

Experiment 5: Voice Recording Circuit

Goal

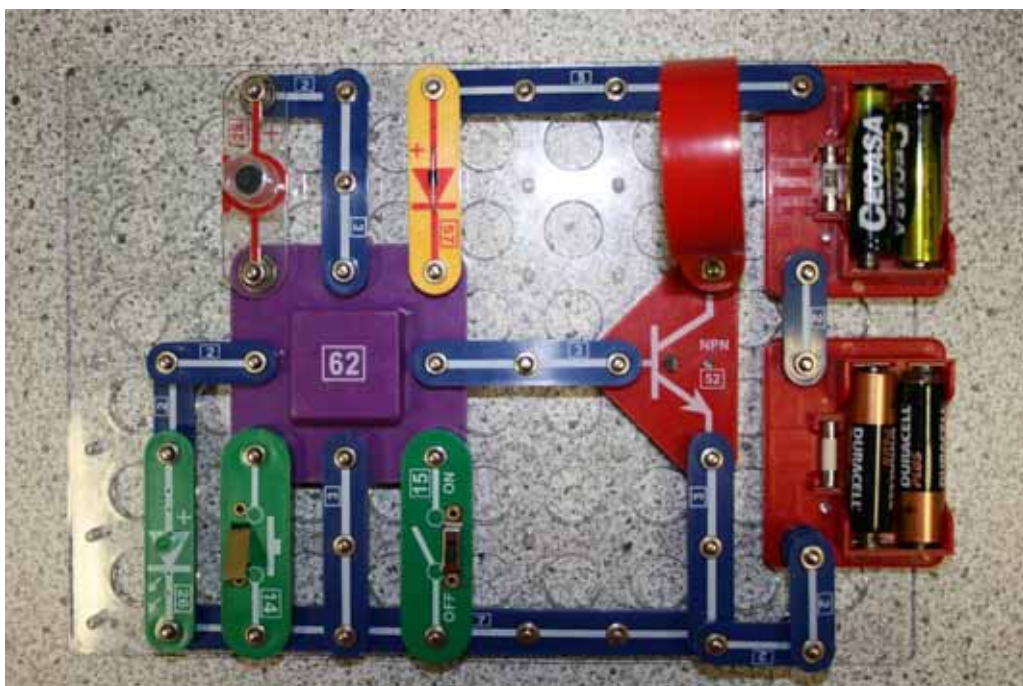
Here you will build a circuit that allows you to record your voice, and play it back again. The circuit also generates some Christmas music. Think about what components you will need, before looking at the parts list below. It's quite a big circuit, and it will take up almost all the space on the board.

Components

1. Microphone. A microphone is something that takes sound signals (like your voice) and converts it into an electrical signal.
2. Speaker. The speaker does the opposite to the microphone – it takes an electrical signal and converts it into a sound.
3. Memory. We need some part of the circuit that will remember what your voice sounded like, and also remember the Christmas music. All of this is built into an IC for you – the Recording IC.
4. Switches. You'll need the slide switch to tell the circuit when you want to begin recording and stop recording. We'll also use the push-button switch for the playback.
5. Battery pack. As usual, the IC and other devices in the circuit need power from the battery to do their job. This IC takes more power than the other circuits we've built. It uses two battery packs in series (like in Experiment 3).
6. LEDs. LED stands for Light Emitting Diode. They are small lights that come in different colours. They are not really necessary in this circuit, but they make it look good!
7. Diode and NPN transistor. This circuit has a diode, which connects the Recording IC to the battery packs. The NPN transistor is used as an amplifier for the speaker.
8. Connectors. As usual, connectors are used like wires to connect all the components up in an electrical circuit.

Build it!

Connect up the circuit as shown below. There are lots of overlapping connectors in some places, so use the one-snap connectors to raise them higher, if needed.



In Action

This circuit works in 3 ways.

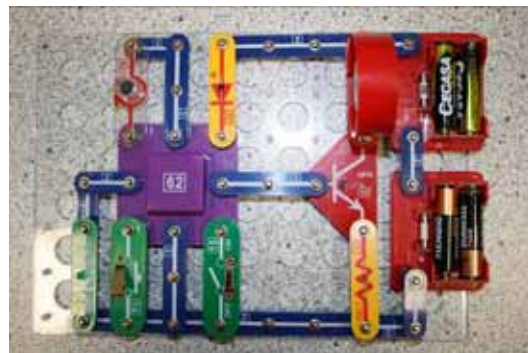
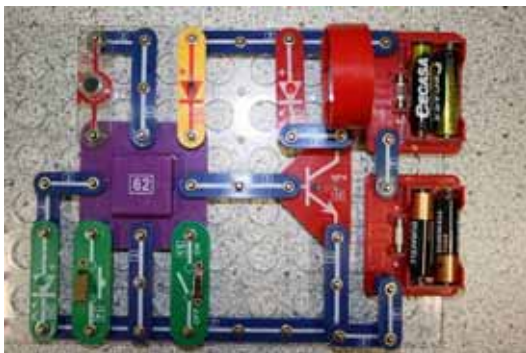
1. When you first build it, you can use it to play Christmas music. Leave the slide switch in the OFF position. Push the push button to hear a tune from the speaker. The green LED will flash on and off in time with the tune. Push the push button again to stop the music.

You can hear two more tunes by pushing the push button again.

2. If you want to record your voice, or someone else's voice, close the slide switch in to the ON position. The speaker will beep once – the circuit is now recording. Say something into the microphone, or whistle a tune. When you are finished, open the slide switch to the OFF position. Or you can wait, because after 6 seconds the IC will stop recording anyway. When the IC stops recording, the speaker beeps twice.
3. Now you can play back what you've just recorded. When playing back, make sure the slide switch is in the OFF position. Push the push button and you will hear the recording through the speaker. Pushing the button again stops the playback. The IC is designed so that if you keep pushing the button, it will switch between playing your recording, and playing Christmas tunes.

Change it around

If you like, you can add an extra LED in parallel across the speaker, like in the picture below left. This LED will flash when the speaker is playing back your recording, or playing the music. Or if the noise from the circuit is getting on your family's nerves, you can limit the current through the speaker (and therefore the volume) by placing a 100 Ohm resistor in the amplifier circuit (below right). But if you do add this extra resistor, there won't be enough current to light the red LED.



Real World

What recording and playback circuits can you think of in the real world? When you listen to music on an MP3 player, that music has been changed into an electrical signal and stored in a memory.

Or when you speak into a mobile phone, a microphone converts your voice into an electrical signal. This signal is then transmitted through the air, and played back to your friend through the speaker on their phone. All of the conversions happen so quickly that you don't notice the delay – it is as if you are talking to your friend in the same room.