

## **AUDIO FILTER & LIMITER ISSUES:**

### **Central Electronics 100/200V**

#### 1.0 Introduction

The Central Electronics 100 and 200V exciters were the first to be equipped with an effective audio speech processing system. The system consisted of a plug-in audio limiter module and a plug-in electronic bandpass filter. The limiter included an amplifier stage, a full-wave clipper and a feedback/indicator stage. The clipper limited the peak-to-peak audio to 2.8volts. Feedback is used to lower the distortion products as a result of the clipping process (tests using an op-amp equivalent of this circuit indicates at least a 12db reduction in distortion products is obtainable via feedback).

The audio filter is an active bandpass filter whose response is 200 to 3500Hz. The filter contains two bridged T networks, which form a lowpass/high pass filter. Six additional full T networks are used as two peaking circuits (200 and 4000Hz) and four rejection circuits (60, 90, 5200 and 7000Hz). The combination of eight networks results in a steep-sided bandpass filter without the delay distortion and signal attenuation associated with passive filters.

The audio filter serves three purposes. The first is to bandlimit the audio response and restrict the transmitted bandwidth to less than 4KHz. Secondly, the filter helps preserve the sideband suppression specifications by attenuating speech products beyond the effective range of the PS-2 audio phaseshift network. Finally, the filter reduces the high-order audio distortion products resultant from speech limiter operation.

#### 2.0 Service Issues

The audio filter module has a history of trouble free operation. If a failure was to occur it generally fails into two categories: low gain or oscillation. Low gain is normally associated with a defective tube. Note that the 200V's used an improved, lower noise 6BL8 in lieu of the 6U8 found in 100V audio filters. Early units can use the 6BL8 as a direct replacement for the 6U8.

It has been found that the 0.01mfd disc capacitors used in filter sections T2, T4 and T6 tend to shift in value and change the filter's bandpass characteristic. It is recommended that these be replaced, using mylar or similar components, as part of the normal restoration of these modules.

Oscillation is normally a result of an unwanted high impedance path on the non-component side of the filter circuit board. The 100/200V's used a dip bath process to solder the filter and limiter printed circuit boards. Over time, the flux residue left on these boards is likely to become contaminated and, in so doing, form high leakage unwanted signal paths between traces. Should oscillation occur, clean off all PC board rosin residue using a cleaner designed for the purpose. A rag soaked in alcohol or lacquer thinner will often achieve the desired result. Heavy rosin accumulations should first be dislodged using a small pick prior to applying the flux remover. Thoroughly dry the board prior to reassembly within its module housing.

The audio limiter originally used mercury cells to bias the clipper diodes. These had a tendency to leak, contaminate the limiter pc board and cause a reduction in gain or loss of clipper operation. An early modification was to install an external battery power supply via a small, dual AA battery holder located on the limiter module housing.

It is now recommended that the diode-battery combination be removed entirely and replaced by a pair of end-to-end connected 1N5227 zener diodes.

If the limiter fails to function, verify that the 28681 feedback transformer is functional by resistance testing the primary/secondary windings. If an open is found, it is likely that acid from the mercury cells has migrated up one or more transformer leads and has corroded open the small gauge wire used in the transformer, itself. Replacement transformers are available now, for \$15 plus postage.

If the transmitter exhibits a fall off in audio gain during highly humid conditions, suspect acid migration from the old mercury cells into the pc board material. When the acid combines with moisture, significant leakage to ground occurs with a resultant falloff in audio gain. The only known cure for this failure is replacement of the pc board as all previous attempts to remove the acid have resulted in wasted time.