

# Balancing the Blade of the FM-220 Harbach Electronics Replacement Cooling Fan

The Heath SB-220 is the venerable workhorse of the linear amplifier world. Although the SB-220 and its younger brother, the SB-221, have now been out of production since the 1980's, there are many thousands of these amplifiers still in daily use throughout the world. Thanks to G4FTC, David Sparvell, for this information.

The only routine maintenance required for the motor is a few drops of light oil on the fan bearings every year. However, the motor is a very basic open style shaded pole motor with sleeve bearings. A 6-bladed plastic fan simply friction-fitted on the motor shaft which due to it's mounting position, not only effectively cooling the glass envelopes of the 3-500z tubes, but also the tube base pins and seals. Even though the fan bearing may be given their annual drops of oil, the open sleeve bearings are prone to picking up dust and grit that will eventually cause them to fail.

But fortunately for SB-220 owners, spare parts and replacement tubes are readily available; replacement fans, switch wafers, relays, etc., being available from Harbach Electronics. Dayton, the well-known fan and blower manufacturer make the replacement blades and motors. They also provide a greater airflow than the original Heathkit fan.

I own two SB-220s, and recently one of the fans started to become noisy, and brought a replacement fan from Harbach Electronics. After fitting, the first noticeable change was the significantly increased airflow. But also very noticeable was the vibration from the fan to the extent where I could feel the vibration being transmitted through the operating table. This condition needed to be corrected otherwise the new fan would have a short life!

Upon investigation, the fan blade assembly, although brand new, was out of balance. I don't know if this is a common problem, but it may be that my specimen was at the limit of manufacturing tolerance. The amount of imbalance is likely to be only a fraction of a gram, but when rotating at 3000 RPM, this imbalance is enough to cause significant vibration. I made up a shaft (4.6mm diameter about 75 mm long) to perform a static balance. With the fan blade assembly mounted on this test shaft, and the shaft suspended on the rims of two drinking glasses, the fan blade assembly will rotate under gravity and will come to rest with the heaviest blade pointing downwards. To balance the fan, trim some plastic off the very tip of the heavy blade. This trimming should be no more than the thickest of a piece of paper. The fan should be re-checked, and the process repeated until the fan blade assembly shows no bias. The fan blade assembly may then be re-fitted to the motor shaft. After performing this process, the vibration was eliminated!

