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Aircraft headset to ham radio adapter

5-6 minutes

Catching up on long-overdue blog posts, here's a project I did a couple of years ago to adapt an aircraft headset to my Yaesu FT-857D ham radio. Aircraft headphones are optimized for the high-noise environment of an airplane—the earmuffs keep the ambient sound (noise) out and the microphone is designed to let only the pilot's voice in. While I haven't used my ham radio in a plane, the headset works well in other noisy environments.

OK, but why an adapter?

Aircraft communication systems had their formative years in the 1930s and 1940s; so much of the communication technology used in today's aircraft was designed to meet technical requirements established back in the '30s.

For this project, the microphone technology standards are what drive the requirements. The electrical standard for aircraft

microphones is based on the carbon microphones used back in the formative years. Besides being available in the 1930s, carbon mikes are naturally noise cancelling and work well in an airplane. They also need some electrical current to work. This adapter provides the current necessary to make an airplane-compatible microphone work with a ham radio and it adapts the connectors– the headset's connectors are also not compatible with those used by the ham radio.

The design project was more mechanical than electrical. The headphones (speakers) on the headset are electrically compatible, so only a connector adapter is necessary. The electrical circuit used is a composite of several I found on the web and in ***QST***, the magazine of the ARRL, and requires only a few components. Nevertheless, the hard work was in getting it all to fit in a box. Unlike my timer project, looks and durability were important design criteria.

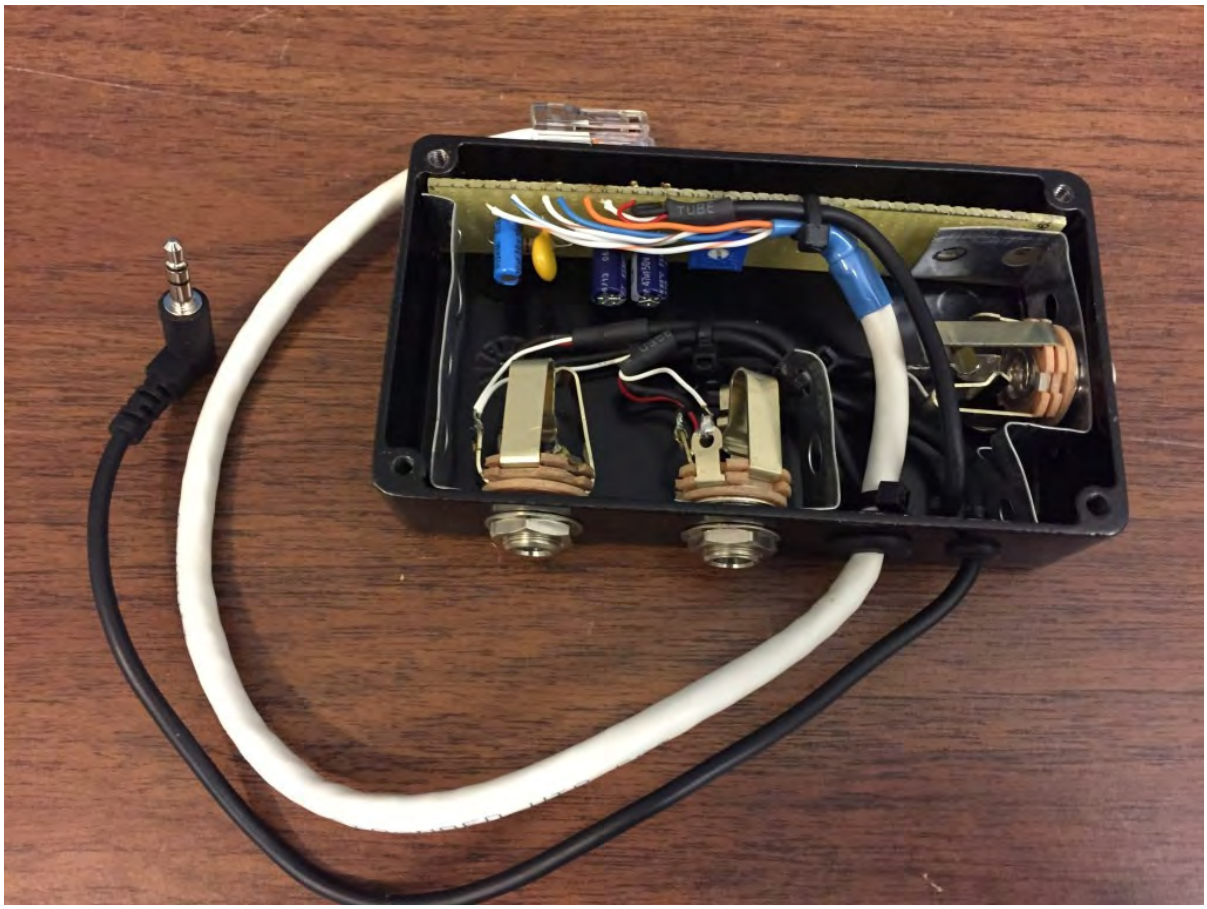
Some of the requirements:

- The high-order bit: it had to adapt an aircraft headset to the ham radio.
- The adapter case had to support the stiff headset connectors.
- The case had to be as small as possible, but large enough for all the connections and cables.
- The cables and connectors had to survive multiple connections and disconnections.
- The case had to be removable but, when mounted to the radio, mounted securely.

The end result came out rather well and has survived two years of

domestic and overseas deployments. With any luck, it'll survive as long as the timer project I described a while back.

HeadsetAdapterBox contains the mechanical drawings, circuit schematics, and parts list, if you're interested in building one. (Some assembly required–actually, ALL assembly is required!)



The inner workings of the finished adapter

My favorite design detail: positioning the microphone gain control (the blue square with a white circle, located in the center of the image) so that it can be adjusted without opening the case–it is accessible by inserting a long, insulated, adjustment screwdriver through the headphone jack (the connector to the left of the white cable). Of course, after all this, it didn't need adjusting.

The finished adapter mounted and ready for service.

Update

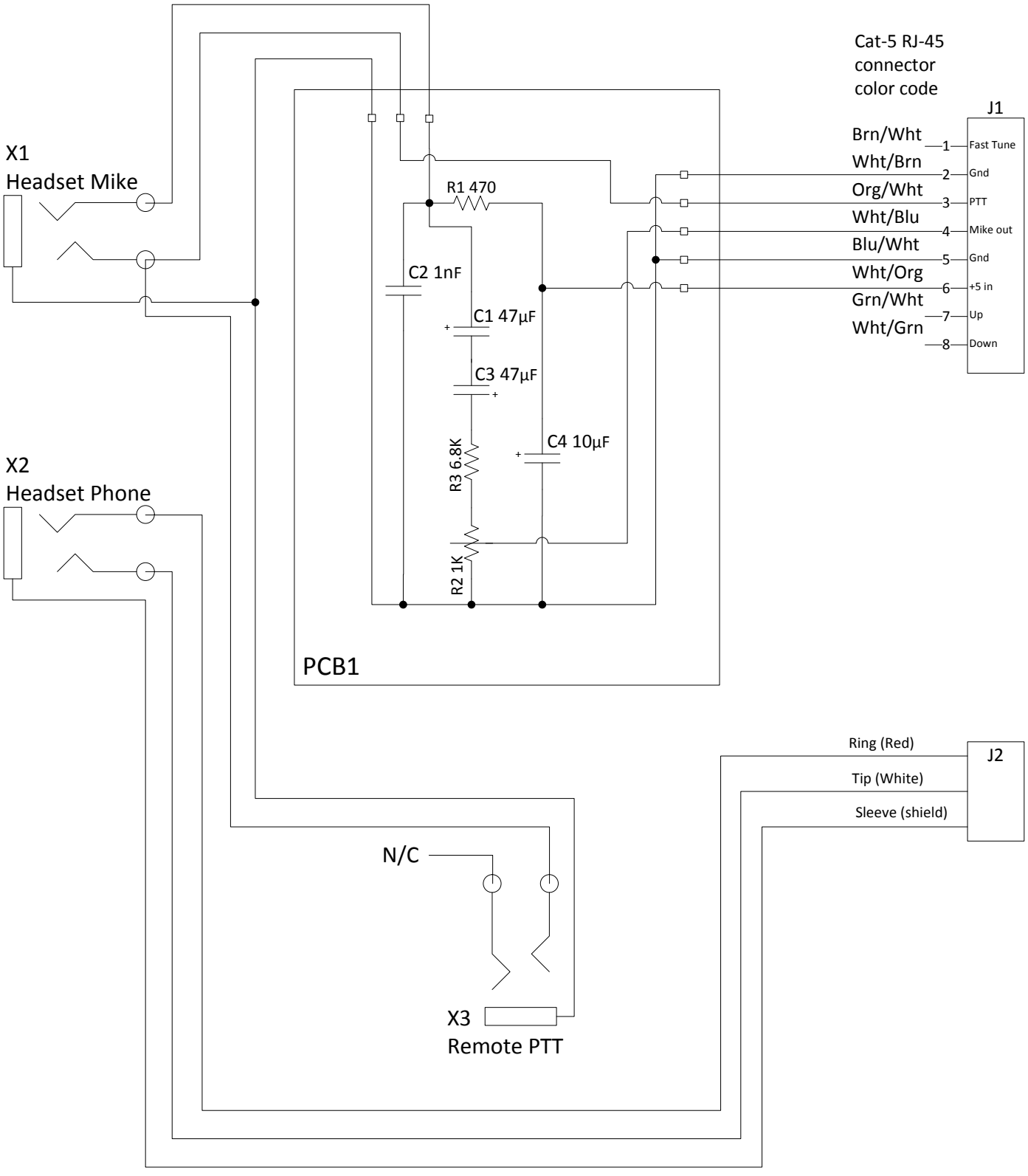
This topic has received a lot of traffic, lately, so I thought I'd add some additional links. I've not been able to find links to the ARRL references I mention above. When I do, I'll add them here. Also, I don't want to give the impression that I invented any of this. The circuit is very common. Mine derives from Aviation Headsets for Ham Radio, which derives from Aviation Headset Connected to FT-897, posted a few years earlier. As I recall, one reference I found for this application was from the 1990's. I adapted these to my particular application and, if anything, my contribution to the project was in the mechanical design, more than the electrical circuitry. Along those lines, I will say that after the past few years of use, the industrial Velcro attachment method has proven to be quite reliable.

If I had to do it again, I would add an external speaker jack and switch. Plugging in the adapter to the radio's headset jack disables the radio's speaker. That's great when you're operating by yourself, but when there are people huddled around you who also want to listen (and you don't want to give up the convenience and clarity of the headset), not being able to also output the audio to a speaker can make things awkward.

For your convenience, and to save you from rummaging through Google, here are some more links on the subject. You'll notice they have a lot in common, with variations to accommodate their individual applications. Some of the pages were posted since my article, and they are in no particular order. They are here only to help you make the best adapter for your application. Enjoy!

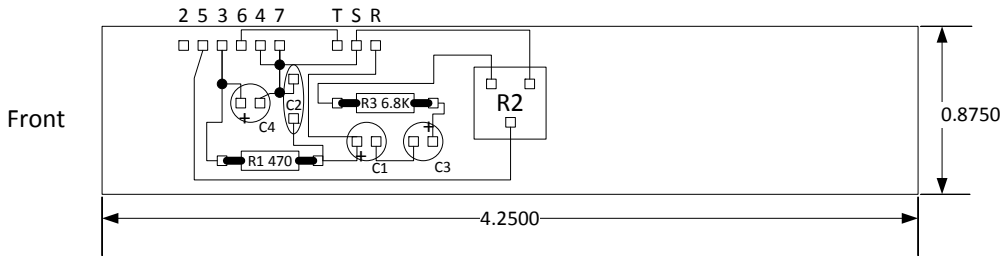
- Aviation Headsets in Amateur Radio
- UPDATE: Adapting an aviation headset

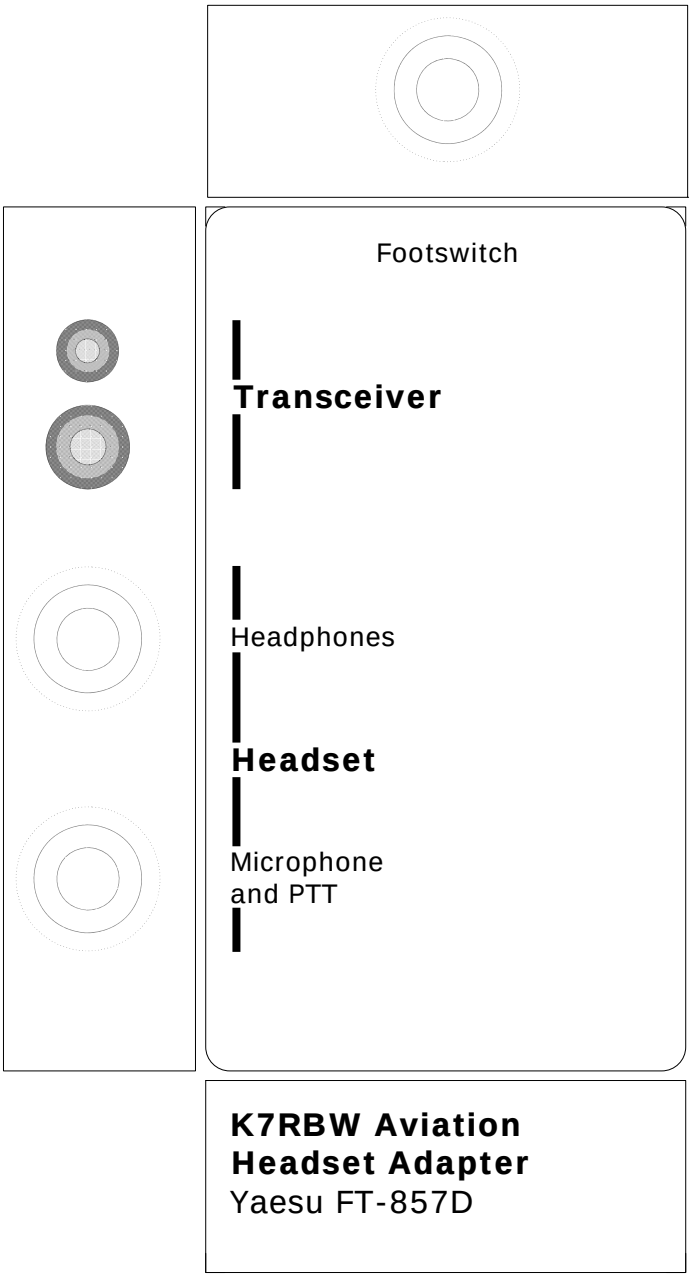
- Adapting an Aviation Headset for Amateur Radio


Cat-5 RJ-45
connector
color code
J1
Brn/Wht
Wht/Brn
Org/Wht
Wht/Blu
Blu/Wht
Wht/Org
Grn/Wht
Wht/Grn
1 Fast Tune
2 Gnd
3 PTT
4 Mike out
5 Gnd
6 +5 in
7 Up
8 Down
X1
Headset Mike
R1 470
C2 1nF
C1 47µF
C3 47µF
C4 10µF
R3 6.8K
R2 1K
X2
Headset Phone
PCB1
Ring (Red)
Tip (White)
Sleeve (shield)
J2
N/C
X3
Remote PTT

Mouser #	Mfr. #	Manufacturer	Desc.	Customer Part #	Order Qty.	Price (USD)	Ext.: (USD)
534-733	733	Keystone Electronics	Cable Mounting & Accessories RUBBER GROMMET .250 BUNA N	Case	2	$0.14	$0.28
80-ESK476M050AE3EA	ESK476M050AE3EA	Kemet	Aluminum Electrolytic Capacitors - Leaded 50volts 47uF 20%	C1,3	2	$0.24	$0.48
534-9600	9600	Keystone Electronics	Screws & Fasteners .250 4-40 Steel Hex Machine Screw Nut		4	$0.10	$0.40
534-9505	9505	Keystone Electronics	Screws & Fasteners 1" 4-40 STEEL FLAT	Case	4	$0.24	$0.96
761-2102-440-AL-7	2102-440-AL-7	RAF Electronic Hardware	Standoffs & Spacers 3/8 LGNTH 4-40 STD FML HEX STANDOFF	Case	4	$0.19	$0.76
140-REA100M1HBK0511P	REA100M1HBK-0511P	Lelon	Aluminum Electrolytic Capacitors - Leaded 50V 10uF 20% 5x11mm	C4	1	$0.08	$0.08
172-7434-E	172-7434-E	Kobiconn	Audio Cables / Video Cables / RCA Cables 3.5 STEREO PLG/RA 36"BLACK/STRIP/TIN	X2	1	$3.41	$3.41
652-3386F-1-102LF	3386F-1-102LF	Bourns	Trimmer Resistors - Through Hole 3/8" 1Kohms 10% 0.5Watts Square	R2	1	$1.60	$1.60
594-S102K33Y5PP63K5R	S102K33Y5PP63K5R	Vishay	Ceramic Disc Capacitors .2LS 1000PF 2KV 10%	C2	1	$0.12	$0.12
293-6.8K-RC	293-6.8K-RC	Xicon	Carbon Film Resistors - Through Hole	R3	1	$0.15	$0.15
293-470-RC	293-470-RC	Xicon	Carbon Film Resistors - Through Hole 470ohms	R1	1	$0.15	$0.15
589-7100-45	7100-45	Twin Industries	PCBs & Breadboards .1" Grid .042" Holes 4.0"X 5.0"; FR4	PCB1	1	$4.99	$4.99
644-NK5EPC3Y	NK5EPC3Y	Panduit	Ethernet Cables / Networking Cables Category 5E 3 Foot	J1	1	$4.57	$4.57
502-12B	12B	Switchcraft	Phone Connectors 3 CONDUCTOR 1/4"	X1,4	2	$1.85	$3.70
502-S-12B	S12B	Switchcraft	Phone Connectors 3 CONDUCTOR .210"ID	X3	2	$2.67	$5.34
400-4621	462-0020E	Deltron	Enclosures, Boxes, & Cases DIECAST	Case	1	$16.91	$16.91

Circuit board
Component view (towards connectors)





Labels
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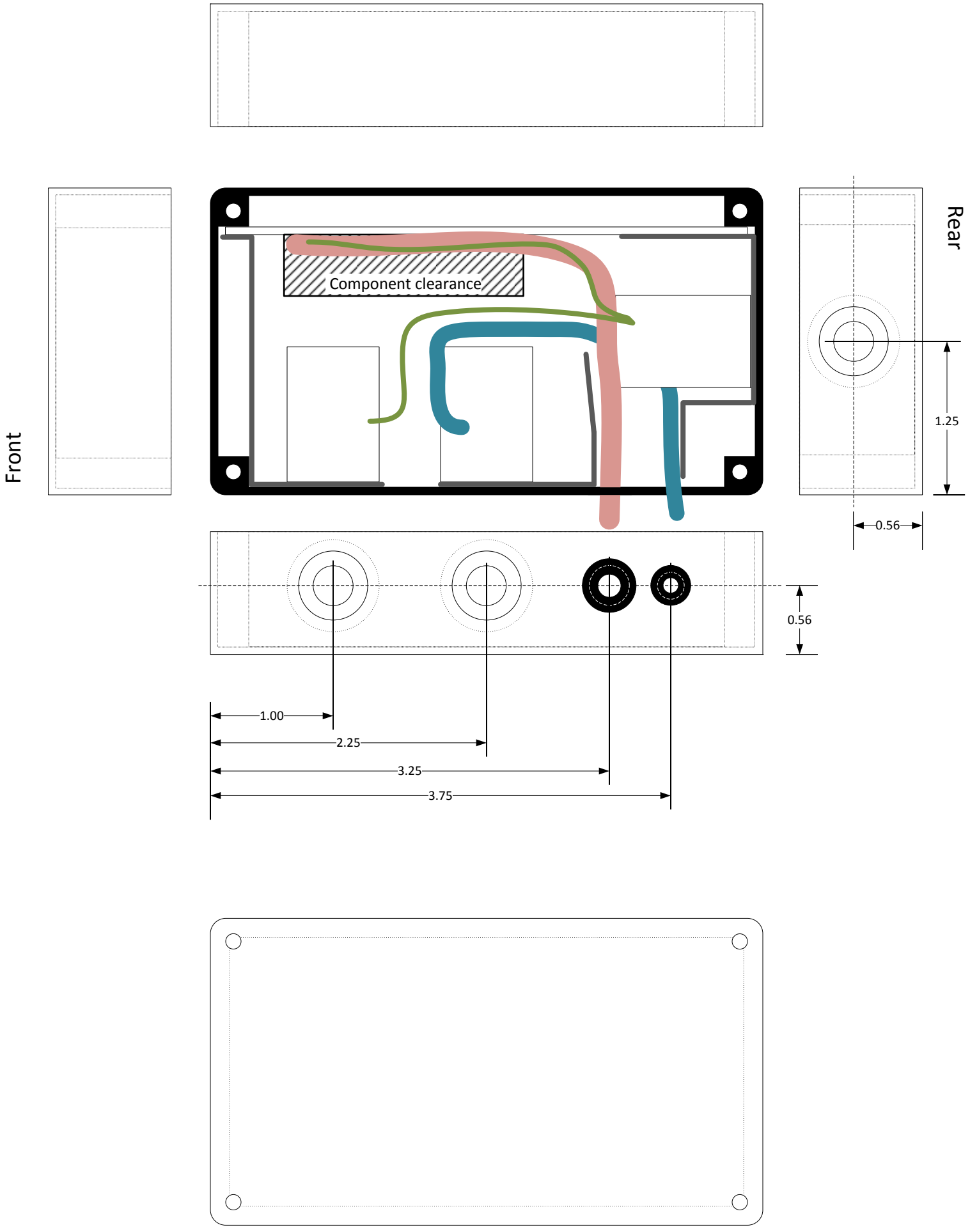
Front
Component clearance
Rear
1.25
0.56
0.56
1.00
2.25
3.25
3.75