SDR Cube Transceiver

Online Assembly Guide

Detailed construction notes for building and testing each of the SDR Cube kit modules

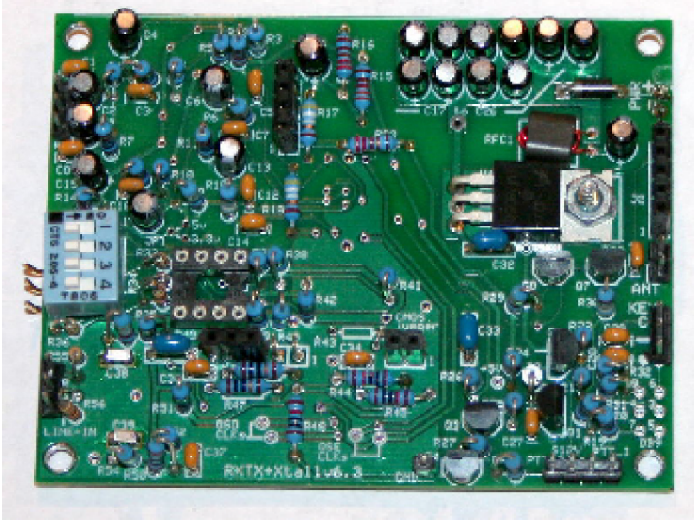
Home Bill of Materials I/O Board Controls Board DSP Board Softrock SR-Base Softrock TX/PA RXAMP X-LPF Internal Cable Set External Cable Set Main Enclosure Accessory Enclosure Digital Subassembly Test Final Assembly RF Functional Test

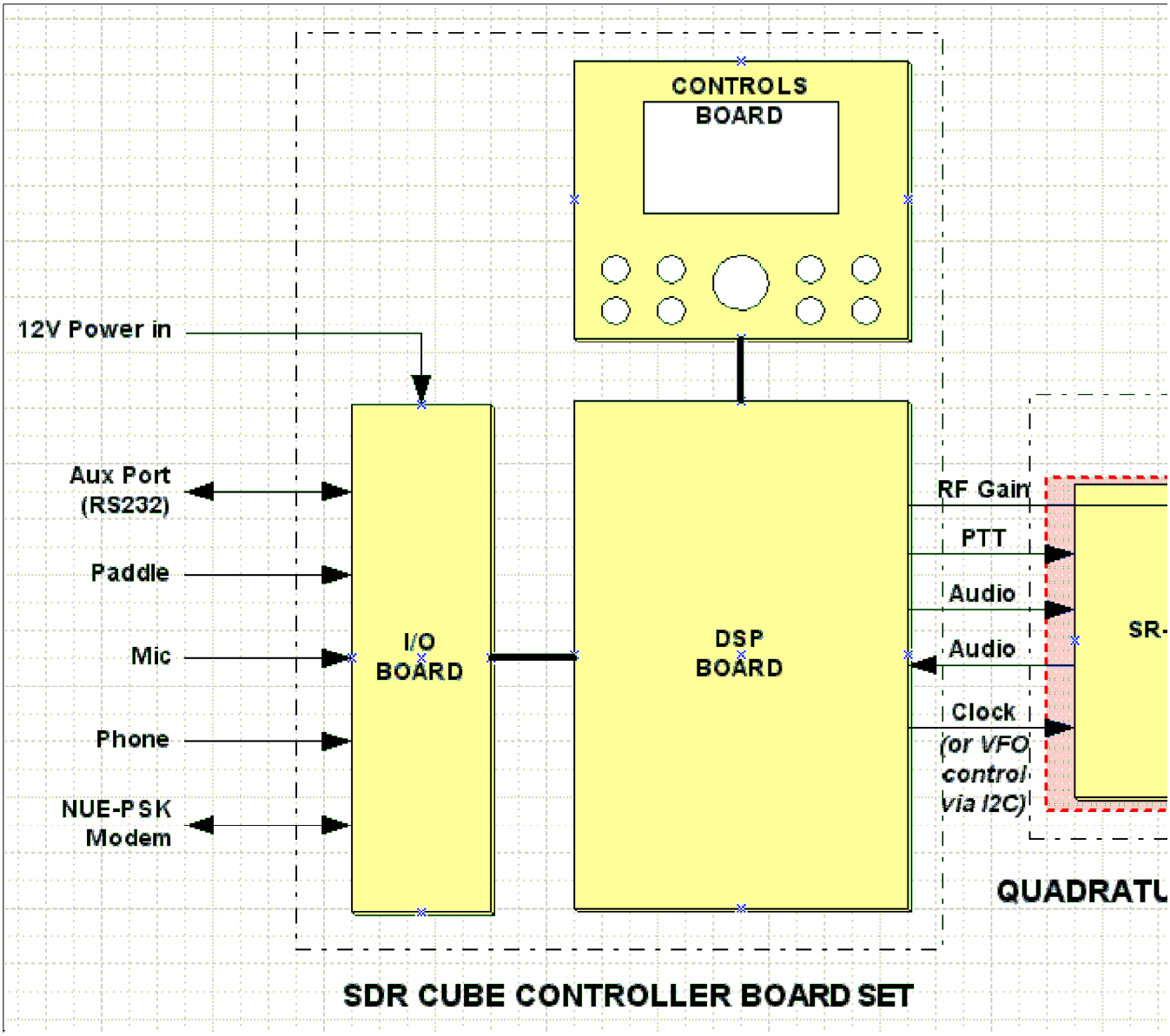
Building the Softrock RXTX Base Board (SR-Base)

... (Section version 1.0b: L and R designator corrected for P5 in SR-Base layout.)

What Is It?

The SDR Cube is designed to interface to any quadrature-based RF front end that provides I/Q baseband audio signals. We use the terms “RF front end” and “RF deck” to mean the electronics that perform the mixing, amplification and filtering of RF signals for an HF radio. The most popular and prolific RF deck around is the Softrock family of small and inexpensive kits. Some 11,000 of these boards in different flavors have been sold around the world already, and each depends on a PC for signal processing and user interface. So by designing the SDR Cube to easily interface with this huge installed base of Softrocks, we provide a way for every Softrock owner to decouple from the complexities of using the PC as a radio, while simultaneously tapping into a ready-made market without needing first to design the RF deck ourselves. A slight downside of this approach is that the simplified designs of the Softrock naturally offer some design compromises that result in lower RF performance – sensitivity, clock feed-thru, unwanted mixing byproducts, etc – which may in turn be perceived as SDR Cube limitations. However there are other higher-ended I/Q-based products that also work in a stellar fashion with the Cube … products such as the Genesis Radio SDR family, the original FlexRadio SDR-1000 electronics and the FA-SDR from Funk Amateur magazine. And who knows, in the future perhaps someone will design a high-performance RF deck to mate specifically within the SDR Cube enclosure!




CONTROLS
BOARD
12V Power in
Aux Port
(RS232)
Paddle
Mic
Phone
NUE-PSK
Modem
I/O
BOARD
DSP
BOARD
RF Gain
PTT
Audio
Audio
Clock
(or VFO
control
via I2C)
SR-
QUADRATU
SDR CUBE CONTROLLER BOARD SET

PARTS LIST *(Yellow-highlighted parts below were missing from first round shipments of SR-base Kit ... coming in Service Pack shipment Jan 4.)*

Version C13

Designator	QTY	Description
C1, C8	2	1000pF ceramic
C2, C4, C6, C9, C11, C13, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C31	19	10uF 16v
C3, C10	2	100pF ceramic
C5, C7, C12, C14	4	0.022uF ceramic
C27	1	0.033uF ceramic
C30, C34	2	0.01uF ceramic
C35	1	4.7uF ceramic
C32, C33	2	4.7uF ceramic
C36, C37	2	0.047uF ceramic
C38, C39	2	CAP CER 4700PF 50V C0G RAD
C40, C41, C42, C43, C44, C45, C46, C47,C48, C49, C50, C51, C55, C60, C62, C63, C64, C65	18	0.1uF 1206 SMT
C52, C53, C54, C56	4	0.01uf 1206 SMT
C57, C58, C59, C61	4	0.01uf 1206 SMT
D1, D2	2	1N4003
J1	1	4 pin, SIP sockets
J2	1	5 pin, SIP sockets
J3	1	2 pin, SIP sockets
J4	1	3 pin, SIP sockets
Q1, Q3, Q4	3	2N3904
Q2	1	2N3906
Q7, Q8	2	BS170
P2	1	2 pin, SIP pinheader, R/A
P3, P4	2	2 pin, SIP pinheager
P5, P6, P7	3	3 pin, SIP pinheader
R1, R2, R4, R5, R7, R8, R10, R11	8	10.0k, 1%
R19, R20, R25, R44, R45, R48	6	10.0k, 1%
R3, R6, R9, R12, R18, R17	6	49.9, 1%
R13, R14, R16, R22	4	2.21k, 1%
R15	1	3.32k, 1%
R23	1	22.1, 1%
R24	1	22.1k, 1%
R27	1	22.1k, 1%
R51, R52	2	1.00k, 1%
R46, R47, R49, R50	4	10.0, 1%
R55, R56	2	100, 1/6 W
R28	1	221, 1%
R21, R29, R30, R53, R54	5	4.99k 1%
R26	1	4.99K, 1%
U1, U2	2	TLV2462
U3, U10	2	FST3253
U4	1	LM7805
U5	1	LP2992AIMS-3.3V
U9	1	74AC74
U11	1	LT6221
U7	1	Si570

RFC-1	1	BN-43-2402, 4T, #26
	1	Wire, #26, 6"
	1	PCB
		Hardware
Standoffs	4	Spacer, AL, hex tapped, #4, 1/4" (PCB)
Screws	8	Machine screw, pan slotted, #4-40x3/16"

CONSTRUCTION STEPS

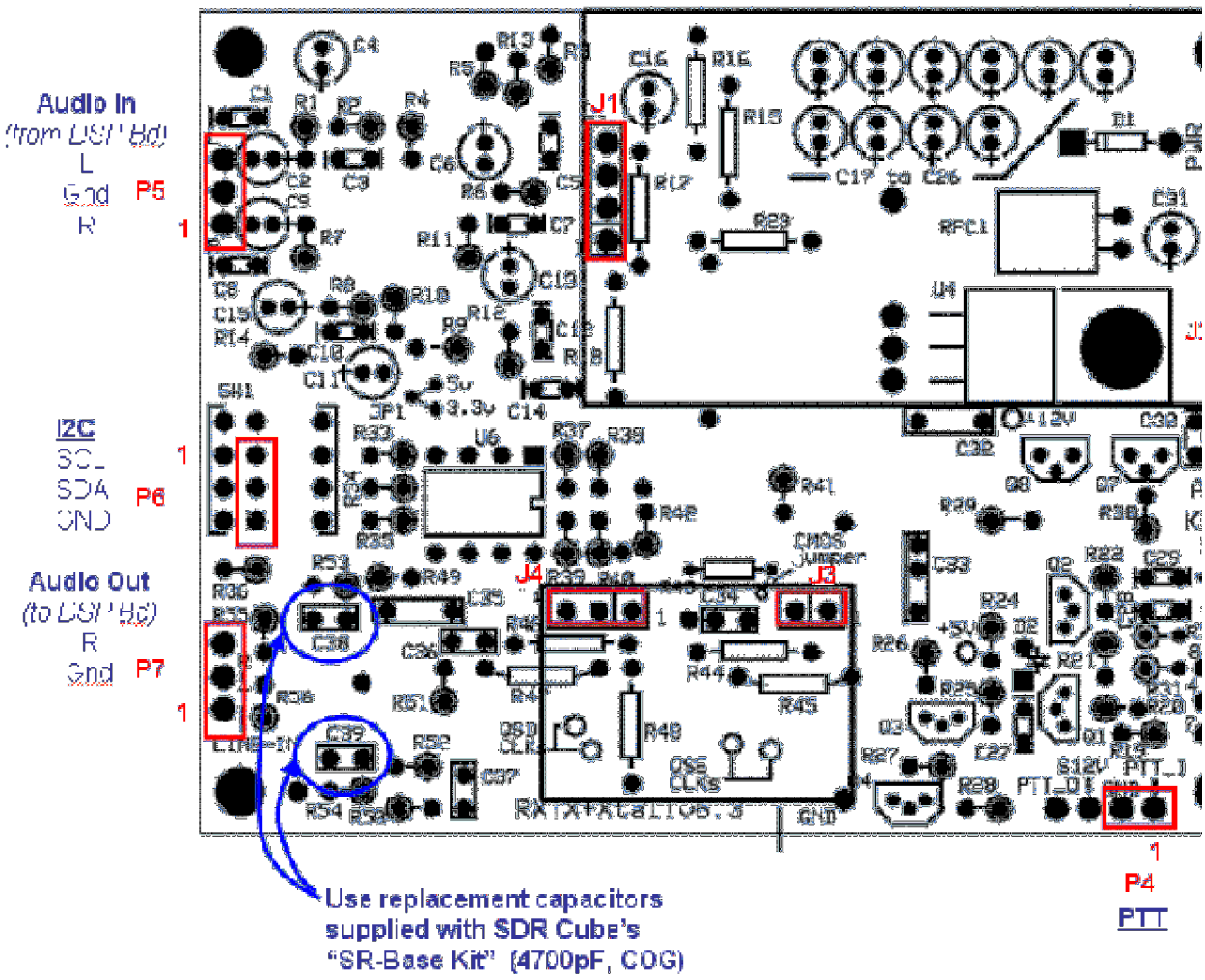
[____] STEP 1: Inventory the supplied parts

We basically supply a standard Softrock RXTX 6.3 base board for the SR-Base Kit - the same as has classically been provided by Tony Parks, except for some unnecessary parts (some support parts for the Si570 local control: DIP switch, pull-up resistors, microcontroller and IC socket, and the voltage translator for the Si570.)

We also supply some additional parts, above and beyond what has classically been provided in the RXTX 6.3 kits. This items below are those marked in BLUE in the main Parts List ...

Designator	QTY	Description	
C38, C39	2	4700pF ceramic, COG	
P2	1	2 pin, SIP pinheader, R/A	
P3, P4	2	2 pin, SIP pinheager	
P5, P6, P7	3	3 pin, SIP pinheader	
Standoffs	4	Spacer, AL, hex tapped, #4, 1/4" (PCB)	
Screws	8	Machine screw, pan slotted, #4-40x3/16"	

The graphic below shows where the extra parts go ...



[____] STEP 2: Go to the official Softrock Construction web pages by WB5RVZ and build your SR-base by following those instruction.

We are linking over to the excellent WB5RVZ Softrock Assembly pages for Cube owners to build their SR-Base and TXPA modules ...
http://www.wb5rvz.com/sdr/RXTX_V6_3/

Robby's done an outstanding job of documenting everything that needs to be done for the RXTX 6.3 ... and except for the few items noted here in our own SDR Cube Assy Guide, there's nothing better that could be provided!

NOTE:
While we are pointing Cube builders of the SR-Base kit (and TXPA too) over to the WB5RVZ site for construction guidance, please remember that we essentially started with the RXTX and took away some parts that were unnecessary for use with the Cube, thus keeping the cost and complexity as low as possible.

So we created a concise list of "parts differences" between our SR-Base Kit and the standard RXTX 6.3 Kits that had been shipping from Tony Parks ... we didn't want Cube owners to think that there were missing parts with our kit because of the difference from the old RXTX kit.

So when you go through the recommended assembly process on the WB5RVZ website for the RXTX, please keep this list present and don't worry if those pages reference something that you don't have parts for. (Although of course ask if you still have questions!)

Not needed components from original RXTX kits
R31, R32 (2.21 K)
R33, R34, R35, R36, R43 (100)
R37, R38, R39, R40 (10 K)
C28, C29 (0.047 uF)
U6 (12F683)
U8 (FIN1002), depend upon the Si570 type, see SoftRock instructions
Socket for U6
SW1 (4-pos DIP switch)
DB9 interface
4 #4 1/8" nylon spacers
1 #4 metal lock washer
4 #4 nylon washers
5 4-40 hex nuts

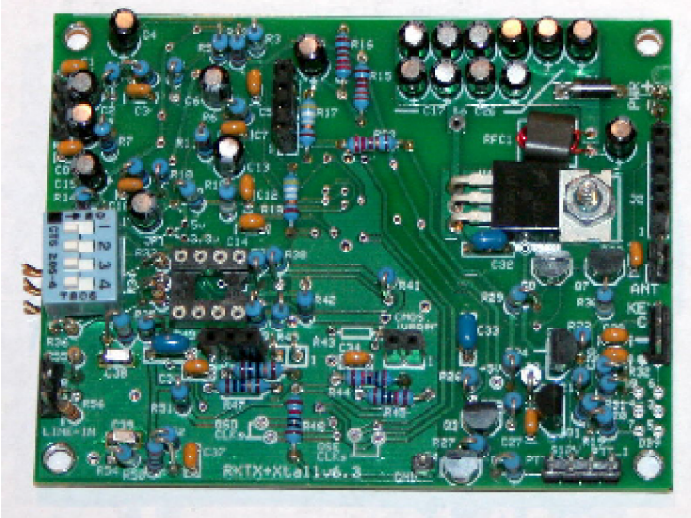
CHANGED
C38 (220 pF) to C38 (4700 pF)
C39 (220 pF) to C39 (4700 pF)
U11 (LT6231) to U11 (LT6221)

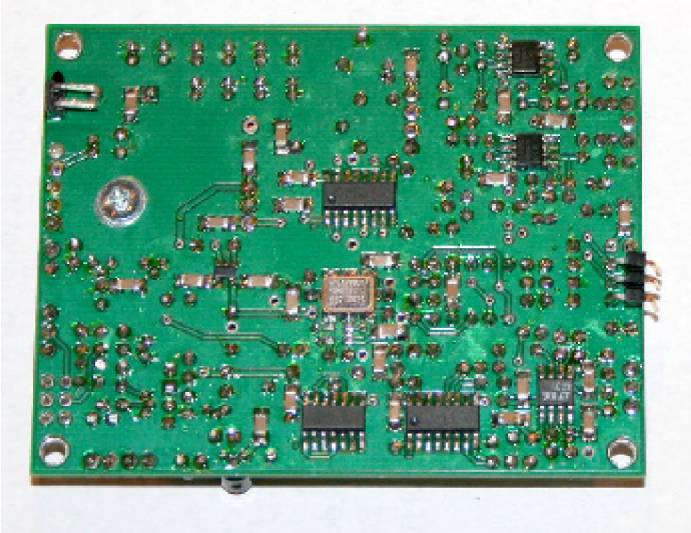
ADDED
1 2-pin SIP pin header, R/A
2 2-pin SIP pin header
3 3-pin SIP pin header
3 4-40 x 3/8" machine screws

If you already have a complete and original RXTX 6.3 that you intend to use with the SDR Cube (as is pictured on our SR-Base assembly page) ... just remove IC U6, replace C38 and C39 with the 4700pF capacitors we supply, and add the pinheaders to the edge of the board so you can connect the Internal Cable Set from the Cube boards. Follow the instructions here on our Assy Guide web page.

So to re-iterate ... nobody is short any parts in their SR-Base Kit. This list above arose because we point SR-Base Kit builders over to the WB5RVZ web page for building the SR-Base Kit.

If you are working with an existing RXTX 6.3, you can attach the connectors to the board as shown below. Don't bother trying to remove the DIP Switch SW1, as it is too difficult. Just add the 3-position pinheader on the inside row of the pads on the bottom side as shown in the photos ...





Pagemaster: n2apb@midnightdesignsolutions.com
Page last updated: Jan 21, 2011