

Homebrew Challenge II — And the Winners Are...

We had a good response to the second ARRL Homebrew Challenge — here's a quick summary.

Joel R. Hallas, W1ZR
QST Technical Editor

This challenge was to build a linear amplifier designed to boost the 5 W, 40 meter output from the transceivers from the first Homebrew Challenge up to the 50 W level.¹ This time we received five qualifying entries in our quest for low cost linear amplifiers. We received entries from Colin M. Brackney, KR4HO, David W. Cripe, NMØS, Donald W. Huff, W6JL, and two (a separate entry for each contest element) from James C. Veatch, WA2EUJ.

Each of the five entries satisfied all of the minimum technical requirements, as well as the requirement to be able to be duplicated for under \$125 using readily available parts.

The Competition

The basic prize (\$200) was to be awarded to the entry that passed all of our technical and performance criteria at the lowest cost. Entries ranged in cost from \$28 to \$111. In addition, we offered an additional prize (\$300) for the amplifier with the most additional features, but still under the \$125 limit. The competition judges were composed of ARRL staff with considerable experience in technological and operation aspects of low power amateur communications (see Figure 1).

The Basic Prize

Since all the entries met the technical requirements, the basic prize would go to the amplifier with the lowest cost. We had two entries at right around \$30, and since they had taken different approaches to the “design to cost” objective we decided to make two prize awards of \$200.

The absolute lowest cost amplifier was entered by Donald W. Huff, W6JL, with a price tag of \$28.36. Don's amplifier was a conventional, push-pull class AB MOSFET design that did what it had to do at a very low cost through careful parts procurement and a minimalist approach to packaging. It met all basic requirements, in fact could put out 62 W, rather than just the required 50 and design details for other bands were provided. Don's design will be presented in a QST article currently scheduled for June 2010 (see Figure 2).

At a slightly higher cost, \$30.98, David W. Cripe, NMØS, a contestant in the first Homebrew Challenge, took a very creative approach to the “design to cost” objective. Dave noted that a major cost element was the heatsink needed to eliminate the heat from the usual relatively inefficient class AB amplifier.

S. KHRYSZYNE KEANE, K1SFA



Figure 1 — ARRL Lab Engineer Bob Allison, WB1GCM presents the results of his lab evaluations to the challenge judges as he discusses the features of each entry. Left to right: ARRL Sr Lab Engineer Zack Lau, W1VT, W1AW Station Manager Joe Carcia, NJ1Q, Bob Allison, ARRL Contest Manager Sean Kutzko, KX9X, and QST Technical Editor Joel Hallas, W1ZR. Judges not in the photo: ARRL Lab Manager Ed Hare, W1RFI, and QEX Editor Larry Wolfgang, WR1B.

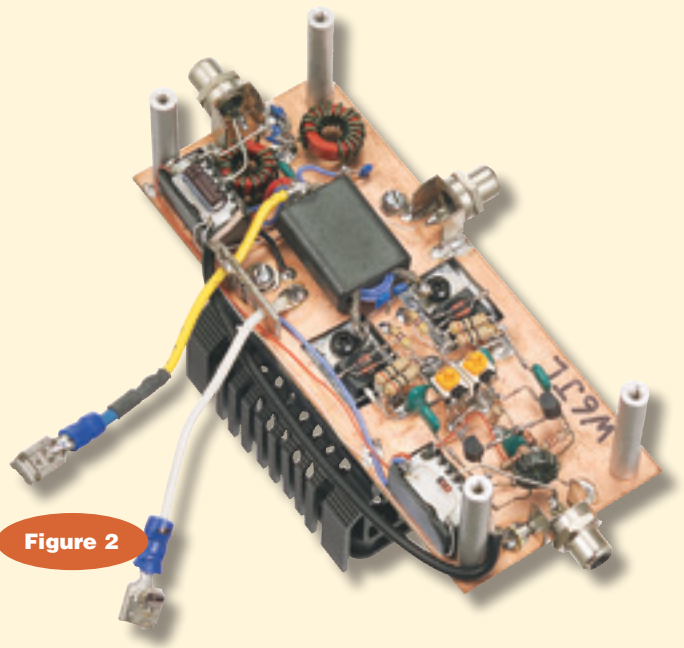


Figure 2

¹J. Hallas, W1ZR, “Announcement — Second ARRL Homebrew Challenge,” QST, Feb 2009, p 75.

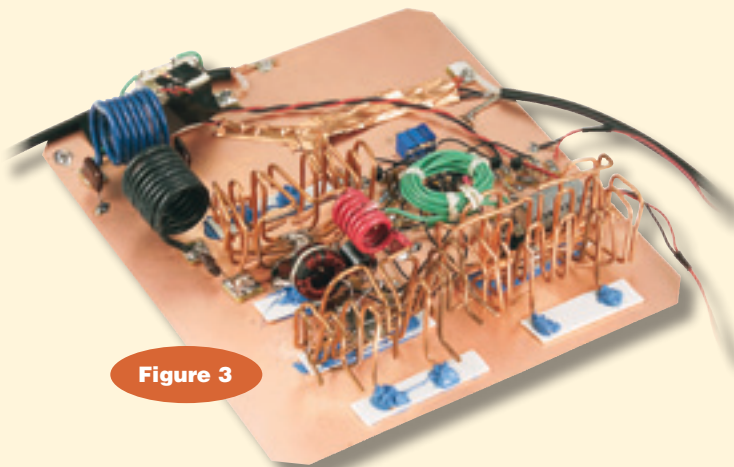


Figure 3

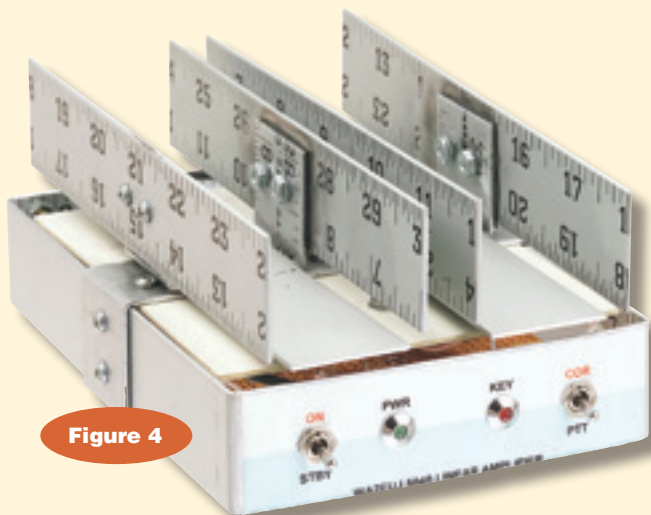


Figure 4



Figure 5

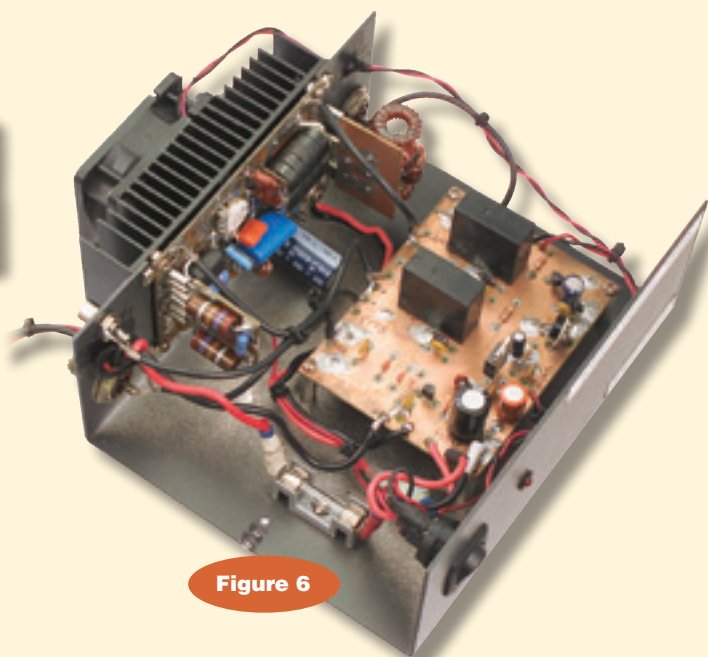


Figure 6

Instead of meeting that head-on, as Don did, Dave went to the more efficient class E as the basis of his amplifier. Since class E is not inherently linear, Dave traded the heatsink cost against the additional circuitry required to linearize its operation. The resulting amplifier was able to meet its linearity and the key down operation specs using just some bits of house wire as a heat sink. In addition to its minimal requirements, Dave's amplifier included carrier sense transmit-receive (TR) switching to operate with his MFJ Cub that doesn't have TR contacts. Dave's amplifier will also be described in a forthcoming issue of *QST* (see Figure 3).

Most Additional Features for Under \$125

While the basic entry from Homebrew Challenge I winner James C. Veatch, WA2EUI, at \$47.72 didn't get to the winner's circle, it did have many nice features. For that one Jim solved the heat sink cost problem by building his own from two aluminum yardsticks (see Figure 4). He had enough left to fabricate the chassis, very clever.

For his advanced entry, Jim sprung for a commercial heat sink and came up with an amplifier meeting the basic requirements and many additional features including: a design free of the potentially hazardous BeO substrate material; multiple band operation, in his case bandswitching for 30-40, 20-17 and 15 meters, and solid state TR switching for full break in CW. Jim also provided carrier sense TR switching and a set of controls and indicators including an LED forward and reflected power meter. It was all in a very nice looking homemade enclosure. Look for details of Jim's amplifier in an upcoming article (see Figure 5).

The entry from Colin M. Brackney, KR4HO, was a very nicely constructed and nicely packaged 65 to 70 W amplifier with high

quality components and a full enclosure with switch, indicators, plug-in input attenuator for different power levels, capability to plug in different low-pass filters for different bands and even a fuse. It met all technical requirements, and came in comfortably under the cost ceiling at \$110.97. It could have easily won an award in other competitions, but it didn't quite win in either category here. Colin will receive an Honorable Mention certificate and his choice of a 2010 *ARRL Handbook* or the latest *ARRL Antenna Book* (see Figure 6).

Wrapping Up

We were very pleased at the quality of diverse approaches taken to the different requirements by the entrants and with the creative touches that we observed. This is truly an exhibition of the spirit of Amateur Radio at her finest and we gratefully thank all those who participated. Special thanks also to ARRL Lab Test Engineer Bob Allison, WB1GCM, for his thorough technical evaluation of each amplifier in the ARRL Lab.

We also solicit thoughts on an appropriate and achievable objective for Homebrew Challenge III! Just drop a note to me at w1zr@arrl.org.

