Ham Radio Solutions
CW Hotline Kit
Assembly Manual

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The Ham Radio Solutions CW Hotline kit is a fairly simple construction project that can usually be built in an hour or two. You will need a low wattage pencil-type soldering iron with a small tip, some thin solder, a pair of diagonal cutters and a Phillips head screwdriver. Desoldering braid may be required to correct soldering mistakes. Be sure to wear eye protection when soldering and cutting leads.

CW Hotline Kit Styles

CW Hotline kits are available in 2 assembly styles:

- Kit Style B - with a blank PCB, and all through hole components. For those that want a full kit building experience.
- Kit Style C - with a partially assembled PCB. You just need to add the ESP8266 module, 2 LEDs, a button and speaker. For those who prefer an easier assembly.

Follow the assembly directions below for your kit style. Both kits styles can be ordered with optional built in Iambic paddles.

Most parts for the B style kit, except for a few at the end, should be inserted into the side of the PCB with the jack silkscreens J1, J2, J6. Unless otherwise indicated, parts should be flush with the PCB. After inserting, turn the board over and solder the leads to the pads on the other side. It is often helpful to just solder one lead, then ensure the component is correctly positioned before soldering the remaining leads. Be sure to only solder the correct pads, and do not let any solder touch any other pad or trace. Trim any excess leads with diagonal cutters after soldering each batch of components. The checklist will be useful to ensure all components are properly assembled.

Build slowly and follow the instructions. Use the images to confirm component placement.

Kit B PCB Parts

- ☐ PCB - blank CW Hotline Printed Circuit Board
- ☐ R1, R2, R4 - 680 ohm resistors (blue-gray-brown)
- ☐ R3 - 10K ohm resistor (brown-black-orange)
- ☐ C1 - 0.1uf capacitor (marked 104)
- ☐ Q1, Q2 - 2222A NPN transistors
- ☐ R6 - 1K ohm potentiometer (marked 102)
- ☐ J1, J2, J6 - 3.5mm stereo TRS jacks
- ☐ 2 1x8 male header posts for ESP8266
- ☐ Additional parts listed with Kit C below

Kit B PCB Assembly

- ☐ Install resistors R1, R2, & R4. For each resistor, bend the leads near the bulb 90 degrees and parallel and insert into the PCB. Orientation is not important.
- ☐ Install resistor R3 as resistors above.
- ☐ Install capacitor C1. Orientation is not important.
- ☐ Install transistors Q1 & Q2. Be sure to match the orientation with the flat side on the silkscreen. Leads are often very close together so do not let solder contact between any 2 leads.
- ☐ Install potentiometer R6.
- ☐ Install stereo jacks J1, J2, J6. Ensure all jacks are flush with the PCB.
- ☐ Install 2 1x8 male header posts into PCB. Insert the short sides of the post in the PCB holes. Solder just one pin each on the other side of the PCB, ensure the pins are perpendicular and flush with the PCB, temporarily test fit the blue ESP8266 PCB, and then solder the remaining pins. Use standard ESD precautions when handling the ESP8266 PCB. If you do not have a grounding strap, touch a large piece of metal before touching the ESP8266 PCB.
- ☐ Insert the blue ESP8266 PCB onto the long sides of the previous header posts, being sure to match the silk screen orientation, with the reset button nearest the upper left corner. Solder only two diagonally opposite pins to the hole on the top face of the blue ESP8266 PCB and verify the board is flush. Solder the remaining pins. Do not trim the remaining exposed posts.
- ☐ Insert the green LED D1 onto **the other side of the PCB**. The shorter lead, nearest the flat side of the LED, should go into the square hole. **The LED should not be flush with the PCB**, but instead a 5/32” or 4mm gap between the PCB and the bottom of the LED. Temporarily place the LED and PCB in the case to set the position for the LED to slightly protrude. Solder just one lead and adjust until the spacing is correct, then solder the other lead.
- ☐ Insert the red LED D2 the same way as D1.
- ☐ Insert button SW1 on the same side of the PCB as the LEDs. Orientation is not important, but the leads should align with the holes. Install flush with the PCB.
- ☐ Install the speaker leads into pads marked SP1 on the LED side of the PCB. If the speaker has a connector on the end of the leads, remove it and strip the insulation. The red wire should go to the square hole. Solder on the other side. Use the small square of double sided foam tape to stick the speaker to the PCB above the circle.
- ☐ Continue assembly following Kit C instructions below.

Kit C PCB Parts

- ☐ PCB - partially assembled CW Hotline Printed Circuit Board
- ☐ ESP8266 in WeMos D1 mini form factor, programmed with CW Hotline firmware
- ☐ D1 - green 3MM LED
- ☐ D2 - red 3MM LED
- ☐ SW1 - SPST momentary button
- ☐ 1 small speaker
- ☐ 1 small piece foam tape
- ☐ 2 M3x6 black screws
- ☐ 1 USB-C cable

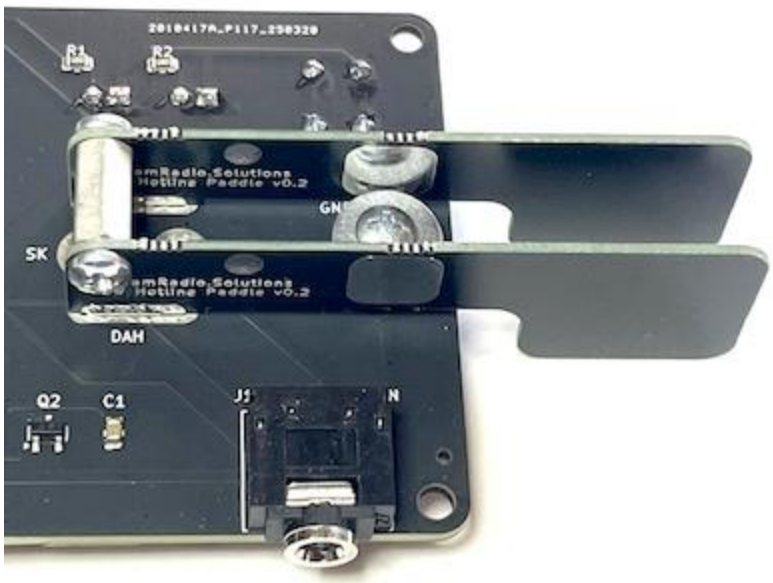
Kit C PCB Assembly

- ☐ Insert the blue ESP8266 PCB onto the long sides of the previous header posts, being sure to match the silk screen orientation, with the reset button nearest the upper left corner. Solder only two diagonally opposite pins to the hole on the top face of the blue ESP8266 PCB and verify the board is flush. Solder the remaining pins. Do not trim the remaining exposed posts.
- ☐ Insert the green LED D1 onto **the other side of the PCB**. The shorter lead, nearest the flat side of the LED, should go into the square hole. **The LED should not be flush with the PCB**, but instead a 5/32” or 4mm gap between the PCB and the bottom of the LED. Temporarily place the LED and PCB in the case to set the position for the LED to slightly protrude. Solder just one lead and adjust until the spacing is correct, then solder the other lead.
- ☐ Insert the red LED D2 the same way as D1.
- ☐ Insert button SW1 on the same side of the PCB as the LEDs. Orientation is not important, but the leads should align with the holes. Install flush with the PCB.
- ☐ Install the speaker leads into pads marked SP1 on the LED side of the PCB. If the speaker has a connector on the end of the leads, remove it and strip the insulation. The red wire should go to the square hole. Solder on the other side. Use the small square of double sided foam tape to stick the speaker to the PCB above the circle.

After Above PCB Assembly

If the CW Hotline will include the built in iambic paddles, follow the instructions below. If it will be only used with external keys and paddles, disregard those instructions.

Iambic Paddle Parts



- ☐ 2 Paddle PCB arms (1 left, 1 right)
- ☐ 2 #4-40 3/16” screws
- ☐ 1 13/32” #4-40 hex standoff (10.3mm long)
- ☐ 1 #4-40 ⅜” screws
- ☐ 1 #6 steel washer (9.8mm x 1.1mm thick)
- ☐ 2 #4 nuts

Iampic Paddle Assembly

- ☐ Separate the paddle arms from each other and lightly sand or file the edge where they were connected.
- ☐ Connect the paddle arms to each other using the hex standoff to create the spacing. Be sure the paddle arm text is on the outside, the exposed contact pads are on the inside facing each other. Use the two 3/16” screws through the two large holes in the paddle arm corners.
- ☐ Insert the paddle arms tabs into the main PCB on the jack side.
- ☐ Solder just one corner of one of the arm tabs on the LED side of the main PCB, ensuring the arm is parallel with but doesn’t contact the main PCB except at the soldering pad. Once it is in position, solder the rest of the tab.
- ☐ Solder the other arm in a similar manner.
- ☐ Install the larger #6 washer to the ⅜” screw and secure with a nut. This washer will be the contact point for both paddle arm pads.
- ☐ Insert that screw into the hole on the main PCB marked GND with the washer between the paddle arms. Secure on the other side of the PCB with a nut.
- ☐ Adjust and rotate the washer so that it is equally spaced between the paddle arms.
- ☐ Optionally push or pull the arms slightly while melting the solder to fine tune the arm spacing.

CW Hotline Case

CW Hotline includes a pre-drilled and cut case. There are 2 case styles:

- with a hole for iambic paddles, and
- without that hole for a version that only works with an external key.

After PCB is assembled:

- ☐ Secure PCB to the case with 2 black screws in the corner holes furthest from the 3.5mm jacks. Do not over tighten or the plastic may crack.
- ☐ Close case with the case lid, with the notched lip end near the built in key if included. If the lid makes contact with the paddle arms, cut away a bit of the lid lip.
- ☐ Apply vinyl label.

Schematic