

# Electronic Bug Emulator

*Put some personality back into your CW.*

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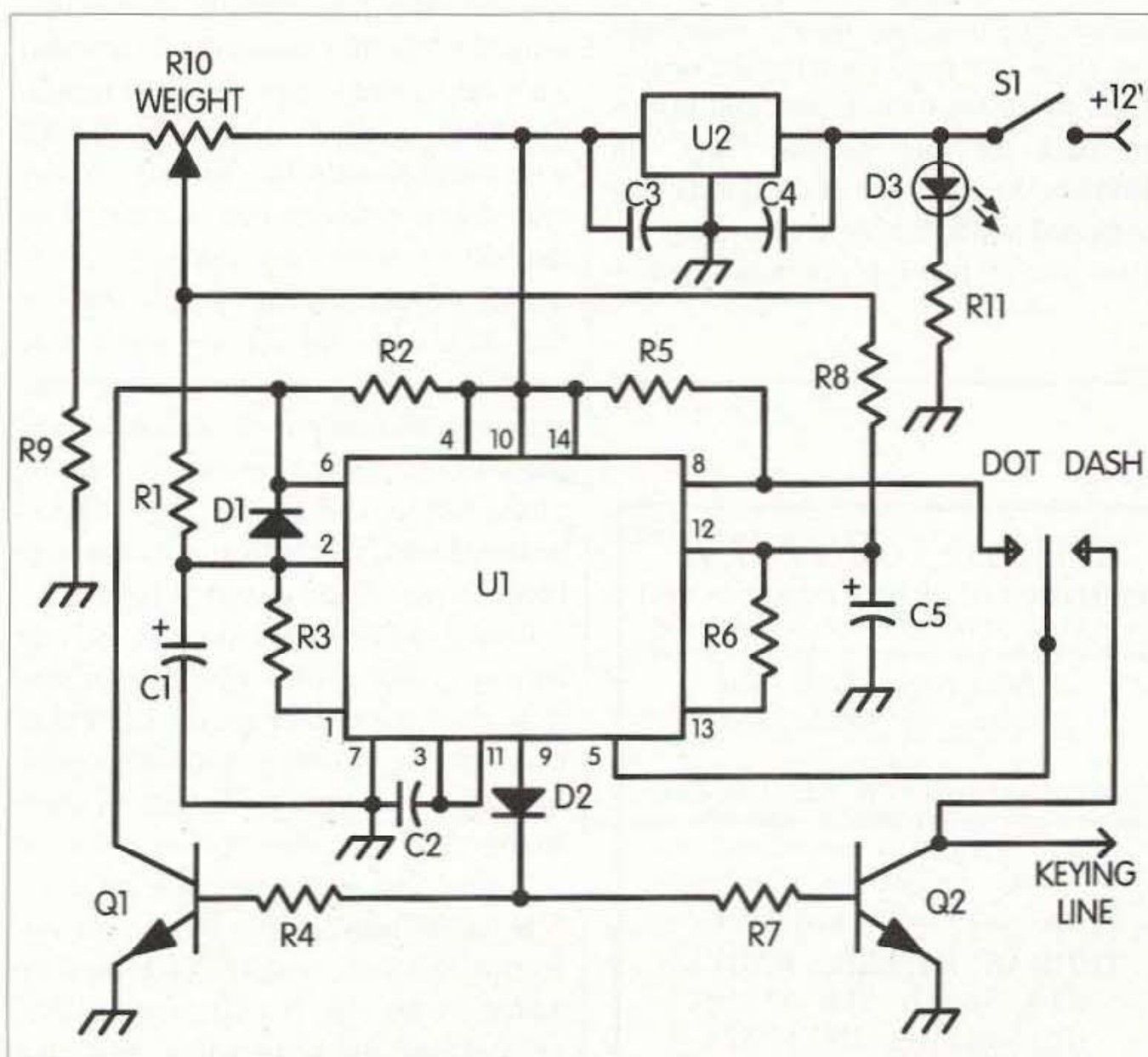
**H**ow many of us initially succumbed to the lure of an electronic keyer and sold our bugs, only to become dissatisfied at the lack of personality in our CW? Or made keying errors with the new gadgets and wished we had our old bugs back? Yes, you and me and lots of others. With this article, I hope to take many of us forward to the past.

New standard Vibroplex® bugs cost \$160, and the price rises rapidly for the fancier models. This is a cost most of us cannot afford to pay. But all is not lost. Described here is a very simple, cheap, and easy way to put the feel of a bug back into our operating, and it can be done for less than five dollars!

However, before we spend that five dollars there is a minor problem to solve. Some of us already have single-lever paddles, which is what is needed to complete the electronic bug. As far as I know, all such paddles have grounded wipers. This circuit requires that the paddle have all three contacts floating—dot, dash, and wiper. Unless an existing paddle can be modified, it may be necessary to home-brew a single-lever paddle in order to take advantage of this project.

**Fig. 1** illustrates the simple electronic portion of the single paddle bug. The circuit is not original with me. I

started with a portion of a 25-year-old design by W7ZOI and made some modifications to get the results I



**Fig. 1.** Schematic of spaced dots generator.



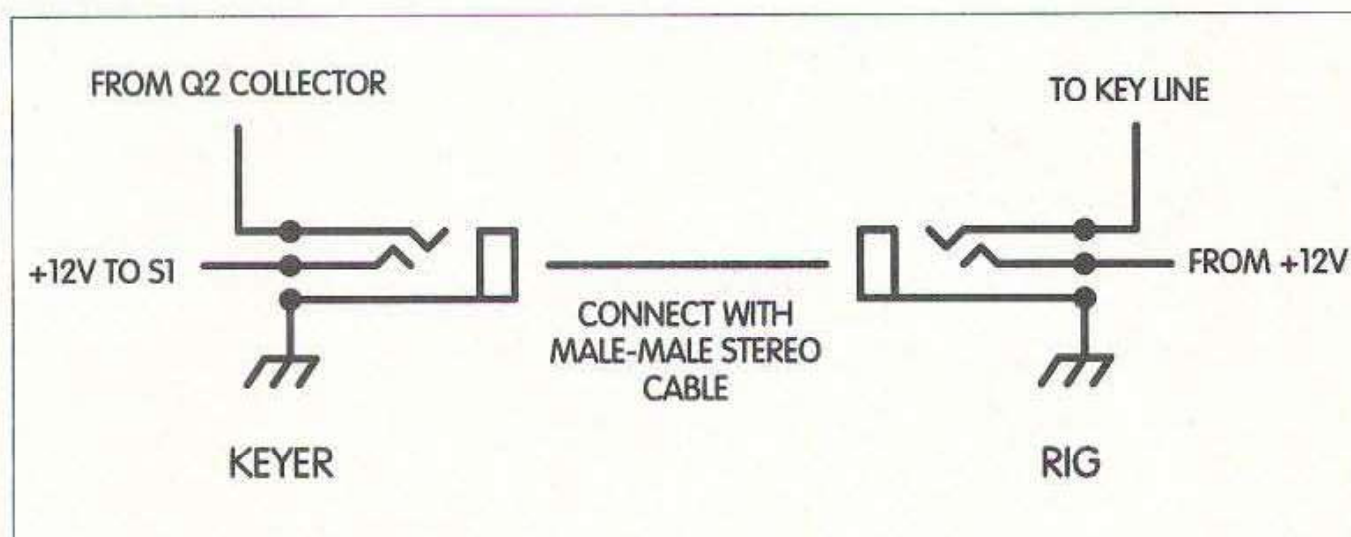


Fig. 2. Power and keying wiring.

needed. The original circuit was more complex and did things not needed in this final design.

Both timers in U1 together produce perfect dots and spaces, the speed of which is controlled by the weight potentiometer, R10, which serves the same purpose as moving the weight on a bug. When the paddle is pressed for dots, a stream of perfectly spaced dots is generated and keys the rig through Q2, the keying transistor. Dot speed is adjustable, as on a Vibroplex, from approximately three to 25 dots per second—equivalent to a keying speed range of seven to 60 wpm.

When the paddle is pressed for dashes, this is a "key down" condition exactly as in a bug, allowing the operator to make his own dashes and bringing back the familiar bug "feel." In addition, the dash side of the paddle can be tapped just as if it were a hand key for those times when it is necessary to key

very slowly. Also, this function is retained even if the circuit is not powered.

### Construction

The spaced dot generator can be constructed on a small piece of perfboard or a general-purpose printed circuit board, or you can use the "dead bug" style of ugly construction on a small piece of unetched printed circuit board. Parts placement and lead lengths are not critical. It can be mounted in a small enclosure, or possibly right on or inside the base of the paddle.

To reduce clutter, it will be preferable to solder three jumpers on the bottom of U1 before mounting it, whether a socket is used or not. Strip the insulation from a short length of stranded wire and separate the strands. Solder one strand between pins 4 and 10 on the bottom of the chip, making the soldered connections high on the pins of the chip, and clip off any extra lead lengths. Solder another jumper between pin 3 and pin 11. Place a small piece of cellophane tape on the bottom of the chip covering these two jumpers as insulation. Now solder a final jumper between pin 10 and pin 14 as before.

Power can be supplied by an internal battery or by taking operating voltage from the rig it will be used with. Fig. 1 includes an optional On/Off switch and LED if an internal battery is used. In this case, you may or may not want to include the voltage regulator U2.

If taking power from the rig for operating this unit, a stereo jack must be added to the rig. It will carry +12 V, ground, and the keying line through a connecting cable. The ring carries the

### Parts List

C1, C5	1 $\mu$ F 10 V
C2, C3, C4	0.1 $\mu$ F disc or monolithic
D1, D2	1N4148, 1N914, or equivalent
D3	LED
Q1, Q2	NPN bipolar transistor (2N3904, 2N4400, 2N2222, etc.)
R1, R8	33 k 5% 1/4 W
R2, R5, R9	47 k 5% 1/4 W
R3, R6	100 5% 1/4 W
R4	10 k 5% 1/4 W
R7	2.2 k 5% 1/4 W
R10	10 k linear potentiometer
R11	2.4 k 5% 1/4 W
S1	SPST toggle or slide switch
U1	556 dual timer IC
U2	78L05 regulator

Table 1. Parts list.

keying line, the tip carries +12 V, and the sleeve is common ground. Fig. 2 illustrates using a stereo jack on both the dot maker and the rig, and connecting the two through a three-wire cable with stereo plugs on each end. However, the cable can be hard-wired into the electronic circuit and the stereo plug on the other end plugged into the new jack on the rig.

This circuit draws only about 10 mA with U2 installed. If you wish to have audio monitoring of your keying, perhaps for practice sessions, a small piezoelectric alarm can be connected directly between the +5 volt bus and the collector of Q2. This will add about 10 more milliamps to the total drain with key down.

### Forward to the past

Now that you have your new electronic bug emulator, no one you QSO with will have any idea you aren't using a Vibroplex!

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