K2 - IMPROVED HANDLING OF EXTREMELY STRONG (AND NEARBY) SIGNALS

by: Wayne Burdick, N6KR 14 January, 2003

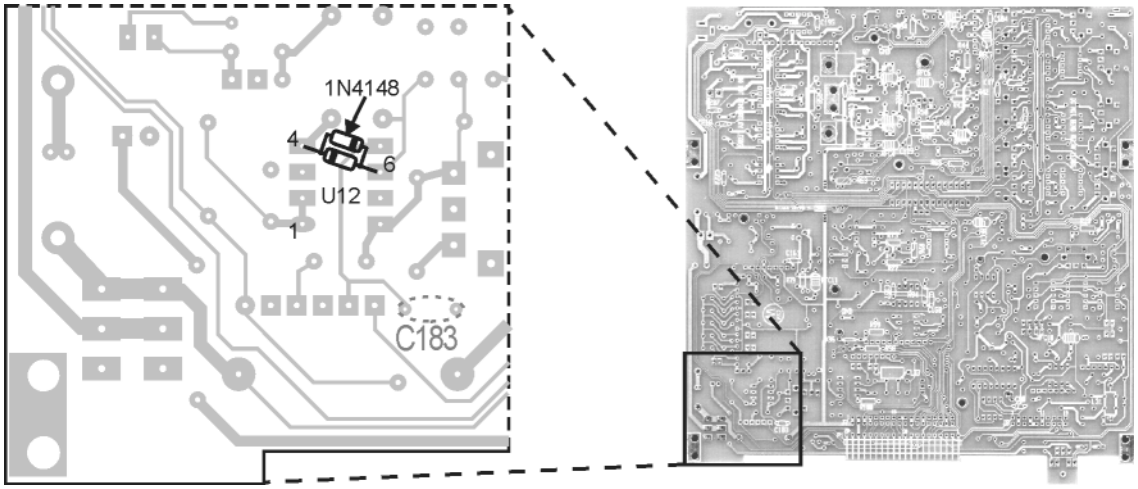
A few HF Pack operators have reported K2 received audio distortion when in the presence of nearby transmitters operating on the same exact frequency as the K2, such as when two HF Pack operators are standing next to each other and talking to another station elsewhere. There is a very simple change that dramatically increases the K2's on-frequency extreme signal-handling capability. The mod requires only two 1N4148 or 1N914 diodes.

Modification Details (Refer to the illustrations of the K2 RF board, below)

This applies to all K2s regardless of serial number.

1. On the bottom side of the K2 RF board, using short leads, solder a 1N4148 or 1N914 diode (or equivalent) between pins 4 and 6 of the I.F. amp (U12, MC1350). The cathode (banded end) should go to pin 4.

2. Solder a second diode of the same type between the same two pins, but with the banded end toward pin 6.



Results:

With the diodes in place, we've been able to transmit at 100 watts into an antenna just a few feet from the K2's own antenna with no apparent K2 receiver degradation. In these tests the receiving antenna was non resonant. But at the lower power levels used for HF pack operation, there should be no problem even with resonant antennas operating in each other's near field. Fast and slow AGC still work normally.

Technical Details:

The MC1350 used in the K2 for receive automatic gain control (AGC) can handle up to about 2.5-3.0 V peak-to-peak at its input, pin 4. Beyond this, the AGC becomes ineffective, and the product detector can be overdriven. Normal on-air, on-frequency signals are generally under 200 mV at pin 4 of the I.F. amp, even at "S9 + 40 dB" as indicated on the K2's S-meter. But when you inject an extremely large signal from a nearby transmitter on the same frequency, the signal can go as high as 7 Vpp unless it is hard-limited.

The two diodes limit the signal to 1.4 V peak-to-peak. Even when the diodes are conducting, i.e. when the signal is so strong that it looks like a square wave at pin 4, there is no audible signal distortion. This is because the MC1350 is followed by a second crystal filter which removes any harmonic distortion products (i.e. multiples of 4.915 MHz). The diodes appear to have no other side-effects.

The modification provides a large increase in on-frequency dynamic range by acting as a clean limiter. Most commercial rigs use multiple I.F. amp stages to achieve this, but this adds a lot of complexity, significant IF noise and increases current drain, which is not compatible with the K2's intended use as a battery-powered field radio. It is also unnecessary; the K2's gain distribution is such that the diode limiter will never interfere with received signal quality.