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The New, Improved "Best Keyer Yet"

—updating MINI-MOS

When I became the owner of a brand new TS-520D, I became somewhat ashamed of my Radio Shack straight key. I looked around at several different keyers and decided that the best I had seen, by far, was the MINI-MOS by WA6EGY.[1] I left fingerprints all over the article for quite a while, and then Santa Claus delivered a beautiful new HK-1 dual-lever squeeze paddle from Ham Radio Center.[2] I was now forced to quit fingering the pages and start building.

Now, being the type of person I am, I can't leave a perfectly good design alone, even one as beautiful as the MINI-MOS. After much searching, I was finally able to make two changes that, I think, add the icing to the cake. The two changes are independent of each other, so both, either, or neither can be incorporated.

Photos by Jim Gerritz WA4FMA

Final happy combination: MINI-MOS+, HK-1 squeeze paddle, and TS-520D.

Mod. 1 is quite simple. In the original keyer, the base of the paddle, if an external paddle is used, is not at ground but at -9 volts. If you are as violent on CW as I am, or if your shack is as messy as mine, there is a very real possibility that the paddle base could come in contact with ground, vastly reducing battery life. By replacing the cross-coupled NAND gates used for dot and dash storage with a dual type D flip-flop, used for set-reset, the paddle base is now at $+V_{dd}$, which is chassis ground. The only thing that is not obvious is the fact that, with both the set and reset inputs to the 4013 flip-flop high, both the Q and $\overline{Q}$ outputs go high. This feature is necessary to make the keyer work as originally designed.

Mod. 2 is a little more complex. One thing I had noticed when working CW is that, as the speed goes higher, character spacing seems to disappear. I hoped that my CW didn't exhibit this phenomenon, but I wanted to be sure. I wanted automatic character spacing. I also decided that I didn't need, or want, the built-in sidetone oscillator, since there was already one in the TS-520D. This freed up two 2-input NOR gates and one 2-input OR gate for other uses. By adding one quad 2-input NAND gate (4011), I could get my automatic character spacing.

Now for those of you who may have forgotten, the MINI-MOS does not just generate dots and dashes, but dot/space and dash/space pairs. When U3A is set, an element two dot lengths is sent, first a dot (1 dot length) and then a space (1 dot length). When U3B is set, an element four dot lengths long is sent, first a dash (3 dot lengths) and then a space (1 dot length). In order to get a character space (3 dot lengths), a space 2 dot lengths long had to be added to the end of the element being sent

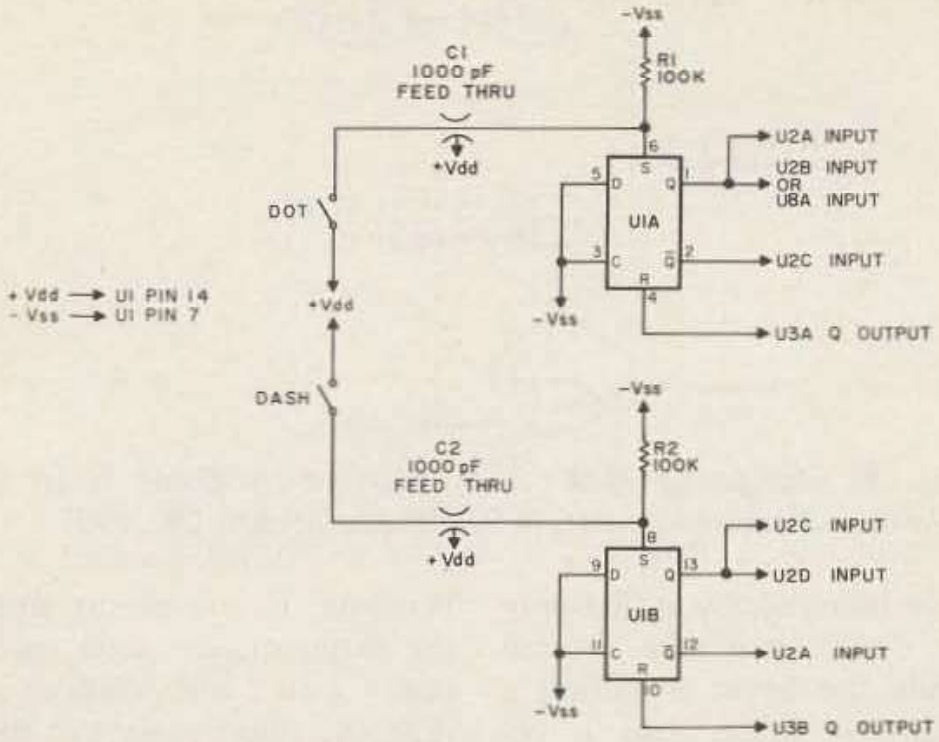


Fig. 1. Mod. 1 to place paddle base at chassis ground (+ V_{dd}). Second U1A Q output goes to U2B if Mod. 2 is not incorporated or to U8A if Mod. 2 is incorporated. U1: 4013.

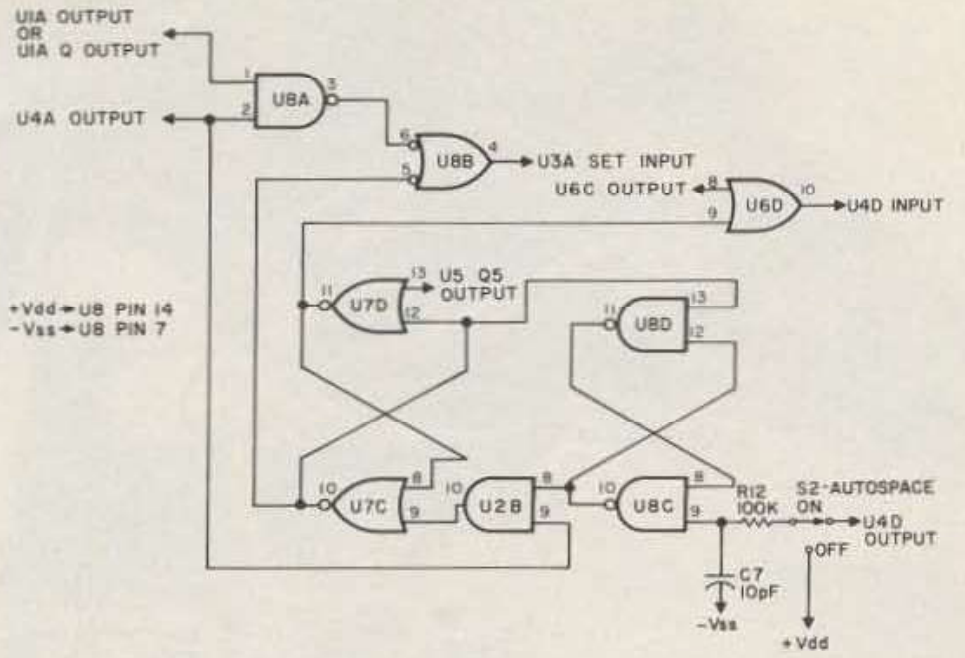


Fig. 2. Mod. 2 to add automatic character spacing (also removes sidetone oscillator). U8A and U8B replace U2B in the original circuit. Pin 1 of U8A comes from U1A Q output if Mod. 1 is incorporated. U6D is inserted between U6C output and U4D input. U8: 4011.

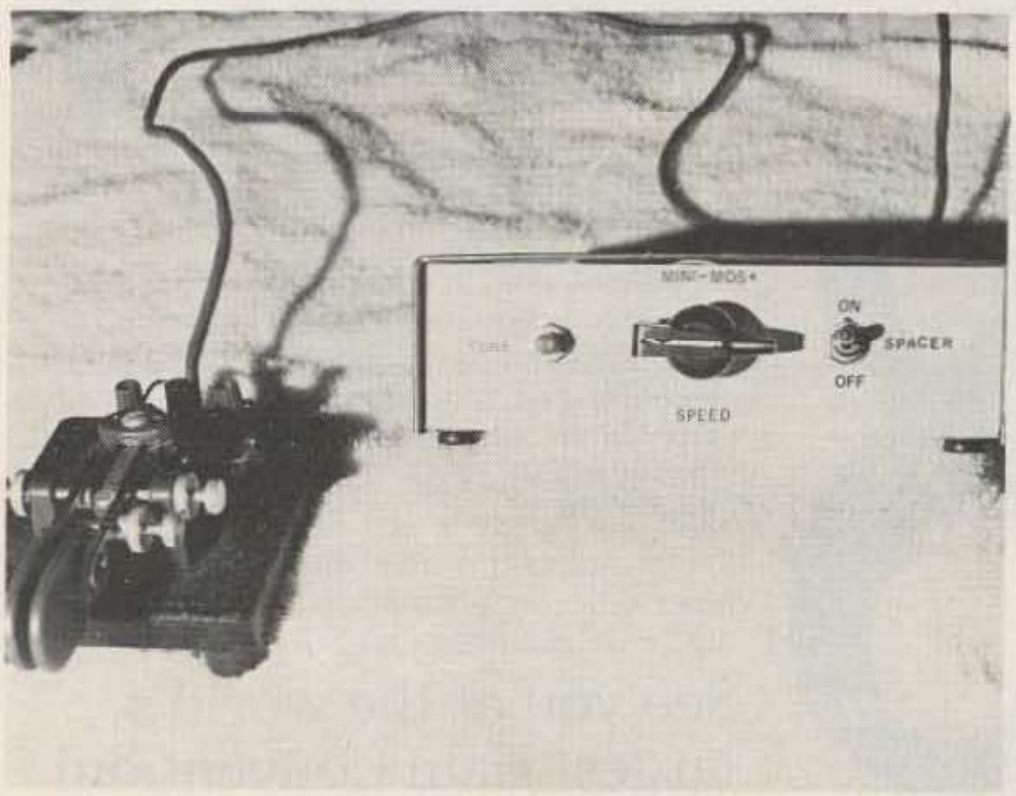
at the appropriate time. This is done by telling the keyer to send a dot element, but inhibiting the output.

Referring to Fig. 2, the operation is really quite simple. Whenever an element is sent by the MINI-MOS, the output of U4D goes low. This is fed to a set-reset flip-flop consisting of U8C and U8D. This flip-flop sets with the first element sent and remains set until it is reset by the initiation of the character space. This flip-flop says, "Something has been sent, and a character space needs to be sent." The output of this flip-flop is sent to AND gate U2B. The other input to U2B comes from the output of U4A, the clock control line. As long as a dot or dash element is being sent, this line is low, but, when all elements have been sent, it goes high. Therefore, the output of U2B says, "Something has been sent, and the sending is over. Start a character space." The output of U2B sets another set-reset flip-flop formed by U7C and U7D.

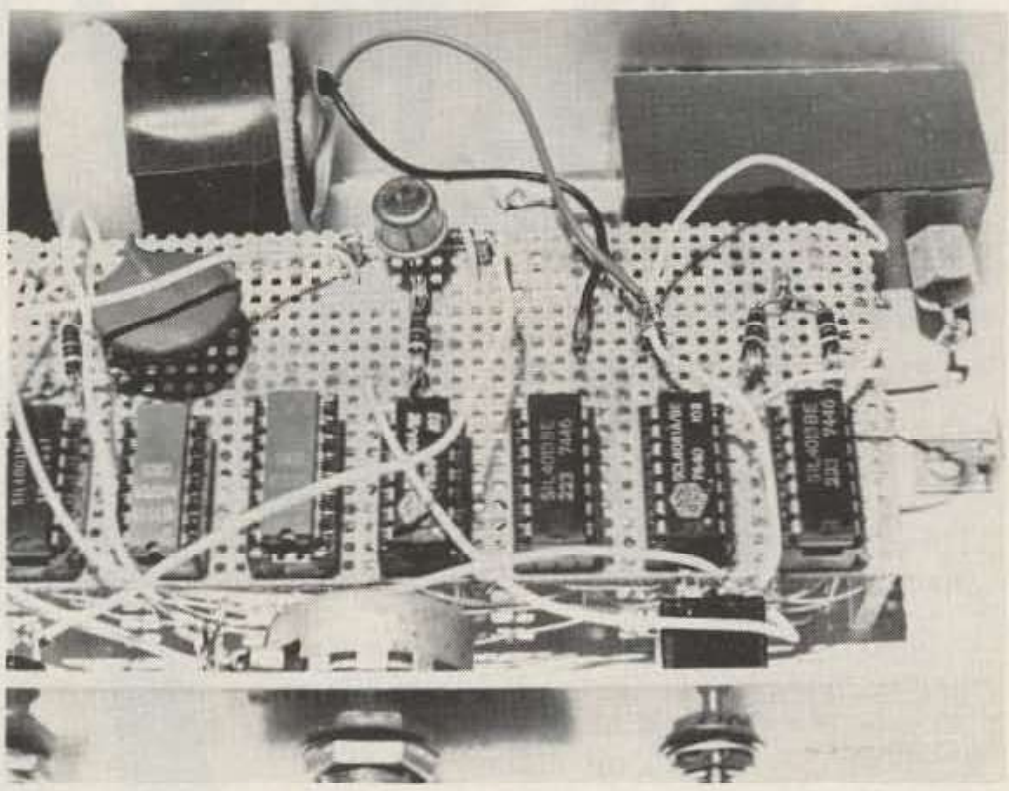
When this flip-flop is set, several things happen. First, the low output of U7C goes through U8B (which, along with U8A, has replaced U2B in the original circuit) and sets U3A, starting the dot element sequence. Second, the high output from U7D goes to U6D (which has been inserted between U6C and U4D in the original circuit), inhibiting the dot that would normally be sent at this time. Third, the low output from U7C is also sent to the U8C/U8D flip-flop, resetting it. Now, after one dot length, the Q5 output of U5 goes high, indicating that a dot was sent (except that we inhibited it at U6D) and that a space is now being sent. This signal is used to reset the U7C/U7D flip-flop. When U5Q5 goes back low, the sequence is complete, and normal operation may now proceed. The auto space can be disabled by removing the set input to the U8C/U8D flip-flop. This is done with S2.

If you wish to retain the sidetone oscillator, you'll have to add another IC, as shown in Fig. 3.

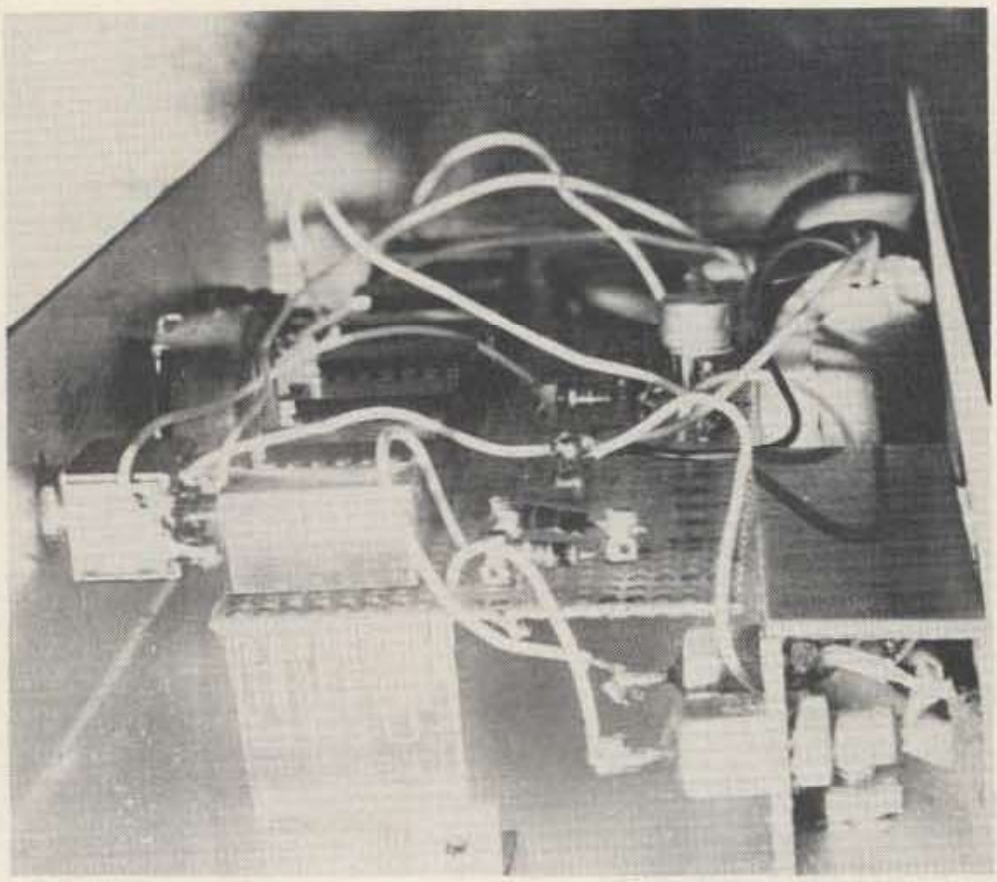
As you can see from the photographs, I built my MINI-MOS+ using wire-wrap. I was not particularly interested in making it very small. I used mine for a while just



Front panel view. It's nice and uncluttered. Note the lack of power switch.



Inside view. MINI-MOS+ was built mostly with wire-wrap. IC sockets were glued to the perfboard and flea clips were used for discrete components. U1 is on the right, and U8 is out of the picture on the left. The little box in the right rear is an rf filter made of single-clad circuit board and 1000 pF feedthroughs on the dot, dash, and key lines. Battery is at the left rear, wrapped in foam.



Close-up of perfboard mounting and rf filter. Perfboard was mounted using 3/4-inch squares of Plexiglas™ glued to the perfboard and chassis.

loose on the desk and had no trouble with rf, except occasionally on 10 meters. Once in the metal box, no problems were encountered. For you guys with sharp eyes, the 16-pin IC is a 4020 that I used in place of the 4024 in the original circuit. I just happened to have a 4020, and there is no difference in the operation.

Operation is straightforward with no glitches. The only idiosyncrasy is that only a dash may be stored while the keyer is sending a character space. This is because the keyer thinks it is sending a dot while sending a character space. The automatic character spacing forces you to use the squeeze paddle properly. Not only does it do what it is designed to do, force proper spacing between characters, but, if you allow a little extra time between elements, it will throw in a character space. Sending MARMI instead of QRZ during a contest is embarrassing.

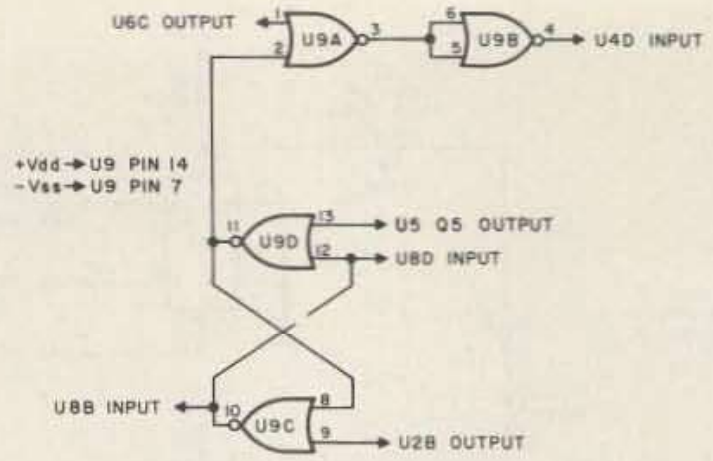


Fig. 3. Change to Mod. 2 if sidetone oscillator is to be retained. A second new IC (U9) must be added. U9: 4001.

However, if you persist with the automatic character spacing, you will notice a dramatic improvement in the quality of your CW.

With these two minor mods, the MINI-MOS+ will do anything any other keyer will and will do it cheaper and with much less power consumption. Build one — you'll like it. ■

References

[1] Erich A. Pfeiffer WA6EGY, "MINI-MOS — The Best Keyer Yet?", *73*, Aug., 1976, page 38.

[2] Ham Radio Center, Inc., 8342 Olive Blvd., St. Louis MO 63132.