RCA
Plain Talk
and Technical Tips

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Product Safety and Servicing

RCA goes to great lengths in assuring that the product placed in the consumer's home is as safe as our technology can make it. Particular attention is paid to using components that have an adequate margin of safety against failures involving over-temperature or over-voltage conditions. An extraordinary amount of engineering time and effort is devoted to development of preventive measures in circuit areas and failure modes in which a malfunction might result in a hazard to the consumer. For example, special flame retardant resistors, components with flame retardant insulation, and special lead dress are used to minimize the possibility of damage to the receiver when a component fails. Many RCA sets also include special protective circuitry that renders the receiver inoperative in the event of a malfunction that could result in excessive high voltage.

These special safety components and circuit areas are identified in RCA Service Data by use of a gray overprint on the appropriate schematic areas. The reader may be asking at this time, "What does this mean to me?" This discussion has a very significant meaning to the service technician, for improper and/or careless servicing can defeat the safety designed and manufactured into a consumer product by RCA. For example, the replacement of a flame-retardant resistor with an ordinary carbon type resistor would be an undesirable change in this built-in consumer safety feature of the receiver, and might result in substantial damage to the chassis should this improper replacement component fail.

Another area of service laxity concerns the high voltage and/or protective safety circuit areas. With the high operating voltages involved, this circuitry is occasionally subject to malfunctions. Nearly all service technicians in their servicing careers have replaced components in the horizontal output/high-voltage circuits. Most technicians are aware that the critical nature of the high-voltage circuitry requires exact replacement parts and particular attention to correct lead dress during installation. Repeat failures can happen when correct service techniques are not used.

Accumulated dust and dirt is another condition that is service-correctable. Older television chassis may often be covered with a thick layer of dust. This dust is more than just a dirty hand and clothing nuisance—it also may reduce the cooling of circuit components. Most technicians, routinely vacuum the dust from a chassis before placing it

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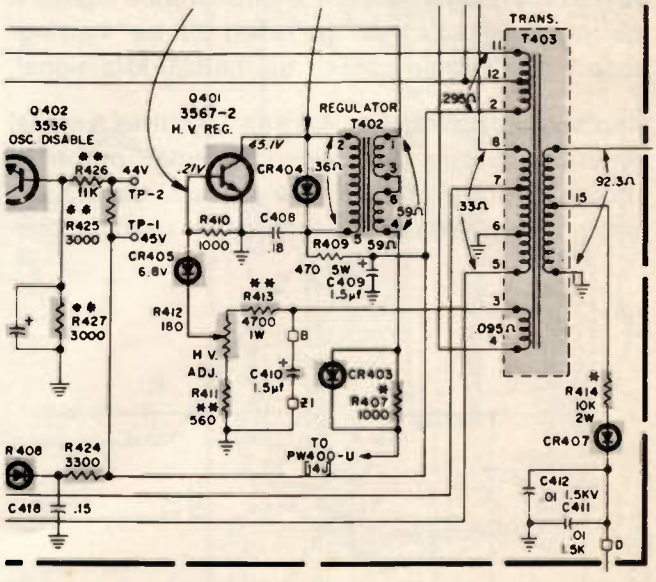

Figure 1—Special Components Areas

A publication for the service industry prepared by RCA Consumer Electronics

In-Home 4.5 MHz Trap Adjustment

All RCA color receivers include a 4.5 MHz trap to prevent sound interference from causing beat patterns ("herringbone") in the picture when the receiver's **COLOR** control is advanced. The 4.5 MHz signal is created in the video detector, and is the beat-frequency difference between the 41.25 MHz sound carrier and the 45.75 MHz picture carrier. The 4.5 MHz trap is located between the video detector and the chroma take-off point. This prevents

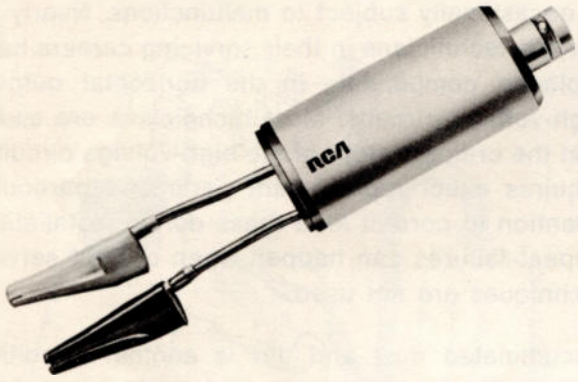

Figure 2—The WG-449A 4.5 MHz Trap Probe

the 4.5 MHz signal from entering the chroma circuits where it could intermodulate with the 3.58 MHz color subcarrier and produce the objectionable 920 kHz beat-difference interference signal. If the trap is misadjusted, the result will be "herringbone" interference caused by the 920 kHz signal.

Normally, adjusting the "4.5 trap" requires a signal generator, scope, and video detector probe—a shop job. However RCA now manufactures a detector probe, (WG-449A) that, when used in conjunction with an electronic voltmeter, permits adjustment of the trap in the customer's home, using an off-the-air signal. (A WG-427A cable and a WG-430A adaptor are required to couple the probe to the voltmeter.) To make the adjustment, it is first necessary to remove the back cover of the color receiver. Then, on many sets, the **COLOR** control will be accessible so that the WG-449A probe can be connected between the top end of the **COLOR** control and chassis ground.

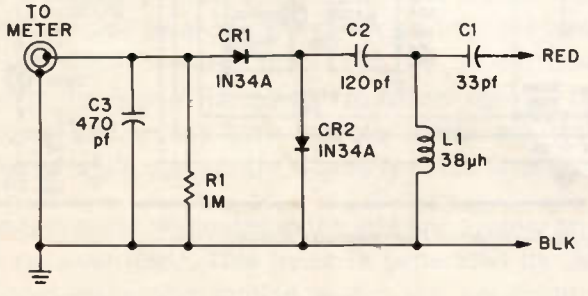

Figure 3—Schematic of WG-449A

To set the trap, tune the receiver to a local TV station, defeat AFT, and adjust the **fine-tuning** control to the point where the herringbone sound beats appear in the picture. The receiver has now been mistuned far enough so that the TV station sound carrier is out of the 41.25 MHz sound traps, allowing an extra strong sound carrier to pass through the IF into the video detector where it produces a strong 4.5 MHz beat with the picture carrier.

All conditions have now been set for an exact adjustment of the trap. With the electronic voltmeter connected to the **COLOR** control via the WG-449A probe, set the range switch to a near midscale reading. Then adjust the 4.5 MHz trap for minimum meter deflection. That's all there is to it. Reset the

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Signal-To-Noise Ratio

The signal-to-noise ratio which is established primarily by the RF input circuitry of a television receiver has a great deal to do with whether or not the receiver is going to provide good (low noise) reception. The criterion for receiver performance is determined by the ratio of the desired signal to that of the external and internal noise that rides along with it, not just the strength of the signal alone.

Noise in a television receiver, the electrical disturbances that causes hissing in the sound and snow on the screen of a picture tube, is of two distinct types: impulse noise or random noise.

Impulse noise ordinarily originates outside of the receiver and antenna system. Such noise is usually generated by atmospheric disturbances and man-made electrical devices. Impulse noise is minimized by giving careful consideration to antenna location

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Servicing

Replacing Horizontal Output Transformer

When replacing the horizontal output transformer, it would be well to consider the possible cause(s) of failure, and take steps to assure reliable operation of the replacement transformer. Two possible causes of failure are (not in order of predominance):

1. Over-voltage induced (insulation breakdown) due to regulator failure (the tube and/or other components such as the precision voltage divider resistors or the 1000 ohm cathode resistor), hold-down circuit failure, or operation without load.
2. Excessive current due to misadjusted efficiency coil, excess load on circuit, defective horizontal output tube. (Presence of dripped wax usually does not indicate that transformer is defective.)

The above two types of failures can be prevented by making the horizontal deflection circuit adjustments described in RCA Service Data, at the same time taking care to watch for possible causes of (1) and (2) type failures as described above.

Other failures may be caused by poor lead dress, poor soldering, and/or dirt that results in corona or arcing-induced insulation failure. The steps outlined below will eliminate the possibility of damaging the replacement transformer and the attendant "repeat failure" situation.

REPLACEMENT PRECAUTIONS

Tube Seated

1. Insert the tube pins completely into the tube socket then pull back out about an eighth inch.
2. Position the cover so that the tube top cap is directly in line with the cavity. The tube position can be varied slightly in its socket.
3. Slide the cover toward its closed position maintaining correct alignment. After the tube cap contacts the cavity, press the cover firmly to its completely closed position. This ensures proper cap-to-cavity contact.

Lead Dress

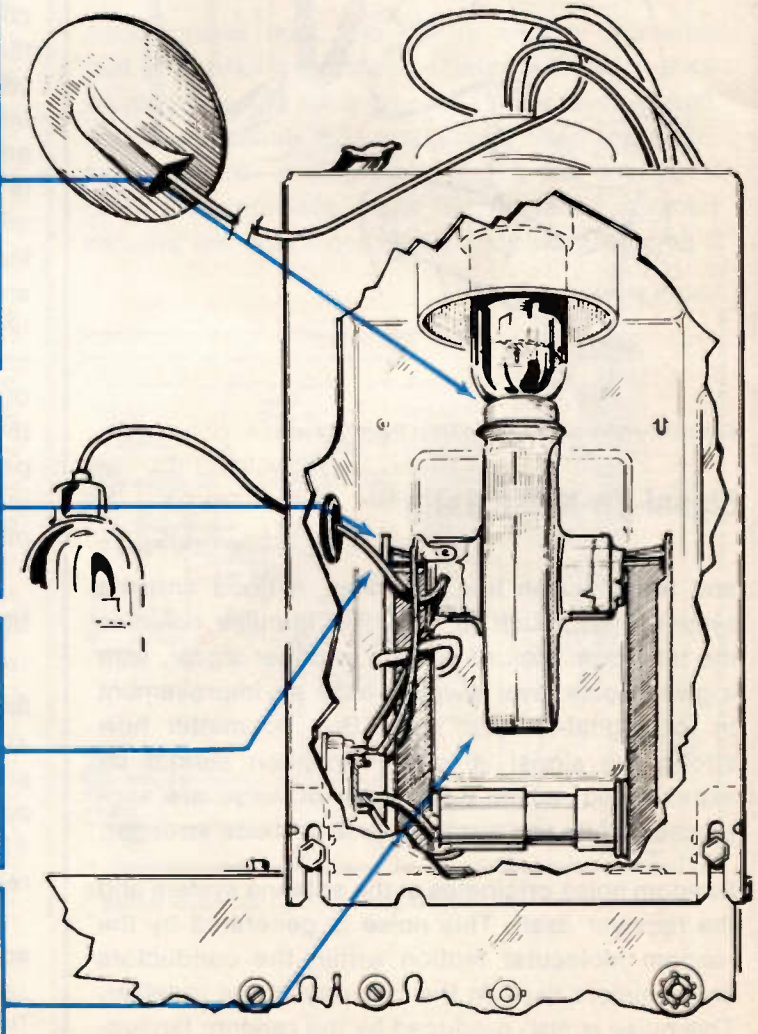
Dress all leads away from:
1. Transformer "tire"
2. Yoke lead terminals
3. Damper terminals
4. Inside of high-voltage shield compartment

Solder Connections

Observe the following precautions:
1. Clean and rounded connections
2. No burned insulation
3. No stray wires
4. No solder splashes or metallic chips on transformer windings
5. Remove excess rosin flux

Cleanliness

Dirt is the enemy of high-voltage circuits. Use clean dry rag to wipe:
1. Interior of high-voltage shield compartment
2. Replacement transformer
3. High-voltage rectifier



NOTE: IF REPLACEMENT TRANSFORMER HAS LARGER DIAMETER (FLAME RETARDANT) LEADS, SHIELD HOLES MAY REQUIRE ENLARGING TO ACCOMMODATE LEADS OF NEW TRANSFORMER.

Product Safety and Servicing

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on the service bench. But, what about the chassis that does not leave the customer's home? It is equally important that the dust be removed from chassis in these receivers. So do your customer a favor while at the same time protecting his television receiver. Equip yourself with a vacuum cleaner and make it standard policy to always clean the chassis. Your clothes and your customer will appreciate and benefit from the extra moment this takes.

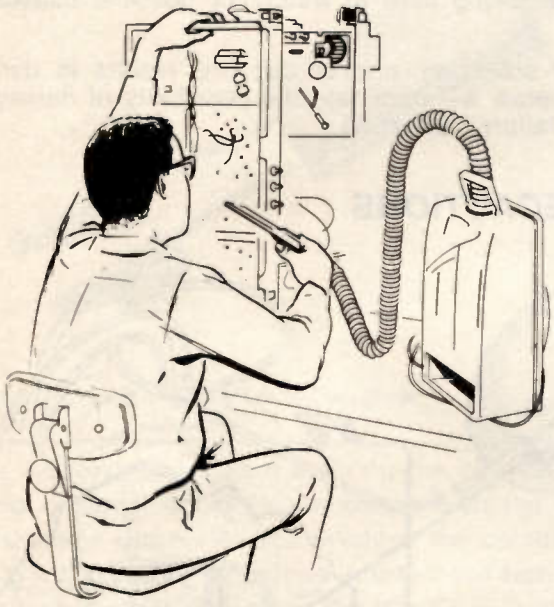

Figure 4—Remove Dirt and Dust from Chassis

Signal-To-Noise Ratio

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and transmission line shielding. A good antenna system does much to minimize impulse noise in the television picture since a stronger signal, with a given noise level always yields an improvement in the signal-to-noise ratio. But, no matter how strong the signal is, good reception cannot be experienced unless both types of noise are suppressed while the wanted signal is made stronger.

Random noise originates in the antenna system and the receiver itself. This noise is generated by the random molecular motion within the conductors and resistors used in the circuitry of the receiver. This noise is also produced by the random fluctuations of the electron emission from the cathodes the tubes used in the receiver, or effects of minority carrier phenomenon in solid-state devices. The suppression of random noise depends primarily upon the careful design of the RF input circuitry used in the tuner of the television receiver, as the noise generated here must be amplified by all the succeeding stages. The signal-to-noise ratio of the tuner, because the tuner noise receives maximum amplification, basically determines the signal-to-noise ratio of the entire receiver. This is because the random noise generated in the input of the receiver (RF amplifier stage) is amplified to a level far exceeding the random noise generated in the remaining circuits of the receiver.

Noise Control Adjustment

RCA solid-state color receivers have a technician adjustable **Noise** control which can be used to optimize the performance of a receiver when unusual signal and/or noise conditions are encountered. The **Noise** control allows the automatic-gain-control action of the tuner RF stage to be adjusted to compensate for various signal conditions. Although the control is factory-adjusted for average signal conditions, a touch-up adjustment will sometimes improve the set operation when a noisy picture or beats are encountered. The adjustment procedure is to simply tune to the offending channel and then adjust the control slightly in each direction until the picture is improved. The correct operating point should be well defined; one side of the correct setting the picture will contain noise and on the other side beats may appear in the picture. If there is any doubt as to what is the correct **Noise** control setting, then simply adjust the control until noise just appears in the picture and then back the control off until the noise just disappears. Finally check the other channels for proper operation.

In-Home 4.5 MHz Trap Adjustment

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fine-tuning control on the receiver for best color and turn AFT "on." With the 4.5 MHz trap now properly set, there should be no sound interference pattern in the picture. If beats are still present, the 41.25 MHz sound traps may be misaligned, which requires more detailed servicing.

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