Geocities.com/midimagic@sbcglobal.net/mixcurve.htm. You can find the settings needed when using an RIAA phono section to correct for the non-RIAA curves at: www.Geocities.com/midimagic@sbcglobal.net/mixcompn.htm.

First look up the code for the equalization curve of your recording (such as 500C-16 for Columbia LPs). Then look up that code in the second resource. In this example you need these corrections:
20Hz -8.0dB
40Hz -5.0dB
62Hz -4.5dB
100Hz -2.0dB

The plan was to run the output from my custom stand-alone RIAA phono preamp through my Behringer DEQ2496 equalizer into my computer's sound card. In the analog domain, the Behringer only has balanced inputs and outputs. It would be fed from an unbalanced preamplifier and would feed an unbalanced computer audio card.

Therefore, the signal would undergo a transformation from unbalanced to balanced and then back to unbalanced in its journey from the phono cartridge to the computer sound card. Instead of using adapter cables to convert between unbalanced and balanced, as I had done in the past, it seemed time to "kick it up a notch."

This application was a good way to test the circuits from THAT Corporation. The concept was to build a box that could take the unbalanced output of the phono preamp, convert it to balanced (using two THAT 1646 differential line-drivers) for the equalizer inputs, and then convert the equalizer output back to unbalanced (using two THAT 1206 balanced line-input receivers) to feed monitoring headphones and the computer.

STARTING THE PROJECT

Any electronics project I have built started with an idea, moved to a schematic, then layout, construction, and testing. The concept part was made easy with these new ICs and their supporting datasheets.

Usually I draw the schematic by hand and then do the layout and build the project using perfboard and terminals. This time I tried another approach—find an easy-to-use PC software package that would enable me to produce a printed circuit board onscreen.

A web search led me to www.ExpressPCB.com, an Oregon-based company offering free tools that allow you to produce a schematic, check it for errors, link the schematic to a board-layout program, complete the layout, and electronically ship the results to them for circuit-board production.

Their schematic program (ExpressSCH) comes with a library of device components. You can also produce your own components either by modifying one of their existing components or by producing your own and storing them in a custom component library.

Although reasonably intuitive, it took a while for me to understand the production of a device from scratch, especially the placement of leads, connections, and the numbering scheme. Their manual will guide you through the process of producing a schematic. One subset of that manual is a guide to help you when making schematic components to use in the program (that part is available from them in PDF format at www.ExpressPCB.com/ExpressPCBBin/ExpressSCHComponentGuide.pdf).

In addition to the library of components, the program also comes with a library of symbols. As with components, you can make custom symbols and store them in a custom symbol library. I especially liked the use of ports, which are symbols indicating a connection that can be for signals, power, grounds, and so on. Using them eliminated the need to show a lot of repetitive connecting lines on the schematic.

For example, you could use a symbol on the schematic for a +15V DC supply connection wherever you needed one, without running a line back to a single supply point. Because the schematic will later be linked to a PCB layout program, the ports will indicate connections that need to be made on the board without actually showing the connecting links as lines. This resulted in a very clean schematic that looked more like a group of functional blocks than my freehand drawings. It also allows you to save your frequently used components and symbols in a library called Favorites that minimizes search effort when drawing the schematic. Once learned, the program was quite effective. An additional bonus is a tool that checks for netlist errors such as pins that were not connected.

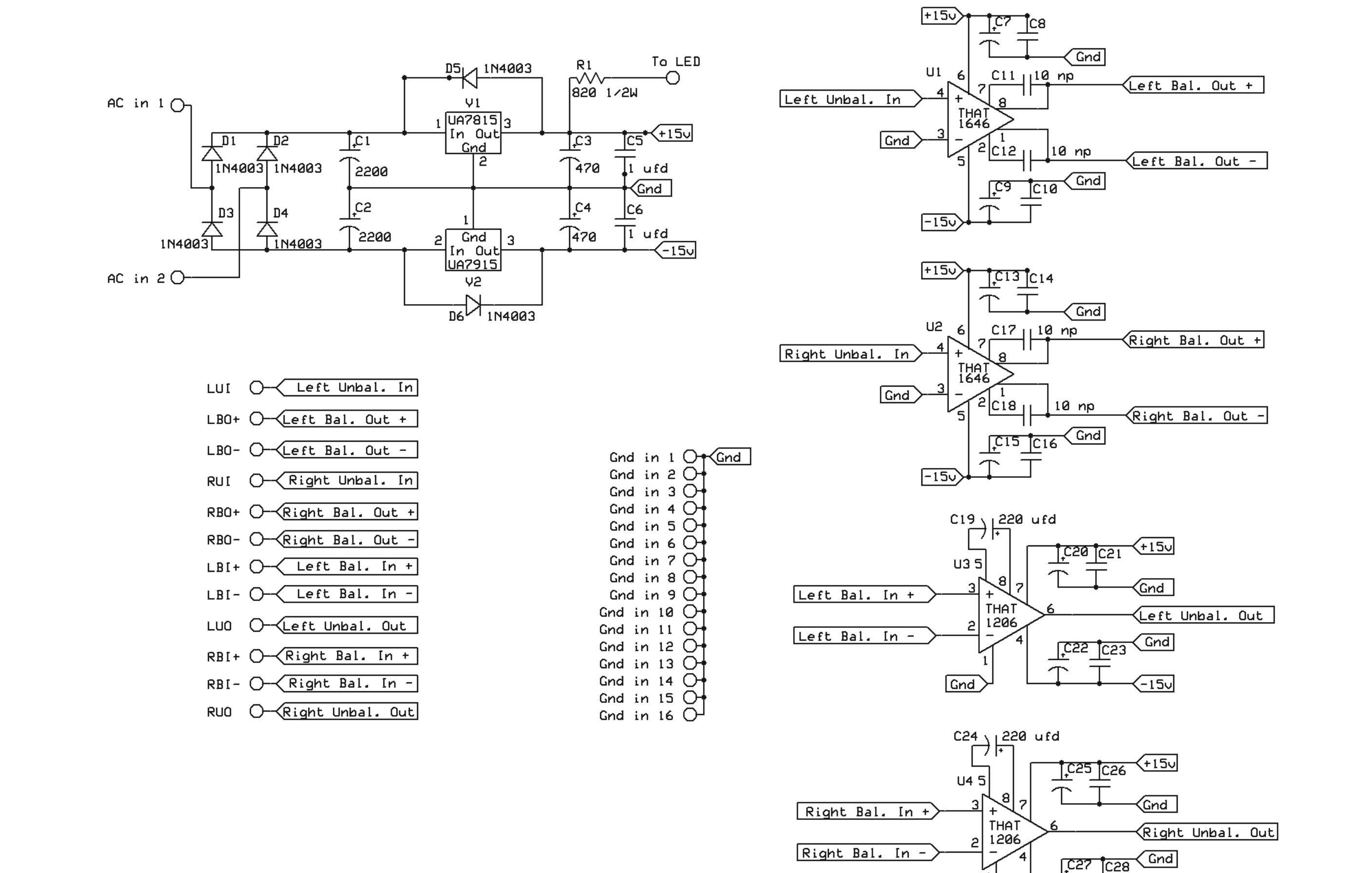

FIGURE 1: Unbalanced/balanced converter circuit.

CIRCUIT DESCRIPTION

Figure 1 shows my completed schematic, including the power supply but less the power transformer (which is not mounted on the board). The power supply section takes the secondary output of a 34V AC center-tapped transformer, uses four diodes (D1 – D4) in a full-wave bridge configuration to rectify it, and filters it using capacitors C1 and C2. That DC voltage then passes through two IC regulators (V1 for the positive bus; V2 for the negative bus), and is further filtered using capacitors C3 – C6.

Diodes D5 and D6 provide protection for the regulators against reverse bias. Resistor R1 feeds power to a chassis-mounted power indicator LED. The transformer secondary's center tap is connected to the circuit board's ground.

For this project, where high levels of RF interference would not be a problem, I used a basic configuration for the unbalanced-to-balanced and the balanced-to-unbalanced sections. If RFI is a problem, the ICs' datasheets detail methods to reduce RFI without materially affecting common-mode rejection.

The active sections of the circuit are simple, as shown in the schematic. The unbalanced-to-balanced section of the left channel consists of U1 (the balanced-line driver), power supply bypass capacitors C7 – C10 mounted right at the IC leads, and two capacitors C11 and C12 that serve to reduce the output DC common-mode voltage to zero. It is repeated for the right channel using U2.

The balanced-to-unbalanced section of the left channel consists of U3 (the balanced input line receiver), power supply bypass capacitors C20 – C23 mounted right at the IC leads, and capacitor C19 that provides the bootstrapping current to generate a very high AC common-mode impedance.

Again, these are simple circuits. If the circuits will be subjected to very high RFI or the possibility of electrostatic discharges, refer to the datasheets for suggestions on how to reduce those risks with minimal impact on common-mode rejection.

Also note the ports for power, signal, and ground leads. The signal and some of the ground ports are connected to stand-alone holes with descriptions indicating the functions of each port. The power