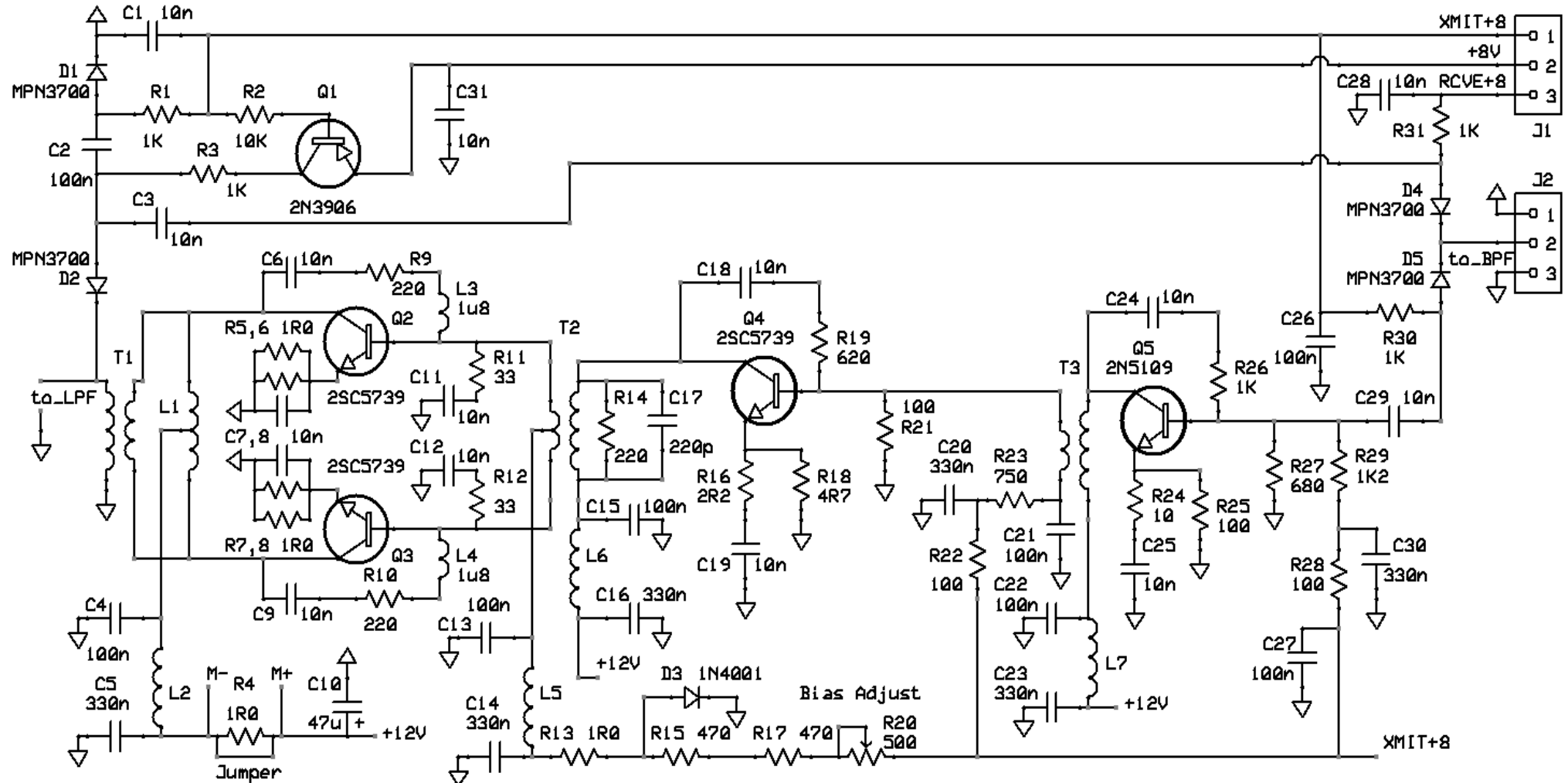


Build this Universal 10 watt Linear RF Amplifier for \$48

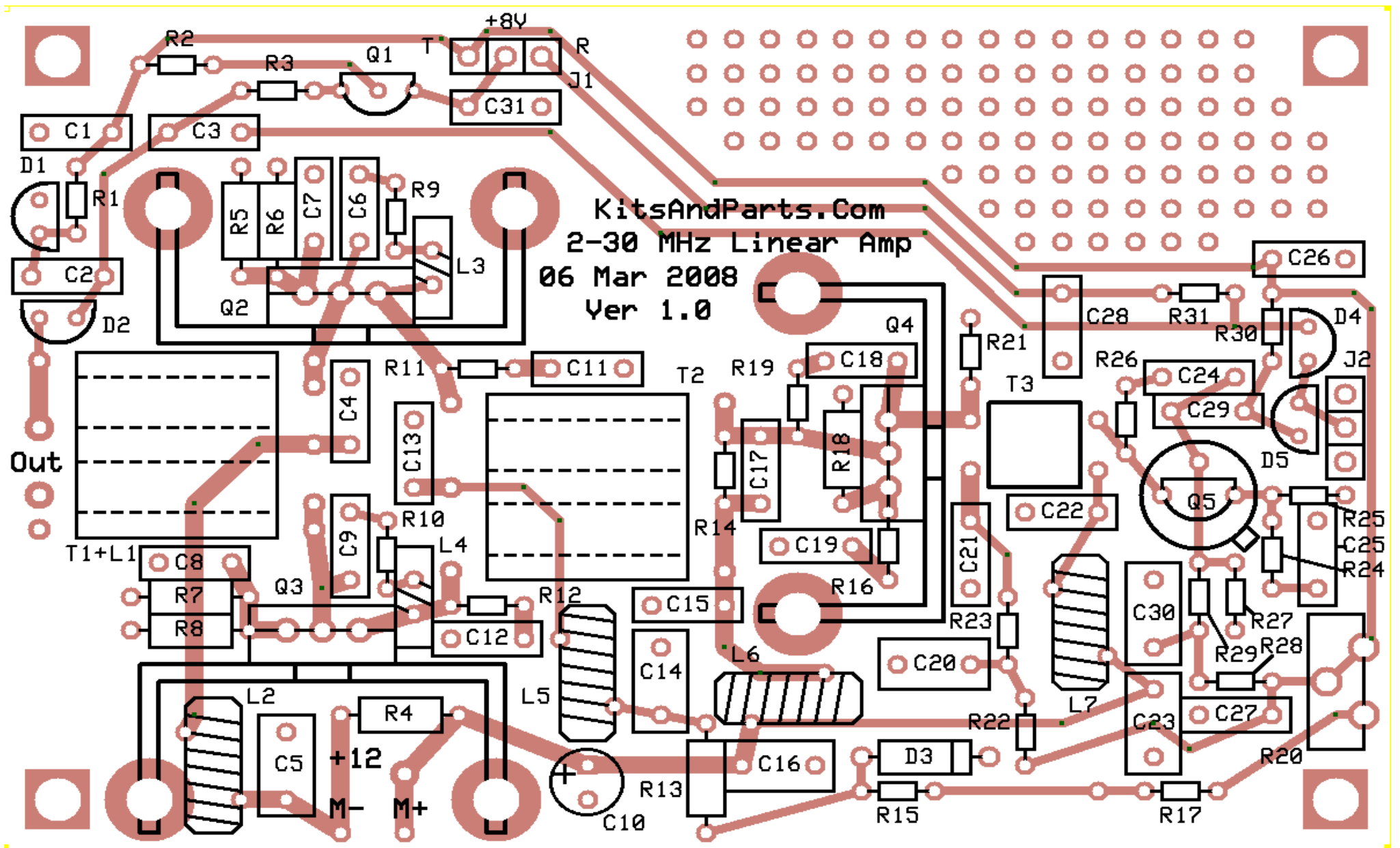
(on Acroread please use CTRL+L for full-screen view)

In case you want to print the manual use the option "Multiple pages" in order to save paper and resources. Thank you!



Universal HF Linear Amp 1.8-30 MHz		
Kits And Parts Dot Com		
by W8DIZ	Rev 1.0	16 Mar 2008

T1= FT-61-202_7T::5T L1= FT-43-202_3T:3T
 T2= FT-61-202_7T::2T:2T L2,5,6,7= FT-37-43_10T
 T3= FT-43-2402_6T::2T L3,4= FT-23-43_3T



Specs are:

- * 12-15 Vdc operation with +8V XMIT/RCVE control
- * Source RF is the output from a standard +7 dBm
- * Diode Ring mixer via a 6 dB loss band pass filter
- * Output is ~10 Watts SSB/CW

Building Instructions:

1. Inventory all Parts

RESISTORS

√	Qty.	Part	Reference	√	Qty.	Part	Reference
	6	1.0 Ω ¼ W	R4, 5, 6, 7, 8, 13		1	620 Ω	R19
	1	2.2 Ω	R16		1	680 Ω	R27
	1	4.7 Ω ¼ W	R18		1	750 Ω	R23
	1	10 Ω	R24		5	1.0 kΩ	R1, 3, 26, 30, 31
	2	33 Ω	R11,12		1	1.2 kΩ	R29
	4	100 Ω	R21, 22, 25, 28		1	10 kΩ	R2
	3	220 Ω	R9, 10, 14				
	2	470 Ω	R15, 17		1	500 Ω	R20 pot

Note: While building the kit, for a better readability 1.0 Ω = 1R0 ;1.0 kΩ = 1k0 ...

CAPACITORS

√	Qty.	Part	Reference
	1	220 pF	C17
	15	10 nF	C1, 3, 6, 7, 8, 9, 11, 12, 18, 19, 24, 25, 28, 29, 31
	8	100 nF	C2, 4, 13, 15, 21, 22, 26, 27
	6	330 nF	C5, 14, 16, 20, 23, 30
	1	47 μF	C10

SEMICONDUCTORS AND OTHERS

√	Qty.	Part	Reference	√	Qty.	Part	Reference
	4	MPN3700	D1, 2, 4, 5		2	FT23-43	L3, 4
	1	1N4001	D3		4	FT37-43	L2, 5, 6, 7
	1	2N3906	Q1		1	BN43-202	L1
	1	2N5109	Q5		1	BN43-2402	T3
	2	2SC5739	Q2, 3, 4		2	BN61-202	T1, 2
	1	#26 wire	8 feet		1	PCB	
	7	#30 wire	8 in. red/green twisted pair		3	Heat sink	(black)

2. Install all 1/4 Watt Resistors.

Note: Bend the resistor leads a sharp 90 degrees from the body

__R4,5,6,7,8,13: 1R0	Brown	Black	Gold	Gold
__R18: 4R7	Yellow	Violet	Gold	Gold

3. Install all 1/8 Watt Resistors and the pot.

Note: Bend the resistor leads a sharp 90 degrees from the body

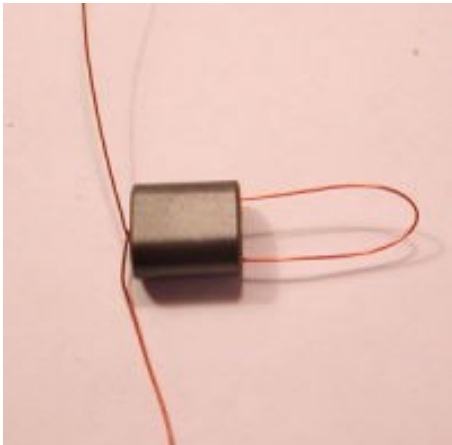
__R1,3,26,30,31: 1k0	Brown	Black	Red	Gold
__R2: 10kΩ	Brown	Black	Orange	Gold
__R9,10,14: 220 Ω	Red	Red	Brown	Gold
__R11,12: 33 Ω	Orange	Orange	Black	Gold
__R15,17: 470 Ω	Yellow	Violet	Brown	Gold
__R16: 2R2	Red	Red	Gold	Gold
__R19: 620 Ω	Blue	Red	Brown	Gold
__R21,22,25,28: 100 Ω	Brown	Black	Brown	Gold
__R23: 750 Ω	Violet	Green	Brown	Gold
__R24: 10 Ω	Brown	Black	Black	Gold
__R27: 680 Ω	Blue	Gray	Brown	Gold
__R29: 1k2	Brown	Red	Red	Gold

__R20: 500 Ω pot

4. Wind and Install all Chokes and Transformers.

Note that the two BN-61-202 binoculars are a dull gray while the BN-43-202 is shiny black

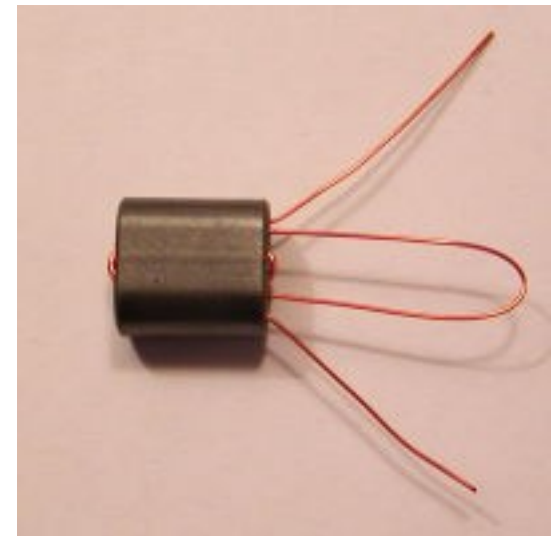
L1: Wind 6 full turns of 26 GA wire through a shiny black BN-43-202 center tapped at 3 turns.



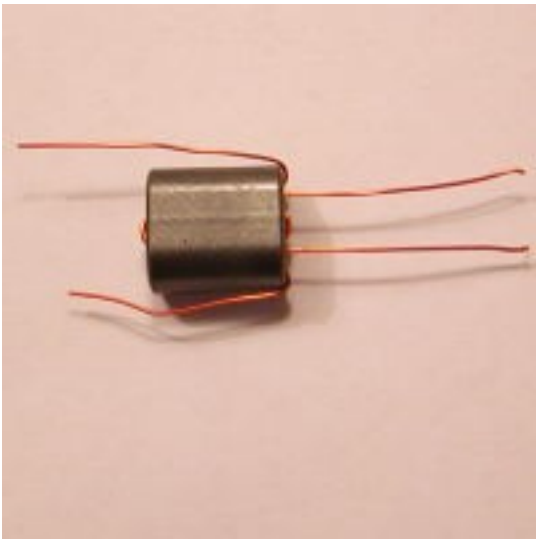
Cut 12 inches of 26 GA wire. Fold the wire in half and insert into both holes of L1, leaving a one inch loop.

Wind each wire 2 and 1/2 turns times more through the binocular.

You should now have 6 turns visible on the left side of L1

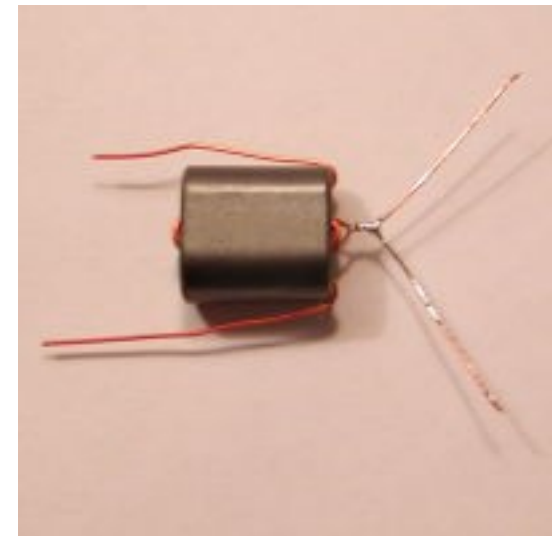


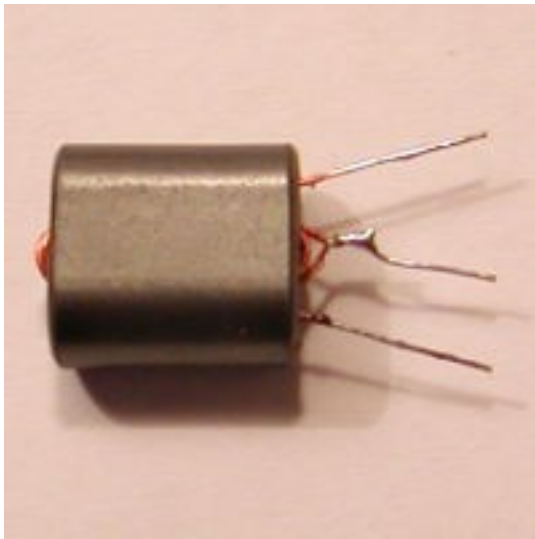
Fold back the two end wires and cut the loop of L1



Strip the insulation off the two right wires using sidecutters or sandpaper.

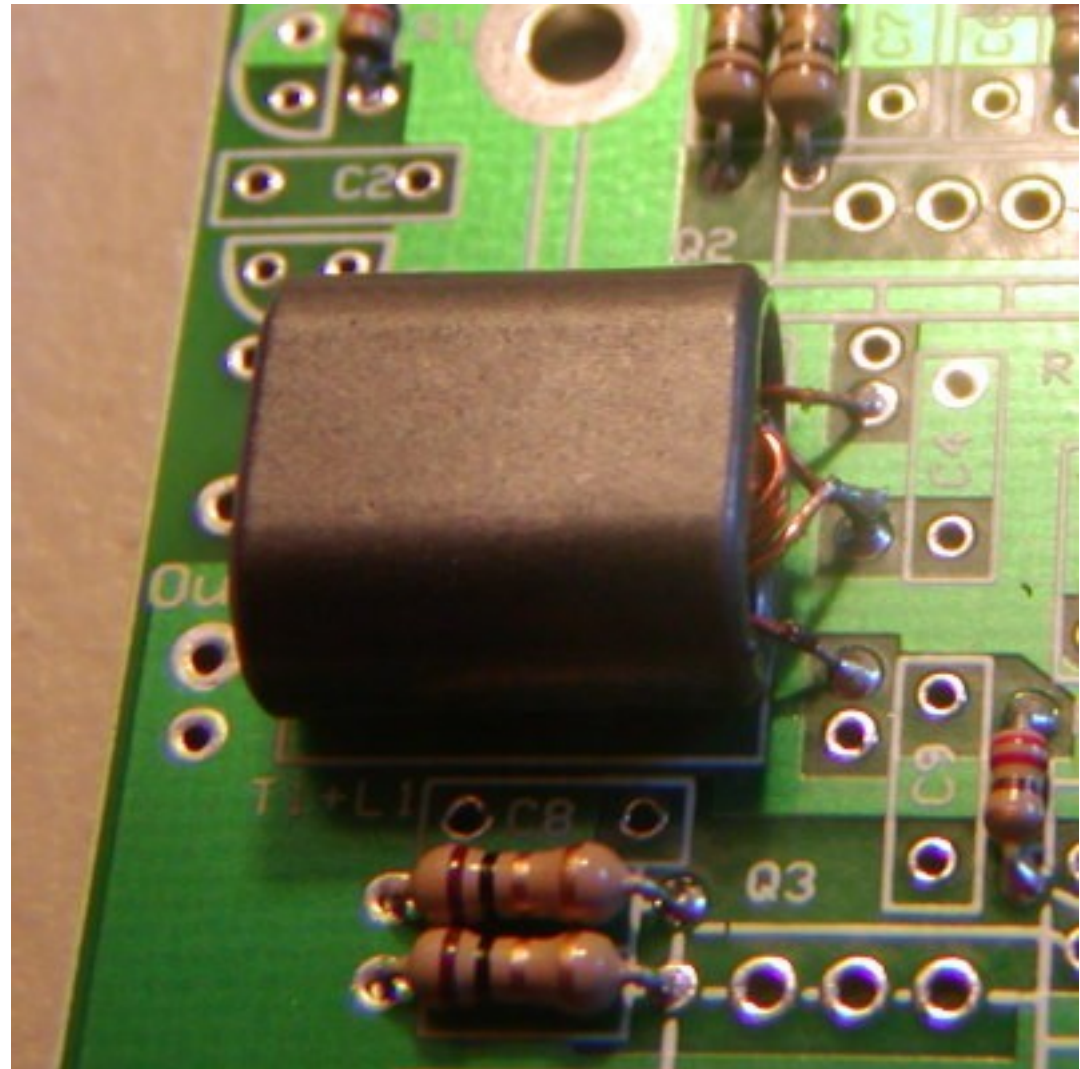
Twist the wires together and solder together to create a centertap for L1



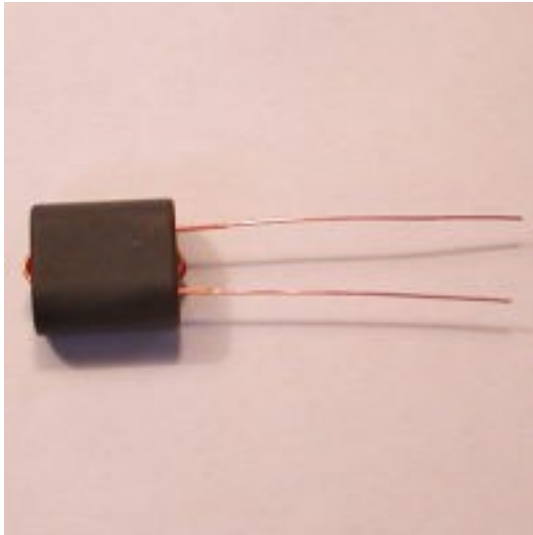


Strip the insulation off the two left wires and tin. Cut to about 1/2 inch and form L1 per the picture.

Align and Install L1 on the PCB into the holes per the picture. Solder and trim leads.



T1: Wind 5 full turns of 26 GA wire through a BN-61-202 dull gray binocular

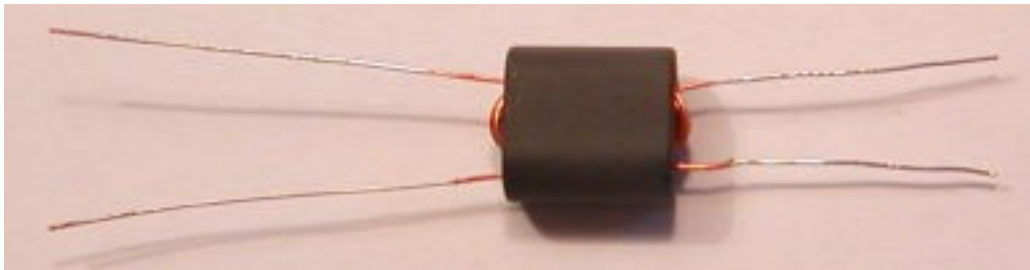


Cut 10 inches of 26 GA wire. Fold the wire in half and insert into both holes of T1.

Wind each wire 2 full turns more through the binocular.

You should now have 5 turns visible on the left side of T1

Temporarily, twist the two wires together so that winding the second layer will be easier.



Cut 15 inches of 26 GA wire. Fold the wire in half and insert into both holes of T1 from the right side.

Wind each wire 3 full turns more through the binocular.

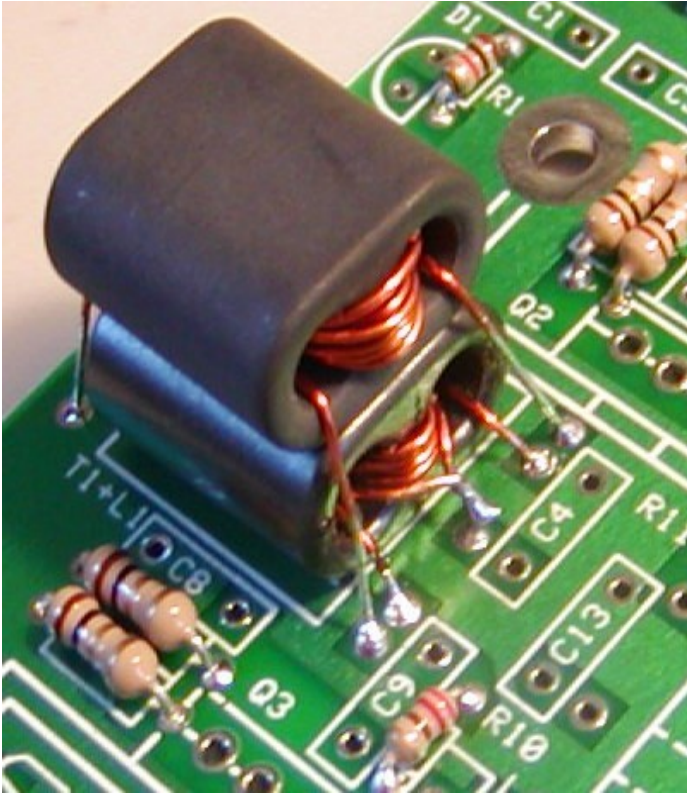
Unwind and trim the wires on the 5 turn winding (right side) to 1.5 inches.

Strip the insulation off the two right wires using sidecutters or sandpaper and tin.

Trim the wires of T1 on the 7 turn winding (left side) to 2.0 inches.

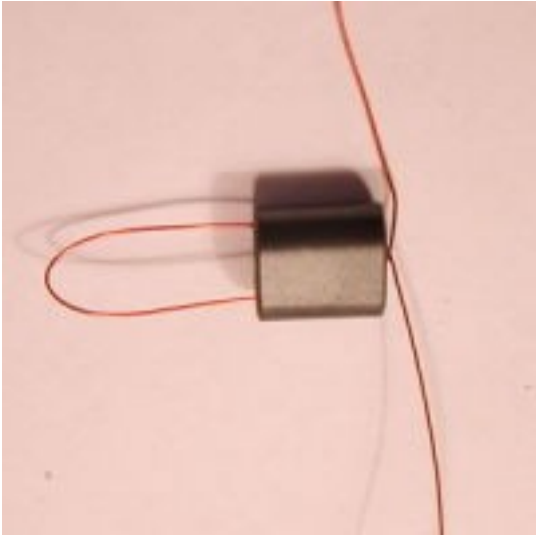
Strip the insulation off the two left wires using sidecutters or sandpaper and tin.

Align and Install T1 on top of L1 on the PCB.



Solder and trim leads.

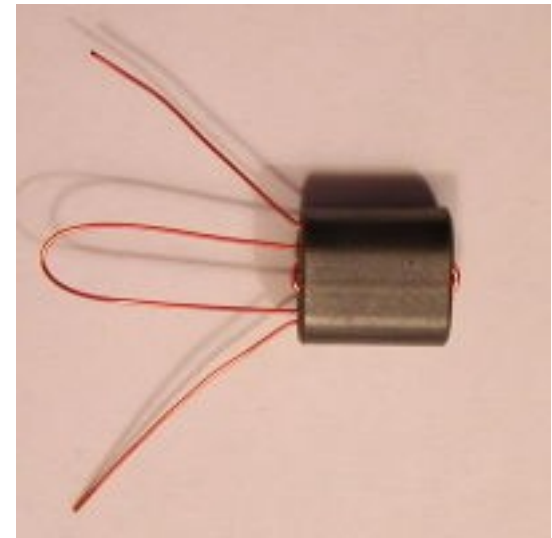
____T2: Wind 4 full turns of 26 GA wire through a dull gray BN-61-202 center tapped at 2 turns



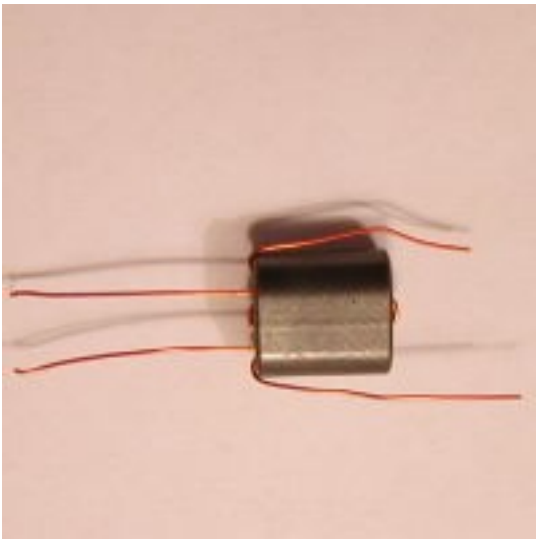
Cut 10 inches of 26 GA wire. Fold the wire in half and insert into both holes of T2, leaving a one inch loop.

Wind each wire 1 and 1/2 turns times more through the binocular.

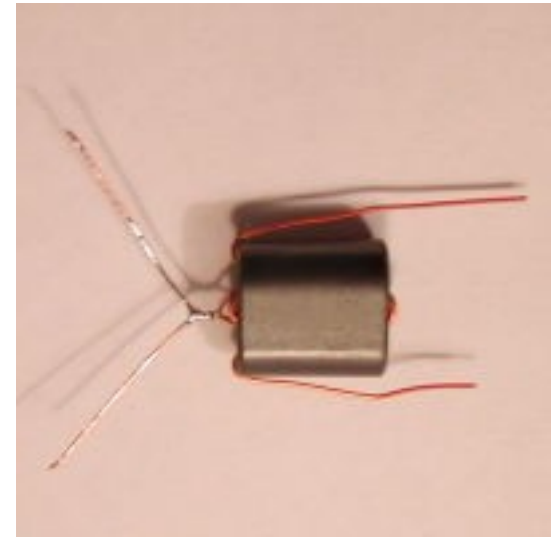
You should now have 4 turns visible on the right side of T2

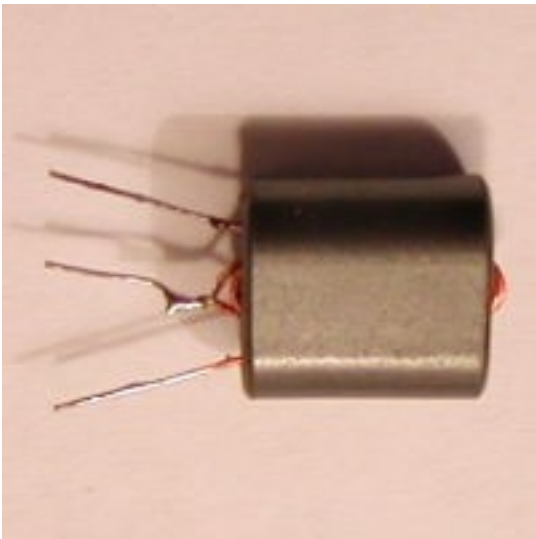


Fold back the two end wires and cut the loop of T2
Strip the insulation off the two left wires using
sidecutters or sandpaper.



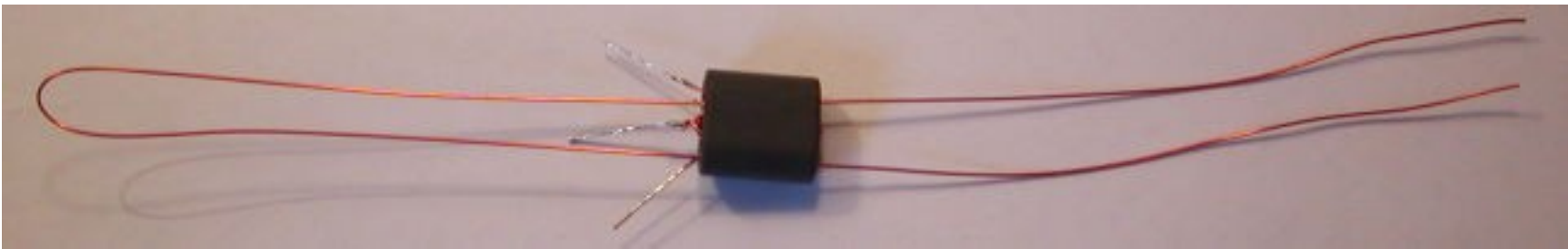
Twist the wires together and solder together to
create a center tap for T2





Strip the insulation off the two right wires and tin. Cut to about 1/2 inch and form T2 per the picture.

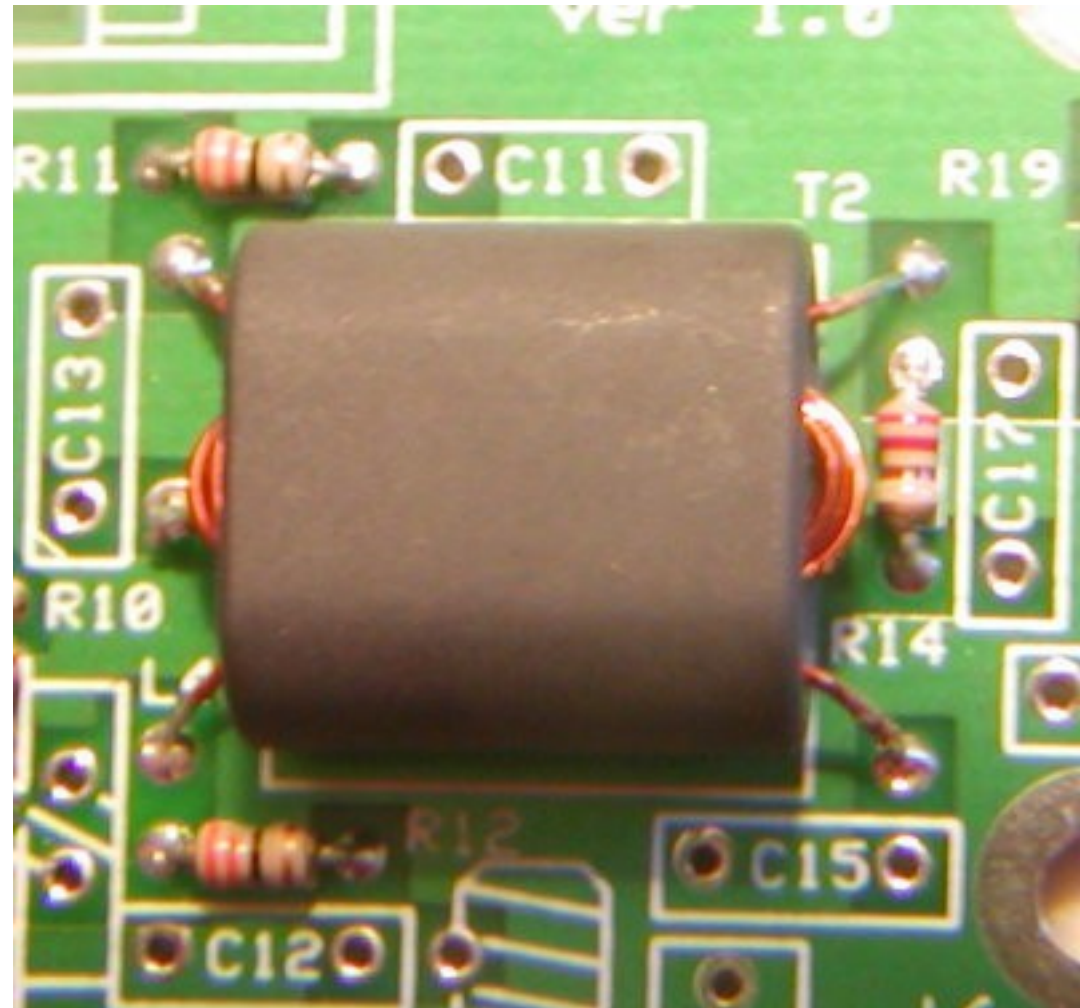
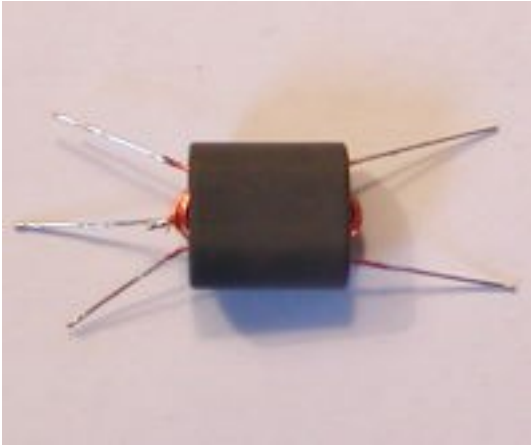
Cut 15 inches of 26 GA wire. Fold the wire in half and insert into both holes of T2 from the left side.



Wind each wire 3 full turns more through the binocular. Trim to 2 inches.

Strip the insulation off the two right wires using sidecutters or sandpaper and tin.

Align and Install T2 on the PCB into the holes per the picture.
Solder and trim leads.

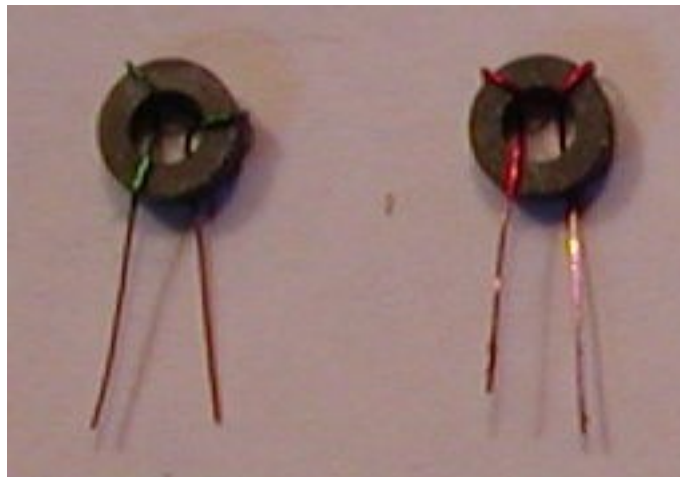


___L3 and L4: cut two inches off of the 10 inch piece of twisted 30 GA red/green wire.

Place three turns of either color wire on L3, a FT23-43 toroid

Repeat for L4. Strip the insulation using sidecutters or sandpaper and tin.

DO NOT INSTALL AT THIS TIME.



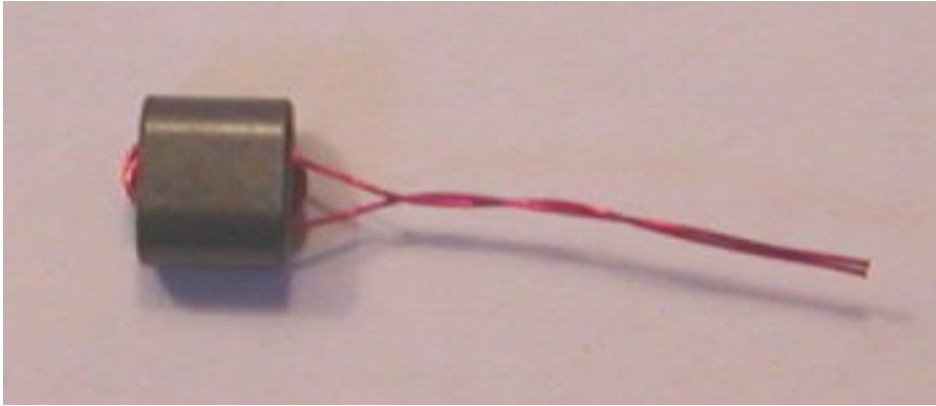
T3: Wind 6 and 2 full turns of 30 GA wire through a BN-43-2402 small binocular

Locate the red 30 GA wire. Fold the wire in half and insert into both holes of T3.

Wind each wire another 2 and a 1/2 turn through the binocular.

You should now have 6 turns visible on the left side of T3

Temporarily, twist the two wires together so that winding the second layer will be easier.



Locate the green 30 GA wire. Fold the wire in half and insert into both holes of T3 from the left side.

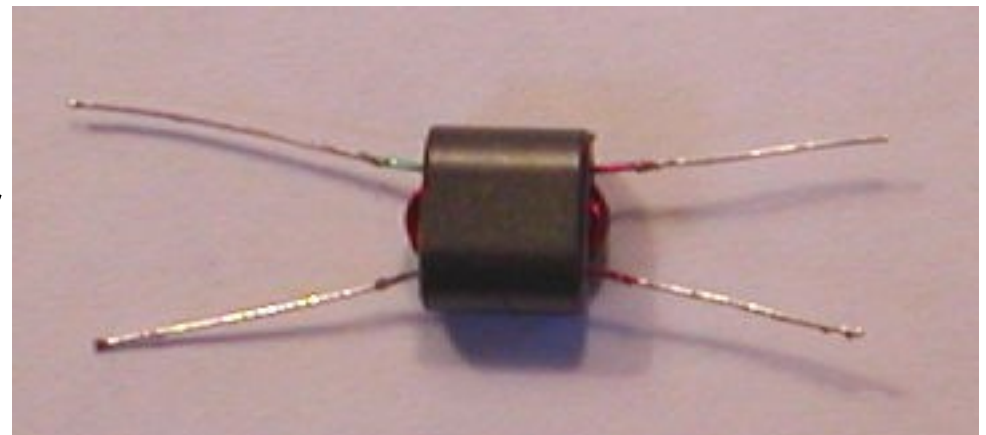
Wind each wire 1/2 turn more through the binocular.

Unwind and trim the wires on the 6

turn winding (right side) to a half inch.

Strip the insulation off the two right wires using sidecutters or sandpaper and tin.

Trim the wires of T3 on the 2 turn

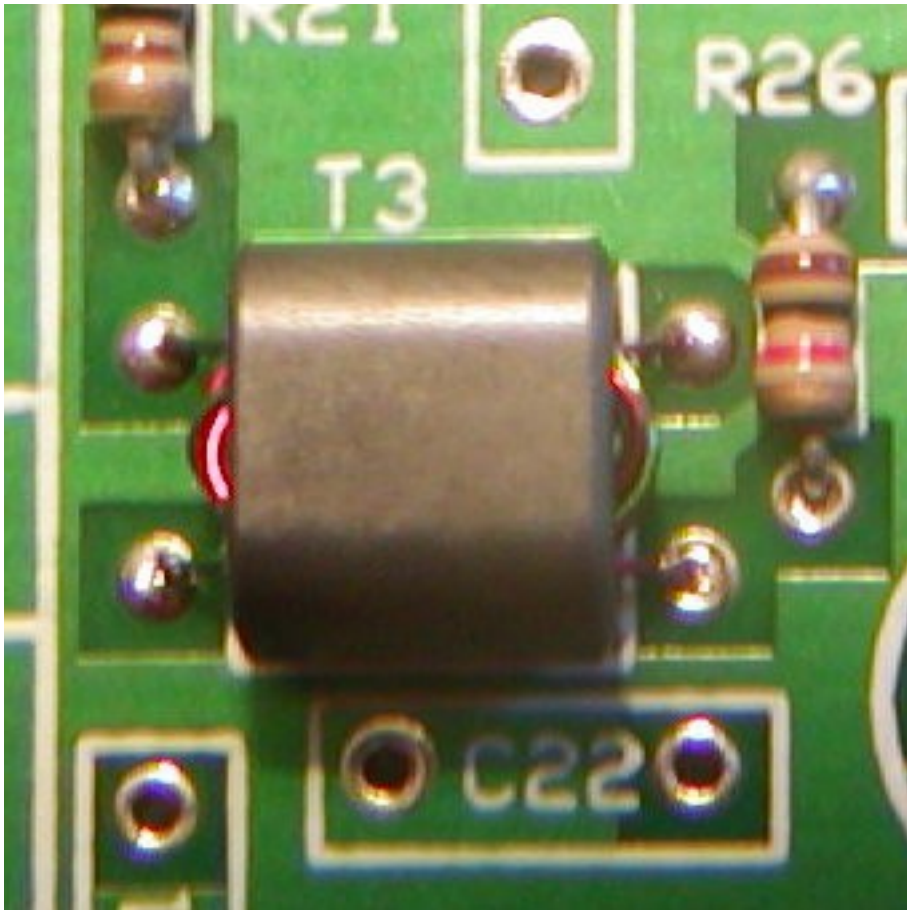


winding (left side) to a half inch.

Strip the insulation off the two left wires using sidecutters or sandpaper and tin.

Align and Install T3 on the PCB.

Solder and trim leads.



__L2,5,6,7: Wind 10 turns of 26 GA wire on an FT37-43 ferrite toroid.

Cut 8 inches of 26 GA wire. Wind the wire on the toroid clockwise.

Trim the wires of L2 to a half inch.

Strip the insulation off the wires using sidecutters or sandpaper and tin.

DO NOT INSTALL THE CHOKES AT THIS TIME.



5. Install all capacitors.

__C1,3,6,7,8,9,11,12,18,19,24,25,28,29,31: 10 nF

__C2,4,13,15,21,22,26,27: 100 nF

Straighten blue 100nF capacitor's leads before installing.

__C17: 220 pF

__C5,14,16,20,23,30: 330 nF

Note that C30 fits tight against R29

__C10: 47 μ F

6. Install all Diodes.

___D1,2,4,5: MPN3700 - install flush against PCB per parts markings

DO NOT OVERHEAT WHEN SOLDERING

___D3: 1N4001 - note the polarity band

7. Install remaining chokes

___L3,4: 3 turn FT23-43 choke - install per parts markings on the PCB

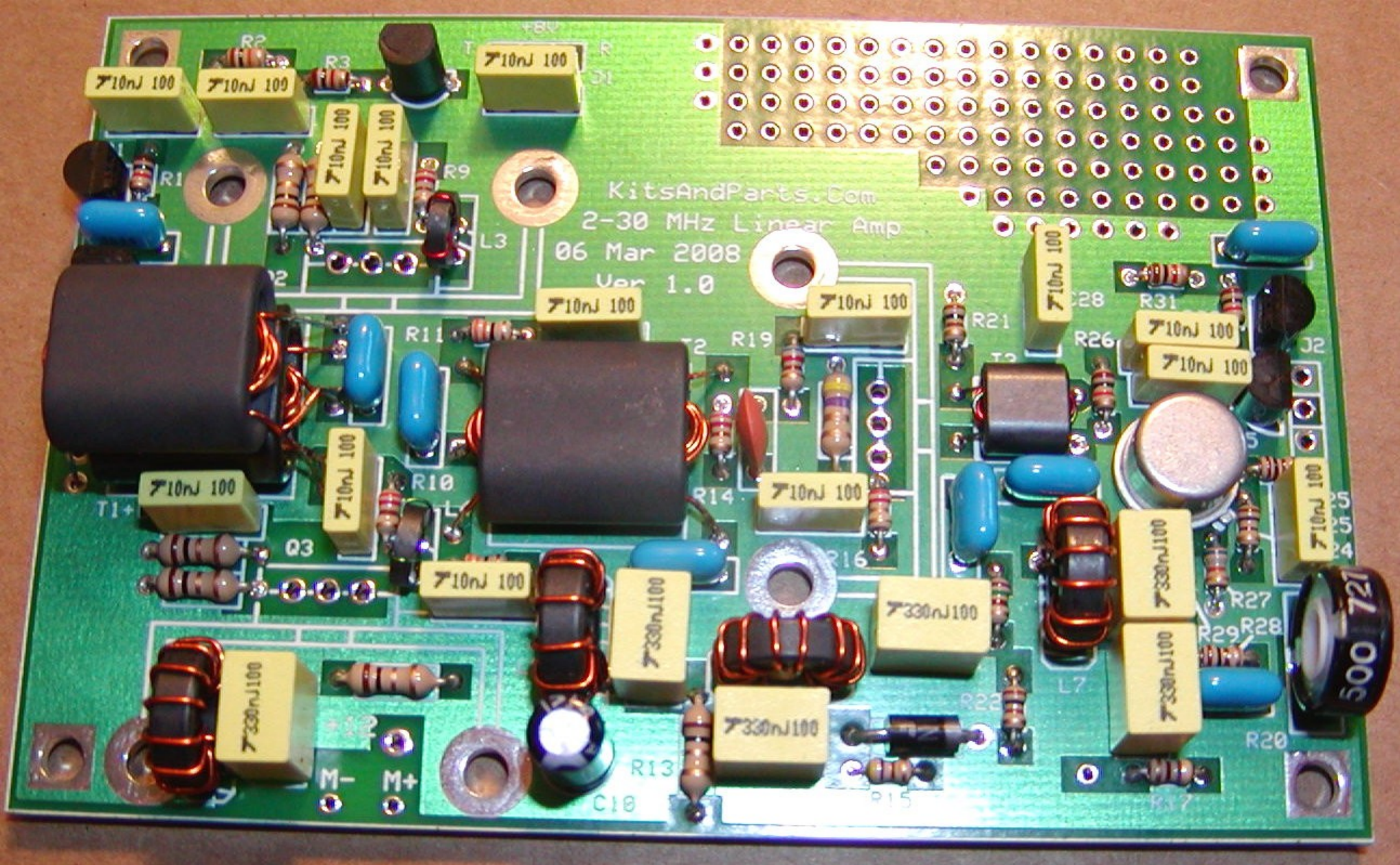
___L2,5,6,7: 10 turn FT37-43 choke - install per parts markings on the PCB

8. Install all Transistors, some of them already fitted WITH Heat Sinks.

___Q5: 2N5109 - install 1/10 inch or 2,5 mm spacing above the PCB

___Q1: 2N3906 - install per parts markings on the PCB

Here is a picture of the PCB without heat sinks



NOTE: The follow 3 transistors should use Heat Sink Grease

It is available from Radio Shack, part # 276-1372 @ \$2.99

Q2: 2SC5739 - Mount the transistor per parts markings on the PCB.

The transistor is mounted on the inside of the heat sink.

Use Heat Sink Grease between the Transistor and the heat sink.

Use a 4-40 screw and nut to secure the transistor to the heat sink.

Make sure the head of the screw faces away from the PCB (up)

Q3: 2SC5739 - Mount the transistor per parts markings on the PCB.

The transistor is mounted on the outside of the heat sink.

Use Heat Sink Grease between the Transistor and the heat sink.

Use a 4-40 screw and nut to secure the transistor to the heat sink.

Make sure the head of the screw faces away from the PCB (down)

Q4: 2SC5739 - Mount the transistor per parts markings on the PCB.

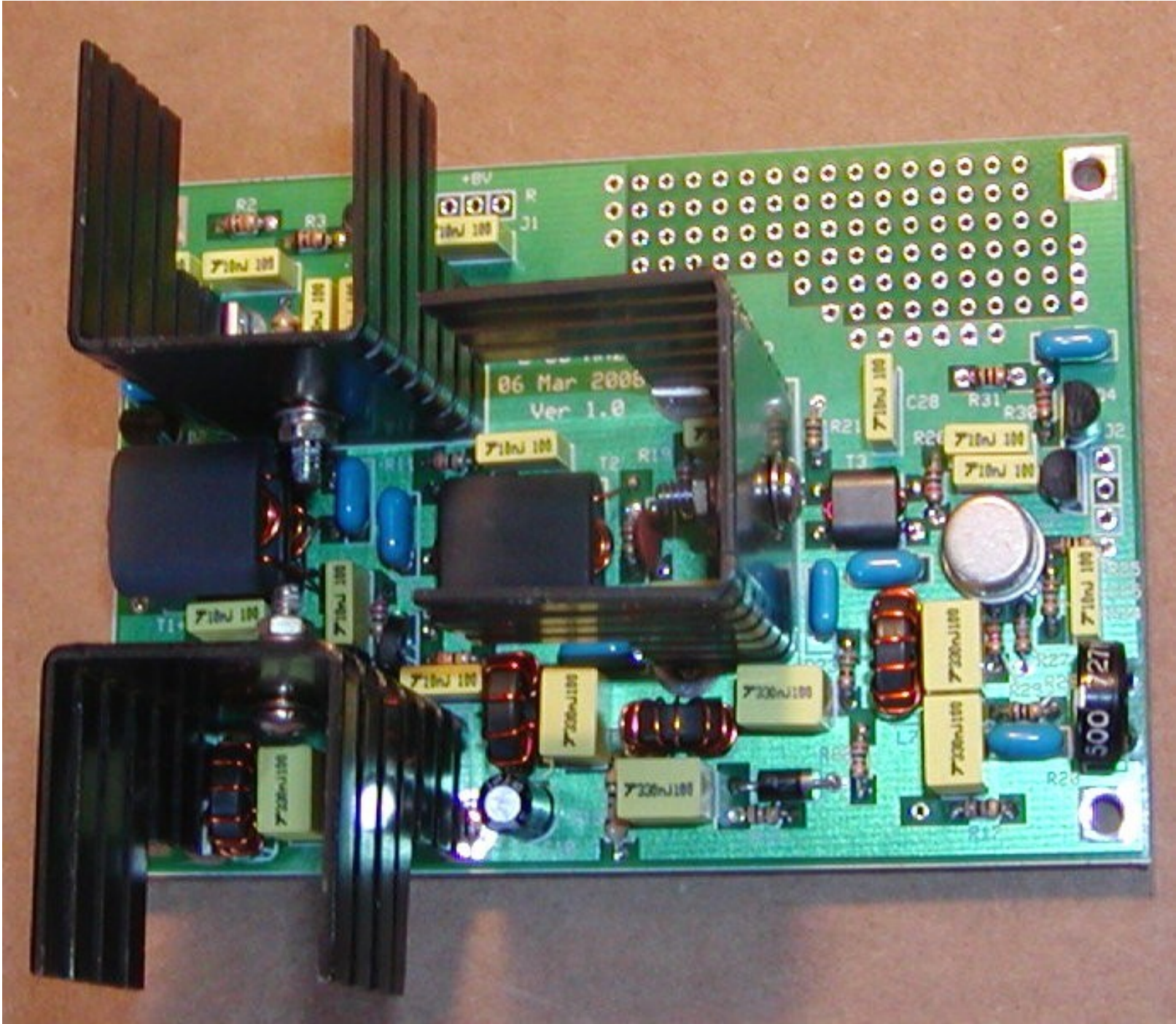
The transistor is mounted on the inside of the heat sink.

Use Heat Sink Grease between the Transistor and the heat sink.

Use a 4-40 screw and nut to secure the transistor to the heat sink.

Make sure the head of the screw faces away from the PCB (right)

Here is a picture of the PCB with heat sinks



8. Miscellaneous Notes.

__R17: This resistor can optionally be 1/4 watt for higher heat dissipation.

Note the extra PCB mounting hole between R15 and R17.
For experimenters wanting to try different RF final amps.

__M1 % M+: These pads are available for measuring the BIAS currents of Q2 plus Q3.

50 milliamps per transistor or 100 milliamps total.

Adjust R20 (500 ohm pot) for desired bias current.

__J2 pin 2: The input of the Amp needs to be at DC ground for the PIN diodes D4,5 to function.

This can be achieved via a link coupling from the Band Pass Filter output, or requires a 40uH choke to ground (10 turns on an FT37-43 ferrite toroid)

__J1: To test and/or operate the linear amp, you will need +8V at 500 mA and XMIT and RCVE control signals at an 8 volt level.

When not active, the control signal levels should be at ZERO volts/ground.