Visual CW Tuning Indicator

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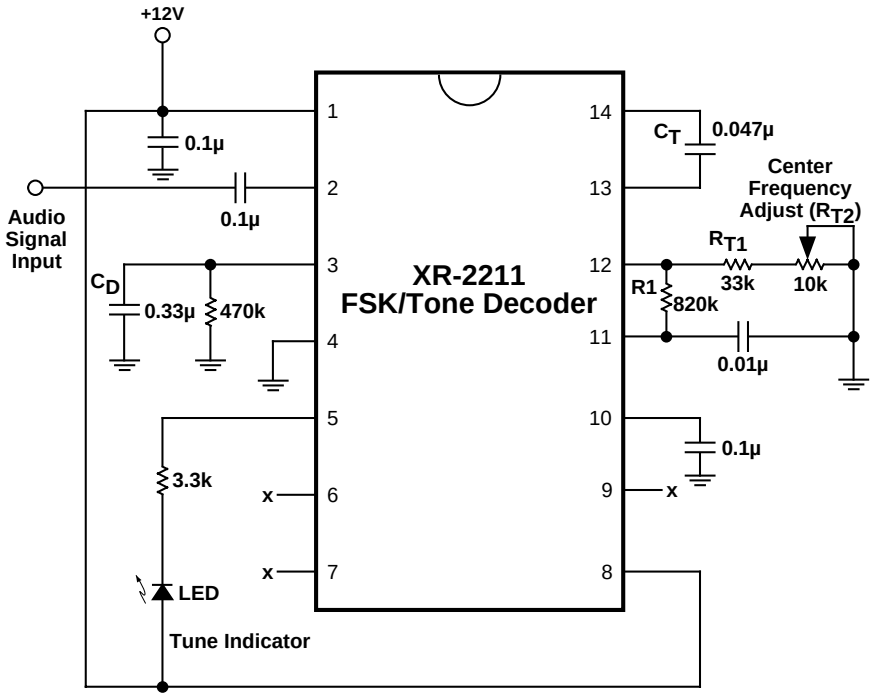
One of the FT-1000MP “bells-and-whistles” that I really like is the CW Center Tuning indicator. This feature allows you to quickly zero-beat a received signal, even if you have poor tone perception (“tone deaf”). This feature is readily adapted to any rig by adding a tone decoder, which is a simple, low cost, single-IC function.



The “Visible CW Tuning Indicator” flashes an LED when the signal is properly tuned.

Circuit Description

The circuit presented uses a XR-2211 FSK decoder, the same device used as the demodulator in most first-generation packet TNCs. It connects to the audio output of your transceiver; the line-out or phone-patch output of some rigs is ideal. The XR-2211 is a phase-locked loop IC using a resistor and capacitor for frequency adjustment, and other resistors/capacitors for independently setting the detection bandwidth. It is available at the local electronic “junk” stores and is manufactured by Exar, Raytheon, and JRC/NJM. Digi-Key lists them for $1.59 in single piece quantities.

This tuning indicator requires a clean +12V supply for operation. With the component values shown, the tone decoder center frequency will range from below 500Hz to above 600Hz; component tolerances have been considered. The capture bandwidth of the tone decoder is about ±25Hz.

If you prefer a lower center frequency, increase R_T and/or C_T. Detection bandwidth is inversely proportional to R1. Tone detect lock time is proportional to C_D. For best results, use a good quality, temperature stable capacitor for C_T. Mylar, polystyrene or other poly- chemistries will work much better than standard disc ceramics. Also, keep the total value of R_{T1} + R_{T2} between 10kΩ and 100kΩ.

Tuning and Operation

Connect the audio input to the speaker, line out, phone patch out, or similar connector on your receiver/transceiver. With its high input impedance, this tuning indicator does not noticeably load down even line-level audio outputs. Tune in a constant carrier or calibrator signal of the desired pitch and increase the audio gain higher than normal. Rotate R_{T2} to its fully counterclockwise position, then adjust clockwise until the LED first fully illuminates. Note this shaft position. Continue turning R_{T2} clockwise until the LED turns off. Reverse the rotation until the LED again just lights without flashing. Now center the shaft between the two "first light" positions. Reduce the audio gain to normal listening levels and verify the LED remains on.

After completing the tuning process, the LED will illuminate as you get within about 25Hz of a signal. It will flash on and off a bit with the incoming signal: do not expect to copy code this way, however. There is a trade-off between detection speed and false triggering. The component values shown are what I consider the best compromise. The detector takes a few dot lengths to light and, once lit, a few dot lengths to shut off (at 35 WPM or so).

This circuit helps me tune in stations when searching the band. I find it especially useful when (attempting) two radio contesting. This way I can find and tune in a CQer, getting fairly close to zero-beat by watching the light, while concentrating most of my attention on the run rig.

Now, I have another of the FT-1000MP features on my "old" rig at a small fraction of the price.