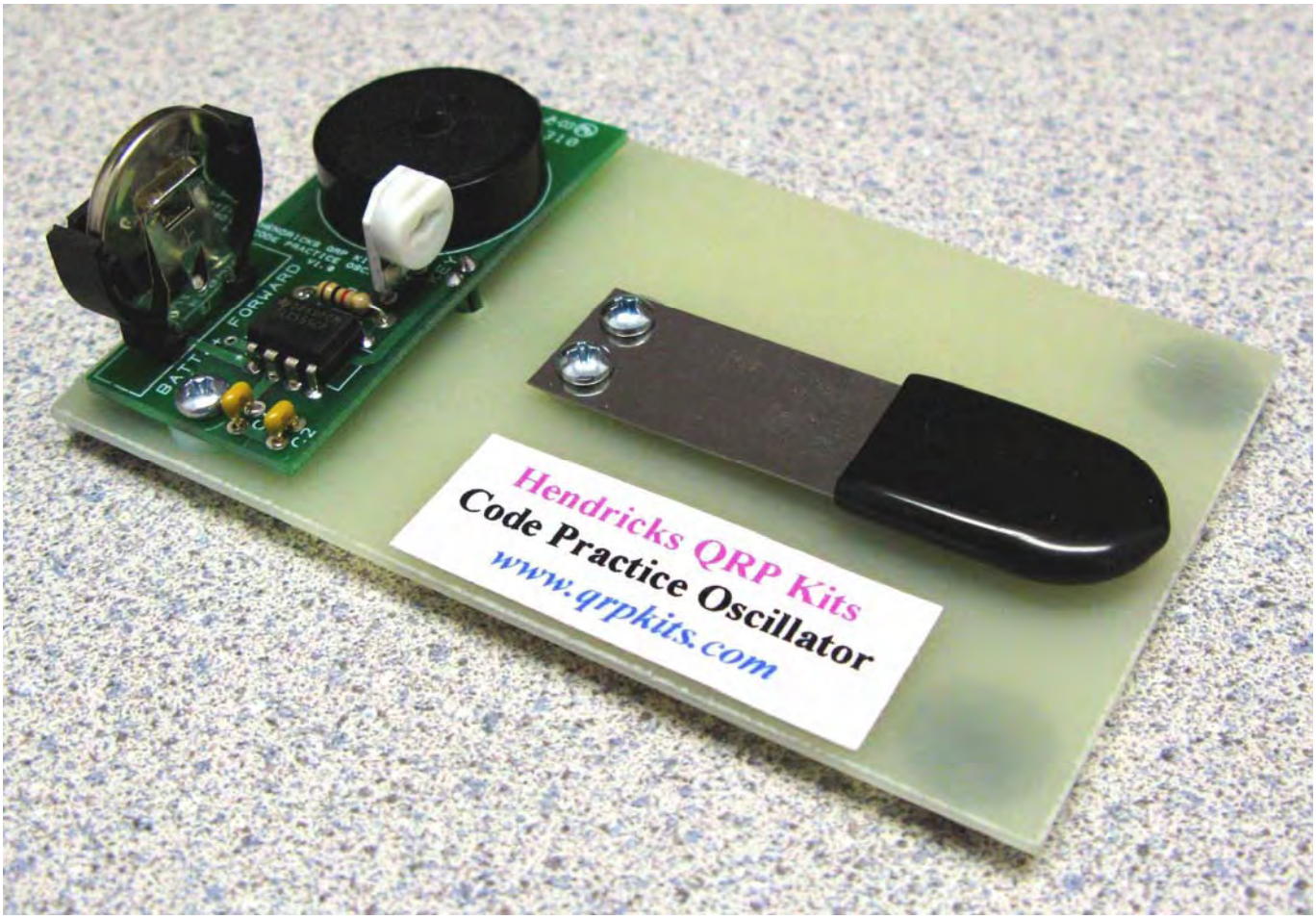
Hendricks Code Practice Oscillator Kit



This kit is offered to initiate the first time builder in the various techniques of mechanical and electronic kit construction. At the end of the approximately one hour project, the builder will produce a code practice oscillator to generate International Morse code, and bring about interest in ham radio.

This is a very basic, easy to assemble kit with all the components supplied. The professionally fabricated printed circuit board, electronic and mechanical components, and battery are all included.

The tools required are an inexpensive 20 watt soldering iron, hand drill, 1/8” dia. drill bit, rosin core solder, small side cutters, needle nose pliers, file, phillips screwdriver, and a centerpunch. The builder will begin the project by learning how to identify the various mechanical and electronic components. Then, step by step, assemble the project to produce a working code practice oscillator.

The builder will first check the parts inventory. This will teach identifying the various components, and then assembling the printed circuit board. The circuit will then be tested for operation before proceeding to the mechanical portion. The use of simple hand tools is required, and the youngest builders will require adult assistance and supervision. Soldering components is required, so if you have never soldered components before, seek an “Elmer” to learn basic soldering techniques. A working kit is assured by following the instructions below, and will build confidence to pursue more complex kits as construction skills are mastered.

Parts Inventory

R1 – 1K ohm resistor (brown-black-red-gold)
R2 – 50k ohm potentiometer
C1-C2 - .01 uF capacitor (103)
U1 – TLC555CPE4, 8 pin DIP, Integrated circuit
PC1 - Piezoelectric transducer
1 - Battery – CR2032, 3v, Lithium Ion battery
1 - Battery holder
12” Hook up wire

1 - Key base - 4” x 2 1/2” x 1/16” thick epoxy board
1 - Printed circuit board – 2.30” x 1.00”
1 - 4-40 x 3/16” L, brass, pan head screw
2 - 4-40 x 1/4” L, pan head screw
2 - 4-40 x 5/16 L, pan head screw
4 - #4 x 1/16” thick nylon washer
5 - 4-40 nut
1 - S. S. leaf spring
1 - Aluminum spacer, 5/8” x 3/4” x 1/16” thick
1 - Black vinyl sleeve
1 – Nameplate

Parts identification

Start by laying out and familiarizing yourself with the individual components, and matching them to the pictures below.

1K ohm resistor
(brown-black-red-gold)

50K ohm potentiometer

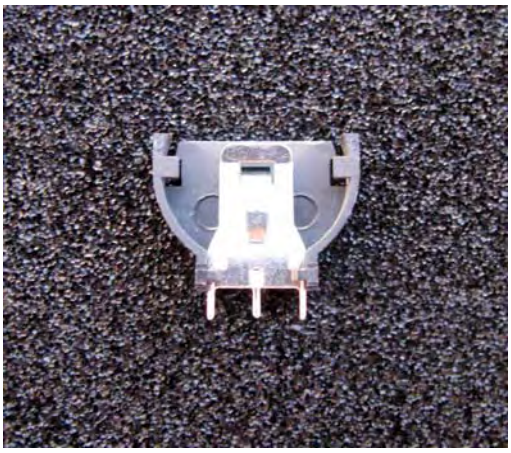
C1 and C2 capacitors are yellow in color and have the value code printed on the side of them as shown:

103 is a .01uF capacitor

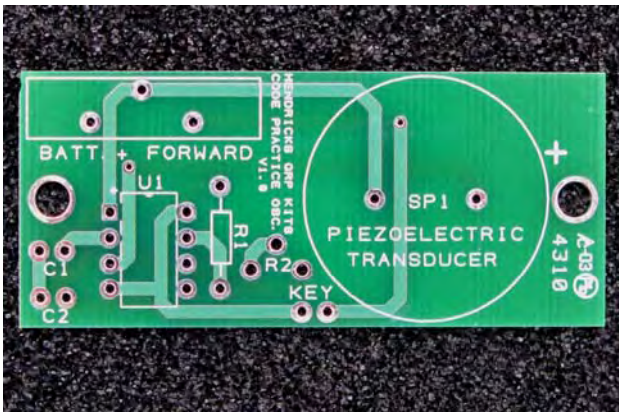
U1 – TLC555 Integrated circuit

SP1 – Piezoelectric transducer
Do not peel off the protective tape until finished

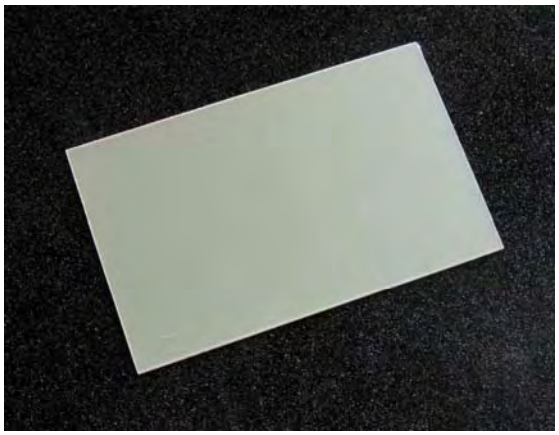
CR2032, 3V Lithium battery



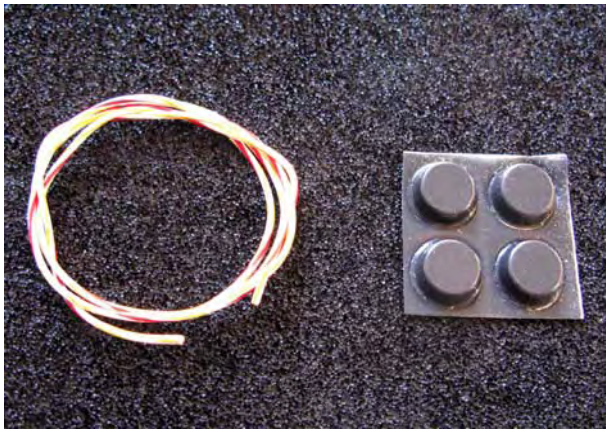
Battery holder



Printed circuit board

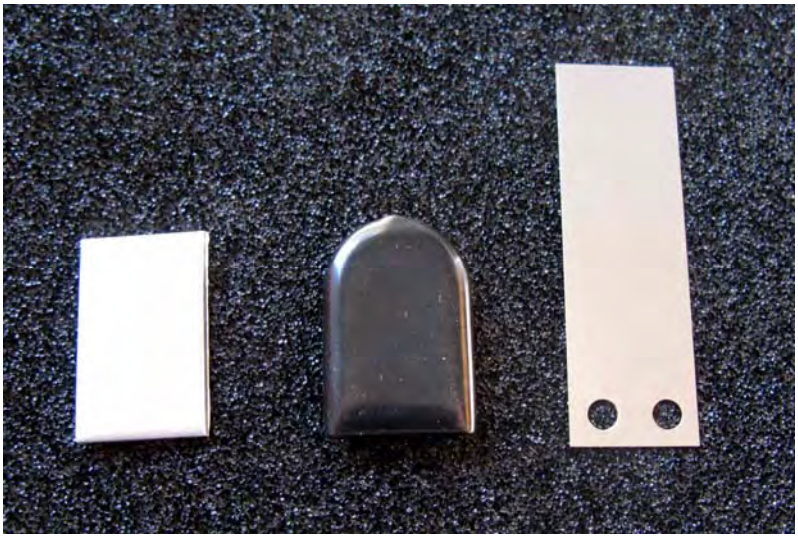


Key base



Hook-up wire and Mounting feet

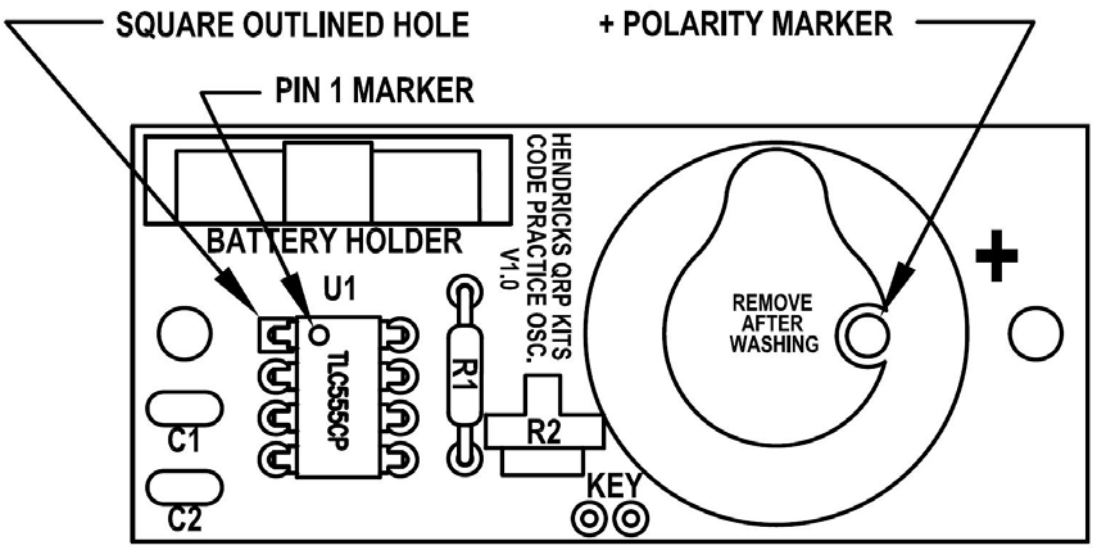
From left to right: Nylon washers, 4-40 nuts, 5/16”L screws, 1/4”L screws, 3/16”L Brass screw



From left to right: Aluminum spacer, Vinyl cap, and S.S. leaf spring

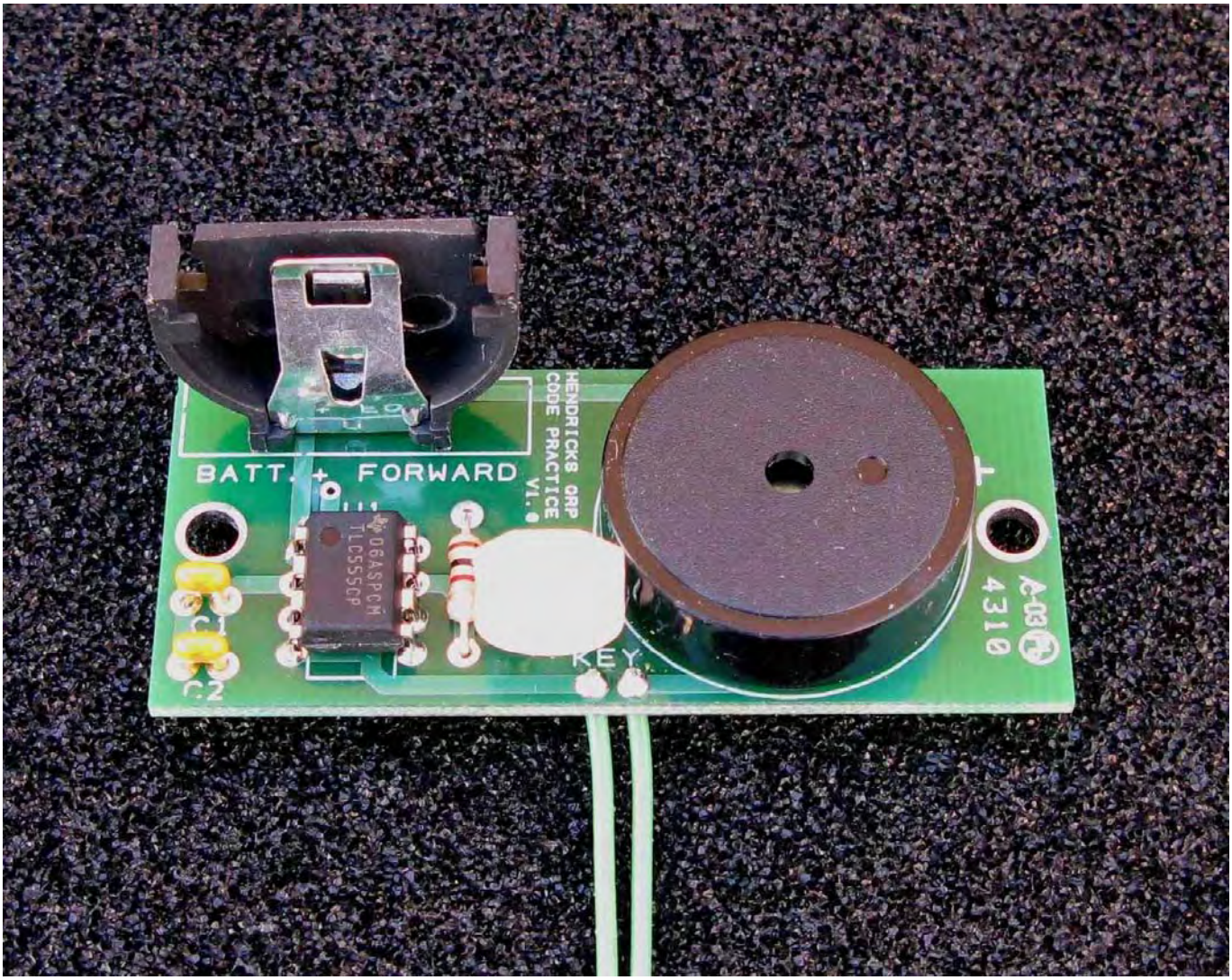
Electronic Assembly

We will start with assembling the printed circuit board, starting with the smallest components, and ending with largest. Install one component at a time. Place the component on the top side of the board. **Note:** The top of the board is the side with the silk screen lettering. Solder the component to the backside of the board, and then trim the component lead on the back side. The picture below shows the location of the various components.



- R1 – 1K ohm resistor (brown-black-red-gold).
- C1 - .01uF (103) capacitor.
- C2 - .01uF (103) capacitor.
- U1 – TLC555CPE4, 8 pin DIP, Integrated circuit. Install so that pin #1 of the IC, shown by the small circle on one corner of the IC matches up with the square outlined hole on the printed circuit board. **Note:** Before soldering, double check the U1 orientation, because this component is difficult to remove after soldering.
- R2 – 50K ohm potentiometer.
- SP1 – Piezoelectric transducer. **Note:** Install so that the polarity marker, shown above, is to the right side of the board.
- Battery holder, place on board and solder the three pins.

- Strip and solder two 4” long pieces of the hook-up wire, to the pads marked “KEY”. **Note:** These are extending from the bottom of the board, and soldered on the top side. Consult the picture below.



The finished board should look like the picture above.

Now is a good time to test the board. Start by stripping 3/8” off the ends of the two 4” leads, soldered to the board. Peel off the protective tape on the piezoelectric transducer, and install the CR2032 battery into the battery holder with the “+” side of the battery facing towards U1, the integrated circuit.

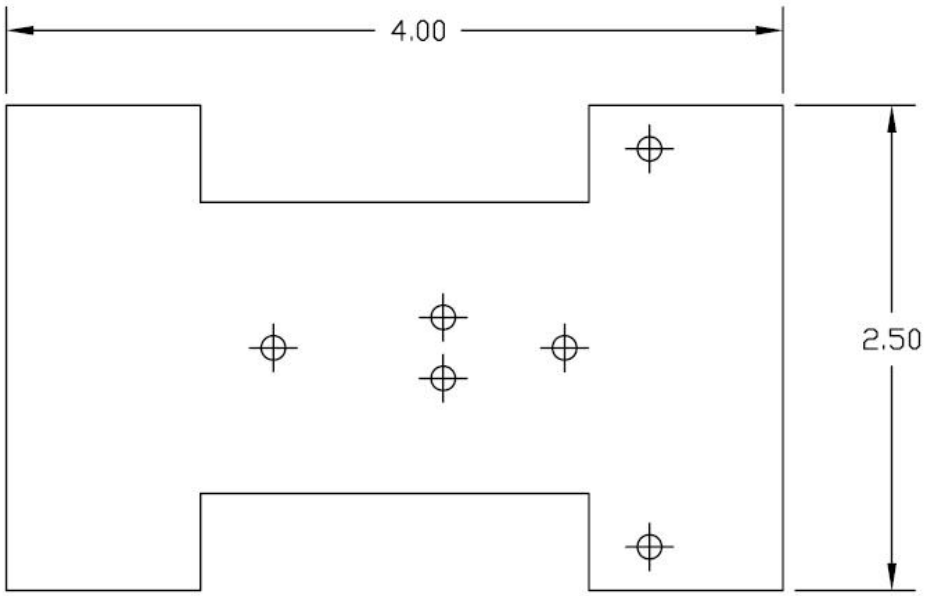
Touch the two stripped leads together. A tone should be heard out of the transducer. The tone can be adjusted by turning the potentiometer, R2. This also acts somewhat as a volume control, due to the frequency response peaks and valleys of the piezoelectric transducer. If all is OK, remove the battery for now.

Troubleshooting:

If nothing is heard, the most common fault is poor soldering. Inspect the board carefully with a magnifying glass, and correct any bad connections. Due to the small number of parts and diversity of shapes, it is difficult to put a part in the wrong location. However, sometimes it is difficult to see your own mistakes, so have another person look at your work.

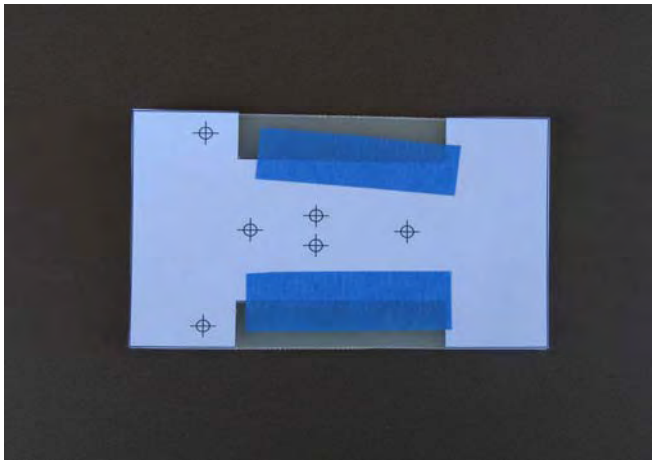
Mechanical Assembly

Key base preparation:

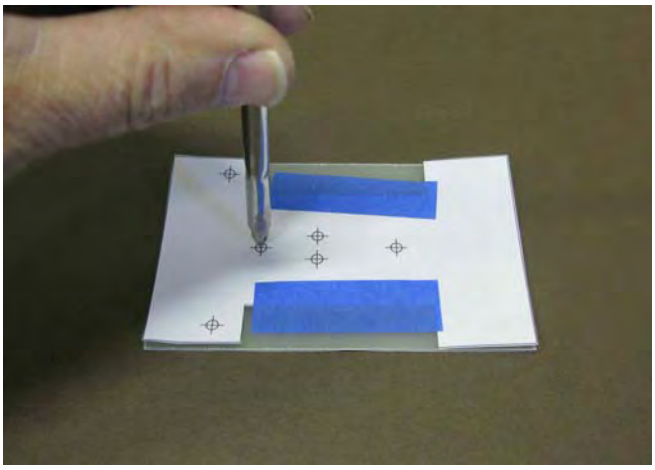


Marking template for drilling

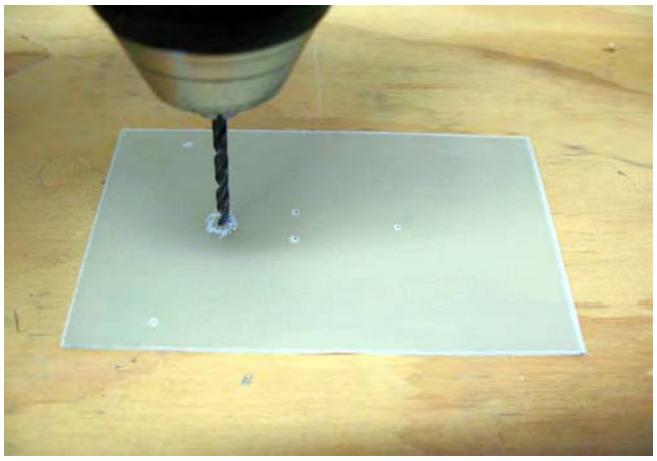
Print this page at “no scaling” and check that the output is the size shown. Adjust your printer scaling if necessary. **Note:** This must print to these dimensions, or the hole spacing will not be correct. If you cannot obtain these dimensions, refer to the hole pattern reference in the appendix.



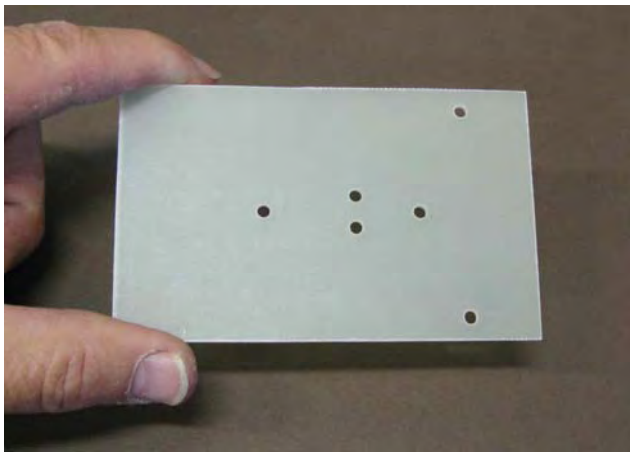
Cut the outline and tape to the key base.



Mark the crosses with a nail or center punch.

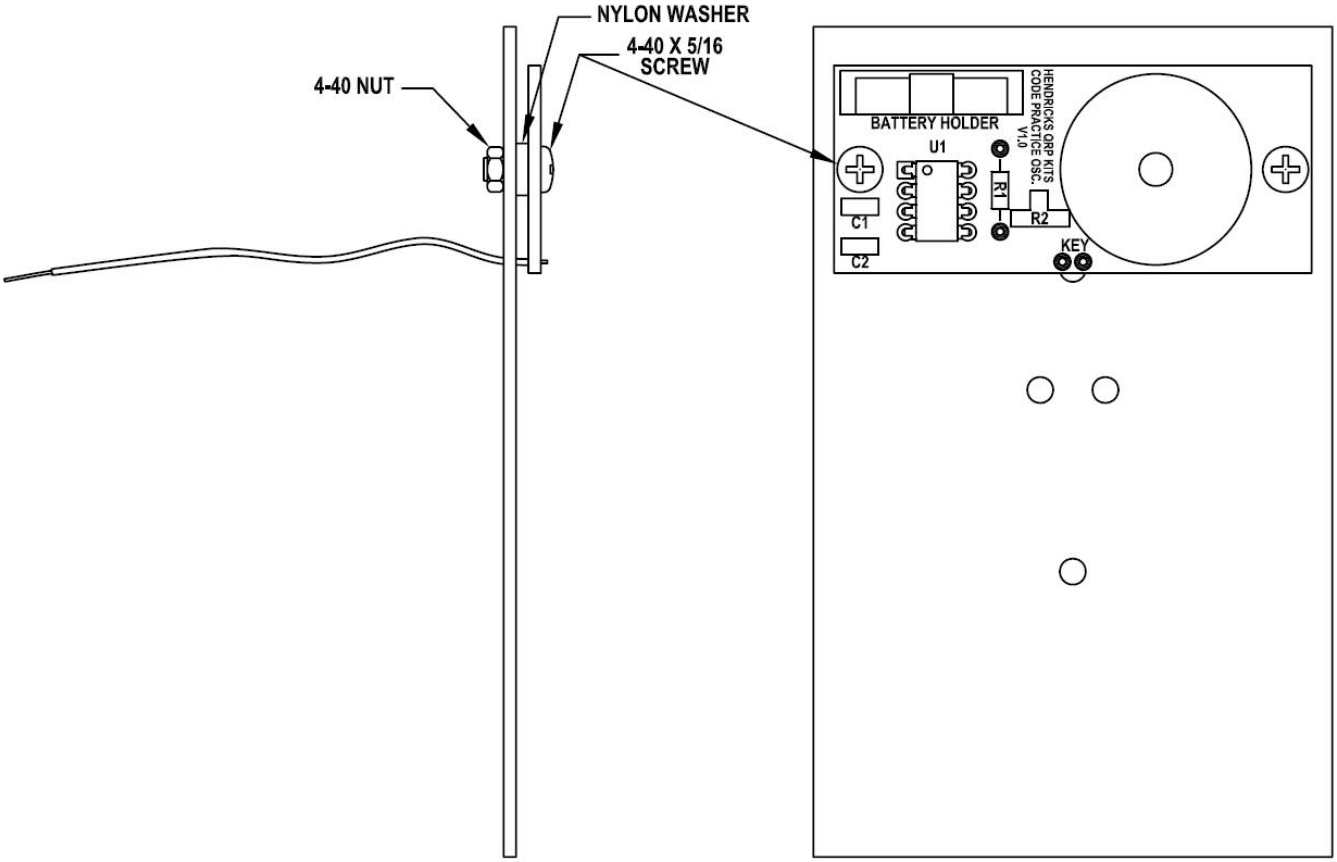


Drill all six holes, 1/8” diameter.

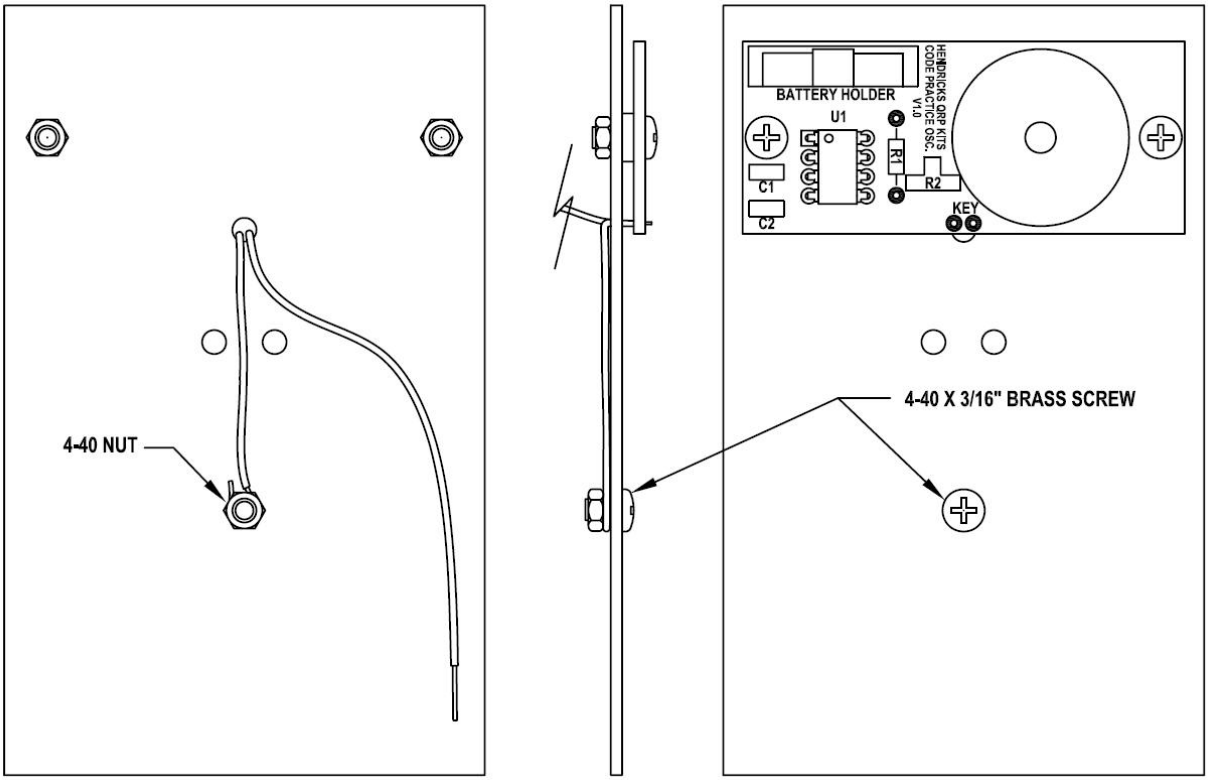


The base should look like this when finished.

Next, assemble the finished and tested printed circuit board to the key base as follows:



Note: Make sure all component leads on the bottom of the board, except the two 4” wires, are trimmed to 1/16” or less. Feed the two pieces of hook-up wire through the hole shown. Use two 4-40 x 5/16 L. screws, and place the two nylon washers between the PCB and the Key base, and secure with two 4-40 nuts as shown.

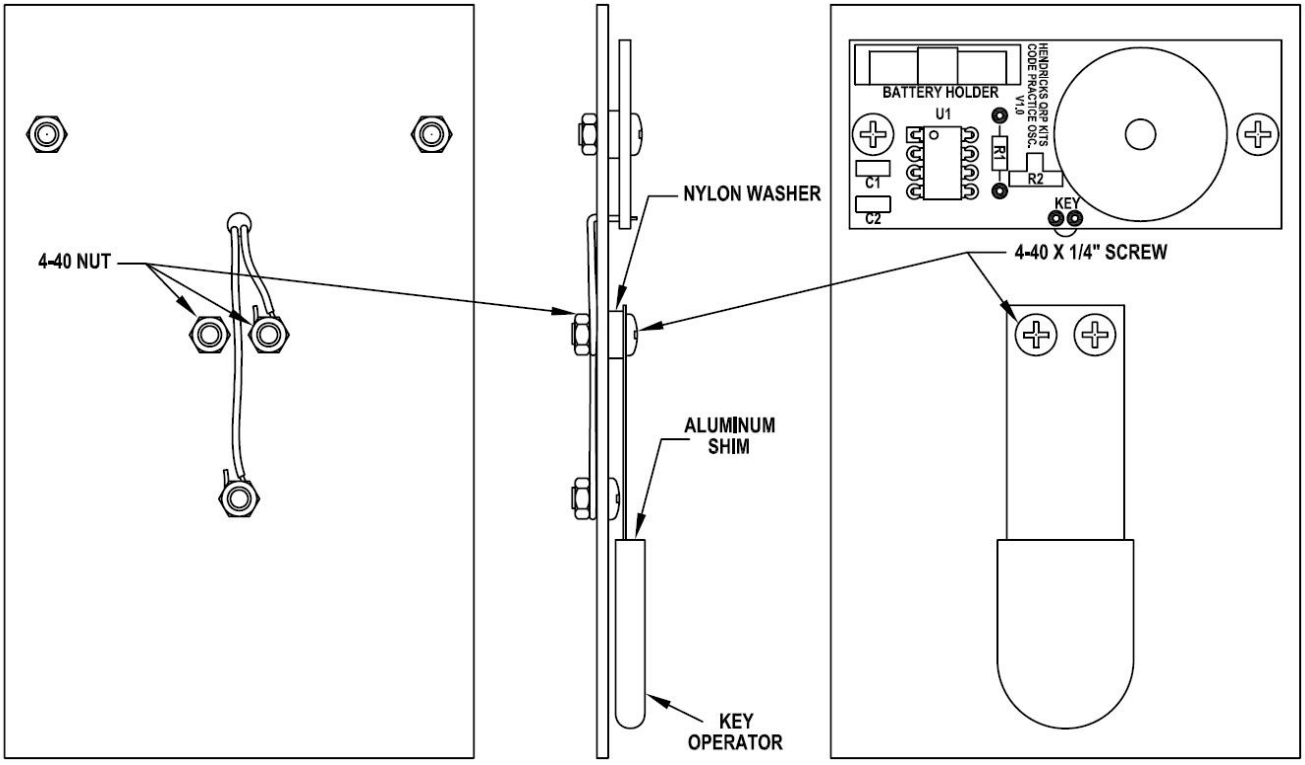


Place the 4-40 x 3/16” long brass screw so that the head of the screw is on the top of the key base, as shown. Cut and strip either of the wires as shown and attach it under the nut that secures the brass screw. This screw acts as the contact point for the key operator.

Next prepare the aluminum shim as follows:

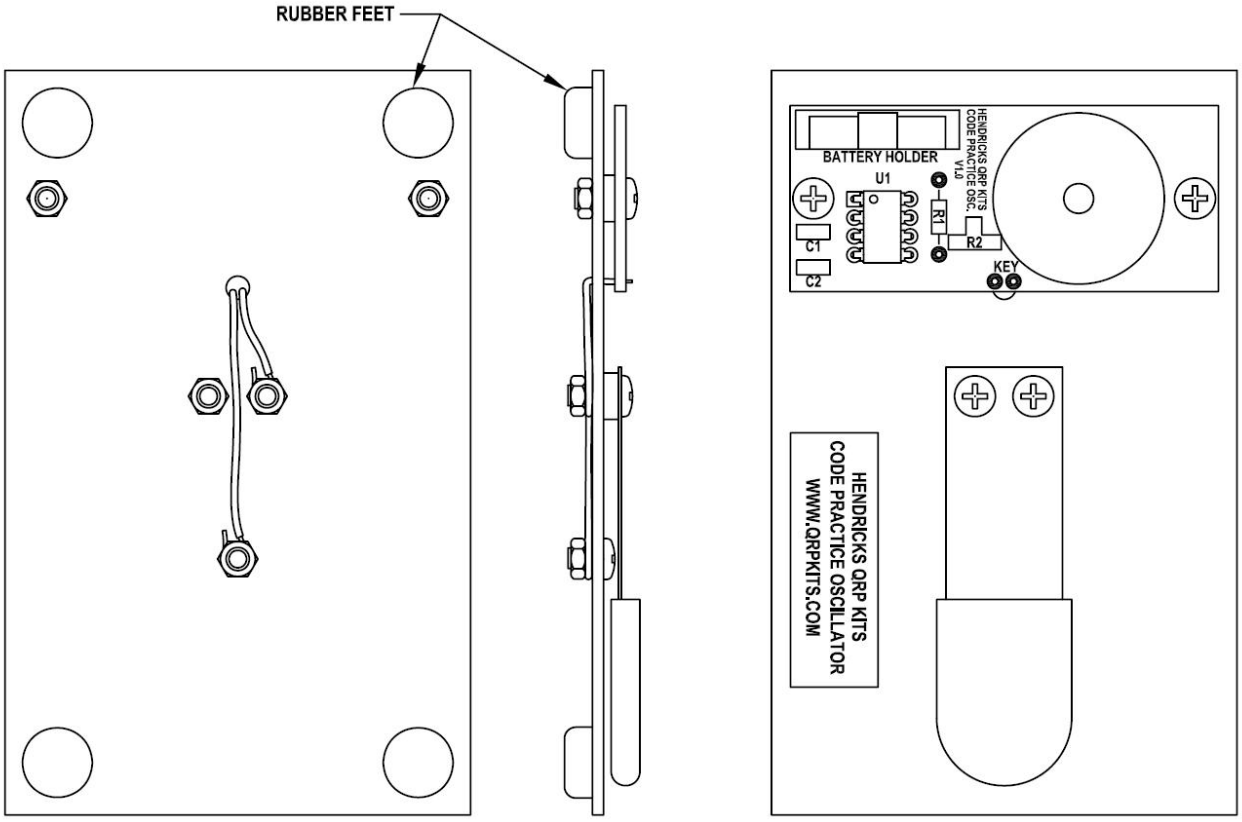
Start by filing a radius on one end of the aluminum spacer to look like the above picture. Slip the rounded end into the vinyl sleeve. Then slip the end of the S.S. leaf that does not have the holes, underneath the aluminum spacer. The completed part should look like the picture below.

At final assembly, to the key base, the aluminum spacer is on top of the S.S. leaf spring.



Note: Position the key operator so that the aluminum shim is on top of the S.S. leaf spring.

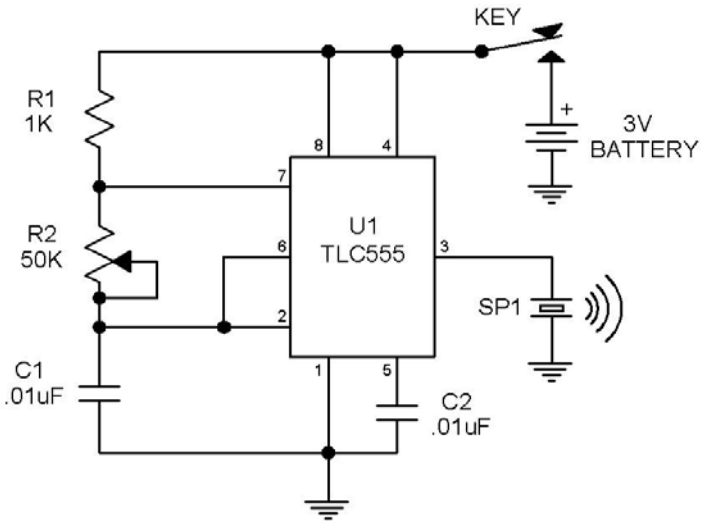
Mount the key operator using two 4-40 x 1/4” screws, with the two nylon washers between the base and the key operator, and two 4-40 nuts. Secure the trimmed and stripped remaining wire under one of the nuts, as shown. You can now re-install the battery and feel free to bend the S.S. leaf spring to achieve the feel you desire for your key. You will need a small amount of clearance between the leaf spring and the brass screw head. This is the switch that drives the oscillator. Also, when storing away the key, you may want to remove the battery or put a small piece of cardboard between the contacts to keep from depleting the battery.



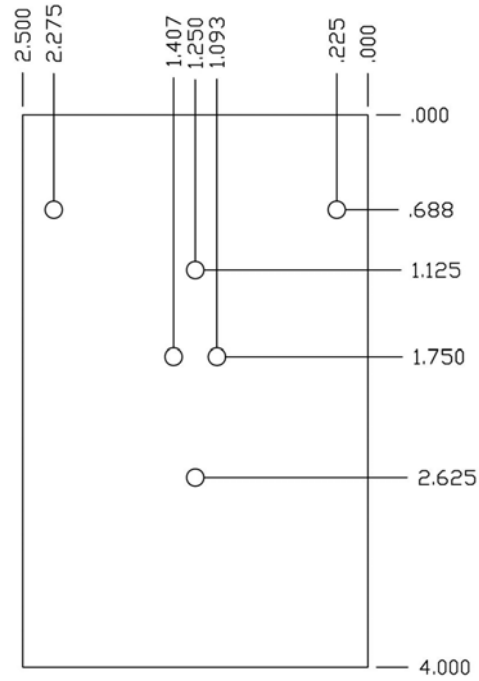
Apply the four rubber feet, at the corners, and the self adhesive nameplate. This completes the assembly.

Now that you have finished building your Hendricks Code Practice Oscillator, how about building another project? We suggest that you build the Scout Regen Receiver as your next building adventure. The Scout Regen is an easy kit to build, and with the skills that you have acquired by building the Hendricks Code Practice Oscillator, you are ready to tackle this fun project. Plus, when you get done, you will have a radio receiver capable of hearing amateur radio signals in the 80, 60, 40m bands, and foreign AM broadcast stations in the 49–31m bands from all over the world. You can check out the Scout Regen at ***www.qrpkits.com***.

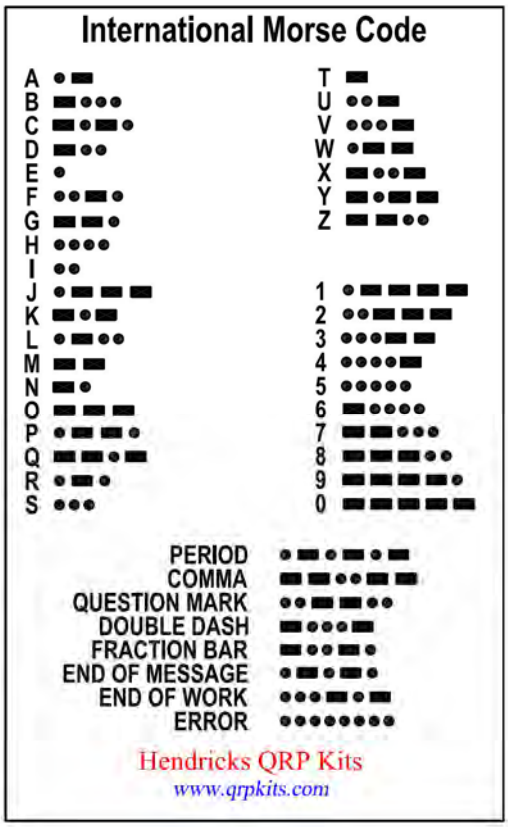
Appendix:



HENDRICKS CODE PRACTICE OSCILLATOR
V 1.0



Hole pattern reference



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