

DINAH (Version 4) Construction Manual

DINAH (DIN connector based Allstar interface for Hams) is a kit construction project that implements a radio interface to a Raspberry Pi running Allstar software (www.kitsforhams.com/dinah). An Allstar node can be implemented using DINAH, a UHF or VHF radio with a packet (or data) interface, an off-the-shelf miniDIN cable and a Raspberry Pi running the Allstar program.

DINAH can also be used with the Dire Wolf software (www.groups.io/g/direwolf). Two new solder bridge jumper pads are available on DINAH Version 4 to select between 1200/9600 baud and isolate the COS signal.

Unlike the full-featured and more flexible Allstar radio interface solutions from other suppliers, DINAH is designed specifically to interface to the 6 pin DIN connector commonly used for the packet (or data) connection on ham radio VHF and UHF radios. Because this packet interface is fairly standard, DINAH requires no additional gain or potentiometers in the audio paths. Required audio gain settings can be achieved from within the Allstar program. An inexpensive standard off-the-shelf cable with 6 pin miniDIN male connectors on both ends is used to connect DINAH to the radio. Thus the builder does not have to build an interface cable. However, the DINAH PCB (which uses 0805 surface mount parts) includes optional jumpers and parts locations to permit the builder to insert fixed attenuation in the audio paths, select 1200 or 9600 audio and isolate the COS signal for additional interfacing flexibility. DINAH measures only 2 inches long and 1 inch square (50mm by 25mm). It has a built-in male USB connector to plug into a Raspberry Pi (2, 3 or 4) and a COMM (blinking green) communication LED on one end and a 6 six pin female DIN connector (to connect to your radio) plus PTT (red) and COS (green) status LEDs on the other end.

Designed by N8AR, DINAH is available as a parts kit or completely assembled.



Disclaimer:

This device controls equipment that could be damaged by said device. You are responsible for installing, configuring, testing and verifying that the device performs properly in your environment. The developers cannot be held liable for any direct, indirect, consequential or incidental damages to other pieces of software, equipment, goods or persons arising from the use of this device.

By constructing this device you accept the above terms of copyright and disclaimer.

Release Notes:

RELEASE	DATE	CHANGES
2.00	2019-06-11	Initial release
4.0	2021-01-11	Rewritten for version 4 hardware

Table of Contents

DINAH Overview	4
Key Features.....	4
Degree of soldering difficulty – Easy.....	4
Degree of mechanical difficulty - easy (if you use the 3D printed plastic end caps)	4
Required Materials.....	5
Tools.....	5
Step 1. Installing the Four Through-Hole Parts	6
Step 2. OPTIONAL - Cutting Holes in the Aluminum Enclosure End Caps.....	9
Step 3. Final Mechanical Assembly	10
Appendix 1. DINAH Parts List and Board Layouts	12
Appendix 2. DINAH Schematic Diagram	13
Appendix 3. DINAH Jumpers	14
Appendix 3. End Cap Drilling Templates	15

DINAH Overview

Key Features

- Small, portable, USB-powered
- Pre-assembled SMD board simplifies construction
- Uses CM119B or CM108B USB audio codec integrated circuit
- Rugged, RFI-resistant aluminum enclosure
- RFI filter capacitors
- Uses standard low-cost 6 pin male-to-male miniDIN cable
- Interfaces to standard packet (data) interface on many VHF/UHF radios
- 3D printed plastic enclosure end plates minimize mechanical assembly effort
- Blank aluminum end caps included for modification and use in the event of RFI issues
- Jumpers and extra parts locations facilitate custom configurations

Degree of soldering difficulty – Easy

- The DINAH PC board provided with the kit comes with all the surface mount parts installed. The builder installs four through-hole parts.
 - A four pin USB connector
 - A six pin miniDIN connector
 - A two pin LED
 - A four pin LED array

Degree of mechanical difficulty - easy (if you use the 3D printed plastic end caps)

- If you decide to use the metal end caps, you will need to refer to the end cap drawings in the appendix to mark, drill and cut the required holes and slot.

Required Materials

- DINAH Kit (see Appendix for parts list, schematic and PCB layout)

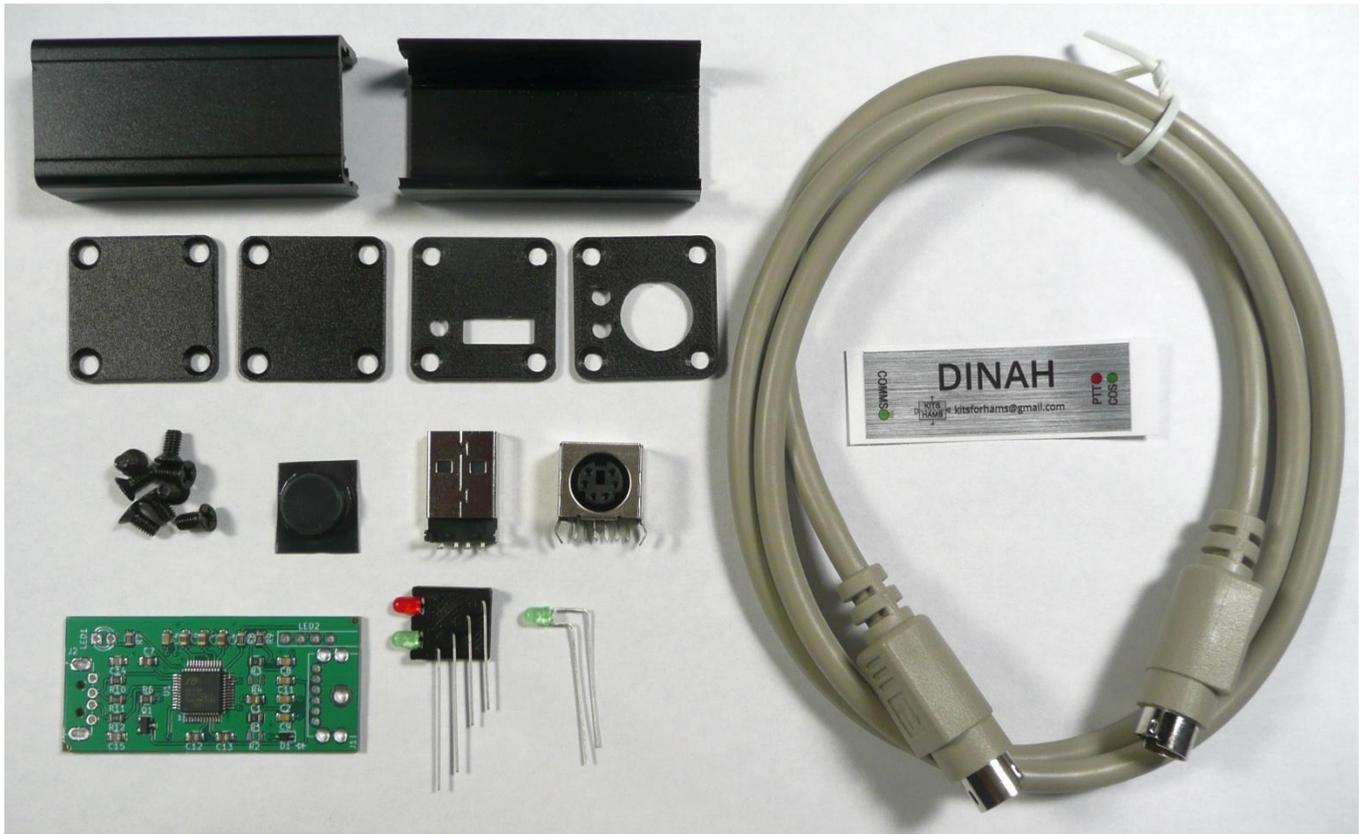


FIGURE 1 - DINAH Kit Parts

Tools

- Low wattage (50 watt) solder pencil with small tip and solder
- Phillips screwdriver, small side cutters, small needle nosed pliers
- *If using metal end caps* – drill, drill bit set and a set of small files

Step 1. Installing the Four Through-Hole Parts

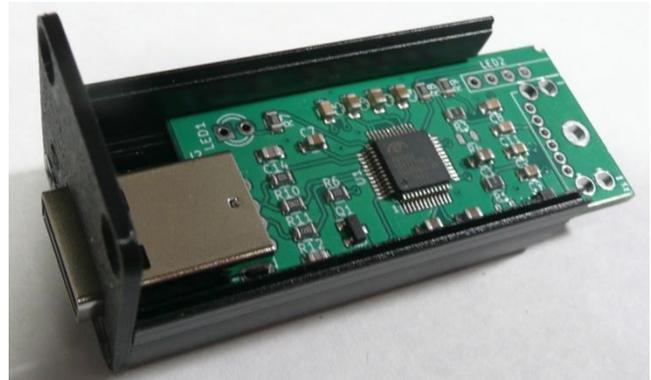
The DINAH V4 kit is shipped with the PC board, DINAH label and LEDs located inside the assembled case. In this step you will disassemble the DINAH case to access these parts. You will then install and solder the USB connector, miniDIN connector, green LED and red/green LED array into the PC board.

CAUTION: The DINAH PC board contains static sensitive parts. Use static prevention procedures when working with the PC board.

Remove the metal end caps from the case by removing eight end cap mounting screws. Remove the parts located in the case and set them aside for later installation.

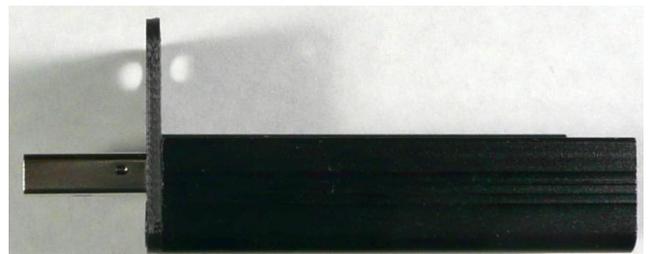
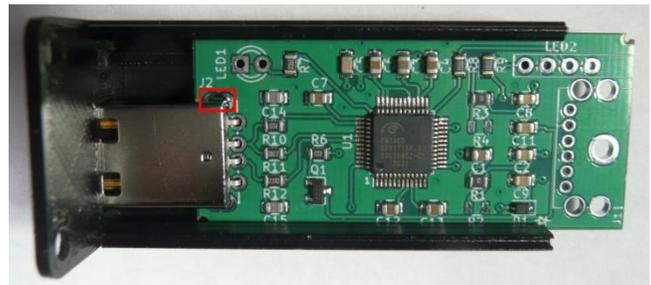


Attach the USB/LED end cap to one of the case halves using two end cap mounting screws. Place the USB connector in position on the PCB. Press the connector firmly to ensure it contacts the PCB then slide the PCB and connector into the case with the USB connector protruding about 1/8 inch through the USB connector slot in the end cap.

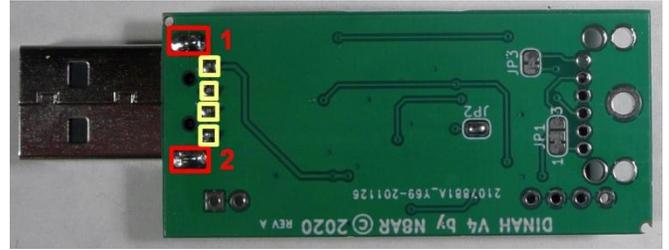


Ensure the connector is fully seated to the board. Then solder the mounting/shield pin closest to the center of the board from the top as indicated by the red rectangle in the photo to the right. This will hold the connector in the proper position for soldering on the back side of the board.

Slide the PCB so that the USB connector extends fully from the slot in the end cap. Visually verify that the portion of the USB connector protruding through the slot is perpendicular to the end cap. If it is not close to perpendicular, reheat your solder joint and carefully reposition the connector until it is perpendicular.

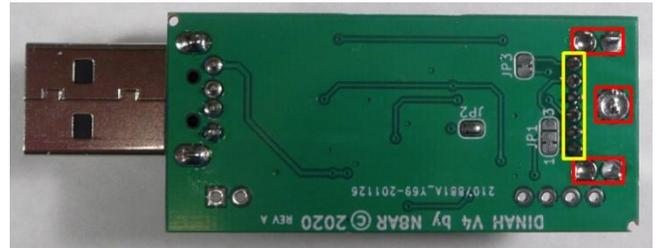
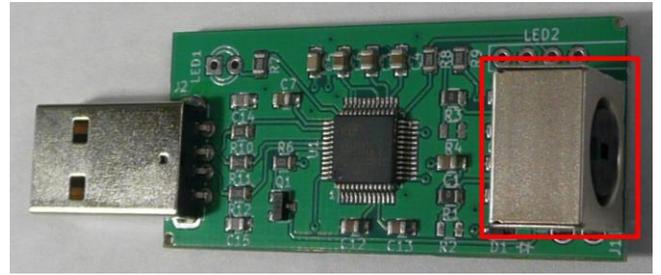


Remove the board with USB connector from the case. Be careful not to disturb the positioning of the USB connector in the board. Solder the two mounting/shield pins from the bottom as indicated by the red rectangles in the photo to the right. **(Caution: Solder the pin closest to the edge of the board first)** Fit check the board with connector by installing the board in the case/end cap. Reheat solder joints and adjust the USB connector if required. Remove the board with USB connector from the case and solder the four remaining pins outlined in yellow.

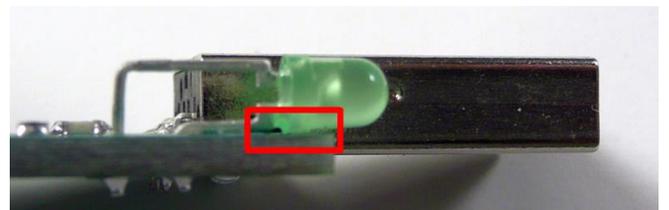


Insert the DIN connector pins into the PC board from the top as shown in the photo. Ensure the connector is flat and seated to the board. Using the minimum solder necessary when soldering the 5 mounting/shield pins as you will need to trim four of them in the next step, solder the 5 mounting/shield pins and the six electrical pins to the bottom side of the board.

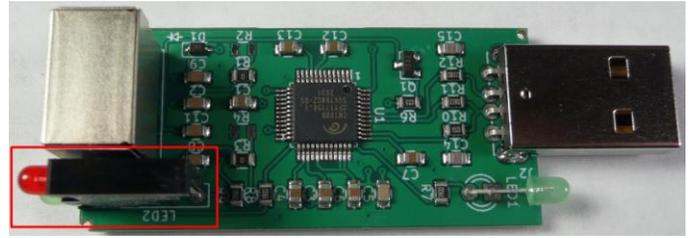
After soldering, trim the excess lead length of the four mounting/shield pins protruding above the board as shown in the third photo



Insert the green LED with the formed leads into the board and position it as shown in the photos to the right. Note that the largest diameter part of the LED body is touching the PC board. Solder it in place and trim any excess lead length.



Insert the LED array into the PC board. Ensure it is vertically at right angles to the PC board and parallel to the board edges. Solder the pin farthest from the board end and then recheck the alignment. Adjust as necessary and then solder the remaining pins. Trim excess lead length after soldering.



Step 2. OPTIONAL - Cutting Holes in the Aluminum Enclosure End Caps

The DINAH kit ships with 3D printed plastic end caps that align with the connectors and LEDs on the printed circuit board. The enclosure's original metal end caps are also included. Drilling and cutting the aluminum end caps is required only if you decide not to use the plastic end caps because they are not as pretty, you need additional EMI shielding or you just like the challenge.

The DINAH enclosure requires an end cap with one slot for the USB connector and LED. A second end cap is required with three holes for the DIN connector and two LEDs.

Dimensioned drawings for the end caps are shown in Appendix 3.

You could also consider using the printed end caps as a template to mark the metal end caps for drilling, cutting and filing.

After creating the required holes, we have found that a black permanent marker works nicely to "touch-up" the exposed aluminum.

Step 3. Final Mechanical Assembly

In this section, you will perform final assembly of DINAH

Slide the assembled PC board into the extrusion half with the installed USB end cap.



Place the other extrusion half in position on top of the bottom extrusion and fasten it to the USB end cap using two screws. Use care when installing the screws to avoid cross-threading them. The holes are tapped so the screws should turn easily.

HINT: Loosen the two bottom screws slightly to facilitate alignment of the top two screw holes.



Attach the DIN end cap using four black flat head screws.

HINT: Partially install all four screws, then tighten.



Clean the recessed area on the top of the case with isopropyl alcohol. Let dry and then apply the "DINAH" label in the recessed area in the top of the case. Ensure the label is oriented correctly so that COMMS, PTT and COS lettering on the label agree with the location of the LEDs at each end.



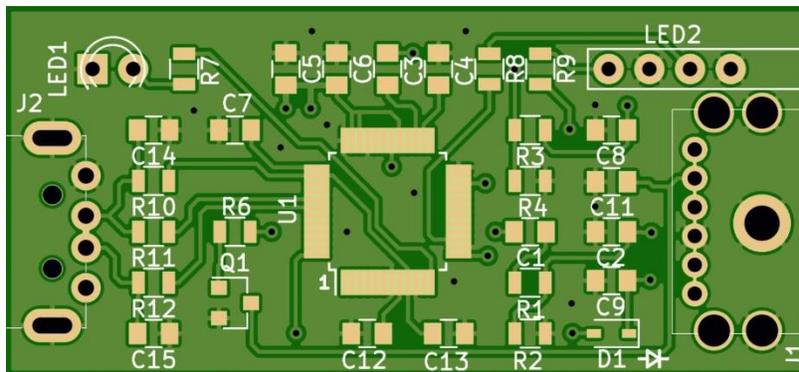
A polyurethane spacer foot has been provided with the kit to provide support to the DIN end of DINAH when she is plugged into a USB port on your Pi. It's thickness is appropriate for various Pi cases that I use. Use it at your discretion. If you need a different thickness, consider using stick-on felt feet.

Clean the area on the bottom of the case with isopropyl alcohol. Let it dry then apply the foot.

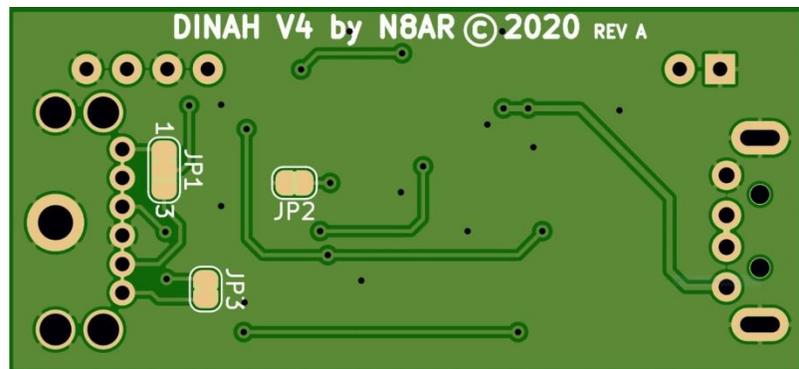


Appendix 1. DINAH Parts List and Board Layouts

REF	NAME	PART NO	DESCRIPTION	MFG
	PC Board	N/A	DINAH PCB with Installed SMD Parts	JLCpcb
LED1	Green LED	LTL-4231N	3mm, Through Hole, Green, Diffused	Lite-On
LED2	Red/Green LED	N/A	LED Indicator, 1.8 mm, Red over Green	KFM
J1	Connector	KMDTX-HT-6S-BS	Connector, miniDIN, 6 Pin	Kycon
J2	Connector	UP2-AH-1-TH	Connector, USB, Male, Type A	CUI
	Enclosure	N/A	Extruded enclosure, 50x25x25mm	Eightwood
	DIN Cable	MD101-0103	3ft PS/2 MDIN-6 Male to Male Cable	Cable Leader
	Label	N/A	DINAH I/O Aluminized Label	Stickers Int'l
	End Plates	N/A	3-D Printed End Plates (set of 2)	KFM



DINAH Surface Mount PCB Top



DINAH Surface Mount PCB Bottom

Appendix 3. DINAH Jumpers

There are three solder bridge jumpers on the DINAH V4 board. The jumpers come configured for using DINAH V4 as the radio interface for an Allstar node. Jumpers JP-1 and JP-3 can be reconfigured for using DINAH V4 with Dire Wolf software.

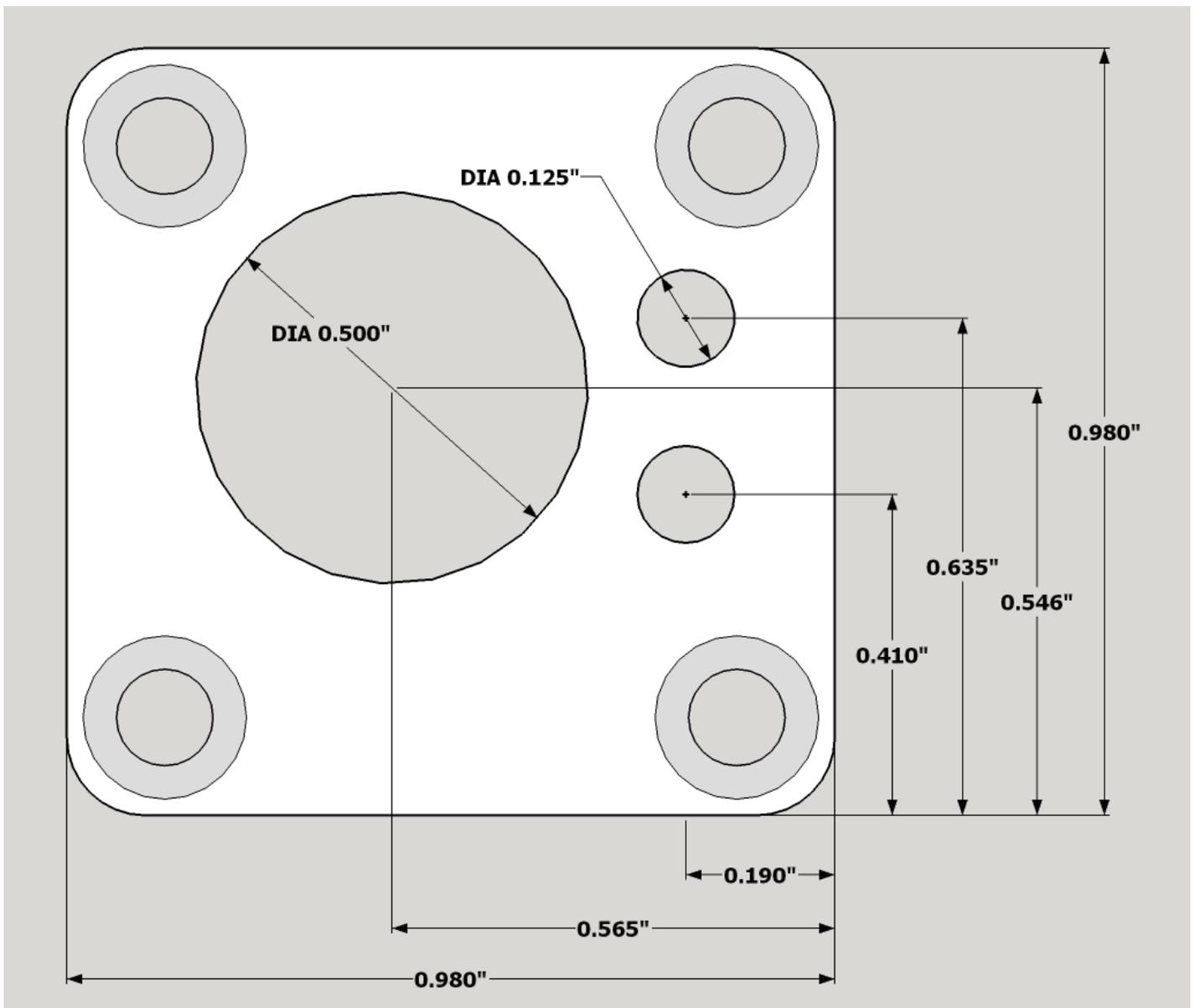
JP-1 Jumper JP-1 is used to select between 1200 and 9600 baud for Dire Wolf or other apps.

JP-2 Jumper JP-2 is used to accommodate the use of a CM119B or a CM108B. It is configured by Kits for Hams..

JP-3 Jumper JP-3 can be cut to prevent the COS signal from the radio being applied to the CM119B/CM108B

Appendix 3. End Cap Drilling Templates

DIN Connector End Cap



USB Connector End Cap

