

Optional Modifications: Grandson of Zerobeat kit by Chuck Olson, WB9KZY, Jackson Harbor Press

- 1) The junction of R13 and R14 which set the pseudo ground level for the op-amp is not bypassed to ground. A .1 uF capacitor (or larger, value not critical) can be soldered from this junction point to ground. While it can't hurt to do this mod, I doubt it will make much difference.
- 2) An alternative to trying to cut a rectangular hole in the case for the LED & LED array is to use an enclosure with a clear or translucent plastic top. See the prototype picture on the Grandson of Zerobeat web page for an example made from an anti-static semiconductor sample box.
- 3) The 1n400x series diode on the +12V power input has saved many a 5V regulator for me. However, it does drop considerable voltage, roughly 0.7 Volt – not a problem at a nominal 12 Volts (up to 13.8 volts) but more of a problem if the kit is being used with a battery. One help is to substitute a Schottky diode such as the 1n5817, 1n5818 or 1n5819. These will save roughly ½ Volt. Another idea is to use a p-channel MOSFET as a polarity reversal protector: connect the drain to +Vin, connect the source to the Grandson of Zerobeat and connect the gate to ground (a series resistor can be used). Depending on the MOSFET used, this results in virtually no voltage drop.
- 4) The TL062 opamp is a favorite of mine, inexpensive and low-power. However there are many better opamps on the market now which are pin compatible and which may offer the builder lower noise or lower power consumption or rail-to-rail performance. Another mod which is easy due to the socketing of the op-amp but which probably won't make much difference.
- 5) One mod which I have done is to use a panel mounted pot for R10, the level set trimpot. This is handy for setting the level when conditions get either noisier or quieter than the last listening session. Either a 100k ohm linear pot can be used or if the builder wants more spread (since the setting is usually fairly close to the center of the pot range), a smaller value pot can be used with two fixed value resistors on each “side” of the pot, the three values to total 100k ohms.
- 6) Similarly to mod 5, a 1k panel mounted pot could be substituted for the brightness trim pot on the daughter board.
- 7) One way to increase the maximum brightness is to use the input voltage to the kit rather than the +5V from the regulator to power the LEDs. First, cut the +5V connection to the daughter board (the rightmost pin on the right angle header, nearest the 1k ohm pot, the 300 ohm resistor and the LM317). Then solder a wire to the daughter board using the hole just above the pin just cut. Finally solder the other end of the wire to the cathode of D12 (the input power diode). This will allow the LEDs to operate at about 20 mA each. Note that the EMI from the kit may increase with this mod since the LEDs are connected through the LM317 to the +Vin supply – initially a 1 uF cap to ground was added to the output of the LM317 but it didn't help - then a series choke was added from the power connector to the kit, I had a 10 mH in the parts bin (M8393-ND Digi-Key) but most any choke should help, be sure to use one with enough current rating to handle the kit.
- 8) For the 5 and 3 mm LEDs, as the brightness control is rotated counterclockwise the blue LEDs will go out before the red/yellow/green ones will. For more consistency the builder can substitute red LEDs for the blue LEDs.