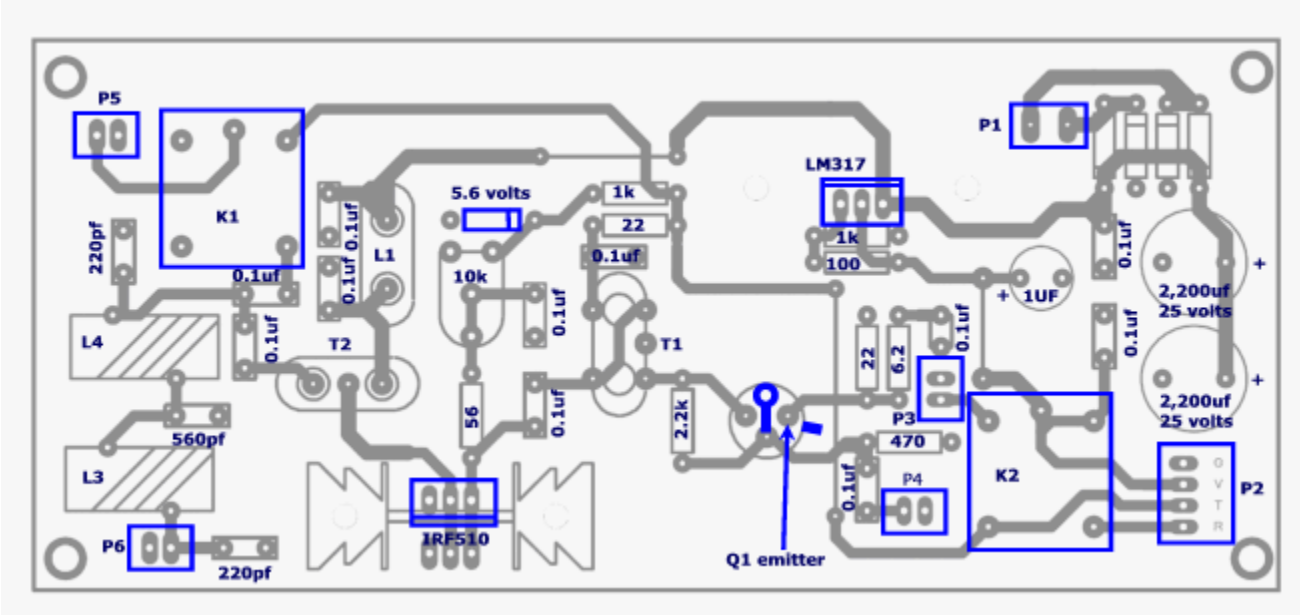
Bitx Version 3 Linear Amplifier Assembly



The power supply section has 2 options.

1 - AC input and a higher voltage on the IRF510 and +12 volts to the bitx.

2 - +12 volts applied to both the final and the exciter.

Power Supply - High voltage on the final

We will need the following components.

	2	0.1uf	capacitors	
	1	1.0uf	capacitor	
	2	2,200uf	capacitors	25 volt
	1	100 ohm	resistor	
	1	1k	resistor	
	4	1n4001	diodes	
	1	LM317	voltage regulator	
	1	relay	see below	
	8	header pins		

Relays may be purchased from:

Omron G5LE-14-12 (Newark)
http://newark.com/omron-electronic-components/g5le-14-dc12/power-relay/dp/36K1937?_requestid=36176\

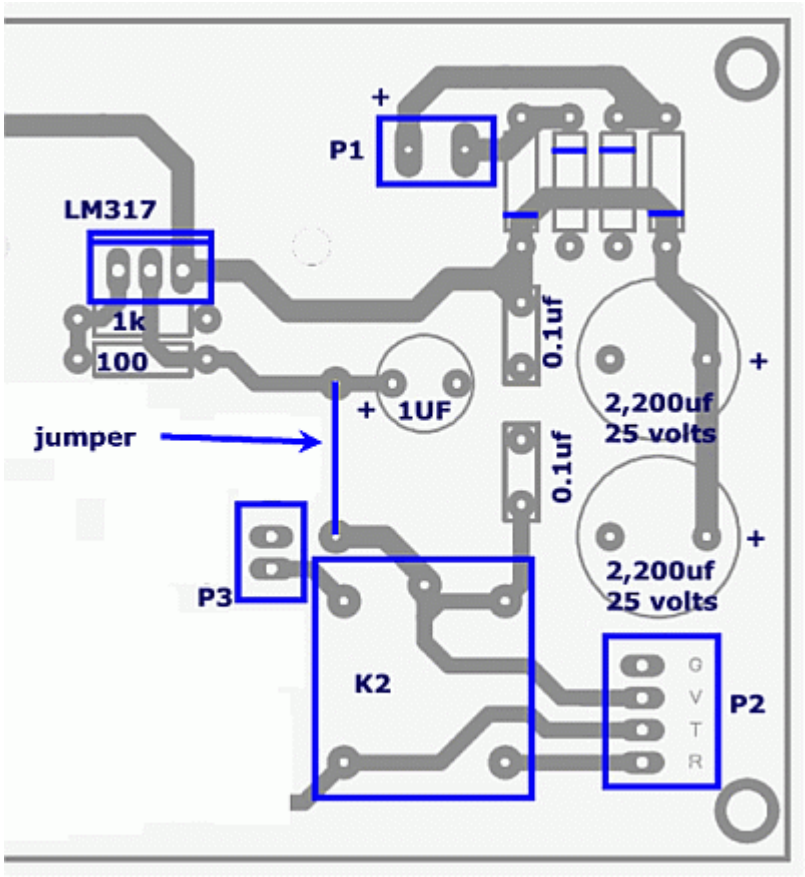
or

677-SRUDH-SH-112D1 (Mouser)

http://mouser.com/Search/Refine.aspx?Keyword=677-SRUDH-SH-112D1

Install components as shown below observing polarity on the diodes and electrolytic capacitors.

The original layout drawings for the linear show a 980 ohm resistor in the voltage determining network for the LM317. Using a 1000 ohm resistor will result in a regulated voltage of around 13 volts for the exciter board and is perfectly acceptable.



Testing the AC power supply

Do not apply more than 16 vac to the ac supply or the working voltage on the 25 volt electrolytic capacitors will be exceeded!

Apply the ac power to P1. Measure the voltage between P2 - V and G. Using the resistance values listed it should measure approximately 13 volts.

volts

Measure the voltage at the right side of the LM317. This will vary depending on the AC input voltage. It should be more than 16 and less than 25.

volts

You can test the operation of the relay by connecting the voltmeter to P2 - T and shorting the 2 pins of P3 This is the PTT switch point. When the relay operates you should read the 12 volt supply.

Power Supply - Using 12 volt battery power

When using a 12 volt battery supply we do not need the LM317. The +12 volts is applied to both the final and the exciter board.

We will need the following components.

	2	0.1uf	capacitors	
	1	1.0uf	capacitor	
	2	2,200uf	capacitors	25 volt
	1	1n4001	diode	
	1	relay	furnished with board	
	8	header pins		

Relays may be purchased from:

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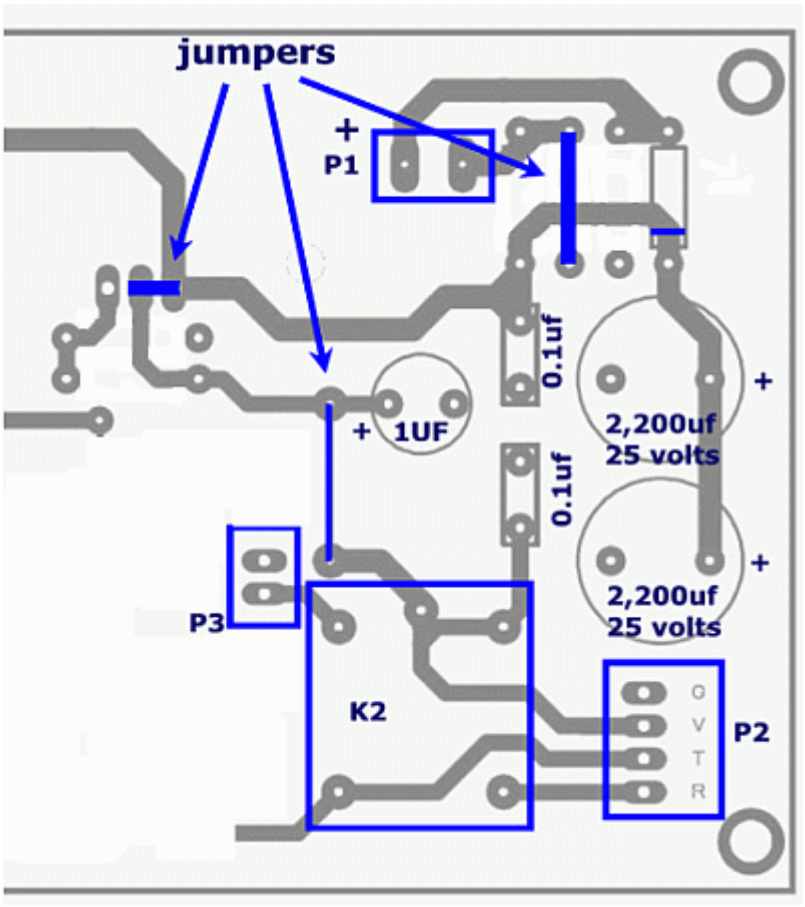
Install the components as shown below. Be sure to install the jumpers.



Testing the 12 volt power supply

Apply DC power to P1 observing polarity. Measure the voltage between P2 - V and G. It should measure the DC supply voltage.

_____ volts

You can test the operation of the relay by connecting the voltmeter to P2 - T and shorting the 2 pins of P3 This is the PTT switch point. When the relay operates you should read the 12 volt supply.

Driver

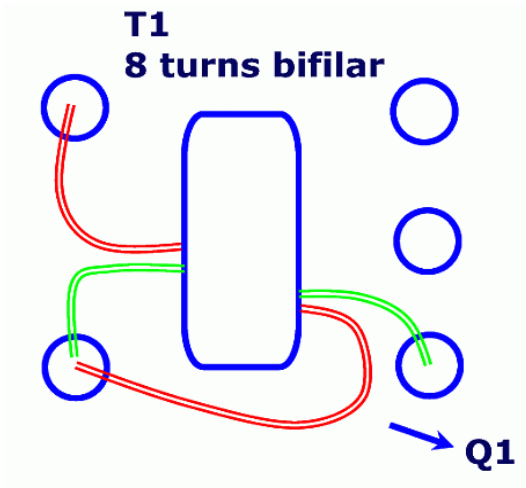
We will need the following components. We will install components for the final input circuit so we can test the driver circuit under load.

☐	5	0.1uf	capacitors
☐	1	6.2 ohm	resistor
☐	2	22 ohm	resistors
☐	1	56 ohm	resistor
☐	1	470 ohm	resistor
☐	1	1k	resistor
☐	1	2,2k	resistor

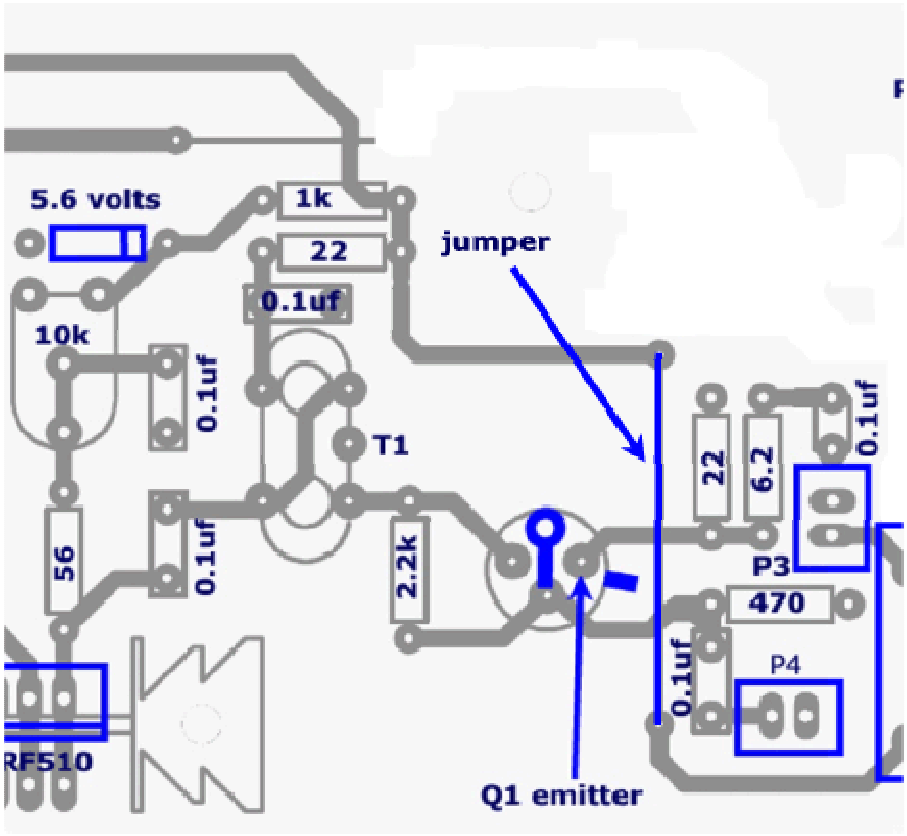
	1	10k	potentiometer	
	1	5.6 volt	zener diode	
	1	2n2218	transistor	
	1	transformer	8 bifilar turns on FT37-43 core	T1
	2	header pins	P4	

Transformer, T1, will take 7" wire. #26 - #30 is fine. With the specified core, the inductance should be around 22uh although it really isn't particularly critical. See http://golddredgervideo.com/kc0wox/bitx/transformers.htm for a discussion why.

Install T1 as shown below. If you don't have colored wire, verify with an ohm meter that the are connected as shown. After removing the insulation, tin the leads and twist the red and green wire together to form the center tap portion of the transformer.



Install components as shown below. Board pattern for Q1 may vary slightly from drawing.

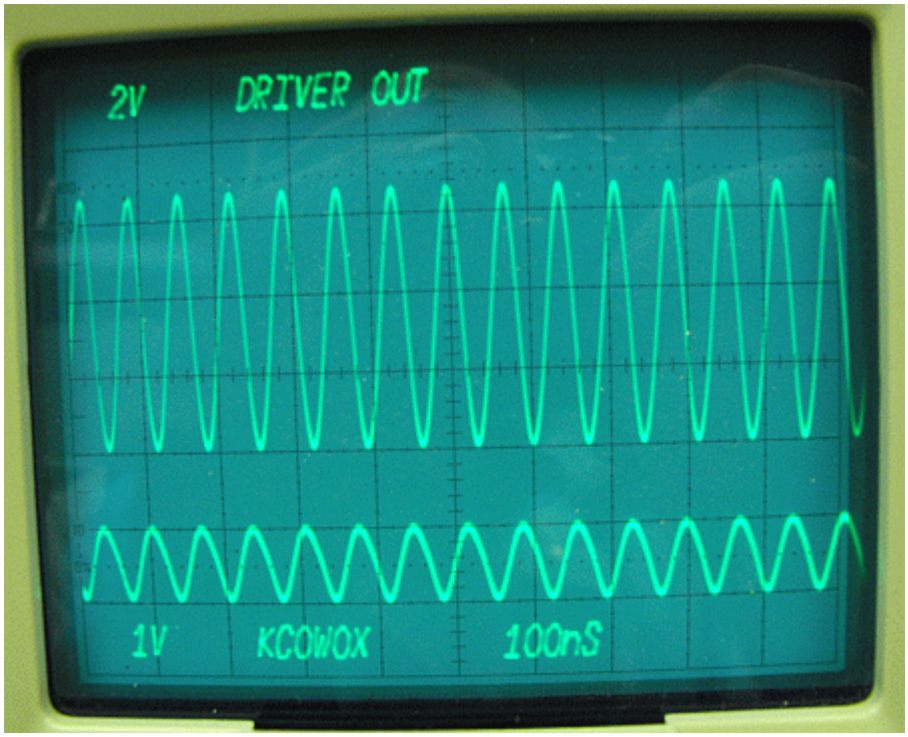


Apply power to the input connector. Short the 2 pins on the PTT connector, P3, to switch to transmit mode and
measure Q1 voltages. Compare them to the chart below.

Q1		
Collector	11.88	
Base	1.90	
Emitter	1.188	

Connect the digital voltmeter to the bottom end of the 56 ohm resistor. Adjust the pot and verify that the voltage varies between 0 and the zener's voltage rating. After verification, adjust it fully CCW for a reading of 0 volts. This is the preliminary bias setting of the IRF510.

With an input signal at P4 of 14.250mhz and an amplitude of 1 volt pk-pk, the signal voltage at the lower end of the 56 ohm resistor should be around 6 volts pk-pk as shown below.



This completes the driver section.

Final

We will need the following components.

	4	0.1uf	capacitors	
	2	220pf	capacitors	npo
	1	560pf	capacitor	npo
	1	rfc	11 turns #28 FT37-43	L1
	2	inductor	13 turns #28 T37-6 .55uh	L3, L4
	1	transformer	3 bifilar turns #28 FT37-43	T2
	1	IRF510	FET	
	1	relay	furnished or see below	K1
	4	header pins		P5, P6

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http://newark.com/omron-electronic-components/g5le-14-dc12/power-relay/dp/36K1937?_requestid=36176\

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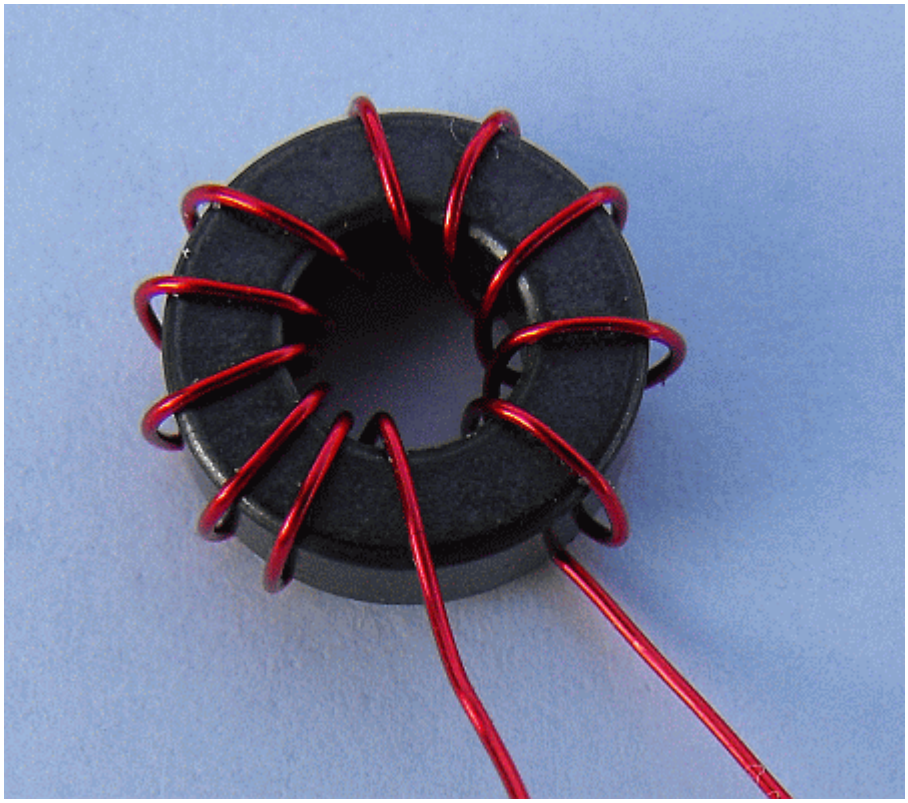
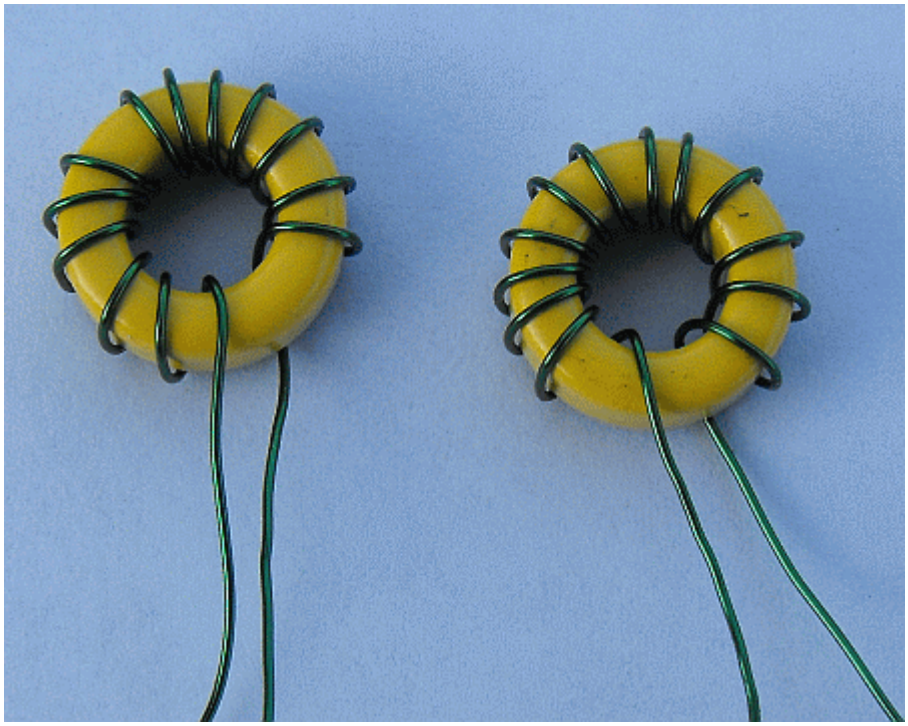
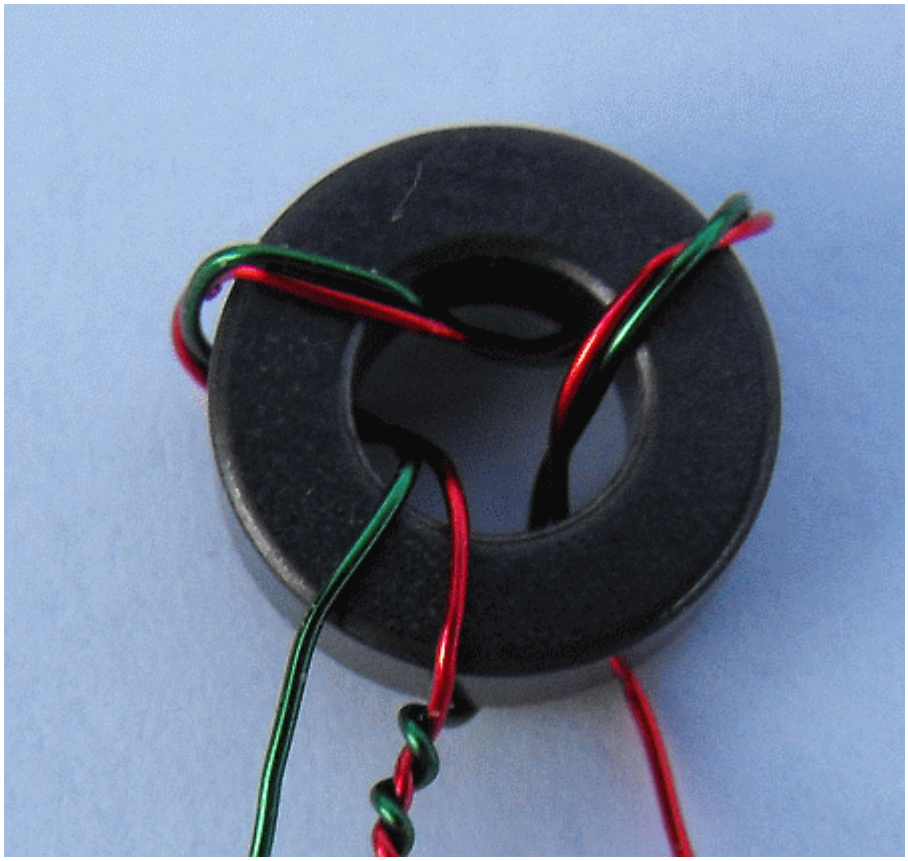
L1 will take 8" of wire and should measure around 42uh.
The actual value isn't too critical as this is used as a radio frequency choke and as long as it has plenty of inductance, value really doesn't matter. Mine measured 36.67uh. When using cores with a high Al, the calculated vs. actual will vary more.



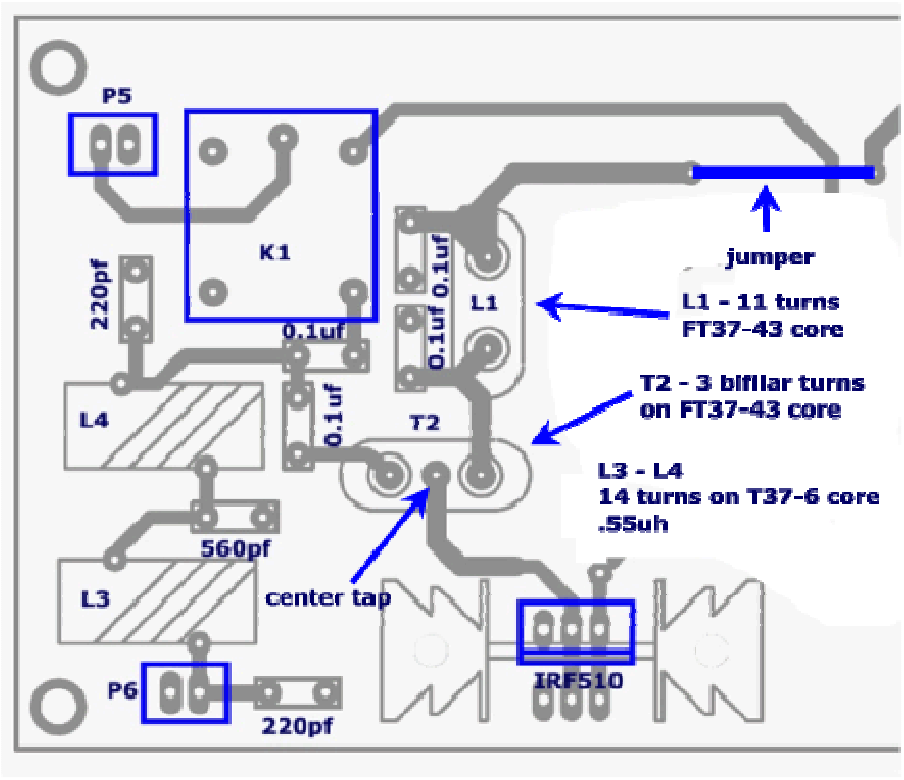
L3, L4 will take 8" of wire and measure .55uh.
13 turns on mine measured .599uh Be sure to spread out the turns over the whole core. If they bunch together, it will raise the inductance.



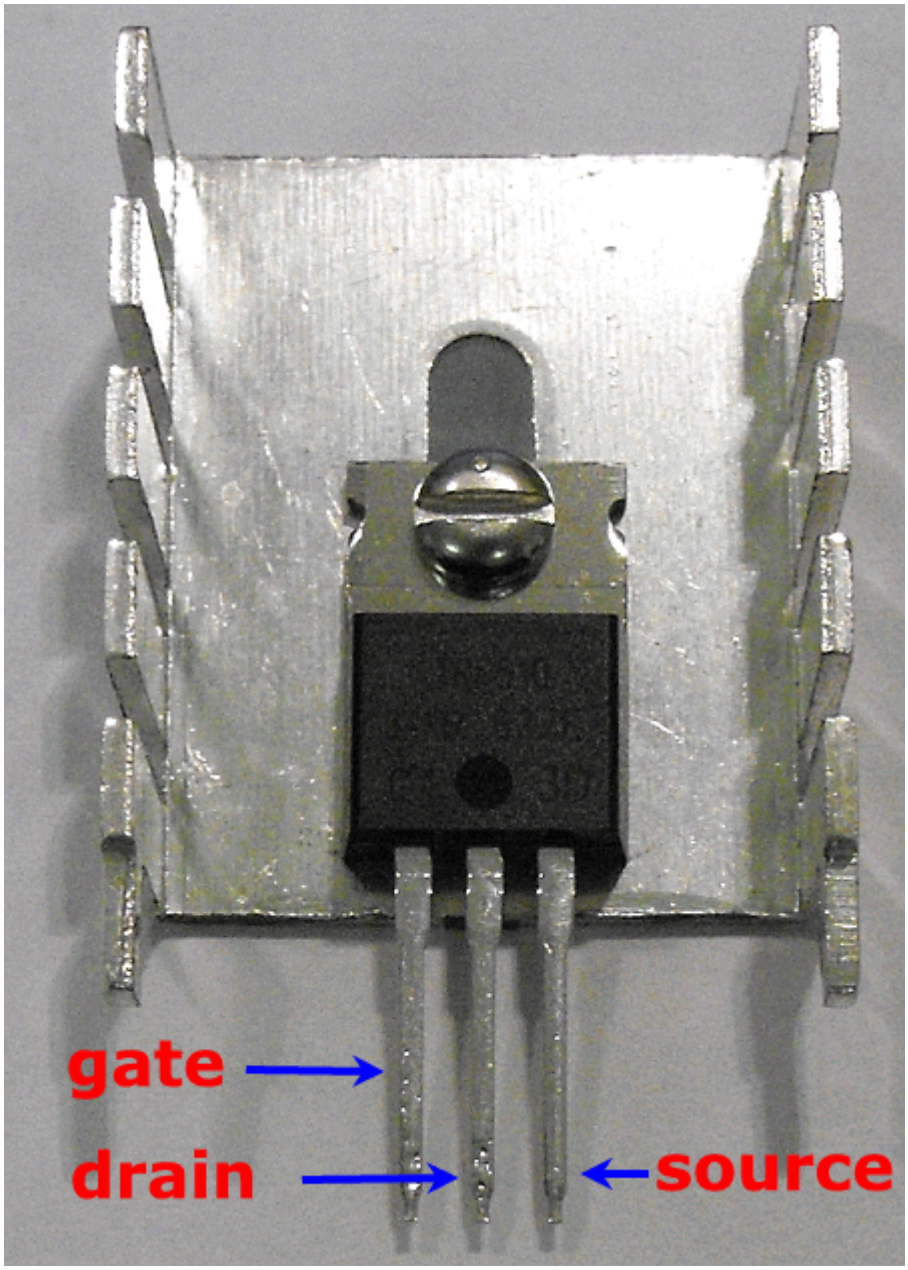
T2 will take 4" of wire and each winding should measure 3.15uh.



Install all of the components but the jumper, the relay and the IRF510. Do them last. This will give you a little more finger room. The jumper will be left off as this is the current meter point to set the bias on the IRF510.

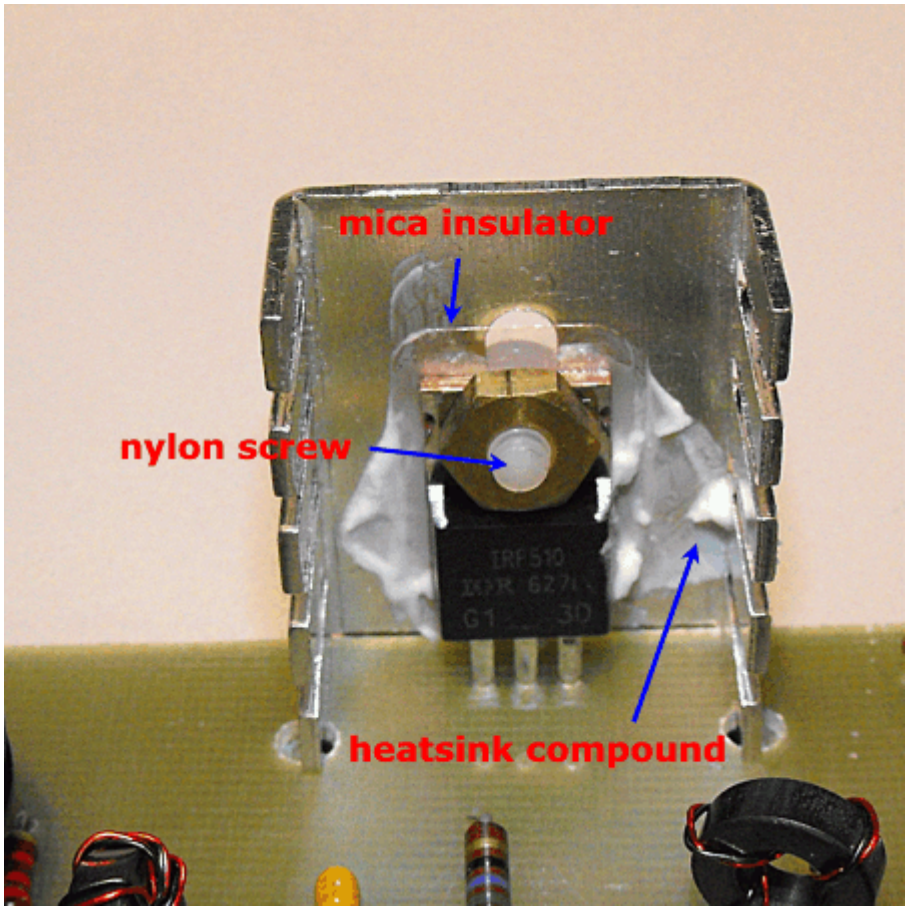


The IRF510 pin out is shown below.



Use some heat sink compound between the FET and the heat sink.

The completed installation should look like this. Using a brass nut is an option. The nylon screw isn't. The heat sink needs to be insulated from the FET's tab. Use an ohmmeter to verify it both before and after installation on the board. If your heat sink is not aluminum, you can scrape the solder mask off around the tabs on the back of the board and then carefully bend the tabs over. Do this before you solder the IRF510 leads. Using a heavy soldering iron, solder the tabs to the ground plane of the board. This will ground the heat sink.



Testing

Connect a dummy load to P6.

Connect power to P1.

Connect a ma meter in the place of the jumper not installed when construction the final. The + lead should be to the right towards P1. Set the meter to measure 50 ma's.

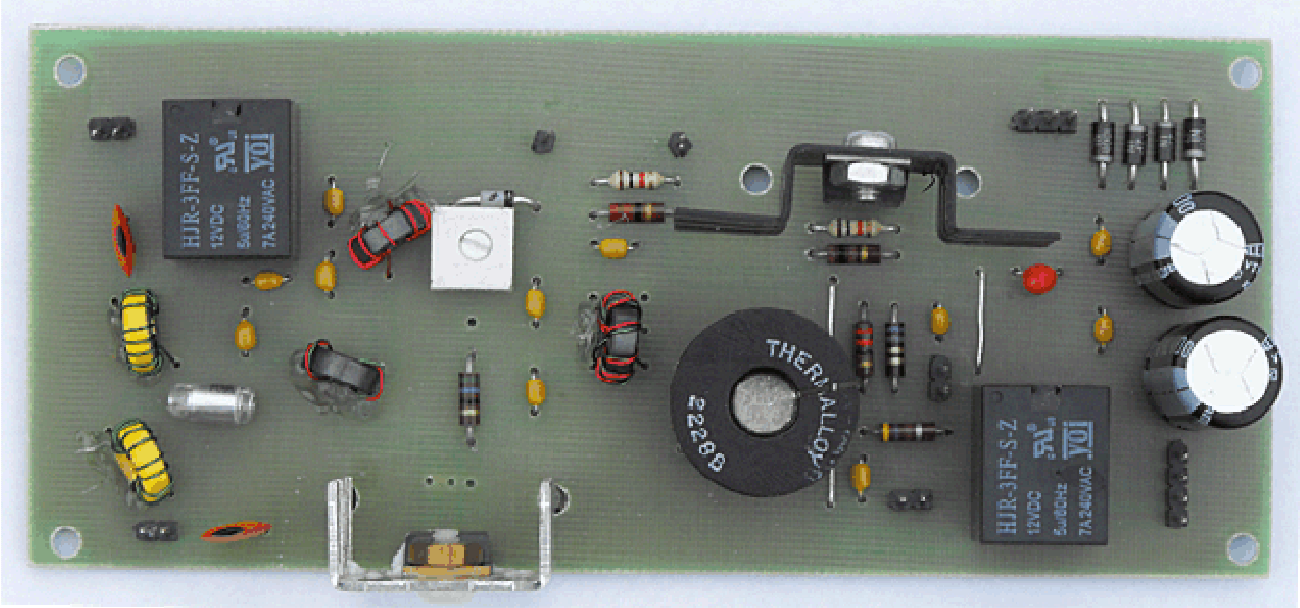
Verify that the final bias pot is fully CCW.

Apply power. You should read 0 current as the FET has not been biased on yet. If you do, turn off power and verify that the heat sink is not grounded and that the FET drain is not grounded.

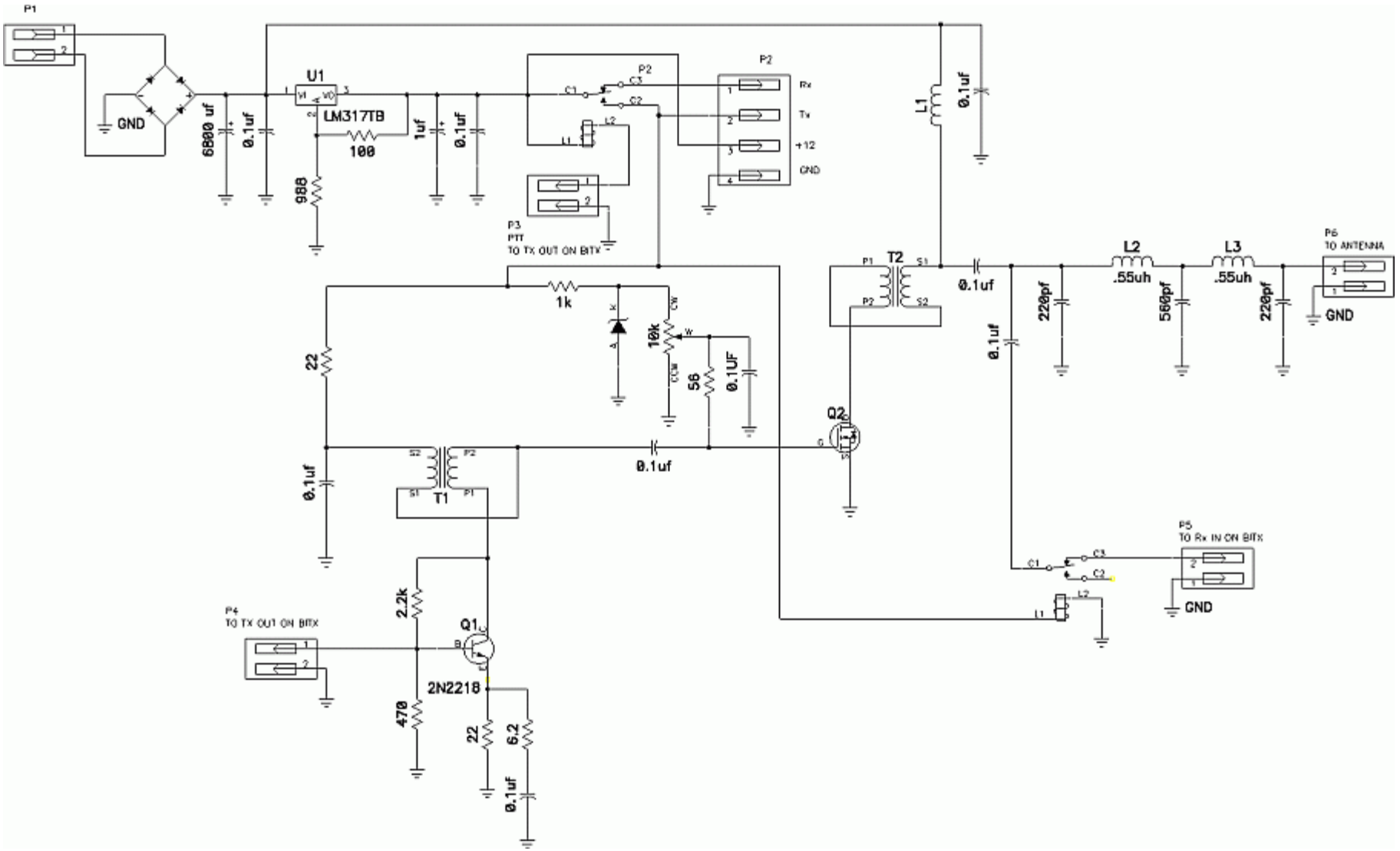
Adjust the bias pot for 40 - 50 ma's current. This will probably be a little over halfway on the pot. It will come on fast so adjust carefully.

If you have an oscilloscope, connect it across the dummy load.

Apply a signal to P4 and monitor the output. It will take around 1 volt pk-pk to get 4 watts out.



The completed board. The toroids have been glued to the board using a hot glue gun. The final bias jumper is not shown in place.


P1
GND
6800 uf
0.1uf
U1
LM317TB
100
988
1uf
0.1uf
P2
C1
C3
C2
L2
P2
Rx
Tx
+12
GND
P3
PTT
TO TX OUT ON BITX
0.1uf
L1
1k
22
10k
CW
CCW
56
0.1UF
T2
P1
S1
P2
S2
0.1uf
220pf
L2
.55uh
560pf
L3
.55uh
220pf
P6
TO ANTENNA
GND
0.1uf
Q2
0.1uf
T1
P5
TO Rx IN ON BITX
C1
C3
C2
L2
L1
GND
P4
TO TX OUT ON BITX
2.2k
Q1
2N2218
470
22
6.2
0.1uf