Reveille

Phonostage

Assembly Manual

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Reveille Phonostage

All discrete components (sorry no tubes this time) operating in pure Class-A, the Reveille Phonostage is a very high quality, completely dual mono, low noise, high gain design. The basic version can be used with all medium to high output MC cartridges and all MM cartridges. It's quite possible this design will work with MC cartridges as low as 0.4mV output....your success however will be determined by adequate matching to the rest of your system.

The design utilizes a very linear input amplifier with extremely low noise. Its gain can be changed for 20, 30 and 40dB. The output amplifier provides and additional 24dB of gain resulting in a maximum gain of 64dB.

I chose a discrete class-A circuit design over tubes for several reasons however the main driving force was linearity and low noise. Amplifying signals in the sub-millivolt region with tubes is almost impossible to pull off without the introduction of unwanted noise. My philosophy has always been to start with as clean a signal as possible and then tailor as needed from there. Solid state circuits are ultra-quiet, and if designed properly (low noise, class-A) can provide a very natural sound with great resolution, detail and pitch-black backgrounds. The Reveille Phonostage won't get in the way of your vinyl.

The Reveille Phonostage is completely dual mono including separate power transformers and on-off switches for each channel. Each amplifier channel has its own onboard voltage regulators which are fed by separate ultra-low noise power supplies. The power transformers are isolated from the rest of the circuitry providing the necessary shielding for the phono circuit as well as adjacent audio equipment.

High quality components are used throughout with an optional upgrade to the super low noise Caddock foil resistors. Wiring is provided through OFC shielded cable and input/output connections are via the Cardas silver/rhodium rca jacks. The power cord is detachable.

Setup and Operation

Setup is relatively straight forward.

1. Connect the signal cables from the turntable into the Reveille's rear panel jacks.

2. Connect the turntable ground wire to the ground post located on the rear panel of the Reveille.

3. Connect the signal cables from the Reveille's output jacks to your linestage input jacks.

4. If you are using a Moving Magnet cartridge open the top cover to the Reveille (make sure the Reveille is not powered on). Locate on the circuit board a set of 8 gold plated pins pointing vertically upwards. Two of these pins will be covered by a blue cap. This cap will cover the pins designated by the number "30" silkscreened onto the circuit board. Remove this cap by pulling upwards...it should slide off of the pins. Relocate this cap to the set of pins marked "20". Repeat this step for the other channel. If you are using a Moving Coil cartridge continue to step 5.

5. Plug the power cord into the IEC connector on the rear panel of the Reveille.

6. You are now ready to apply power. There is one on-off power switch for each channel.

7. If you are using an MC cartridge, play a record and listen at different loudness levels. Is there too much noise? Is there too much gain from the phonostage? Is there distortion or does the phonostage sound like it is being overdriven? If you answer yes to any of the above questions, remove the cover of the phonostage and with the unit powered off, change the gain setting (as described above) from "30" to either "20" or "40" and listen again.

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Reveille Phonostage Description

The Reveille Phonostage is a high quality, low-cost discrete phono preamplifier. Because of its low noise and high gain it can be used with all medium to high output MC pickups and all MM pickups.

The Reveille phono preamp is using a two-amplifier approach, instead of the usual single amplifier. This allows you to optimize it for low noise, RIAA accuracy, high gain and dynamic range.

The first stage is a linear amplifier with extremely low input noise. Its gain can be changed with the feedback network for 20, 30 and 40 dB. The RC network R27-C16 provides a passive 75usec roll-off for the RIAA equalization. The second stage provides further amplification of 24 dB, and at the same time boosts the bass according to the RIAA characteristics. The maximum gain of the phono preamp is 64dB. For MM pickups we recommend you run the first stage at 20dB for combined gain of 44dB. For MC pickups experimentation will be required to determine the proper gain selection for lowest noise.

Circuit description.

The complete schematic of the phono preamp is shown in fig. 1. The input stage consists of 2 pairs of JFETs in a symmetrical, complementary configuration (Ql-Q4). The FETs, 2SK170/2SJ74 were developed for low-noise application. They have very high gm, and due to the large chip size, also high capacitance. R6, R7, R9, R10 and trimpot P1 determine the drain current of the FETs in the circuit. Ideally it should be 5.9mA per device, resulting in a voltage drop of 2.4 to 3.0V across the resistors R4 and R14.

Q5 and Q6 are cascode stages, providing several improvements over the single, common-source stage. First, for optimum noise the FETs should be operated at less than 15V drain-source voltage, according to the data sheet. By biasing the cascode stage at 15V, the drain-source voltage will be limited to approximately 14.4V. Second, the FETs have very high input capacitance because of the Miller effect. Using a cascode configuration reduces this significantly. Finally, the cascode configuration is inherently more linear than the single, common-source stage. Because you need a +/-15 Volt supply for the servo circuit anyway, adding the cascode costs only two transistors and two resistors.

The second stage of the phono preamp consists of Q8-Q11, connected in cascode. The cascode connection in the second stage is essential, this stage is working with very high voltage swing and needs to be very linear. In addition, it has to contribute little noise to the overall sound, consequently these transistors have to be very low noise types. I am using the ROHM 2SB737 and 2SD786 for these positions. They are operated at 10mA collector current, in order to be able to drive the input capacitances of the output MOSFETs. D1 and D2 provide the bias voltage for the cascode transistors Q9 and Q10. They are referenced to the emitter voltage of Q8 and Q11 to keep the voltage across their collector-emitter junction constant. This reduces their effective capacitance and improves high frequency linearity.

The output stage consists of Q12 and Q13, using 2SK216 and 2SJ79 MOSFETs in TO-220 package. The output stage must be capable of driving the low-impedance feedback network, which, in the 20dB-gain position, is approximately 120 Ohm. This stage would be capable of driving such a low impedance in class-AB with a relatively low quiescent current. However, listening tests show that operating it in class-A produces a much better sound. Consequently, this stage is operated at approximately 80mA quiescent current, and requires proper heatsinking of Ql2 and Q13.

The feedback network allows you to select three gains in the RIAA stage: 20, 30 and 40dB. Note that the change of the gain will produce an instantaneous DC shift in the amplifier, which will stabilize itself in a few seconds, but which might be dangerous to your speakers. It is therefore recommended to switch off the unit before you change the gain.

Q7 and associated circuitry control the offset in the first stage. The filter-network around the servo circuit is selected in such a way that it does not affect the operation of the first stage in the audio frequency range. R27 and C16 provide the 75usec roll off for the RIAA equalization.

The input stage consists of Q1 and Q2, these are 2SK170/2SJ74 FETS. The input stage is operated at 4mA, 2mA in each FET. The current is adjusted by P3, with R35 presetting the adjustment range. It is recommended to use the BL or the V group for easy adjustment.

The second stage is an operational amplifier working in pure Class-A. For good linearity and for high drive capability the Class-A second-stage cascode is operated at 30mA. Q19, Q20, Q21 and Q22 are high current devices with good linearity at the operating current. D3 and D4 provide the bias voltage for the cascode transistors Q20 and Q21. Again, they are referenced to the emitter of Q19 and Q22 to keep the collector-emitter voltage of Q19 and Q22 constant. This reduces the effective capacitance and improves high frequency linearity. Q20 and Q21 have to be heatsinked due to the high power dissipation.

The feedback network, consisting of R41, R44, R45, and C24, make sure that the bass boost in the RIAA compensation is taken care of. The 1kHz gain of this stage is 24dB. C28 and R50-C29 are selected for good square wave response.

Q23 and Q24 provide +-24 Volt regulated voltage for the entire phono board. Q16 and Q18 are fixed +/-15 Volt regulators, providing the two servo circuits Q7 and Q17, with regulated voltage. They also supply reference voltage to the cascode transistors Q5 and Q6 in the input stage.

The power supply figure 2, is a dual-mono design featuring a shielded toroid transformer and bridge rectification utilizing the International Rectifier HEXFRED diodes. Capacitors C1-C8 are snubbers for the rectifier diodes thereby providing attenuation for any switching noise. C9-C12 provides filtering for the final +/-28Vdc output voltage.

Words of Caution

Always keep in mind that you are the manufacturer of this linestage. The final appearance of this equipment and its sound quality will largerly depend upon the care taken during the assembly of this kit. We recommend that your work surface be padded, clean of debris and kept clean during assembly. This will prevent the chassis from becoming accidentally scratched. Keep finger prints to a minimum (wear white cotton gloves when handling the chassis). This chassis design is very heavy so be careful and don't drop it on your dining room table! Don't create antennas out of the hookup wire by making big loops and arches. Keep all wiring neat, lead lengths short and routed close to the chassis. Believe us when we say "neat wiring sounds mo better".

Tools Required for Assembly

Soldering Iron
Solder
Solder Wick™ or Solder-Removing Device
Pliers
Wire Strippers
Hex Drivers
Screw Drivers
Multimeter
Cotton Gloves

Before Beginning

The next few pages include the schematics and parts lists. Check the components delivered to you against those on the parts list. Notify us immediately if there are any missing pieces.

Please read through the manual thoroughly before beginning assembly. This will give you with a rough idea of the entire assembly process and how much detail is provided herein.

Welborne Labs reserves the right to ocassionally change or substitute parts of equal or greater quality.

Phonostage Parts List

Resistors

R1,R6,R7,R9,R10	6.81	Holco (Caddock)
R2,R43	47.5k	Holco (Caddock)
R5,R12,R33, R34	22.0	Holco (Caddock)
R4,R14	237	Holco (Caddock)
R8	110	Holco (Caddock)
R11	12.0	Holco (Caddock)
R15	2.21k	Holco (Caddock)
R53,R55	2.21k	Holco
R19,R46	1.0M	Holco (Caddock)
R16,R47	1.0M	Holco
R17	249	Holco (Caddock)
R18	1.10k	Holco (Caddock)
R20,R22	200	Holco (Caddock)
R21,R23,R25,R29, R30,R40,R42	100	Holco (Caddock)
R24,R49	33.2k	Holco (Caddock)
R26,R50	47.5	Holco (Caddock)
R27	732	Holco (Caddock)
R28	100k	Holco (Caddock)
R31,R32,R38,R39	1.40k	Holco (Caddock)
R35	10.0	Holco (Caddock)
R36,R37	17.4	Holco (Caddock)
R41	221	Holco (Caddock)
R44	3.32k	Holco (Caddock)
R45	31.6k	Holco (Caddock)
R48,R51	68.1	Holco (Caddock)
R52,R54	121	Holco

Trimpots

P1,P4	10.0	Multiturn Cermet
P2	500	Multiturn Cermet
P3	200	Multiturn Cermet

Capacitors

C1	100-150pf/630V	Wima FKP
C11,C12,C14, C21,C25,C26	0.1uf/100V	Wima
C4,C6,C22,C27	10uf/35V	Elna
C5	220pf/50V	Polystyrene
C15	560pf/50V	Polystyrene
C10	150pf/630V	Wima FKP
C13	220pf/50V	Polystyrene
C16,C24	0.1uf/100V	Wima

Phonostage Parts List (one channel)

Capacitors (continued)

C17	Short	Not Used
C18,C20	47uf/63V	Elna
C2,C8,C28,C30,C32	0.1uf/63V	Wima MKS
C34		
C23	33pf/630V	Silver Mica
C29	330pf/630V	Wima FKP
C31,C33	10uf/63V	Elna

Semiconductors

Q1,Q2	2SK170BL/V
Q3,Q4	2SJ74BL/V
Q5,Q10,Q11	2SD786, 2SC3329 or 2SC1627A
Q6,Q8,Q9	2SB737, 2SA1316 or 2SA817A
Q7,Q17	LF411CN
Q12	2SK216 (use mica insulator/heatsink)
Q13	2SJ79 (use mica Insulator/heatsink)
Q14	2SK389BL/V
Q15	2SJ109BL/V
Q16	78L15
Q18	79L15
Q19	2SA817A
Q20	2SA1306 (use heatsink)
Q21	2SC3298 (use heatsink)
Q22	2SC1627A
Q23	LT1085CT (use mica Insulator/heatsink)
Q24	LT1033CT (use mica Insulator/heatsink)
D1,D2,D3,D4	LM336Z-2.5

Miscellaneous

H12,H13	Heatsinks (gold anodized)
H2,H3	Heatsinks Aluminum
STD	Standoffs (4) with screws (8)
RCA	Cardas Rhodium rca jacks (4)
GRND	Cardas ground post
Jumpers	Gain Select Jumper
Coax	Input/Output coax cable
HS	Heatshrink tubing
CB	Circuit Board

Power Supply Parts List (both channels)

Resistors

R1,R2	1kohm	1/2W metal film

Capacitors

C1,C2,C3,C4, C5,C6,C7,C8	.01uf/63V	Wima FKP
C9,C10,C11,C12	3300uf/35V	Elna
C13,C14	.01uf/1000V	Ceramic

Semiconductors

D1,D2,D3,D4, D5,D6,D7,D8	3A/600V	HEXFRED
LED		Blue Led w/harness (2)

Miscellaneous

T1,T2		Avel toroid power transformer w/screws & nuts (4)
STD		Standoffs (5) with screws (10)
IEC		IEC connector w/screws & nuts (2)
SW1,SW2	SPST	Toggle switch
Fuse	1A/250V	Fuse Holder and Fuse
ICORD		IEC power cord
H/W		Power Transformer Hardware 8-32 x 1/2 (4)
Wire		Hookup wire
CB		Power Supply circuit board

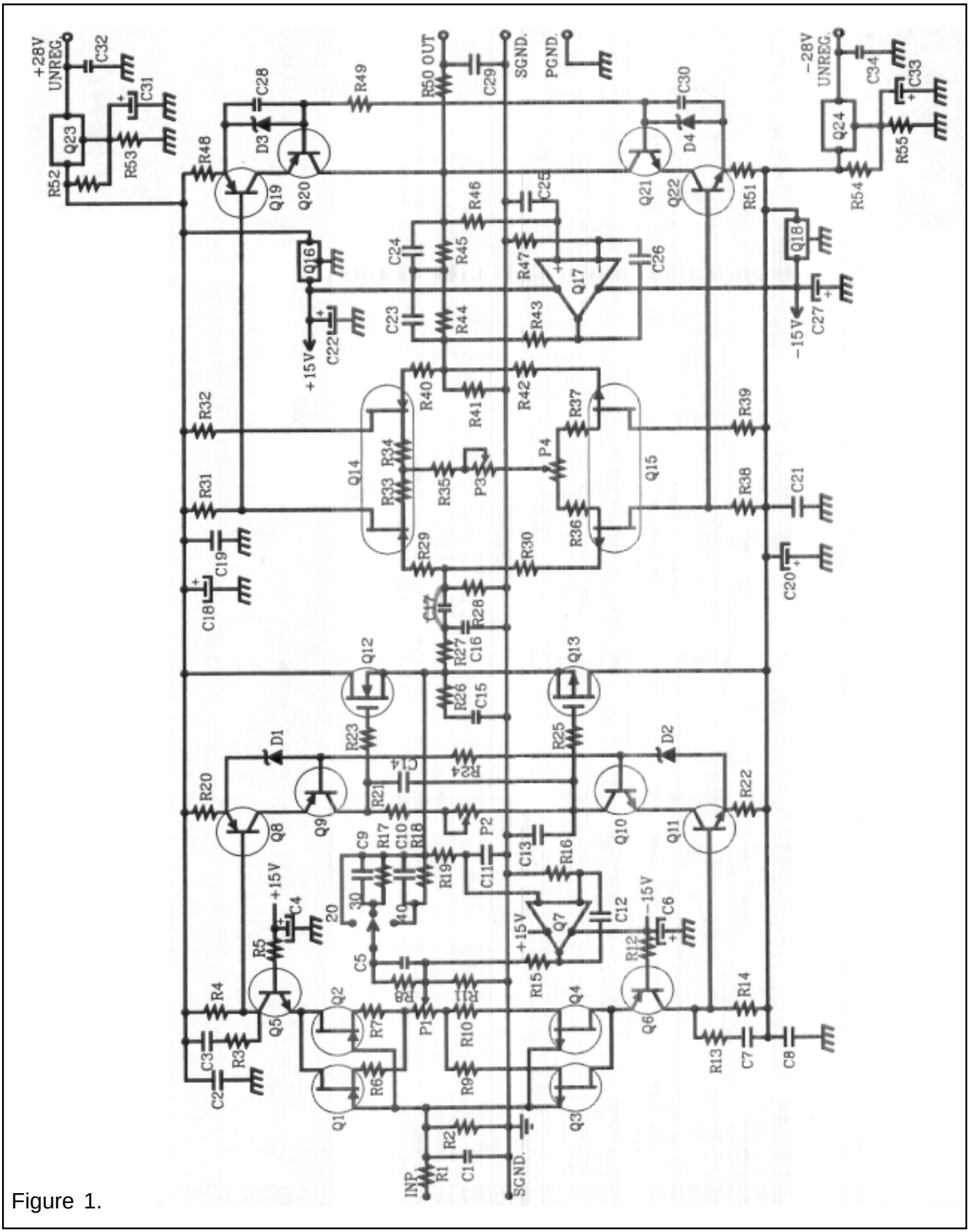


Figure 1.

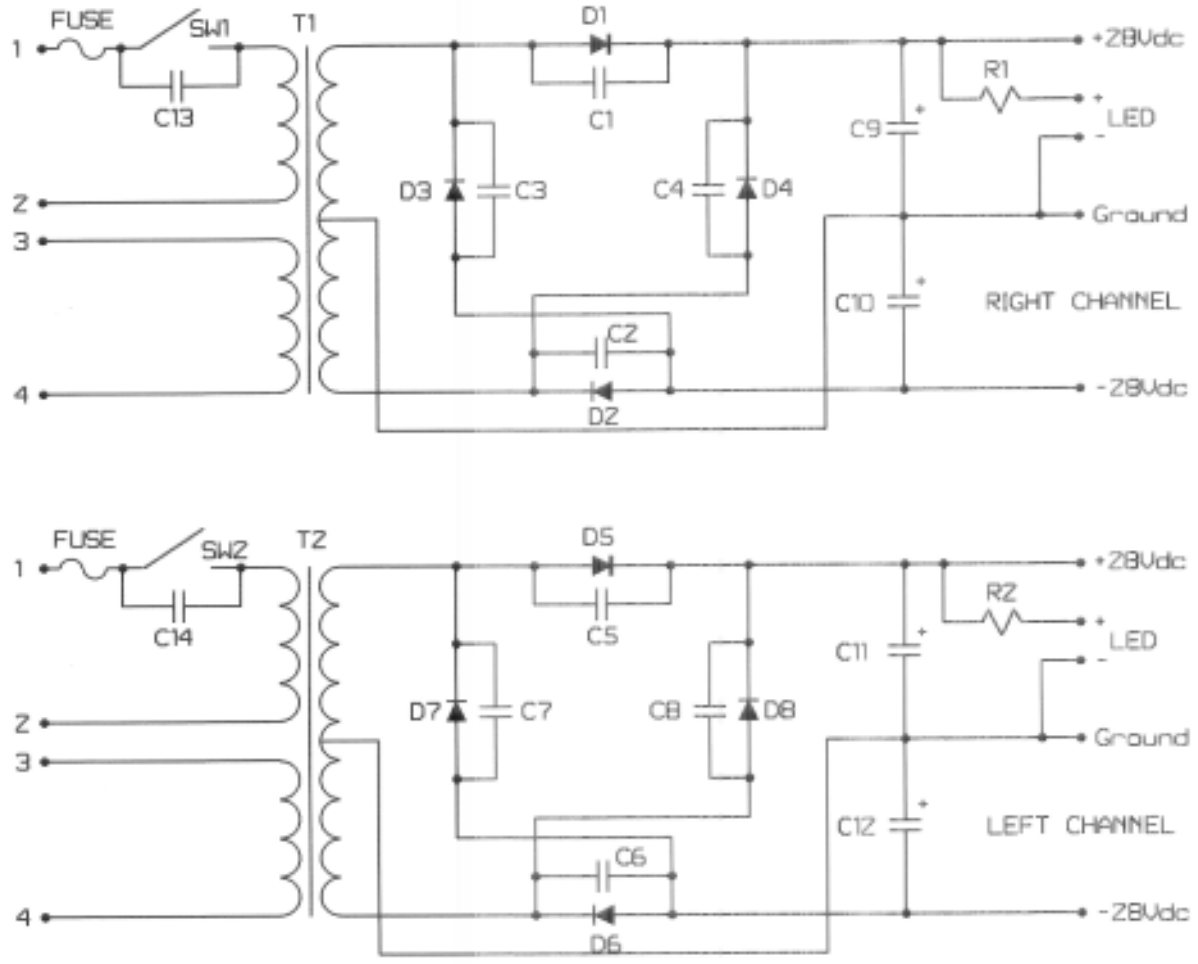

FUSE
SW1
T1
D1
C13
C1
+28Vdc
R1
LED
C9
1
2
3
4
D3
C3
C4
D4
Ground
C10
RIGHT CHANNEL
C2
D2
-28Vdc
FUSE
SW2
T2
D5
C14
C5
+28Vdc
RZ
LED
C11
1
2
3
4
D7
C7
C8
D8
Ground
C12
LEFT CHANNEL
C6
D6
-28Vdc

Figure 2.

Power Supply Assembly

Locate the large bag marked “Power Supply Parts”. Check the parts in the bag against the Parts List located on page 9 of this manual. Make sure all parts have been supplied before beginning assembly.

Locate the power supply circuit board. Turn the board upside down so the silver foil traces are visible.

Refering to figure 3, notice there are 6 places where the circuit board traces have been broken. We have labeled them on figure 3 as A, B, C, D, E & F. Some of these broken traces will be bridged depending upon your ac voltage requirements. (*yeah, I know, kind of a Kludge way of doing it, but as you will soon see, space is very tight inside the chassis.*)

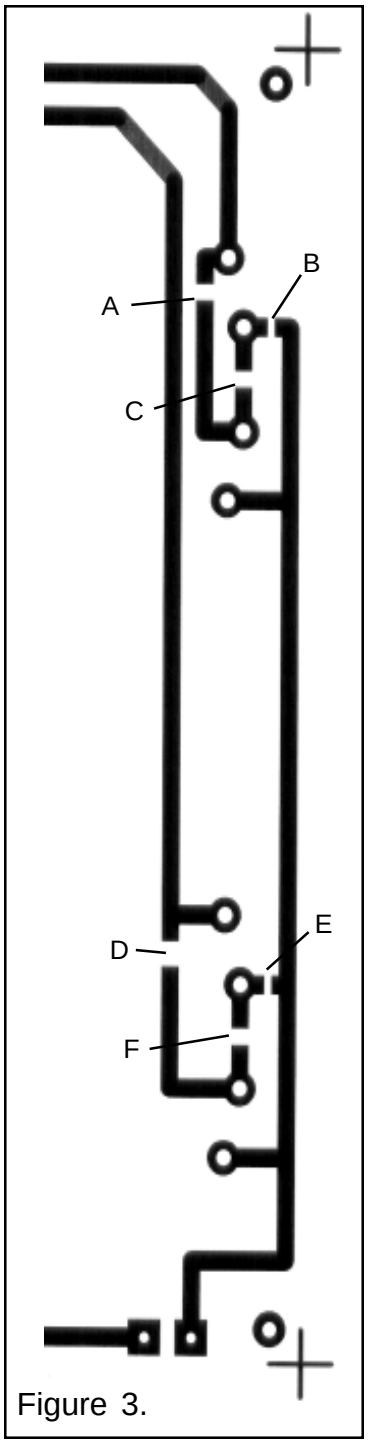


Figure 3.

A small bare piece of wire 1/4 inch in length will be used for each jumper. You can trim off the end of a resistor lead or use some of the solid core wire provided with the kit. Place the jumper across the broken circuit board trace. Place your soldering iron tip on top of the jumper wire and flow solder until a bridge is made. Allow the joint to cool.

For 115Vac operation solder jumpers at locations A, B, D and E only.

For 230Vac operation solder jumpers at locations C and F only.

Next locate the bag marked “R1/R2”. Turn the board over so the white component patterns are visible and locate the positions for R1 and R2. Bend the leads of resistors R1 and R2 and insert these leads through the holes. Push the resistor leads all of the way through the board so that the resistors are mounted flat against the circuit board. Turn the board over and solder the leads. Allow to cool and trim the leads.

Locate the bag marked “C1-C8”. In a similar manner as you installed the above resistors, install these capacitors in their designated locations, turn the board over and solder. Make sure the capacitors are sitting flat on the surface of the circuit board.

Let’s take a quick timeout and make sure you are mounting these parts correctly. Refer to figure 4 below. Are your parts mounted nice and straight? If not resolder them.

Figure 4.

How about your solder joints? You’re not using too much solder are you?

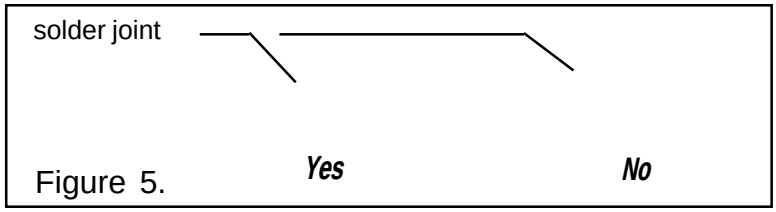


Figure 5.

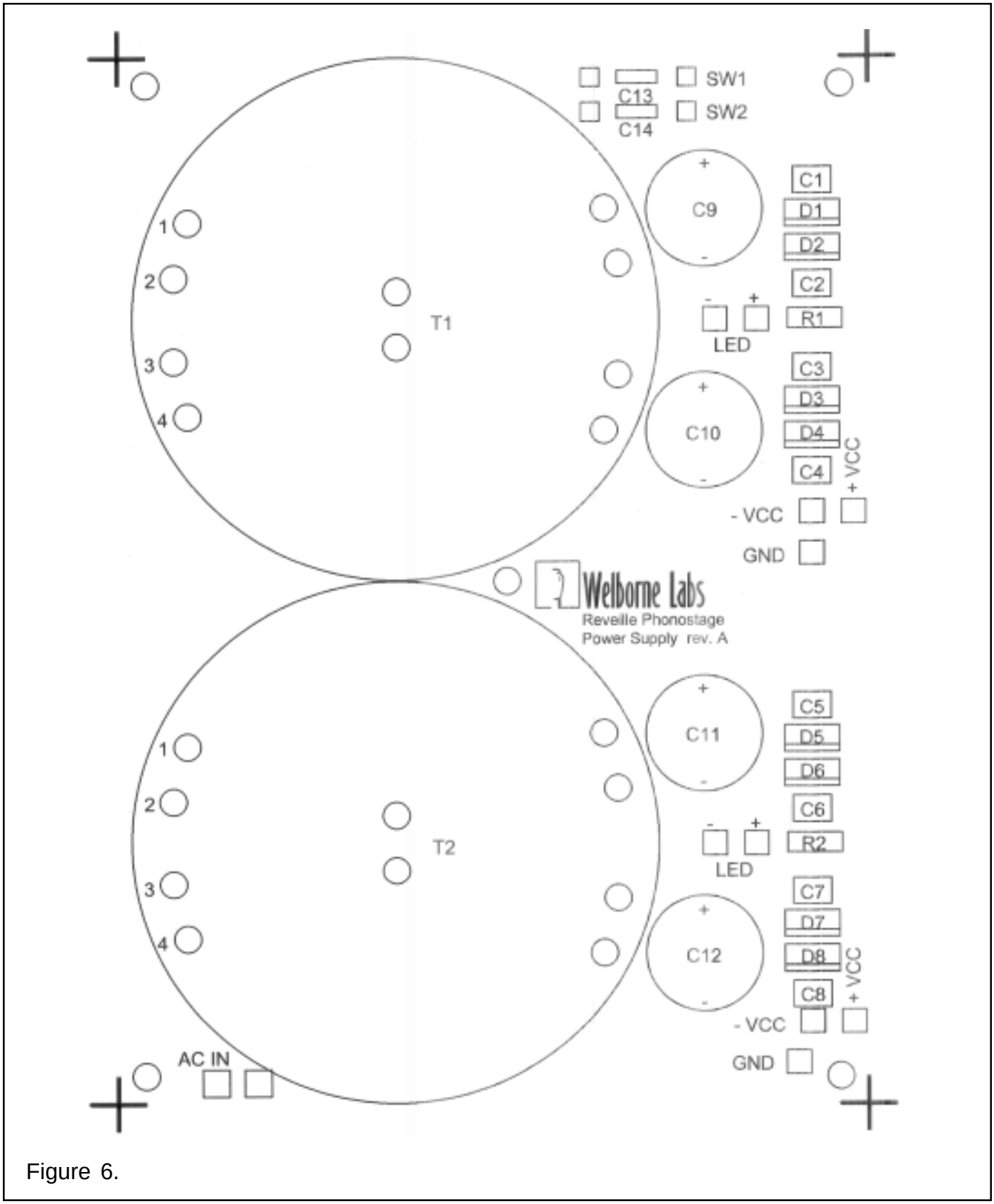

SW1
C13
SW2
C14
C9
C1
D1
D2
C2
R1
LED
T1
1
2
3
4
C10
C3
D3
D4
C4
+ VCC
- VCC
GND
Welborne Labs
Reveille Phonostage
Power Supply rev. A
C11
C5
D5
D6
C6
R2
LED
T2
C12
C7
D7
D8
C8
+ VCC
- VCC
GND
AC IN

Figure 6.

Power Supply Assembly (continued)

There are two unmarked pads beside capacitors C10 and C12. Use a short piece of wire and jumper these two pads by soldering the wire between them.

Install capacitors C9, C10, C11 and C12. Note the polarity of these components. The negative (-) terminal is identified on the capacitor body by the white stripe. Install and solder.

Install capacitors C13 and C14. These capacitors have no polarity.

Next install the power transformer T1 and T2. The terminals labeled 1 through 4 will be positioned towards the outside of the circuit board. Because of the terminal spacing the transformers can only be installed in the correct direction. Locate the bag marked “H/W” containing four screws. Two of these screws will be installed from the bottom side of the board up through the transformers thereby firmly attaching each transformer to the circuit board. You can now solder the transformer terminals to the circuit board.

Next install the 8 diodes D1-D8. These diodes have polarity and must be installed in the correct orientation. On the component diagram each rectangle, representing the diode, has a smaller rectangle inside it. This smaller rectangle represents the metal tab on the back of the actual diode. So install the diodes so their metal tab is oriented with the smaller rectangle.

Locate the bag marked “STD”. Install the 5 standoffs to the circuit board using the chrome plate screws. There is one standoff installed at each corner of the board and one installed in the middle of the board located between the two transformers.

Locate the black teflon coated hook up wire. Cut two pieces 3 inches in length and strip 1/4” of insulation from one end of both wires. Insert these wires through the two pads marked “AC IN”, turn the board over and solder. Trim the excess lead wire.

Cut two more pieces 3 inches in length and strip 1/4” of insulation from one end of both wires. Insert these wires through the two pads marked “GND”, turn the board over and solder. Trim the excess lead wire.

Locate the yellow teflon coated hook up wire. Cut two pieces 4 inches in length and strip 1/4” of insulation from one end of both wires. Insert these wires through the two pads marked “+ VCC”, turn the board over and solder. Trim the excess lead wire.

Locate the white teflon coated hook up wire. Cut two pieces 4 inches in length and strip 1/4” of insulation from one end of both wires. Insert these wires through the two pads marked “- VCC”, turn the board over and solder. Trim the excess lead wire.

Cut one piece of white hookup wire to a length of 3 inches. Strip 1/4” of insulation from one end, insert into the pad marked “SW1” and solder.

Cut one piece of white hookup wire to a length of 5 inches. Strip 1/4” of insulation from one end, insert into the pad marked “SW2” and solder.

Cut one piece of black hookup wire to a length of 3 inches. Strip 1/4” of insulation from one end, insert into the remaining pad next to C13 and solder.

Cut one piece of black hookup wire to a length of 5 inches. Strip 1/4” of insulation from one end, insert into the remaining pad next to C14 and solder.

Locate the bag marked “LED” and remove the two black/white wire harnesses. Measured from the small black cup end, cut the black and white wire of one harness to a length of 4”. Solder this harness to the pads marked “LED” located

Power Supply Assembly (continued)

between C9 and C10. The white wire is inserted into the pad marked " + " and the black is inserted into the pad marked " - ".

Measured from the small black cup end, cut the black and white wire of the remaining harness to a length of 9". Solder this harness to the pads marked "LED" located between C11 and C12. The white wire is inserted into the pad marked " + " and the black is inserted into the pad marked " - ".

This completes the assembly of the power supply circuit board. Turn the board over and closely inspect your solder joints under a bright light. Make sure there are no voids in the solder joints. If there are any voids you can reflow the solder with your soldering iron.

Power Supply Board Installation

Remove the chassis from its box and remove the top cover. Be very careful when handling the chassis and using tools around the chassis so as not to scratch its surface.

On the rear panel, install the IEC connector using the supplied hardware.

Cut two pieces of black hookup wire to a length of 2 inches and strip 1/2" of insulation from one end. Cut another piece of black hookup wire to a length of 4" and strip 1/2" of insulation from one end. Locate the bag marked "GND". Remove the ground post and insert all three wires into the threaded tube. Solder these wires (be careful not to allow solder to flow onto the threads) and allow the post to cool.

Locate the white Teflon coated coax cable. Cut two pieces to a length of 2.5", one piece to a length of 6.5" and another piece to a length of 7.0". On one end of each coax wire strip back 1/2" of the outer jacket. Be careful not to cut too deep as the shield is just beneath the surface of the Teflon jacket. The metal shield is braided. Use a small pin to unbraid the shield. Start at the cut edge and slowly pull the pin through the braid (away from the cable) working your way backwards until the shield is unbraided. Pull the unbraided wires to one side and twist together forming a single wire. Strip back 1/8" of insulation from the center conductor.

Locate the bag marked "RCA". Remove the washers and nut from each RCA jack. Solder the center conductor of each coax wire into the center barrel on the back of each RCA jack.

On the back plate of each RCA jack you will notice two notches and one small hole. Twist the braid wire tightly and insert into the small hole and solder.

Install the ground post onto the rear panel of the phono chassis. Tighten the locking nut securely. Gather one coax wire/ rca 2.5" in length and one coax/rca wire 6.5" in length. Previously you soldered two 2" wires to the ground post. Strip 3/8" of insulation from these two wires. Bend these stripped ends to form an "L" shape. Insert one wire end into the notch on the rca rear plate and solder. Solder the other stripped end to the other rca plate. You should now have two rca jacks with coax wires soldered to them and both jacks connected to the ground post.

Install these rca jack to the rear panel of the phono chassis. These RCA jacks are the "output" jacks. The 2.5" wire/rca is the left channel. The 6.5" wire/rca is the right channel. One teflon washer should be on the outside of the chassis and one washer placed on the inside of the chassis. Note: the washers have very small "shoulders" on one side. This shoulder should be inserted into the rear panel's mounting hole. Normally a red washer should be visible on the outside of the chassis for the "right" channel and a white washer visible for the "left" channel. Tighten the locking nuts securely.

Install the input rca jacks to the rear panel of the phono chassis. The 2.5" wire/rca is the left channel. The 7.0" wire/rca is the right channel. Tighten the locking nuts securely.

Install the fuse holder on the rear panel using the supplied hardware.

Power Supply Board Installation (continued)

Strip 1/4” of insulation from the remaining ground post wire and solder it to the center terminal on the IEC connector.

Cut a piece of black hookup wire to a length of 2” strip the ends and solder one end to the side terminal of the fuse holder. Solder the other end to the adjacent terminal of the IEC connector.

Locate the power switches SW1 and SW2. Install them on the front panel (don’t forget to wear the gloves when handling the chassis) by slowly screwing them into the threaded holes. Try installing the switches first without the jam nuts. Thread the switches as far as they will go. Do not over-tighten and strip the threads. The goal is to have the switch tight enough that it won’t become loose and rotate but you also want the switch oriented such that the body of the switch is vertical. If you are unable to position all of the switches vertically and secured tightly, remove the switches and install one jam nut onto the threaded bushing of the switch. Then install the switches back into the panel. By adjusting the jam nuts you will eventually be able to position the switches vertically and secured tightly. Make sure all of the switch toggles protrude out in front of the panel approximately the same distance. *This procedure will be a very iterative process but patience will pay off. If you run out of patience, you can cheat by applying a very very small amount of super glue to the threads at the base of the switch. Caution: too much glue and you may not be able to remove the switch should you need to.* Install the front panel onto the chassis.

Now we are ready to install the power supply circuit board. Position the board as shown in figure 7.

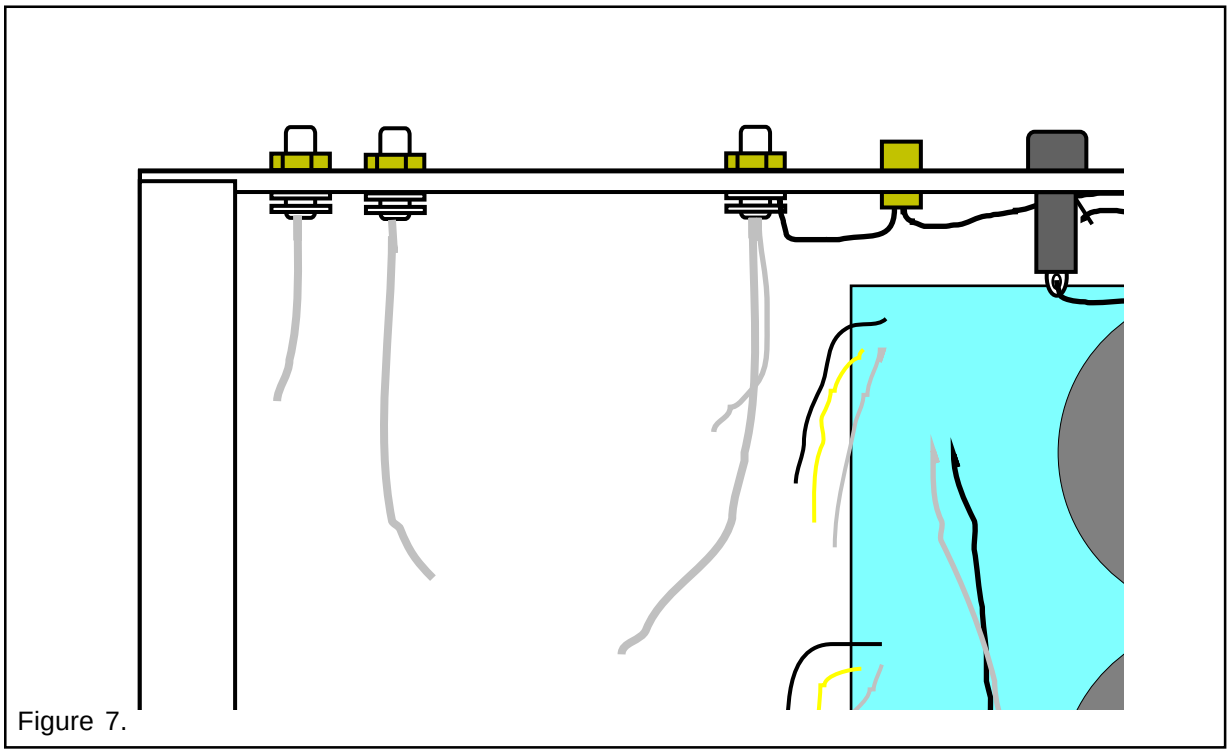


Figure 7.

Use the black screws to secure the power supply board. Feed them from the bottom of the chassis and into the plastic standoffs on the bottom of the circuit board.

Solder one wire from the pad marked “AC IN” to the remaining unused IEC terminal. Solder the other “AC IN” wire to the rear terminal of the fuse holder.

Locate the white wire and black wire emerging from each side of capacitor C13 on the circuit board. Twist these two wires together and route towards the “right” channel power switch. Cut the wires to proper length and solder the black wire to the center terminal on the back of the switch and the white wire to the bottom terminal.

Power Supply Board Installation (continued)

Locate the white wire and black wire emerging from each side of capacitor C14 on the circuit board. Twist these two wires together and route towards the “left” channel power switch. Cut the wires to proper length and solder the black wire to the center terminal on the back of the switch and the white wire to the bottom terminal.

Install the LEDs into the front panel. The LEDs are a “press fit” so push them in as far as they will go without exerting too much force. You will note that the LED has a long lead and a short lead. The long lead is the positive terminal the short lead the negative. Install the LED harness by inserting the LED leads into the black connector cup. The positive LED lead corresponds to the white wire on the LED harness and the negative lead is the black wire. You may need to shorten the LED leads so that the black connector cup can be pushed up flush to the back of the rear panel. A very tiny drop of super glue added to the connector cup lip will firmly hold it against the rear of the front panel. Don’t use too much in case you need to remove the LED at a later date.

You are now ready to test the power supply operation. Install the fuse in the fuse holder. Place the power switch toggles in the “down” position. Install the power cord and plug it into an ac outlet.

Test one channel at a time and use a volt meter to measure the voltages. Test the right channel first. Set the meter for DC volts at a scale of 30 volts or greater. Connect the red (+) test probe of the voltmeter to the yellow wire (+VCC) and the black (-) test probe of the meter to the black wire (GND). Flip the power switch. You should measure approximately 28 volts +/- 0.5 volts. Disconnect the red test probe, change the polarity of your meter and then connect this probe to the white wire (-VCC). You should measure 28 volts once again. Turn off this channel and allow the voltage to drain down to zero volts. Make sure both the +28 volts and -28 volts drain down to zero volts.

Repeat the above procedure for the left channel.

Troubleshooting Problems

Did you have any problems with the above measurements?

Did the LEDs turn on? If not, maybe you got the polarity reversed.

Did any capacitors explode? If yes, after you change your underwear, go back and check the polarity, you most likely have the capacitor installed backwards.

Other problems? Give us a call or e-mail.

Phono Board Assembly

There are two completely separate phonostages located on one circuit board (left and right channel). The directions will be given for the assembly of one channel. Repeat these instructions for the second channel.

Install the 4 plastic standoffs, one on each corner of the board, using the chrome plated screws.

You will notice on the board that in some places there is an unmarked white line between adjacent pads. Actually there is a total of 6 per channel. Install a jumper wire and solder it between these two pads.

Refer to figure 10B on the following page for this step. The PGND and SGND traces need to be connected for proper operation. Turn the phono board upside and solder a short bare piece of wire between the two traces shown on the board. Do this for both channels. Lay the piece of wire (indicated in red) on the board such that it makes contact with both circuit board traces, place your soldering iron tip on top of this jumper wire and flow solder until the wire is connected.

It is recommended to start the assembly of the board with the voltage regulators and then test its operation before proceeding. Install the following regulator parts: R52, R53, R54, R55, C18, C20, C21, C31, C32, C33, C34. Note that these capacitors have polarity and the negative terminal is identified by the gold stripe on the capacitor's side. Mount Q23 and Q24 to their aluminum heatsinks as depicted in figure 8 below. The heatsinks are mounted back-to-back and the transistors then attached by the screw and nut. Install Q23 and Q24 on the circuit board as shown in figure 11.

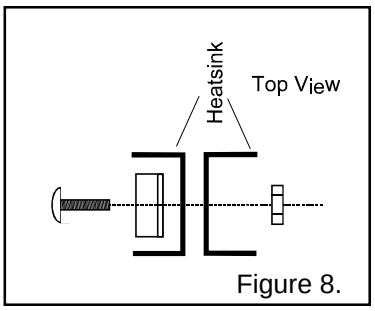


Figure 8.

Temporarily connect the power supply to the phonostage board. We recommend you use jumper clips as opposed to soldering wires to the pads. The +VCC output on the power supply board connects to the +28V pad on the phono board. The -VCC output on the power supply board connects to the -28V pad on the phono board. The GND output on the power supply board connects to the PGND pad on the phono board.

Power up each channel and measure the dc voltages. Connect the red (+) test probe to the resistor lead of R52 on the side closest to C31. Connect the black (-) test probe to ground. You should measure 24 volts. Turn off the power.

Reverse the polarity on the meter and connect the red (+) test probe to the resistor lead of R54 on the side closest to Q24. Connect the black (-) test probe to ground. You should measure 24 volts.

Next, install regulators Q16, Q18 and capacitors C22 and C27. Note that these capacitors have polarity and the negative terminal is identified by the gold stripe on the capacitor's side.

Power up each channel again and measure the dc voltages. Connect the red (+) test probe to the lead of regulator Q16 on the side closest to C22. Connect the black (-) test probe to ground. You should measure 15 volts.

Reverse the polarity on the meter and connect the red (+) test probe to the lead of regulator Q18 on the side closest to R41. Connect the black (-) test probe to ground. You should measure 15 volts.

If the above voltages test OK you can proceed with the installation of the first stage components.

Install the following components:

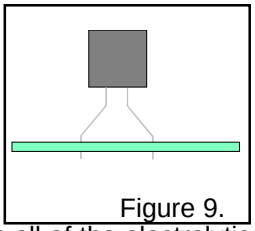


Figure 9.

R1 through R28. Note: R3 and R13 are not used so leave their slots empty. Mount all of the Holco resistors flush with the surface of the circuit board. If you are installing the Caddock resistors bend their leads and install them as shown in figure 9.

C1 through C17. Note: C3, C7 and C9 are not used so leave their slots empty. Note polarities on all of the electrolytic capacitors. Use a jumper wire in place of C17. C8 may be a tight fit between the previously installed resistors. You can install it on the bottom of the circuit board if you like.

Q1 through Q6 (do not install Q7 at this time). Q8 through Q13. Mount transistors Q12 and Q13 to the gold anodized heatsinks as shown in figure 10. D1 and D2.

P1 and P2. Set trimpot P1 to its midpoint position. Set trimpot P2 to its maximum position (about 10 turns in the clockwise direction).

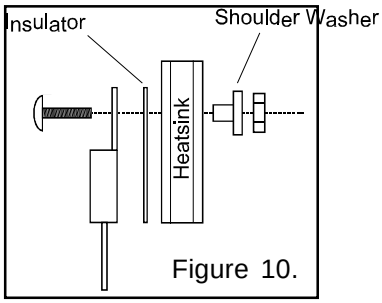


Figure 10.

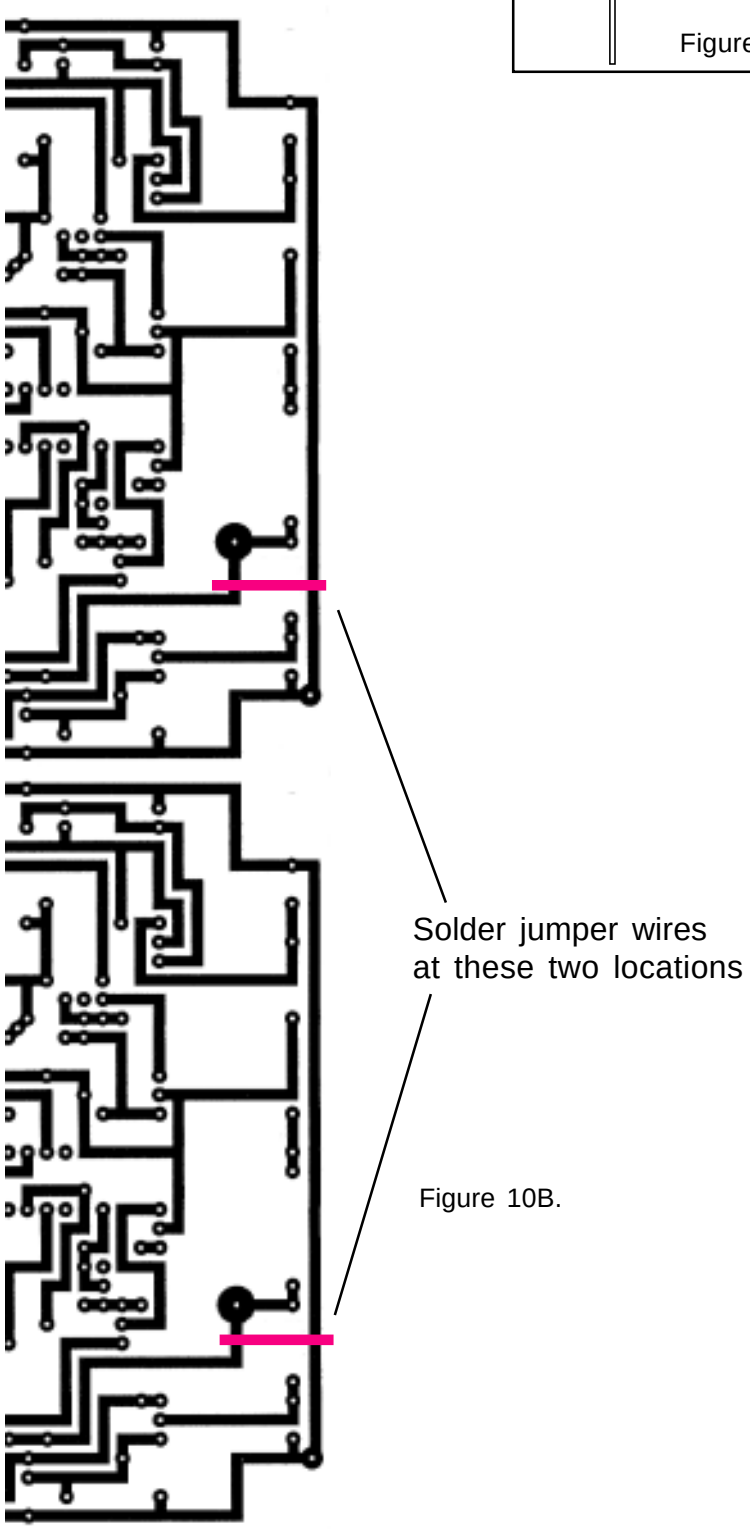
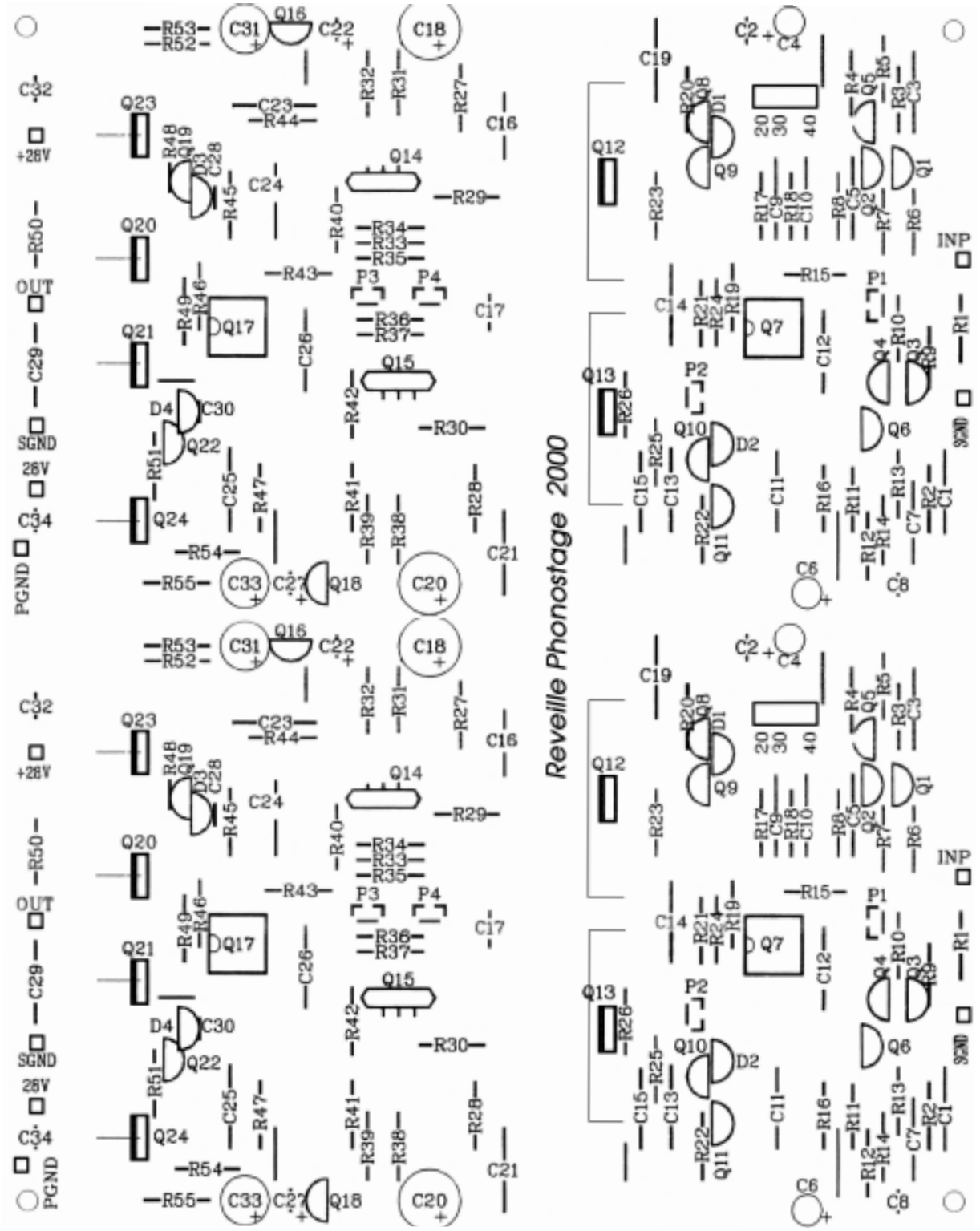


Figure 10B.


Reveille Phonostage 2000
+28V
OUT
SGND
-28V
PGND
INP
Q1
Q2
Q4
Q5
Q6
Q7
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16
Q17
Q18
Q20
Q21
Q22
Q23
Q24
D1
D2
D3
D4
P1
P2
P3
P4
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
C25
C26
C27
C28
C29
C30
C31
C32
C33
C34
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
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R20
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R24
R25
R26
R27
R28
R29
R30
R31
R32
R34
R35
R36
R37
R38
R39
R40
R41
R42
R43
R44
R45
R46
R47
R48
R49
R50
R51
R52
R53
R54
R55

Figure 11.

Phono Board Assembly (continued)

Install the jumper strip. The short leads are inserted through the circuit board and soldered on the foil side. These lead lengths are very short so make sure you get a good solder connection. Please Note: There is a very small connecting wire soldered to the bottom of the circuit board making contact with one of the jumper strip pads (only on one channel), do not disturb this wire. Set the blue jumper clip on the 20dB gain setting.

Connect a DC voltmeter across resistor R4 (or R14) and check the voltage drop. It should be between 2.4 and 3.2 volts.

Next you connect an ammeter in series between the +VCC connection on the power supply board and +28V connection on the phono board and set the ammeter to 200 mA. Adjust the total supply current to approximately 65mA with P2. This is equivalent to an output stage current of approximately 75 mA.

Connect the positive (+) test probe of your meter to the lead of R26 closest to C14 and the negative (-) test probe to ground. Check the DC offset voltage of the amplifier. Adjust the offset to zero volts with P1. Normally you should be able to do this, however if the output is still a few millivolts off of zero, leave it like that, turn the power off and install Q7.

With Q7 installed, turn on the power and measure the dc offset voltage again. After a few seconds the DC offset should go down to less than 2 mV. If it doesn't, you may have a significant mismatch between the N-channel and the P-channel JFETs. Call us before proceeding.

If the above voltage measurements checkout OK you can install the remaining components except for Q17. Note: C19 is not used so leave its slot empty.

Set P3 and P4 to their mid position.

Installing Q20 and Q21 to the heatsink does not require insulators.

Power up the phonostage and connect a voltmeter across R31 (or R38). Adjust the voltage drop across the resistor to between 2.4 and 3.2 volts with P3.

Connect the voltmeter to the output of the phonostage and check the offset voltage. Adjust the offset to zero volts with P4. You can install Q17 now, it should keep the offset at zero volts.

You can now connect the power supply board wires to the phono board. Cut to the appropriate length and solder. This is accomplished by inserting each wire through the top of the board and then folding the board up and over to solder the wires on the bottom. The +VCC power supply wires connect to the +28V pad on the phono board. The -VCC power supply wires connect to the -28V pad on the phono board. The GND power supply wires connect to the PGND pad on the phono board.

Connect the rca input jack wires to the phono board. Remove the input jacks from the rear panel. Strip approximately 1.25" of the outer Teflon jacket and unbraid the shield. Twist the unbraided wires together to form a single wire. Solder the center conductor of the coax cable to the phono board pad marked "INP". Solder the shield to the pad marked "SGND".

Repeat the above procedure for the output jacks. Solder the center conductor of the coax cable to the phono board pad marked "OUT". Solder the shield to the pad marked "SGND".

Reinstall the rca jacks and tighten the locking nuts securely.

Use the black screws to secure the phono board. Feed them from the bottom of the chassis and into the plastic standoffs on the bottom of the circuit board.

This completes the assembly of the Reveille Phonostage.

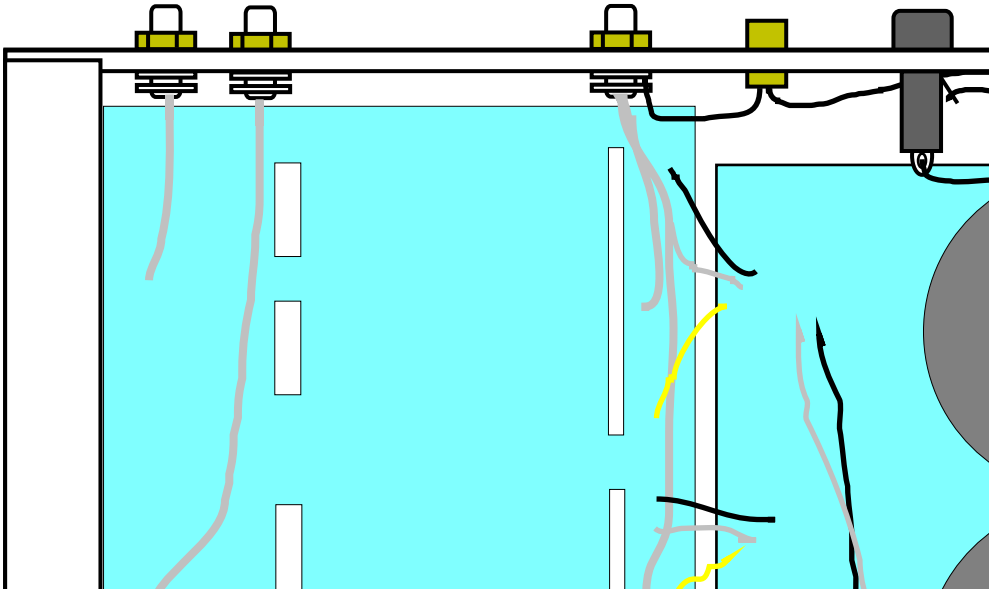

Figure 12.

If you have difficulty building or troubleshooting your equipment, give us a call. We will be glad to help you get your equipment running. We have a very high success rate at troubleshooting equipment problems over the telephone however phone calls can be expensive and they will be on your nickel, not ours. A letter or e-mail might be more appropriate, but in either case it will help if you have taken the time to write down as many symptoms as possible and also take and record some resistance measurements at key nodes in the circuit. If all else fails, you can send your phonostage to us, however this should be your last resort.

We have built and tested this phonostage many times over and it works and therefore we have to assume that if your phonostage does not work, it is most likely something you did wrong during assembly. Please be prepared to pay a flat rate fee of $35 per hour for repairs. Assuming you did a good job of assembling the unit but overlooked a step or installed a component incorrectly, our repair time should be minimal and your charges will most likely be under $100.00. Whatever the case may be, don't give up, please give us a call. We really want you to complete this project.

Final Notes

The Reveille Phonostage is designed to require a minimum amount of maintenance. A light application of a window cleaner, such as Windex, 409, etc., can be used to remove dust, dirt and fingerprints from the chassis. I recommend you ocassionally clean the rca connectors with a good quality cleaner/conditioner.

Have fun with your experimentation and listening. I hope you receive many years of enjoyment from your purchase.

Peace and Happiness,

Ron Welborne

Limited Warranty

Thank you for purchasing the Welborne Labs Reveille Phonostage

All Welborne Labs audio kits are covered by a limited 90 day parts warranty, effective from the date of purchase. With some exceptions (for example tube warranties) this limited parts warranty may be extended.

All factory assembled Welborne Labs products purchased in the United States are covered by a limited 3 year warranty, effective from the date of purchase. This warranty is valid for the original purchaser only.

Welborne Labs warrants its products to perform according to their specifications. Any failure, due to a manufacturing defect, will be corrected by Welborne Labs.

Under no circumstances would the following be included as warranty coverage:

Any product which has been operated in a manner not in accordance with the instructions in this manual.

Any product which has been repaired or modified by any person(s) not specifically authorized by Welborne Labs.

Any product which, in our judgement has been subjected to abuse.

This warranty gives you specific legal rights. You may also have other rights depending on the laws of the state in which you reside.

Should your Welborne Labs product fail, pack it in its original box, along with your bill of sale, and return it to Welborne Labs. The unit should be shipped freight prepaid to the factory. Welborne Labs will prepay the freight for the return trip.

Welborne Labs P.O. Box 260198, 971 E. Garden Drive Littleton, CO 80126 USA
PH: 303.470.6585 FAX: 303.791-5783 E-MAIL: wlabs@ix.netcom.com

Reveille

Phonostage

Owners & Assembly Manual