KENWOOD

Technical Information Exchange

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Kenwood Hybrid Low or No RF Drive How to Troubleshoot

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Test equipment required: (either item 1, 2 or 3)

1. RF probe and VTVM (DMM if no VTVM). Will need two standard RF probes. One with single diode and one with 3 diodes. Do not use single diode probe to try to measure plate of Driver tube or control grids of Finals.
2. RF Millivolt meter with 40dB or 100:1 capacitive voltage divider probe
3. O-scope (100mhz bandwidth minimum is best for most accurate rf levels)
4. VTVM or DMM for dc voltages.

Low or no RF drive.

1. On a good rig (100 watts out) run TX Level Diagram and record as base line data for your rig. Run on all bands with emphasis on 14.200 mhz.

2. RF drive levels listed for TS-830 Driver tube plate and finals control grids is optimistic in my experience. 77.5 volts at Driver tube plate will be closer to 65 volts and 53.5 volts at 6146 control grids will be closer to 48 volts.

3. Run TX Level Diagrams with SG off in CW mode and make sure you set CAR Level Pot on each band to obtain full scale ALC deflection (FSD) on the meter and not full scale ALC box. If cannot get FSD then just peak for maximum ALC indication. This ensures correct TIF level is applied to TX Mixer.

4. If TIF level is low/missing then focus troubleshooting efforts on the IF board. Too many possible items to list all here. That will take a separate white paper. Ask on Yahoo forum or contact me off list if you find low TIF level. Low TIF level is possible, but not very common. Can be due to bad Balanced Modulator diodes, low or missing CV voltage, low Carrier oscillator level, bad IF crystal filter or filter switching diodes, but again low or missing TIF signal is not common reason for low or no RF drive.

TX MIXER OUTPUT (on RF board) LOW OR MISSING RF DRIVE LEVEL

A. Check RF input (TIF) Note: Need O-scope to measure and will not be clean sine wave due to VCO or HET oscillator leak back.
B. Check LO input (HET or VCO need approx 1.0 rf volts)
C. Check dual gate mosfets DC operating voltages (Drain, Source, and Gate tx bias levels)
D. Note: Dual gate mosfets seldom fail. They dont get weak. Either good or bad. Bad = shorted or open. If you read close to Drain voltage on Source lead or device metal can then the mosfet is bad.
E. Missing band specific Mixer tuned circuit.
   a) Bad bandswitch contact or high resistance contact (most common). Try tapping on the bandswitch knob or gently rocking the knob back and forth either side of the detent. Note: Do not rock band switch with SG switch on and rig keyed. Only do this test with SG switch off and rig keyed and watch for momentary ALC indication.
   b) Bad mixer tank coil. Open winding, shorted winding, bad solder connection (not common)

c) Bad mixer tank capacitor. Open, leaky, shorted, shifted value or bad solder connection (not common). Remember these caps are Type "N" Negative Temp Coefficient caps dont replace with Type 2 caps.

DRIVER TUBE PLATE LOW OR MISSING RF DRIVE LEVEL

A. Bad inter-stage coupling cap from TX mixer (not common)
B. Bad/weak Driver tube (common)
C. Low or missing Driver tube dc voltages (plate, screen grid, cathode, grid tx bias) Best to use Pomona test socket to measure. Absent test socket can measure with tube out of the socket.
D. Bad solder joints at Driver tube socket. May be able to detect by pressing and pulling on the tube and shield. Caution: Tube shield will be hot.
E. Missing band specific Driver tuned circuits
See E under TX Mixer above for all same things and just substitute Driver tank components.
F. Bad solder connections at VC-2 and VC-3 air variable caps. Can usually detect these by tapping or pressing on the air variable cap frames and the ALC indication will come and go.

6146 FINALS CONTROL GRIDS LOW OR MISSING RF DRIVE LEVEL

A. Bad inter-stage coupling capacitor. One or two caps in series depending on hybrid model (not common)
B. Bad DRV lead wire solder connections (not common)
C. Bad solder connections at control grid of 6146 finals tube socket pins.
D. Shorted control grid (not common)

Some things to remember:

1. If you do not have an RF Millivolt meter or O-scope and want to use a standard RF probe/VTVM make sure you use a 3 diode probe to measure Driver tube plate rf level. Single germanium diode probe will be damaged due to exceeding signal diode PIV rating. If you homebrew a 3 diode probe make sure to include a dc blocking capacitor (.01 or .047 cap value not critical).

2. Cant use single diode rf probe to measure TIF. Signal level is too low to get measurable reading. Need O-Scope or RF millivolt meter to measure TIF signal at output of IF board or input to the RF board.

3. Measuring fixed padder caps in final cage and/or cleaning S22 bandswitch have nothing to do with low or no RF drive. Advice to check these is misguided. Nothing in the PA cage has anything to do with RF drive. You can cut the plate blocking cap out and throw away and you will have RF drive at control grids of finals. Now weak or no RF output can be due to bad RF Plate choke. Look to see if the large plate choke windings are discolored brown or black. Also if the RF drive is weak or missing on just 15 and/or 17 meters it may be due to bad L36 Driver Tube plate choke. This is a small green cylinder shaped choke. The top half of it may be darkened if bad.

4. To get good ALC indication with the SG switch off you need two things.
   A. Normal operating DC bias voltage on the 6146 control grids (approx -55vdc to -60vdc). You measure this with rig in Send.
   B. Approx 46 to 49 rf volts. 49 x 1.414 = 69 peak rf volts. At this level will see maximum ALC deflection. If you have -55vdc bias and 39rf volts then there will be no ALC indication as 39 x 1.414 = 55 peak rf volts. Control grid will not swing positive with only 39 rf volts of drive. The control grids must be positive with respect to the cathode for current to flow. RF drive must overcome the operating bias for grid current to flow. No grid current = no ALC indication.

5. Absent these two conditions you can have RF output, but no ALC indication. ALC is produced whenever the RF drive level is sufficient to exceed the dc bias offset and cause the control grids to become positive with respect to the cathode and cause positive grid current to flow. That level will be a maximum of approx 45ua of grid current and cause ALC indication on the meter.

Unfortunately in my experience most of the low RF drive levels encountered at TX Mixer output or Driver tube plate especially if on just one or two bands is almost always due to bad bandswitch contacts not switching in the required parallel resonant tank circuit or introducing high resistance which detunes the resonant circuit. OK to attempt to clean the contacts, but if no improvement then need to troubleshoot and testing/measuring the Mixer and Driver tank coils and caps is not easy.

It is really difficult to apply contact cleaner to the close spaced vertically oriented band switch boards and gain any effective cleaning action on these contacts. You also risk damaging the contact fingers. Even if successful it is often a short lived fix.

See Dick Housdens procedure for bandswitch removal and cleaning and solder repair listed on the WB4HFN website under the Kenwood User tab. You have a choice of rivet to contact soldering or installation of short jumper wires from the contacts to the pc traces. You can also use the silver conductive ink pen method, but in my opinion the solder method is better.

73s
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