Cheap 'N Dirty Signal Tracing in the K2

by: Tom Hammond NØSS rev.2 04/08/2002

I posted something about this signal tracing method on the Elecraft Reflector (probably July 2000), and I have suggested its use to many builders since that time, but it appears now might be a good time to not only reinforce it, but to give some additional 'operational' points of interest… especially since I've seen at least one reference to it's having been suggested by Elecraft Tech Support as well.

About a year and a half ago, someone on the reflector reported that he'd reached the point in the assembly of the RF board for his K2 where he was supposed to be hearing signals of 40 meters, but he heard very little. He knew the band was open because he heard signals on his 'big rig', but few sounds managed to make it thru his K2.

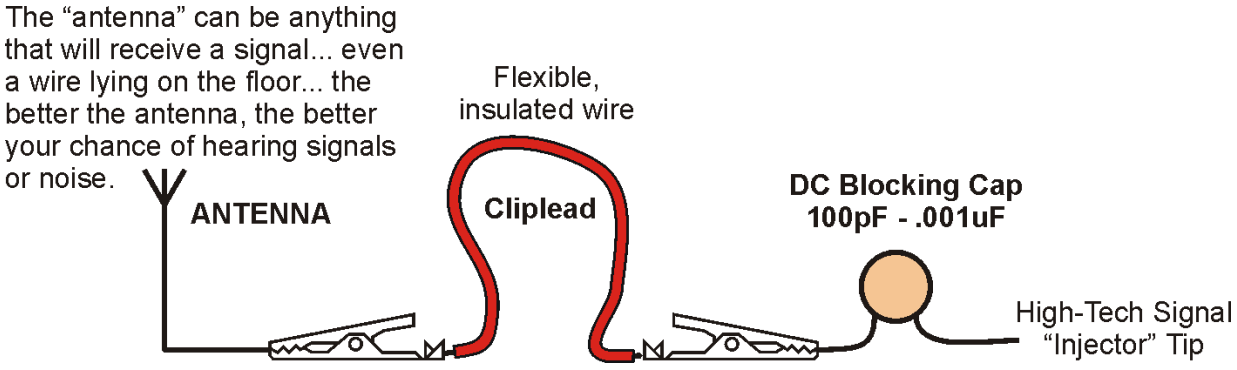
My first suggestion to him was to beg, borrow, or steal a signal generator from another 'local' and to start doing some signal tracing, using the signal generator to inject a signal at appropriate points along the receive signal path on the K2, to see where the signal disappeared.

It turned out that this fellow lived in a small town and was (at least to his knowledge) the only ham in the area. Therefore, no availability of a signal generator. Something else had to be found as this builder had virtually no test equipment, other than a digital voltmeter.

The K2 was specifically designed to be a single-conversion receiver. This means that the incoming signal is mixed only once in order to convert it to a common IF (intermediate frequency). The signal path from the antenna up to the one and only IF mixer can be readily signal-traced if you can provide a signal somewhere within the band in question. If you first inject a signal AT the input to the IF mixer (see test point #1 on the included K2 RF PC board layout), AND you can HEAR that signal at the output of the K2 (speaker or phones), you have a pretty good indication that all the oscillators, mixers, and audio stages are functioning properly. This probably won't save the day, BUT it will at least give you an idea of where to begin to continue your testing efforts.

However, we still needed to obtain an in-band signal source… and it had been in front of us all the time… it's an ANTENNA, a cliplead, and a small value capacitor!

Here's a pictorial of the Cheap 'N Dirty Signal Injector:



Granted, there's almost nothing to it... and that's the idea… virtually ANY builder can make one of these devices to assist in signal tracing efforts of a 'deaf' K2.

If you have success at injecting a signal at test point #1, move on to point #2, and so on, until you have located the point in the circuit where the signal either disappears or drops significantly in level. This tells you that the problem lies somewhere between the last SUCCESSFUL test point and the test point at which you failed to hear the injected signal.

Here's a list of the various starting "test points", along with a brief description of where they are in the circuit itself. I have also annotated them on the parts layout diagram at the end of this document.

NOTE: The following steps assume you are testing the 40M band. If testing another band, for steps thru 5 & 6 and steps 11 thru 13, use your schematic and locate an identical test point in the band-specific element (BPF or LPF) through which you are tracing.

Test Point	Description
1	RF Board (2 of 4), C143, input to the TUF-1 Receive Mixer.
2	RF Board (2 of 4), C141, input to the Preamp. Test with the preamp ON and OFF. Signal levels should drop somewhat (but not disappear) when the Preamp is OFF.
3	RF Board (2 of 4), C53, input to the Attenuator. Test with Atten. ON and OFF. Signal levels should drop somewhat (but not disappear) when the Attenuator is ON.
4	RF Board (2 of 4), D6, output of the BPF (Band-Pass Filter).
5	RF Board (3 of 4), junction of C4 & C5, wiper of K1a (output 40M BPF).
6	RF Board (3 of 4), junction of C7 & C8, wiper of K1b (input 40M BPF).
7	RF Board (3 of 4), Jumper W6, input to BPF.
8	RF Board (3 of 4), junction of D2 & D3, part of the T-R switch
9	RF Board (3 of 4), junction of D3 & D4, part of the T-R switch
10	RF Board (3 of 4), Jumper W1, output of LPF (Low-Pass Filter)
11	RF Board (3 of 4), C225, wiper of K12a, output of 40M LPF
12	RF Board (3 of 4), C226 middle of 40M LPF
13	RF Board (3 of 4), C227, wiper of K12b, input of 40M LPF

A few hints:

BE CAREFUL to not short a PC board pad to ground (or to an adjacent pad). Some pads may have DC voltage on them!!

DO NOT omit the DC blocking capacitor in the signal injector. Your antenna may be at DC ground, and some of the PC board pads may have DC on them.

Be sure that you are testing on an 'open' band, where signals really are present. Real live signals are best, but a noisy band can be of some use as well. If you can't find an open (or noisy) band, and if you have a broadband noise source, it can often be substituted as a signal source.

If you find a test point which fails, test it several times, the point you are touching may have a thin covering of rosin (or lead oxidation), left over from soldering, and you may have to break through that (insulative) covering in order to achieve a good connection.

FOLLOW your testing on the schematic, so you will have a better 'feel' for exactly where you are during your efforts. If you find a point of failure, use the schematic (and the pictorial) to help identify other possibly points for signal injection as you work deeper into a section of the radio.

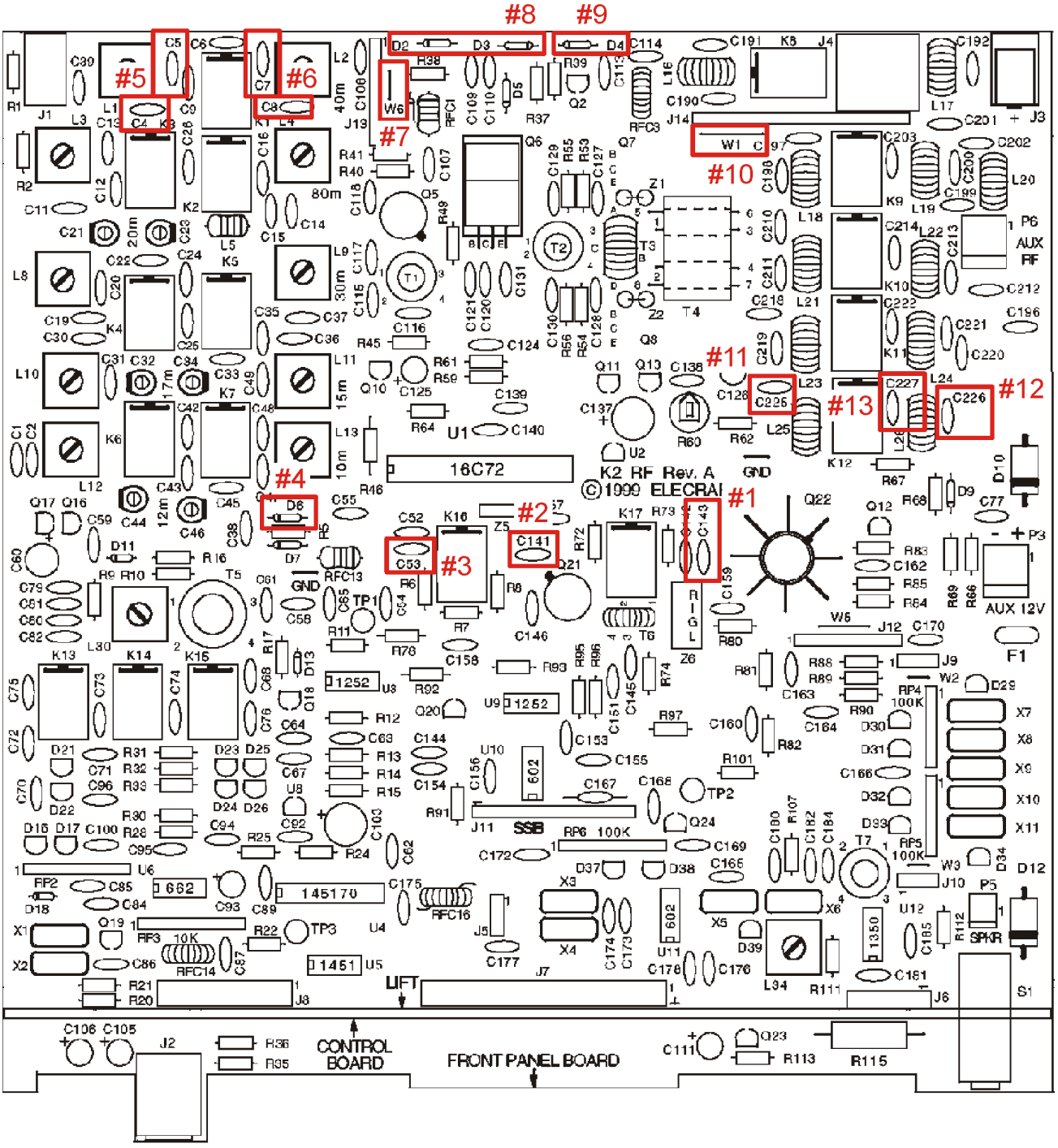
When checking capacitors which are ***in series*** with the signal path, be sure to check on BOTH sides of the capacitor, if the signal fails on one side, but not the other, the capacitor may be open.

When testing at test points 4, 8 and 9 (diode switches), if your tracing fails here, it may not be due to a bad diode, but the lack of switching voltage (8R) used to turn these diodes on. Check for the presence of . 7-8VDC on the ANODES (non-bar end) of these diodes before you assume they're bad.

NOTE - If you have the Noise Blanker (KNB2) installed and need to access C143 (test point #1), remove the NB and install a wire jumper between pins 1 & 6 of J12.

Cheap ‘N Dirty K2 RF Signal Tracing

K2 RF Board



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