

## BM 800 Studio Quality Microphone for Amateur Radio Use



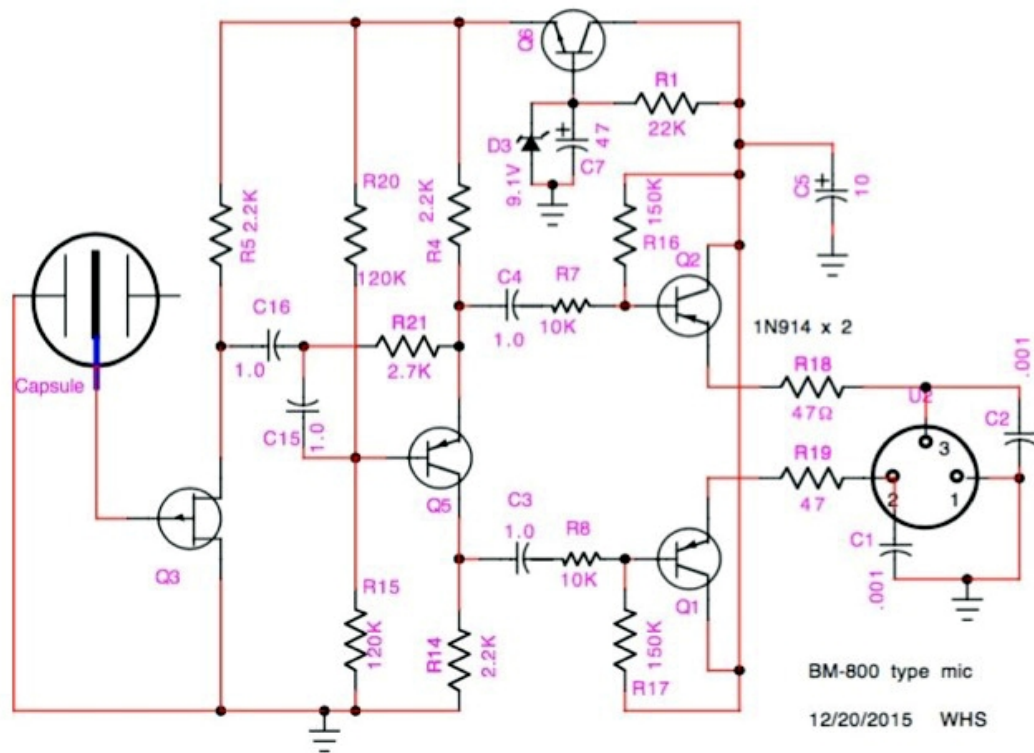
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This popular condenser studio microphone is available for as little as \$20.00 this includes the anti-vibration mount, audio cable plus a wind sock.

The microphone as supplied will work on any low voltage source (Phantom Voltage) as that supplied by a computer sound card (5 Volts), just plug the supplied cable into the microphone input and you will have a studio quality microphone for your computer.

*\*\* Note, that the microphone will have greater sensitivity if the phantom voltage is increased, this can be in the range from 40 Volts down to 5 Volts, the sensitivity will vary slightly and if used as a radio microphone has very little consequence.*

### **Converting from Balanced to Unbalanced**



The microphone as supplied is wired to plug straight into a computer sound card, however for a balanced application as on a Public Address system, Pin 2 and 3 are the balanced output, the diagram above shows how the Phantom Voltage can be applied to either Pin 2 or Pin 3, to understand what goes on in as far as using low Phantom Voltages, the above configuration is not ideal for low Phantom Voltage application, however the Chinese will supply the above so configured to run on a computer sound card.

Let's consider what goes on here.

Q1 or Q2 act as series pass transistors, the DC Phantom voltage is fed to the regulator, via either transistor, the collector of Q1 or Q2 will be at a lower voltage than the emitter thus the transistor concerned will pass DC to Q6 the Series Regulator, with this there are some slight voltage drops, this has to be considered if we run this microphone at low Phantom Voltages, a slight loss in sensitivity takes place.

The microphone when converted to unbalanced output, the Q1, Q2, R18 and R19 become redundant, reducing the DC loss, making the loss in sensitivity at low Phantom voltage a lot less if run at 5 Volts.

### Circuit description

The Capsule (High Impedance) is amplified by the FET (Q3)  
Q6 acts as a phase splitter, so configured to have levels at the collector and the emitter to be of equal amplitude but 180 deg. out of phase to each other, these two signals are coupled to Q1 and Q2 that act as emitter followers, providing the required balanced output.

### **Modification to Unbalanced**

Not knowing the impedance of the capsule, its hard to exactly state the gain of the FET stage, only to say that it's considerable, that all following stages offer no gain at all, that are either to couple DC to the regulator or provide the balanced output.

With this in mind we can take the unbalanced output from the collector of Q5, retaining its buffering function to the FET stage. Thus, a simple network of a series capacitor and a resistor to ground provides all that is required to couple to an unbalanced audio input.

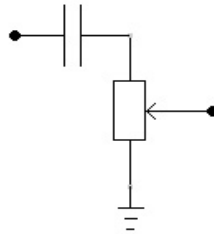


Fig.1

The capacitor is connected to the collector of Q5 and the potentiometer becomes the Microphone level output control.

The other components can be left active as they draw next to little current, plus if ever required to reverse the microphone to its original form, it's an easy task to do so.

### **Frequency Response**

The BM 800 has a wide frequency response; this is far greater than what is required when using a radio. The assumption that the radio will take care of the required audio pass band can be a fallacy since the radio is designed to use a particular microphone and its frequency response is likely to be matched to the radio input characteristics.

The safe procedure is to limit the response to the 300 Hz to 3000 Hz this can be easily done with a simple second order RC filter. (Fig 2)

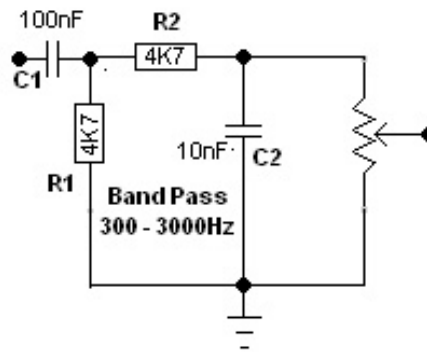


Fig. 2

The value of the output "Pot" should be a magnitude order of 10 times larger than R2, thus to maintain the time constant formed by R2 and C2, in practice it can be reduced to 20K

If we substitute the Fig. 1 with Fig. 2, we end up with an adjustable unbalanced output with a frequency response of 300 Hz to 3000 Hz

If the intent is to use the microphone with its full frequency response, just substitute the above, with a capacitor from 0.1uF to 1uF (Not critical) and a 20K potentiometer like in Fig. 1,

Use monolithic non- polarized capacitor.

### **Physical Modification for Radio use**

This is where some metal work is to take place. The original Cannon connector does not readily lend itself for radio applications, in my case I wanted the compatibility for Kenwood radios to remain. My modified microphone can be connected direct to the TS590 and it works as if it was the original MC 60 Microphone.

You can retain the Cannon connector, however you must make an adaptor cable, where in my case I can use any of the interconnect cables supplied by Kenwood.

So, if you wish to proceed as I have, this is what you need to do.

Remove the Cannon male pins, cut back the barrel and fit an 8 PIN Microphone Socket as used on your Radio.



Fig 3

Take note of how the Cannon connector is wired up, this in case you wish to reverse the modification electrically.

Note, that the only part that is not reversible is the step of cutting off the part that houses the Cannon part of the plug.

Undo the screw that holds the Cannon plug, unsolder the wires from the microphone PCB.

Now we need to cut off as close as possible to the base, the protrusion that houses the Cannon plug.

I am not about to tell you how to do this, I am assuming you have some metal working skills. The metal is soft and easy to cut with a hack saw.

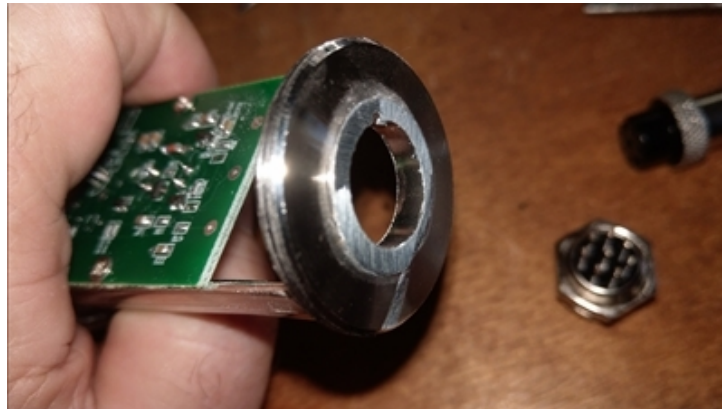


Fig 4

Fig 4 shows what I did. Now I can fit an 8 PIN socket.



Fig 5

The wiring of the socket was such to complement the Kenwood radio, you can arrange this for your radio.

## **Making the Filter - Level Out Board**

With some vendors the microphone comes with two PCB inside, one has all the components, the other is blank, remove the blank board and use this as a template to make a new board, you can use Vero board or something similar, or if so inclined, make a new PCB with the filter and level board.

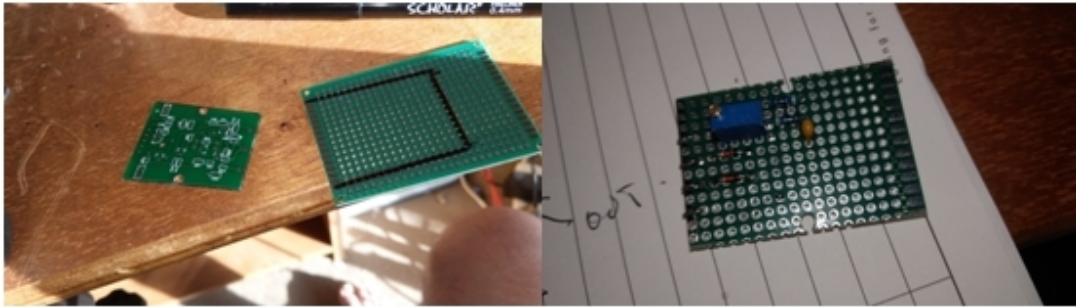


Fig 6

In my case I needed the Phantom Voltage to arrive from two different sources, depending on where the microphone was mounted or connected to, in my case either as a direct cable connection to the Radio, or on the modified MC60 base.

Using the Kenwood PIN assignment, PIN 5 provides a voltage of 7 Volts where on my modified MC60 Base I use PIN 2, I required a method of being able to use either source of the Phantom Voltage.

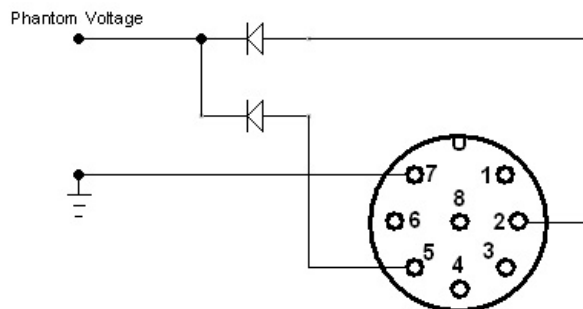


Fig 7

If the microphone is connected direct to the radio, the phantom voltage arrives on PIN 5  
if connected to the MC 60 modified base it arrives on PIN 2



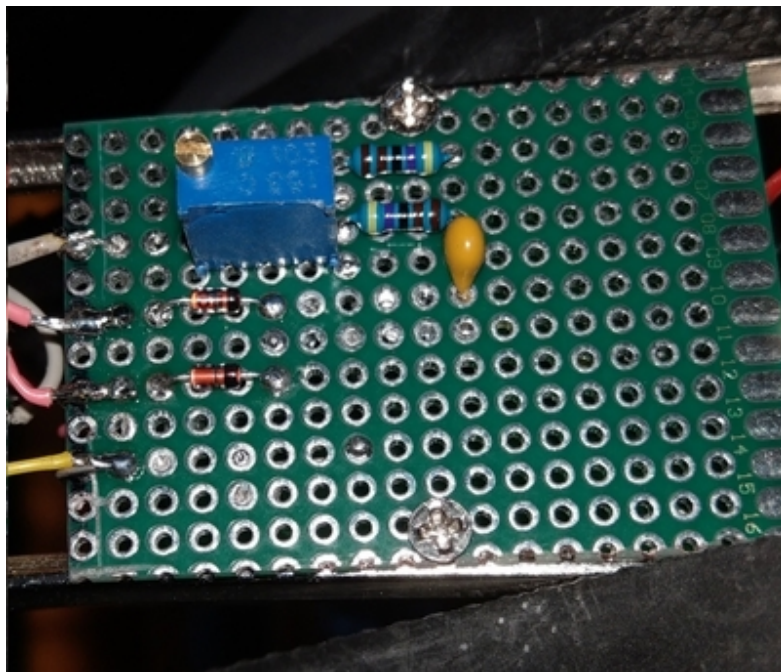
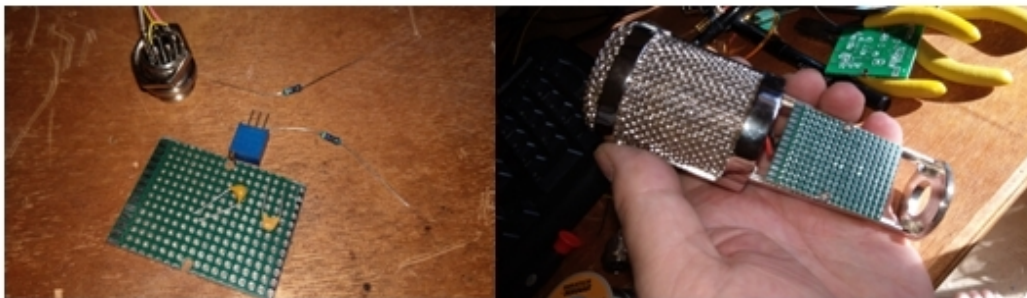


Fig 8

There is plenty of room to accommodate the Pass Band filter and the voltage steering diodes.

You can get creative. This is how I did it.

From the top, Audio Out, Pin 2 Voltage, Pin 5 Voltage, Ground.

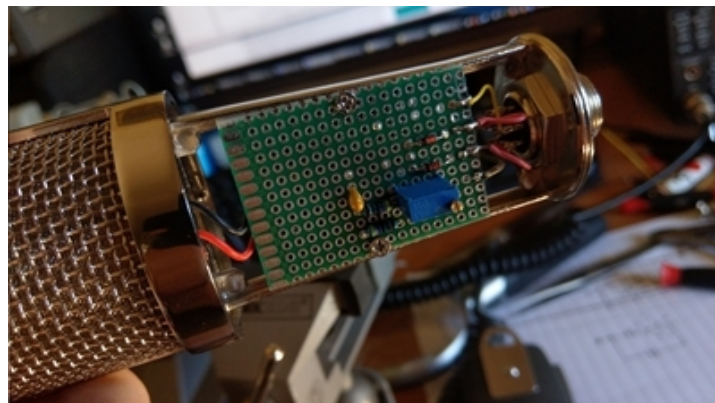


Fig 9

### Connecting the add on board

As mentioned above the audio out is taken from the collector of Q5, this is fed to C1 of the pass band filter.

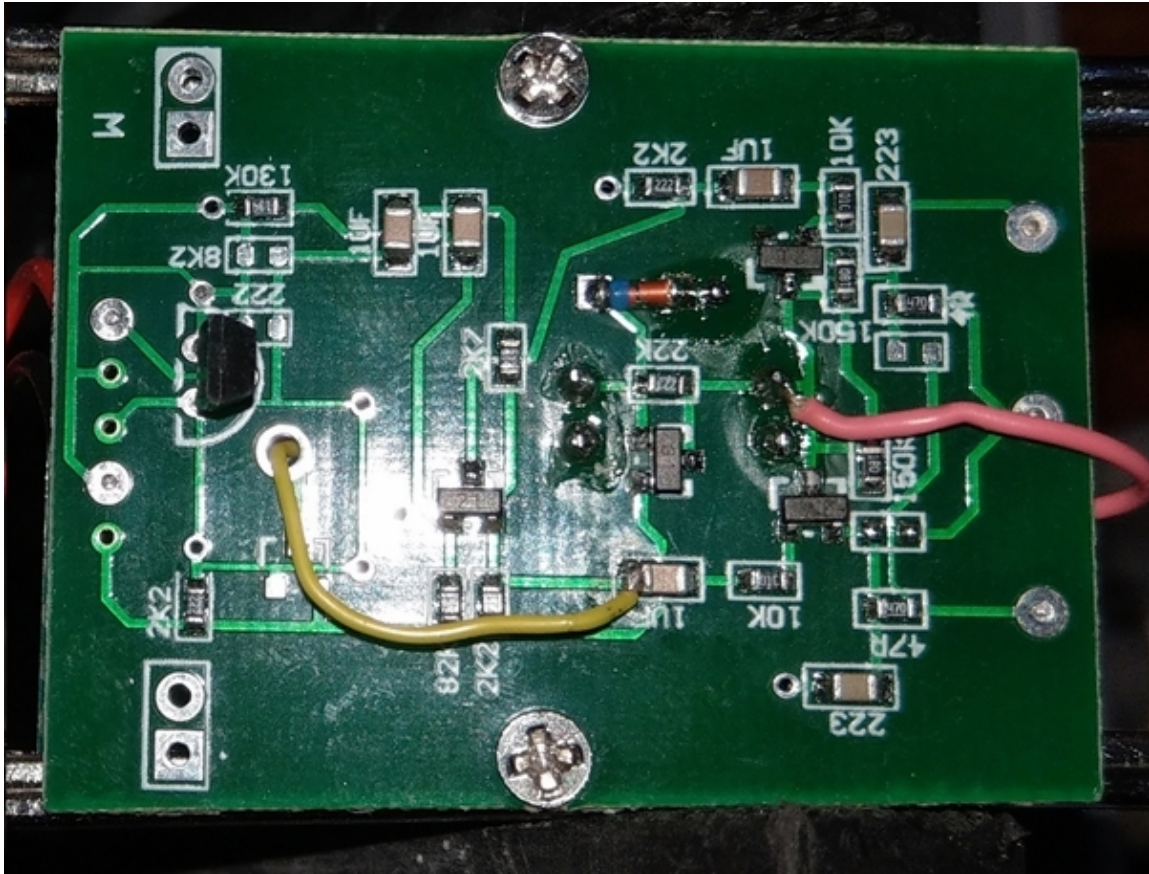


Fig 10

The Yellow wire is the input to the filter, the pink wire is the Phantom Voltage from either Pin 2 or Pin 5 (DC Steering Diodes) Many places exist to connect a ground, the pad below the pink wire is a ground point (-Ve of the Electro filter cap).

This is all that is required in the mod.

Adjust the required level with the pot, then have fun with your new microphone.

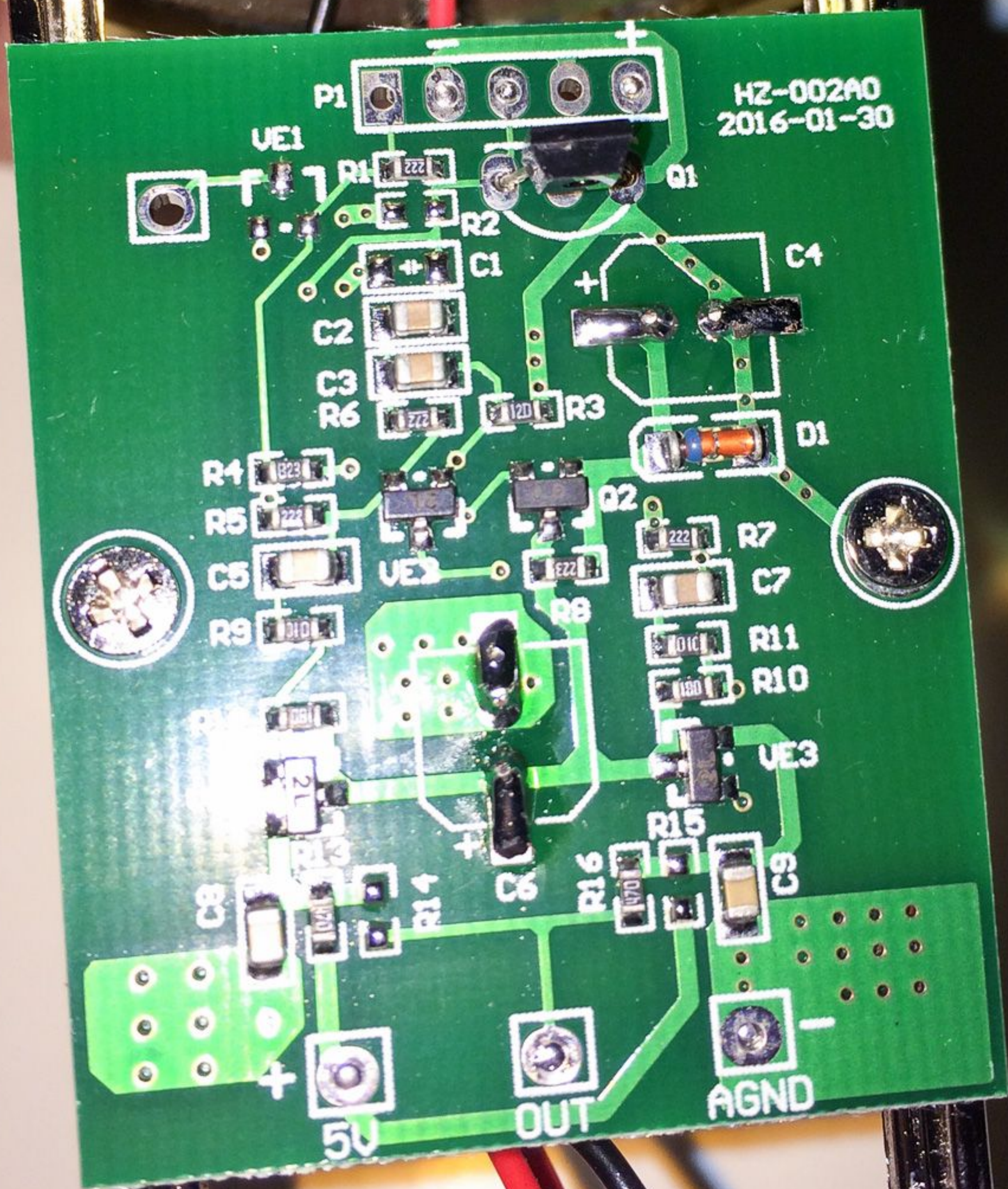
de Robert VK2YMU













P1

UE1

HZ-002A1

2016-08-22

R1

R2

C1

C2

C3

R6

R3

R4

R5

C5

R9

UE2

Q2

D1

R8

R7

C7

R11

R10

R12

UE4

R13

C8

R14

C6

R16

R15

C9

UE3

+

5V

OUT

AGND

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