

## Modifying the Motorola DTMF Microphone For 16 Button Operation

James L. Reese WD5IYT

May 10, 2002

The Motorola DTMF microphone is easily modified to produce all 16 DTMF tones. This modification involves installing a small pushbutton switch in the side of the microphone to "shift" the third column of buttons to produce the fourth column tones. Since this microphone does auto-PTT, it is pretty easy to send tones using this switch. It takes a bit of getting used to, but it is not difficult to operate.

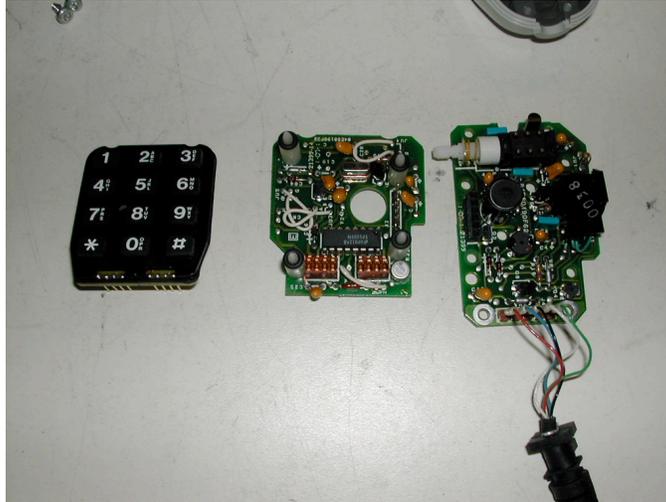
There are many different types of this microphone, but they are all basically the same inside, with a few differences in jumper settings. I have seen one version that has modifications to the circuit, but none of these differences affect the ability to perform the fourth column modification.

Some versions have a lighted keypad. The pinout on the keyboard connector is slightly different in these units, but the modification is the same. Follow the directions closely and you will not have any trouble.



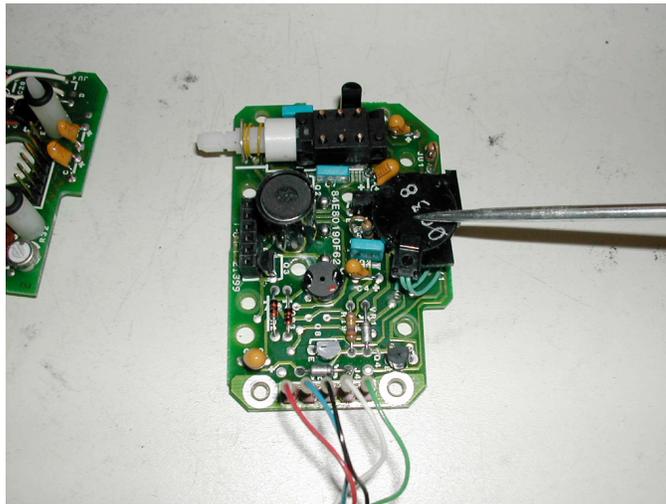
This photo shows the original microphone before modification.

To begin the modification, remove the back cover from the microphone and take the circuit board stack out of the case. The stack is held in with four torx screws. Unplug the boards from each other and lay them out on the table.



Here are the three circuit boards removed from the case. Left to right are the keypad, the DTMF generator board, and the microphone audio board.

Begin with the microphone audio board. First, remove the "beeper". This is the black plastic device on the right-hand side of the board. You can just clip the wires off at the board.



To improve the microphone audio quality, change R19 to 100K and change C2 to .047uF. R19 is near the bottom edge of the board just above the white wire. C2 is just to the left of the "beeper".

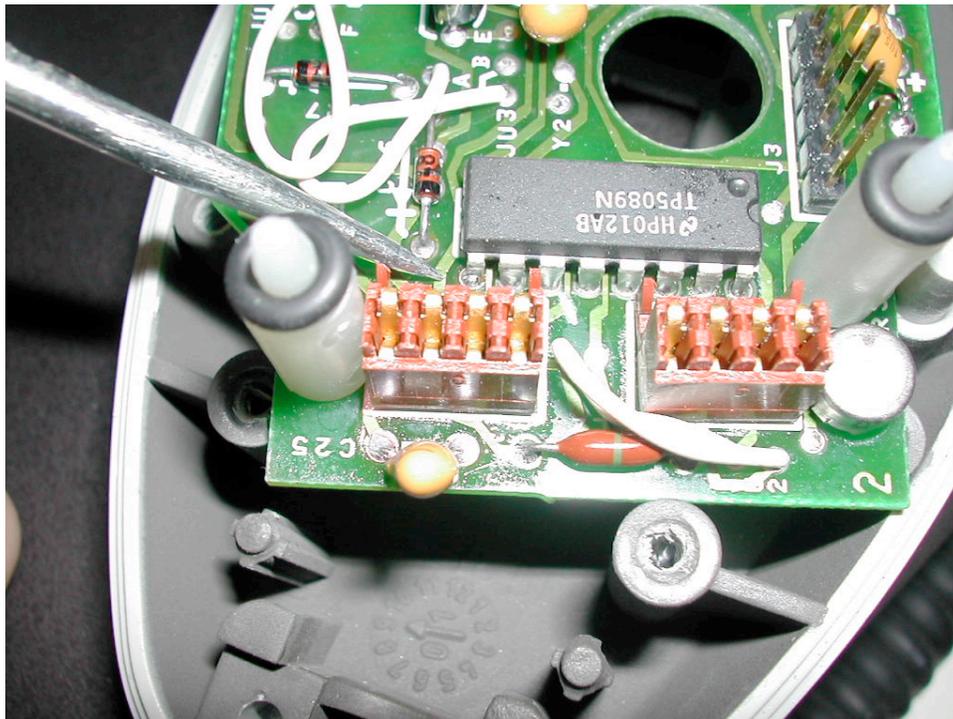
Set the microphone audio board aside. You're done with it.

Next, take the DTMF generator board and confirm the jumper settings. The correct settings for these jumpers are:

JU3 to Position A  
JU4 to Position C  
JU5 to Position G

Next, locate the PC board trace going from the third column of the keypad connector to pin 5 of U2, the DTMF generator chip. This is the DIP package chip, not the surface mount chip on the solder side of the board.

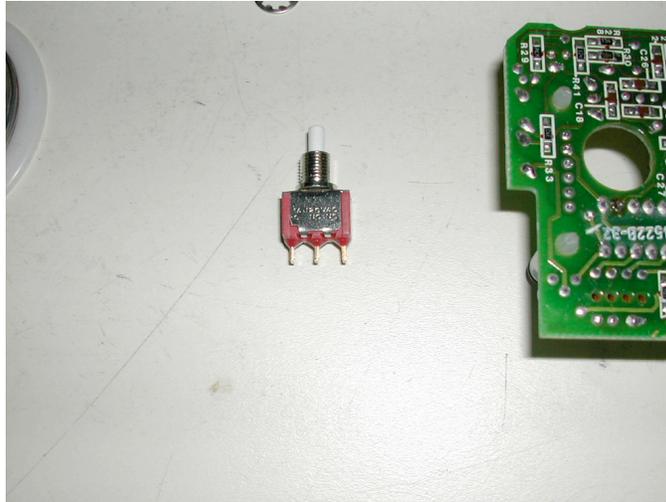
The lighted keypad versions of the microphone are slightly different, so use an ohmmeter to make sure you have the correct pin on the connector before cutting the PC board trace. The photo below shows the NON-LIGHTED version of the board.



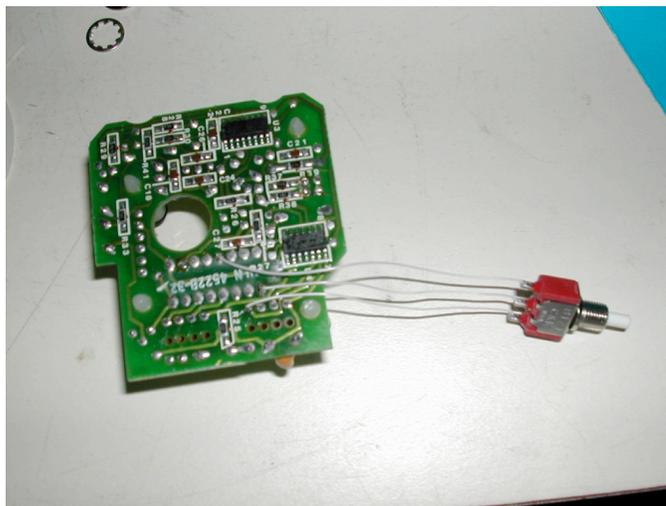
Cut the trace on the board indicated by the pointer. This breaks the connection from column 3 of the keypad to pin 5 of U2.

Locate a small, SPDT pushbutton switch. I used a CK switch, but many manufacturers make similar switches. Anything that will fit in the space vacated by the "beeper" will work.

Hook up the switch with small wire so the common of the switch goes to the keyboard connector pin for column 3, the Normally Closed side of the switch goes to U2 pin 5. The Normally Open side of the switch goes to U2 pin 9.



This photo shows the switch I used.



Here is the switch wired to the board. Note: The common pin is NOT connected properly in this photo...verify with ohmmeter that you have the correct pin on the keyboard connector. I took the photo before I found the mistake!

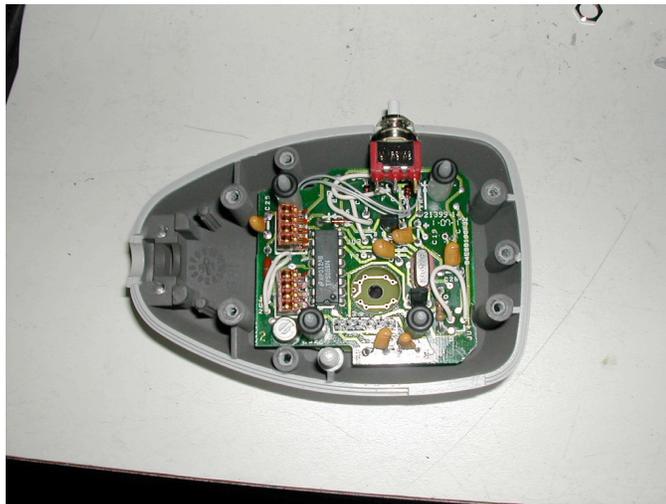
This completes the modification to the DTMF generator board.

Next, take the front half of the microphone case and cut a notch in the right side to fit your switch. Use the space formerly occupied by the slot in the right side where sound from the "beeper" came out. I used a small rat-tail file and a Dremel tool to cut this notch.

The following photo shows the completed notch.



Next, plug the keypad back into the DTMF generator board and install the board, with switch, back into the front half of the microphone case.



This photo shows the front half of the case with the board and switch installed.

Now, carefully plug the microphone audio board back together with the rest and screw it down. **BENCH TEST THE MICROPHONE NOW!** Don't get cocky and put it in the car before testing like I did...



This photo shows the finished microphone. I took a small pair of diagonal cutters and trimmed the handle on the switch so that only enough protrudes to make it easy to activate.