

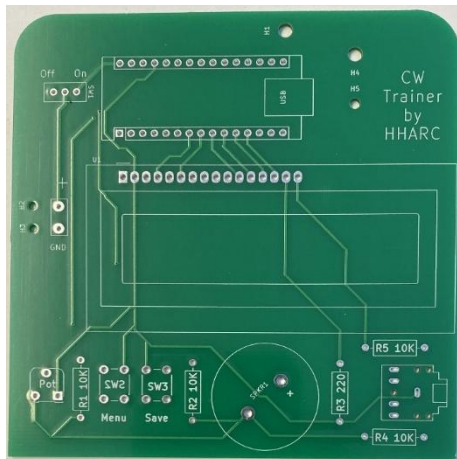
## HHARC CW Trainer

This project makes a trainer to help you learn Morse Code (or as hams usually refer to it – CW, Continuous Wave.) You can use either a straight key or a paddle.

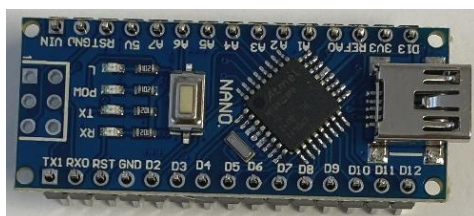


### Parts List:

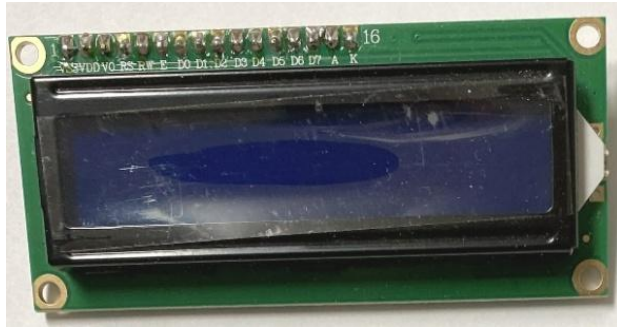
The Printed Circuit Board (pcb)



An Arduino Nano microcontroller



# LCD (liquid crystal display) and 16-pin header



A 220  $\Omega$  resistor



and four 10 k $\Omega$  resistors



An audio jack



a 10 k $\Omega$  potentiometer



A speaker



, a spacer and nut



A 9V battery clip & holder



Two #2 bolts and nuts



with one lock washer

A slide switch



and two button switches

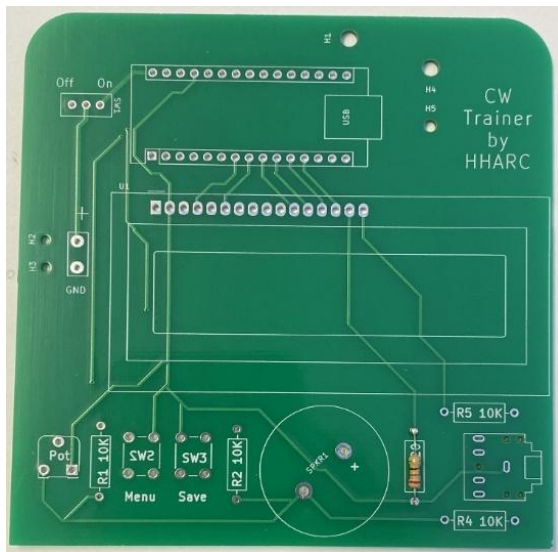




Cardboard backing

This kit comes either as a solder kit or as a kit in which the electronics have already been soldered and which only requires a few further steps to attach the hardware. If you have purchased a kit with the soldering already completed, you can skip to the section marked **Hardware**.

Assembly Instructions: First, you need to solder the 16-pin header to the LCD. This can be done in several ways. If you have a “helping hand” device, you can place the pcb in the helping hand clips, laying the pcb horizontally; put the header in the slots for the LCD, put the LCD over the header pins and solder them. **Do not solder the LCD to the pcb yet, just set it aside for now.**



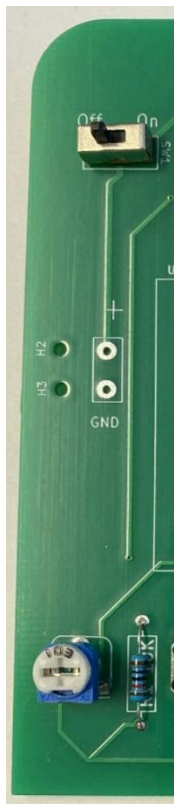
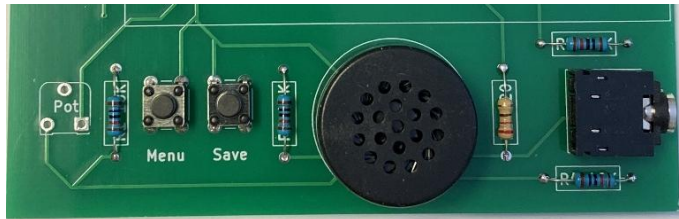
Next, solder the 220  $\Omega$  resistor (R3), then solder the four 10 k $\Omega$  resistors



Next, solder the audio jack and the two button switches

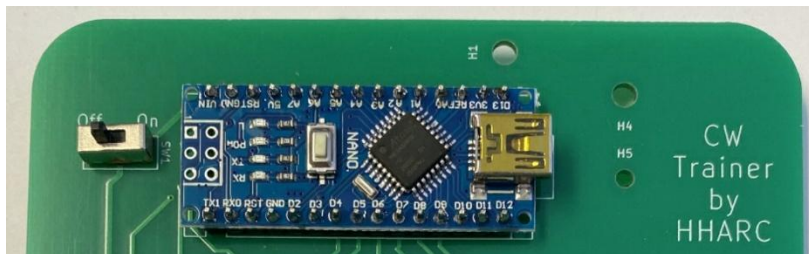


Then the speaker

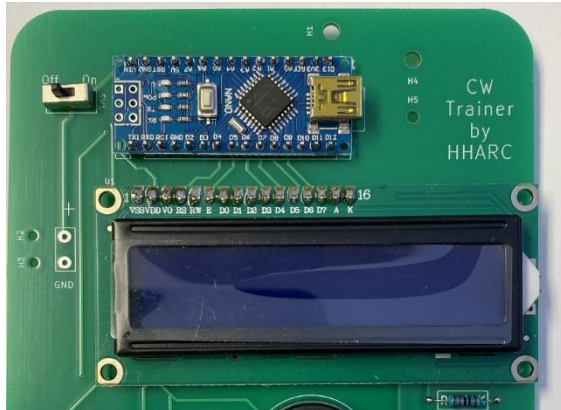


Solder the slide switch. Solder one lead of the switch and then check if it is in the correct position. If needed, heat the lead and reposition, then solder the other leads. Solder the potentiometer.

Solder the Nano with the USB jack to the right



Now, solder the LCD



Take the battery clip and put the battery wires in the holes H2 and H3 with the red wire (+) toward the top.



Put the bare wires through the pads, and solder.



At this point, you can temporarily plug the provided straight key into the audio jack.

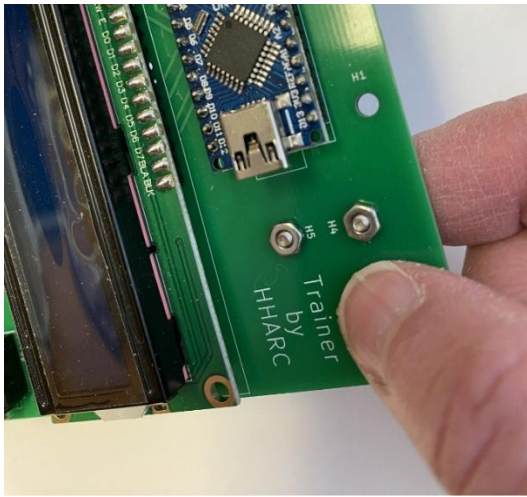


Attach a 9-volt battery and turn it on. Adjust the contrast of the LCD with the potentiometer and see if you can produce Morse code. Re-solder a connection if needed, then remove the battery and key to make it easier to attach the hardware.

## Hardware

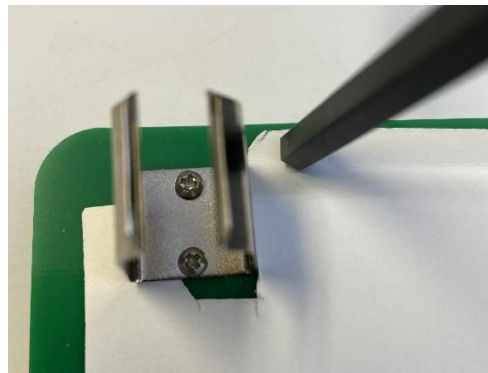
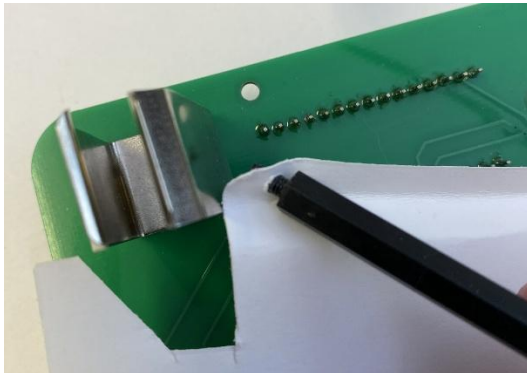


Put the two small bolts through the battery holder, and hold the bolts with a finger as you place them through holes H4 and H5.



Put a lock washer on the upper bolt and then place the nuts on the bolts. Tighten loosely, just until the nuts are on the bolts and won't fall off.

Put the spacer in the hole in the cardboard backing and work the tab on the left side of the backing under the left side of the battery holder. Place the spacer in hole H1 and put on its nut. Tighten all three nuts until secure.



Insert a 9-Volt battery into the battery cap and place the battery into its holder. Adjust the battery such that it does not touch the surface the trainer is resting on and that the trainer doesn't wobble. Plug in your key and turn the device on; further adjust the LCD's contrast with the potentiometer as needed. You are ready to start practicing Morse Code!

