

## Fabricating a custom chassis from copper clad FR4 pcb material for the QRP Labs QCX Transceiver



This document shows how I fabricated compact chassis from 1/16" thick double side copper clad FR4 pcb stock. The case forms a box type case with a simple cover. Approximate size is 4.25"(108mm) x 3.56"(91mm) x 1.40(36mm). Please refer to the general fabrication techniques for working with the clad material at:

[http://qrpguys.apps-1and1.com/wp-content/uploads/2016/11/pcb\\_chassis\\_a.pdf](http://qrpguys.apps-1and1.com/wp-content/uploads/2016/11/pcb_chassis_a.pdf)

The specific chassis dimensions and decals are contained in this document. I chose to leave all the controls, lcd display, and I/O ports remaining on the board and not mount them remotely. I also used all the hardware and standoffs that came with the kit. The only components I have added to the chassis is a standard 2.1mm x 5.5mm female power jack that connects to the stock power connector on the pcb, and some control extensions to get the knobs and pushbuttons through the chassis cover. This arrangement may not be the easiest solution, but it is just the way I chose to package my project, with the simple tools I have.

**The latest revision can be found in the Misc. Files section of [www.qrpguys.com](http://www.qrpguys.com).**

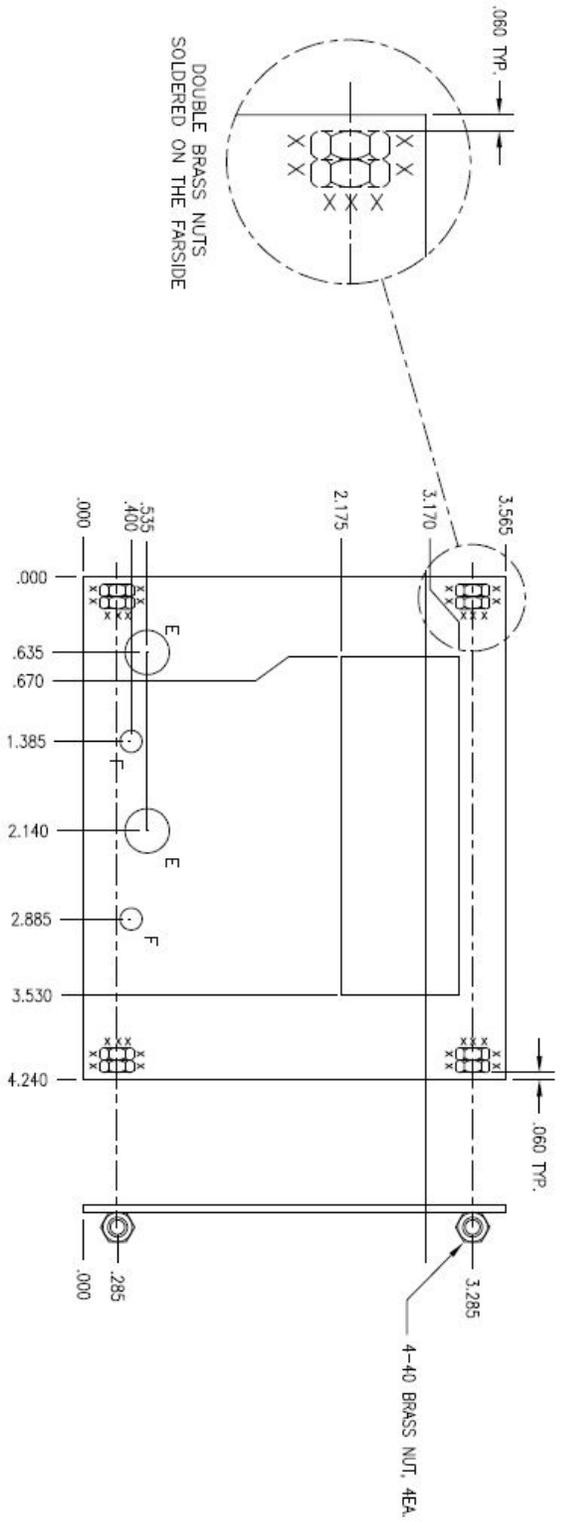
I have incorporated a QRPGuys KX Single Lever Paddle to mount to the front of the chassis attached with flat coin magnets, and added the 3.5mm plug with pigtail. Two magnets are epoxied to the mounting surface of the paddle, and the opposing magnets are attached to the chassis with two sided tape. It plugs into the existing Ø3.5mm paddle female connector, making it removable for storage. I also added four self adhesive feet on the bottom of the chassis.



Every attempt was used to stay with existing parts in the kit. I found it necessary to use 1/4" dia. knobs for the shaft extensions. I used one Tayda # A-2828, \$.49 ea. for the gain and one # A-1006, \$.56 for the encoder. I found it better to replace the two pushbutton switches with ones that had longer stems for bonding the extensions.

PRELIMINARY

REVISIONS		
REV	DESCRIPTION	DATE
INITIAL RELEASE		10/28/17



- HOLE LEGEND
- A -  $\phi$ .250
  - B -  $\phi$ .312
  - C -  $\phi$ .125
  - D -  $\phi$ .125 CSK. .220 X 8Z
  - E -  $\phi$ .375
  - F -  $\phi$ .187

CHASSIS COVER

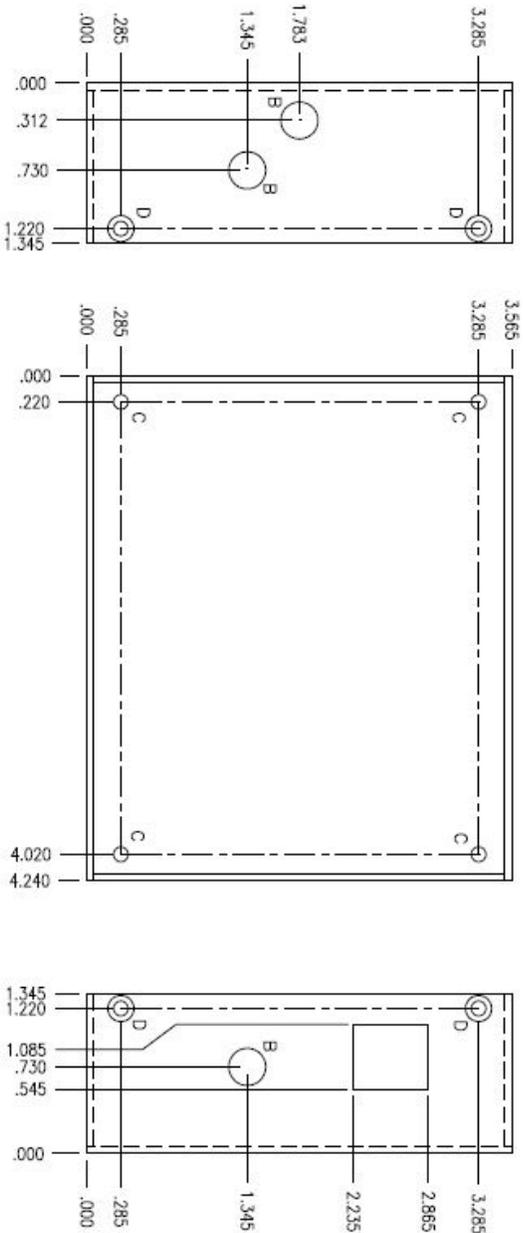
MATERIAL - .06 THK. FR4 COPPER CLAD DOUBLE SIDE PC BOARD MATERIAL  
 FOR PCB CHASSIS FABRICATION TECHNIQUES, VISIT:  
[http://qrpguys.apps-1and1.com/wp-content/uploads/2016/11/pcb\\_chassis\\_arpdf](http://qrpguys.apps-1and1.com/wp-content/uploads/2016/11/pcb_chassis_arpdf)

1PC. - 4.240" X 5.565"

UNLESS OTHERWISE SPECIFIED  
 DIMENSIONS ARE IN INCHES  
 TOLERANCES ARE:  
 FRACTIONS DECIMALS ANGLES  
 $\pm 1/32$  .XX  $\pm$  .015  $\pm 1^\circ$   
 SURFACE FINISH  $\sqrt{\quad}$   
 BREAK EDGES .005-.020  
 RADIUS OR CHAMFER

 WWW.QRPGUYS.COM		TITLE QCX PCB MATERIAL CHASSIS	
DRAWN	W44MNT	SCALE	FULL
SHEET	1 OF 2	REF.	
DATE	10/28/17	DWG.#	QCX01

REVISIONS		
REV	DESCRIPTION	DATE
	INITIAL RELEASE	10/28/17



CHASSIS BOTTOM

- HOLE LEGEND
- A -  $\phi$ .250
  - B -  $\phi$ .312
  - C -  $\phi$ .125
  - D -  $\phi$ .125 CSK .220 X 82°
  - E -  $\phi$ .375
  - F -  $\phi$ .187

MATERIAL - .06 THK. FR4 COPPER CLAD DOUBLE SIDE PCB BOARD MATERIAL  
 FOR PCB CHASSIS FABRICATION TECHNIQUES, VISIT:  
[http://qrpguys.dpps-1and1.com/wp-content/uploads/2016/11/pcb\\_chassis\\_a.pdf](http://qrpguys.dpps-1and1.com/wp-content/uploads/2016/11/pcb_chassis_a.pdf)

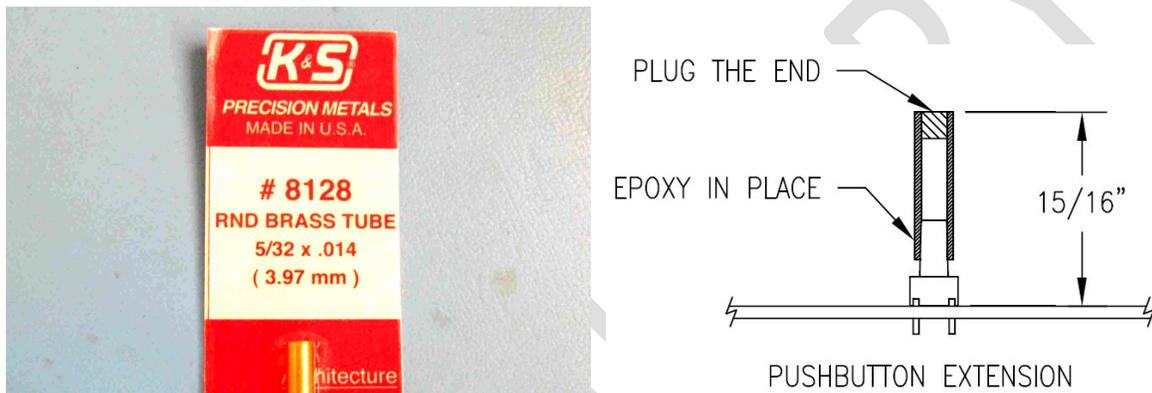
1PC. - 4.240" X 5.565"  
 2PCS. - 4.240" X 1.285"  
 2PCS. - 3.445" X 1.285"

UNLESS OTHERWISE SPECIFIED  
 DIMENSIONS ARE IN INCHES  
 TOLERANCES ARE:  
 FRACTIONS DECIMALS ANGLES  
 $\pm 1/32$  .XX  $\pm$  .015  $\pm 1^\circ$   
 .XXX  $\pm$  .005  
 SURFACE FINISH  
 BREAK EDGES .005-.020  
 RADIUS OR CHAMFER

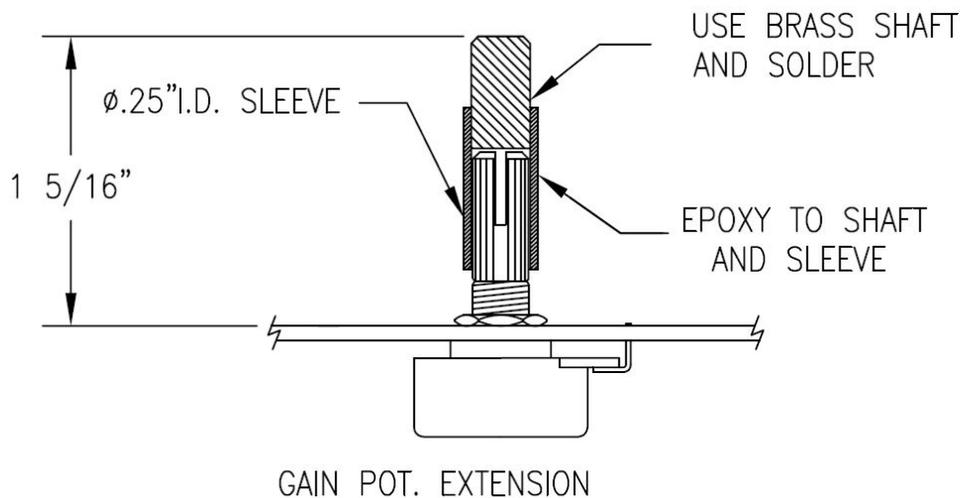
<b>QRPGuys</b> WWW.QRPGUYS.COM			
TITLE QCX PCB MATERIAL CHASSIS			
DRAWN	WAAHNT	SCALE	FULL
SHEET	2 OF 2	REF.	DWG.#
			QCX01
		DATE	10/28/17

At first glance this seems like an easy exercise in just securing the board to the chassis, attach the cover, put on the knobs and you're good to go. However, you will notice on your QCX assembly that the user controls that need to protrude thru the top cover are all different lengths, and all too short. The "Gain" and "Encoder" need to be extended to about 1 5/16" over the surface of the pcb, and the "Pushbuttons" about 15/16" to allow access through the cover.

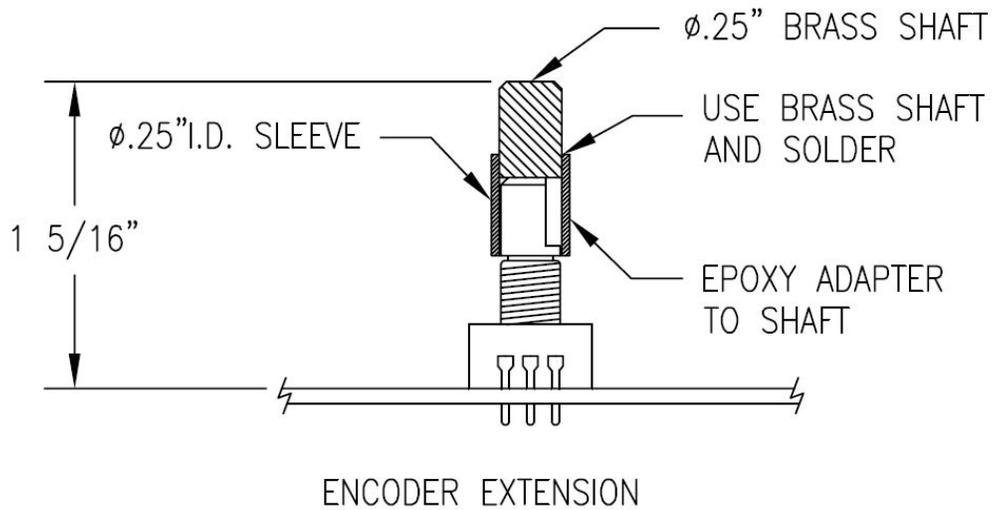
First and easiest to solve are the two pushbuttons. The pushbuttons are a standard footprint and longer operating levers are easily obtained from many sources. It is best to replace them with something longer to permit a small sleeve to be cemented on the lever making it any length you choose. You can use the original short switches, but you would need to be very careful. Use a small amount of adhesive, *and be careful not to let the adhesive seep into the switch*. You can find thin walled brass tubing at hobby shops, or hardware stores. For the pushbutton to extend 3/16" above the chassis, the overall length from the surface of the pcb must be ~1.00". You may wish to plug the end of the tube. See below.



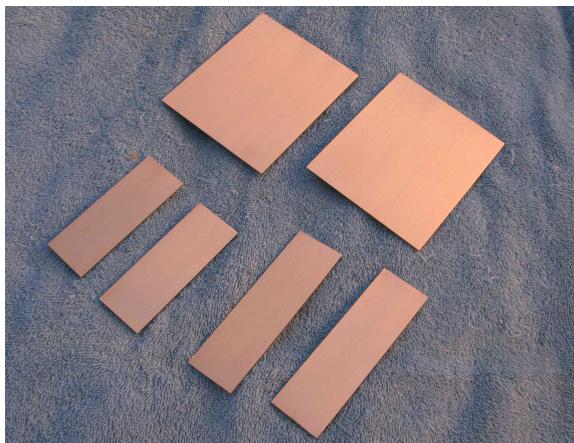
The gain control needs to be extended approximately 1/2". The same company as above makes 9/32" O.D. x 1/4" I.D. brass tubing you can get at the local hardware store or hobby shop that can be epoxied to the splined shaft of the potentiometer. Then you can add any length .25" dia. brass rod to make it longer. Solder the shaft extension to the sleeve and carefully check the overall length before the final bonding. Only use a small amount of adhesive. *Be careful not to let the adhesive seep into the potentiometer*. The potentiometer has to be mounted on the pcb before you do this because the retaining nut will not pass over the extension. See below:



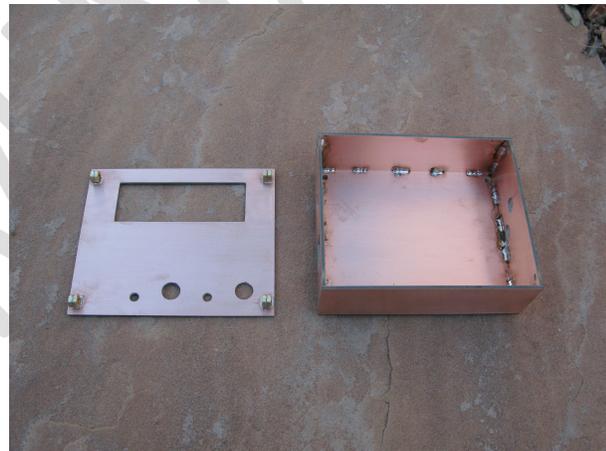
It will be necessary to use the same technique on the encoder, however it can be done before mounting the encoder, as the mounting nut is not used. Only use a small amount of adhesive. *Be careful not to let the adhesive seep into the encoder.* See below:



Pictures of the effort:



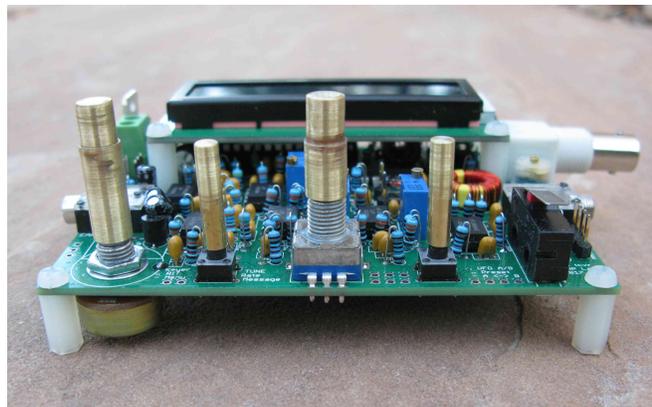
Stock cut and sized



Soldered chassis w/ holes



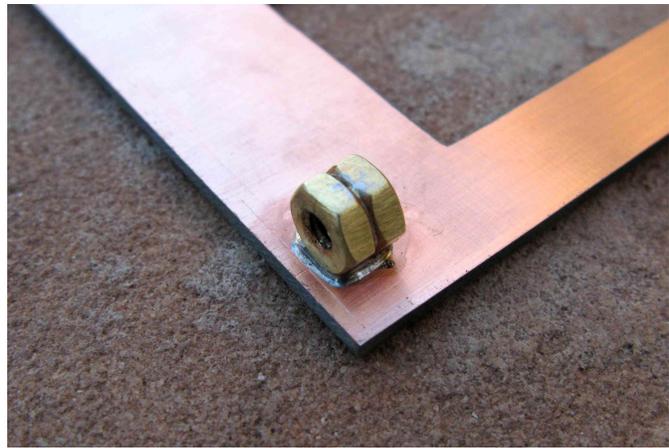
Chassis trial fit



Extension trial fit



Cover fit check



Cover double nut detail



Final fit check before painting



Just before decals

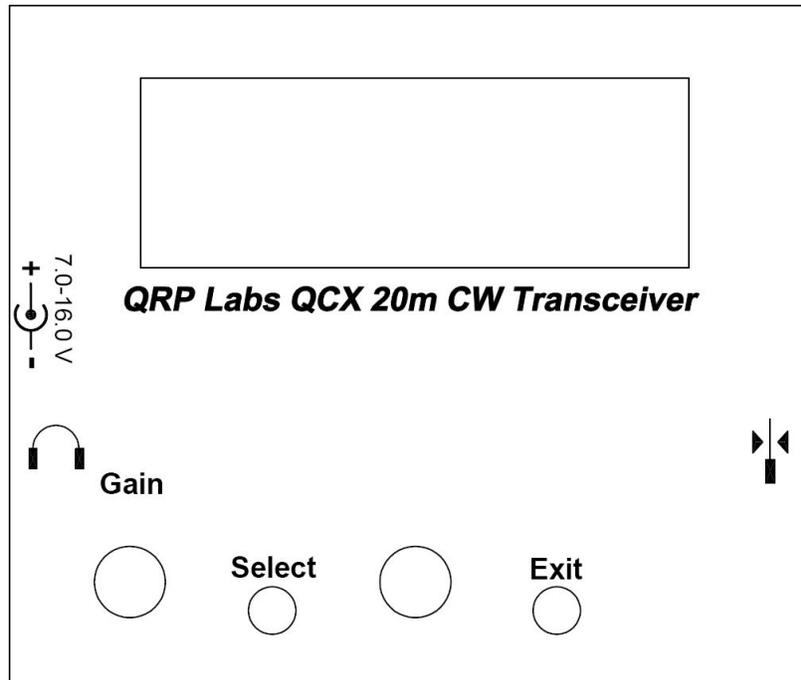


With decals



Completed

## Decal Installation



Depending on how you want to finish your QCX chassis, after painting, you may choose to print your own waterslide decals on a laser printer. I use Papilio Item# PAS48511G laser waterslide decal paper for all my chassis decals. The decals are applied the same as model airplane decals. Cut around each group of text or symbols you wish to apply. It doesn't have to be perfect as the background film is transparent. Apply the decals before you mount anything to the chassis. Have the knobs handy, and use the above picture to get the correct spacing around the holes and cutouts, as it is very easy to do a great decal installation and have a portion covered up with a knob

**Thoroughly clean the surface of the panel to remove any oils or contamination.**

Trim around the decal. After trimming, place the decal in a bowl of lukewarm water, with a small drop of dish soap to reduce the surface tension, for 10-15 seconds. Using tweezers, handle carefully to avoid tearing. Start to slide the decal off to the side of the backing paper, and place the unsupported edge of the decal close to the final location. Hold the edge of the decal against the panel, with your finger, and slide the paper out from under the decal. You can slide the decal around to the right position, as it will float slightly on the film of water. Use a knife point or something sharp to do this. When in position, hold the edge of the decal with your finger and gently squeegee excess water out from under the decal with a tissue or paper towel. Work from the center, to both sides. Remove any bubbles by blotting or wiping gently to the sides. Do this for each decal, and take your time. Allow to set overnight, or speed drying by placing near a fan for a few of hours. When dry, spray two *light* coats of water based clear acrylic spray. Laser decal paper is available from many sources, including eBay.

