# Heathkit SB200 fan

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**http://w5yi.org/**
**http://www.arrl.org/**

**BEWARE OF THE LETHAL VOLTAGES INSIDE THIS AMPLIFIER!**

**EVEN EXPERIENCED AND KNOWLEDGEABLE TECHNICIANS HAVE GOTTEN CARELESS AND BEEN KILLED WORKING ON VACUUM TUBE EQUIPMENT. EVEN SOLID STATE EQUIPMENT CAN KILL YOU IF YOU DO NOT KNOW THE SAFETY PROCEDURES.**

**DO NOT WORK ON YOUR RADIO GEAR UNLESS YOU ARE REALLY SURE OF ALL THE SAFETY TECHNIQUES REQUIRED. THESE INCLUDE, BUT ARE NOT LIMITED TO:**

- **DISCONNECT THE POWER CORD WHEN WORKING INSIDE.**
- **DISCHARGE ALL FILTER CAPACITORS.**
- **BE CAREFUL HANDLING TUBES, ESPECIALLY THE PLATE CAPS.**
- **REMOVE FRAGILE COMPONENTS WHEN SERVICING, AND STORE THEM SAFELY TO AVOID DAMAGE.**

**YOU ARE RESPONSIBLE FOR THE DECISION TO MODIFY YOUR EQUIPMENT, AND NO LIABILITY IS ASSUMED MY ME OR ANY OF THE LINKS I MENTIONED. THE SOLUTIONS PROPOSED MAY NOT BE APPROPRIATE FOR YOUR RADIO SYSTEM.**

**PLEASE DO NOT COPY THIS PAGE WITHOUT CREDIT TO ME. IF YOU WANT TO LINK TO IT, I WILL UPDATE THE PAGE FROM TIME TO TIME AS I GO FORWARD WITH THE OTHER**

**WORK. IT WILL BE TO YOUR ADVANTAGE TO HAVE THE LATEST INFORMATION.**

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The Harbach fan mod has been around for a while. This kit, along with the capacitor/rectifier kit is a good way to modernize your Heathkit SB200/201. The fan has high quality bearings and will last a long time.

Harbach also has fixes for failed antenna relay. I plan to do the power supply and soft start kit later.

http://www.harbachelectronics.com/main/page_products_sb200__sb201.html

See W8JI discussion about the Parasitic Suppressors.

http://w8ji.com/SB221/sb-221.htm
http://w8ji.com/relay.htm

http://w8ji.com/vhf_stability.htm

If the color codes are unreadable due to discoloration, they are probably fried. You can carefully remove them and separate the coil from one end of the resistor to test them. They usually go up in value. Replace them now, not after the amp becomes unstable and damages something. Consider doing something about the filter capacitors underneath the chassis. You can see that I did replace them while I was in there.

**DO NOT DO MULTIPLE MODS IN ONE SESSION!**
**DO ONE OR A SENSIBLE GROUP OF THEM.**
**OTHERWISE YOU MAY BE SCRATCHING YOUR HEAD TRYING TO FIGURE OUT WHICH ONE CAUSED THE SMOKE DUE TO IMPROPER WIRING OR CHOICE OF COMPONENTS.**

**CHECK ALL FILTER CAPACITORS FOR CORRECT POLARITY BEFORE POWERING UP!!!!!!!!**
**YOU CAN SEE A PLUS MARK ON THE CHASSIS NEXT TO ONE OF THE CAPACITORS I CHANGED. I PUT IT THERE BEFORE I REMOVED THE OLD ONE.**

See also the discussion on repairing the original parasitic suppressors. Mine measured over 300 ohms and were cooked. I took the precaution of buying a large quantity of 47 Ohm carbon resistors. Do NOT use modern inductive resistor types, or you may severely damage your amplifier!!!!

http://w8ji.com/images/Carbon_Metal_resistors.jpg
http://www.eham.net/ehamforum/smf/index.php?action=printpage;topic=74640.0

You should decide for yourself which approach you should take to that problem. I am not going to endorse one or get involved in a debate with somebody about why I did it differently. This is an example of the importance of carefully researching your mods on the internet, to be sure you are comfortable with your final choice.

This section gives an alternate solution to the Harbach fan kit. I scrounged all the parts except the small

12.6V @ 500mA Radio Shack power transformer. The 80mm square fans draw about 200mA each. The bridge rectifier shown is rated for 5A. The 1000uF 35V capacitor delivers 12VDC to the fans. You should check the voltage with an accurate meter yourself, particularly if you decide to up the capacitance or use fans with different current draw. Do not exceed the voltage rating of the fans. The old black wires to the original AC fan are wired to the 120VAC primary of the power transformer. Everything is fastened with GE RTV (bathtub caulk), to avoid defacing the amplifier with drilled holes.

This way, the original fan or the Harbach fan can be installed later if you change your mind. Do not use inferior RTV, which may not completely set, and does not provide the mechanical stability required.

The nice feature of the square fans is that they do not leak any air around the outside of the fan. ALL of the air pressurizes the final compartment. More air comes out of the fans I selected than the original fan. You can do a simple test with just your hand feeling the air coming out. Fans with less current draw may cause the voltage to soar out of spec, and may not deliver enough air. **Some fans do not work well with the back pressure of the sheet metal with holes. Test them out with a small power supply and hold them in place to see if the air delivered is sufficient.** I chose the best ones I had, nice ball bearing units for long life and quiet operation. These were removed from scrapped defective new commercial power supplies. You can probably find what you want at Mouser or surplus sources.

**BE SURE TO MOUNT THE FANS SO THAT THE AIRFLOW IS UP INTO THE FINAL COMPARTMENT!!!!!!!**

**OBSERVE POLARITY ON THE CAPACITOR, DIODE BRIDGE, AND FANS!**

**Figure 1:** Top view of SB200 amplifier with fans installed.

**Figure 2:** Bottom View Closeup of the fan and transformer mounting using GE RTV.

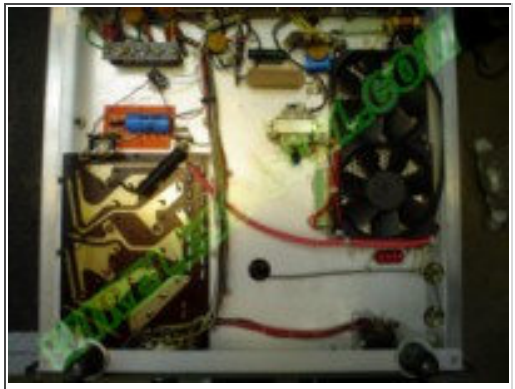

**Figure 3:** Bottom View Showing final wiring of the bridge rectifier and filter capacitor.

In Figure 1, above, please note how the original vent holes are completely covered, ensuring that all the air delivered by the fans pressurize the final compartment. The RTV mounts the fans and also seals them against air leakage. The transformer is mounted "dead bug" leads UP with RTV. Clean all surfaces to ensure good adherence of the glue.

To finish off this fan improvement section, use flat black paint on the top cover. CLEAN THE METAL FROM ALL DUST AND GREASE FIRST. Be sure to use masking tape on the bottom where it meets the main chassis, and the safety notice. This assures proper grounding and protects the safety notice.

I like to bake the sheet metal projects I do in a conventional electric oven.

Let the paint dry thoroughly FIRST.

Then Pre-Heat the oven to 140 degrees F; use a calibrated thermometer. Turn the heat OFF. Place the sheet metal inside to bake it. Remove the finished piece in a couple hours. It will improve the adherence and finish the cure of the paint.

The black paint considerably helps with the radiant heat from the tubes. Ideally, all final amp compartments should be flat black inside and out, but disassembly of everything to paint it all would be a hassle. This looks good, like it was not an afterthought, and is a major improvement without heroic effort.

This completes the fan phase of the project. Enjoy increased tube life from the cooler amplifier. Its like being too rich or too thin. There is no such thing as too much air moving through your RF amplifier!

No schematic is included with this phase. If you cannot figure out how to wire up a bridge rectifier and capacitor - you shouldn't be doing this!

73,
Janis
AB2RA

**Back to Projects**

**Back to the home page**

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