RCA
# Plain Talk
and Technical Tips

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## CTC 46, 54 High-Voltage Protective Circuit

Late production CTC 46 and all CTC 54 chassis include a special hold-down circuit to indicate a failure condition which results in excessive high voltage by producing a non-viewable picture. The hold-down circuit incorporated in these chassis detects an increase in high voltage and renders the picture non-viewable by throwing the horizontal oscillator far enough out of sync that adjustment of the customer **Horizontal-Hold control** or **Hold-Limit** service adjustment will not restore a normal picture. In the event horizontal sync is lost, the problem in these chassis could be either horizontal sync/oscillator related, or the normal operation of the hold-down circuit signaling a condition of excessive high voltage. A malfunction of the hold-down circuit will also produce a non-viewable picture. It is extremely important that correct high-voltage and proper hold-down circuit operation are confirmed as a step in servicing these chassis.

CTC 46 and CTC 54 chassis using this protective hold-down circuit can be easily identified by the additional transistor (Q402), test-points (TP-1 and TP-2), and associated components located adjacent to the horizontal oscillator (MAH Module) area of the PW 400 circuit board—see Figure-1.

### Servicing

If a problem is suspected in the hold-down circuit, the operation can be easily checked as follows:

1. Ground TP-2 with set operating and adjust **Horizontal-Hold** to sync picture. If horizontal sync can be restored, problem is due to excessive high voltage and must be corrected before instrument back cover is replaced. If picture cannot be "synced," problem is probably in the horizontal oscillator/sync circuit.

2. **Important:** Before replacing instrument back-cover, check operation of hold-down circuit as follows: With instrument operating on 120 VAC line and all controls set for a normal picture, temporarily short TP-1 to TP-2. This **MUST** cause picture to lose horizontal sync. Adjusting **Brightness** control should cause a small shift in the number of bars visible on the screen.

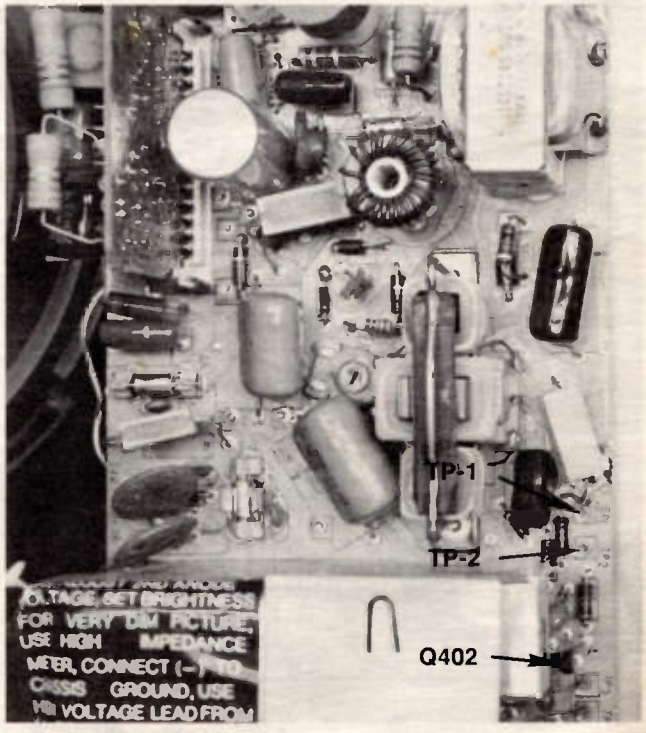


*Figure 1—Hold-down Circuit Location (PW 400 Board)*

### *Special Notice*

**RCA will soon be mailing up-date pages for the RCA Home Service Handbook. To receive these pages, your handbook must be registered by mailing in the registration card in the front of your book. If you haven't, please take a moment now to fill out and mail your registration card.**

PS

A publication for the service industry prepared by RCA Consumer Electronics

# Horizontal Sweep Circuit Noise

Television receivers produce acoustical energy (noise) at the horizontal sweep frequency. Although the frequency of this sound is at the upper limit of hearing, sometimes a set owner, whose hearing is acute, objects to this 15.7 kHz noise. When complaints of this nature are encountered, several steps can be taken to minimize the noise.

One cause of this noise is the vibration of the glass envelopes of horizontal circuit tubes. So first try substituting the horizontal output, damper, regulator (if used) and high-voltage rectifier tubes, one at a time, to see if the noise is reduced. Or, as an alternative, hold an insulated rod against the glass envelope of each tube to see if it will damp-out the glass vibration. Replace the tube or tubes that are causing the noise.

If the chassis has a pincushion correction circuit, slightly reduce the setting of the **Pincushion Amplitude** control and listen for a reduction in noise level. If this check reduces the sound level, tighten the pincushion transformer mounting and/or insert tapered toothpicks between the coils and the transformer core.

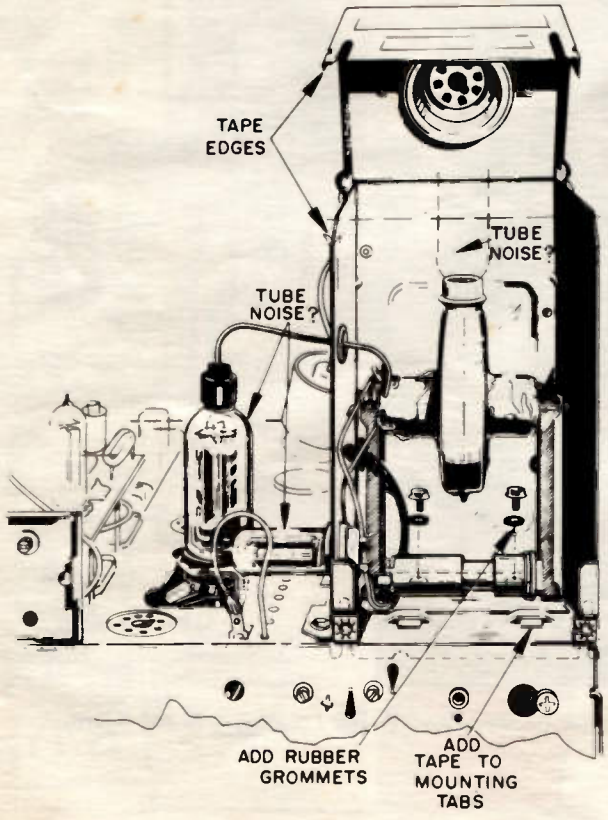


*Figure 2—Noise Suppression Techniques*

Use an insulated rod to press on the mounting screws, rivets, brackets and hinges of the high-voltage compartment cover. Any vibrating part that produces noise can be silenced by applying a dab of silicone rubber, or by adding a small piece of electrical tape. If the high-voltage compartment cover is the source of noise, add a cork pad or tape to the contact edges of the cover.

To eliminate the horizontal output transformer singing noise, carefully loosen the transformer from its mounting, just far enough to insert rubber spacers between the transformer and its mount. Also, add rubber grommets to the transformer mounting screws. Carefully reinsert transformer mounting screws into the chassis—the transformer should be tightened sufficiently to insure a secure mounting; but not so tight as to defeat the purpose of the rubber inserts or to strip the self-tapping screws. Turn the receiver "on" and check for normal operation.

**Note:** To insure correct operation and continuing customer safety, it is very important that the **high-voltage adjustments and safety checks** be made as instructed in RCA Service Data.

# Corona

Corona existing anywhere within the high-voltage circuitry of a television receiver can adversely affect the performance of the receiver. In addition to causing signal interference, it can upset AGC action, promote horizontal instability, and even cause vertical jitter. In color receivers, corona can cause a loss of color. Also, in time, corona can lead to insulation failure. These important facts should not be overlooked when servicing receivers exhibiting any of the symptoms mentioned above.

On some color receivers that have been in use a long time, the plate cap of the high-voltage regulator tube may deteriorate, causing corona. It is usually necessary to examine the inside of the cap to determine if corona has damaged the cap. If evidence of damage is visible, this plate cap or any other component that may be responsible for corona should be replaced, repaired, or cleaned as required to restore normal receiver operation.

*Continued on Page 4*

# Zener Regulation and Replacements

The zener (avalanche-breakdown) diode is constructed much like a silicon rectifier diode. When **forward** biased the zener conducts with minimum voltage drop. When **reverse** biased, however, it does not conduct until a specific **breakdown** voltage is reached. It is the reverse voltage characteristic of the zener diode that distinguishes it from the silicon rectifier.

To better understand the reverse voltage (breakdown) characteristics of zener diodes it would be well to examine Figure-3, which illustrates the voltage/current curve of a typical zener diode. Notice that the breakdown voltage remains essentially constant from a minimum sustaining current of about 5 mA up to the maximum power rating of the diode.

Several things must be known in zener circuit application. These include the minimum and maximum DC voltage input to the regulator circuit, minimum and maximum DC current requirements from the zener regulated supply, maximum power dissipated in the zener (to determine zener wattage requirements), and its minimum sustaining current. (A discussion of "zener regulator design" appeared in the Jul-Aug 1969 issue of "Plain Talk.")

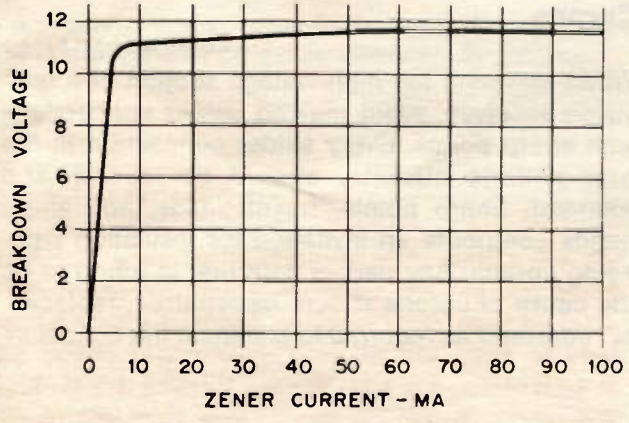


*Figure 3—Typical Voltage/Current Curve*

## Regulated Transistor Supply

The simplified circuit (Figure-4) illustrates a zener regulator system used in the KCS 176 black and white television chassis. The DC voltage supplied from the cathode of the horizontal output tube is held constant by the 12-volt zener; thus, supplying regulated 12 volts required for transistor circuitry. Failure of this zener would cause a loss in the constant 12-volt supply to the transistor stages and also cathode bias of the horizontal output stage.

## Zener Replacement

As previously discussed, several things must be considered in the design of zener circuitry—voltage, current, and wattage. Due to the critical nature of these circuits it is recommended that only **exact** replacements **(RCA Stock Numbers from RCA Service Data)** be used when a failure is noted.

When replacing a defective zener diode certain precautions should be taken, just as when replacing other solid state devices (transistors, integrated circuits, etc.). Care must be taken to prevent possible damage to the zener due to excessive **heat** or **voltage;** soldering irons should be of **low wattage** and **grounded** in such a way that will prevent possible damage to the zener during the soldering operation.

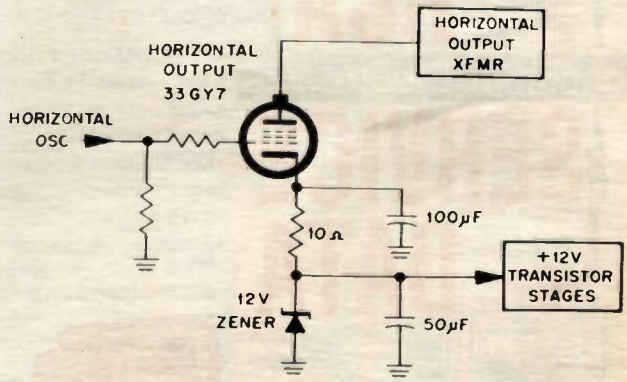


*Figure 4—Regulated Transistor Supply*

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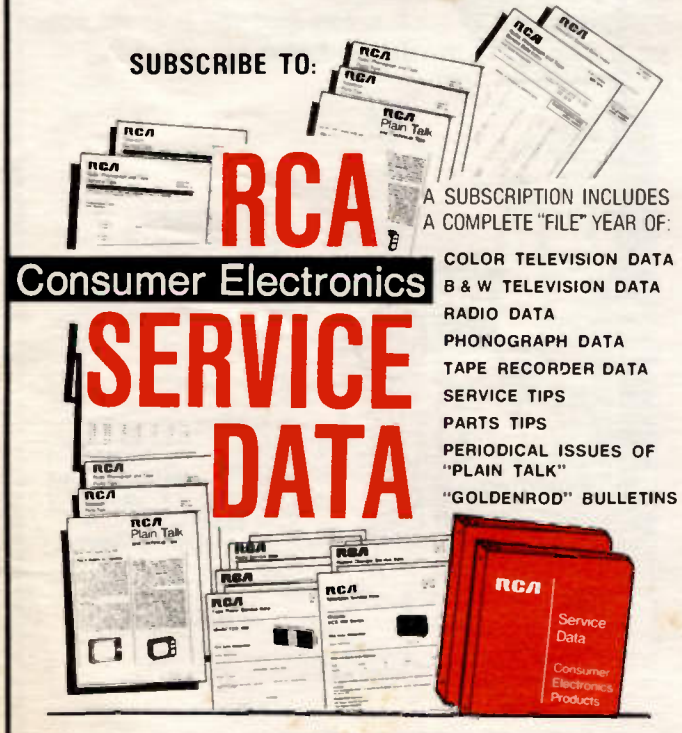


*Figure 5—RCA Service Data*

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## Corona

*Continued from Page 2*

When servicing the high-voltage section of a television receiver, avoid making solder connections with sharp points. Every solder connection in the high-voltage circuitry should be smooth and rounded. Sharp points, frayed leads, and sharp bends contribute an invitation for insulation damaging corona. Any part or wire that is found to be the cause of corona should be repaired, replaced, or redressed as required to eliminate the condition.

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