

Part#	ID	Value	Description	Qty	Part #	Mouser
			Voltages >= Indicated			http://www.mouser.com/
Mouser	C14 & C15	1uf	25v	10	81-RDER71H105K2M1C03	\$0.40 Click link for Mouser
Mouser	C11 & C12	1uf	25v	x	81-RDER71H105K2M1C03	\$0.40 C12 puts signal on stereo channel
Mouser	C1	1uf	25v	x	81-RDER71H105K2M1C03	\$0.40
Mouser	C3	1uf	25v	x	81-RDER71H105K2M1C03	\$0.40
Mouser	C6	1uf	25v	x	81-RDER71H105K2M1C03	\$0.40
Mouser	C21	1uf	25v	x	81-RDER71H105K2M1C03	\$0.40
Mouser	C25	1uf	25v	x	81-RDER71H105K2M1C03	\$0.40 Pitch Change Up
Not Used	C26	1uf	25v	x	81-RDER71H105K2M1C03	\$0.40
Mouser	C24	47pf	extra added	8	581-SR211A470KAR	Cancels 2kz Noise on Output
Mouser	.1uf	C2, C5, C18, C20, C27, C28, C29		7	\$0.21 505-MKS4.1/100/10	\$1.47 Style change for easy recognition
272-1436	C4	10 uf	\$1.79	1	\$0.60 581-TAP106K025CCS	Tantalum dampens 555 noise
272-1030	C29	470uf	35v	2	\$0.40 80-ESK477M035AH2EA	See note #2 Supply filtering
272-1030	C10	470uf	35v	x	\$0.40 80-ESK477M035AH2EA	Leave 1/2" leads above board
272-1029	C9	470uf / .1uf	Across Vactrol	x	\$0.40 80-ESW227M035AG4AA	VC See note #1 below
RS	R12	1 Meg	1/4 watt	3	\$0.07 660-MF1/4LCT52R105J	
RS	R13	1 Meg	1/4 watt	x	\$0.07	
RS	R11	100K	1/4 watt	6	\$0.07 660-MF1/4LCT52R104J	
RS	R16	100K	1/4 watt	x	\$0.07	
RS	R17	100K	1/4 watt	x	\$0.07	All Mouser preferred parts
RS	R14	100K	1/4 watt	x	\$0.07	have their part # indicated!
RS	R2	4.7K	1/4 watt	4	\$0.07 660-MF1/4LCT52R472J	
RS	R18	10K	1/4 watt	6	\$0.07 660-MF1/4LCT52R103J	
	R1 & R7	1K	1/4 watt	4	\$0.07 660-MF1/4LCT52R102J	\$0.28
	R27	1K	1/4 watt	x	\$0.07 660-MF1/4LCT52R102J	
Not Used	Rx	1K	1/4 watt	x	xxx Used for total silence at Mute	see note #3 below
RS	R3	47K	1/4 watt	2	\$0.07 660-MF1/4LCT52R473J	
RS	R10	47K	1/4 watt	x	\$0.07	
RS	R4 & R31	100 ohm	1/4 watt	1	\$0.07 660-MF1/4LCT52R101J	R31 added for power filtering
	R28 & R29 & R32	2.2K	1/4 watt	5	\$0.07 660-MF1/4LCT52R222J	R32 adds wide quiet response
RS	R22 & R26	2.2K	1/4 watt	x	\$0.07	
RS	R21	470R	1/2 watt	2	\$0.18 660-MF1/2CC4700F	Adds load to 7809 regulator

Radio Shack resistor color codes are easier to read & photograph than Mouser resistors.

J2-jack Must use 3.5 mm TRS cable. Never connect to sound card (Damage). A cord from J2 to another J2 jack is all that's acceptable.

Input-1 Can be used to monitor the timbre enhanced sound to avoid the J2 powered jack or Input for Stand Alone Volume Control.

Output-1 Used for Theremin Volume Controlled Output or Stand Alone Volume Output. Not used used on the Theremin Pitch Board.

Output-2 The heterodyning audio is monitored here, Pitch Preview for Pitch or Volume control Waveshape.

Note: **A theremin must have a good earth ground to work properly!**

1. C9 - 470uf smoothes the PWM across Vactrol during Volume Control, on the Pitch Board C9 = .1uf for HF noise suppression off TLC555 driving LED-2.
2. C29 - 470uf adds extra power supply filtering to RF Oscillators C10 - Needs extra 1/2" lead length above board so it can be pushed out of the way.
3. For total volume cutoff use a 1K ohms at Rx, if quiet sound bleed through is desired, leave Rx off. Most likely not needed, determine after build.

3.25.13

Phoenix Theremin 5.2" Board Components - Page 2

276-1388	2 Contacts	Terminals	Pitch = 5 mm or .2"	10	.35 ea	845-MBE-152	\$3.50	
276-1715	U1	TL082			\$2.19	LM358 below is better		
Mouser	U1	LM358	LM358 sub for TL082?	1		595-LM358PE3	\$0.48	LM358 is preferred over TL082
276-1723	U2	NE555P	RS = 1.99	1		595-NE555P	\$0.21	Use standard Not low power
276-1995	IC Sockets		2 in RS Pack	2	\$0.42	571-1825093-2		Use sockets - see note #2
276-1103	D1	1N4001	50v PIV	1	\$0.08	512-1N4001		1N4001 to 1N4007 can work
Transistor	Q3	50 mhz	Must use MPS A42	3	\$1.00	863-MPSA42RL1G		Must use MPS A42
276-1604	Q4	Not Used	0.2			PNP		PNP Reversed-Motion
276-008	LED-1	fwd v =< 2.4	Pitch & Volume Board	1	0.23	638-HLMP3750A		See Note #6 below
276-009	LED-2	fwd v =< 2.4	2.19	1	0.16	638-HLMP3950A		These are matching style LED's
Mouser	X1	7809	9v Regulator	1		512-LM7809CT	\$0.57	Beefy regulator loaded by R21
Mouser	1/8" Stereo Jack		1.49	6		STX-3120-3B	\$8.94	Used for mono/stereo see note #4
Mouser	Switch-1	Buy-1	0.48	1		SPDT 611-OS102011MS2QN1		For Switching in Edgy sound effect
Mouser	Switch-2	Not Used?	0.68			DPDT 611-OS202011MS2QN1		VC <i>It is cheap so buy one anyway!</i>
271-282	POT 1	10K	Trimmer	1	\$0.85	652-3306F-1-103	Mouser	Main Level Adjust - see note #3
271-280	POT 2	1K	Trimmer	1	\$0.85	652-3306F-1-102	Mouser	Trimmer can work for fixed timbre
Mouser	POT 2	1K				Pnl-Knurl 858-P160KN2-0QA25B1K		500 In stock 1.25.13
274-407	Knob	Classic		2		Use shaft extenders?		Cut from plastic tube
		594-63P102T7 1K	594-63P502T7 5K			594-63P103T7 10K		Substitute Trimmer Pots
		858-72PMR 1K	858-72PMR 5K			858-72PMR 10K		Substitute Trimmer Pots
		652-3309P-1-102				652-3309P-1-103		Substitute Trimmer Pots

Harmonic Enhancement

Mouser	U3	V0618a	Opto-Isolator for Pitch	1	\$0.43	78-VO618A	Pitch	Only needed on pitch board
Mouser	Audio Transformer		P=65 S=55	1	\$2.00	42TM016-RC	Pitch	"P" Towards C26 on Pitch Board
Radio Shack	RF Choke	\$2.99				http://www.radioshack.com/product/index.jsp?productId=3012599#tabsetBasic		
Allied Elec	Vactrol	VTL5C1	Opto-Coupler	N/A	Opto	Allied Electronics		This works best for vol shading
Allied Elec		2nd Choice	Opto-Coupler	N/A		NSL-32SR3		Substitute for Vactrol (untested)
273-069	This choke may block internal RF interference. Place one between J2 to J2 and one on TRS cable to the computer sound card.							

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- The volume control direction can be switched by tuning or connecting to the opposite Ant2 connection.
The ideal wave form for volume control at Output-2 is an arch, a broad width top and downward point.
- Always use sockets to protect the IC's.
- Pot-1 sets the overall operating level at Output-2 (1v p-p), to high creates a buzzy edge. At the lowest frequency adjust to where LED-2 just turns on.
Also this Pot can be adjusted to where it just turns on at a low note like A2 - 220 hz for reference.
- J2 has 12v on pin 5, audio on pin 2, ground on pin 1. Output-2 is in two directions, use either for unmodified audio. Feed the signal to Input-1 for J2 output.
If you don't have an oscilloscope record the Line-Out audio at Output-2 into Audacity to view the wave shape.
A wall adapter can be plugged into the jack next to the 7809. 12 volts dc regulated. You "don't " want the 7809 to get warm.
- Use a "hum loop filter" between Volume Output-1 and EQ-preamp. Minimize cable lengths. [See Phoenix Cables](#)
- LED-1 needed for volume control must be 2.4v or less forward voltage as it works in conjunction with the Vactrol LED to get proper response.

Use a Power Strip with a green LED ground indicator and a "F" coax connector off the end for a good ground source.

3.25.13 * Pitch & Volume 3" x 3" Oscillator Board - Page 3

Part#	ID	Value	Description	Part #	Mouser	
RS	R25	470R	1/2 watt	x \$0.18	660-MF1/2CC4700F	Reduces Pot-4 value
RS	R5 & R15	10K	1/4 watt	x \$0.07		Click link for Mouser
RS	R6 & R19	10K	1/4 watt	x \$0.07		
RS	R8 & R20	4.7K	1/4 watt	x \$0.07		
RS	R9	100K	1/4 watt	x \$0.07		
RS	R23	220K	1/4 watt	1 \$0.07	660-MF1/4DC2203F	
RS	R24	1Meg	1/4 watt	x \$0.07		
RS	R27	1K	1/4 watt	x \$0.07		Adds to wave shape and thermal stability
RS	R30	47K	1/4 watt	x \$0.07		Pitch Board Only
Mouser	.1uf	C18, C20, C27, C28, C29		x	see above Page 1	
Mouser	47pf	C13, C16, C17, C19, C22, C23		x	Pitch-Osc 581-SR211A470KAR	\$1.61
272-123	C7, C8	100pf	50v	x	COG/NPO C322C101J2G5TA	\$0.44
Transistor	Q1 & Q2	50 mhz	Pitch must use MPS A42	x	Pitch-Osc 863-MPSA42RL1G	
276-1122	D2	1N914	Diode	1	78-1N914	\$0.06
Mouser	L1	360uh	796khz IF	2	Red 42IF110-RC	\$1.48 Buy extra one, you might break it
Mouser	L2	360uh	796khz IF	x	Red 42IF110-RC	\$1.48 905 in stock 2.08.13
Mouser	POT 4	1K	Use Short Below		Knurl-Tall 858-P160KN2-0QA25B1K	Board Tall - see note #1 & #2
Mouser	POT 4	1K	On Template as Short	1	Knurl-Short 858-P160KN0QD15B1K	\$0.96 Good Choice - see note #1 & #2
Mouser	POT 4	500 ohm			RV170F-10-15R1-B500_ohms	\$2.00 Solder Lugs - see note 2b below
Mouser	POT 4	250 ohm	Special		774-026TB32R251B1A1	\$2.00 Solder Lugs - see note #4 below
Mouser	POT 5	5K	3309P-1-502_5K_Sub	1	Pitch-Only 652-3306F-1-502	\$0.85 Shapes audio - see note #3
Lev Antenna	Spring Coil	ion Spring Item #: 246623		1	Lowes or Home Depot	\$4.95
Lev Antenna	clear pipe for outside spring support.	The Hillman Group 9/16" x 16-1/2" x .054" Zinc Plated			Model #:543011	
					http://www.lnt.com/show_product/11442-507396	Plastic Tube LNT

Note:

- Pot-4 1K uses R25 - 470 ohm in parallel so it behaves more like a 320 ohm pot, use R25 - 330 ohm for less sensitivity
- Pot-4 uses a jumper wire shown on board for direction of operation, wire on right side CCW move Null towards you, pitch rises.
- Pot-4 500-ohms with solder lugs Mounted off board using a twisted wire pair, R25 = 470 ohm
- Pot-5 5K Pot set 1/3 counter clockwise, turning it clockwise smooths audio wave - NOT installed on Volume Board.
- R25 - If you use a 250 ohm Pot-4 do NOT installed C25.

Select only one Pot-4 per board

<http://www.alliedelec.com/search/productdetail.aspx?SKU=9800700>

Select only one Pot-4 style per board

Vactrol - Allied Elec Supplier

You need to Order Double Parts count for a complete theremin with Pitch & Volume using two pc boards.

\$44.67 <=Pitch Only Theremin Total

Single board parts count= 102

\$12.00 <=Add a Vactrol - Only one used

<=You received this with the PCB's I sent

Total does not include PCB, Cables, Enclosure, Power Supply Method, Tax, Handling or Shipping Charges

CableWholesale.com - has excellent prices on TRS 1/8" stereo cables and a \$7 walwart that is a good value. =>

[See Phoenix Cables](#)

Hardware Corner Hole Size = .156 or 5/32"
 Enercell™ 12V/500mA AC Adapter Radio Shack Catalog #: 273-357

Screw Size = #6 or 1/8"
 Adaptaplug F #: 273-339 \$20.49 <= Over Priced