



Figure 8.1 Schematic of phono preamplifier circuit.

tion'' refers to a standard pre-emphasis that was involved in cutting the master record mold. This pre-emphasis was designed to limit the excursion of the groove at low frequencies and to improve signal strength at high frequencies. The preamplifier has to undo this pre-emphasis, with an opposite de-emphasis, and in doing so modifies the noise results from what you would have for an amplifier without de-emphasis. The circuit file for this follows:

```
Noise from magnetic phono-cartridge
Vgen 1 0 AC 1
Rgen 1 2 1350
Lgen 2 3 .5
Rin 3 0 47K
E1 4 0 3 0 10 ; first pole of RIAA curve @ 50Hz w/20db boost
R1 4 5 1
C1 5 0 3.528m
R1A 4 6 212.8m ; pole @ 2120Hz
C1A 6 5 352.8u ; zero @ 500Hz
.ac dec 100 20 20K
.noise v(5) Vgen 100
.probe
.end
```

You will notice that we have selected the output of the equalization as our noise output, and the signal generator of the phono-cartridge as our reference input. We have selected a frequency response analysis with a range of 20 hertz to 20,000 hertz to cover the entire audio range. This is the range over which the noise calculations will be made. After running PSpice, we may graph the noise results directly. But first, let's look at the transfer function of the equalizer, so you will understand some of the noise calculations we try later. The transfer function is displayed as shown in Figure 8.2.

With 1000 hertz as the unity gain reference frequency, you can see that the lower frequencies get quite a boost. Let us see what this does to the noise from our pre-amplifier.