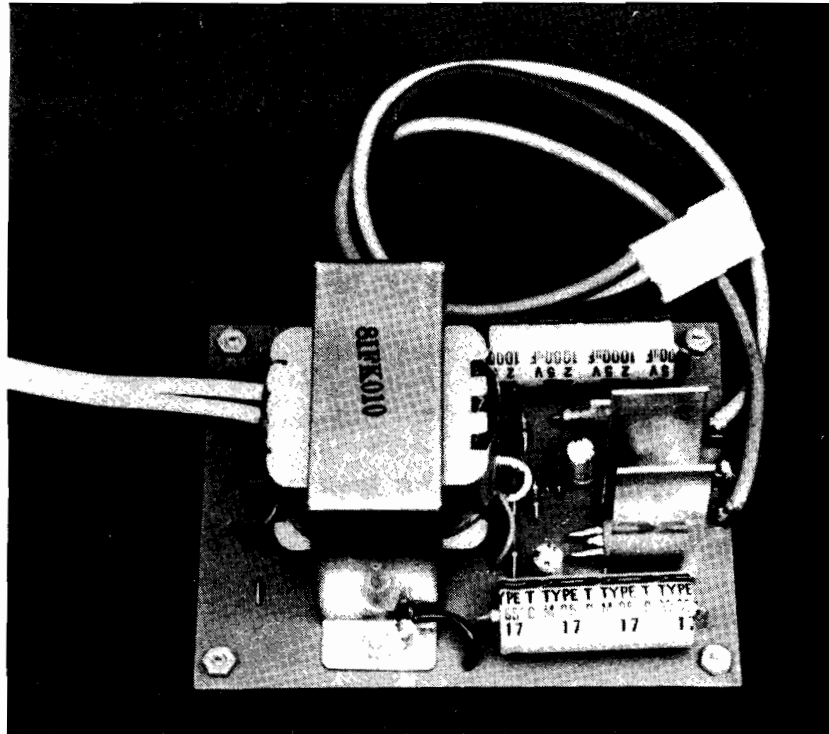


PAIA



PS-87 POWER SUPPLY ASSEMBLY MANUAL

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PS-87 INSTRUCTIONS

Prior to beginning assembly, check the supplied parts against the following parts list.

QUANTITY	ITEM
1.....	PS-87 Circuit Board
1.....	24 volt center tapped 1-Amp Power Transformer (NOTE: some kits may be supplied with transformer number 81FK010 which is labeled 12 volt secondary. This is actually a 24 volt transformer.)
2.....	1000 mfd, 25 volt (or greater) electrolytic capacitor
4.....	33 mfd, 16 volt (or greater) electrolytic capacitor
1.....	.01 mfd disc capacitor
2.....	150K resistor COLOR CODE: brown-green-yellow
1.....	270 ohm resistor COLOR CODE: red-violet-brown
1.....	330 ohm resistor COLOR CODE: orange-orange-brown
1.....	5 ohm, 5 watt (or greater) resistor
4.....	1N4001 diodes (NOTE: some kits may be supplied with diodes which have a higher number, such as 1N4003, etc. This will not affect performance of the kit.)
1.....	2N5129 or 2N3904 transistor
1.....	LM340T-5, or 7805 voltage regulator
1.....	LM320T-5, or 7905 voltage regulator
1.....	THM 6043 clip-on heatsink
1.....	PC mount heatsink
6.....	rubber feet
4.....	flea clips
1.....	AC line cord
1.....	solder lug

- 1.....bundle (3x 10 inches) 18 guage wire
- 13 circuit connector housing
- 1.....male connector pin
- 2.....female connector pin
- 7.....#4-40 nut
- 7.....#4 lockwashers
- 5.....4-40 x 1/4" machine screws
- 2.....4-40 x 1/2" machine screws
- 2.....#6 flat washers
- 6.....#4 x 3/4" self-tap screws

If you should find any parts missing, damaged, or otherwise unusable, contact PAIA Electronics Tech Services for replacement. Along with your request, we must have the packer number from the parts bag, and the order number which contained this kit.

SOLDERING

Use care when mounting all components. Use only rosin core solder. Use of acid core solder or paste fluxes will void the warranty of this kit. A proper solder joint has just enough solder to cover the round soldering pad and about 1/16 inch (2 mm) of the lead passing through it. There are two improper connections to beware of: Using too little solder will result in a connection which will appear to be soldered when actually there is a layer of flux insulating the component lead from the solder bead. This situation can be cured by reheating the connection and flowing additional solder into the joint. If too much solder is used on a connection, there is a danger of the excess solder flowing between adjacent connections or circuit paths causing a short circuit. Unintentional bridges can be cleaned off by holding the connection upside down and flowing the excess solder off onto the tip of a clean, hot soldering iron.

Select a soldering IRON with a small tip and a power rating of not more than 35 watts. Soldering GUNS are completely unacceptable for assembling solid state equipment, as the large magnetic fields they generate can damage some components. Be sure to **KEEP YOUR SOLDERING IRON TIP CLEAN**. Before soldering a connection, wipe the tip on a damp sponge or rag. This will aid in heat transfer and prolong tip life.

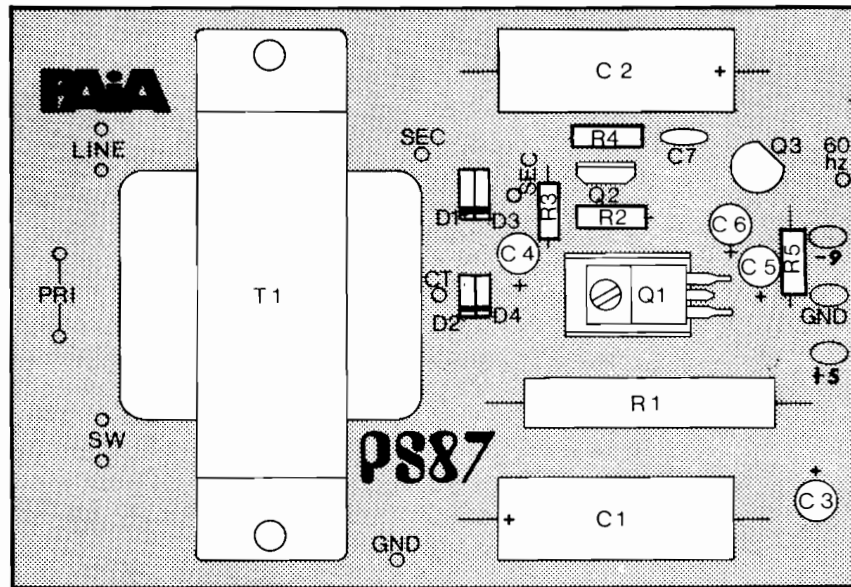
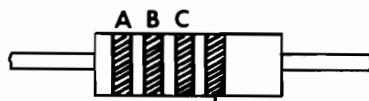


Figure 1

CIRCUIT BOARD ASSEMBLY

- () Prepare the circuit board for assembly by thoroughly cleaning the conductor side of the board with a scouring cleanser or steel wool pad. Rinse the board completely with clear water and allow to fully dry. A BRIGHT SHINY BOARD AIDS IN SUCCESSFUL SOLDERING!

Solder each of the fixed resistors in place following the parts placement designators printed on the circuit board and the assembly drawing figure 1. Note that the fixed resistors are non-polarized and may be mounted with either of their leads in either of the holes provided. Insert both leads in the mounting holes and push the resistor FULLY against the board. On the conductor side of the board, bend the leads outwards to about a 45 degree angle to help hold the component in place. AFTER SOLDERING, clip off each lead flush with the solder joint. SAVE THE EXCESS CLIPPED OFF LEADS FOR USE AS JUMPERS IN LATER STEPS.

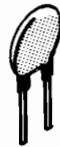


Silver or gold - disregard this band.

NUMBER	VALUE	COLOR CODE A-B-C
() R2.....	330 ohm.....	orange-orange-brown
() R3.....	270 ohm.....	red-violet-brown
() R4.....	150K	brown-green-yellow
() R5.....	150K	brown-green-yellow

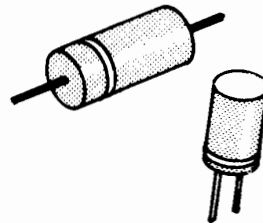
() Select the larger 5 ohm power resistor (R1). When mounting this component, the body of the resistor should remain about 1/4" (7 mm) away from the circuit board to allow for proper cooling. Otherwise, mount and solder in place as above.

() Install the ceramic disk capacitor (C7, .01 mfd.) Like the resistors, this component is non-polarized. Solder in place, and clip the excess leads.

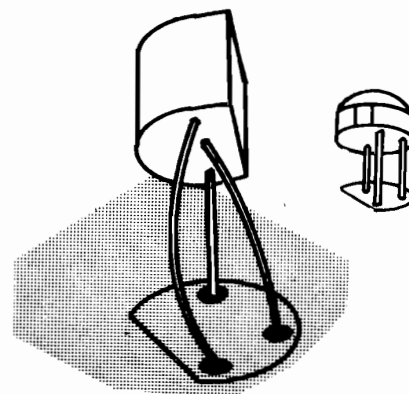


Up to this point, all components have been non-polarized. Electrolytic capacitors are polarized, and the component lead which has been designated positive "+" on the body of the part MUST be installed in the circuit board hole which is labeled "+". In the event that the capacitors supplied have their negative (-) lead marked, it is to go through the unmarked hole in the circuit board. Note that the specified operating voltage is a minimum acceptable rating. Capacitors supplied with specific kits may have a higher voltage rating than that specified, however they will not affect the performance of the kit.

- () C11000 mfd., 25 volt
- () C21000 mfd., 25 volt
- () C333 mfd., 16 volt
- () C433 mfd., 16 volt
- () C533 mfd., 16 volt
- () C633 mfd., 16 volt

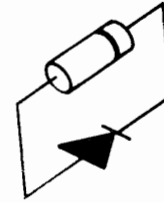


Install the transistor. The actual unit supplied may be in one of two different case styles. Mounting orientation is shown for each style. All semiconductors are heat sensitive and may be damaged if allowed to get too hot while soldering. To be on the safe side, heat sink each transistor lead during the soldering operation by grasping it with a pair of needle nose pliers at a point between the circuit board and the body of the component.



- () Q32N5129 or 2N3904

Install the diodes. Like transistors, diodes are heat sensitive so the heat sinking procedure previously used should be repeated for diode installation. The physical orientation of the diodes is related to the circuit board designations as shown in the adjacent drawing.



- () D1.....1N4001
- () D2.....1N4001
- () D3.....1N4001
- () D41N4001

Next we will install the voltage regulators. Note that the regulators have a plastic body on which the type number is printed. This is the "face" of the part. The "back" of the part consists of the metal heat dissipator/mounting tab. Like transistors, excessive installation temperatures can damage the part, so repeat the heat sinking process when installing the regulators.

- () Select the LM320-5 or 7905 type regulator (Q2). On the circuit board, the designator shows the back of the regulator (the two parallel lines represent the top of the mounting tab) towards C2. Prepare the regulator leads by slightly bending the outer two leads toward the face of the regulator. Install Q2 on the board LEAVING about 1/4" of space between the board and body of Q2. Solder in place.

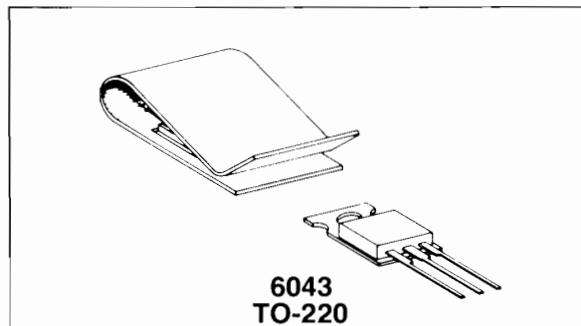


Figure 2

- () Select the THM 6043 clip-on heat sink. Slip this over Q2 such that the flat surface of the heat sink contacts the back of the regulator, and the curved portion of the sink presses against the face of Q2. Note that the heat sink is made with internal flanges to guide the sink over the regulator, and that there will be a "snap" which locks the sink in place when it is fully installed.

- () Select the LM340-5 or 7805 type regulator (Q1). This part will be mounted horizontally on the board, so we must prepare the leads before mounting. At a

point 1/8" (3 mm) from the body of Q1, use a pair of needle nose pliers to bend the center lead 90 degrees towards the back of Q1. At a point 1/4" (6 mm) from the body, bend the two outer leads in a similar manner.

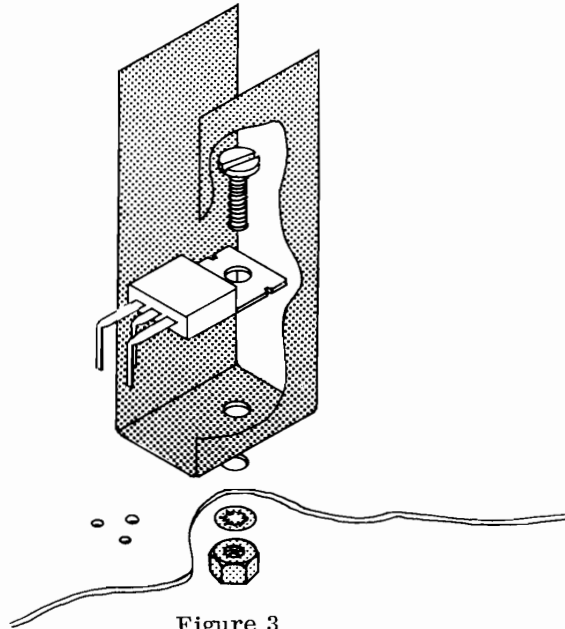


Figure 3

() Locate the large "U" shaped heat sink, a #4-40 x 1/4" screw, a #4 nut, and a #4 lockwasher. Peel protective paper off of heat sink. Noting that the mounting hole in the heat sink is drilled off-center, lay the regulator into the bottom of the heat sink such that the back of Q1 is contacting the bottom of the "U" and so the body of Q1 is fully inside the heatsink rather than partially "hanging out". Insert the screw through the mounting tab of Q1, through the heat sink, and through the circuit board. **MAKE SURE** that the leads of Q1 are aligned with and inserted into their respective holes.

Install a lockwasher and nut on the bottom of the screw and tighten. Solder the three leads of Q1, making sure to heat sink while soldering. Due to manufacturing processes, the fins of the heat sink may not be exactly perpendicular to the board. **ONCE THE HEAT SINK IS MOUNTED**, the fins should be straightened to a true vertical by hand.

() Before the transformer is mounted, prepare its leads by cutting the black primary leads to a length of 1" (2.5 cm) as measured from the body of the transformer. Strip 1/4" (6mm) of insulation from the end of each lead. Twist the exposed strands and "tin" by melting a small amount of solder into the exposed leads.

() In a similar manner, cut the two red secondary leads to a length of 1.5" (3.8 cm). Strip and tin as before.

() Cut the secondary center tap lead (white or striped) to a length of 1" (2.5 cm). Strip and tin as before.

() Using the blade of a screwdriver or pocket knife, scrape the insulating varnish from the top surface of the two transformer mounting ears. This will insure good grounding contact when mounting.

() Mount the transformer by inserting a #4-40 1/2" machine screw through the bottom of a rubber foot, through the circuit board (from the conductor side), and through the transformer mounting flanges. NOTE that the transformer's black leads must be facing the "PRI" holes. On the screw which is nearest the hole labeled "GND", install a #6 flat washer, a solder lug, a #4 lockwasher, and a #4 nut. Tighten. On the other screw, install the same hardware deleting the solder lug. See figure 4.

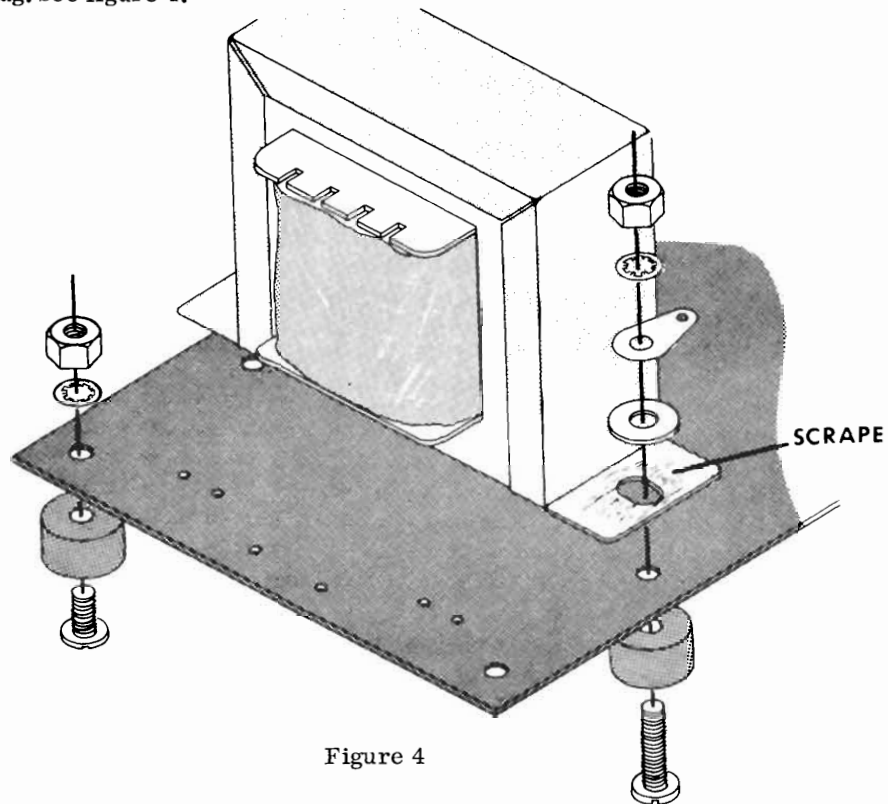


Figure 4

() Install the two black transformer leads in the holes labeled "PRI". Solder both connections.

() Install the two red transformer leads in the holes labeled "SEC". Solder both connections.

() Insert the white or striped transformer lead in the hole labeled "CT". Solder.

() Using a section of scrap component lead or transformer lead, install a 1" (2.5 cm) jumper from the transformer solder lug to point "GND". Solder both connections.

() Using four #4-40 x 1/4" screws, four #4 lockwashers, and four #4 nuts mount the four remaining rubber feet in the corners of the circuit board. See Fig. 4.

() Separate the two conductors of the line cord to a distance of 1" (2.5 cm) from the end of the cord. Strip 1/4" (6 mm) of insulation from each lead, twist the strands, and tin. Install the two leads in the circuit board holes labeled "LINE". Solder both connections.

() If you are going to be using a power switch with your particular application, the switch leads should be connected to the holes labeled "SW". If no switch is required, install a wire jumper between these points. Solder. NOTE: The power switch is not included in this kit.

() Install the four flea clips in the four output holes nearest the edge of the board (+5, Ground, -9, and 60 Hz). Solder in place after pushing the clips fully into the holes.

NOTE that six #4 x 3/4" self-tap screws are also provided. If you are using the PS-87 supply in a dedicated application where you want the board permanently mounted (such as in the PAIA 8782 Digital Keyboard), these screws can be used in place of the four #4-40 x 1/4" screws in each corner, and in place of the two #4 -40 x 1/2" screws holding the transformer. You should still use the six rubber feet under the circuit board to act as "cushioned" spacers. Also be sure to retain the use of the solder lug and #6 flat washers to insure that the transformer housing is at a solid ground potential. Before mounting the circuit board, it would probably be helpful to start six pilot holes in the wood case using an awl or 1/16 inch drill.

() Using the three 10" (25 cm) lengths of heavy wire provided, strip 1/4" (6 mm) of insulation from each end of each wire. Twist and tin the exposed strands of wire.

() Solder one end of each wire to the three output flea clips previously installed on the PS-87 board. The white lead goes to -9, the red lead goes to +5, and the black lead goes to ground.

() Locate the free end of the black wire connected to the GROUND output. Select the male Molex pin. (This is the one which looks like a rounded bullet. The two which look like open cylinders are the female Molex pins.) Lay the tinned end of the ground wire into the central section of the male molex pin, and solder into place. Using a pair of needlenose pliers, fold the strain relief "ears" of the molex pin around the installed wire. See Figure 5.

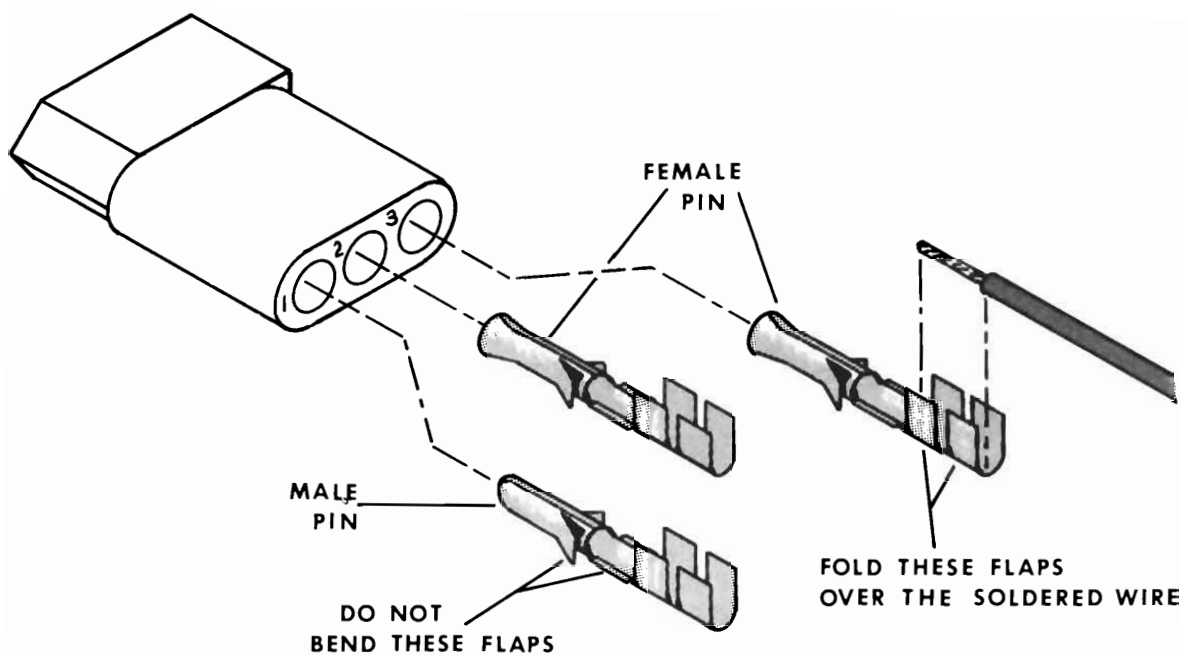


Figure 5

() Select the molded plastic Molex pin holder. Note that one end is rounded and one end is squared off with a triangular polarization feature. On the rounded end of the holder, you will find that the three holes have been numbered. Number 1 is the hole which is closest to the triangle polarizer on the other end. Hole number 1 is the hole into which we will insert the prepared ground cable/ Molex pin. **MAKE SURE** you have properly identified the location of hole number 1, as the molex pins are **IMPOSSIBLE** to remove once they are installed. Grasp the ground wire with a pair of needlenose pliers just behind the molex pin. Insert the pin into hole number one from the rounded end of the plastic holder. Push the pin into the hole as far as it will go. The far "bullet" shaped end of the plug should be approximately flush with the other end of the holder.

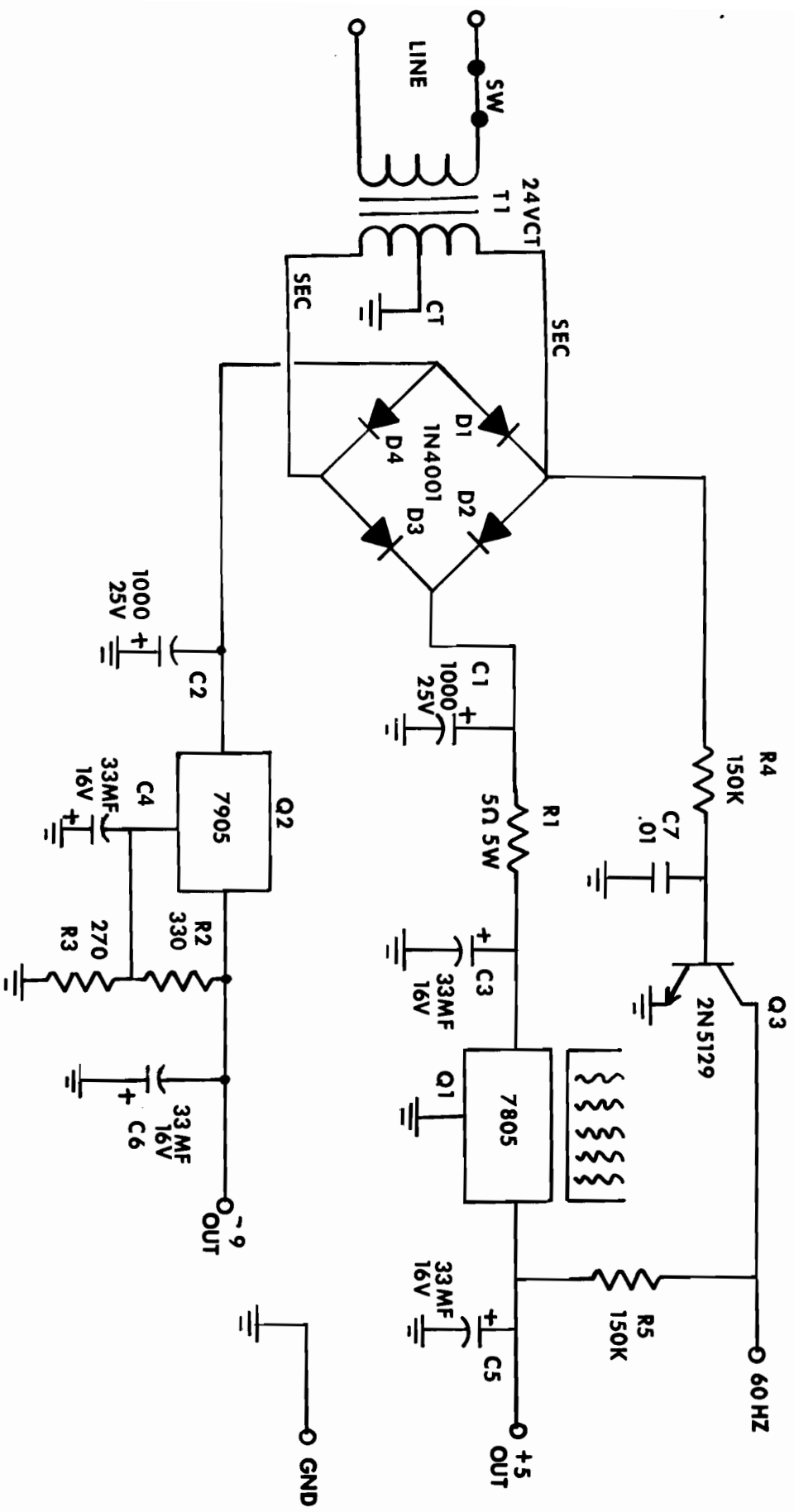
() Locate the free end of the white wire connected to the -9 volt output. In a similar manner, connect a female Molex pin on the end of this cable, and insert in hole number 2, the middle hole, of the Molex plastic holder.

() Locate the free end of the +5 volt output wire (red). As above, install the remaining female Molex pin on this wire and insert into hole number 3 of the plastic Molex holder. Hole number three should be **FARTHEST** from the polarization point on the squared end of the holder.

This completes assembly of the PAIA PS-87 Power Supply. Test the supply by connecting the line cord to an outlet and using a voltmeter or similar voltage testing device to confirm that the output voltages are within 10% of +5 volts and -9 volts.

During operation with a microprocessor, it will be normal for the heat sink fins and power resistor to get VERY warm. Be careful not to touch the fins or Q1. The heat sink should provide adequate thermal dissipation for loads drawing up to 1.5 Amp. The regulator chips include shutdown circuits for overheating and shorted loads in case either of these conditions should occur.

To test the "60 Hz" output, view the signal at the output with an oscilloscope and confirm that the period of the waveform is 16.6 milliseconds, and that the amplitude is 5 volts. If you don't have access to a 'scope, this output can be tested under 'processor control at a later time if you should ever need to use it.



Schematic