LNF1-A Amplifier Modifications
Dated March 17, 2009

These amplifiers were manufactured in the late 1970s by Electronics One, Inc., Atlanta, Georgia. Electronics One was a firm which manufactured products under contract for customers. It did not have any specific product line. I remember a major project they had was the manufacture of electronic circuits for the upgrade of gasoline pumps. An assistant there was a student of mine at Georgia Tech. He knew that I was playing around with the design of audio power amplifiers. He came by my office one day and asked if I would be interested in going in with a partner to manufacture and sell the amplifiers. The first amplifiers were in a grey "shoebox like" chassis. The grey color was soon replaced with black. Because the shoebox chassis had a lot of wiring between the circuit boards and the power transistors, a rack-mount version was developed. The power transistors mounted directly on the circuit boards in this version. It also had a clipping indicator. I have no idea how many amplifiers were made. After the company went out of business around 1980, I found out from a former employer that he was ordered not to talk to me. The company was closed and the owner left town before I found out what had happened. I have the prototype grey shoebox amplifier and the prototype black rack-mount amplifier. Neither have given any problems and both still work. The shoebox amp was used for several years by a restaurant in their audio system. I have included all of the circuit diagrams and layout diagrams that were given to me back when the amplifiers were being made. There are several modifications that I would recommend if anyone has one of the amplifiers. If you attempt any of the modifications, you should have a "solder sucker" (I prefer the Paladin brand) and a roll of solder wick. This stuff tends to become oxidized and I recommend putting a small amount of solder flux on it before using it. A temperature controlled solder iron should be used. I recommend a 700 °F temperature tip. Some or all of the circuit boards were plated through the holes. It is tricky to remove the solder from the holes when replacing a part. I have found the flux coated solder wick to be useful in doing this. Below are the modifications. Some of them reference particular drawings. It may be that these also apply to other drawings because changes may have been made to some amplifiers before a new drawing was made.

1. Clip out $R_{20}$ and $R_{21}$.
2. Clip out $R_{33}$ and $C_{10}$.
3. On drawing 182 – 100, clip out $C_{14}$, and $C_{15}$.
4. On drawing 182 – 3000, clip out $C_{14}$ if present.
5. On drawing 282 – 1002, clip out $C_{15}$, $C_{16}$, $C_{19}$, and $C_{20}$.
6. On drawing 182 – 3000, clip out $C_{15}$ and $C_{16}$.
7. On drawings 182 – 3000 and 282 – 1002, clip out capacitors $C_{14}$ and $C_{17}$.
8. Drawing 182 – 100 shows resistors $R_{44}$ and $R_{45}$ (both 240$\Omega$, 1/4 W) near transistors $Q_{18}$ and $Q_{19}$. These resistors should be replaced if they are missing. If there are no holes for them on the circuit board, they can be soldered to the backs of the circuit board.

9. Add a 10 pF silver mica capacitor from the collector to base of transistors $Q_6$ and $Q_7$. These must be soldered to the backs of the circuit boards.

10. As shown on drawing 182 – 100, $C_9$ (0.1 F, 100 V) and $R_{32}$ (10$\Omega$, 2 W) are connected in series across the loudspeaker output binding posts on the rear of the chassis. On some models, this network was moved to the circuit board. If it is on the circuit board, it should be moved to the output binding posts. This is important, for the circuit can oscillate with the network on the circuit board. On drawing 282 – 1002, there is a $C_9$ (incorrectly labeled $C_7$) and $R_{32}$ on the circuit board and a $R_{48}$ and $C_{18}$ on the output binding posts. Remove the network on the circuit board and change the values on the output binding post to the correct values. This $RC$ network is to suppress parasitic oscillations. Although I prefer a 10$\Omega$ resistor, I believe that a 22$\Omega$ resistor is sufficient. But it and the 0.1 $\mu$F capacitor must be on the output binding posts.

After the modifications are made, it is probably a good idea to check the bias current if you have the equipment. Although it is optional, you can do this as follows:

1. The power should be turned off and the power supply capacitors discharged.

2. Adjust the bias potentiometer for maximum resistance. This is important. Use an ohmmeter to verify that the resistance is a maximum and not a minimum. You can blow the output transistors if it is set for minimum.

3. Remove the dc fuse in series with either the positive or negative power supply lead to the circuit board for one channel and clip an ammeter across the fuse terminals.

4. Power the amp up with no input signal or load. Adjust the bias potentiometer for a current of 100 mA. Be careful. Once I accidentally blew the output transistors in one channel of an amplifier I was building when I mistakenly tried to adjust P1 for the wrong channel.

5. As the amp warms up, the current will drift. Readjust P1 until the drift stops. This will take about 10 minutes.

6. Turn the amp off. Wait until the power supply discharges, then install F2.

7. Remove F3 and repeat this procedure for the other channel.

8. You can seal the bias potentiometers with a dab of clear silicon seal.