc plate voltage is dependent upon the plate current flow — as the plate current increases the plate voltage decreases. Since the plate voltage is applied directly to the CRT grids, any change in the plate voltage is a change in the CRT bias. By varying the grid bias of the triodes with the blanking pulse the dc plate voltage and the bias on the CRT grids are changed.

The blanking pulse is also amplified by each triode and serves to blank the CRT at the horizontal scanning rate. The blanking pulse is negative-going at the CRT grids since a signal inversion does not occur in a cathode-driven amplifier.

The bandpass amplifier conducts only when a color signal is received. To prevent noise signals from reaching the CRT grids the amplifier is cut-off



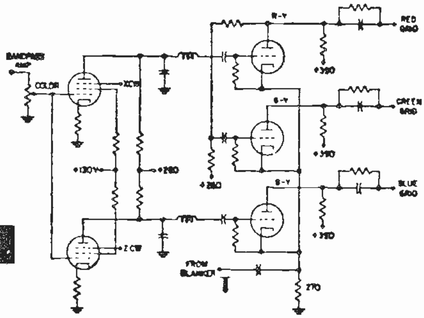
during a B/W transmission by the killer amplifier. The killer stage is sim-



ilar to an AGC amplifier. A positive horizontal pulse is applied to the killer plate through a coupling capacitor.

During B/W transmission the tube conducts on each pulse and places a negative charge on the plate side of the coupling capacitor. This negative dc voltage is applied to the grid of the bandpass amplifier—cutting it off.

These frequencies must also be coupled through an 18pf capacitor to the chroma circuits. The small size of the coupling capacitor allows the chroma information to pass but



blocks the relatively low frequencies of the luminance signal. The chrominance signal is then coupled to the bandpass amplifier grid through the chroma take-off coil. This coil is broadly resonant to 3.58MHz and allows the color information to pass while attenuating all frequencies that are outside the passband.

The sidebands are amplified by the bandpass amplifier and coupled through the color control to the synchronous demodulators. This amplifier is a special IF stage for the chrominance sidebands. A positive horizontal blanking pulse is used to cut-off the amplifier at the end of each scanning line. This is done to key out the burst signal that is present during the horizontal blanking period. The burst signal is eliminated at this point to prevent spurious colors from appearing on the screen of the CRT.

The job of keying out the burst signal is accomplished by the blanker stage. The cathodes of the blanker and the bandpass amplifier are connected together and share a common cathode resistor to ground. A positive pulse from the horizontal output transformer is coupled to the blanker amplifier grid. As this stage conducts, a positive pulse is developed, across the common-cathode resistor, high enough to cut-off the bandpass amplifier. The bandpass amplifier is cut-off at the time the burst signal is present on its grid — the burst does not appear in the plate circuit.

Color TV Adapter

The 170652-1 cable kit for adapting a Magnavox T904 Series color CRT test jig is available. It allows you to remove the T904 chassis and troubleshoot it on the bench. The kit also adapts the 23 and 19 in. chassis to the jig. It is pointed out, however, that all final checks and adjustments should be made with the CRT and neck components in the original instrument.

Magnavox Color Service Hints

Power Transformer Hi-line Tap

All 45 Series and T904 Series Magnavox color chassis provide a hi-line tap on the power transformer primary, to provide for the wide variation in line voltage which exists in some areas. Two leads from the hot side of the primary are connected to a terminal strip with solderless connectors. One of the terminals on the strip is connected to the hot side of the ac line, the other is blank. Under normal line voltage conditions (108 to 123v) the black and red lead should be connected to the ac line terminals. Under "high line" conditions the black and white lead should be connected to the line. In either case the unused lead must be connected to the blank terminal.

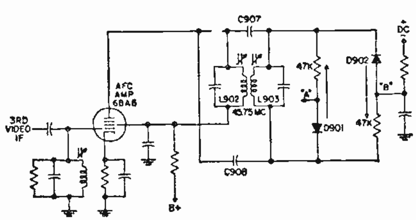
Voltage Regulator Tube - 6BK4

The voltage regulator tube, type 6BK4, normally has an internal connection between the cathode (pin 1) and pin 3 and pin 3 was used in production for the cathode connection. It has been recently found that at least one manufacturer's 6BK4's do not have this internal connection. If a tube of this type is used, no high voltage regulation would exist.

A jumper wire is now being connected between pins 1 and 3 in production to prevent this possibility.

Magnavox Automatic Color Control

In a number of versions of the 45 Series chassis, the T904 and the new color chassis, automatic frequency control circuitry has been added to make tuning less critical and to compensate for oscillator drift. The TV signal from the VHF or UHF tuner is amplified by the three IF stages and coupled to the AFC amplifier. The output circuit of the AFC amp is tuned to 45.75MHz which is the frequency of the IF video carrier. The video carrier is then applied to the AFC discrimninator. Any frequency variations between the video carrier and the resonant frequency of the discriminator transformer results in a plus or minus dc correction voltage in



the output circuit. The correction voltage is then fed back to an AFC diode in the oscillator circuit of the tuner which causes the oscillator frequency to shift to the correct tuning point. As shown below, the signal from the 3rd IF stage is amplified by the AFC amplifier and coupled through C907 and C908 to the discriminator diodes, D901 and D902.

The IF signal is also coupled to the discriminator transformer. Actually, L902 and L903 are separate coils, but they are spaced close enough to each other to provide transformer action. These coils are tuned to 45.75MHz, the IF frequency of the video carrier. While passing through the transformer, the IF signal is delayed 90deg. out of phase. This delayed signal adds to the *direct* signal coupled through C907 and C908. As a result, the ac voltage applied to D901 is 90deg. out of phase with the voltage applied to D902. The diodes conduct equally through their respective load resistors and produce zero voltage between points "A" and "B".

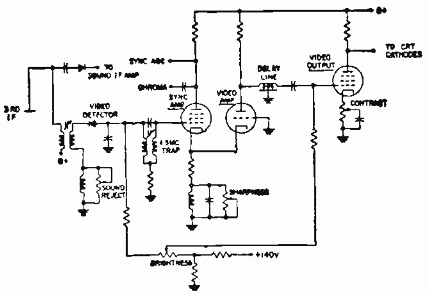
If the oscillator drifts off frequency or if it has been mistuned slightly, the IF video carrier frequency will be shifted above or below 45.75MHz. The secondary tuned circuit will appear to be an inductance or a capacitance, depending on the direction of frequency shift. The phase shift introduced by the transformer will now be *more* or *less* than 90deg. The resultant ac voltage applied to the diodes will then cause one diode to conduct more while the other diode will conduct less.

If diode D901 conducts less, then the heavier current flow through D902 will cause point "B" to become negative with respect to point "A". This negative voltage is filtered and coupled to the tuner to correct the oscillator frequency. When diode D901 conducts heavily, point "B" becomes positive with respect to point "A". The positive voltage "B" then corrects the oscillator frequency in the opposite direction.

Luminance Channel of Magnavox 45 and T904 Series

At the plate of the last IF stage the 41.25MHz sound carrier and the 45.75MHz video carrier couple through a capacitor to the sound detector diode. The two signals combine to form a 45MHz difference frequency which is then coupled to the sound IF amplifier and the following circuits.

The IF output also couples through the IF transformer to the video detector. The 41.25MHz sound carrier is present at this point and is filtered out by the sound reject trap. In prac-



tical circuitry it is not possible to completely eliminate the sound carrier and as a result a portion of this signal mixes with the 45.75MHz video carrier in the video detector and produces a low amplitude 4.5MHz output signal. This 4.5MHz signal, if not eliminated, will beat with the 3.58MHz chrominance signal to produce a 920kHz signal. This beat signal would be amplified and appear as narrow diagonal lines across the picture tube screen. To prevent this beat signal from being produced a bifilar wound trap is used to attenuate 4.5MHz signal in the output of the video detector.

The video IF carrier is applied to the cathode of the video detector diode. The detector output is a video signal in which the sync tips are negative. The signal is then coupled to the grid of the sync amplifier where it is amplified and inverted in the plate circuit. At this point the video signal is coupled to the AGC amplifier grid and the sync separator grid. Also at this point, the chrominance information is separated from the luminance signal by coupling it through an 18pf capacitor to the bandpass amplifier grid and the burst amplifier grid.

The sync amplifier also acts as a cathode follower for the luminance signal. The signal is developed across a small, unbypassed cathode resistor and drives the cathode of the video amplifier. This stage exhibits low gain and low output impedance and achieves an excellent impedance match to the delay line in the plate circuit. You will recall that the purpose of the delay line is to retard the luminance signal a small amount so that it arrives at the picture tube in unison with the color information. The delay line retards the luminance signal about one Msec.

A sharpness control is located in the cathode circuit of the sync amplifier to provide varying amounts of amplification for the high frequency components of the video signal. The control is connected across a resonant circuit tuned to about 2MHz. The tuned circuit looks like a high impedance to the frequencies around 2MHz when the control arm is grounded. These frequencies are then reduced in amplitude by degeneration. As the control arm is moved toward the cathode, more and more of the high frequencies are shunted around the tank circuit and amplified. This control has its usefulness in weak-signal areas. Background noise can be reduced with this control so that it becomes less noticeable.

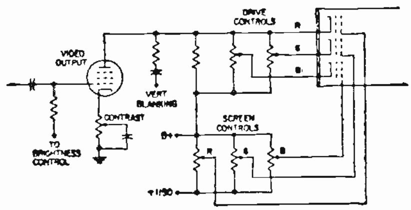
The signal is coupled from the delay line to the grid of the video output stage through a capacitor. The dc component is not lost, however, because a parallel path is provided by the Brightness control. A negative dc voltage is developed at the anode of the video detector diode, and this voltage is applied to one end of the brightness control. A small positive voltage is applied to the opposite end of the control by the two voltage dividing resistors. With this arrangement, the bias on the grid of the video output tube can be varied from a negative value to a positive value. This causes the dc plate voltage of the output stage to vary.

As the cathodes of the CRT become more positive the beam currents decrease and the brightness is reduced. Conversely, decreasing the cathode voltage increases the beam currents and brightness level. The dc component of the video signal adds or subtracts from the grid voltage on the video output tube so the brightness varies with the low frequency components of the video signal.

The video signal is inverted so that sync tips are in a positive direction. This is the proper polarity for driving the picture tube cathodes. A positive vertical blanking pulse from the plate of the vertical output tube is coupled to the CRT cathodes and provides blanking of the three guns during the vertical retrace period.

The luminance signal is coupled directly to the cathode of the red gun, and through the video drive controls to the green and blue guns. The light emitting qualities of the three phosphors are unequal. Since the red phosphor is usually the least efficient of the three it receives the full value of the luminance signal. The drive controls reduce the luminance signal reaching the green and blue guns so all three guns are equalized.

In conjunction with the drive con-



trols there are three screen voltage potentiometers, one for each gun. These also compensate for differences in phosphor efficiencies and cut-off characteristics in the individual guns. The contrast control is located in the cathode circuit. A 50μf capacitor connects from the center arm to ground. This circuit operates on the degeneration principle. Minimum contrast occurs when the center arm is moved to the ground end of the control. At this setting the video voltage developed across the control opposes the video signal on the grid. This is negative feedback or degeneration. As the control arm is moved toward the cathode more and more of the control resistance producing less degeneration and more amplification of the video signal and, therefore, more contrast.

Magnavox Adapter Plugs and Cables for Color Servicing

All current color TV chassis (T911-07, T918-09, T919-10, T920-08 and later versions) use a universal power cable. In non-remote models a jumper plug assembly (part #170796-1) is used to terminate this cable. In remote control models this cable plugs into the remote chassis, but if the TV chassis is removed to the shop for service without the remote chassis the jumper plug will be required to operate the TV chassis. Also if the remote receiver should be removed to the shop for repair, this jumper plug can be used to permit normal operation of the TV receiver by the customer. A 170796-1 plug assembly is now included.

On stereo theatre models this same jumper plug can be used to operate the TV chassis on the service bench. When the TV chassis is removed for service you can keep the radio and phono portions of the unit operating for the customer by using the special ac line cord (part #170786-1) to connect between the remote and outlet.

On non-remote stereo theatre models a relay and cable assembly (part #704038-1) is used between the TV chassis power cable and the radio chassis. If the TV chassis is removed for service on these models the special ac line cord (170786-1) should be plugged into the relay assembly to allow the radio and phono to be operated in the normal manner.

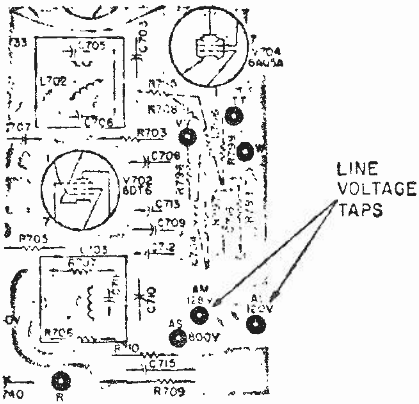
The 704038-1 relay assembly can be a handy service accessory if a remote chassis is removed from a stereo theatre model for service in the shop. By temporarily installing this assembly the customer can have full use of TV, radio and phono while the remote chassis is being repaired.

Burst Amplifier Tube Change In Magnavox Color TV

Color TV chassis T911, T918, T919 and T920 are now using a 6KE8 tube in the burst amplifier (V706) instead of the 6GH8. These tubes are directly interchangeable with no circuit changes required. The 6KE8 provides an increase in burst amplitude at the output of the burst amp stage and is recommeded as a replacement for the 6GH8 (V706) in cases of critical color sync.

Color TV Models T911/T918/T919/T920 /T931 — Line Voltage Tap

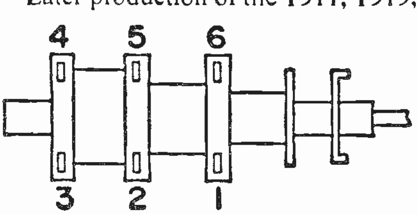
All color TV models using the T911, T918, T919, T920 or T931 chassis are provided with line voltage taps. Although this feature has been employed for some time, apparently some technicians are not aware of it. It is particularly important to see that the tap is in the high line voltage (128v) position if the receiver is to be



operated under high line voltage conditions. This tap is in the form of solderless terminals on the chroma board adjacent to the power transformer. One terminal is marked "AL120v" (for low or normal line voltage) and the other is marked "AM128v" (for high line).

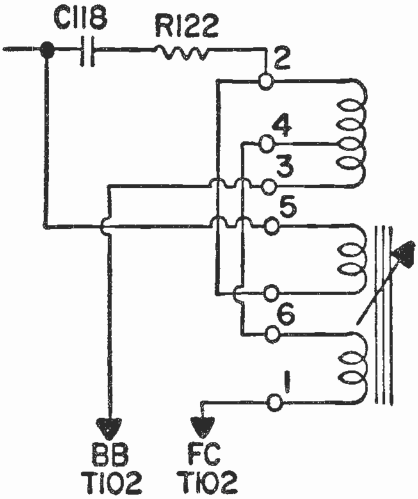
Color TV Chassis T911/T919/T920/ T931 — New Focus Transformer

Later production of the T911, T919,



T920 and T931 color TV chassis uses a new type focus transformer part No.

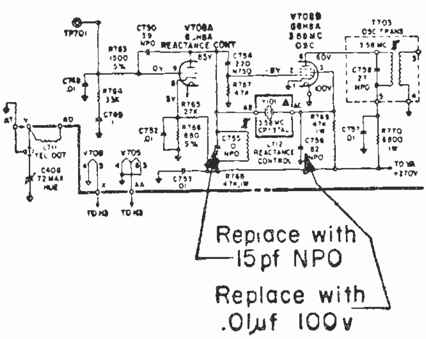
361306-1. The 361306-1 can be used as a replacement for the earlier transformer (361240-3); however, because of physical differences between the two, the connections are not the same.



Terminal identification and the correct wiring for the 361306-1 transformer are shown in illustration.

Critical Color Sync On Magnavox Color TV Chassis

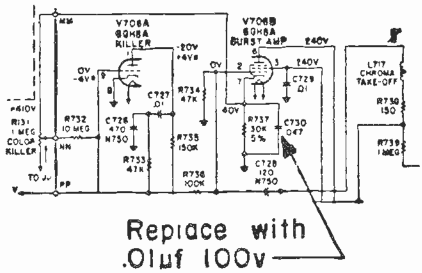
If critical color sync is encountered on the 911, 918, 919 and 920 chassis — after necessary checks are made to determine if the 3.58MHz oscillator



reactance control and killer circuitry is functioning normally — the following changes can be made.

1. Remove C755 (10pf NPO) and replace it with a 15pf NPO.
2. Remove C756 (82pf NPO) and replace it with a 100pf NPO.
3. If C730 is a 0.047µf, replace it with a 0.01µf 100v.
4. If the burst amplifier tube is a 6GH8, replace it with a 6KE8.
5. Perform AFPC adjustment as outlined in the service manual.

The first two changes permit the



3.58MHz oscillator to operate on a more linear curve which improves the "hold-in" range of the color sync circuit. Changes 3 and 4 provide an increase in the burst signal amplitude which increases the control voltage applied from the phase detector diodes to the reactance control circuit.

Magnavox T919 Color Circuitry

The composite signal is fed from the output of the 1st video amplifier to the grid of the bandpass amplifier (V707A).

If the signal being transmitted is a B/W transmission, a positive horizontal pulse is applied to the color killer plate. During this monochrome transmission, V706A conducts on each of these pulses. Each pulse places a negative charge on the plate side of C727. As the capacitor discharges, a negative voltage is developed and applied to the grid of the bandpass amplifier, thus cutting it off. The color killer control determines the amount of plate current which will flow in the killer tube. This in turn the free-running frequency of the 3.58MHz oscillator.

The purpose of the 3.58MHz oscillator is to re-create the 3.58MHz sub-carrier required to demodulate the sub-carrier sidebands. This reinserted signal must have the same phase and frequency as that which was suppressed at the transmitter. The oscillator portion of this tube consists of the cathode, grid and screen-grid with the screen functioning as the oscillator plate. The CW signal is then electron-coupled to the plate and through the transformer to the demodulators. The secondary winding is followed by a phase-shifting network to derive two CW signals. The "X" signal, coupled directly to the "X" demodulator, is in phase with the chroma signal and the "Z" signal is approximately 85deg out of phase with the "X" signal and is coupled to the "Z" demodulator.

The "X" and "Z" terminology has no special meaning except to differentiate between the R-Y and B-Y axis. A certain amount of phase shift from the R-Y and B-Y axis is developed because of the common cathode resistor of the color-difference amplifiers. Hence, it is necessary to shift the CW reference signals to compensate for this phase shift. Since these two signals are out of phase and each demodulator will conduct when its reference signal reaches its peak positive value, the "X" demodulator will conduct approximately 85deg ahead of the "Z" demodulator.

As the chroma signal phase shifts to correspond to a new color, the plate current of these demodulators is also affected. This increase or decrease in current also affects the R-Y and B-Y sections of the 6MD8 tube which in turn either increases or decreases the conduction in the red and green guns of the CRT. Simultaneously, since the green signal is made up of portions of each demodulator output, the G-Y section of the 6MD8 increases or decreases — conduction thus controlling the green gun in the CRT. The output from each demodulator is a series of 3.58MHz pulses varying in amplitude according to the chroma signal at the control grid of the demodulators. These 3.58MHz pulses are filtered in the plate circuit of the demodulators — leaving only the demodulated signals which are then applied to the color difference amplifier for amplification before being applied to the individual CRT grid.

The individual CRT beams are modulated by the phase and amplitude variations of the color signal on the grid and by the amplitude of the luminance signal on the cathode. These beams then combine to produce the desired picture.

Color TV Chassis T919/T920 — Horizontal Centering

These chassis employ a diode (SR-104) paralleled by a 4.7Ω resistor (R171) which is series connected with the horizontal deflection coils. This diode/resistor combination is connected between pin 8 on the deflection yoke plug (blue lead) and terminal BB on the horizontal output transformer. This circuit is used to provide

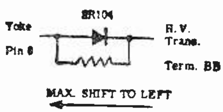


Figure A

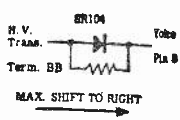


Figure B

horizontal centering of the picture which can be shifted either to the left or right. In some chassis you will find a jumper wire connected across the diode resistor combination.

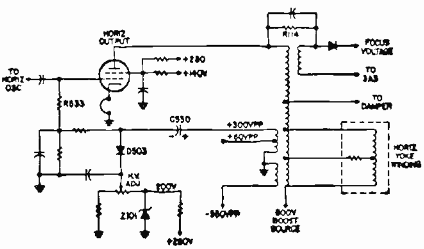
In cases when horizontal centering adjustment is needed, check the wiring of SR104. The illustrations indicate the direction of picture movement provided in each case.

If the circuit is connected as shown in Fig. A, placing a jumper across the diode will shift the picture to the right approximately ½in. If additional shift to the right is needed, remove the jumper and reverse the connections to the diode as shown in illustration B.

To be sure of the direction and amount of picture movement, it is suggested that you use a crosshatch generator and mark the center vertical line on the tube face with a piece of masking tape.

Color TV Chassis T924 — Horizontal output Circuit

The modified sawtooth signal, developed by the horizontal oscillator, is capacitively coupled to the horizon-



tal output grid (see illustration). The horizontal output tube conducts during approximately 50% of scan time and is responsible for scanning only the right hand side of the screen. When the beam reaches the right hand side of the screen, the horizontal output is driven to cut-off. At that time the field which has been developed in the flyback collapses causing a reversal in the voltage across it. The voltage across the yoke is suddenly reversed and the beam is moved from the right side of the screen to the extreme left side. This means yoke current has decreased from maximum in one direction to zero and then to maximum in the opposite direction. After this current reversal, yoke current ceases to flow and its field collapses causing a reversal in voltage which forward biases the damper tube. The yoke now discharges its energy through the damper to move the beam from the left side of the screen to the center. As the beam reaches the center, the horizontal output tube is again "switched on" and the cycle repeats.

The pulse, developed across the flyback transformer as a result of the collapsing field, measures about 5kv at the plate of the horizontal output. This pulse is stepped up through the HV winding and rectified by a 3A3 to provide 24kv for the CRT anode.

This pulse is rectified directly by a solid-state rectifier to provide approximately 5kv of voltage for the focus electrode. This voltage is made variable by using a transformer to couple opposite phase voltages to the cathode of the focus rectifier. This is the same procedure used on previous Magnavox chassis.

The dc return for both the focus rectifier and HV rectifier is through R114 and the horizontal output tube to ground. The reason for this arrangement is that the focus voltage will "track" the high voltage.

This is required for proper focusing of the beams with different values of anode voltage. The anode voltage can vary slightly from one scene to another or as the brightness control setting is changed. If the focus voltage did not change accordingly, defocusing of the beams would occur at all levels of brightness except for the point where the two voltages were exactly equal.

The basic idea is to make the focus voltage go up as high voltage goes up, or down as the high voltage goes down.

To see how this is accomplished, assume the brightness control was advanced. This would cause the CRT anode to draw more current and since its dc return to ground is through R114 and the horizontal output tube, a voltage drop is developed across R114 making the anode side of the focus rectifier become more negative. The focus rectifier, therefore, cannot rectify as much of the 5kv pulse as before so the resultant dc focus voltage will be lower.

The HV shunt regulator system is not employed in this chassis. Instead a feedback regulation system is used, whereas a sample of horizontal signal is rectified, filtered and fed back as an automatic bias control for the horizontal output tube.

To establish a reference voltage, a 200v Zener diode (Z101) is connected in series with a resistor between the 280v supply and ground. This provides a voltage source which does not change with supply voltage variations. From this 200v source the HV adjust control is connected in series with a fixed resistor to ground. The wiper arm of the HV control is connected to the cathode of a small silicon diode (D503). Since the HV control and the fixed resistor to ground are approximately the same value, the cathode of D503 can be varied from 200 to 100 volts.

A positive going 300v pulse is coupled through C530 to the anode of D503 causing C530 to become charged to the polarity indicated. Assuming the HV control was set to midrange, C530 would charge up to approximately 150v. This voltage is filtered to remove the ac component and then connected to the horizontal output tube grid through R533.

To understand how this circuit regulates the HV, assume the video scene suddenly became brighter. The HV would drop because of increased loading on the output system.

The increased loading causes the amplitude of the pulse coupled through C530 to decrease; therefore the negative voltage developed at the anode of D503 becomes less. The grid voltage of the horizontal output becomes less negative (or more positive) and the stage conducts harder, thereby compensating for the additional load.

The opposite would occur should the loading on the output system decrease. As in the vertical circuit, this system also compensates for slight variations in ac line voltage.

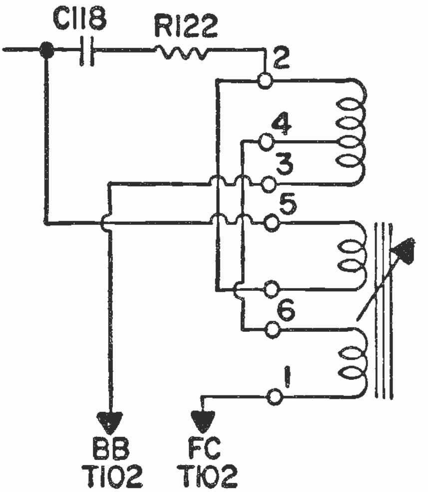
In this circuit the horizontal output cathode current varies depending upon the brightness of the video scene as well as the brightness control setting. The average cathode current (at normal brightness) runs approximately 200ma but will vary from 160ma at minimum brightness to 220ma at high brightness.

Magnavox Gray Scale Adjustments And 'Chromatone'

The "CB" production of the T920 chassis use solderless connectors in the cathode leads to the CRT socket. This feature is employed to assist in color temperature adjustment (gray scale). Normally the blue and green cathodes are connected to the blue and green drive controls respectively, and the red cathode is driven directly. Some picture tubes, depending on the characteristics of the three guns, may require less drive to the red gun and more to either the green or blue gun. The "quick disconnect" solderless connectors make it easier to change the drive connections to the CRT cathodes to accommodate for this difference.

At the present time 25AP22 and 25XP22 picture tubes are being used in production and with the 25AP22 the cathode leads are connected normally (red to red, etc.). Under these circumstances the color temperature

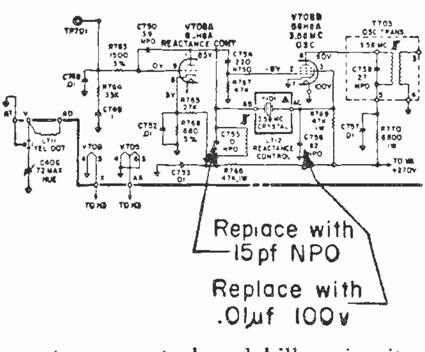
361306-1. The 361306-1 can be used as a replacement for the earlier transformer (361240-3); however, because of physical differences between the two, the connections are not the same.



Terminal identification and the correct wiring for the 361306-1 transformer are shown in illustration.

Critical Color Sync On Magnavox Color TV Chassis

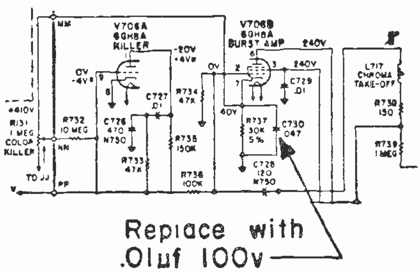
If critical color sync is encountered on the 911, 918, 919 and 920 chassis — after necessary checks are made to determine if the 3.58MHz oscillator



reactance control and killer circuitry is functioning normally — the following changes can be made.

1. Remove C755 (10pf NPO) and replace it with a 15pf NPO.
2. Remove C756 (82pf NPO) and replace it with a 100pf NPO.
3. If C730 is a 0.047µf, replace it with a 0.01µf 100v.
4. If the burst amplifier tube is a 6GH8, replace it with a 6KE8.
5. Perform AFPC adjustment as outlined in the service manual.

The first two changes permit the



3.58MHz oscillator to operate on a more linear curve which improves the "hold-in" range of the color sync circuit. Changes 3 and 4 provide an increase in the burst signal amplitude which increases the control voltage applied from the phase detector diodes to the reactance control circuit.

Magnavox T919 Color Circuitry

The composite signal is fed from the output of the 1st video amplifier to the grid of the bandpass amplifier (V707A).

If the signal being transmitted is a B/W transmission, a positive horizontal pulse is applied to the color killer plate. During this monochrome transmission, V706A conducts on each of these pulses. Each pulse places a negative charge on the plate side of C727. As the capacitor discharges, a negative voltage is developed and applied to the grid of the bandpass amplifier, thus cutting it off. The color killer control determines the amount of plate current which will flow in the killer tube. This in turn determines the amount of bias developed and applied to the bandpass amplifier.

If the transmission is a color signal, the bandpass amplifier must conduct and to do this the color killer must be cut off. This is accomplished by the bias voltage developed by the killer detector circuit which uses two diodes (CR701A & B).

The burst amplifier is normally biased to cut off and also turned on by a portion of the same horizontal pulse which is normally used to turn on the color killer. As the burst amplifier is turned on, a 3.58MHz burst signal is coupled to the grid through the capacitor, C728. The burst signal is amplified and appears across the burst transformer.

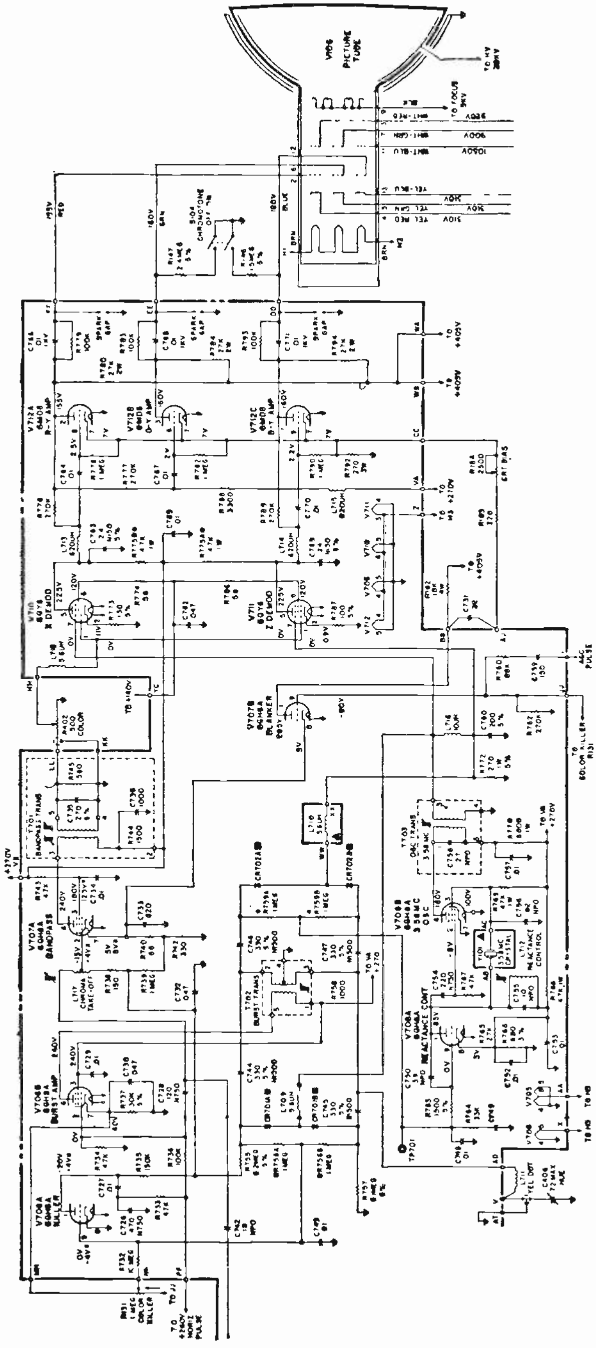
Two burst signals are coupled from the secondary of the burst transformer to the killer-detector diodes through the capacitors C744 and C745. These two signals are 180deg out of phase. Simultaneously, a third signal is applied to the junction of these diodes from the 3.58MHz oscillator transformer secondary, through choke L709. The phase relationship of the third signal to the other two signals is such that both diodes will conduct. Because of this relationship, however, one diode will conduct more heavily than the other — developing a negative voltage at the junction of the two load resistors and coupling it to the color-killer grid. This negative voltage biases the color killer to cut-off so that even if the horizontal pulse is present at its plate, the tube will not conduct and thus allows the bandpass amplifier to conduct.

The bandpass amplifier must amplify only the chrominance portion of the incoming signal. This information is contained in the frequencies between 3.08MHz and 4.08MHz. This chroma information is coupled from the 1st video amplifier plate by an 18pf capacitor. The small size of this capacitor blocks the relatively low frequencies of the luminance signal which is also present at the plate of the 1st video amplifier.

To prevent the burst signal from being amplified by the bandpass amplifier, a positive pulse is applied to the blanker tube grid. As this stage conducts a positive pulse is developed across its cathode resistor, which (being common to the bandpass amplifier), cuts off the bandpass amplifier during the time the burst signal is present on its grid. Thus, only the chroma information is passed to the demodulators.

The phase detector circuit compares the phase of the transmitted burst signal with the 3.58MHz oscillator. Under normal operating conditions, when the two signals have the correct phase relationship, the two diodes (CR702A & B) will conduct equally. If the oscillator signal tends to advance or retard its phase relationship with the incoming signal, the two diodes become unbalanced. Thus one diode will conduct more heavily than the other and the necessary correction voltage is applied to the reactance tube grid and to the 3.58MHz oscillator.

The reactance tube functions as an electronic variable capacitor. If a positive correction voltage from the phase detectors is applied to this tube, the effective capacitance across the 3.58MHz crystal increases — resulting in a lower oscillator frequency. A negative correction voltage from the phase detectors decreases the effective capacitance across the 3.58MHz crystal — resulting in a higher oscillator frequency. A reactance control coil, located in the plate circuit of the reactance tube, off-sets any inherent capacity in the tube itself and also sets



the free-running frequency of the 3.58MHz oscillator.

The purpose of the 3.58MHz oscillator is to re-create the 3.58MHz sub-carrier required to demodulate the sub-carrier sidebands. This reinserted signal must have the same phase and frequency as that which was suppressed at the transmitter. The oscillator portion of this tube consists of the cathode, grid and screen-grid with the screen functioning as the oscillator plate. The CW signal is then electron-coupled to the plate and through the transformer to the demodulators. The secondary winding is followed by a phase-shifting network to derive two CW signals. The "X" signal, coupled directly to the "X" demodulator, is in phase with the chroma signal and the "Z" signal is approximately 85deg out of phase with the "X" signal and is coupled to the "Z" demodulator.

The "X" and "Z" terminology has no special meaning except to differentiate between the R-Y and B-Y axis. A certain amount of phase shift from the R-Y and B-Y axis is developed because of the common cathode resistor of the color-difference amplifiers. Hence, it is necessary to shift the CW reference signals to compensate for this phase shift. Since these two signals are out of phase and each demodulator will conduct when its reference signal reaches its peak positive value, the "X" demodulator will conduct approximately 85deg ahead of the "Z" demodulator.

As the chroma signal phase shifts to correspond to a new color, the plate current of these demodulators is also affected. This increase or decrease in current also affects the R-Y and B-Y sections of the 6MD8 tube which in turn either increases or decreases the conduction in the red and green guns of the CRT. Simultaneously, since the green signal is made up of portions of each demodulator output, the G-Y section of the 6MD8 increases or decreases — conduction thus controlling the green gun in the CRT. The output from each demodulator is a series of 3.58MHz pulses varying in amplitude according to the chroma signal at the control grid of the demodulators. These 3.58MHz pulses are filtered in the plate circuit of the demodulators — leaving only the demodulated signals which are then applied to the color difference amplifier for amplification before being applied to the individual CRT grid.

The individual CRT beams are modulated by the phase and amplitude variations of the color signal on the grid and by the amplitude of the luminance signal on the cathode. These beams then combine to produce the desired picture.

Color TV Chassis T919/T920 — Horizontal Centering

These chassis employ a diode (SR-104) paralleled by a 4.7Ω resistor (R171) which is series connected with the horizontal deflection coils. This diode/resistor combination is connected between pin 8 on the deflection yoke plug (blue lead) and terminal BB on the horizontal output transformer. This circuit is used to provide

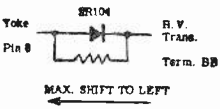


Figure A

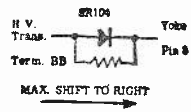


Figure B

horizontal centering of the picture which can be shifted either to the left or right. In some chassis you will find a jumper wire connected across the diode resistor combination.

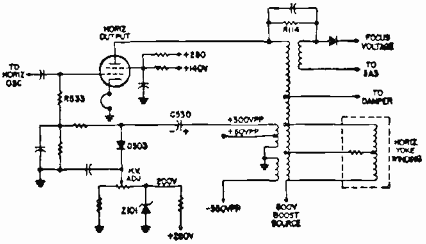
In cases when horizontal centering adjustment is needed, check the wiring of SR104. The illustrations indicate the direction of picture movement provided in each case.

If the circuit is connected as shown in Fig. A, placing a jumper across the diode will shift the picture to the right approximately ½in. If additional shift to the right is needed, remove the jumper and reverse the connections to the diode as shown in illustration B.

To be sure of the direction and amount of picture movement, it is suggested that you use a crosshatch generator and mark the center vertical line on the tube face with a piece of masking tape.

Color TV Chassis T924—Horizontal output Circuit

The modified sawtooth signal, developed by the horizontal oscillator, is capacitively coupled to the horizon-



tal output grid (see illustration). The horizontal output tube conducts during approximately 50% of scan time and is responsible for scanning only the right hand side of the screen. When the beam reaches the right hand side of the screen, the horizontal output is driven to cut-off. At that time the field which has been developed in the flyback collapses causing a reversal in the voltage across it. The voltage across the yoke is suddenly reversed and the beam is moved from the right side of the screen to the extreme left side. This means yoke current has decreased from maximum in one direction to zero and then to maximum in the opposite direction. After this current reversal, yoke current ceases to flow and its field collapses causing a reversal in voltage which forward biases the damper tube. The yoke now discharges its energy through the damper to move the beam from the left side of the screen to the center. As the beam reaches the center, the horizontal output tube is again "switched on" and the cycle repeats.

The pulse, developed across the flyback transformer as a result of the collapsing field, measures about 5kv at the plate of the horizontal output. This pulse is stepped up through the HV winding and rectified by a 3A3 to provide 24kv for the CRT anode.

This pulse is rectified directly by a solid-state rectifier to provide approximately 5kv of voltage for the focus electrode. This voltage is made variable by using a transformer to couple opposite phase voltages to the cathode of the focus rectifier. This is the same procedure used on previous Magnavox chassis.

The dc return for both the focus rectifier and HV rectifier is through R114 and the horizontal output tube to ground. The reason for this arrangement is that the focus voltage will "track" the high voltage.

This is required for proper focusing of the beams with different values of anode voltage. The anode voltage can vary slightly from one scene to another or as the brightness control setting is changed. If the focus voltage did not change accordingly, defocusing of the beams would occur at all levels of brightness except for the point where the two voltages were exactly equal.

The basic idea is to make the focus voltage go up as high voltage goes up, or down as the high voltage goes down.

To see how this is accomplished, assume the brightness control was advanced. This would cause the CRT anode to draw more current and since its dc return to ground is through R114 and the horizontal output tube, a voltage drop is developed across R114 making the anode side of the focus rectifier become more negative. The focus rectifier, therefore, cannot rectify as much of the 5kv pulse as before so the resultant dc focus voltage will be lower.

The HV shunt regulator system is not employed in this chassis. Instead a feedback regulation system is used, whereas a sample of horizontal signal is rectified, filtered and fed back as an automatic bias control for the horizontal output tube.

To establish a reference voltage, a 200v Zener diode (Z101) is connected in series with a resistor between the 280v supply and ground. This provides a voltage source which does not change with supply voltage variations. From this 200v source the HV adjust control is connected in series with a fixed resistor to ground. The wiper arm of the HV control is connected to the cathode of a small silicon diode (D503). Since the HV control and the fixed resistor to ground are approximately the same value, the cathode of D503 can be varied from 200 to 100 volts.

A positive going 300v pulse is coupled through C530 to the anode of D503 causing C530 to become charged to the polarity indicated. Assuming the HV control was set to midrange, C530 would charge up to approximately 150v. This voltage is filtered to remove the ac component and then connected to the horizontal output tube grid through R533.

To understand how this circuit regulates the HV, assume the video scene suddenly became brighter. The HV would drop because of increased loading on the output system.

The increased loading causes the amplitude of the pulse coupled through C530 to decrease; therefore the negative voltage developed at the anode of D503 becomes less. The grid voltage of the horizontal output becomes less negative (or more positive) and the stage conducts harder, thereby compensating for the additional load.

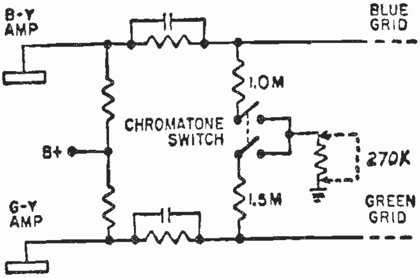
The opposite would occur should the loading on the output system decrease. As in the vertical circuit, this system also compensates for slight variations in ac line voltage.

In this circuit the horizontal output cathode current varies depending upon the brightness of the video scene as well as the brightness control setting. The average cathode current (at normal brightness) runs approximately 200ma but will vary from 160ma at minimum brightness to 220ma at high brightness.

Magnavox Gray Scale Adjustments And 'Chromatone'

The "CB" production of the T920 chassis use solderless connectors in the cathode leads to the CRT socket. This feature is employed to assist in color temperature adjustment (gray scale). Normally the blue and green cathodes are connected to the blue and green drive controls respectively, and the red cathode is driven directly. Some picture tubes, depending on the characteristics of the three guns, may require less drive to the red gun and more to either the green or blue gun. The "quick disconnect" solderless connectors make it easier to change the drive connections to the CRT cathodes to accommodate for this difference.

At the present time 25AP22 and 25XP22 picture tubes are being used in production and with the 25AP22 the cathode leads are connected normally (red to red, etc.). Under these circumstances the color temperature adjustments as outlined in the service manual will apply. With the 25XP22,



in most cases, the red cathode will be connected to the GREEN DRIVE control and the green cathode to the RED DRIVE connection. Color temperature adjustment procedure in this case is somewhat different. As a first step, check the drive controls by varying the controls and watching the CRT screen to determine how they are connected. If turning up the GREEN drive control causes the screen to go red this means the green and red connectors have been transposed to equalize the gun characteristics. In this case set the BLUE drive to maximum and the control that now affects the RED drive to minimum, then proceed with the screen control adjustments as follows:

1. Set the BRIGHTNESS control to minimum, SCREEN controls fully CCW, CRT BIAS fully CCW and be sure that the "Chromatone" switch is at the OFF position.
2. Set the service switch to SERVICE and advance each screen control to a point where they produce a barely visible horizontal line. (If one or more controls fail to produce a line with its screen control at full CW, advance the CRT BIAS control slightly and readjust the other two screen controls.)
3. Return the service switch to NORMAL, tune in a monochrome picture and set the BRIGHTNESS to maximum. If necessary, advance the CRT BIAS control so a slight picture blooming is noticeable at maximum brightness.
4. Turn the BRIGHTNESS control down to normal brightness and adjust the RED, BLUE and GREEN drive controls as necessary to maintain the same color temperature in highlight and lowlight areas.
5. While adjusting the BRIGHTNESS control, check to see that the screen maintains essentially the same color temperature. If one color predominates at low brightness, adjust the corresponding screen control (if red predominates turn the RED screen down) to minimize the effect.

The "CB" production of the T920 chassis also includes a circuit change in the "Chromatone" circuit as shown: The 1.5M resistor (R147) connected to the green grid was 2.4M and the 1M resistor (R146) was 1.5M in earlier production. Also the 270K has been added in series with the switch to ground. When the 25XP22 CRT is used this resistor is shorted out by a jumper wire as shown. When the 25AP22 CRT is used, the jumper wire is clipped out.

Burst Amplifier and 3.58MHz Oscillator Circuit of the Magnavox T924 Color Chassis

The burst amplifier and 3.58MHz oscillator circuitry is shown here. The chroma signal and a positive horizontal pulse are applied to the grid of the burst amplifier. The burst amplifier conducts only during the interval that the grid is driven positive by the horizontal pulse. This coincides with the interval that the color burst reference signal is present on the grid, therefore, the burst signal is amplified but the chroma information is rejected.

If a scope is connected to the grid of the burst amplifier (scope sweep set to view horizontal rate), you can see the positive horizontal pulse with the burst signal sitting on the peak. The amplitude measured at this point is in the vicinity of 65v P-P.

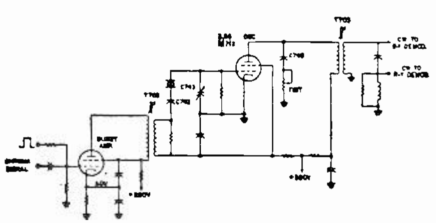
Moving the scope lead to the plate would reveal a burst signal having an amplitude of approximately 180v P-P.

This burst signal is then coupled through a low impedance link on the burst transformer to the grid circuit of the 3.58MHz oscillator. The injection of the burst signal in this fashion causes the frequency of the 3.58MHz oscillator to become "locked" with that of the burst signal.

The 3.58MHz oscillator is a version of the Pierce oscillator with the screen grid acting as the anode. Feedback is from the screen, through the link (on the burst transformer), through C742, through the crystal and back to the grid.

The free-running frequency of the oscillator can be precisely adjusted to 3.58MHz by the small trimmer capacitor, C743 (2-12pf). This adjustment is made during AFPC alignment.

The oscillator signal is electron coupled to the plate which employs a 3.58MHz tuned transformer for its load. The secondary of this transformer is used to couple the 3.58MHz CW reference signals to the R-Y and B-Y demodulators. These are identical 3.58MHz sinewaves having an amplitude of approximately 15v P-P. A



phase shift network is connected across the secondary so that the CW signal to the R-Y demodulator will lag the B-Y CW signal by approximately 90deg. This relationship is necessary to demodulate the chroma signal properly. Remember that the 3.58MHz reference signals applied to the demodulators represent the re-inserted carrier with which the chroma signals — originally modulated but suppressed prior to transmission. The chroma signal was modulated with a 3.58MHz signal on two different axes 90deg apart which accounts for this phase shift network in the receiver.

This phase shift network "fixes" the phase relationship between the R-Y and B-Y CW signals. Both signals can be phase shifted, however, by rotating the TINT control. Assuming the TINT control is centered and T703 is tuned to precisely 3.58MHz, the plate circuit of the oscillator will look resistive. Rotating the TINT control back and forth will cause the plate circuit to be tuned above and below resonance which causes the circuit to look capacitive and then inductive, resulting in a phase shift of the 3.58MHz signal.

This permits phase adjustment of reference signals so the demodulated signal will reproduce the same tint (or hue) on the screen of the receiver as the scene originally scanned by the television camera. (Normal phase shift is approximately ±50 deg.)

To be certain these circuits are performing their job, it may be necessary to perform an AFPC (automatic frequency and phase control) adjustment occasionally.

AFPC Adjustment

1. Tune in color bar generator.
2. Set TINT control to center of its range.
3. Ground grid of burst amplifier.
4. Connect VTVM to pin 9 of V706 (grid of killer).
5. Adjust T702 (burst transformer) for minimum dc (negative) voltage.

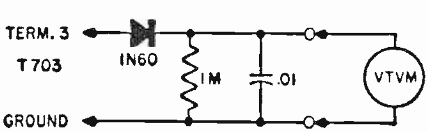
Note: The 3.58MHz oscillator must be running during this adjustment.

6. Adjust oscillator trimmer capacitor, C743, for zero beat (color bars stand still or drift slowly). **Note:** At zero beat the color bars will be the same color from top to bottom.
7. Remove ground from burst amplifier grid and connect VTVM to plate of either demodulator.
8. Adjust T703 (oscillator plate transformer) for maximum dc reading.
9. Observe color bar pattern and touch-up T703 (if necessary) for correct tint. Check TINT control for sufficient range.

Color TV Chassis T924 — Color AFPC Adjustment

There have been reports of difficulty in obtaining proper operation after performing the AFPC adjustments as outlined in service manual No. 7297. Rotation of the tint control in some cases may result in a change in picture brightness, a loss of color sync or even loss of color. To prevent this, disregard the original adjustment procedure and proceed as follows:

1. Connect a color bar generator to the antenna terminals and adjust the receiver for a normal color bar pattern.
2. Set the tint color to its approximate center.
3. Ground the burst amplifier grid, pin 2 of V706.



4. Connect a VTVM to the color killer grid, pin 9 of V706 and set it to read a negative dc voltage.
5. Adjust the burst transformer T702 to obtain a minimum negative dc voltage reading.
6. Adjust the 3.58MHz oscillator trimmer, C743 so the color bars stand still or just drift by slowly on the screen.
7. Remove the ground from the burst amplifier grid and connect the VTVM through the detector network shown, to terminal 3 of the oscillator plate transformer, T703.
8. Rotate the tint control to either extreme and adjust T703 (correct peak is with the slug located close to the circuit board) for approximately -9v on the VTVM. Rotate the control to the other extreme and check the voltage reading. Adjust T703 so an equal voltage reading is obtained at both extremes of the tint control.
9. Adjust the tint control to the point where a "dip" is noticed in the VTVM reading (approximately -7v — this is the electrical center of the control. With the control set at this point, ground the grid of the burst amplifier (pin 2, V706) and reset C743 so the color bars stand still or drift slowly.
10. Remove the detector network and the ground from the burst amplifier grid. Check the tint control operation. The color bar shift, either side of the proper color setting, need not be equal so long as it will shift at least one bar on either side.

TV Chassis T925 — Replacement 21KA6 Tubes

The T925 chassis (Model 1T115) uses a type 21KA6 in the horizontal output stage. Some 21KA6 tubes being uses as replacements have the screen grid connected to pin 3 rather than pin 7. These tubes can be used by connecting a jumper wire on the 21KA6 tube socket from pin 3 to pin 7. Later production of the T925 chassis will have this jumper employed.

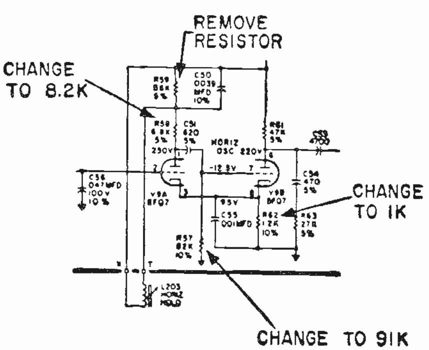
MAGNAVOX

Color TV Chassis H12 — B+ Dropping Resistor

In the H12 color chassis (manual S1062), the 1.6K B+ dropping resistor, R748, has been changed from a 15w to a 20w rating for improved reliability. The part number for the new resistor is 61C20-100. It will be substituted automatically on orders for the old 61C20-79. When changing this resistor, use the clip from the original to mount the replacement in order to assure maximum heat dissipation.

TV Chassis T927 — Christmas Tree Effect

There have been reports of horizontal oscillator instability resulting in a symptom sometimes called



"Christmas tree effect." A production change has been made in the T927 chassis to eliminate this tendency. In this change R59 is deleted, R58 is changed from 6.8K to 8.2K, R57 from 82K to 91K and R62 from 1.2K to 1K.

Color TV Chassis T931/T933/T938—Burst Amplifier Tube

The type 6MQ8 is now being used in some chassis instead of the 6KE8. Either the 6KE8 or 6MQ8 can be used as a replacement since these tube types are directly interchangeable.

Caution should be observed when removing forward bias to evaluate transistor action. Since removing forward bias turns off collector current, the collector voltage rises to its supply voltage and there is a possibility of this voltage exceeding the breakdown voltage on the transistor. A good rule to apply in these cases is to note the presence and value of the collector load and emitter resistors which will govern the amount of current flow if the breakdown voltage is exceeded. If these resistors will limit the current to a value within the power dissipation of the transistor, there is little likelihood of damage if the breakdown voltage is slightly exceeded for a brief interval.

As experience is gained using "in circuit transistor testing," the procedure for most transistors will simplify the following:

Measure collector voltage. If it is lower than the supply voltage, the transistor is conducting. With the meter still on the collector, short the base and emitter together. If the collector voltage rises to the supply voltage, the transistor is not shorted and is capable of being turned off. This simplified procedure will not work in all cases, i.e., a collector connected to ground. But as experience in servicing transistor circuits is gained, it becomes easier to see where this technique is applicable and it is a fast, simple way to evaluate a transistor without removing it from the circuit.

Once it is clearly determined that the current through a particular stage is incorrect, it is usually advisable to remove the transistor. This will allow you to check the transistor and measure the bias resistor values without the inaccuracies of having the transistor junctions across them. Every effort should be made to determine that a particular stage does contain a defect before any attempt is made to remove the transistor.

6BK4 Tube Replacement

Judging from the number of good tubes received as "defective" warranty returns, some service technicians appear to be diagnosing 6BK4 voltage regulator tubes as defective because the glass envelope has discolored. Glass discoloration on this tube is normal and has no detrimental effect on the strength of the glass envelope, the tube performance or on its life expectancy.

Before replacing a 6BK4 tube in a color TV receiver: (1) Observe glow inside the 6BK4 while turning the BRIGHTNESS control up and down. The glow should be maximum with a dark screen and it should decrease as BRIGHTNESS is turned up. If it does, the tube is regulating. (2) Set the HV to the value specified in the service manual for that chassis under dark screen conditions. Measure the voltage drop across the 1K cathode resistor. The reading should be 1v or higher with a dark screen and drop to zero as the BRIGHTNESS is turned up to the blooming point. (3) Perform setup adjustments as outlined in the chassis service manual paying particular attention to CRT BIAS controls. If excessive blooming persists at maximum BRIGHTNESS, readjust the CRT BIAS control.

Magnavox 6JE6 Tube Failures In Horizontal Frequency Circuits

The failure of the horizontal output tube (6JE6) in the T911, T918, T919 and T920 color-TV chassis can be caused by a defect in the horizontal oscillator circuit, which causes the oscillator frequency to multiply. Such a problem can be caused by shorted turns in the horizontal frequency coil L501A. In this case the frequency may double or triple and as a result there will be little or no grid drive on the output tube. If the horizontal output tube is allowed to operate for any length of time under these conditions, it will eventually get too hot and break down.

When replacing a 6JE6, check the horizontal frequency coil by going through the horizontal hold adjustment as follows:

1. Short out the sine wave coil (L501B) with a jumper to ground, a convenient place to do this is across capacitor C528. Also short to ground the grid (pin 9) of the sync separator V703B.
2. Adjust the horiz. hold control to bring the oscillator into frequency. If you cannot bring the oscillator close to proper frequency it is possible that L501A has shorted turns and the coil assembly should be replaced with a new one, part no. 360960-3 replacement.

After making the replacement, repeat steps 1 and 2 to set the frequency. Since the sine wave coil L501B is part of this assembly, it will also have to be adjusted. To do this, remove the jumper across C528, but leave the jumper in place from the sync sep. grid to ground and then adjust the sine wave coil until the picture stops moving horizontally, which indicates that the oscillator is set to the proper free-running frequency.

New Magnavox Models Using 22JP22 Color CRT

New models, for example, the 1T710 and 1T712, are now in production using the 22JP22 picture tube (227 sq in. viewing area). The chassis used in these models is the T919 series. This chassis will have "Quick Disconnect" solderless connectors in the CRT cathode leads to assist in obtaining proper color temperature tracking. The 22JP22 CRT, like the 25XP22, is said to require less drive to the red gun. The revised adjustment procedure for color temperature as outlined in Newsletter No. 1967-4 for the T920 chassis using the 25XP22 tube will also apply to the T919 using the 22JP22 tube.

When making setup adjustments on these models check the action of the drive controls; if turning up the "green" drive control causes the screen to go *red*, this means that the red and green cathode leads have been transposed to equalize the characteristics of the three guns. In this case set the blue drive to maximum and the control that affects the red drive to *minimum*, then proceed with adjustment of the screen controls as outlined in Newsletter No. 1967-4

All Color TV — Blue Lateral and Purity Devices

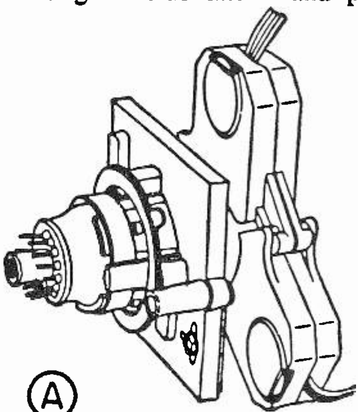
Several different types of devices have been used with rectangular CRTs from time to time to provide lateral positioning of the blue beam and for color purity adjustment. This has resulted in some confusion concerning the proper position of the different devices on the tube neck. The following describes the basic types of devices used and illustrates their relative location on the tube.

An early type combination blue lateral magnet and purity ring (shown at "A") had the purity adjustment rings mounted on the rear of the blue lateral assembly. The blue lateral magnet is positioned over the center of the focus grid of the blue gun and this places the purity rings approximately in line with the control and screen grid elements.

Some later production models used a blue lateral magnet (shown at "B") with a separate purity ring assembly placed on the tube ahead of the lateral magnet. In this case, the blue lateral magnet is positioned over the focus element of the blue gun as before, but the purity ring assembly is located about half-way between the blue lateral magnet and the convergence yoke on the tube neck. This accounts for the term "post-purity" which infers that purity adjustment of the three beams takes place after beam focusing. This arrangement was used to provide improved spot focus on certain tubes and to eliminate "spot-tailing," a misshaping of the beam, which caused problems in obtaining good purity. This arrangement was a two-piece device with post-purity.

On later type devices (shown at "C") a combination blue lateral and purity device with post-purity accomplishes the same results as the two-piece post-purity arrangement previously described. Here the purity rings are a part of the blue lateral magnet assembly, but unlike the earlier combination device the purity rings are now mounted on the front of the assembly. The blue lateral magnet is positioned on the tube neck over the focus-element as before and this results in the purity rings being located between the blue lateral and the convergence yoke as with the two-piece device.

This new combination device (Part No. 361292-1) is now being stocked at all Magnavox parts depots. It is suggested that where poor purity is experienced as a result of "spot-tailing" this can be corrected by replacing the original blue lateral and purity



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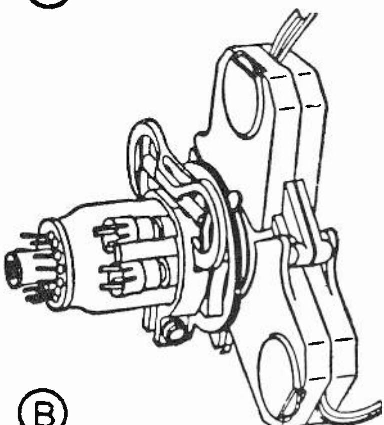

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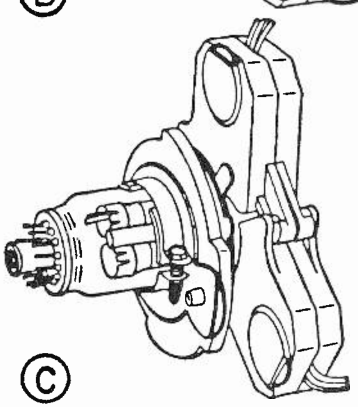

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device with part No. 361292-1.

You are cautioned when replacing a color CRT to make note of the type device used for blue lateral adjustment and purity and to replace it in its proper position. As an example, you will not be able to obtain good purity if the two-piece device is replaced so that the purity ring is in the rear of the blue lateral magnet.

Instant Automatic Remote Control — Automatic Off and VHF Search Tune Circuit Description

The ac voltage across the VHF motor is applied through a resistor to D1 which rectifies the voltage and charges C107. The dc voltage is stabilized by the 26v Zener diode. Notice that "ground" is not chassis ground but the common side of the 120vac line.

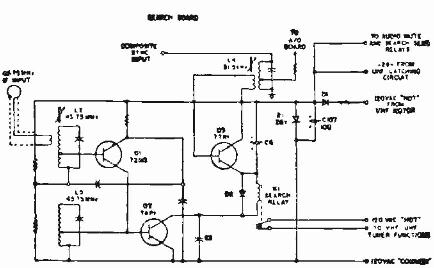
The dc voltage is developed only when the receiver is searching for a station. The presence of a station is indicated by the arrival of the 45.75-MHz IF picture carrier and composite sync pulses. These two signals cause the search relay, K1, to energize momentarily and open the ac voltage to the tuning motor to stop the search cycle. The dc voltage is then removed from the transistors until the VHF or UHF search tuning function is started again.

The 45.75MHz picture IF signal is picked up from the discriminator coil on the tuner AFC board. A one-turn link is soldered to the lid of the discriminator shield and is positioned around the coil. The picture carrier is coupled to a tank circuit, L2 on the search board, and amplified by Q1. Another tank circuit, L3, serves as the collector load and the signal is applied to the base of Q2. Q2 conducts on the negative half-cycle and acts as a switch in conjunction with C2 to connect the end of the search relay coil to the ac common ground. However, Q2 cannot conduct until Q3 is switched on.

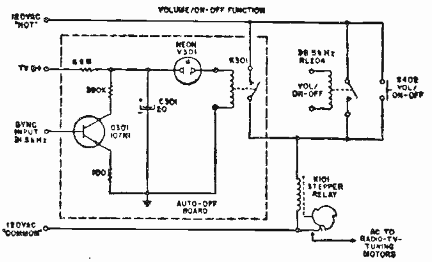
Both Q2 and Q3 are in series with the search relay coil and both transistors must be switched on before the relay will be energized. Q2 is switched on by the picture IF signal and Q3 is switched on by the composite sync signal. The sync signal is obtained from the output of the sync separator stage. The sync contains 15.75kHz horizontal blanking and sync pulses along with the 31.5kHz equalizing pulses which occur during the vertical blanking interval. To prevent interaction between the circuit on the search board and the sync circuits in the receiver chassis, the input circuit, L4, is tuned to the 2nd harmonic of the horizontal pulses. Because of the ringing action of the tank, the signal applied to the base of Q3 is a fairly good sinewave. Q3 becomes forward biased on the positive half-cycles and acts as a switch in conjunction with C6.

The sync pulses and picture IF signal are both present when the receiver is tuned to a station signal. Both Q2 and Q3 conduct and the search relay becomes energized. The relay contacts open and stop the tuning motor. Ac is removed from D1, the −26v supply is removed, K1 becomes de-energized, and the contacts close until the search cycle is repeated.

The −26vdc supply voltage that is developed during the search cycle is also applied to two relays. One re-



lay is used to mute the audio during search time. The second relay is used to bias the IF stages during search time to reduce the gain of the receiver. The purpose of the reduced gain is to prevent the receiver from stopping on images that may appear on some channels. The amount of IF bias is



adjustable with the search sensitivity control on the ear apron of the television chassis.

The automatic-off circuit is simply a relaxation oscillator. When the transistor is not conducting, C301 charges toward the B+ supply voltage through the 6.8M resistor. Since the values of the resistor and capacitor are quite large it takes a relatively long time for the capacitor to charge. When the capacitor becomes charged to about 80 or 90v, the neon lamp, V301, conducts and the capacitor discharges through the lamp and the relay coil. The relay contacts close and advance the stepper relay one step. The capacitor slowly charges again to the firing point of the neon lamp and the stepper relay is advanced again. This process continues until the stepper relay advances to the OFF position and ac is removed from the TV set. The time required for the auto-off circuit to turn off the receiver runs from 1½ to 3 minutes, depending on how many times the stepper relay must be advanced to reach the OFF position.

The circuit is prevented from oscillating when a station is tuned in.

The AFC diode, or varicap, shown in Fig. 2, acts as a voltage variable

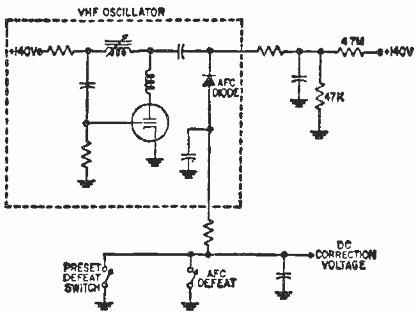


Fig. 2—Magnavox VHF oscillator and DEFEAT switch circuitry.

capacitor. As the dc voltage across the diode increases, the capacity decreases; and as the dc voltage decreases, capacity increases. Any change in dc voltage across the diode changes the diode capacity which, in turn, alters the oscillator frequency. The AFC diode must be operated in a reverse-biased condition. This is done by placing a fixed positive voltage on the cathode and then using the correction voltage from the discriminator to vary the anode voltage. The plus or minus correction voltage adds to or reduces the total voltage across the diode, decreasing or increasing the capacity across the tank circuit. A positive correction voltage reduces the total voltage across the diode, increases capacity, and lowers the oscillator frequency. A negative correction voltage produces the opposite effect.

The dc correction voltage is shorted to ground by the pre-set DEFEAT switch when the VHF fine tuning control is adjusted. This allows the customer to tune the receiver to approximately the correct point. When the fine tuning control is released, the pre-set DEFEAT switch opens and the AFC circuit takes control.

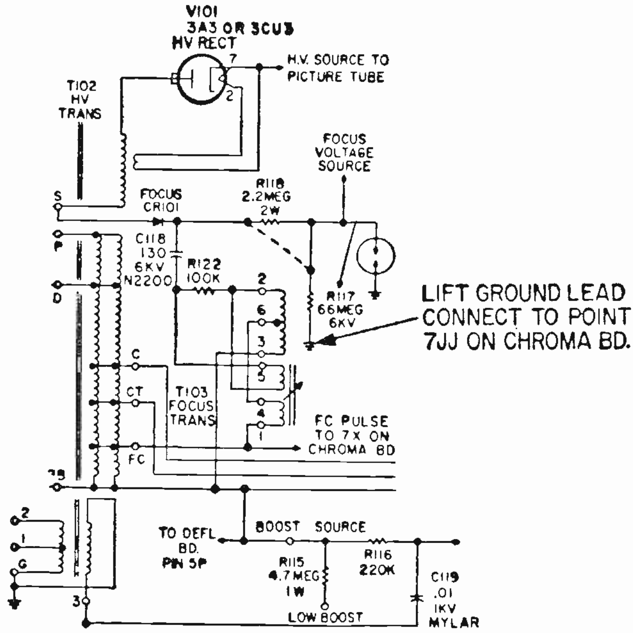
A second AFC DEFEAT switch on the BRIGHTNESS control may be used to disable the AFC if desired. This switch might be used in weak signal areas where snow is excessive. With AFC defeated, the picture can be detuned to minimize snow. This procedure would be suitable only for B/W reception, however, since very much detuning of a color program would result in loss of color. This DEFEAT switch would also be used when tuning in a UHF station. To maintain the advantages of the AFC to eliminate oscillator drift, be sure to press the switch IN after tuning.

Color TV Chassis T924—Elimination of Afterglow on CRT Face

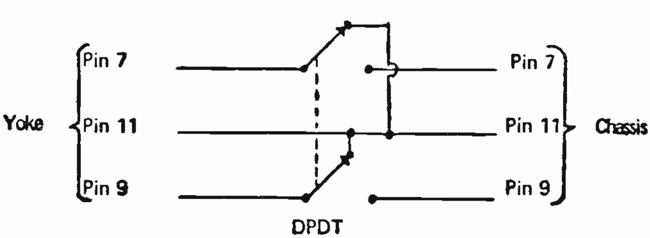
Afterglow on the face of a CRT used with a T924 chassis can be eliminated by lifting the ground end of resistor R117, the 66M 6kv focus resistor and soldering it to point 7JJ on the chroma board. This can be most readily accomplished by lifting the ground lead of R117 from its ground connection and moving the lead to one of the blank holes on the terminal board. Run the lead through the hole and bend it around the edge of the terminal board to minimize its movement. Solder a length of hookup wire to the resistor lead and route the wire to point 7JJ on the chroma board by the most convenient route. Solder it to this point.

Color TV Chassis T924—Modification of Color Test Fixture

Refer to Service Manual 7297, Sections 4.1 and 2. The test fixture yoke is wired as shown on the schematic for



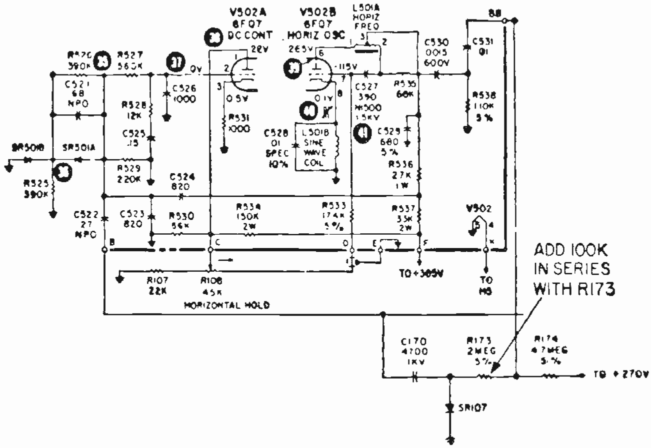
the T924-03, 07 and 09 versions. These chassis are directly adaptable to the test fixture. However, the vertical yoke windings are connected internally in the T924-01, 02, 05, 06, 08 and 10 versions. These versions will have no vertical sweep when used with the fixture. A DPDT switch,



such as part No. 160370-5, can be inserted in the yoke extension cable as shown to enable the fixture to be used with all T924 versions.

Color TV Chassis T933—Service Hints
Horizontal Jitter, Low 6BK4 Current, Raster Size Change as Brightness Control Setting Is Changed

Resistor R173 (2M, ½w, 5%) in the grid circuit of the 6JE6 horizontal output tube can cause horizontal jitter, low 6BK4 current and changing raster size as the brightness



control setting is changed, and when its value drops below 1.9M. If the value is indicated as being near the low tolerance limit and the ohmmeter is not known to be accurate, add a 100K resistor in series with R173. Recheck the circuit for elimination of the symptoms.

Minimum 6BK4 Current

With CRT BIAS and BRIGHTNESS controls set for a dark screen (no CRT current) the 6BK4 current must be minimum of 1ma. This current can be checked by measuring the voltage across R121, the 1K cathode resistor of the 6BK4. This voltage must be a minimum of 1v (I=E/R).

Channel Eight Tweet Reduction

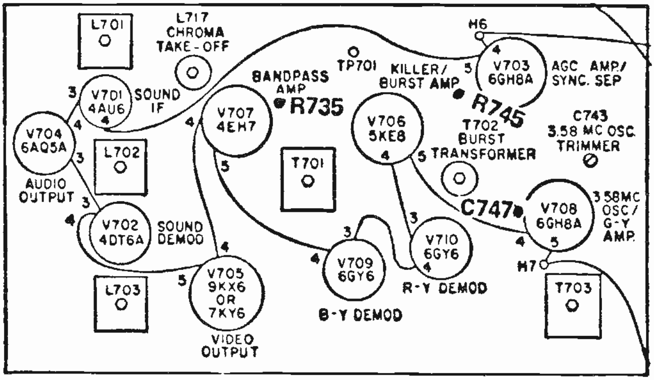
The following circuit modification is recommended for the reduction of channel eight tweet.

(1) Install a 15K, 2w resistor between the junction of R909 and R903 on the AFC board, and point VA(+270v) on the chroma board. This can be accomplished from the underneath side of the boards and will require an extension wire. (2) Remove and discard L905 and its extension lead. L905 is connected on the underneath side of AFC board between the junction of R909 and C913 on the AFC board and point YC(+140) on the chroma board. (3) Also remove and discard R909 on the AFC board.

Once this circuit modification has been completed the plate/screen supply for V901 will be the 270v source.

Color TV Chassis T924—'In Cabinet' AFPC Alignment

AFPC alignment can be accomplished in the T924 chassis without removing the chassis from the cabinet. The accompanying illustration of the chroma board points out the location of three connecting points (available from the top of the chassis), which are electrically equivalent to the alignment points listed in the service manual. They are



as follows: R735-V706B-Pin 2, R745-V706A-Pin 9, C747-T703-Pin 3.

Procedure: (1) Disconnect the chassis from the power source. (2) Connect a long clip lead to each of the three indicated points. Use leads which are sufficiently long to hang over the back of the chassis without shorting. Identify each lead so that its connecting point can readily be determined. (3) Insert tuning tools into T702 and T703, and leave them in place throughout adjustment procedure. (4) Set a long insulated screwdriver in place on C743. (5) Connect the chassis to the power source through an isolation transformer. (6) Complete the AFPC alignment as described in the service manual, using the installed clip leads as test points. (7) Disconnect the chassis from the power source before removing the clip leads and tuning tools.

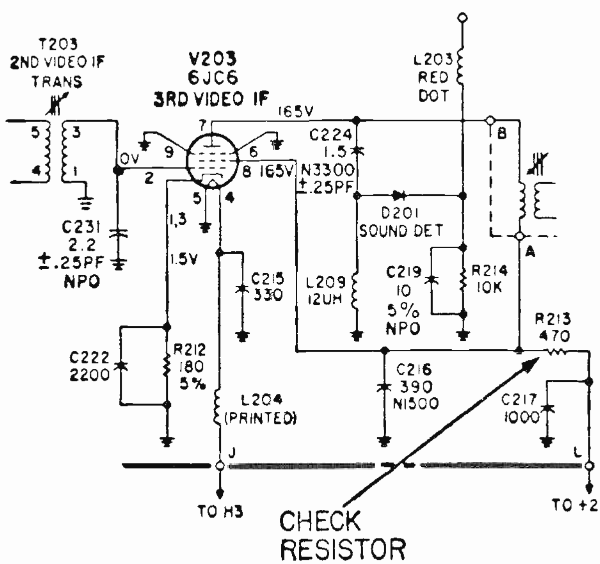
Importance of Proper Setup of TAC Models

Proper setup of color temperature, purity and convergence are important on any color television receiver. In the case of models using the T940 chassis with the exclusive total automatic color (TAC) feature, this is even more important because you will be calling attention to color fidelity in your demonstrations of the Automatic Tint Corrector. When making the color TV set-up adjustments, always be sure that the CHROMATONE switch is in the OFF position. You are also reminded that the chassis includes a RED DRIVE control adjustment in addition to GREEN and BLUE. It has been somewhat standard practice in field adjustment to set the DRIVE controls at or near maximum. With recent improvements in color picture tubes, particularly in the efficiency of the red phosphors, proper setting of these controls is more important. With these newer tubes, proper white balance is obtained in many cases with RED DRIVE at or near midpoint. So when you set the color temperature, be sure to check the RED DRIVE setting to insure proper white balance (tracking) with variation of the BRIGHTNESS control.

To set up the Automatic Tint Corrector (ATC) circuit, tune in a color signal and first set the ATC switch to the OFF position. Adjust the COLOR and TINT controls for good fleshtones, then set the ATC switch ON and adjust the PREFERENCE control for proper fleshtones.

Color TV Chassis T931/T933/T938—Defective 6LM8 Video/Sync Amplifier and 6JC6A 3rd Video IF Amplifier

Low contrast, deterioration of picture quality, low chroma output and poor sync are all possible symptoms of a defective 6LM8 tube. The symptoms may be more or less pronounced depending upon the condition of the tube. Check the 6LM8 tube as a possible cause when these symp-



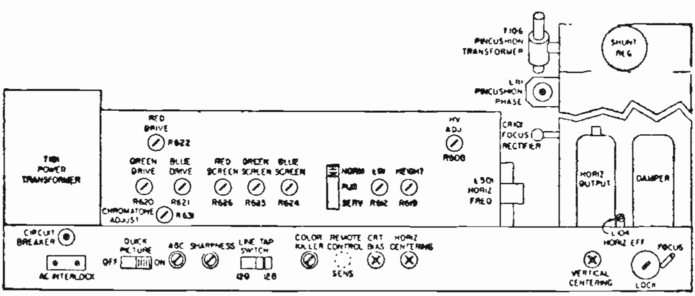
toms are noted. Sometimes the failure of the 6JC6A 3rd video IF tube will result in failure of the plate/screen load resistor, R213. Check the condition of this 470Ω, ½w resistor when replacing a defective 6JC6A tube.

With the ATC switch in the FULL-ON position the PREFERENCE control will swing the fleshtones from green through normal to red, similar to the tint control action. With the ATC switch in the PARTIAL position the PREFERENCE control will have a more limited range.

Several changes have been made in the arrangement of the setup controls on the rear panel of the T940 chassis compared to previous chassis. The rear panel layout is shown on page 74. Note the CHROMATONE control which allows for adjustment to the most pleasing sepia tone on a black and white picture. This control is active only when the CHROMATONE switch is ON. The SHARPNESS control is also on the rear panel and there is a slide switch provided for high line voltage operation. The HIGH VOLTAGE ADJUSTMENT is located on the rear panel.

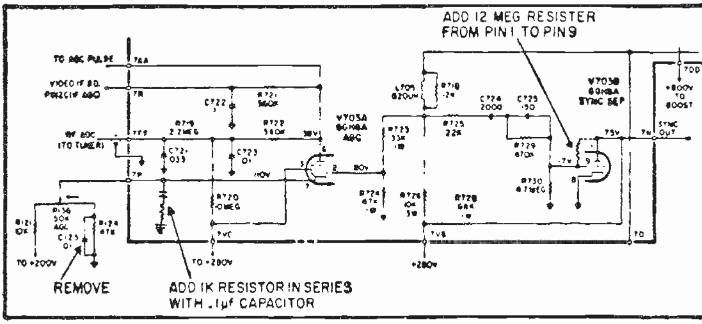
Color TV Chassis T924—Critical Horizontal Hold or 'Lock-Out'

Horizontal "Lock-Out" is the condition described as follows: The receiver loses horizontal sync when tuned from one channel to another or where tuned off channel and back on channel, and sync can be restored only by adjusting the horizontal hold control. The horizontal hold control may be critical in adjustment but no other symptoms of horizontal troubles are presented.



If a T924 chassis has these symptoms, add a 12M, 1/2w, 10% resistor (part number 230104-263) from Pin 1 to Pin 9 of V703, the sync separator.

The recommended correction for hooking at the top of the picture is as follows: (1) Add a 1K, 1/2w resistor in series with a .1μf, 400v capacitor from point 7P on the chroma board (cathode of V703A) to ground. The resistor is to be connected to point 7P and the capacitor to ground. (2) Remove C125 (.01μf, 500v) from the circuit.



Importance of Proper Setup of TAC Models

Proper setup of color temperature, purity and convergence are important on any color television receiver. In the case of models using the T940 chassis with the exclusive total automatic color (TAC) feature, this is even more important because you will be calling attention to color fidelity in your demonstrations of the Automatic Tint Corrector. When making the color TV set-up adjustments, always be sure that the CHROMATONE switch is in the OFF position. You are also reminded that the chassis includes a RED DRIVE control adjustment in addition to GREEN and BLUE. It has been somewhat standard practice in field adjustment to set the DRIVE controls at or near maximum. With recent improvements in color picture tubes, particularly in the efficiency of the red phosphors, proper setting of these controls is more important. With these newer tubes, proper white balance is obtained in many cases with RED DRIVE at or near midpoint. So when you set the color temperature, be sure to check the RED DRIVE setting to insure proper white balance (tracking) with variation of the BRIGHTNESS control.

To set up the Automatic Tint Corrector (ATC) circuit, tune in a color signal and first set the ATC switch to the OFF position. Adjust the COLOR and TINT controls for good fleshtones, then set the ATC switch ON and adjust the PREFERENCE control for proper fleshtones.

With the ATC switch in the FULL-ON position the PREFERENCE control will swing the fleshtones from green through normal to red, similar to the tint control action. With the ATC switch in the PARTIAL position the PREFERENCE control will have a more limited range.

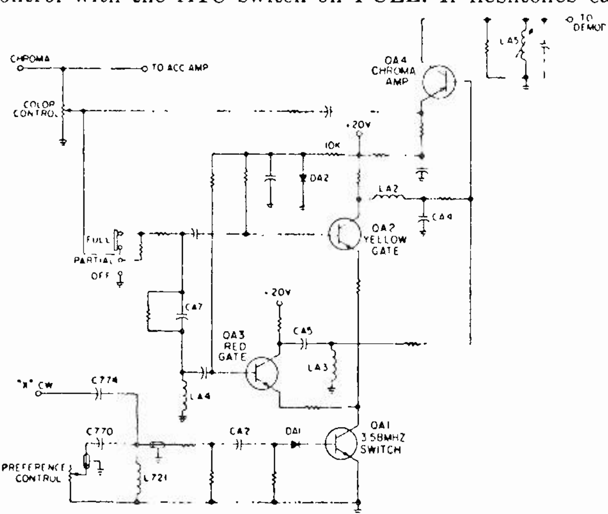
Several changes have been made in the arrangement of the setup controls on the rear panel of the T940 chassis compared to previous chassis. The rear panel layout is shown on page 74. Note the CHROMATONE control which allows for adjustment to the most pleasing sepia tone on a black and white picture. This control is active only when the CHROMATONE switch is ON. The SHARPNESS control is also on the rear panel and there is a slide switch provided for high line voltage operation. The HIGH VOLTAGE ADJUSTMENT is located on the rear panel.

Color TV Chassis T940—Troubleshooting the ATC Circuit

The Automatic Tint Control (ATC) circuit may be checked very quickly for proper operation with the ATC switch and the PREFERENCE control. First, turn off the ATC switch and tune in a color picture. Adjust the TINT control for correct fleshtones. If the picture is normal, two assumptions can be made—the 20vdc supply to the ATC board is present and the chroma amplifier is working. If the chroma amp is not working properly, the symptom of "weak color" or "no color" will result. This symptom may also be produced by the bandpass amplifier and the killer stage. Defects in the killer detector, phase detector, and the 3.58MHz oscillator may also produce this symptom. Scope checks, using a low-capacitance probe, should be made to trace the chroma signal to the point where it is lost.

With the ATC switch placed in the FULL position, the PREFERENCE control should vary fleshtones from green, through normal, to magenta, similar to the action of the TINT control. With the ATC switch in the PARTIAL position, the range of the PREFERENCE control is reduced.

A problem in either the red gate or the yellow gate may be isolated by observing the action of the PREFERENCE control with the ATC switch on FULL. If fleshtones can-



not be shifted to green, the defect is most likely in the red gate circuit. If fleshtones cannot be shifted to magenta, the defect is in the yellow gate circuit.

The gates may be checked for proper operation using a scope and a color bar signal. While scoping the collector of the yellow gate, adjust the PREFERENCE control to obtain maximum amplitude of the first bar following the horizontal blanking interval. Move the scope probe to the collector of the red gate; the third and fourth bars should have approximately equal amplitude. If no waveform is present, check the base signals and the dc voltages.

If the PREFERENCE control has little or no effect on fleshtones with the ATC switch on FULL, the problem will most likely be the 3.58MHz switch or loss of the "X" CW signal. The switch transistor and base circuit components should be checked for opens and shorts. A shorted switch transistor will allow the gates to conduct on the positive half-cycle of any chroma signal and all ten bars of a color bar pattern will be present at the collector of both gates. An open 3.58MHz switch, or loss of the "X" CW signal, will prevent the gates from conducting at any time and there will be no collector signal on either gate.

The AUTOMATIC COLOR CONTROL (ACC) circuit functions to minimize large variations in chroma amplitude so that frequent adjustment of the COLOR control becomes unnecessary. Control is accomplished by changing the gain of the bandpass amplifier with a dc voltage. The ACC circuit utilized in the T940 chassis uses two signals to develop the control voltage—the burst signal and the chroma signal. An increase in either one or both of these signals causes a negative-going voltage to be applied to the control grid of the bandpass amplifier to reduce gain. A reduction of either signal causes the gain of the amplifier to increase.

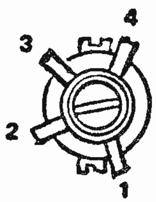
Color TV Chassis T924/T939—No HV In Chassis Used With 22in. or Larger CRT

A "No High Voltage Condition," in a chassis using a pincushion correction circuit, could possibly be caused by a faulty pincushion transformer, T106. To check this, unplug the deflection yoke and check for partial restoration of high voltage, approximately 12kv. If high voltage is partially restored with the yoke unplugged, transformer T106 is one possible cause of the problem.

Color TV Chassis T936—3rd IF Transformer L8

Reports from the field indicate some confusion regarding proper adjustment of the 3rd IF transformer L8. L8 differs from past IF transformer design to the extent that provision is made for adjusting both the inductance of the coils and the coupling between the coils. The inductance is adjusted in the conventional manner by positioning slugs within the coil form. The top of the L8 coil form consists of a plastic cap with a hex adjustment opening in the center. The plastic cap can be rotated to vary the coupling between the primary and secondary windings by physically varying the distance between them. Varying the coupling between the primary and secondary windings varies the bandwidth of the circuit. Adjustment instructions for this transformer are given in the Service Manual 7314.

Focus Transformer Part No. 360957-6—Terminal Identification



There is apparently some confusion in the field concerning the identification of terminals on this transformer when it is used as a replacement for the 360957-5. There is a blue dot located between terminals 3 and 4, however, this dot is not always clearly visible. The best way to identify these terminals is to view the transformer from the rear as illustrated and count the terminals clockwise from one to four.

Color TV Chassis T935—Horizontal Retrace Blanking

Early production models of the 1T5007, which uses the T935 chassis, could exhibit a horizontal retrace blanking line on the left video of the screen. This line shifts in the opposite direction of the video information when the horizontal hold control is adjusted.

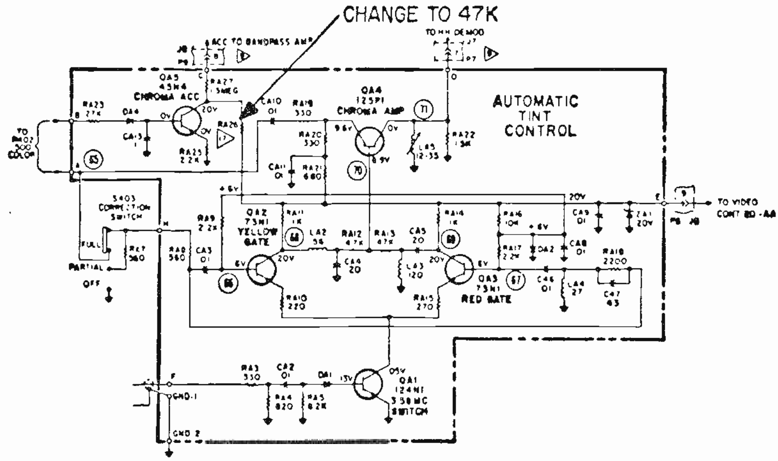
The problem can be corrected by adding a series network consisting of a 15K,½w resistor and a 1000pf, 500v capacitor between J13 (G1 of the CRT) and the junction of R406/C403. This circuit has been incorporated in later production.

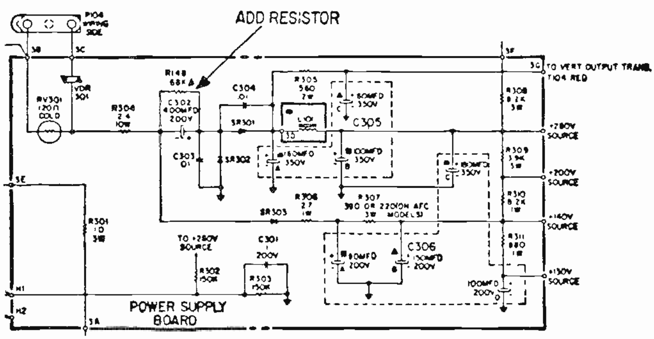
Color TV Chassis T940—Increasing Range of ACC

A recent production change has been made in the T940 chassis changing RA26 on the ATC board from 10K to 47K in value. This change provides an increase in the range of the Automatic Chroma Control circuit to compensate for wider variations in chroma level in the transmitted signal.

Color TV Chassis T924/T939—Purity Shift

Some of these chassis have evidenced a tendency to shift purity when the instrument is turned on within a five minute period after having been turned off. The purity shift is not evident, however, if the set has been turned off for a period of time longer than five minutes. This problem can be eliminated by adding a 68K resistor across C302, in the power supply. This change has been made in later production of the T939 chassis.





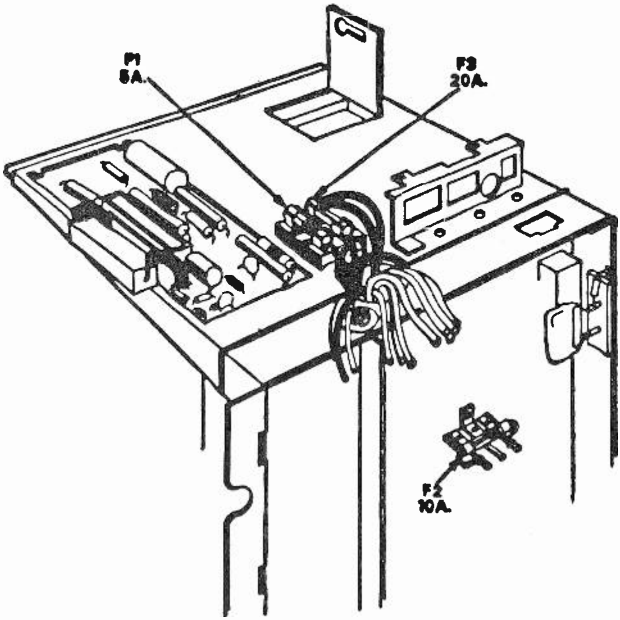
Remote Control Model 1C6313—Remote Sensitivity Control

If you should encounter a Model 1C6313, using the T939-06 chassis, on which the remote sensitivity control seems to have no effect, check the wiring of the control. If there is no connection to the center tap of the remote sensitivity control, connect a jumper wire between the center tap and the end terminal having the red wire connected to it.

Color TV Chassis T936, T939, T940—Fuses Added

Recent production changes have incorporated additional fuse protection on these chassis. These fuses are clearly identified by a label affixed to the chassis near the fuse location.

On the T940 chassis there are three fuses in addition to the circuit breaker.



T940 Chassis (bottom view)

F1, a 5a, 125v Slo-Blo fuse (Magnavox Part No. 180157-19) is connected in the 120vac supply line prior to the line choke and power transformer primary winding. This fuse provides additional protection even when the instrument is turned off and in the "Quick-On" position.

F2, a 10a, 32v Slo-Blo fuse (Magnavox Part No. 180948-3100) is connected in the "H2" heater supply which provides heater voltage for the color CRT, Shunt Regulator and AGC Amp.

F3, a 20a, 32v Slo-Blo fuse (Magnavox Part No. 180157-39) is connected in the "H3" heater supply circuit.

F1 and F3 are mounted in fuse holders located on the side of the chassis, as illustrated below, and F2 is located on a terminal board on the underside of the chassis.

On the T939 chassis there are two added fuses.

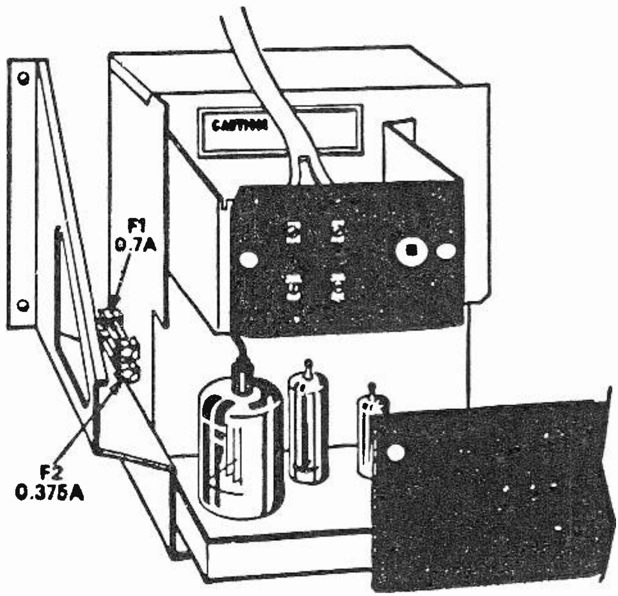
F1, a .5a, 125v Slo-Blo fuse (Magnavox Part No 180157-17) is connected in series with the primary winding of the filament transformer.

F2, a .6a, 125v Slo-Blo fuse (Magnavox Part No. 180948-5060) is connected in series with the "Quick-On" winding of the filament transformer. F1 is mounted on the side of the chassis as illustrated, and F2 is located on the underside of the chassis.

On the T936 chassis you will find either one or two added fuses, depending on whether or not the model uses the "Quick-On" feature.

F1, a .7a, 125v fuse (Magnavox Part No. 180157-37) is connected in series with the primary winding of the filament transformer.

Both fuses are located in fuse holders located on the side of the chassis as illustrated.



T936 Chassis

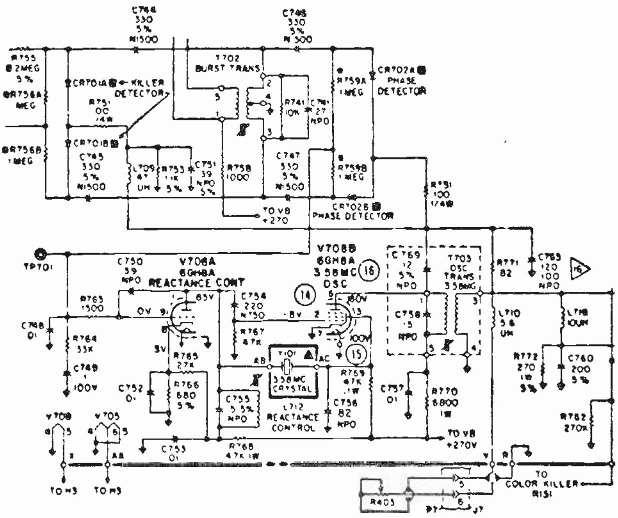
Color TV Chassis T939 and T940—Improved Thermistor

Thermistor, Part No. 230170-2, is used in the auto-degaussing circuit on both the T939 and T940 chassis. Some cases have been reported, where the leads on this thermistor have separated from the body due to heat in the T939 chassis. A new improved version of the 230170-2 thermistor is now being used which can be identified by the fact that approximately 75 percent of the surface area of the body on both sides is soldered. On the early version, the leads appeared to be spot soldered to the body.

You should use only the later type as a replacement in the T939 chassis. The early version can continue to be used as a replacement in the T940 chassis. Magna-Par will stock and ship only the improved version.

Color TV Chassis T931/T933/T940—Color Sync Problems

The mentioned chassis as well as earlier chassis—such as the T920,T919,T918 and T911—use a matched pair diodes in the color killer and phase detector circuits. You



are reminded to include these diodes in your troubleshooting checks whenever you are working on a color sync problem. Either the color killer detector diodes (CR701A and CR701B) or the color phase detector diodes (CR702A and CR702B) can be the cause of intermittent loss of color sync, poor color sync or in some cases even loss of color. These diodes are specified as matched pairs, meaning they have identical characteristics. If one of the diodes in these matched pairs should suffer a change in characteristics, operation of the circuit will be impaired. The usual resistance checks will not be satisfactory in determining if the suspected diode has changed characteristics. If you suspect that either the killer detector or phase detector circuits are at fault, the following check is suggested:

Connect a color-bar generator to the receiver and set it for a normal color-bar display. Remove the 3.58MHz Oscillator tube (V708) and ground the junction of R756A and R756B in the color-killer detector circuit. Using a VTVM, measure the dc voltage to ground at each outside terminal of a diode pair—for example, at the anode of diode CR701A and cathode of CR701B. The voltage at the anode should be negative, while positive at the cathode. The exact value of the voltages measured at these points will vary from set to set and also with the level of the burst signal. (Typical values might be +55v at the cathode and —55v at the anode.) The important point is the difference, if any, between the voltages measured across each of the diode pairs. Under ideal conditions there should be no difference. However, a 10 percent variation is allowable. If a voltage difference in excess of 10 percent exists across either diode pair, replace the pair with a matched pair, Part No. 170733-1.

Color TV Chassis T940—Color and Volume Control Drive Motor Variations

A number of T940 chassis, used with the 704054 8-Function Remote Control units, were built using 48vac motors instead of the 120vac motors listed in the T940 service manual. To make this substitution the following circuit changes were made:

- R405 was changed to 1.2K, 10w.
- A 2µf, 50v capacitor (non-polarized) was added between the blue and green motor leads of each motor.

The originally specified 120v motor, however, can be used as a field replacement in these chassis provided that the 2µf capacitor is first removed.

The units equipped with these 48v motors are all identified by a label attached to the rear plate of the VHF tuner motor assembly which reads as follows: When replacing the Volume or Color control motor in this instrument, eliminate the 2µf, 50v capacitor wired between the blue and green leads of the original motor.

These 48v motors are identified by an X following the group number. For instance, a 48v color drive motor used in a T940-02-AA chassis would be identified as 500225-3X. However, should the motor fail, you should order a replacement 500225-3 (120vac motor) as specified in the service manual. The only circuit change required to replace the 48v motor with the 120v motor is that the 2µf capacitor on the control unit must be removed; it is not necessary to change resistor R405.

NOTE: R405 was added as a 5.6K resistor on early remote versions to reduce the torque of the motor since some problems had been experienced with shaft breakage on the capacitor type tint control. The value was later changed to 2.7K and this value is not critical when the 120v motors are used.

Color TV Chassis T947—Protection of the Delay Line

The Delay Line on the T947 chassis (Model 1C6104) is mounted on the vertical chassis section and protrudes outward about ½ in. past the chassis frame. If the chassis should be turned over on its side it is possible that the delay line or its connections can be broken. If the chassis must be laid on its side with the delay line facing down, protect the delay line from possible physical damage by securely supporting the edges of the chassis so that it does not rest on this component.

Color TV Chassis T924/T939/T950 Chassis—Series Filament Ground Return

These chassis have series string filaments, and the only path to the main chassis ground from the end of the filament string in the VHF tuner is through the shield of the IF cable. If continuity between the VHF tuner and the main chassis, through the IF cable shield, is interrupted, the filaments will not have a ground return path. Check for continuity of the filament string using chassis ground and not the tuner assembly as ground reference.

Color TV Chassis T924—Replacing Filament Transformer

You are cautioned that a wiring error in installing a replacement transformer can result in transformer over heating, which may be inadvertently diagnosed as a defective transformer. This error can result from transposing the transformer's black lead and its black/white lead. Referring to Service Manual 7297, Section 4.2, you will see that the schematic for versions using the "Quick-On" feature (T924-03 etc.) shows the "QUICK-ON" switch connected to the yellow transformer lead. When the main ON-OFF switch is in the OFF position, the line voltage is applied across the complete transformer primary. If the black and black/white leads are transposed in hooking up the replacement transformer, the entire line voltage would be applied across the primary section between the yellow and black leads. Under these circumstances you would not notice any problem with the QUICK-ON switch in its OFF position. However, with the switch in the ON position severe overheating of the transformer will result.

Under normal operating conditions the external surface of the transformer will reach a temperature that is uncomfortable to the hand. This does not indicate a defective transformer.

TV Model 1T5261—Power Cord 1A9182

Some of the power cords may have the leads improperly connected at the cigarette lighter plug end. The negative battery connection should go to pin five on the receiver power plug and the positive to pin three.

Chassis T-936—Elimination of Vertical Jitter

Vertical jitter in instruments utilizing this chassis can be corrected by removing capacitor C54 (4μf, 25v), located on the horizontal circuit board, and reinstalling it on the VHF tuner directly between the RF AGC terminal and ground. Install a 4μf, 24v capacitor on the VHF tuner directly between the +18vdc terminal and ground. Install a 1000μh choke, Magnavox Part No. 361324-102, in series with the +18vdc terminal of the VHF tuner.

Remote Receiver Model 704058—Station Skipping

Adjustment of the horizontal hold, remote sensitivity and high voltage are all important to proper operation of the remote receiver and in some cases misadjustment can result in channel skipping. In such cases the following checks are suggested:

- Check the horizontal hold to insure that the horizontal sync locks-in on all stations. Note: If the horizontal oscillator is running off frequency due to a change in value of resistor R533, this can cause channel skipping. Check resistor R533 (174K, 5%, ½w) and if necessary replace it with a Magnavox part No. 230190-1745.
- Check the setting of the search sensitivity control and if the control is set too low this can cause skipping.
- Check the high voltage and adjust the High-Voltage control as necessary to provide 24.5kv as outlined in the service manual.

During the normal operation of a TV set having a 704058 remote control receiver, the collector of transistor Q1, the coincidence gate transistor located on the AFT board of the TV chassis, and the base circuit of transistor Q20, the sync gate driver transistor located on the remote receiver chassis, receive their operating voltages from a ±60v pulse supplied from the horizontal output transformer. When the tuner is off-channel, transistor Q1 will be cut off because sync pulses are not present to bias it into conduction. During this time the voltage at the base of transistor Q20 is sufficient to cause it to saturate. When a station is tuned in, the sync pulses provide the saturation bias for transistor Q1. When transistor Q1 saturates, the forward bias voltage to transistor Q20 is reduced to below cut-off.

If the high voltage adjustment is set to increase the high voltage appreciably above its normal value, the loading on the horizontal output circuit will be reduced and the amplitude of the pulse voltages in the horizontal output circuit will increase. This increase in pulse voltage can be sufficient to keep the forward bias of transistor Q20 from being reduced to cut-off value, resulting in the remote receiver search circuit not recognizing that a station has been located.

If you encounter a problem of "station skipping" and all other conditions, including the adjustment of the AGC, Horizontal Hold and Remote Sensitivity controls seem normal, check the value of the high voltage and readjust as necessary.

Chassis T936—High Voltage Adjustment

The high voltage adjustment on this chassis is located directly behind the vertical height control and is adjustable by inserting a screwdriver through the hollow shaft of the height control. Although these two adjustments are concentric, the controls are not physically connected and there is a narrow space between them. In compliance with current safety standards that the high voltage adjustment be made inaccessible to the customer, a fishpaper barrier has been installed in the space between the two controls in current production. Therefore, to adjust high voltage in instruments using this chassis, the back must be removed, and the fishpaper tilted to one side before a screwdriver can be inserted into the high voltage control. You are reminded that this adjustment should be made only while monitoring the anode voltage at the CRT.

Color TV Chassis T940/T951—Reducing "Nuisance" Opening of Fuse F3

As the current flows across the junctions of the fuse clips and metal ferrules on the ends of Fuse F3, a substantial amount of heat is developed because of the resistivity of the junction. This heat lowers the opening current value of the fuse and it may subsequently open for no apparent reason. The application of a small amount of silicone grease to the fuse ferrules will aid in the dissipation of the heat and reduce the "nuisance" opening of the fuse. Do not bend the fuse clips to attempt to establish firmer contact between clip and ferrule as this results in less clip resiliency and an increase in contact resistance.

Color TV Chassis T950 with 704059 Remote Control Receiver—Volume ON/OFF Stepping Relay Circuit Modification

Early production of the T950 chassis equipped with the 704059 Remote Receiver has the Volume ON/OFF relay, K401, connected in the rectifier bridge arrangement. The relay, Part No. 160418-6, and the bridge connected rectifiers, Part No. 530082-4, are physically located on the tuner mounting bracket as shown in the illustration (Fig. 1).

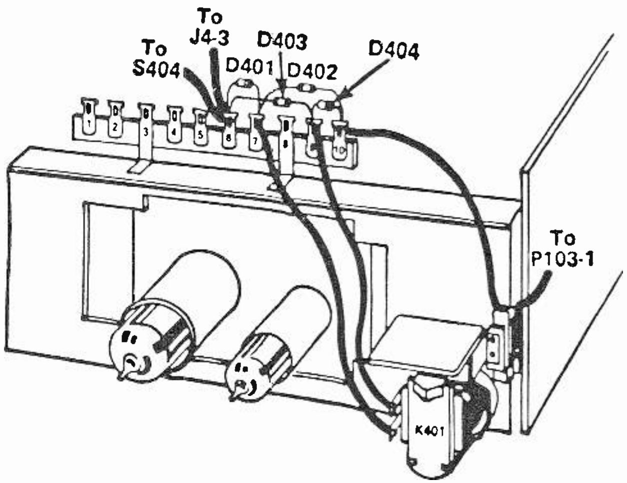


Fig. 1—Tuner assembly removed from cabinet to show component location of early production circuit.

In current production units, the relay circuit has been modified, as shown schematically in the diagram, to provide greater reliability. If it becomes necessary to replace a stepping relay connected in an early production circuit, it is recommended that at the same time the circuit be modified to the later production circuit to reduce the chance of future relay failure. The steps for the field modification are as follows: Fig. 1 illustrates the original parts location and Fig. 2 illustrates the parts location for the field modification. The terminals of the terminal strip have been numbered sequentially, 1 through 10, with terminal 1 nearest the front of the tuner assembly.

- Remove the discard diodes D403 and D404 (Fig. 1) which are installed between terminals 6 and 9, and between 9 and 10.
- Remove the two wires connected to terminal 6 (Fig. 1) and reconnect them to terminal 1 (Fig. 2).
- Connect an insulated jumper wire between terminals 9 and 10 (Fig. 2).

- Install a 560Ω, 5w resistor between terminals 1 and 6 (Fig. 2).

Electrically, the modified circuit should be as shown in the partial schematic in Fig. 2.

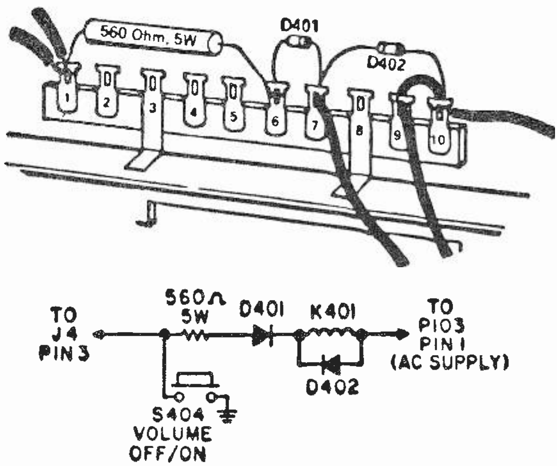
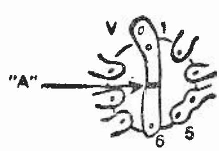


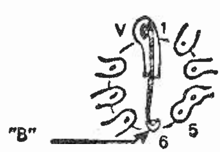
Fig. 2—Circuit and component location after field modification.

Color TV Chassis T931/T933—Arcing Between Pins 5 and 6 of V506 Pin-Cushion Amplifier Tube

During bench service on the Magnavox T931 and T933 chassis, a preventative-maintenance modification is recommended on the deflection board. Pin 6 of tube V506 has a +400v potential and Pin 5 is essentially at ground potential. Over a period of time build-up of dust and other deposits may result in an arcing between these points with possible damage to the PC board. After cleaning off the deposits, it is recommended that the copper pattern connection between Pins 1 and 6 be replaced with a jumper wire as outlined in the following instructions: Lift capacitor C571 out of the way and use a solder sucker to remove the solder from Pin 6. Use a thin bladed knife (or razor blade) to cut the copper pattern at



V506 Underside View Before Modification



V506 Underside View After Modification

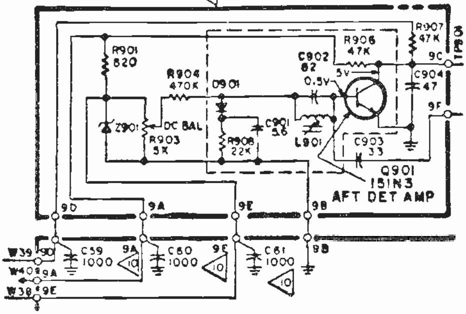
Point A; and then while heating the copper area to be removed with a soldering iron, use the knife to lift the copper pad at Pin 6 and peel it back to the cut point. Add a jumper wire from Terminal "V" (Pin 1) to Pin 6. It is important that the jumper wire be connected at Pin 6 as shown at Point B, to allow maximum possible clearance between Pins 6 and 5. Then return capacitor C571 to its original position.

Color TV Chassis T936, T950, T951, T952—Convergence Coil Assembly 701280-100

The 701280-100 convergence coil assembly, which is the complete convergence yoke without cable and plug, can be used as a general replacement for the convergence yoke assembly used in receivers using these chassis. An instruction sheet included with the coil assembly provides instructions for removing the cable and plug from the original assembly and wiring it to the new replacement. The individual red, blue and green coils will still be available as replacements in the cases where you need to replace an open or shorted coil. If, however, you have need for a replacement Plastic Holder (Part No. 141487-1), you can order the 701280-100 coil assembly, avoiding the necessity of having to remove the three coils and install them in a new holder.

Color TV Chassis T936—AFT Field Adjustment

When field adjusting the AFT circuit, select a station broadcasting a color program, preferably VHF, adjusting the fine tuning for optimum picture and sound with the



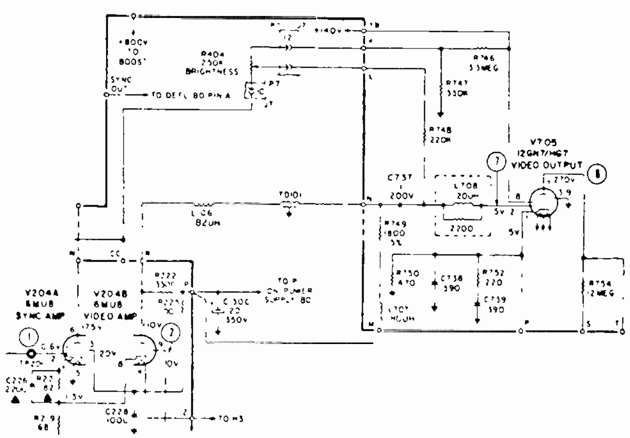
AFT switch in the OFF position. Connect a VTVM across points 9E and 9D of the AFT module and move the AFT switch to ON. Adjust the dc balance control, R903 for 0v.

MAGNAVOX

Remove the VTVM and while watching the picture, move the AFT switch to OFF. If no change in the quality of the picture or chroma level is noted, no further adjustment is required. If a change is noted, switch the AFT switch to ON and adjust the slug in coil L901 for optimum picture and sound. Then switch the AFT OFF and then ON—while observing the picture. Retouch the adjustment of coil L901 until little or no difference in picture quality is noted between the OFF and ON positions of the AFT switch. Check all available stations and compromise the adjustment of L901 if necessary.

Color TV Chassis T950/T951—Elimination of High Resolution "Screen Door" Checkering Effect

As part of a video circuit modification to increase video resolution, some late production versions of the T950 and T951 chassis were produced without a capacitor across coil L106, at the input of the delay line. Along with increased resolution, these TV sets may be subject to a checkering or "screen door" effect in the picture. To reduce this effect, a later production chassis modification has added a 27pf capacitor (Part No. 250508-2705) across L106 in the T950 chassis and a 20pf, capacitor (Part No. 250508-2005) across L106 in the T951 chassis. To reduce the screen door effect on a chassis produced without the capacitor across L106, install the appropriate value capacitor as indicated. Although a 33pf capacitor was originally



used in earlier versions, be careful not to use this value in chassis that were produced without it. Because of other circuit changes, the installation of a 33pf capacitor in this circuit would eliminate the screen door effect, but it would also reduce video resolution.

Color-TV Chassis T958 and T962—New 6EN4 High-Voltage Regulator Tube

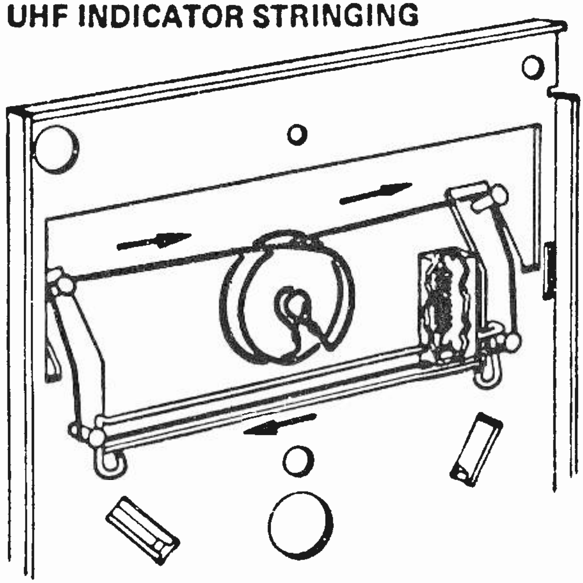
The 6EN4 is an improved high-voltage regulator tube and is a recommended replacement for the 6BK4/6EL4 type. You are cautioned, however, that the 6BK4/6EL4 cannot be used in chassis designed to use the 6EN4. This is because the grid connection on the tube socket has been changed from pin 5 to pin 6, and if a 6BK4/6EL4 should be substituted on these chassis, there would be no connection to the tube grid. Under these circumstances, the high-voltage hold-down circuit will be activated and will automatically limit the high voltage to 18kv.

The T958 chassis used the 6EN4 in initial production, however, the T962 was initially produced with the 6BK4C/6EL4 type. Later production of the T962 chassis has since gone exclusively to the 6EN4 type. During this changeover period, the tube/chassis labels on some models using the T962 chassis identified the high-voltage regulator as 6EN4/6EL4. You are cautioned in this case to always use the 6EN4 as a replacement to be assured regulation.

Color-TV Chassis T950/T951/T958/T962—UHF Dial Cord Breakage

It has been determined that breakage of the UHF dial cord has in some cases been caused by the dial cord rub-

UHF INDICATOR STRINGING



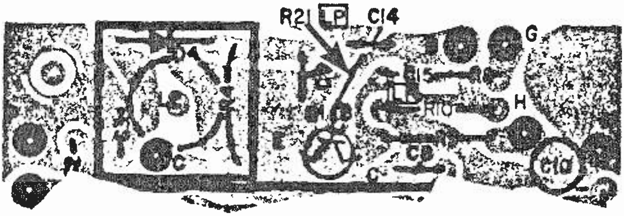
bing against sharp burrs on the edges of the cord guide flanges of the tuner mounting assembly in the front panel (see illustration).

To eliminate this problem, Teflon rings (Part No. 103142-1) are being placed over the brass guide posts, on the outer end of the guide flanges, and located between the dial cord and the metal flanges. The Teflon ring will keep the cord from rubbing against the flange edges. These rings can be easily installed and are available from your Magnavox parts center.

Color-TV Chassis Early T950/T951 with Remote Control—Protection of the Coincidence Gate Transistor

On early production versions of these chassis it is possible that coincidence gate transistor Q1 on the AFT board could be damaged as a result of a high-voltage arc within the chassis. To prevent such damage, a 100Ω resistor, R21, was added in series with the base of Q1 in later versions of these chassis.

AUTOMATIC FINE TUNING (AFT) BOARD (EARLY PRODUCTION)



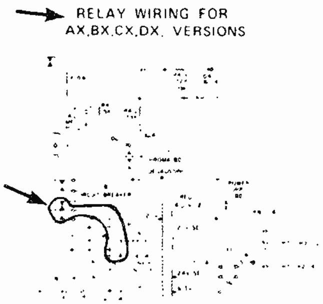
If transistor Q1 on an early version AFT board should require replacement, a 100Ω protective resistor should be added to the circuit at the same time. To accomplish this, cut the copper clad off the AFT board between the base of Q1 and the junction of C14, as shown in the illustration, install a 100Ω, ½w resistor, R21, in series between the base of Q1 and point B on the AFT board.

Remote Control Receivers 704058/704064/704065—Faulty Capacitor Causing Distorted Audio in TV Set

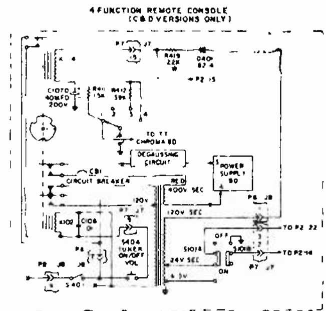
Distorted audio from the TV receiver can be caused by a faulty 0.47μf capacitor (C35 in models 704058 and 704064, C34 in model 704065) located in the collector circuit of the sound mute control transistor (Q19 in models 704058 and 704064, Q20 in model 704065).

Color-TV Chassis T958 with 704065 Remote Control—Stepper .elay Circuit Change

The ON-OFF/VOLUME Stepper circuit for the C and D versions of color-TV receiver chassis T958 was modified to include a second relay, K104. This modification is indicated in Service Manual 7331 Section 4.1 in the block



Corrected Circuit



Circuit in Manual

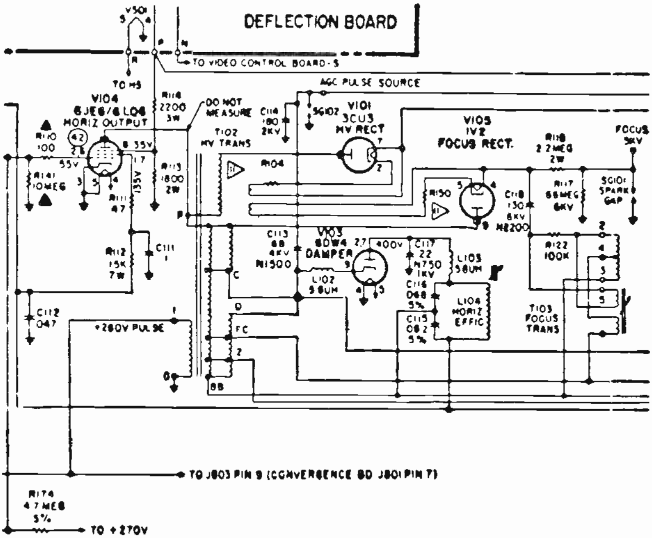
labeled "Relay Wiring for AX, BX, CX, DX Versions" and in Service Manual 7326 (704059 and 704065 Remote Control Receivers), Page 9 in the block labeled "AX Four-Function Remote-Console Only." The schematic and labeling of these diagrams in both manuals are in error and should be corrected as indicated in the illustrations shown. The arrows in the illustration at the left indicate the areas in need of correction. The illustration on the right indicates the correct wiring for relays K102 and K104. This correction should be noted in both of the indicated service manuals.

Color-TV Chassis T958—High-Voltage Rectifier Tube 3DB3

Starting with the AC production code, all T958 chassis will use the 3DB3 high-voltage rectifier tube. The tube socket wiring in these chassis is different from that used for the 3A3/3CU3 tubes and they cannot be used as a substitute. If a 3A3/3CU3 is inadvertently installed in one of these chassis in the place of a 3DB3, the result will be no high voltage.

Color TV Chassis T938—Installing Replacement High-Voltage Transformer 361328-1

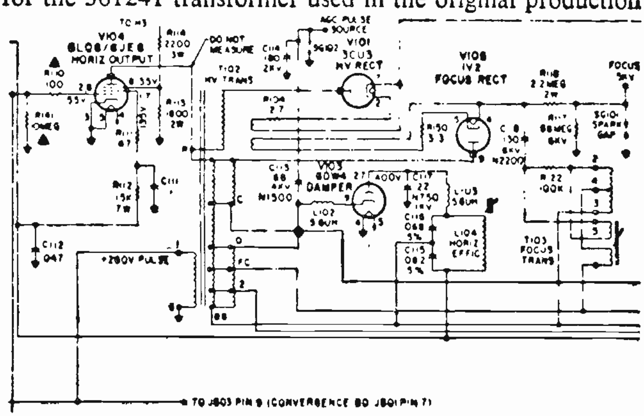
Transformer No. 361328-1 is the recommended replacement for the 361241 transformer used in the early production chassis. When installing this transformer, be sure that terminals C and D on the transformer are connected through a jumper wire.



The chassis employs a Horizontal Centering circuit (Diode and Resistor with solderless connectors for adjustment). These may not be shown on your copy of the T938 schematic diagram; if so, please add them. Failure to make the proper connection between terminals C and D will result in apparent normal operation, however, the transformer will be operating at excessive temperatures.

Color TV Chassis T918—Installing Replacement High-Voltage Transformer 361328-1

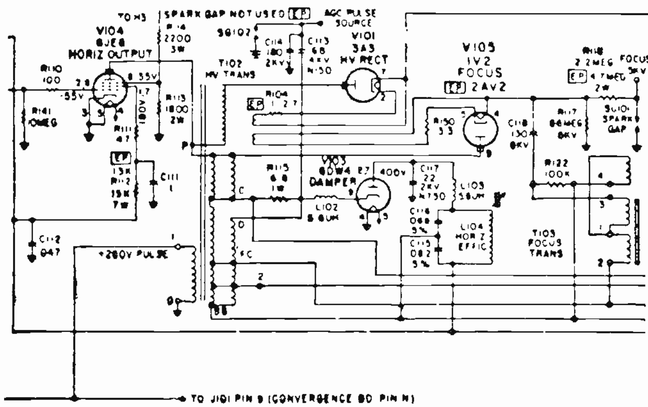
Transformer 361328-1 is the recommended replacement for the 361241 transformer used in the original production



CIRCUIT WITH HORIZONTAL CENTERING

chassis. When installing this transformer be sure that terminals C and D on the transformer are connected through either a jumper wire or a 6.8Ω, 1w resistor.

- If the chassis employs a Horizontal Centering circuit (Diode and Resistor with solderless connectors for adjustment) terminals C and D must be connected with a short jumper wire.
- If the chassis does not employ the centering circuit, terminals C and D must be connected through a 6.8Ω, 1w resistor.

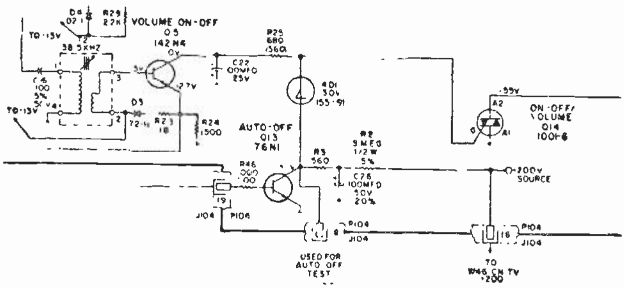


CIRCUIT WITHOUT HORIZONTAL CENTERING

These connections may not be shown on your copy of the T918 schematic diagram; if so, please add them. Failure to make the proper connection between terminals C and D will result in apparent normal operation, however, the transformer will be operating at excessive temperatures.

Remote-Control Receiver Model 704069—Addition of Current Limiter Resistor

It has been found that an arc in the picture tube of a color-TV set with a 704069-1 remote control receiver can cause a high-amplitude transient pulse to appear at the base circuit of transistor Q13 in this receiver. In some instances, the current produced by such a transient is sufficient to destroy the transistor. Because of this, a current-limiting resistor is installed in series with the base of Q13 in all late production units. If an early production remote control not having such a resistor in series with the base of Q13 is encountered, one should be installed. This can readily be accomplished by cutting the foil between the base of Q13 and Pin 19 of the edge connector and then bridging the cut with a 1K resistor.



The exact value of the resistor is not critical. Individual values of 100Ω and 1K have been used for this application in production; however, for field modification, the 1K value is preferred.

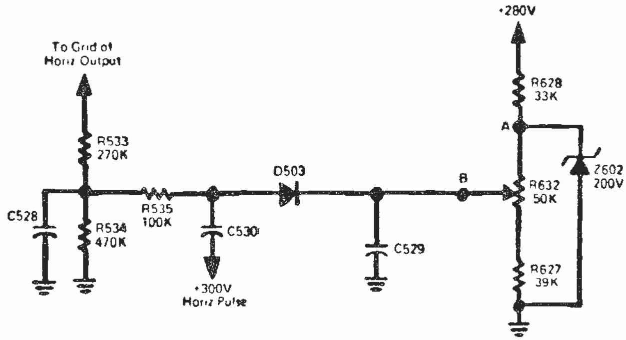
Color-TV Chassis T946—AGC Control Added

An AGC control has been added to the T946 chassis, B production. The control, Part No. 220217-5, is a 1.5K potentiometer with a blue adjustment wheel. The control physically replaces the fixed resistor (R50), which was used in earlier production chassis. This control should be adjusted to produce minimum snow on the weakest channel available. The strongest station should then be observed to insure that AGC overload is not present. If overload is present, readjust the control to just eliminate the overload condition.

Color-TV Chassis T924/T939/T950—Reduced High Voltage Caused by Leaky Zener Regulator Diode

The illustration is a simplified diagram of the high-voltage regulation circuit used in color-TV receiver chassis T950. Except for the circuit symbol numbers, this circuit is the same as that used in color-TV chassis T924 and T939.

A regulated 200v reference potential at the HIGH-VOLTAGE control (point A) is maintained by zener diode Z602—this potential variable over a range from about 88v to the full 200v present at the cathode (point B) of diode D503. The voltages present at the cathode of D503 determines the amount of the negative charge developed at its anode by capacitor C530 during each horizontal pulse. The resulting negative voltage is divided across resistors R534 and R535, and applied as negative bias to the horizontal output tube grid. The amount of this bias determines the conduction of the tube and as a result the amount of high voltage. As the bias at the horizontal output tube grid becomes more negative, the high voltage reduced and vice versa.

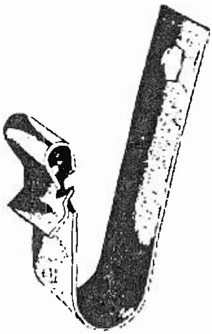


If diode Z602 becomes defective, the high voltage is affected. If the diode opens, the potential at point A rises slightly and results in a very slight increase in high voltage. However, if the diode becomes leaky or shorts, the potential at point A decreases, causing an increase in negative bias at the horizontal output tube grid. An increase in this negative bias results in reduced high voltage, accompanied by decreased screen brightness and a narrower raster. The degree of reduction of high voltage, brightness and raster width can range from very slight to severe, depending on the degree of leakage in diode Z602.

Color-TV Models 7322,24,26—Elimination of Static Electricity Build-Up on Controls

In early production units, the metal band around the picture tube does not contact the picture tube ground circuit. Because of this, a static electrical charge can accumulate on the metallic trim on the mask and control knobs. This static charge can be eliminated by grounding the picture tube band.

A simple method of grounding the picture tube band consists of inserting a spring clip, Magnavox Part No. 171192-1, between the picture tube and the metal support rail, which is located between the upper and lower picture tube mounting brackets on the tuner side of the tube. The clip must be so oriented that its straight, longest side contacts the picture tube metal band and the clip portion fits over the edge of the support rail.



The spring clip can be inserted without removing any hardware. At the area of the lower mounting bracket, near the speaker, work the straight, longest side of the clip under the edge of the purity shield.

Before pressing the clip into place, move it toward the center of the support rail. Then, press the clip portion over the edge of the support rail, fully seating the clip; and, using a screwdriver or other sturdy tool, slide the clip another inch or so toward the center of the support rail. This sliding of the clip causes the clip to score the metal finish of both the support rail and the picture tube band, providing a good electrical contact on both areas.

In late production units, the band is grounded during production. Whether or not the band is grounded in any particular instrument can be determined by measuring the resistance between the picture tube band and the ground circuit.

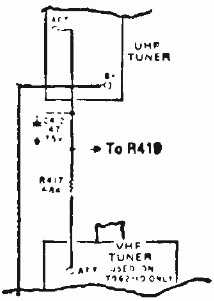
The spring clips, Part No. 171192-1, are available at no charge from your district service center.

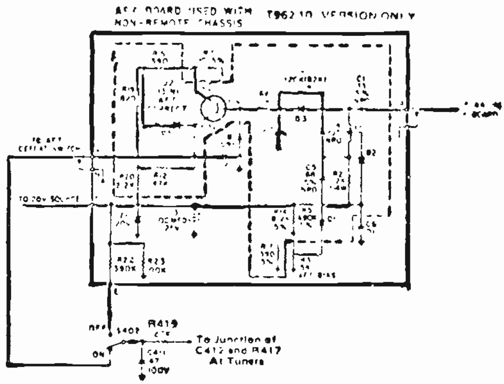
Convergence and Screen Purity Problems

Problems associated with convergence and screen purity frequently result from inadequate degaussing of all metal near the picture tube. Any magnetized metal near the picture tube can affect the landing points of the beams on the screen. And because of this, all metal other than permanent magnets that are purposely located near the picture tube must be completely demagnetized. Some TV sets use a metal back cover or a metal picture tube cup attached to the back cover. Although frequently the back is not attached to the instrument at the time the TV set is degaussed, the metal back or picture tube cup also must be completely degaussed to prevent its having any influence on purity. Each time a TV set is degaussed, be sure that any metal portion of the back cover is also thoroughly degaussed.

Color-TV Chassis T962-10—New Tuners and AFT Correction Circuit

The 340193-1 VHF tuner, 340190-2/340191-2 UHF tuner and the AFT board used with the T962-10 version chassis differ from those used with all other T962 chassis





versions. In the tuners, the anodes of the AFT varicaps are connected to ground reference and the AFT correction voltage supplied from the AFT board is centered around +5v, and applied to the cathodes. There is no +20v reference source applied to these tuners. Since the AFT correction voltage required for these tuners is centered around +5v rather than +15v as for the tuners of all other T962 chassis versions, the AFT circuit has been modified to provide the proper voltage range. The illustrations show both the schematic for the new AFT board and the connection of the AFT correction voltage to the tuners for the T962-10 version.

Color-TV Chassis T952—Low Brightness Symptoms

When troubleshooting a T952 chassis for symptoms of low brightness, it is suggested that you check the value of resistor R132 located in the cathode circuit of the picture tube. The original resistor—6.8K, 2w—may have changed in value, and some cases have been reported where the resistance has dropped as low as 3K. As a replacement, you should use Magnavox Part No. 230193-6829, or equivalent, which is a 6.8K, 3w, glass-body resistor.

Some cases have been reported where an aging picture tube was replaced, but the brightness was still not completely restored to normal. Resistor R132 should be checked and replaced in these cases.

This chassis employs a beam-limiting circuit (transistor Q25 and associated circuitry) which provides safety protection for the picture tube, horizontal-output transformer and tube, by sensing the cathode current in the horizontal-output tube and adjusting the picture-tube bias to maintain this current within proper limits. Obviously this circuit will effect brightness, however, you are cautioned to not make any circuit or component value changes in this circuit in an attempt to correct for low brightness.

Color-TV Chassis T979—Bright Horizontal Line Moving Vertically

An intermittent condition is reported consisting of a bright horizontal line that appears to move vertically through the bottom third of the screen. A condition of vertical jitter may also be apparent and in some cases the condition appears to be corrected by tapping or moving certain components on the "D" panel. Further investigation indicates that this condition may be caused by a contaminate, such as solder flux, in the "D" panel plug-in socket —at pins 5, 6 and 7 in particular.

If you encounter this condition, it is suggested that both the male pins and the female connectors on the "D" panel be cleaned using an approved cleaner which will not react with the PC board or adjacent components. The inside of the female connectors should be cleaned with this solvent, using an applicator such as a toothpick, and then thoroughly dried.

Color-TV Models IT5052 and IT5054—UHF Tuner Transistor Failure

In cases of transistor failure in the UHF tuner on these models, check to see if there is a ground strap connected from the upper right side of the tuner mounting assembly to the picture tube shield. This ground strap was employed in only a small quantity of these models and you are requested to remove the strap on those models you service. It is suspected that a momentary arcing in the picture tube could result in sufficient conduction through this strap to damage the UHF transistor. The tuner assembly is grounded by other means and removal of this strap will not affect set operation.

Color-TV Chassis T979—White Balance Adjustment

The procedure listed in the company's T979 chassis Service Manual (7339) neglects to mention that it may be necessary in strong signal areas to switch to an unused channel or disconnect the antenna when making white balance adjustments. It is possible under strong signal conditions to have sufficient conduction in the IF stages to cause the luminance amplifier collector voltage to decrease, resulting in an incorrect white balance set-up. Removing the signal eliminates this possibility.

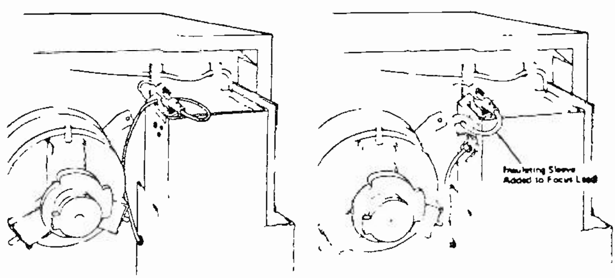
Color-TV Chassis T958/T962—Failure of Capacitor C529

There have been reports of no high-voltage resulting from failure of capacitor C529, located in the horizontal oscillator circuit. In all cases checked, it was found that the capacitor had shorted. The capacitor used in production is a silver mica, 680pf rated at 500v, Part No. 250364-350. This is the correct replacement part that should be used. The company's diagram incorrectly identifies C529 as 200v.

Color-TV Chassis T939—Focus Rectifier Lead Dress Modification

The T939 Color-TV chassis used in both consumer and hotel/motel product lines marketed during 1969 should be inspected for focus-rectifier lead-dress whenever any service is performed.

On some versions of this chassis the focus-rectifier socket is mounted on top of the high-voltage cage. Illustration A shows improper dressing of the focus-rectifier lead, which



A B

could cause arcing between the lead and the high-voltage cage and/or deflection-yoke bracket.

Illustration B shows the recommended method for eliminating this possibility, using materials available without charge from Magnavox. Order Kit No. 171282-1 containing instructions and materials for five modifications from your Magnavox district.

Color-TV Chassis T936/956/957—Snivets on UHF Channels

A condition of snivets on the left side of the screen on UHF channels may be caused by a leaky diode, D102. This diode is located in the horizontal-output section and is in series with the center arm of the HIGH-VOLTAGE ADJUSTMENT control. Replacement with a Magnavox Part No. 530088-1004 diode will correct this condition.

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Color-TV Chassis T958 and T974—Elimination of Capacitors in Yoke

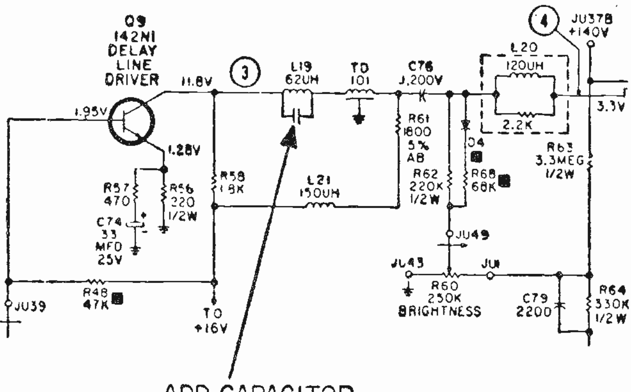
The deflection yoke used in the new T974 chassis and also in the later T958 versions has been designed to eliminate the capacitors normally connected across the yoke windings from the yoke assembly. These components are now mounted on a terminal board at the top rear of the high-voltage cage. When you are using one of these chassis with a Magnavox test fixture for troubleshooting, the capacitors on the TV chassis will be paralleling those on the test fixture yoke and as a result some overscan will occur.

Correction for Horizontal Convergence "Blue Droop"

Inability to converge horizontal blue lines at the edges is described as "blue droop." This condition can be corrected by optimizing the value of resistor R816, which is connected in series with the HORIZONTAL BLUE TILT control. In most chassis, resistor R816 will be a 10Ω, 1w resistor. In some cases, however, the tolerances in the circuitry will be such that the optimum value of resistor R816 for proper correction may be 22Ω or 33Ω. If this condition is noticed on a particular chassis, you may find that the best value for resistor R816 may be anywhere between 10Ω and 33Ω.

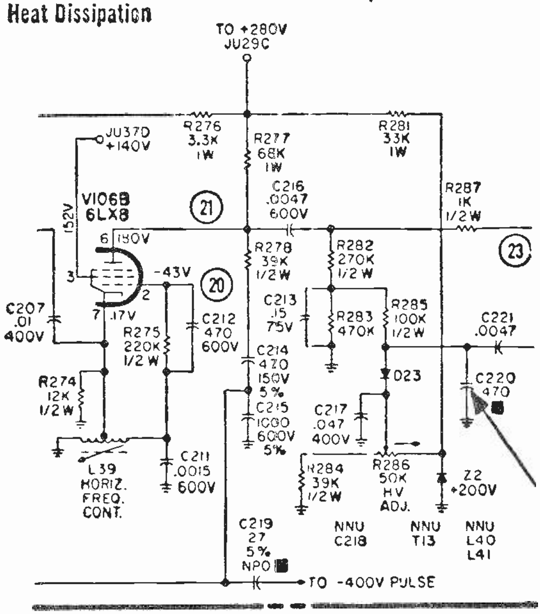
Color-TV Chassis T952—Elimination of 3.58MHz Beat Pattern

Later versions of the T952 chassis incorporate a 33pf capacitor across L19 in the delay line circuit. This capacitor, which is identified as C75 (Part No. 250508-3305)



can be added to earlier version chassis to improve performance in cases where this beat pattern is noticed.

Color-TV Chassis T952—Removal of Capacitor C220 for Reduction in Heat Dissipation

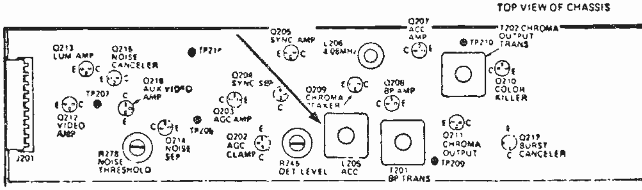


Capacitor C220 (470pf) was used in some T952 chassis —connected between the junction of C221, resistor R285 and diode D23 to ground. This capacitor was removed in later production and results in a reduction in heat dissipation in the horizontal output circuit. You are requested to remove this capacitor, if found in any T952 chassis that you are servicing.

Color-TV Chassis T974/T936/T956/T957—ACC Servicing Tip

The ACC (Automatic Chroma Control) circuitry used in the T974, T936, T956 and T957 chassis are designed to monitor the station burst signal and compensate for

TOP VIEW OF CHASSIS



changes in chroma levels which in theory should proportionately accompany burst level changes. In practice, all stations do not maintain specified burst-chroma level relationships.

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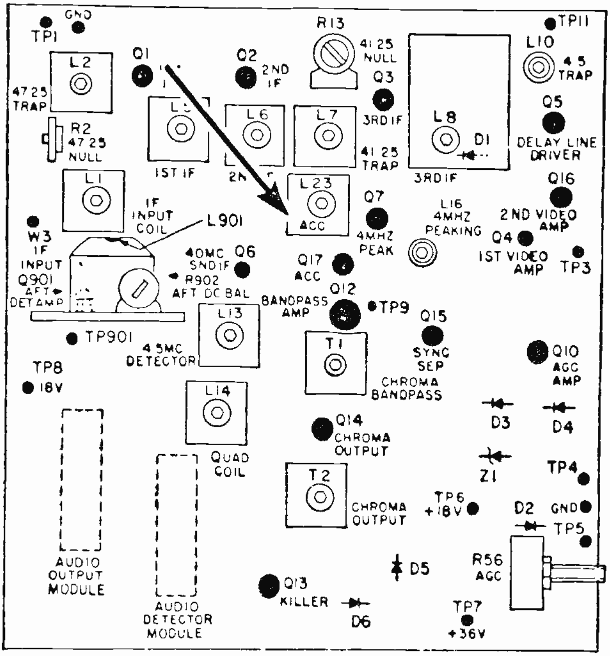
If a station transmits too high a burst, too much bias will be placed on the chroma amplifier. This could result in a no color condition on a model utilizing one of the above chassis. Initially, the indication would be saturated reds. When this condition is corrected by use of the COLOR control, the other colors drop out.

The condition can be alleviated by detuning the ACC coil, L205, on the T974 chassis or L23 on the T936, T956 or T957 chassis. The effect of the ACC action is reduced by the amount of detuning. Best performance was ob-



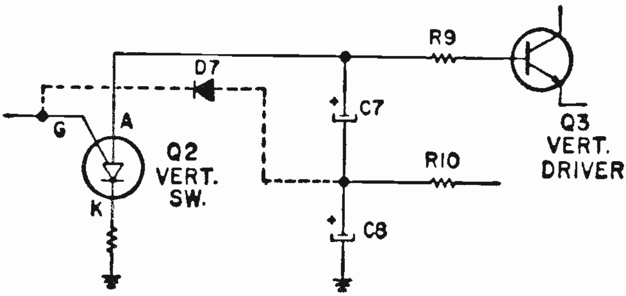
tained by turning the slug 5 to 6 complete turns clockwise (toward the board).

Color-TV Chassis T979—Vertical Jitter

There have been reports of vertical jitter, particularly during scene changes. Engineering evaluation of the problem determined that capacitor C8 on the "D" panel was not completely discharging during the conduction time of the Vertical Switch transistor, Q2.

To eliminate the problem, a Silicon Diode, D7, was incorporated in production on all chassis after December 18, 1972. The diode is forward biased by the lowering of the gate potential when the switch conducts. This provides a low-impedance discharge path for capacitor C8 and insures the removal of any residual charge on the capacitor.

The diode, Part No. 530116-3, is available at the Magnavox Parts Centers and only this silicon device should be used in modifying early production "D" Panels.



This diode has been added on the second issue of the Magnavox factory schematic dated December, 1972.

Color-TV Chassis T979—Brightness Change

A condition of brightness change may be experienced in the T979 chassis during the first few minutes of operation. The problem occurs because Z101, an 18v zener diode, is located adjacent to high-wattage resistors. A thermal action takes place which changes the zener voltage and causes the brightness change. The problem may be eliminated by relocating Z101 to the underside of one of the "C" panel connectors. Connect the cathode of the diode to Pin 10 and the anode to the chassis ground. If the brightness continues to change over a long period of time (up to 15 minutes or so), the problem may be caused by a faulty luminance output transistor, Q4, on the "E" panel.

Color-TV Chassis T952—Flyback Removal

Several field reports have indicated that flyback removal is difficult in the T952 chassis because of the screws which hold the flyback in place. These two screws are driven through the flyback bracket into the PC board, necessitating removal of the screws from inside the flyback cage. Removal can be simplified by removing the high-voltage rectifier tube socket before attempting to remove the screws. The high-voltage cage does not have to be removed to change a flyback if the above procedure is used. Removal of the high-voltage socket simply requires removing two "wing nuts."

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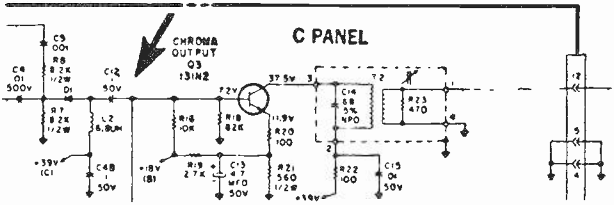
Color-TV Chassis T979—Failure of C12 on "C" Panel

A condition of weak or no chroma has been traced to leakage in capacitor C12, located on the "C" panel. This



capacitor is used in the input circuit of the chroma output stage to couple the chroma signals from the COLOR control to the base of transistor Q3, while blocking the 39v dc applied to the anode of diode D1.

The suspect capacitor is a .1μf/50v unit manufactured by Dielectron and can be readily identified by a letter D on its body. Replacement with a .1μf/100v should precede any additional troubleshooting as any leakage will alter the operating voltages of transistor Q3.

Test Fixture Yoke Matching Transformer Kit 171266-1

A possibility exists that the 6800pf/600v capacitor, located between pins 6 and 9 on the transformer, could be damaged by heat from the 18K, 7w resistor tied between these same terminals.

To prevent possible damage, the capacitor should be relocated. This can be accomplished very quickly and easily by unsoldering the leads of the capacitor and mounting it behind the board. The leads can be passed through the existing terminal holes and reconnected. Kits in current production are incorporating this change.

In the event the capacitor has already been damaged, a replacement can be ordered under part number 250590-6820.

Color-TV Chassis T952—Service Tips

The March issue of Magnavox Service News contained a service tip regarding replacing flyback transformers on the T952 color-TV chassis. The information was incorrect regarding the chassis versions in which each of the two flybacks were used. The T952 chassis is used with two types of picture tubes—the bi-potential type and the

Einzel-lens type. The bi-potential picture tube requires 25kv anode voltage and about 5kv focus voltage. The Einzel-lens type picture tube uses a lower anode voltage and a much lower focus voltage.

Two parts lists are contained in the Color-TV chassis T952 service literature (Manual 7328)—Sections 5.1 and 5.2. The chassis versions shown in Section 5.1 use the No. 361385-1 transformer, a 31LQ6 horizontal output tube and an Einzel picture tube. The chassis versions shown in Section 5.2 use the No. 361461-2 transformer, a 30MB6 horizontal output tube and a bi-potential picture tube.

If the wrong transformer is installed in the T952 chassis using the bi-potential tube, the high-voltage rectifier will receive too much filament voltage and fail in a short time. In addition, the picture tube anode voltage will be too low. If the wrong transformer is used in the chassis with the Einzel tube, a condition of "no high voltage" will exist because of too little heater voltage applied to the high-voltage rectifier tube. Obviously, the correct transformer must be used in both instances to obtain proper and safe operation.

Color-TV Chassis T979/989—Board and Module Modifications

Engineering evaluation of certain audio and vertical problems occurring in these chassis have been traced to a resistive contact between the module and its socket or the panel and chassis connector. In the past removing and cleaning the connector in some cases resulted in only a temporary cure for the problem. A recommendation made earlier to solder a jumper across the faulty connector solved the problem but defeated the plugability feature.

To solve both problems, alterations have been made to the modules and panels involved. A pigtail lead has been attached to the module or panel and a push-on connector fastened to the free end of the lead. This permits bridging the connector at fault while retaining its interchangeability feature.

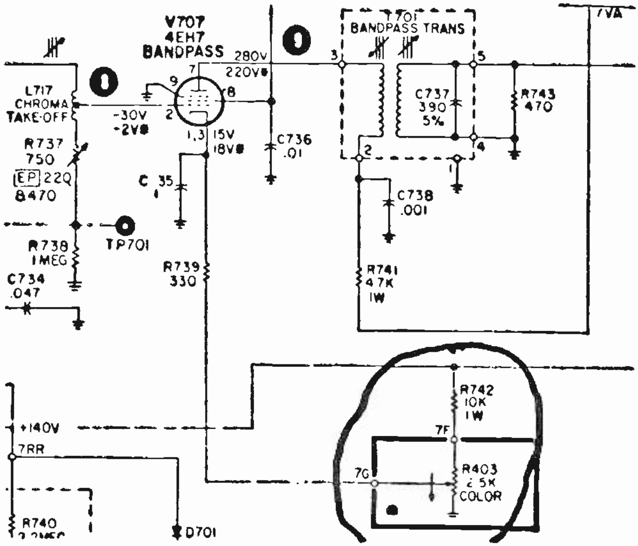
Descriptions of the changes and instructions on their adaptation to the chassis are detailed in the following modifications:

Color-TV Chassis T989—Excessive Contrast

Correction of an excessive contrast condition in the T989 chassis can be accomplished by increasing the resistance of resistor R128 from 150 to 390Ω. The range of the CONTRAST control is increased in the Videomatic Mode to allow the customer to achieve the contrast desired. This change was incorporated into production on 9/19/73.

Color-TV Chassis T924/939/950—Failure of Resistor R742

Two cases involving the failure of R742, a 10K, 1w resistor, have been noted. The symptom was no reduction in color saturation when the COLOR control was turned counterclockwise. Investigation showed that R742 was opened



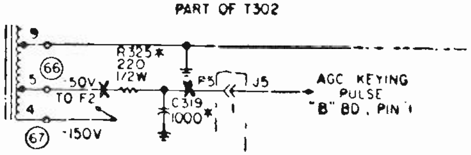
and in one case the COLOR control was damaged. The failure resulted from current flow in excess of the power rating of the resistor.

Should you have occasion to replace resistor R742, a 2w unit should be used. If the COLOR control is replaced, make certain that the chassis ground lead is soldered to the low side of the control. A no-color condition will result if this lead is left disconnected.

Color-TV Chassis T989—Ringing Bars on Left Side of Picture

A few early production T989 TV chassis may exhibit a condition of horizontal ringing. This will be evidenced by multiple vertical bars appearing on the left side of the

PART OF T302



screen. The problem can be eliminated by connecting a 220Ω, ½w resistor in series with the AGC pulse line from

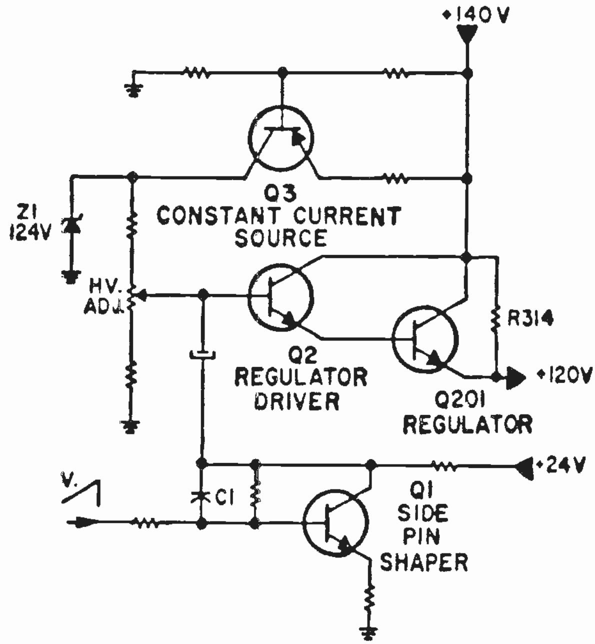
Pin 5 of the horizontal-output transformer and connecting a .001μf, 500v capacitor from the wire side of the resistor to ground. This change was incorporated in production on June 15, 1973.

Vertical Oscillator/Drive Module 703616-1

Early production units exhibited a vertical jitter created by a resistive contact at pin 9 of this module. Future replacement modules will bridge pin 9 directly to pin 22 on the "D" panel using the pigtail, push-on connector arrangement.

Color-TV Chassis T989—Troubleshooting the Power Supply

The pilot lamps are important indicators when diagnosing AC problems in the power supply. If the lamps do not light when the AC switch is in the ON position, the following checks should be made:



1) Be sure the AC line cord is connected to the wall outlet, then push the circuit breaker reset button.

2) Check the AC voltage at the wall outlet with a voltmeter or by turning on a floor lamp on the same house circuit, to determine if the house fuse or circuit breaker has opened.
3) Check the continuity of the AC cord. It should measure 100K with the AC switch OFF and only a few ohms with the switch ON.
4) If the resistance reads infinity, first determine that the ¼-in. retaining screw above the AC interlock is in place and is holding the AC plug securely in the interlock receptacle. Then check the AC cord, the interlock connections, the circuit breaker, and the line filter for opens or poor contacts.
5) If the reading is 100K regardless of the ON/OFF switch position, check the switch, the AC connections to the switch, and the primary winding of the power transformer.

If the circuit breaker opens instantly when the receiver is switched ON, it is likely that one or more of the diodes in the power supply is shorted. A shorted input capacitor will produce the same effect. Resistance checks of each rectifier circuit will reveal which circuit is at fault. Reverse the leads of the ohmeter while taking the readings, because the meter battery will forward bias the rectifiers to produce a low reading in one direction. A high reading should be obtained with the leads reversed. Of course, a short circuit will produce low readings regardless of lead polarity.

Open and leaky filter capacitors can produce a number of trouble symptoms, such as hum in the sound, hum bars in the picture, and regeneration. A combination of these symptoms frequently result. Open capacitors may be checked by bridging a known good capacitor across the suspected one. (The connection should be made with the set switched OFF.) Leaky capacitors can be detected by resistance checks or by disconnecting them from the circuit and substituting another of the same approximate value and voltage rating.

A problem in the 140v DC supply could be caused by a defective regulator module or regulator transistor. The 120v DC output from the regulator transistor is fused to protect the supply from the heavy surge of current that would result from a short in the horizontal deflection circuit. Resistance checks and module substitution will help isolate problems in this circuit.

Modularization of circuits in modern TV receivers has simplified the business of troubleshooting. However, certain components such as transformers, filter capacitors, power transistors and high-wattage resistors often are not installed on modules because of their extreme weight, size or heat dissipating requirements. A number of other components also are installed on the chassis because of functional or mechanical considerations. Problems relating to these off-module components can be solved using the conventional troubleshooting techniques.

21 Detent Tuner—Cleaning Precautions

The 21 detent tuner is used in many models of the portable and console color televisions, including all remote-controlled models. This tuner uses both VHF and UHF strips. The UHF strips are actually potentiometers which are enclosed in a plastic housing. The popular aerosol type tuner sprays should not be used with the 21 detent tuner because the chemical might deteriorate the plastic housing on the UHF strips. If the service technician finds it necessary to clean the contacts in the tuner, the job should be performed properly, and a new tuner wiping pad (part number 171013-1) should be installed.

Color TV Chassis T989—Hum at Low Volume Level

A recent production change in the T989 chassis incorporates an additional filter network in the audio B+ line, to eliminate the possibility of low level hum, which may be noticeable in the sound at low volume. If this problem is encountered and the hum cannot be eliminated by the normal procedure of panel or module replacement, the additional filter network components are available as a kit, for field installation. The resistor and capacitor for the filter network along with complete instructions for installation of the components are included in the kit. The part number for the kit is 171343-1. It is available at the district parts centers.

Color TV Chassis T989—Intermittent Brightness Variation

A condition of intermittent brightness variation which might appear with the T989 chassis can be caused by high contact resistance at pin 8 of the Videomatic module (part number 703508-2). This problem can be eliminated by installing a jumper wire from pin 8 of the Videomatic module to pin 29 of the "B" panel. Replacement Videomatic modules are now being supplied with a jumper wire (connected to pin 8) which has a "push-on" connector for easy connection to pin 29 of the "B" panel.

"D" Panel 703505-1 Vertical Problem and Yoke Capacitor C16

Two pigtail connectors are attached to this panel to bridge terminals 5 and 7. They are attached to the foil side of the panel and should be mated with chassis pins 5 and 7 on the chassis mounted connector.

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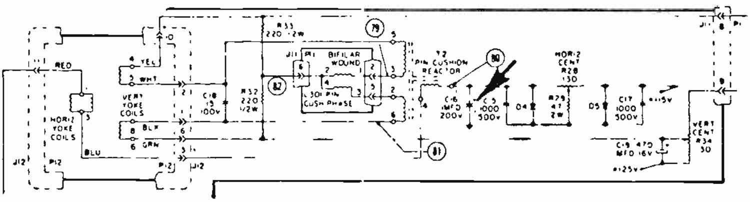
Capacitor C16 at the upper left hand corner of the "D" panel is charged and discharged by the horizontal yoke current. It is a special capacitor and may not be substituted by a general purpose capacitor. It was discovered that a run of these capacitors fell below minimum specifications.

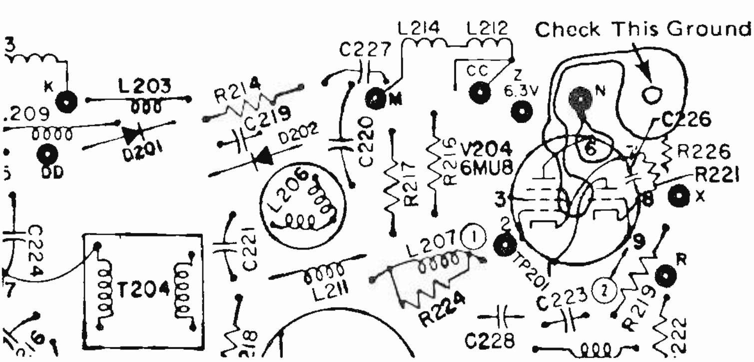
You are requested to help the manufacturer locate and remove these capacitors from service by visually inspecting the unit any time you have occasion to service a T979 chassis. The faulty components are identified by the letters MF on the capacitor body. For example: Pactron, 1.0μf +10%, MF200v.



If you discover one of these capacitors in service, replace the "D" panel. Credit will be issued to you when the panel is returned to the Magnavox Parts Center. Approved capacitors are identified by an MPC, HA or MF (with an accompanying white dot).

Color-TV Chassis T958—Hum Bar

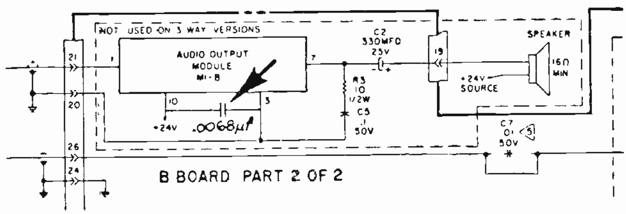
A strong hum bar that would occur intermittently on a T958 chassis was traced to a poor solder ground at the filament of V204, 6MU8 on the Video IF board. The SER-



VICE SWITCH in this instance proved to be a valuable service aid when it was noted that the bar was still visible in the PURITY position of the switch. The ground point is shown in the illustration.

Audio Output Module 612046-202

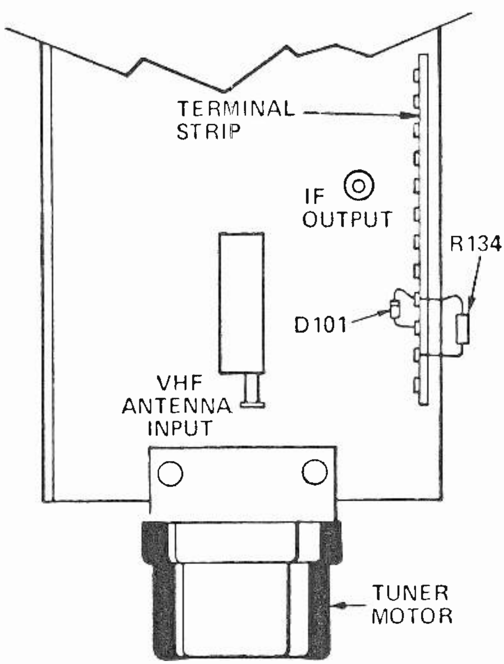
A .0068μf capacitor has been bridged from B+ (pin 10) and ground (pin 3) on the module to preclude the possi-



bility of oscillations occurring in the module. In addition, a pigtail is attached on the ground land surface at terminal 3. This lead is to be brought around the board and attached to pin 20 on the chassis.

Color TV Chassis T989—Remote Control UHF AGC Improved

The T989 chassis employing the six-function remote control and digital readout features may exhibit overload symptoms on strong UHF signals. This condition can be



corrected by changing resistor R134 from 150 K, ½ w to 270 K, ½ w. The change increases the RF, AGC voltage applied to the UHF, RF amplifier in the 340236-1 UHF varactor tuner. Resistor R134 is physically located on a terminal strip on top of the 21-channel detent tuner, as shown in illustration.

Color TV Chassis T989—8-Function Remote Control

Certain stereo theatre models, such as the CD4971 console and the CD4987 Armoires, utilize the T989 chassis with the No. 704078—8-function remote-control system. In cases where the TV chassis is returned to the shop for repair, a special procedure must be followed in order to power the chassis on the bench. First, connect a jumper between pins 1 and 2 on the 6-pin Molex plug that connects to the radio chassis. Next, use a wedge to hold the contacts of relay 202 closed. The chassis may now be operated in the normal manner. Be sure to remove the jumper and the wedge when repairs have been completed.

Universal Video Output Module Part No. 703552-4

A new video output module, Part No. 703552-4, is now available which is a universal replacement for the 612032-1, 612032-101, 703552-1, and 703552-2 modules used in the T981, T982, and T987 chassis, and the 612032-1, 612032-101, and 703552-3 modules used in the T989 chassis. A DRIVE control, R8, is mounted on the new module and must be set correctly for the chassis in which the module is installed.

When this new module is placed in a T989 chassis, R8 should be set to its maximum clockwise (minimum resistance) position. (The control is not needed in the T989 chassis and the fully clockwise position effectively takes the control out of the circuit.) White balance adjustments should be performed as outlined in Magnavox Service Manual No. 7343.

Early T981, T982, and T987 chassis used "DRIVE" controls to set the low-light color temperature of the picture tube. These DRIVE controls were actually DC BIAS adjustments and were re-named "Background" controls in later chassis versions. Control R8 on the new modules serves to control the amount of signal applied to each picture tube cathode, to provide correct high-light tracking.

When the universal module is installed in a T981, T982, or T987 chassis, R8 should be turned maximum clockwise and white balance adjustments performed in accordance with the service manual procedure. The brightness control should be turned up and down to check color temperature at both high-light and low-light conditions. The old drive (BACKGROUND) controls on the rear apron should be adjusted for proper gray scale at low brightness settings, and R8 should be adjusted for proper gray scale at high brightness settings.

New "CE" Color TV Models—Modifications

Last year, the 10-digit, alpha-numeric model numbering system was put into effect. Models introduced in 1973 were identified by the letter "D" in the model number, such as the color TV model C*D*4730WA11. Since the first of this year, several models have been shipped with the second letter updated to "E," such as C*E*4731WA11, to indicate 1974 model introductions. Certain color TV models which use the T989 chassis and carry the "E" designation have been modified in the following ways:

First, the wiring for the AFT switch has been altered to enhance the benefits provided by the Videomatic feature. Formerly, the AFT circuit could be switched on or off only when the VIDEOMATIC button was in the on position. With Videomatic off, the AFT circuit was inoperative. This switching action has been reversed in the "CE" models so that AFT is always on when Videomatic is on, regardless of the AFT switch position. When Videomatic is off, the AFT circuit may be turned on or off as desired. The AFT switch is located on the front panel of "E" models and on the secondary control (rear) panel of "D" models.

A second change concerns the HIGH BRIGHTNESS ADJUST (on the rear apron of the chassis), which has been deleted in the "CE" models. One PRESET BRIGHTNESS control has been retained for Videomatic set up, and is positioned behind the customer-operated BRIGHTNESS control. This preset control should be adjusted for the desired brightness level with the VIDEOMATIC switch in the on position and with the customer BRIGHTNESS control set at the 12 o'clock position.

Also, a PRESET CONTRAST control has been mounted behind the main CONTRAST control. Similar to the other preset adjustments, the PRESET CONTRAST control is adjusted through the hollow shaft of the customer-operated CONTRAST control, and it is set for the desired contrast level with the VIDEOMATIC switch in the on position and the customer CONTRAST control set at the 12 o'clock position. Stereo theatre models which use the 704078 remote control do *not* have the PRESET CONTRAST control, because the PRESET COLOR control occupies this position.

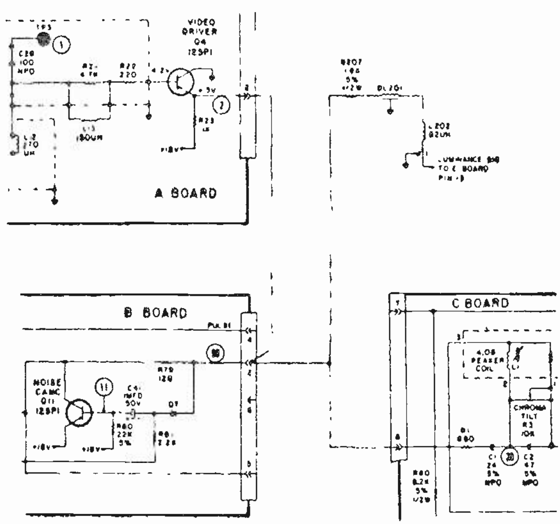
Color TV Chassis T989—Digital Channel-Indicator Dimmer Circuit

Color TV models which use the T989 chassis and the 704084-1 Six-Function Remote Control system have a dimming circuit to control the brilliance of the channel-indicator lamps. In normal operation, the proper combination of lamps is switched in for each position of the channel-selector knob to indicate the channel number When a channel is first switched in, the selected channel-indicator lamps glow at maximum brilliance for several seconds. At the end of this time, a dimmer circuit switches the lamps to a half-power condition so that the channel number becomes less noticeable during normal viewing.

There have been cases reported where the lamps remain at full brilliance all of the time. In each instance, the problem was traced to a shorted or leaky diode, D20, on the Remote Receiver module. The diode is made of germanium, rather than silicon, and this fact is important to the correct operation of the remote system. Should diode D20 require replacement, be sure to use the correct replacement—Part No. 530092-1001.

Color TV Chassis T979—Vertical Line on Left Side of Raster

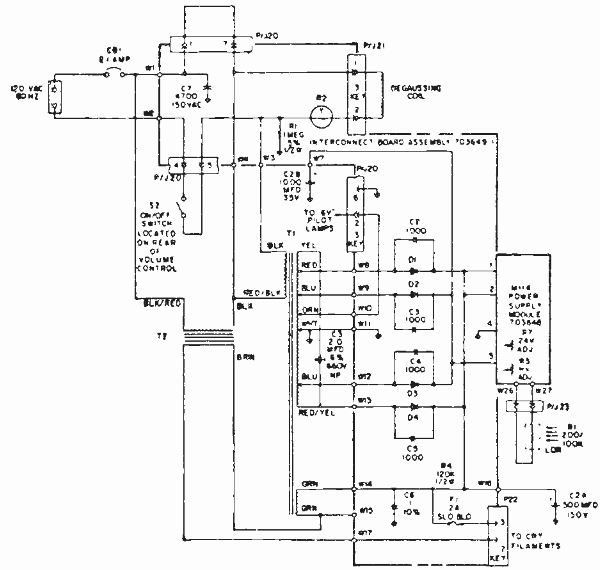
A narrow vertical line on the left side of the raster has been noticed on a limited number of T979 chassis. The cause has been traced to an error in the wiring from the "B" board. The illustration shows the correct wiring arrangement. The vertical line on the screen is produced when the wire from pin 6 of the "C" board is erroneously connected to pin 3 of the "B" board instead of to pin 2. The result is that the video signal is routed through R79



on the "B" board before being applied to the video stages. R79 introduces a small pulse into the video signal. The solution is to remove this wire from pin 3 of the "B" board and connect it to pin 2.

Color TV Chassis T995—Quick-On Wiring

Most TV receivers in this year's product line do not have the Quick-On feature. The T995 color TV chassis was originally designed with the Quick-On feature and contains a Quick-On transformer. The function of this transformer is defeated as shown in the illustration. The



jumper wire from pin 1 to 7 on P/J 20 of the Interconnect board shorts out the primary winding of the Quick-On transformer, T2, and disables the Quick-On option. The filament voltage to the picture tube is provided by the bottom winding on the power transformer, T1 (Part No. 300316-1). However, the Quick-On transformer must remain in the circuit because its secondary winding serves as a load in series with the picture tube filaments.

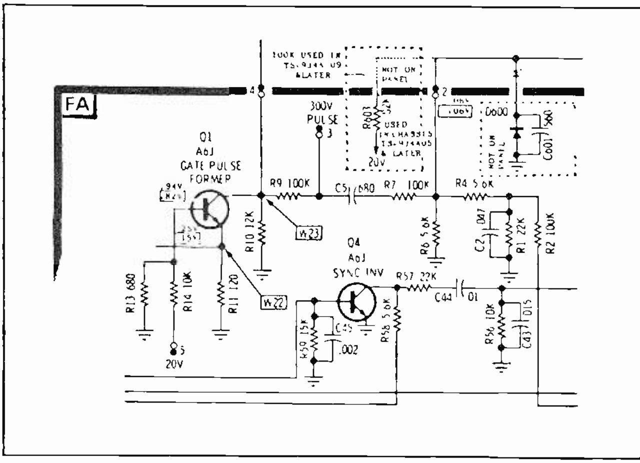
In the near future, transformer T1 will be changed to part number 300316-2. At that time, the filament winding of T1 will be 6.3 v AC and will be connected to terminals W14 and W17 of the Interconnect board. Transformer T2 will be eliminated.

Color TV Chassis T995—Vertical Shading Bars

Vertical shading bars beginning at the left side of the raster and attenuating in density toward the center of the screen are caused by inadequate ground contact between the vertical and horizontal members of the chassis. This ground contact is made by a U-shaped clip on the vertical chassis member. When the chassis is placed in the upright position, this clip makes ground contact with the horizontal chassis near the flyback transformer. The problem may be corrected by simply bending the ground clip downward slightly to ensure its contact with the horizontal member when the chassis is in the upright position. In the future, production will use two ground clips, one on each chassis member. These clips will contact each other when the vertical member is placed in the upright position.

Color TV Chassis TS-934—Vertical Black Line at Top and Sometimes at the Bottom of the Screen

Remove resistor R603 (82K or 100K), connected at pin 2 of the FA panel. If the vertical line is still present on the

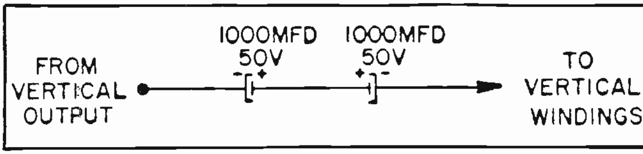


screen, add diode D600 (Part No. 48-67120A01), with 560-pf, disc capacitor in parallel, as shown in the accompanying illustration.

Color TV Chassis T989—Hookup to Test Fixtures

The two vertical windings of the deflection yoke used in the T989 chassis are normally connected in parallel. The parallel arrangement is maintained with T989 Adapter Cable, Part No. 171323-1, when the chassis is connected to the yoke in the Magnavox S973 Test Fixture. The vertical output stages in the T989 chassis are DC coupled to the yoke windings, and a 1-amp, fast-blow fuse is connected in series with each output stage, to protect against component damage should one of the output transistors become shorted.

If the chassis is connected to a test fixture which has the vertical yoke windings connected in series, a shorted vertical-output stage could cause a high DC current to flow through the windings, but not sufficiently high enough to open the 1-amp fuse. As a result, the electron beam might strike and eventually cut through the neck of the picture tube. (The CRT in the S973 fixture cannot be damaged by this problem as long as the correct fuses are in use and if



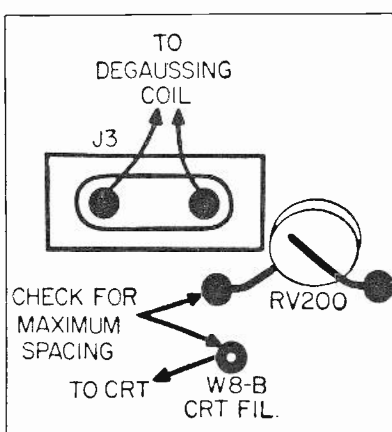
the fuses are not defeated by jumper wires.)

To prevent the possibility of damage to fixtures other than the S973, two 1000-Mfd., 50-v capacitors should be connected back-to-back and placed in series with the vertical-output lead between the chassis and the yoke. The capacitors prevent DC current from passing through the windings, so that the amount of deflection is determined only by the amplitude of the AC vertical sweep voltage.

Color TV Chassis T981/T982/T987—Power Supply Diode Failures

Failure of one or more power supply diodes, and possibly the CRT filament, might occur in the T981, T982, and T987 color TV chassis as a result of arcing in the picture tube. The voltage pulse produced by the arc travels down one of the CRT filament leads to point W8B on the Scan board. If this lead is positioned too close to thermistor RV200, the pulse will be transferred to the thermistor and to the power supply diodes. Should any of these diodes have to be replaced, check the position of the filament lead to be sure it is dressed as far away from RV200 as possible. An inspection of the filament lead dress should be made on all T981, T982, and T987 chassis during routine service.

The power supply diodes might also be destroyed if the T981 or T982 chassis is connected directly to earth ground. Neither of these chassis is equipped with isolating power transformer. The AC line voltage is connected directly to a bridge rectifier, and the circuit arrangement causes the



chassis to measure approximately 70 v AC above earth ground, regardless of the polarity of the AC plug. If the chassis is connected to earth ground (such as through the ground lead of a VTVM using a three-wire AC cord), one or more of the diodes in the bridge circuit will be destroyed instantly. This problem can occur in any radio or TV set which has one side of the AC line connected to the chassis. Therefore, an isolation transformer should always be used when servicing this type chassis.

Color TV Chassis T995—Module Removal

The Horizontal module and the Retrace/Screen module are each held in place by a nylon mounting post fastened to the module with a ¼ inch hex screw.

The nylon post snaps into a hole in the chassis to secure the module. The modules should be removed by pushing the post out of the chassis hole, not by removing the screw on the module. Replacement modules are supplied with nylon mounting posts attached to the module.

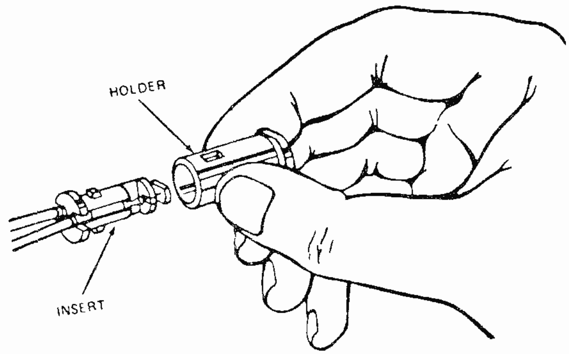
Color TV Chassis—High Voltage Rectifier/Tripler Short

In cases of high voltage/tripler failure in early production TV sets using these chassis, there is a possibility that the horizontal output transformer, T302, and other associated components may be damaged. Other components to check when this type of failure occurs include: Capacitor C104, resistor R140, the power supply diodes, and the Video Delay module.

The possibility of multiple component failure can be prevented by changing R140 to a carbon film type 1K ohm resistor (Part No. 230214-1025). Whenever these early production units are in the shop, R140 should be changed to a carbon film type resistor as preventative maintenance. Elevate the resistor ¼-inch above the PC board. Current production (identified by the numeral 2 as the last digit of the model number such as CE4360WA12) uses a carbon film resistor for R140.

Videomatic TV Sets—New LDR Holders

A new LDR holder assembly has been developed to minimize the possibility of LDR damage from static discharges. The new assembly is made of two parts—the holder (Part No. 143593-1) and the insert (Part No. 143592-1). The entire assembly is still removable from the front of the instrument as usual, but to separate the holder from the insert the holder must be gripped as shown in illustration and squeezed to unlock it. This new assembly may be used to replace all original holders with the part number 142848 or 143290.



All Color Chassis—CRT Interchangeability

Color picture tubes currently manufactured use high X-ray absorption glass. Earlier tubes used standard X - ray absorption glass and should not be used to replace tubes of the high - absorption type. The following list shows standard- and high - absorption color picture tube types. Any tube in the right column can be used as a substitution for the tube(s) across from it in the left column. However, tubes in the left column cannot be substituted for those in the right column.

Standard Absorption	*High Absorption*
25VCTP22)	
25VCDP22)	
25VBYP22)	25VCXP22
25VBEP22)	
25VAGP22)	
19VDKTC02	19VEJTC02
19VDNP22	19VEGP22
18VAKP22	18VBWP22
17VATTC02	17VAZTC02

Color TV Chassis T960/T984 — Snow, No Picture

TV Models ME5050, 5056, and 5064 use the 340248-1 UHF tuner with the T960 B/W chassis. The oscillator transistor in the UHF tuner may be subject to failure depending on the source of the UHF tuner B+ voltage. Service Manual 7337 correctly shows the B+ source obtained from the 135 v supply through a 13 K dropping resistor, R504, on the main PC board. Some of these models omitted resistor R504 and obtained the UHF tuner B+ voltage directly from the chassis' 13 v source. The UHF tuners using the 12 v source for their B+ are the ones subject to failure. To correct this condition, rewire the UHF tuner B+ per the Service Manual. Resistor R504 is a 2 watt metal film resistor and must be Magnavox part number 230192-1335 or equivalent. Rewiring instructions will accompany replacement tuners.

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B/W models ME5110 and 5111 use the 340238-1 UHF tuner and the T984 chassis. Some of these UHF tuners also were connected to the 12 v source. The same possibility of failure exists here as with the T960 chassis. Service Manual 7345 correctly shows the UHF tuner B+ source obtained from the 135 v supply through a 15K dropping resistor, R202. R202 is located on the VHF tuner wafer switch. To correct the wiring, rewire the UHF tuner B+ voltage per the Service Manual. R202 is a 2 watt metal film resistor and must be Magnavox part number 230192-1539 or equivalent. Rewiring instructions will accompany replacement tuners.

Color TV Chassis T989—Vertical-Output Failure

Overtightening the mounting bolts on the vertical - output transistors can cause an intermittent or complete loss of vertical deflection in the T989 chassis. A hole in the collector tab of the transistors aligns with a hole in the heat sink and a bolt secures each transistor to the heat sink through these holes. Variations in transistor lead length sometimes caused intermittent lead contact in the transistor sockets. Therefore, the mounting holes in the heat sink were changed to slots, to allow each transistor room to seat well into its socket. Because of these mounting slots in the heat sink, it is now possible to overtighten the mounting bolts and bend the collector tab of the transistors enough to open the collector connection inside the transistor. The field solution for this problem is to add an aluminum washer (Part No. 101857-44) behind the transistors, between the collector tab and the mica insulator. Use a small amount of silicon grease on both sides of the washer. This washer prevents the transistor's collector tab from bending when the mounting bolt is tightened.

This solution also applies to a similar problem with audio drive transistors Q15 and Q19 in the R231 radio chassis.

Color TV Chassis T981/2/7—CRT Burn Spots

A burn may occur at the center of the screen on these chassis, if the high voltage is interrupted three or four times in rapid succession. Intermittent malfunctions in the horizontal circuitry are the type of malfunctions most likely to produce this symptom. The Horizonal Oscillator/Driver module contains a socket which mounts to stakes on the master PC board. Before replacing a burned CRT in these chassis, be sure to resolder these stakes to the master PC board. Other possibilities which can cause intermittent interruption of the high voltage are loose solder connections on the module socket or loose solder connections of components on the module.

Color TV Chassis T981/2/7—Power Supply Diode Failure

Early production runs of this chassis series used 1 Amp power supply diodes (PN 530162-1). Two package sizes were used, one small and one large. However, both the small and the large 530162-1 diodes are electrically equivalent and both are subject to early failure under stress conditions. For this reason, the power supply diodes were replaced with 3 Amp devices (PN 530180-1). The following steps will minimize power supply diode failure:

1. Use the 3 Amp 530180-1 diodes as replacements. Whenever a defective 530162-1 diode is encountered, replace all four power supply diodes with the 3 Amp devices. Use care when forming the diode leads. Some 3 Amp diodes were found to have failed due to fractures incurred during the lead forming process.
2. Ensure that the CRT filament leads are not dressed against the thermistor, RV200.
3. Always use an isolation transformer when servicing.

Color TV Chassis T995—Audio Pop at Turn Off

The initial production of the T995 chassis uses a Sound module, Part No. 703727-1, which contains two IC's. When using this sound module an audio "pop" may occasionally be heard in the speaker when the set is turned off, with the volume at minimum. The loudness of the pop varies and will not be heard every time the set is turned off. The symptom can be eliminated by adding a series RC network across the AC switch. Use a 22 ohm, ½w resistor and a .047 mfd, 150 VAC capacitor (Part No. 250661-4770).

Star TV Systems — Rapid On Off Operation

When a STAR set is turned Off and then On again several seconds later, the channel which was last selected will reappear. However, if the unit is turned Off and On again very rapidly, the station may be detuned. To regain the original channel, reselect the channel or turn the set Off for several seconds and then back On. This condition is normal.

Color TV Chassis T960 — Vertical Jitter

This B/W chassis may exhibit vertical jitter due to distortion of the vertical sync pulses in the Video IF module. The module can be modified by connecting the ground lead of capacitor C10 directly to the ground lead of capacitor C12. To modify the module:

1. Remove the electrolytic capacitor, C10.
2. Install a new axial lead type 10 mfd 25 v electrolytic capacitor to the foil side of the module PC board. PN 270117-1135 is a 35 v 10 mfd axial lead capacitor which may also be used. Solder the negative lead of the new capacitor directly to the ground lead of C12. Connect the positive lead to the original C10 positive connection.

Production is now using 703428-7 Video IF module. The new module does not require modification.

Color TV Chassis T985/986 — Vertical Jitter

Vertical jitter may occur on some of these portable color TV chassis. When the amount of jitter varies as the brightness is changed, the problem is probably caused by a low high voltage setting or high line voltage. Ensure that the high voltage is set to 22 kv for the T985 and 24 kv for the T986 (zero beam current). The condition can be further improved by changing the value of R7 on the 120v regulator module. The resistor should be changed from 220 ohms to 470 ohms.

A second condition of vertical jitter which is not associated with brightness change may be corrected by adding a .1 mfd capacitor across R12 on the Vertical Oscillator module.

21 Detent Tuners — Replaceable UHF Pot Strips

The 21 detent tuner is a combination of VHF tuning strips and UHF potentiometer strips. The UHF strips apply voltage to a separate varactor UHF tuner. The PN for the UHF strips is 171356-1. If a UHF pot strip becomes defective, it should be replaced in lieu of replacing the complete tuner.

Color TV Chassis T981/2/7—Horizontal Module and Regulator Module Variations

Later versions of this chassis series use a new Horizontal Oscillator/Driver module, M202, Part No. 703728-1. The original module and the new module are *not* interchangeable. If the incorrect module is placed in one of these chassis, the result is horizontal tearing and instability. The Horizontal Hold control will not stabilize the picture.

The original Horizontal Oscillator/Driver module used was Part No. 703554-1. This module must be used in T981 chassis versions whose high voltage setting is 25 kv and with T982/987 chassis versions whose high voltage setting is 27.5 kv. The new Horizontal Oscillator/Driver module, Part No. 703728-1, must be used in the T981-08, 09, and 11 versions, whose high setting is 27 kv. The 703728-1 module must also be used in the T982-12, 13, 14, 15, and 16 versions as well as the T987-11, and 12 versions. The T982/987 chassis operates at a 28.5 kv high voltage setting.

These later chassis versions also use a new Voltage Regulator/Pincushion module, M300, Part No. 703556-4. This new module has a Pincushion control and must be used as a replacement in all chassis which use the 703728-1 Horizontal Oscillator/Driver module. The original Voltage Regulator/Pincushion module is Part No. 703556-2 and has no Pincushion control. The −4 module may be used in place of the −2, but the −2 cannot be used in place of the −4 or severe pincushioning will result.

Section 4.2-11 of the Service Manual contains an outlined notation that the 703728-1 Horizontal Osc/Driver Module contains a High Voltage Protection circuit and no attempt should be made to repair this module. This is why no schematic is shown.

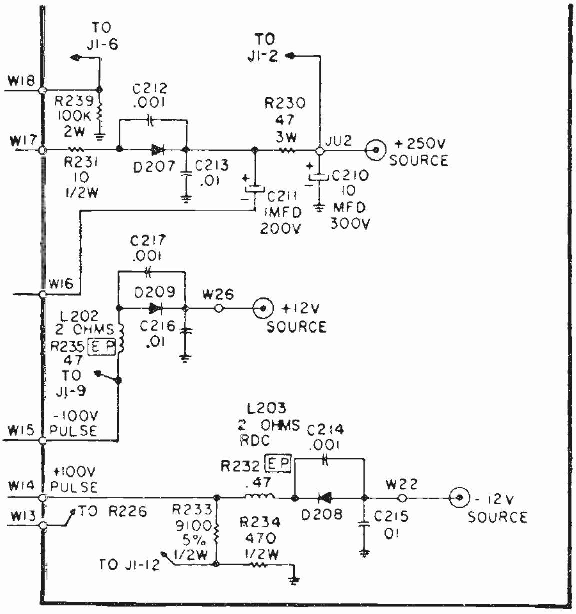
Color TV Chassis T995—Strong Color In Purity and Service Positions Of Service Switch

On non-Videomatic T995 models (T995-03), the chroma signal stays on the screen when the Service Switch is pulled to the Purity or the Service position. The luminance is removed. When setting Purity or White Balance, select an unused channel or turn the Color control all the way down.

This condition occurs because the chroma signal does not pass through the Videomatic module on non-Videomatic sets. Although this module is still referred to as a "Videomatic" module on these models, it contains only luminance circuitry. The Service Switch defeats the chroma on Videomatic sets by interrupting the 24 volt supply to the chroma amps on the Videomatic module. Since no chroma amps are used on the Videomatic module with non-Videomatic sets, the Service Switch does not defeat chroma on these models.

Color TV Chassis T981/982/987 — Failure of Resistors R232 and R235

Resistors R232 and R235 are .47 - ohm, ½w, metal film resistors used in the plus and minus 12v DC vertical power supplies of early production chassis. If either of these resis-



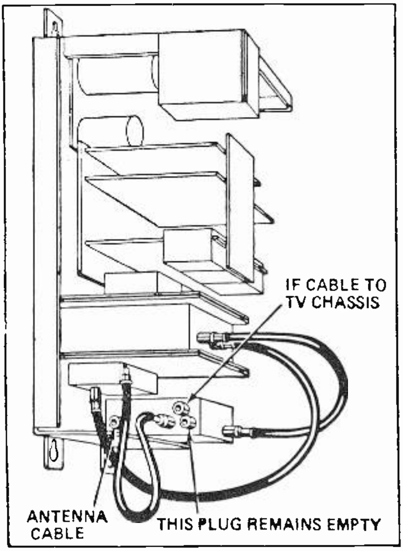
tors fails and replacing the resistor corrects the problem, it is very possible that a previous problem existed and the resistor was overstressed but did not fail at that time. Sometime after the original problem was corrected, the resistor fails.

To prevent this from occurring, R232 and R235 have been changed to RF chokes (part number 361528-1). In this manner, if a problem occurs in the plus or minus 12v DC supplies, the appropriate RF choke will act as a fuse and open. The chokes have been designated L202 and L203. The partial schematic shows these chokes and their electrical location in the 12v DC supplies. If a failure should occur which is directly associated with either 12v DC supply, both R232 and R235 should be replaced with the RF chokes. These resistors are physically located on the right rear corner of the Scan board, near the flyback transformer.

In addition, resistor R231, located in the 250v DC supply, has been changed to the RF choke for the same reasons. R231 is a 10 - ohm, ½w metal film resistor, shown near W17 in the schematic. The RF choke which replaced this resistor is designated L204 and is not shown on the schematic.

Star Remote Control — Coax Cable Connections

Replacement of the STAR Tuning Assembly may cause confusion when the coax connectors are reattached to the



VHF tuner. As shown in the illustration, two coax cables connect to the VHF tuner. One is the antenna cable and the other is the IF cable to the TV chassis. Notice that one of the plugs remains empty. If the IF cable is connected to the empty plug, the results will be a snowy picture or no picture. When installing a replacement STAR Tuning Assembly, be sure to connect the IF cable to the correct plug.

Color TV Chassis T995—Servicing the IF and RF Circuits

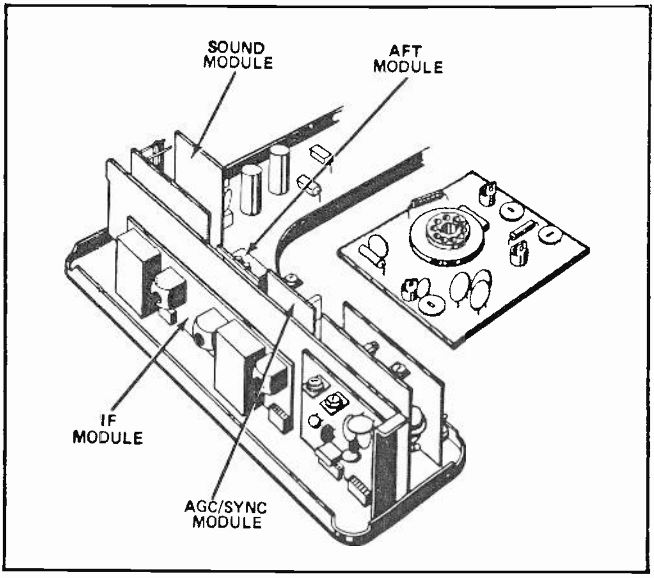
Some checks can be performed to help isolate the source of a given trouble symptom. For example, a symptom of "raster only, no picture, no sound" could be a bad tuner, or IF module, the AFT module detuning the station, or the AGC/Sync module turning the IF or RF amplifiers off. The module layout is shown in the illustration. The following steps illustrate an approach which could be taken to isolate the source of this problem:

1) Switch the Videomatic and AFT circuit *off* and adjust the fine tuning.

(A) If the picture can be tuned in manually, check the AFT module by measuring the DC voltage at TP1 and TP2 while the VHF tuner is on an unused channel. The voltages should be between 5.5 volts and 7 volts on each test point, and the difference between the two must be less than 1 volt. (B) If these voltages are not correct, replace the AFT module. If they are correct, perform the AFT alignment.

2) Measure the RF and IF AGC voltages to ensure they are correct for maximum gain.

(A) The RF AGC voltage should be about plus 10 volts and the IF AGC voltage should be about plus 4.5 volts. (B) If the voltages are incorrect, replace the AGC/Sync module.



3) Unplug the IF cable from the IF module and try the IF jack test.

(A) Turn the *volume* control *up* and tap on the inside of the IF input jack on the IF module with a small screwdriver. If flashing can be seen on the screen and scratching noise heard from the speaker, the IF module is likely not dead. (B) If this test has no effect, replace the IF module.

4. If the first three steps check good, the problem is likely to be the lack of signal to the IF module. Check the tuners.

(A) If located in an area where only UHF stations are available, connect a color bar generator or a UHF-to-VHF converter to the VHF antenna inputs to observe if a picture is produced. Remember, a defective VHF tuner could also prevent UHF reception because the IF signal from the UHF tuner must pass through the VHF tuner which is likely defective. If both UHF and VHF stations are available, and neither can be received, the VHF tuner is likely defective.

(B) A defective tuner can be confirmed by using a commercially available test tuner.

The RF and IF processing circuitry is designed and packaged in easily accessible tuners and easily replaced circuit modules. With a general understanding of the operation of these parts, the professional service technician can efficiently isolate the source of a problem and repair it with a minimum amount of time and effort.

Star Remote Control—Tuner Subber Aids Troubleshooting

When troubleshooting a STAR equipped T995 chassis, the trouble must first be isolated to a chassis problem or a STAR problem. A tuner subber can easily determine where the fault lies. A tuner subber is a commercially available self contained tuner which can be used to substitute the original tuner. The tuner subber connects to the IF input of the TV chassis. If the television produces a good picture with the tuner subber, the fault must be with the STAR. If not, the fault lies in the TV chassis and the STAR system need not be replaced unnecessarily.

To use a tuner subber, unplug the TV IF cable from the STAR Tuning Assembly and plug the cable into the IF receptacle provided in the tuner subber. Also, connect the antenna to the tuner subber. When connected in this manner, the STAR system should operate normally except for channel selection. The tuner subber is also helpful when performing the T995 Chroma Oscillator adjustment, which requires detuning of a station.

Star TV Remote Control—Random Shut Off

If a STAR equipped instrument randomly turns itself off, the cause could be a momentary interruption of AC power to the STAR Tuning Assembly. The AC line cord, circuit breaker, and AC wiring to the STAR Tuning Assembly are likely items to check for intermittent power interruption. Whenever the AC power is interrupted, the STAR DC power supply drops, turning the set off.

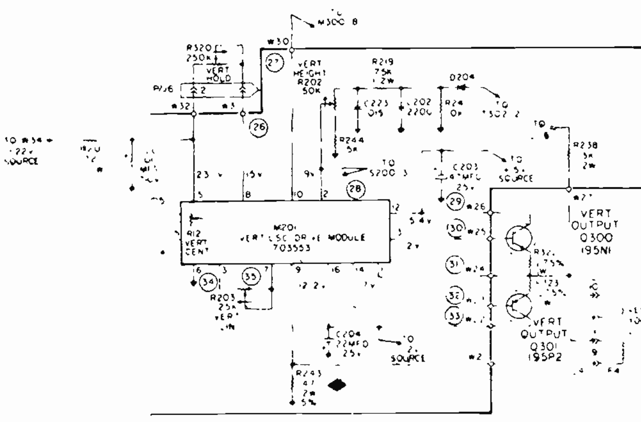
Switching the Remote switch off, can help isolate the source of the random shut off problem. If the set no longer turns itself off, the problem is likely in the STAR Remote Receiver. If the set continues to randomly turn off, the problem is likely with the STAR Tuning Assembly or intermittent AC power interruption.

Color TV Chassis T985/986—Inoperative Set

The 120 volt Regulator module (Part No. 703660-1) could develop an open connection at pin 11 and cause this symptom. The problem can be corrected by resoldering *all* connector pins on this module.

Color TV Chassis T981/2/7—Keystoned Or Slanted Raster

Capacitors C203 and C204 are the plus and minus 12-volt filter capacitors used in these chassis. When the capacitor fails, it usually causes a small slanted raster with

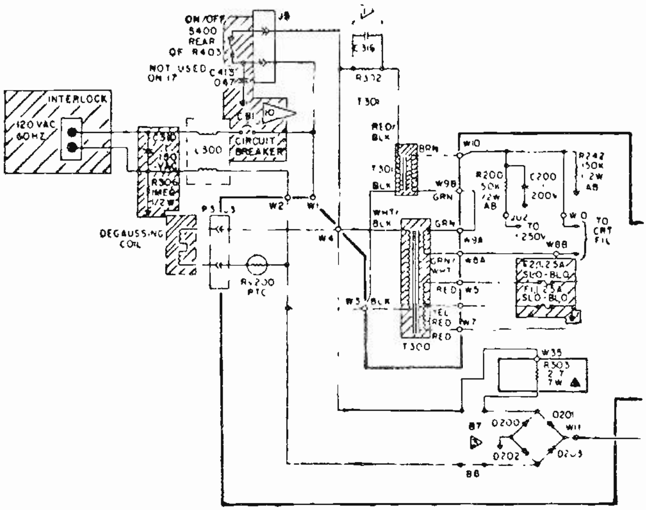


a keystone effect similar to a shorted yoke. These parts should be replaced with 100 mfd. capacitors @ 25 VDC, Part No. 270109-1225, to prevent the problem from re-occurring.

Color TV Chassis T981/2/7—Overheating Filament Transformers

Early versions of these chassis use a constant voltage filament transformer that requires a series capacitor for proper operation. The capacitor is designated C316 and the schematic has a footnote indicating which capacitor is required. If a wrong value capacitor is used, the transformer will overheat.

Later version chassis do not use the constant voltage filament transformer and, therefore, the capacitor is not



required. Some early version chassis were field modified to eliminate buzzing transformers and the capacitor was shorted out when the constant voltage type was replaced with a non-constant voltage type.

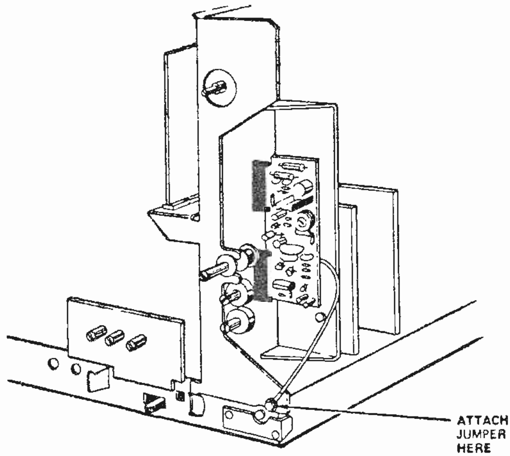
Star Remote Control—Use One Chip Sound Module Only

The STAR remote control system varies the volume level by applying a DC voltage to the 703639 Sound Module in the T995 color TV chassis. This Sound Module is the one which uses only one integrated circuit (one chip). Sound Module Part No. 703727-1, used in other T995 models, has two integrated circuits (two chip). The two chip and one chip Sound Modules are interchangeable in the T995 chassis, *except with STAR models.* STAR models must use the one chip Sound Module, Part No. 703639-1. When a two chip Sound Module is placed in a STAR set, the result is "no sound".

The Magnavox Parts Division stocks the 703639-1 as a universal replacement Sound Module for all T995 chassis.

Color TV Chassis T989—Black Shadow On Screen

A black shadow on the CRT, usually appearing in the upper right portion of the screen, can be eliminated with the addition of a jumper wire to the chassis from the Vertical Oscillator/Driver module on the "D" panel. The jumper is soldered to the ground land at the junction of R3 and C2 on the module. The other end of the jumper is attached to the chassis frame as shown in the illustration. The jumper plus instructions will accompany all replacement "D" panels and Vertical Oscillator/Driver modules.



Color TV Chassis T985/986—Poor Reception On Low VHF Channels With Built-In Antenna

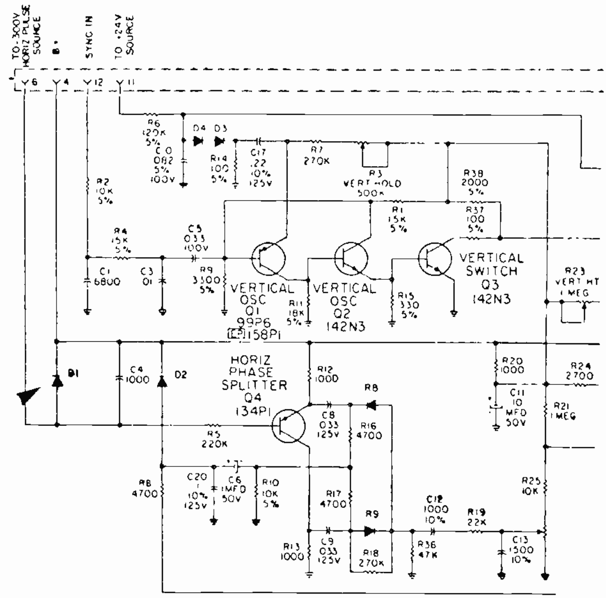
This symtom may be due to the built-in rabbit ear antenna. The solution is to replace the antenna with a Part No. 701315-19. The two elements of the replacement antenna each have eight sections and extend to 48 inches. In addition, the two elements can be separated 180 degrees apart. The full 180 degrees separation is desired for best reception on low VHF channels.

Color TV Chassis T995—No High Voltage

A symptom of "no high voltage" because of a defective horizontal output transistor can be the fault of a shorted diode, D1, on the Vertical module. When D1 shorts, it places a low impedance path to ground on the flyback transformer. The resultant increased horizontal output current destroys the Horizontal Output transistor, Q1, and thus the high voltage is lost. Replacing the Horizontal Output transistor will not solve the problem since the replacement transistor will also be destroyed. To avoid this problem, check D1 with an ohmmeter whenever replacing Q1.

Color TV Chassis T995— Brightness Change After Turn-On

Some of these chassis may exhibit a condition of continual brightness increase during the first ten minutes after initial turn-on. This symptom can be corrected by replacing the Vidoematic Switch Module Part No. 703654-1 with a 70364-2 version. The 703654-2 Videomatic Switch Module contains a thermistor circuit which prevents the brightness drift.



Star Tuning Assembly—Routine Checks For Replacements

If a replacement STAR Tuning Assembly does not operate properly, check the following items before assuming that the replacement assembly is defective: 1) Test/Normal Switch—should be in the Normal position. If not, the raster will rapidly flash on and off. 2) Remote On/Off Switch—should be in the On position. If not, the STAR will not respond to the transmitter. 3) Band II and Band III Adjustments—if these are misadjusted, the STAR will not tune correctly. Refer to the T995 Service Manual for adjustment procedures. 4) Character Drive and Vertical Frequency Adjustments—if these are misadjusted, the channel number readout may be too bright or too dim or of unsatisfactory height. Refer to the T995 Service Manual for adjustment procedures.

Star TV Systems — Slight Audio Feedthrough

A slight amount of audio feedthrough is normal on STAR sets when Muting is engaged. The feedthrough level remains constant, regardless of where the volume was set when Muting was engaged. When Volume Up is activated, Muting is automatically disengaged.

Star Remote Control—No Channel Readout On Screen

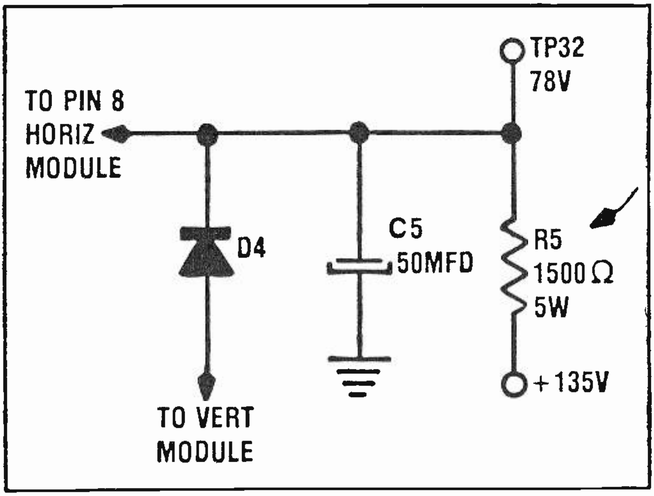
This symptom can be caused by a defective Vertical module on the T995 chassis, although the chassis will operate normally and no apparent symptoms may be evident. If the Vertical Blanker (Q9) on the Vertical module is defective, no vertical pulse is supplied to the STAR Tuning Assembly. The result is no character generation. Also, no vertical blanking will be applied to the CRT, but this fact may not be evident unless the brightness is turned up. The solution is to replace the T995 Vertical Module.

Color TV Chassis T995—HV Adjust Has No Effect

Apparent normal operation may result when the 125 volt regulator transistor, Q4, shorts C-E on the Power Supply module. However, the HV will be in the vicinity of 33 kv and the HV Adjust will have no affect. Replace the Power Supply module.■

CHASSIS: Magnavox T995

TROUBLE SYMPTOM: Incorrect horizontal scan or complete loss of raster (sound unaffected).



CAUSE: If cause is traced to a defect on the horizontal module or a defective horizontal output transistor Q1, always check the voltage at TP32 after replacing either the module or Q1. The voltage at TP32 should be about 78 volts. If it is significantly higher, the value of R5 (1500 ohms, 5W) probably has decreased, in which case R5 should be replaced to prevent repeated failure of the horizontal module or transistor Q1.

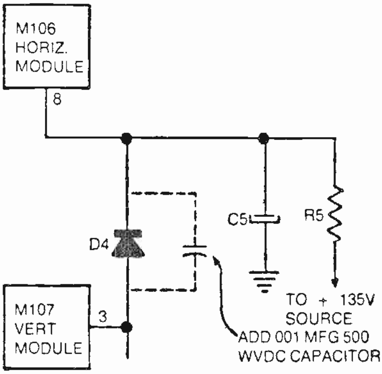
CHASSIS: Magnavox T985

TROUBLE SYMPTOM: Buzz heard during turn on of receiver.

CAUSE: Cores of degaussing coils are too close to picture tube mounting bracket and vibrate against it during turn on of the receiver. Place a screwdriver between the core and the picture tube mounting bracket and gently bend the core slightly away from the bracket or, alternatively, place a piece of tape between the core and the mounting bracket.

CHASSIS: Magnavox T995

TROUBLE SYMPTOM: A white stripe which extends down from the top of the screen about three inches and curves to the left. This video interference occurs only under certain weak signal conditions.



CAUSE: Radiation from diode D4, which is electrically connected between pin 3 of the M107 vertical module and pin 8 of the M106 horizontal module. (The physical location of D4 is on the copper side of the "mother" printed-circuit board, near the lower right side of the chassis.) To eliminate this radiation or the possibility of it occurring, add a 0.001 μF, 500V capacitor (Magnavox part 250551-1029) across D4. Place the capacitor as close to the printed-circuit board as possible, but avoid shorting out the adjacent copper lands on the board.

CHASSIS: Magnavox T985/986/991/995/998

TROUBLE SYMPTOM: AM, FM, OR CB interference in sound.

CAUSE: Interfering signal feeds through sound module. In other than STAR-equipped models, this problem can be cured by replacing the 703727-1 two-chip or 703639-1 one-chip sound modules with a new one-chip sound module (Magnavox 703760-1). The new 703760-1 should not be used in STAR-equipped models because of excessive audio feedthrough at minimum volume settings. If the new 703760-1 sound module is not readily available, the 703727-1 and 703639-1 modules can be modified to reduce or eliminate interference in the following manner:

703727-1 two-chip module—
A) Add a 0.001 μF capacitor across R5.
B) Add a 2.2K resistor in series with C9.

703639-1 one-chip module—
A) Cut the copper between pin 10 of the module and C10. Add a 2.2K resistor from pin 10 to C10. This places the 2.2K resistor in series with pin 10 and the junction of IC1, pin 1, and C10.
B) Add a 0.001 μF, (100V) capacitor between pin 3 of the IC and ground.
C) Cut the copper between pin 3 of the IC and the junction of pin 8 of the module and C11, and add a 2.2K resistor across the cut.

CHASSIS: Magnavox T960/966

TROUBLE SYMPTOM: Horizontal sync instability during warmup of receiver.

CAUSE: Slow stabilization of the horizontal oscillator, which might be cured by replacing the following resistors with carbon-film types and the following capacitors with mica types:

T960 Chassis—
A) Replace 47K R608 with a 47K carbon-film type (Magnavox part 230212-4735).
B) Replace 180K R607 with a 180K carbon-film type (Magnavox part 230212-1845).
C) Replace 470pF C606 with a 470pF mica type (Magnavox part 250702-4715).

T966 Chassis—
A) Replace 240K R155 with a 240K carbon-film type (Magnavox part 230212-2445).
B) Replace 470pF C130 with a 470pF mica type (Magnavox part 250702-4715).

MAGNAVOX

CHASSIS: Magnavox T998

TROUBLE SYMPTOM: Beat and hash interference in the picture.

CAUSE: RF interference, which can be cured by the following modifications on the IF module:

A) Remove C16 from the component side of the module board and place it between pin 16 and ground on the copper side of the board.
B) Add a 0.001 μF capacitor (Magnavox part 250551-1020) between pin 16 and 17 of IC1 on the copper side of the board.

CHASSIS: Magnavox T985/986/991
TROUBLE SYMPTOM: Continual or intermittent loss of video and sound
CAUSE: Open or intermittently open coil L1, which physically is on the tuner control assembly and electrically is in series with the B+ supply to the VHF tuner. Absence of B+ on the tuner side of the coil confirms probability that an open L1 is the cause of video and sound loss. Replace only the coil (Magnavox Part No. 360676-21), not the complete tuner control assembly.
CHASSIS: Magnavox T981/982/987

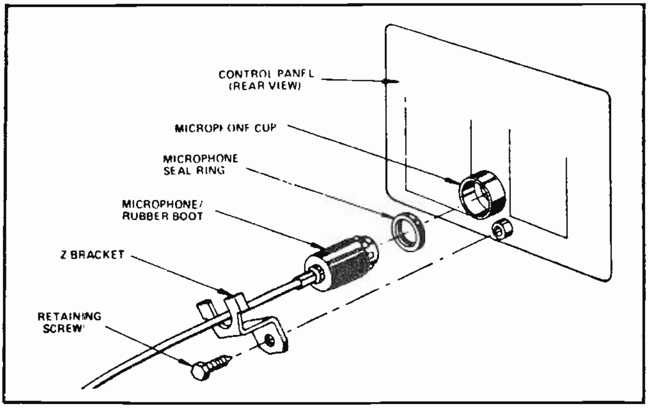
TROUBLE SYMPTOM: Spot burned into center of the picture tube

CAUSE: If the high voltage is interrupted three or four times in rapid succession it might cause a burn spot in the center of the picture tube. The type of defect most likely to cause repeated, rapid interruption of the high voltage, and the resultant CRT burn spot, is an intermittent malfunction in the horizontal drive or sweep section. The most probable cause of this type of trouble symptom are improperly soldered stakes on which the socket of the Horizontal Oscillator/Driver module is mounted on the main printed-circuit board. Before replacing a burned picture tube in these chassis, resolder the associated stakes on the master printed-circuit board. Improperly soldered connections on the Horizontal Oscillator/Driver module socket or improperly soldered components on the module itself are also "probable" causes.

B&W Chassis T997—Interference pattern when using a built-in antenna
If a customer complains of a horizontal zig-zag line of interference about a third of the way down the screen, check the base of Q404, the Vertical Retrace Clipper. Early production models of the T997 chassis were built with a 4700 ohm resistor, R413, at the base of Q404. This has been changed now to a diode, D407. If you find a 4.7K resistor in the problem set, remove it and install a diode, Part No. 530181-1, with the anode going to the base of Q404. The T997 chassis will pull out far enough to allow the change without unplugging any wires. This problem may only show up when the built-in antenna is used.

Videomatic Touch Tune Models—low remote receiver sensitivity

Videomatic models equipped with the RG9000 Remote kit can be controlled with the transmitter at distances up to 30 feet. If the set will operate only when the transmitter is within a few feet of the remote receiver microphone, try a known-good transmitter. If the transmitter does not correct



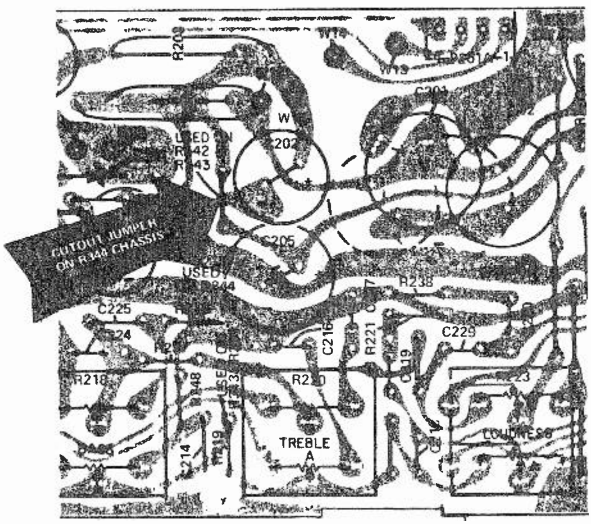
the problem, check the remote receiver microphone for proper installation. The microphone *must* be insulated from the metal control panel. A contact between these assemblies will produce a ground loop and greatly desensitize the remote receiver. When a low sensitivity symptom occurs, remove the microphone from its mounting cup and make the following checks:

- Check that the microphone seal ring is installed in the cup ahead of the microphone.
- Check that the metal microphone housing not covered by the rubber boot is insulated with electrical tape to prevent possible contact with the cup.
- Place the microphone squarely into the cup.
- Install the Z bracket so the ears capture the sides of the boot and the cable connector is centered in the bracket opening.

If these checks do not correct the low sensitivity problem, replace the Remote Receiver assembly.

Radio Chassis R344—C202 capacitor failure

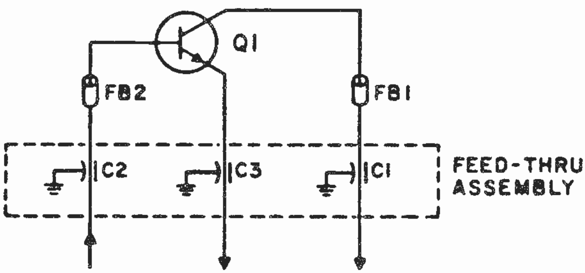
A few R344 stereo console chassis were produced with a jumper at C202 installed. This jumper is intended for use only on the R342 and R343 chassis. When it has been installed wrongly in the R344, it can create distortion at high volume levels, and can eventually damage C202. If the jumper is found in an R344 chassis being serviced, remove the jumper.



Color TV Chassis T995—Replacing the feed-thru capacitance assembly

In late production of the T995 chassis, three feed-thru capacitors and two ferrite beads have been added to the horizontal output stage. The capacitors are soldered to a mounting bracket which is attached to the heat sink alongside the horizontal output transistor, Q1, as shown in the diagram. The connecting leads to the base and collector pass through the opening in the ferrite beads.

If replacement of one of the feed-thru capacitors is necessary, you can save time by replacing the entire feed-thru assembly, which consists of the bracket and capacitors soldered in place. The ferrite beads are not provided because the originals can be re-used. Part number is 171441-1.



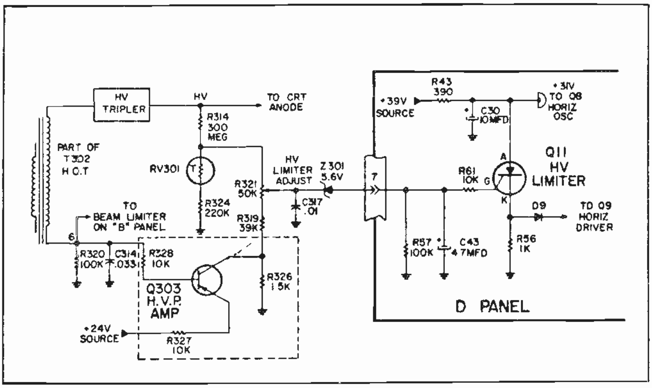
Color TV Chassis T981/T982—Importance of Yoke Connector

The +145V source, which is interlocked through the yoke connector, disables the television whenever the yoke is disconnected. However, if the TV is turned on when the yoke is disconnected, capacitor C301A will charge to about 175V and remain there since there is no bleeder resistor for this capacitor. If the TV is then turned off and the yoke plug reconnected without discharging C301A, a current transient will flow through Q4, the driver regulator transistor, destroying it can cause horizontal tearing and low high voltage. So, in the event of a Q4 failure, a 1000 ohm, ¼W resistor should be added in series with the base of the replacement transistor unless one is already present.

Color TV Chassis T989—Troubleshooting the High Voltage Protection circuit.

The T989 chassis uses a HV monitoring circuit to sense excessive HV. When the HV exceeds acceptable limits, the circuit kills the horizontal oscillator and shuts down the HV. (See diagram below).

The circuit is preset at the factory and R321 is sealed. Therefore, any readjustment of the circuit requires installation



of a new HV limiter Adjust, R321. If component values in the divider network change, the circuit trip point will be changed. R314 and RV301 are likely suspects. RV301 should measure approximately 750K at 25 degrees C, and approximately 225K at 55 degrees C. Z301 is also a critical circuit component. If it is too leaky, it will allow the circuit to trip prematurely. A specially screened diode must be used for Z301. To replace the diode, order kit P.N. 171383-1. The kit contains a new diode and a new R321.

MAGNAVOX

B/W TV Chassis T998—Defective horizontal hold control
If the wiper arm of the Horizontal Hold control opens or becomes intermittent in the T998 chassis, the Horizontal Output transistor and associated resistors could be damaged. You can correct the problem by soldering a jumper lead between the arm terminal and the unused end terminal on the replacement control. This jumper will ensure that the entire resistance of the control is always in the circuit and that repeat failures will be minimized. As a preventative maintenance measure, check all the T998 chassis that come into the shop and add the jumper if it is missing.

Color TV Chassis T981/T982/T987—Loss of fleshtones
A defective capacitor, C154, can be the cause of loss of fleshtones in these chassis. C154 is a 180 pf polystyrene capacitor mounted on the "signal" board between the Chroma Demodulator module and the Chroma Processor module. Since the capacitor is polystyrene, it is subject to degradation from excessive heat, flux, cleaning solution, etc.

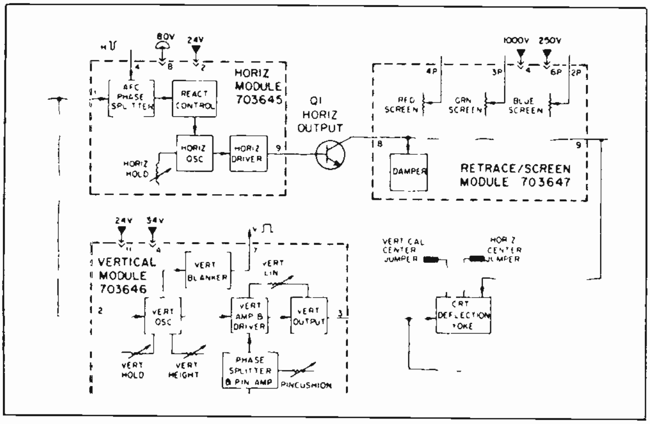
Videomatic Touch Tune—Low receiver sensitivity.
Unit should operate at up to 30 feet. If not, front panel mike may be shorted to panel. Must be insulated or ground loop occurs. To correct, check mike for proper insulation, square fit and see that the seal is installed between the rubber boot on the mike and the mike cup on the panel.

Color TV Chassis T985 — Intermittent contact on secondary controls
This set uses Nomex insulation, which is a stiff paper, between the CRT anode cap and the top of the cabinet. If installed incorrectly, this insulation could apply pressure against the small secondary control PC board at the upper right portion of the chassis. Over a period of time this pressure could cause intermittent contact of the secondary controls. If this occurs, the controls will require resoldering on the PC board.

When the insulation is correctly installed, it will not touch the secondary control board and blue-green lettering will be visible on top of the insulation. If the insulation is found to be upside down (lettering not visible and insulation applying pressure to secondary board), remove the secondary control board and the two screws securing the insulation. Turn the insulation over and reinstall the two screws plus the secondary control board.

Color TV Chassis T989—Brightness variations.
Replacement B panels (P.N. 703574-11) with clean, lubricated and crimped contacts solve most brightness variation problems in this chassis. However, other components may also cause problems. Also check the following: antenna connection (one lead may be loose); high brightness preset control may be misadjusted or intermittent; LDR may be defective; videomatic switch may have contaminants on contacts; service switch may need to be cleaned or replaced; transistor sockets may need cleaning; or the connector P/J5 may have intermittent pin contacts.

Color TV Chassis T995—An extra pin in vertical output socket.
Damage may occur to some early production T995 chassis if care is not exercised in replacing the Vertical Output module. In these early production sets, pin 5 was installed in the mother board. In later production, pin 5 was removed and a nylon key was installed in the hole for pin 5. If too much force is applied when installing a module with the key into a set with the extra pin, the mother board can be broken. If one of these sets is encountered, either snip off pin 5 at the board, or remove the key from the module.



T981/2/7 TV Chassis—Video washout and retrace lines.
These symptoms appear at low brightness level with Videomatic Off when R304 opens. The picture is normal at medium brightness levels and above. R304 is soldered to one of the terminals on the HV tripler. The resistor is 820K and must be replaced only with Magnavox Part No. 230161-10.

R304 is only used on certain versions of these chassis. These versions are those T981 chassis whose HV is set to 27KV and T982-7 chassic whose HV is set to 28.5KV. The version numbers are as follows: T981-08,09,11 and T982-12,13,14,15,16 and T987-11 and 12.

CHASSIS: Magnavox T991

TROUBLE SYMPTOM: Green cast to picture during warmup.

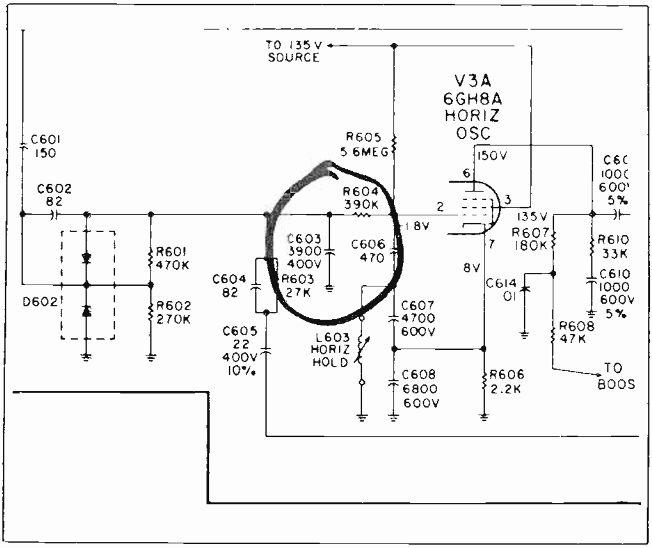
CAUSE: If this condition does not last more than 3 to 5 minutes after the receiver is turned on, it should be considered normal and, therefore, no corrective is necessary. (The greenish cast during warmup is an inherent characteristic of the picture tubes used in models equipped with the T991 chassis.)

T979/T989—Resistors inside CRT socket.
A ½-watt resistor (apprx. 2K ohms) is connected in series with each of the CRT pins (except filaments) to prevent damage from CRT arcs. These resistors are located inside of the CRT socket assembly. If one of these resistors becomes intermittent (open), it may result in a picture complaint. For example, if the resistor connected to the CRT focus pin should fail, you may observe intermittent focus. If any intermittent picture condition is encountered, check these resistors and replace any defective ones with resistors of comparable value and wattage or replace the entire CRT socket assembly, part No. 180935-2 (T979 chassis) or 180935-3 (T989 chassis).

T991 TV Chassis—No video with sides of raster pulled in.
These symptoms may be the result of an activated HV limiter circuit on the Horizontal Oscillator/Driver module. The HV limiter circuit monitors the DC supply voltage to the horizontal output circuitry. This DC level determines the HV level. When the DC supply surpasses a predetermined point, the HV limiter circuit causes the horizontal oscillator to increase drastically in frequency. The visual results on the screen are: sides of raster pulled in, no video, vertical retrace lines, and sound OK. The circuit will not reset until the malfunction has been corrected. CAUTION: The HV limiter circuitry is factory tested and must never be serviced. If a malfunction is suspected, replace the Horizontal Oscillator/Driver module.

Color TV Chassis T997—No horizontal sync
If a problem of no horizontal sync is encountered with the T997 chassis, check the wire connection from Pin 5 of the flyback terminal board to the flyback 17V pulse winding. This wire may have been broken during shipment. To correct this problem, solder a short piece of wire from Pin 5 to the broken lead of the flyback winding.

TV Chassis T960—Erratic horizontal sync
A condition of erratic horizontal sync with the T960 chassis may be caused by an incorrect value capacitor installed at location C603. C603 should be a .0039 mfd, 10%, 600VDC capacitor. A wrong value capacitor causes interference to the horizontal AFC correction voltage. If it is determined this is the situation, replace C603 with the correct capacitor, Part No. 250590-3929.



BG7520 Odyssey—No ball reset
If the BG750 (Odyssey 500) is stored in a cold environment, the ball may not reset until the unit has been allowed to stabilize at room temperature. This problem has been traced to the Odyssey Blanking Pulse Width adjustment. The blanking pulse varies enough with temperature change to prevent the ball from resetting after it goes off the right side of the screen. It has also been determined that a black bar to the left

and/or right side of the screen may result from exessive heat.

If either of these symptoms are encountered, first insure the unit has been allowed to stablize at room temperature. If the problem still persists, perform the Blanking Pulse Width and Centering adjustments as follows: 1. Adjust R43 until a black bar just appears at either or both edges of the screen.

2. Adjust R44 to center the picture (bar should be showing on both sides of the screen—if not, repeat step 1 and 2).

3. Readjust R43 until the bars at the edge of the screen just disappear. (Make sure the picture remains centered while readjusting R43).

MGA

Color-TV Model T50 Chassis—Horizontal Weaving

Some reports have been received from field service personnel of this symptom. There can be several causes that result in the same general appearance of the picture and it is important to recognize the cause in order to take the proper corrective action.

If you are in a CATV area, some cable signals contain hum modulation and/or have a reduced sync percentage that result in this type of display. A determination can be made by observing the signal on a scope at the TP301 picture detector. If these conditions are present on a CATV signal, then the enclosed modification will usually correct the condition if the signal degradation is not too severe.

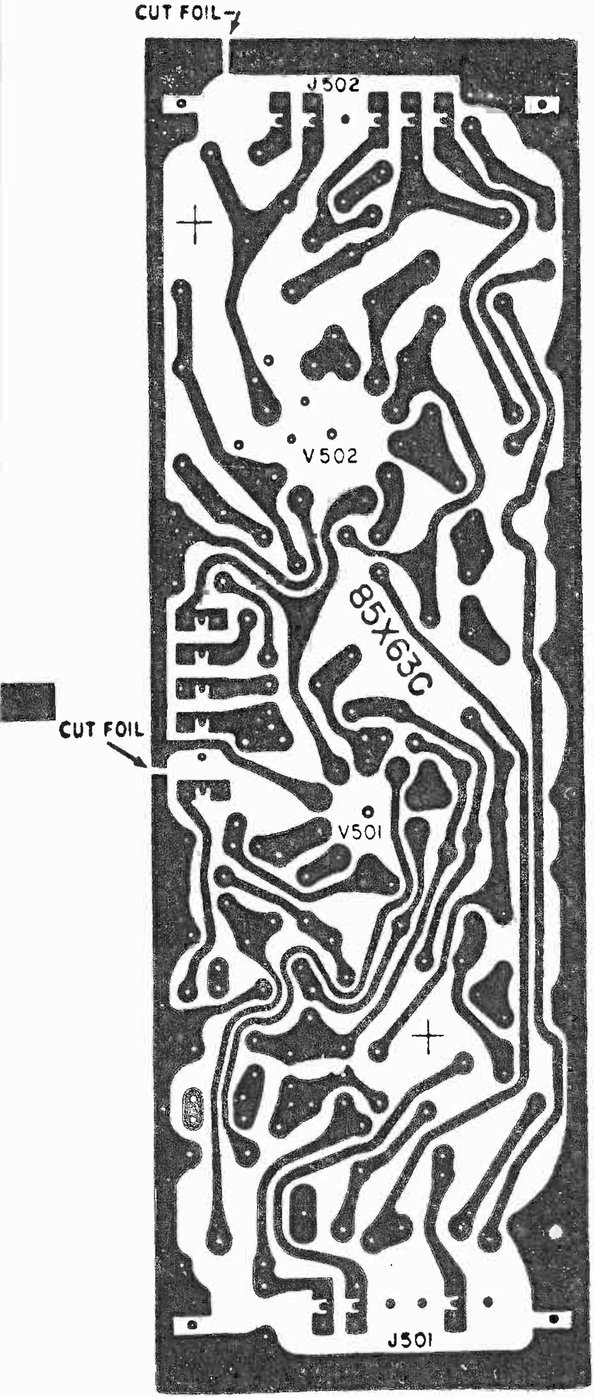
There is a possibility of heater ground currents on the PW500 (P156) deflection board, having a common path to ground with the horizontal oscillator automatic phase control circuit returns. This condition can come and go depending upon the contact resistance of the four ground pins on the corners of the boards.

It is a good practice to eliminate this common path possibility by cutting the foil with a sharp instrument at the two locations shown on the illustration.

Under these (cut) conditions, the heater currents are isolated from the APC circuits and the contact resistance of the four ground pins will not be a contributing factor.

A factory modification has been included on all chassis with Serial No. 825200 and above and/or with a red paint mark to the right of the ac cord connection and a red paint mark on the serial number label on the outside of the carton.

There is a possibility in a very small percentage of the receivers that a poor common internal weld on the ground side of the four-section can electrolytic 45X0536-001 may exist. This can cause hum in the system resulting in hori-


CUT FOIL
J502
V502
85X63C
CUT FOIL
V501
J501

zontal displacement of the picture and on some occasions result also in hum in the sound.

The AGC control on the picture IF board must be properly adjusted. While the service manual describes both a visual and/or a scope adjustment, the visual adjustment by an inexperienced person will quite often result in the receiver being in a semi-overloaded condition. This results in crushed sync and causes video to be recovered on the separated sync, resulting in picture weaving.

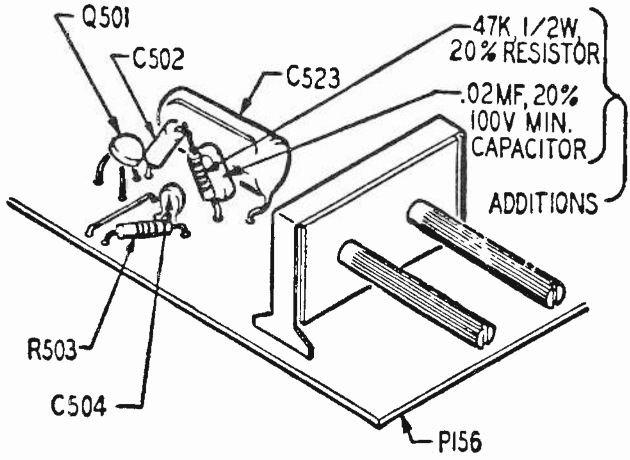
The adjustment must be made so that there is no sync crushing on the strongest signal in the area ($20\mu v$ to $50\mu v$ preferred), and at the same time the detector level must be maintained so as not to suffer a loss in contrast. The best method for correct adjustment is to use a scope.

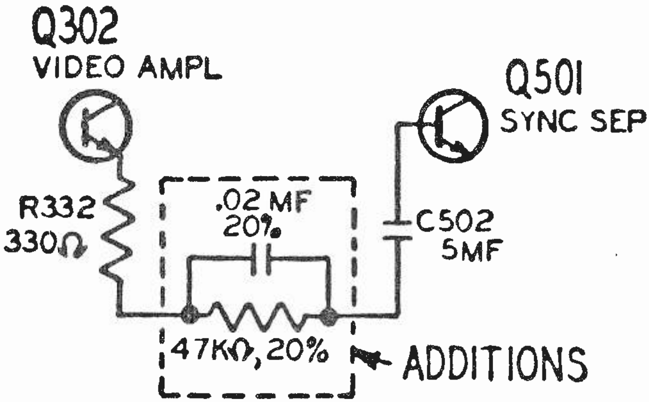
In some areas and during some transmissions, the non-synchronous hum can be actually transmitted by the stations. The best way to check this is to look at other channels making sure the receiver is not in a semi-overloaded condition. Refer back to AGC adjustment.

Modification for CATV Systems (T50 Series Chassis)

Modifications on P154 IF Board—Remove C321, $.22\mu f$ capacitor. In its place solder a $.01\mu f$, 20% capacitor.

Modifications on P156, Sweep Board—Unsolder and lift from the board the end of capacitor C502 which is close to the dual control. Insert between the end of capacitor C502 and the hole from which it was removed a 47K, ½w 20% resistor and a $.02\mu f$ 20% 100v minimum capaci-





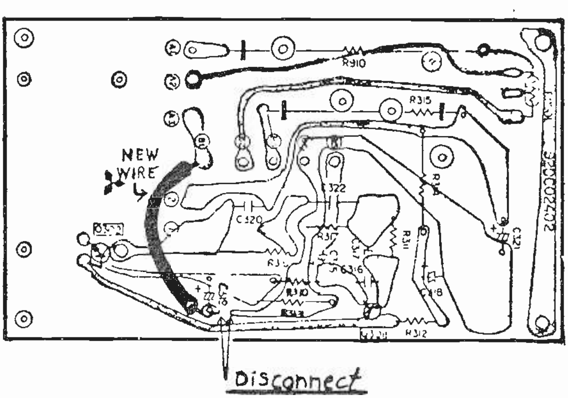
tor in parallel. Change transistor Q501 to an 86X0048-001 transistor. Cut foil on the PW500 board as shown to eliminate a common-ground path between the heater returns and APC circuits.

Color TV Models CH160, CH190, CH191—Sound Problem

A small percentage of these models may develop an unusual sound condition after a period of use by the customer. Two distinct and separate problems can occur: 1) buzz, 2) squeal or loud growl.

Buzz

This condition is commonly called "sync buzz" or "vertical sync buzz" and is caused by vertical sync feeding into the audio circuits. If the television is operated in a quiet room with the volume at low levels, a few customers may object to the level of buzz that can be heard. The problem



can be corrected by performing the following steps: 1) Clip the ground lead connected to terminal B4 on the audio board. 2) Insert and solder a 2-inch length of #18 insulated wire in series with the ground lead. 3) Dress the insulated loop along the yoke housing and move it around until a position is found in which the vertical buzz is reduced to a minimum. 4) Tape the loop to the yoke housing at the point of minimum buzz, using black vinyl electrical tape.

Squeal or Loud Growl

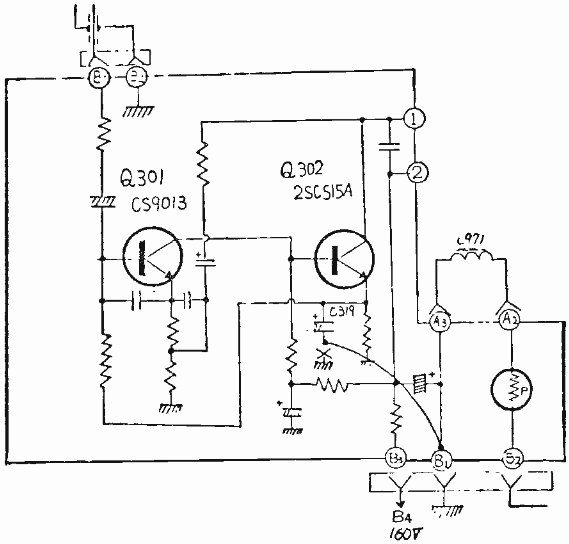
This condition will also occur at low settings of the VOLUME control but it requires a different correction than that of the first buzz problem.

Study the accompanying drawing of the audio board—the top schematic shows the electrical layout and the bottom drawing shows the mechanical layout.

Disconnect the negative side of capacitor C319 on the PC board. The easiest way is to cut the printed circuit at the negative end of C319, as shown in the mechanical drawing.

Add a short piece of new wire from the negative side of C319 to terminal B1 on the PC board.

Remove the five-connector plug on the audio board and clean the contacts at ground terminal B4. Using a tuner cleaner that does not attack plastics, clean contact B4. Also, visually inspect and do whatever else is necessary to be absolutely certain that contact B4 is making positive contact.



After completing the previous steps, follow the brown lead from contact B4 to a male-female disconnect plug that also contains a green wire going to the VOLUME control. Check the contacts within the molex plug at both the brown wire point and the green wire point going to the VOLUME control. Make certain that the pins are fully seated and secured within the plug. Check to see that pins are not loose or bent. Exercise the necessary technical checks, including continuity tests and perhaps soldering, to assure that all audio circuit connections through the plug are making positive contact.

Motorola

Motorola TS908 Service Experience

A 0.01μf capacitor was added across the color indicator light and resistor R923 (82K) was changed to 180K in the Motorola TS908 chassis. Adding this capacitor and resistor revised the circuitry so that it became a relaxation oscillator at approximately 1kHz. This change caused the color indicator light to burn continuously without any tendency to flicker.

On some sets, the 1kHz oscillation may be coupled capacitively from the light leads through the 12-pin plug on the chassis to the grid lead of the audio output tube. This can result in an audible note at low volume level when the color indicator light is on.

To eliminate this 1kHz note in the audio, it is only necessary to remove the 0.01μf capacitor. The capacitor is located on the 2-lug terminal strip on the UHF tuner mounting bracket. Removing this capacitor may cause the bulb to flicker. Reversing the neon bulb leads may cure the flicker, if not, polarizing the neon bulb will cure the flicker in most sets.

The neon bulb can be polarized in the following manner: Connect a 7.5K, 4w resistor to the right side (white wire) of the 2-lug terminal strip that feeds the neon bulb and ground. This will cause the neon bulb to fire. Allow the bulb to remain fired for not more than 10 sec.

In chassis coded TS908E08 and later, resistor R923 (150K) was physically moved from the 2nd color IF coil, T902, to the 2-lug terminal strip on the UHF tuner mounting bracket. Re-locating the resistor serves to isolate the lead wire running through the 12-pin chassis plug and reduces the danger of coupling the 1kHz note to the audio output tube.

Color Chassis TS914/918 — Short Life 6JS6 Horizontal Output Tube

Slow Heating Damper Tube

Some replacement damper tubes heat slower than original equipment tubes causing excessive current drain in the 6JS6 output tube during warm-up. Kit 1P65147A41 is available from your Motorola distributor. It contains instructions and a diode which must be added to the circuit to prevent excessive 6JS6 current regardless of damper tube used.

The kit also contains a replacement screen resistor which will allow the installation of the newly developed 6LB6 output tube.

The kit may be installed at the top of the chassis in the home.

Excessive Horizontal Output Current without External Symptoms

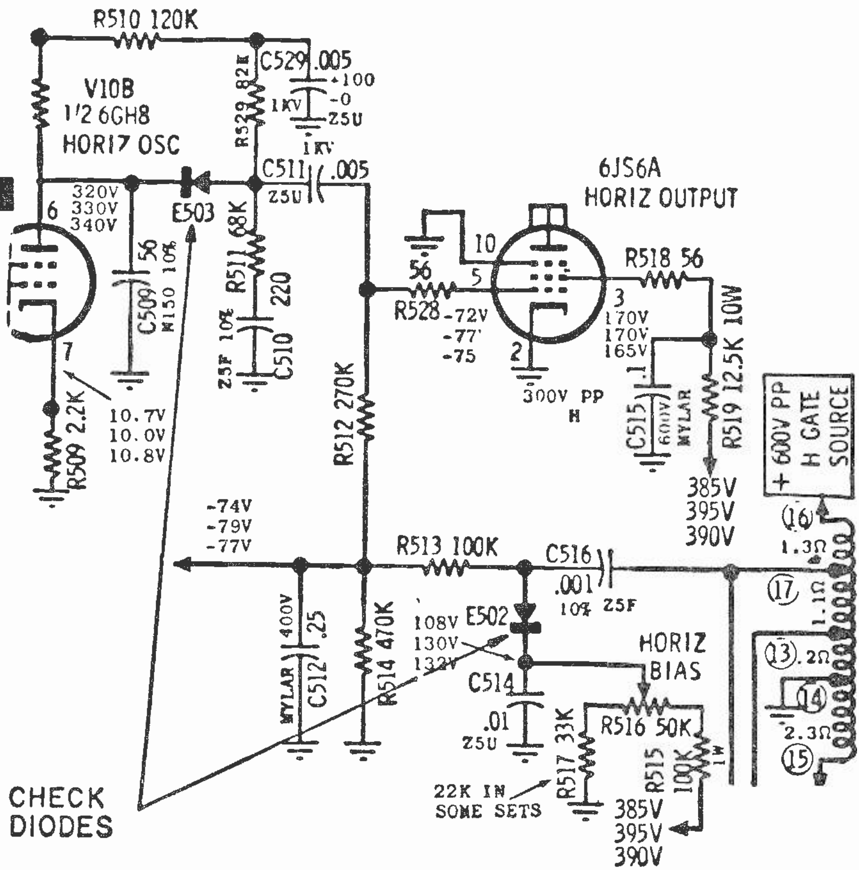
When replacing more than a normal number of horizontal output tubes, it becomes good practice to check the current drain after installing the replacement tube. If current drain is normal, it is safe to assume that the circuit is operating properly. If excessive current is encountered, further checks should be made to determine the cause. Adaptors are available at most parts houses for measuring current drain in popular types of horizontal output tubes. Chassis TS914/918 current drain at 122v line, with proper horizontal bias setting, should be in the order of 185ma at no brightness and 240ma at normal brightness.

Some causes of excessive current: (1) shorted horizontal coupling diode E503, (2) open E502 horizontal bias diode, (3) shorted turns in the deflection yoke, improper horizontal bias setting or bias setting not adjusted to compensate for unusually high line voltage

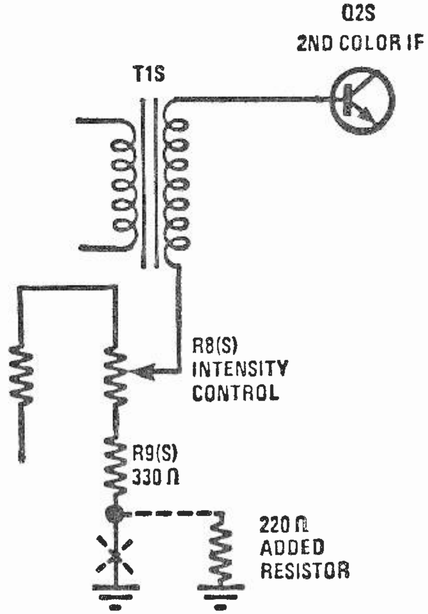
If abnormal line voltages are found, it might be advisable to contact the local power company.

Color TV Chassis TS-915—Centering Intensity Control of Chassis Coded TS-915D-28 and Earlier

This change should be made if the operating point (color cut-in) is well above the approximate center of the intensity control setting.



1. Pull chassis out to service position. The five terminal strips shown in the photo may be physically wired



in two ways; electrically, however, the wiring is the same. 2. To effect this change, a 220 resistor is added in series with R9(S) (330Ω) and the intensity control R8(S), to ground. (3) Proceed as follows (refer to photo): A. If the 560Ω 2w resistor R21(E) is wired to terminal 2, move the wire to terminal 3. B. If the 330Ω resistor R9(S) from the intensity control is wired to terminal 3, remove and wire to terminal 2. C. If a ju· ›er wire exists between terminals 2 and 3, remove and discard. D. Add a 220Ω ½w resistor between terminals 2 and 3. 4. Final check: R9(S) 330Ω resistor from bottom of intensity control should be wired to terminal 2. Added resistor (220Ω) should be wired from terminal 2 to 3. R21(E) 560Ω 2w resistor should be wired to terminal 3. Solder all connections.

Chassis coded TS-915D-29 and later include the above change. In some chassis R9(S) (330Ω) may be replaced with a 560Ω resistor instead of adding the 220Ω resistor. Net result is the same.

Color TV Chassis TS915/TS191 Service Tips

Symptom: CRT warm-up is slow with the quick-on switch in the "on" position. A low brightness condition is evident and the CRT has appearance of being soft (gassy). *Cause:* Insufficient CRT heater voltage when set is on. *Solution:* Turn set on. Make note of picture brightness and the intensity of CRT heaters. Set quick-on defeat switch (rear of set) to off position. If the picture brightness or CRT heater intensity decreases, the master on/off switch on front of set is defective (Part No. 40P65171A81). *Alternate check:* Measure filament voltage on CRT. It should be about 3.5v when set is turned off, but in the standby position. Turn set on. Filament voltage should increase to 6.3v. If it doesn't, the master on/off switch is defective.

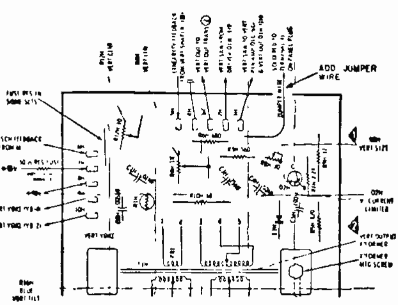
Do not adjust ABL and/or G2 controls above normal to overcome low CRT heater voltage. Over adjustment may cause excessive load on horizontal panel (F). CRT may be damaged if operated with low heater voltage.

Color Chassis TS915/919— Service Tips

Vertical Retrace Lines Visible at High Brightness. Current production sets are designed to operate properly with the G2 controls set to track near the center of their operating range. Tracking the set with the G2 controls at or near maximum setting can produce vertical retrace lines at high brightness. Tracking the set with the controls at mid-range will eliminate the problem.

To Eliminate Hum in Raster at Low Brightness in TS915 Chassis. 1. Remove and discard R46(L) identified as R16(L) on early schematics. Value of R46(L) varies: can be 6.8K, 7.5K or 8.2K, R46(L) is located between brightness control and ground. 2. Remove and discard C24(E) (500μf) located on contrast control to ground. 3. Remove and discard .05 capacitor located at opposite end of brightness control and ground (not shown on schematic). 4. Connect an 82 Ω, ½w resistor from terminal on brightness control, left open in Step 1, to junction of R54E and contrast control. 5. Pull "L" panel from chassis. Clip and discard C12(L) (.05 capacitor). 6. Replace "L" panel and check set. It may be necessary to readjust ABL for correct brightness level.

Streaking at the Lower Portion of the Raster. Vertical jitter can result from a contaminated "1H" terminal on the convergence panel. It is not recommended that any sharp tools be



used for cleaning. Rather, the convergence panel can be removed and reinserted several times. Two screws which provide mechanical support for the vertical output transformer must be removed to accomplish this. The self-cleaning action of the pins on the five-pin male panel connector usually brightens the 1H contact and prevents distortion of the connecting terminal surfaces.

A positive correction is to add a jumper across contact 1H. Most convergence panels have a male bullet-head connector mounted near terminal 1H. Construct a 6-in. jumper with a female bullet-head connector soldered to one end. Solder the other end of the jumper to the 1H pin of the five-pin chassis mounted panel connector. Be sure to do this on the wiring side of the five-pin panel connector. Engage the bullet-head connectors on the panel. Jumpers which have the appropriate female bullet-head connector already soldered on one end are available from your Motorola distributor under part No. 30V68618A60.

Those panels which do not contain the male bullet-head connector can be drilled to accommodate one. A .05in. hole drilled in the etched circuit which leads to contact 1H will accept the required male connector. Be sure to solder the connector to the etched circuit for good electrical contact. Male bullet-head connectors for this purpose are available from your Motorola distributor under part No. 39S10184A09.

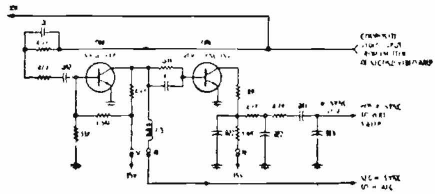
Color TV Chassis TS915/919 — Noise Protection, Sync and AGC Circuits

Shown in illustration, is the complete sync, AGC and noise immunity circuits. Very similar to circuits used in conventional B/W receivers, the bias arrangements and circuit layout are quite simple.

The noise separator is cut off for all signals at sync tip amplitude and lower by a threshold potentiometer. Only noise pulses having an amplitude higher than the sync pulses cause the separator to conduct. The separator output contains noise spikes separated from the composite video signal. There is no phase inversion of the noise because of the common base arrangement at the separator. The following noise inverter amplifies the positive input noise spikes and inverts them to negative polarity. Recombining with the original video signal at the 2nd video amplifier emitter, the original positive-going noise spike is canceled by an amplified and inverted negative spike.

The keyed AGC circuit is familiar. Using horizontal sync pulse amplitude as an indicator of signal strength, the AGC gate conducts when the horizontal sync and the collector pulse coincide. The extent to which the gate conducts is a function of sync pulse amplitude. Conduction charges an 8 μf capacitor negatively at the base of a PNP AGC amplifier. A coupling diode prevents capacitor discharge. The capacitor charge is proportional to signal strength, and causes the AGC amplifier to conduct proportional to signal strength. With conduction from collector-to-emitter in this PNP stage, a positive voltage proportional to signal strength is developed across a 720 Ω collector load resistor for application as a forward AGC voltage to the 2nd video IF amplifier base.

RF AGC delay is obtained with a reverse biased diode which permits a fixed forward bias at the RF amplifier base until the AGC amplifier conducts hard enough to overcome the reverse bias. At this threshold, RF

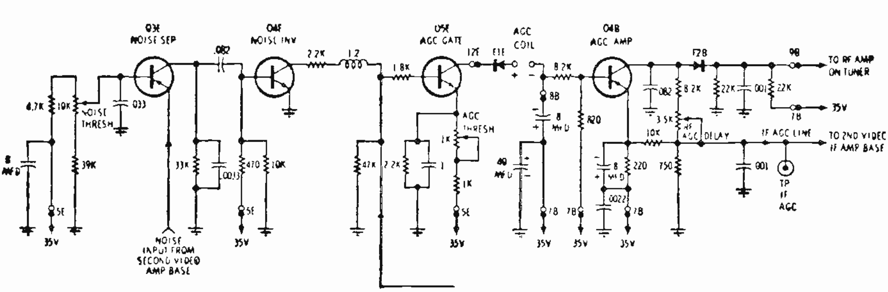


AGC will increase to reduce gain.

A typical signal biased Class C separator strips horizontal and vertical sync pulses from the composite video signal. Separated sync is negative at the separator output which solves horizontal AFC requirements. Vertical sweep, however, requires a positive trigger. An additional amplifier inverts the negative sync to positive.

The AGC gate stage shown in illustration, is typical of keyed amplifiers which rely on the coincidence of two signals for conduction. These signals are the horizontal sync pulses at the base and a collector pulse generated by horizontal flyback. Additionally, an amplifier provides a signal-variable forward bias to the video IF amplifier. Diode E2B provides a delay of AGC voltage applied to the RF amplifier.

The sync separator is a conventional signal-biased amplifier which causes class C operation. The composite video signal at the base input



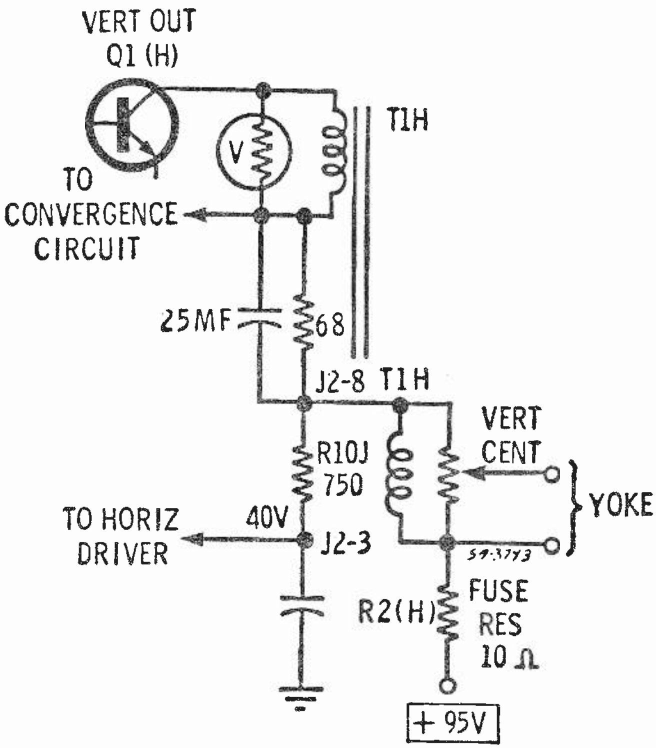
is rejected. Only sync pulses overcome the signal bias, permitting passage through the stage.

Vertical deflection is synchronized with positive-going sync pulses. An additional amplifier is required to provide this sync polarity, the separator output contains negative sync pulses.

A typical integrator at the vertical sync inverter collector rejects horizontal sync pulses while integrating vertical sync for frame interlace.

Color TV Chassis TS-915—No High Voltage

Symptom: No raster and a check reveals there is no high



voltage. Possible Cause: Open vertical fuse resistor, R2(H). The fuse is located on convergence panel door. Procedure: Use voltmeter to check for 95v at both terminals of the resistor. Do not jumper fuse terminals. If resistor is open, check for a short at the load end. Suspect a shorted vertical transistor. See illustration for details on how this open resistor causes loss of high voltage. Analysis: The fuse resistor protects the vertical output transformer and associated parts should the transistor short. A 40v supply (was 26-28v in previous models) is secured from this circuit through R10J at terminal J2-3. This 40v supplies the horizontal driver stage. Thus, if the fuse opens, there will be no raster because of no high voltage. The fuse not only protects the vertical output transformer, but it avoids a horizontal line if the vertical transistor shorts and blows the fuse.

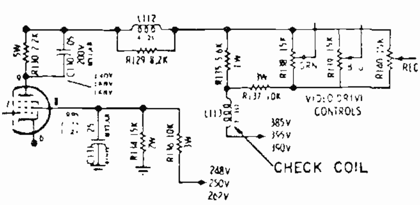
Color Chassis TS921 — Color Killer Adjustment on Chassis Coded 'B-00 and Later'

The color demodulator and color killer circuits in the TS921B-00 chassis have been redesigned to provide a more positive color killer action and increase dc coupling of the video.

The color killer adjustment procedure remains the same with one exception; if the color killer control must be adjusted, take note of the B/W background setting. Large excursions of the color killer control can affect B/W tracking. If the background setting must be readjusted, make the color killer adjustment first, then proceed with the tracking adjustment.

Color TV Chassis TS918 — Service Tips

Symptom: No video. Brightness remains on for 10 to 15 minutes, then fades out. Horizontal output tube (6JS6) runs red hot when brightness is lost. **Cause:** Check voltage on cathodes of CRT. If low (approximately 230v is normal) or no voltage, resistance of L113 is either high or coil is open. Short across L113. See if brightness returns. **Solution:** Replace L113



and check receiver for normal operation. If set runs too long with L113 open, it may be necessary to replace the horizontal output tube (6JS6) also. If the chassis is coded TS918 "A08" or ealier, we suggest that you add a diode in the plate circuit of the horizontal oscillator to aid in starting the horizontal oscillator. Kit 1P65147A41 is available from your Motorola distributor. It contains complete instructions and necessary parts.

Color TV Chassis TS915/TS919— Service Tips

Symptom: Circuit breaker pops when set is turned on. **Cause:** E4J diode in (255v source) power supply shorted. **Solution:** Replace E4J and check other diodes in power supply; replace if required.

Symptom: Circuit breaker pops in seven to ten seconds after turned on. **Cause:** Defective Q6F or Q7F on horizontal panel. To check, remove F panel. Set should remain on. **Solution:** If after removing F panel set remains on, replace F panel.

Symptom: Circuit breaker pops when F panel removed. **Cause:** Q1R horizontal regulator defective. Remove Q1R, reset circuit breaker; if set remains on, Q1R is shorted. **Solution:** When set remains on after removal of Q1R, replace Q1R (horizontal regulator). If Q1R is open, little or no high voltage will be developed.

Color TV Chassis TS924 – Color Sync Limiter Circuit Description

The loading effect on V19Z (½-5GH8A) imposed by the demodulator switching and the hue control network is minimized by using a pentode which is a constant current generator (plate current is independent of plate voltage).

The continuous color sync signal generated by the crystal is tuned by L2S1, C15S1, C14S1 and coupled to the grid of the limiter. With 18v P-P sync signal here, there is more signal than grid voltage-plate current "window" to pass it. Consequently, amplitude changes occur either beyond maximum plate current or below cutoff and do not appear in the output. As a result, a constant amplitude signal rings the plate load transformer (T3S1).

The plate circuit is tuned to 3.58MHz by T3S1 which also splits the signal into four phases by virtue of the two center-tapped secondary windings. From here the sync signal is coupled to the two demodulators in such a phase as to detect "X" signals at one, and "Z" signals at the other.

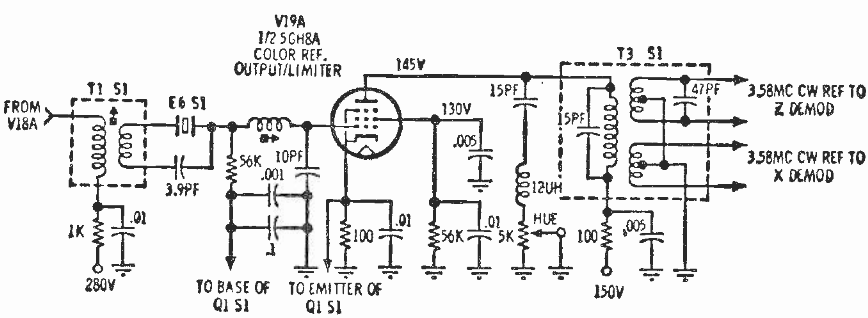
To compensate for station-to-station variations of color sync phase plus accidental phase shifts caused by wave propogation, antenna characteristics and receiver alignment, a manual phase shift device is required in all color receivers. The "hue" control, as it is called, sets the phase of the reinserted reference carrier so that color demodulation occurs along the correct phase angle's axis. The standard reference, of course, is facial skin color. Only when demodulation occurs along the X and Z axis in this receiver will proper color voltages be passed on to the CRT. A phase shift error related to the reinserted carrier doesn't stop the demodulation process, but the recovered color difference signals will not turn the right CRT gun on or off at the right time. Therefore, reproduced color will be incorrect.

The hue control network is a C/L/R in series from V19Z's plate to ground and is a variable phase shift combination.

In round numbers, the 15pf capacitor (C20S1) presents about 3000Ω reactance. The 12μh coil (L8S1) is a nominal 270Ω and can be overlooked as far as phase shift control is concerned. The coil is there to suppress harmonics. The hue control (R912) is a 5000Ω potentiometer and is the only circuit variable in the actual hue control network.

The CW reference signal delivered to the demodulators by the secondary of T3S1 varies in phase with respect to the color sync driving signal as the hue potentiometer is varied. At resonance, T3S1 is basically a resistive load on V19Z. With a change in hue control resistance, which shifts signal phase at the plate of V19Z, reactance is introduced in the primary of T3S1. If signal phase is shifted above resonance, the load is primarily inductive reactance; below resonance, the load is capacitive reactance.

The phase response of a transformer is familiar to most technicians. The phase shift discriminator transformer with its familiar "S" curve response



If the tuner drifts, the 45.75MHz video IF carrier change frequency. This frequency change is sensed by the discriminator coil, causing unequal conduction of the discriminator diodes. A resultant correction voltage is developed because the voltage across each diodes is no longer equal. Coupling this correction voltage to a varactor in the tuner pulls the tuner's oscillator back on frequency.

With correct fine tuning, no correction voltage from the discriminator diodes is developed. An incorrect fine tuning adjustment will cause a corresponding dc correction voltage to be developed by the FTL for the tuner. An FTL defeat switch located in shunt with the correction voltage is provided to defeat FTL, allowing manual fine tuning, then switched back to FTL position.

The output signal from the 1st 40kHz amplifier, Q1, is RC coupled into the base of the 2nd 40kHz amplifier, Q2, as shown.

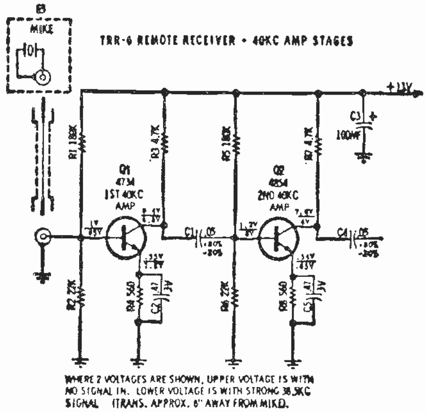


Fig. 1

Remote Control System

A remote control receiver, TRR-6, is used in 1966 Motorola color TV receivers. It contains 6 transistors and 3 relays and the system operates in the 40kHz range.

The microphone amplifier input stage is shown in Fig. 1.

A high impedance microphone, resonant in the 40kHz range, is connected to the base of transistor Q1.

Forward bias for transistor Q1 is provided by resistors R1, R2 and R4. This sets up approximately 0.6v forward bias on Q1's base and establishes a class A operating condition. If the static current of the transmitter tends to change, the voltage drop across emitter resistor R4 will also change in a direction to oppose the current change. Capacitor C1 couples the signal from the collector of Q1 into the base of the following stage.

Type 4734 and 4854 NPN transistors were selected for the microphone and first amplifier stage because of their stable characteristics under conditions existing inside the TV cabinet.

The relatively high values of the emitter resistors stabilize transistor operation to prevent performance change over long periods of time. Capacitors C2 and C5, across the emitter resistors, prevent loss of amplification caused by degeneration of the signal across the resistors.

These two stages (Q1 and Q2) are identical in circuit design.

Frequency Detector Limiter

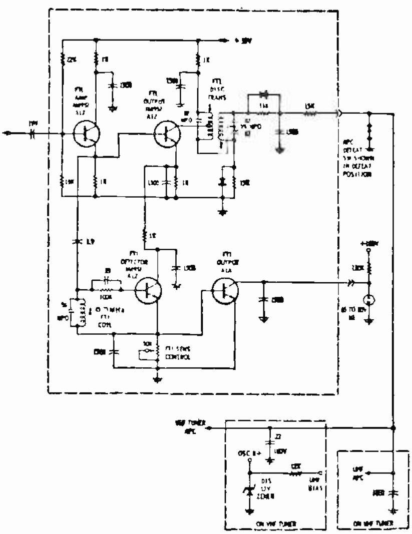
The signal is coupled from the 2nd untuned RC amplifier stage into the frequency detector limiter stage by C4.

Forward bias for this stage is provided by voltage divider resistors R10 is a common example of employing the phase-shift characteristics of a transformer.

Motorola's Solid-State Color Chassis Fine Tuning Indicator and Fine Tuning Lock Circuit

In some solid-state color receiver models, an FTL (fine tuning lock) AFC circuit is employed to assure correct fine tuning. FTL compensates for normal tuner drift and aging of components. Also, an indicator light operates in conjunction with the FTL to signal the customer when fine tuning is necessary.

Four NPN transistors, two diodes and a neon lamp make up the active components in the fine tuning indicator and lock circuits. This complete network is located on a single replaceable panel located on top of the video IF panel.



A selected portion of the 45.7MHz video IF carrier is coupled from the 3rd video IF collector through a 1pf capacitor to an FTL amplifier stage. Operating as a class "A" emitter-follower, the FTL amplifier minimizes loading on the video IF, sending the IF signal to the FTL output and fine tuning indicator (FTI) detector.

Located across the input of the FTI detector emitter-follower is a high "Q" 45.75MHz parallel tuned resonant tank (FTI coil). The tank selects the video IF carrier and presents the carrier to the FTI detector for detection and current amplification. The 45.75MHz video IF carrier is only present when fine tuning is correct. Here the 45.75MHz carrier is converted to a dc voltage and directly coupled to the FTI output.

Connected as a common-emitter, the FTI output is in shunt with the FTI neon indicator lamp. Conduction of the transistor extinguishes the neon lamp.

When 45.75MHz is present, indicating correct fine tuning, the FTI detector and output both conduct to extinguish the neon lamp.

If 45.75MHz is not present, indicating incorrect fine tuning, the FTI detector and output will become nonconductive, allowing the neon lamp to light. This signals the customer to re-adjust the fine tuning control.

Directly coupled from the FTL amplifier stage, the video IF signal is presented to a class "A" operated common-emitter FTL output. A discriminator transformer tuned to 45.75MHz center frequency recovers the amplified IF signal.

The discriminator secondary feeds two diodes. Rectification of the IF signal by the diodes produces opposite voltages across balanced diode load resistors. Across both diodes a dc correction voltage is coupled through a "pi" filter to a varactor (voltage-variable capacitor) across the tuner oscillator.

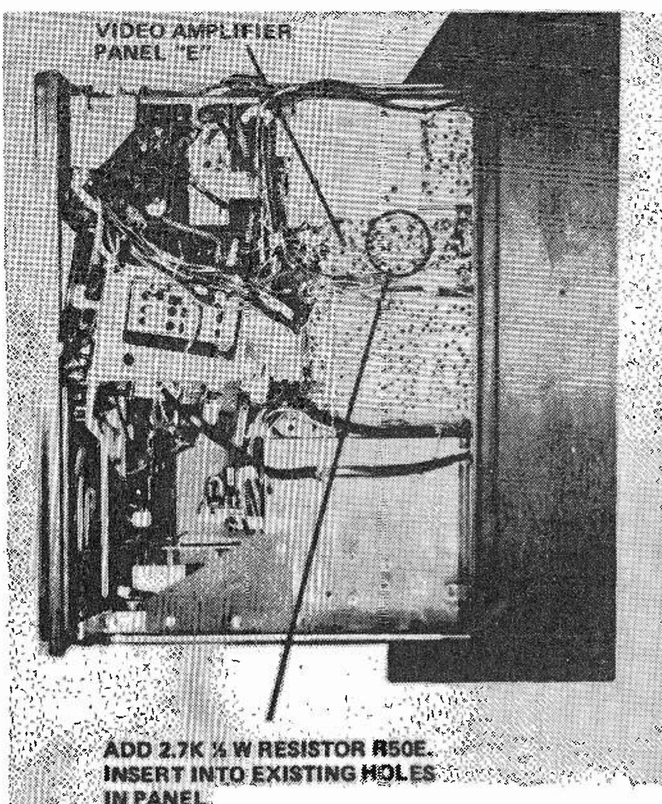
Tuner drift is counteracted by a varying dc correction voltage applied to the varactor from the FTL circuit.

and R11 in the base circuit and resistor R14 in the emitter. This stage acts as a limiter because of the high value of the 10K collector load resistor, R13 and the fact that the signal having passed through the previous amplifying stages now has sufficient amplitude to drive transistor Q3 from cut-off to saturation on alternate half cycles. R15, the 10K pot, operates as a range control by changing Q3's collector voltage and in turn its output voltage. With the arm at ground, the control is set for maximum output and range.

Color TV Chassis TS915—Service Information
Video Ringing

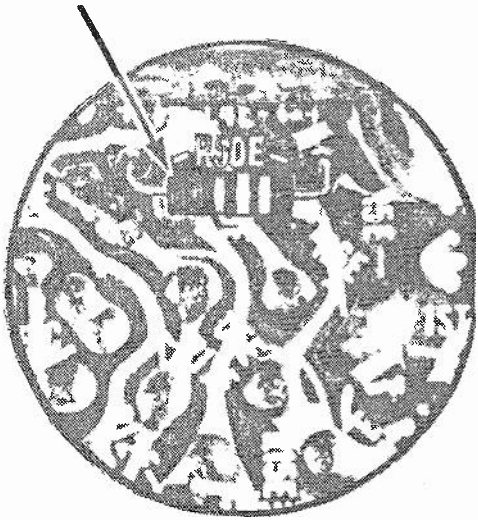
Several changes have been made in recent editions of video amplifier (E) panels to provide optimum response and picture detail.

Symptom: Under certain operating conditions, sets with E-14 or E-15 panels may tend to "ring" in the second

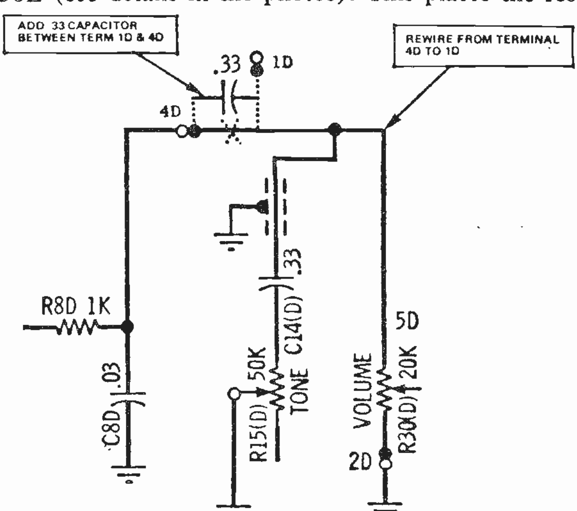


video stage and cause either (1) a multiple ghost effect with each ghost spaced about ¼ in. to the right, or (2) a slightly "busy" background.

SOLDER.



Solution: For sets using either E-14 or E-15 panels, install a 2.7K ½ w resistor in the space provided for resistor R50E (see details in the photos). This places the resistor



in parallel with the video peaking coil and prevents ringing. This modification will not be needed for subsequent E panels.

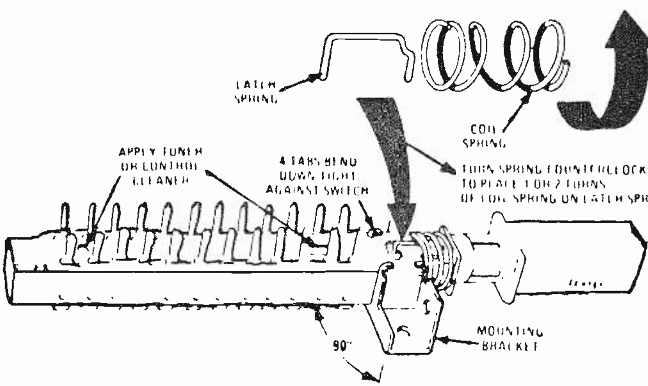
TS-915 Remote Chassis Only

Symptom: Audio popping during channel change function in TS-915 remote chassis only. Solution: Add a .33μf capacitor in series with volume control. Remove all leads from terminal 4D on chassis and connect to terminal 1D. Add .33μf capacitor between terminals 1D and 4D. Capacitor part is No. 8S10191A69. (See partial schematic diagram.)

Color-TV Chassis TS-929/931/934/938—INSTA-MATIC Switch will not Function Properly

If the INSTA-MATIC switch locks down but will not release or switch will not lock down and there is erratic, mechanical action, make the following corrections:

The switch body may not be properly positioned relative to the mounting bracket. Align the switch body perpendicular to the bracket and tighten the four mounting tabs as



shown in the illustration. Turn the coil spring to place one or two turns over latch spring, whichever obtains the best action. The latch spring may be distorted. If so, replace it with latch spring Part No. 42P63085.

If the switch has intermittent electrical action, make the following corrections: The replacement of switch contacts may be avoided by spraying inside of the switch with good grade of tuner or control cleaner (Part No. 11P65176A04).

Color-TV Chassis Early 16 and 18TS-929—Fuse Failing for No Apparent Reason

It is assumed that the horizontal driver, output and damper tubes are good and that the horizontal-output tube grid bias has been checked and is near normal.

If the horizontal output cathode fuse is the clip-in type, use a special red-banded .5a fuse (Fuse Part No. 65-138460). If fuse is a soldered-in type, install a special kit (Part No. 65P65192A91).

It is suggested that the following checks be made in the following order:

Beam current may be set too high. Allow five minute warm up time, then measure the boost voltage with no raster (zero beam current, using the 1000v dc scale on the meter). In manual operation and with the BRIGHTNESS control at maximum, adjust the MASTER BRIGHTNESS control for a 50v drop in the meter reading.

Check pincushion transformer T-500 for overheating or for discolored insulation. Replace any defective transformers with a new type: TS-929B45 and earlier, use 25D70067A01; TS-929B46 and later, use 25P65192A67.

If the above steps do not solve the problem, install a new type horizontal output transformer (Part No. 24P65174A43). It also includes a .6a fuse which should be installed. (Do not use the .6a fuse used with the old-type transformer.)

If the problem causes the horizontal-output tube plate to turn red and trips the circuit breaker (blows cathode fuse on early TS-929), check the following components and voltages:

Check for grid drive bias on the horizontal-output tube. If present, inspect pincushion transformer T-500. If insulation is discolored, remove leads 4 and 6 to the primary of T-500. If overheating is corrected, change the transformer.

Color-TV Color/Video Panel LA/MA/WA—Noise Immunity Circuits

The "CA" Panel has an adjustable noise "limiter" circuit to reduce the undesirable effects of noise under weak signal conditions.

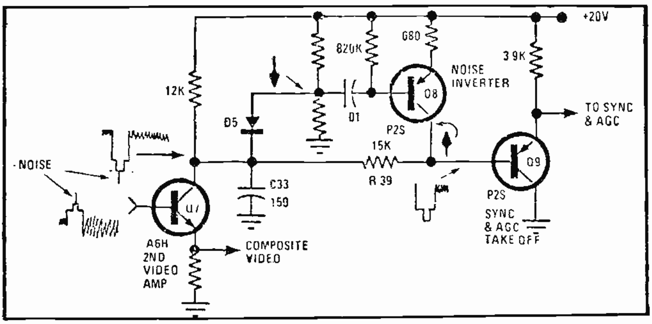
In the "LA" Panel, a new noise "inverter" circuit cancels the noise signal by inverting its phase and feeding it back on itself. No adjustment is required in this circuit, although misadjustment of the AGC control (detector level) can affect its operation.

Composite video at the base of transistor Q7 (second video amplifier) contains positive-going sync and blanking. High-frequency video information is taken from the emitter of this stage and applied to the picture tube.

Sync and blanking signals, amplified and inverted by transistor Q7, are present at the collector of Q7. High-frequency video information is rolled off by capacitor C33 because the signals needed for sync and AGC action have lower frequencies.

When a noise-free signal is received, the low-frequency sync signal is passed to the base of transistor Q9 through resistor R39, and is unaffected by transistor Q8. When noise is present along with the sync signal, and it exceeds the sync amplitude, it can affect sync and AGC. This is prevented by passing any negative-going voltage that exceeds sync amplitude (in the negative direction) through diode D5 and capacitor C34 to the base of transistor Q8. (Diode D5 is normally reverse biased but is made conductive by the noise pulse.)

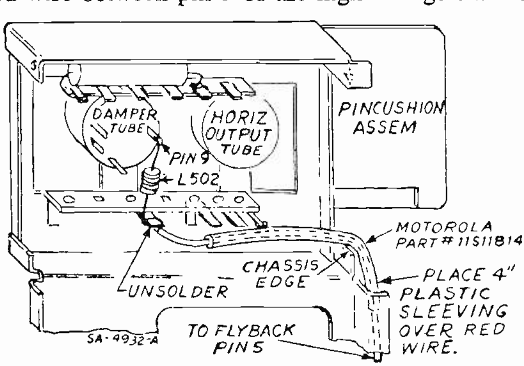
Common emitter stage Q8 conducts with this negative-going signal (noise) on its base, resulting in a positive



going voltage at its collector. This voltage cancels out the negative-going voltage (noise) from Q7. In this manner, Q8 inverts the noise pulse, to cancel its effect on Q9, producing a clean signal for application to the sync and AGC circuits, which should be unaffected by noise pulses that might be present.

Color TV Chassis TS-934—Thin Vertical Line Near Left Edge of Screen

RF radiation may be caused by damaged insulation on the red wire between pin 5 of the high-voltage transformer



and pin 9 of the damper tube. Place plastic sleeving over the wire, to prevent leakage to the chassis edge, as shown in the accompanying illustration.

Olympic

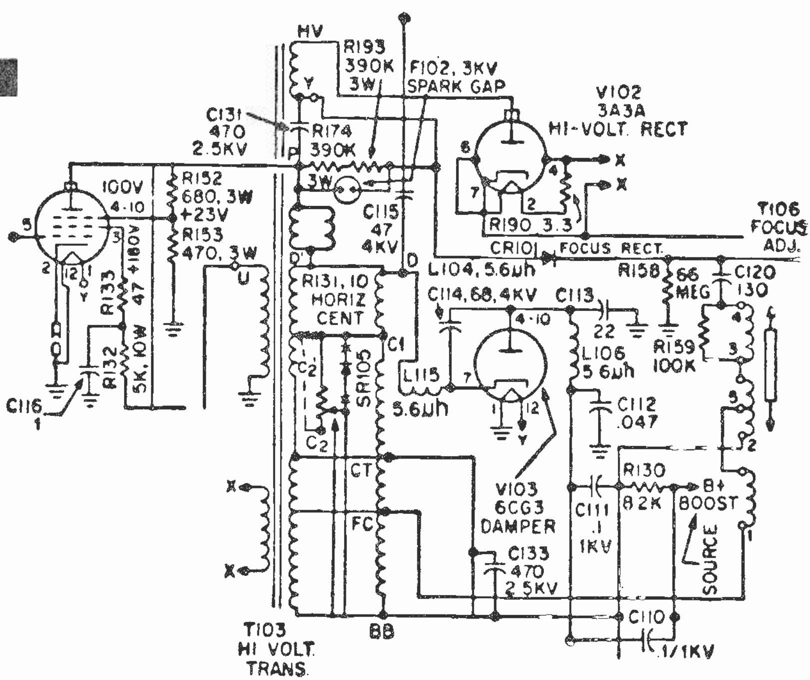
Color TV Chassis CTC19/21 — Spark Gap Functions and Causes of Failure

Chassis CTC19/21 employs a high voltage regulation system controlling the grid bias drive characteristic of the horizontal output tube in proportion to the high voltage requirements. The flyback transformer ringing pulse is used as one of the reference controls since its amplitude is proportional to the high voltage developed. CRT cathode voltage is also used to control regulator conduction since it varies according to CRT beam current.

In this system the 6FQ7 tube triode section acts as the regulator.

Operational parameters of this design allow for a wide variation in high voltage. As much as 4kv deviation is normal and it becomes necessary to provide a means of focus tracking to maintain accurate focus throughout the normal range of operation. The focus voltage is a secondary product of the high voltage developed and must be equal to approximately 20 percent of the total CRT anode voltage at all levels of operation.

The network consisting of focus tracking resistors R174, R193, spark gap F102, Part No. FU35370 and their associated filter C131, together



with a "split" flyback winding, forms the components of the focus tracking circuit. In a brief analysis, focus tracking is accomplished by the voltage drop across the two resistors because of CRT beam currents. With an increase in CRT conduction, more current is drawn through the resistors which results in an increased voltage drop appearing across them. Consequently, this drop is added to the output of the focus rectifier to adjust focus according to changes in beam current. Filter capacitor C131 forms a long time constant that acts to smooth out variations across the resistors. Spark gap F102 provides protection from overloads which would result in increased voltages beyond the capacities of components.

Any defect which would cause the CRT to conduct too heavily might result in spark gap arcing, such as:

1. Video amplifier failure, lowering plate voltage. (shorted 6JT8 tube drawing excess grid current, would cause the CRT cathode voltage to be low).
2. CRT defect (internal short).
3. CRT screen setting too high, resulting in excessive brightness.
4. Blanker defect causing heavy conduction (defective 6BN11 tube, or trouble in blanker circuit could cause excessive brightness, result in arcing).
5. Kine bias, or AGC controls set for too much brightness.

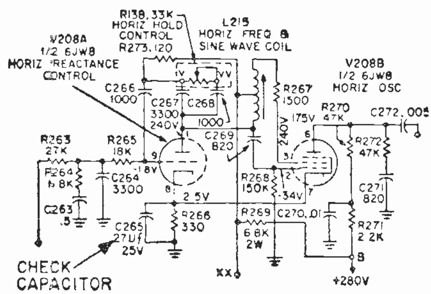
Increased current through the focus tracking resistors R174 and R193 will cause the voltage drop to exceed the rating across the protective spark gap.

This leakage condition can be determined by positioning the service switch to the "service" position. This in turn applies B+ directly to the CRT cathodes and if arcing ceases, the cause was obviously a video amplifier defect.

There is also the possibility of the original spark gap part No. FU35370 breaking down and no apparent circuit trouble. Replace, when necessary, with an improved type No. CO-34853-1, which Olympic has been supplying for the past 6 month. Part No. CO34853-1 is a combination of spark gap F102 and capacitor C131.

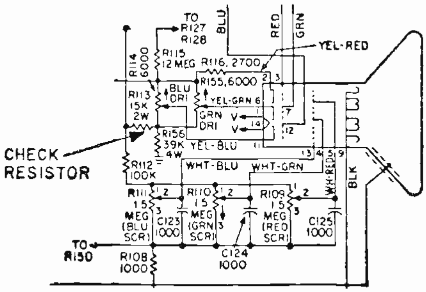
Color TV Chassis CTC19/20/21 — Service Hints

CTC19/21 **Problem:** Jittering picture lacking vertically stability. **Correction:** Check R281. If it is a 330K resistor, try a 560K replacement or try a lower value. The best value to use depends on signal conditions. **Problem:** Intermittent arcing from the 3A3 HV rectifier socket to the metal cover on top of the high voltage cage. **Correction:** Remove metal cover, place high-voltage tape inside, covering entire underside of topmost section and re-install.



CTC19/20/21 **Problem:** Picture bends, or may lose horizontal sync. **Correction:** Check and replace if necessary C265, a 27 μf, 25v capacitor in the cathode circuit of V208, the Horiz. Reactance Control tube 6JW8.

CTC20 **Problem:** Excessive blooming, and no brightness cut-off. **Correction:** Check R113 if open. This is a 15K 2w resistor in CRT cathode circuit at input to drive control, located on rear apron adjacent to drive control.

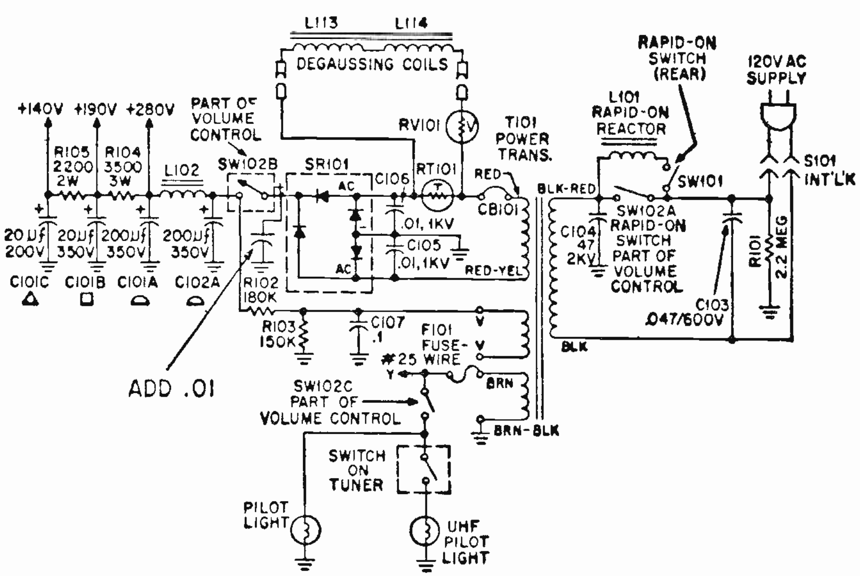


CT910 **Problem:** No high voltage. **Correction:** Check for an increase in value of R802, a 470K resistor in grid circuit of the 31JS6 tube, which may be cutting the tube off. **Problem:** No color, or weak color. **Correction:** Check for open or increase in value of R603, the 47 Ω cathode resistor of V17, (the 6GH8 bandpass amplifier). Replace if necessary.

Color TV Chassis CTC19/20/21 — Service Information

Horizontal Lock Correction CTC19/20/21. If it is difficult to lock the picture horizontally, particularly after replacing the horizontal oscillator tube 6JW8, shunt a 680pf capacitor (Olympic part # CCD-681K) across C267 (a 0.003 μf). Do this on underside of board, but first check if the change was made at the factory or during prior service.

Replacement of Silicon Rectifier in Power Supply CTC20. If it becomes necessary to replace the bridge rectifier (part # RF34720) in the low voltage power supply, it is suggested to use four separate silicon rectifiers, available from Olympic kit # PP61054 or equivelent. Installation instructions are included in the kit. After installa-



tion of these rectifiers a hum bar may appear. To remove the hum bar, visible only under certain field signal conditions, there should be two 0.01 μf 500v capacitors added to the circuit as follows:

Add a capacitor from B+ low voltage rectifier output to ground. This capacitor should be a 0.01μf 500r.

Another capacitor is added from the color-on indicator circuit (point "Y" of SR102) to ground.

These capacitors are also furnished in the kit PP61054 with detailed installation instructions. The diagram shows the two added capacitors in their respective circuits.

Adjusting Video Drive Controls On Olympic Color Chassis

All current production of the CTC-19/20/21 chassis will employ a RED drive control in addition to the present GREEN and BLUE drive controls. This control has been added so the best tracking conditions can be obtained with the color picture tubes employing the improved rare-earth, red-emitting phosphor which features unity cathode current ratios.

Generally, the best positions for the drive controls are fully clockwise. Check the picture from highlight to lowlight, adjust the VIDEO drive controls when necessary to maintain the gray raster throughout the usable brightness range.

The aforementioned adjustments are made after the regular screen adjustments are made according to the manufacturer's service instructions.

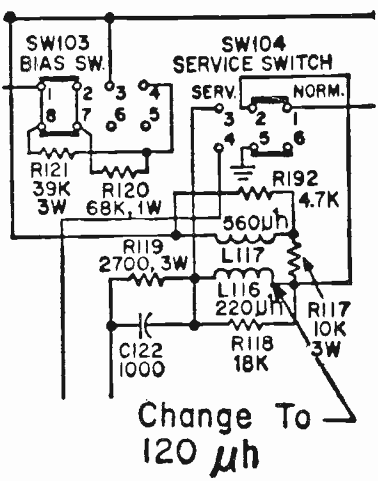
Adjust the "TRUECOLOR" control to mid-range before making any screen adjustments.

'Ringing' or 'Ghosting' in CTC-19/20/21 Olympic Color

On some early production runs, a pronounced "ringing" or "ghosting" may be noticed trailing dark objects, but not necessarily tuneable.

To eliminate this "bounce" and also improve video definition on the CTC-20 chassis, replace peaking coil L116, part number CL32345-13 (220μh) with new coil number CL32442-19 (120μh). This coil is located behind the rear control panel, straddling the NORM-SERV switch. For each reach, tilt panel backward by removing several self-tapping screws.

On the CTC19/21 chassis connect



a jumper wire between the blue and red dot connections of peaking coil T107, located on a terminal strip on the rear apron of the rear control panel to eliminate this "bounce."

To eliminate further noise content in the picture of the CTC19/20/21 chassis, particularly in semi-fringe areas, parallel R231, a 22M resistor, with another 22M resistor, bringing its combined total value down to approximately 10 to 11M. A convenient point for installation is between the AGC terminal on the tuner and the +280v lug of the terminal strip located adjacent to the tuner.

Misconvergence of Olympic CTC-19,-20,-21 Chassis

Severe misconvergence of the blue field or blue convergence out of tolerance by ¼ to ½in. has been reported.

When this happens, check R802, a 100Ω, 1w resistor located alongside the selenium rectifier on the convergence board. It may have changed value because of excessive current flow before horizontal convergence coil T801 is properly adjusted. (Under normal circumstances, the iron core in T801 should be about ¼ to 5/16in. from top of coil form.)

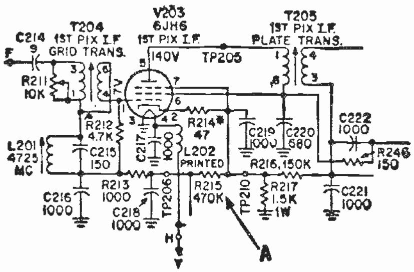
If the resistor R802 is discolored or burned. it must be replaced by two 100Ω 1w resistors connected in series.

If difficult side convergence is encountered, check for excessive tape (more than one layer) under convergence yoke which was placed there for shipping purposes. It will help improve blue convergence, particularly at the raster sides if excess tape is removed from the CRT neck.

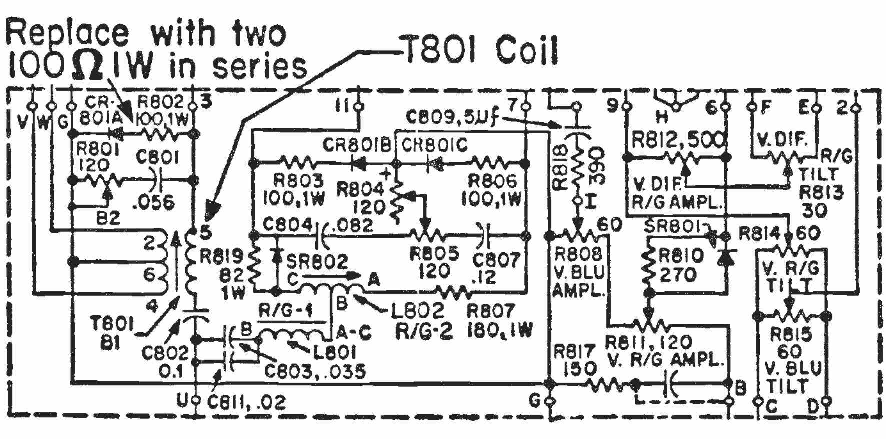
Circuit Changes in Run 17 of Olympic's CTC20 Chassis

Several circuit changes have been made at the factory on the 17th run of the CTC20 chassis. These changes can also be made in the field without removing the chassis from the cabinet. It should not, however, be necessary to incorporate all of these changes on every set, and only those changes required to solve a specific problem should be made.

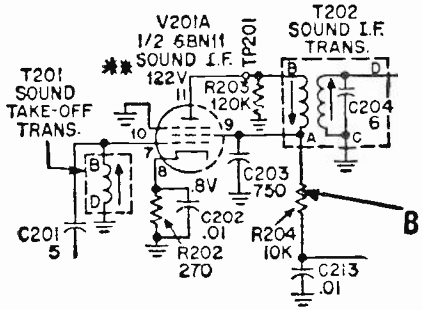
The color-TV receiver's sensitivity and picture quality can be improved in fringe areas by shunting the 470K



resistor, R215 (A), in the 1st picture IF section with a 220K, ½w resistor. This will reduce the effective value of the resistor to 150K. After the resistor has been shunted, it will then be necessary to readjust the AGC control.



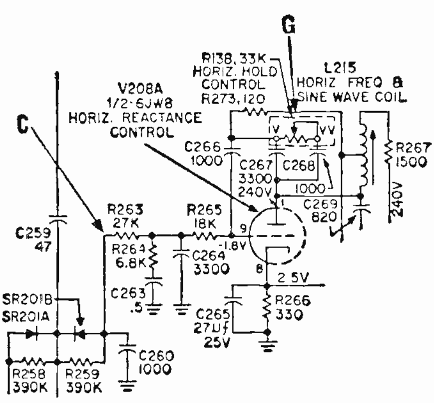
Additional beat or hash will probably develop as a result of having



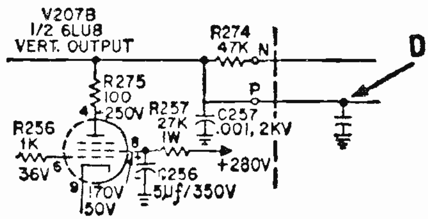
shunted the 470K resistor. This difficulty can be easily corrected by removing the 10K resistor, R204 (B), connected to the sound IF transformer and replacing it with a 22K, ½w resistor.

The small hook or kink that may sometimes appear on vertical lines in the picture, where they are crossed by horizonal lines, can be easily eliminated by replacing the 6.8K resistor, R263 (C), in the horizontal reactance control circuit with a 470K, ½w resistor.

The interlace can be improved by adding a 0.01μf, 1kv disc capacitor

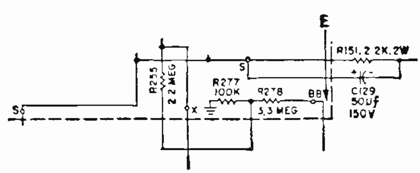


between point "P" on the signal board (D) and chassis ground. Point "P" is a lug conveniently accessible at the rear of the printed circuit board behind the rear controls. The bare wire at the top of a 0.001μf, 2kv capacitor mounted adjacent to point "P" can be used as a grounding point.



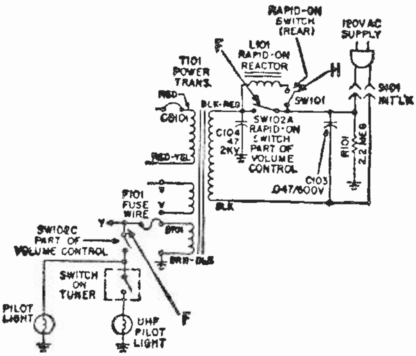
The replacement parts that have been described are available from Olympic as kit No. TP35477.

Under certain signal conditions a slowly moving vertical bar may be visible in the raster. This condition can be corrected by rerouting a heavy cotton red wire (boost) from point "BB"



(E) on the signal board, which runs along the power supply section into a cable tied to a terminal under the high-voltage section. This wire should be disconnected from point "BB," pulled out of the cable, and rerouted straight up from the high-voltage chassis section and behind the back control panel. The wire should be dressed near the printed circuit board, trimmed of its excess length and reconnected to point "BB."

Another set of wires may also have to be moved to eliminate the vertical bar. Four wires, excluding the pilot light wires, soldered to the ON-OFF switch (F) should be removed from the cable. Each pair of wires should be twisted, and both pairs of wires should be twisted around each other. They should then be resoldered to the



switch without again passing through the cable.

Noise and beats present in the picture can be reduced even further by rerouting all wires from the horizontal hold (G — same Fig. as resistor C) and vacation switch (H), as far from the antenna leads as possible. The best way to route them is toward the high-voltage cage and then down. These wires should not fall across the IF section on the chassis.

Color TV Chassis CT910 — Lack of Video Gain

Video gain can be improved, if desired, by substitution of a 10KR8 tube for V9, the 10JY8 video amplifier tube. It may then be necessary to readjust the red, blue and green screen controls to a higher level in order to achieve a better brightness and contrast ratio. The 10JY8 tubes removed are not subject to warranty replacement oı credit. 10KR8 tubes are available from Olympic.

Color TV Chassis CT911 — No Sound

Check speaker wires. The end connector of the wire may not make proper contact with the speaker's lug; when reconnecting the wire, make sure the wire connector meets the speaker s lug.

On this model, in order to disable the horizontal sweep, lift the anode connector from the 31JS6A horizontal output tube. Do not lift the ground connection from pin 2 of the 31JS6A horizontal output tube to disable the oscillator, or to measure cathode current. This is a lead with a ground lug tied to the mounting screw of the focus control located on top of the high voltage cage; do not turn the set on with this lead removed as this would result in damage to the tube and convergence board.

Brighter Picture Adjustments on Olympic Color Model CT910

1. Adjust RED, BLUE, GREEN drive controls to maximum.
2. Set service switch to SERVICE position.
3. Adjust RED, BLUE, GREEN screen controls to produce visible medium bright line.
4. Return service switch to NORMAL and adjust AGC for normal bright picture with contrast and brightness set near maximum.
5. Adjust HV to achieve approximately 23.5kv at zero beam.
6. Check and reset drive controls for proper black and white reproduction at all brightness levels.
7. Adjust focus at bright picture level.
8. Adjust color killer to permit wider range on fine tuning before losing color.

Production Changes and Adjustments in Olympic Color TV Chassis CT910

Insufficient brightness and contrast: Change resistors as follows: R-304 from 22K to 33K ½w. R306 from 150K to 56K ½w. R312 from 180K to 100K ½w. Chassis serial 006500 and up have been modified.

No color, or weak color, or color range of tint control incorrect: Reset the burst phase transformer T-602 approx. ½ turn.

Fine tuning control very limited in range (First 200 production units only): Reset color-killer and AGC controls (rear of TV set).

Color TV Model CT-910—Service Hints

Symptom: Intermittent tuner operation. Correction: Check R-10 (10K-1w) resistor. This resistor is easily accessible from the inside of tuner. It is the mixer-plate load resistor.

Symptom: Restricted focus range. Correction: Check R-808 (68M) focus rectifier load resistor for a possible change in value.

Symptom: Vertical linearity control improvement. Correction: There may be an improvement by changing R-241 (120K) resistor to 68K.

Symptom: Poor vertical retrace suppression. Correction: Check and replace, if necessary, C420 (.05μf) capacitor which may have leakage.

Symptom: Excessive brightness and weak color. Correction: Check resistor R608 (15K); it may be "open." It is located on Pin 8 of V18.

Color TV Model CTC-30—Service Hints

Symptom: Poor color killer action. Correction: Check that C-170, a .01μf disc capacitor, is wired as shown in the sketch which is in accordance with the schematic in the service manual. A few early production units may have been shipped with one leg of C-170 wired incorrectly.

Color TV Chassis CT-911—Sensitivity Improvement

The sensitivity of this model can be improved for fringe operation by performing the following adjustments: (1) Preset contrast control to mid range. (2) Adjust brightness for normal viewing. (3) Adjust AGC control clockwise for best signal-to-noise ratio, while observing for overload on strongest local signal. (4) If luminance tends to overdrive on strong signal, tube V8 can be replaced with an 8JV8 which will effectively reduce contrast level.

Color TV Chassis CTC19/21/31—Intermittent Color

Some of these late production chassis may exhibit intermittent color which is occasionally aggravated by a vibrating or flexing chroma board. Inspecting tube socket

V703 may reveal that resistor R746 is shorting against capacitor C724 due to a shift in the position of the spaghetti insulation. Relocate R746 to provide sufficient clearance.

Color TV Chassis CTC20/30—Dark Lines at Left Side of Raster

Ringing bars appearing as three or four dark vertical lines may show up at the left side of the raster in CTC 20/30 color chassis.

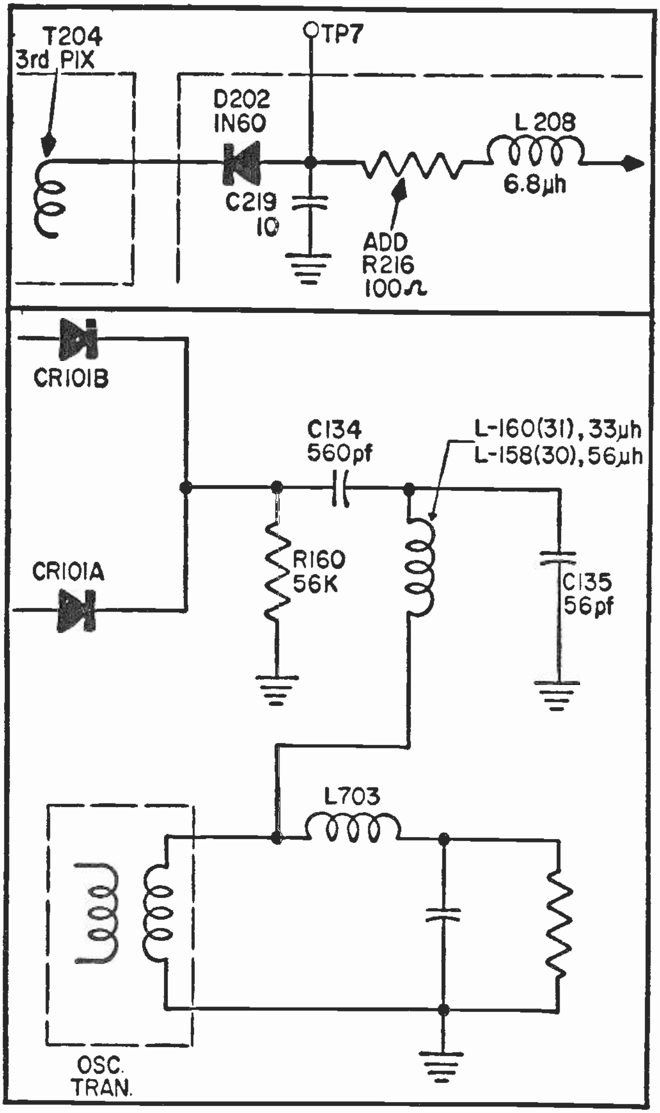
The following horizontal output circuit changes will offer relief from this condition.

1. Add a 150pf 3kv capacitor in series with a 1.5K ½w resistor between pin #6 of J106 and chassis ground.
2. Add a second identical RC network connected to shunt control RV-102.

Color Model CT-400 Chassis—Service Hints

Symptom: Knob "wobbling" on the tint control. Correction: Remove knob, add sleeve (bushing), manufacturer part #PP36137 and reinstall knob. It is recommended that when sleeve is installed on the tint control knob, it is also added to the color control knob, so that both have the same "feel." Symptom: High pitch sound that appears to come from the horizontal output transformer. Correction: We found this to be a frequency of 1/2 15750Hz = 7875Hz, which is one-half the horizontal sweep frequency. In some sets the high voltage cage door is resonant to this frequency. Dampening with a piece of tape around the door's edge and tightening screws around cage area should correct this "sing." Symptom: Critical vertical hold, accompanied by some high-voltage arcing in the picture. Correction: Make sure that the CRT's aquadag coating makes contact with grounding wire finger from the CRT harness. There should be two spring contactors. Symptom: 60Hz sync buss audible when volume is turned way down. Correction: Ground low side of volume control to control mounting bracket. Symptom: Beat pattern on screen when viewing Channel 3 with indoor dipole antenna. Correction: Add a 100 Ω resistor, as shown on the diagram. This should be helpful in most areas. Symptom: Horizontal frequency drift over a period of time during the first one-half hour of operation. Correction: Replace C267, a .0033μf 500v capacitor with a polystyrene type .0039μf 500v; its location is between the horizontal oscillator coil and horizontal oscillator tube.

There is an error on the schematic, CTC-30/31, which was supplied with the initial group of production models. This error was not in the wiring of the chassis: (a) Components



R-160 (56K) and C134 (560pf) in the ACC circuits of CTC-30 and 31 should be interchanged. (b) Takeoff to ACC on CTC-30 was shown on wrong side of phase shift coil. Proper connections are shown.

OLYMPIC

Color TV Model CT400—Color Sync Problem

Symptom: Intermittent color sync, or no color sync. Correction: Check capacitor C621 (0.33μf, 400v) located near 8JV8 (center of board); it may have opened. Also check capacitor C633 (.01μf, 400v) located near L605 (top front corner of board), as it may cause reactance control drift.

Color TV Model CT400—No Color

Symptom: Intermittent color, or no color. Screen may appear predominantly green. Correction: Check 6GH8 tube, the 3.58MHz subcarrier and replace, if defective. Also check capacitor C635 (.01μf, 400v) located near the top center of the board and replace it if necessary to correct intermittent or no color condition.

Philco

Hum In Picture 16M91 Chassis

In any cases of colored hum bars on monchrome pictures in models using the 16M91 color chassis, the problem may be due to poor ground connections of the eyelets to the chroma perma circuit panel or the eyelets to the chassis. Good grounding of the eyelets on the chroma panel in the vicinity of the video output tube and the 6GU7 matrix amplifiers should be checked.

In cases where the hum bars appear in black and white on monochrome pictures, the eyelets in the video and IF chain should be checked. Symptoms of color or black and white hum bars may appear at the top or bottom and may be either stationary or rolling.

16QT85 Horizontal Circuits

Horizontal Oscillator and Reactance Circuit

This is a sine-wave horizontal oscillator (Fig. 1). The frequency is determined mainly by the variable coil and the capacitors across it. The reactance tube also helps to control the frequency. The reactance tube is coupled to the cathode of the horizontal oscillator and thus is effectively in shunt across part of the tuned circuit. The signal appearing at the plate of the reactance tube is actually from the horizontal oscillator.

Note the 100pf capacitor from plate to grid of the reactance tube. This feeds back a signal to the reactance grid which is capacitive, that is, it is leading the signal at the plate. This capacitive signal is amplified by the reactance tube and coupled into the cathode circuit of the horizontal oscillator.

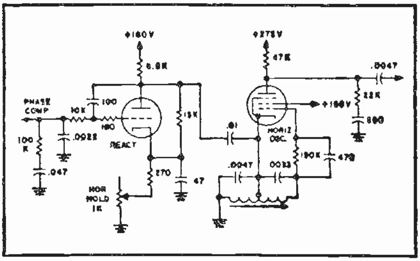


Fig. 1—Philco 16QT85 horizontal oscillator and reactance circuit

Any change in bias of the reactance tube will cause a change in the output of the tube which means more or less of the capacitive current will be introduced into the cathode circuit of the horizontal oscillator. An increase in current will lower the frequency of the oscillator because of the apparent increase in capacitance. A decrease in current will increase the frequency because of the apparent decrease in capacitance.

The bias of the reactance tube is controlled by the setting of the horizontal hold control and by any dc voltage which may be introduced by the phase comparer. This dc voltage will be positive if the horizontal oscillator tries to drift higher and negative if it tries to drift lower.

Horizontal Output Circuit Bias

In addition to the bias developed by the drive from the horizontal oscillator, some bias is developed by the pulses from a winding on the

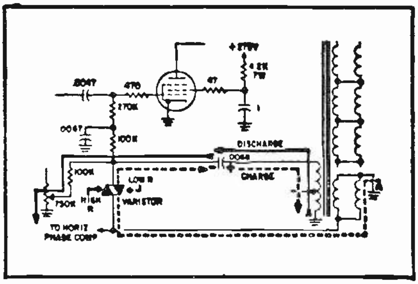


Fig. 2—Horizontal output circuit bias

HOT. These pulses appear across the horizontal bias control and the 100K resistor which is in series with it, through the pulse coupling capacitor (0.0068μf) shown in Fig. 2.

Another winding on the HOT is used for sampling for the phase comparer. This winding is placed in series with a varistor, which is also in series with the pulse coupling capacitor. The pulse from the bias winding will be a

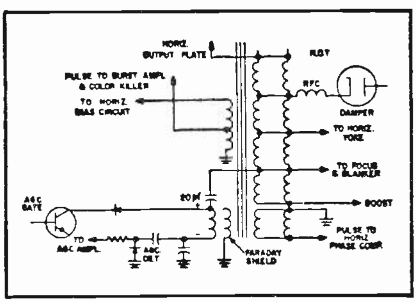


Fig. 3—Horizontal output transformer circuit details

Focus Coil Production Change

Some early production Philco 25in. color sets using the 16QT85A chassis will contain a focus coil less the tuning stick. The focus coil can be adjusted by a standard hex head alignment tool. Later production sets will incorporate the focus coil with tuning stick.

Focus adjustment procedure for focus coils without tuning sticks:

1. Rotate focus coil tuning core maximum counterclockwise
2. Rotate tuning core clockwise until picture is in focus

Once picture is in focus do not turn core any further, since continuous turning will place the picture out of focus and back into focus on a second peak. If you maintain focus on this second peak, serious damage to the focus coil may result because of overheating. The correct focus peak is the first peak from the maximum counterclockwise position. Later production sets, using the focus coil with tuning stick, will incorporate a stop so that it can only be adjusted to the first peak.

Warranty Returns of Philco 'P' and 'Q' Line Color-TV Horizontal Output Transformers

Engineering evaluation of a large percentage of horizontal output transformers returned in warranty has shown that those tested were good and had no defects. Technicians have been returning the transformers because of wax drippings which appear on the base of the transformers. These wax drippings are normal and are caused by heat generated by the transformer.

An excess amount of wax drippings may be more apparent on "Q" line transformers because they have been double-impregnated with wax. Therefore, any transformers that are suspected of being bad, should be checked to ascertain if they are bad.

The following checks should be made:

1. Using a VOM or VTVM check for open windings, making sure the dc resistance of the windings agree with the schematic.
2. Although a VOM or VTVM will not indicate one shorted turn, a

shorted turn can be found by using a flyback tester or a B&K Analyst.

3. Check the two 430K resistors (R218 and R219) which are mounted on the transformer. Also, check the 0.0027μf. 2.5kv capacitor (C210) mounted on the transformer. The resistors and capacitors are replaceable and are carried by the accessory division under the following part numbers: 430K resistor 33-1363-145 0.002μf. 2.5kv capacitor 30-4712-2.

Replacing Terminal Strips in Philco-Ford Color Sets

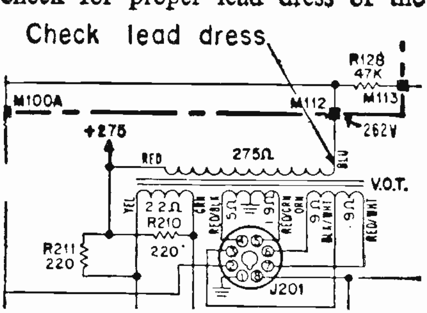
Because of the high voltage on the terminal points of strips B1 and B2, it is essential that in the event of replacement, these strips be exact factory replacements.

Strips B1 and B2 are reportedly made of a special material to withstand humidity, heat and other environmental conditions. The manufacturer warns that never, under any circumstances, should they be replaced with a standard terminal strip.

For the locations of terminal strips B1 and B2, refer to your schematics of color chassis 16QT85A, 16NT82 and 17KT50. Terminal B1 contains 6 lugs and is part no. 76-10310-41, while terminal B2 contains 5 lugs and is part no. 76-10310-42.

Correcting Buzz in Philco-Ford Color Chassis "P" and "Q" Line

If an audible vertical buzz is noted with the volume control turned to minimum in the mentioned chassis, check for proper lead dress of the blue lead from the vertical output transformer to lug M112 on the deflection sound panel.



The blue lead should be dressed along the sides of the deflection sound panel and under no circumstances across the panel.

If the blue lead is running across the panel and is in the vicinity of the audio output tube socket, the 60Hz would be picked up in the grid circuit of the audio tube and would be heard in the speaker.

Color TV Chassis 14M91/15M91/16M91 —High Voltage Adjustment

Measured AC Line Voltage	High Voltage Adjustment Tolerances (-1000v +0v)
105	21kv
110	22kv
115	23kv
120	24kv
125	25kv

The chart provides information for adjusting high voltage under various ac line conditions. To use the chart. first determine the ac line voltage with an accurate ac voltmeter at the outlet to which the set will be connected. After measuring the voltage at the outlet, refer to the chart and set the HIGH VOLTAGE ADJ. control (VR8 14M91). (VR21 15M91 and 16M91) for the high voltage corresponding to the ac line voltage. Under no circumstances should the high voltage exceed the rated value indicated the the chart. Note that the tolerance of the high voltage adjustment is -1kv and $+0$v. If there is any question as to the voltage setting, adjust the high voltage slightly below the rated setting.

Use an accurate, reliable, high voltage meter and high voltage probe.

If the ac line voltage measured is somewhere between two of the voltages given in the chart, use the nearest lower ac voltage. As an example, if the line voltage measures 112vac — that is, part way between 110 and 115-

vac as shown in the chart — use the 110vac figure and adjust the high voltage for 22kv. The high voltage adjustment is always made with the brightness control set at minimum (zero beam current).

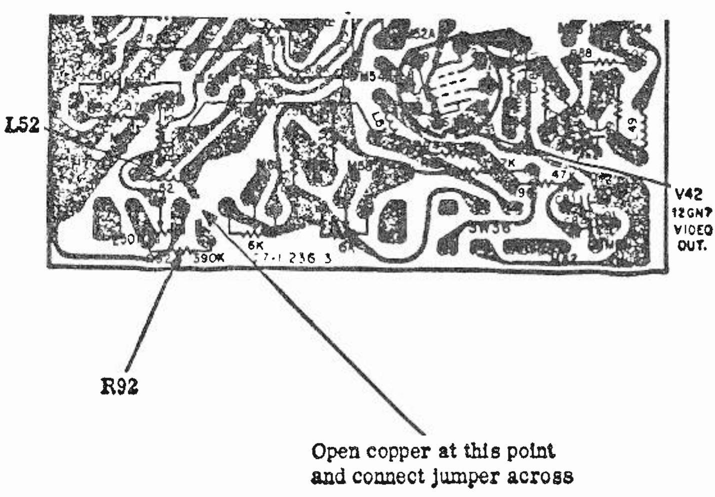
Do not exceed 30kv on high voltage probe.

Color TV Chassis 18QT85/18MT70—Failure of Blue and Green Drive Control

The problem of an all-red or excessive red raster may be due to an open blue or green drive control (VR36).

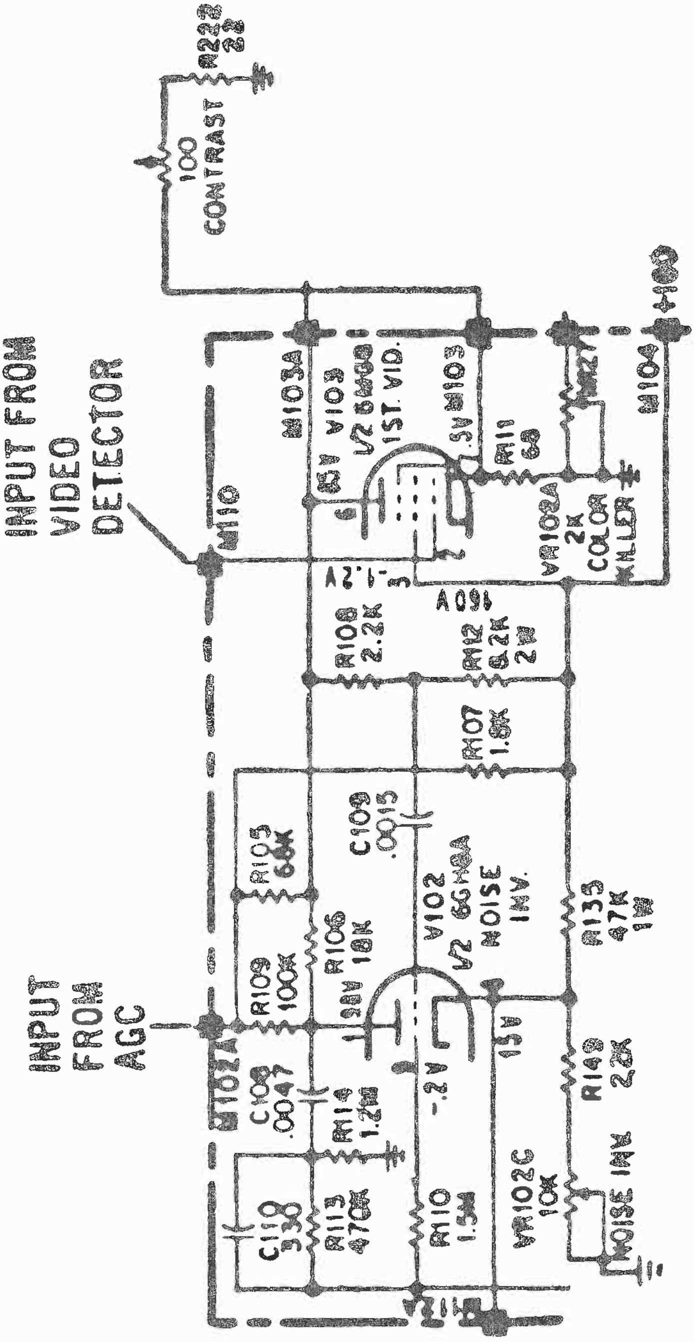
Engineering evaluation has shown that the blue or green drive control can open if arcing appeared between the copper circuitry connecting the drive control and B+.

Late production of the subject chassis incorporates a physical copper change in the area of the blue and green drive controls to prevent arcing and afford additional protection from future failure of the controls. This improvement does not affect the blue and green circuits electrically.



In those instances where a set is removed for replacement of the control or for servicing other than the control, the following change should be made to protect the control from future failure (refer to drawing).

(1) Open the copper strip connecting coil L52 and resistor R92 (390K). (2) Connect an insulated jumper between coil L52 and resistor R92 (390K).


INPUT FROM VIDEO DETECTOR
INPUT FROM AGC
100 CONTRAST
V103 1/2 6U8 1ST. VID.
V102 1/2 6GH8A NOISE INV.
C109 .0015
R108 2.2K
R107 1.8K
R105 68K
R106 10K
R109 100K
C108 .0047
R133 47K 1W
R149 22K
VR102C 10K NOISE INV.
VR102A 2K COLOR KILLER
160 V
M103A
M104
M110

Color TV Chassis 17MT80A/18QT86—Video Amplifier Servicing

Defects in this section usually affect the picture and sync while the sound remains normal. Some of the symptoms are: weak or no picture, low contrast or hum bars in the picture.

In order to maintain the proper signal gain through each of the video amplifier stages, the initial signal supplied to the first stage should be of a constant amplitude and voltage. Therefore, trouble in the video amplifier stages may be the result of a wrong AGC voltage. For this reason, an external positive bias should again be applied while troubleshooting the video amplifiers.

Trying to determine the source of trouble in transistor circuits by voltage checks alone can be quite frustrating. The voltmeter shunt will complete the circuit when you are reading voltages across open components. In this way erroneous indications can be obtained, leading to false conclusions. To avoid errors of this kind, it is better to use an oscilloscope and follow the waveform through the circuit, noting where it disappears. The trouble exists between the points where the signal last appears and where it disappears. If other parts in the suspected circuit check properly, substitute a transistor known to be good to determine if the transistor is at fault.

By close analysis of the symptoms on the screen, along with a knowledge of the circuits involved, you can usually localize the trouble to one or two stages. For example, in the 17MT80A color chassis, the signal used for sync and AGC is taken from the output of the 1st video amplifier stage. Therefore, if the sync and AGC operation are unaffected, the problem is probably in the video driver or video output stages.

Another example is a lack of, or misfitting, detail in the color picture. This usually means that the luminance signal from the video amplifiers is not being delayed properly. This function is performed by the delay line which couples the video driver to the output. It delays the video (or luminance) signal long enough to allow the chroma signal to pass through the various stages in the chroma section. In this way, both signals arrive simultaneously at the CRT.

If the delay line is open, of course there will be no detail in the color picture and no black and white reception. However, if the delay line is shorted, the missing time lag will cause a misfit of detail information in the color picture, making it appear misconverged.

Simply shunting across the delay line with a clip lead while in operation should enable you to determine if it needs replacement. It is impractical to repair a delay line; instead, it should be replaced with a duplicate.

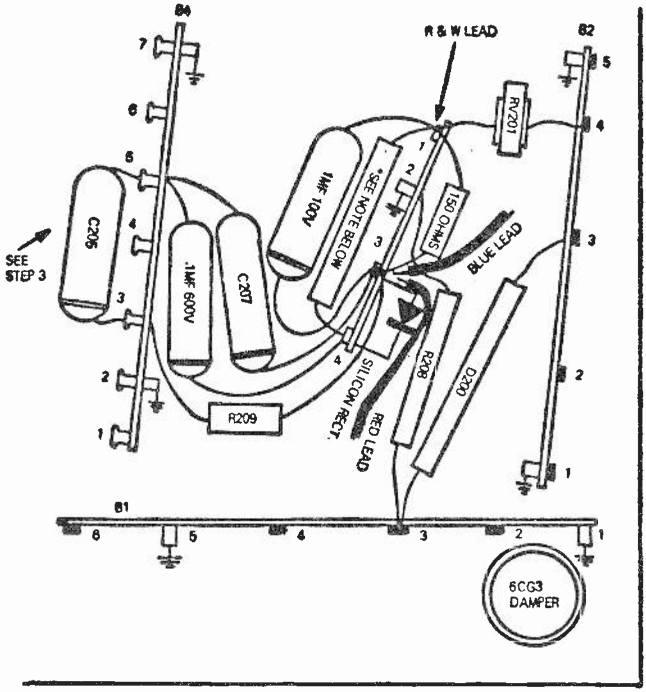
It should be noted here that in some newer color televisions, such as the Philco 18QT86 color chassis, the video driver transistor has been replaced by an IC or "Integrated Circuit." The IC offers several advantages over its transistor counterpart, such as increased high frequency response due to proper impedance matching over a wider band of frequencies. Also, since the IC has a higher reliability record, it will seldom give any trouble. Troubleshooting methods should center around signal tracing the input and output signals with an oscilloscope (the inner-stage connections of the IC are all encased and not accessible) and checking supply voltages. Close inspection of the area is recommended because you are more apt to find a bad connection or trouble in the printed board than in the component itself. If the IC unit is found to be defective, it is not repairable and must be replaced as a unit.

Color TV Chassis 16QT85 and 16NT82—Horizontal Centering Improvement

The following procedure can be used in certain instances to improve centering in the subject chassis.

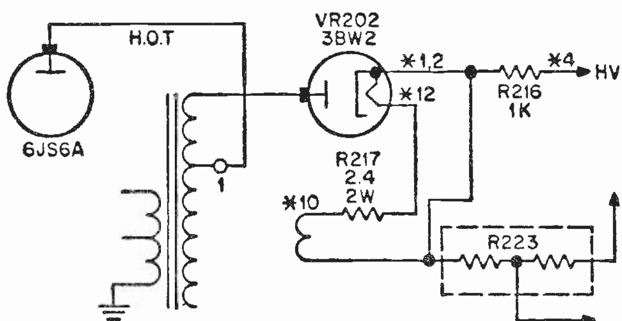
1. Unsolder components R208, R209, C207 and RV 201 from terminal strip B3; also the red, blue, and the red and white lead.
2. Remove terminal strip B3 and replace it with a 4-lug terminal strip (with lug #2 being the only ground lug), at an angle so that it runs parallel to the focus rectifier D200.
3. Move capacitor C205 from its present physical position to the opposite side of terminal strip B4 and resolder to the same lugs (3 and 5).
4. Reconnect the following components to terminal strip B3 as follows: RV201 to lug #1, R208 to lug #2, R209 to lug #4, C207 to lug #3, the red and blue leads to Lug #3 and the red and white lead to lug #1.
5. Connect the 150Ω 1/2w resistor to B3 between lugs 1 and 3.
6. Connect the silicon rectifier to B3 between lugs 3 and 4 (see drawing for polarity). Anode side connects to lug #3.
7. Connect the 1μf 100v mylar capacitor to B3 between lugs 1 and 3.
8. Connect the .1μf 600v capacitor between terminal strip B4 lug # 5 and terminal strip B3 lug #4.
9. Connect the 1.5K (7to 10w) resistor to B3 between lugs #1 and 4. Keep some clearance between the 1.5K and the other components because of heat.

NOTE: In step 9, the 1.5K (7to 10w) resistor will shift the picture 7/16in. to the right. If you desire a greater shift, you may use a 1K (7 to 10w) resistor which will move the raster approximately 5/8in. to the right. Never go lower than 1K in an attempt to obtain a shift greater than 5/8in.



Color TV Chassis 20KT40/20KT41—High Voltage Rectifier Tube

The 3AW2 high voltage rectifier tube originally scheduled to be used in chassis type 20KT40 and 20KT41 was changed in first production to a type 3BW2. All preliminary service data and service manual PR4165 should be cor-



rected to show this change. The 3AW2 tube should not be used as a replacement in this chassis since production changes to the wiring of the tube socket increases the filament voltage such that the 3AW2, if used, would have a very short life. Only a 3BW2 should be used for replacement purposes.

Color TV Chassis 20QT88/20QT90—Excessive Tuner Torque and Ratchet Type Noise When Changing Channels

Because of the physical arrangement of the tuner drive assembly used in the 20QT88 and 20QT90 chassis, it became necessary to add additional shipping protection to the drive train assembly to prevent the gears from disengaging during shipments to the field.

The addition of neoprene pads between the channel drum bracket and the VHF and UHF idler shafts, plus beaded wire dress ties between the VHF and UHF drive gears and idler shafts.

In the event of field complaints of tight channel changing or ratchet type noise, the neoprene pads and beaded ties should be removed.

Chassis 20QT88 and 20QT90 is used in the following Models:

C7260TWA	C7280TWA	C9350TWA
C7260TWA-1	C7280TWA-1	C9351TMA
C7261TMA	C7292TPC	C9352TPC
C7261TMA-1	C7292TPC-1	C9360TWA

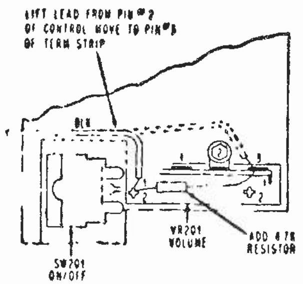
Color-Killer Location and Adjustment

The COLOR KILLER control (VR2V) on the modular chassis is located on the signal board and is accessible from the rear of the chassis. There is no provision made in the cabinet back to adjust this control, the back must be removed to make the color killer adjustment.

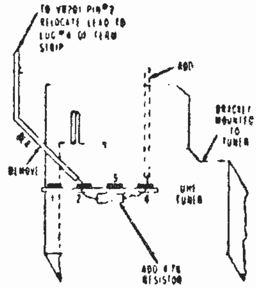
This adjustment should be made as outlined: Set the channel selector to an unused channel to obtain color snow. Then set the COLOR control to mid-range position with the Philcomatic switch in its OFF position, adjusting the COLOR KILLER control (VR2V) until color snow disappears.

Low-Level VOLUME (slide-type control)

The slide-type VOLUME control may exhibit a sharp increase in volume as the control is moved from minimum toward maximum. To correct this condition, a 4.7K, ½w resistor is wired in series with the ground (black) lead of the VOLUME control. Mount the resistor as shown.



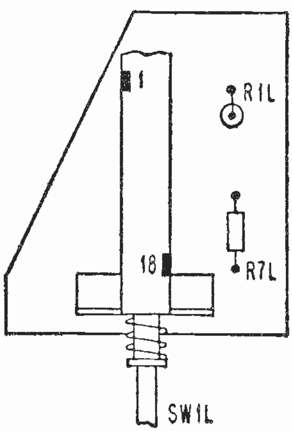
WIRING DIAGRAM FOR DETENT TUNER



FOR V V C TYPE TUNERS

High-Contrast Level with Minimum Contrast-Control Setting

Chassis that may exhibit a high contrast level with the CONTRAST control at minimum (full counterclockwise) can be corrected by replacing resistor R1L with a 1.2k ½w resistor and resistor R7L with a 560Ω resistor. These resistors are located on the Philcomatic switch panel as shown.

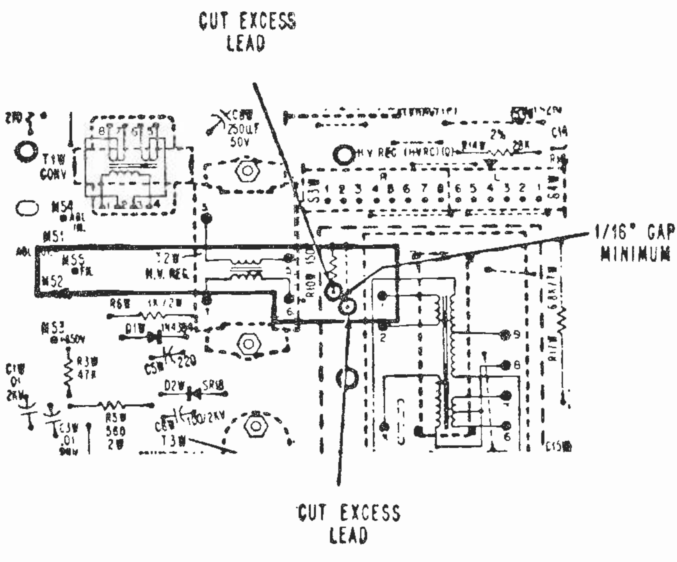


PHILCOMATIC SWITCH/PANEL

Color-TV Chassis 3CS90/91, 3CY90/91—Picture-Tube Filament Failure

Should an open picture-tube filament be encountered in any of the color modular chassis, a possible cause of failure may be the closeness of solder points between the picture-tube filament and the 150v point located on the deflection mother board (W). Any leakage or short between these two points could destroy the picture-tube filament.

Upon referring to the drawing you will note that the points in question are between one end of resistor R10W and the copper strip going to pin 6 of the high-voltage regulator transformer, T2W. Check the spacing between these two points. There should be a minimum spacing of 1/16 in. free of foreign material. Also, any excess leads that extend through the two points should be cut off. Therefore, before replacing a picture tube which exhibits an open picture-tube filament, check the two points as indicated.



It is strongly recommended that should any of the subject chassis come in for shop service regardless of reason, check the two points in order to prevent any possible future failure.

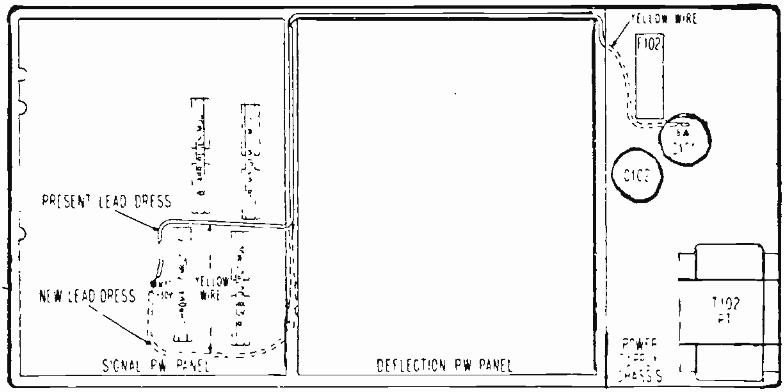
Color-TV Chassis 3CS90/3CS91/3CY90/3CY91—Service Adjustments
UHF Tuner 70 Position (Detent)

Chassis employing the 70 position detent UHF tuner (76-14326-1) may require readjustment of the FINE TUNING control when changing channels. This is characteristic of this tuner and should not be classified as a defective tuner.

PHILCO

Color-TV Chassis 3CS90/91, 3CY90/91—Video Ringing on Right Side of Raster

In the event a condition of video ringing (gray bars) is noted on the right side of the raster, a change in lead dress of the 30v line from the power supply to the 30v lug M37 on the signal mother board may help in reducing or eliminating the gray bars.



CHASSIS TOP VIEW

Refer to the drawing to locate the 30v yellow lead. The lead dress can be performed without removing the chassis or extending the lead length.

It is recommended that when service is required on any of the subject chassis, the 30v lead dress be checked and redressed if required.

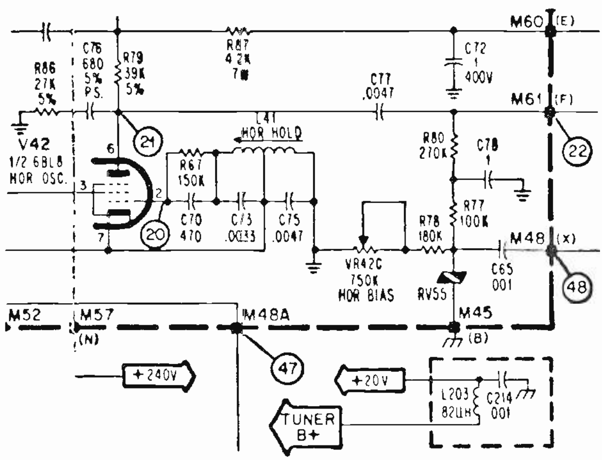
Color-TV Chassis 3CS90/91 and 3CY90/91—Picture Tube Test Jig Yoke Adapter

Because of the differences between the yoke employed in a picture tube test jig and yoke used in the Philco modular chassis, a yoke conversion adaptor must be used when troubleshooting any of the subject chassis.

Under no circumstances should a standard yoke be plugged into a modular chassis. Therefore, the manufacturer has available a conversion adaptor which can be used on the Philco modular chassis as well as many other modular brands. The adaptor may be ordered under part number 328-0334-2.

Color-TV "A" Line Chassis 23-in. and Smaller Screen—Three Vertical Lines in Left Side of Raster

In the event three black vertical bars appear on the left side of the raster—with or without video information—field reports indicate resistors R77 and R78 may be the cause. It is recommended that resistor R77 be changed to 330K, ½w. It is also suggested that resistor R78 be changed to



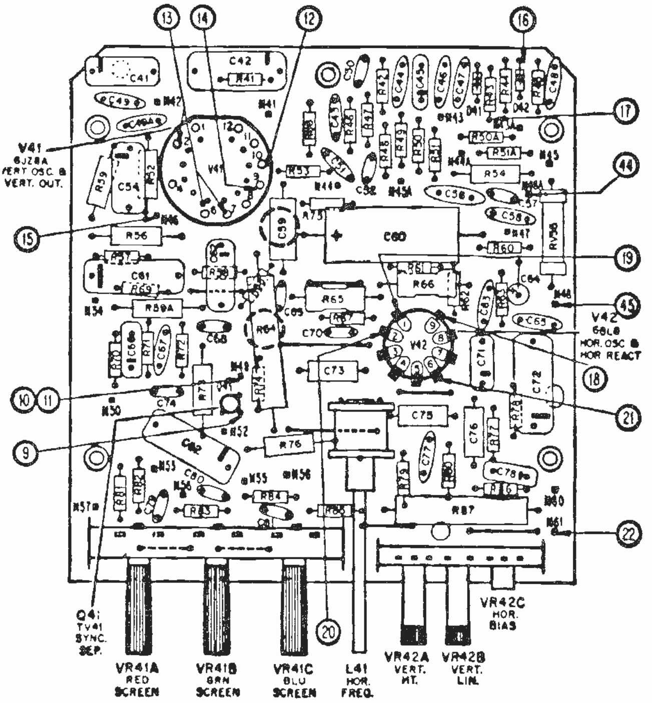
100K, 1w and be mounted vertically on the panel. Check the HORIZONTAL BIAS ADJUST control which should be set at its maximum high-voltage setting.

For an improvement in performance, resistors R77 and R78 may be changed to these values indicated on all incoming chassis repairs, thereby, possibly eliminating the occurrence of the symptoms described.

All Hybrid Color-TV Chassis—Vertical Rolling

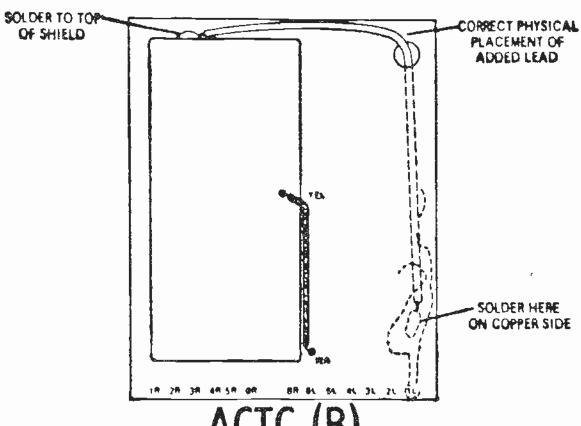
Field reports have indicated that a potential problem of vertical rolling may exist because of the failure of capacitor C59, 8200pf, located at the grid of the vertical-oscillator tube. Should this capacitor develop leakage, complete loss of vertical sync develops and the VERTICAL HOLD control has no effect.

Failure of capacitor C59 may be caused by heat generated by resistor R64 (750Ω or 1.5K, 7w), which is in close proximity to capacitor C59. It is therefore, strongly recommended that should this capacitor be found to be defective, be sure that resistor R64 is kept as far away from the capacitor as possible after replacement. Also, when performing any type of service on a hybrid chassis, reposition resistor R64 away from the capacitor to prevent any future failure of the capacitor.



Color-TV Chassis 3CS90/3CY90—Video Ringing in Weak Signal Areas

In the event a condition of video ringing appears in weak or fringe signal areas, the addition of a ground lead to the



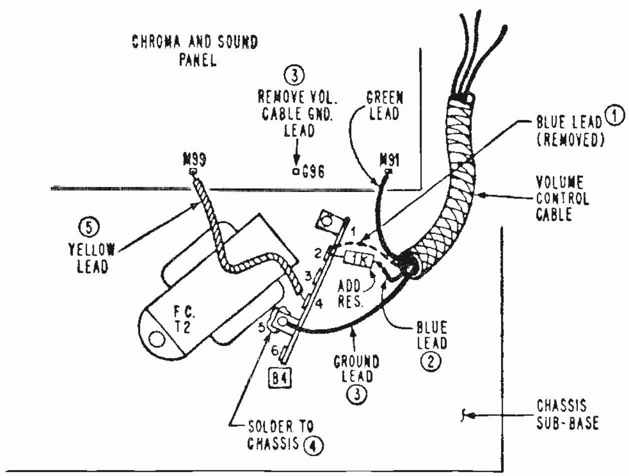
ACTC (B)
TOP COMPONENT VIEW

ACTC module (B) (Part No. 69-1000), between the top of the shield and terminal (1L) should correct the problem.

Color TV Chassis 22QT80, 21KT40/41—Buzz or Hum at Low Setting of Volume Control

If hum or buzz is encountered at low levels of volume in any of these chassis, the following procedures should remove or reduce the hum or buzz to a point where it will no longer be objectionable:

1) Remove the blue lead of the volume control cable



CHASSIS BOTTOM VIEW

from lug 2 on terminal B4.

2) Connect a 1K, ½w resistor between lug 2 and the blue lead.

3) Remove the ground lead of the volume cable from lug G96 on the PW panel and reconnect it to lug 5 (ground) on terminal B4.

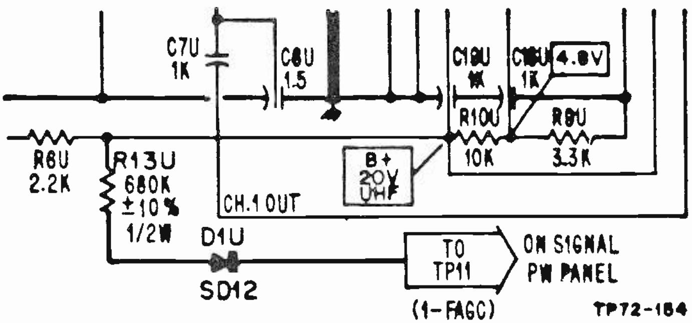
4) Securely solder ground lug 5 on terminal B4 to the chassis, for improved mechanical grounding.

5) Dress the yellow lead connected between lug M99 (on PW panel) and B4-4 away from filter choke (T2) and at right angles to the choke core, as shown in the accompanying illustration.

Color TV Chassis 4CS73/4CY91—Medium Level Snow on UHF Channels Using VVC Tuner

A production change has been made on the VVC tuner to increase the receiver's gain and eliminate or reduce medium level snow on UHF channels.

The change involves mounting a three-lug terminal strip on the tuner frame and connecting a 680 K-ohm resistor (R13U) from capacitor C19U to the anode of diode SD12 (DIU) No. 34-8057-13, and then connecting the cathode of the diode to lug TP11 (1-FAGC) on the Signal PW Panel with an added wire. (Refer to attached illustration for layout of the new parts.)



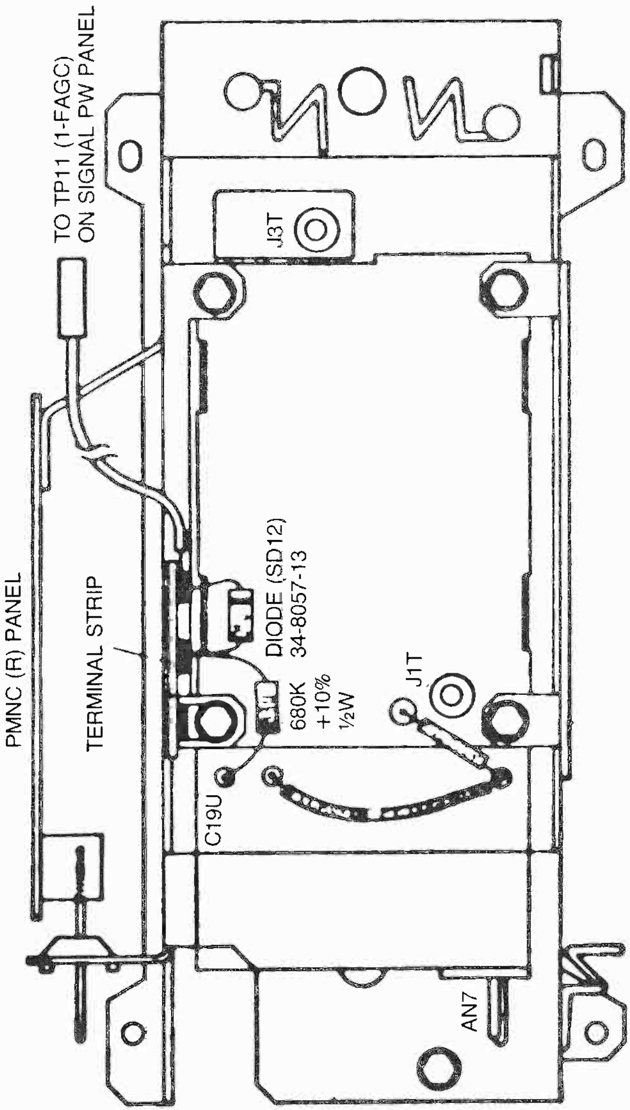
This modification should be made on tuners not already modified if a snowy UHF picture is produced in an area where a nearly snow free picture is possible (assuming no other defect is causing the snowy UHF picture).

Color TV Chassis 3CS90/91 and 3CY90/91—Failure of the Sound Module SDAC

Before replacing a defective sound module, first check the speaker for the proper part number and voice coil impedance. The manufacturer says field reports have shown that in some instances, when a defective sound module was located, the wrong speaker was found in the cabinet, thereby destroying the output transistor. For future reference, all speakers in all Philco modular chassis have a voice coil impedance of 22 ohms. The speaker part number for the 3CS90/91 chassis (19 inch portables) is 36-1734-1—and the speaker part number for the 3CY90/91 chassis (25 inch consoles) is 36-1734-4.

All A and B line chassis—Hum bar in video.

Check the +20V line and adjust for output voltage vs. AC line voltage as indicated in chart below. This assumes no other component has been found defective. With adjustment of the +20V line, hum bar should disappear.


TO TP11 (1-FAGC)
ON SIGNAL PW PANEL
J3T
PMNC (R) PANEL
TERMINAL STRIP
DIODE (SD12)
34-8057-13
680K
+10%
½W
J1T
C19U
AN7

PHILCO

AC Line voltage		+20V Output Setting	
105VAC	120VAC	+17.2V	+20V
110VAC	125VAC	+18V	+21V
115VAC	130VAC	+19V	+22V

RCA

RCA Victor 1966 Color Chassis

Screen sizes in RCA's 1966 line include 21 in. models, continued production of instruments using a 25 in. color picture tube, and a table model 19 in. color television receiver.

The 21 in. color instruments use the CTC16X chassis. Various types of home entertainment instruments using the CTC16X are available, including table models, consoles and color combinations equipped for FM, FM/stereo, AM and stereo phono. Althougł the CTC16X is basically a continued version of last year's 21 in. chassis, a number of engineering changes and tube-type changes have been introduced.

Twenty-five in. receivers use the new CTC-17X color chassis. Generally the CTC-17X is similar in many respects to the CTC17 of last year. This new color chassis, however, has additional provisions to prevent the possibility of UHF radiation interference; a transistorized circuit to provide for positive blanking of the color picture tube during vertical retrace; and added stability in the color section by using a frame-grid tube in the burst amplifier stage. The CTC17X chassis is employed in deluxe console instruments.

Instruments using the 19 in. rectangular 90 deg color picture tube employ the CTC19 color chassis. Although the CTC19 is a new chassis, the performance and service features contained in previous color chassis (especially those of last year's 25 in. chassis) are retained including: "X" and "Z" demodulation to recover R-Y, B-Y and G-Y color difference signals, simplified set-up procedures for convergence, purity and gray-scale tracking.

The CTC19 is designed to operate the 19EYP22, rectangular 90 deg CRT. The tube is a scaled-down version of the manufacturer's three-gun, shadow-mask 25-in. tube used in the CTC17 chassis.

Although the physical size and shape of the chassis is new (for accommodation of a 19 in. picture tube), the general operation of the receiver closely follows that of the 25 in. CTC17. Two "solid copper circuit" boards are used in main chassis construction. Instruments employing the CTC19 chassis uses VHF tuner KRK128.

All receivers are factory equipped for UHF operation, using the transistorized KRK120 UHF tuner. Remote control is included in some models. The three-function, all-transistor KRS28 remote receiver currently employed in black-and-white instruments is utilized.

Sound signals in CTC19 are processed by a three stage sound circuit, using a frame-grid 6JC6 as sound IF amplifier, a 6HZ6 as demodulator and a familiar 6AQ5 in the audio output circuit.

The front-end of CTC19 consists of a tuner with a nuvistor and frame-grid mixer and two IF stages using frame-grid tubes. Two video amplifiers are employed in the new color chassis. Like in the company's previous color chassis, the brightness signal is dc coupled to the cathodes of the picture tube via green and blue drive control circuits, and a convenient service switch is included for tracking adjustments. When this switch is in the service position a fixed potential is applied to the cathodes of the picture tube and vertical sweep is collapsed.

The CTC19 features a one-stage chroma bandpass, "X" and "Z" demodulators and color-difference amplifiers to recover R-Y, B-Y and G-Y signals. The progression of chroma signals through these stages follows closely the signal flow in the CTC17.

A 6GF7 tube is used in the vertical oscillator output stage. Although a few component values have changed, the basic circuit follows closely the vertical circuits in the CTC17 color chassis. Likewise, the horizontal oscillator AFC circuit is closely related to that used in the CTC17 oscillator circuits employing a 6FQ7. A 2AV2 focus rectifier, and a 6BS3 damper are used. The Horizontal output tube is a type 6KM6. The 6BK4B shunt regulator used in the CTC19 is a further refinement of the 6BK4 family. The 3A3 is used as the high voltage rectifier tube. A 24 kv second anode voltage for the 19 in. picture tube is provided by this rectifier. The high voltage control is in the grid circuit of the shunt regulator; a 1000 Ω metering resistor appears in the cathode.

Color Chassis — Checking the VDR

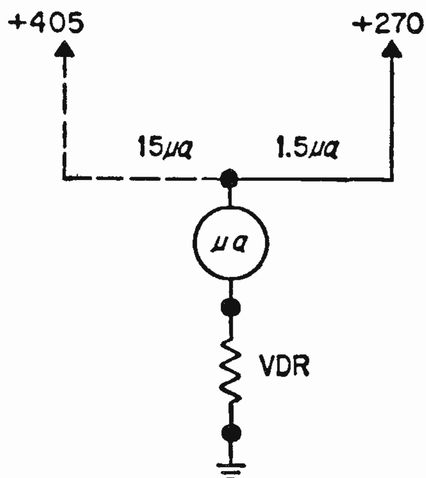
The vertical output circuit of the color chassis employs a voltage dependent resistor (VDR). This special component regulates the bias on the vertical output tube, permitting the vertical picture size to remain constant when wide variations occur in line voltage.

The VDR is generally trouble-free. There could be instances, however, where the service technician might wish to check its operation.

An open-circuited VDR will cause vertical overscan and some loss of vertical hold because of an excessive feedback pulse from the output section.

A shorted VDR will cause a loss of vertical deflection because of an absence of feedback from the output stage to the oscillator section.

One quick check of a VDR is to substitute a new part. Another method of checking a VDR is to substitute a 1M resistor — if the VDR is de-



fective, this resistor will allow the circuit to operate. However, vertical size will be excessive and no voltage regulation would be realized. A simple out-of-circuit test is shown in the illustration. This test is performed by measuring the current through the VDR when two different positive voltages are applied. A voltage difference of approximately 1.5 to 1 results in a 10 to 1 current change. Notice that the voltages used in the test setup are readily available from the operating television chassis and the test actually demonstrates the characteristics of the VDR. Remember the VDR is a reliable device and seldom become defective.

New RCA Vertical-Output Tube For Color

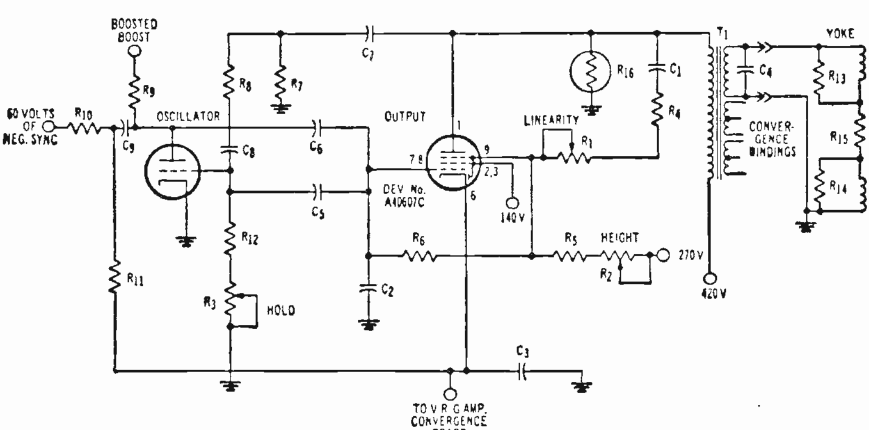
A new developmental beam power tube, which is said to offer the first practical solution to one of the most difficult problem areas in color TV receivers—the vertical-output amplifier—is announced by RCA. "The new developmental type beam power tube with integral diode, when used in recommended vertical-deflection circuits for color TV receivers, provides a number of outstanding benefits," according to G. J. Janoff, manager, marketing. "These benefits include true height control, exceptionally good linearity, a minimum of interaction between the height and linearity controls, greater independence from variations in tube characteristics, and fewer components than conventional circuits," he said. Two vertical deflection circuits have been developed by RCA for high B+ and low B+ operation of the new tube, RCA A40607C. Basically, these circuits operate in the same manner as conventional vertical-deflection circuits.

Their difference lies in the use of feedback stabilization provided by the integral diode which is connected internally to grid 3 of the tube. Both circuits are said to be insensitive to changes in tube characteristics and interelectrode leakage current.

The integral diode is used to develop bias and a drive waveform for grid 1. During retrace, capacitor C1 charges negatively through the diode. Potentiometer R1 controls the amount of charging current and in effect sets the start of scan on grid 1.

During scan, capacitor C1 discharges through the resistance path of R4, R1, R5 and R2 back to the B+ voltage. Capacitor C1 provides negative feedback voltage into the circuit which makes the circuit practically independent of tube characteristics. Potentiometer R2 is used to control the rate of discharge.

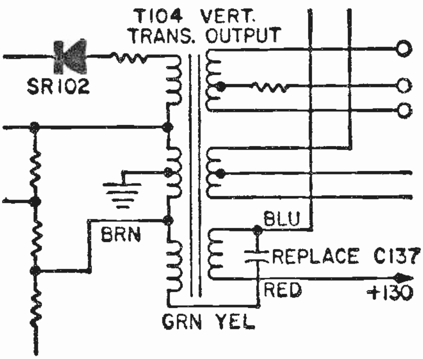
Because this independent path is provided for the partial development of the drive waveform and bias, the height and linearity controls have little effect on the vertical frequency.



FEEDBACK STABILIZED VERTICAL OUTPUT CIRCUIT FOR HIGH B+ COLOR-TV RECEIVERS

Critical Vertical Hold on RCA Victor CTC17, 17X Chassis

Reports indicate that leakage of C137, a 0.0033μf capacitor, may cause critical vertical hold.

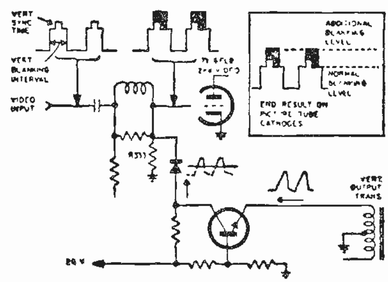


It is recommended that when a replacement is necessary, an RCA stock #120347 capacitor or one with exact specifications, be used. This capacitor is a ceramic 0.0033μf $\pm$10% and rated at 3kv.

RCA CTC17X Vertical Blanking

In modern TV design it is common practice to supply, from within the receiver circuits, blanking pulses in addition to those transmitted by the station. Most receivers supplement vertical blanking; some also include horizontal bianking. Usually, pulses obtained via fixed-value components perform this function. In RCA's CTC17X color chassis, however, active vertical blanking is realized by inclusion of a separate transistorized stage. The solid state circuit permits precise timing and shaping of a pulse to be used for elimination of vertical retrace lines.

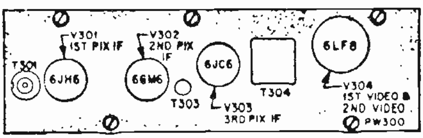
An NPN transistor functioning in a grounded base configuration is used. In this circuit, the emitter is the signal input element — that is, a pulse obtained from the vertical output transformer is coupled to the emitter. The transistor is so biased that during active scanning time the transistor is conducting. During the time that the positive vertical pulse is applied to the emitter (during vertical retract time) the transistor is forced into cutoff. Now, recall that in a common base circuit, with the signal takeoff in the



collector circuit, the input signal to the emitter has no phase reversal. Therefore, a selected portion of the positive input pulse is developed in the collector output circuit. The positive signal, shaped by the transistor circuit, is coupled via the diode to the grid of the second video tube; this added positive signal increase at the grid causes more tube conduction during the time indicated by the shaped portion of the waveform. (The waveform illustrated at the input to the video stage is indicating the vertical blanking interval and the vertical sync pulse). R333 (27K) is a bias resistor to limit the positive excursion on the grid, thus protecting the tube. The output signal available at the plate is, of course, a negative going signal, modified to include the additional blanking level. The transistor actually acts as a switch — during scanning time the transistor is conducting; during vertical retrace time, the transistor is driven into cutoff. The block diagram shows the end result on the picture tube cathodes — after inversion and amplification in the third video amplifier. The additional level appears during vertical retrace time; the increased positive signal impressed on the cathodes of the picture tube is sufficient to insure complete blanking of vertical retrace lines.

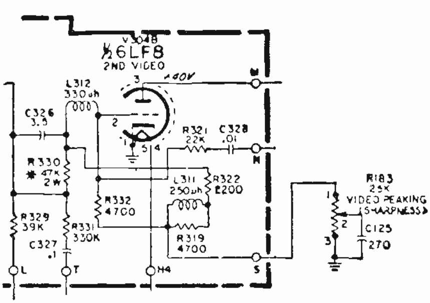
Comparing RCA's 1967 CTC21 Series With Its 1966 CTC17X Series

There are many similarities between the physical shape and electrical circuits of the 1966 CTC17X series and the 1967 CTC21 series color-TV receivers. Both series use 6JH6, 6GM6



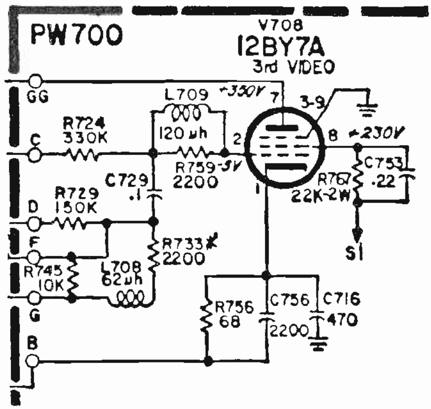
and 6JC6 tubes in the 1st, 2nd and 3rd video IF amplifiers and the 1st video amplifier is also similar with its 6LF8 tube.

Although the 2nd video amplifier is basically the same, a video peaking control (R183) (PICTURE SHARPNESS

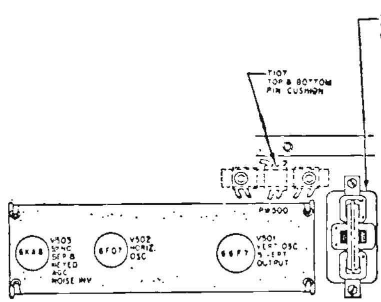


control located on the front panel) has been added to the control grid of the 6LF8 tube. This control grid is also the insertion point for vertical blanking signals. Pulses, obtained from the vertical output plate circuit via an RC network (R321 and C328), are coupled to the control grid.

The 3rd video amplifier stage on the CTC21 series uses a 12BY7A tube. The only significant change in this circuit has been the removal of the video peaking switch from the cathode circuit.

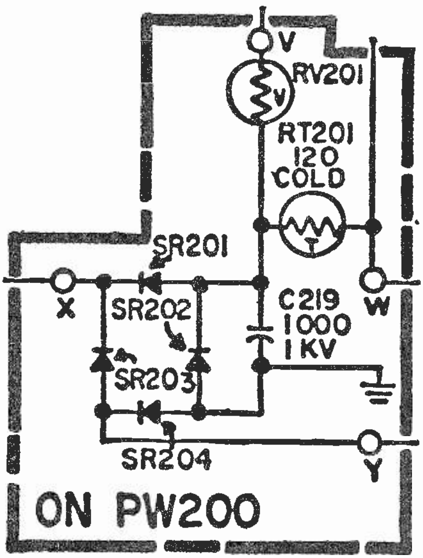


The AGC/sync separator and horizontal sweep stages (6KA8), the vertical oscillator and output stage



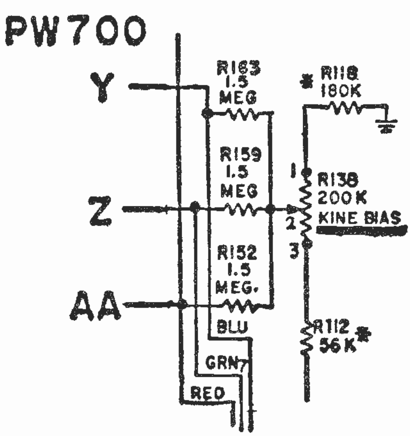
(6GF7), pincushioning circuits and B+ supply (bridge circuit using silicon diodes) are all very similar to those in the CTC17X series.

A new high-voltage rectifier tube (3A3A) is designed for higher reliability in the high-voltage circuits. The new tube is slightly shorter than type 3A3, but they are directly interchangeable. All new tubes of either type now have a circle of metallic paint on the bottom area of the glass envelope to



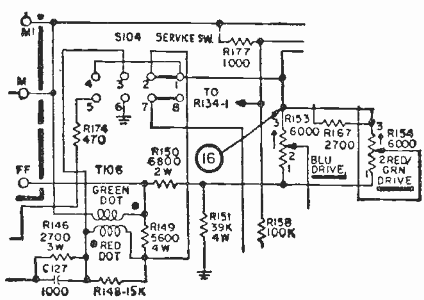
help prevent HV radiation.

The KINE BIAS adjustment has been relocated, and in the CTC21 series



the control (R138) is part of a voltage divider network across the 405v, B+ line. Adjusting the control changes the dc potential applied to the control grids of the color CRT. The red, green and blue grids are connected via 1.5M resistors to the potentiometer slider. With this variable control, finer adjustments can be made in the CRT bias conditions, resulting in maximum efficiency from the tube and less blooming at high brightness.

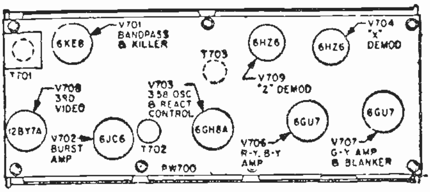
The CTC21 series has a new two-position switch located at the rear of the chassis. This switch is used to control the red or green video drive to the CRT. Changing the position of the switch interchanges the connection to the red and green cathodes, thus, connecting the drive potentiometer to either one cathode or the other. If B/W tracking cannot be obtained (especially after CRT replacement),



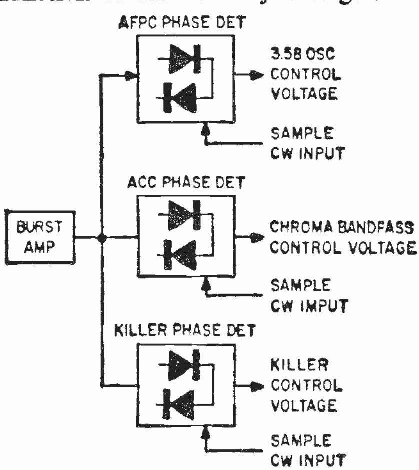
it may be necessary to change the position of the switch.

The service switch (S104) in the CTC21 is a three-position switch, having positions for NORMAL, SERVICE and RASTER. When raster is selected, all video and noise is removed from the color CRT, leaving a noise-free raster. In this position, purity adjustments can be made without removing an IF tube or using some other means to remove this signal from the screen. This position may also be used to check high-light/low-light color temperature tracking. (A similar switch is reportedly used on all 1967 RCA color chassis.)

Although the color stages of the CTC21 and CTC17X series are basically the same, some new features are incorporated in the CTC21. A different tube type is used in the chroma bandpass amplifier with a 6KE8 replacing the 6GH8A. The triode section of the 6KE8 functions in the color killer. This blanker stage uses the same circuitry as the CTC17X series, however, the output of the blanker remains constant since the switch has been removed from the plate circuit.



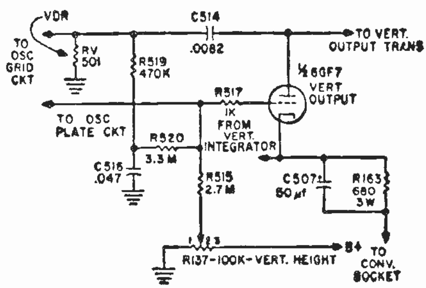
The block diagram illustrates the function of the color sync stages.



There are three separate detectors, one for AFPC, one for the killer function and one for automatic chroma control. The AFPC and killer detectors, although using diodes, have functions similar to the quadruple 6JU8 in the CTC17X series. The additional 3rd detector — the ACC circuit — is designed to provide a controlled gain through the chroma bandpass stage, with varying levels of incoming signals.

VDR Application in RCA CTC17X Color Chassis

A "varistor" (VDR) is a component which exhibits the characteristics of decreasing its resistance as the voltage across it increases. This characteristic is used to advantage in TV deflection circuits where regulation of sweep output amplitude is desirable.



A typical application of a VDR is in the vertical output stage—to maintain uniform vertical sweep over a wide range of line voltages (from low to high). The vertical circuit used in the CTC17X color chassis (see schematic) employs a VDR for this purpose.

In this circuit, RV501 conducts during the large positive retrace pulse which appears at the vertical output plate. This conduction charges C514 during retrace. During the scanning interval the resistance of the VDR is extremely high, so no loading is presented to the vertical output tube. R519 and C516 form an RC filter so a relatively clean negative dc voltage is developed across C516. Part of this negative voltage is applied to the vertical output tube grid through a voltage divider network consisting of R520, R515 and part of the height control resistance from the arm to ground.

As the line voltage increases, a larger positive pulse appears on the plate of the output tube during retrace. The additional pulse amplitude further reduces the effective resistance of the VDR during retrace and increases the charge on C514. More negative dc voltage is developed at C516 increasing bias on the output stage grid, lowering the output of the 6GF7 vertical output tube.

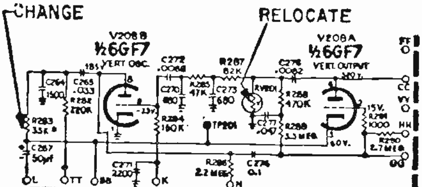
An open circuited VDR would cause vertical overscan and some loss of vertical sync. The loss in vertical hold is noticed with excessive overscan, the output tube grid is driven positive and plate saturation occurs. This attenuates the sync pulse which is normally amplified before it's fed back to the oscillator grid.

In the case of a shorted VDR, a loss of vertical deflection would result and feedback from the output to oscillator section is shorted to ground through the VDR.

RCA Victor Color Chassis CTC20 Vertical Sync and Height Slump

If you experience soft vertical sync, sync coupling resistor R282 should be changed from 470K to 220K as shown in the schematic. Production units now use the 220K.

In some cases you may find that vertical centering complaints are ac-



tually caused by slump at the top of the raster.

To help in correcting this condition:

1. Change R283 to a negative temperature coefficient resistor; the same value 33K should be used.

2. Relocate RV201 to bottom of chassis to prevent RV201 from changing value because of temperature.

In this particular system, an approximate. 5v reference voltage is generated within the integrated circuit for use in achieving total UHF AFT defeat action. This defeat action is electrically accomplished by shorting to this 5v reference, the correction voltage applied to the UHF tuner.

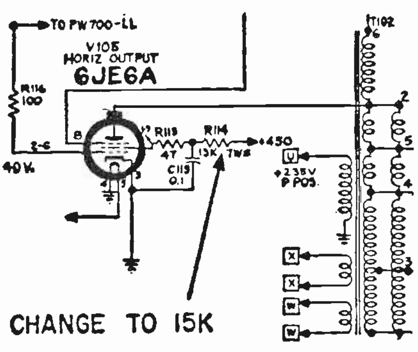
The automatic switching action which accomplished UHF and VHF defeat is identical to that employed by the CTC21. A switch, working in conjunction with the spring-loaded VHF fine tuning mechanism, provides the discriminator/amplifier output shorting action. When the fine tuning knob is depressed, the AFT is defeated; when the fine tuning knob is released, AFT operation is re-established. A similar switching action occurs with the UHF fine tuning mechanism, shorting the AFT amplifier output to the separate 5v reference.

The CTC30, like the CTC21, provides a customer permanent AFT defeat switch, mounted on the front control panel. The CTC30 control panel AFT defeat switch operates by shorting both AFT discriminator/amplifier outputs to the separate 5v reference.

Because of the possibility of AFT adjacent channel sound "lock-out" during VHF channel change, it is necessary to disable the AFT system during this time. This is achieved by momentarily shorting to ground (whenever VHF channel change takes place) the power supply voltage applied to the AFT discriminator/amplifier. The shorting action occurs between detent positions by allowing the grounded VHF detent spring (located on the front of the VHF tuner) to contact a small insulated terminal tied to the AFT power supply lead. This shorting action, in conjunction with a 25pf capacitor located on the AFT discriminator subchassis, provides the required AFT disable time necessary to achieve immunity from AFT "lock out." A 10 Ω resistor is placed in series with the AFT power supply lead to the shorting terminal. This resistor eliminates contact "pitting" caused by instantaneous shorting currents.

New Damper Tube in RCA Victor Color Chassis

Effective with November 1966 production, all 25in. color chassis CTC21, 24, 25 and 25X were equipped with a new type damper tube, 6CL3. The tube biasing is identical to the Novar



6DW4. However, the tubes are not interchangeable without circuit modification.

The 6CL3 is said to be more efficient than the 6DW4, requiring an increase in the screen grid load of the horizontal output tube. It will be necessary to change R114 from 13K to 15K if the new damper is used. Horizontal efficiency coil and HV adjustments must be performed after the conversion.

If you encounter a chassis where repeat failures occur — a change from the 6DW4 to the 6CL3 may help.

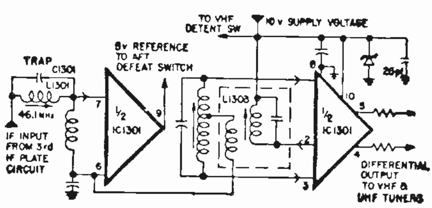
Color TV Chassis CTC30 — Description of the Integrated AFT Circuit

The AFT feature was first introduced in RCA Victor color television instruments June 1966, in the CTC21 color chassis. This is said to be the industry's first transistorized color television AFT system and continues in the 1968 CTC28 and CTC35 color chassis.

The CTC30 chassis will employ the integrated circuit AFT system. This system displays operational and reliability characteristics that in many categories surpasses comparable characteristics displayed by the transistorized AFT system.

The integrated circuit (IC) employed in this AFT discriminator/amplifier system is a type TA5274, labeled IC1301 in the circuit diagram. The functions performed by the IC and its associated outboarded components are: buffer amplification (IF), detection, differential dc amplification and dc voltage regulation.

The discriminator/amplifier functions in this manner:



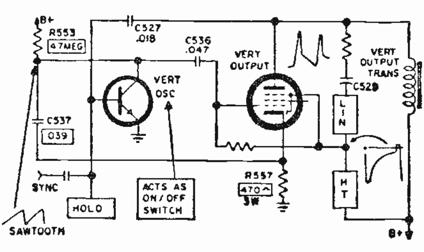
A sample of the picture IF output is applied to the AFT system through a 1.5pf capacitor located in the plate circuit of the 3rd video IF amplifier. This incoming picture IF energy is applied to a tuned input circuit consisting of L1301 and C1301. These components act both as an adjacent channel sound trap and an IF frequency peaking circuit — the correct trap frequency is automatically attained when the input tuned circuit is peaked at 46.1MHz.

The signal is then fed into the buffer amplifier section of the IC, the output of which appears across the discriminator transformer primary (also peaked to 46.1MHz). The discriminator transformer secondary is tuned to 45.75MHz. This secondary feeds the integrated circuit discriminator diodes. The output of the discriminator diodes is applied to an amplifier which delivers a differential voltage output. This differential output is composed of two voltages — one appearing at each of the IC output terminals. The difference between these voltages (or differential), represents the amount and direction of deviation of the incoming IF frequency (from 45.75MHz). If the incoming IF frequency is exactly 45.75MHz, each discriminator output terminal voltage is 5.5v, the difference between them is therefore 0 volts. As the incoming IF frequency deviates from 45.75MHz, one output terminal voltage increases and the other output terminal voltage decreases an equal amount. The voltage at each terminal will either increase or decrease depending on the direction the incoming IF frequency deviates from 45.75MHz. The system is capable of producing a ±9v differential within its pull-in range. This voltage represents a potential frequency correction for a frequency error of approximately two times the output of the single-ended transistorized system; the final VHF frequency error attained by the system is reduced by 50%. Also, because of this increased output, the pull-in range over which total frequency correction may occur is increased. The manner of obtaining oscillator frequency control by using a "variable capacitance" transistor in the VHF tuner and a varicap diode in the UHF tuner remains unchanged. Also, the manner in which AFT defeat action is accomplished is very similar to that employed by last year's CTC21. Some electrical differences exist, however.

VHF AFT defeat action can be and is electrically accomplished by shorting together the AFT differential amplifier outputs. UHF defeat is slightly different, however. The UHF varicap AFT action requires only one of the differential amplifier outputs. It would appear then, that UHF AFT defeat action would also occur if the AFT differential amplifier outputs were shorted. But, because of the relatively high impedance outputs, some partial UHF AFT action is present when these outputs are shorted. Even though the difference between the outputs is zero, the common above-ground voltage is not constant with fine tuning error.

Color TV Chassis CTC36—Vertical Circuit Description

The vertical deflection circuit comprises a transistor oscillator stage and a pentode output stage. The pentode is a special type, having a diode plate which employs the common cathode of the pentode. This diode, in conjunction

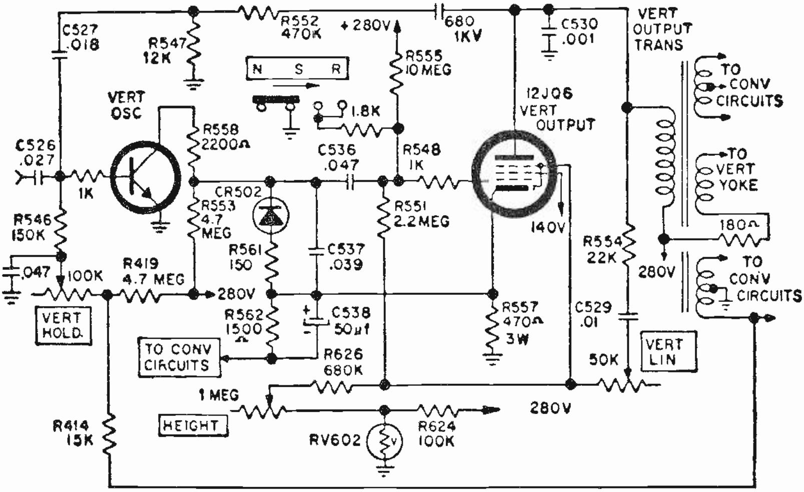


with a resistance-capacitance network coupled in a feedback arrangement between the output and the input electrodes of the pentode, develops a feedback voltage which is added to the sawtooth waveform for vertical linearity and size control. Another feedback path to sustain oscillations, is from the output stage to the base circuit of the transistor oscillator. The base circuit is also the input electrode for synchronizing vertical sync pulses. Vertical hold circuitry (customer control) is arranged to adjust the triggering waveform component to the base of the oscillator. The height and linearity circuits operate in conjunction with the pentode stage.

The transistor oscillator stage (see simplified schematic of vertical sweep action) acts as an On/Off switch. A resistance-capacitance sawtooth generator circuit (R553, C537) coupled to the grid of the output stage is subjected to alternate charging from the B+ supply and discharging through the transistor in an operating cycle recurring at the vertical sweep rate. (The charging path for C537 is completed through the cathode resistor of the output tube.) The oscillator transistor conducts during retrace time to provide a discharge path for the sawtooth capacitor. The sawtooth voltage developed across the capacitor (C537) is coupled through C536 to the control grid of the output stage. This grid voltage waveform, which is substantially linear, causes plate current to flow in the output stage. The plate current variation of the output stage is coupled to the deflection yoke by means of a vertical output transformer.

During the trace portion of each deflection cycle, plate current increases causing plate voltage to decrease in a substantially linear manner. At the end of vertical trace time, a positive polarity synchronizing pulse is applied via a capacitor to the base of the oscillator transistor, driving the transistor into conduction. As the transistor conducts, the voltage across C537 decreases rapidly, driving the control grid of the output stage negative.

When the output stage is driven into cutoff, the plate voltage waveform increases rapidly as a result of the energy



Vertical Oscillator and Output Circuit—CTC 36 stored in the deflection windings. The developed positive pulse, coupled through C527 to the base of the oscillator maintains the transistor conductive. Near the end of vertical retrace, as the positive waveform decreases, the oscillator transistor is turned "off." Capacitor C537 then commences to recharge, to initiate the next deflection cycle.

The linearity and height control circuits function in the following manner: During retrace time the capacitor (C529) in the linearity circuit is charged through the conduction of the internal diode. The discharging of this capacitor through the linearity and height control circuits during field scan provides the feedback waveform for linearity. The linearity control setting determines the amount of charge that C529 receives during retrace, thus the proper waveform for linearity can be attained. Adjustment of the height control, however, primarily determines the average dc of the waveform, and in so doing provides the bias control for proper picture height setting.

A detailed schematic of the vertical oscillator and output stages in the CTC36 can be used to point out several other features. The oscillator is provided with an additional triggering waveform component derived from the transformer secondary windings. The waveform is coupled to the base circuit of the oscillator via R414, the vertical hold control and R546. The dc base bias is provided by resistor R419 coupled from the B+ supply to the junction of the hold control and R414.

A diode (CR502) is coupled across the sawtooth forming capacitor C537. The purpose of this diode is to prevent an instability condition, because C537 would otherwise charge to cathode voltage potential during retrace; any disturbance in the output tube could then be regenerative and cause a severe jitter in the picture. With CR502 in the circuit, the voltage across C537 at the start of each cycle is substantially constant (namely the forward drop in the diode) independent of what the cathode voltage was in the preceding cycle. Thus, by guaranteeing that at the start of every cycle the grid drive on the tube always starts at the same point (for a given setting of the controls) the above mentioned instability is prevented.

A VDR (RV602) is located in the height control circuit to maintain substantially constant reference voltage to provide height "tracking" with line voltage variations.

The normal-service-raster switch grounds the grid circuit of the output tube through a 1.8K resistor when in the service position to collapse vertical sweep for making color temperature adjustments. The function of the 1.8K resistor is to provide protection for the diode and transistor from picture tube "arcs."—COURTESY OF RCA VICTOR.

Color TV Chassis CTC38—Difference Amplifiers Circuit Description

In the CTC38 chassis, pentodes are used as the R-Y and B-Y amplifiers to amplify the low level color signals from the balanced diodes. The R-Y amplifier (V705) uses a 6CB6A tube. The B-Y demodulator (V704B) uses the pentode section of the 6GH8A tube. This is possible because the 6CB6 and the pentode section of the 6GH8 have similar electrical characteristics. Notice in the simplified schematic (Color Difference Amplifiers) that the grid leak resistor from each of the difference amplifier stages is connected to the color killer circuit rather than ground. In this chassis the balanced diode demodulators are not killed as were the tube-type demodulators in the CTC31. Therefore, the R-Y and B-Y amplifier stages are color-killed in this chassis. The G-Y amplifier is very similar to that of the CTC31 because the input signal for this stage is obtained by combining a portion of the R-Y and B-Y signals in a matrix network. The 3.58MHz trap in the grid circuit of the G-Y amplifier eliminates any 3.58MHz energy that might be amplified by this stage.

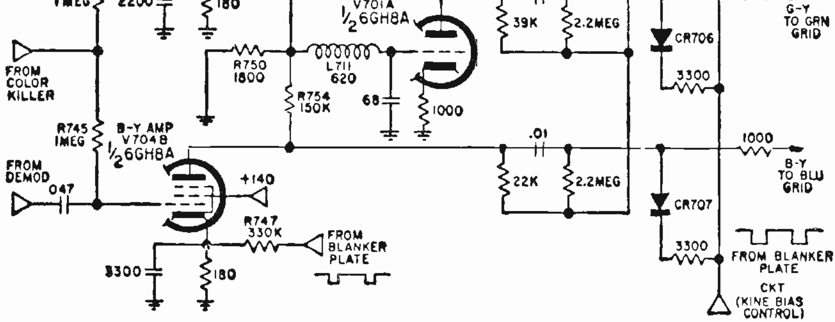
The ac coupling is used to drive the CRT grids as it was in 1968 two IF color chassis (shown in simplified schematic). Here again, the familiar diode clamp circuit is used to establish and maintain the dc operating point of the CRT tube grids. These clamp diodes are switched on during retrace by a negative going pulse at the plate of the blanker stage, and the low impedance presented by the forward-biased diodes effectively clamps the grids at a fixed potential that is established by the setting of the kine bias control. Notice also that 1K resistors appear in series with each grid lead to protect the diodes against any possible CRT arcing. Also added protection is provided by the 3.3K resistor in series with each diode.

An additional small pulse from the plate of the blanker stage is applied to the cathode of the B-Y amplifier. This pulse is used to adjust the operating point of the CRT blue grid so that the correct grid voltage is established, thus preventing a screen temperature shift under no color conditions when the B-Y amplifier stage is color-killed.

Color TV Chassis CTC40 – the MOS Field-Effect Transistor

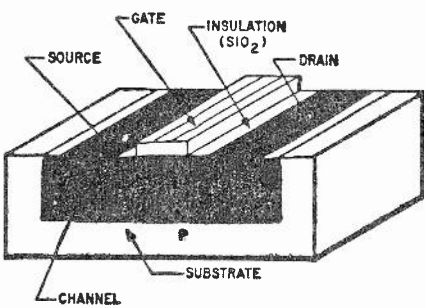
The KRK142 tuner used in the CTC40 color chassis features an RF amplifier stage using a special type dual-gate MOS-FET transistor. To those not acquainted with this terminology, the MOS-FET is a Metal Oxide Semiconductor-Field Effect Transistor. Because a solid-state device of this type has not been previously used, it would be wise to acquaint the reader with some interesting facts about this new transistor.

The MOS-FET combines the advantages of solid-state devices (small size, low power consumption and mechanical ruggedness) with a very high input resistance and linear over-all transfer characteristics that closely resemble those of a pentode vacuum tube. In



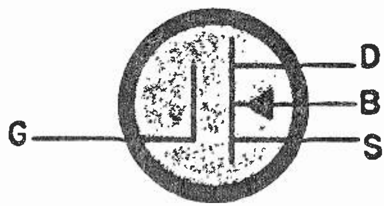
many respects an MOS-FET controls electron flow by the action of an electrostatic field. This implies that the signal input need not supply current, as is necessary in the case of driving the base of a transistor.

The input element of the MOS-FET consists of a metal control electrode (gate) that acts as one plate of a capacitor—the other plate consists of the semiconductor material. A charge applied to the gate electrode produces an equal but opposite charge in the semiconductor layer (channel) located directly beneath the gate. This charge in the channel area controls conduction between two additional electrodes known as the source and drain, which



are applied to the opposite ends of the channel. As shown in the illustration, the gate electrode of a MOS-FET is comprised of a metallic contact separated from the semiconductor channel by an extremely thin layer of silicon oxide which acts as an insulator (capacitor dielectric). In the depletion type device illustrated, a negative charge applied to the insulated gate electrode will deplete the source-to-drain channel of electrons. When a positive charge is applied to the gate electrode, conductivity will increase, resulting in increased electron flow. Because the source-drain current is controlled entirely by varying the electrostatic charge on the gate control electrode, no current is required to bias the input of the device. Therefore, the MOS-FET has an extremely high input resistance.

N-CHANNEL
DEPLETION- TYPE



The manufacturing processes used to produce MOS transistors are similar to those used for high-speed silicon switching transistors. Production starts with a lightly doped wafer of P type silicon material. After a polishing operation, the wafer is oxidized in a furnace and photo-lithographic techniques are used to etch away the oxide coating, exposing bare silicon in the source and drain regions of each of the multitude of transistors that are being formed on the wafer. The source and drain regions are next formed by diffusing an N type material such as phosphorus into the wafer.

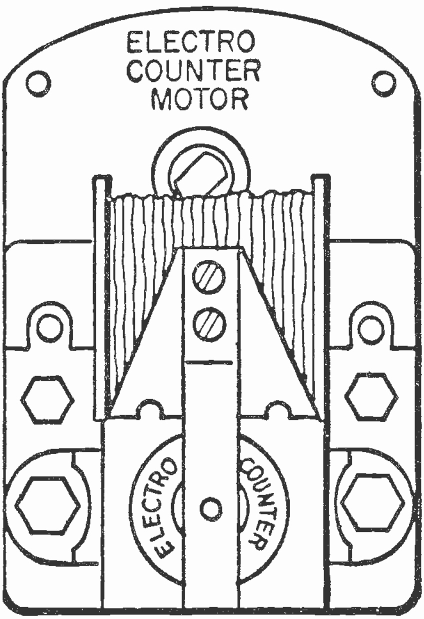
This diffusion operation forms a bridge (channel) between the source and drain electrodes.

The wafer is again oxidized to cover the bare silicon regions and a second photo-etching step removes the oxide overlaying the contact regions. In the next step, metal is evaporated over the entire wafer and another photo-etching step removes all metal not needed to produce ohmic contacts to the source, drain and gate electrodes. Finally, the many MOS-FET's on the wafer are mechanically separated and mounted on individual headers. Connection wires are then bounded to the metalized regions and each unit is hermetically sealed in its case. Courtesy of RCA Sales Corp.

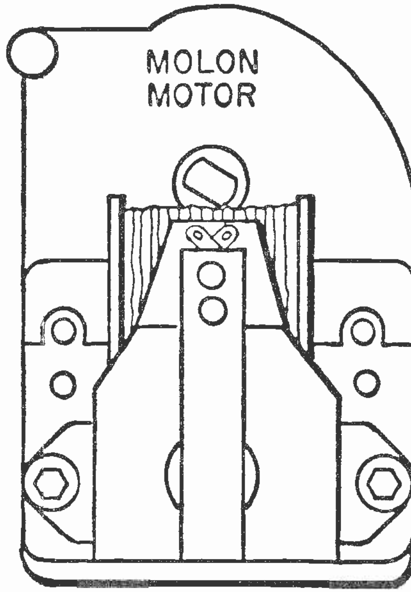
Non-remote Power Tuning CTC30 Chassis — Channel Skipping

Some models with nonremote power tuning may occasionally skip channels. The following corrective action should clear this problem.

Condition "A." Where there is a tendency to skip a VHF channel and an Electro Counter motor is used,



replace "leaf switch" S1002, stock number 115497. **Condition "B."** Where CR1202 diode has failed and an Electro Counter motor is used: (1) Add 10 μf capacitor C1201 — if it is missing, stock number 118832. (2) Replace S1002 switch, stock number 115497. (3) Replace CR1202 diode, stock number 116052. **Condition "C".**



Where there is a tendency to skip a VHF channel or jam and a Molon motor is used, replace motor with Electro Counter m^tor stock number 119680.

Automatic Gain Control

Automatic gain control of a television receiver differs fundamentally from the AGC of an AM broadcast receiver because of the difference between video modulation and audio modulation. In an AM broadcast signal, tones lower than about 30Hz are not transmitted; consequently, any .3-second sample of RF carrier amplitude will be the same as any other .3-second sample. The AGC detector needs a time constant no greater than about 0.3 second to average the received signal and adjust the gain accordingly. The video which modulates a TV transmitter has much lower frequency components. For example, if an all-white picture is transmitted for 5 seconds, the frequency of the video is 0.1Hz. Simply increasing the time constant of the AGC (to perhaps 30 seconds) is not a solution, because unwanted variations in signal level may have shorter periods than the modulation video.

There is one part of the video signal which always produces the same level of transmitter output, namely the horizontal sync pulse. For this reason, the AGC system is made to be sensitive only to sync pulses, and completely insensitive to video information. If the amplitude of sync pulses from the second detector is made to be always the same, all the shades of gray which comprise a scene can be displayed correctly. This type of AGC system is called "keyed AGC," and is used almost universally in modern TV receivers.

Fig. 1 shows the basic keyed-AGC system. Under no-signal conditions, the control grid voltage is zero and the cath-

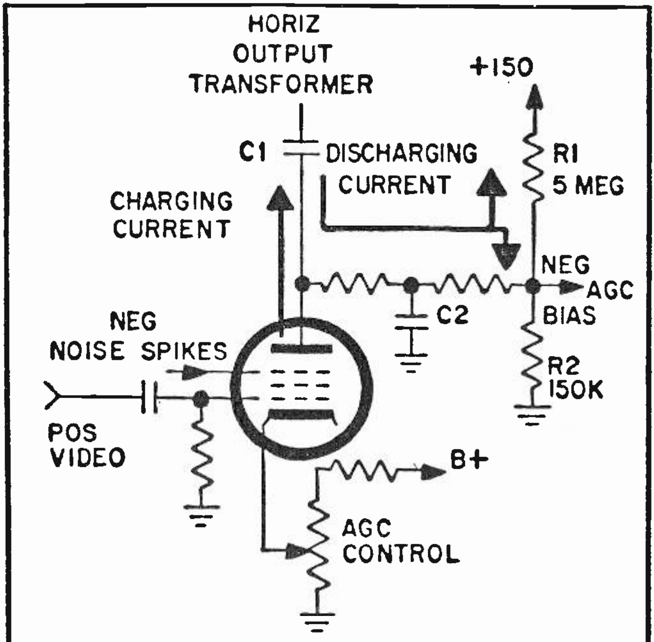


Figure 1 — Basic Keyed-AGC System

ode is biased positive enough to hold the tube near cutoff. The signal at the plate consists of a series of positive pulses from the horizontal-output transformer, but these have no particular effect, since the tube cannot conduct. The bias voltage under these conditions is determined by the voltage division between R1 and R2, and is about + 4.3v. This positive bias to the grids of the RF and IF amplifiers causes them to have maximum gain when no signal is present.

When the receiver is switched to an active channel, video from the receiving section appears at the AGC keyer. As the horizontal oscillator syncs to the incoming signal, each positive retrace pulse from the horizontal-output transformer appears at the plate of the AGC keyer at the same instant a horizontal- sync pulse appears at the control grid.

With both control grid and plate driven positive, the keyer tube conducts, charging capacitor C1. Between pulses, the charge on C1 leaks off through resistors R1 and R2, causing their junction to become negative with respect to ground. This voltage is filtered by capacitor C2 and fed to the grids of the RF and IF amplifiers.

The amount of charge on C1 is determined by the amplitude of the horizontal-sync pulses. If this amplitude increases, the charge increases, the currents through R1 and R2 increase and the AGC voltage becomes more negative. This reduces the receiver gain and, consequently, the amplitude of horizontal-sync pulses from the receiver is maintained at a constant value.

If there were no noise-immunity provisions, a positive noise transient (spike) occurring simultaneously with a sync pulse would effectively increase the amplitude of pulse

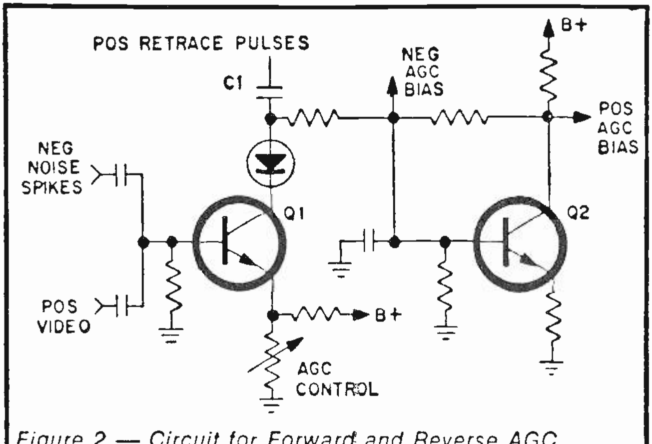


Figure 2 — Circuit for Forward and Reverse AGC

at the grid of the keyer and cause the AGC voltage to swing too far negative. To prevent this, the video signal is inverted and passed through a differentiator, a short-time-constant circuit which removes the sync pulses but passes noise spikes. These negative pulses are fed to the suppressor grid of the keyer tube, thereby reducing conduction. In effect, any unwanted noise pulse is fed to both the control grid and suppressor grid, but the polarities are opposite and they are canceled.

Another method of separating noise spikes from sync pulses is to apply the composite video to a circuit which is biased so that it requires a signal more positive than the sync pulse to bring it out of cutoff. Its action is similar to a sync separator, except that noise spikes, instead of sync

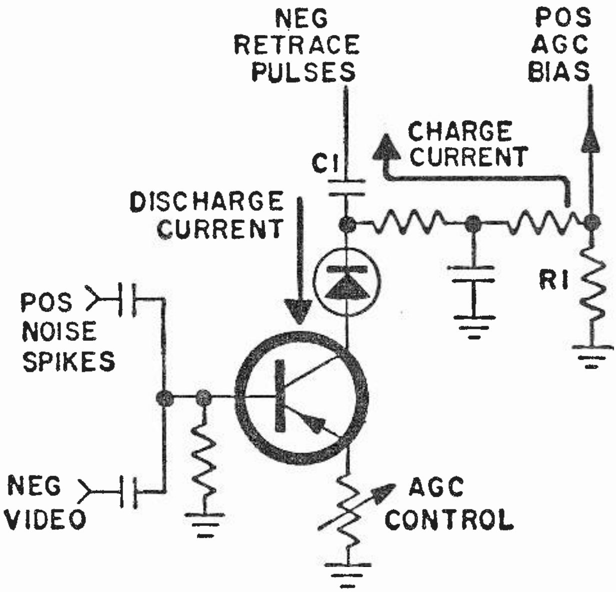


Figure 3 — Circuit for Forward AGC

pulses, are the output. These spikes are fed to the AGC keyer.

In solid-state receivers, it is normal for the AGC bias to be made more positive as the signal tends to increase (forward bias). Fig. 2 and 3 show two methods of modifying the AGC keyer to accomplish this. In Fig. 2, an NPN transistor (Q1) is used as a keyer. The circuit works much like the tube circuit, except that noise pulses are canceled at the base of the transistor instead of being fed to separate elements of the amplifying device. Transistor Q2 is simply an inverter which changes a negative-going input into a positive-going output; gain is very low and may be less than unity. This circuit is useful if both forward and reverse AGC are used in the same receiver.

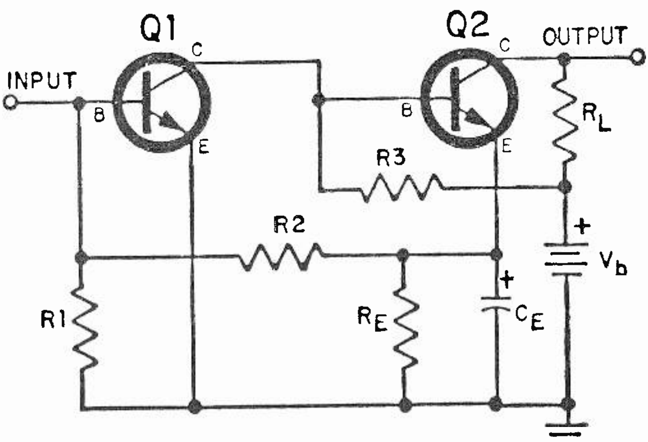
In Fig. 3, positive-going AGC is obtained by using a PNP transistor and reversing the polarities of all the inputs. In this circuit, capacitor C1 is discharged through the transistor during retrace time, and then it must charge through R1 during trace time. As in Fig. 2, the function of the diode is to prevent the AGC voltage from "leaking off" through the transistor.

Servicing Direct-Coupled Circuitry

Technicians are being required to service more and more equipment that employ direct-coupled transistor stages. This type of coupling is simple and transistors readily adapt to it. Many service technicians first encountered direct-coupled stages in portable radio audio output circuitry. Next came complete direct-coupled amplifiers for stereo instruments. Now, with the advent of transistorized television, even more direct-coupled circuits are being used.

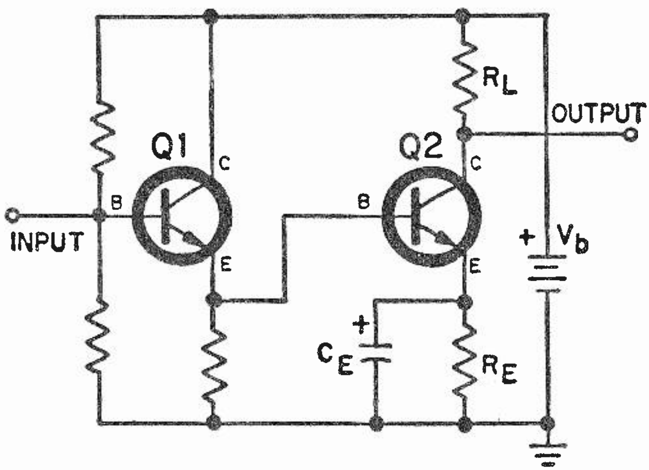
In the direct-coupled circuit shown, resistor R3 served as both the collector load resistor for transistor Q1 and the bias resistor for transistor Q2. Resistor RL is the output load of the amplifier. If another stage were added, RL would serve the same function as R3—collector load for Q2 and bias supply for the added stage. Resistors R1 and R2 enhance circuit stability by providing a feedback path. Stability is of prime consideration in direct-coupled stages since temperature-caused bias variations in one stage will be amplified by all following stages resulting in temperature instability. This is often a limiting factor to the number of stages that can be direct-coupled.

Servicing direct-coupled stages requires a technique that is somewhat different from those used to troubleshoot R-C



or transformer-coupled stages. A different approach is needed since each stage is dependent on the preceding stage for bias. If several stages are direct-coupled, a defect causing incorrect operation of one will affect the bias of the next, and therefore all succeeding stages. Normal signal injection/tracing techniques cannot completely isolate the trouble in this type of circuit.

The actual troubleshooting technique involves checking individual transistor element bias potentials. Start at the output stage of the circuit and check back through each stage to the input of the circuitry involved. Each reading is noted (write it down if necessary), then compared to both the expected normal reading and to the readings taken at



other points in the circuit. The starting point for trouble-shooting circuitry would be to measure the voltage drop across RL to determine the operating condition of Q2. Little drop (or no drop) would indicate non-conduction, while heavy conduction would cause a large drop. In either case, it is necessary to measure the bias potentials on Q1 to determine whether the trouble is actually in the circuitry of Q2, or caused by incorrect bias supplied to Q2 (as a result of Q1 circuit defects). As an example: if tests indicate Q2 is conducting heavily, the cause could be Q2 emitter-to-collector leakage; however, the symptom would be similar if a defective Q1 did supply excessive bias to the base of Q2. The defect can be isolated to a particular stage by checking bias potentials of all transistors in the circuit (starting at the output), and comparing these readings to the normal expected potentials and to each other. Other methods of direct coupling may be encountered as shown in illustration. The servicing technique described in this article is also applicable to this and most other direct-coupled circuits.

Don't overlook the possibility of a defect in one stage supplying excessive bias to one or more succeeding stages, thereby causing other devices to fail. Some circuit designs have built-in current limiting to prevent subsequent device failure; in other designs, multiple device failure is quite possible. Remember, however, a logical analysis of all the dc bias potentials in a circuit will greatly simplify the troubleshooting procedure—regardless of the circuit configuration.

Color TV Receivers—Sound Trap Adjustments

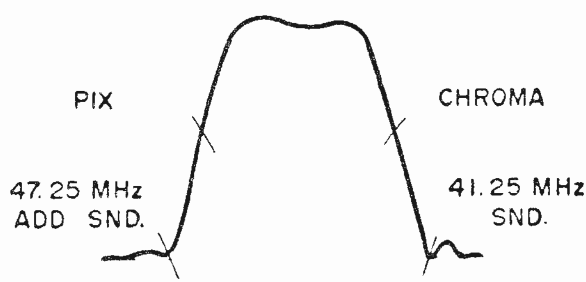
Color television receivers use tuned trap circuits to minimize or eliminate undesired signals. In most chassis, these resonant traps serve to attenuate three frequency components.

The 41.25MHz sound trap reduces the amplitude of the co-channel sound carrier to a point low enough to prevent beats between it and the video carrier.

Another trap (adjacent channel sound) is tuned to 47.25 MHz. As its name implies, this trap restricts the bandpass of the IF system so that the adjacent low-channel sound carrier will not cause interference.

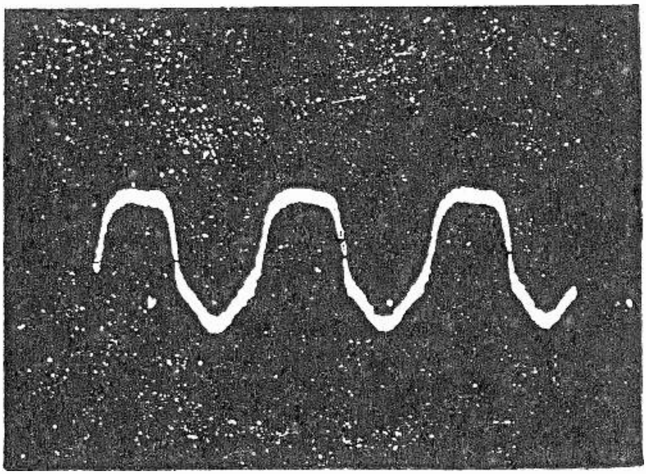
A third trap, resonant at 4.5MHz, is located at the input of the video amplifier system in a color receiver. This trap serves to prevent the 4.5MHz sound signal from beating against the 3.58MHz chroma signal. If the two frequencies are permitted to combine, a 920kHz beat pattern is visible on the screen of the receiver.

All of the above traps should be checked and/or set during the receiver alignment procedure. Shown in the illustration are the positions of the 41.25MHz and 47.25MHz trap frequencies on a typical IF response curve. Both trap frequencies are at the bottom (minimum gain point) on the curve. The alignment instructions specify that the traps are to be adjusted for minimum marker response. This may (or may not) be easy, depending upon the technician's methods and skill. At best, good judgement is required for accurate settings.



It is common practice in many service shops to radiate the marker signals into the chassis. This system, aside from making trap adjustment difficult, can also cause other problems, such as overloading and distortion of the sweep curve.

As previously indicated, the trap frequencies are at the minimum gain points in the IF system. Therefore, it is often difficult or impossible to see the markers without using excessively high levels of marker signal, and risking possible distortion of the sweep curve because of signal overload. It is also evident that it is difficult to judge the exact points of minimum 41.25 and 47.25 response with low



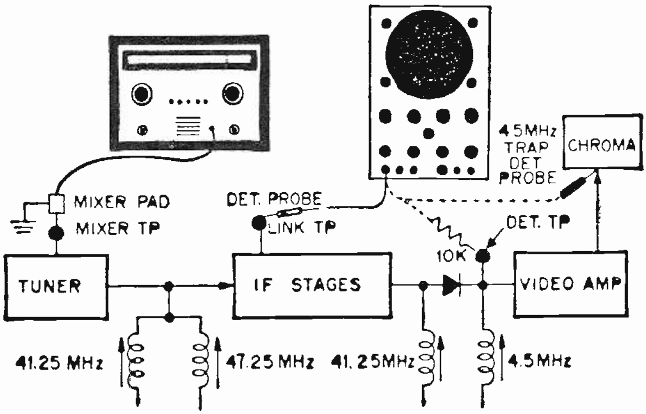
level marker signals when making sound trap adjustments.

The situation can be greatly improved by using the post detection marker insertion system in which the marker signals are not passed through the chassis and thus not affected by IF gain. This is easily accomplished by using an external marker adder. Some recently manufactured alignment equipment includes built-in provisions for post detection marker insertion. Although this system represents an improvement over radiating markers into the chassis, trap adjustment still depends upon correctly interpreting the minimum response points on the curve—often difficult for maximum accuracy.

Modulated CW Method

There is a simple and positive method for setting traps that overcomes the limitations of the radiated marker system, does not require a marker adder, or rely entirely upon the judgement of the technician. This system uses the calibrated marker generator to supply a modulated signal (at the trap frequency) to the input of the television receiver. The normal detector probe (or video detector in the receiver) with an oscilloscope for visible indication, acts as a null detector. Trap setting then becomes simply a matter of adjusting the trap while observing the scope pattern for minimum response. This is easy because the "high Q" nature of these traps makes the null quite sudden and sharp as seen with the modulated signal. With the trap nulled, it has been adjusted to the exact frequency required.

This trap adjustment procedure is accomplished by disconnecting the mixer grid pad from the sweep generator



and connecting it to the output of the marker generator. The technician should next adjust the attenuator switches on the front panel of the marker generator to obtain a low amplitude signal on the lowest input voltage range of the oscilloscope. A suitable level is indicated when the modulated sine wave is undistorted—both top and bottom are symmetrical. (Some experimentation should be attempted on a chassis known to be aligned properly before this procedure is adopted.) When the signal (41.25MHz or 47.25 MHz with 600Hz modulation) is applied, a sine-wave pattern will appear on the scope. The trap can then be adjusted for minimum scope response.

The reader should realize that the accuracy of trap adjustment depends on supplying accurate, calibrated, test frequencies. Therefore, it is advisable to review the marker generator frequency calibration instructions supplied with the instrument before using this procedure.

4.5MHz Trap

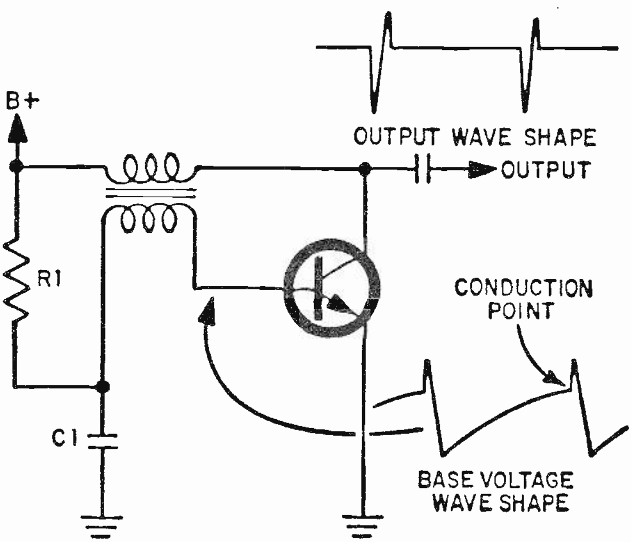
The remaining trap (4.5MHz) is located at the input of the video amplifier. This trap is adjusted somewhat differently, in that we are now dealing with video frequency signals. Also, the procedure will vary somewhat from chassis-to-chassis.

To adjust the 4.5MHz trap, service data will specify connecting the oscilloscope to a particular point in the chroma circuit—usually bandpass amplifier. Once correct input and output conditions are established as per instruction in the service data, the 4.5MHz trap is adjusted for a minimum 600Hz response on the oscilloscope.

Although the foregoing procedures involve changing connections of test equipment, and may on the surface seem somewhat cumbersome, the technician will find (after a little practice) that traps are quickly and easily adjusted with no element of guesswork involved.

Solid-State Blocking Oscillator—Circuit Description

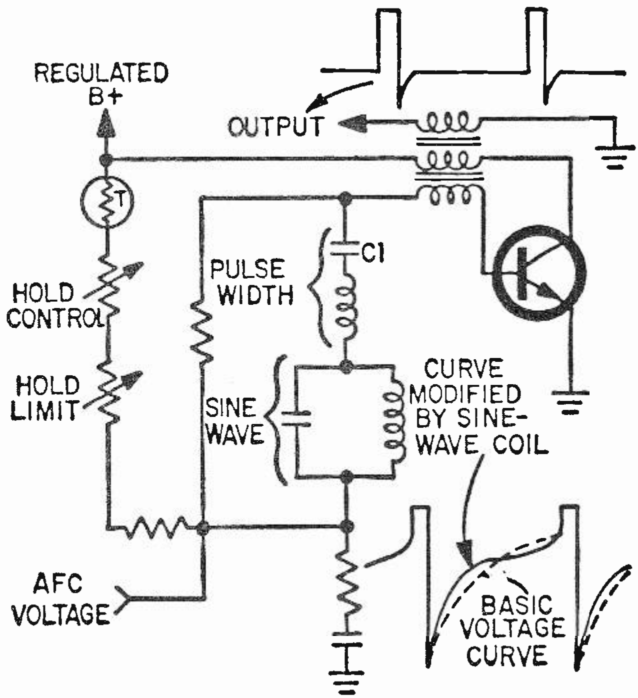
Although the operation of a transistorized blocking oscillator is similar in most respects to the operation of the vacuum-tube counterpart, an examination of the solid-state circuit is warranted. Shown in the illustration is the basic circuit.



Assume that B+has just been applied. The transistor is slightly forward biased by the large resistance between the base and B+, allowing it to conduct, causing a voltage drop across the primary of T1 (collector transformer). This drop is transformed to a positive-going voltage in the secondary which drives the transistor base further positive. The base current is substantial during this time, charging C1. When current saturation (collector) is reached, the magnetic field in T1 can't increase and the secondary voltage falls towards zero. This allows capacitor C1 to begin discharging through resistor R1 to B+, causing the transistor base to be driven negative. This cuts off collector current, allowing the collector voltage to return to B+potential and also driving the base to its maximum negative voltage.

The charging path for C1 has very little resistance but the discharge path through R1 has high resistance. Therefore, the transistor is biased below cutoff for an appreciable length of time which depends on the RC time constant of R1 and C1. When enough of the charge on C1 has leaked off to allow the transistor base to resume conduction, the entire process is repeated.

Several modifications of the basic circuit normally are made to improve overall performance. A typical horizontal blocking oscillator circuit incorporating these changes is shown in the schematic. In the basic circuit, there are



but two windings in the transformer, and the output is taken from the collector. A third secondary winding is often used to provide the output, particularly if a positive pulse is required.

The output of a blocking oscillator characteristically has rapid rise time, a spiked crest and an equally rapid decay. Sharp rise time is normally desirable, but it is usually necessary for the output pulse to have a flat top. This may be accomplished by inserting a suitable delay network between the pulse transformer and the transistor base. By using a resonant circuit, C1 may be made part of the delay circuit. By choosing the correct resonant frequency, the rise time of the output remains short, but the negative-going signal fed back to the base is delayed until the resonant circuit has completed about one-half cycle. As a result the device remains in saturation for the desired period thus producing a flat-topped output.

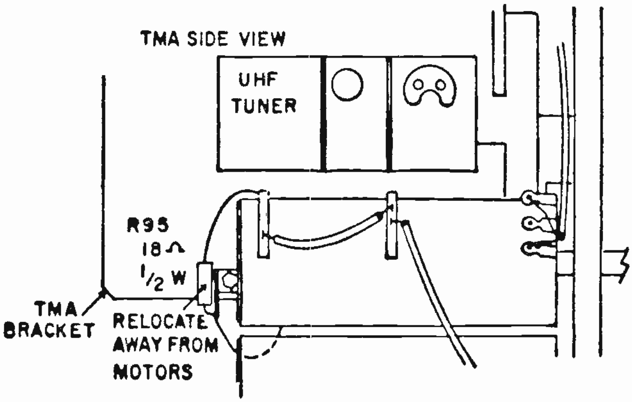
The base waveform shows that between pulses the base voltage rises along an expotential curve. Since the amount of rise per unit of time is relatively small at the time when the base is approaching its conduction point, minute variations in bias voltage, stray fields etc. may cause slight shifts in frequency called pulse jitter. This may be eliminated by modifying the base voltage so that it rises rapidly into conduction. A parallel resonant circuit tuned slightly above the oscillator frequency may be connected between base and ground to change the base-voltage waveshape to make the frequency more stable.

The frequency of a blocking oscillator may be controlled (within limits) by varying the voltage supplied to the bias resistor. By making this voltage more positive, the base returns to the forward-bias point more quickly and frequency is increased. If it is made less positive, the frequency will decrease. In a horizontal-oscillator application, the correcting voltage, which is derived from the horizontal AFC system, is added to the base bias voltage to achieve automatic frequency control of the oscillator.

The hold control and hold-limit control shown in illustration allows the oscillator to be adjusted to the correct frequency by changing the RC time constant of the base circuit. Once this frequency is set near 15,750Hz, the control voltage from the AFC circuit will hold the oscillator in synchronism with the horizontal sync pulses.

Color Remote Control TV "G" Series—Pilot Lamp Lead Dress

The remote color television receivers referenced to this bulletin use a twin-lead for power to the pilot lamp. In some instances (specifically after normal service operations and during reinstallation of the tuner mounting assembly), the "high" side of the lamp power lead could be accidentally "pinched" between the TMA bracket and chassis "shorting" the lamp to chassis. The following corrective steps are to be performed when the referenced receivers are serviced: (1) Make a visual check of the pilot lamp supply lines (twin lead) to find out if lead has been "pinched" or "shorted" by TMA bracket. (2) If lead has been pinched or shorted, remove TMA and place a "spaghetti" sleeve over the pilot lamp leads. (3) Check physical location of

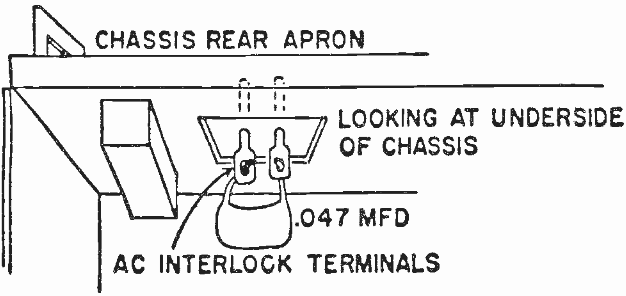


pilot lamp series resistor R95 (18Ω ½w). This resistor, shown in illustration, may be located in close proximity to the color remote motor. Take corrective action necessary (relocate terminal board leads, and/or "body" of resistor) to position body of resistor in a location at least two to three inches away from any of the remote control motors (i.e., color, tint, volume). This action may involve a simple relocation of the terminal board further rearward on the TMA bracket. Resistor R95 is accessible without pulling the TMA or chassis.

It is recommended that all service technicians carry sleeve "spaghetti" and small, isolated-type terminal boards when making in-home service calls on referenced receivers.

Color TV Series "G"—AC Line Capacitor

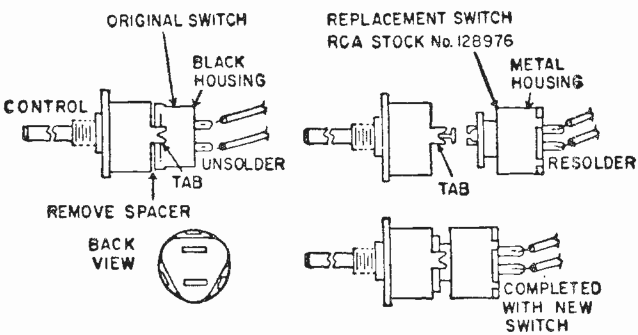
The color television receivers referenced have a .047μf filter capacitor connected across the ac input line. Due to its physical location (wired directly across the ac interlock terminals), the capacitor can easily be checked and/or replaced in the home using the following guidelines and illustration: (1) Remove rear cover and chassis retaining bolts; slide chassis slightly rearward to inspect capacitor across interlock terminals. (2) If the approved capacitor, identified by its white color and stamped with drawing number 90097-221 or 1442487-221 is used, secure chassis and restore receiver operation. No further action is necessary. (3) If the capacitor viewed is brown or reddish-



brown in color, it should be replaced with the approved type. The RCA Stock Number of the approved capacitor is 111286. It is recommended that all service technicians carry this approved type capacitor.

Color TV Model 14F, 14G, 14H Employing CTC15 Chassis—Power On/Off Switch

The color television receivers referenced have a pull-on, push-off type switch assembly that may experience premature failure. Original switch assemblies should be removed

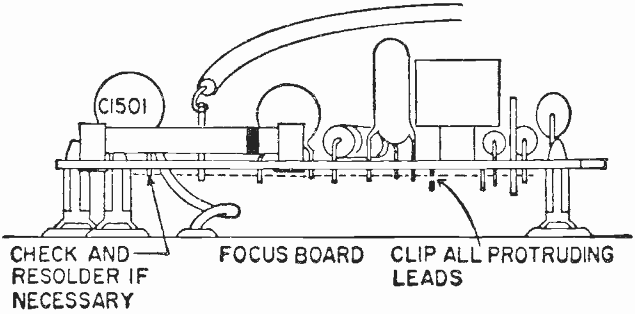


and approved replacements installed as outlined: (1) Remove rear cover and identify the type switch in the receiver. If the switch is the same type as the approved replacement, replace rear cover and restore operation. No further action is necessary. (2) If the original type switch is identified, it should be removed and the approved replacement (RCA Stock No. 128976) installed. (3) The switch should be replaced in the home as follows: Loosen the tuner mounting assembly, unsolder ac leads and remove original switch from the control by bending the three retaining tabs outward. Remove spacer, pull the actuating shaft of the replacement switch to its extended position and slip over the end of the control shaft. Now, secure the switch by bending tabs inward over the switch shoulder. Resolder leads, install TMA and check switch action. Replace rear cover and restore receiver operation with no further action necessary.

The RCA Stock Number of the approved switch is 128976. It is recommended that all service technicians carry this approved type when making in-home service calls on referenced receivers.

Color TV Series "L"—Focus Board Circuitry

The color TV sets included in this series contain focus boards that could arc to ground. To provide a method of checking and eliminating any arcing in this area, the following procedure should be used: (1) Remove the plastic dust cover from the focus area by unsnapping plastic clips (if the cover is translucent, discard). (2) Unsnap the focus board from the chassis mounting standoff. Use care when unsnapping. (3) Clip off all protruding leads to within 0.1 in. of the board, as illustrated. (4) Inspect the solder connections between C-1501 and the board, resolder if needed. (5) Reinstall the board on its proper chassis standoffs. (6) Install an opaque plastic dust cover, RCA Stock No. 128661, if the original dust cover was discarded. Note: It is recommended that the RCA Stock No. 128661 opaque dust cover be carried by service technicians when making calls to service this chassis.

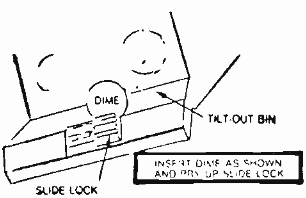


Color TV "M" Line—Tilt-Out Bin and Slide Lock Replacement

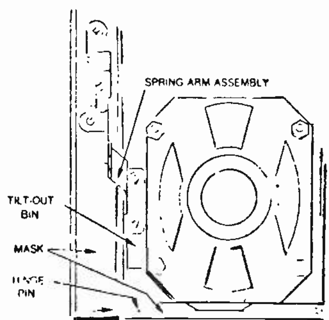
Both the tilt-out bin (crystal-control panel) and the slide lock (clip-door lock) that holds the bin closed are individually replaceable on "M" line color television instruments utilizing this feature.

To remove the lock, pry up the rear (or slide portion) of the lock with a coin or small screwdriver (as shown in the illustration) until it is released from its track on the bin. To replace, insert the lock so that the slide portion is above the track, then press down until the slide snaps into place.

To remove the bin: (1) Remove the customer controls panel from the bin and disconnect the speaker leads. (2) Remove two Phillips screws, securing the spring arm assembly to the bin. (3) While facing the rear of the cabinet, release the left hinge pin by pressing the pin into the hole (in the bin) until it clears the edge of the mask. (4) The bin can then be rotated slightly (to disengage the other hinge pin) and removed from the front.



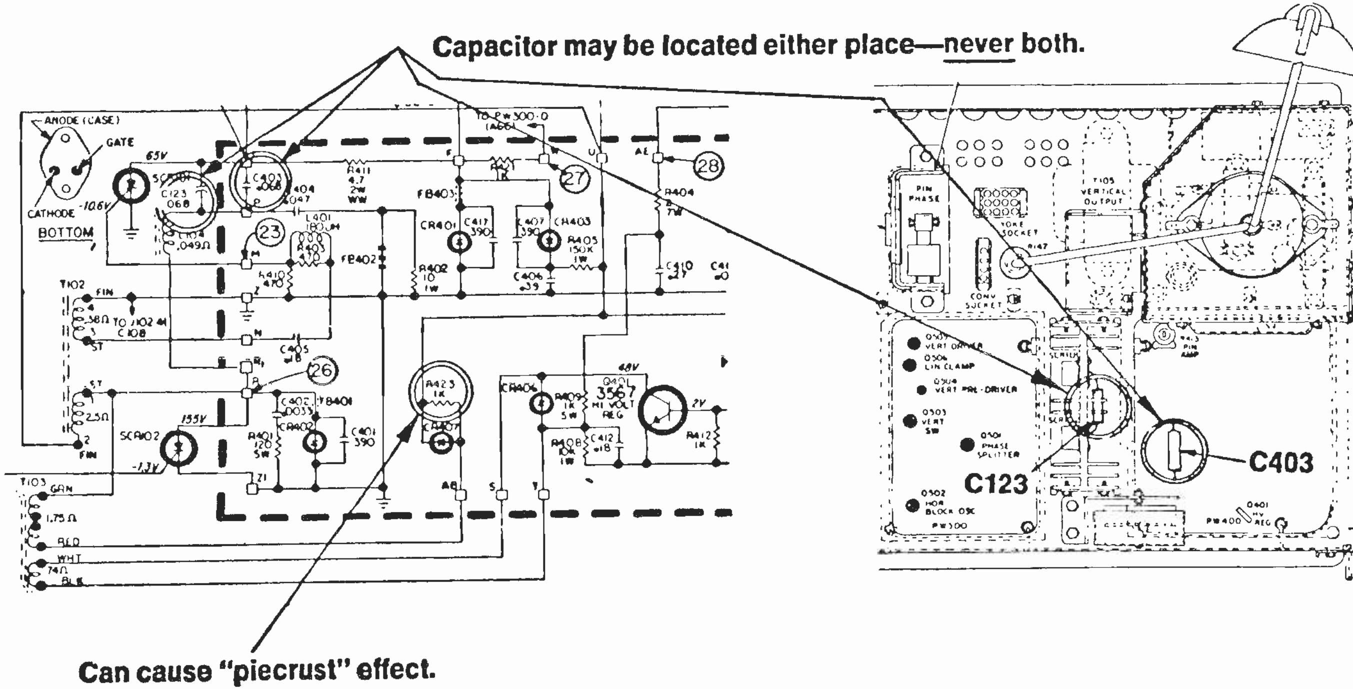
Slide Lock Removal



Tilt-Out Bin Removal

Color TV Chassis CTC40, 47—Servicing SCR Sweep System

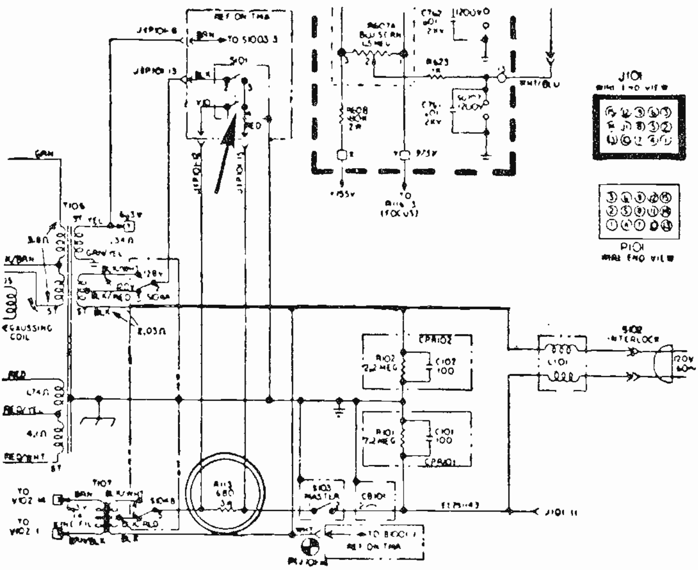
The 0.068μf commutator capacitor used in the horizontal deflection circuit of this chassis is located either on the PW300 board or on a terminal board under the SCR heat sink. Two capacitors in parallel are never used. If the capacitor is on PW400, it is C403; off the board, it is C123. In either case, the capacitor is the same type and the replacement stock number is 165437.


Capacitor may be located either place—never both.
Can cause "piecrust" effect.
C123
C403
ANODE (CASE)
GATE
CATHODE
BOTTOM
SCR401
SCR402
CR401
CR402
CR403
CR406
CR407
R404
R405
R411
R402
R423
R412
FB401
FB402
FB403
T102
T103
T105 VERTICAL OUTPUT
PIN PHASE
YOKE SOCKET
CONV SOCKET
PW300
PW400
HI VOLT REG

A "piecrust" or "geartooth" effect in the raster (scalloped edges) at different brightness levels may be the result of resistor R423 opening. Under these conditions the high voltage and brightness limiter operation appear to be normal, while in some instances the symptom may be accompanied by a high-pitched squeal.

Color TV Chassis CTC40—Color Tracking

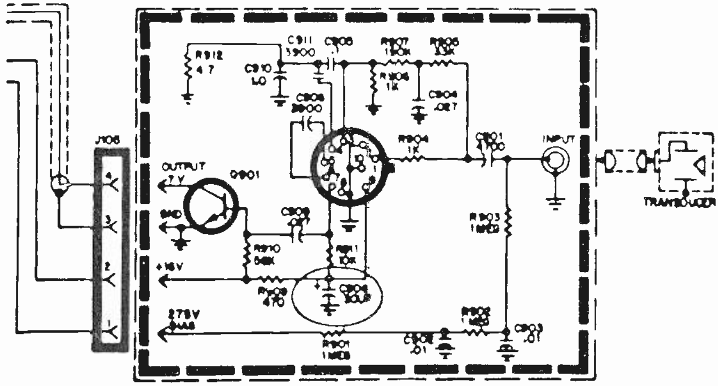
Some color tracking problems in instruments utilizing the CTC40 chassis—which seem to relate to a defective picture tube—may actually be the result of a defective ON/OFF switch. Should the section of the switch used to bypass



the picture tube filament dropping resistor (R113) become intermittent, the filament voltage could vary between 5 (STANDBY) and 6.3v (ON). This can cause variations in color tracking.

Color TV Chassis CTC42/43/44/47—Reduced Remote Sensitivity

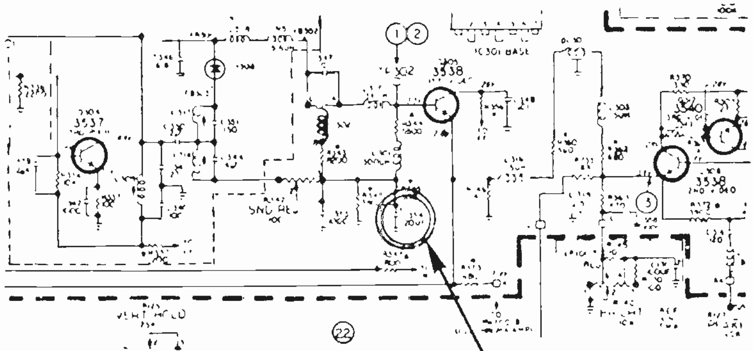
Reduced remote-control sensitivity of instruments utilizing these chassis may be the result of an off-value electrolytic capacitor in the preamplifier. The capacitor is Symbol No. C908, Part No. 128058, a 30μf, 15v electrolytic ca-



pacitor. If replaced, use part No. 132062, a tantalum type 27μf, 15v electrolytic for maximum reliability.

Color TV Chassis CTC40, 44, 47—Distorted Video and/or Marginal Sync

A wide variety of video and/or sync symptoms in these chassis may be the result of an electrolytic capacitor (a



Check Electrolytic

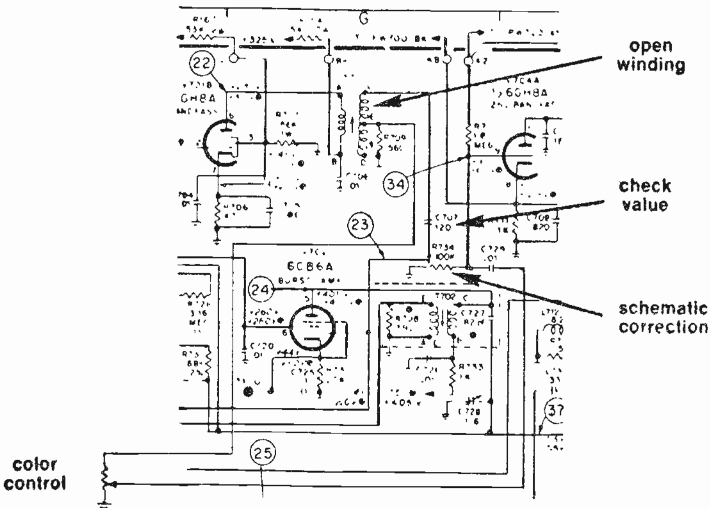
20μf 15v electrolytic, RCA stock No. 121995) changing value. Possible symptoms include: video "smear"; video "bends"; unstable sync; or various combinations of these symptoms. In addition, the symptom may vary with the brightness control setting.

Color TV Chassis CTC 38, 39—Color Sync

Some symptoms associated with the color sync and/or ACC-killer circuitry in TV sets utilizing these chassis may be the result of an open winding in the first bandpass transformer, T701 (Stock No. 124761). If the open occurs in the winding connected between terminals C and E, the color signal input to the burst amplifier stage will be incorrect. However, the path for chroma input to the second band-pass amplifier stage will be normal.

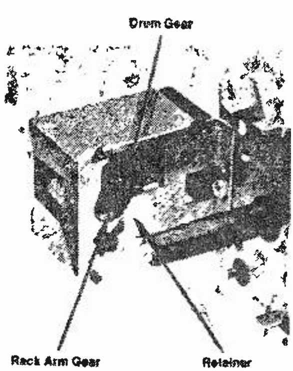
In addition, make certain capacitor C707 is the correct value (120pf).

The schematic correction pertains to Service Data 1970 No. T3 only.



Color TV Chassis Employing U Tuner (KRK170)—UHF Channel Indicator

In areas of multiple UHF channel reception (where the TV station channels used are relatively close together), some difficulty may be encountered identifying specific channels on instruments utilizing the six-detent U tuner (KRK170).



Optimum channel identification can be achieved by either of the following methods. Both require removal of the tuner mounting assembly.

First, if the error is slight and the instrument is non-remote:

- Tune the mechanism so that the lowest channel in the area is indicated on the drum.
- Loosen three ¼-in. U tuner mounting screws and slide the tuner (holes are slotted) until that channel is received, then tighten the screws.

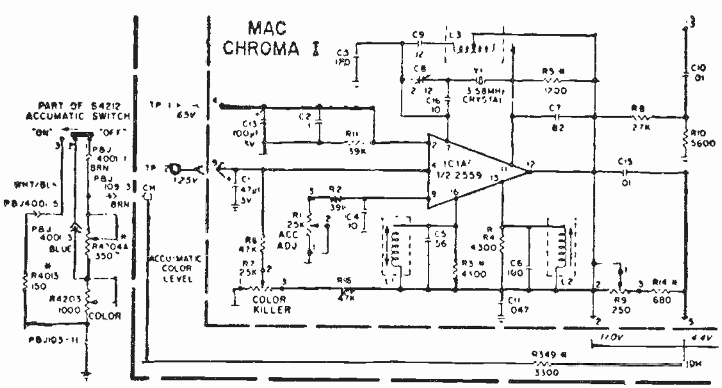
If the error is greater, or the instrument is a remote type:

- Tune the KRK170 for reception of a known channel, preferably one between channels 45 and 55.
- While holding the indicator drum, spring the nylon retainer out until the teeth of the drum gear are disengaged from the teeth of the rack gear arm.
- Turn the U drum until the indicator shows the channel being received.
- Mesh the teeth of the drum gear and the rack gear, then return the nylon retainer to its original position.

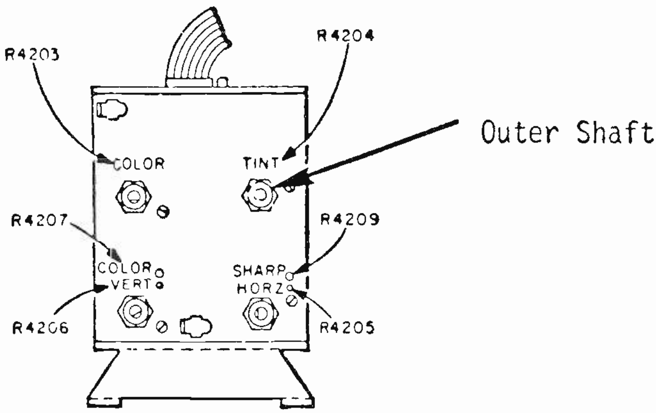
Color TV Chassis CTC46 Series—AccuMatic Color Level Control Adjustment

The function of the AccuMatic color level control is to provide a means of trimming the "AccuMatic On" color saturation level so that it is the same as that set by the customer color control during "AccuMatic Off" operation.

The AccuMatic color control is a service adjustment which is set during manufacture and normally needs no further attention unless the MAC module is replaced. If the MAC (Chroma I) module is replaced, then turn the



AccuMatic OFF, tune in a color program, set the customer color control to minimum and adjust control R9 until color just disappears. Then adjust the customer color control for the most pleasant color viewing. Turn AccuMatic ON and adjust the AccuMatic Color Level Control (R4204A) so that there is minimum change in color saturation between AccuMatic ON and OFF operation.



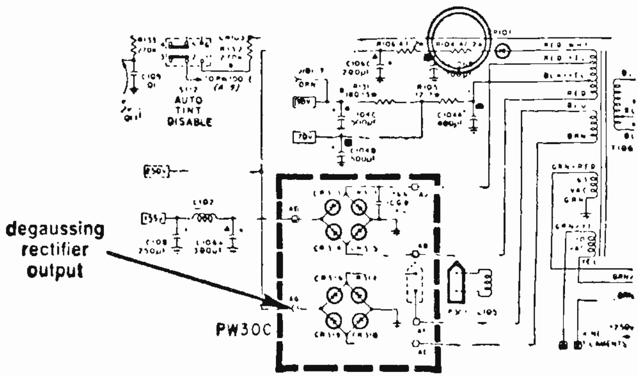
The control is one section of R4204 (customer tint control) and is accessible by removing the tint knob. Use a general cement GC9308, Xcelite TW-140 or similar tool to make the adjustment.

Color TV Chassis CTC44/CTC47—Hum Bars and/or Degaussing "Interference"

Resistor R104, in the 240v dc supply circuit, is a 47Ω, 2w flame retardative (film) type resistor in early-production receivers. In the event this resistor fails, the instrument may continue to operate on the 220v dc supplied by the degaussing bridge rectifier output. Symptoms for R104 failure may include a hum bar and/or degaussing "interference" in the raster.

For a quick check, unplug the degaussing coils and if the video is lost, the 250v dc supply is inoperative. In those specific chassis where resistor R104 fails, replace it with a 47Ω, 4w flame retardative type resistor (Stock No. 132879).

Replacement resistor R106 (47Ω, 2w film) is Stock No. 132951.



Color TV Chassis CTC 46 Series—Servicing with the ACM Switch Disconnected

The automatic color (ACM) switch associated with this chassis is secured to the cabinet mask (rather than the tuner mount assembly) by two Phillips type screws. The switch can be left in place by unplugging one Molex-type connector and disconnecting two automatic color control light switch leads from the tuner assembly.

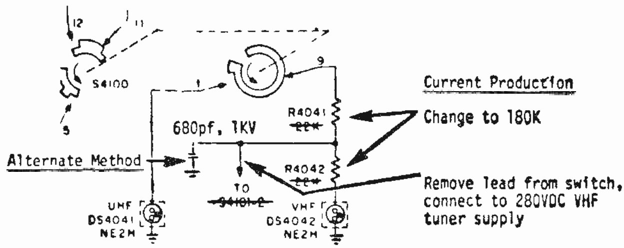
The chassis can be operated without the automatic color switch connected. However, the serviceman should be aware of the following: the AccuTint circuitry will be ON. Color cannot be completely extinguished with the color control unless controls R4204A (AccuMatic color level) and/or MAC-R9 are misadjusted. The TINT control range will be off-center (toward greenish fleshtones).

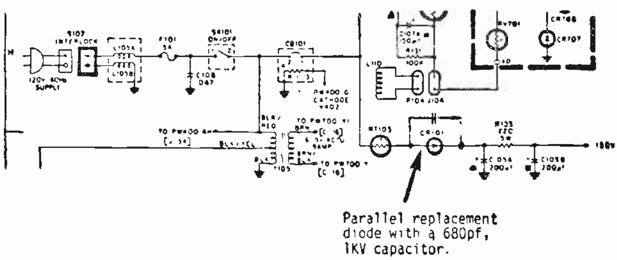
When troubleshooting color circuitry, or for a final operational check after other circuits have been serviced, the ACM switch should be connected.

Servicing can be simplified by stocking a spare switch. Either switch assembly (Stock No. 133653 or 134507) can be used for troubleshooting purposes.

Color TV Chassis CTC 52 Series—"Hum-Bar" Interference

There is the possibility of a hum-bar in the picture on TV sets employing this chassis, when operated in weak signal areas. The interference appears as the "silicon-bar" type normally associated with the power supply rectifiers. In some cases the interference may be from the neon channel indicator bulbs. For TV sets in current production the bulbs are operated on dc, as shown in the partial schematic. An alternate method, which may eliminate the interference on one channel but not another, is to add a capacitor as shown.

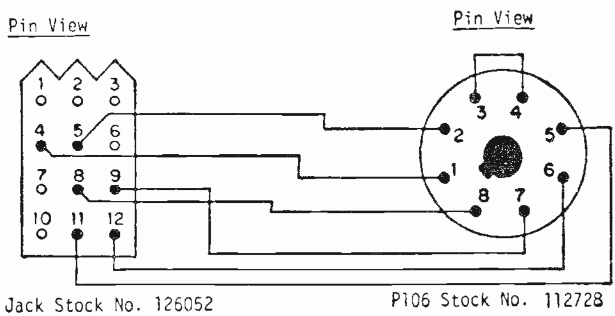


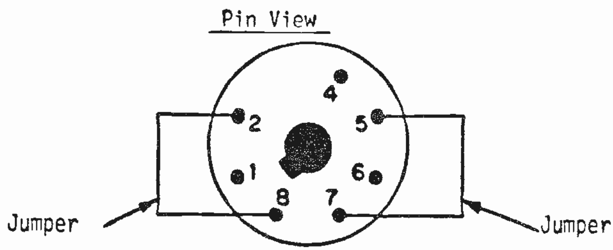


Premature failure of the 130v B+ supply diode, CR101, in early-production TV sets utilizing this chassis may, in some instances, be the result of a kine arc damaging the diode. To prevent failures, make certain that a 680pf, 1kv capacitor (Stock No. 113165) is connected in parallel with the replacement.

Color TV Chassis CTC 46 Series—Operating the CTC 46 on a CTC 40-44-47 Test Fixture

A special yoke adaptor and convergence jumper plug are required to operate the CTC 46 chassis on a test jig that is set up for the CTC 40, 44 and 47 chassis.

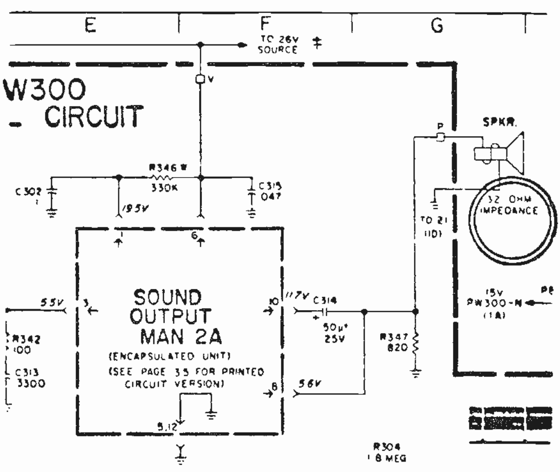




P107 Stock No. 114767

Color TV Chassis CTC 46 Series—Sound Output Module

The output impedance of the sound output module (MAN) is relatively high (32 to 35Ω) compared to other current color chassis.

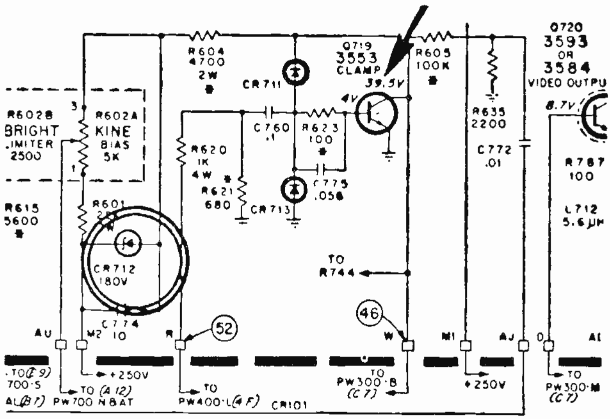


In the event bench servicing is required, make certain a lower impedance (4 to 8Ω) test speaker is not used, since this can result in damage to MAN module components.

Color TV Chassis CTC 40, 44, 47—Brightness Problems Caused by Diode CR712

Some brightness symptoms in these chassis, which are generally associated with CRT circuitry, may be caused by a leaky or shorted zener diode, CR712. The symptoms may include—retrace lines in raster—inability to cut off raster with brightness control—not possible to extinguish lines with screen and/or kine bias controls during color temperature setup procedure. The collector voltage of the clamp transistor, Q719, should read 139.5v.

schematic correction
normal reading 139.5V



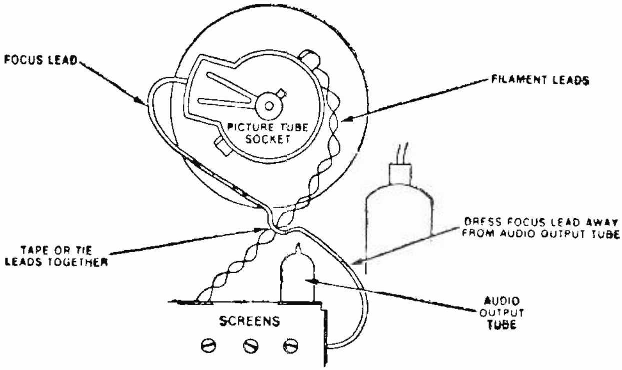
Color-TV Chassis CTC38/39—Picture Tube Focus Lead

Lead dress is established in a specific configuration in TV sets for several reasons. One reason is to prevent interference between the various circuits in the receiver. Another important reason is to insure the reliability and safety of the instrument.

The consequences of changing leads from their intended position can be severe. Symptoms and hazards bearing no relation to the original service problem can be induced into the receiver.

One such possibility concerns the positioning of the focus lead attached to the picture tube socket of the CTC38 and CTC39 chassis. During manufacture, the black focus lead is attached with tape or a tie wire to the two brown filament leads. This lead dress is established to keep the focus lead away from the audio output tube. If this lead dress is not maintained, over a period of time heat from the tube may cause deterioration of the insulation. The result can be an audio output tube failure, due to arcing between the lead and the tube elements.

To insure maximum reliability, this lead dress should be checked whenever the receiver is serviced for any reason.



Color-TV Chassis CTC46 Series—Color-Temperature Adjustments (Revised)

To make a proper color temperature adjustment, first set the SCREEN controls to minimum (full CW). Next, adjust the DRIVE controls to maximum (full CW). Then turn the KINESCOPE BIAS control to minimum (full CW).

Position the SERVICE switch to the SERVICE position and advance the SCREEN controls one at a time, properly balancing their output to just produce a horizontal white line. If one or more of the guns will not light, advance the KINESCOPE BIAS control until the dimmest gun will just light, then proceed with SCREEN control settings as just outlined. The BRIGHTNESS control has no effect when the SERVICE switch is in the SERVICE position.

Position the SERVICE switch to raster position. Set the BRIGHTNESS control to a normal viewing level and adjust the DRIVE controls for 9300° Kelvin color temperature (white raster). One of the DRIVE controls must be at maximum when the set-up is completed.

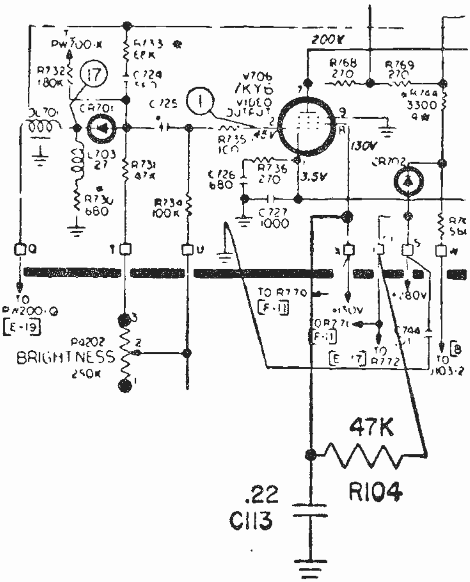
Next move the SERVICE switch (S601) to the NORMAL position, turn the COLOR control to minimum (fully CCW) and check the gray scale tracking from low lights to highlights throughout the usable brightness range. If gray scale does not track properly, repeat steps two and three.

Color-TV Chassis CTC55 Series—Brightness Limiter/HV Adjustment

The following adjustment and check procedures (in brief form) may be helpful in resolving "insufficient brightness," "poor picture," or similar problems in early-production instruments.

Brightness Limiter Adjustment

The line voltage should be 120vac and the chassis ON for at least 10 min. Then turn the tuner to an unused channel and obtain a blank raster by inserting a screwdriver blade between tie point TP203 and the adjacent IF can (see Tekfax schematic No. 1378 and illustration). Then set the SCREEN controls correctly (just cut off). Turn the BRIGHTNESS control to maximum, CONTRAST control to mid-range and adjust the BRIGHTNESS LIMITER control (R406) to obtain a horizontal output tube cathode current of 260ma. If



the 260ma current cannot be obtained, either change resistor R731 to 27K or bridge it with a 68K resistor.

The 260ma setting is correct for the early-production chassis. The current should be set to 240ma in the later-production chassis (chassis with a video output screen resistor 47K, R104).

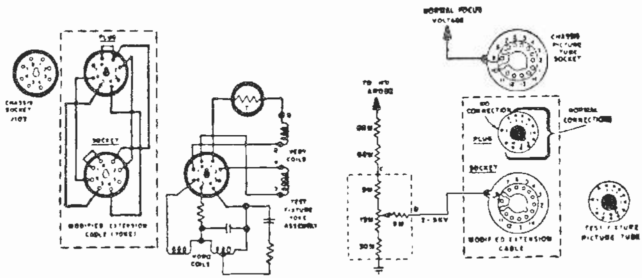
High-Voltage Check

Perform this check on normal station signal. The high voltage should measure 21.5kv with an open jumper across resistor R413. Then turn the BRIGHTNESS control to maximum—the allowable drop from the previous reading is 3kv.

Focus and Picture Tube Cable Modification

The 20VAHP22 picture tube used with the CTC50 color-TV chassis contains an "Einzel" gun which requires a low focus voltage. The picture tube used in the CTC38 test jig requires a high focus voltage, therefore a modification must be made to provide a high-focus voltage from the CTC50 chassis. The picture tube extension cable, No. 13B113, is used for modification.

- Remove the connecting wire from Pin 9 of the extension cable plug only. All other connections between the plug and socket of the picture tube extension cable remain as



originally connected. The focus voltage is provided by an externally connected voltage divider from the high voltage anode to ground. Components needed to make up this focus system include: Two 66M resistors (Part #114651), a CTC44 focus control assembly (Part #129925) and a length of insulated high-voltage lead.
- Connect the two 66M resistors in series. (Make the junction between the resistors as short as possible.)
- Connect the insulated high-voltage lead to one end of the series resistors. (Make the connection as short as possible.)
- Connect the free end of the series resistors through the rear FOCUS control cover and solder to Point C of the FOCUS control. Cut away excess resistor lead. (Resistor end should be flush with back of control housing.)

All connections from the high-voltage lead to the focus control, including the surface area of the externally connected resistors, must be well insulated to prevent arcing. When this unit is first used, be sure to check the insulation around this area using a grounding stick.

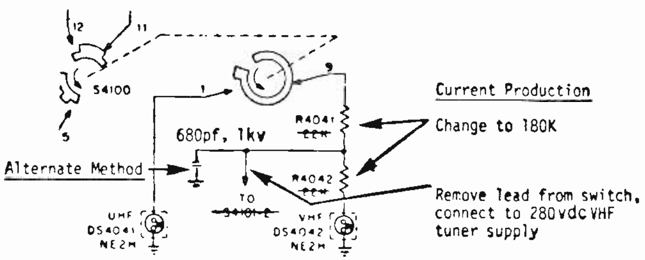
- Connect the loose end of the wire from Pin 9 of the extension cable socket, through the back cover of the focus assembly, to terminal B of the focus assembly. (Strip only enough insulation from the lead to make the solder connection.)
- Connect a ground lead to Terminal A of the focus assembly. The length of the connecting leads is up to the individual to suit his needs. Alligator clips can be used for easier connection to the high-voltage anode and

ground. A bracket could be made for attaching the focus network to the chassis or test fixture.

Check all connections for mechanical and electrical quality before closing up the focus housing. It must be understood that some quality will be lost due to the absence of the pin cushion circuitry and convergence network. Also some difference exists in deflection which may require adjustment of the VERTICAL HEIGHT and LINEARITY control to obtain a full raster.

Color-TV Chassis CTC51 Series—"Hum-Bar" Interference

There is the possibility of a hum-bar in the picture on TV sets employing this chassis when operated in weak-signal areas. The interference appears as the "silicon-bar" type normally associated with the power supply rectifiers. In some cases the interference may be from the neon channel indicator bulbs. In current production the bulbs are operated on



dc as shown in the partial schematic. An alternate method, which may eliminate the interference on one channel but not another, is to add a capacitor as shown.

Color-TV Chassis CTC50 Series—Chassis-to-Test Fixture Adaptation

The CTC50 chassis can be operated with the CTC38/39 test fixture by modifying the existing extension cables. These modifications compensate for differences in the yoke assembly and the picture-tube focus requirements. It was generally felt that the convergence assembly is not absolutely necessary for bench servicing and is therefore omitted from the adaptation procedure.

Yoke Extension Cable Modification

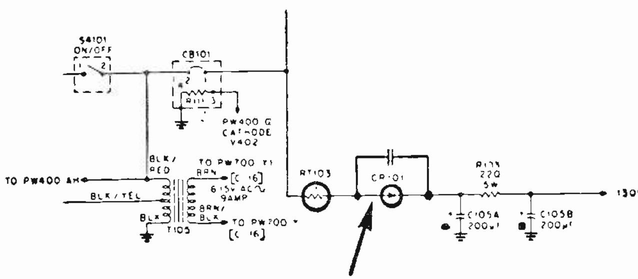
The deflecting yoke extension cable, No. 221-X-1, is used in the following modification procedures. However, the existing CTC38 color-TV chassis yoke extension cables can be modified in the same manner. (The modified extension cable cannot be used with the CTC38 or 39 chassis). No change is required to the chassis yoke socket or the test fixture yoke plug.

- Remove the connecting wires from Pins 3 and 7 of the extension cable plug and socket.
- Cutoff Pins 3 and 7 of the extension cable plug.
- Leaving a 2-in. length of wire at Lug 8 of the socket, cut the Pin 8 connecting wire.
- Connect the loose end of the wire on Pin 8 of the plug to Pin 1 of the plug.
- Connect the loose end of the wire on Lug 8 of the socket to Lug 7 of the socket.

The connecting wires from Pins 1, 2, 4, 5 and 6 remain as originally connected between plug and socket. To make this adaptation, it is necessary to eliminate the pin cushion circuitry, resulting in no pin cushion correction when using the test fixture.

Color-TV Chassis CTC51 Series—Diode CR101 Protection

Premature failure of the 130v B+ supply diode (CR101) in early production TV sets using this chassis may in some instances be the result of a picture tube arc damaging the



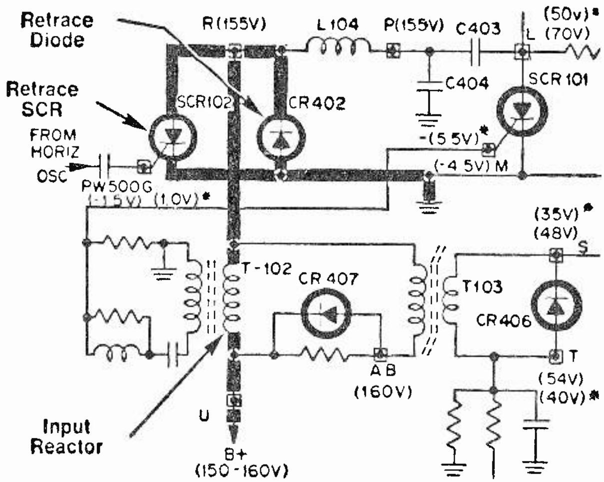
Parallel replacement
diode with a 680pf,
1kv capacitor.

diode. To prevent such failures, make certain a 680pf, 1kv capacitor, Stock No. 113165, is connected in parallel with the diode replacement.

Color-TV Chassis CTC40,44,47—Servicing SCR Sweep Systems

A poor, but common troubleshooting technique is the practice of jumpering the circuit breaker to locate B+ shorts—often making a difficult service job out of a relatively simple one because of additional component failures. Locating the induced problems usually requires more involved troubleshooting techniques than finding the original one.

One example of this can become quite evident when servicing the SCR sweep system. In the event the retrace SCR (SCR 102) or retrace diode (CR 402) fails (shorts), the 155v supply is connected to ground through the input reactor (T102) primary winding. Consequently, the circuit breaker will trip—the normal protective action. If circuit



action is defeated for only a short time (4-8 sec) either by holding the breaker "in" or by jumpering, the input reactor will be overloaded, resulting in the possibility of shorted turns.

Now, after the original defective component (shorted retrace SCR or retrace diode) is replaced, a new induced symptom of "no high voltage, circuit breaker holds" will be evident. Additional servicing time will be required to find that the trace SCR has no gate pulse because the input reactor has shorted primary turns.

Also, damage to the filter choke and/or power transformer can be expected if the chassis is operated for any length of time with the circuit breaker jumpered. Current instruments utilizing such chassis as the CTC46, CTC49 and CTC54 have a fuse in series with the circuit breaker for protection in the event that breaker action is defeated.

Color-TV Chassis CTC22/41,42,43—Damper Diodes

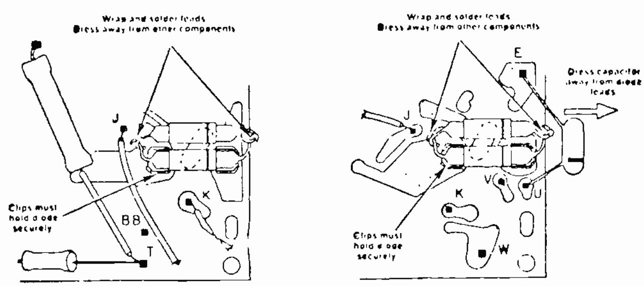
For maximum reliability of the solid-state damper diode, as employed in these chassis, it is advisable to use two devices in parallel when replacement is required.

Damper diodes are supplied by two vendors, the black plastic barrel portion of one is slightly larger than the other. Always use two of the same configuration.

RCA Parts and Accessories will be packaging, under Stock No. 135320, two diodes which are the same as those previously supplied except they will have leads attached to either end. Installation instructions will be included. Single diodes (without leads) Stock No. 120818, will not be available.

When installing the diodes, wrap the diode leads together and solder, making a good mechanical and electrical bond. Keep leads as short as possible, clipping off any excess. Space diodes approximately ⅛ in. apart for easier installation. Then install the diodes as shown in the appropriate illustration.

Relatively high differences in potential exist between the damper diode terminals and other components in the immediate area. These components include capacitors, the



CTC 41 42 43 CTC 22

metal chassis, board terminal stakes and associated leads, and printed circuitry on the PW400 board itself as well as adjacent boards. Be sure the diode leads are dressed well away from these components. Make certain the mounting clips hold the diodes securely in position after proper lead dress has been established.

Color-TV Chassis CTC46 Series—Troubleshooting Focus Symptoms

The symptom of "poor" or "no focus" may be caused by a shorted or leaky spark gap on the focus lead. This spark gap is an integral part of the picture tube socket. The socket for this chassis is stocked by Parts and Accessories as a complete unit, including leads, under Stock No. 135506.

The following procedure may be helpful in isolating focus symptoms:

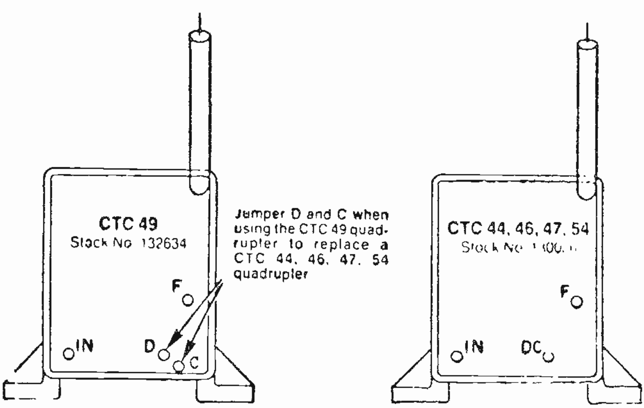
With the TV set power OFF, disconnect the picture tube socket ground strap from its ground connection and connect a high-voltage meter between the picture-tube-socket ground strap and ground. Turn the TV set ON. Caution: If the focus lead spark gap is shorted, 5kv to 6kv can be present on the picture tube socket ground strap when the strap is ungrounded. Operate the TV set in this mode only long enough to perform the check.

If this check verifies that the socket is not shorted, replace the ground strap and check the voltage quadrupler. It can be assumed that the voltage quadrupler is functioning if 5kv to 6kv is measured between Pin F of the quadrupler and ground.

The next step is to confirm proper focus control operation. The focus voltage at the picture tube socket should vary between about 4kv and 6kv while rotating the FOCUS control.

Color-TV Chassis CTC44/46/47/49/54—High-Voltage Quadrupler Interchangeability

The CTC49 quadrupler (Stock No. 132634) can be used as a direct replacement for the CTC44,46,47,54 quadrupler

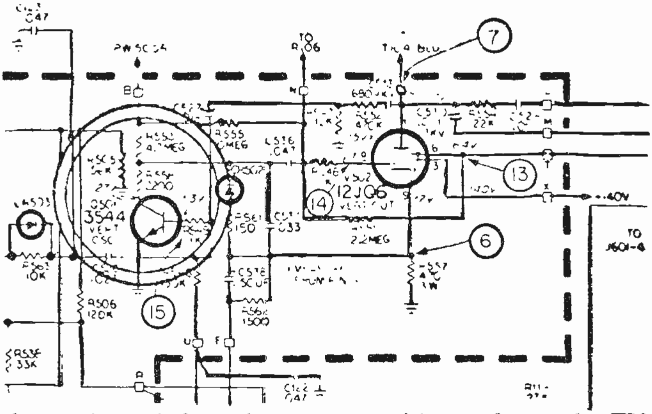


(Stock No. 130026) by jumpering quadrupler terminals D and C together and using that point for the DC connection. Stock No. 130026 cannot be used in the CTC49 chassis.

Color-TV Chassis CTC36—Unstable Vertical Sweep

Loss of vertical sweep in this chassis, when no sync input is present (i.e., during channel changes, when the tuner is on an inactive channel, etc.), may be the result of an off-tolerance vertical oscillator transistor, Q501.

To test for this condition: First turn instrument OFF. Then disable the sync input to transistor Q501 by moving



the service switch to the RASTER position and turn the TV set ON again.

No vertical sweep (oscillator does not restart) under these conditions indicates the possibility of an off-tolerance transistor (Q501). Output components (such as tube V502 and/or cathode resistor R557) may be damaged if the instrument has been operated any length of time without the vertical oscillator running.

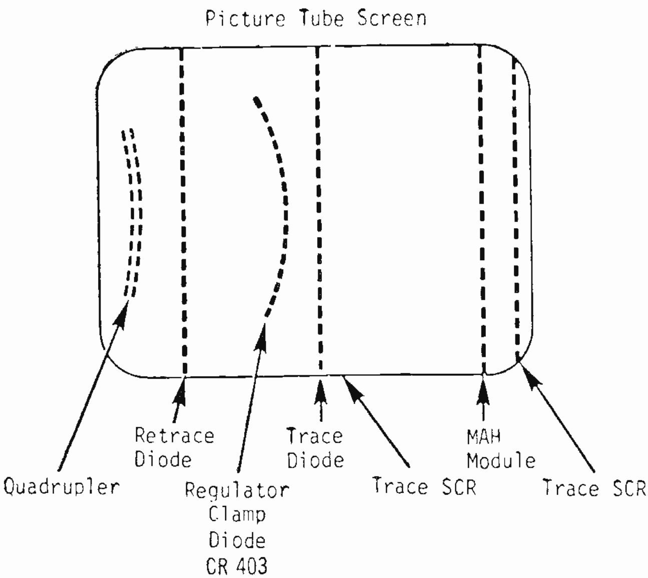
Color-TV Chassis CTC54 Series—Horizontal Interference

Interference patterns on relatively weak station signals may be the result of switching transients from components in the horizontal sweep circuitry. The general location and configuration of the interference on the screen can give a hint as to which component should be substituted to eliminate the interference.

The interference caused by the Regulator Clamp Diode (CR403) may appear as a straight line (rather than bowed as shown) in some instruments. Stock No. 131475 (Trace Diode) or 131476 (Retrace Diode) can be used as a replacement for CR403 in this chassis.

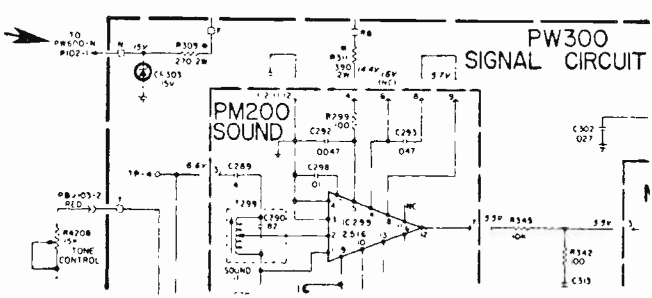
Color-TV Chassis CTC54 Series—Vertical Sweep/Video Symptoms

There is the possibility of vertical-sweep symptoms (under or over scan) which cannot be resolved with the nor-



mal substitution of the MAG module and /or vertical output devices. In some instances, video/AGC symptoms may also be evident.

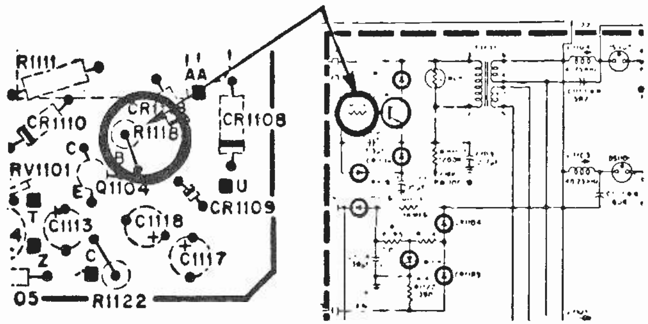
If these symptoms are encountered, check the +15v source. Excessive voltage may be the result of an open 15v zener diode (CR303 on the partial schematic), while the voltage is low at this point, check for a leaky zener (CR303) or an overload such as a shorted VHF tuner feed-through capacitor on the 15v line.



Slow Remote Control Operation

There is the possibility of slow reaction of the remote system in early-production instruments. This symptom has been described as "slow turn-ON/OFF," "delayed channel change," "sluggish remote action," etc.

A resistor value change in the noise immunity circuit,

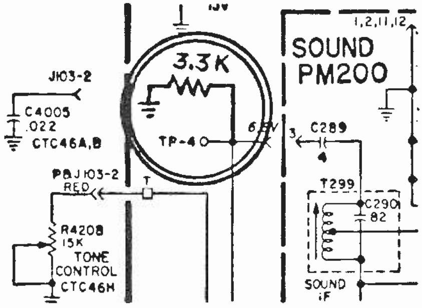


(base of transistor Q1104) as shown in the above illustration, may be helpful in resolving this symptom.

Color-TV Chassis CTC46 Series—Hum Modulation

There have been isolated instances of hum modulation in instruments utilizing this chassis. The intensity of the hum is variable with the fine tuning.

Usually the hum can be reduced to an acceptable level by

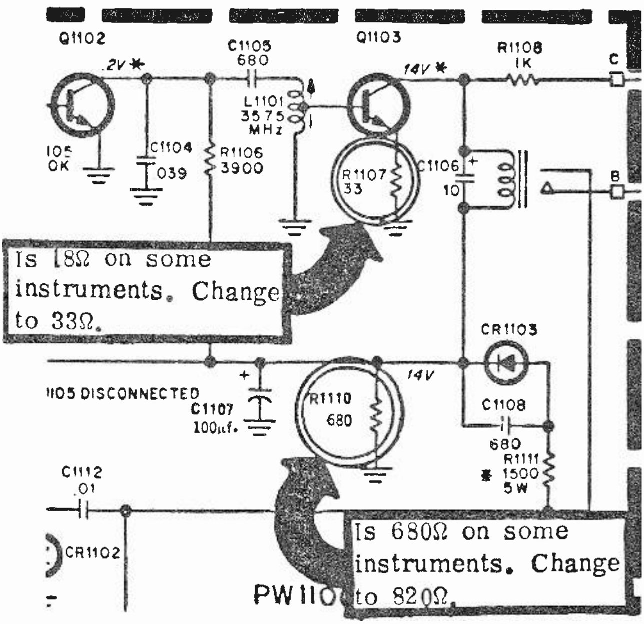


connecting a 3300Ω resistor from TP4 to ground on the PW400 board. If the hum is still present on strong signals a smaller value resistor may be used. However, do not use a value lower than 2200Ω.

Color-TV Chassis CTC52 Series—Remote Noise Immunity

In the event early-production versions of the CTC52XR chassis exhibit poor remote noise immunity, i.e. the remote function is triggered by spurious noise (such as telephone ringing, etc.), the following changes may improve selectivity.

First check the value of emitter resistor R1107; and if it is 18Ω, change it to 33Ω. Then check the value of power supply resistor R1110; and if it is 680Ω, change it to a 820Ω, 5%, 1w film type. Resistor R1110 is connected from the cathode of diode CR1103 to ground. This resistor and C1107 (a 100μf electrolytic capacitor) were inadvertently left off the Service Data schematic.



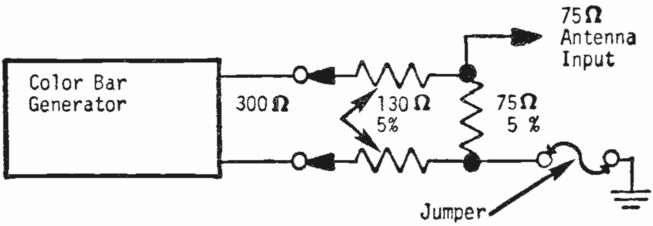
Color-TV Chassis CTC59 Series—Use of Color Bar Generator

The CTC59 is a "Hot" chassis. Therefore, normal hot-chassis servicing procedures should be observed when servicing this chassis.

The 300-to-75Ω balun transformer is mounted on the back cover of Model EQ475W/WR TV sets and is connected to the antenna block through a short coaxial cable with a standard antenna-type coaxial connector. There are several ways of connecting the 300Ω output of a color bar generator to the TV set with the back cover removed:

Connect the generator directly to the 75Ω coaxial connector wiring using a ½w resistor lead to make contact with the center conductor and ground the other lead. This method is satisfactory for most service requirements even though the impedance mismatch causes some "ghosting."

Construct a resistive matching pad as shown in illustration. This will minimize "ghosting" but will also attenuate the signal somewhat.

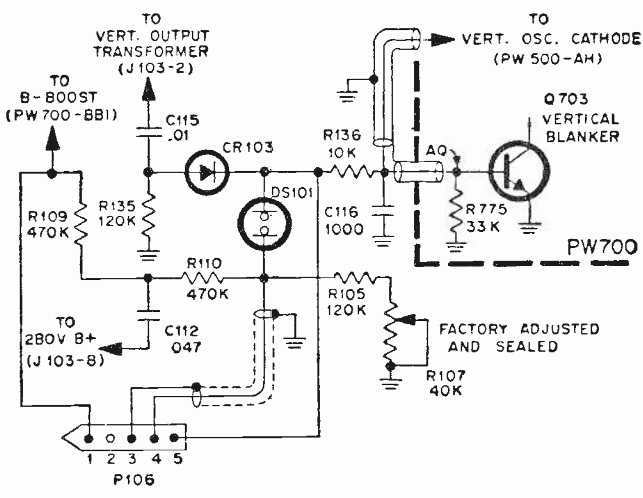


Use a commercial 75-to-300Ω matching transformer (or another TV balun transformer, Stock No. 134986) with appropriate connectors.

Make an extension cable for the back cover-to-instrument connection. Use coaxial cable with a male connector on one end, female on the other.

Color-TV Chassis CTC63 Series—High-Voltage Protection Circuit/ Isolating "No Video" Symptoms

In the event the high voltage increases above a predetermined level, the high-voltage protection circuit blanks the video signal by activating the vertical blanking stage. The symptom of "No Video" in the CTC63 chassis may be attributed to one of three areas: the video stages, the high-



CTC 63 - HIGH VOLTAGE PROTECTION CIRCUIT SCHEMATIC voltage circuit, or the high-voltage protection circuit.

Outlined are procedures which can be used to isolate the symptom to a specific circuit area:

Apply power to the receiver. Then visually inspect the neon bulb, DS101, shown in illustration. If the neon bulb is lighted, proceed to the next step. If the bulb is not lighted, the problem is in the video section and troubleshooting of the video circuitry will be required.

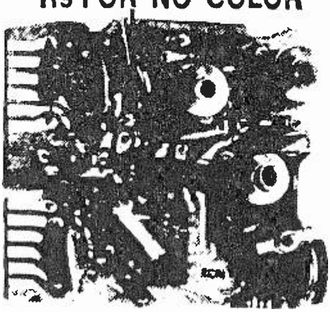
Measure the voltage from Pin 1 to Pin 3 (ground) of the test fixture plug, P106. If this voltage exceeds 880v, the problem is in the high-voltage section; while if it does not exceed the 880v, the problem is in the high-voltage protection section. It is then necessary to troubleshoot the high-voltage protection section.

Should the solution of a problem in the high-voltage protection circuit involve replacement of variable resistor R107, it is necessary to reset the control for proper circuit operation. The following procedures are prescribed for correct adjustment:

Set the line voltage to 120v and the BRIGHTNESS control to minimum. Connect a 10M, 1% precision resistor to Pins 1 and 4 of test fixture P106 (leads should be as short as possible). Then from a fully clockwise position, rotate control R107 until the neon bulb fires. Then, very slowly turn control R107 in a clockwise direction until the neon bulb is just extinguished. Adjust the customer controls for a normal picture. Check the operation of the high-voltage protection circuit by connecting a 5M, 1% precision resistor to Pins 1 and 4 of test fixture P106. The video should now be blanked. Cement the control (R107) after the proper setup is achieved.

Color-TV Chassis CTC46, 54, 59—Zero Color-Level Control

The function of the ZERO COLOR-LEVEL control (R9 on the Chroma 1, MAC 002A Module) is to optimize custom-



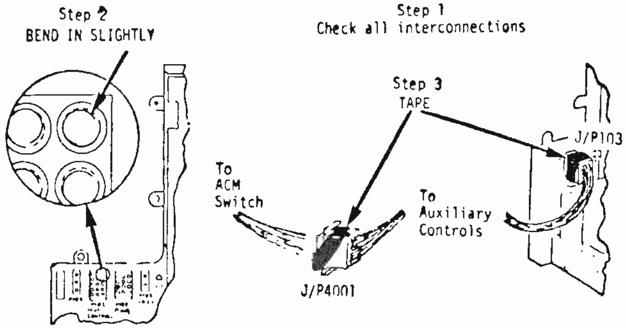
er color control tracking. Control R9 is set during production, and unless inadvertently misadjusted during servicing, or the MAC module is replaced, it should not require further adjustment.

In the event normal color saturation is not obtained at normal mid-range setting of the customer COLOR control, R9 may require adjustment as follows: Tune in a color program with the ACCUMATIC switch in the OFF position, then turn customer COLOR control to minimum and adjust R9 so that the color is just gone from the picture.

Color-TV Chassis CTC48—Intermittent Color as Control Bin is Opened or Closed

In those instances where intermittent color is encountered as the auxiliary control bin is opened or closed, the following procedures are suggested:

Examine wiring between chassis, auxiliary control assembly and ACM switch (J/P103 and J/P4001) for in-



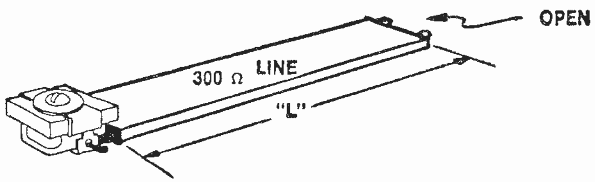
termittent connections.

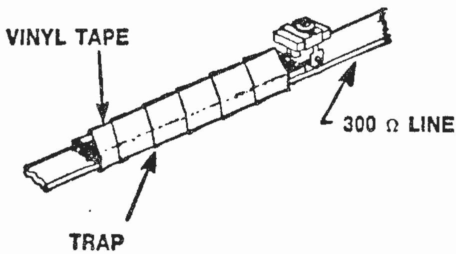
Ensure positive plug and jack connections by bending (slightly) the female pins in P103 (auxiliary control assembly-to-chassis) and P4001 (auxiliary control assembly-to-ACM switch).

Tape the mentioned plugs to their respective jacks.

UHF Traps

In areas where one or more of the lower UHF channels are received at an exceptionally high level resulting in AGC overload or interference, a UHF trap may be helpful in attenuating the signal. A trap cut for a particular channel can be positioned on the 300Ω lead-in near the antennal terminals. This trap should be moved and retuned





until the optimum position along the lead-in is found. Secure the trap by taping along its entire length with vinyl tape.

UHF traps can be easily made by cutting the Stock No. 78818 FM Trap to a specific length as noted below:

UHF Channel	"L" Inches	UHF Channel	"L" Inches
14-15	4⅜ in.	25-26	3⅝ in.
16-17	4¼ in.	27-28	3½ in.
18	4⅛ in.	29-30	3⅜ in.
19-20	4 in.	31	3¼ in.
21-22	3⅞ in.	32-33	3⅛ in.
23-24	3¾ in.		

Picture Tube 21VAKP22 Grounding Clip

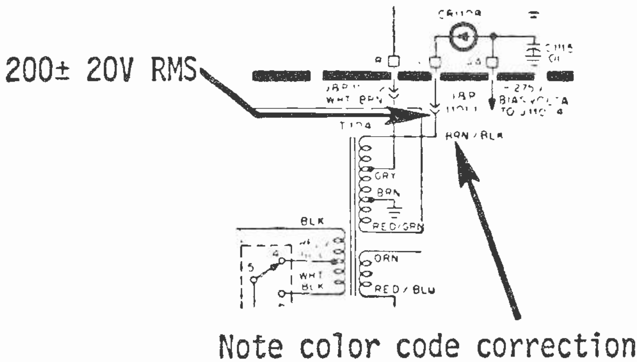
Some versions of the 21VAKP22 picture tube utilize a metalized tape which completely surrounds the tube in the area just behind the screen. TV sets built with this version of the 21VAKP22 have a special spring clip installed between the metalized tape and one of the picture tube mounting hooks.

Whenever this version of the 21VAKP22 is used in a TV set, whether original equipment or a replacement, this spring clip must be installed in order to ensure a positive ground return path for the tape, thus preventing the possibility of symptoms such as corona or high-voltage leakage in the area of the face plate.

The spring clip is the same as the chassis-to-rear cover retaining clip used on RCA color-TV sets for several years. The clip Stock No. is 78324, Drawing No. 938283-1.

Color-TV Chassis CTC46 Series—Standby Transformer Replacement

To insure optimum reliability in those isolated instances where the Standby Transformer (T104) must be replaced, make sure the replacement transformer is connected as



shown in the Basic Service Data and in the partial schematic.

To confirm the connections are correct, check the following voltage: The voltage at J/P1101-1 (Remote Amplifier) must be 200 ±20v rms.

Color-TV Chassis XL-100—MAD and MAN Modules

In the past all ceramic-substrate modules used in XL-100 chassis (MAD and MAN modules) have been coated with a green epoxy coating. RCA engineering has determined that the epoxy coating is unnecessary. Hence, late-production of "R" line (1973 model year) XL-100 chassis will utilize uncoated ceramic-substrate MAD and MAN modules. These modules are blue rather than green due to the color of the protective paint used to cover the printed circuitry. These uncoated modules are just as reliable as the coated type and are directly interchangeable.

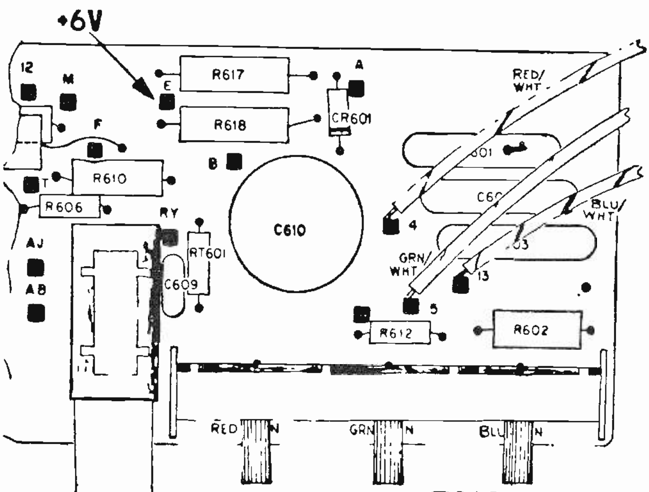
Color-TV Chassis CTC54 Series—Bench Servicing Remote/Color Hum Bar

When bench servicing the remote amplifier circuitry, precautions should be made to protect the memory modules (CRM's) in the remote amplifier from possible damage due to transients. The remote amplifier chassis frame must be grounded to the main chassis when bench servicing. When the remote and main chassis are installed in the instrument, this common ground is made through a foil strap in the cabinet.

A high resistance connection at either end of the foil can result in the symptom of a color bar moving vertically through the picture. Symptom analysis can be misleading since the bar may not be evident when the degaussing coil is unplugged.

Color-TV Chassis CTC54 Series—ETA Motor Symptoms/Servicing

Various symptoms—such as "Motor runs continuously" or "motor does not run," relating to the motor (B4601) associated with the Electronic Tuning Assembly (ETA 423B)—which are not resolved by the replacement of the



PW600

MAT module may be the result of loss of the 6v dc input to the MAP module circuitry. This power supply is located on the PW600 board and consists of diode CR601, electrolytic capacitor C610, and two 15Ω, 2w resistors—R617 and R618.

"Triple-Branded" 6MJ6/6LQ6/6JE6C Horizontal Deflection Tube

The new RCA 6MJ6, which has been triple-branded to include 6LQ6 and 6JE6C, is a double-ended, high-perveance, beam power tube of the novar type with a T-12 envelope. This tube type is specifically designed to be an ultra-reliable field replacement for the older 6LQ6 and 6JE6C tubes in horizontal deflection amplifier service in color TV receivers.

This new horizontal-output tube has an integral envelope top-cap assembly which eliminates loose top-caps and minimizes glass dome failures.

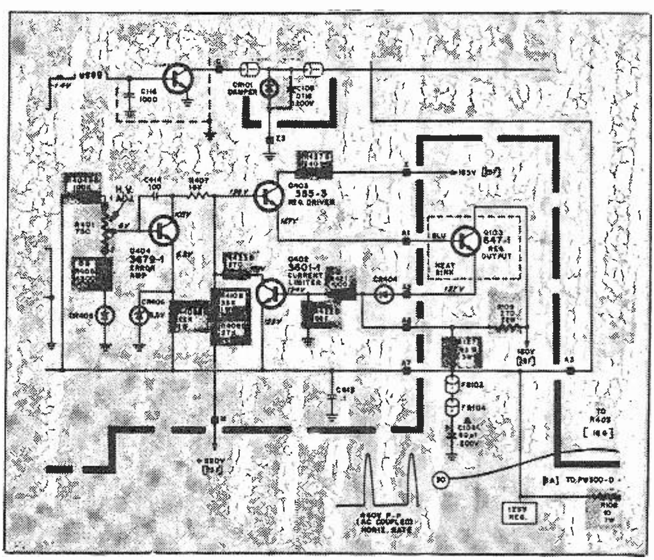
The design also assures reduced microphonics and improves the ability to withstand shock and vibration. Other improvements allow this type to endure the excessive plate dissipation encountered during receiver fault conditions. Control testing assures that the tube can withstand a 200-w plate dissipation for a continuous or accumulated exposure time not exceeding 40 seconds, which should be sufficient time to permit conventional receiver protection devices to function.

The sharp high-voltage cutoff characteristic and the high transconductance (gm) of the tube assure low retrace conduction levels even in TV receivers with reduced drive voltage.

A plate connector cools the plate by conduction, resulting in lower plate operating temperatures and longer life. The special plate structure is designed to minimize secondary-electron emission from the plate and "knee" discontinuities in the zero-bias region of the E_b — I_b characteristic. A separate base-pin connection to grid No. 3 is provided so that positive voltage can be applied to grid No. 3 to minimize interference from "snivets" and to increase power output.

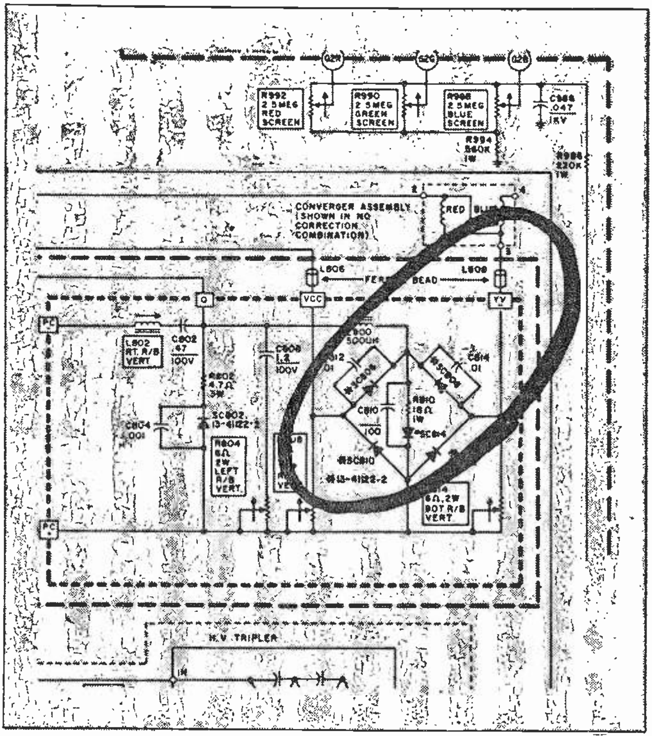
Color TV Chassis CTC 71—Insufficient width at higher brightness levels

To correct, replace either defective zener diode CR406 or current limiter transistor Q402, as shown in diagram.



RCA

Color TV Chassis CTC 48—Circuit breaker trips at high brightness levels. Previous replacement of C403 was incorrect. Replace now with RCA specified part.



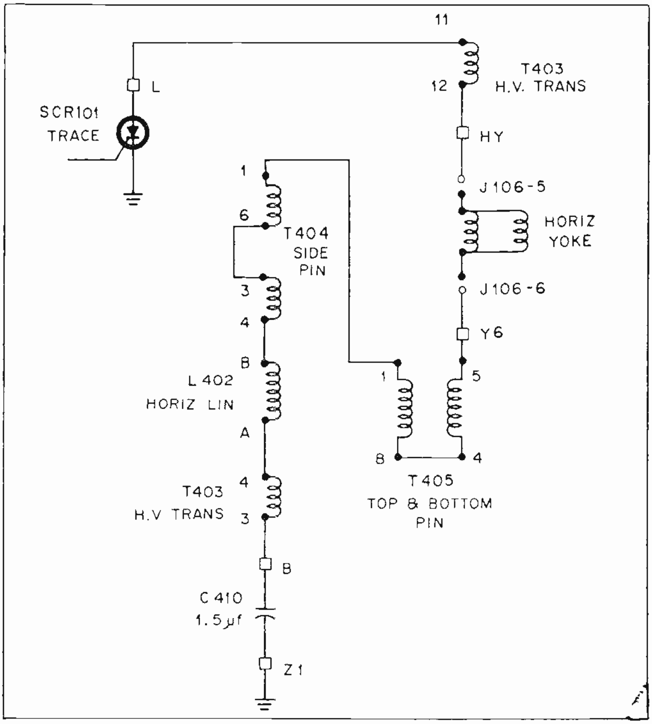
CHASSIS: RCA CTC68

TROUBLE SYMPTOM: Beat pattern in picture

CAUSE: Open AFT filter capacitor G4002, on the tuner mounting assembly.

CTC 46 Chassis—Checking continuity of, and replacing SCR101 (trace).
If during servicing, it is determined that the Trace SCR (SCR101) is defective, the following checks should be made before replacement. (1) Measure continuity from PW400-L to PW400-B. Resistance should measure approximately 1 ohm. If an open is indicated, further resistance checks of the series

path shown in the partial schematic below should be made to isolate the open. (2) If continuity is normal between PW400-L and PW400-B check for the possibility of an open in the SCR socket and/or the circuitry associated with the yoke return capacitor, C410. (3) Repair any open circuits located in Steps 1 and 2 then replace the SCR. **ET/D**

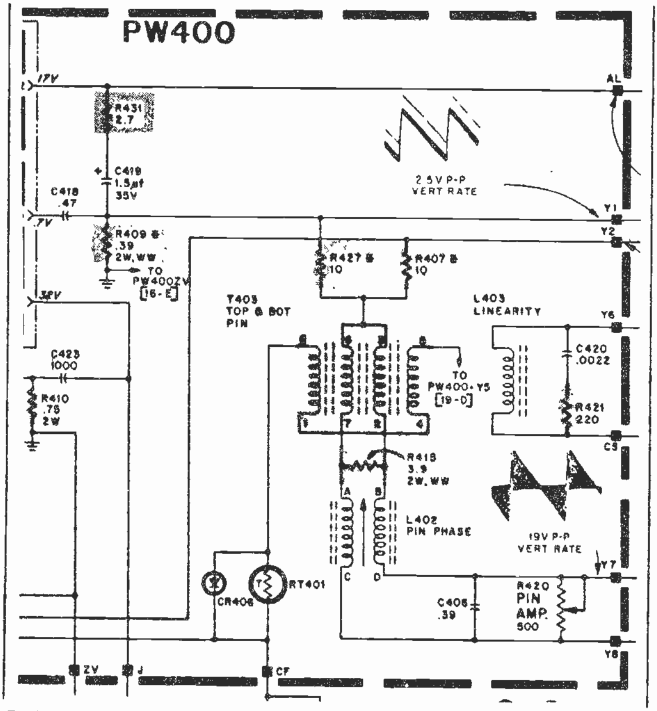


CHASSIS: RCA CTC68

TROUBLE SYMPTOM: Adjustment of BRIGHTNESS control affects height of raster.

CAUSE: Open R320 in base circuit of brightness limiter transistor Q302.

Color TV Chassis CTC 62—Vertical sweep intermittently collapses to four inches and both vertical hold and height act as centering control. Also, unstable vertical size. To correct, repair open connection, between winding and lug, on L402, and repair open connection at junction of R407 R427, and T403.



Color TV Chassis CTC 59XA — Malfunction in the low voltage power supply

Check capacitors C13 or C14 in horizontal output circuit. They could be shorted. If so, use RCA part no. 167871 for replacement.

Color TV Chassis CTC 31—Vertical Foldover problem, with voltage too high and fluctuating on 12JQ6-G

First replace the service switch. Then to check, remove white wire to 1800 ohm regulator and check for voltage with switch in normal position.

Color TV Chassis CTC68—Horizontal hold intermittently goes off frequency. Also slight curvature at top of the raster

The problem is probably a loose solder connection at pin 3 of the T405 pincushion transformer. Resolder.

Color TV Chassis CTC 74—Relay K201 drops out when instrument is turned on.

To correct, check for shorted or leaky CR205 (43V zener diode) and/or Q201 (protective control switch transistor).

Model/Chassis:

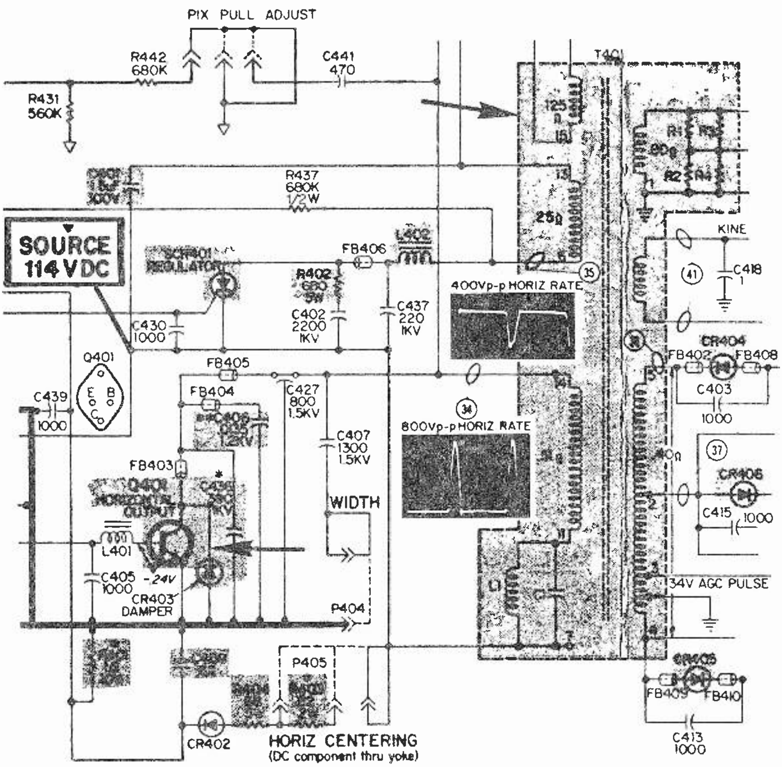
GB758/CTC90.

Symptom:

Repetitive failure of horizontal transistor, Q401.

Corrective Action:

Check T401 flyback transformer for high voltage leakage.



Chassis:

All XL-100

Symptom:

Can't turn screens down.

Possible Cause:

- Diode CR307

RCA

Model/Chassis:

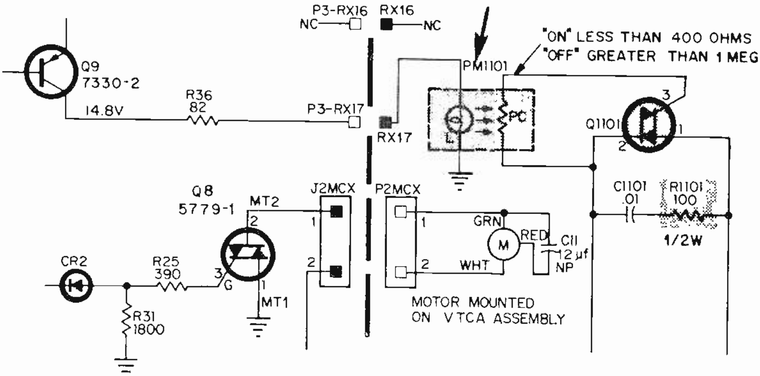
FB530R/CTC90.

Symptom:

Will not turn on—either manually or with remote control hand unit.

Corrective Action:

Check for defective photocell PM 1101 (open lamp).



Chassis:

All XL-100

Symptom:

Brightness level changes between UHF and VHF.

Possible Cause:

- Diode CR303

Chassis:

CTC58/CTC68

Symptom:

Picture bends with high brightness setting.

Possible Casue:

- Diode CR408 leaky—100K

Model/Chassis:

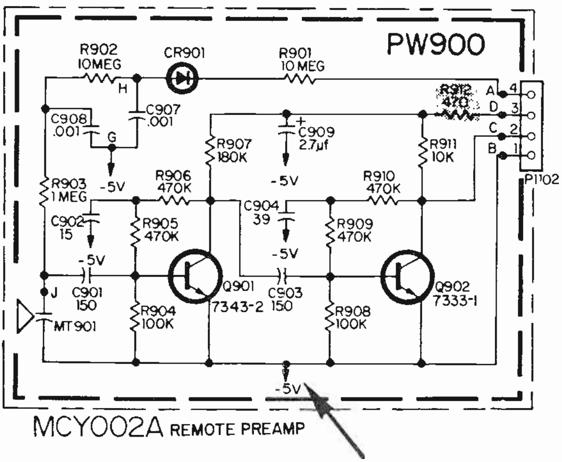
GB702R/CTC90.

Symptom:

Remote instrument, would intermittently turn itself off.

Corrective Action:

Check MCY002A Remote Preamp mounting. The metal case is at −5 volts. Symptom can be caused if case is grounded.



Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

No video and high brightness.

Possible Cause:

- Open connection at PW200-GG

RCA

Model/Chassis:

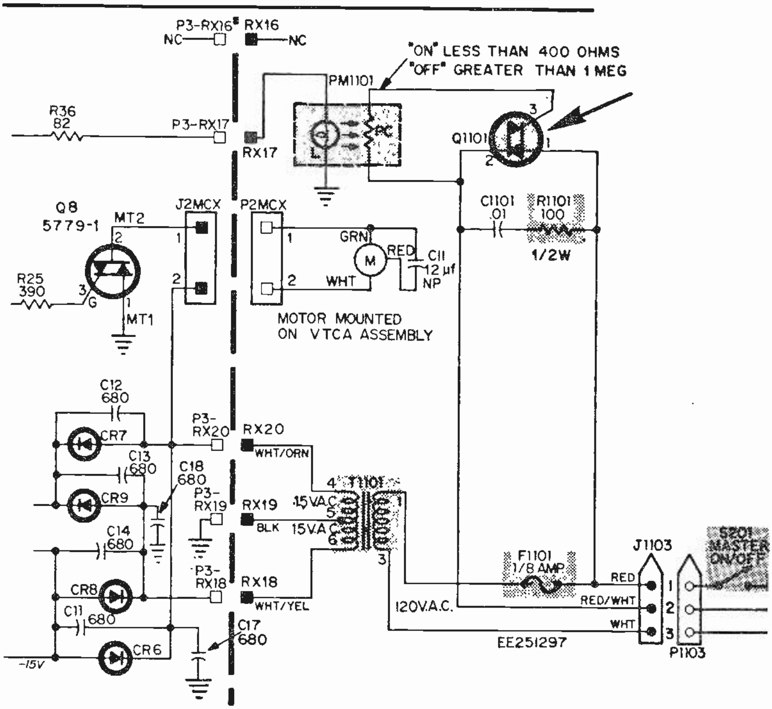
GB728R/CTC90.

Symptom:

Two narrow horizontal bands moving up through picture—similar to 120 Hz hum bars. Cannot be seen when using isolation transformer.

Corrective Action:

Check, by substitution, Q1101 triac on remote amplifier chassis.



Chassis:

All XL-100

Symptom:

Negative picture.

Possible Cause:

- Diode CR303 leaky—4K

Model/Chassis:

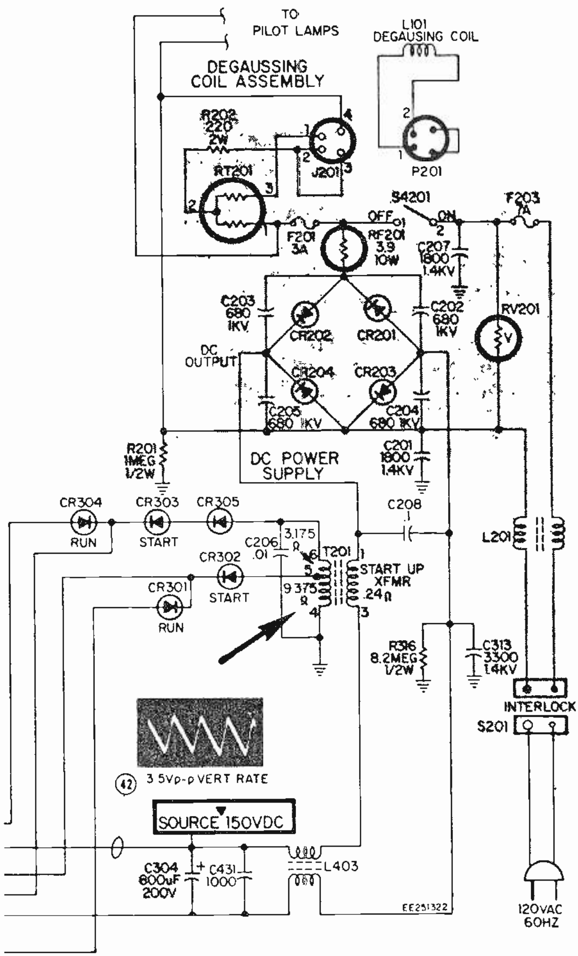
GB728/CTC90.

Symptom:

Two severe bends moving slowly up left side of picture. May not be noticeable when using isolation transformer.

Corrective Action:

Check start transformer (T201) wiring. Wires to terminals 5 and 6 may be reversed.



RCA

Model/Chassis:

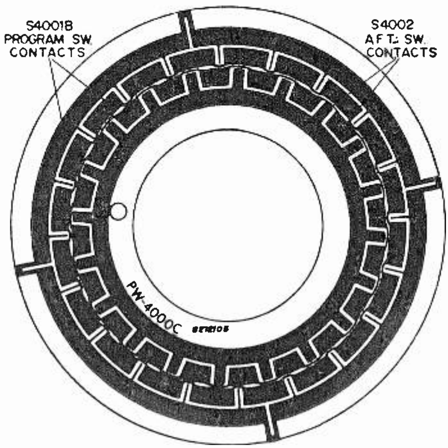
Remote or power tune varactor tuner control assembly (VTCA).

Symptom:

Does not stop on programmed channels. May be intermittent.

Corrective Action:

Check programming "switch" (printed circuit in dial drum). Clean, then recoat using stock number 143685 lubricant only.



Chassis:

All XL-100

Symptom:

Brightness too high.

Possible Cause:

- Defective diode CR307

Chassis:

All XL-100

Symptom:

Looks like barkhausen on all channels in weak area.

Possible Cause:

- Defective diode CR301

Model/Chassis:

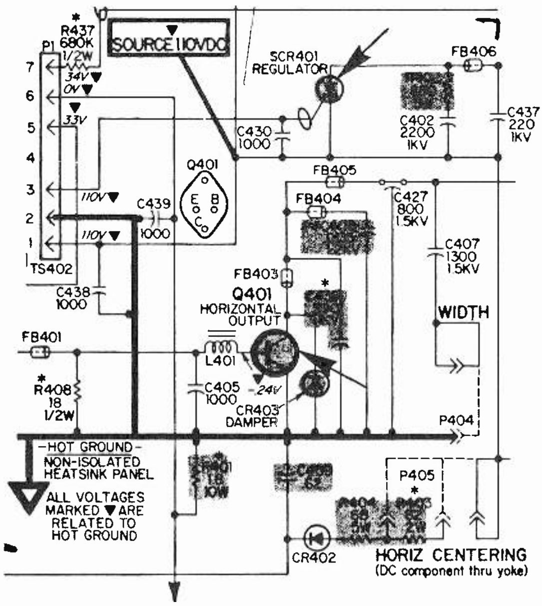
FB443/CTC85.

Symptom:

Dead, no B plus on anode of regulator SCR 401; or, dead, no B plus at collector of horizontal output Q401.

Corrective Action:

Check for good electrical contact between mounting screw heads and the case of SCR 401, or case of Q401.



Chassis:

CTC58/CTC68

Symptom:

Retrace lines.

Possible Cause:

- Resistor R105

RCA

Model/Chassis:

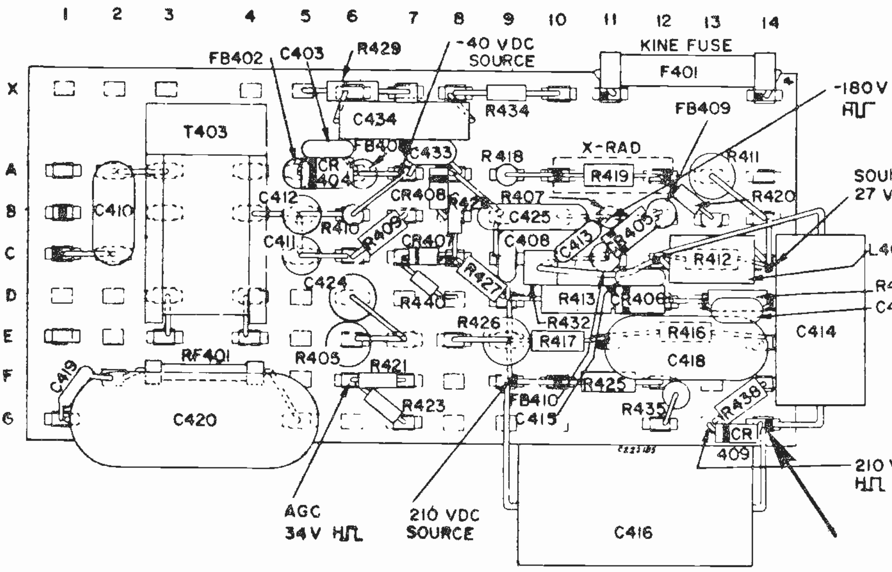
FB441/CTC85.

Symptom:

Drive line on left side of screen; also, as volume is increased, brightness decreases.

Corrective Action:

Check for cold solder joint at G 14-ground point for C414 and C416.



Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

No service line and low brightness.

Possible Cause:

- Resistor R104
- Diode CR106

Model/Chassis:

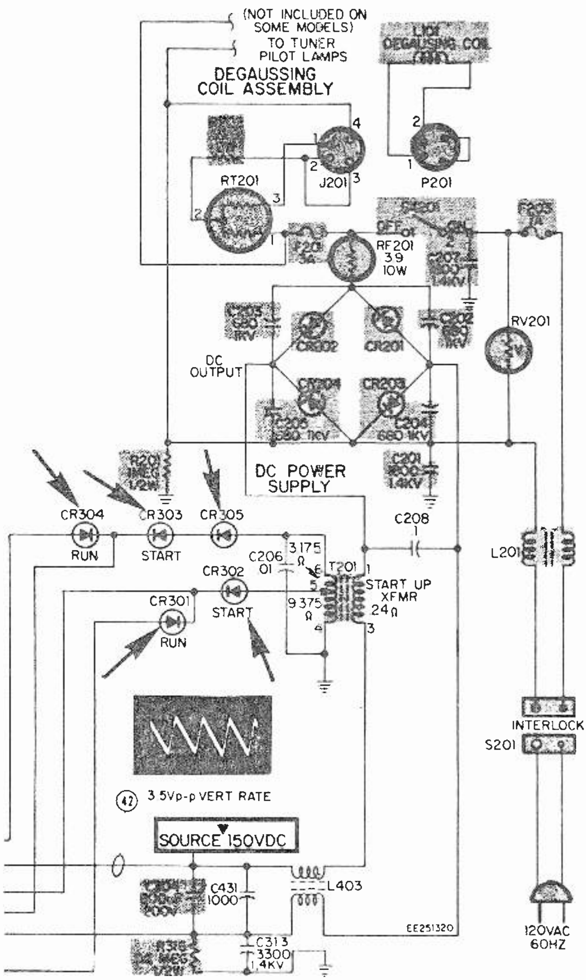
FB443/CTC85.

Symptom:

Two horizontal bands (120 Hz hum bars) moving up through picture.

Corrective Action:

Check for a leaky start/run diode (CR301, CR302, CR303, CR304, CR305).



RCA

Model/Chassis:

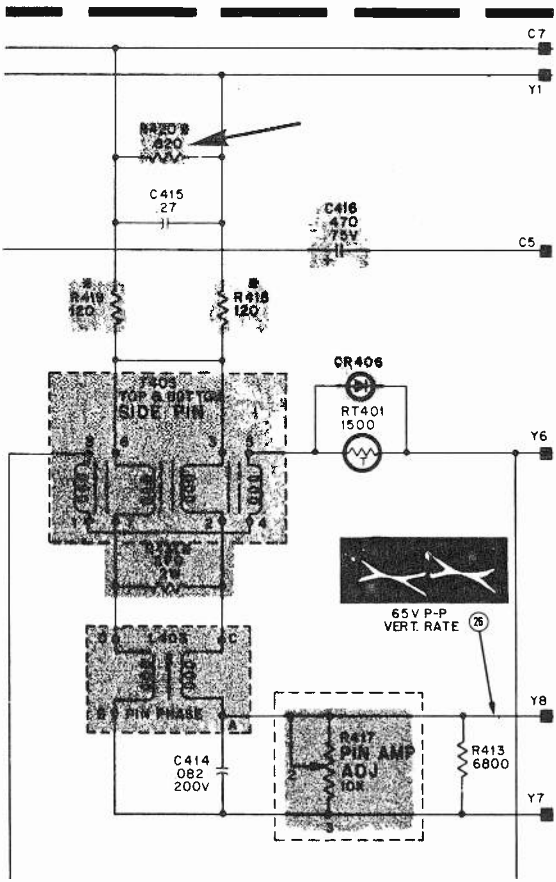
FA510/CTC78.

Symptom:

Not quite enough vertical sweep with height control at maximum, retrace lines visible at top.

Corrective Action:

Check value of R420—may be 120 ohms rather than correct 820 ohms.



RCA

Model/Chassis:

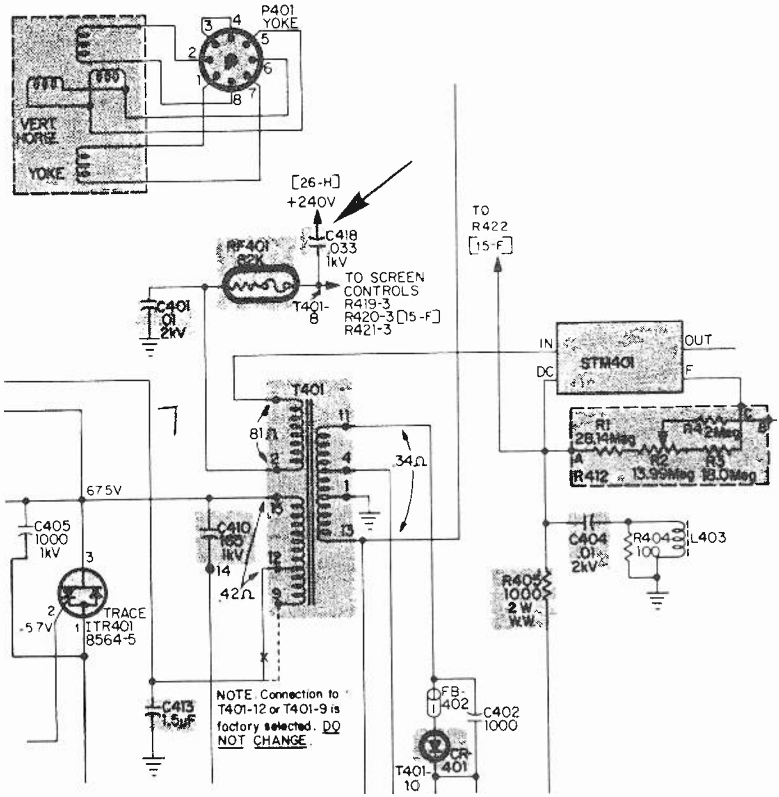
FA518/CTC81

Symptom:

Very dim picture, RF 401 screen supply fuse open.

Corrective Action:

Check for leaky C418.



RCA

Model/Chassis:

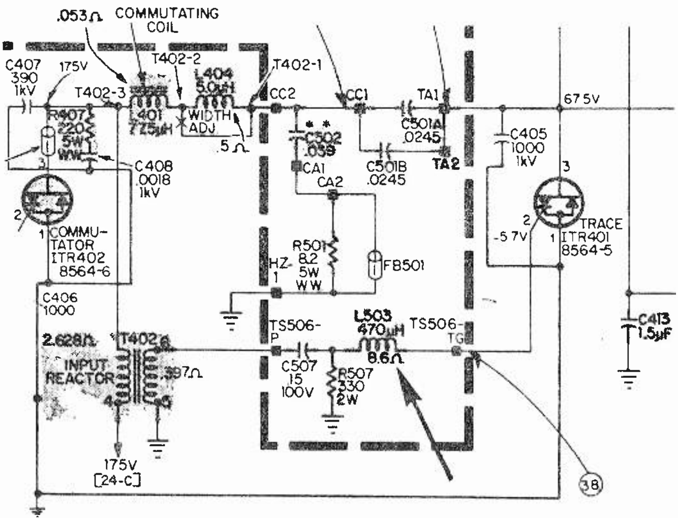
GA704/CTC81.

Symptom:

"ITR squeal" and horizontal foldover.

Corrective Action:

Check for an open L503 (in gate of trace ITR).



Chassis:

All XL-100

Symptom:

Strips of noise in picture.

Possible Cause:

- Diode CR301
- Diode CR307

Model/Chassis:

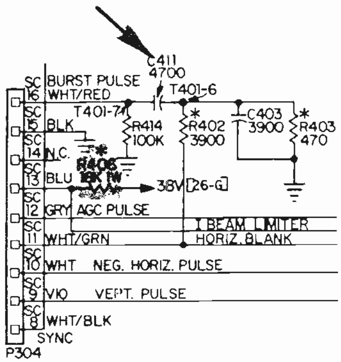
Color Track/CTC74, CTC81.

Symptom:

Intermittent loss of color.

Corrective Action:

Check for an intermittent C411 burst pulse coupling capacitor.



Chassis:

All XL-100

Symptom:

No control over brightness.

Possible cause:

- Poor connection from PW300-BB to Q302
- Open connection at T401-10, -11
- MAC module
- Open connection from PW300-HV to C309
- CR307
- R144

RCA

Model/Chassis:

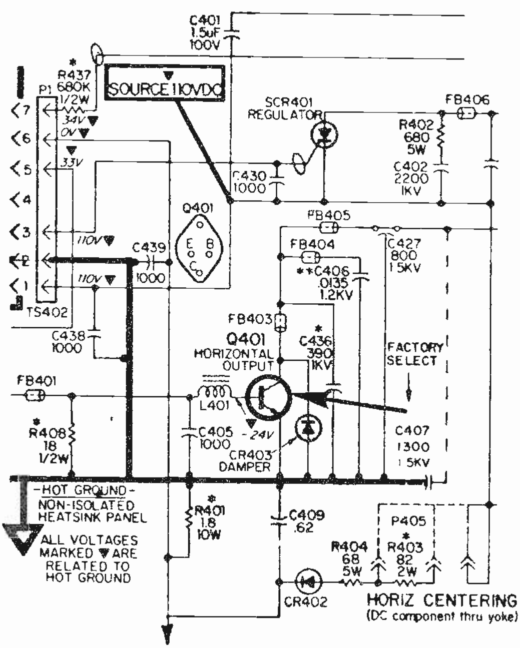
XtendedLife chassis—CTC85, 86, 89, 90.

Symptom:

In-circuit tests indicate Q401 horizontal output transistor is shorted, C to E.

Corrective Action:

Don't overlook the mica insulator. If the insulator is punctured, or whenever Q401 is replaced, discard the original insulator and install a new one (stock number 137748). Before reassembly, thoroughly clean the heat sink, check Q401 case for burrs, and apply silicone heat sink compound (stock number 138227) to both surfaces.



Model/Chassis:

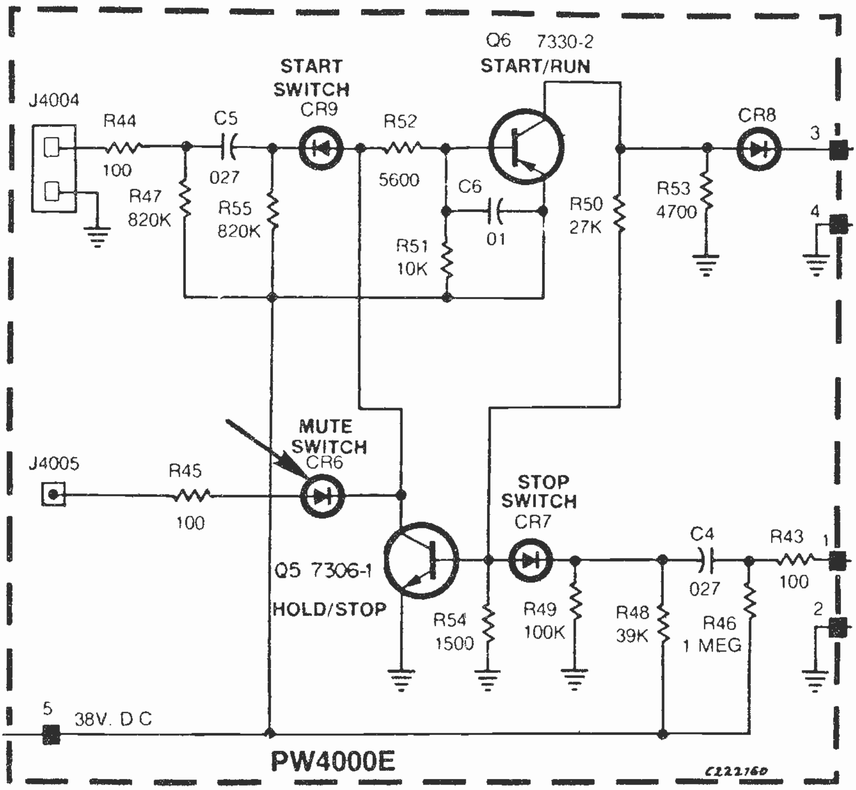
GA835/CTC81 (Service Data 1976 C-6-S1).

Symptom:

Power tuning won't stop on channels.

Corrective Action:

Check the "switch contacts" (printed circuit) on the inside of the channel indicator drum. If lubricant is dry or dirty, clean the printed circuit and recoat with RCA stock number 143685 only.



RCA

Model Chassis:

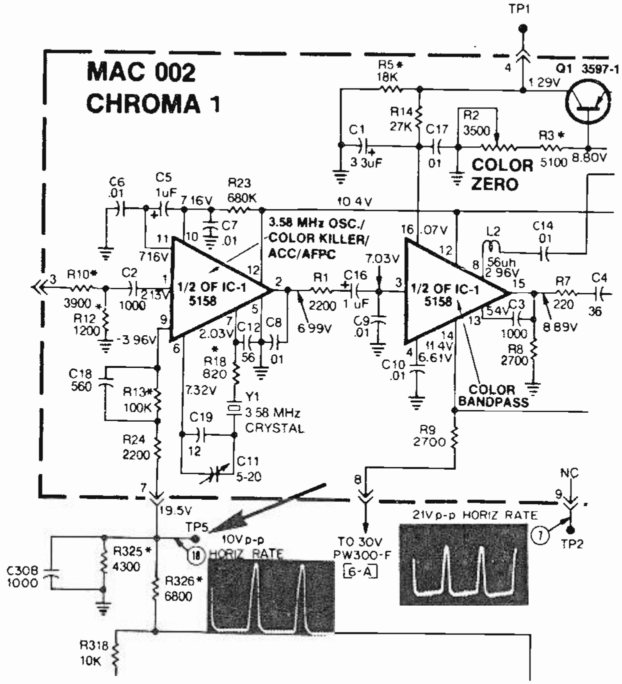
FA450/CTC76 (Service Data 1976 C-9).

Symptom:

No color, "AC" bending in picture.

Corrective Action:

Check for loss of burst keying pulse at TP 5 on PW 300, possibly caused by a cold solder connection on flyback winding.



Chassis:

All XL-100

Symptom:

Distorted picture.

Possible Cause:

- Capacitor C305 open

Model/Chassis:

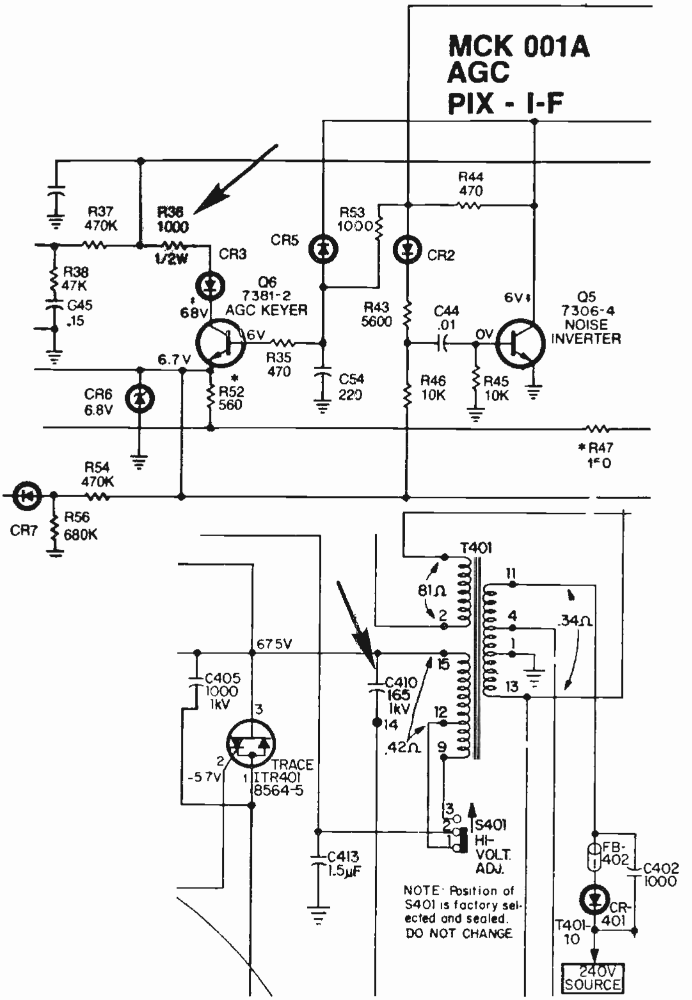
GU800/CTC81.

Symptom:

Symptoms indicate MCK IF module is defective but replacement does not restore normal operation.

Corrective Action:

Check C410—if it is shorted, R36 in the replacement MCK module will likely open.



RCA

Model/Chassis:

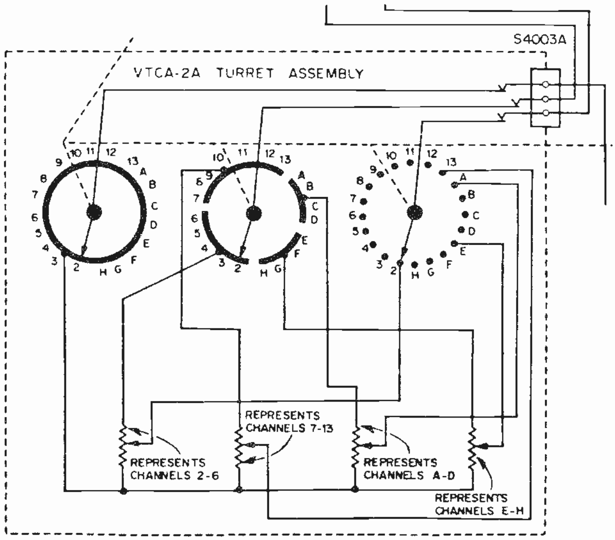
FB497/CTC89.

Symptom:

Intermittent channel reception, or complete loss of certain channels.

Corrective Action:

Check for intermittent or open connections on the control drum—part of VTCA-2, Varactor Tuner Control Assembly.



Chassis:

All XL-100

Symptom:

Low brightness.

Possible Cause:

- Resistor R304
- Resistor 104
- Diode CR104

Model/Chassis:

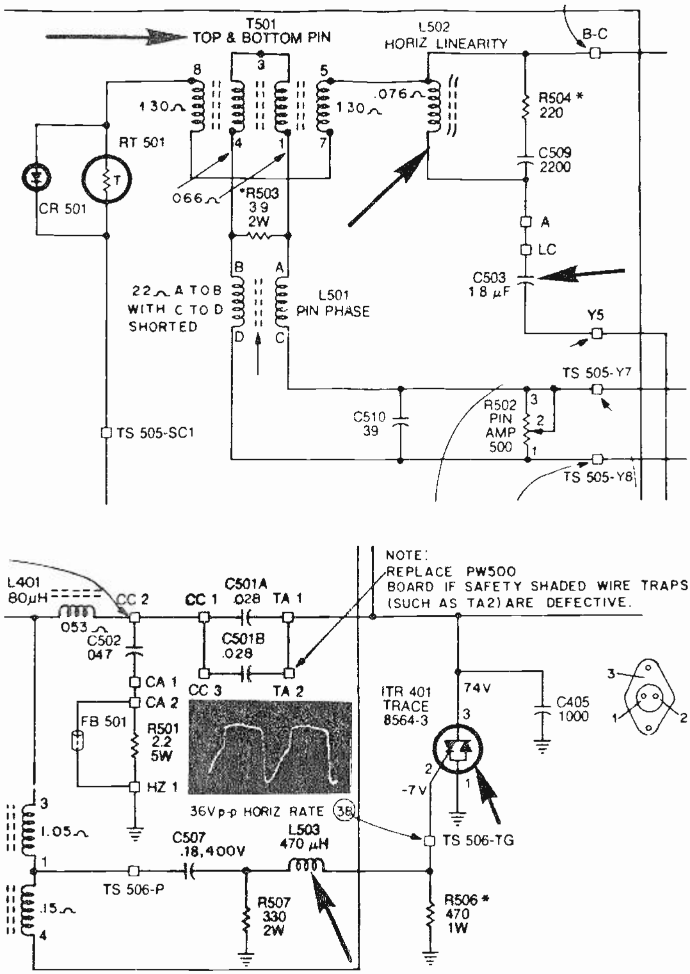
FU490/CTC74.

Symptom:

RF401 open, R508 and R510 overheating.

Corrective Action:

Check for an open yoke return capacitor C503 (or an open anywhere in the yoke circuit—T501, L502, ITR401, etc.), or open L503 in the ITR gate circuit.



RCA

Model/Chassis:

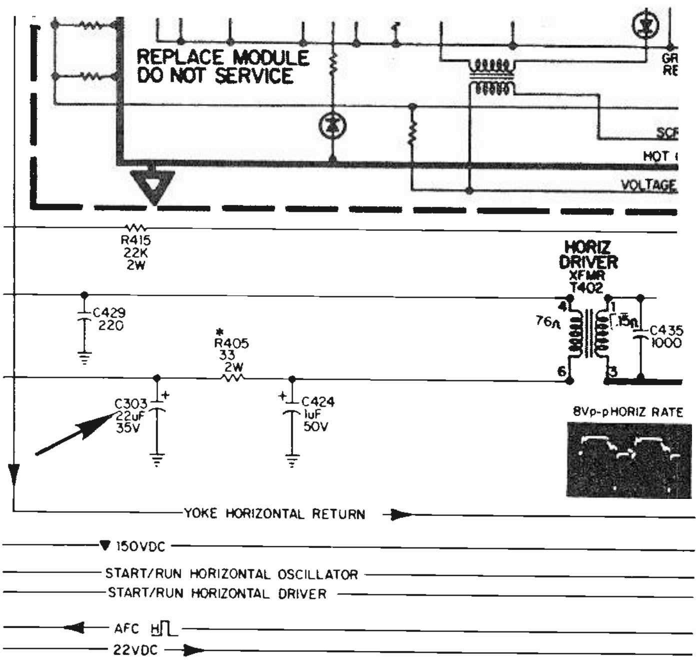
GB 704/CTC 90.

Symptom:

Horizontal "tear" rolling through picture; or repetitive MDH module failure.

Corrective Action:

Check for open C303.



Chassis:

CTC58/CTC68

Symptom:

No video and no control over brightness.

Possible Cause:

- Resistor R105

Model/Chassis:

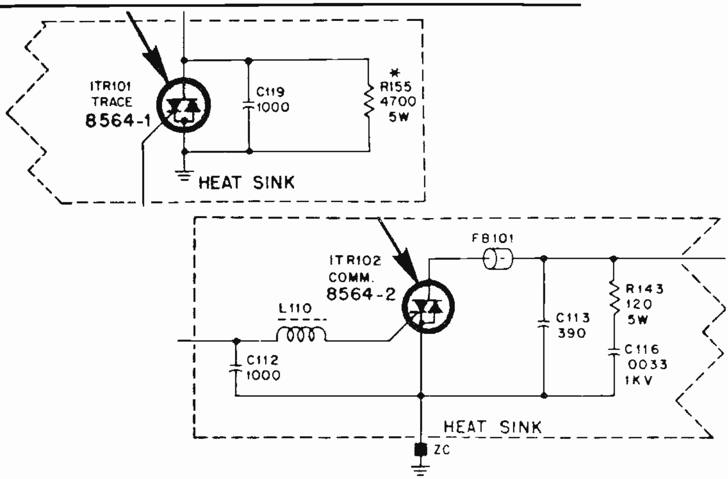
EA 352/CTC 72.

Symptom:

When first turned on, set plays normally for about 30 seconds. Then raster and sound come and go. Finally set is dead.

Corrective Action:

Check, by substitution, for defective ITR 101 *or* 102.



Chassis:

All XL-100

Symptom:

No brightness.

Possible Cause:

- MAE module
- Open connection from PW200 to service switch
- MAL terminal 9 open
- Open connection from PW300-AC to R147
- Service switch
- CR104 open
- Defective Q302
- Defective L301

RCA

Model/Chassis:

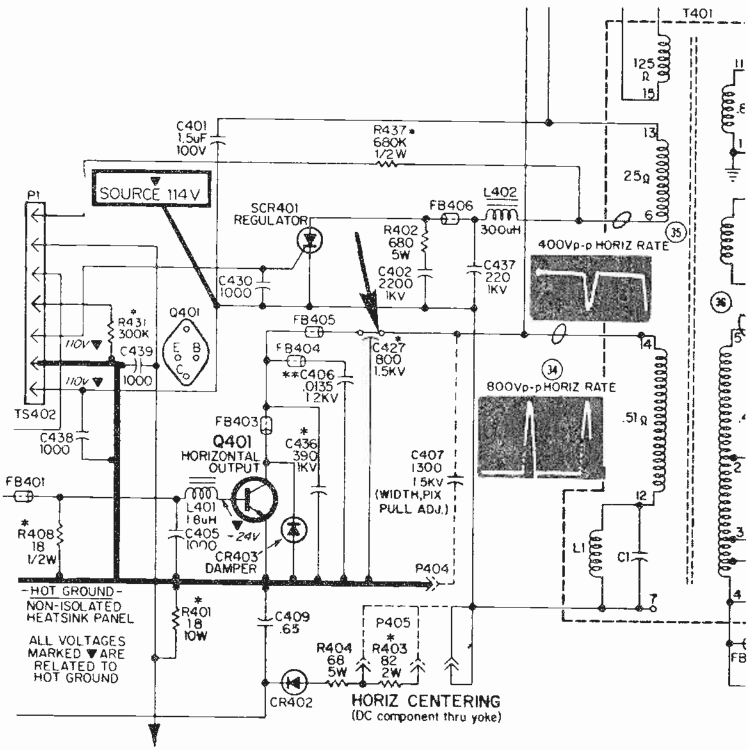
FB 488WR/CTC 89.

Symptom:

Set dead (no sound, no raster) but dial lights and remote motor will run.

Corrective Action:

Check for cold solder joint at C427 (Q401 collector circuit).



Chassis:

All XL-100

Symptom:

Motorboating on some channels.

Possible Cause:

- Transistor Q5 in tuner.

Model/Chassis:

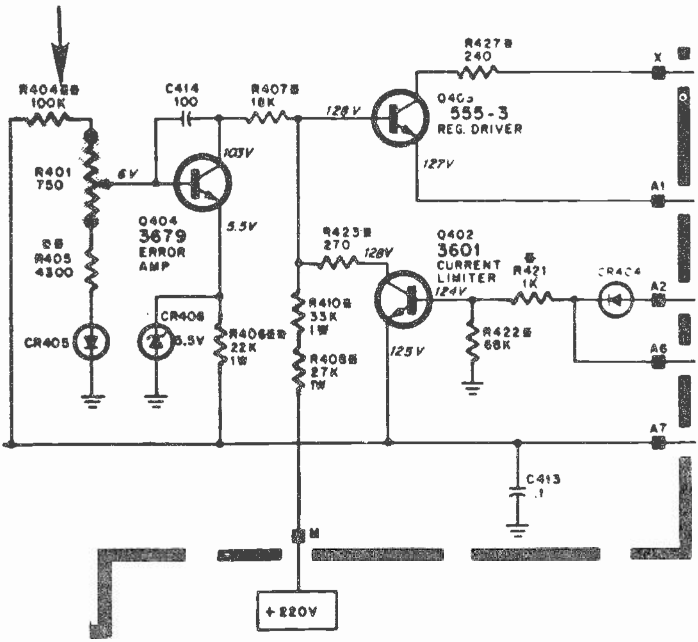
FX 430/CTC 71.

Symptom:

Horizontal off frequency and regulator output voltage about 15 volts high.

Corrective Action:

Check value of resistor R404 to assure only 2% tolerance.



Chassis:

All XL-100

Symptom:

Excessive color and no contrast.

Possible Cause:

- Open connection at P109-3

RCA

Model/Chassis:

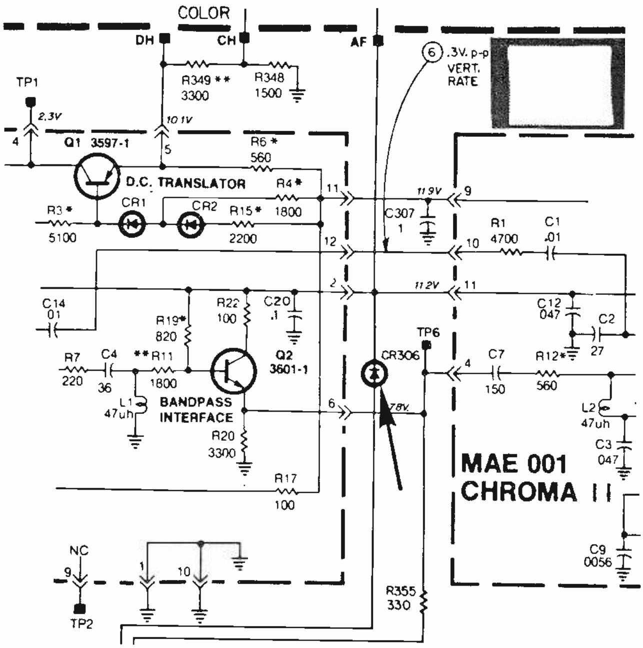
EA 355/CTC 72.

Symptom:

No color except for a one-inch multi-colored vertical bar at the extreme left edge of the screen.

Corrective Action:

Check for a shorted CR 306 diode.



Chassis:

All XL-100

Symptom:

No control of tint.

Possible Cause:

- Open connection at PW4200-AF

Model/Chassis:

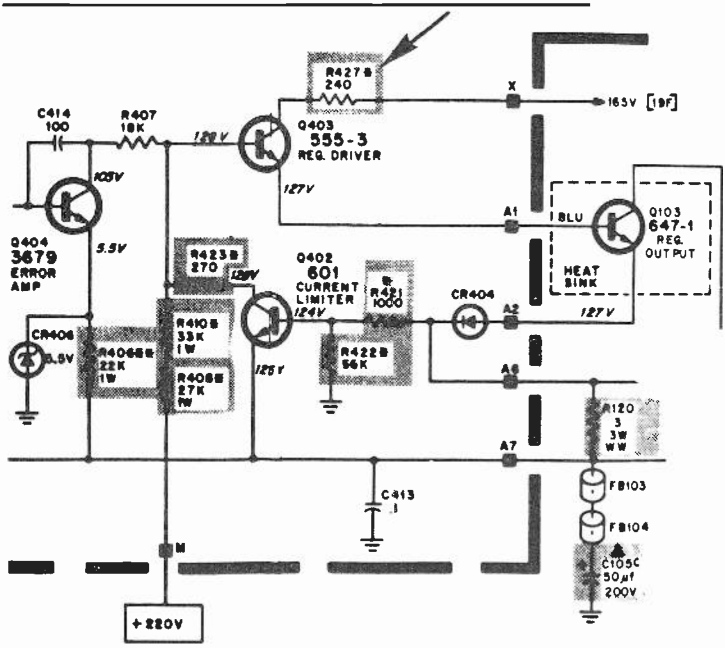
FT 484/CTC 76 Series.

Symptom:

Low high voltage, width varies with brightness control setting.

Corrective Action:

Check for an open R427, 240 ohm resistor, in the regulator circuit.



Chassis:

All XL-100

Symptom:

No minimum color.

Possible Cause:

- Open connection at resistor R349

Model/Chassis:

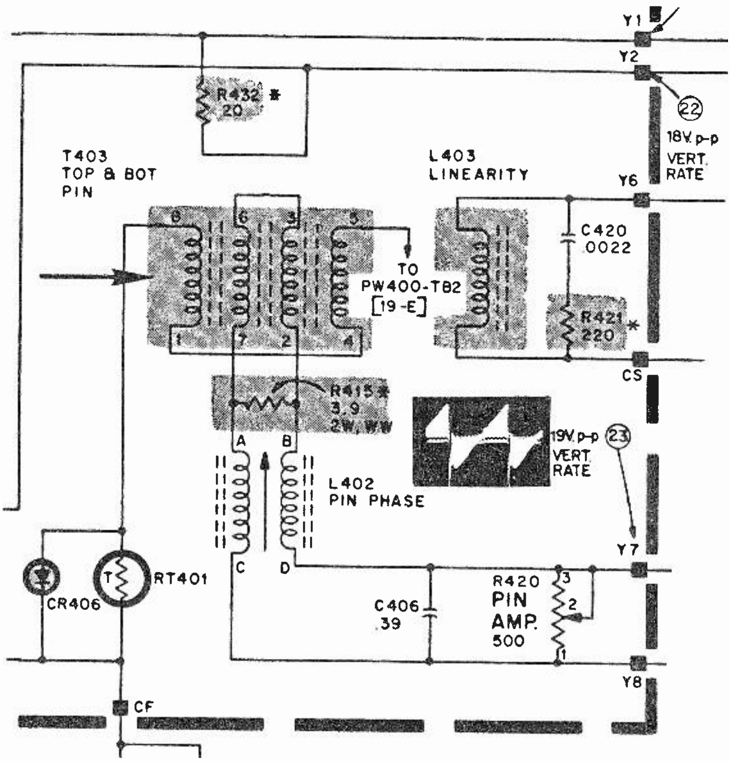
EB 395/CTC 72.

Symptom:

No vertical deflection, only one inch of horizontal deflection.

Corrective Action:

Check for a short between windings in pincushion correction transformer T403.



Chassis:

CTC62/CTC72

Symptom:

No purity.

Possible Cause:

- Yoke band to kine loose.

Chassis:

All XL-100

Symptom:

No picture or sound.

Possible Cause:

- Capacitor C120 shorted
- Resistor R317
- Diode CR303
- Defective service switch

Chassis:

All XL-100

Symptom:

No control of blue horizontal convergence.

Possible Cause:

- Capacitor C806

Chassis:

All XL-100

Symptom:

Vertical color bars.

Possible Cause:

- Defective diode CR305

Chassis:

All XL-100

Symptom:

"Colored" raster.

Possible Cause:

- Open connection at terminal 5 of MAD socket

Chassis:

All XL-100

Symptom:

Snowy picture.

Possible Cause:

- Open connection in tuner from Q1 to R6
- Defective Q3 in tuner
- Defective Q5 in tuner

Chassis:

All XL-100

Symptom:

No UHF or channel 2, intermittent.

Possible Cause:

- Open connection in tuner from Q2 to R21

Chassis:

All XL-100

Symptom:

No AFT.

Possible Cause:

- AFT switch defective

Chassis:

All XL-100

Symptom:

Hash or beat pattern.

Possible Cause:

- Capacitor C4001 open

Chassis:

All XL-100

Symptom:

No VHF but UHF okay.

Possible Cause:

- Defective Q3 in tuner

Chassis:

All XL-100

Symptom:

Intermittent snow.

Possible Cause:

- Antenna filter and cable

Chassis:

All XL-100

Symptom:

AFT off frequency.

Possible Cause:

- L9 on MAK module needs adjustment

Chassis:

All XL-100

Symptom:

No sound.

Possible Cause:

- Capacitor C302
- Capacitor C315 shorted

RCA

Chassis:

CTC58/CTC68

Symptom:

Vertical sweep collapses at one end of hold control.

Possible Cause:

- Defective diode CR102

Chassis:

CTC58/CTC68

Symptom:

Vertical breathing.

Possible Cause:

- Defective capacitor C103

Chassis:

CTC58/CTC68

Symptom:

No vertical deflecton.

Possible Cause:

- Defective L403
- Capacitor C1 in tuner is shorted
- Defective diode CR303
- Defective MAG module

Chassis:

CTC58/CTC68

Symptom:

No vertical deflection and Q102 keeps shorting.

Possible Cause:

- Defective diode CR105

Chassis:

All XL-100

Symptom:

Low sound.

Possible Cause:

- Capacitor C314 open

Chassis:

All XL-100

Symptom:

Intermittent sound.

Possible Cause:

- Capacitor C314

Chassis:

All XL-100

Symptom:

Distorted sound.

Possible Cause:

- Capacitor C302 shorted
- Defective capacitor C314

Chassis:

CTC58/CTC68

Symptom:

Bottom of vertical sweep creeps up when hot.

Possible Cause:

- Transistor Q102

RCA

Chassis:

CTC58/CTC68

Symptom:

Trapezoidal raster.

Possible Cause:

- Open connection at T405 pin 2
- Defective pin phase coil L403

Chassis:

CTC58/CTC68

Symptom:

Vertical size varies with brightness.

Possible Cause:

- Resistor R320 open

Chassis:

CTC58/CTC68

Symptom:

Reduced vertical deflection and service line not centered.

Possible Cause:

- Capacitor C416 open

Chassis:

CTC58/CTC68

Symptom:

Intermittent vertical deflection.

Possible Cause:

- Open connection on PW800

Chassis:

CTC58/CTC68

Symptom:

Wrong vertical frequency.

Possible Cause:

- Diode CR102 open

Chassis:

CTC58/CTC68

Symptom:

Intermittent vertical frequency.

Possible Cause:

- Open connection at resistor R604

Chassis:

CTC58/CTC68

Symptom:

Loss of vertical sweep and audio after 10 minutes.

Possible Cause:

- Short in VHF tuner

Chassis:

CTC58/CTC68

Symptom:

Horizontal foldover.

Possible Cause:

- Open connection at input reactor T401
- Open 470 μH choke L401

RCA

Chassis:

CTC58/CTC68

Symptom:

Reduced width and high voltage.

Possible Cause:

- Leaky 13V zener diode CR405 in HV regulator

Chassis:

CTC58/CTC68

Symptom:

No high voltage.

Possible Cause:

- Open connection from T403 to PW400
- Defective diode CR403
- Open resistor R125
- Open resistor R4205
- Defective diode CR401
- Defective HV tripler STM101
- Leaky SCR102
- Open connection at pin 8 of the MAB module

Chassis:

CTC58/CTC68

Symptom:

Excessive high voltage.

Possible Cause:

- Open connection at pin 4 of HV transformer T403
- Defective HV regulator transistor Q401

Chassis:

CTC58/CTC68

Symptom:

Low high voltage and diode CR406 overheats.

Possible Cause:

- Open connection from PW400-W to diode CR406

Chassis:

CTC58/CTC68

Symptom:

High voltage drops intermittently from 26 kV to 20 kV.

Possible Cause:

- Defective diode CR405

Chassis:

CTC58/CTC68

Symptom:

Circuit breakers trips when brightness is raised.

Possible Cause:

- Defective SCR102

Chassis:

CTC58/CTC68

Symptom:

Circuit breaker trips when channel is changed.

Possible Cause:

- Defective SCR101

RCA

Chassis:

CTC58/CTC68

Symptom:

Arcing.

Possible Cause:

- Defective HV tripler SMT101

Chassis:

CTC58/CTC68

Symptom:

Circuit breaker trips.

Possible Cause:

- Defective 13V zener CR405
- Shorted HV transformer T403
- Open connection at diode CR401
- Shorted 68 μH choke L108

Chassis:

CTC58/CTC68

Symptom:

Keystone raster.

Possible Cause:

- Open connection at pin 2 of pincushion transformer T405

Chassis:

CTC58/CTC68

Symptom:

Reduced horizontal deflection and foldover.

Possible Cause:

- Diode CR401 loose in socket

Chassis:

CTC58/CTC68

Symptom:

No high voltage regulation, no color, and no sync

Possible Cause:

- Open connection from PW400-H to pin 3 of high voltage transformer T403

Chassis:

CTC58/CTC68

Symptom:

Low high voltage.

Possible Cause:

- Open input reactor T401
- Leaky capacitor C115
- Defective high voltage transformer T403

Chassis:

CTC58/CTC68

Symptom:

Varying brightness causes circuit breaker to trip.

Possible Cause:

- Defective capacitor C406

Chassis:

CTC58/CTC68

Symptom:

Horizontal singing

Possible Cause:

- Loose shield on choke L108
- Broken core of choke L108

RCA

Chassis:

CTC58/CTC68

Symptom:

Raster not centered.

Possible Cause:

- Defective SCR102

Chassis:

CTC58/CTC68

Symptom:

Raster ringing.

Possible Cause:

- Green lead at PW300-AK too close to green focus lead—redress

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Chassis:

CTC58/CTC68

Symptom:

Excessive width.

Possible Cause:

- Open 1.5 μF capacitor C120

Chassis:

CTC58/CTC68

Symptom:

Intermittent horizontal hold.

Possible Cause:

- Resistor R4205

Chassis:

CTC58/CTC68

Symptom:

Holddown circuit inoperative.

Possible Cause:

- Defective resistor R427

Chassis:

CTC58/CTC68

Symptom:

Horizontal off frequency.

Possible Cause:

- Defective holddown transistor Q402

Chassis:

CTC58/CTC68

Symptom:

Bending vertical lines at high brightness.

Possible Cause:

- Defective diode CR408

Chassis:

CTC58/CTC68

Symptom:

Horizontal off frequency and excessive high voltage.

Possible Cause:

- Defective 13V zener CR405

RCA

Chassis:

CTC58/CTC68

Symptom:

Horizontal off frequency and circuit breaker trips.

Possible Cause:

- Defective holddown transistor Q402

Chassis:

CTC58/CTC68

Symptom:

No CRT filament.

Possible Cause:

- Defective transformer T104

Chassis:

CTC58/CTC68

Symptom:

No raster and no sound but high voltage okay.

Possible Cause:

- Open 3A fuse F102

Chassis:

CTC58/CTC68

Symptom:

No 15V supply

Possible Cause:

- Shorted capacitor C1 in tuner

Chassis:

CTC58/CTC68

Symptom:

Circuit breaker trips when ACM is turned on.

Possible Cause:

- Short between ACM switch and tuner mounting assembly

Chassis:

CTC58/CTC68

Symptom:

Circuit breaker trips intermittently.

Possible Cause:

- Open 4.7 μF capacitor C417
- Defective 13V zener CR405
- Defective 64 μH choke L108
- Defective capacitor C104

Chassis:

CTC58/CTC68

Symptom:

Circuit breaker trips when first turned on, then okay.

Possible Cause:

- SCR insulator

Chassis:

CTC62/CTC72

Symptom:

No vertical sync after 20 minutes.

Possible Cause:

- Defective MAG004 module

RCA

Chassis:

CTC62/CTC72

Symptom:

No vertical deflection.

Possible Cause:

- Open filter capacitor C104
- Defective vertical height control R118
- Open resistor R112
- Shorted 27V zener CR405

Chassis:

CTC62/CTC72

Symptom:

Vertical size varies with brightness.

Possible Cause:

- Open resistor R320

Chassis:

CTC62/CTC72

Symptom:

No vertical deflection or sound.

Possible Cause:

- Defective input reactor T402

Chassis:

CTC62/CTC72

Symptom:

Intermittent vertical defelection.

Possible Cause:

- Open 2.2M resistor R422

Chassis:

CTC62/CTC72

Symptom:

No high voltage.

Possible Cause:

- Defective trace ITR 101
- Open connection at ITR socket

Chassis:

CTC62/CTC72

Symptom:

Horizontal off frequency at low brightness level.

Possible Cause:

- Defective 1.75 μF capacitor C110
- Defective 1.75 μF capacitor C111

Chassis:

CTC62/CTC72

Symptom:

Horizontal singing.

Possible Cause:

- Defective linearity coil L403

Chassis:

CTC62/CTC72

Symptom:

Lines in picture.

Possible Cause:

- Defective two-section 0.051 μF capacitor C413

RCA

Chassis:

CTC62/CTC72

Symptom:

Narrow raster.

Possible Cause:

- Defective power supply filter C102
- Open 470 μH choke L401

Chassis:

CTC62/CTC72

Symptom:

Open 7A fuse F101.

Possible Cause:

- Defective RV101

Chassis:

CTC62/CTC72

Symptom:

No 15V supply

Possible Cause:

- Shorted capacitor C1 in tuner

Chassis:

CTC62/CTC72

Symptom:

Circuit breaker intermittently trips.

Possible Cause:

- Defective circuit breaker CB101
- Defective capacitor C413

Chassis:

CTC62/CTC72

Symptom:

Poor purity.

Possible Cause:

- Defective CRT

Chassis:

CTC62/CTC72

Symptom:

Intermittent CRT filament

Possible Cause:

- Open connection at input reactor T402

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

No vertical deflection.

Possible Cause:

- Open 470 μF capacitor C409
- Defective transistor Q101
- Defective transistor Q102
- Open R202C

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Intermittent loss of vertical sweep at bottom of raster.

Possible Cause:

- Mounting screw for transistor Q102 loose

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Dim horizontal line through center of raster, crossover distortion.

Possible Cause:

- Defective diode CR105

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Vertical size varies with brightness level.

Possible Cause:

- Open 4.7K resistor R320

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Intermittent vertical rolling.

Possible Cause:

- Shorted diode CR107

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Vertical foldover.

Possible Cause:

- Open connection at pincushion transformer T402

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

No high voltage.

Possible Cause:

- Defective HV tripler SMT101
- Shorted damper CR101
- Defective horizontal output transistor Q401
- Defective spark gap SG101

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Not enough width.

Possible Cause:

- Shorted regulator output transistor Q103
- Open 240-ohm resistor R427
- Defective damper diode CR101
- Defective 5.5V zener CR406
- Defective diode CR404
- Defective diode CR403

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Intermittent high voltage.

Possible Cause:

- Open connection at PW400-C

RCA

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Narrow raster and excessive high voltage.

Possible Cause:

- Open capacitor C108

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

No horizontal deflection.

Possible Cause:

- Open connection at pin 3 and 6 of pincushion transformer T402

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Trapezoidal raster.

Possible Cause:

- Defective yoke

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Margin on left side at high brightness level.

Possible Cause:

- Open 240-ohm resistor R427

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

No horizontal hold.

Possible Cause:

- Defective current limiter transistor Q402
- Defective 270-ohm resistor R423

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

No horizontal sync and no color.

Possible Cause:

- Defective high voltage transformer T401

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

No 15V supply.

Possible Cause:

- Shorted capacitor C1 in tuner.

Chassis:

CTC60/CTC70/CTC71/CTC76

Symptom:

Circuit breaker trips.

Possible Cause:

- Short in MAB power supply module

RCA

Chassis:

All XL-100 remote circuits

Symptom:

Remote won't operate at close range.

Possible Cause:

- R1105 need adjustment

Chassis:

All XL-100 remote circuits

Symptom:

Set won't turn off.

Possible Cause:

- Defective triac Q104
- Defective transistor Q1110
- Shoted Q1111

Chassis:

All XL-100 remote circuits

Symptom:

Remote not working but local okay.

Possible Cause:

- Open transistor Q1102

Chassis:

All XL-100 remote circuits

Symptom:

Remote not working.

Possible Cause:

- Shorted CR1101
- Open fuse F101
- Open capacitor C1117
- Defective transistor Q1111
- Defective K1101
- Open connection at MAY007A-C

Chassis:

All XL-100 remote circuits

Symptom:

Remote channels keep running.

Possible Cause:

- Shorted transistor Q1103

Chassis:

All XL-100 remote circuits

Symptom:

Won't change channels.

Possible Cause:

- Shorted capacitor C1108

Chassis:

All XL-100 remote circuits

Symptom:

Set will not turn on.

Possible Cause:

- Defective triac Q104
- Emmited-base short in transistor Q1111
- Shorted 16V zener CR1101

RCA

Chassis:

All XL-100 remote circuits

Symptom:

Remote sensitivity poor.

Possible Cause:

- Defective CR1103

Chassis:

All XL-100 remote circuits

Symptom:

Local on/off only works at one volume setting and overall volume is low.

Possible Cause:

- Defective diode CR1117

Chassis:

All XL-100 remote circuits

Symptom:

No medium or low volume.

Possible Cause:

- Defective transistor Q1117

Chassis:

All XL-100 remote circuits

Symptom:

Set turns itself on.

Possible Cause:

- Pot R1105 needs adjustment

Chassis:

All XL-100 remote circuits

Symptom:

Circuit breaker trips.

Possible Cause:

- Leakage in photocell PM101
- Defective capacitor C1117

Chassis:

All XL-100 remote circuits

Symptom:

Won't bypass UHF channel A.

Possible Cause:

- Open resistor R4701

Chassis:

All XL-100 remote circuits

Symptom:

Doesn't stay on manually.

Possible Cause:

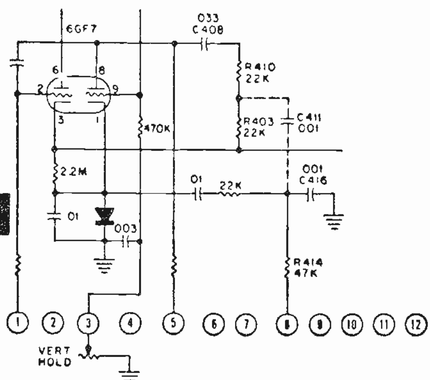
- Defective capacitor C1101

Setchell-Carlson

Weak Vertical Sync in Setchell Carlson Color TV

The following modifications to the vertical sync circuit in the CE unit will improve the vertical hold in areas where vertical sync is weak because of low line voltage or local signal conditions.

1. Remove C411 (sync coupling capacitor which is connected to the junction of R403 and R410).
2. Disconnect pin 1 of 6GF7 from ground. (Connect this ground wire to pin 5 of the 6GF7.)
3. Install a silicon diode, a 2.2M ½w resistor, 2 0.01 μf 1kv disc capacitors and a 22K ½w resistor as shown in schematic.



Vertical oscillator drift as the receiver warms up or vertical lock-in at the end of the vertical hold control range can be caused by a defective 12M resistor (R404) in the vertical hold circuit.

Modify the vertical hold circuit to the schematic shown, removing R404 (12M), R406 (2.2M), and R405 (470K). The 470K resistor is then placed between pin 9 of the 6GF7 and terminal 3 of the plug strip (vertical hold control). A 0.003μf, 1kv disc capacitor is added between terminal 3 of the plug strip and ground.

Modification in Setchell Carlson Color TV Units CF-1,2,3,4

Blooming or "raster collapse" momentary loss of horizontal sweep and high voltage) is caused by an overload in the high voltage circuits. The overload is the result of CRT beam current exceeding the limit which can be regulated by the 6BK4 high voltage regulator tube and the added load causes lowering of all voltages developed by the horizontal output circuit.

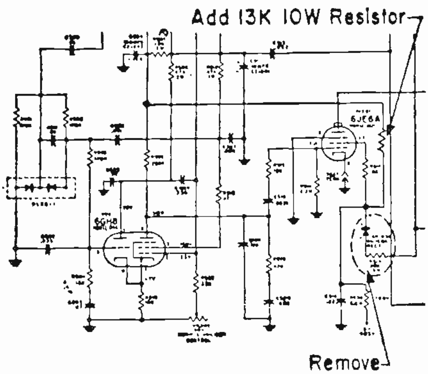
Color receivers should be used with subdued room lighting to obtain adequate brightness and color contrast without approaching the overload point.

If brightness, contrast or color are set too high, a sudden change in picture modulation or a change from monochrome to color can cause blooming or "raster collapse."

The Horizontal output circuit can be modified as follows:

1. Remove the 6JE6A screen supply rectifier (CR1034) and the 10w resistor (R518) between the screen rectifier and terminal 9 of the CF unit socket strip.

2. Install a 13K 10w resistor between B+ 405v (tie lug of the 100μf 450v electrolytic capacitor) and the junction of R517 and C512 (6JE6A screen bypass capacitor).

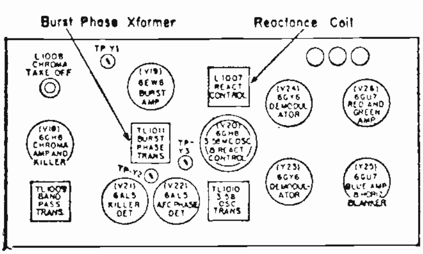


3. Install a ⅜ amp fuse in the cathode circuit of the 6JE6A. The cathode is brought out to a ground connection on the front of the CF unit and is labeled Horiz Out. Cath.

A kit is available from Setchell Carlson which contains all the components for making this modification.

Intermittent Color in Setchell Carlson TV

Symptoms: Color goes off when the micro tuning is set for best picture. Color goes on and off as the horizontal hold is adjusted within the horizontal lock-in range. No color on some stations or programs. No color



when TV receiver is first switched on or after it has been on for some time.

Correction: Adjust Color Killer Control. (1) Set the channel selector to a vacant UHF channel. (2) Set the color control at maximum clockwise position. (3) Advance the color killer control until color appears in the snow and then retard the color killer control approximately 10deg past the point where color disappears in the snow. **Adjust 3.5MHz Oscillator Frequency.** (1) Connect a color bar generator to the receiver. (2) Set the color control for normal color level. (3) Remove the burst amplifier tube (6EW6-CY unit). (4) Adjust the reactance coil for color oscillator zero beat (minimum movement of the color bars). The reactance coil is located in front of the 6EW6 bust ampifier and to the left of the 6GH8 3.58MHz oscillator. (5) Replace the burst amplifier tube.

Check the TINT control range. The tint control range can be centered by a slight adjustment of the burst phase transformer. The burst phase transformer is located between the 6EW6 burst amplifier and the 6AL5s.

Setchell Carlson Color Tuning Light

A glowing light has taken all the guesswork out of fine tuning color television.

That's the claim of Setchell Carlson, Inc. for their new development, Color Tuning Light, a feature introduced on 1967 color TVs.

Here's how it works: The micro-tuning knob on the color set is adjusted until the light glows at its brightest. When the light is bright, the set is accurately tuned for the selected channel. Nobody, whether a TV service technician or electrical engineer, can tune the channel any better, the manufacturer claims.

The brightness of Tuning Light also helps to indicate proper antenna direction in situations where rotor-type antennas are installed. And, the indicator functions with UHF as well as VHF reception.

Unlike tuning devices which measure signal strength, the Tuning Light indicates proper frequency, glowing brightest when the band is locked-in perfectly.

After the micro-tuning adjustment is completed, the viewer can adjust color and tint controls to suit his personal taste.

Setchell Carlson, a St. Paul-based manufacturer of color, black and white and closed circuit television receivers, has a patent pending on the process.

Design Change in Setchell-Carlson Tuning Light Circuitry

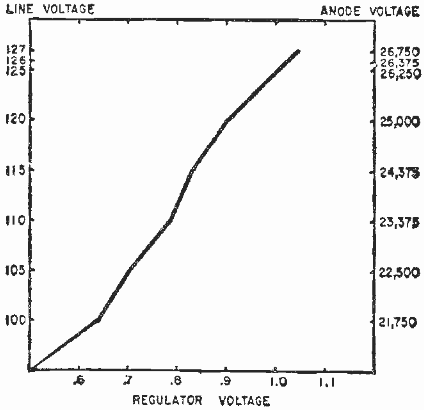
All Setchell Carlson color-TV receivers shipped after Oct. 15, 1966 incorporate improved circuitry to enhance tuning light performance.

The improved circuitry is incorporated in the advanced CA8, CBC8 and CD8 units. To better suit local conditions, a threshold control has been provided on the rear of the CA8 unit. This control should be adjusted for proper tuning light indication at optimum tuning on all channels.

On those receivers shipped prior to October 15, 1966, which display herringbone at the indicated tuning point, the condition can usually be cleared up with a slight adjustment of the 41.25MHz sound trap. Turn the top slug in the 4th IF can (CBC7 unit) approximately 1/8 turn clockwise and reset the micro tuning control.

Setchell-Carlson Compares Line Voltages With Other Voltages

Two 23-in. and three 25-in. Setchell-Carlson Color-TV receivers were checked for various line voltages.

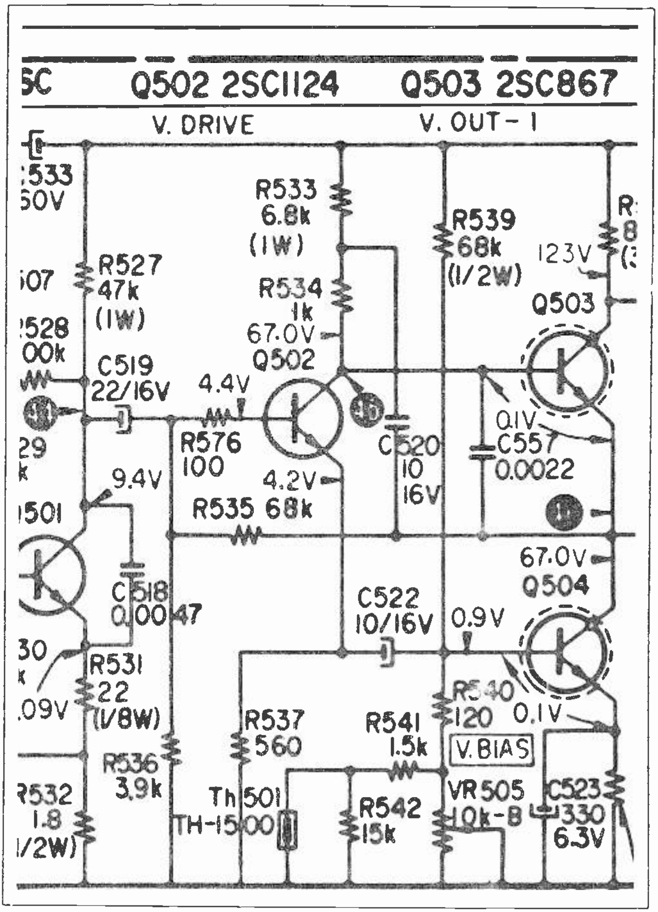


When setting up the experiment, 120vac was used as the normal line voltage. At that line voltage, the high voltage was adjusted to 25kv. The resulting voltages are shown in the graph.

Sony

Color TV Chassis KV 1722 — Vertical foldover. Horizontal Drive Line

If top half of the picture is streaked, replace resistor R535 (68K). It's probably shorted. (See diagram to right)



Sylvania

Sylvania D01 Color Sets

If you encounter weak color on this chassis check L602. This choke may open. It is located in 6EW6 (V8) plate circuit . . . If you run into no color and weak video, it may be caused by a shorted 2nd IF screen grid bypass capacitor (560pf) . . . It is also reported that shrinking rasters can be caused by horizontal output tubes that are new. If you run into this problem, try at least three new ones before you jump to any conclusions. It is also recommended that no tubes that have been overheated should be placed back in the set. They may give you a hard time later.

Sylvania D01 and D02 Color Chassis

Horizontal Hold

With certain signal conditions the Sylvania D01 and D02 color chassis may exhibit poor horizontal hold or may lock off sync. A better locking range and greater stability may be obtained by installing a 10M ½w resistor from the sync separator's plate to the grid.

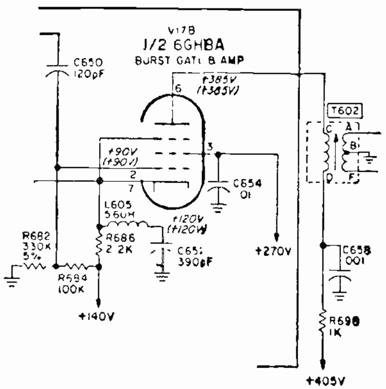
Alignment of the horizontal oscillator coil should be checked anytime there is trouble with horizontal sync. The recommended procedure follows for both the 21 and 25 in. color chassis.

Short out the sync by grounding the input to the sync separator. Short out the oscillator coil by placing a jumper from pin eight of the oscillator to ground. Adjust the horizontal hold control until the picture syncs horizontally or floats by slowly. Next, remove the short and adjust the coil for a horizontal sync or slow floating condition. After the sync short is removed the process is complete.

Unstable Color Sync

A very perplexing problem is color loss because of killer action or color sync loss. Actually, both problems are the same since killer cutoff is caused by a loss of color sync. Consequently, to determine the root of the problem the color killer must be opened. In most cases the color will exhibit a "barberpole" effect.

To correct this unstable condition, R682 (shown in schematic) located in the grid circuit of the burst gate amplifier should be changed to 330K. This resistor may presently be 270 or 240K. This change will make color sync more stable.



Other recommended changes are:

In the same stage L605 and C652, in shunt with the suppressor grid, should be removed. These two components are in one sealed unit. They should be replaced with a 1000pf disc type capacitor.

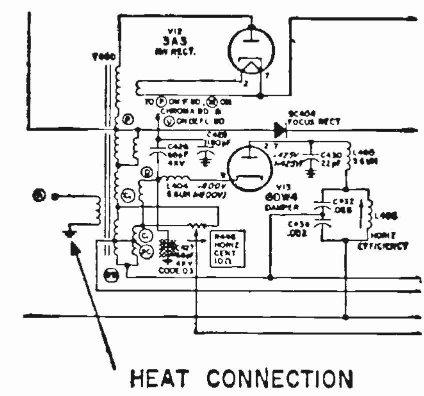
R680, located in the grid circuit of the burst gate clipper, should be changed from 180K to 68K and, finally, R601, located in the grid of the chroma amplifier, should be changed from the present 5.6 or 3.3M to 1.5M.

None of the above changes should be made without first being sure the reactance coil and the 3.58Mc output transformer is properly aligned.

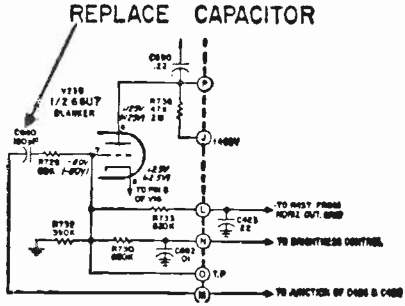
"Open" the color killer to obtain sufficient color and burst during this alignment procedure. Tune in a color station. A color bar generator may be used although it is less desirable than a station transmission. Advance the chroma control to maximum clockwise. Detune fine tuning until color is barely visible. At this point, the color may fall out of sync. Adjust the reactance coil until it is centered in the locked-in range of the color signal. It may be possible to reduce the fine tuning still further to obtain a more accurate setting of the reactance coil.

Color Sync and Brightness Problems on Sylvania's DO1, DO2

Intermittent color sync problems



have been found in several DO1 and DO2 chassis caused by a cold solder joint. This connection is found on the ground side of the flyback AFC

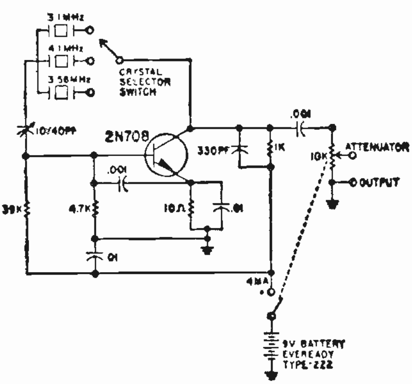


transformer winding. Re-heat the joint and if there's smoke, there's rosin.

An intermittent opening of C680 in the blanker tube grid circuit, V23B, will cause the brightness to change. Replacement of the 150pf capacitor with a new component will correct the trouble.

Field Alignment of Chroma Amplifiers Sylvania DO2

Touch-up chroma adjustments are often necessary in the field when weak, improper or no color presentation is encountered. With the necessary instruments listed here and crystal oscillator (schematic shown)



a quick alignment can be made. Following the procedure given here, results comparable to the original factory alignment are possible. If this procedure does not solve these problems, a complete realignment should be made using the applicable service literature.

Instruments Needed:

1—Dot-Bar Generator
1—Electron tube voltmeter
1—Demodulator probe
1—Crystal oscillator with a 4.1MHz or 3.1MHz crystal and variable output 0 to 2v.
1—Hex tuning wand

Procedure:

1. Verify that the complaint is valid and the trouble is not caused by improper operating voltages or defective tubes.
2. Remove receiver back cover and horizontal output tube.
3. Set controls as follows:
   a. Color killer open to allow bandpass stage operation.
   b. Color control set to mid range.
   c. Tint control set to mid range.
4. Remove one IF tube to prevent spurious chroma signals.

Test Instrument Connections:

1. Connect the crystal oscillator output to test point "S" on the IF board. (1st video amplifier grid.)
2. Connect the VTVM with demodulator probe to test point "S" on the chroma board. (Chroma input grids of "S" and "Z" demodulators.)

Alignment Procedure:

1. Apply power to receiver and test instruments.
2. Set crystal oscillator to 4.1MHz and adjust chroma take-off coil (L604) to maximum VTVM reading.
3. Turn bandpass transformer (T600) slugs all the way to top and bottom positions.
4. Set crystal oscillator to 3.1MHz and turn bottom slug to peak VTVM reading — then turn an additional one turn clockwise. If the first peak obtainable appears when the slug is in the extreme position, reverse steps 4 and 5 then tune top slug to 3.1MHz and bottom to 4.1MHz.
5. Set crystal oscillator to 4.1MHz and turn top slug to peak VTVM reading. Do not adjust beyond obtained peak.

Receiver Checks:

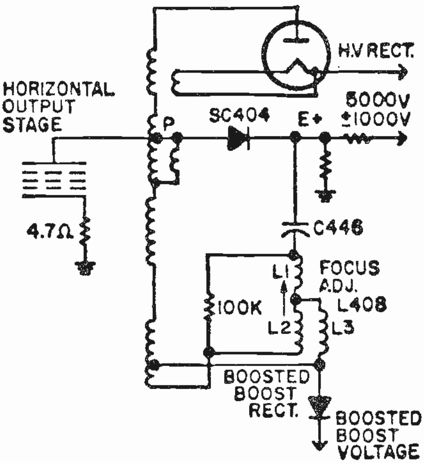
1. Disconnect power to receiver and remove test instruments.
2. Replace tubes and switch set on.
3. Apply a color bar pattern and adjust to best presentation of colors.
4. Check tint control range and adjust transformer (T602) if necessary.
5. Using VTVM and demodulator probe, peak (T604) 3.5MHz oscillator output transformer.
6. View a color program and evaluate color presentation.

Color TV Chassis D02,D10 — Focus Voltage and HV Circuits

Focus Voltage Supply

An adjustable intermediate high voltage of about 5kv is required for the color CRT focusing electrode. This voltage is developed by using flyback pulses at a suitable tap on the flyback transformer and applying it in series with a rectifier diode to the focus electrode. A capacitor and coil network (see schematic) is connected between the diode output and the B+ boost terminal.

The complete focus coil network, L408, employs three windings, an input winding (L3), output winding (L1) and a common winding (L2). These coils are mounted on a common form. A 100K damping resistor is placed across the L1 and L2 windings. The focus coil output is coupled by C446 to the focus rectifier cathode. This capacitor, in addition to supplying a reference pulse, also serves as the focus supply filter capacitor.



A powdered iron core slug in the coil form (focus control) varies the effective pulse voltage division at the junction of L1 and L2 by differentially varying the coupling of L1 to the other two coils.

The coils, L2 and L3, operate in mutual opposition so an additional pulse input of adjustable amplitude and polarity may be applied to the rectifier cathode. This control affects the amount of "switch-on" bias of the rectifier and therefore, the amount of focus voltage developed. By adjusting the slug, a waveform similar to that shown in illustration A and B may be obtained at the cathode of diode SC404.

Coil L408 windings are connected in such a way as to make the pulse across the series winding either aid or oppose the main pulse from the focus tap "P." About 1kv of focus voltage variation is available when the focus slug is adjusted with a nominal value of 4.8 to 5.2kv

Sylvania's DO6 Color Chassis

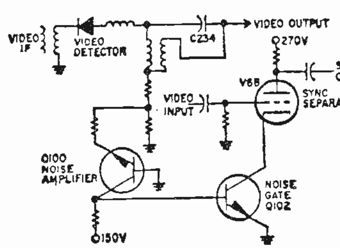
The new chassis is similar to the DO5 color chassis and has many features of the DO2 shown here. It employs a power transformer, shunt type high voltage regulation and pincushion correction at the raster top and bottom. The pincushion correction circuit uses a passive transformer and is slug adjusted.

Chroma circuits are very similar to the DO5 chassis, "X" and "Z" demodulation is used to drive the color differency amplifiers. Matrixing in the cathode and grid circuits provide drive for the G-Y amplifier.

In the video amplifier circuit the pentode-triode (10JT8) used in the DO5 has been replaced by a 6HL7 pentode and the triode section (color killer) is now transistor Q600, an SE1002/2N3694 type.

An additional refinement has been made in the noise gate circuit. Transistor (Q102) has been added to provide greater bias amplification.

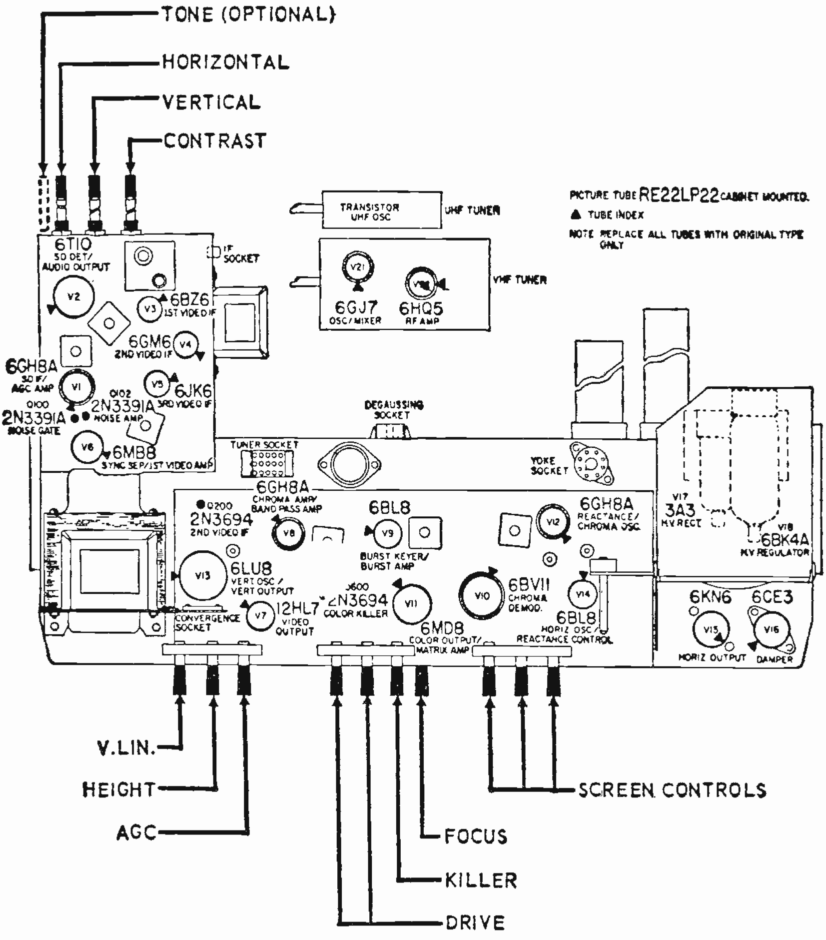
This bias is used to cut off the



sync separator stage and prevent noise pulses from affecting the scanning oscillators. (See schematic above.)

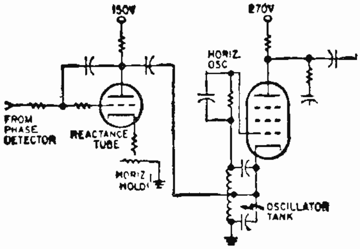
The brightness and contrast levels are set by adjusting the contrast range control. A spike flyback pulse is rectified by SC204 to provide a negative dc source for biasing the final video amplifier. This sets the amplifier conduction level and, by dc coupling, the CRT cathode potential. This bias is further adjusted by signal level regardless of average video level variations. To prevent loss of gray scale range caused by changes in average video level, dc restoration is required.

The horizontal AFC circuit in the D06 is similar to traditional AFC used in color subcarrier frequency control. A diode phase detector is used to compare oscillator and horizontal sync pulse frequency to provide a correction voltage. This voltage controls the reactive current conduction of a reactance tube. The react-



D06 CHASSIS LAYOUT

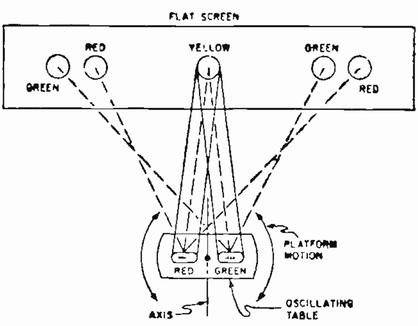
ance tube is paralleled with a portion of the oscillator tank circuit to provide oscillator control as shown below.



At the grid of the video output stage, dc restoration is accomplished by the clamping diode, SC204. This diode clamps at about the blanking level to provide fixed bias for the video output stage.

Color TV Chassis D06/D07/D09/D10 — Convergence Problems

If two parallel light beams swing back and forth at a point of rotation and scan a screen horizontally, the problem of dynamic misconvergence



can be illustrated. In the illustration, note the red and green beams coincide at the screen center and form a yellow circle of light. However, when the beams swing right or left an equal amount, the beams no longer coincide, then separate red and green light circles are formed. The farther the beams move away from the center position, the worse this condition becomes.

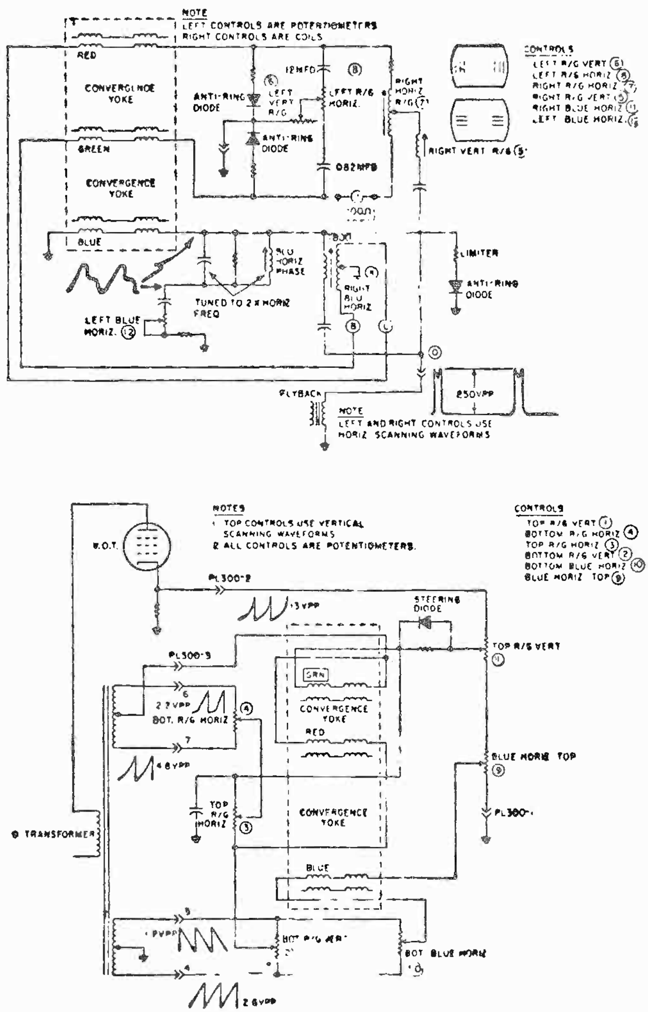
To correct this condition, keeping a yellow spot of light in all positions of the oscillating platform, it can be seen the most remote lamp from the point being scanned must be reduced in its swing, or the nearest lamp swing, or a combination of both of these corrective measures. If the beams are scanning a vertical screen with a vertical oscillating table, a similar type correction is required.

In the color CRT the three scanning beams must receive a similar corrective deflecting field from the convergence yoke. They can first be made to converge mechanically and statically at the center of the screen by static and purity adjustments. But as soon as they move horizontally or vertically, an increasing amount of correction is required. It is the function of the dynamic convergence waveforms and the convergence yoke to provide this correction. Correction waveforms, taken as part of the output from the horizontal and vertical deflection systems, are used to provide both vertical and horizontal beam scanning correction. The horizontal and vertical convergence voltage circuits are shown in illustrations. The typical input waveforms to these circuits are also shown. It should be noted that R/G convergence waveforms interact with the blue waveforms; these circuits are also shown. It should be noted that the R/G convergence waveforms interact with the blue waveforms through T800 (RT Blue Horiz.). Therefore, in this circuit the blue convergence should be approximately adjusted before proceeding with R/G convergence.

Horizontal and vertical convergence errors can be separated for ease of viewing while making adjustments. For example, all vertical convergence adjustments should be made on a vertical line through the screen center. Any errors appearing on left or right during this adjustment should be ignored. The only misconvergence that can occur along this vertical line is because of the horizontal parabolic waveform causing the beam to move faster or slower across the screen to cause bending of a center vertical line.

Center horizontal convergence in a vertical line is a function of the vertical sweep waveform.

The best convergence is obtained when all raster positioning controls including center and linearities have



already been made. Rough setup should be made preliminary to setting purity. Then go back and make final adjustments of static and dynamic convergence. Any further adjustment of the raster positioning should not be made unless touch-up of all controls is intended.

The following notes apply chiefly to Sylvania D06, DO7, D09, and D10 chassis (see illustration):

1. Left red horizontal droop may be brought up to match the green by breaking connection between the .082 µf capacitor and the RT R/G horizontal coil and inserting a 100 Ω, ½w resistor. (For less correction, less resistance may be used.)

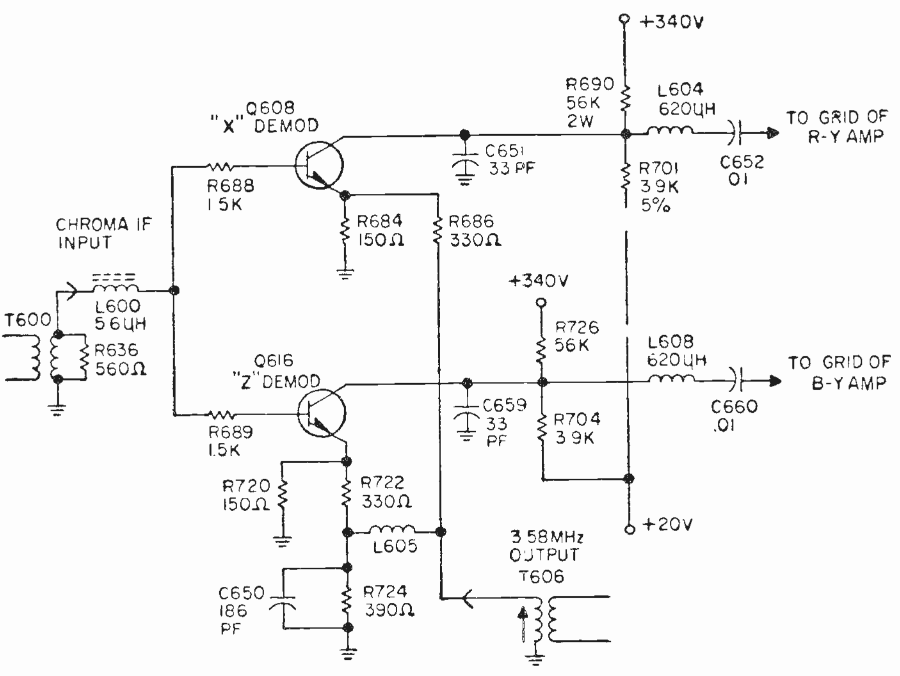
2. A high red, left, horizontal line may be corrected (opposite problem of No. 1) by moving the yellow/green wire on convergence board from pin "L" (RT-Blue horizontal) to ground connection "G," or reverse leads from T700 primary at "B" and "L."

3. If red is high on RT horizontal, replace the .082 µf capacitor with a .056 µf capacitor.

If you make any of these changes, the convergence board should be so tagged. A touch-up of both static and dynamic controls is nearly always necessary after any of these changes.

Color TV Chassis D12/D13 — "X" and "Z" Demodulators Circuit Description

To demodulate the chroma sidebands of the Sylvania D12 and D13 chassis, transistorized "X" and "Z" demodulators provide synchronous detection of these signals. The 3.58-MHz reference oscillator injection voltage is applied to the emitter of these stages. This voltage is several

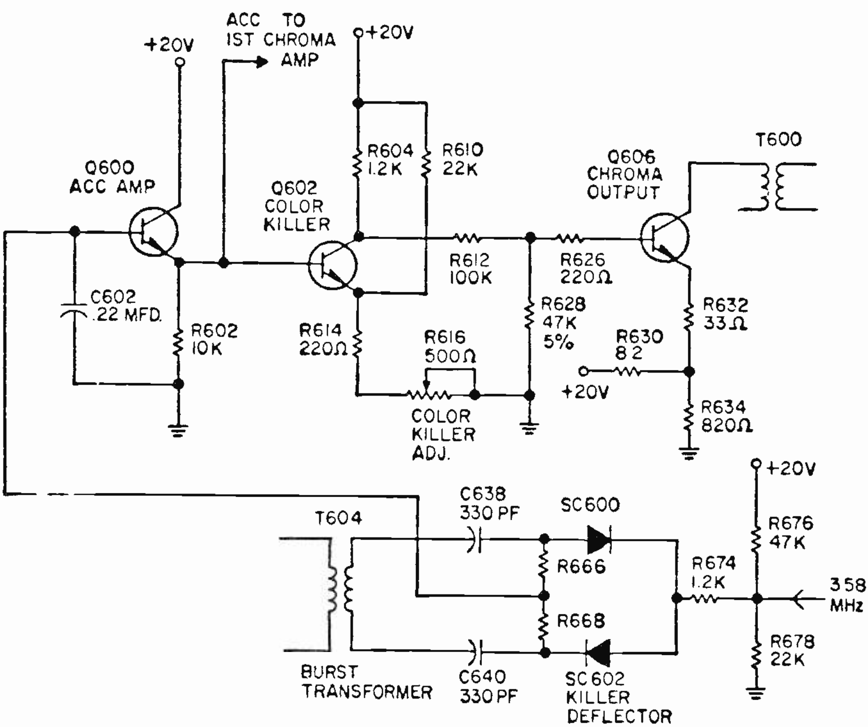


times the chroma input amplitude of the 3.58MHz pulses in the collector circuits of the demodulators. The phase of the 3.58MHz applied to the "Z" demodulator is shifted approximately 90deg by coil L605 and capacitor C650. The actual shift is selected for best color presentation.

When chroma signals are applied to the base of the demodulators, the phase and amplitude of the chroma will influence the average amplitude of collector pulses in each demodulator. These pulses go in a less positive direction, nominally to about one-half the B+ voltage (40v). If the incoming chroma is in-phase with reference pulses, the collector will drop to less than ½ B+ value. If they are out of phase, collector pulses will not be able to fall as low as ½ B+ value. If chroma signals are 90deg out-of-phase, part of the collector pulse will be below ½ B+ value and part will be above ½ B+ value. The result is an average of zero change in collector pulses. The collector pulses are averaged by a low pass filter before application to the R-Y and B-Y amplifiers. These networks are C651 and L604 in the "X" demodulator, and C659 and L608 of the "Y" demodulator. After the collector pulse smoothing is complete, only color video remains and it is applied to the difference amplifiers through C652 and C660.

Color TV Chassis D12/D13—ACC and Color Killer Circuits

When color burst is received, it is gated by blanker transistor Q604, then fed through burst amplifier Q614. Aft-

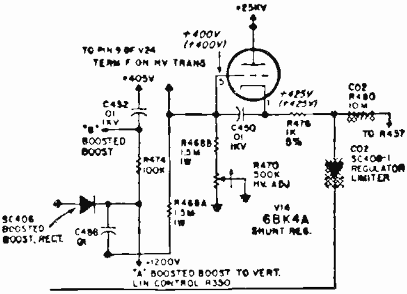


er amplification it is coupled through burst transformer T604, to the ACC and killer detector circuit. Opposite phases of the burst signal are coupled to the cathode and anode diodes SC600 and SC602. These two signals of opposite phase are compared in amplitude with a 3.58MHz reference signal. The reference signal is applied to the opposite anode and cathode of the diodes at all times.

During the presence of a burst signal, one diode conducts more than the other and produces a less positive voltage at the junction of R666 and R668. This less positive voltage is used to bias "off" ACC amplifier Q600 to produce a reduced output bias voltage at its emitter. The less positive voltage at the emitter is used for two purposes: It serves as an ACC voltage for the 1st chroma amplifier and as "turn off" bias for the color killer stage. When the burst signal is absent, only the reference signal is applied to the ACC detector diodes and the voltage at the resistor junction is more positive (four to six volts). This voltage will bias "on" the ACC and color killer transistors, which causes the collector of color killer transistor Q602 to drop from 20v to about 5v. This provides about 1v to the base of the chroma output stage which biases it off completely and blocks spurious color channel signals. It should be noted that 1v applied to the base of the chroma output stage is sufficient to cut it off because the emitter is already positive due to the divider action of emitter resistor R634 and R630 from the 20v line.

HV Automatic Protection Circuit

This circuit consists of interconnecting bias networks that serve the following functions in case of high voltage regulator failure or misadjustment of this circuit (see simplified diagram): (a) reduce horizontal output drive by increased bias, (b) decrease CRT conduction by biasing off the final video



amplifier, (c) provide over-voltage protection for flyback, CRT and high voltage components.

Under normal conditions the shunt regulator is conducting through diode SC408. The positive voltage at SC408 anode is coupled through R480 to drive the horizontal output grid in a positive direction. Full power will then be delivered to the horizontal transformer and associated circuits.

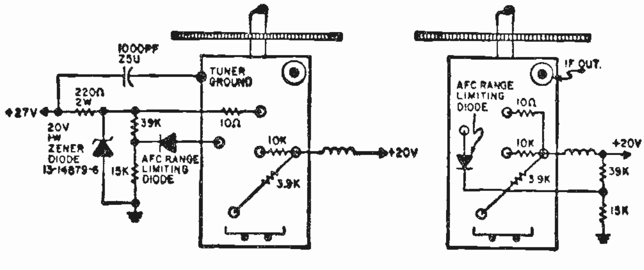
If the HV regulator should stop conducting, its cathode will become less positive and SC408 will become reverse biased and cut off. When this happens, the positive polarity influence of R480 is removed and the high grid leak bias from the blanker stage reduces conduction of the horizontal output stage. The extra bias is also applied through R431 to the video output stage grid. The video output stage delivers less video, its plate voltage rises and causes the CRT guns to go almost to cutoff.

The result of this biasing is a dim picture, reduced horizontal drive and no excessive high voltage.

It should be noted that the HV regulator grid received a correction bias automatically as a function of the boost B+ voltage, horizontal output tube and video output grid bias.

Color TV Chassis D12/D13—Local Oscillator Stabilization on 54-23857-3 Tuner

To stabilize local shift with line voltage, a 27v B+ oscillator frequency source is connected from positive side of C522 to pin 4 of SK500. From pin 4 to PL500 the 27v B+ is



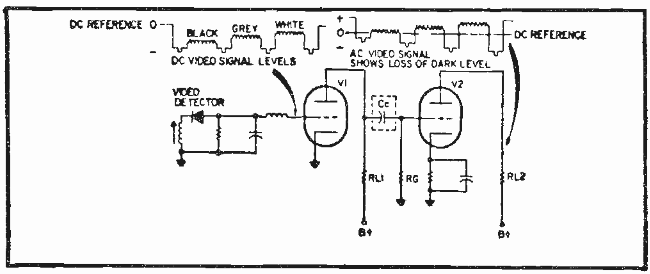
NEW CIRCUIT ORIGINAL CIRCUIT

wired to the tuner through the circuit shown.

To correct for local oscillation radiation problems, a 1000pf-Z5U capacitor has been added from the + 27v side of a 220 Ω 2w resistor to tuner ground.

Color TV Chassis D12—DC Restoration

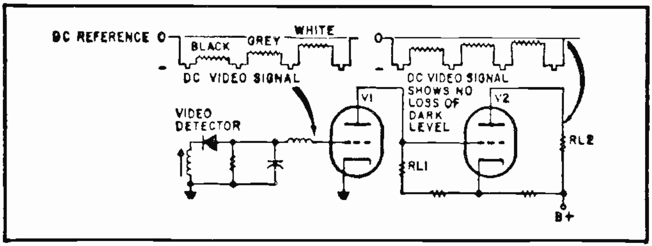
The purpose of dc restoration in a black and white television set is to maintain the black to white signal ratios present in the transmitted signal. In color television, dc restoration is needed to maintain color fidelity, from fully saturated



colors to the lighter pastel colors. If the black level changes due to the Y signal loosing its dc reference, the colors desaturate.

Interstage coupling capacitors shown in the illustration remove the dc reference from the video signal making it an ac signal. The peak to peak input voltage does not change. However, the grid leak bias developed by the positive portion of the waveform changes as the signal level changes. This action shifts the conduction level of the amplifier. The voltage drop across RL2 will vary with the grid leak bias.

In the direct coupled amplifier, the average conduction level is related to the grid to cathode dc bias voltage of the



amplifier. The voltage drop across the load resistor RL1 is coupled directly to the grid of V2 developing a voltage drop across the load RL2.

When the input signal is applied to the grid of V2, the dc bias is increased or decreased by the voltage changes. The dc reference in the output signal waveform shown in schematic is maintained and saturated colors remain saturated.

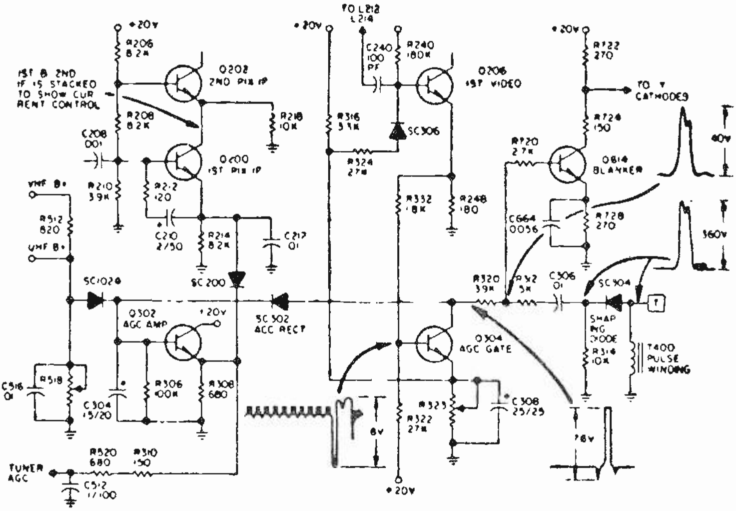
When fully saturated colors are transmitted as part of the composite video signal each color has a definite brightness level, that must be maintained. DC restoration in the Y channel insure the correct brightness level for each of these colors. As an example, if saturated red is transmitted the brightness level is 30 percent. The 30 percent brightness level is maintained in the Y channel as referenced to the blanking pulse. This Y channel signal without dc restoration increase its white level as shown, the color will loose its fully saturated condition showing up as a washed out red or pink.

Color TV Chassis D14—Peak Detector—AGC Circuit Description

The new color TV chassis, D14, uses a peak detector-AGC system to control signal gain in the first and second IF stages.

The peak detector's AGC gate characteristics are variable in terms of impedance. When the base signal amplitude on transistor Q304 is high, the gate impedance is high. Likewise, when the composite signal applied to the base is low, the gate impedance is low.

The AGC gate collector voltage is applied during flyback trace when a positive pulse from the T400 pulse winding triggers Q304 collector positive through attenuating resistors R322, R312 and coupling capacitor C306. The base-emitter forward voltage is coupled from the voltage divider resistors, R322, R332 and R248, placing Q304 in the "on" mode. Negative sync signal is applied to the base of Q304 from the 1st video amplifier emitter resistor R248. This negative going signal blocks the forward voltage from the bias network, reducing Q304 conduction. When Q304 is in a low conduction state, it presents a high shunt impedance to the positive pulse applied to its collector and thus causes no appreciable attenuation.



When SC200 is reversed biased, the only conduction path for Q200 is through R214. This 8.2K ohm voltage drop increases the emitter voltage, reducing the V_{be} and stage gain.

Weak signals result in a lower amplitude sync applied to the base of Q304 placing less blocking voltage against the forward bias. This forward bias puts Q304 into a high conduction mode, making the transistor act like a low impedance when it receives the collector positive pulse. This low shunt impedance effectively reduces the pulse amplitude applied to the AGC rectifier, SC302.

When Q200 emitter impedance is lowered, the emitter voltage decreases causing the transistor V_{be} to increase and result in more IF stage gain.

Signal Condition	Q No.	Function	Vc	Vb	Ve	Symptoms
Normal	304	AGC Gate	2.4	2.9	2.7	None
Weak	304	AGC Gate	2.125	2.85	2.125	Noisy Pix

Test point [T] 350 to 360V pk pk pulse

Signal Condition	Q No.	Function	Vc	Vb	Ve	Symptoms
Normal	302	AGC Amp.	19.6	7V	6.4	None
Weak	302	AGC Amp	19.6	3	2.5	Noisy Pix

Component Number	Failure Mode	Symptoms	V	VR	VF
SC302	Open	No Raster	20	0	2.4
C304	Open		20	3	4
R306	Open	Raster Brightens	20	8	7.5
R308	Open	Raster Brightens	20	8	8
Q302	Open	No Raster	20	20	3

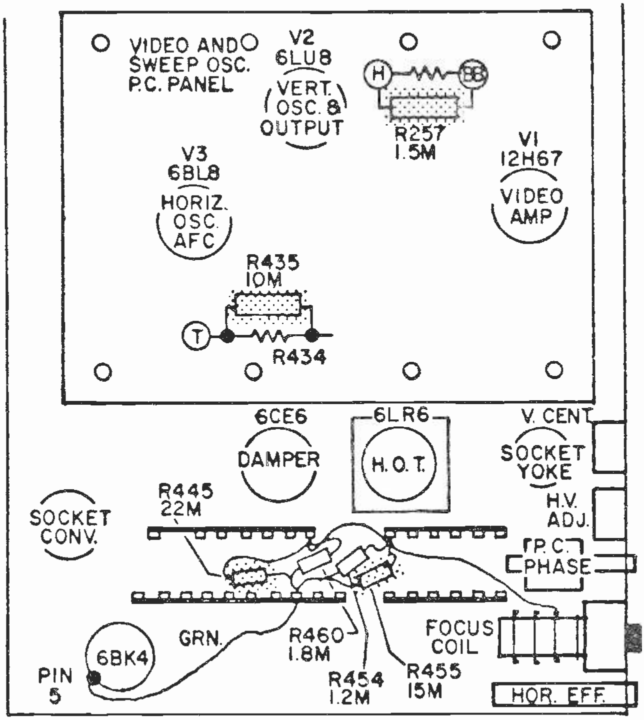
A dc scope can be used as a voltmeter for both dc and peak to peak voltage readings, or use a VTVM for the dc measurements.

The following readings were taken under two signal conditions: normal and weak, at Q304 collector, base and emitter using a VTVM.

Test Procedure: (1) Connect the color bar generator to the TV set tuner antenna terminals. (2) Adjust color bar generator output to normal (preselected).

Why Change a CRT First?

What seemingly could be a soft CRT may be just a shift in circuit parameters caused by variances in resistors, transistors, vacuum tubes, and the CRT.



These slight changes can add up one way or the other, affecting either or both the second anode voltage and CRT brightness parameters.

See illustration for chassis D12 trim resistor's location identified by the shaded area. Removal of specified resistors will correct one or both of the conditions mentioned.

However, prior to trimming the second anode voltage and/or brightness to specified standards, the screen and drive control must be adjusted by the normal set-up practices for proper grey scale and grey scale tracking.

HV Trimming

If necessary, trim up the high voltage to specification using a black raster (no beam current). First, measure the second anode voltage, make any adjustment to raise or lower it to 25kv by turning potentiometer R456, the HV adjust control.

Should the second anode voltage not meet the 25kv mark during adjustment, a voltage change is required across the 6BK4 bias network R456, R455 and R454, R460 and R445.

The bias network IR drop ratios are changed by removing one or the other trim resistors, R445 or R455.

When the HV adjust is made, and the second anode voltage falls below 25kv, R445, a 22M resistor, is removed, making the grid voltage less positive, decreasing the 6BK4 conduction, raising the second anode voltage.

If any high voltage set up conditions develop that re-

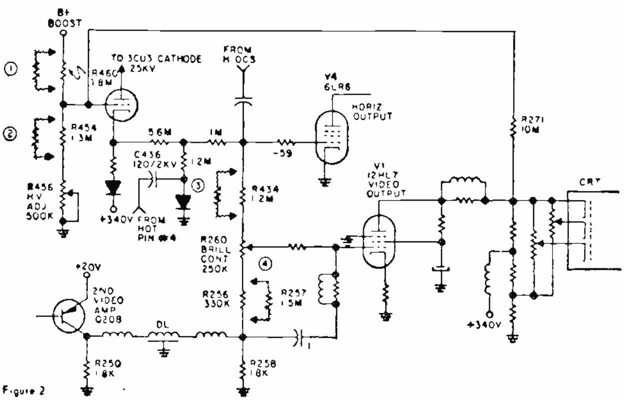


Figure 2

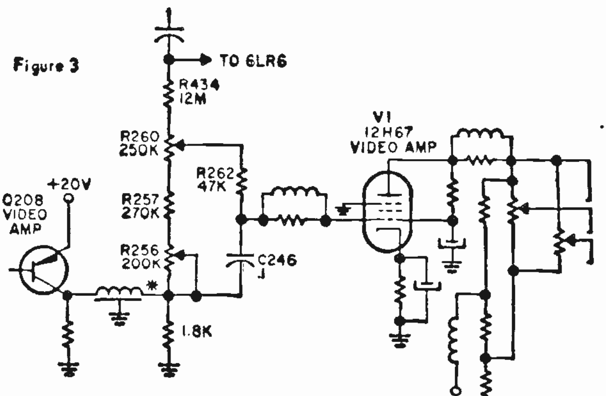
quire a high voltage reduction beyond the HV adjust control range, the IR drop ratios can be changed by removing R455, a 15M resistor, making the 6BK4 grid voltage more positive (increasing its conduction), and lowering the HV.

Brilliance Trimming

Brightness parameters are observed by using full contrast and brightness control setting, with the second anode voltage as previously adjusted, and a 90% brightness raster. This condition may be developed in the field by connecting a cross hatch generator to the set, and detuning either the set or the generator to show black lines.

When the brightness is varied, the raster may compress, but this is normal if raster edges are not viewable.

Figure 3



However, should the raster edge show, its condition is fixed by removing a 1.5M resistor, R257, from the brightness control resistance network. The voltage ratios across the divider changes, placing the brightness control in a more negative voltage range. Now, the video amplifier conduction lowers, raising its plate voltage, making the CRT cathodes more positive turning down beam current.

Should the brightness level be too low, and the raster not compressed during brightness control changes, be certain R257, a 1.5M resistor, is in the circuit and then remove R435, a 10M resistor. This resistance change will shift the IR drop ratios, placing the brightness control in a less negative voltage range. This change shifts the video amplifier's dc level, lowering its plate and CRT cathode voltage, thus increasing the brightness.

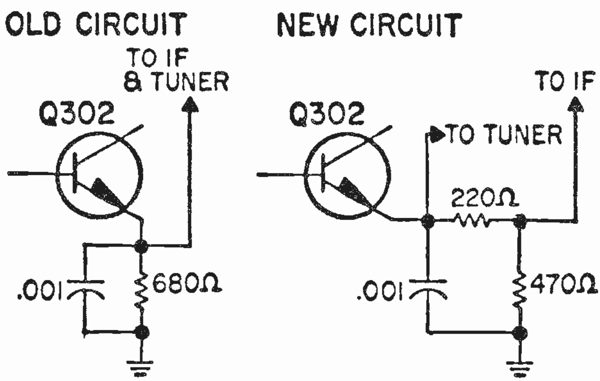
Trim Pot (Brightness Range Pot)
Chassis D12-09-09 D12-15-07 D12-21-50 D12-11-06 D12-20-50

Brightness trimming resistors R257 and R256, a 330K and 1.5M, have been replaced by a trim pot R256 and a 270K resistor R257. The brightness range pot has been added between R258, a 1.8K resistor and R257. The brightness range pot adjustment accomplishes the same effect for brightness control as the trim resistors.

Color-TV Chassis D14, D15 and D16, Early Chassis Without Video Buffer Stage—Intermittent Loss of Horizontal Sync When Changing Channels

When all checks of the horizontal and sync circuits show normal operation, and advancing the AGC to the point just before overload corrects the horizontal problem but results in vertical jitter, several modifications can be made to boost the sync level and eliminate these problems.

Change the emitter resistor to the first IF transistor, Q200, from 15K to 8.2K. In many cases this resistor has already been changed in production. Then modify the AGC amplifier circuitry as shown in the diagram below.



Also change resistor R334 in base circuit of transistor Q308 from 470K to 390K. Any lower value than this will affect horizontal phasing and could cause excessive horizontal jitter on weak stations. Change capacitor C304, the AGC filter, to approximately twice its original value. Too much capacity will cause airplane flutter and increase effects of co-channel interference.

Color-TV Chassis E02-1,-2,—Vertical Jitter

At some signal levels, the VERTICAL-HOLD control can be adjusted to cause vertical jitter in the picture. To correct this condition for all signal levels, make the following changes: Remove resistor R57 (on EO2-1 tuner panel only) and replace it with a jumper as shown in Fig. 1. Insert a 39K, ½w, 10% resistor from tie point GB to the junction of capacitor C55, resistor R54, R58 and diode

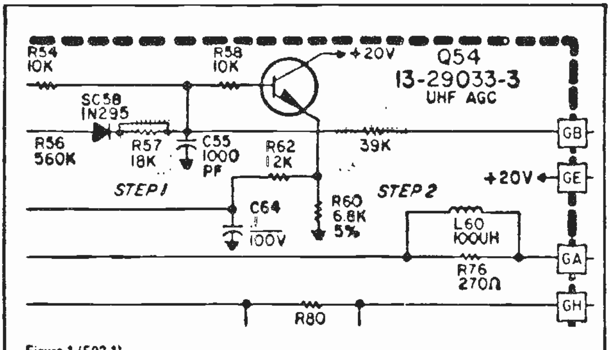


Figure 1 (E02-1)

SC58 (on EO2-1-2 tuner panel) as shown in Fig. 1 and 2.

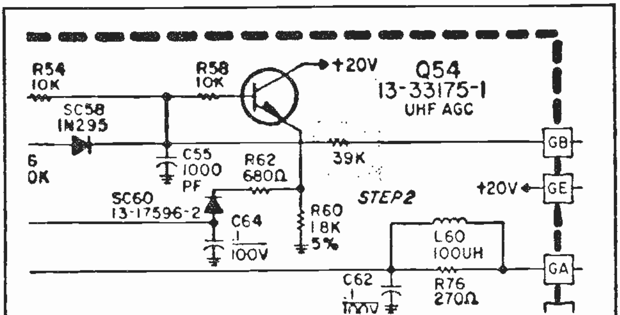


Figure 2 (E02 2)

Remove capacitor C208 (on EO2-1-2 IF panel) and replace it with a 5μf, 50v electrolytic capacitor, as shown in Fig. 3. Remove capacitor C302 (on EO2-1-2 IF panel)

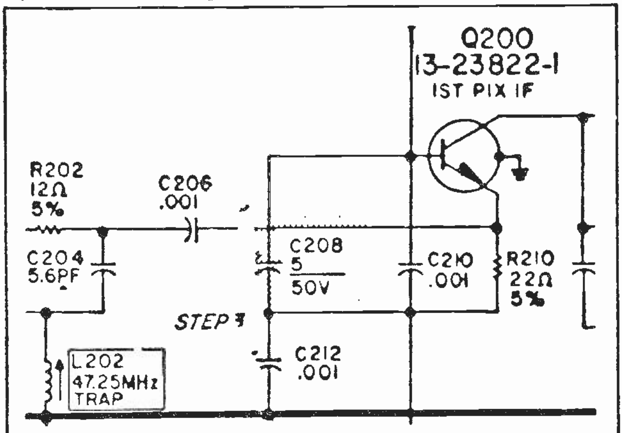


Figure 3 (E02-1,-2)

and replace it with a .33μf, 100v capacitor as shown in Fig. 4.

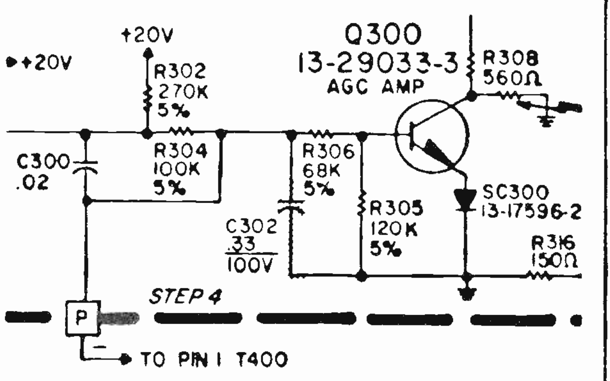


Figure 4 (E02 1, 2)

Color-TV Model CL2498 Entertainment Center—Wrong Speakers Installed

A small quantity of the above model TV sets were shipped with the wrong speakers installed. The correct speaker for the TV function only (two per set) is Part No. 12-15696-5. If the speakers in the set are −3, they should be replaced with the −5. Performance of the TV set is not affected at normal listening volume, however, premature failure of the audio output transistors in the TV chassis can be experienced if the TV set is operated at high volume with the incorrect speakers used.

Color TV Chassis E04—Solving Tuning Problems

Step 1—Substitute the switching panel. If the trouble is corrected, check the transistors on the original panel. If the problem is not corrected, the trouble is in the tuner or pushbutton assembly. Go to Step 2.

Step 2—Check voltages to the tuner at the switching panel terminals, as follows:

TM4—B+ +24 volts.
TM3—VHF Switch +24 volts.
TN3—AGC will vary with signal.
TM6—Hi-Lo Band Switching, approximately −24 volts, Low - Band.
TM6—Hi-Lo Band Switching, approximately +24 volts, High-Bands
TL6—Timing voltage, approximately + .5 volts to +28 volts VHF, +1.5 volts to +28 volts UHF.

Suggestion—Using a working set, make a chart of tuning voltages for all channels received in your area, for future trouble shooting reference. If problem is intermittent, take voltage readings when operating normally and then with trouble occuring, and compare. The AGC voltage will not be too helpful as a loss of signal or drift will change it. If the voltages are OK and do not change, the tuner is defective.

Step 3—If the tuning or switching voltages are not correct or change when the problem occurs, one or more of the push - button modules are defective. The tuning voltage should vary through the ranges listed above as a button is tuned over its entire travel.

A defective P.B. bank can often be located by opening the buss wires at the rear edge, one bank at a time. Unsolder and slip a strip of cardboard between wires and foil contacts. When a defective bank is opened, the remaining banks will tune OK.

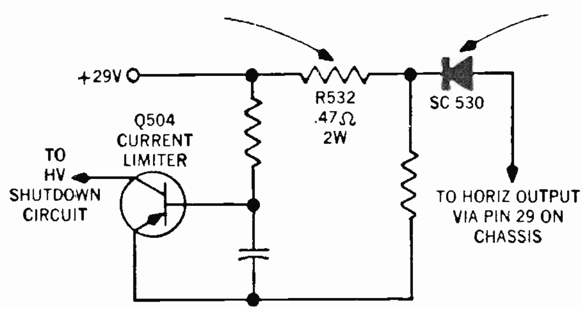
Make resistance check of the P.B. bank. If the bank is opened, the diodes and transistors should be checked. The in - circuit check will show a defective diode and switch contacts.

A "sub" bank can be made up by using an extra bank and a package of miniature chp leads available at parts houses. Cut the clip off of one of the leads and solder leads to the foil contacts at the rear of the bank. The U-V jumper wire should be cut and a short clip connection installed across, so the split U-V bank can be subbed. To use, clip the leads to the appropriate buss wires in cluster, in place of a bank that has been isolated as above, and tune in the channels.

A set of extension cables including an IF extension will allow the cluster to be placed on the top of the set while servicing the unit.

CHASSIS: GTE Sylvania E08

TROUBLE SYMPTOM: Picture and sound absent.

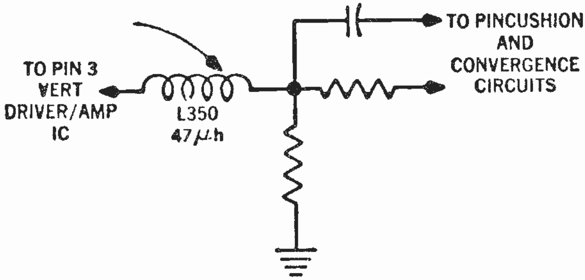


CAUSE: Diode SC530 shorted, burning open R532.

SYLVANIA

CHASSIS: GTE Sylvania E08

TROUBLE SYMPTOM: Vertical sweep absent

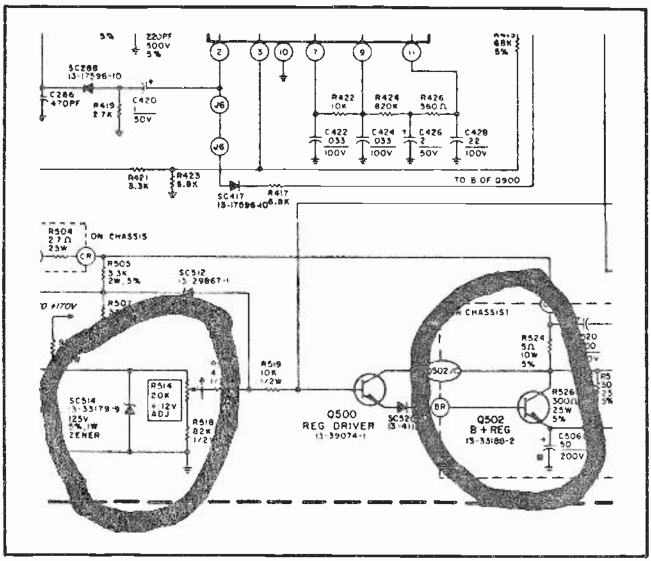


CAUSE: Choke L350 open

CHASSIS: Sylvania D16

TROUBLE SYMPTOM: Repeated failure (short life) of 6LR6 horizontal output tube (V4).

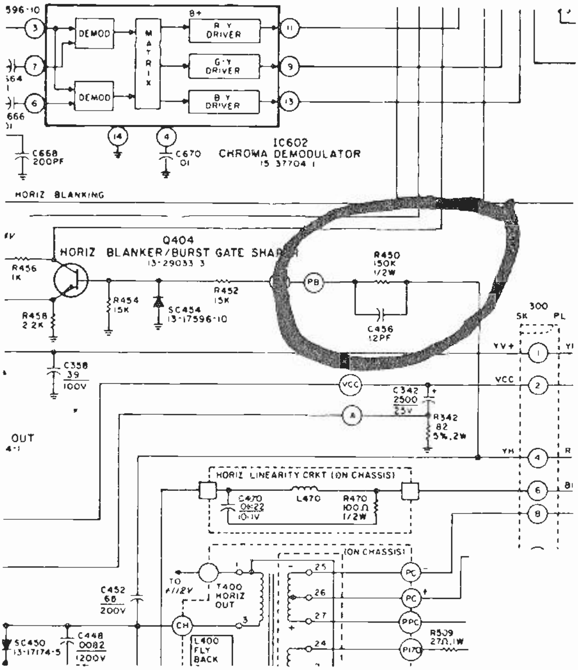
CAUSE: VDR R446 (assuming that drive to control grid of V4 is normal and high voltage is adjusted properly). ■



Color TV Chassis E21—A small picture and low B+
The problem is in the power supply caused very likely by a leaky zener diode SC 514 and transistor Q502 which is the B+ regulator.

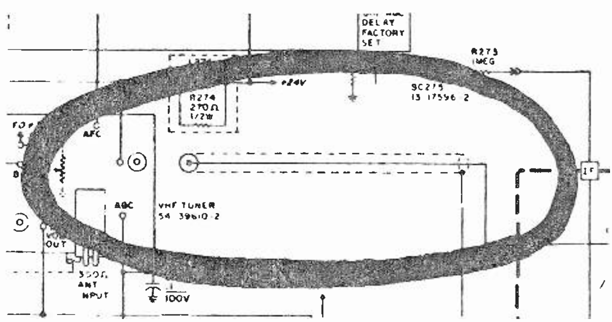
Color TV Chassis E21—A shrunken horizontal picture

This symptom points to a capacitor (C456) in the horizontal circuit that has changed value. This will cause resistor R452 to overheat and thus shrink the picture on the right side about 4 inches.



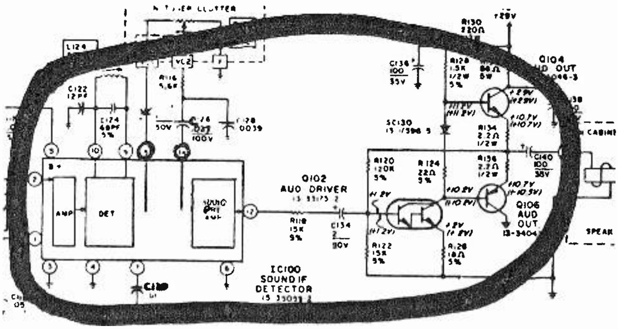
Color TV Chassis E21-6—Snowy picture. AGC voltage does not change with signal strength.

The IF cable is probably shorted near plug.

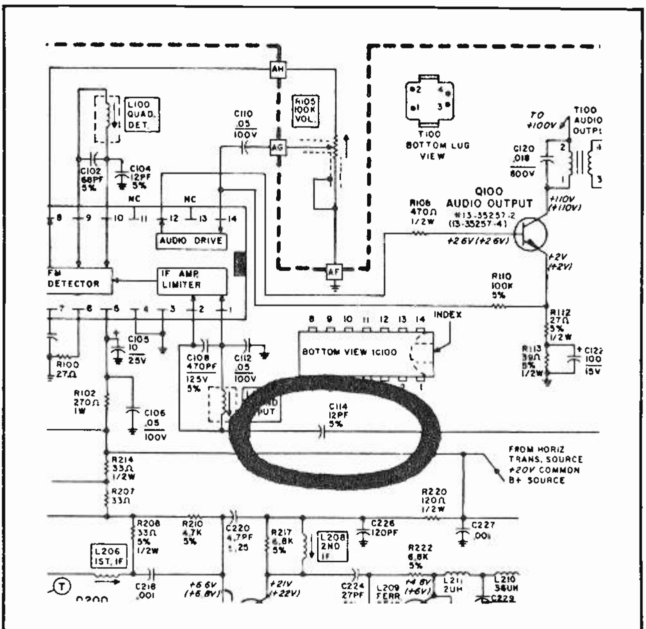


SYLVANIA

Color TV Chassis E08—No sound.
Probable cause is defective IC100, Q104, Q106, or Q102. Replace defective component.

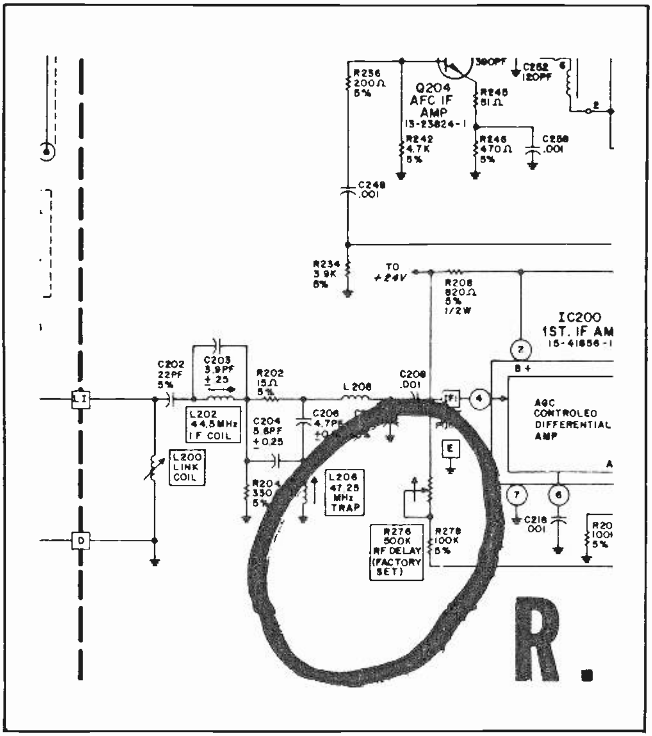


B/W Television Chassis A19—Sound won't track best picture on all channels
Probable cause is a defective capacitor (C114, as shown in diagram). Replace capacitor.



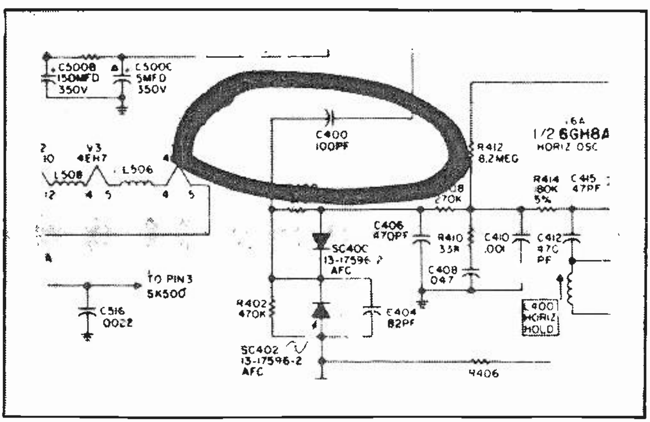
Color TV Chassis E06/08/20/21—Snowy UHF picture

The cause is probably the RF AGC Delay (R276) set too high. Do not replace the UHF tuner. Instead, check the delay control.



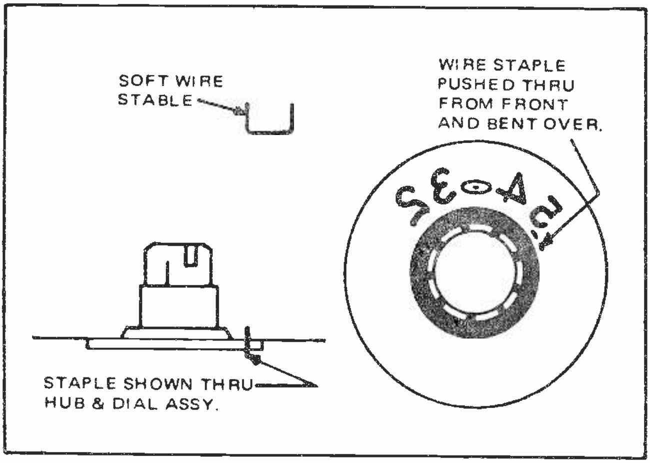
B/W Chassis B-10-7—Horizontal oscillator will not start except when set has been in 'instant on' mode. Then it is off frequency.

The fault is capacitor C400 which is shorted. Replace.

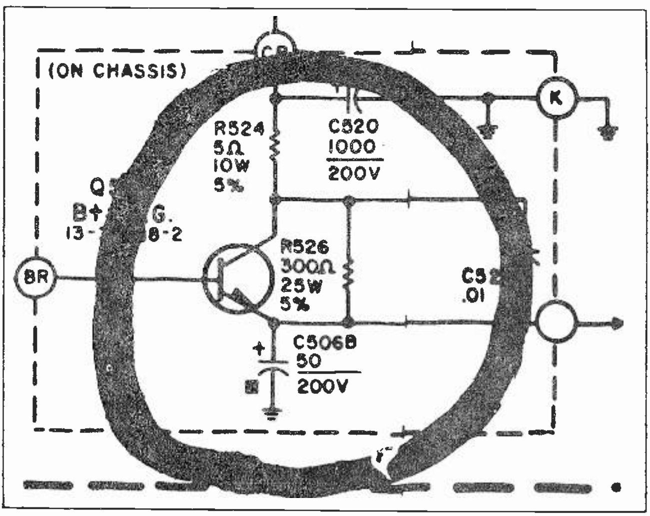


SYLVANIA

B/W Television (console)—Correction of VHF dial slippage
Properly calibrate VHF dial, and then remove complete dial and hub assembly from tuner shaft. Install soft wire staple through the plastic dial and hub as shown in diagram. Use a low wattage soldering iron to heat staple as you push it through hub and dial. Then bend staple over on the backside.

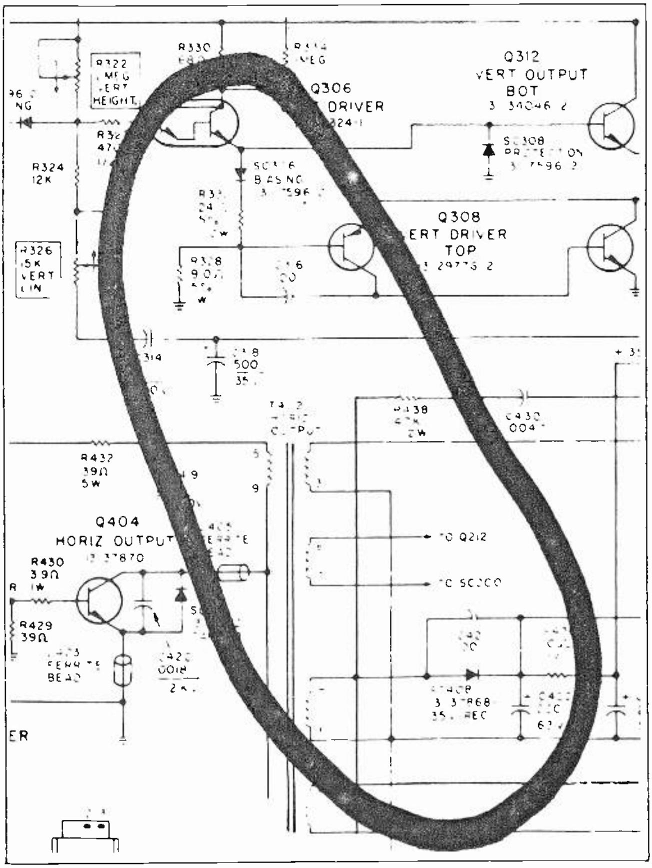


E21-3 Chassis—The regulated B+ supply stopped 70 volts, with a ticking sound from the flyback.
The cause is probably an open 50mfd, 200V section filter capacitor C506B. Replace capacitor.



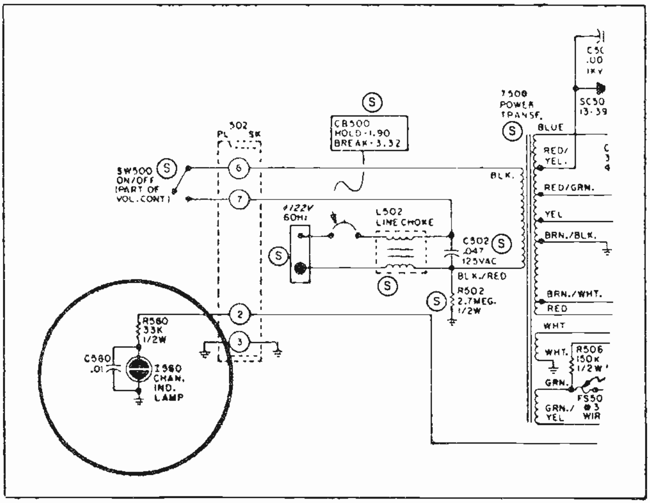
A12 Chassis—No sound—no video—and SC408 shorts when replaced.

The cause is a partially short SC306, causing vertical stage to load down the 35V supply. To repair, replace both diodes—SC306 and SC408.

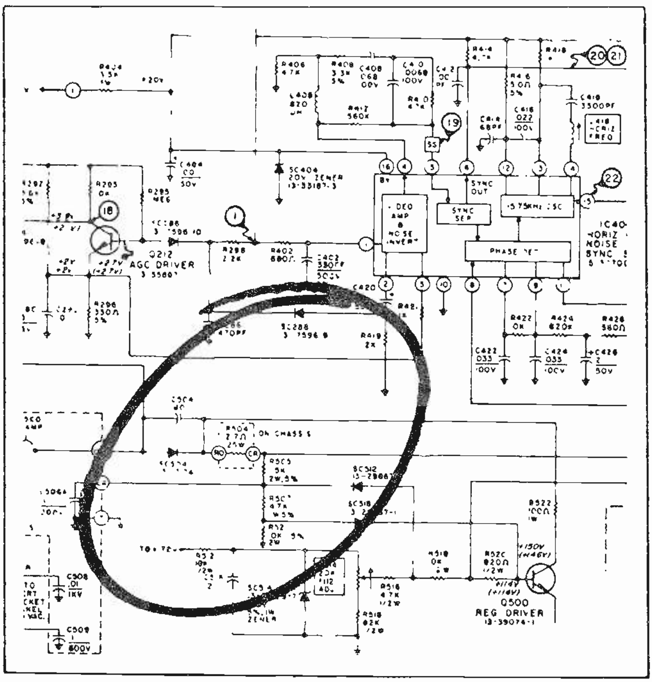


Color Chassis E41,E42,E44, and E45—Dial light flickers; low light output, or fails.

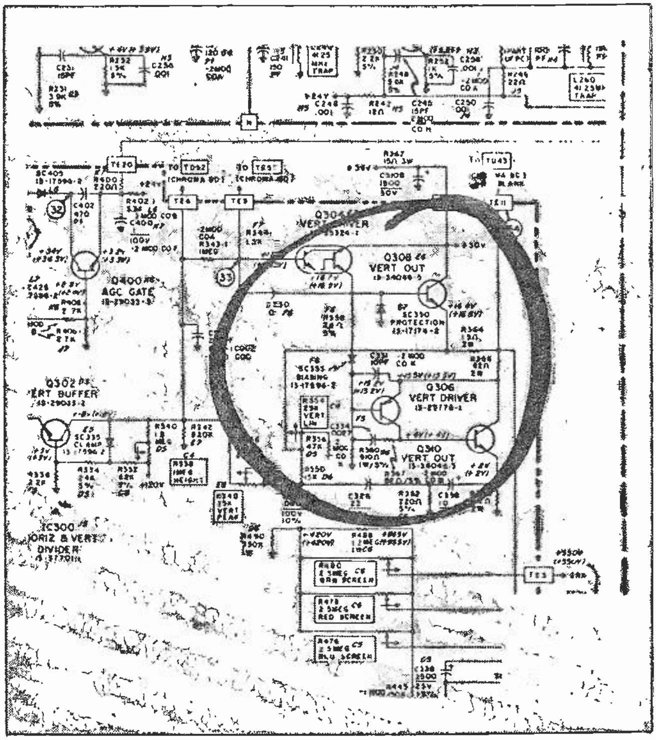
Caused when C560.01 capacitor causes a high peak current to the neon bulb. To repair, replace neon bulb with part 30-33062-3. Then remove C560.01 capacitor and replace with a .001/600Vcapacitor, Sylvania part 43-14017-337. The capacitor is located on the tuner cluster. Whenever this set requires service, capacitor C560 should be replaced.



Color TV Chassis E08—The chassis is dead.
Probable cause is an open resistor R504 and/or a shorted B+ Regulator Q502 (not shown). Replace bad component(s).



Color TV Chassis E03/04/05—The raster lines at the bottom third of the screen squeeze together.
Replace the Vertical Driver, Q306 (diagram below).



Color TV Chassis E21—The red & blue bottom vertical lines would not converge. Turning the control only causes bottom of picture to fold up. SC808 is probably breaking down under load. Checks O.K. out of circuit.

E21-9 Color TV Chassis.
Heavy black line on right side of picture. Most noticeable on weak channels, very obvious on unused channels. Extends into UHF channels. Varies in intensity with channel change. Most noticeable when using set antenna. Being picked up on antenna. Cause: Q400, horizontal driver radiating; set had GE 13-39098-1 in it (tan color). Changed to another type (black), not GE, eliminated problem.

SYLVANIA

E21-3 Color TV Chassis.

Overload on strong signals, sync touchy when medium signal tuned. Okay on fringe signals. Cause: T220—½ of primary open.

E210307 Color TV Chassis.

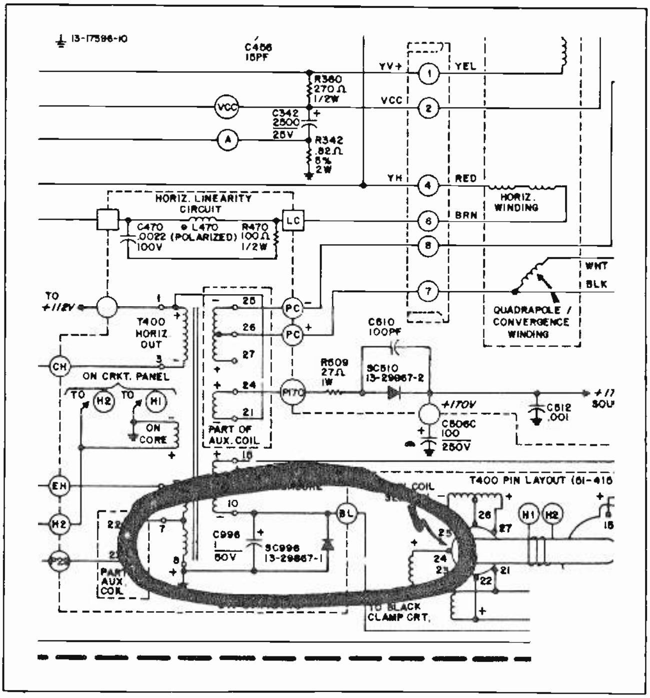
Red and blue bottom vertical lines would not converge. Tuning control only covered bottom of picture to fold up. Cause: SC808 breaking down with load. Checked okay out of set.

E20, E21 Color TV Chassis.

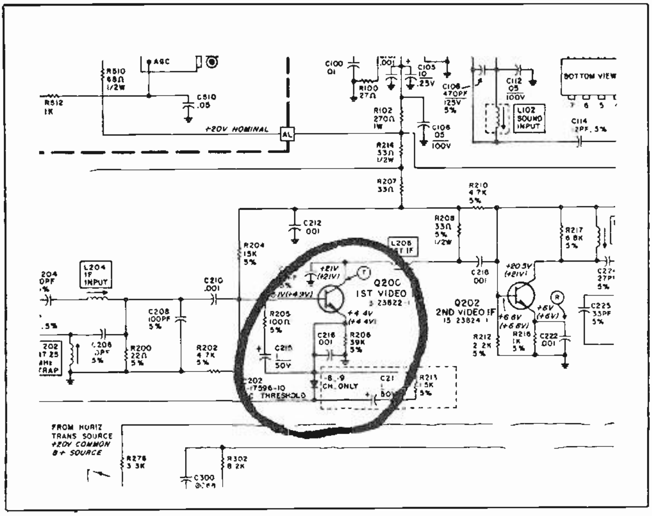
Full color control setting has only enough color to see a difference from black and white. Voltage check in the chroma circuitry uncovered no significant discrepency. All active devices were changed to no benefit. Checking with a scope showed the presence of all waveforms but with little amplitude. Cause: L605, 33µH choke open.

Color TV Chassis E21 — Problem is low brightness

Check SC996 and/or C996 for an open. Replace if necesary.



A12 Chassis—AGC overload when horizontal hold is adjusted. Sync is critical.
Possible cause is a shorted AGC threshold diode (SC202).



A12 Chassis—Sound O.K. but horizontal line across middle, R330 (68 ohm) resistor burning or open.
The SC308 protection diode on the base of Q312 is probably shorted.

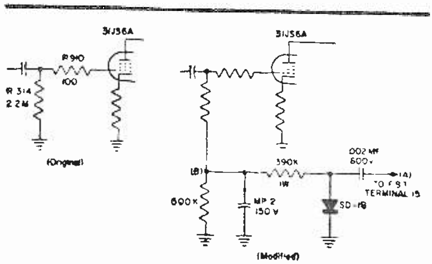
TRUETONE

Color TV Model 2DC4815—Circuit Modifications

Modification of Horizontal Output Circuit

This modification of the horizontal output circuit decreases X-ray radiation by 1/5, if the high voltage shunt egulator is not operating. In working condition the shunt regulators' (6BK4A) high voltage characteristics and other electrical characteristics are exactly the same as those of the original set.

The modified circuit shown works as follows: The AGC's horizontal pulse is rectified and added to the first grid of the horizontal output tube 31JS6A for control. When the shunt regulator is working, the voltage of point (B) is

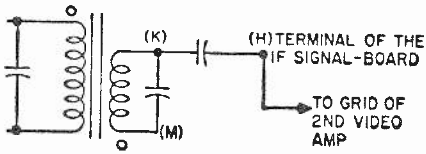


−40v. When the shunt regulator is not working, the voltage of point (A) increases. This voltage increase at point (A) causes the minus voltage at point (B) to increase:

This minus voltage controls the current of the 31JS6A and minimizes the X-ray radiation.

Modification of Vertical Circuit

This modification was made to eliminate the vertical retrace-line with normal brightness. A 600v .005μF paper-

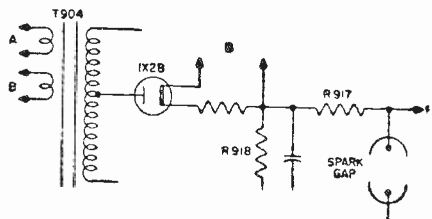


filled capacitor was added between the (K) terminal of the vertical output transformer and the (H) terminal of the IF signal board.

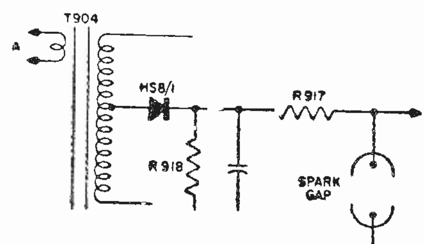
When this capacitor was included in the vertical circuit, it was necessary to reverse the terminal connections on the secondary of the vertical output transformer and the deflection yoke.

Modification of Focus Circuit

This modification was made to im-



(Original)



(MODIFIED)

prove the serviceability of the set. The 1X2B focus rectifier tube was replaced with a high voltage selenium rectifier HS8/1. The remainder of this circuit remained the same.

The selenium rectifier is placed across the terminal board of the fly-back transformer.

Change of CRT Type

The original picture tube used in this set was a 16CSP22 and was replaced with a 16DAP22. There are no electrical or mechanical differences in these tubes.

The change was made to obtain a truer red color and greater luminance.

Westinghouse

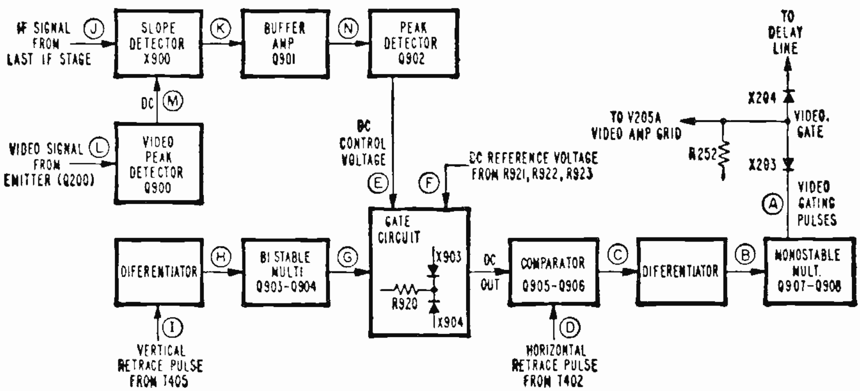
Westinghouse Introduces 'On Screen Tuning Bar' Feature

Proper fine tuning of the local oscillator in a color television is as important and much more critical, than for monochrome receivers. The reason being that all color information can be lost if the fine tuning is misadjusted. Therefore, some means of indicating proper fine tuning for color, as well as for B/W reception, would be an aid to the viewer.

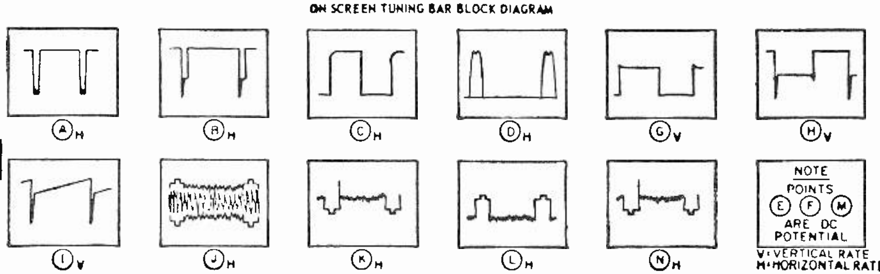
This method employs the CRT screen as the indicating device. The presentation is to display the degree of mistuning, to show the necessary direction of adjustment for correction and to indicate when correct tuning has been achieved. See screen illustration.

The object is to display two vertical lines on the CRT screen when the viewer desires to check or adjust the fine tuning. The lines are superimposed with the received picture and provides simultaneous viewing of picture quality and fine tuning indication. A switch is provided so the viewer can remove the vertical lines when he completes the adjustment.

One of the lines is stationary and acts as a reference. The other line is



ON SCREEN TUNING BAR BLOCK DIAGRAM



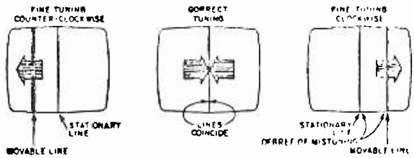
WAVESHAPES ASSOCIATED WITH BLOCK DIAGRAM movable with fine tuning adjustment and can move to either side of the reference line. Correct fine tuning is indicated when the lines coincide. The direction of mistuning is indicated by the position of the movable line with respect to the stationary line. Also, the degree of mistuning is indicated by the spacing between the two lines. The larger the spacing, the greater is the degree of mistuning.

The circuits responsible for developing the two dark vertical lines on the CRT are shown in the block diagram. These circuits will provide two sets of gating pulses sufficient to cut off the video amplifier for approximately 1 or 2μs. This results in two dark vertical lines appearing on the screen of the CRT. Two dc voltages are also developed to control the pulse forming circuits.

One voltage, referred to as the reference voltage, is developed across a voltage dividing network consisting of resistors, R921, R922 and R923. This voltage develops the stationary or reference line. The other voltage, referred to as the control voltage, can be varied by adjusting the fine tuning control. This voltage develops the movable vertical line.

The circuits to be described, except for the video gate circuit, are combined on one small separate PC board and attached to the main color TV chassis. Three sources of voltage are required for the added circuits. Two of the voltage sources are obtained directly from the chassis power supply. The third source is developed in the cathode circuit of the audio section.

A push-on/off type switch, located on the control panel, is provided to activate or deactivate the multicircuits so the generated lines on the CRT screen can be turned on/off. The control signal portions of the circuitry are continuously activated. The reason for this is, if these transistors were switched off there would be detrimental loading on the video circuitry of the main chassis and also the possibility of harmonic generation (tweet) in the slope detector portion.



The lines are generated in a time-sharing system in which the reference line is generated during one picture field and the movable line is generated during the next field. The required signals needed to generate the lines are a series of narrow video gating pulses of about 1 or 2μs duration and synchronized to the horizontal scan rate. These video gating pulses as shown in waveshape "A", are sent to the grid of the video amplifier, cutting the amplifier off. Diode X203 acts as a closed gate during these pulses allowing them to be applied to the grid. At the same time, diode X204 acts as an open gate, preventing any video information from arriving on the grid of the video amplifier.

The 1 or 2μs video gating pulses are generated in the monostable multivibrator. This circuit consists of a pair of transistors, Q907 and Q908.

The pulses necessary to operate the monostable multivibrator are shaped by the differentiator, as shown in waveshape "B". The input to the differentiator is provided by the comparator.

The comparator is also a monostable multivibrator and its purpose is to provide trigger pulses (waveshape "C") to the differentiator.

The timing of these trigger pulses, in reference to the horizontal retrace pulses, (waveshape "D") will determine the position of the generated line on the CRT.

The name comparator is chosen because the circuit essentially compares the level of an input voltage to the level of an internally generated saw tooth voltage, to determine when the multivibrator will change state.

The purpose of this circuit is to allow the comparator to monitor two different signals in a particular time sharing mode. During the first time period (one picture field) the gate presents to the comparator a reference voltage (point "F"). During the next field the gate presents to the comparator a control voltage (point "E"), which is a function of the fine tuning. The gate has two diodes and a suitable biasing scheme to provide the switching of either signal. These diode switches are controlled from a bistable multivibrator.

The bistable multivibrator changes state on each vertical pulse so the switching rate of each gate signal is 30Hz. The vertical retrace pulse from transformer T405, shown in waveshape "I", is shaped into a usable pulse by the differentiator (waveshape "H") and passed onto the bistable multivibrator.

An IF signal is taken from the last IF stage (waveshape "J") and sent to the slope detector.

The slope detector has the responsibility of converting frequency variations into voltage variations. As the fine tuning is varied, the IF picture carrier moves higher or lower in frequency, resulting in a varying output voltage from the slope detector.

This signal is then detected and filtered, resulting in a negative going video signal of about 3v P-P.

The video peak detector is used to compensate for signal level changes at the last IF stage If the compensation were not used, the dc control voltage would not only be a function of the IF picture carrier frequency, but also of its amplitude. For strong moderate received signals the AGC system of the receiver maintains the IF picture carrier level relatively constant at the input to the slope detector. However, for received signals below the threshold of operation of the AGC system, the IF picture level will decrease and so will the dc control voltage. To compensate for this, the level of IF picture carrier is monitored by taking the video signal from the emitter of the first video amplifier, Q200, and sending it to the video peak detector (waveshape "L"). The video peak detector dc output voltage (Point "M") is then added in opposite polarity to the slope detector output. Relatively good tracking is achieved so the dc control voltage remains constant at correct tuning for strong to zero received signals.

The buffer is needed to isolate the peak detector from the slope detector, otherwise there would be loading on the tuned circuit of the slope detector. The output of the buffer amplifier is shown in waveshape "N".

Following the buffer amplifier is a peak detector for the video signal developed by the slope detector. The output of the peak detector is a dc potential at Point "E".

Color TV Chassis V2655 — Demodulator Circuit Description

The demodulator system is a two-stage circuit that consists of V306, called the "X" demodulator, and V305, called the "Z" demodulator, and their associated components. Both demodulators employ 6HZ6 tubes.

Referring to schematic, it can be seen that the 6HZ6 is a multi-element tube. It has two independent control grids. (Pins 1 and 7), each demodulator requires two input signals. The two inputs are:

1. The output signal of V302B, the bandpass amplifier (waveshape 14). This is the chroma information sent to the grids, pin 1 of both demodulators.

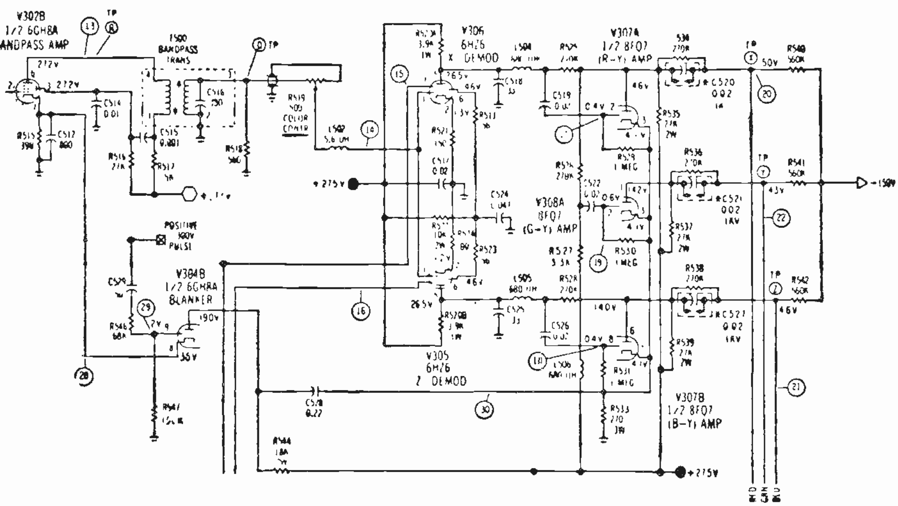
2. A 3.58MHz CW signal from V3-10B, the local oscillator (wave-shape 15 and 16).

The purpose of the demodulator is to convert the phase and amplitude differences of the two input signals into information that the color difference amplifier circuit can accept and enlarge to magnitudes necessary for driving the CRT grids. The output of tube V306 and "X" demodulator stage (waveshape 17), is shown after the 3.58MHz component has been filtered by coil, L504, and capacitor, C518.

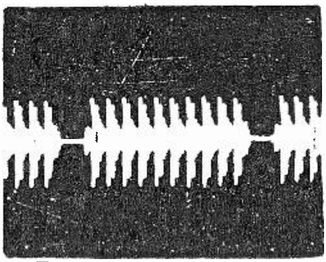
As the filter network operates the same in all instances narrated, it will not be mentioned each time, but all outputs of the demodulators referred to will be after passing through the filter network.

When the color signal input and the local oscillator signals are in phase, the output of the demodulator is at maximum negative amplitude. When the two input signals are 180deg out of phase, the output amplitude reaches a maximum in the positive direction. A 90deg phase shift between the color signal and the local oscillator signal results in zero output. Any phase angle difference that lies between the points referenced above will result in some output

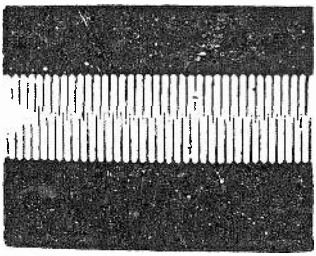
The local oscillator signal that is applied to pin 7 operates as an on/off switch to the demodulator tube. When the applied signal is in the positive half cycle, the tube conducts and when the signal is in the negative half cycle, the demodulator tube is shut off. Therefore, if the incoming color signal at pin 1 is in phase with the local oscillator signal applied to pin 7, the demodulator tube is conducting during the entire positive half cycle of the color signal. As a result, the average plate current increases and the average plate voltage becomes less positive than when the demodulator is cut off and is shown in the output as the most negative point. When the incoming color signal reaches pin 1, 180deg out of phase with the local oscillator signal present at pin 7 pin 1 and 7 be-



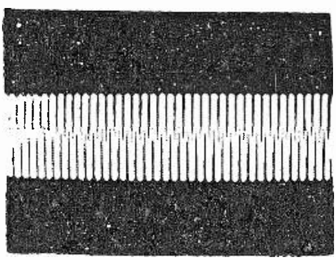
come negative—allowing the demodulator tube to conduct. The result is a lower average plate current flow and that means a more positive plate voltage in comparison to the previously described conditions. When the incoming color signal is 90deg out of phase with the local oscillator signal, the demodulator tube is conducting during half of the positive cycle and half of the negative cycle. As the plate current of the demodulator tube increases and decreases equally during this condition, the average plate current shows no change. No change in current means no change in voltage and the output is zero.



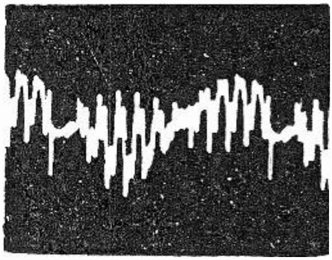
14 "H" 3.5V P-P
Pin #1-V306



15 "H" 25V P-P
Pin #7-V306



16 "H" 25V P-P
Pin #7-V305



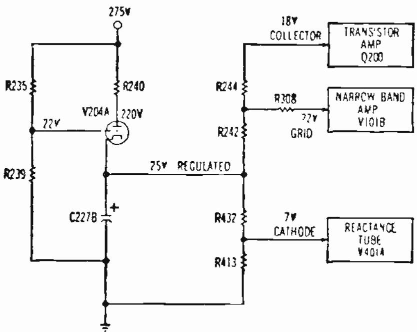
17 "H" 15V P-P
'Pin #2-V307A

Voltage Regulator and Diode Protection in Westinghouse V2655 Color Chassis

Triode tube, V204, acts as a series voltage regulator to develop a stable 25v source which is applied to the collector of the video amplifier transistor, Q200, the narrow band amplifier grid, V101B and the horizontal reactance control cathode, V401A. The low voltage regulator is shown in the simplified schematic.

Although the circuit somewhat resembles a cathode-follower arrangement, its action is entirely different since no input or output signal is associated with tube action. Its only purpose is to provide a dc reference voltage that remains at a stable value despite changes in the amount of current flowing through transistor amplifier Q200. (Q200 is the first video amplifier whose output will vary with changes in signal levels.)

Regulation takes place as follows: The grid potential is fixed at 22v by the voltage divider network R235 and R239 which are connected between ground and the 275v supply. The cathode voltage tends to follow the grid voltages and will be approximately

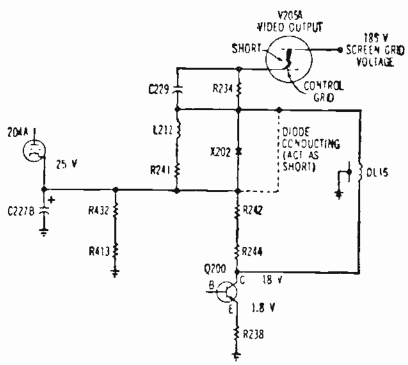


25v. Also, since the cathode represents a low impedance to ac, its dc output will remain nearly constant at 25v. Any sudden ac changes which try to vary the cathode voltage will be filtered out by electrolytic capacitor, C227B. The current flowing through transistor Q200 and load resistor R244 vary with signal level changes. But these variations do not appear in the cathode circuit of the tube, V204A. The result is a regulated source voltage driving the transistor.

Diode X202 is used as a protective device for transistor Q200. Under normal conditions, the diode is reverse biased and will not conduct. The schematic shown here indicates 25v applied to its cathode and 18v to its anode. Anode voltage is taken from the collector of transistor Q200 and fed through the delay line, DL16.

If either a momentary or permanent short occurs from the control grid to screen grid of the video output tube, V205A, the 185v screen voltage causes diode X202 to be forward biased by 185v at the cathode side of the diode. The diode conducts, but acts as a short circuit with negligible voltage drop across it. Thus, a potential of approximately 25v is maintained at either end of the diode to prevent HV damage to Q200.

Actually, for dc purposes, the diode X202 is not really necessary, but is essential for ac reasons, particularly for control of the initial surge created when the grid short first occurs in the tube, V205A. If a short occurs, the grid immediately goes from 0 to 185v. The resultant spike charges capacitors C227B and C229 with the voltage divided proportionally between them in relation to their individual



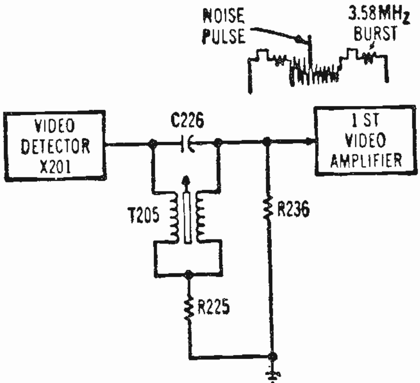
capacities. Without the short circuit action of the diode, these capacitor charging currents would produce a voltage spike across R241. The spike would be immediately coupled to the transistor Q200 through the delay line, DL16 and the destruction of the transistor would result. With the diode in the circuit, however, it effectively "short circuits the spike" and protects the transistor.

Video Circuits in Westinghouse V2655 Color Chassis

The signal waveform at the video

detector output is shown in the block diagram. Diode, X201, is connected so a rectified sync-positive output will be developed. The signal appears across the detector load consisting of R236 in parallel with trap, T205 and resistor, R225.

The waveform may appear to be the same as a B/W signal at first, but

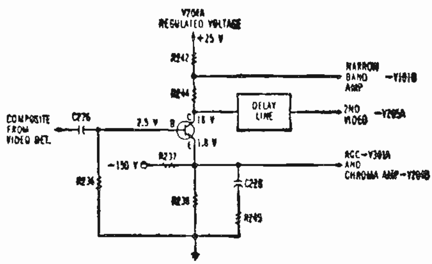


closer examination will reveal a "burst signal" on the back porch of the blanking signal. This is an eight cycle burst of the 3.58MHz signal, transmitted along with the composite signal, to maintain color sync between the receiver and transmitter. This is essential for correct reproduction of colors.

Another difference that may be seen in the composite signal — if viewed on a scope during color telecasting — the video information will appear somewhat more dense. This is caused by the presence of color sidebands and depends on the contents of the picture being televised.

T205 is a 4.5MHz trap used to eliminate any possible 920kHz beat that may develop between the 4.5MHz sound IF and the 3.58MHz color subcarrier.

An NPN transistor, Q200, is used for the 1st video amplifier. It is shown in the schematic here. To conduct and amplify, the elements of an NPN transistor must be biased so the emitter will be at the most negative potential, the base slightly positive with respect to the emitter and the collec-



tor at the most positive potential. Since the emitter is at 1.8v, the base at 2.5v, the collector at 18v, the dc operating voltages are in correct relationship for an NPN transistor. Forward bias between base and emitter is plus .7v which will allow the transistor to conduct. The dc electron current path through the transistor will be from ground, through R238, transistor emitter to collector, R244, R242 and to the regulated source potential of 25v. The 25v source voltage is taken from the cathode of V204A, the low voltage regulator. It acts as a regulated supply voltage which is very important for operating stability in transistor amplifiers.

The sync positive composite video waveform is applied between the base and emitter of transistor Q200. Two output signals are produced, one at the emitter which has the same polarity as the one at the base and the amplified output at the collector which is a sync pulse negative composite video signal. The signal from the emitter—an emitter follower arrangement—is applied to the chroma amplifier, V204B, to produce all chroma information and to the AGC keyer stage, V301A.

The amplified composite waveform as produced in the collector circuit is passed on to two sections—through the delay line to the 2nd video amp, V205A and through resistor R244, to the grid of the narrow band amplifier, V101B.

In summary, transistor video amplifier, Q200, amplifies the composite video signal. Since the output signal produced is passed on to four separate sections of the receiver, it is essential that this stage function correctly.

Color TV Chassis V8001 – Automatic Chroma Control and Color Killer Circuit Description

Automatic Chroma Control (ACC) maintains the chroma amplifier output by establishing feedback from the emitter of Q501.

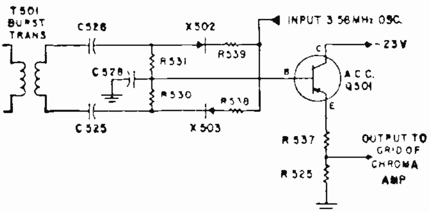
When a color signal is received, a nominal −5v is developed across R530, R531 and fed to the base of Q501. Voltages at the base and emitter of Q501 will vary depending on the magnitude of the burst. This sets up a variable forward bias on the base of Q501 and the emitter voltage varies in proportion to this changing base voltage. A part of the changing emitter voltage is fed back to the grid of the chroma amp thus changing the bias.

A burst signal of lower magnitude develops a lower voltage on the resistors R530, R531, which in turn provides a lower base voltage and therefore, less conduction of Q501.

A burst signal of higher magnitude develops a higher voltage across resistors R530, R531, in turn providing a higher base voltage to Q501. Under this condition, the transistor will conduct more. Accordingly, the emitter voltage of Q501 will also go up or down depending on the magnitude of the burst signal on the base.

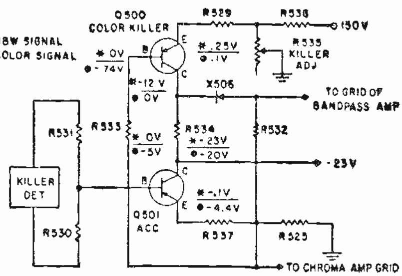
During B/W transmission, only the local 3.58MHz oscillator signal is fed to the diodes X502 and X503. The output across R530, R531 is zero volts and fed to the base of Q501. Now, with the base voltage more positive than the emitter, the PNP transistor is cut off.

The function of the color killer is to cut off the bandpass amplifier when color is not being transmitted by the station. Therefore, the color killer is a switching operation, either conducting or non-conducting. The color killer and ACC are closely related in this set. In fact, the color killer is activated by operation of the ACC amplifier which is fed by the killer detector diodes.



In some color television chassis, the color killer is cut off when color information is being received and the bandpass amplifier conducts. In the 14in. chassis, however, the color killer transistor conducts during color transmission. To understand the operation of Q500, we will start from a condition where no color is being transmitted. With no burst signal present at the killer detector diodes, X502 and X503, the only signal present is the 3.58MHz of the receiver oscillator; zero voltage is developed across the balanced resistors R530 and R531. Therefore zero voltage is fed to the base of Q501, a PNP transistor. With zero at the base and (−.1v) at the emitter, the transistor is cut off.

The emitter of Q501 is coupled to the base of Q500 by R533. With Q501 cut off, zero voltage is applied to the base of the PNP transistor Q500, and Q500 is cut off. The collector voltage when Q500 is cut off is −12v. This negative voltage on the cathode of X506 forward biases the diode and the negative voltage is fed to the grid of the bandpass amplifier, V12A.



This bias, when applied to the grid of the bandpass amplifier drives the grid well into the cut-off region. Therefore, no color information or noise can get through to the demodulators.

With a color program being received, the burst amplifier and transformer will have a signal present to feed into the killer detector diodes which are still receiving the 3.58MHz signal from the oscillator. The output of the killer detector is a negative 5v with a strong color signal being received.

The tuning of the receiver and the amount of burst received from the transmitting station will determine the voltages being applied to the ACC and chroma amplifier. *Use of a color bar generator while troubleshooting these circuits will stabilize the readings.*

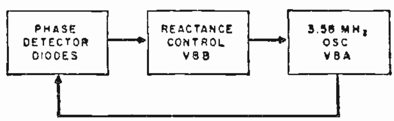
With −5v on the base of Q501, it will conduct, causing a voltage drop across R525 of approximately −2v. This voltage, when fed to Q500 through R533, places approximately −0.7v on the base, thereby turning on Q500 as you would a switch.

Therefore, the center of the two 15K emitter resistors, acting as a voltage divide, is fed to two places. It is fed to the grid of the chroma amplifier where the voltage will contribute to the bias and vary the gain of this tube according to the amount of burst received by the killer diodes. It is also fed to the base of the color killer, Q500, which is turned on by this negative voltage. The collector of Q500 is reduced to zero from −12v by current flowing through the collector resistor, R534. With zero volts on the cathode of diode, X506, it is now non-conducting and an open circuit. With no additional bias added to the grid of the bandpass amp from Q500, the bandpass amplifier tube will now conduct, passing color. Transistors and diodes are used, giving the chassis solid-state reliability.

Color TV Chassis V8001—Reactance Control Circuit Description

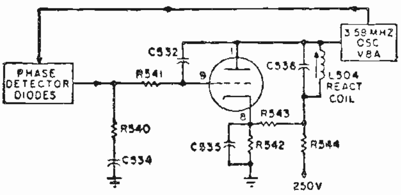
Tube V8B, the reactance control circuit, is used to convert the correction voltages from the phase detector into a capacitive reactance change that prevents the 3.58MHz oscillator from changing frequency (see block diagram).

The frequency determining factor in the 3.58MHz oscillator circuit is X507, the 3.58MHz crystal. The frequency range of the crystal can be "rubberized" or extended in either direction by placing a variable capacitor in parallel with the crys-



tal. Effectively, this is what the reactance control circuit does:

It translates the correction voltage from the phase detector into a capacity change across the 3.58MHz crystal. A signal voltage representing the 3.58 MHz oscillator signal is taken from the reactance coil, L504, and fed back to the control grid of



the reactance tube, V8B, through capacitor C532. This feedback signal applied to the control grid of the reactance tube will keep the plate current in phase. The plate current of V8B, the reactance control tube, will always lead the oscillator signal by 90deg. Consequently, when a voltage is applied to the grid of the reactance tube, the plate current will lead the plate voltage by 90deg. Since current leading voltage by 90deg is a characteristic of capacitors, the output of the reactance control circuit connected across the 3.58MHz oscillator will act like a capacitor to the oscillator. As a result, the reactance circuit will respond to oscillator frequency shifts in the following manner:

1. When the oscillator attempts to go higher in frequency, the phase detector will send a positive correction voltage to the grid of the reactance control tube. This positive correction voltage causes an increase in the leading current of the reactance tube. The increase in leading current acts like a smaller capacitive reactance, hence a larger capacity, to the oscillator and results in lowering the oscillator frequency.

2. When the oscillator attempts to go lower in frequency, the phase detector will send a negative correction voltage to the grid of the reactance tube. This negative voltage causes a decrease in the leading current of the reactance tube which results in a larger capacitive reactance, hence a smaller capacity, and raises the oscillator frequency.

To offset any adverse effect from the inter-electrode capacity of the reactance tube itself, adjustable plate coil, L504, is adjusted so the control grid of the reactance tube is at zero bias when the 3.58MHz oscillator is correct in frequency and phase.

Color TV Chassis V8001—CRT Circuit

A feature of this new CRT is the blue gun down operation. This simply means that the CRT is mounted in the cabinet with the blue gun downward (toward the chassis).

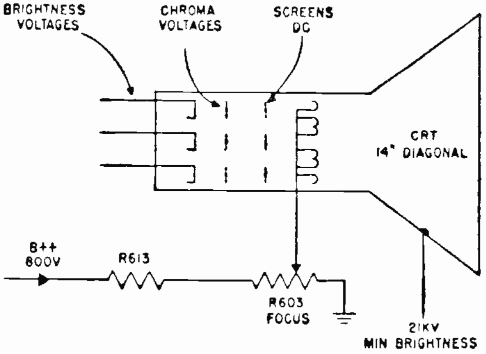
Similarly, the convergence yoke assembly must be mounted on the neck of the CRT with the blue yoke assembly down over the blue gun of the CRT as shown.

This new 14in. CRT uses a 6.3v, 900ma heater which is supplied from a separate filament transformer.

If the focus control is adjusted from one extreme to another, do not be alarmed to see a very slight change in focus which is a characteristic of this system.

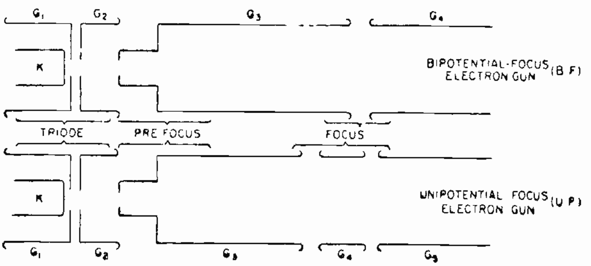
WESTINGHOUSE

The 14in. diagonal color CRT has a new focus system called the Einzel lens. The Einzel lens is the same system



used in all B/W CRT's. Therefore, problems which have occurred previously in focus diodes, etc., have been virtually eliminated.

Picture tubes used in present-day TV receivers may be



classified into two types characterized by the focusing method used. One type uses a "bi-potential" focusing lens and the other uses a "unipotential" or "Einzel" focusing lens.

Shown in diagram is the Einzel method. The focus voltage of 800v is actually boosted B+ and is independent of the high voltage. This is not true of the bi-potential method which used a percentage of the high voltage as the focusing voltage. The advantages of the Einzel lens (unipotential) gun compared to that of the bi-potential gun are as follows:

(1) The CRT maintains sharp focus even with large variations of the high voltage.

(2) The Einzel lens eliminates the need for extensive focus circuits.

(3) Secondary variable high voltage supply is not needed for focusing.

(4) Relatively flat focus characteristics minimizes need for focus voltage adjustments.

(5) There is no high focus voltage connected to the stem lead through the CRT base eliminating leakage or arcing.

The main difference between the two gun types is in the operation of the focus electrode, G3 in the BF gun, and G4 in the UF gun. In the BF gun, G3 is connected to a variable secondary high voltage supply of 3 to 6Kv. Focusing in the BF gun is very sensitive to the G4-G3 voltage ratio variations. In the UF gun, G4 is connected either to ground or to a variable low voltage supply, −250 to +800v, or to fixed low voltage taps. Focusing in the UF gun is relatively insensitive to variations in the G4-G5 voltage ratio.

Most present-day monochrome picture tubes use the unipotential gun design. However, because of the higher voltages used in color sets, only a few of the smaller color tubes are unipotential.

Color TV Chassis V8001—Demodulator Circuit

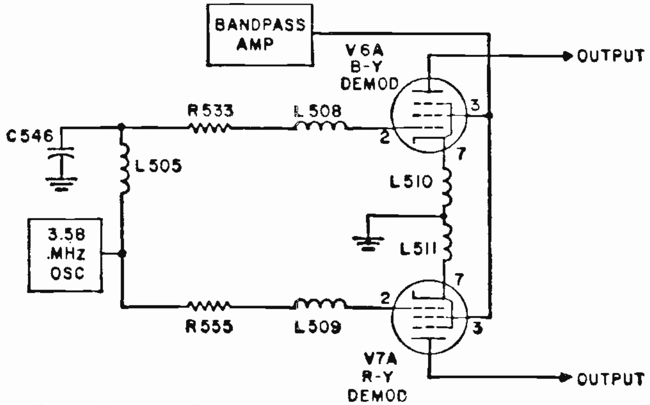
The demodulator system is a two stage circuit that consists of V7A called the R-Y demodulator and V6A called the B-Y demodulator, and their associated components. Both demodulators use 5GH8A tubes. Each demodulator requires two input signals. The two input signals are:

1. The output signal of V12A, the bandpass amplifier.
2. A 3.58MHz CW signal from V8A, the local oscillator.

The output of the bandpass amplifier is passed to the screen grids (G2) of the two demodulators.

Two signals from the 3.58MHz local oscillator, differing only in phase, are fed into G1, the control grids.

The purpose of the demodulator is to convert the phase



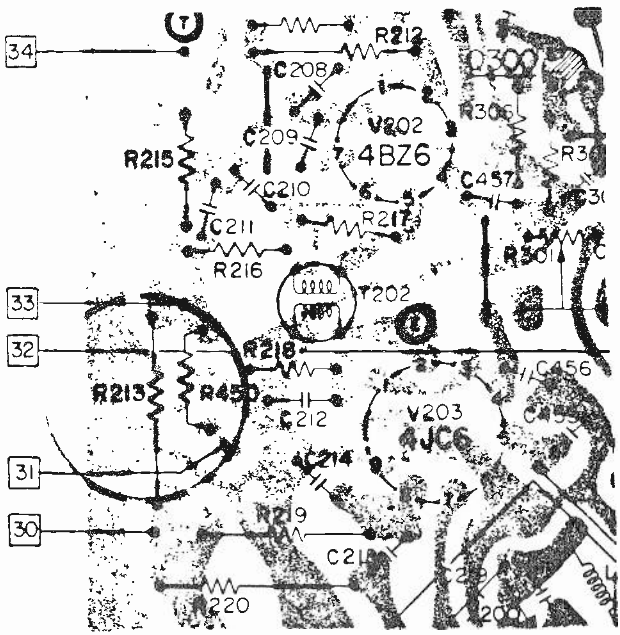
and amplitude differences of the two input signals into information that the color difference amplifier circuit can enlarge to magnitudes necessary for driving the CRT grids.

At the transmitter during a color telecast only the intelligence contained in the red information signal and the blue information signal has to be transmitted for color reproduction. Combining the R-Y and B-Y signals algebraically and electronically in the receiver will result in the reproduction of the green color. The R-Y and B-Y signals at the transmitter are fed into separate modulators and maintain a 90 degree phase relationship by the introduction of a signal from an oscillator at the transmitter into the two modulators that are 90 degrees apart in phase. In circuitry of receivers in the past the same relationship of 90 degrees was maintained by introducing the 3.58 MHz signal of the receiver's local oscillator into the R-Y and B-Y demodulators 90 degrees apart in phase.

Color TV Chassis V2655, V2656—Service Hints

In early production of the IF printed circuit boards, the value of resistor R213, a 47Ω resistor, was incorrectly marked 47K on the top of the PC board.

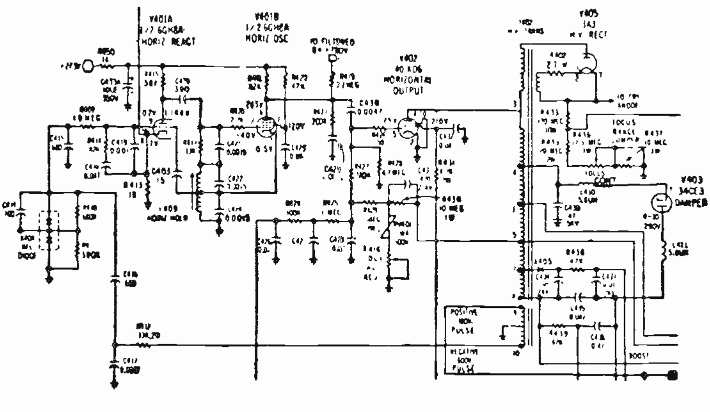
Resistor R213 is a stone-type fusible resistor which may



break apart under overload conditions. When this happens, the technician may see the 47K marking and replace the burned out one with a 47K value (which is wrong), the correct value should be 47Ω. Please note the location of resistor R213 on the partial diagram of the IF PC board and replace it only with a 47Ω, 4w, fusible, stone-type resistor, Westinghouse part number 250V020H79.

Color TV Chassis V2655, V2656—Horizontal and Output Circuit

SYMPTOM	POSSIBILITIES
No raster, high cathode current on 40KD6 (horizontal output)	Check "Q" of coil L409, also wave form at grid of horizontal oscillator V401B.
One bar similar to blanking bar on left	Try replacing L409 (horizontal oscillator coil). A low "Q" coil may not phase properly.
Several bars on screen of CRT	Check value of capacitor C434 (.01μf, 2kv) and capacitor C437 (.01μf, 2kv), there may be mismatch between C434 and C437.
No high voltage	Capacitor C421 shorted. This is a .0015μf polystyrene capacitor in the horizontal oscillator circuit. When working with polystyrene capacitors, it is very important to keep heat away from the outside plastic, or capacitor failure may occur. Replace C421.
Intermittent picture	Shorted cable from flyback transformer terminal number 10 to R412, a 33K, 2w resistor in the horizontal AFC circuit. Moving the cable causes the problem to disappear. The problem reappears after operating the set a few hours. Replace cable.



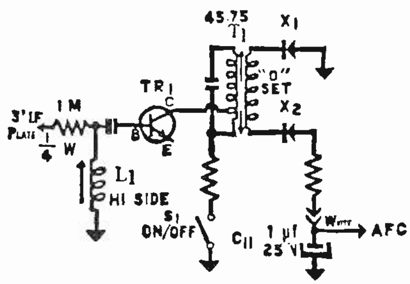
WESTINGHOUSE

Insufficient width	Check if resistor R430 (10M, 1w) changed value.
Insufficient width	If slightly more width is required for a full screen, change capacitor C438, 47pf 5 kv to 82pf 5kv.
Poor drive or no high voltage	Changed value or open R422, a 47K resistor.
Foldover in center	Leaky capacitor C420, 390pf.

Zenith

The AFC (automatic fine tuning control) permits the receiver to lock on the proper color tuning when the fine tuning perma-set control is reasonably close to frequency.

Circuitry is basically an FM discriminator network of two diodes, center-tuned to 45.75MHz, at the output of a transistor. Since 45.75MHz is on the slope of the IF response curve, a correction has to be introduced in the form of L1, which is tuned above 45.75, reacting with the IF curve to create a flat area between 45 and 46MHz.



Automatic Fine-Tuning Control

The discriminator transformer is tuned so the primary (top) is on 45.75MHz. The secondary is then adjusted so that, on an air signal, with the perma-set tuning adjusted for the best picture, there is no shift in tuning frequency as the AFC switch on the front panel is switched from "off" to "on."

When making frequency adjustments of L1 and primary of T1, the AFC output white lead is disconnected to improve sensitivity. It is then reconnected while making the final "Zero Shift" adjustment of the T1 secondary.

This unit is a plug-in type, with a mounting screw to secure firm ground contact. It may be removed from the set for servicing without upsetting receiver operation, other than deleting the AFC function.

The discriminator response curve for the AFC unit is rather typical, with one exception. Note that the low frequency side of the response curve dips back below zero to the negative side in the vicinity of 42.75-MHz.

This was designed for a very good reason—there are two carriers involved in the transmitted television signal: the picture carrier at 41.75-MHz and the sound carrier at 41.25-MHz. Now with a normal discriminator response curve we would observe that as 45.75 shifted upward in frequency. it would move into the negative portion of the response curve. However, the 41.25 carrier would then be riding up the far left portion of the positive skirt so the two voltages would tend to counteract and cancel.

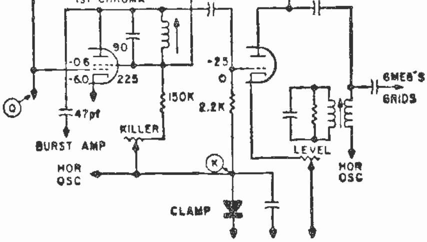
With the negative dip designed into the response curve at 42.75MHz, however, we find that the carriers work together: when the frequency shifts upward and the 45.75MHz picture carrier shifts into the negative voltage area, the 41.25MHz sound carrier also dips toward the 42.75-MHz minimum and develops a negative voltage, to aid in the AFC error voltage.

On the other hand, as frequency shifts downward, and 45.75MHz moves into the positive voltage area, the 41.25MHz signal drifts out to the left into an area of no correction voltage so it has no effect and can be disregarded.

Zenith's 20X138 Color Chassis Chroma Amplifier Circuit

Chroma information is sampled from the picture detector through a 7pf capacitor to the first chroma amplifier, then the second, where a composite chroma amplitude of about 12v P-P is fed to the grids of the 6ME8 demodulator tubes.

The first chroma stage has variable gain, dependent upon "burst" amplitude which is determined by Auto-



matic Chroma Control (ACC) action. Adjustment of the second chroma plate coil is critical for faithful reproduction of color information. Proper tuning of the 2nd plate coil requires the permeability tuning slug to be on the "chassis side" of the coil center.

Phase relationship of the upper and lower sidebands is rather critical in adjustment for best chroma response. Factory alignments are said to be carefully performed prior to release of all chassis from the assembly lines.

Voltage readings are important in the chroma system. The 2nd chroma stage grid dc return is through test point "K" and the color killer control. The color killer is tapped back to the horizontal discharge grid for a source of negative bias only and is in a voltage divider network to the screen then on to B+ 250v.

On a B/W signal, bias on the 1st chroma grid is −0.6v. This low bias level permits reasonable current flow in the 1st chroma stage, ½ 6KT8 pulling both plate and screen down to 90v and the low screen level permits the grid of the 2nd stage to drop to −25v well below cutoff. Although there is information through the 1st stage and to the grid of the 2nd stage, this stage being at cutoff will not allow signal to pass into the demodulators.

When color information is present and "burst" appears, bias at test point "Q," the 1st chroma grid drops to about −6v. With grid bias more negative on the 1st stage, current reduces so the plate and screen voltages increase to 225v.

The 2nd stage grid voltage is reduced, but a portion of this voltage increase is used to shift its bias from −25 v to 0, which then allows this stage to conduct — passing chroma information to the demodulators and to the CRT.

At test point "K," the diode to

ground is in effect a dc clamp which does not permit the grid to go positive.

"Burst" information is sampled from the plate of the 1st chroma amplifier through a 47pf coupling capacitor.

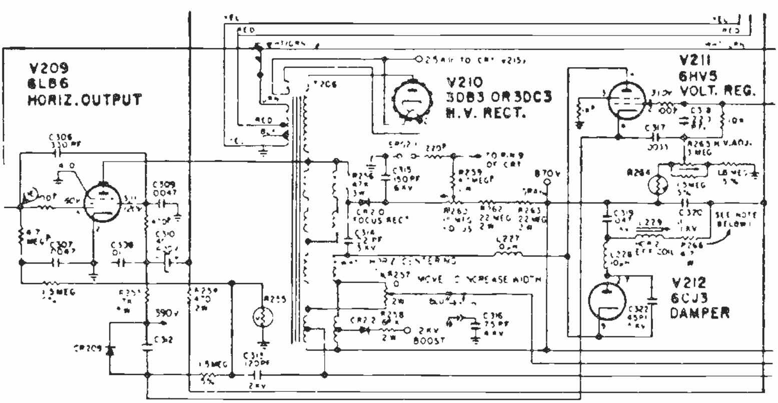
Color TV Chassis 14A9C51—HV 'Hold Down' Circuit

The purpose of this circuit is to limit the maximum high voltage under conditions of misadjustment of the HV adjust control or circuit malfunction.

Under normal conditions where the high voltage is at 25kv and the 6HV5 regulator tube is functioning properly, current will be drawn through the diode in its cathode circuit. The positive voltage at the cathode (approximately 390v B+) will be reflected to the high side of the VDR through the 1.5M resistor. The pulse appearing at the lower winding of the sweep transformer will cause the 120pf capacitor to assume a charge through the VDR. However, the positive B+ voltage at the same point (high side of the VDR) will be sufficiently high to cancel the "negative" charge on the capacitor. Thus, nearly zero voltage will appear at this junction.

The control grid of the horizontal output tube is returned to ground through the 4.7M and 1.5M resistors and the VDR.

Thus, since zero volts appears at the high side of the VDR, this point is essentially at ground potential. The bias (drive



voltage) for the horizontal output tube is achieved in the conventional manner (grid current flow charging the coupling capacitor).

Should the circuit malfunction where the high voltage tends to increase, the pulse amplitude coupled to the 120pf capacitor will also increase. This will cause a greater charge on the capacitor and produce an amount of negative voltage at the high side of the VDR which will overcome the positive voltage to some degree. The resulting negative voltage will in turn be reflected to the grid of the horizontal output tube preventing the high voltage from rising to excessive limits.

Should the cathode of the 6HV5 open, the tube would be nonconducting. The diode in the cathode circuit would also be nonconducting (blocked state) and B+ would be absent from its anode and from the high side of the VDR. Thus, the full "negative" charge on the 120pf capacitor (having no B+ voltage to overcome) would be reflected to the control grid of the horizontal output tube. This voltage value may be in excess of negative 100v which would decrease high voltage to less than 20kv.

Therefore, should the regulation malfunction, the HV hold-down circuit prevents the high voltage from rising to excessive limits.

It should be noted that in the 14A9C51 the VDR circuit functions as a protective device, whereas in the 12A10C15 chassis similar circuitry incorporating a VDR is actually used for regulation.

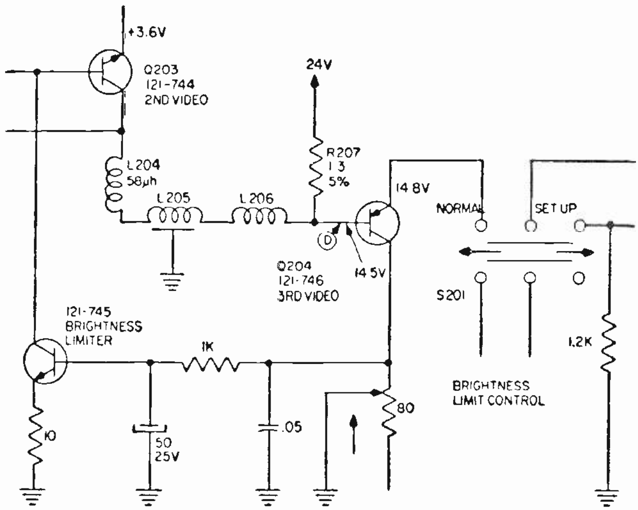
Color TV Chassis 12A13C52—Improved Brightness Stability

An additional circuit enhancing brightness stability is incorporated in the 12A13C52 chassis. Otherwise the 12A-13C52 is the same as the 12A12C52 chassis. Since part of the circuitry includes an additional transistor, the chassis number has been changed from 12A12C52 to 12A13C52.

As shown, the brightness limiter circuit includes a Brightness Limiter transistor and a Brightness Limit control which is adjusted to provide maximum brightness without picture blooming. Essentially, any change in the average picture tube current is "sensed" as a change in current through the limit control. An increase in the average beam current causes an increase in the charge on the 50μf capacitor at the base of the Brightness Limiter transistor. In turn, the Brightness Limiter transistor increases in conduction, which results in a decrease of collector-to-emitter resistance. The base of the second video amplifier is lowered in potential, reducing base bias and therefore the gain of the stage. The result is a reduction in average picture tube beam current.

In making adjustments:

- Tune in a B/W program (or temporarily set Chroma Level control to minimum if only color programs are available). Then set the Color Commander, Brightness



and Brightness Limit controls to maximum.
- Adjust the Brightness Range control for a vertical overscan (bloom) of approximately 1 in.
- Adjust the Brightness Limit control to reduce overscan (bloom) by ¾ in.
- The ¼-in. bloom remaining can be checked by slightly reducing the Brightness control.

Color-TV Chassis 25DC57—Voltage-Sensor Circuit

Should an R339, 12K, ½w resistor connected from the emitter to collector of voltage-sensor transistor Q214 become lower in value, it could cause the limit switch circuit to become too sensitive. Complaints may be of occasional loss of raster, which will return again.

It is recommended that resistor R339 be replaced on all sets being serviced with a 12K, 1w resistor (Zenith Part No. 63-6115). The limit switch circuit is for protection and it should never be defeated.

Color-TV Chassis 19DC12/22/28—Dressing of Focus Capacitor

On 19DC12, 19DC22 and 19DC28 chassis using a red high-voltage tripler (212-140), a separate focus capacitor

ZENITH

Module Cross-Reference Guide

Original Module	Function	Substitute Module	Notes
9-22	Video Sound (22AB55 Chassis)	None	None
9-23	Sync AGC (B/W/Color Chassis)	9-76	One way only
9-24	Vertical (22AB55 Chassis)	None	None
9-25	Horizontal (22AB55 Chassis)	None	None
9-26	Second Color Amplifier & Demodulator	9-47	Inter-fit either way
9-27	Sub-Carrier Regenerator	9-27X or 9-69	Inter-fit either way. Shield must be used with 9-27X.
9-37	Chroma Amplifier	9-97	Resistor 8.2K (R919) must be clipped.
9-37	Chroma Amplifier	9-82	"D" line chassis or later
9-47	Second Color Amplifier	9-26	Either way
9-80	Vertical	9-75	Either way
9-82	Chroma Amplifier	9-97	Either way
9-83	Vertical Switch	None	None
9-91	Video Processor	None	None
9-97	Chroma Amplifier	9-82	Either way
9-103	Audio Detection + Output	None	None
150-12	IF Amplifier	None	None
150-14	IF Amplifier	None	None
150-18	IF Amplifier	None	None
150-20	IF Amplifier	None	None
150-104	IF Amplifier	150-112 or 150-106	None
150-106	IF Amplifier	150-112	None
150-108	IF Amplifier	150-162 or 150-160 or 150-182 or 150-186	None
150-110	IF Amplifier	150-162 or 150-182 or 150-186	None
150-112	IF Amplifier	None	None
150-114	IF Amplifier	150-164 or 150-184	None

9-48	Video Processor	9-91	Resistor 2.2K (R419) must be clipped
9-49	Color Demodulator	None	None
9-50	Chroma Amplifier & Demodulator	9-50A	Must also change 9-77A to match
9-50A	Chroma Amplifier & Demodulator	9-50	Must also change 9-77A to match
9-57	Horizontal	9-70	Either way
9-58	Vertical Miller	None	None
9-59	Nerve Center	None	None
9-67	Horizontal	9-25	One way only
9-69	Sub-Carrier Regenerator	9-27X	Inter-fit either way 9-27X requires shield.
9-70	Horizontal	9-57	Inter-fit either way
9-75	Vertical Oscillator	9-80	Either way
9-76	Sync AGC	None	None
9-77	Crystal Ringing	9-77A	Must change 9-50 to 9-50A
9-77A	Crystal Ringing	9-77	Must change 9-50A to 9-50
9-78	Vertical	None	None
9-79	Varactor Control	None	None

150-152	IF Amplifier	None	None
150-160	IF Amplifier	150-162 or 150-182 or 150-186	None
150-162	IF Amplifier	150-182 or 150-186	None
150-164	IF Amplifier	150-184	None
150-166	IF Amplifier	150-180	None
150-176	IF Amplifier	150-190 or 150-190A	None
150-190	IF Amplifier	150-190A	None
150-1	AFC	None	None
150-3	AFC	150-9	None
150-4	AFC	150-6	None
150-7	AFC	None	None
150-9	AFC	150-9-01	None
150-10	AFC	None	None
150-201	Audio Detection	150-208	None
150-204	Audio Detection	None	None
150-206	Audio Detection	None	None
150-208	Audio Detection	15-208X	None
150-211	Audio Detection	None	None
150-214	Audio Detection Output	None	None

(22-6314 or 22-6845-01) was used. In some instances this capacitor has been improperly dressed too close to a metal bracket or too close to the cabinet surface, adversely affecting capacitor reliability.

Whenever one of these chassis is serviced, it should be inspected to see whether it contains the red tripler (212-140) and associated separate focus capacitor (22-6314 or 22-6845-01). (The capacitor is used only with part number 212-140 tripler, not with other part number triplers.)

If the 212-140 tripler and separate capacitor are present, and if either one is defective, replace both with a 212-130X tripler, which does not require a separate capacitor.

If these parts are present, and neither is defective, the capacitor location or dressing should be checked and corrected if necessary in accordance with Fig. 1 of these in-

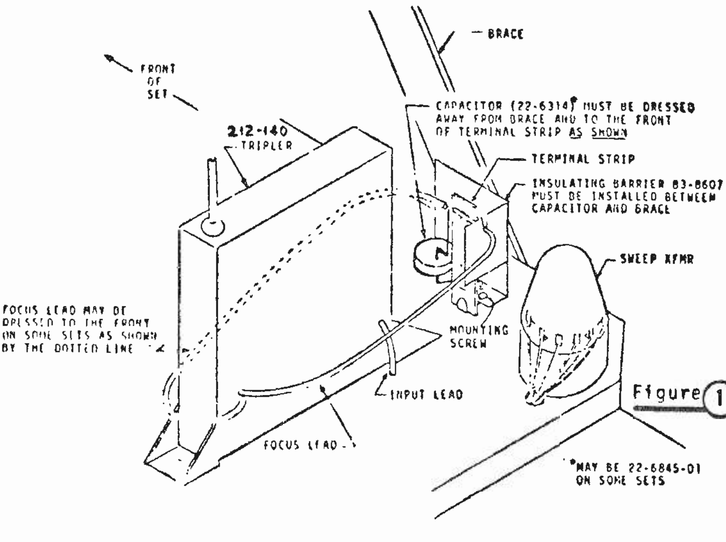


Figure 1

structions. Also, an insulating barrier (83-8607) should be installed in accordance with the instructions (Fig. 2) if one is not already present. A supply of 83-8607 is available from your Zenith distributor without charge.

This procedure will minimize the likelihood of a capacitor failure.

Instructions

The installation of insulating barrier 83-8607 is recommended to ensure the proper location of the capacitor and to prevent damage to the capacitor due to high voltage arcing, which may occur if the capacitor is not properly located.

Prepare the insulating barrier for installation by making two right-angle folds along the perforation as shown in Fig. 2.

Refer to Fig. 1. Dress the capacitor (22-6314) away from the brace and to the front of the vertically mounted terminal strip as shown. Remove screw holding the terminal strip to the chassis. Place the insulating barrier under the terminal strip mounting tab, align holes and replace mounting screw.

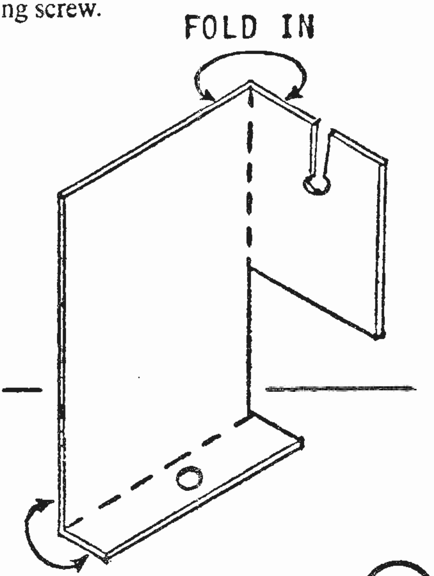


Figure 2

Providing the tripler white focus lead is routed toward the back of set, position the lead through the notch provided in the insulating barrier as shown. Should the focus lead be routed to the front of set, the lead is not positioned through the notch in insulating barrier.

Color TV Chassis 17/19EC45—Video Circuits—Minimize Brightness Drift

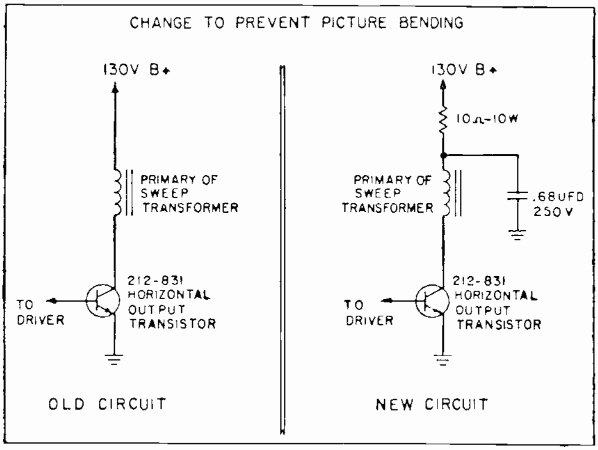
Normal temperature increases during warmup could result in a slight brightness drift in some 17 V and 19 V receivers. A modification to the 9 - 88 module was made which created the new interchangeable 9 - 88 - 01 module, associated with the 121 - 744 second video amplifier transistor stage. Most of the drift was caused by a normal change in the internal bias of this transistor and could result in a slight increase in brightness as the receiver warmed up. The changes on this module are shown in the illustration. Negative DC feedback is provided by the 12 K and the 3.9 K resistors in the collector to emitter path. In addition, a diode was added in series to compensate for the internal bias drift of the second video stage. Since these changes reduced the DC coupling of the video system, an additional change was made in the input circuit to restore the system to its original value. The transistor was also changed to a higher Beta device to further minimize any dependence of drift due to power supply voltage change with temperature.

Color TV Chassis 17/19EC45—Hiss In Sound

New audio circuitry in current receivers was designed to achieve greater "presence" in the sound system for portables. However, it was found that in some signal conditions an excessive amount of hiss was present. The audio circuitry was modified by the addition of a single .0068 mfd capacitor in parallel with the .0033 mfd capacitor shown in the illustration. This will reduce the hiss under poor signal conditions.

Color TV Chassis 17/19EC45—Picture Bending

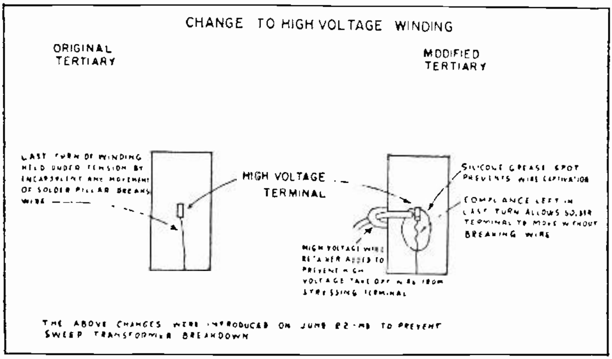
Under some signal conditions and control settings, a slight amount of picture bending could be observed in some E - Line chassis. This is found to be at a greater or lesser



degree at peak anode currents. An R - C decoupling network shown in the illustration consisting of a 10 ohm, 10 watt resistor and a .68 mfd, 200 DC WV capacitor installed between the sweep transformer primary and the + 130 volt supply.

Color TV Chassis 17/19EC45—Broken Tertiary Leads—Improved Sweep Transformer

A problem that has been encountered occasionally in the field has been the breakage of the tertiary winding where it exits from the "tire" of the sweep transformer as shown in the illustration. In earlier versions, the last run was held



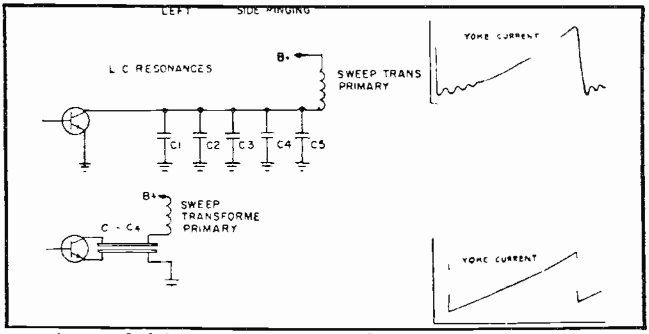
under tension by the incapsulent. Excessive movement of the solder - terminal could break the wire. The problem was resolved by use of silicone rubber to prevent rigid captivation and a retainer was added for stress relief.

Color TV Chassis 17/19EC45—Ringing on The Left Side Of Raster

The following information is devoted to changes that have been made in color TV chassis to improve their performance and reliability. These changes have been incorporated since the "E" line was introduced. Included are the reasons why the changes were made and the components concerned.

Critical Safety Componet — New four lead capacitor in the horizontal output circuit.

Shown in the illustration are several redundant retrace capacitors. These capacitors are required to guard against excessive high voltage in the event of a single unit failure mode. Guide lines laid down by HEW rules forbid the use of a single "lumped value" capacitor with a single common ground return. Several redundant value capacitors were spread out at widely spearate locations within the horizontal output circuit in order to conform with HEW regulations. The wiring required with the use of redundant capacitors could, in some instances, produce an undesirable ring effect. A new and unique 4 - lead capacitor has been designed and developed. It is installed on the horizontal output transistor heat sink as shown in the illustration. One feature of this new capacitor is that if there is an open mode failure, the DC current path is removed from the horizontal output transistor and renders it inoperable. This feature completely eliminates any possibility of "excessive" high voltage being developed which could result from the open mode failure of any one of the redundant capacitors now in the chassis. The compactness and short - lead con-



nections of this new capacitor also prevents the development of multiple resonance.

Do not install this capacitor on a receiver which is not equipped with one at the date of manufacture.

A second possible cause of ringing on the left side of the raster was found in the B+ supply to the Video IF module. Under certain conditions ringing in the horizontal circuit could be introduced into the +24 volt supply, and then into the video IF stages, and finally into the video stages where it might show up as ringing on the left side of the picture. In order to minimize this possibility, the +24 volt supply for the IF strip was changed from terminal U4 on the sound module to a filtered + 24 volt supply source at terminal W13 on the AGC - Sync module.

Color TV Chassis 17EC35, 17EC45, 19EC45 (Run No. 401 and higher only) 17FC35, 17FC45, 19FC45, 19FC45Z, 19FC46, 23FC45, 25FC45 (all). Color TV Models E, F, S, and T.

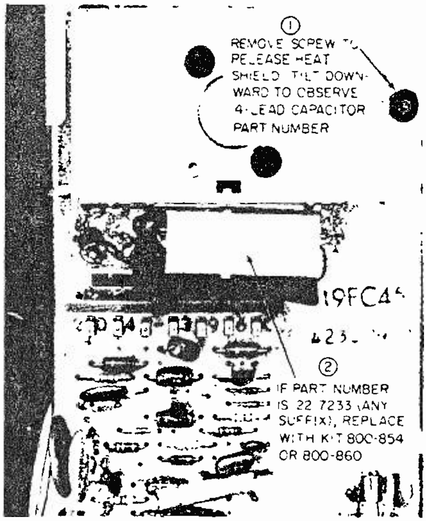
Field experience has disclosed a reliability problem with the 22-7233 capacitor that was not discovered in laboratory or quality controls tests.

Typically, the failure occurs after many months of operation. The capacitor fails suddenly, causing a secondary failure of one or more other components and immediately disabling the receiver. Horizontal output transistor, tripler, vertical module, picture tube (neck crack), or other parts may be affected.

An intensive engineering investigation of this problem has been carried out both in the laboratory and in field service and has established that there is no safety problem involved. However, the failure repair costs may be higher than the customer should be expected to pay.

Failures, occurring *within warranty* are, of course, covered by the warranty. Failures occurring due to this problem *after warranty* will be covered by the Zenith Policy Adjustment Program until further notice. Policy Adjustment claims *for this problem only* are to be made on Warranty Claim Form number 3744C.

To minimize continuing failures of this part and the attendant consumer dissatisfaction, the following procedure is to be instituted by distributor-approved Zenith Service Centers. This applies to any of the above chassis when serviced for any reason, in-home or in-shop, and also to any stock merchandise still in distributor or dealer inventory.



Inspect the four-lead capacitor below the heat shield and replace it if it is part number 22-7233 of any suffix version. (See Photograph). Use only kit 800-854 (with new capacitor 22-7465) for replacement or alternate kit 800-860 with capacitor 22-7504, which will also be supplied later this year. Always follow servicing guidelines and safety checks given in service manuals.

The replacement capacitor will be supplied through Zenith distributors. A labor claim of $4.50 for preventive maintenance will be paid through the Zenith distributor on Warranty Claim Form Number 3744C.

All labor claims associated with this capacitor problem are to be made on Warranty Claim Form Number 3744C and submitted to the Zenith distributor.

A special code number must be written in the box labelled, "On Special Distributor Instructions" as follows:

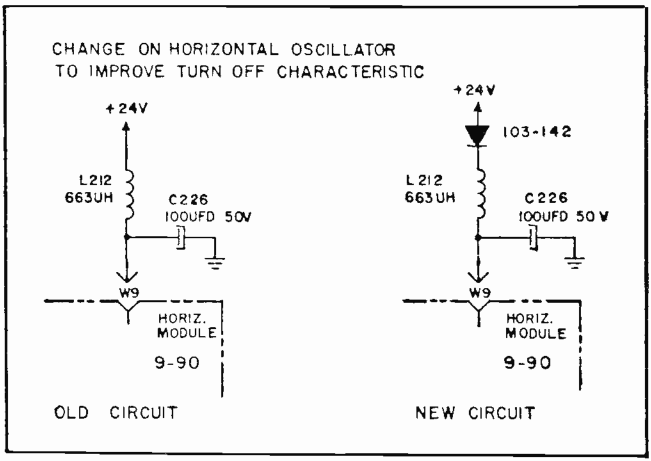
Situation:	Code Number
Routine in-warranty service: Also replace 22-7233 as Preventive Maintenance and add $4.50 to profile rate	18
In warranty Capacitor Failure Repair labor at profile rate	19
Out of Warranty Preventive Maintenance Special labor charge of $4.50	20

Out of Warranty 21
Capacitor failure, Policy Adjustment
Repair labor at profile rate

Credit will be given for all parts replaced under this program. Parts are to be returned to the Zenith distributor accompany labor claims and with a Defective Warranty Parts Tag attached (old form 901-82 or new form 3618). Parts Tag must show:
Warranty Claim number
Date failed or replaced
TV model and serial numbers
TV date code
The letters " PM " written in the upper left corner for 22-7233 capacitor replaced for preventive maintenance 'only (not failure).

Color TV Chassis 17/19EC45—Improved Horizontal Turn - Off Characteristics

In some receivers a bright vertical spot could be seen on the screen as the receiver is turned off. This could be caused by the horizontal scan decaying at a faster rate than the

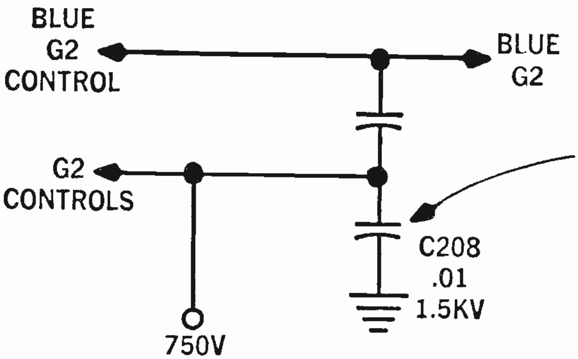


vertical scan. A 103 - 142 diode was added as shown in the illustration to insure the 100 mfd capacitor (C226) discharges into the module rather than into the 24 volt supply, increasing the decay time of the horizontal system.

CAUSE: Capacitor C203 defective

CHASSIS: Zenith 25FC45

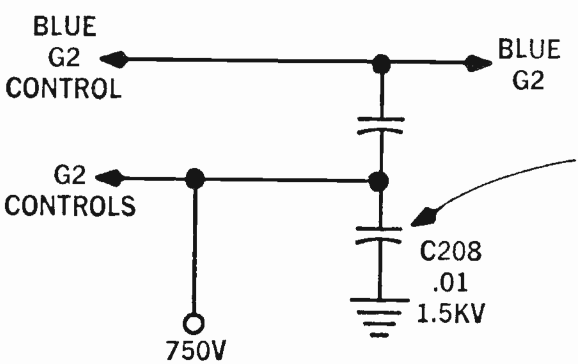
TROUBLE SYMPTOM: Color fidelity poor overall; color smeared on edges of dark objects in picture; G2 voltage reduced; absence of setup line in service position of NORMAL/SERVICE switch.



CAUSE: Leaky C208. About 5 megohms of leakage measured across C208.

CHASSIS: Zenith 25FC45

TROUBLE SYMPTOM: Low brightness; absence of setup line in service position of NORMAL/SERVICE switch.

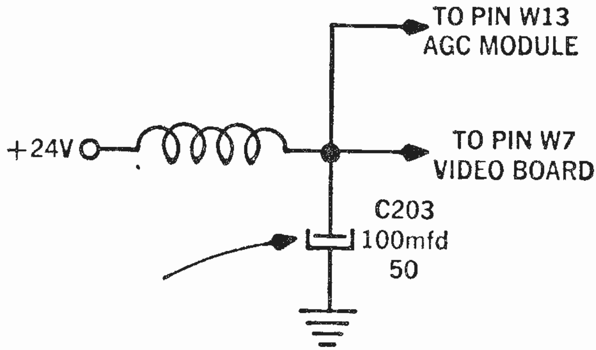


CAUSE: Leaky or shorted C208, in CRT screen grid circuit. About 100K ohms of leakage measured across C208.

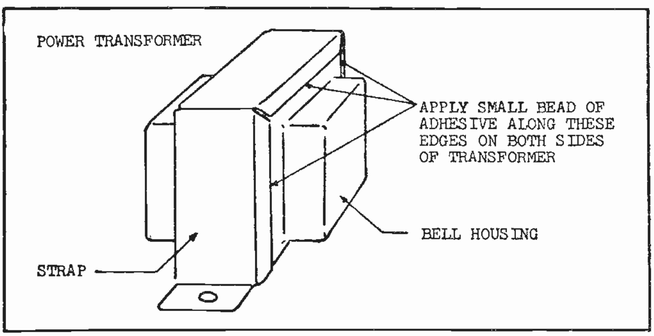
ZENITH

CHASSIS: Zenith 25FC45

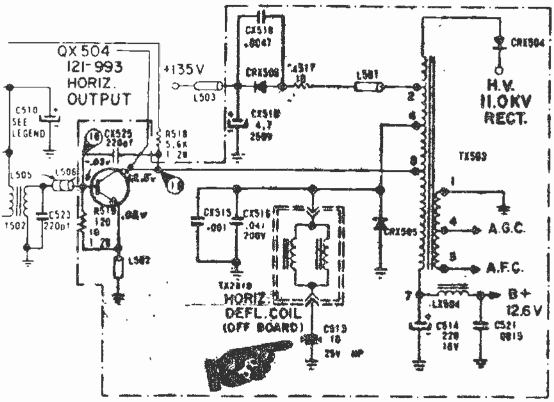
TROUBLE SYMPTOM: Horizontal sync loss; vertical bar moving through raster (windshield wiper effect).



Digital Clock Radio, Model H472W—Audible hum and vibration
The power transformer bell housings on certain early production H472W digital clock radios may vibrate and produce an audible hum. At very low volume levels, this may be noticeable to some people. If a repair is desired, apply a small bead of a good adhesive such as epoxy between adjoining edges of the bell housings and transformer strap as indicated by arrows in diagram below. Allow the adhesive time to cure thoroughly before plugging in the receiver for operation.



B & W TV—Replacement capacitor in horizontal yoke circuit
Special nonpolarized capacitors are used in series with the horizontal yoke coil of all Zenith 9 and 12-inch all-solid-state B & W TV. These capacitors are specially designed for high current application in this circuit. If they fail, be sure to replace them with the identical part available only from Zenith. Other replacement parts which seem to have similar characteristics (and even higher voltage ratings) will fail. ■



CAPACITOR IN 9GB1X CHASSIS SHOWN

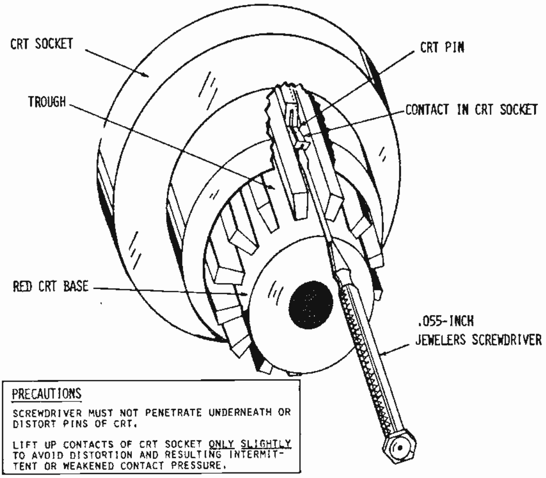
Chassis 25FC45—No raster, loss of high voltage.
Several causes possible, (1) Open peaking coil (L212) in 24V supply to horizontal module, or (2) when changing coil, check the vertical module. It may reduce brightness and open new coil again. Substitute new module to be sure there is no loss of brightness, or coil may open again in a few hours.

Color TV Chassis 13GC10—No reception on low VHF channels. All other channels are O.K.
Probable cause is an open 5.7 VAC winding on the power transformer.

Color TV Chassis 25EC58—After set warms up, a slight vertical retrace is visible, and becomes more visible longer set is on.
Resistor R260 (75K ohm, ½W), part No. 63-9947-17, is faulty.

ZENITH

Color TV Chassis "J" line—CRT sockets binding to CRT.
The CRT sockets of the video output module may in some instances bind to the base of the CRT in early production 13 and 17 inch "J" line receivers. This condition could be due to the contacts of the CRT socket binding near the bottom of the troughs of the CRT base. If binding does occur, do not pull excessively in trying to remove the socket, or you could break the CRT. Instead, obtain a "B" size jeweler's screwdriver. Carefully insert it within the troughs of the CRT base and gently "pry" each one of the contacts slightly as shown in illustration below. NOTE: BE SURE NOT TO ALLOW THE SCREWDRIVER TO PENETRATE UNDERNEATH AND DISTORT THE PINS OF THE CRT. ALSO, BE VERY CERTAIN NOT TO "PRY" THE SOCKET CONTACTS TOO MUCH, SINCE EXCESSIVE FORCE WILL DISTORT THE CONTACTS AND REDUCE CONTACT PRESSURE. INTERMITTENT OR NO OPERATION MAY RESULT. After each one of the 11 contacts of the CRT socket has been lifted gently, the CRT socket/module should pull off the CRT base with only a moderate amount of force. Mechanical changes have been implemented in later production receivers which will prevent the possibility of the aforementioned binding.



PRECAUTIONS

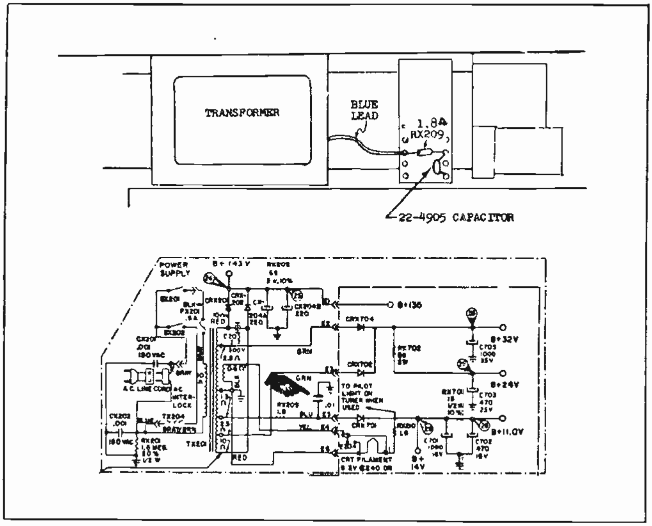
SCREWDRIVER MUST NOT PENETRATE UNDERNEATH OR DISTORT PINS OF CRT.

LIFT UP CONTACTS OF CRT SOCKET ONLY SLIGHTLY TO AVOID DISTORTION AND RESULTING INTERMITTENT OR WEAKENED CONTACT PRESSURE.

Color TV Chassis 19HC55—Shrunken picture (insufficient width).
Solution is to replace R233 in the pincushion circuit.

B/W TV Chassis 19GB1—Shorted diode creates no-audio condition

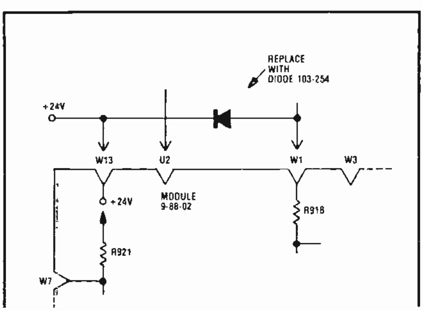
In the earlier production chassis, if diode CRX701 should short, fusing resistor RX209 will open, yielding the no-audio condition. In servicing this kind of problem, a protective capacitor, (.01 mfd 500V disc) should be added as indicated in diagram below. Dress leads carefully and use sleeving if necessary.



TROUBLE SYMPTOM: Reduced brightness or complete loss of raster

CAUSE: Failure of diode (Zenith Part No. 103-142) connected between pins W1 and W13 of Module 9-88-02. (In chassis equipped with the "−02" module, the diode is connected between pins W1 and W13 of the module socket. In chassis equipped with the "−02A" or "−02C" module, the diode is wired between terminals W1 and W13 on the module itself.) For improved reliability, replace this diode, if defective, with a diode having Zenith Part No. 103-254.

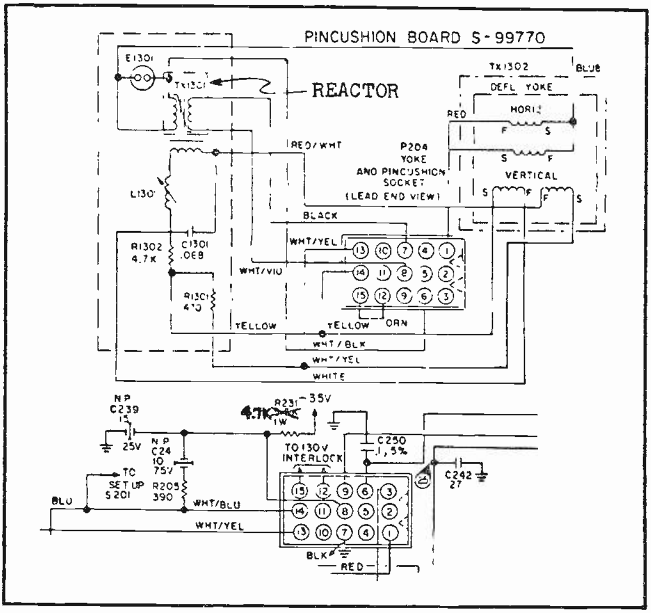
CHASSIS: All Zenith "G" Line Color TV Chassis with a diode connected between pins W1 and W13 of Module 9-88-02.



ZENITH

Color TV Chassis 25HC50, 23HC50, 23HC50Z—Existence of drive line

A drive line in these early production H-line receivers may develop, caused by a pincushion reactor with excessive inductance. The drive line will be noticeable only in the zoom mode. It can be eliminated by replacing R231, a 5.6K, 1-watt resistor, with a 4.7K, 1-watt resistor. This lower resistance causes a slight increase in reactor current, which effectively lowers the inductance of reactor, 95-3182. In later H-line models this was factory modified.



Modules inoperative because of ineffective contacts.
In many instances, a module suspected of being inoperative may only have ineffective or marginal contacts. You can quickly check for this possibility. Simply remove the module in question from its receptacle, and plug it back in. If contacts were weak, the receiver will in all probability operate properly. (If the operation of the set is still not proper, a known good module should be tried.) In the event that the contacts were weak, the module should again be removed and the spring tension of the contact tabs on the module should be increased. To increase tension, use a narrow instrument such as a jewelers-type screwdriver and carefully push the tabs slightly inward. *CAUTION: Do not push excessively on tabs, or breakage may occur.*

EDITOR'S NOTE: *This technique applies to other makes. It has been a common problem with Motorola Quasar "CA" panels causing unusual and sometimes intermittent video and color symptoms.*

23HC45 Color TV Chassis	Raster and sound both intermittent (2 or 3 times in 8-hour period).	Faulty 24-volt regulator transistor QX201.
25EC58 Color TV Chassis	"White Streaks" horizontal through picture. AGC delay action critical.	Leaky capacitor C231 (near video processor module 9-48).
23HC45Z4 Color TV Chassis	No Color	Shorted winding in flyback transformer TX206.
25HC45 Color TV Chassis	Pix almost normal with low brightness. Color smears when brightness is advanced.	Capacitor C208 shorted (on red G2 control).
23HC50 Color TV Chassis	Left 1/3 of picture darker than right side.	Open filter capacitor CX214.
25HC45 Color TV Chassis	With red G2 at maximum, green and blue will not vary. No green and blue with G2 off. Cannot get gray scale.	Capacitor C211 shorted (on right side of schematic near CRT).

Miscellaneous

Transistors For Color TV

High voltage silicon transistors for horizontal output circuits of 25in. color TV receivers are announced by Delco Radio Div. of General Motors.

Two of the new DTS402 transistors are connected in series to the flyback transformer primary with center tap. The circuit features off-line operation, B+ regulation, and individual peak detector clamps for each transistor.

The circuit, which permits off-line operation, eliminates the large transformer previously needed.

The transistors switch 120v, producing a retrace pulse up to 1.2kv. The peak current switched is 3.5a, while the high voltage circuit provides 24kv at 1.3ma with 3kv regulation. Known high voltage fault conditions are endured safely by the two DTS402 transistors.

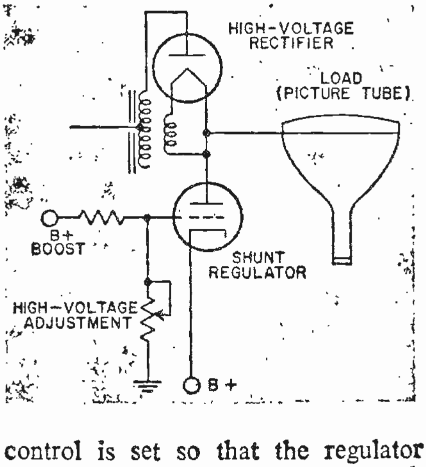
The DTS402 transistor is a version of Delco's DTS423 silicon power transistor presently being offered to industry. The DTS402 has a maximum fall time specification and a 700v V_{CEX} rating.

High-Voltage Regulator

High voltage in a color television receiver must be kept constant at all levels of picture tube beam current to prevent blooming and changes in raster size as the brightness level of the picture changes. Voltage is kept constant by a shunt regulator circuit.

The triode acts to maintain a constant load on the high-voltage supply. When the signal drives the picture down to the darkness level, CRT beam current is cut off, and maximum current flows through the regulator. At the highest brightness level, regulator current drops to its minimum value. Thus, load current on the power supply is held constant, and high voltage remains at a fixed level.

Grid voltage for the regulator tube is taken from a voltage divider in the B + boost supply. The voltage operating point is determined by the setting of the high-voltage adjustment. This

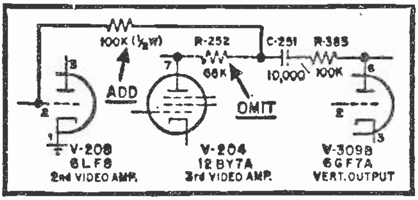


control is set so that the regulator tube passes enough current to absorb the current load of the supply when the picture tube is cut off (black).

If high voltage starts to decrease because of increased beam current, the B+ boost voltage also drops and the grid of the triode becomes less positive. Regulator-tube plate current decreases to compensate for the increase in picture-tube beam current.

Vertical Retrace Blanking In DuMont Color Chassis

A circuit modification will improve the vertical retrace blanking of chas-



sis 120814 coded with triangle "F" (or higher letter), 120822, 835 coded with triangle "E" (or higher letter), 120844, 858, 859, 868 coded with triangle "B" (or higher letter).

A resistor, R252 (68K, ½w), should be removed from the circuit, and another resistor (100K, ½w) should be added between a capacitor, C251 (10,000pf), and pin 2 of V208 (6LF8, 2nd video amplifier). This resistor should be installed on the etched circuit side of PC2, the video and sound board. Insulating sleeving should be used on the resistor leads to prevent the possibility of short circuits.

edi ELECTRONIC DEVICES, INC.

Color-TV Service Tip

In addition to all other benefits, the use of a solid-state device for replacing the high-voltage rectifier tube eliminates the need for the filament winding of the flyback transformer (a frequent failure part and trouble source).

The filament winding can be severed (or ignored) saving time and often a flyback replacement.

A complete line of solid-state high voltage rectifiers, damper diodes and focus rectifiers are available from edi Electronics Devices, Inc.

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