

# An Almost-No-Solder Electronic Organ

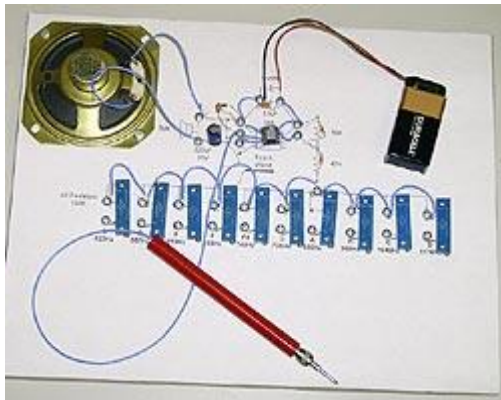
By Mark Spencer, WA8SME, former ARRL Education & Technology Program Coordinator and Dave Hassler, K7CCC, former News Editor of QST and the ARRLWeb  
February 28, 2004



*Over two dozen concepts in physics and electronics can be taught with a project built from just a handful of parts...and it's fun, too!*

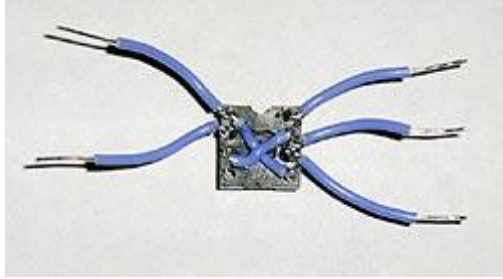
You remember *Field of Dreams* the baseball fantasy movie where Ray Kinsella heard a voice that whispered, "If you build it, they will come," don't you? Well, former ARRL Education & Technology Program Coordinator Mark Spencer, WA8SME, has come up with a successor to his [No-Solder Code Practice Oscillator project](#) that--if you build it--is sure to spark delight and interest in children.

The new project is a 10-key electronic organ--designed with the same construction methods as the CPO--with simplicity, low cost and fun kept in the mix. "This is a little more involved than the CPO, but it allows for a whole mess of things that can be studied during the construction and use of this little project," Spencer said.



**A whole stack of electronics concepts related to Amateur Radio can be taught using this simple almost-no-solder electronic organ project. [Mark Spencer, WA8SME, photo]**

He rattled off a laundry list of learning possibilities: frequency, pitch, period wavelength, square versus sine wave, amplitude, duty cycle, RC time constants, blocking cap, bypass cap, integrated circuits versus discrete components, oscillation, fixed versus variable value components, monostable versus astable oscillation, solving algebraic equations for an unknown, electronic fundamentals of a musical instrument, frequency versus pitch, amplitude versus pitch, stability, unit conversion using scientific notation, musical notes and scale.

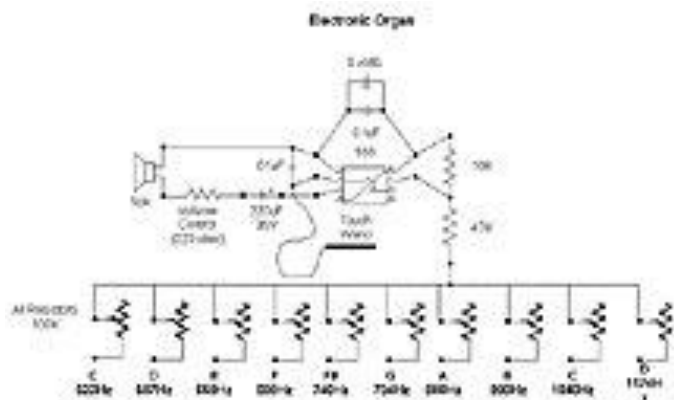


**Note the connections between pins 8 and 4, and 6 and 2, of the socket. Someone with soldering experience should prepare the socket before children begin construction. [Mark Spencer, WA8SME, photo]**

The project involves the use of a 555 timer IC as an astable oscillator. This requires a little soldering prep work by an adult to make the small integrated circuit a little easier for children to work with when it's connected to the board, Spencer said. To "extend" the pins of the IC socket, small leads of 18 or 20 gauge copper wire are soldered to the relevant pins to allow kids to bring the IC into the circuit without soldering ([see close-up photo](#)).

The rest of the parts list is as follows:

- 10 - 100 k $\Omega$  variable resistors
- 2 - 0.01  $\mu$ F disk capacitors
- 1 - 220  $\mu$ F, 35 V electrolytic capacitor
- 1 - 47 k $\Omega$ , 1/4 W resistor
- 1 - 10 k $\Omega$ , 1/4 W resistor
- 1 - 220  $\Omega$ , 1/4 W resistor
- 1 - 4 to 16  $\Omega$  speaker
- 1 - 9 V battery and connector with leads



## **The project schematic.**

You'll also need a probe to use as a "touch wand," some hook-up wire, 36 wood screws of an appropriate length and a board of at least 10 by 6 inches. Spencer noted that some of the screw/connection points can be eliminated and the 220  $\Omega$  resistor can be changed to demonstrate volume control. "I'm sure there are a couple of other little changes or modifications that can be done," Spencer said. "That's what's fun about it: giving kids the chance to experiment and see what happens."

To obtain the schematic/layout, click on the image here to get a full-sized picture. Print it out and affix it to a piece of pine, fir or 3/4 inch plywood. Then, start building! It's often helpful to make a small "starter hole" with a drill, awl or nail where each screw will go, especially if you choose a board made of hardwood. Once construction is finished, the variable resistors need to be tuned to the marked frequencies, initially tuned to the key of G; many other tunings are possible. Then, it's time to start playing heavenly music!

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