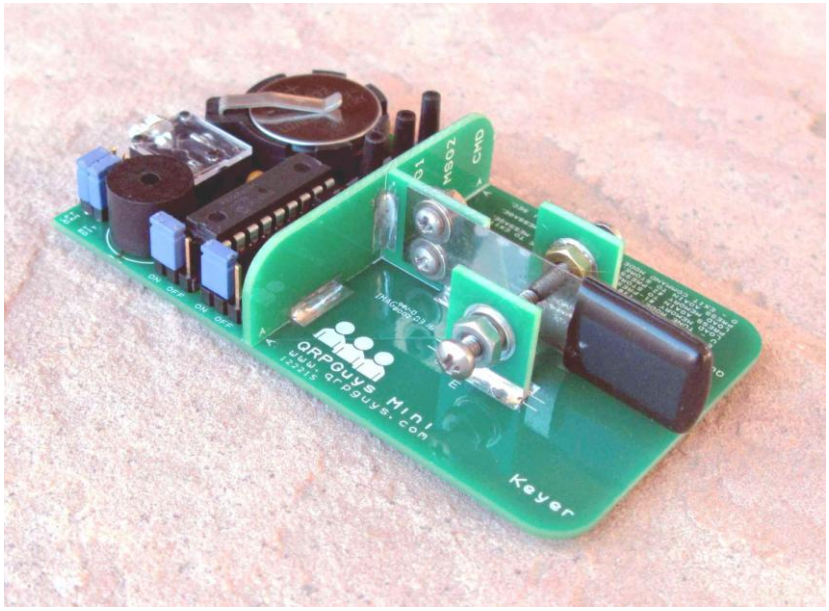
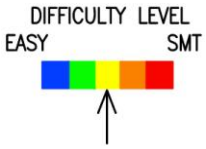
QRPGuys Single Lever Keyer/Paddle





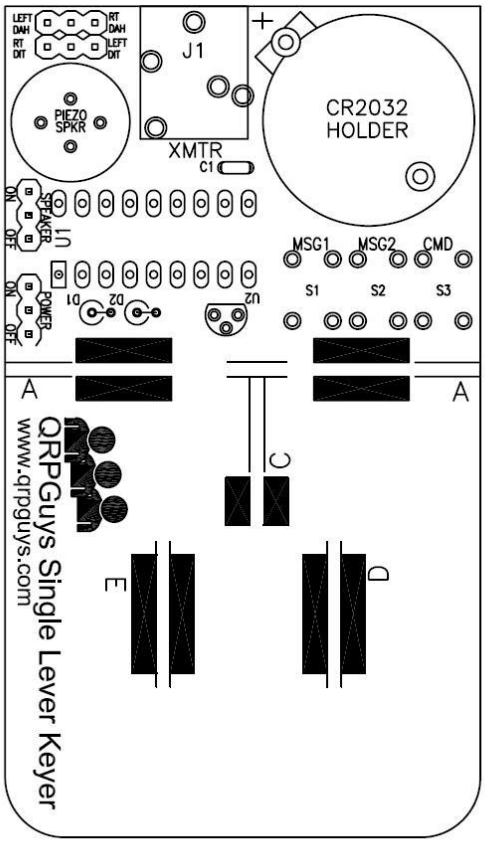
First, familiarize yourself with the parts and check for all the components. If a part is missing, please contact us and we will send one. You must use ***qrpguys.parts@gmail.com*** to request a part.

Parts List

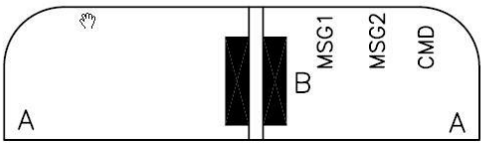
1 – QRPGuys Mini Single Lever Keyer PCB, 5 pieces
1 – U1, PIC 16F628A MPU, 18pin DIP
1 – U2, BS-170 field effect transistor
2 – D1, D2, 1N4148 diode, small glass, w/black band on one end
1 – C1, .1uF capacitor, marked 104
1 – 3.5mm stereo audio jack
3 – S1, S2, S3 momentary, N.O., PCB mount, pushbutton switch
1 – 18 pin DIP socket
1 – Piezo speaker
1 – CR2032 coin battery holder
4 – 3 position in-line header
4 – header jumper
2 – 2-56 x .25”L SS pan head Phillips screw
4 - #2 SS flat washer
2 - #2 SS lock washer
2 – 2-56 SS nut
2 – 4-40 x .62”L SS pan head Phillips screw
1 – 4-40 x .25”L SS pan head Phillips screw
2 – #4 SS flat washer
2 - #4 SS lock washer
2 – 4-40 SS nut
2 – 4-40 Brass nut
1 – 4-40 x 1”L Zinc pan head screw
1 – SS paddle leaf
1 - 1/2” wide x 2”L plastic shim
1 - 1/2” x 1” vinyl caplug
4 – Silicone self-adhesive foot, 6mm

Even if you have done radio kit assembly before, please read through all the instructions before you start. This kit is a little different, in that the mechanical components are the part of the printed circuit board. The instructions give you the scope of the project and an understanding of the techniques we have employed. You will be assembling the kit from five pieces of PCB material, and when assembled, forms a portion of the electrical connections. The base also contains the circuitry for the keyer and battery holder to run the keyer. There are solder pads, registration marks, and letter coded parts, that match each other. When you tack and solder the components it will make a sturdy mechanical and electrical assembly.

Refer to the figure below for identification of the individual PCB parts.



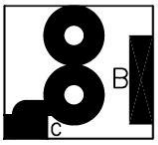
BASE



BACKSTOP

RIGHT CONTACT HOLDER

LEFT CONTACT HOLDER

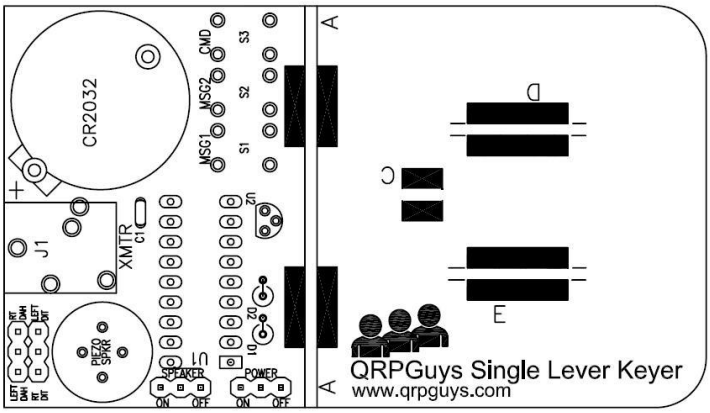


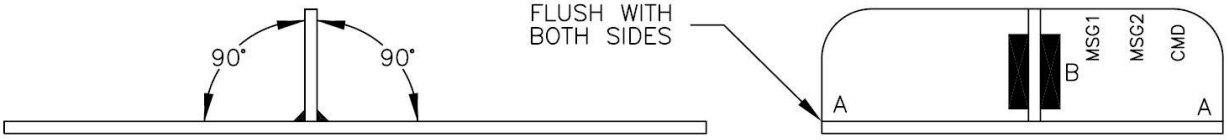
PADDLE LEAF HOLDER

On all the mechanical assembly soldering you do, you will use the same technique. You tack a single tiny point first, and then check to see that it is square and aligned with the registration points. It is easy to re-heat the joint and adjust the alignment when there is only a single point. Then you tack the other pads, before you do the finish soldering.

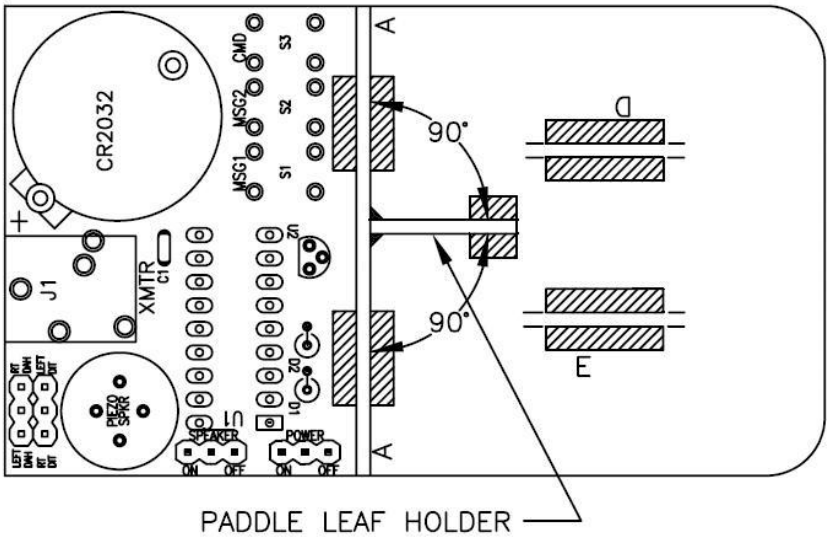
Notice that the pieces are coded with letters that will match up when you have them in the correct alignment. The first two pieces to be joined are the **backstop** and the **base**.

You only slightly tack a point on one intersecting pad and then check to see that it is square to the base, aligned with the registration points, and flush with the sides. ***If it is not, do not try the bend it to fix it, you will lift the pad off the surface.*** You need to re-heat the tack and straighten it while the heat is applied. Once it is square, tack the opposite side pad. After a small tack is done on all the pads you can go back and touch up all the solder pads, and it will stay square and flush with the edges.

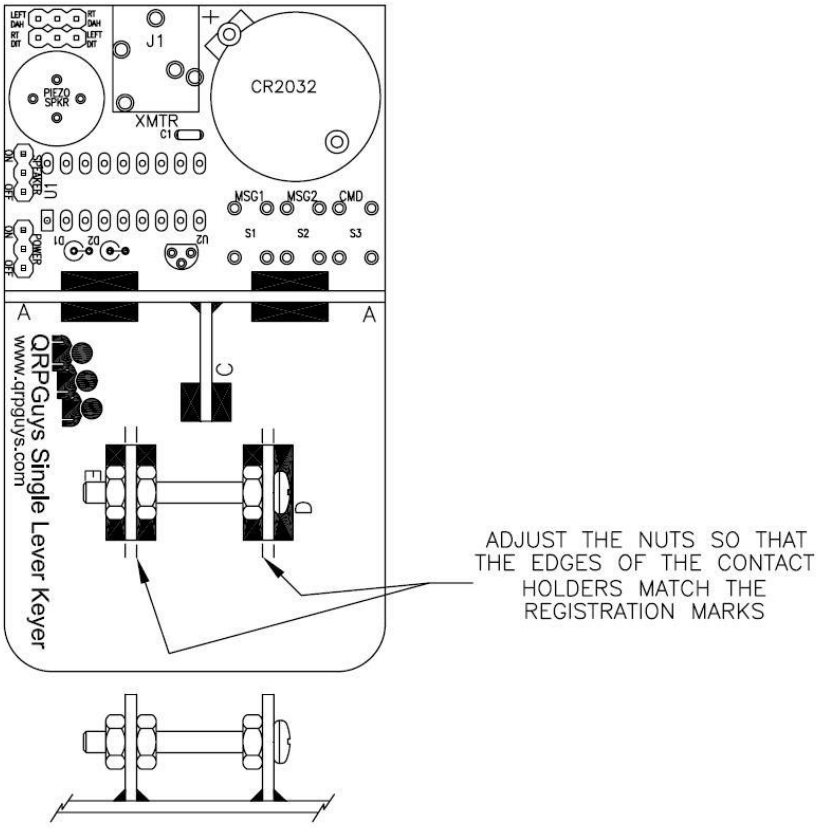




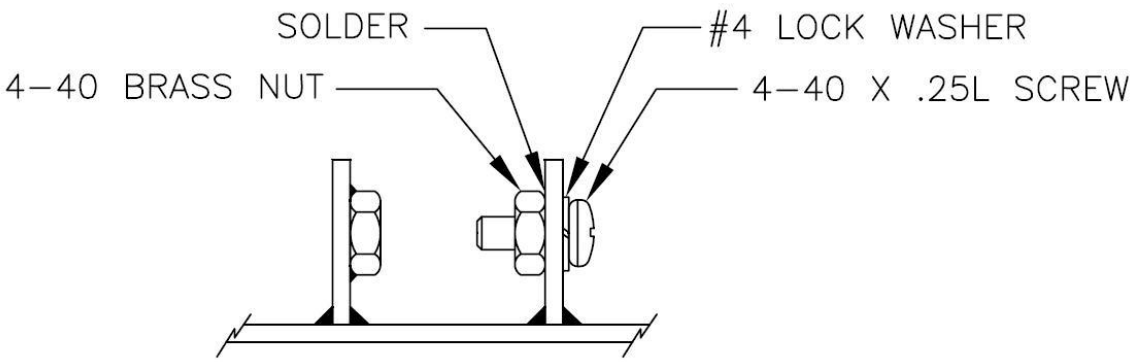
Use the same technique adding the **paddle leaf holder**. Match the registration letters and alignment marks. Lightly tack one pad and check for squareness. Adjust if needed by re-heating the tack. Do this on all the pads. Once you are satisfied with the alignment, go back and finish soldering all of the pads.



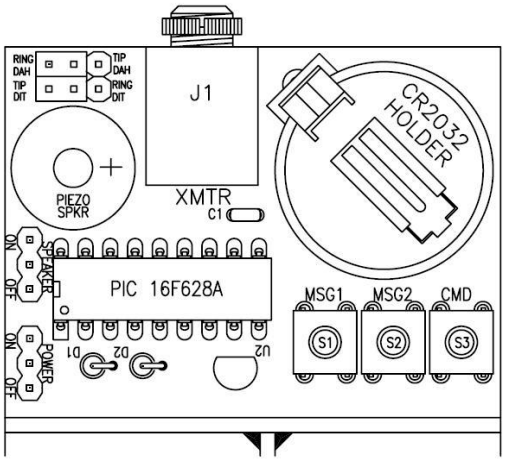
Refer to the figures below. Use the 4-40 x 1” long screw and, adjust the nuts so that the spacing matches the registration lines silkscreened onto the surface of the board. Do not solder all of one side at once. Tack both sides of the holders, and alternate back and forth between the two sides adding a little more solder, then, the holders will remain straight when you remove the support screw.



The two brass nuts need to be permanently soldered to the “inside” of both the contact holders. Use the 4-40 x .25L SS screw and #4 lock washer to hold in place, and solder them. The lock washer insures that the nut will be flush with the PCB when it is heated. It is helpful to rub the face of the nut on some scotchbrite or emery paper to clean up the surface contacting the PCB.

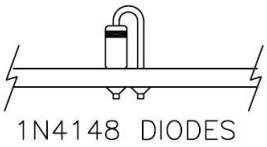


This completes soldering the mechanical pieces.



Parts placement figure

[ ] Install D1 and D2, the small glass 1N4148 diodes, vertically, with the black cathode band **"UP"** as shown graphic below. The circle marking on the board must match the body of the diode to get the polarity correct.



[ ] Install C1, .1uF capacitor, marked 104

[ ] Install U2, the BS-170 field effect transistor, observe the outline shown on the board and placement graphic.

[ ] Install the 18 pin DIP socket. Put the notched of the socket at the end of the row of holes with the rectangular pad.

[ ] Install the 3 pin headers at the power, speaker, and paddle orientation positions.

[ ] Install J1, the 3.5mm audio jack where indicated.

[ ] Install S1, S2, S3, the PCB mounted switches, flush with the board.

[ ] Install the piezo speaker where shown. Match the "+" polarity marked on the board and part when installing.

[ ] Install the U1, the PIC16F628A into the DIP socket observing the pin1 location.

When inserting IC's the pins are flared so that they can be retained by auto insertion tools. Gently rock them on a flat surface so the pins are parallel and they will insert into the sockets more easily.

[ ] Install the CR2032 battery holder, matching the outline.

This completes the electronic PCB assembly.

Finishing the mechanical assembly.

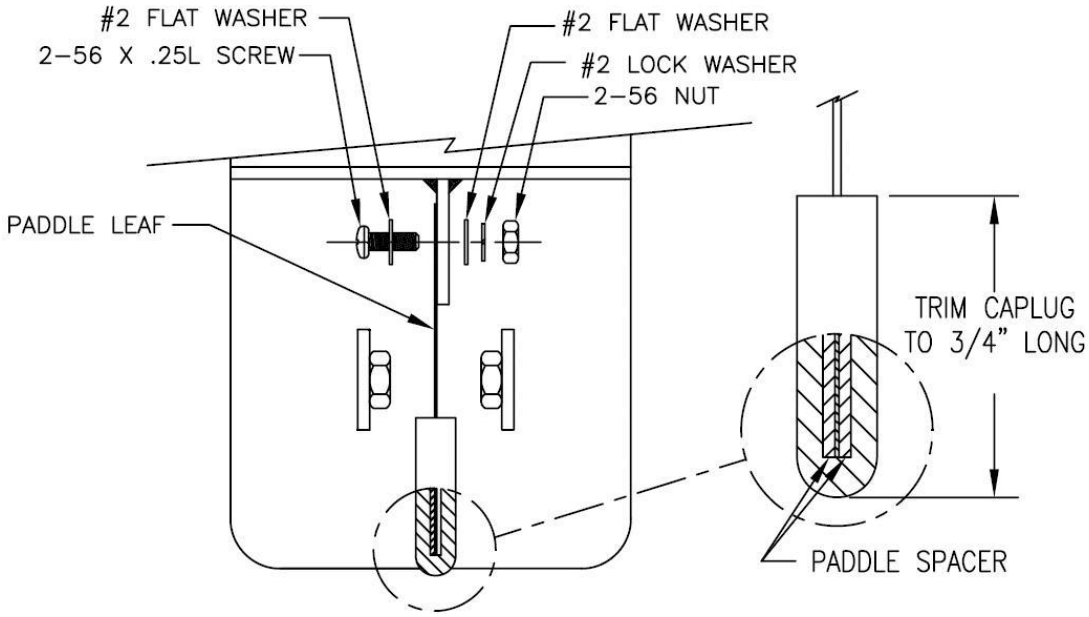
Assemble the paddle lever components as shown in the figure below. It's a good idea to assemble the hardware over a cookie sheet. Any hardware is difficult to find if dropped.

[ ] Secure the paddle leaf to the **paddle leaf holder.** If the paddle leaf holder is not perfectly square, the paddle leaf may be off to one side, or on an angle. Simply bend it to be centered between the two contact supports. Center the paddle leaf before installing the contacts. Assemble the hardware in the order shown.

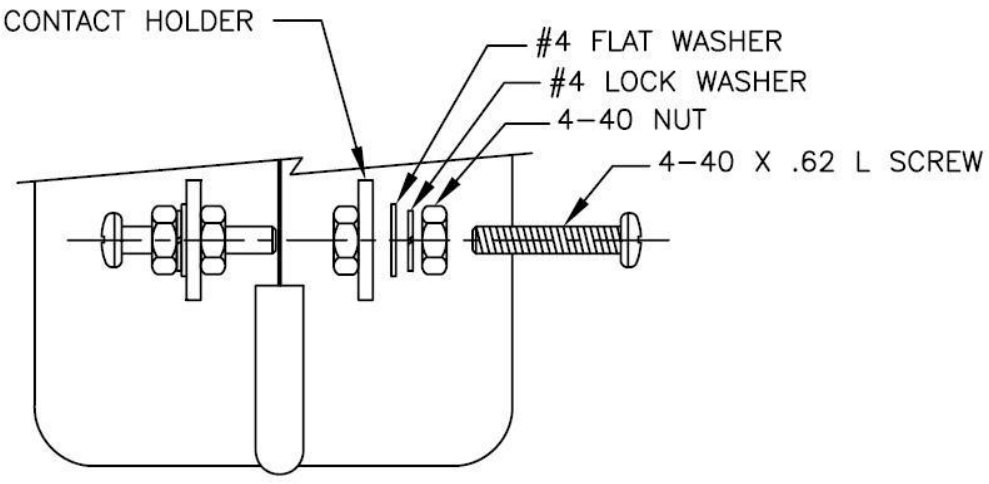
[ ] Cut the Caplug lever cover 3/4" long from the closed end. Scissors will work easily.

[ ] Cut the piece of the supplied 1/2" wide plastic into two 5/8" long pieces.

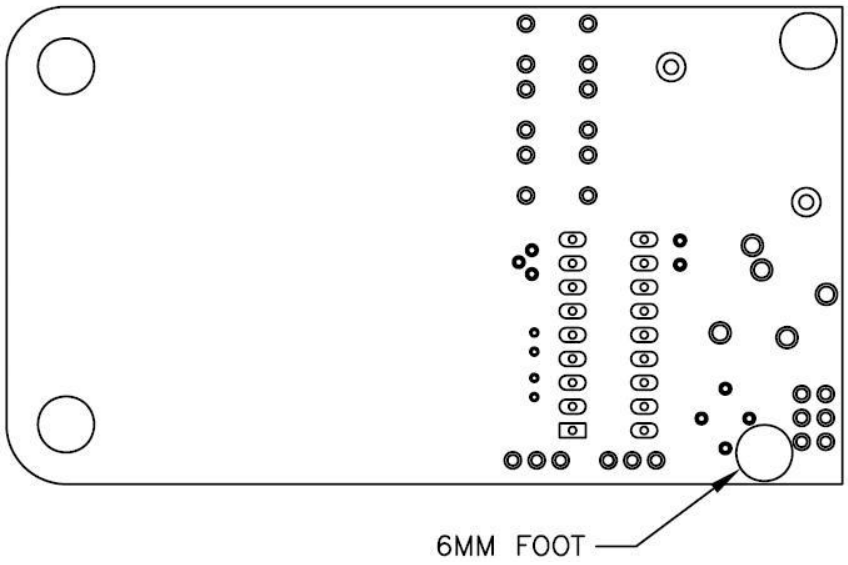
[ ] Sandwich the paddle lever with the plastic spacers and slide the Caplug over the end of the paddle leaf.



[ ] Install the contact screws to the contact holders as shown in the figure below. The contact distance to the paddle leaf can be adjusted from a few thousandths of an inch to whatever you feel comfortable with for sending.



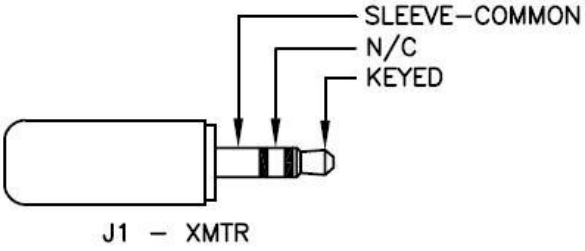
[ ] Attach the four self adhesive feet to the bottom corners.



This completes the assembly

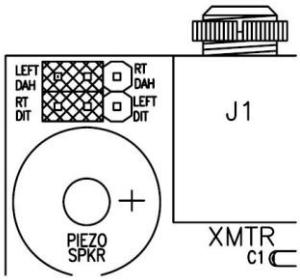
Cable configurations for connecting to XMTR (J1):

The XMTR output goes low when keyed



Test Drive

Set up the paddle response for which side you want the “dit” and “dah” to be on, by using the jumpers placed on the headers. *Shown is “LFT DAH” and “RT DIT”.*



Insert a 3v. CR2032 lithium coin battery, **"+"** side up. Set the power header to "ON", and the speaker header to "ON". Energy usage is very low (1mA active, 1*u*A standby) and the battery will last quite some time. The power jumper header is for storage only, in case the paddle lever gets pushed to one side, activating the keyer while not in use.

Try sending some code. You should hear your sending at the default speed of 15WPM. If you don't receive these responses, the most common errors are faulty solder joints. Inspect carefully for a bridged, or a missed solder joint. Verify that the PIC chip is installed with pin #1 in the correct position. The next most common mistake is the polarity reversed on a diode. It is helpful to have someone else look for errors, as you can easily miss your own mistakes.

The software for the PIC16F628A is in the public domain and used here with the consent of the author governed by the GNU General Public License, Version 2, June 1991. You are permitted to use and modify the PIC program for your own use. The chip is not locked, and can be reprogrammed. The complete documentation and files can be found at the URL

http://www.strozzi.it/users/carlo/hamradio/iz4kbs-keyer/

Using the keyer

The default speed of the keyer is ~15WPM. To change the speed you must enter the command mode. The command mode is initiated by pressing the "**CMD**" button for 1 sec., and the keyer will respond by sending "C" in a lower pitch tone. ***All command responses are sent in the lower pitched tone, indicating that you are in the command mode.*** Each touch of the "dah" side of the paddle will increase the speed by one increment, "dit" will decrease the speed by one increment. There are 31 increments to cover 6 to 45WPM. You exit the command mode by pressing the "**CMD**" button for 1 sec., or by sending a "D" character. The speed setting is stored in the PIC EEPROM, so it is not lost if you move the power jumper to off.

Most the commands listed, the keyer will respond with announcing an "R". The exception to that are the speed and tune commands, (E, T, U).

Entering a message

Button labeled "**MSG1**" has about 63 characters stored in the PIC EEPROM, and is stored if the power jumper is disconnected. Button labeled "**MSG2**" has about 55 characters and is stored in the PIC internal RAM. This message will be deleted if you disconnect the power jumper.

To enter a message, press the message button you want for about 1/2 sec. until the keyer responds with an **"M"** for message record. Enter your message. Then press the same message button to store it. The keyer will respond with an **"S"** for stored. If you exceed the character limit, the keyer will respond with an **"F"** for full, indicating that you have exceeded your limit and stops recording.

To play your recorded message, lightly tap the appropriate button.

Commands:

The command mode is initiated by pressing the "**CMD**" button for 1 sec., and the keyer will respond by sending "C" in a lower pitch tone. ***All command responses are sent in the lower pitched tone, indicating that you are in the command mode.*** You exit the command mode by pressing the "**CMD**" button for 1 sec., or by sending a "D" character.

Command D: Exits command mode.

Command F: Play forever. Loops playback mode. Ends by another "F", or tap paddle.

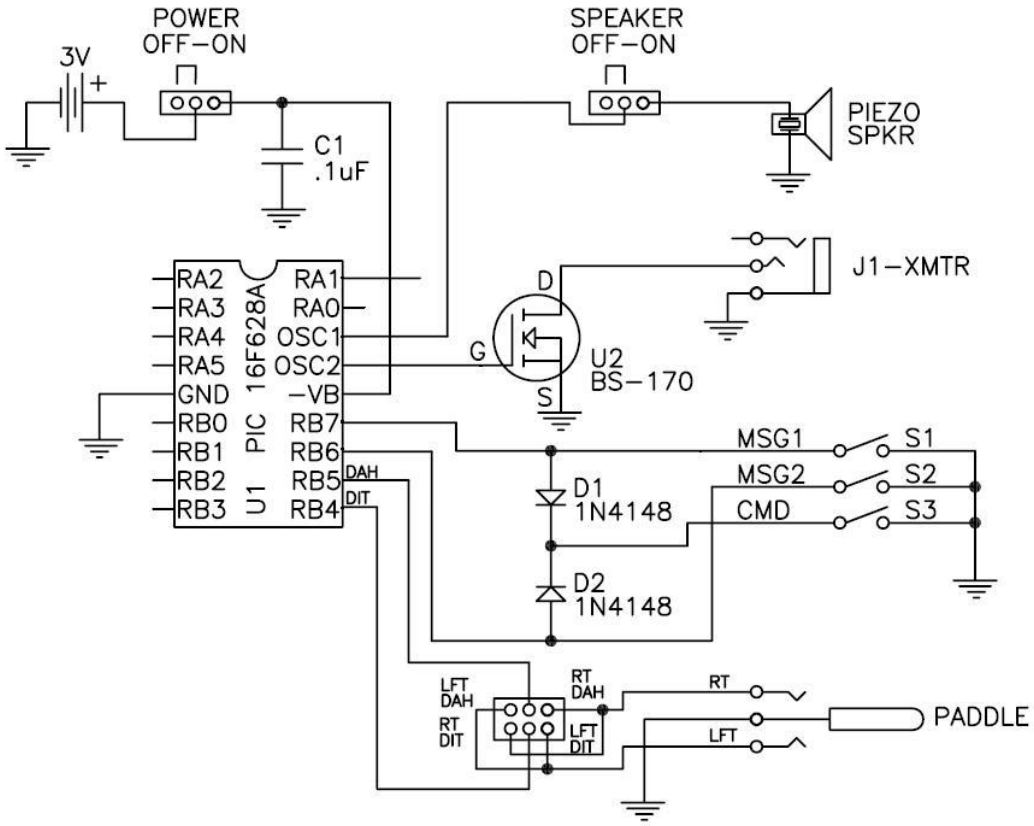
Command T: Increases CW speed.

Command E: Decreases CW speed.

Command U: Turns the transmitter on for 30 sec. Tap paddle to end.

There are some additional contest mode commands, Consult the complete manual at:
http://www.strozzi.it/users/carlo/hamradio/iz4kbs-keyer/

Schematic:



Notes: