

Tube Mic Pre Plan Set

Tube Mic Pre Design Analysis

The Tube Microphone Preamp uses several design tricks to produce an extraordinarily versatile, but low cost, tube processor. A unique BLEND control allows continuous panning between a completely linear solid state preamp and tube stages that can be driven hard or soft to get as much or as little tube coloration as desired.

Most tube circuits operate with hundreds of Volts of plate supply voltage, and components for these voltages are often difficult to find and expensive. But the trick that we use to make the tube really SOUND LIKE a tube is to starve it with low plate voltage so we get a big break in component cost and availability. And rather than use a custom multiwinding power transformer, clever design derives all the voltages necessary from a single 12VAC transformer.

The schematic is shown below. Power from the 12 VAC transformer PWR1 is positive half-wave rectified by D1 and filtered by C1, C2 and R1 for a +15V supply rail. A -15V supply is provided by D2, C3, C4 and R2.

A voltage multiplier produces the 48 Volts for phantom power and tube plate supply. C6, R4 and R5 together with three of the six inverters in IC1 form a 60 kHz., 16V p-p square wave oscillator. Two of the buffers in IC1 are wired in parallel to provide greater output current to drive the network of diodes (D3-D7) and capacitors (C7-C11) that multiply the 16V square wave up to 48VDC. The

phantom power and plate voltage are isolated from one another and filtered with the R/C combinations R7/C12 and R9/C14 respectively. Phantom power to the input XLR connector can be switched on and off with S1. The final buffer in IC1 is used to sense the presence of phantom power and light LED D9 when phantom power is available.

The signal path begins with a differential amplifier (IC2:A, R19, R20, R38 and R39) that converts the balanced input to single ended to drive the tube stages. Phantom power is delivered to the input XLR connector through R25 and R36 and blocked from the amplifier inputs by C19 and C23. Back to back zener diode pairs D12/D13 and D14/D15 prevent stray static charges or transients from damaging the input amp or microphone and zener D16 similarly protects the phantom supply lines. The output of the differential amp appears across the potentiometer R35.

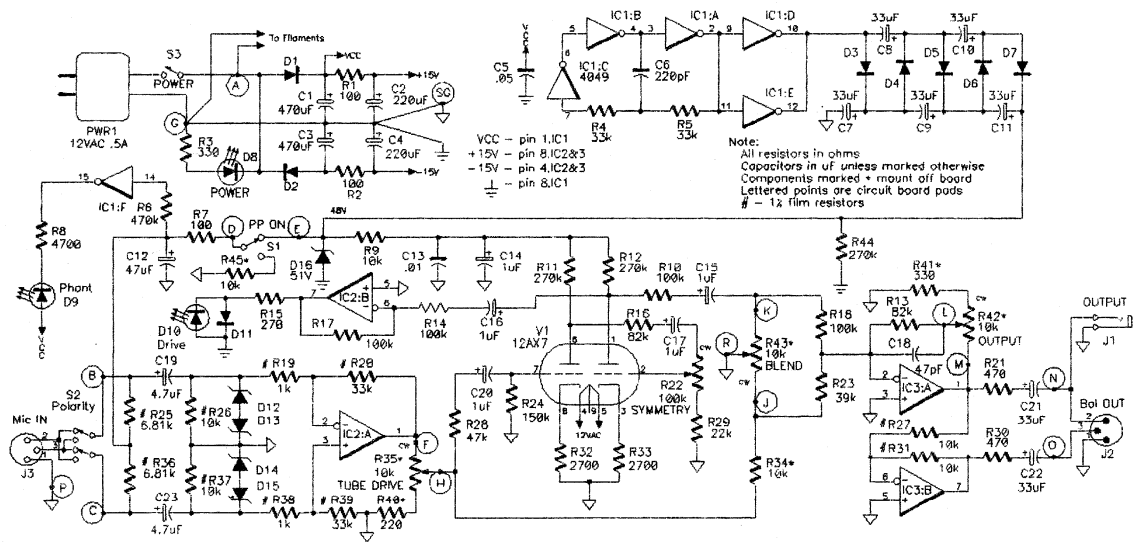
Two tube stages contained within V1, a 12AX7 Dual Triode, are cascaded to provide maximum control of asymmetry and dynamic nonlinearities on strong transients. The diff. amp output at the wiper of the TUBE DRIVE control R35 is coupled by R28 and C20 to the grid resistor of the first tube stage, R24. The output of this stage appears across the plate load resistor R11 and is coupled by R16 and C17 to the SYMMETRY trimmer R22, which sets the amount of signal applied to the grid of the second stage. The output of the second stage appears across plate load resistor R12.

The IC2:B opamp monitors the output of the tube by way of C16 and R14 and lights Drive LED D10 to visually indicate how hard the tube is working. Diode D11 provides a dummy load to equalize the current drawn from the amp on positive and negative half-cycles.

A final output buffer stage built around opamp IC3:A converts the relatively high impedance output of the tubes to a more reasonable lower impedance consistent with contemporary audio gear and provides the in-phase leg of the balanced output. The out-of-phase leg is supplied by the simple inverter consisting of IC3:B and resistors R27 and R31.

The IC3:A amp also allows mixing of the dry (pre-tube) signal with post-tube processed signal using the BLEND pot R43. At the CW end of the rotation of this control the final amplifier is fed exclusively with the output of the tube and at the CCW end it's fed by the output of the diff. amp. Intermediate settings mix the two.

Finally, IC3:A provides variable gain to compensate for how hard or soft the tube is being driven and to bring the final output up to line levels. The OUTPUT control, R42, in combination with R13 and R41 sets the amount of feedback for the stage and consequently its gain. Capacitor C18 rolls off the high frequency response at a corner frequency of about 30 kHz.



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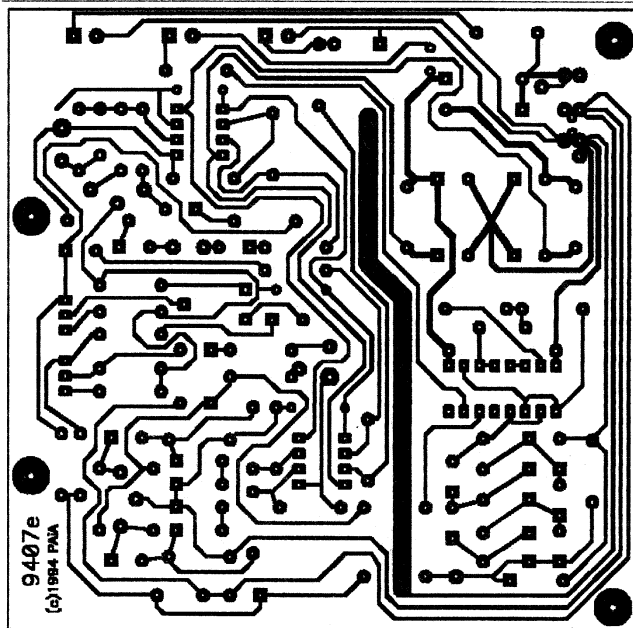
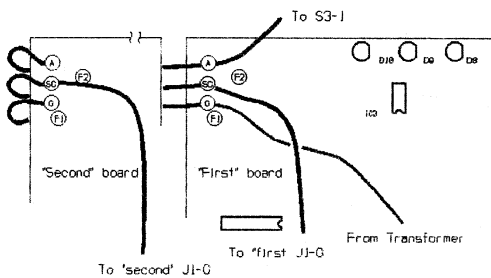
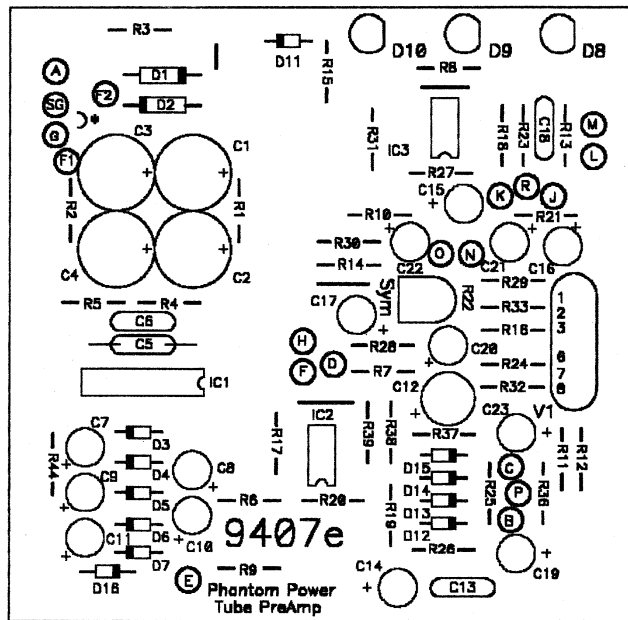


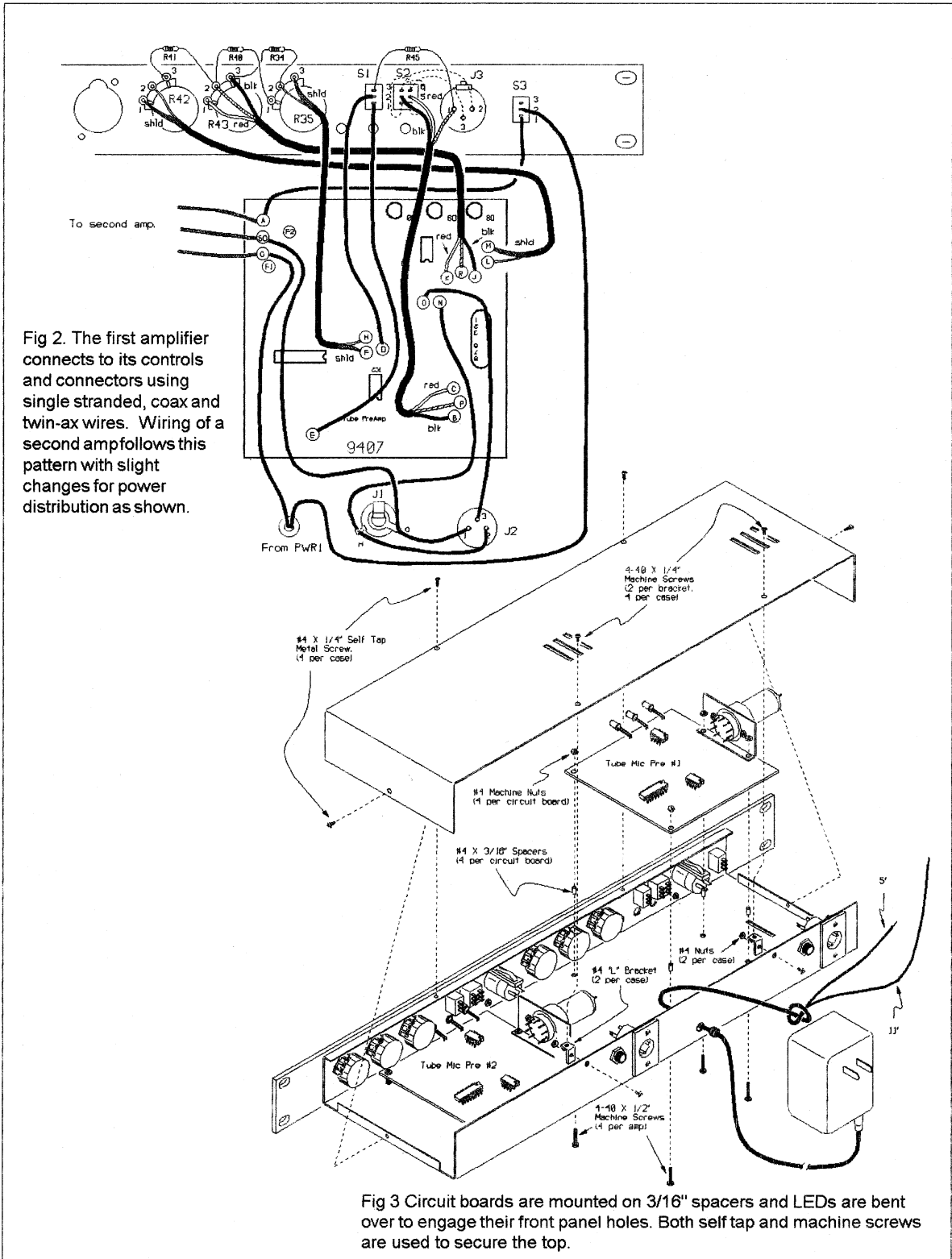
Fig 1a. This is the full size foil pattern for the Tube Mic Pre Circuit board. License is granted to reproduce this copyright circuit board for your personal, noncommercial use only.

Fig 1b. Components are placed on the circuit board following this parts legending. Wire jumpers are indicated with solid lines. The jumper indicated with the curved line between pads "G" and "SG" is placed on the first amplifier board only.



Route inter-board power and ground wiring under the "second" board.

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Tube Microphone Preamp Packing list 95.4.4

Tube, Semiconductors:		Resistors, 1/4W 1% film; values in ohms:	
1	12AX7 Vacuum Tube	V1	2 1k brown-black-black-brown R19,R38
1	4049 CMOS Hex Inverter	IC1	4 10k brown-black-black-red R26,R27, R31,R37
2	5532 Dual Low Noise OpAmp	IC2,IC3	2 33k orange-orange-black-red R20,R39
2	1N4001 Power Diodes	D1,D2	2 6.81k blue-grey-brown-brown R25,R36
6	1N4148 Signal Diodes	D3-D7,D11	Switches, connectors, etc:
3	Red LED	D8, D9,	1 SPDT Miniature Toggle Switch S1
1	51V Zener Diode	D10	1 DPDT Miniature Toggle Switch S2
4	6.8V Zener Diodes	D12-D15	1 1/4" Open Circuit Phone Jack J1
		D16	1 Panel Mount Male XLR Conn. J2
			1 Panel Mount Fml XLR Conn. J3
Capacitors, Ceramic disks:			Otherstuff:
1	.01 uF	C13	1 9407pc Circuit Board
1	.05 uF	C5	3 Set Screw Knobs
1	220 pF	C6	1 9 pin Miniature Tube Socket
1	47 pF	C18	1 Tube Mounting Bracket
Capacitors, Electrolytic:			3 36" lengths #22 Stranded Wire
5	1 uF 50V	C14-C17, C20	1 14" length Small Diameter Tubing
			1 18" length small bare wire
2	220 uF 25V	C2,C4	1 11" length RG-174/U Co-ax Cable
7	33uF 16V	C7-C11, C21,C22	1 11" length Belden 9501 Twin-ax Cable
		C1,C3	10 #4 Machine Nuts
2	470uF 25V	C12	8 4-40 X 1/2" Machine Screws
1	47uF 50V		2 4-40 X 1/4" Machine Screws
Capacitors, Tantalum:		C19,C23	4 #4 X 3/16" Spacers
2	4.7uF 50V		
Potentiometers:			WITH FIRST AMP
1	100k Ohm Trimmer	R22	1 12VAC 500 mA Wall Transformer PWR1
3	10k Ohm Panel Mount	R35*,R42*, R43*	1 SPDT Miniature Toggle Switch S3
			1 1/4" Rubber Grommet
Resistors, 1/4W 5%; values in ohms:			9407 CASE (optional)
3	100 brown-black-brown	R1,R2,R7	1 9407 Rack Panel
4	100k brown-black-yellow	R10,R14, R17, R18	1 9407 Case Bottom
		R9,R34*, R45*	1 9407 Case Top
3	10K brown-black-orange	R24	2 #4 Machine Nuts
		R40*	4 4-40 X 1/4" Machine Screws
1	150k brown-green-yellow	R29	4 #4 X 1/4" Self-tap Screws
1	220 red-red-brown	R15	2 #4 "L" Brackets
1	22k red-red-orange	R32,R33	
1	270 red-violet-brown	R11,R12	
2	2700 red-violet-red	R44	
3	270k red-violet-yellow	R3,R41*	
		R4,R5	
2	330 orange-orange-brown	R23	
2	33k orange-orange-orange	R21,R30	
1	39k orange-white-orange	R8	
2	470 yellow-violet-brown	R28	
1	4700 yellow-violet-red	R6	
1	47k yellow-violet-orange	R13,R16	
1	470k yellow-violet-yellow		
2	82k grey-red-orange		

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PRICES:

Complete kit of parts to build a single Tube Mic Pre	order #9407k
Complete kit of parts to build two Tube Mic Pre's	order (2) #9407k
Option Rack Case	order #9407c

<http://www.paia.com/tubestuff.asp>