The Class-A No. 20 moves into Class AB for music peaks, doing so at lower levels as the load impedance falls below 4 ohms.

nels in a stereo setup are kept to a minimum. Normally, when we speak of "dual mono," we are referring to two separate amplifiers on a single chassis, each with its own power supply. The No. 20 takes this concept one step farther: It uses dual-mono supply rails! Each half of the waveform has its own power supply and regulator.

Fixed-bias Class-A amplifiers, favored by audiophiles, are very inefficient because they dissipate as much power during quiet passages as they do at full power. With an amplifier delivering high current and reasonable power, a pair of amps can demand more electricity than the average home's wiring can draw from the power company. Levinson's solution is to fix the bias at a reasonable level and design the circuitry to move into Class-AB operation for music peaks, doing so at lower output levels as the load impedance falls below 4 ohms.

Most amplifiers do not use the No. 20's level of regulation (regulation of all stages, including outputs) because of increased cost and decreased power available for momentary music peaks. Unregulated amplifiers, on the other hand, are somewhat dependent on the open-circuit voltage of the a.c. power line. The No. 20 is highly independent of the power line. Even if a brownout smokes your air conditioner, the No. 20 will play with full power. The regulated power supply in the No. 20 actually does more to stabilize and purify the power source than even the expensive line conditioners sold for use with computers.

Madrigal has designed a highly sophisticated protection circuit for this amplifier. Some protection schemes have interfered with sonics by mistaking a difficult but normal load for a fault. This unneeded protection results in snapping sounds or premature clipping. The No. 20's protection scheme analyzes and handles an extremely broad range of load conditions without sonic interference. Part of this ability derives from the No. 20's overbuilt "eight-up, eight-down" output stage, which uses eight transistors in each half of the push-pull circuit. While even a simple protection scheme could protect such circuitry without affecting performance into normal loads, the No. 20 goes much farther, sensing and reacting to only those extreme conditions that the amp is not designed to handle.

The No. 20's protection consists of a fusing system, elec-

ARC WELDING WITH AN AMPLIFIER

An enthusiastic reviewer might call a beefy amplifier an "arc welder" as an exaggerated compliment to its ruggedness and current-handling capacity. However, no one would really expect an amplifier to actually melt steel. Almost no one, that is, except this reviewing team. We say this amplifier is an arc welder and back up this statement with a photograph (Fig. B1) of two 0.05-inch steel plates welded together by a pair of Mark Levinson No. 20s.

Arc welding is accomplished by creating an electric arc that melts metal. The molten sections of the items to be joined flow together and are then allowed to cool. In practice, the power source is connected to the two pieces to be joined and to a flux-coated welding rod. The arc is struck by momentarily shorting the rod to the work pieces. The flux is vaporized, forming an ionic conducting path for the arc and cleaning the metal. The arc stabilizes at about 100 amperes and 30 V (creating temperatures of 3,000° F), depending on the thickness of the metal and welding rod. If this sounds like the world's worst amplifier load, you're right!

Coauthor Clark summoned Paul Grzebik to carry out the task. Paul has the reputation, in Detroit's technical community, for a willingness to try anything once, from building a parade float to scaling a TV transmitting tower. He readily agreed to our assignment. Clark drove both No. 20 amps with a 1-kHz square wave to full output into a series resistor mixing network that combined both amplifier outputs in parallel to obtain the high current needed. After experimentation (and several blown line fuses), approximately 1 ohm was found to deliver the maximum current for starting and sustaining the arc.

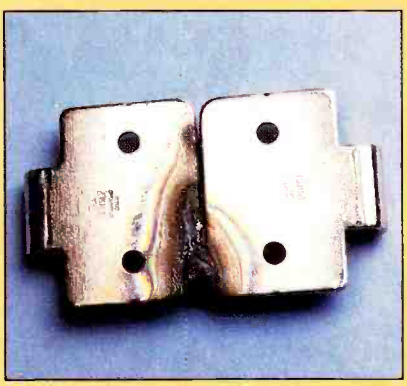

Fig. B1—Results of the arc-welding experiment.

Wearing a mask and gloves (the intense blue light from the arc can burn the unprotected retina, while molten metal can splatter on the hands), Grzebik began welding. The arc turned out to be a fairly effective plasma tweeter, creating strong 1-kHz square-wave sound radiation that required wearing ear protectors as well. Grzebik completed a small weld and, impressed, pronounced it satisfactory.

After the welding, the No. 20s, still only lukewarm, were again put on the test bench. Distortion tests verified that no change in their performance had resulted from this extraordinary exercise.

What's the point? With this test, Clark verified his confidence in the exceptional output capability and comprehensive protection built into these amplifiers. A few other amps might be able to weld steel without destroying themselves, but the No. 20s were certain to survive the experiment.

One note: Don't attempt this feat yourself unless you are an accomplished welder, have the proper equipment, and are using amplifiers with extraordinary protection circuitry and output stages that can handle current extremes. Injury to yourself and destruction of lesser amplifiers may result. Don't expect manufacturers to repair your damaged amp under warranty, either!

L.L.G. and D.L.C.