

# Instructions for building the PGA144 2m preamplifier

---

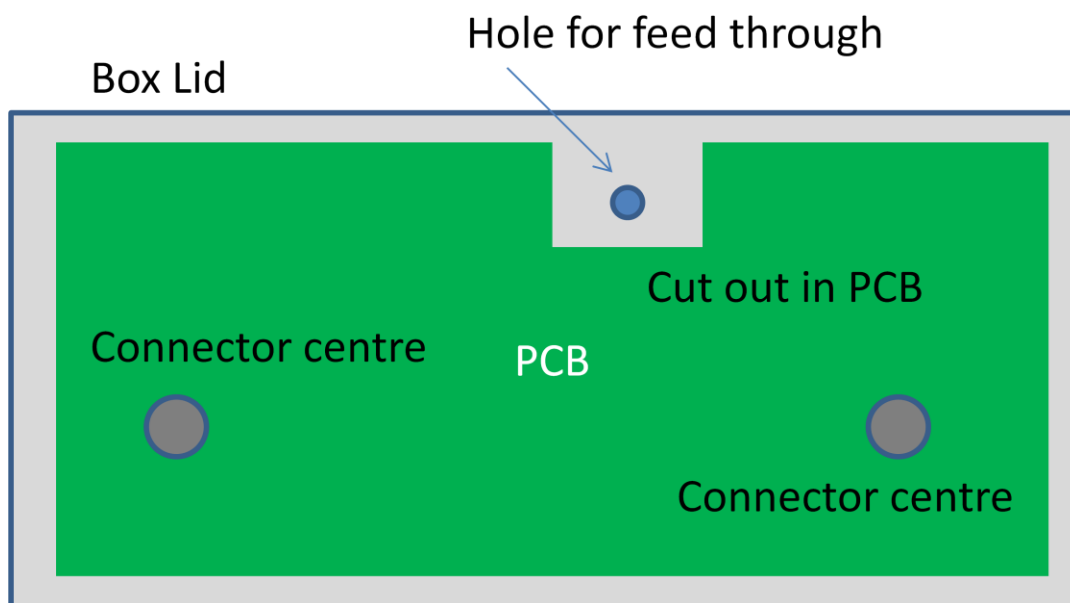
## First step

Carefully place the PCB, track side up, inside the lid of the tinplate box. Ensure that the PCB is centrally located.

Mark the positions of the connector centre spills, through the holes in the PCB, onto the inside of the box lid. Double check the PCB is central.

Mark the outline of the cut-out in the PCB onto the lid.

Remove the PCB for safe keeping.



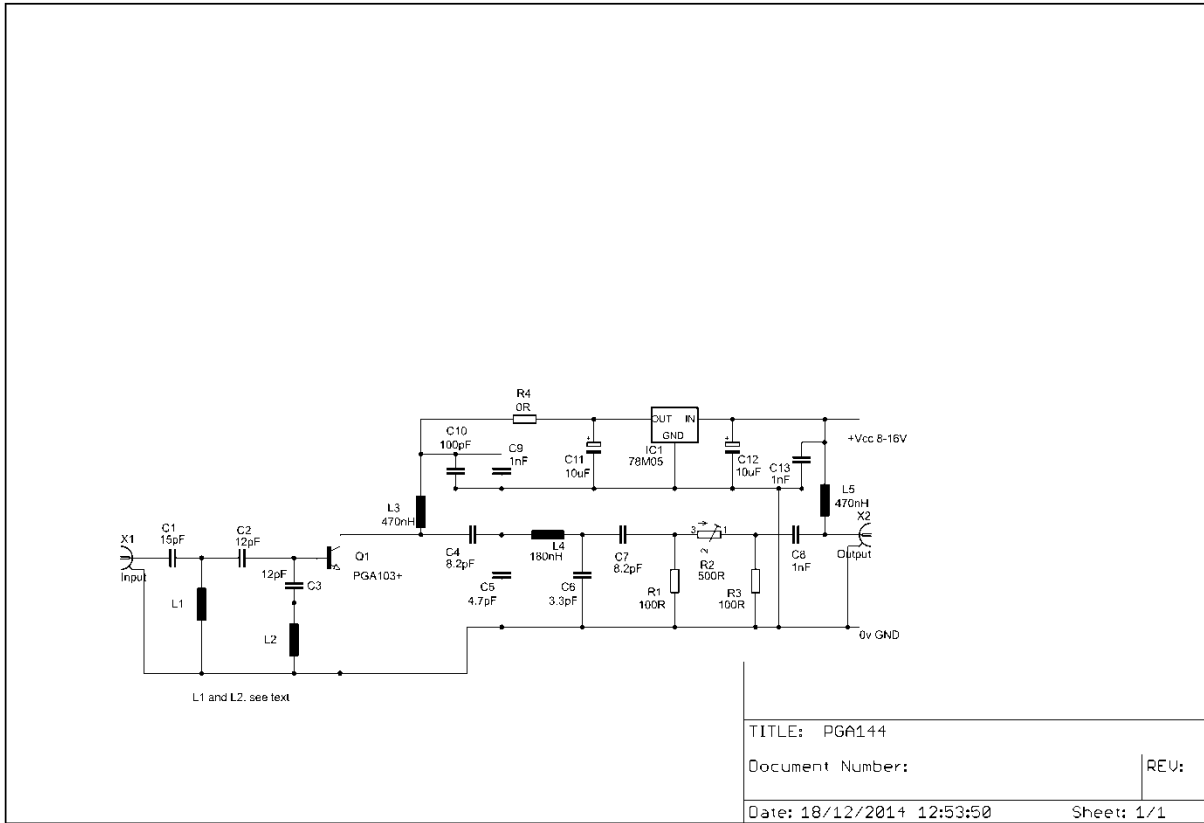
Drill 2mm holes in the box lid corresponding the connector centres and the feed through.

Open out the **connector** holes to 6.5mm diameter.

The feed through hole should be left at 2mm diameter if the supplied feed through is to be used, otherwise open it out for the feed through you intend to use.

## Step 2

Solder all the SMD parts onto the PCB except the PGA103+ , taking particular care to ensure all joints are sound. Small diameter leaded solder and a fine pointed soldering iron bit will help here.



Schematic of the PGA144

Part	value	Kit Identification markings
<b>C1</b>	15pF	Brown/green
<b>C2</b>	12pF	Brown/red
<b>C3</b>	12pF	Brown/red
<b>C4</b>	8.2pF	green
<b>C5</b>	4.7pF	black
<b>C6</b>	4.7pF	black
<b>C7</b>	8.2pF	green
<b>C8</b>	1nF	blue
<b>C9</b>	1nF	blue
<b>C10</b>	100pF	yellow
<b>C11</b>	10uF/20V Tantalum	Black/clear
<b>C12</b>	10uF/20V Tantalum	Black/clear
<b>C13</b>	1nF	blue
<b>R1</b>	100R	Brown/black/black
<b>R2</b>	500R	trimmer
<b>R3</b>	100R	Brown/black/black
<b>R4</b>	0R	Black/black
<b>L1, L2</b>	See text	
<b>L3</b>	470nH	Violet/clear
<b>L4</b>	180nH Q =>50	Red/clear
<b>L5</b>	470nH	Violet/clear
<b>Q1</b>	PGA103+	Sot89 package
<b>IC2</b>	78M05	DPAK

Component list PGA144

Do not add L5 unless you are intending to power feed over the coax.

### Step 3

Wind inductor L1. This should be 3 close wound turns of the supplied 22SWG (0.7mm)enamelled copper wire on a 5.5mm diameter mandrel.

Bend the 'tails' of the coil down and cut off to 2mm long.



L2 should be 9 turns, also close wound, and on a 5.5mm diameter mandrel.

Scrape the enamel off the tails of the coils and tin with a hot soldering iron.

Insert the coil tails into the respective holes in the PCB so that the bottom of each coil is 1mm off the surface of the PCB. Solder to the track or pad. This is best done from the underside of the PCB. Cut off the excess tail lengths so that they do not protrude more than 0.25mm below the PCB to prevent shorting to the lid of the box when the unit is assembled.

L1 should remain very tightly wound. L2 will be 'opened out' slightly during alignment.

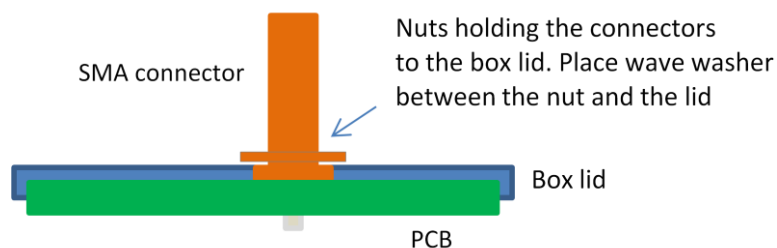
### Step 3

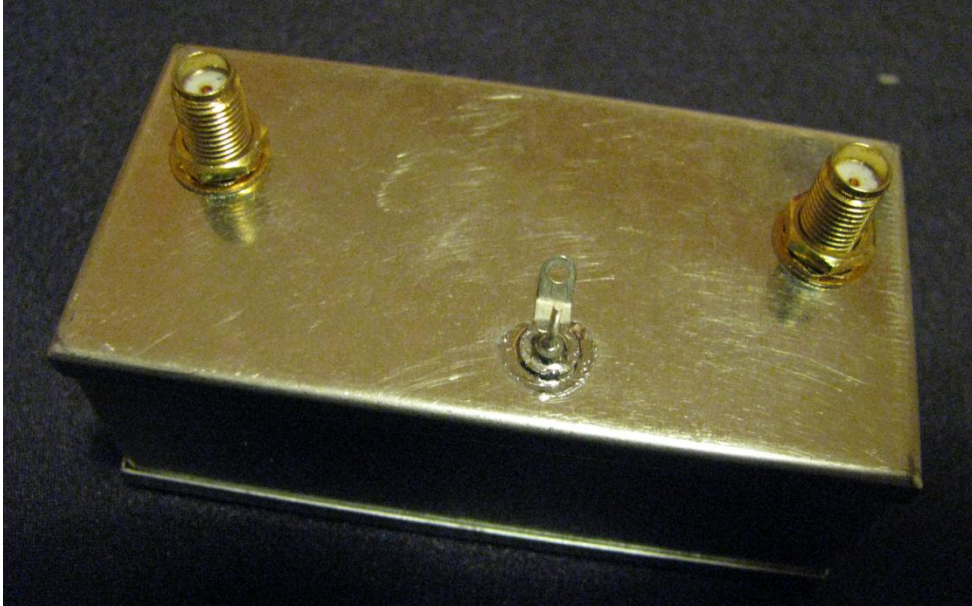
Solder the PGA103 to the PCB pads taking care not to short the input pin to ground as this will instantly destroy the device when power is applied.

### Step 4

Turn the PCB over and solder the pins ( spill) of the two long SMA connectors to the track pad on the top ( component side) of the PCB, ensuring the connector is flat down onto the PCB pad on the underside (bottom) of the PCB. Once you are sure it is perfectly straight, solder round the edge of the connector to attach it firmly to the PCB.

The connectors are inserted through the two 6.5mm holes and held in place with a washer and nut, as shown below.





### Step 5

Hold the solder tag in a pair of long nose pliers and carefully bend the solder part up about 45°

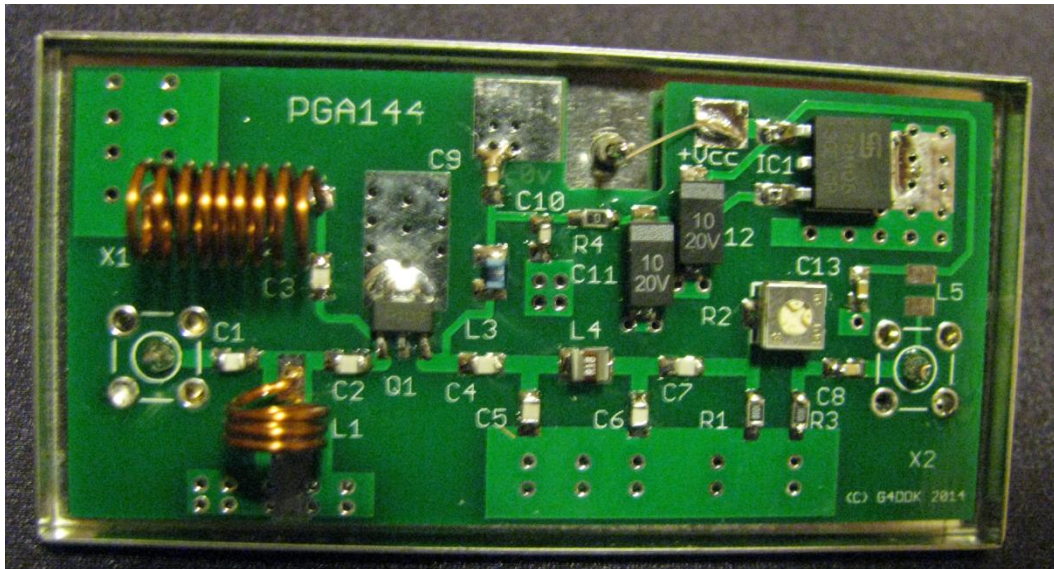
Place the feed through capacitor through the 2.2mm hole in the solder tag.

Place the feed through capacitor through the 2mm hole in the box.

Carefully solder the tag and feed through to the outside of the box lid as shown, ensuring the feed through is straight.

### Step 6

Inside the box, solder a short piece of wire between the feed through and the adjacent PCB +Vcc pad ( not the ground pad!)



### Step 7

Assemble the sides and bottom of the box and solder the sides and bottom together to form an open topped box. When complete this will provide the screening for the PGA144. There should be no need to solder the lid, with its PCB, to the remainder of the box. If they fit together loosely, gently fold the lip ends of the lid inwards a VERY SMALL amount to ensure a tight fit.



### Step 8

Carefully inspect the built PGA144 for errors and dry joints. When you are satisfied it is all correct proceed to testing and alignment.

## Testing and alignment

Connect to a +12v source and check that the current taken is 110mA ( a few mA either way is OK).

If it's not significantly different to 110mA you have a fault and this must be found before proceeding.

**You must align the preamp before it will give its best results. If you don't have suitable equipment to do this then by following the instruction that follow you will be very close to optimum performance.**

Ensure L1 is close wound. Do not be tempted to open it out. Close wound is correct for this coil.

Adjust the 500Ω gain trimmer pot, R2, fully clockwise for maximum gain.

Either connect a low level ( below -30dBm) swept 50 to 150MHz signal or a 98MHz CW signal to the input whilst monitoring the output level. Carefully open out the end turns of L2 to minimise the 98MHz signal or observe a sharp notch at 98MHz on the swept output. It will only be necessary to open out the coil a **very, very, small** amount, as shown in the photo. In spite of the BPF at the output, you will still see the 98MHz at the output.

The swept signal will show a pass-band centred at 145MHz and several MHz wide. There will be a sharp notch at 98MHz. The 145MHz gain should be 20dB.

If you have the right test equipment you can carefully adjust L1 for best input return loss. There will be a sharp improvement in return loss at about 130MHz, the HPF corner frequency, but the return loss at 145MHz will be between 9 and 10dB. This is perfectly satisfactory and needs no further attention.

That's it. The PGA144 is ready to use!

Document history.	Version 0.1	Initial draft	17/12/14
	Version 0.2	First revision	2/1/15