

# Ensemble RXTX 05\_RF I/O and Switching

[Home](#) [Bill of Materials](#) [Power Supply](#) [USB Power Supply](#) [Local Oscillator](#) [Dividers](#) [RF I/O and Switching](#) [RX Mixer](#)  
[\(QSD\)](#) [RX Opamps and Output](#) [TX Opamps](#) [TX Mixer \(QSE\)](#) [Driver/PA](#) [External Connections](#) [Comments](#)  
[Acronyms](#) [Inventory](#) [Revisions as of 3/21/2011](#) [Components By Stage](#) [WB5RVZ Main Website](#)

Search:  Search selected SDR sites

## RF I/O and Switching Introduction

### General

*The RXTX Ensemble board with a date of 4/4/10 had a wiring error concerning the point in the circuit where the RX BPF antenna connection is made.*

*The author got caught by this and reinstalled C27 to the underside of the board (shown in the bottom view of the completed board). Production boards will not have this problem.*

This stage handles the RF input and Output paths, along with the switching from Receive to Transmit. The radio defaults to the RX mode. When a PTT signal is sent down the USB line to the ATtiny 85 in the Local Oscillator stage, that signal is passed through to the radio across the galvanically isolated boundary between the digital and analog side of the rig via the optoisolator, U4.

In RX the /PTT line is pulled toward 12 volts which results in Q10 conducting RX signal and Q9 pulling the /OE pins of U10 low to enable the QSD operation.

In TX the /PTT line is pulled low by optoisolator U4 and Q9 and Q10 are not conducting. This results in Q11 conducting and shorting the RX input to ground. It also results in pulling the base of Q3 down, turning it on and generating the S12V supply to the PA on transmit.

This allows the rig to use the path to the antenna jack by RX and TX. As a matter of convenience, we install all of that path in this stage.

This stage includes winding a toroidal transformer and three toroidal coils. The builder needs to be very careful to note the toroid requirements, which are band-specific. Be sure to use the right toroid, as indicated in the Bill of Materials. Check:

1. The color: "Tnn-2" is red; "Tnn-6" is yellow)
2. The size: "T25-n" is a 0.25" OD toroid; T30-n" is a 0.30" OD toroid; and "T37-n" is 0.37"

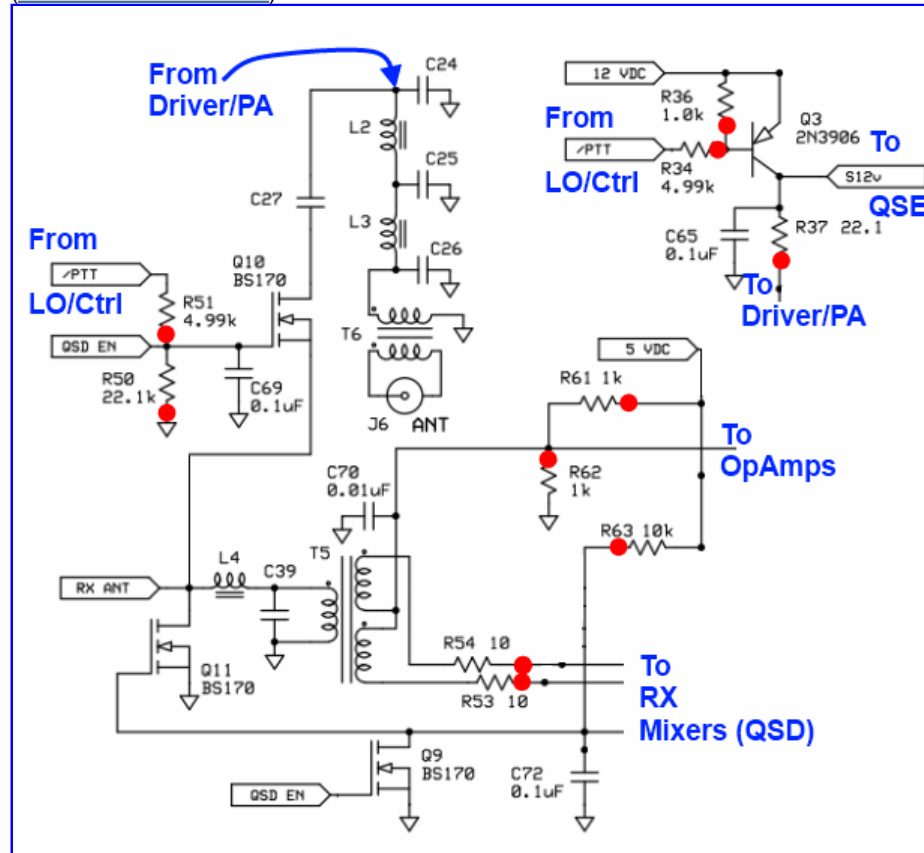
If you have no experience with winding and installing toroidal inductors, you are strongly encouraged to review the [WB5RVZ Instructions for Winding and Installing such inductors](#).

[\(go directly to build notes\)](#)

## RF I/O and Switching Schematic

(Resistor testpoints (hairpin, top, or left-hand lead), as physically installed on the board, are marked in the schematic with red dots)

(Click for Full Schematic)



(above schematic has clickable areas that can be used for navigation)

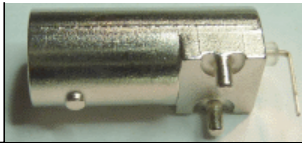


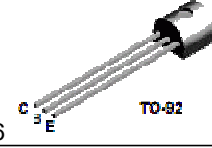
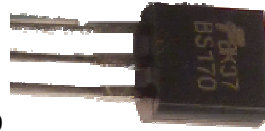
(go directly to build notes)

## RF I/O and Switching Bill of Materials





### Stage Bill of Materials

(resistor images and color codes courtesy of [Wilfried, DL5SWB's R-Color Code program](#))

Check Count	Component	Marking	Category
<input type="checkbox"/> 3	1 k 1/4W 1%	br-blk-blk-br-br	1/4W
<input type="checkbox"/> 1	10 k 1/4W 1%	br-blk-blk-r-br	1/4W
<input type="checkbox"/> 2	10 ohm 1/4W 1%	br-blk-blk-gld-br	1/4W
<input type="checkbox"/> 1	22.1 ohm 1%	red-red-brn-gld-brn	1/4W
<input type="checkbox"/> 2	4.99 k 1/4W 1%	y-w-w-br-br	1/4W




<input type="checkbox"/>	1	bnc connector pcb (rt-angle)		BNC-RA
<input type="checkbox"/>	15	band-specific		misc
<input type="checkbox"/>	1	0.01 uF	(smt) 	SMT 1206
<input type="checkbox"/>	3	0.1 uF	(smt) black stripe 	SMT 1206
<input type="checkbox"/>	1	<a href="#">2N3906 PNP transistor</a>	 2N3906 TO-92	TO-92
<input type="checkbox"/>	3	<a href="#">BS170 N-Channel Enhancement Mode FET</a>	 BS170	TO-92

**Band Specific Items for 160m Band**

Check	Designation	Component	Marking	Category	Orientation	Notes	Circuit
<input type="checkbox"/>	C24	2200 pF 5%	222	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C25	4700 pF 5%	472	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C26	2200 pF 5%	222	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C27	390 pF 5%	391 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C39	5600 pF 5%	562	Ceramic			RF I/O and Switching
<input type="checkbox"/>	L2	3.4 uH: 29T #26 on T37-2 (red) (17")	 red	Coil			RF I/O and Switching
<input type="checkbox"/>	L2core	T37-2 toroid core	 red	Toroid			RF I/O and Switching
<input type="checkbox"/>	L3	3.4 uH: 29T #26 on T37-2 (red) (17")	 red	Coil			RF I/O and Switching



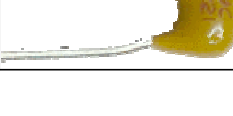
<input type="checkbox"/>	L3core	T37-2 toroid core	red 	Toroid			RF I/O and Switching
<input type="checkbox"/>	L4	18.7 uH: 66T #30 on T30-2 (red) (35")	red 	Coil			RF I/O and Switching
<input type="checkbox"/>	L4core	T30-2 toroid core	red 	Toroid			RF I/O and Switching
<input type="checkbox"/>	T5	1.4 uH: 18T/2x9T bifilar #30 on T30-2 (red) 11"	red 	Xfrmr			RF I/O and Switching
<input type="checkbox"/>	T5core	T30-2 toroid core	red 	Toroid			RF I/O and Switching
<input type="checkbox"/>	T6	4T bifilar #30 on BN-43-2402 (9")		xfrmr			RF I/O and Switching
<input type="checkbox"/>	T6core	BN-43-2402 (no markings!)	none 	Binocular core			RF I/O and Switching













**Band Specific Items for 80, 40m Band**

Check	Designation	Component	Marking	Category	Orientation	Notes	Circuit
<input type="checkbox"/>	C24	470 pF 5%	471	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C25	820 pF 5%	821	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C26	470 pF 5%	471	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C27	560 pF	561	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C39	680 pF 5%	681 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	L2	1.4 uH: 19T #26 on T37-2 (red) 12"	red 	Coil			RF I/O and Switching
<input type="checkbox"/>	L2core	T37-2 toroid core	red 	Toroid			RF I/O and Switching

<input type="checkbox"/>	L3	1.4 uH: 19T #26 on T37-2 (red) 12"	red 	Coil			RF I/O and Switching
<input type="checkbox"/>	L3core	T37-2 toroid core	red 	Toroid			RF I/O and Switching
<input type="checkbox"/>	L4	1.6 uH: 22T #30 on T25-2 (red) (10")	red 	Coil			RF I/O and Switching
<input type="checkbox"/>	L4core	T25-2 toroid core	red 	Toroid			RF I/O and Switching
<input type="checkbox"/>	T5	1.2 uH: 18T/2x9T bifilar #30 on T25-2 (red) 9"	red 	Xfrmr			RF I/O and Switching
<input type="checkbox"/>	T5core	T25-2 toroid core	red 	Toroid			RF I/O and Switching
<input type="checkbox"/>	T6	4T bifilar #30 on BN-43-2402 (9")		xfrmr			RF I/O and Switching
<input type="checkbox"/>	T6core	BN-43-2402 (no markings!)	none 	Binocular core			RF I/O and Switching

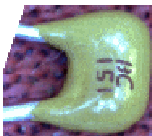
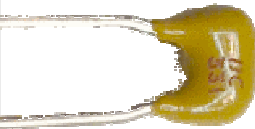
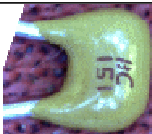








**Band Specific Items for 40, 30, 20m Band**

Check	Designation	Component	Marking	Category	Orientation	Notes	Circuit
<input type="checkbox"/>	C24	220 pF 5%	221 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C25	470 pF 5%	471 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C26	220 pF 5%	221 	Ceramic			RF I/O and Switching

<input type="checkbox"/>	C27	330 pF 5%	331 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C39	470 pF 5%	471 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	L2	0.8 uH: 16T #26 on T37-6 (yellow) (11")	yellow 	Coil			RF I/O and Switching
<input type="checkbox"/>	L2core	T37-6 toroid core	yellow 	Toroid			RF I/O and Switching
<input type="checkbox"/>	L3	0.8 uH: 16T #26 on T37-6 (yellow) (11")	yellow 	Coil			RF I/O and Switching
<input type="checkbox"/>	L3core	T37-6 toroid core	yellow 	Toroid			RF I/O and Switching
<input type="checkbox"/>	L4	0.9uH 18T #30 on T25-6(yellow) (10")	yellow 	Coil			RF I/O and Switching
<input type="checkbox"/>	L4core	T25-6 toroid core	yellow 	Toroid			RF I/O and Switching
<input type="checkbox"/>	T5	0.69 uH: 16T/2x8T bifilar #30 on T25-6 (yellow) 9"	yellow 	Xfrmr			RF I/O and Switching
<input type="checkbox"/>	T5core	T25-6 toroid core	yellow 	Toroid			RF I/O and Switching
<input type="checkbox"/>	T6	4T bifilar #30 on BN-61-2402 (9")		xfrmr			RF I/O and Switching
<input type="checkbox"/>	T6core	BN-61-2402 (no Markings!)	none 	Binocular core			RF I/O and Switching







**Band Specific Items for 30, 20, 17m Band**

Check	Designation	Component	Marking	Category	Orientation	Notes	Circuit
-------	-------------	-----------	---------	----------	-------------	-------	---------

<input type="checkbox"/>	C24	150 pF 5%	151 	Ceramic		RF I/O and Switching
<input type="checkbox"/>	C25	330 pF 5%	331 	Ceramic		RF I/O and Switching
<input type="checkbox"/>	C26	150 pF 5%	151 	Ceramic		RF I/O and Switching
<input type="checkbox"/>	C27	180 pF 5%	181 	Ceramic		RF I/O and Switching
<input type="checkbox"/>	C39	220 pF 5%	221 	Ceramic		RF I/O and Switching
<input type="checkbox"/>	L2	0.6 uH: 14T #26 on T37-6 (yellow) (10")	yellow 	Coil		RF I/O and Switching
<input type="checkbox"/>	L2core	T37-6 toroid core	yellow 	Toroid		RF I/O and Switching
<input type="checkbox"/>	L3	0.6 uH: 14T #26 on T37-6 (yellow) (10")	yellow 	Coil		RF I/O and Switching
<input type="checkbox"/>	L3core	T37-6 toroid core	yellow 	Toroid		RF I/O and Switching
<input type="checkbox"/>	L4	0.78 uH 17T #30 on T25-6 (yellow) (8")	yellow 	Coil		RF I/O and Switching
<input type="checkbox"/>	L4core	T25-6 toroid core	yellow 	Toroid		RF I/O and Switching

<input type="checkbox"/>	T5	0.6 uH: 14T/2x7T bifilar #30 on T25-6 (yellow) 8"	yellow 	Xfrmr			RF I/O and Switching
<input type="checkbox"/>	T5core	T25-6 toroid core	yellow 	Toroid			RF I/O and Switching
<input type="checkbox"/>	T6	4T bifilar #30 on BN-61-2402 (9")		xfrmr			RF I/O and Switching
<input type="checkbox"/>	T6core	BN-61-2402 (no Markings!)	none 	Binocular core			RF I/O and Switching

**Band Specific Items for 15, 12, 10m Band**

Check	Designation	Component	Marking	Category	Orientation	Notes	Circuit
<input type="checkbox"/>	C24	100 pF 5%	101 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C25	180 pF 5%	181 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C26	100 pF 5%	101 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C27	82 pF	82J 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	C39	330 pF 5%	331 	Ceramic			RF I/O and Switching
<input type="checkbox"/>	L2	0.36 uH: 11T #26 on T37-6 (yellow)	yellow 	Coil			RF I/O and Switching



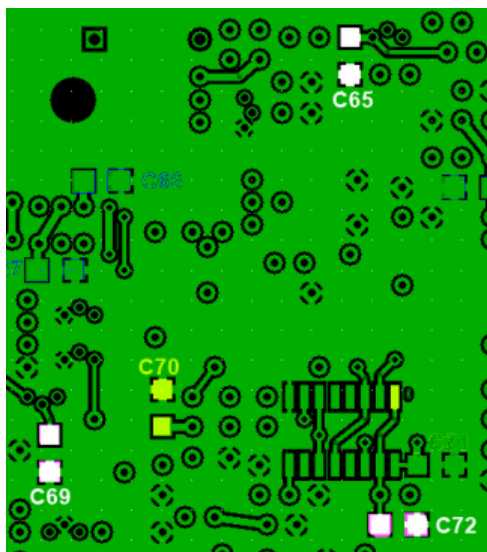
<input type="checkbox"/>	L2core	T37-6 toroid core	yellow 	Toroid		RF I/O and Switching
<input type="checkbox"/>	L3	0.36 uH: 11T #26 on T37-6 (yellow)	yellow 	Coil		RF I/O and Switching
<input type="checkbox"/>	L3core	T37-6 toroid core	yellow 	Toroid		RF I/O and Switching
<input type="checkbox"/>	L4	0.53 uH 14T #30 on T25-6 (10")	yellow 	Coil		RF I/O and Switching
<input type="checkbox"/>	L4core	T25-6 toroid core	yellow 	Toroid		RF I/O and Switching
<input type="checkbox"/>	T5	0.13 uH: 7T/2x4T bifilar #30 on T25-6 (yellow) 5"	yellow 	Xfrmr		RF I/O and Switching
<input type="checkbox"/>	T5core	T25-6 toroid core	yellow 	Toroid		RF I/O and Switching
<input type="checkbox"/>	T6	4T bifilar #30 on BN-61-2402 (9")		xfrmr		RF I/O and Switching
<input type="checkbox"/>	T6core	BN-61-2402 (no Markings!)	none 	Binocular core		RF I/O and Switching

### RF I/O and Switching Summary Build Notes


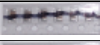


- Install SMT Capacitors
- Wind and Install Coils
- Wind and Install Transformers
- Install Topside Transistors
- Install Band-Specific Capacitors
- Install Topside Resistors
- Install BNC Connector
- [Test the Stage](#)

## RF I/O and Switching Detailed Build Notes

### Bottom of the Board



#### Install SMT Capacitors

Check	Designation	Component	Marking	Category	Orientation	Notes
<input type="checkbox"/>	C70	0.01 uF	(smt) 	SMT 1206		
<input type="checkbox"/>	C65	0.1 uF	(smt) black stripe 	SMT 1206		
<input type="checkbox"/>	C69	0.1 uF	(smt) black stripe 	SMT 1206		
<input type="checkbox"/>	C72	0.1 uF	(smt) black stripe 	SMT 1206		



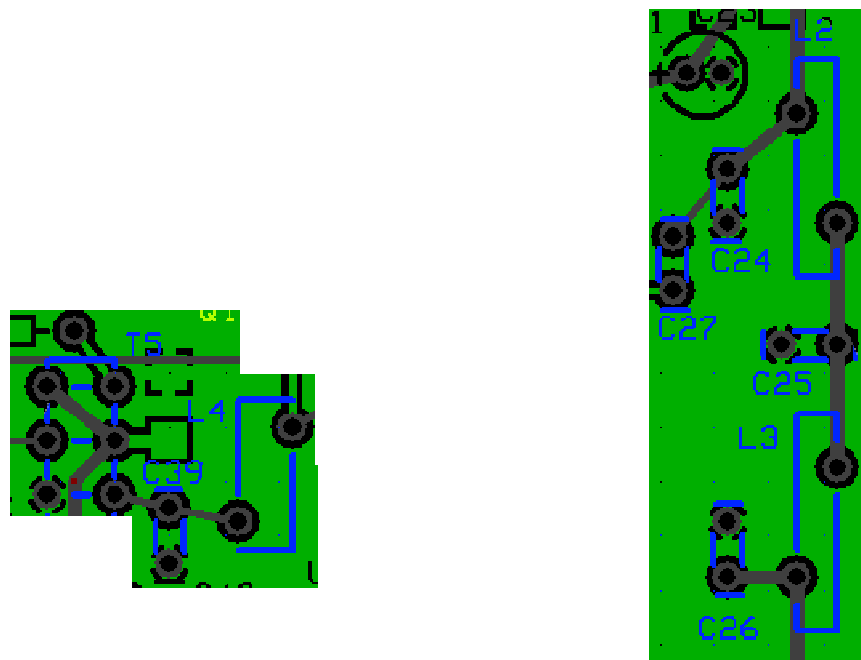
### Wind and Install Coils

Wind and install each of the three coils. Recall that any pass of the wire through the toroid's core counts as ONE turn. Refer to the [WB5RVZ coil winding instructions](#) for details on how to wind and prepare/install single-winding coils.











Once you have installed the the coils (L2 and L3 and L4), you can test your soldering by checking the continuity of the winding for each coil as follows (using points on traces connecting the coils to other components - these tests are most easily done PRIOR to installing the remaining components in this stage):






Coil	First Point	Second Point
L2	C27(top)	C25 (right)
L3	C25 (right)	C26 (bottom)
L4	Top C27 (leftmost hole)	C39 (top) (note Power must be on and transistors installed.)

Note: L4 is switched on. You will need to power the board and let the switching transistors provide continuity on the path to/through L4.



Check	Designation	Component	Marking	Category	Orientation	Notes
<input type="checkbox"/>	L2	band-specific	Band Component Marking	misc		

			160m	3.4 uH: 29T #26 on T37-2 (red) (17") (Coil)	red 			
			80, 40m	1.4 uH: 19T #26 on T37-2 (red) 12" (Coil)	red 			
			40, 30, 20m	0.8 uH: 16T #26 on T37-6 (yellow) (11") (Coil)	yellow 			
			30, 20, 17m	0.6 uH: 14T #26 on T37-6 (yellow) (10") (Coil)	yellow 			
			15, 12, 10m	0.36 uH: 11T #26 on T37-6 (yellow) (Coil)	yellow 			
<input type="checkbox"/>	L2core	band-specific				misc		
			BandComponent Marking					
			160m	3.4 uH: 29T #26 on T37-2 (red) (17") (Coil)	red 			
			80, 40m	1.4 uH: 19T #26 on T37-2 (red) 12" (Coil)	red 			
			40, 30, 20m	0.8 uH: 16T #26 on T37-6 (yellow) (11") (Coil)	yellow 			
			30, 20, 17m	0.6 uH: 14T #26 on T37-6 (yellow) (10") (Coil)	yellow 			
			15, 12, 10m	0.36 uH: 11T #26 on T37-6 (yellow) (Coil)	yellow 			
<input type="checkbox"/>	L3	band-specific				misc		

<input type="checkbox"/>	L3core	band-specific			misc		
<input type="checkbox"/>	L4	band-specific	Band	Component	Marking	misc	
			160m	18.7 uH: 66T #30 on T30-2 (red) (35") (Coil)	red 		
			80, 40m	1.6 uH: 22T #30 on T25-2 (red) (10") (Coil)	red 		
			40, 30, 20m	0.9uH 18T #30 on T25-6 (yellow) (10") (Coil)	yellow 		
			30, 20, 17m	0.78 uH 17T #30 on T25-6 (yellow) (8") (Coil)	yellow 		
			15, 12, 10m	0.53 uH 14T #30 on T25-6 (10") (Coil)	yellow 		
<input type="checkbox"/>	L4core	band-specific			misc		

### Wind and Install Transformers

Wind and install toroidal transformers T5 and T6. See the [WB5RVZ Instructions for Toroidal Transformers for important, detailed instructions on how to wind and install toroidal transformers.](#)

After installing the transformers, you should check the primary and secondary windings for continuity with your ohmmeter, using the following testpoints connected via traces to the windings (these tests are easier done prior to installing the remaining components in this stage):

Coil	First Point	Second Point
T5 Primary	C39 (left)	C39 (right)
T5 Secondaries	R53 (right)	R54 (bottom)
T6 Secondary	C26 (bottom)	C26 (top)
T6 Primary	Center conductor of J6	Shield side of J6

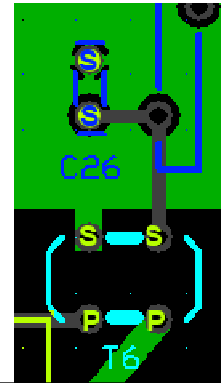
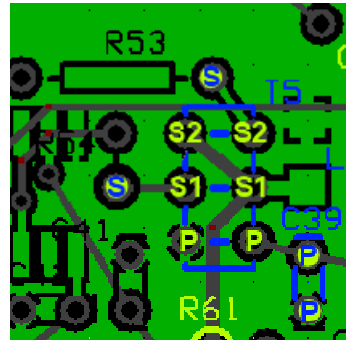
If you are unfamiliar with winding and installing inductors, you may want to refer to the WB5RVZ construction hints for [coils \(toroidal\)](#) and transformers ( [toroidal](#) and [binocular](#)). Click [here](#) for details on identifying toroid cores.

## Decoding the transformer specifications:

Transformers' windings are specified using the pattern "nnT/wXmmT" or "wXmmT/nnT", where:









- "nn" is the number of turns in the single winding
- "mm" is the number of turns in the multiple windings
- "w" = the number of multiple windings (e.g., 2 = bifilar; 3 = trifilar, etc.)

Thus, e.g., "18T/2x9T bifilar #30" means, using #30 wire, produce a single 18 turn primary winding and two 9-turn secondary windings; "2x9T bifilar/ 18T #30" means, using #30 wire, produce two 9-turn primary windings and a single 18 turn secondary winding.

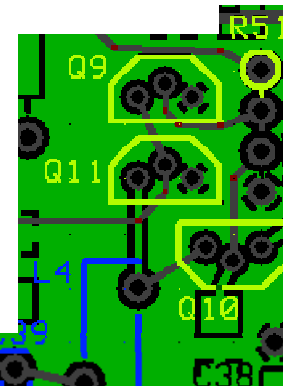
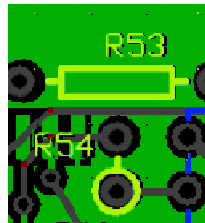
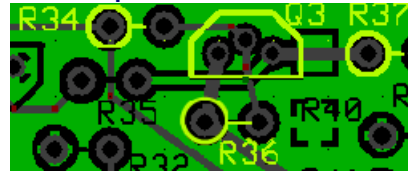


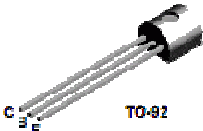

## Test T6 primaries at J6

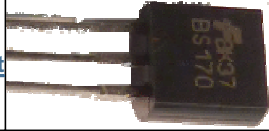
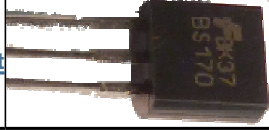
Check	Designation	Component	Marking		Category	Orientation	Notes
☐	T5	band-specific	Band	Component	misc		
			160m	1.4 uH: 18T/2x9T bifilar #30 on T30-2 (red) 11" (Xfrmr)			
			80, 40m	1.2 uH: 18T/2x9T bifilar #30 on T25-2 (red) 9" (Xfrmr)			

			40, 30, 20m	0.69 uH: 16T/2x8T bifilar #30 on T25-6 (yellow) 9" (Xfrmr)	yellow 			
			30, 20, 17m	0.6 uH: 14T/2x7T bifilar #30 on T25-6 (yellow) 8" (Xfrmr)	yellow 			
			15, 12, 10m	0.13 uH: 7T/2x4T bifilar #30 on T25-6 (yellow) 5" (Xfrmr)	yellow 			
<input type="checkbox"/>	T5core	band-specific				misc		
<input type="checkbox"/>	T6	band-specific	160m	4T bifilar #30 on BN-43-2402 (9") (xfrmr)		misc		
			80, 40m	4T bifilar #30 on BN-43-2402 (9") (xfrmr)				
			40, 30, 20m	4T bifilar #30 on BN-61-2402 (9") (xfrmr)				
			30, 20, 17m	4T bifilar #30 on BN-61-2402 (9") (xfrmr)				
			15, 12, 10m	4T bifilar #30 on BN-61-2402 (9") (xfrmr)				
<input type="checkbox"/>	T6core	band-specific				misc		

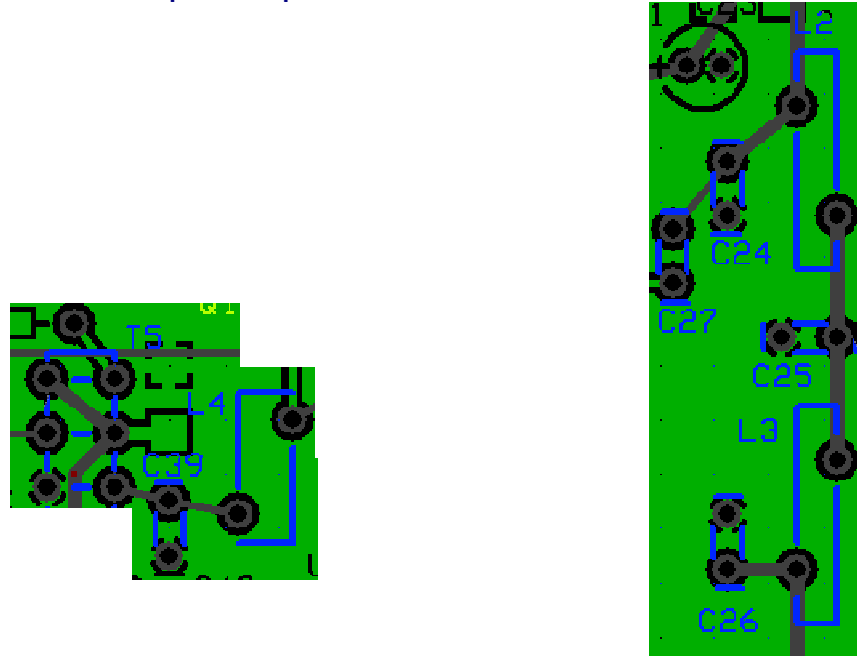


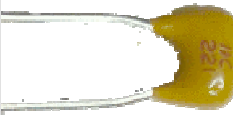
**Install Topside Transistors**


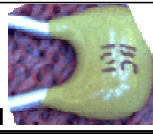

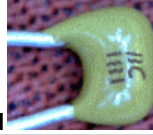



Check	Designation	Component	Marking	Category	Orientation	Notes
<input type="checkbox"/>	Q03	<a href="#">2N3906 PNP transistor</a>	<b>2N3906</b>  TO-92	TO-92		
<input type="checkbox"/>	Q09	<a href="#">BS170 N-Channel Enhancement Mode FET</a>	<b>BS170</b>  BS170	TO-92		Take <a href="#">ESD precautions</a>








<input type="checkbox"/>	Q10	<a href="#">BS170 N-Channel Enhancement Mode FET</a>		TO-92		Take <a href="#">ESD precautions</a>
<input type="checkbox"/>	Q11	<a href="#">BS170 N-Channel Enhancement Mode FET</a>		TO-92		Take <a href="#">ESD precautions</a>

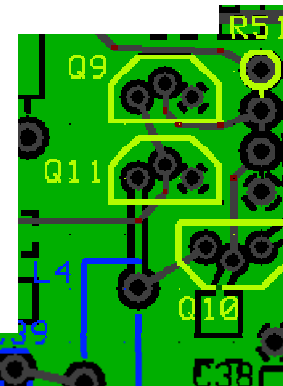
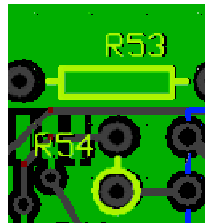
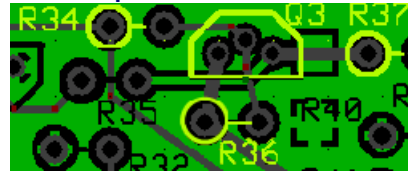
### Install Band-Specific Capacitors












Check	Designation	Component	Marking		Category	Orientation	Notes
<input type="checkbox"/>	C24	band-specific	Band	Component			
			160m	2200 pF 5% (Ceramic)			
			80, 40m	470 pF 5% (Ceramic)			
			40, 30, 20m	220 pF 5% (Ceramic)			
						misc	

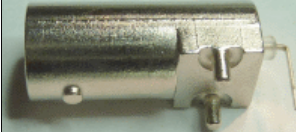
☐	C25	band-specific	30, 20, 17m	150 pF 5% (Ceramic)	151 	misc
			15, 12, 10m	100 pF 5% (Ceramic)	101 	
			BandComponentMarking			
			160m	4700 pF 5% (Ceramic)	472	
			80, 40m	820 pF 5% (Ceramic)	821	
			40, 30, 20m	470 pF 5% (Ceramic)	471	
			30, 20, 17m	330 pF 5% (Ceramic)	331 	
☐	C26	band-specific	15, 12, 10m	180 pF 5% (Ceramic)	181 	misc
			BandComponentMarking			
			160m	2200 pF 5% (Ceramic)	222	
			80, 40m	470 pF 5% (Ceramic)	471	
			40, 30, 20m	220 pF 5% (Ceramic)	221 	
			30, 20, 17m	150 pF 5% (Ceramic)	151 	
			15, 12, 10m	100 pF 5% (Ceramic)	101 	

☐	C27	band-specific	Band Component	Marking	misc		
			160m 390 pF 5% (Ceramic)	391 			
			80, 40m 560 pF (Ceramic)	561			
			40, 30, 20m 330 pF 5% (Ceramic)	331 			
			30, 20, 17m 180 pF 5% (Ceramic)	181 			
☐	C39	band-specific	15, 12, 10m 82 pF (Ceramic)	82J 	misc		
			Band Component	Marking			
			160m 5600 pF 5% (Ceramic)	562			
			80, 40m 680 pF 5% (Ceramic)	681 			
			40, 30, 20m 470 pF 5% (Ceramic)	471			
			30, 20, 17m 220 pF 5% (Ceramic)	221 	misc		
			15, 12, 10m 330 pF 5% (Ceramic)	331 			

**Install Topside Resistors**

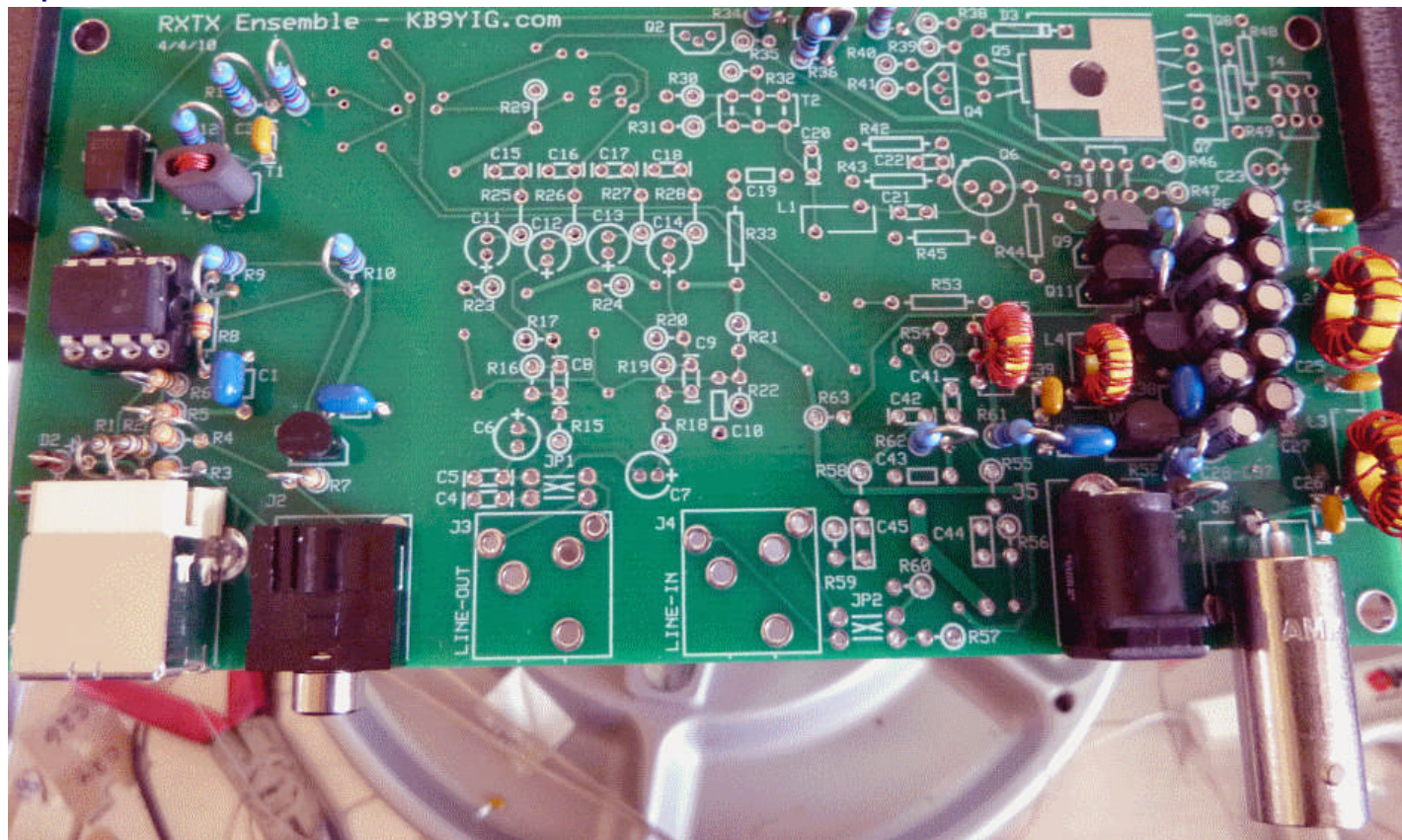
Check	Designation	Component	Marking	Category	Orientation	Notes
<input type="checkbox"/>	R53	10 ohm 1/4W 1%	br-blk-blk-gld-br 	1/4W	flat-horiz	
<input type="checkbox"/>	R54	10 ohm 1/4W 1%	br-blk-blk-gld-br 	1/4W	S-N	
<input type="checkbox"/>	R37	22.1 ohm 1%	red-red-brn-gld-brn 	1/4W	W-E	
<input type="checkbox"/>	R36	1 k 1/4W 1%	br-blk-blk-br-br 	1/4W	W-E	
<input type="checkbox"/>	R61	1 k 1/4W 1%	br-blk-blk-br-br 	1/4W	W-E	
<input type="checkbox"/>	R62	1 k 1/4W 1%	br-blk-blk-br-br 	1/4W	W-E	
<input type="checkbox"/>	R34	4.99 k 1/4W 1%	y-w-w-br-br 	1/4W	W-E	
<input type="checkbox"/>	R51	4.99 k 1/4W 1%	y-w-w-br-br 	1/4W	N-S	
<input type="checkbox"/>	R63	10 k 1/4W 1%	br-blk-blk-r-br 	1/4W	W-E	

**Install BNC Connector**

Check	Designation	Component	Marking	Category	Orientation	Notes
<input type="checkbox"/>	J6	bnc connector pcb (rt-angle)		BNC-RA		

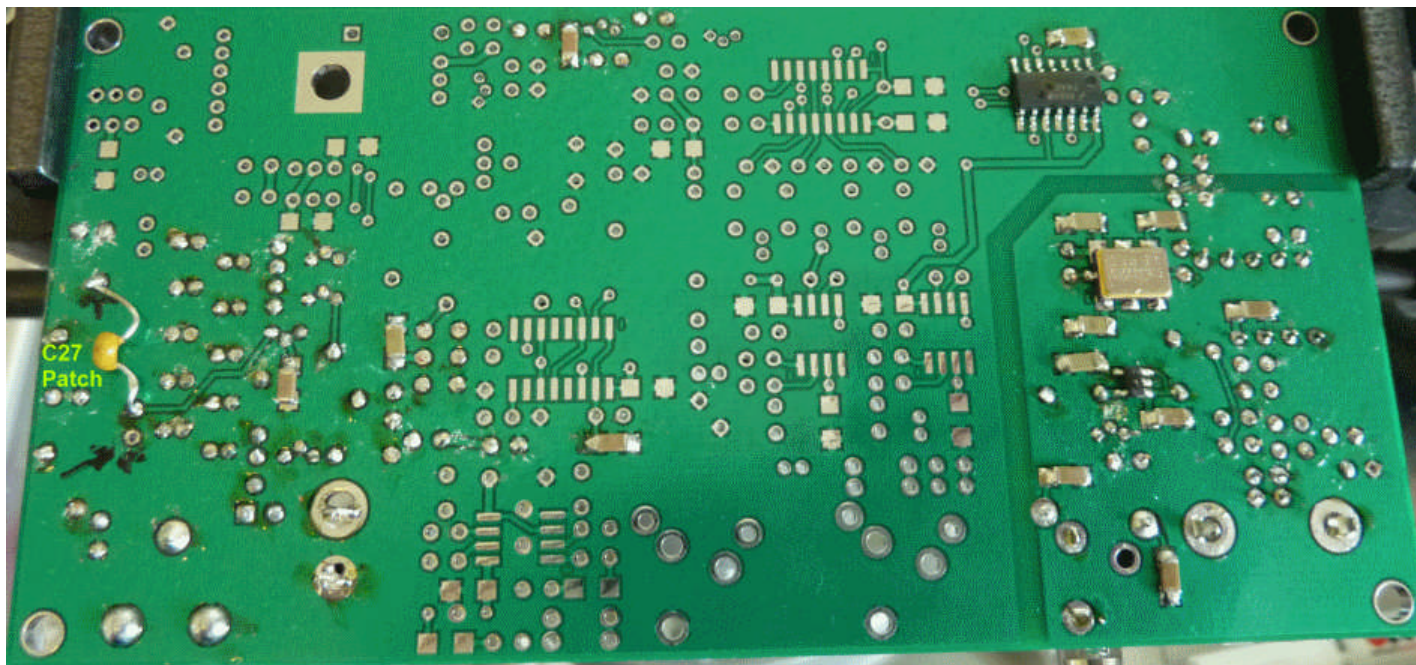
**RF I/O and Switching Completed Stage**

Author inadvertently left R53 and R54 out of the completed board in this phase. Those components should actually be installed in this phase.

**Top of the Board**



## Bottom of the Board



## RF I/O and Switching Testing

### Current Draw

#### Test Setup

Power up the board and check the current draw

#### Test Measurements

Testpoint	Units	Nominal Value	Author's	Yours
Current draw	mA	<20	16.1	

### Voltage Divider Test

#### Test Setup

R61 and R62 form a voltage divider off of the 5 volt rail.

The output of that voltage divider go to the secondary windings of T5 to Resistors R53 and R54

Apply 12V power to the board and measure the voltage at the hairpin lead of R62.

#### Test Measurements

Testpoint	Units	Nominal Value	Author's	Yours
R62 hairpin lead (wrt regular ground) (with V+ = 12.7V)	Vdc	2.5	2.48	
R53 left lead (wrt regular ground)	Vdc	2.5	tbd	
R54 hairpin lead (wrt regular ground)	Vdc	2.5	tbd	

## RF Switching Testing

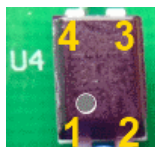
### Test Setup

Voltages are measured WRT (regular) ground (R50 hairpin)

Test the PTT switching from the default RX/QSD enabled to the switched TX/QSE enabled.

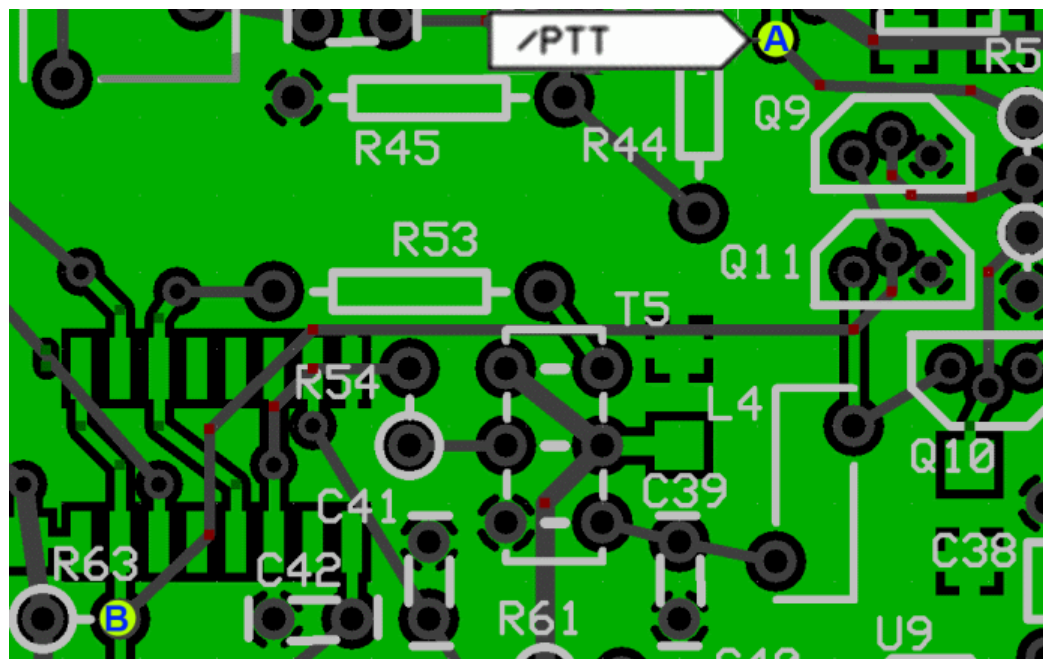
Requires USB connected and 13V power applied to the board.

Test for default (RX) and then use SDR Software to activate PTT and test for QSD disabled OFF.



(As an alternative to using the SDR Software to activate PTT, you can use a cliplead to ground the top left-hand lead of U4, activating PTT.)

Enabling PTT also should pull the base of Q3 down, turning it on and generating the S12V supply to the PA on transmit.





### Test Measurements

Testpoint	Units	Nominal Value	Author's	Yours
Default (RX Activated): Point A	Vdc	High (9 - 12 Vdc)	9.86	
Default (RX Activated): Point B (R63 hairpin)	Vdc	Low (~ 0)	0	
PTT Activated: Point A	Vdc	Low (~ 0)	0	
PTT Activated: Point B	Vdc	High (~ 5)	4.95	

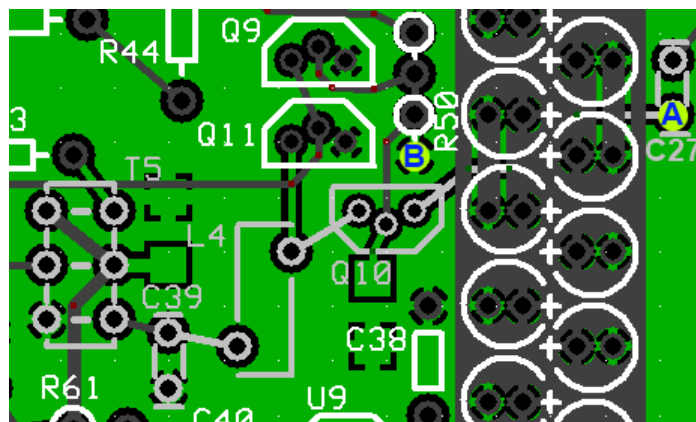
### RF Path Testing

#### Test Setup

Using your ohmmeter, test for continuity along the RF path for the RX. The path can be tested between C27 (bottom pin - point A) and regular ground (hairpin lead of R50).

You must have the USB powered up and the board's 12V power applied to test the path from C27 (point A) through to the other (ground) end of T5 (ground, point B).

Note: the testpoint "A", shown on the graphic, MUST be POSITIVE with respect to test point "B" in order to correctly assess the continuity from A to B. Normally, the positive lead will be the red lead of your ohmmeter. If you get an OPEN reading, try reversing the leads of your ohmmeter..



### Test Measurements

Testpoint	Units	Nominal Value	Author's	Yours
Point A to Point B	ohm	0	0	

[Home](#)
[Bill of Materials](#)
[Power Supply](#)
[USB Power Supply](#)
[Local Oscillator](#)
[Dividers](#)
[RF I/O and Switching](#)
[RX Mixer \(QSD\)](#)
[RX Opamps and Output](#)
[TX Opamps](#)
[TX Mixer \(QSE\)](#)
[Driver/PA](#)
[External Connections](#)
[Comments](#)
[Acronyms](#)
[Inventory](#)
[Revisions as of 3/21/2011](#)
[Components By Stage](#)
[WB5RVZ Main Website](#)