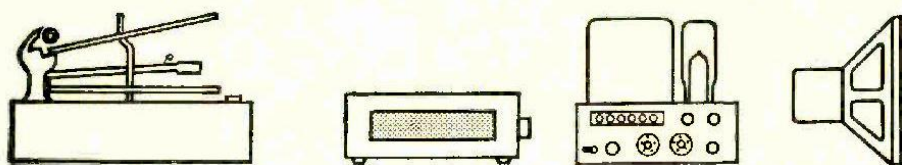


EQUIPMENT



PROFILE

HEATHKIT TRANSISTOR STEREO AMPLIFIER, MODEL AA-21

The Heathkit AA-21 is billed as a 70-watt stereo amplifier (35 watts per channel) which achieves this power output (not music power) without benefit of output transformers or vacuum tubes. From experience, even before we tested this unit, we tended to credit Heath with having told the truth. Sure enough, the unit delivers at least 35 watts per channel, into an 8-ohm load, and is completely solid state. Nary a vacuum tube to be found in the whole shebang.

With this excellent start to encourage us, we took a closer look at the Heath AA-21. Hope we don't sound too tongue-in-cheek, but frankly we have learned, also from experience, to tuck our tongue in when approaching a transistor amplifier from the rear. We've been bitten before. Or something.

Anyhow, the AA-21 is an integrated stereo amplifier and control center with sufficient flexibility to handle all requirements of a modern home system. Thus there are six sets of inputs including tape head, magnetic phono (note that the ceramic input seems to have disappeared from the modern amplifier), tuner, FM stereo, AUX, and tape monitor. Input-level sets are provided, cleverly hidden behind a fold-down panel on the front of the unit. On the front panel, dual concentric controls are provided for the usual signal-handling functions: bass, treble, and volume. These controls are designed to operate both channels simultaneously by means of a friction clutch, which is overridden to control each channel separately. Of course there are the usual mode and function switches. Hidden behind the fold-down panel with the level sets are the loudness-contour switch, tape-monitor switch, and the speaker-phase

switch. The power on-off switch is activated by pressing that section of the front panel bearing the Heathkit logo. Two convenience outlets are provided, one switched and the other unswitched.

The Circuit

Fundamentally the circuitry utilized in a transistor preamp is similar to the circuitry used in a tube preamp, taking into account the essentially different characteristics of these two devices. For example, equalization networks for both the NAB and RIAA characteristics are feedback type around the first two transistors. Then there are the usual tone networks using gain as necessary to compensate for the losses due to the networks. Following this, again, we have the usual driver stages, although the three stages utilized in the AA-21 are somewhat more than the normal number. The driver stages then feed the driver transformer, which in turn feeds the output stage. So far, all is pretty common, excepting of course that transistors are used instead of tubes.

But that output stage is different. First of all there are four, big, powerful, and expensive, transistors used in each channel. These transistors are arranged in a series circuit known as single-ended push-pull. Strangely enough, this circuit is not unique to transistors. We recall a circuit shown by Philips of the Netherlands which was essentially the same but used tubes. Unfortunately, however, the output impedance was in the hundreds of ohms so that one had to use a relatively high impedance speaker. In the Heath circuit, the output impedance of the transistors makes it possible to couple directly to commonly available speakers. Actually the low impedance of transistors is not an unmixed blessing. In the preamp stage, for example, the low impedance offered at the magnetic phono input (30k) may very well attenuate high

frequencies for some cartridges.

Anyhow, both current and voltage feedback loops are used around the output stage to reduce distortion and to improve stability.

The power supply uses four diodes in a full-wave bridge to provide the positive and negative d.c. Decoupling and filtering for the driver stages is supplied by an active filter network containing a pair of transistors as well as capacitors and resistors. A similar network is used to further filter and regulate the preamp d.c.

We hope Heath has started a trend in kit design—in our opinion this kit is worth emulating. What they have done is to pre-assemble several of the "sticky" assemblies, dip them in some gunk, and make them as easy to install as a tube. Modules are provided for three networks in each channel, and installing them consists of plugging into the holes in the printed circuit board.

Another device falling into the time- and labor-saving category are the cables which are provided; they do make it a veritable snap to wire up the front end of this kit. The AA-21 was one of the most effortless kits we have built to date; that is, it went together with no strain, fuss, or muss.

Unfortunately, the manual was not fully



Fig. 2. View of one of the circuit boards showing the encapsulated modules.

as excellent as the kit. Don't misunderstand, it is a good manual in its way; instructions are complete and accurate (we found only one or two small errors), and certainly they are clear. Our reservation has to do with the lack of explanation about what is being done in the various sections, and why. Of course this has been mentioned editorially several times in *AUDIO*, but still we continue to receive manuals which have not made any attempt to relieve the boredom of skatey-eight consecutive steps which one must follow implicitly. Nothing for the mind, everything for the hands. Come now, Mr. Manual Preparer, do you really think that of kit builders?

Performance

The Heathkit AA-21 is certainly entitled to be billed as a high-fidelity instrument: Distortion never exceeded 2 per cent and throughout most of the frequency spectrum it produced much less. At rated power, the distortion was just under 2 per cent at 20,000 cps; at 20 cps it was just over 1 per cent. Intermodulation was 0.9 per cent at rated power (60 and 6000 cps mixed 4:1).

Although rated at 35 watts per channel, we were able to achieve 40 watts per channel at 1000 cps and with an 8-ohm load; at 16 ohms the AA-21 produced 28 watts, and with a 4-ohm load it produced 21 watts. Hum, as referred to an output of 35 watts, was -65 db for the high-level inputs.

The frequency response, while generally flat and within 1 db from 35 20,000 cps, did fall off somewhat from 35 cps down. At 20 cps it was 4.5 db down.

Over-all, the Heathkit AA-21 stands out as a reliable and unusually well thought out transistor amplifier whose characteristics and performance clearly place it in the high fidelity category. Listening to it confirms the instrument test results. F-18



Fig. 1. Heathkit transistor stereo amplifier, Model AA-21.