Ensemble RXTX 06_RX Mixer (QSD)

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

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RX Mixer (QSD) Introduction

Theory of Operation

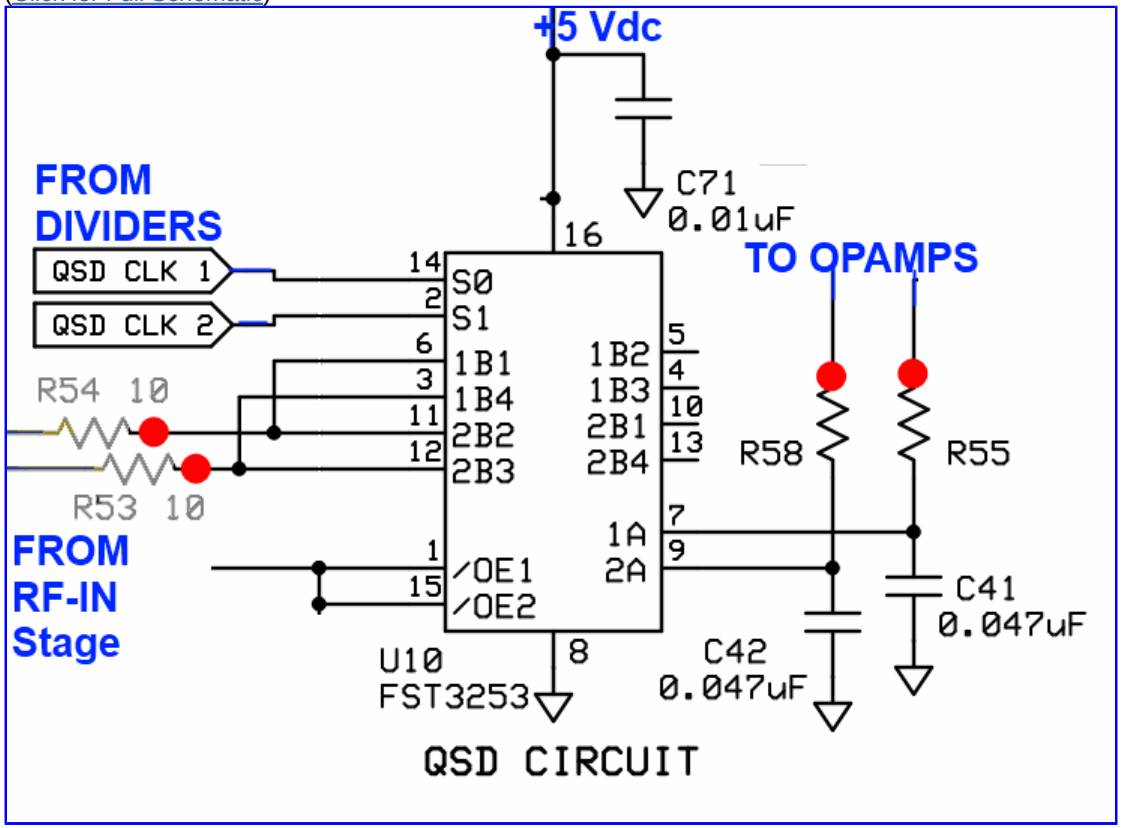
The mixer stage ("QSD" - Quadrature Sampling Detector) acts like two traditional direct conversion mixers operating in tandem. Each takes in half of the filtered RF from the bandpass filter stage and one of the quadrature center frequency signals, then "mixes"/down-converts them to with an output being the traditional mixer products, in this case, two (infra) audio frequency signals that represent the difference between the two inputs (RF and Local Oscillator). These two signals are referred to as the detected I (in-phase) and Q (Quadrature) signals and are fed into the high gain Op-Amps stage for amplification and delivery to the audio outputs (and, thence, to the PC's sound card). The mixer is enabled by the QSD enable line, switched in the RF I/O Control Stage's Q9. When the PTT line is activated, the QSD Enabling line goes high and disables the RX Mixer.

(go directly to build notes)

RX Mixer (QSD) 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)



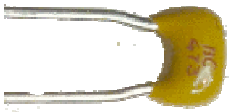
(above schematic has clickable areas that can be used for navigation)

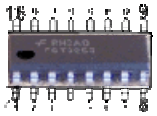
(go directly to build notes)

RX Mixer (QSD) 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
❑	2	0.047 uF 5%	473 	Ceramic
❑	2	band-specific		misc
❑	1	0.01 uF	(smt) 	SMT 1206

❑	1	FST3253 mux/demux switch	FST3253 	SOIC-16

Band Specific Items for 160m Band

Check	Designation	Component	Marking	Category	Orientation	Notes	Circuit
❑	R55	49.9 ohm 1%	yel-wht-wht-gld-brn	1/4W	N-S		RX Mixer (QSD)
❑	R58	49.9 ohm 1%	yel-wht-wht-gld-brn	1/4W	N-S		RX Mixer (QSD)

Band Specific Items for 80, 40m Band

Check	Designation	Component	Marking	Category	Orientation	Notes	Circuit
❑	R55	49.9 ohm 1%	yel-wht-wht-gld-brn	1/4W	N-S		RX Mixer (QSD)
❑	R58	49.9 ohm 1%	yel-wht-wht-gld-brn	1/4W	N-S		RX Mixer (QSD)

Band Specific Items for 40, 30, 20m Band

Check	Designation	Component	Marking	Category	Orientation	Notes	Circuit
❑	R55	10 ohm 1/4W 1%	br-blk-blk-gld-br	1/4W	N-S		RX Mixer (QSD)
❑	R58	10 ohm 1/4W 1%	br-blk-blk-gld-br	1/4W	N-S		RX Mixer (QSD)

Band Specific Items for 30, 20, 17m Band

Check	Designation	Component	Marking	Category	Orientation	Notes	Circuit
❑	R55	10 ohm 1/4W 1%	br-blk-blk-gld-br	1/4W	N-S		RX Mixer (QSD)
❑	R58	10 ohm 1/4W 1%	br-blk-blk-gld-br	1/4W	N-S		RX Mixer (QSD)

Band Specific Items for 15, 12, 10m Band

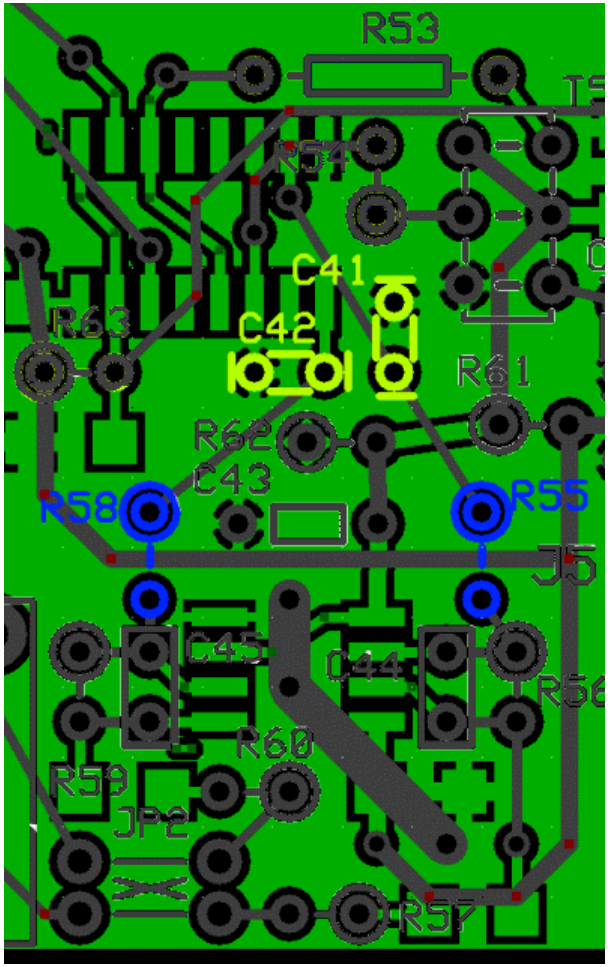
Check	Designation	Component	Marking	Category	Orientation	Notes	Circuit
❑	R55	10 ohm 1/4W 1%	br-blk-blk-gld-br	1/4W	N-S		RX Mixer (QSD)
❑	R58	10 ohm 1/4W 1%	br-blk-blk-gld-br	1/4W	N-S		RX Mixer (QSD)

RX Mixer (QSD) Summary Build Notes

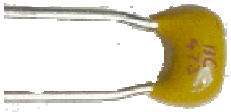
- Install Bottomside Components
- Install Topside Components
- Install Band-specific Components
- Test the Stage

RX Mixer (QSD) Detailed Build Notes

Top of the Board

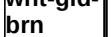
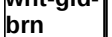


Install Topside Components

Check	Designation	Component	Marking	Category	Orientation	Notes
❑	C41	0.047 uF 5%	473 	Ceramic		
❑	C42	0.047 uF 5%	473 	Ceramic		

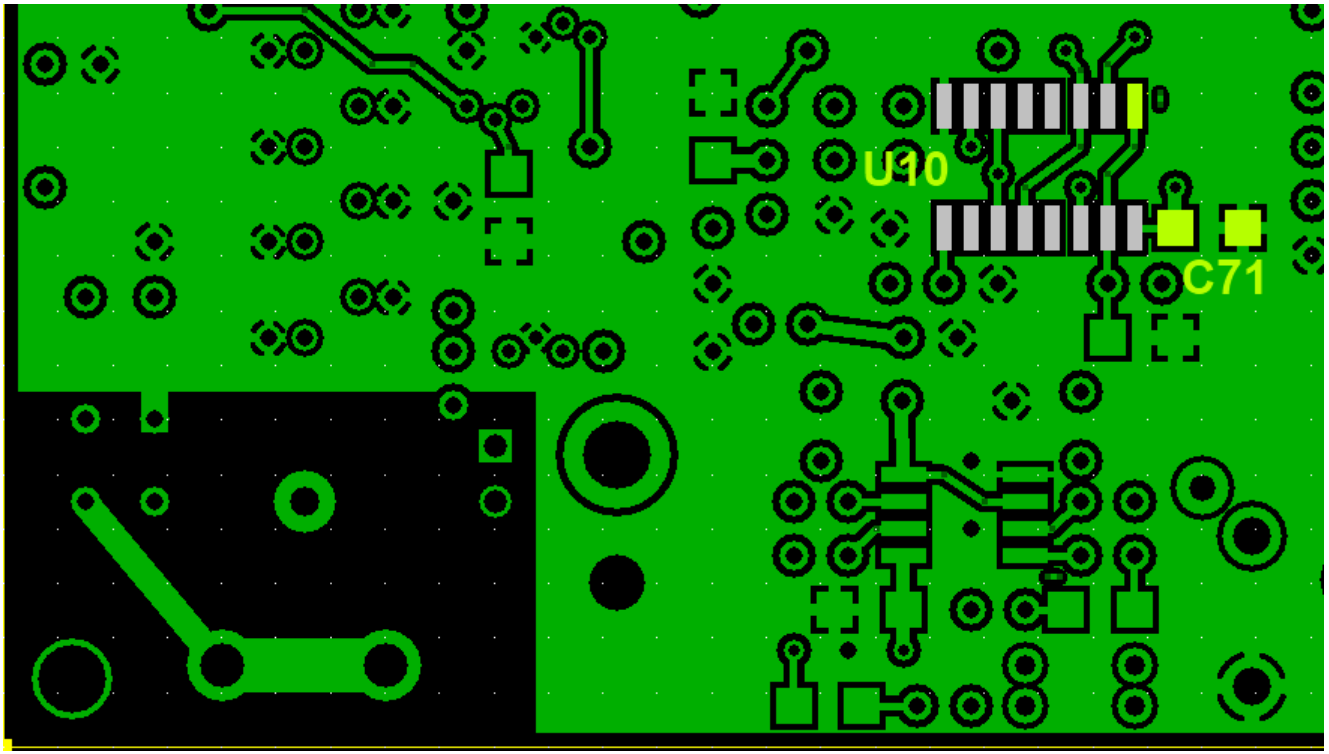
Install Band-specific Components

The band-specific resistors are either 49.9 or 10 ohms (both have a GOLD 4th band. Do not get them mixed up with 10k or 4.99k resistors.

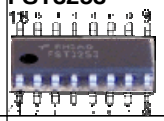
Check	Designation	Component	Marking	Category	Orientation	Notes
❑	R55	band-specific	Band / Component / Marking: 160m: 49.9 ohm 1% (1/4W) — yel-wht-wht-gld-brn  80, 40m: 49.9 ohm 1% (1/4W) — yel-wht-wht-gld-brn  40, 30, 20m: 10 ohm 1/4W 1% (1/4W) — br-blk-blk-gld-br  30, 20, 17m: 10 ohm 1/4W 1% (1/4W) — br-blk-blk-gld-br  15, 12, 10m: 10 ohm 1/4W 1% (1/4W) — br-blk-blk-gld-br 	misc	N-S	
❑	R58	band-specific	Band / Component / Marking: 160m: 49.9 ohm 1% (1/4W) — yel-wht-wht-gld-brn  80, 40m: 49.9 ohm 1% (1/4W) — yel-wht-wht-gld-brn 	misc	N-S	

40, 30, 20m	10 ohm 1/4W 1% (1/4W)	br-blk-blk-gld-br
30, 20, 17m	10 ohm 1/4W 1% (1/4W)	br-blk-blk-gld-br
15, 12, 10m	10 ohm 1/4W 1% (1/4W)	br-blk-blk-gld-br

Bottom of the Board

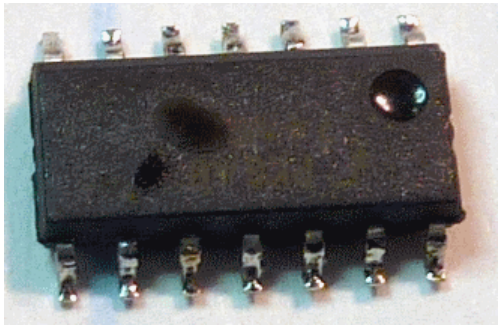


Install Bottomside Components

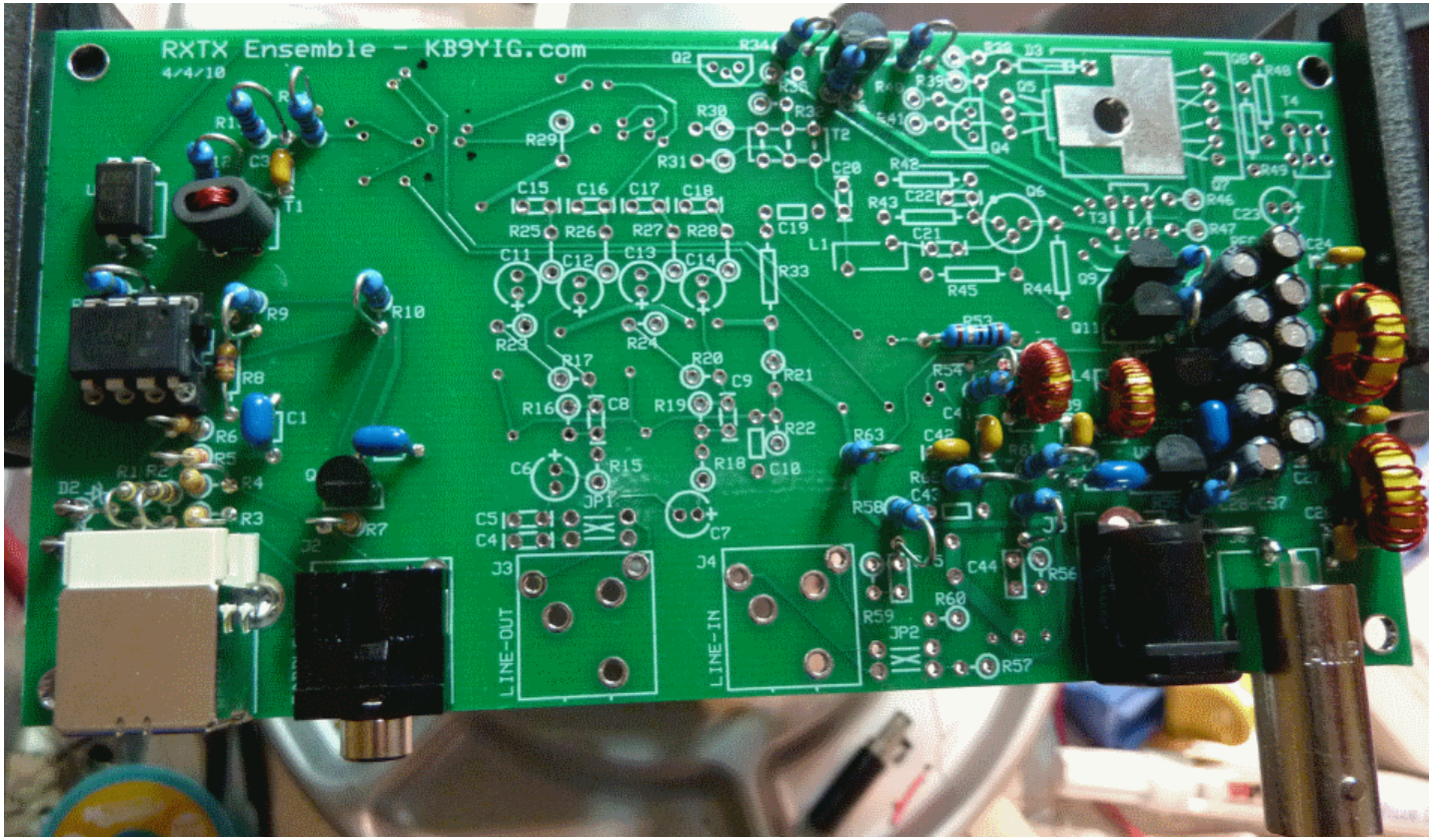
Check	Designation	Component	Marking	Category	Orientation	Notes
❑	U10	FST3253 mux/demux switch	FST3253 	SOIC-16		Take ESD precautions
❑	C71	0.01 uF	(smt) 	SMT 1206		

RX Mixer (QSD) Completed Stage

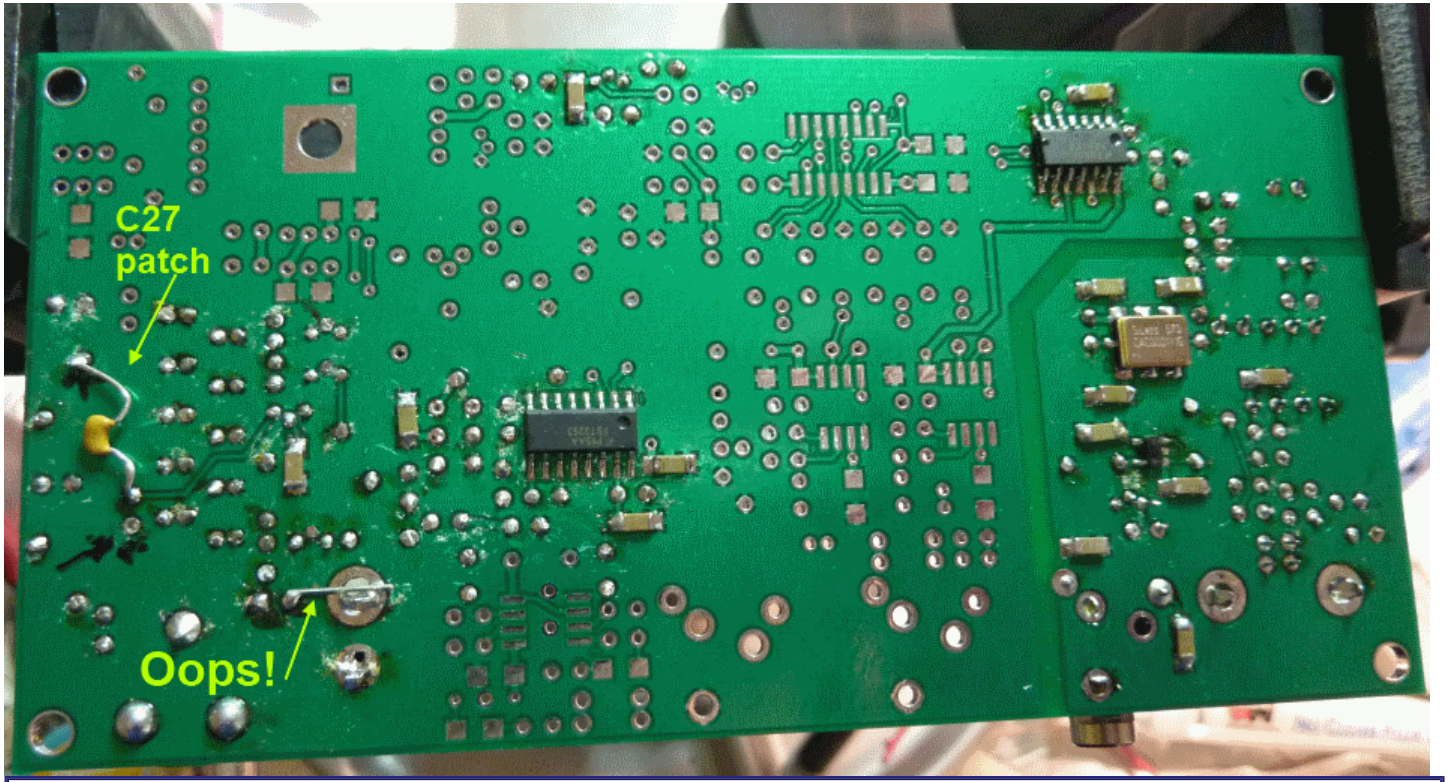
Author, while testing in this stage, accidentally shorted the 12V supply. The result was that the trace from the power socket to the diode was vaporized and had to be replaced with an underside patch. Also, this managed to "fry" the 74AC74 Quad Clock Generator IC:



Top of the Board



Bottom of the Board



RX Mixer (QSD) Testing

IC Pin Voltages

Test Setup

Test Setup

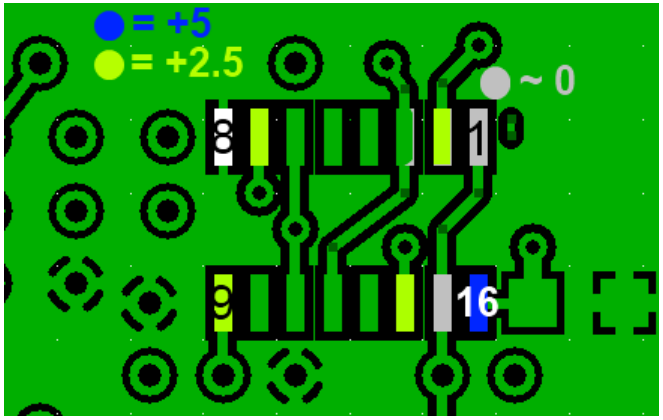
Voltages are measured WRT (regular) ground (R50 hairpin)

Power the board, connect USB to PC, run Rocky (to send PTT signal)

Measure pin voltages with PTT OFF

Measure Pin 1 and 15 voltages with PTT ON

It is best to test for these voltages at the actual pins (not the pads), thereby ensuring correct soldering of the pins to the pads.



Test Measurements

Testpoint	Units	Nominal Value	Author's	Yours
Pin 8	Vdc	0	0	
Pins 1 and 15 (PTT OFF)	mVdc	0 - 50	50	
Pin 2 (from Divider)	Vdc	2.5	2.47	
Pin 14 (from Divider)	Vdc	2.5	2.47	
Pin 7 (to OpAmp)	Vdc	2.5	2.48	
Pin 9 (to OpAmp)	Vdc	2.5	2.48	
Pin 16 (Vdd)	Vdc	5	4.95	
Pins 1 and 15 (PTT ON)	Vdc	high (Vdc)	4.95	

Optional Mixer Test

Test Setup

Test Requirement (Optional)

At the antenna input, inject a signal that is 10 kHz above or below the selected center frequency.

Probe the hairpin leads of R55 and R58 for a 10 kHz audio frequency signal (in quadrature). You may use the hairpin of R50 for a ground point.

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