TV Trouble Shooting Manual

VOLUME 1
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Preface

Throughout the manual, circuit diagrams and their associated wave-forms, voltage and resistances are given for reference, and to complement the discussions about trouble-shooting fundamentals, procedures and techniques.

Trouble-shooting procedures and circuit diagrams used in this manual are based mainly on the NTSC color television transmission system. Troubles—things that can go wrong with the set—are classified into 45 typical symptoms.

Although there are distinct differences in the color decoder circuits in the NTSC, PAL and SECAM TV transmission systems, most of the symptoms discussed in this manual are common among them. The flow chart, logic and trouble-shooting procedures themselves are general; so is the processing of color TV signal. The manuals are written such that technicians working on the PAL-SECAM system can easily adopt the repair procedure.

When actually trouble-shooting, the technician should always refer to the schematic diagram of the defective receiver. Trouble-shooting without it will be difficult.

This manual is also recommended as training material for TV-repair technicians. The most efficient trouble-shooting procedures can be discussed while going over the classified trouble symptoms.

SOME TIPS

1 A good repair-man conducts a prompt diagnosis of the trouble symptoms and repairs the defective set in the shortest possible time. Do not trouble-shoot a circuit unless you have determined what stage in it is defective. When trouble-shooting a particular stage, bear in mind its function. This will help you diagnose its operation—and find the defective stage and the defective component.

2 Wear cotton gloves while trouble-shooting, to avoid electrical shock. Also note that, especially in tropical countries, sweat on the hands may later on cause corrosion.

3 Never remove a component from the circuit unless you have confirmed it to be defective. In some cases, when you suspect a component to be defective, you may find it necessary to disconnect one of its terminals, or the component itself, from the circuit for testing. Before doing this, first measure voltage or observe wave-forms. If a reading is wrong, analyze the circuit and check which component may be causing the trouble and should be tested.

4 Discharge large capacitors and the stored charge in the cathode-ray tube (CRT) to avoid dangerous shocks—especially when trouble-shooting the CRT circuits or the horizontal output circuit. The aquadag (a conductive coating) layer inside the CRT, which connects the anode to the anode button, and the aquadag layer outside the CRT, which is connected to ground, are separated by the glass wall

16 Weak contrast
This symptom can be divided into two cases. One is accompanied with too much noise or snow, the other is not (simply weak in contrast).

**Cause:** Weak contrast and snowy picture are caused by a trouble in the antenna or in the RF amplifier circuit.

Plain weak contrast is caused by a trouble between the mixer and the video amplifier circuit inclusive.

**TROUBLE-SHOOTING PROCEDURE**

Check whether the TV set has a weak contrast reception in all channels. If you observe weak contrast in only one station, check the faulty contact in the tuner.

If there is weak contrast in all channels, adjust the AGC control (both RF and AGC) first. If the symptom cannot be eliminated, check if the symptom is accompanied with snow or not.

If the picture is snowy, check for an open circuit in the antenna feeder cable or in the RF amplifier circuit.

If the picture is not snowy, observe the output signal of the video detector with an oscilloscope, as shown in Fig. 16-1. Normally, a signal of around 1.5 V p-p to 2 V p-p can be observed. If the strength of the signal is very low, check the mixer, VIF, video detector and the AGC circuits. If the output voltage of the video detector is normal, check the video amplifier circuit. Refer to the flow chart shown in Fig. 16-2.

1. **Trouble-shooting the antenna circuit**

An open or broken feeder cable connecting the external antenna and the receiver will result in weak contrast and noisy picture. The condition of the feeder cable can be easily detected by visual inspection or by a continuity test.

In coastal areas, granules of salt adhering to the feeder cable will decrease the strength of the signal transmitted to the receiver. If this is suspected to be causing the symptom, replace the feeder cable at least once a year or replace it with coaxial cable.

2. **Identifying a loose contact in the tuner**

Tune the receiver to a station with weak contrast, then tap or slightly move ("jiggle") the tuner knob. If the contrast varies while doing so, then a loose contact in the tuner is confirmed.

In case the extent of the damage in the contacts of the tuner is minimal, a contact cleaner oil can be used to revive the contact points. Do not apply too much contact cleaner oil, as it may gather dust and worsen the condition later. It may also be hazardous to the tuner circuit. After applying the contact cleaner, wipe off the excessive oil. If the contacts are badly damaged and cannot be remedied by a contact cleaner, the only alternative is to replace the tuner.

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21 **No color**
This symptom is characterized by a monochrome picture even during color reception. There are three cases of this symptom. 1) color loss in all channels, 2) color loss in a particular channel and 3) intermittent color loss.

**Cause**

1. **No color in all channels.** A trouble in any of the following circuits may cause the symptom: bandpass amplifier, ACC, color killer, 3.58 MHz oscillator, 3.58 MHz output, burst gate and burst amplifier circuits.

2. **No color in some or in a particular channel.** This symptom is caused by a misadjustment in the fine-tuning circuit (shift in the local oscillator frequency) or a loose contact in the channel selector switch.

3. **Intermittent color loss.** This is caused by a loose contact in the channel selector, mismatch between the antenna and the receiver or an intermittent operation of the 3.58 MHz oscillator.

**TROUBLE-SHOOTING PROCEDURE**

**a. Solid-state circuits**

The trouble-shooting procedure for color loss in all channels will be discussed. Nevertheless, it may serve as reference for trouble-shooting the receiver for the other cases of color loss.

Note that for this symptom, the defective component may be in any of the numerous possible defective circuits. Thus, for an efficient and prompt trouble-shooting, observe the symptom carefully. The exact method of trouble-shooting a receiver for this kind of symptom varies with the type of circuit used in the chroma or color circuits. The trouble-shooting details that will be given are for circuits similar to the one given in Fig. 21-2. However, the trouble-shooting flow chart shown in Fig. 21-1 may be used as reference in trouble-shooting other types of circuits.

First, adjust the fine-tuning control with the color intensity set at maximum and the color killer set at minimum. If you cannot get the color, trouble-shoot the color circuits.

Short the collector and the emitter of the ACC transistor (Q2) in Fig. 21-2. If the color appears, the ACC circuit is defective. Otherwise, if you cannot regain the color, disconnect the short across the collector and the emitter of the ACC transistor and ground the emitter of the second bandpass transistor (Q3). After doing so, adjust the color killer control. If you cannot get the color, the trouble may be in the bandpass amplifier circuit. Otherwise, if you recover a normal color, the color killer circuit is defective. But if the brighter parts of the picture have a weak tint of blush green, the 3.58 MHz oscillator or the 3.58 MHz output circuit may be defective.

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**25 Weak color**
This symptom is also usually referred to as *faded or insufficient color*. It is characterized by a weak maximum color reproduction. This symptom can be divided into two cases: 1) weak color in all channels and 2) weak color in some stations.

*Cause:* Weak color in all channels is caused by a breakdown in the ACC circuit or by a bandpass amplifier with a decreased gain. Weak color in some stations is caused by a poorly tuned fine-tuning circuit, a mismatch between the antenna and the feeder cable, a defective antenna, a defective feeder cable or an aging tuner.

**TROUBLE-SHOOTING PROCEDURE**
Set the color control at maximum and then adjust the fine-tuning circuit with the fine-tuning knob to get maximum color for every station. If only some stations have weak color, check the condition and the matching of the antenna and the feeder cable. A mismatch between the antenna and the feeder cable affects the receiver’s reception and good color reproduction cannot be expected. Otherwise, if all channels have weak color and the color strength is not uniform, trouble-shoot the ACC and the bandpass amplifier.

A simple method of detecting a mismatch is to wrap the antenna cable just before the antenna terminals of the receiver with an aluminum foil about 10 cm long. Move the foil slowly away from the antenna terminals and observe its effect on the color on the screen. If the color intensity changes as the foil is moved, then a mismatch between the cable and the antenna is confirmed. This mismatch causes weak color reproduction.

*Trouble-shooting the ACC and the bandpass amplifier circuit.*
For chroma circuits similar to Fig. 25-1, a breakdown in the ACC (Automatic Color Control) circuit will reduce the gain of the first bandpass amplifier circuit. This will result in a decrease in the overall gain of the bandpass amplifier block. Open resistors (R1, R2 or R3) and shorted base-emitter or emitter-collector junctions of Q1 are likely troubles. Refer to symptom [21] (No color) for a more extensive procedure in trouble-shooting the bandpass amplifier circuit.

*Reference*
The ACC circuit keeps the strength of the chroma signals of different stations at a constant level for the color circuits of the receiver. The ACC circuit in Fig. 25-1 consists of two transistor (Q2 and Q4) stages. The color killer detector output signal is amplified by the ACC amplifier transistor (Q4) and then coupled to the base of the ACC amplifier transistor (Q2).

The internal resistance of Q2 is controlled by the output signal of Q4, and

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