

## Cooling Fan Speed Reducer

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My portable HF station has two small cooling fans (hooked up in parallel) mounted on the heatsink of the transceiver. Although the rig has an internal fan, the equipment is in a plastic box with only the front open for ventilation. Also, the heatsink is only a couple of inches from the back wall while the owner's manual says this distance should be at least four inches.

The fans run rather fast and are noisy on the full station voltage, so I decided to build a small circuit to reduce the fan voltage to something more reasonable. A way to do this is with a voltage regulator like the well-known LM317. With only a handful of added parts you can get a constant 9.5 volts out while the input voltage ranges from 11.5 to 14.5 volts or more.

This circuit is a standard one, found in many sources. All the information you need can be found in the LM317 datasheet and National Semiconductor Application Note 181 (both easy to find with a Google search). The two resistors R1 and R2 set the output voltage via a formula shown just below the schematic. I used a 2K ohm trim pot for R2, but you can substitute a fixed resistor close enough to the ideal value to get something near 9.5 volts out.

If your input voltage range or output voltage is different, you should note that typically you need the input voltage to be at least 2 volts more than the output. On the other hand, the larger the difference between input and output voltages, the more heat must be dissipated in the LM317. Consult the datasheet for more information on this.

Below the schematic are shown the calculations to determine if a heatsink is needed in this application. I assumed a very hot ambient temperature (60 deg C) and measured the maximum current draw of the fans and

assumed a maximum input voltage of 14.5v. Under these conditions the LM317 must dissipate just under a watt of power. The calculations show that no heatsink is needed, but since I was going to put the circuit in an unventilated box, I decided to attach the metal tab of the LM317 to the aluminum cover.

It is important to know that the metal tab of the LM317 is "hot," that is, it is connected to the output pin. Consequently, I had to use special mounting hardware which includes a plastic shoulder washer for the mounting screw and a small mica sheet between the LM317 and the cover. (I also used some thermal grease.) If instead you use a heatsink that slip-mounts on the tab, just be sure the heatsink doesn't touch any part of the circuit or a metal case.

For construction I used a small square of perf board. The LM317 is mounted underneath the board with its pins bent 90 degrees. The other parts are mounted on the top. Just about any construction method will work.

With this circuit between the power supply line and the fans, the fans run slower and quieter, and they are likely to last longer, too.