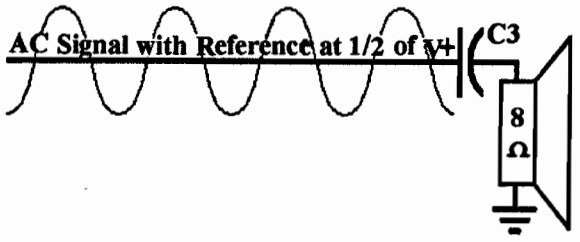

Figure L57-4

the signal and feedback at pin 2 would be referenced to ground in a DC system. They would no longer be floating artificially referenced to a redefined ground at half of the voltage. Take a moment and trace the circuit.

If you want to stop the circuit from working, go ahead and bypass C3 and connect the speaker directly to the connected emitters.

What? It stopped working? Don't say I didn't tell you so.

Lesson 58
The Electret Microphone

An electret microphone is a common component in audio systems. It is inexpensive and very sensitive. Microphones offer many design opportunities for this project.

Look carefully at the components inside the electret microphone (Figure L58-1).

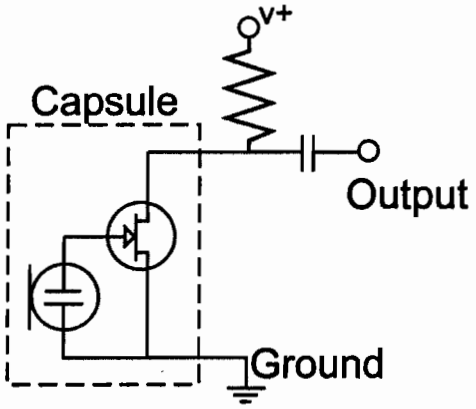

Figure L58-1

There are three types of microphones:

1. The coil microphone is similar to a speaker. It uses a magnet set inside a coil of wire. These can work independently of a powered circuit because they create their own voltage.
2. Piezo (crystal) microphones also create their own energy. These crystal structures respond to the compression and decompression of sound waves, releasing electrical energy. The crystals effectively translate the fluctuating energy into fluctuating voltage. This works in reverse, too. Feed voltage to the crystals and they vibrate. This effect is used to create quality, low-power speakers.
3. The electret microphone is an active capacitor. One of its plates is exposed to the air so that it vibrates as sound hits it. The plate's fluctuations disturb the steady DC voltage (pressure) by deforming the exposed plate ever so slightly. Those fluctuations in voltage match the sound. That becomes our signal. Because the electret microphone is an active capacitive component it needs power to work.

The photo in Figure 58-2 shows one of the legs connected directly to the outer casing. That leg is ground.

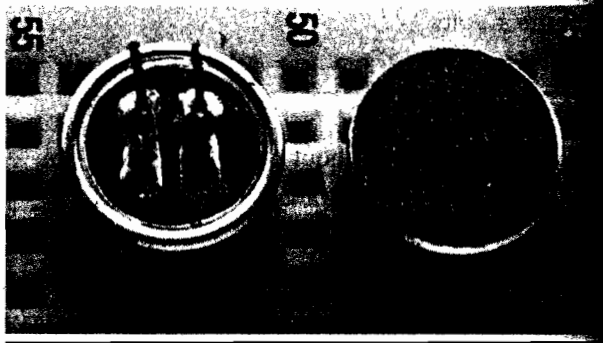

Figure L58-2

Build the Circuit

Set up Figure L58-3 as an independent circuit. Don't attach it to your Op Amp's input.

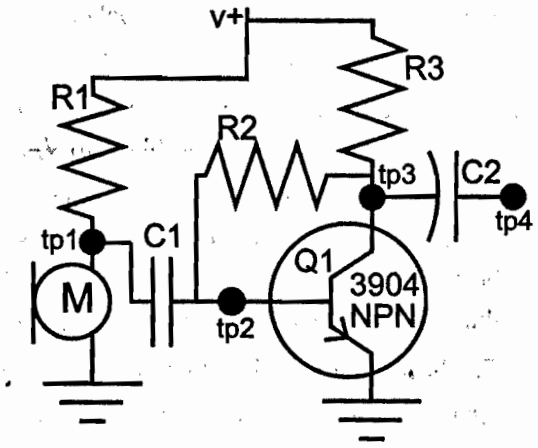

Figure L58-3

The parts needed are listed in the Parts Bin.

All of this looks new, but you're already familiar with it. Let's take a walk through.

- R1 & R3—10 kΩ
- R2—100 kΩ
- M—Electret microphone
- C1—.1 µF
- C2—4.7 µF
- Q1—2N3904 NPN

- R1. Because it is a single resistor, R1 only decreases the current, not the voltage.
- The microphone, like many capacitors, is balanced between DC voltage source and ground.
- C1 and C2 are audio couplers. They pass the AC signal but block the current.
- Q1 is your basic 2N3904 NPN transistor.
- R2 is the feedback loop, from output to input. It works exactly the same as in the Op Amp.
- The ratio of R2:R3 (100k:10k) dictates the gain created by this single transistor amplifier.

Checking It Out

Power it up and let's do some measuring. You will have to set up a speaker near the microphone while a recorded tone is playing. Check AC and DC voltages at all four test points and record these on Table L58-1.

	DC Tone	DC Music	AC Tone	AC Music
TP1				
TP2				
TP3				
TP4				

You can use the Soundcard Scope's Channel 2 to see the tone's signal, but music output from the computer will occupy both channels. If you want to see the microphone's response to music, you'll have to use an outside sound source—something other than your computer.

To use the microphone as an input to the Op Amp, C2 acts as the output audio coupler for the microphone subsystem and the input audio coupler for the Op Amp circuit.