AL811 AL811H Cooling Fan Kit

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This kit contains a fused prewired fan assembly with high/low switch, all necessary hardware, and two 5-watt Zener diodes. Amplifiers will use none, one, or two Zener diodes depending on tubes and age. This kit requires simple mechanical work and between one and four solder connections.

Most Ameritron 811 amplifiers have too little airflow even in normal SSB operation. The Cooltron fan, appearing since at least 2009, is a terrible air mover. It flows roughly 20-30% of the necessary airflow on 60Hz mains. In countries with 50Hz mains, the Cooltron fan flows <5 cfm.

The Cooltron fan has too little airflow for the three-tube amplifier while resting on standby! There is no reason to test if "Cooltron" appears on your fan label. Your fan needs to be changed.

With other fans, while not an absolute test, good air movement should be felt several inches from the tube-side exhaust holes. With proper fan flow, a regular BIC lighter will not stay lit when held about one foot from the tubeside vent.

A better test is to measure the cover's temperature directly above the tubes after an extended idle time with filament only. The cover top area above the tubes should be within 10 degrees F of room temperature no matter how long the amplifier idles. (Do not transmit in this test.)

Normal CW and SSB operation of an AL811H requires at least 25 cfm airflow **through the cabinet** at normal sea-level barometric pressure. A proper fan cannot be selected from very generous fan advertisements. If your amplifier has the pictured Cooltron factory-installed fan, the fan **must** be replaced:



Insufficient airflow is a leading cause of anode connector and tube area hardware failure. Inadequate airflow greatly reduces amplifier component life.

Initial Design and Technical History

(skip reading this part unless you are interested in technical aspects)

In early 1991, at the request of MFJ, I designed the AL811 and AL811H series amplifiers as the cheapest possible amplifiers for medium-power amateur SSB and CW use.

The AL811/811H designs were finalized long before FT8 and today's popular digital modes. No thought or consideration was given to low-efficiency AM or steady carrier mode usage in the AL811 series.

Still, the AL811 series can be used for digital with proper bias and tuning, but only if the correct fan and bias voltage are used. *All Ameritron amplifiers manufactured after 2008 with original fans have inadequate airflow. If your amplifier has a Cooltron fan, the fan is woefully inadequate.*

The correct *minimum airflow* is about 18-20 cfm operating normal SSB and CW with three tubes (25% less power), and ~25 cfm *minimum* on higher duty cycle modes for three or four 811 tubes. This has to be measured with the cover on the amplifier. This airflow results in a ~40° F cabinet air increase around the tubes *at the maximum average rated tube dissipation*. 811 tubes safely dissipate about 60 watts per tube *average* anode heat per tube.

Airflow Tests and New Fan Selection

While not an absolute test, a good breeze should be felt some distance from the tubeside exhaust holes. With a proper fan, a BIC cigarette lighter will extinguish if held one foot from the amplifier tube side holes.

A better test is cabinet cover temperature right above the tubes after an extended idle run time. The cover should be less than 10 degrees F above ambient room temperature.

Measuring airflow takes special fixtures and equipment. We did this work for you in this fan kit. (We rejected about 80% to 90% of the fan models we tested. We make bulk purchases of verified acceptable fans.)

A Word About Tube Swaps

572 tubes will not make the amplifier or cabinet run cooler. For the same power dissipated, the heat produced always remains the same.

572 tubes make tuning time much less critical. 572 tubes also allow the dissipation-limited three-tube 811 to operate at the same power levels as the 811H. 572 tubes have a much shorter emission life but have more immunity to operator error.

Keep this in mind. Tube life is a function of filament hours in the 572B tube and anode temperature in 811 tubes. Tube life is not a function of grid current or drive power.

Regardless of the tube type used in any amplifier, when dissipated power is the same the total thermal rise in the cabinet will be the same for the same airflow rate. Running the amplifier harder produces more heat. Bigger tubes will not make it run cooler.

KF811 and KF811H Fan Kit

We offer a convenient drop-in fan for both the AL-811H internal fan and external-fan AL-811 three-tube amplifiers. Note the external 811 fan and internal 811H fans are slightly different. You must order the proper unit, the *internal mount fan for the AL811H* and the *external mount fan for the three-tube AL811* are slightly different kits.

This kit contains a fan that flows about 15 cfm on low voltage (~10Vdc) and near 30 cfm at 15Vdc, the typical AL811 full DC bus voltage. *This flow rate has been verified with the amplifier cover in place.*

Some 811 amps, due to transformer winding errors, might range up to 17Vdc on the "12V bus". The normal 12V bus voltage is supposed to be 14 Vdc nominal. If you are going to run the fan at high speed (full voltage) most of the time, check your amplifier's yellow wire voltage. Voltage may have to be reduced with a series Zener or a series silicon dropping-diode.

The advantages of this 12V fan conversion are:

- 1.) Same airflow and noise performance on 50 or 60 Hz mains
- 2.) Reduced fan depth
- 3.) Safer installation and wiring
- 4.) Easier fan speed control

Check Your Amplifier's Bias First!

Operating bias is a critical part of high-duty-cycle tube life. This modification is easiest done while the fan is removed! This modification requires more tools and more skill. If you are not comfortable soldering, seek assistance from someone who is. A skilled person can change the fan and do this bias modification in less than one hour.

All very early amplifiers require this modification unless SSB and casual CW operation only. This modification will extend tube life in all amplifiers.

The ideal bias current for minimal heat without compromising IMD is 10 to 20 mA per tube. The three-tube should idle, keyed with no drive, between 30 and 60 mA. The four-tube should be 40-80 mA.

Removing the fan for replacement opens up a clear work area to install bias diodes. The best time to install one or two 3.9V 1N5335B 5-watt Zener diodes is with the fan out.

Input Board Types

There are two basic input board bias systems used in the AL811 series. One is when your amplifier has no bias diodes. This type needs two Zener diodes connected in series.

Early first-generation input boards require two Zener diodes in series. This means you must cut the small white wire in this kit:



The two later input boards, Generation II and Generation III, only need one additional Zener:





The kit shipped before mid-July 2024 includes "floating" tube bias diodes. We anticipate changing to a circuit board sometime in July. Instruction pictures will be updated or revised at that time.

This is the early pre-July 2024 Zener diode assembly:



The transformer lead connects to the silver stripe end. The circuit board connects to the all-black diode end. Do not connect the diodes backward!

To install the Zener block, remove the old fan and cut the white transformer center tap wire midway across the fan opening.



Using a sharp wire stripper, a razor blade, or a knife, trim the white wire insulation back about ¼ inch from the open wire ends. Twist the wire end strands together with your fingers so they are tightly bundled and not all helter-skelter at each wire end. After this slip heatshrink back onto the wires well away from your work area.



Form hooks or loops and twist or crimp the diode and transformer wires together. Make sure it is as neat as possible. Being neat here will make soldering much easier. Keep heatshrink tubing well away from the soldering. Remember to solder the transformer side to the silver band diode end:



Flow the solder well using enough heat. Do not let the heatshrink get close to the soldering heat!



After soldering (be sure to use enough heat to flow solder properly) trim up any sharp or protruding leads



Pull the heatshrink over the solder joint and shrink it down.



End of Zener section!

KF811 and KF811H Installation

These kits are 12-volt RF noise-suppressed two-speed systems with fuse. Note the 811H internal fan and 811 external fan systems are different. Before starting, be sure you have the correct system for internal (AL811H



Tools required:

screwdriverslong nose plierssoldering iron at least 700F small tip60/40 rosin soldersmall wire cutters, longer reach is easier¼ inch combination open-end and box-end wrench (the longer the better)

Replacement Procedure

- 1.) Observe the HV meter position. Make sure the HV meter is working, and then turn the amplifier off and watch the HV decrease. When HV reaches zero the amplifier HV is discharged.
- 2.) Unplug the amplifier from the outlet and remove the cover. Observe the area shown in Figure 2. Remove the small (normally) black fan wires by unsoldering or by just cutting. If any tie is holding the fan wires, very carefully remove any wire ties. This is best done by cutting or crushing only the tie head



Figure 2 Old fan power leads

3.) Unbolt the fan. (Save the hardware.) The internal fan is a little more difficult



Figure 3 unbolt old fan

4.) Remove the fan, you will not reuse screws. Figure 4



Figure 4 remove fan

5.) Rear mount fans use this hardware stack. The spacers (which can be any color) allow reasonably tight screws without breaking or bending the fan mounting tabs. Do not pinch wires!



Figure 5 AL811 three-tube external fan hardware stack



Figure 6

6.) Mount the switch first. The switch mounts in an existing hole. This is the time to do the Zener diode bias mod. The Zener diodes connect in series with the

heavy white transformer wire. Cut the transformer wire, strip it, and insert one or two Zener diodes according to earlier text on page 4.

7.) Next mount the fan in the panel, the airflow direction arrow points inward and the label is inside. **The fan must blow into the cabinet**





8.) The switch can mount with dot up to make high speed up if you like. Figure 8



Figure 8 Dot Up

- 9.) There was a white nylon cord clamp fastened to the chassis or to the fan (Figure 3 top left of the fan). You can either slip the nylon power cord cable clamp over the new fan screw and add a nut to hold it in place, or just throw it away. That clamp is not generally necessary.
- 10.) The ground lug must be securely grounded to one of the fan screws. The fan ground lug should be sandwiched between two nuts on the upper outer-edge screw (front top of Figure 9) after the screw is tight.



Figure 9 ground lug

11.) Route the yellow fan power wire up along the chassis front-to-rear brace for connection to the meter's yellow wire 12V lamp supply. You can also connect to the standby switch yellow wire terminal (which is more difficult) by routing the yellow fan wire along the chassis bottom to the standby switch. Figure 10. Just tack-solder the yellow wire with fresh solder, gently pulling on the yellow fan wire to make sure you made a good connection <u>https://www.youtube.com/watch?v=YG9eHe1Bpzo</u>



Figure 10