

TAU SYSTEMS
MODEL 1190
"PIPE" AUDIO MODIFIER
ASSEMBLY AND OPERATION MANUAL

Description

The PIPE is a totally new sound modifying package, based on phasing and flanging in which a discrete, exceptionally wide range phase delay circuit is electronically controlled in a musically versatile manner via exponential voltage control.

Referring to the Block Diagram, we can see that the output of the Phase Delay is mixed with the audio input, at the Stereo Matrix circuits. This results in the familiar Comb Filter sound with 9 notches and 10 peaks.

Features

- * Sounds like a tuned tube or pipe, hence the name. Many instruments are nothing more than fixed, tuned pipes (horns, reed instruments, even marimbas and "vibes" use tuned pipes).
- * Electronically variable, the pipe-sounding characteristics can be expanded from a tiny $\frac{1}{2}$ inch to over 32 feet!
- * VARIABLE RESONANCE, expanding the coloration or timbre from that of wood (for example) to that of bell-like silver.
- * EXPONENTIAL VOLTAGE CONTROLLED DELAY range of over 1000 to 1! This allows you to create that ACCELERATING SWISH THROUGH INFINITY "flanging" sound, also known as "jet reverb."
- * Creates a stereo "SPATIAL MOTION" effect from any Monaural source.
- * Generates PHASING! 3600 DEGREES of it, in STEREO. Much more dynamic, pronounced, and controllable than any other similar product.
- * Adds a natural (or highly UNnatural!) VIBRATO to any voice or instrument.
- * Pipe units may be "slaved" or "daisy-chained" to operate from one single control voltage.
- * Generates a genuine ROTATING SPEAKER ("leslie") effect. In Stereo or Mono!

Specifications

- * MINIMUM PHASE DELAY RANGE: 30 microseconds to 30 milliseconds (1000:1)
- * PHASE SHIFT: 0 to 3600 degrees
- * MAX. INPUT LEVEL: + 20 dBm at MINIMUM RESONANCE, possibly less at HIGHER RESONANCE, depending on program nature
- * SIGNAL to NOISE RATIO: 94 dB typical
- * FREQUENCY OF LOWEST NOTCH: 16 Hz to 30,000 Hz
- * SWEEP OSCILLATOR: Manual, or from less than 0.1 to over 10 Hz
- * NOTCH DEPTH: 40 dB typical (min. resonance), 70 dB (max. resonance)
- * GAIN: Unity at minimum resonance, up to +20 dB at highest resonance
- * BYPASS SWITCHING: Passive (power need not be on to feed a signal through)
- * SYNTHESIZER INTERFACE: This is a 1 Volt per Octave control input. Plugging in a control voltage source, such as an exponential synthesizer or foot pedal will allow control of the PHASE DELAY in such a manner that the perceived tonality increases 1 octave for each 1 Volt of input. This input does NOT interrupt the manual "DELAY" control which acts similar to the "Fc" pot on a filter.
- * MAXIMUM INPUT LEVEL: +20 dBm. Input impedance is 100K ohms typical, unbalanced.

TOOLS AND TECHNIQUES

In order to assemble and calibrate the TAU SYSTEMS 1190 "PIPE" Audio Modifier, you will need the following equipment and materials:

- A quality pair of small diagonal cutters.
- A soldering pencil, not to exceed 40 watts or 400 degrees; must have a small, clean tip. KEEP SOLDERING IRON TIP CLEAN by using a wet sponge.
- Approximately 5 feet of quality, fine solder, 60/40 electronic grade.
- A small bottle of trichloroethylene, freon, or alcohol for removing solder flux when complete. Be certain of other solvents' compatibility with P.C. material.
- A small exacto knife or razor knife for touchup.
- An oscilloscope with DC input.
- An accurate voltmeter or DVM.
- A calibrated Voltage Reference (a calibrated keyboard controller is fine).
- A 10 Volt P-P input signal.
- A dual 15 Volt power supply capable of delivering at least 30 mA.
- An audio amplifier for monitoring the PIPE's output.

Resistor Color Code Identification

Using the Chart at the right will allow rapid identification of all resistors furnished in this kit.

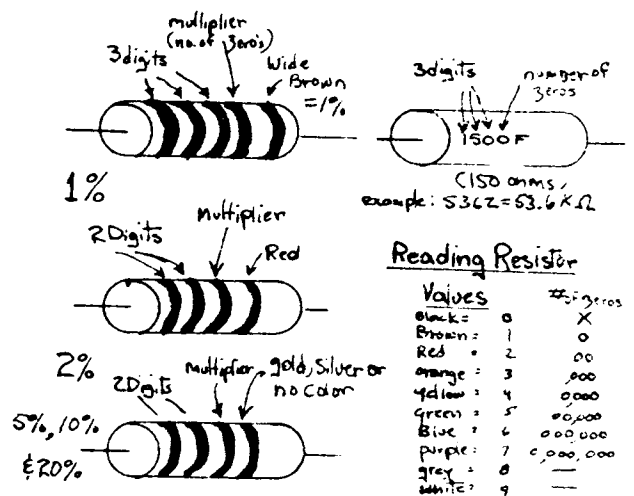


Fig. 1

The PIPE KIT includes:

RESISTORS

R13,14,45	100 ohm
R15	470 ohm
R19,25,39	1,000 ohm
R50,51	1.5K ohm
R34	1.87ohm
R37,38,46,48	2.7K ohm
R9,12	3.3K ohm
R23,44,47	5.6K ohm
R7,8,16,17	10K ohm
18,20,21,22	
24,41	
R42	12K ohm
R10,11	18K ohm
R30,31	27K ohm
R49	33K ohm
R35	91K ohm
R3,40	100K ohm
R26,27,28,	150K ohm
29,43	
R1,2,4,5,6,33	220K ohm
R32	82K ohm
R36,52,53	22M ohm

CAPACITORS

C2,9,10	30 pf
C11,12,13,14	100 pf
C6,7	.0022 uf
C8	.01 uf
C1	0.1 uf

CAPACITORS (CON'D)



C3,4,5,15,16	.68 uf
C18,19,20	
C17	15 uf, electrolytic

MISCELLANEOUS

P1,4	100K ohm Linear Pot. (red marking
P2	100K ohm Log. (Audio) Pot.
P3	10K ohm Log. (Audio) Pot.
T1,2,3	50K ohm Trimmer
T4	20K ohm Trimmer
D1,2	1N 914/1N 4148 Diode
IC-1	TL-084
IC-2,3	1458
IC-4	3086,3045,3046
Q1	2N708, NPN TO-92
Q2	E411, Dual FET
S1,2	DPDT Switch
LED-1,2	Red & Green LED's
2	PD-10 Module
1	PC Board
1	24 Pin Edge Connector

ASSEMBLY INSTRUCTIONS

Referring to fig. 3, insert all jumper wires (J1J13) from the top of the PC Board. Insert J14 last after inserting all resistors and capacitors. Jumpers are designated by the "J". Solder and trim the leads using the diagonal cutters. Using fig. 3 and the chart in fig. 1, identify and locate each resistor and insert, except R34 which is inserted after inserting IC 4 (see detail A). Recheck the values and locations, then solder and trim all leads. After completing this step, add the transistors and IC's. Take care not to press these components down too close to the PC board....too much force may fracture the underside of the device (IC or transistor) and damage the internal connections.

Insert all capacitors as shown in fig. 3. The longer lead on the tantalum cap is the POSITIVE lead; be sure it is in correctly. Solder and trim the leads. Insert the diodes as shown in fig. 3, solder in place and trim, but **BE SURE** that they **ARE PROPERLY ALIGNED!!** ( = ) Locate, identify, and insert all trimmer pots. Solder down and trim the leads.

After assembly, check all solder points for solder bridges or shorts to other PC lands. Remove solder bridges by reheating and using the exacto knife. Then inspect the board for "cold" solder joints (ones which are crystalline grey rather than shiny silver). These crystalline or "cold" joints cause high resistance and in most cases create operational problems. To repair a "cold" solder joint, merely reheat it until the solder flows, then remove the iron.

After inserting all parts, re-check that all components are correctly aligned before going on. Remove and repair any defects. Then clean the board with an appropriate solvent (freon works best) to remove the excess flux which also acts as a resistance. After cleaning, reinspect for shorts or opens between PC lands and repair as necessary.

Pay attention to polarized components. Be sure to align component leads correctly.

Recheck completed Printed Circuit board for missing or erroneously placed components.

1. It is important that all components be properly located and oriented.
2. Visually inspect your "PIPE" after assembly and cleaning.
3. Permanent harm could result from small errors...be sure of your assembly before powering.

I/O TERMINATIONS (Input-Output)

After assembly and before checkout, select which type of I/O jacks and plugs you wish to use with your PIPE (jacks and plugs are not included, they are userselected), and connect all the I/O connections to the edge connector. Additionally, we suggest using a CFR "PanelBlank" which has mounting holes for the edge connector, plus mounting holes for the I/O connectors. Since most types of jacks have grounded frames, you need only connect one ground lead from the edge connector to one of the bolts holding the edge connector to the panel blank. When bolting the edge connector down, either use standoffs, insulated tape, or fish paper to prevent the edge connector from being shorted against the aluminum panel. We strongly recommend that the edge connector be used. If direct soldered connections are made to the printed circuit board, TAU Systems will not be able to test or troubleshoot your board.

C A U T I O N

Do not apply power to your PIPE Kit. When plugging the PIPE P.C. Board into the edge connector, be CERTAIN YOU ARE INSERTING IT CORRECTLY. If inserted backwards, extensive damage to the components WILL CERTAINLY OCCUR.

TAU Systems will replace such damaged parts only at the builder's expense.

Now you may apply power to your PIPE Kit.

Guitar Input

Using the PIPE with guitar or other low level instruments:

If desired, the PIPE may be used with signal levels other than the 10 Volt P-P music synthesizer levels. For example: if used with guitar or other 100 millivolt audio pickups (including microphones) one need only change the value of R3 to 2 meg ohm and add Rx between the PIPE output and ground (Rx is 51 ohms). This optimizes the circuits' signal- to-noise ratio and also lowers the output impedance.

PIPE CALIBRATION PROCEDURE

1. Set panel controls to the following:
Resonance control -P-1- minimum (CCW)
Oscillator frequency -P-2- minimum (CCW)
Oscillator level -P-3- minimum (CCW)
Pitch -P-4- up full (CW)
NOTE: Control rotations are viewed from shaft or knob end.
2. Set trim pots to the following:
Resonance -T1- minimum (CCW)
Notches -T-2- center
Pitch -T-3- minimum (CW)
1V/octave -T-4- center
3. Short wiper of oscillator level control, -P-3#2, to -P-3#3 with a short clip lead.
4. Place mode switch in "flange" position.
5. Place bypass switch in "normal" position.
6. Apply a 1volt RMS (.774 VAC) @ 20 KHz signal to the audio input.
7. Monitor the main output with a scope or AC voltmeter.
8. Slowly turn pitch trim CCW until first null (min output) is reached.
9. Turn panel pitch control down (CCW).
10. Set generator frequency to 180 Hz.
11. Slowly increase generator frequency until first null (min output) is reached. Frequency should be around 220 Hz.

12. Turn notch trimpot for further increased null. Use shielded input cable from the generator to reduce hum pickup.
13. Repeat last two steps, then remove shorting jumper from -P3.
14. Disconnect generator and ground audio input.
15. Turn resonance panel control up full (CW).
16. Listen to main output and/or monitor main output with scope or AC voltmeter.
17. Turn resonance trim pot -T1- up full (CW).
18. Turn panel pitch control up full (CW). Unit should oscillate.
19. Turn resonance trim pot -T1- (CCW) until oscillation just stops, then turn -T-1- an additional 1/8 turn.
20. Apply keyboard control voltage to 1V/octave control input. Adjust 1V/octave trim pot for equal tonality over the range of the keyboard.

Calibration complete.

GUARANTEE

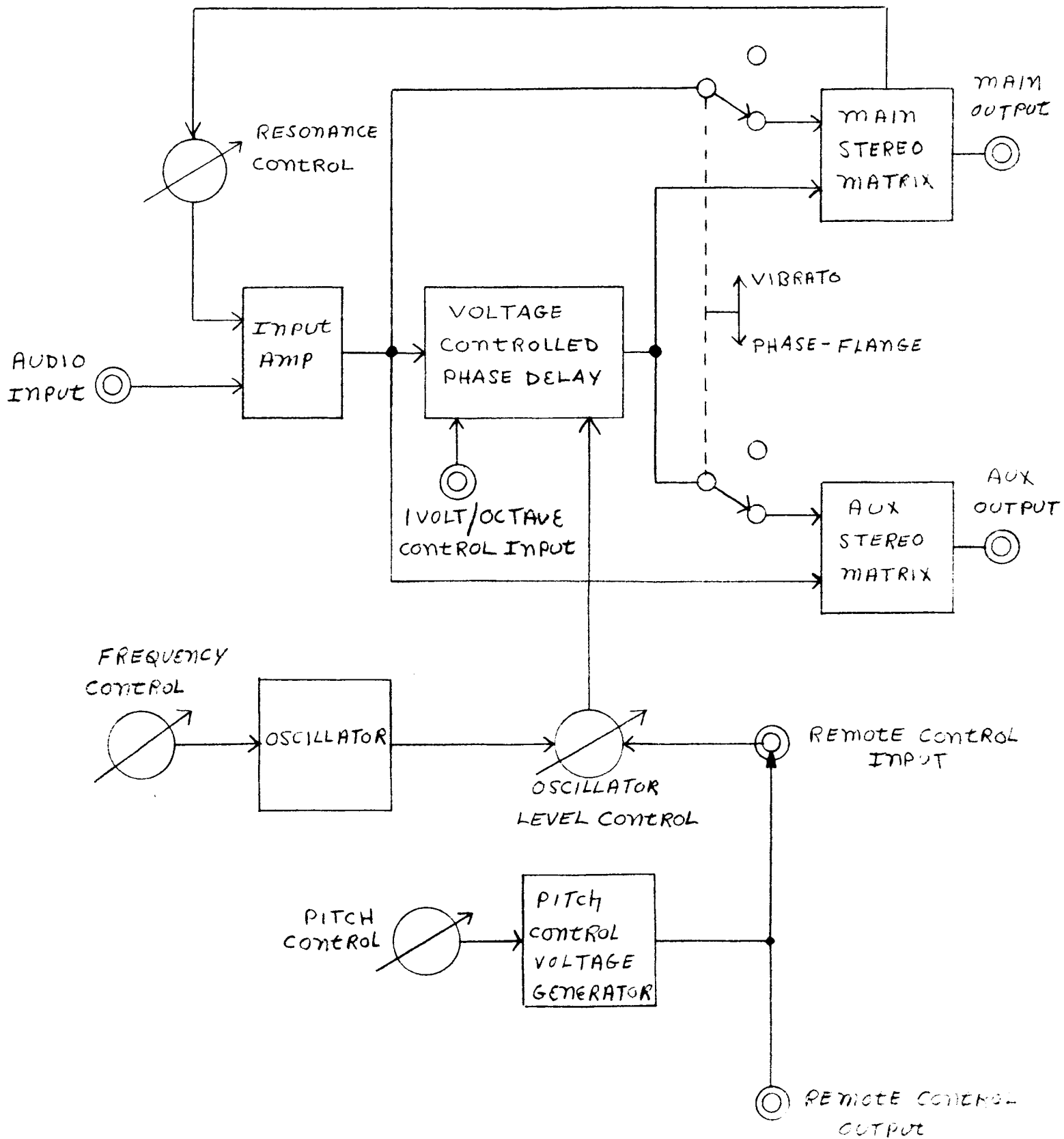
All components and material in the Tau Systems model 1190 "PIPE" are guaranteed for 60 days (from date of shipping). If during this time your "PIPE" fails to function properly, you may return the unit to us with an explanation of the difficulties and we will repair the filter for a nominal handling charge of \$5.00. If, as a result of incorrect assembly, any components are destroyed, we must charge for parts which are replaced.

If your TAU SYSTEMS model 1190 "PIPE" becomes malfunctional after 60 days (from date of shipping), you may return the completed kit to us for repair and recalibration. You will be charged for labor plus cost of any parts replaced.

All correspondence should be directed to:

TAU SYSTEMS
BOX K
Newton, NH 03858

BLOCK DIAGRAM



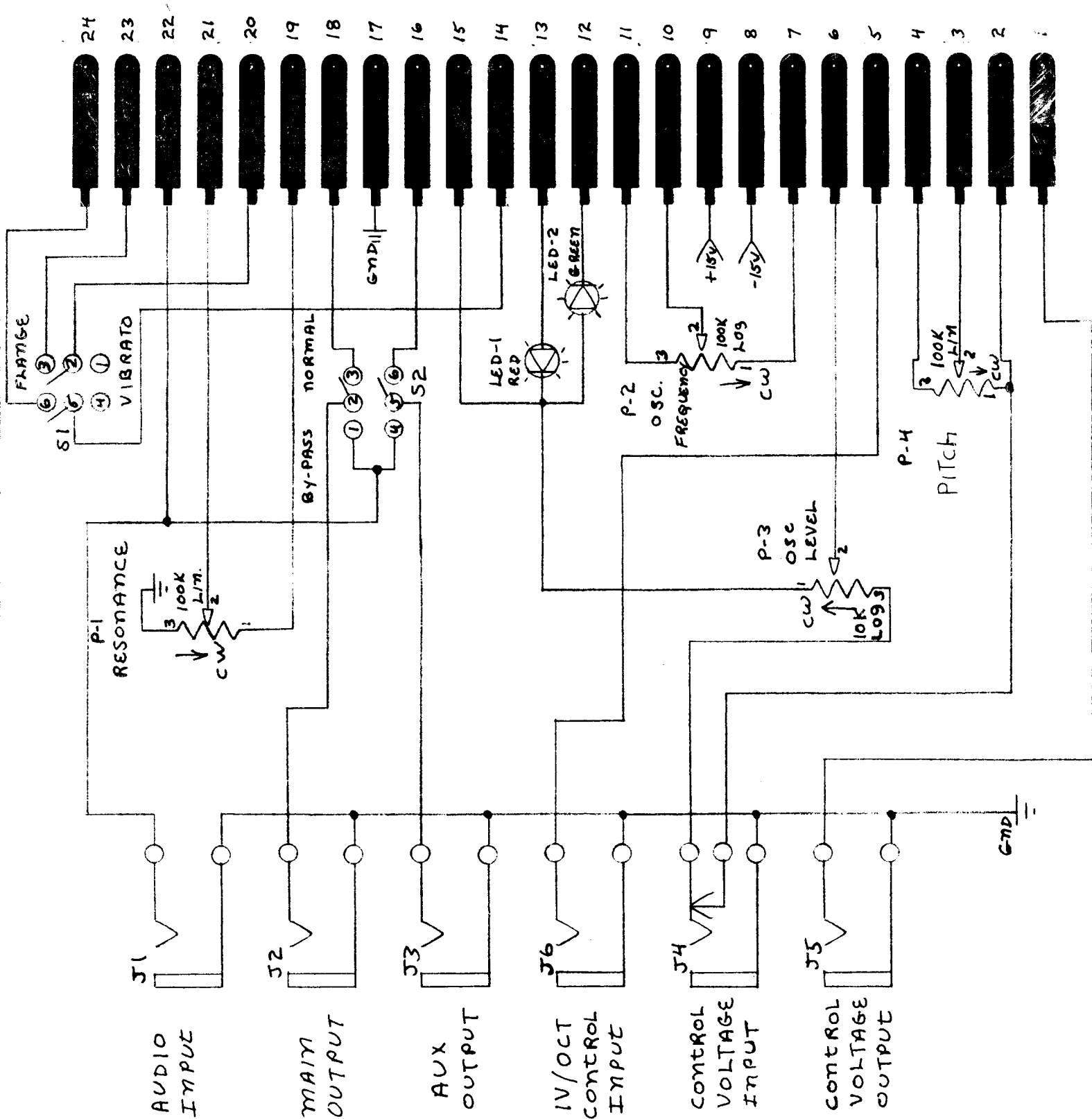
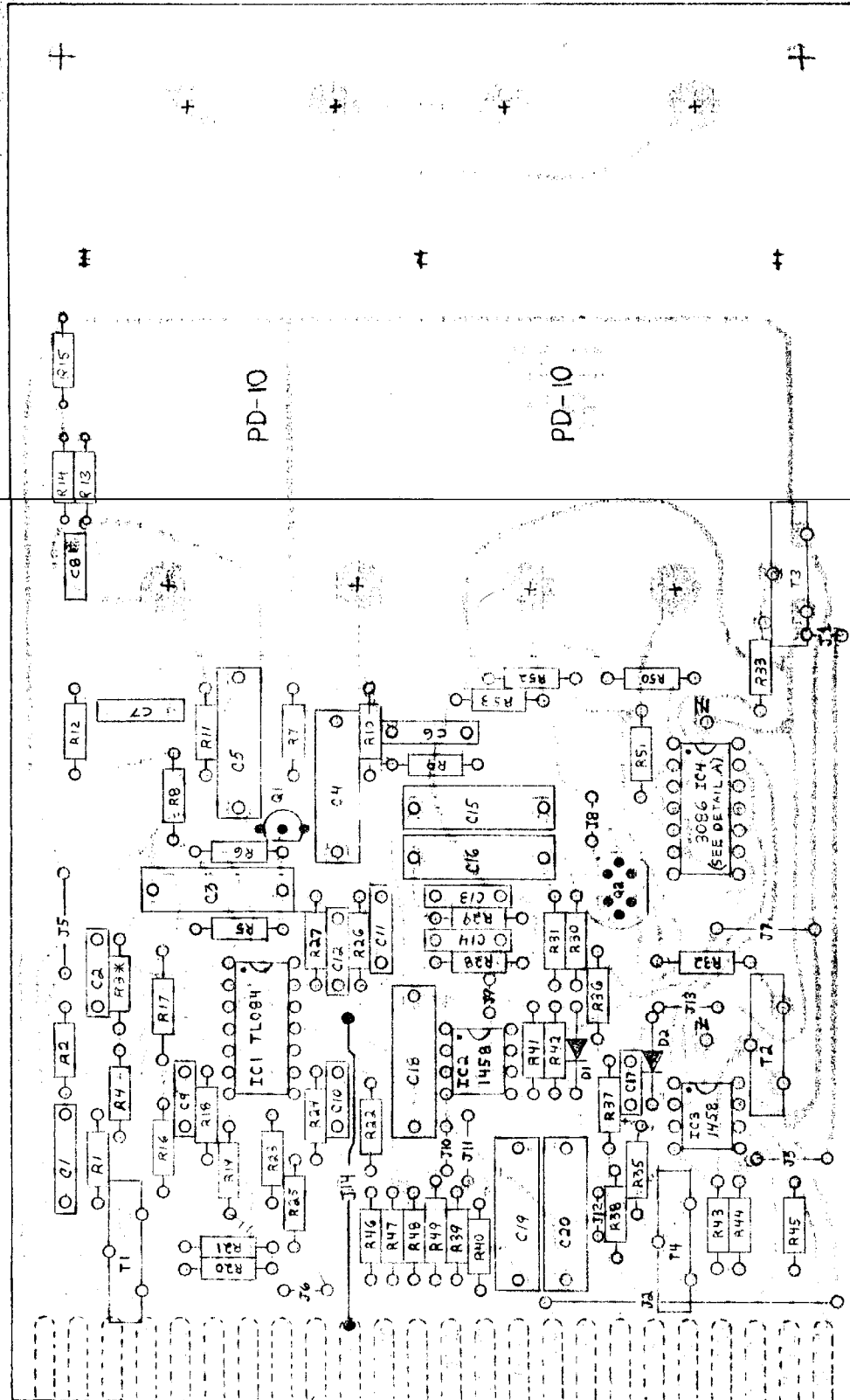
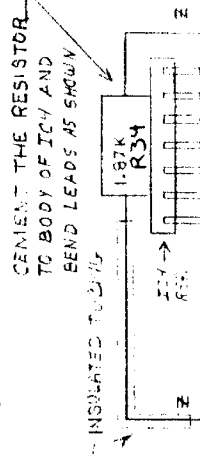


Fig. 3



DETAIL A



NOTES:

1. Square pads on circuit side of board indicates; pin 1 of any device, cathode side of a diode, pos. term. of a polarized cap., collector of a transistor.
2. Wire jumpers J2 & J14 should be insulated wire.

DESIGNATORS USED:

R1 - R53
C1 - C20
IC1 - IC 4
D1 - D2
T1 - T4
J1 - J14 (J4 deleted)
Q1 - Q2