

Dynaco 400 Assimilation

This classic amp benefits from a facelift using today's components.

By Julian Evetts

The Dynaco 400 was the Tyrannosaurus Rex of power amps in 1973. I wanted one badly, but I was bringing up children and settled for the more affordable Dynaco Stereo 80, which pumped out music for the next 20-odd years. It also survived three teen-age boys.

In 1998, I spotted a Dynaco 400 in a used equipment shop, paid way too much, and dragged it home—all 60 pounds! Unfortunately, my “Dynasaur 400” was seriously flawed. It had a nasty habit of going DC and destroying speakers.

PHOTO 1: The rebuilt Dynaco 400.



I spent more money unsuccessfully attempting to repair a unit with too many previous ham-handed repairs and modifications. Eventually I decided it was too old and complicated to fix and too big to use as a doorstop. Resistance was futile; it needed to be assimilated with newer technology (Photo 1).

I decided on a rebuild that would retain the outward appearance of this classic amplifier, while replacing the innards with new components. After looking around, I chose to upgrade using a couple of compact 200W all-MOSFET amplifier modules from Marchand Electronics in Rochester, NY (Photo 2). You can buy the PM224 modules as fully assembled and tested

units, as kits with the PC boards and all parts, or as bare PC boards. See the Marchand site for details, specifications, and schematics.

The rebuild is straightforward. Strip everything but the massive Hammond power transformer from the old chassis (Photo 3). Remove the faceplate and hinge the front part of the chassis forward. Clean the wiring from all front panel con-

PHOTO 2: PM224 Module: 220W RMS into 4 or 8Ω. Better than 0.01% distortion at 1kHz. Differential (balanced) or single-ended inputs. AC or DC coupling (jumper selectable).

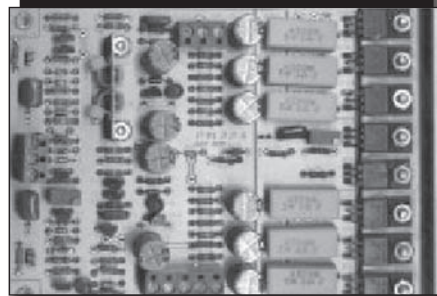


PHOTO 3: The bare chassis with Hammond transformer.

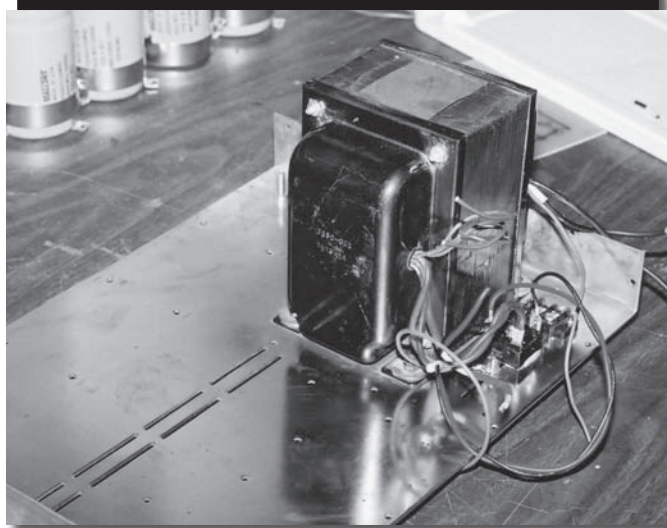
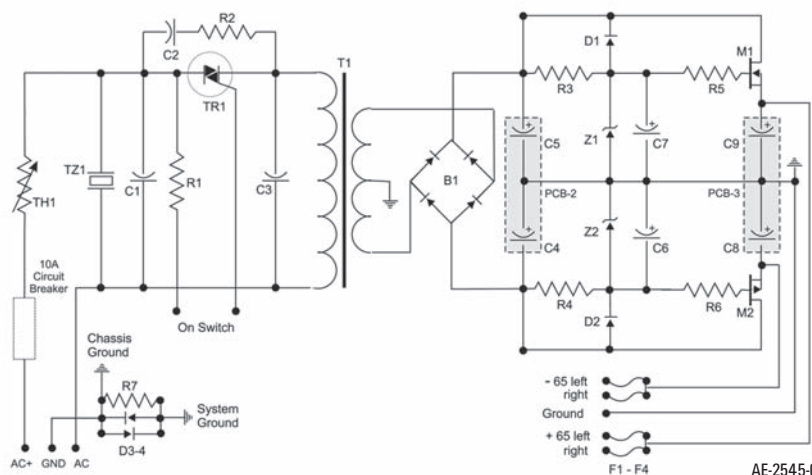


FIGURE 1: Regulated 65V power supply for Marchand PM224 power amplifier modules.



AE-2545-01

trols. Only the power switch and pilot light will be functional in the new amplifier.

The old Dynaco yields about \$200 in parts—a 1,000 VA transformer, heat-sink, rectifier bridge, circuit breaker, switch, speaker fuses, connectors, and a sturdy chassis with lovely big rubber feet. On a good day, you can pick up an old, one-channel-good Dyna 400 for \$50 on eBay; you'll need to talk to the Teamsters about getting it to your place.

Despite the utility of the Dynaco's original 15A power switch, I chose to use a triac to turn the amp on, believing that MOSFETs are more susceptible to switching spikes and noise than the transistors in the old amp. Audiophiles are, as Nelson Pass notes, a superstitious group. The triac power-on circuit is the same as that used in the Pass/Thagard A75. The voltage regulator circuit is taken

PHOTO 4 (top): PCB 1 mounted and voltage regulator MOSFETs bolted to the transformer shield.

PHOTO 5 (center): Power supply elements mounted and wiring ready for modules and heatsink to be attached.

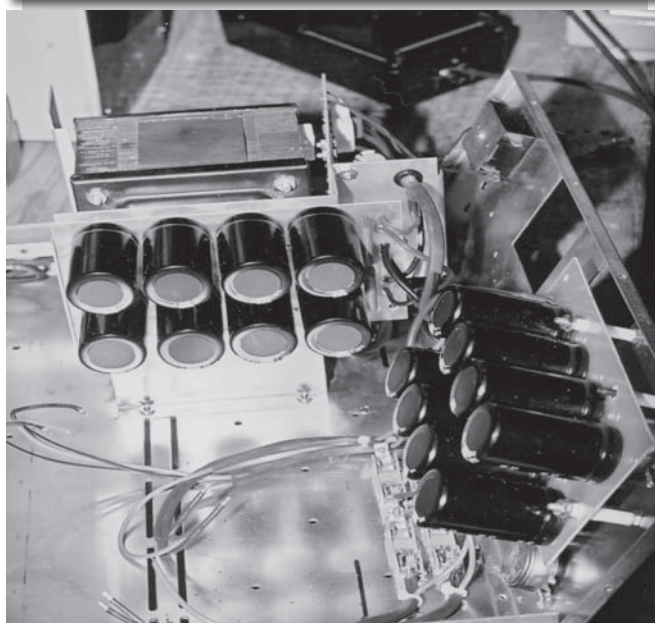
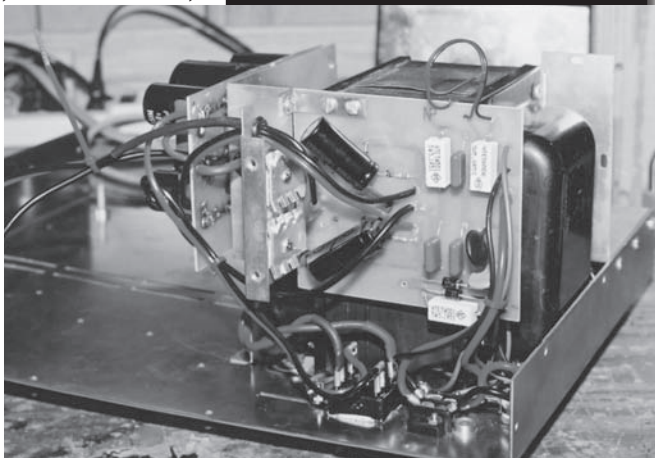
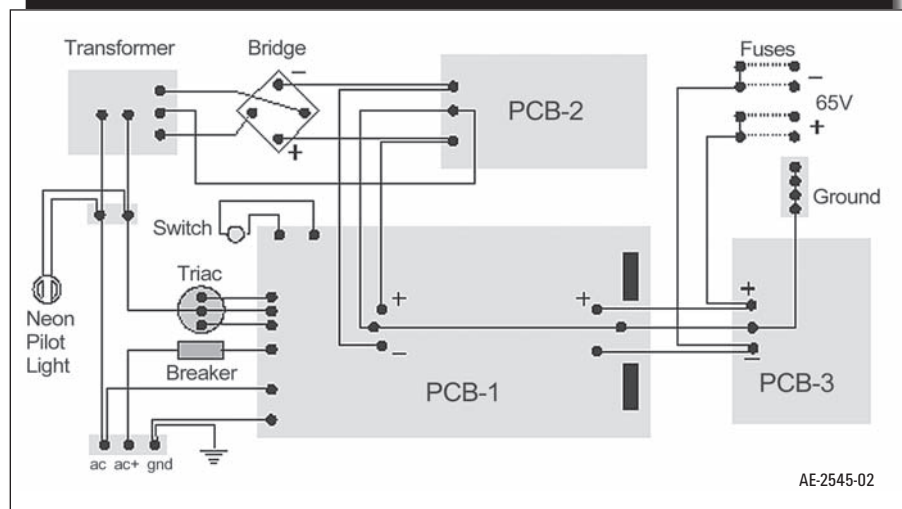


FIGURE 2: 65V power supply—block diagram.



ER Audio Electrostatic Loudspeakers Kits

Now available in the US and UK

The full-range Acorn ESL Kit

ER Audio of Western Australia has been supplying electrostatic loudspeaker kits and repair kits for commercial ESLs such as Quads and B&W to the audiophile community for the past 15 years.

We are proud to announce the establishment of our American and UK/Europe distributors to coincide with the release of the flagship electrostatic loudspeaker DIY kit, the **Acorn**.

The **Acorn** has a double-stacked ESL array with three electrically separate sections. Construction is easy and straightforward.

Sonically, the **Acorn** ranks among the very best of commercial ESLs regardless of cost.

UK/Europe

Colin Topps • claudio@btinternet.com

USA

Mike Beck • beckaudio@gmail.com

Rest of the World

Rob Mackinlay • Rob@eraudio.com.au

Visit our website:

www.eraudio.com.au

PHOTO 6: Power amp modules bolted to the heatsink.

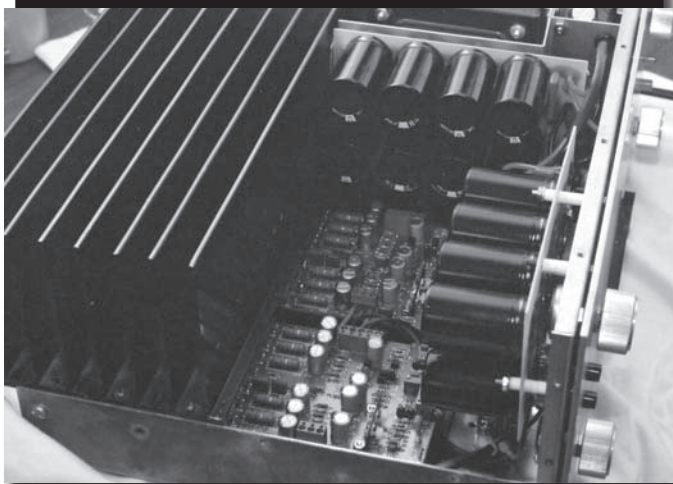
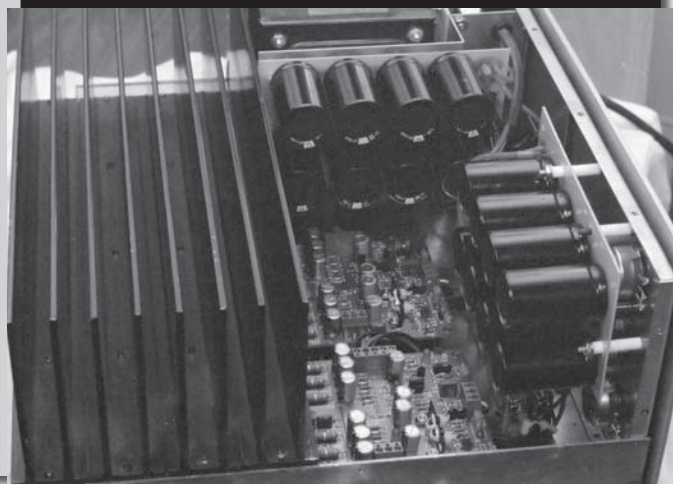


PHOTO 7: Assembled unit. PCB 3 on the right; PCB 2 at the rear; modules below.



from Pass's "Complementary Zen" design. Thanks for both.

Replace the old Dynaco PC30 power distribution board in front of the transformer with the new combined power-on and voltage regulator board, PCB-1. Drill a couple of holes in the transformer shield to bolt down the large voltage regulator MOSFETs (**Photo 4**). I used two old heatsinks as washers

on the top of these devices, but they really don't generate much heat. Place insulating pads or mica washers underneath them.

The large capacitors, C6 and C7, need to be bent over parallel to the board so that they clear the front panel—leave their legs long and cover with heat shrink-wrap. Connect the power switch and pilot light. The original Dynaco pilot is a neon light with a dropping resistor. Connect it across the transformer primary.

The unregulated side of the supply in my amp sits at about $\pm 72V$ (**Photo 5**). The voltage regulator section drops this to a very stable and noise-free $\pm 62V$. This is not the 65V specified in the design, but it is close enough.

Both sets of filter capacitors are mounted on their own PC boards; 40,000 μF before the regulator and 60,000 μF after. PCB 2 fits on the far side of the transformer shield and PCB 3 on the inside of the front panel. You'll need some

spacers to get the front-panel board to sit above the old amp's controls. Use the fuse block from the old amplifier for positive and negative supplies to the left and right amplifier modules.

The two power amplifier modules from Marchand (**Photo 6**) bolt directly onto the base of the oversized Dynaco heatsink. They sit an inch above the floor of the chassis when the heatsink is replaced. They are

Look!!

Click <http://www.eifl.co.jp>
or send e-mail to info@eifl.co.jp
for more products information

- ASANO AMP KIT
- STAX
- SONY (QUALIA 010-MDR1)
- audio-technica
- KOETSU
- DENON
- TANGO (ISO)
- TAMURA
- HASHIMOTO (SANSUI)
- FOSTEX
- JAPANESE AUDIO BO



E-I-F-L

EIFL Corporation

1-8, Fujimi 2-chome, Sayama City, Saitama Pref, 350-1306 JAPAN.
Phone: +81-(0)4-2956-1178 FAX: +81-(0)4-2950-1667
E-mail: info@eifl.co.jp
Wire Transfer: MIZUHO BANK, SWIFT No. MHBKJPJT a/c # 294-9100866

PARTS LIST - Dynaco 400 Assimilation.

- 1 TH1 Thermistor 2.5 Ω - 8A Inrush limiter - (Thermometrics CL 30)
- 1 TZ1 MOV - 250V - 2,500A Transient voltage suppressor (Siemens 510K250)
- 1 T1 Transformer Hammond 1,000 VA, 140V, split secondary
- 1 B1 30A - 250V Rectifier bridge
- 3 C1, 2, 3 .047 μF - 250V Interference suppression capacitor - metalized film
- 8 C4,5 4,700 μF - 100V Electrolytic (Panasonic TSUP - ECO-S2AP472DA)
Capacitors (A-D) and (F-I) on PCB 2
- 2 C6, 7 1,000 μF - 100V Electrolytic - Axial - long leads
- 8 C8, 9 6,800 μF - 80V Electrolytic (Panasonic TSUP - ECO-S1KP682DA)
Capacitors (A-D) and (F-I) on PCB 3
- 4 C4,5,8,9 0.1 μF - 250V Interference suppression capacitor - metalized film
Capacitors (E) and (J) on both PCB 2 and 3
- 3 R1, 2, 7 5 Ω - 2 or 5W Small power resistors
- 2 R3, 4 2.2k Ω - 1/4W Carbon
- 2 R5, 6 221 Ω - 1/4W Carbon
- 1 M1 IRFP 140 IR - MOSFET - N Channel- 23A -100V
- 1 M2 IRFP 9140 IR - MOSFET - P Channel - 23A -100V
- 2-Mounting kits or mica washers for M1,2 - T0-247 case
- 2 Z1,2 Zener diode 68V - 1W
- 2 D1, 2 1N4004 - Diode - 1A
- 2 D3, 4 1N5401 - Diode - 3A
- 4 F1, 2, 3, 4 Fuses 3A, fast blow
- Miscellaneous: terminal blocks, heatsink compound, wire, ties, hardware.

very compact and fit well. You can wire the inputs and outputs of the amp modules before sliding the heat-sink back into the chassis.

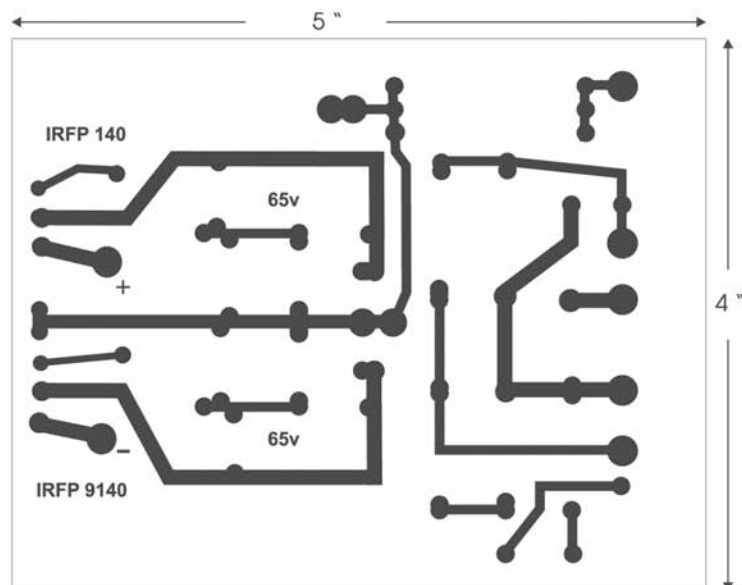
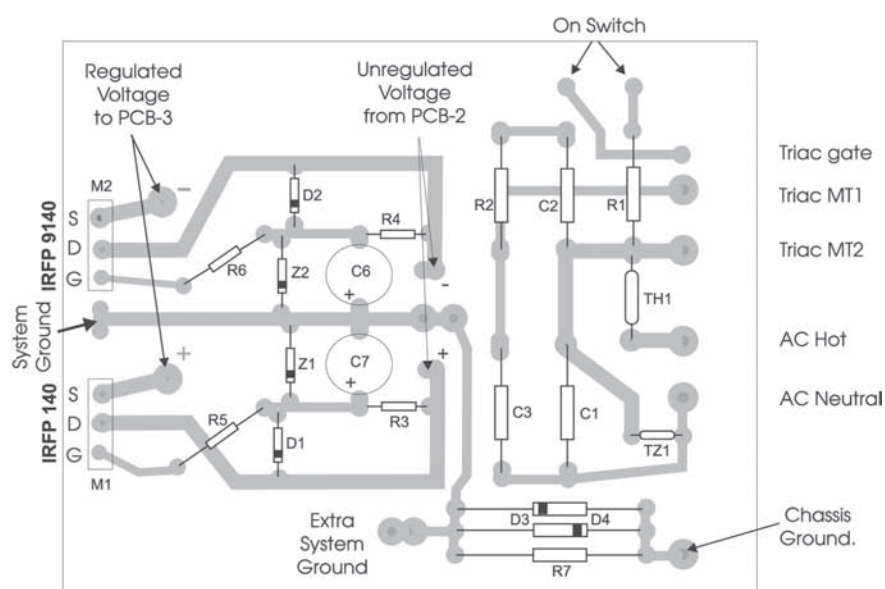
Thanks to quick-connect strips on the boards, hooking up power and ground wires is a two-minute

PHOTO 8: Assimilated "Dynasaur 400" unit returned to service. Shown here slowly burning in on a mix of Asterix, Orbital, Delerium, Enigma, and Infected Mushroom.



FIGURE 3 (top): PCB 1 voltage regulator, top side.

FIGURE 4 (bottom): PCB 1 voltage regulator, copper side.



AE-2545-03,04

Toroids for Audio



Tube Output

Toroidal transformers for tube output applications.

Electrostatic

Step-up toroidal transformers.

Solid State Power

Low noise, low inrush 500 to 2000VA.

Standard Power

Designed for general purpose applications. From 15 to 1500VA.



Part No. **PAT3025-SE**
Application **300B Single-ended**
Primary **2490 ohm**
Power **13W**
Secondary **4 & 8 ohm**
Ratio **24.96:1**
Pwr. Bandwidth **20Hz - 147kHz**
Insertion Loss **0.18dB**
Quality Factor **327,300**
Case **Aluminum**
Finish **Textured black**
Size **153 x 90mm**



8-601 Magnetic Drive
Toronto, ON M3J 3J2
Canada
416-667-9914
FAX 667-8928
1-800-PLITRON (754-8766)
www.plitron.com

www.plitron.com

job. As with the original amplifier, this one opens up nicely for service. The front panel tilts forward for access to the power supply. The heatsink and amplifier modules drop out as a single part once the power and ground wires are disconnected (**Photo 7**).

For now, I am very happy with the rebuilding effort (**Photo 8**). In many respects, the rebuild performs better than the original amplifier and runs much cooler. For the budget conscious, this is a 400W high fidelity amplifier that costs less than a dollar a watt. For people who like to

party, this amp really makes a couple of 15" drivers jump. I'm sure glad the kids are not around to mess with my sound system any more. *aX*

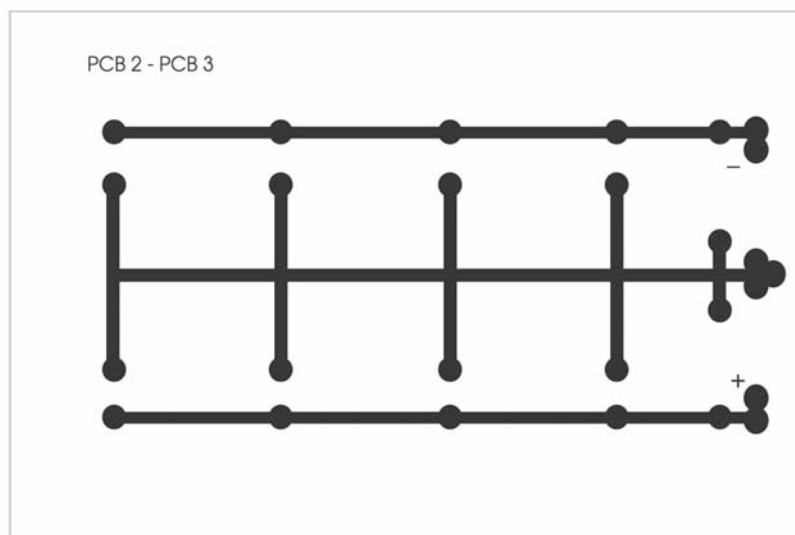
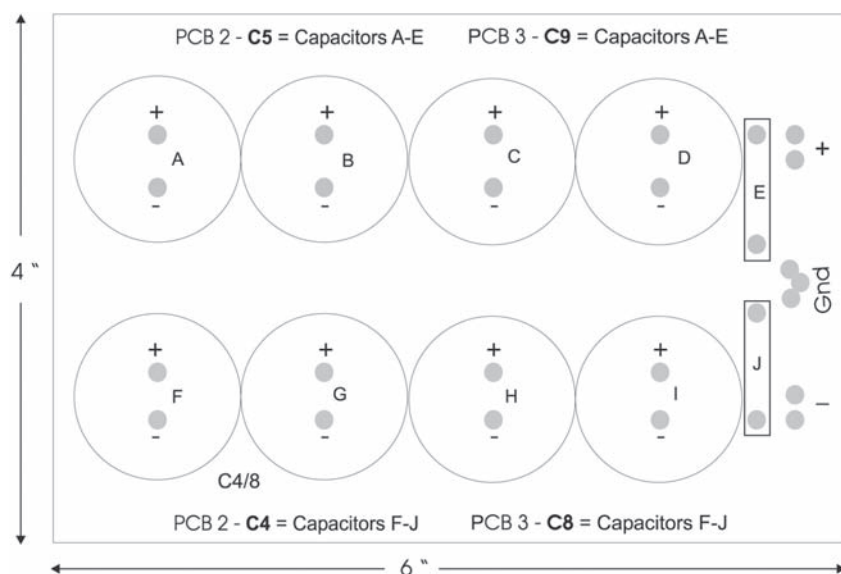
Sources:

Pass, Nelson, "Zen Variations, Part 5: The Complementary Zen," Oct. '03 *audioXpress*.

Thagard, Norman, and Pass, Nelson, "Build the A75 Amplifier," *Audio Amateur* 4/92 and 1/93.

The Unofficial Dynaco Home Page—<http://home.indy.net/~gregdunn/dynaco/>.

FIGURE 5 (top): PCBs 2 and 3 filter capacitors, top side.
FIGURE 6 (bottom): PCBs 2 and 3 filter capacitors, copper side.



AE-2545-05,06

MAKING PC BOARDS

IT'S EASY to make good-looking printed circuit boards using the photofabrication technique.

Print the Artwork – You will need a few sheets of ordinary transparency film—the kind they use to make slides for overhead projectors. Buy it at Staples or Office Depot. You can use a laser or an ink-jet, but make sure that



the type of transparency film matches the printer. I find that I get the best results from ink-jet film in an ink-jet printer set to enhanced mode. The PCB artwork will print full size from this Acrobat file.

The drawings are dimensioned, so check them with a ruler to make sure your printer isn't scaling. Cut out the 4 × 6 design for the copper side of the filter capacitor boards and the 4 × 5 design for the copper side of PCB-1. The photosensitive boards are an inch larger on one side than the designs. Cut them to size after they have been etched.

Expose and develop the boards – Follow the instructions that come with the photosensitive boards. Expose and develop one board at a time. Remove the protective film from the copper side of

Marchand Electronics, Rochester, New York—<http://www.marchandelec.com/>.

Manual—PM224 Power Amplifier Module—<http://www.marchandelec.com/ftp/pm224man.pdf>

Julian Evetts lives in Calgary, Alberta, and works as a consultant and job skills analyst. He grew up on a prairie farm with no electricity, which perhaps deepened his appreciation when he finally did get it. He was bitten early by the electronics bug, built a first crystal set at ten, and due to circumstances, patched together many battery-powered radios in the years that followed. Thus deprived of high-powered amplifiers in childhood, he has perhaps overcompensated in adulthood. He likes to listen to electronica, techno, and trance.

the first presensitized board. Cover it with the artwork and lay a sheet of glass on top to keep the artwork snug to the board. Expose under a fluorescent light for about ten minutes. I always place text in the artwork for PC boards to make it less likely that I will reverse the artwork and produce a mirror-image board.

At the end of the exposure period, remove the glass and the artwork from the board. Dip the board in the developer solution and gently wash away the photoresist to reveal the copper underneath. Rinse immediately and completely under cold running water to stop the process. Expose and develop the other two boards.

Etch the boards using the ferric chloride solution following the instructions on the label. This is the only chemical I have seen that will destroy a stainless steel sink, so be really careful.

Before starting, warm the etching solution by letting the bottle stand in hot water. Put the PC board or boards in the etching tray and cover with warm ferric chloride. Agitate to speed the etching process.

When the copper around the design has been etched away, rinse the board in cold water and scrub lightly with steel wool. Mark the boards and cut to final size—that's an inch off one edge of each board. Drill holes from the copper side of the boards and you're finished.

Photofabrication supplies – Buy a photofabrication kit, such as MG-416K (Photo A). It has everything you will need:

boards, developer, ferric chloride, gloves, and a nifty developing-etching tray.

Otherwise: 1 - Developer (MG - 418)

1 - Ferric Chloride (MG-435)

1 - 4 × 6 presensitized single-sided PCB (MG - 606)

2 - 6 × 6 presensitized single-sided PCB (MG - 609)

Still unsure? MG Chemicals has tutorials, videos, and other helpful information at their prototyping center:

www.mgchemicals.com/techsupport/index_proto.html ■

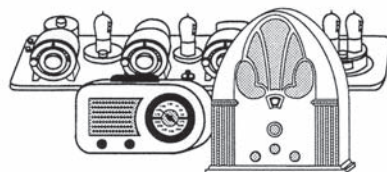
Photo A: Photofabrication Kit from MG Chemicals.

FREE SAMPLE

IF YOU BUY,
SELL, OR COLLECT

OLD RADIOS, YOU NEED...

ANTIQUE RADIO CLASSIFIED



Antique Radio's Largest Monthly Magazine
100 Page Issues!

Classifieds - Ads for Parts & Services - Articles
Auction Prices - Meet & Flea Market Info. Also: Early TV, Art Deco,
Audio, Ham Equip., Books, Telegraph, 40's & 50's Radios & More...
Free 20-word ad each month for subscribers.

Subscriptions: \$19.95 for 6-month trial.
\$39.49 for 1 year (\$57.95 for 1st Class Mail).
Call or write for foreign rates.

Collector's Price Guide books by Bunis:

Antique Radios, 4th Ed. 8500 prices, 400 color photos \$18.95

Transistor Radios, 2nd Ed. 2900 prices, 375 color photos \$16.95

Payment required with order. Add \$3.00 per book order for shipping. In Mass. add 5% tax.

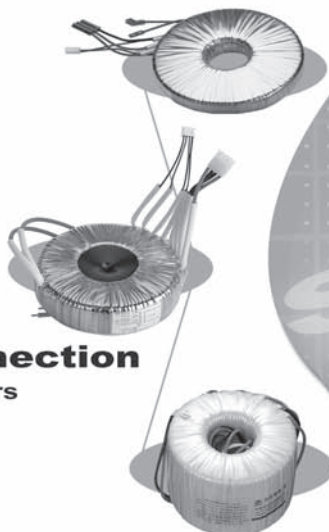


A.R.C., P.O. Box 802-A16, Carlisle, MA 01741

Phone: (978) 371-0512 — Fax: (978) 371-7129



Web: www.antiqueradio.com — E-mail: ARC@antiqueradio.com



Faithful Connection

Sunrise Transformers

www.us2sunrise.com



Sunrise E.&E., Inc

TEL: 909-598-9136 FAX: 909-468-0307