

# A Compact Fixed Frequency Receiver for 144.270 MHz Envelope Modulated Signals

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The receiver board and audio amplifier board fit in a Hammond 1590B diecast box, with internal LiPo batteries. This rev3 version has enough AGC range that the top controls are only volume, on-off, and the PTT button.

There is room inside the box for the compact low power envelope modulated transmitter described in the companion article.



Fig 1 144 MHz receiver

The same circuit board may be used for 144 MHz and 50 MHz receivers by changing the crystal and the inductor and capacitor values on the front-end board.

Sensitivity is 0.1uV for recoverable A2 tones. 0.3uV for clear AM voice. IF bandwidth is 8 kHz. Image rejection is >40dB, using the I Q mixer and 455 kHz IF. Supply is 68mA 9v including audio output amplifier. LO leakage at the RF input port is -61 dBm.

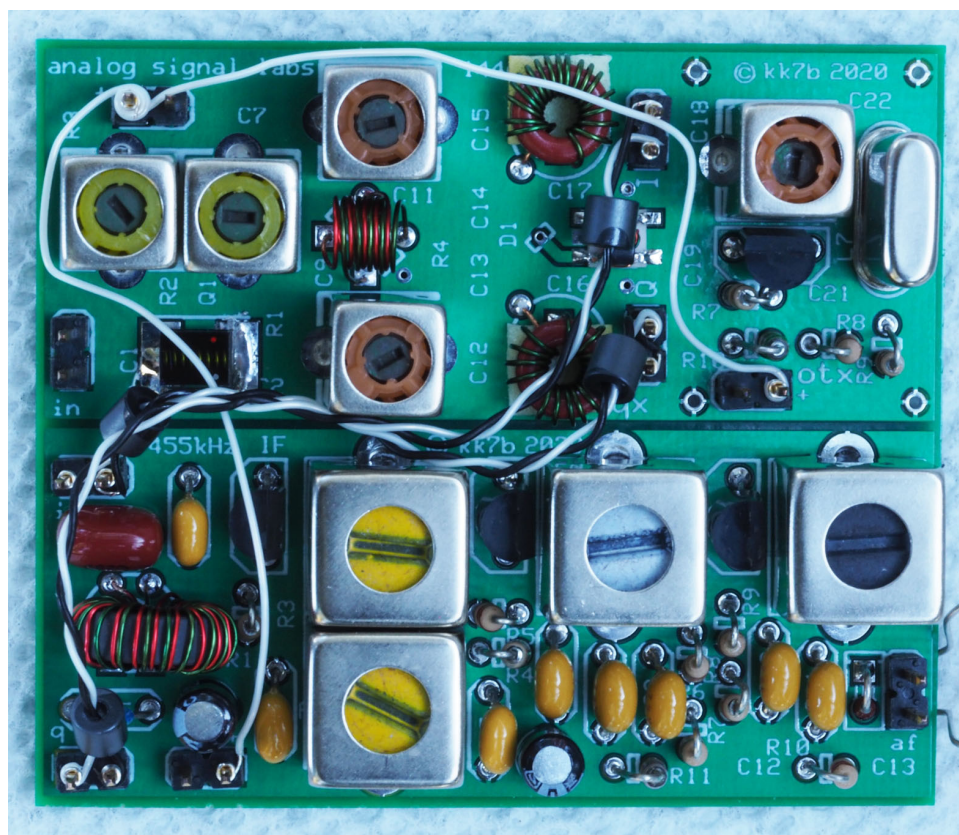


Fig 2 144 MHz AM Receiver rev 3 circuit board

## Detail back side of circuit board photograph

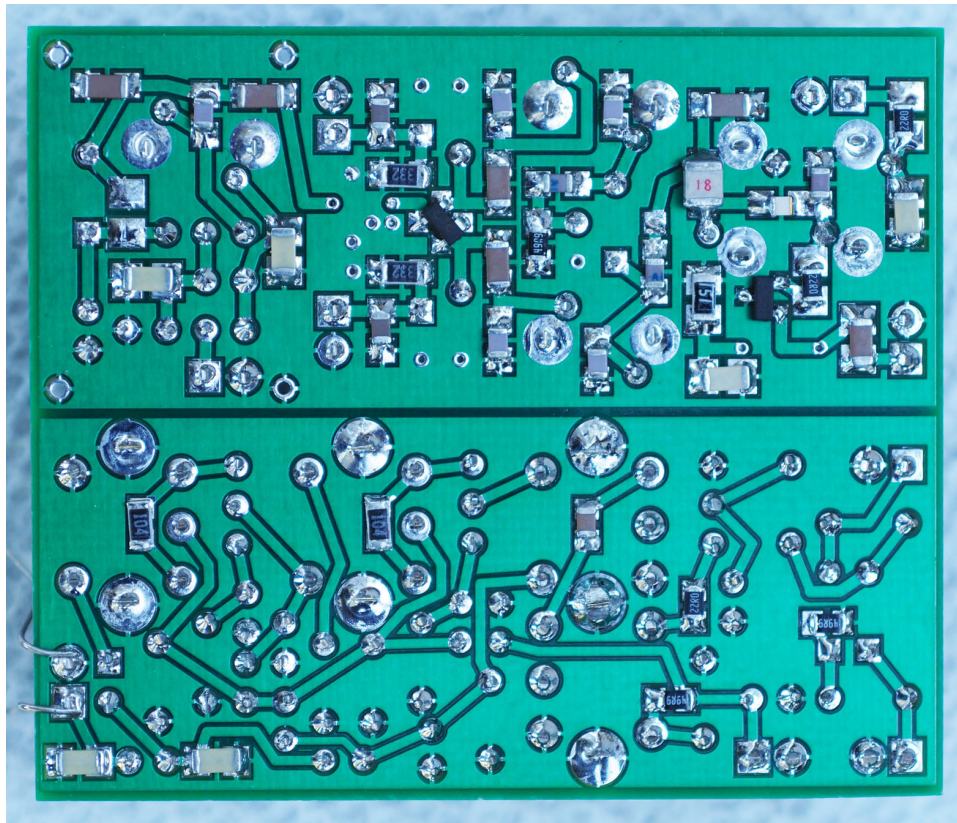


Fig 4 Back side of the circuit board showing many surface mount components in the RF front-end, and a few in the 455 kHz IF strip. Note the cut line between the upper RF and lower IF sections. These are totally independent.

Except for the through-hole components in the 7th Overtone oscillator circuit, the Coilcraft midi-spring and slug-tuned inductors, the bifilar coil for the 144 MHz quadrature hybrid, the 1:1:1 transformer hidden under the ferrite bead, and the two T25-2 toroids, most of the components in the RF front-end of the receiver are surface mount. The surface mount components were chosen from parts on hand. The mix of 1208, 0804, and 0603 sized surface mount components is not intentional, and serves no purpose other than to quickly build a prototype circuit without waiting for a component order.

I and Q interconnects between the RF and IF circuit boards are twisted pair, with 43 mix ferrite bead common mode chokes to isolate the VHF RF and LO from the 455 kHz IF board. Connection of the dc power supply line and ground are as shown, and the white wire +dc connection in the photo works well on the bench.



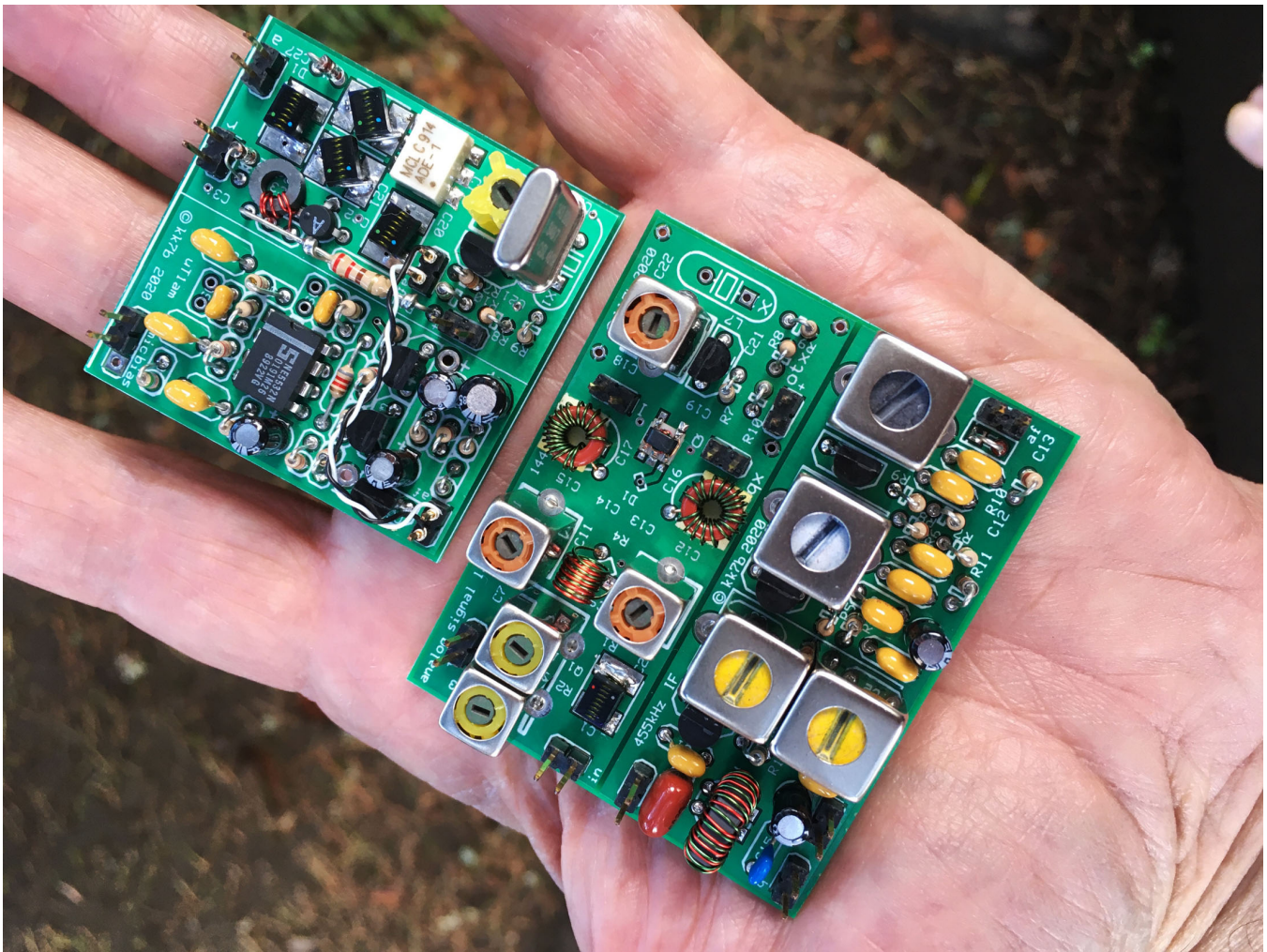


Fig 6 For a sense of scale, here is the rev3 receiver board next to the new VHF 0dBm AM transmitter. The transmitter board has an electret microphone input in the lower left corner and an antenna connection and receive antenna connection on the upper left corner. The 7th overtone crystal hasn't yet been installed on the receiver board in this photo.

This pair, 0dBm carrier and +6dBm PEP output at 100% modulation, and receiver sensitivity of 0.3uV and 8 kHz bandwidth, is useful for medium range line-of-sight paths and has successfully communicated over a mile with a few obstructions. The 0dBm output power is ideal to drive a Mitsubishi Linear Amplifier Module such as the RA07M1317MSA or newer versions, to a carrier output power of 2w and nearly 8w PEP at 100% modulation.

The AGC range and audio fidelity of the detector are appropriate for a larger case and much bigger speaker. This receiver sounds very good to critical ears with high fidelity headphones, and the companion uT1am transmitter is even better.