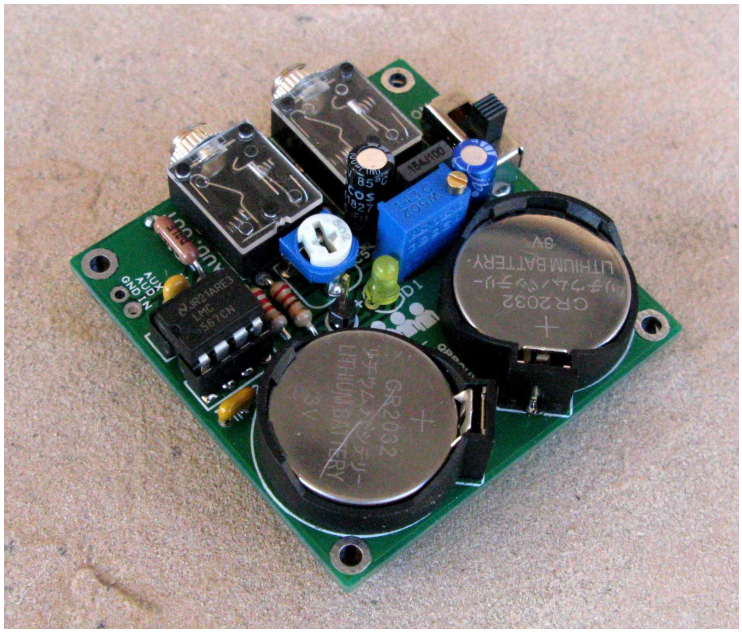
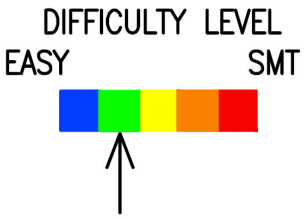
QRPGuys LA3ZA Zero Beat Indicator





First, familiarize yourself with the parts and check for all the components. If a part is missing, please contact us and we will send one. You must use ***qrpguys.parts@gmail.com*** to request a part.

Please read all the instructions before starting the assembly.

Parts List

1 – Zero Beat Indicator pcb
1 – U1, LMC567 tone decoder IC
1 – D1, diffused yellow led
1 – R1, 5K multi turn pot
1 – R2, 22K resistor, (red-red-orange-gold)
1 – R3, 220 ohm resistor, (red-red-brown-gold)
1 – R4, 2.2K resistor, (red-red-red-gold)
1 – R5, not used at this time
1 – R6, 5K trimpot
1 – C1, .15uF, metalized polyester capacitor, marked 154
1 – C2, .01uF, mono capacitor, marked 103
1 – C3, 3.3uF, electrolytic capacitor
1 – C4, .1uF, mono capacitor, marked 104
1 – C5, 100uF, electrolytic capacitor
1 – S1, SPDT slide switch
2 – J1,2, 3.5mm audio jack
2 – CR2032 battery holders
4 – 3/8” dia. rubber foot
1 – 8 pin dip socket
1 – SIP-vertical pin

CR2032 batteries not included

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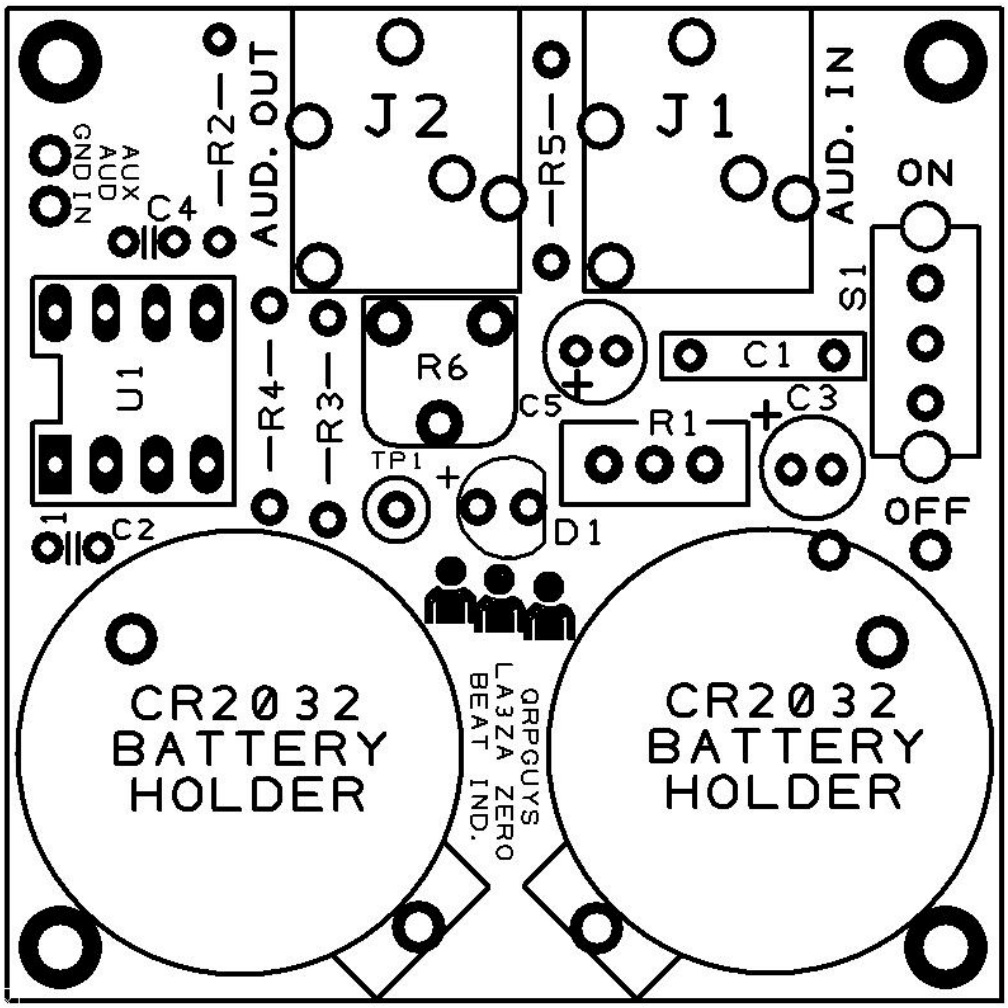
Refer to the graphic below and the PCB silk screening for the placement of the components.



We have designed the board to be used outside, on battery power, or mounted inside your transceiver running from power obtained from your transceiver. We suggest building it as an outside device, and it is easily transformed if you decide to mount it internally.

You will start with the smallest components first and progress to the larger ones.

[ ] Install R2, 22K resistor, (red-red-orange-gold)

[ ] Install R3, 220 ohm resistor, (red-red-brown-gold)

[ ] Install R4, 2.2K resistor, (red-red-red-gold)

[ ] Install C4, .1uF, mono capacitor, marked 104

[ ] Install D1, yellow led, observe polarity, the long lead is positive

[ ] Install the 8 pin dip socket for U1

[ ] Install C1, .15uF polyester film capacitor, marked 154

[ ] Install C2, .01uF, marked 103

[ ] Install C3, 3.3uF, electrolytic capacitor, observe polarity, the long lead is positive

[ ] Install C5, 100uF, electrolytic capacitor, observe polarity, the long lead is positive

[ ] Install R1, 5K, multi turn trimpot

[ ] Install R6, 5K, trimpot

[ ] Install S1, spdt switch

[ ] Install the single SIP pin, at TP1

[ ] Install J1,2, 3.5mm stereo jack

[ ] Install U1, LMC567 into the dip socket, observe the orientation of pin 1

When inserting IC's the pins are flared so that they can be retained by auto insertion tools. Gently rock them on a flat surface so the pins are parallel and they will insert into the sockets more easily.

[ ] Install the four rubber feet on the bottom corners where indicated by the silkscreen.

When you power up the device, the led will flash for about a half second.

The Zero Beat Indicator works by illuminating an led when the exact tone of your transceiver offset frequency is sensed. *The key is determining that frequency.*

Adjusting the zero beat indicator to your transceiver offset, by one of four ways:

The Zero Beat Detector must be calibrated for your particular transceiver.

Scheme 1:. If you know the sound of your audio tone when you are directly on the caller's frequency, apply that audio tone to J1, and you can adjust R1 to illuminate the led at that frequency.

Scheme 2: If you know your offset in Hz of the receiver portion of your transceiver you can adjust R1 so the led will illuminate when the receiver tone matches that offset. To do this you multiply your offset 2X and adjust the frequency measured with your counter or oscilloscope at TP1 to that frequency using R1. For example if your receiver offset is 423Hz you would adjust R1 until you read 846Hz at TP1. *This must be done without any audio input at J1 or the AUX. connections.* The more accurately you do this calibration, the more accurately you will match the frequency of the station your are trying to call.

Scheme 3: Not everyone knows the actual offset in Hz of their transceiver accurately. The following procedure will allow you to measure that offset. To do it, you will need a frequency counter and another

transmitter/transceiver or signal generator. We will call the transceiver you are wanting to know the offset, “Trans A”. The other transceiver or signal generator “Trans B”.

1. If you are using a transceiver for “Trans B” put a dummy load on it and set it for a low power level. Tune it to a frequency “Trans A” can receive and transmit on. Now key “Trans B”, measure the frequency accurately with your frequency counter, and write it down.

2. Power up, and key “Trans A” with a dummy load, and set for a low power level. Measure the output frequency with your frequency counter, tune it to the exact frequency you measured with “Trans B”.

3. Put “Trans A” in receive mode with RIT **off**, if it has it. With “Trans B” still on the dummy load, key it, and *the tone hear on your “Trans A” is the offset frequency*. Measure the frequency of that audio tone and write it down. *That is your offset frequency.*

4. With no audio fed to the audio input of the zero indicator, set the frequency measured at TP1, with your counter or oscilloscope using R1, to 2X the measured offset frequency.

Scheme 4: Once you know your offset frequency. You can set an audio signal generator to that frequency and feed it to the audio input of the Zero Beat Indicator and adjust R1 until the led illuminates on that tone.

The selection of filter component values will allow adjustment of an offset frequency range from about 345Hz to 1082Hz.

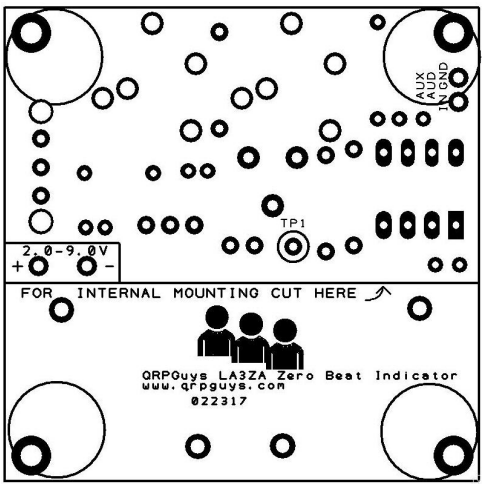
Using the Zero Beat Indicator:

Feed the audio from your transceiver to the audio input. Adjust the audio level so that the led will consistently illuminate at the desired frequency. The audio level to drive the circuit may be louder than comfortable using ear buds direct. If you are using ear buds plug them into the “Audio Output” on the board and adjust the audio using R6 to a comfortable level. The LMC567 has a bandwidth of 12% of the frequency of the set tone. For example if you are set to accept 600Hz, there is a 72Hz window that the led will flash. It is very easy to tune to the center of that window. When you see the led flashing on someone’s signal, your transmitter will be on their frequency.

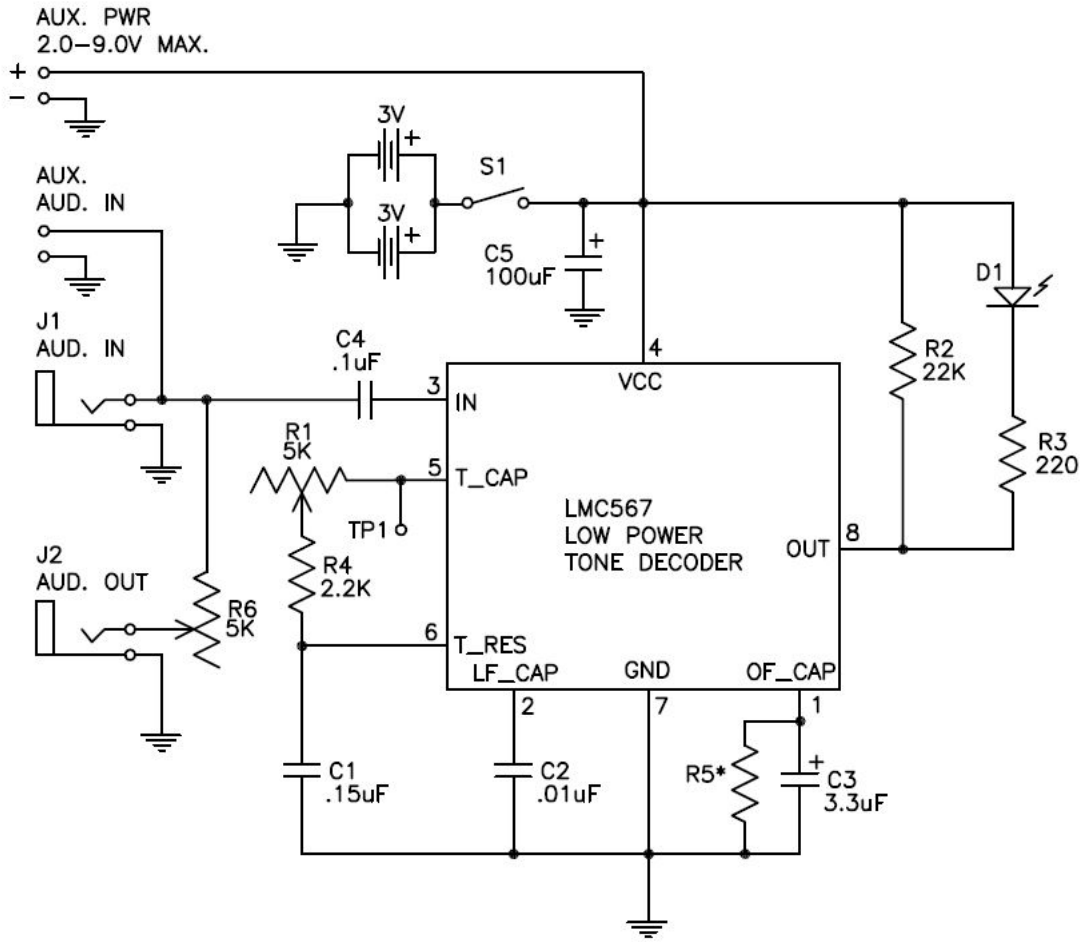
There have been many revisions of this device over the years. This particular low powered version was modified by Sverre (LA3ZA) from a design by KR5L. We contacted Sverre (LA3ZA) and he has agreed to let us carry on with his design and kit it.

Internal mounting provisions:

The board can be also configured for mounting inside your transceiver. By removing the battery holders, rubber feet, and cutting the board on the line shown in the graphic below, the overall size can be reduced to 2.0” x 1.25” and still retain two of the mounting holes The auxiliary audio and power connections are clearly marked on the backside of the pcb. If the Aux. Pwr. pads are used it bypasses the SPDT switch on the board. The led indicator would need to be relocated on your chassis to view as well. If you do not cut the board for your internal installation, remove the batteries.



Schematic:



We included a position R5 for experimenters that want to try different sensitivities. According to the LMC567 specification sheet, *"Pin 1 also provides a means for shifting the input threshold higher or lower by connecting an external resistor to supply or ground. However, reducing the threshold using this technique increases sensitivity to pin 1 carrier ripple and also results in more part to part threshold variation."* The full spec sheet can be downloaded from our Misc. Files tab.

Notes: