ULTRAPATH bp

Battery Powered
Vacuum Tube Linestage

Assembly Manual

designed by:

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Welborne Labs

ULTRAPATH bp
Battery Powered Vacuum Tube Linestage

The Welborne Labs *ULTRAPATH* bp linestage distinguishes itself by continuing the company's 15 year commitment to manufacture uncompromised audio products at affordable prices. The *ULTRAPATH* bp is the first of our new generation of products built to deliver a perceivable quality that adheres to the Welborne Labs design criteria of superb sound, unsurpassed construction and appearance, and outstanding reliability. One important note: the *ULTRAPATH* bp (the "bp" stands for battery-powered) is the first battery-powered vacuum tube linestage "kit" to be offered to the world!

The *ULTRAPATH* bp Linestage includes: 3-input capability (CD, Tuner, Aux), 1 main output and a second output that can be used for biamping, headphones, tape monitoring, etc. The battery-powered concept provides ultra-quiet operation with none of the hash, grundge and phase-anomally related noise attributed to equipment connected to the ac line. This concept, along with the *ULTRAPATH* bp's high component quality, offers the listener a more natural sound capable of greater resolution than most active preamplifiers built today.

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Features, Installation and Operation

Top Panel Features

Source Selection

The *ULTRAPATH* bp uses toggle switches for source switching. Three sources are available including CD, Tuner and Aux. The source switches correspond to the identically named inputs on the rear panel. Positioning the toggle in the "forward" position selects the source. Caution: with this type of source switching, more than one source can be selected at a time therefore, when changing sources, always de-select the old source before selecting the new source. A unique design feature of the *ULTRAPATH* bp provides switching of each source's ground in conjunction with its signal. This feature provides complete isolation of the unselected sources thereby reducing unwanted noise. The signal(s) of unselected sources are also attenuated, further reducing the broadcast of noise into the linestage chassis.

Note: when changing sources it is always good practice to reduce the volume level to its lowest setting.

Volume and Balance Control

The Basic *ULTRAPATH* bp has no balance control capability.

With the Ultimate *ULTRAPATH* bp, volume is controlled by the independent left and right channel mono attenuators. Each attenuator has 24 steps set at approximately 2dB per step. Left and right stereo balance can be obtained by adjusting one channel's attenuator for more or less gain than the other channel.

Rear Panel Features

Inputs

The inputs are separated by channel. The right channel inputs are on the left side of the rear panel and the left channel inputs are on the right side of the rear panel. The *ULTRAPATH* bp Linestage should be powered down when mating and demating connections.

Outputs

The outputs are also separated by channel. The right channel outputs are on the left side of the rear panel and the left channel outputs are on the right side of the rear panel. A second set of outputs are provided and connected in parallel with the main outputs. This second set of output jacks can be converted for tape loop operation or they can be connected to the 300 ohm tap of the output transformer for headphone operation.

Battery Supply Features

The "Left" and "Right" power transfer switches select between the "charging" mode of operation and the "play" mode for each channel. With the switches in the aft position, the LEDs on the Battery Supply should be illuminated indicating the batteries are in the charge mode. With the switches in the forward position, the LEDs on the Battery Supply will be off and the LEDs on the linestage chassis will illuminate indicating that battery power is now applied to the preamp. While the charging circuit does not charge the batteries while in the play mode, the Battery Supply on-off switch can be turned to the "off" position thereby turning off the charging circuit. This will help to reduce noise.

An overnight charge of the batteries should yield approximately 8-10 hours of continuous use. Charging the batteries for 15-20 hours can result in 10-12 hours of continous use. The charging circuit is a trickle charger and thus can be left on for extended periods of time. However, if you do not plan to use the Battery Supply for an extended period of time, it is best to disconnect the supply from the preamp and turn off the charger.

Installation and Operation

Please read through the following setup instructions before operating the *ULTRAPATH* bp Linestage.

1. Connect the signal cables from the source components into the *ULTRAPATH* bp's rear panel jacks.

2. Connect the amplifier input cables to the *ULTRAPATH* bp's main outputs.

3. Flip the "Left" and "Right" transfer switches on the Battery Supply to their aft position. Connect the umbilical cord between the Battery Supply and Preamp. Flip the transfer switches to their forward position.

4. Select the appropriate source, turn up the volume, and enjoy the music.

ULTRAPATH bp

Assembly Manual

Cautionary note:

This product uses rechargeable Lead Acid Batteries and while they are sealed, improper use and operation can result in explosive gases.

- Do not short circuit the battery terminals
- Do not charge in a gas tight enclosure
- Keep away from children
- These batteries contain toxic lead electrodes
- These batteries contain corrosive sulfuric acid

The user assumes all responsibility for the proper use and handling of these batteries.

Please dispose or recycle these batteries properly and in accordance with your local environmental regulations.

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). 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. Note: Items in the parts lists printed in red ink are for the Ultimate Version of this kit.

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

Preamp Parts List

(Note: The left and right channels are identical so for example, there are two resistor “R1”, one for the left channel and one for the right channel.)

R1, R3	100 ohm	Dale (Caddock) - film resistor	(4)
R2	2.61 kohm	Dale (Caddock) - film resistor	(2)
R4	20 kohm	Dale - film resistor	(2)
R5, R6, R7	560 ohm	XYZ - carbon film resistor	(6)
R8	5.11 kohm	Dale (Caddock) - film resistor	(2)
C1	39uf/250V	Solen - polypropylene capacitor	(2)
C1	35uf/440V	ASC - oil capacitor	(2)
C2	10uf	XYZ - (ELNA) - electrolytic capacitor	(2)
C4, C5	470uf/16V	XYZ - (ELNA) - electrolytic capacitor	(4)
S1	sockets	Chinese - Ceramic	(2)
V1	6GM8/ECC86	Various Manufacturers	(2)
LED	diode	green (blue) - light emitting diode	(2)
LH	Harness	LED connector harness	(2)
OT	output transformers	Electra-Print	(2)
VOL	attenuator	Alpha (Gold Point)	
SW1, SW2, SW3	4PDT	Selector Switch	(3)
RCA	connectors	Cardas (Vampire)	(10)
CON1	connector	Power Connector	(1)
CB	circuit board	Double-sided circuit board	(1)
SCY	hookup wire	18ga. solid core red	(1) (2)
SCW	hookup wire	18ga. solid core white	(1) (2)
SCB	hookup wire	18ga. solid core black	(1) (2)
TBL24	hookup wire	24ga. stranded blue (basic only)	(4)
TG24	hookup wire	24ga. stranded green (basic only)	(4)
TB20	hookup wire	24ga. stranded black (basic only)	(8)
TBL20	hookup wire	20ga. solid blue (basic only)	(1)
TG20	hookup wire	20ga. solid green (basic only)	(1)
TB20	hookup wire	20ga. solid black	(1)
SIL23R	hookup wire	23ga. solid core silver red	(8)
SIL23W	hookup wire	23ga. solid core silver white	(8)

PREAMP CHASSIS

Chassis	aluminum chassis		(1)
Bottom	chassis bottom		(1)
FEET	rubber feet	Rubber feet with mounting screws/nuts	(4)
H/W1	screws	Black buttom head screws 6-32	(10)
ST	standoffs	1/2” metal standoffs	(5)
STAR	star washer	ground washer	(1)
CLIP1	nylon clips	Wire harness adhesive clips	(2)
CLIP2	nylon clips	C1 capacitor harness	(2) (4)
KNOB	control knob	Aluminum knob	(1) (2)

Attenuator Resistor List (10K)

(for upgraded controls and Ultimate Version only)

Stereo Attenuator

Step		
1	R1	10.0
2	R2	22.0
3	R3	30.1
4	R4	34.8
5	R5	45.3
6	R6	61.9
7	R7	75.0
8	R8	90.9
9	R9	121
10	R10	150
11	R11	182
12	R12	221
13	R13	274
14	R14	392
15	R15	475
16	R16	562
17	R17	750
18	R18	953
19	R19	1.21k
20	R20	1.50k
21	R21	1.82k
22	R22	2.21k
23	R23	2.74k

Dual Mono Ladder Attenuator

Step		Row A	Row B
1	R1	10.0K	0.00
2	R2	10.0K	22.0
3	R3	10.0K	45.3
4	R4	10.0K	90.9
5	R5	10.0K	121
6	R6	10.0K	150
7	R7	10.0K	182
8	R8	10.0K	249
9	R9	10.0K	348
10	R10	8.25K	402
11	R11	8.25K	499
12	R12	8.25K	681
13	R13	8.25K	825
14	R14	8.25K	1.0K
15	R15	8.25K	1.21K
16	R16	8.25K	1.50K
17	R17	6.81K	2.21K
18	R18	6.81K	2.74K
19	R19	6.19K	3.32K
20	R20	5.62K	3.92K
21	R21	4.99K	5.11K
22	R22	3.16K	6.81K
23	R23	1.91K	8.25K
24	R24	0.00K	10.0K

Battery Supply Parts List

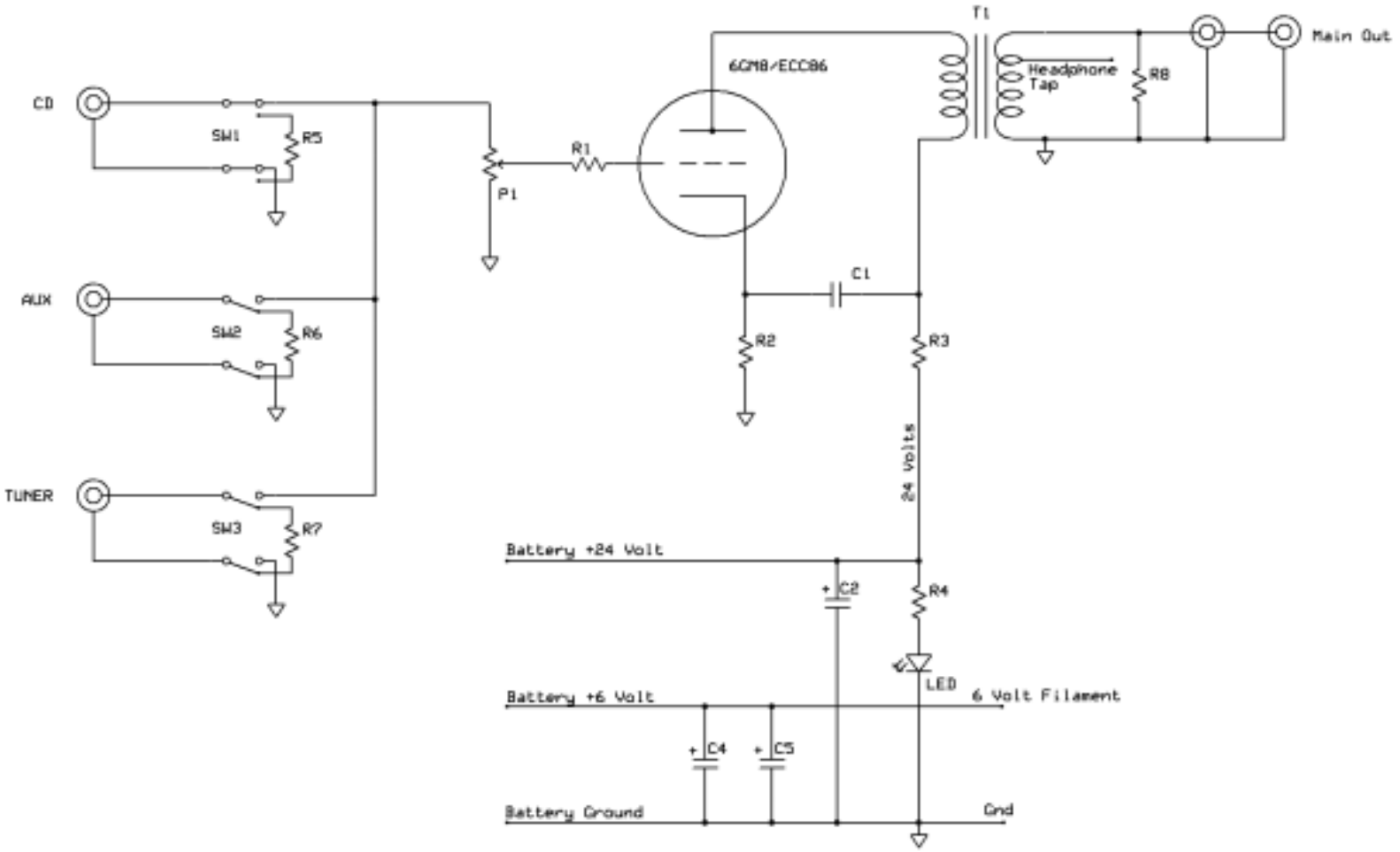
R1, R2	680 ohm	ABZ - metal oxide resistor	(2)
R3, R4	5.1 ohm	ABZ - metal oxide resistor	(2)
C1, C2, C3, C4	330uf/50V	Electrolytic capacitor	(4)
BR1, BR2, BR3, BR4	rectifier	1A/100V Bridge rectfier	(4)
T1	transformer	24V transformer	(1)
T2	transformer	6V transformer	(1)
D1, D2	LED	green (blue) light emitting diode	(2)
LS1, LS2	socket	LED socket	(2)
LH1, LH2	harness	LED connector harness	(2)
B1, B2	battery	6 Volt SLA battery	(2)
B3, B4, B5, B6	battery	12 Volt SLA battery	(4)
CB	circuit board	Double-sided printed circuit board	(1)
FB	fuse holder		(1)
F1	fuse	1/2A 3AG fuse	(1)
F2, F3, F4, F5	fuse	1/2A 2AG pigtail fuse	(4)
PCORD	power cord	18ga 6 foot	(1)
SR	strain relief	power cord strain relief	(1)
CON1	connector	dc power connector	(1)
SW1, SW2	3PDT	Transfer switch	(2)
SW3	SPST	On-Off Switch	(1)
QD	connector	Quick disconnect	(12)
HS	tubing	Heatshrink tubing	(1)
TWR	hookup wire	18ga stranded red	(3)
TWB	hookup wire	18ga stranded black	(4)
TWW	hookup wire	18ga stranded white	(3)
SCW	hookup wire	20ga solid white	(2)
SCB	hookup wire	20ga solid black	(2)
SCR	hookup wire	20ga solid red	(2)
SOL	Solder		(1)

BATTERY SUPPLY CHASSIS

Chassis	aluminum chassis	Battery box	(1)
Top	aluminum top	Battery box cover	(1)
Shelf	aluminum plate	Circuit board shelf	(1)
HL	aluminum handle	Box handle w/ 8-32 screws	(1)
FEET	rubber feet	Rubber feet self-adhesive	(4)
H/W1	screws	Black buttom head screws 6-32	(16)
H/W2	screws	Circuit board mounting screws 4-40	(8)
H/W3	screws	Handle screws 8-32	(2)
ST1	standoffs	1.75” metal standoffs	(4)
ST2	standoffs	.375” plastic standoffs	(4)
FOAM		Foam sheets	(4)

UMBILICAL CORD

CON2	connector	Umbilical connector	(2)
CABLE	umbilical cable	6 conductor cable	(4)
HS	heatshrink	.50 4” section	(1)



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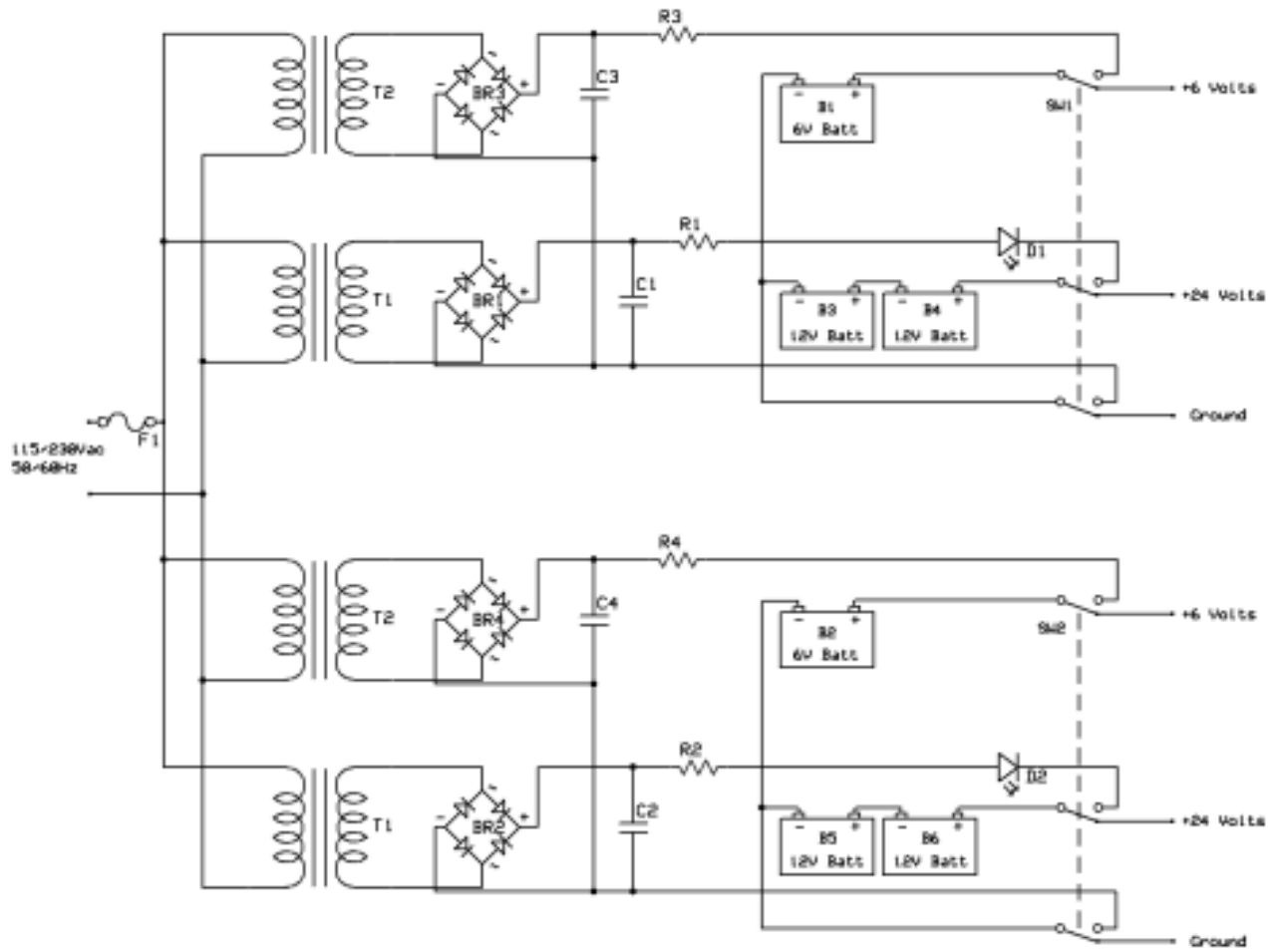
ULTRAPATH bp copyright 2002, 2003		
R. Welborne	Rev 1.2 09/02/2002	Preamp



Welborne Labs		
ULTRAPATH bp copyright 2002, 2003		
R. Welborne	Rev 1.2 09/02/2002	Battery Supply

In the Beginning

We will assemble the battery supply first and you can then be charging the batteries while you assemble the preamp.

Remove the batteries and battery case from its protective packaging. Locate the four adhesive-backed rubber feet and install one under each corner of the battery case bottom. Install batteries B1 and B2 (6 volt batteries) inside the case as shown in Figure 1. Note: Be careful when installing handling the batteries. Do not allow the battery terminals to make contact with the chassis as this could cause a short resulting in violent arcing and damage to the battery and chassis. A foam pad fits between battery B2 and the chassis side wall. Install batteries B3 and B4 (12 volt batteries) next, once again inserting a black foam pad along one of the side walls. Install B6 next and B5 last. The foam pads should provide a snug fit for the batteries.

The next step involves making the wire connections to each of the batteries. Locate the 18ga. stranded hookup wire (red, black and white), the quick disconnect spades (QD), pigtail fuses (F2, F3, F4, F5) and black heatshrink tubing.

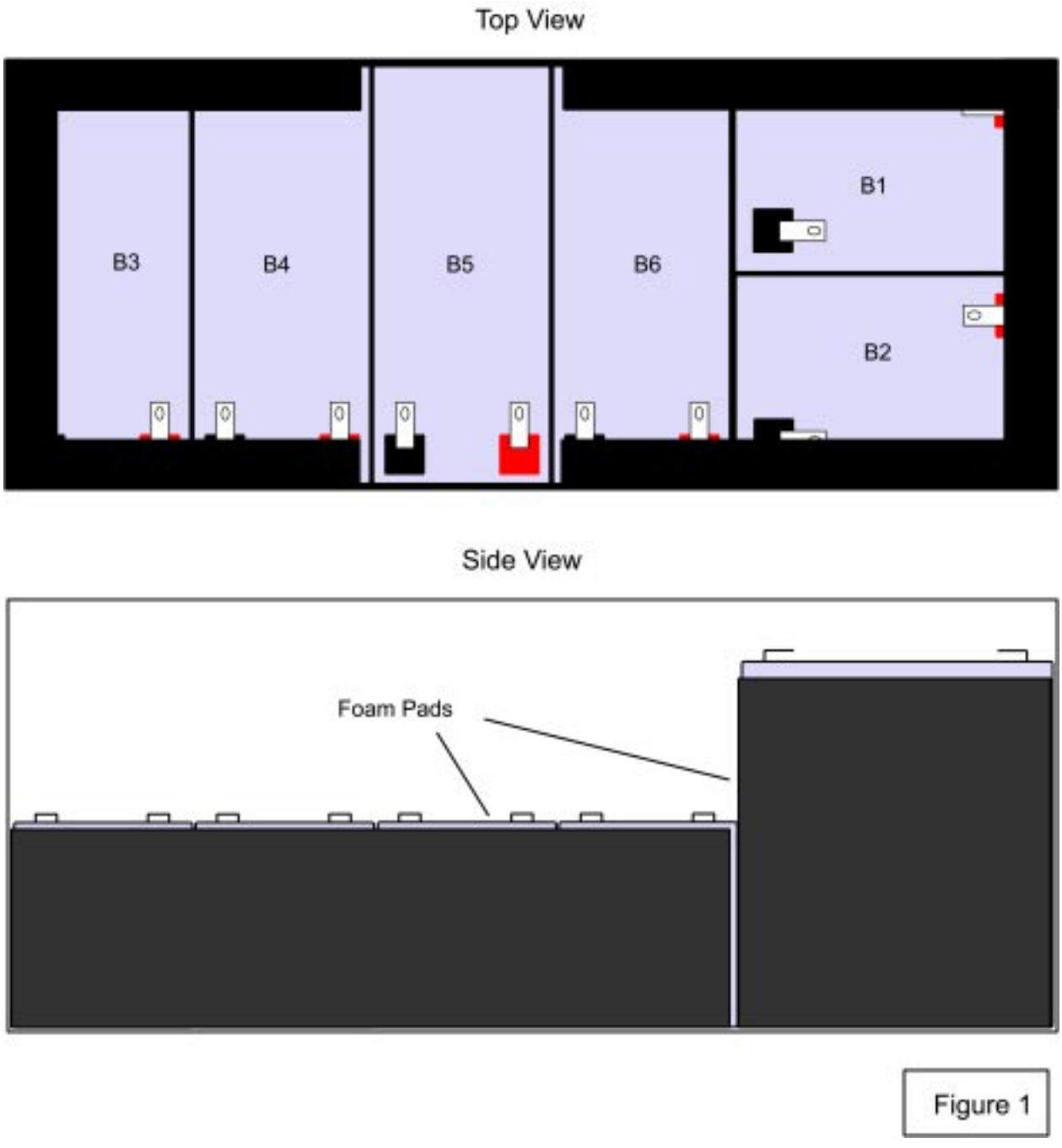


Figure 1

First, make two jumper wires that will be used to series connect the 12 volt batteries. These are the short arch-shaped wires connecting the positive terminal of B3 to the negative terminal of B4 and the positive terminal of B5 to the negative terminal of B6 as shown in Figure 2 below. For each jumper, cut a 2 inch piece of red hookup wire, strip 1/4" of insulation from each of the wire, solder each end into the QD spade and cover with a 1/2" length of black heatshrink tubing. Use a hairdryer or heat from your soldering iron to shrink the tubing over the back of the connector.

Bend the jumper wires into an arch shape and install onto the battery terminals as shown in Figure 2. If the QD spades are too tight to fit onto the battery terminals, you can first loosen their grip a little by inserting a small screwdriver blade into their tangs.

Next, cut 4 pieces of black 18ga. stranded hookup wire 9" in length, solder a QD spade to only one end and cover with black heatshrink tubing. Install these four pieces of wire onto the negative battery terminals of B1, B2, B3 and B5 as shown below.

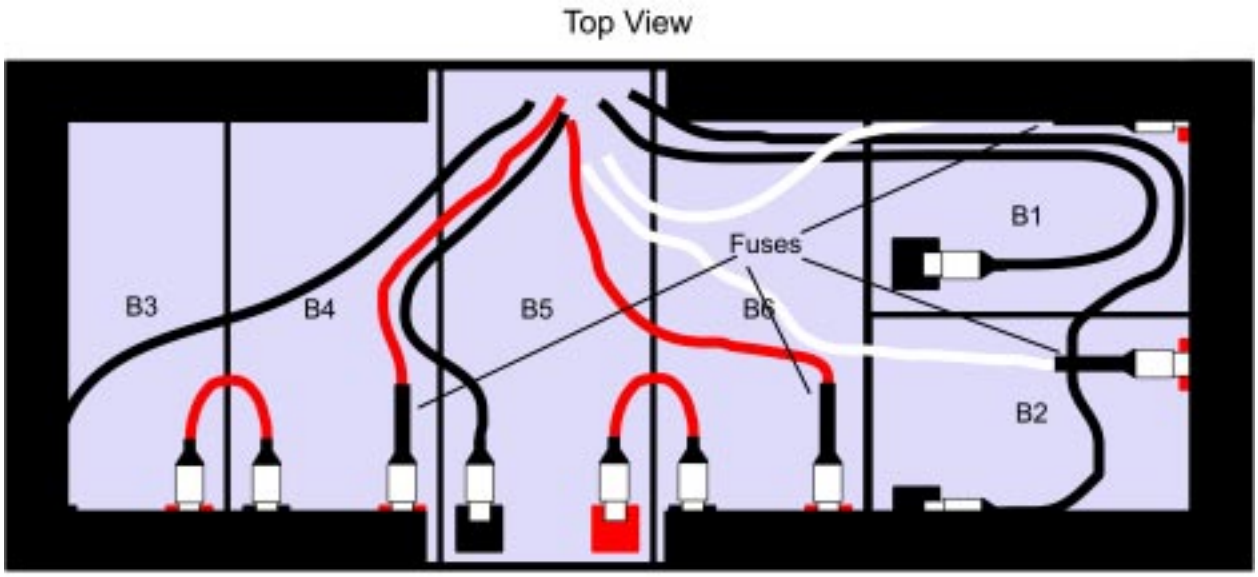


Figure 2

Next, cut 2 pieces of red and white 18ga. stranded hookup wire 8" in length and strip 1/2" of insulation from one end only. Retrieve the pigtail fuses F2, F3, F4 and F5 from their plastic bag. Referring to Figure 3, one end of each pigtail fuse will be soldered to a QD spade and the other end soldered to a red wire.

Take one fuse, cut one of its leads to a length of 1/4" and its other lead to a length of 1/2". Twist the 1/2" length fuse lead around the stripped end of the red wire and solder. Insert the 1/4" length fuse lead into the QD spade and solder. Cut a piece of black heatshrink tubing long enough to cover the fuse, the solder connection to the red wire and the back of the QD spade as shown in Figure 3.

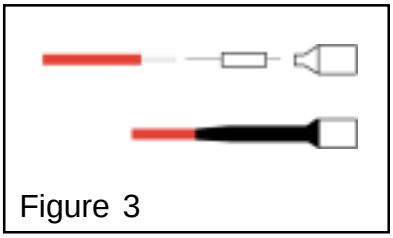


Figure 3

Install these four pieces of wire onto the positive battery terminals of B1, B2, B4 and B6 as shown in Figure 2.

Next you will assemble the battery charger circuit board. Locate the circuit board and the bags marked “H/W2” and “ST2” containing the plastic standoffs. Attach the four standoffs to the corners of the circuit board using four of the screws. The standoffs should be on the side of the board opposite the lettering side.

You will mount the components flat on the surface of the circuit board and on the side with the lettering. Refer to Figure 4 as a guide for proper mounting of the components.

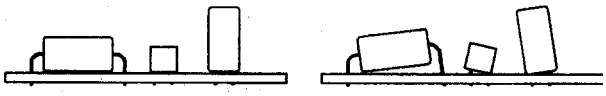


Figure 4

OK, while we’re on the topic of proper assembly techniques...what do your solder joints look like? Refer to Figure 5 for proper solder-etiquette.

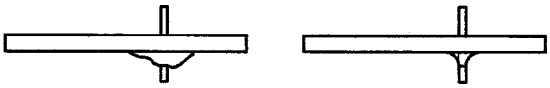


Figure 5

The component leads will be soldered on the side of the circuit board opposite the lettering.

Refer to the component placement guide Figure 6 for the following steps:

Begin with the jumper wires J1 thru J6. Any small gauge wire will work for these jumpers. If you will be operating your ULTRAPATH bp at 110-115Vac install only jumper wires J3, J4, J5 and J6. If you will be operating your ULTRAPATH bp at 220-240Vac install only jumper wires J1 and J2. The leads of these wires should be as short as possible and flat against the circuit board.

Install and solder the resistors R1, R2, R3 and R4.

Install and solder the bridge rectifiers BR1, BR2, BR3 and BR4. Note the polarity on the component body and placement guide.

Install and solder the capacitors C1, C2, C3 and C4. Note the polarity on the component body and placement guide. The white stripe on the body of the capacitor points to the negative terminal.

Install and solder the transformers T1 and T2. Make sure you have them mounted as close to the circuit board as possible. Note the polarity on the component body and placement guide.

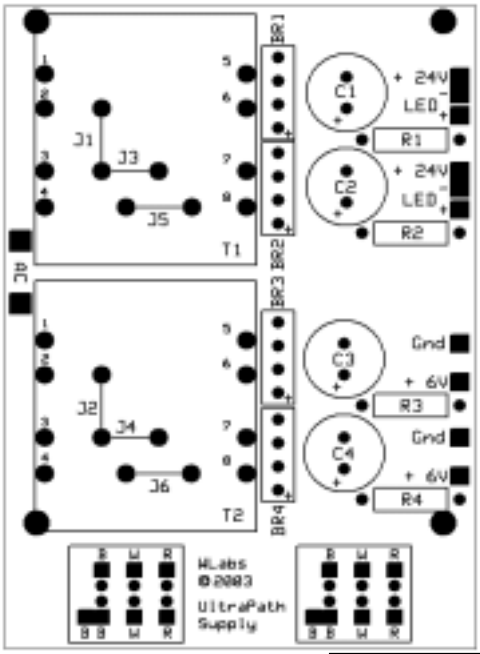


Figure 6

Locate the 20ga solid core hookup wire (red, black & white). Referring to Figure 7, six jumper wires are soldered between the pads on the circuit board.

While Figure 7 shows the wires positioned on the component side of the circuit board, you should actually solder these wires to the bottom side of the circuit board. Cut the wires as short as possible and keep them located as close to the circuit board as possible.

Next, locate the bag marked “LH1, LH2”. These are the connector wires and connector for the LEDs (Light Emitting Diodes). Measured from the black connector end, cut each wire to a length of 5”. Strip 1/4” of insulation from each white and black wire. Once again, these wires will be soldered to the bottom side of the circuit board. Solder the white wire to the pad marked “LED+” and the black wire to the pad marked “LED-” as shown in Figure 7.

This completes the assembly of the Battery Charger circuit board. Place it out of the way.

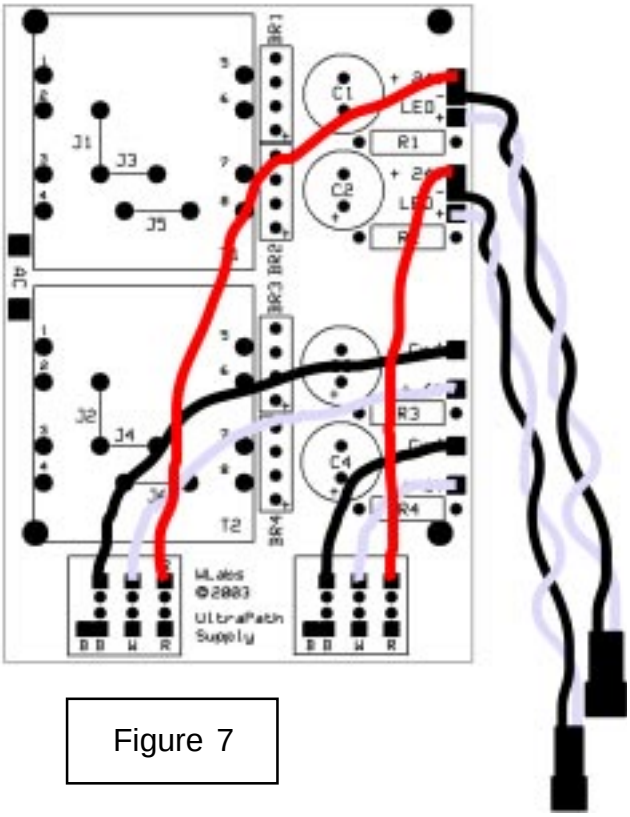


Figure 7

Locate the bag marked “CON1” and remove the connector. Use the 20ga. solid core hookup wire (red, black & white) and cut two pieces of each color to a length of 7”. Strip 1/4” of insulation from one end of each wire and solder them to the back of the connector as shown in Figures 8 and 9. Note: This plastic connector is very fragile and will melt if too much heat is applied.

The best method for soldering the wires into the small connector cups is to first fill each cup with solder. Carefully apply heat to each cup and apply just enough solder to fill each cup about half full. Then heat each cup until the solder flows and insert the wire end into the cup. Make sure no excess solder is allowed to flow outside of the cup as this may increase the possibility of a short ocurring between adjacent connector pins.

Solder the wire colors as shown in Figures 8 and 9 and then set the connector to one side.

Figure 8

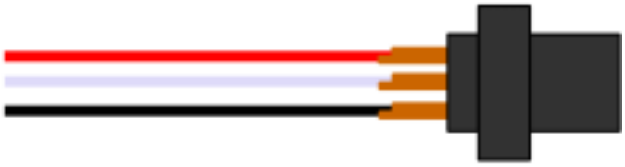


Figure 9

Locate the bag marked “SW1 and SW2” and remove the switches. Use the 20ga. solid core hookup wire (red, black & white) and cut four pieces of each color to a length of 1”. Strip 1/4” of insulation from both ends of each wire. This should leave exactly 1/2” of insulation in the middle of each wire. Bend one stripped end of each wire to a 90 degree angle as shown in Figure 10.

Solder the right-angle end of each wire to the switch’s solder lugs as shown in Figure 10. The wires should be soldered to the bottom two rows as shown and thus you should have a red, white and black wire on the bottom row and a red, white and black wire on the middle row of the switch. Note: This plastic switch is very fragile and will melt if too much heat is applied.

Pick up the Battery Charger circuit board. You will notice at the bottom of the board are two large squares with several pads on the inside as shown in Figure 11. There is a row of square pads marked “B, W & R” and another row of square pads marked “B, B, W & R” with two rows of unmarked circular pads in the middle.

You will now insert the switch wires into the unmarked circular pad rows and solder them to the circuit board. The switch wires should be inserted such that from left to right there is a black, white and red wire. Refer to Figures 11 and 12.

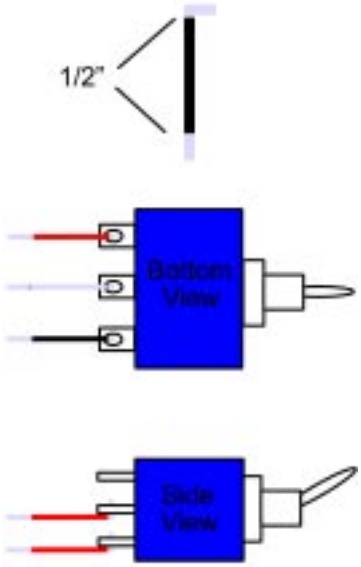


Figure 10

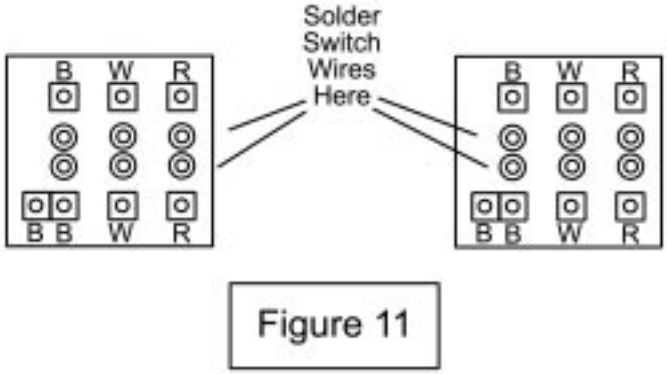
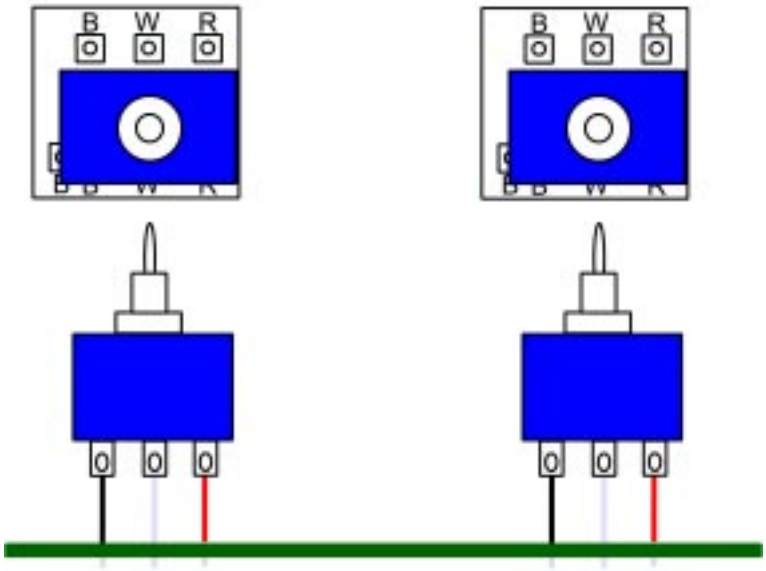


Figure 11



A picture of the finished Battery Charger circuit board.

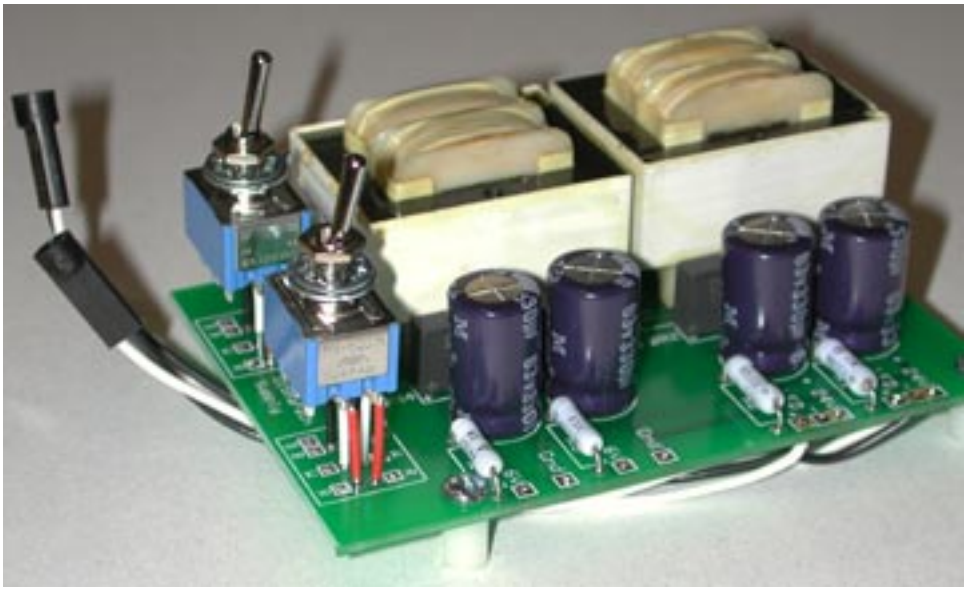


Figure 12

Locate the Battery Supply box top cover and the bag marked “HL”. Install the carrying handle with the two supplied screws as shown below in Figure 13.

Locate the bag marked “LS1 & LS2” and install the LED holders as shown below in Figure 13.

Locate the bag marked “FB” and install the fuse holder in the middle hole as shown below in Figure 13. You can go ahead and install fuse “F1” in the fuse holder.

Locate the bag marked “ST1” and install the four long standoffs as shown below in Figure 13.

Get the “CON1” connector that you previously soldered the six wires to and install on the battery cover in the hole to the left of the fuse holder. Carefully bend the wires as shown below in Figure 13.

Locate the bag marked “SW3” and install the on-off switch in the hole just above the fuse holder as shown below in Figure 13.

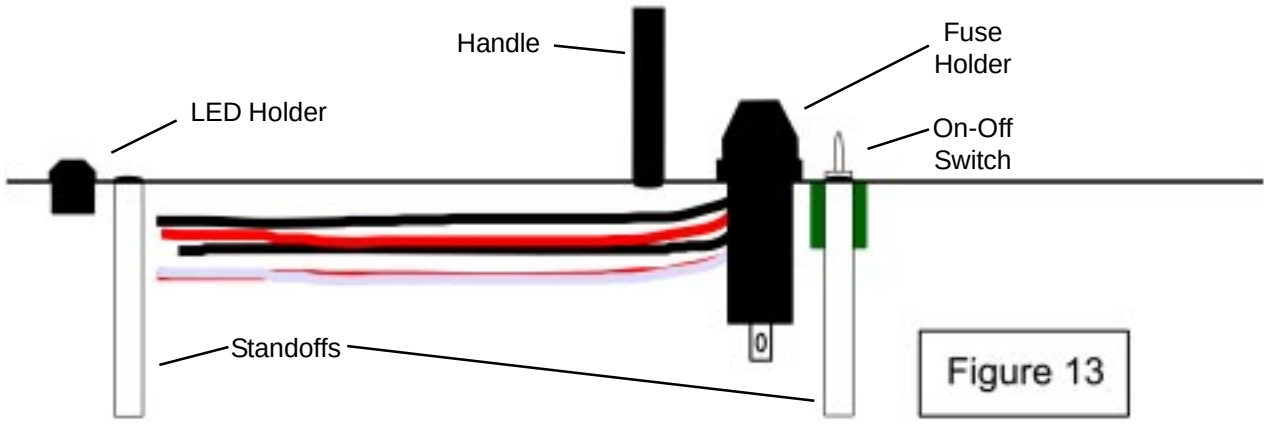


Figure 13

Cut a short piece of the black 20ga. solid core hookup wire, strip the ends and solder it between the bottom terminal of the fuse holder and one solder lug of switch SW3 as shown in Figure 14.

Cut another piece of the black 20ga. solid core hookup wire to a length of approximately 4", strip one end and solder it to the other solder lug of switch SW3 as shown in Figure 14.

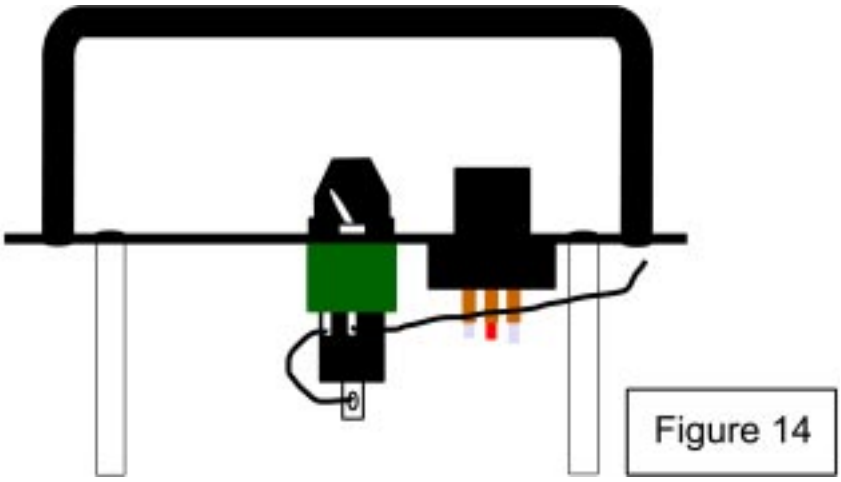


Figure 14

Locate the ac power cord "PCORD" and the bag marked "SR". Using a very sharp knife or razor blade, very carefully remove 4" of the power cord's black outer jacket. Approximately 1" up from the end of the black jacket, wrap the strain relief "SR" around the outer jacket of the power cord, squeeze (or compress) with a pair of pliers and insert the power cord through the battery cover and push the strain relief into the cover until it snaps into place, as shown below in Figure 15.

Cut to length the blue conductor of the power cord and solder it to the side tab of the fuse holder. Cut the green conductor of the power cord to length of approximately 1/2", it will not be used.

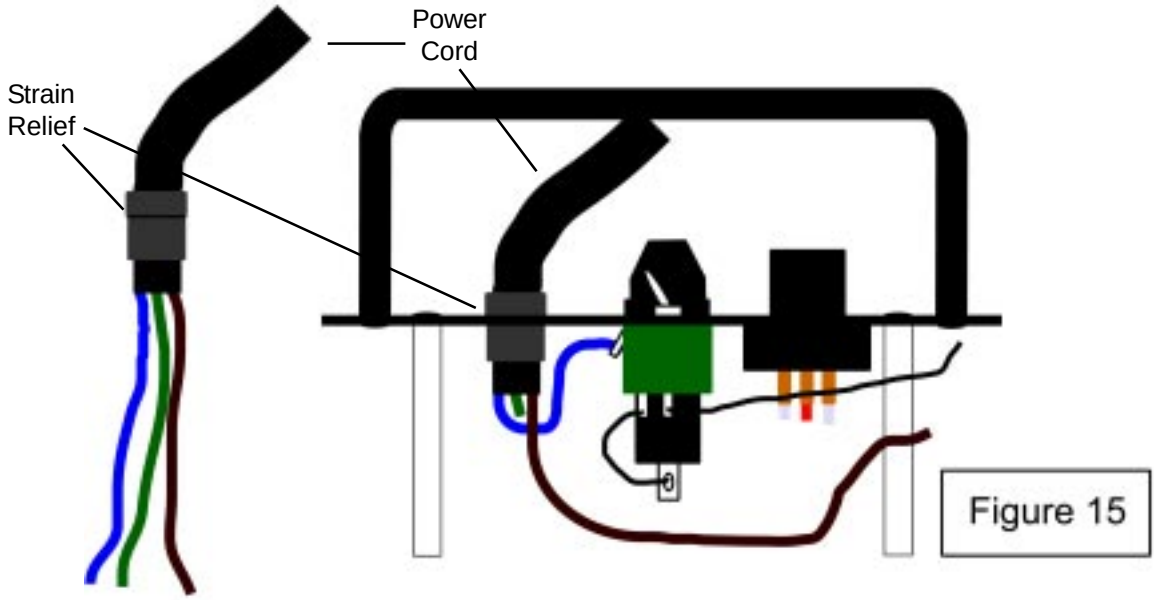


Figure 15

Locate the black 3" x 6" circuit board shelf and using the remaining screws in the bag marked "H/W2" attach the circuit board to the shelf. Now mount the circuit board shelf to the battery cover standoffs using the remaining screws in the bag marked "H/W1" and as shown in Figure 16. You will have to feed the switches SW1 and SW2 through their respective holes in the cover plate and secure them with their mounting nuts and washers. Be careful not to scratch the top cover.

Locate the bag marked "D1 & D2". Take the two LEDs and cut their leads to a length of 3/8" from the bottom of the diode base. Insert each LED into the black connector located on the end of the LED harness and push them all of the way in as shown in Figure 17. You will note that at the base of each LED there is a flattened side, the lead wire closest to this flattened side should be inserted into the harness connector pin associated with its black wire. You can now push the LED and its harness connector into the back of the LED socket mounted on the battery supply cover plate as shown in Figure 16. Approximately 1/8" of the LED should protrude above the opening of the socket.

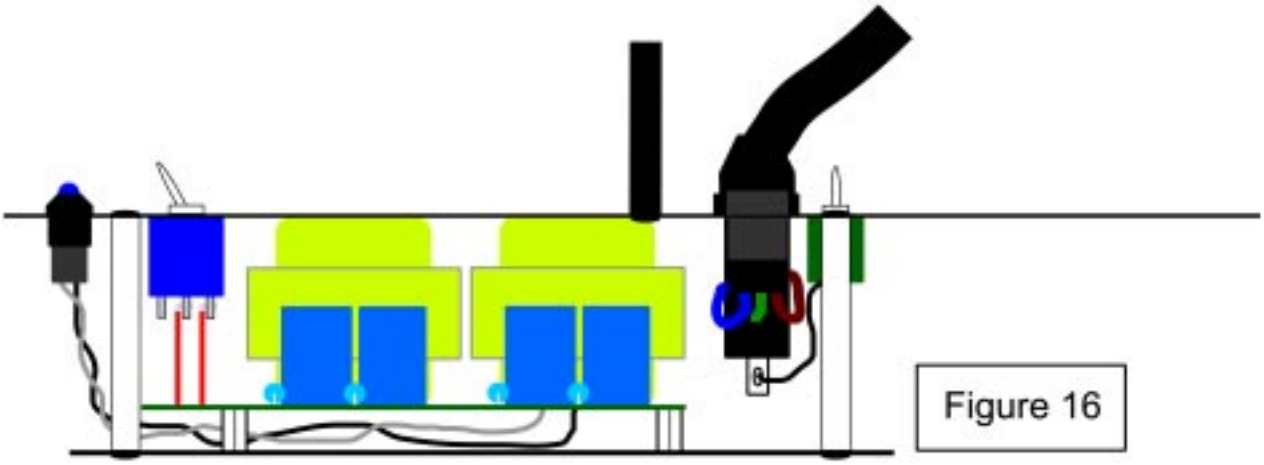


Figure 16

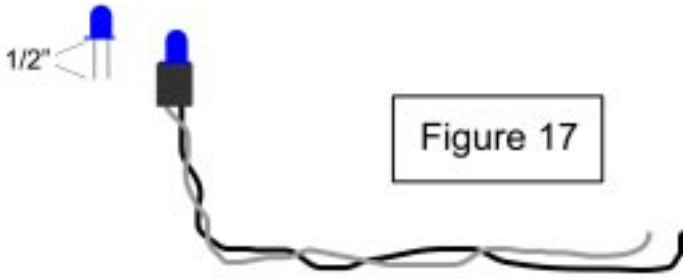


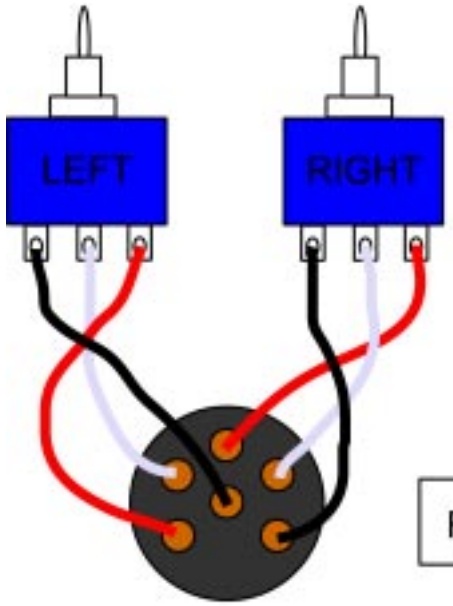
Figure 17

The next step involves soldering the wires previously connected to the backside of CON1 to the switches SW1 and SW2.

Route the wires around the power transformers T1 & T2 but keep them within the perimeter of the four long metal stand-offs. Cut the wires as short as possible, strip 1/4" of insulation from each end and solder the wires to the left and right switches as shown in Figure 18. Be sure to follow the connection diagram exactly as shown.

Refer back to Figures 7 and 15 for the next step. In Figure 7 you will note two circuit board pads on the left side of the board marked "AC". In Figure 15 there is a brown wire from the power cord and a black wire from the on-off switch that were not previously connected to anything. Solder the black wire to the circuit board pad closest to transformer T1 and the brown wire to the circuit board pad closest to transformer T2.

The battery charger circuit and battery cover assembly are now ready to be mated with the batteries.



Back View of Switch

Figure 18

The last step is a little bit tricky and will require a third hand or use something to prop the cover assembly on top of the battery case, as shown in Figure 19, so that you can solder the battery wires to the charger circuit board. Note: care must be taken to assure none of the battery wires accidentally make contact with each other as this could cause a short, creating nasty arcing and possibly a mess in your pants. Route all of the wires to the one end of the chassis (towards battery B3) and up and in between the bottom of the circuit board and the circuit board shelf as shown below in Figure 19. Refering back to Figure 11, you will note there are 8 circuit board pads directly under SW1 and SW2 marked “B”, “B”, “W” and “R”.

Solder the black wire connected to battery B3 and the black wire connected to battery B1 to the pads marked “B” directly underneath the “LEFT” switch. Solder the white wire from battery B1 to the pad marked “W” directly underneath the “LEFT” switch. Solder the red wire connected to battery B4 to the pad marked “R” directly underneath the “LEFT” switch. Note: Do not shorten these wires, you will want some slack in the wires to allow easy access to the batteries.

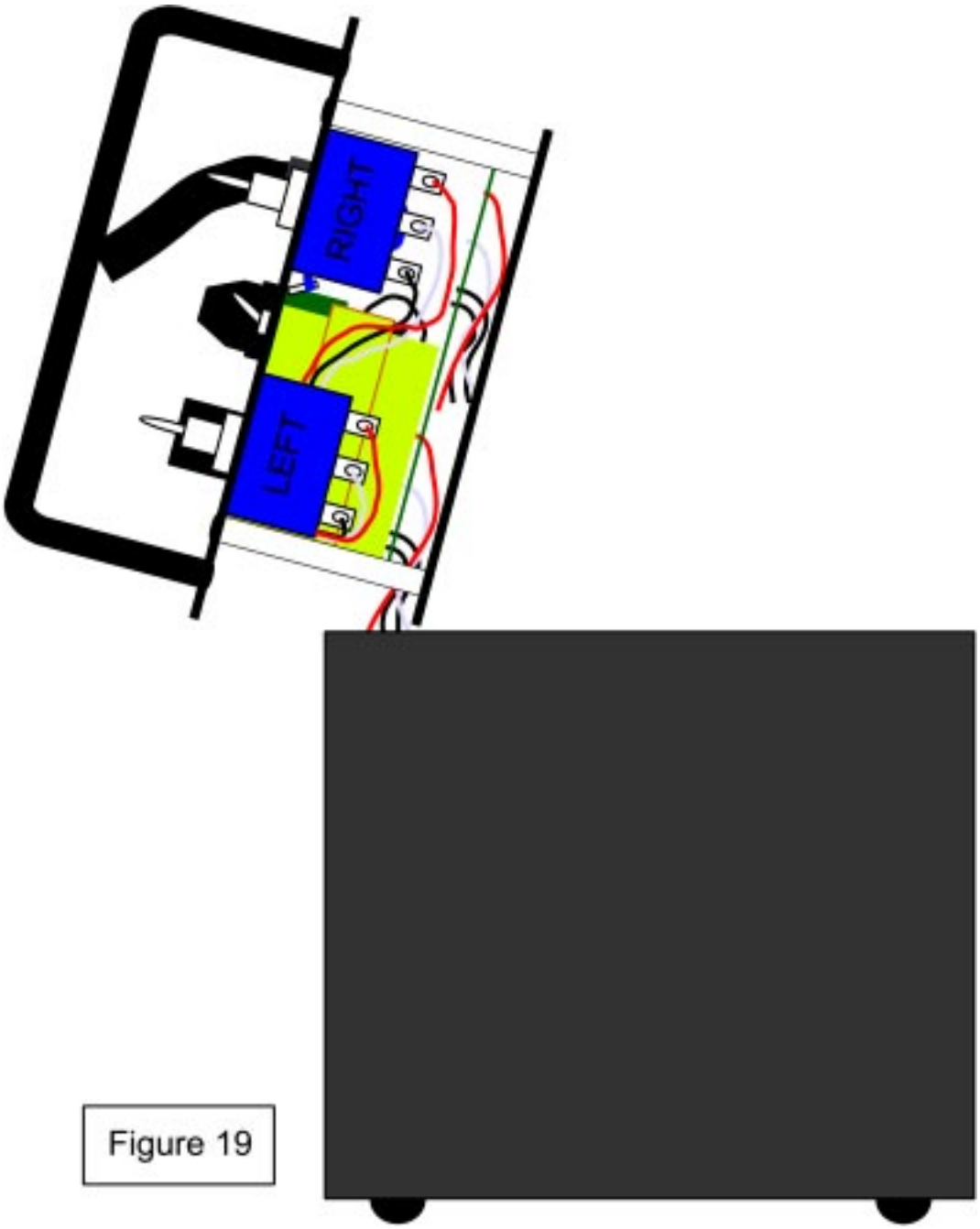


Figure 19

Solder the black wire connected to battery B5 and the black wire connected to battery B2 to the pads marked “B” directly underneath the “RIGHT” switch. Solder the white wire from battery B2 to the pad marked “W” directly underneath the “RIGHT” switch. Solder the red wire connected to battery B6 to the pad marked “R” directly underneath the “RIGHT” switch.

Place the two black foam protective pads on top of the batteries and you can now replace the top cover and secure it to the battery case with the supplied screws.

Test Procedure

Now it’s time to test the operation of the battery supply. Place the Left and Right transfer switches in the forward position. Do NOT plug the battery supply into the ac outlet yet.

Locate the bag marked “CON2” and take out one of the umbilical connectors. You don’t need all of its peripheral pieces at this time, just the main connector body. Plug CON2 into CON1, located next to the fuse holder.

Using a voltmeter and referring to Figure 20 below, make the following measurements:

Note: Be careful, use a steady hand and do not allow a meter test probe to accidentally make contact with more than one connector pin as this will result in a short, creating more nasty arcing and possibly another mess in your pants.

Looking at the exposed connector pins of CON2, they have been numbered 1 thru 6.

Set your voltmeter to read DC volts and connect the negative (black) test probe to pin 1 and the positive test probe to pin 2. You should measure approximately 6 volts.

Now connect the negative (black) test probe to pin 1 and the positive test probe to pin 3. You should measure approximately 25 volts.

Are your measurements OK?

Connect the negative (black) test probe to pin 6 and the positive test probe to pin 4. You should measure approximately 6 volts.

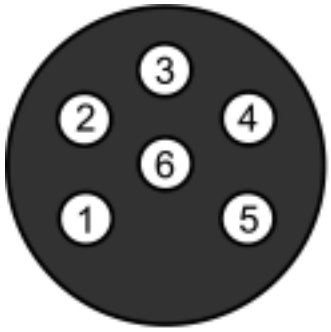
Now connect the negative (black) test probe to pin 6 and the positive test probe to pin 5. You should measure approximately 25 volts.

If these measurements are good, this verifies that your batteries are correctly installed.

Now you can plug the power cord into the ac outlet and flip the Left and Right transfer switches to their back position. Apply power by flipping the on-off switch. Both LEDs should turn on. If one or both of the LEDs do not turn on, power down the unit and make sure you have the LEDs installed with the correct polarity.

If both LEDs light up, this is a good indication that the charger circuit is operating properly. Remove CON2 from CON1 and you can set the battery supply to the side but leave it turned on so the batteries will fully charge.

This completes the Battery Supply Assembly.



CON2

Figure 20

Preamp Assembly

Locate the bag marked “CLIP1”. Take the two adhesive backed wire harness clips, remove the protective strip from the back and install as shown in Figure 21. The clips should be centered in the middle of the chassis with one clip positioned approximately 1” from the rear of the chassis and the other clip positioned approximately 2.5” from the front of the chassis.

Locate the bag marked “SW1”, “SW2”, and “SW3”. Remove the switches and install them onto the chassis as shown in Figure 21. Be careful not to scratch the chassis while installing the switches.

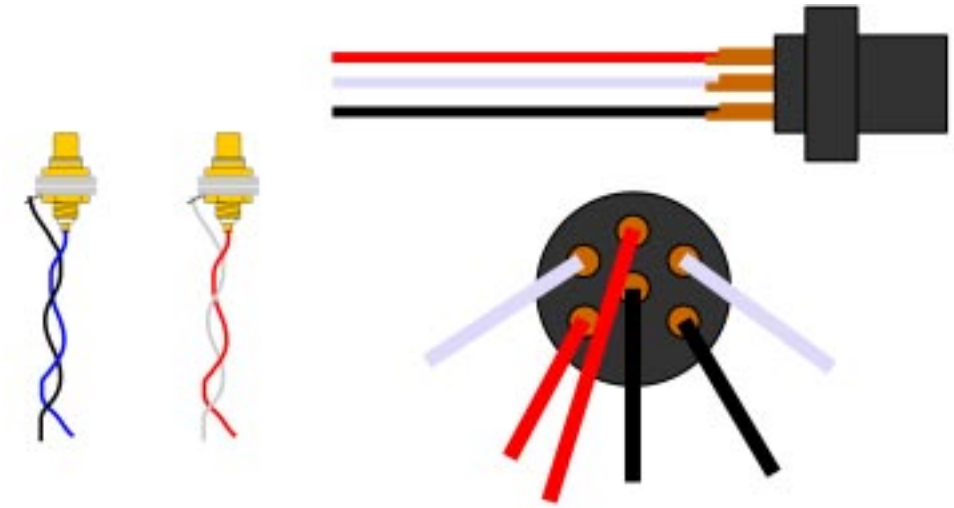
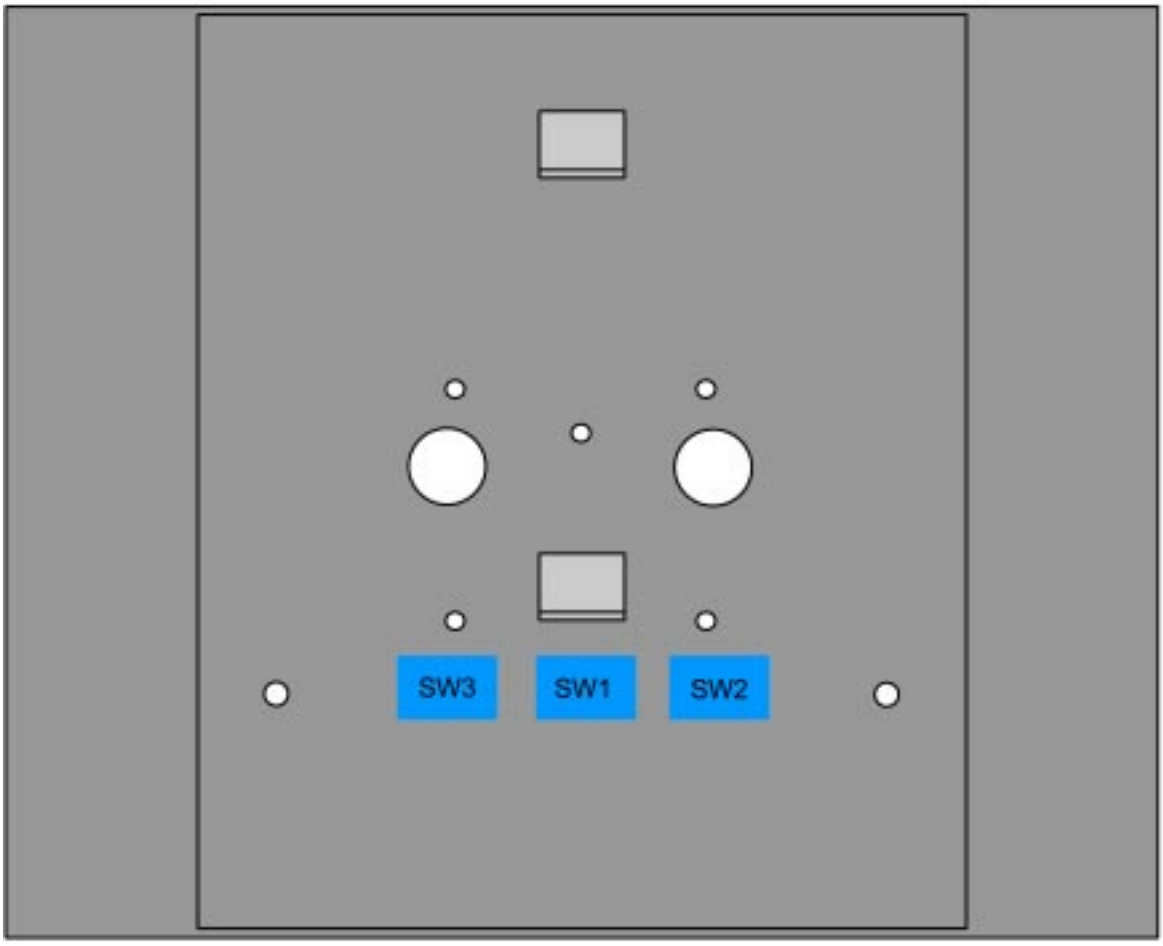


Figure 21



If you have the Basic Version *ULTRAPATH*, proceed with the following steps. If you have the Ultimate Version *ULTRAPATH*, proceed to page 26.

Locate the female RCA jacks, and the 24ga.stranded hookup wire (blue, green and black). You will note there are 5 rca jacks with red bands on them and 5 with white. The red banded jacks will be the right channel and the white banded jacks the left channel.

Note: For the next five steps, be sure to use the supplied insulation washers such that the rca jack and its ground tab are insulated from the chassis.

Cut two pieces of the black wire to a length of 13 inches. Strip 1/4" of insulation from one end and solder one of these wires to the ground tab on a red rca jack and one to the ground tab on a white rca jack as shown in Figure 21. Cut a piece of the green wire to a length of 13 inches and a piece of the blue wire to a length of 13 inches. Strip 1/4" of insulation from one end and solder the green wire to the signal pin on the white rca jack and the blue wire to the signal pin on the red rca jack as shown in Figure 21. Install these two rca jacks onto the chassis in the "CD" position as shown in Figure 22. Twist the signal wire together with its black ground wire (approximately one twist per inch is good) and route the wires through the harness clips as shown in Figure 22.

Cut two pieces of the black wire to a length of 12 inches. Strip 1/4" of insulation from one end and solder one of these wires to the ground tab on a red rca jack and one to the ground tab on a white rca jack. Cut a piece of the green wire to a length of 12 inches and a piece of the blue wire to a length of 12 inches. Strip 1/4" of insulation from one end and solder the green wire to the signal pin on the white rca jack and the blue wire to the signal pin on the red rca jack as shown in Figure 21. Install these two rca jacks onto the chassis in the "AUX" position as shown in Figure 22. Twist the signal wire together with its black ground wire (approximately one twist per inch is good) and route the wires through the harness clips as shown in Figure 22.

Cut two more pieces of the black wire to a length of 12 inches. Strip 1/4" of insulation from one end and solder one of these wires to the ground tab on a red rca jack and one to the ground tab on a white rca jack. Cut a piece of the green wire to a length of 12 inches and a piece of the blue wire to a length of 12 inches. Strip 1/4" of insulation from one end and solder the green wire to the signal pin on the white rca jack and the blue wire to the signal pin on the red rca jack as shown in Figure 21.. Install these two rca jacks onto the chassis in the "TUNER" position as shown in Figure 22. Twist the signal wire together with its black ground wire (approximately one twist per inch is good) and route the wires through the harness clips as shown in Figure 22.

Cut two pieces of the black wire to a length of 8 inches. Strip 1/4" of insulation from one end and solder one of these wires to the ground tab on a red rca jack and one to the ground tab on a white rca jack. Cut a piece of the green wire to a length of 8 inches and a piece of the blue wire to a length of 8 inches. Strip 1/4" of insulation from one end and solder the green wire to the signal pin on the white rca jack and the blue wire to the signal pin on the red rca jack as shown in Figure 21. Install these two rca jacks onto the chassis in the "OUT 1" position as shown in Figure 22. Twist the signal wire together with its black ground wire (approximately one twist per inch is good) and route the wires through the harness clips as shown in Figure 22.

Install the last set of RCA jacks in the OUT 2 position.

Cut a 1" piece of the black hookup wire, strip 1/4" inch of insulation from each end and solder it between the ground lugs of the OUT 1 and OUT 2 rca jacks. Do this for both the left and right channel.

Locate the bag marked "R8" and remove the resistors. Solder one resistor from the OUT 2 rca jack signal pin to its ground tab as shown in Figure 22. Do this for both channels.

Do this next step if you will be paralleling the OUT 1 and OUT 2 output jacks. If you will be configuring the second set of output jacks for headphone use or as a tape out, you can skip this step. Cut a 2" piece of the blue and green hookup wire, strip a 1/4" of insulation from each end and solder these wires between their respective OUT 1 and OUT 2 rca jack signal pins.

If you have the Basic Version *ULTRAPATH*, proceed to page 28.

Basic Version Wiring Diagram

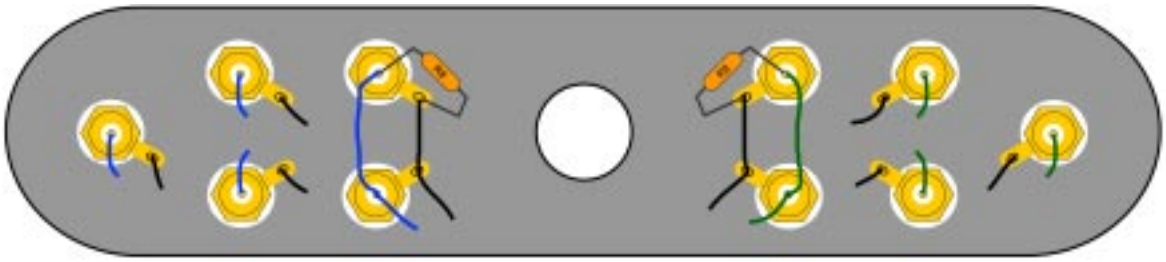
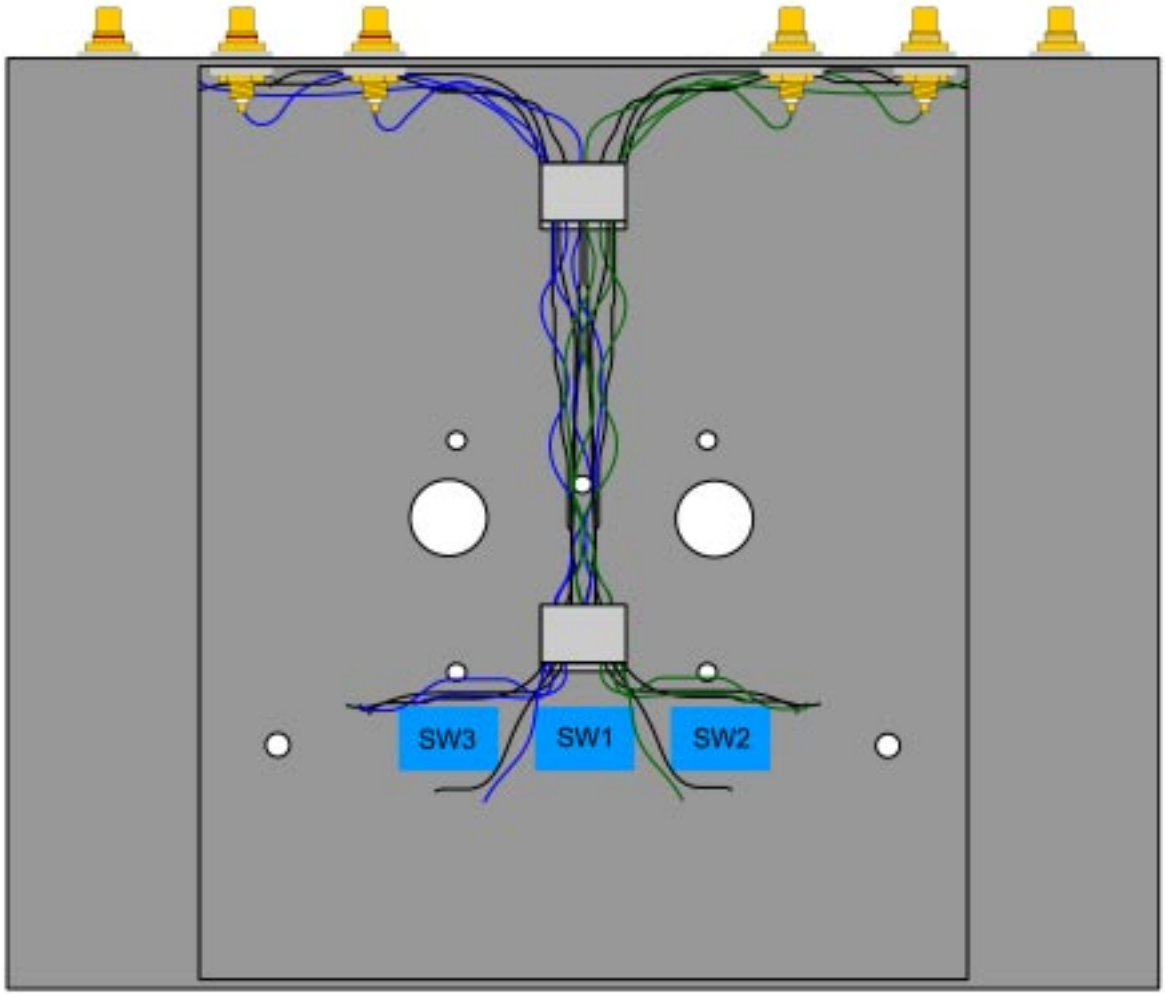


Figure 22



If you have the Ultimate Version *ULTRAPATH*, proceed with the following steps.

Locate the female RCA jacks, and the 23ga.solid core hookup wire (red and white). You will note there are 5 rca jacks with red bands on them and 5 with white. The red banded jacks will be the right channel and the white banded jacks the left channel.

Note: For the next five steps, be sure to use the supplied insulation washers such that the rca jack and its ground tab are insulated from the chassis.

Cut two pieces of the white wire to a length of 13 inches. Strip 1/4" of insulation from one end and solder one of these wires to the ground tab on a red rca jack and one to the ground tab on a white rca jack as shown in Figure 21. Cut two pieces of the red wire to a length of 13 inches. Strip 1/4" of insulation from one end and solder one of these wires to the signal pin on a red rca jack and one to the signal pin on a white rca jack as shown in Figure 21. Install these two rca jacks onto the chassis in the "CD" position as shown in Figure 22. Twist the red signal wire together with its white ground wire (approximately one twist per inch is good) and route the wires through the harness clips as shown in Figure 23.

Cut two pieces of the white wire to a length of 12 inches. Strip 1/4" of insulation from one end and solder one of these wires to the ground tab on a red rca jack and one to the ground tab on a white rca jack as shown in Figure 21. Cut two pieces of the red wire to a length of 12 inches. Strip 1/4" of insulation from one end and solder one of these wires to the signal pin on a red rca jack and one to the signal pin on a white rca jack as shown in Figure 21. Install these two rca jacks onto the chassis in the "AUX" position as shown in Figure 22. Twist the red signal wire together with its white ground wire (approximately one twist per inch is good) and route the wires through the harness clips as shown in Figure 23.

Cut two pieces of the white wire to a length of 12 inches. Strip 1/4" of insulation from one end and solder one of these wires to the ground tab on a red rca jack and one to the ground tab on a white rca jack as shown in Figure 21. Cut two pieces of the red wire to a length of 12 inches. Strip 1/4" of insulation from one end and solder one of these wires to the signal pin on a red rca jack and one to the signal pin on a white rca jack as shown in Figure 21. Install these two rca jacks onto the chassis in the "TUNER" position as shown in Figure 22. Twist the red signal wire together with its white ground wire (approximately one twist per inch is good) and route the wires through the harness clips as shown in Figure 23.

Cut two pieces of the white wire to a length of 8 inches. Strip 1/4" of insulation from one end and solder one of these wires to the ground tab on a red rca jack and one to the ground tab on a white rca jack as shown in Figure 21. Cut two pieces of the red wire to a length of 8 inches. Strip 1/4" of insulation from one end and solder one of these wires to the signal pin on a red rca jack and one to the signal pin on a white rca jack as shown in Figure 21. Install these two rca jacks onto the chassis in the "OUT 1" position as shown in Figure 22. Twist the red signal wire together with its white ground wire (approximately one twist per inch is good) and route the wires through the harness clips as shown in Figure 23.

Install the last set of RCA jacks in the OUT 2 position.

Cut a 1" piece of the white hookup wire, strip 1/4" inch of insulation from each end and solder it between the ground lugs of the OUT 1 and OUT 2 rca jacks. Do this for both the left and right channel.

Locate the bag marked "R8" and remove the resistors. Solder one resistor from the OUT 2 rca jack signal pin to its ground tab as shown in Figure 22. Do this for both channels.

Do this next step if you will be paralleling the OUT 1 and OUT 2 output jacks. If you will be configuring the second set of output jacks for headphone use or as a tape out, you can skip this step. Cut two 2 inch pieces of the white hookup wire, strip a 1/4" of insulation from each end and solder these wires between their respective OUT 1 and OUT 2 rca jack signal pins.

Ultimate Version Wiring Diagram

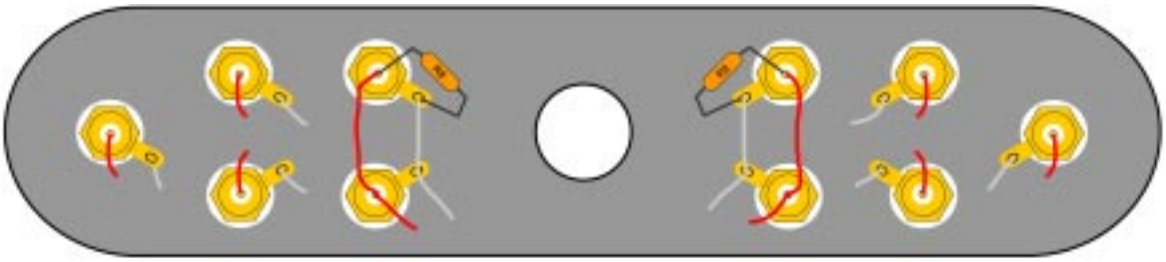
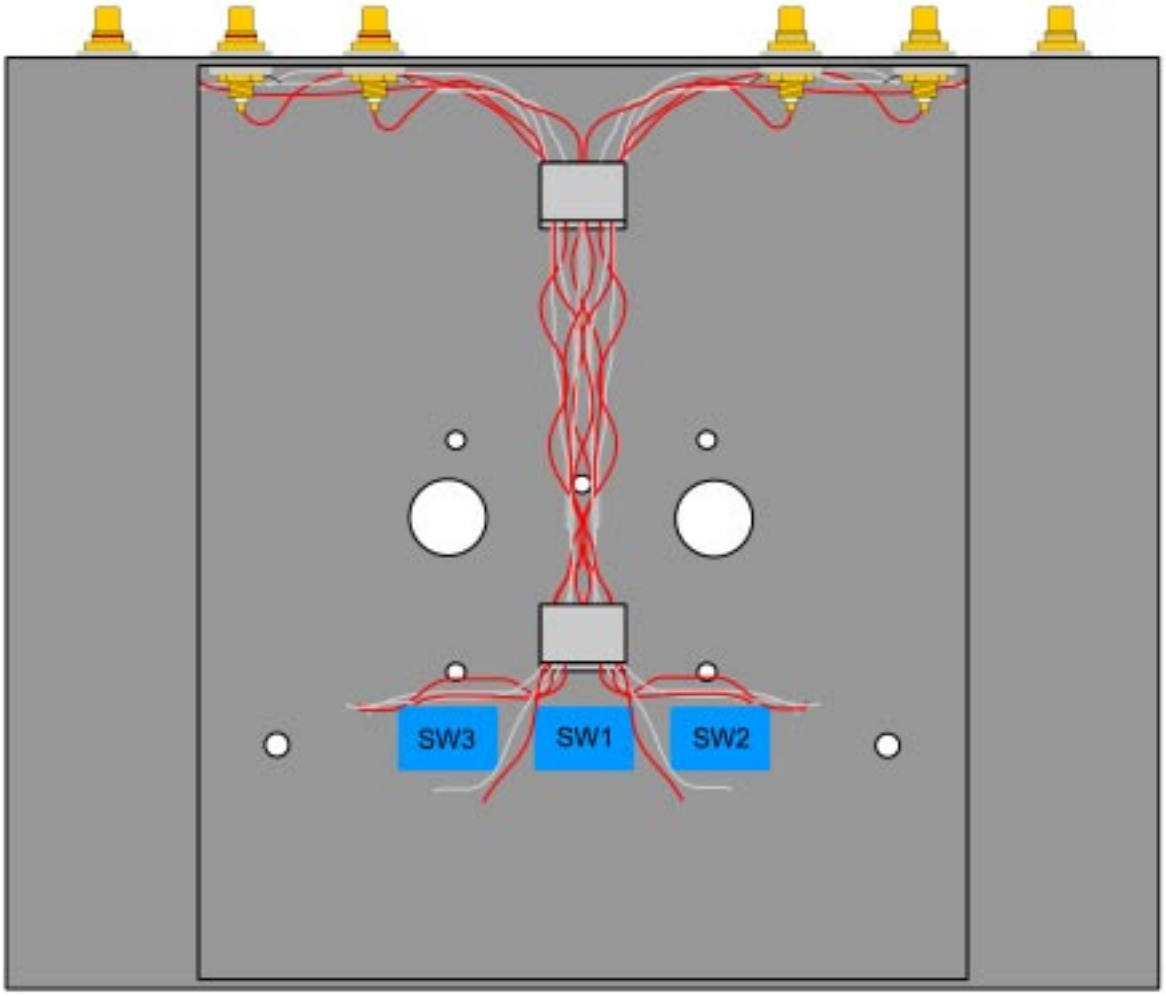


Figure 23



Install the umbilical connector CON1 as shown below in Figure 24 and route the wires through the harness clip.

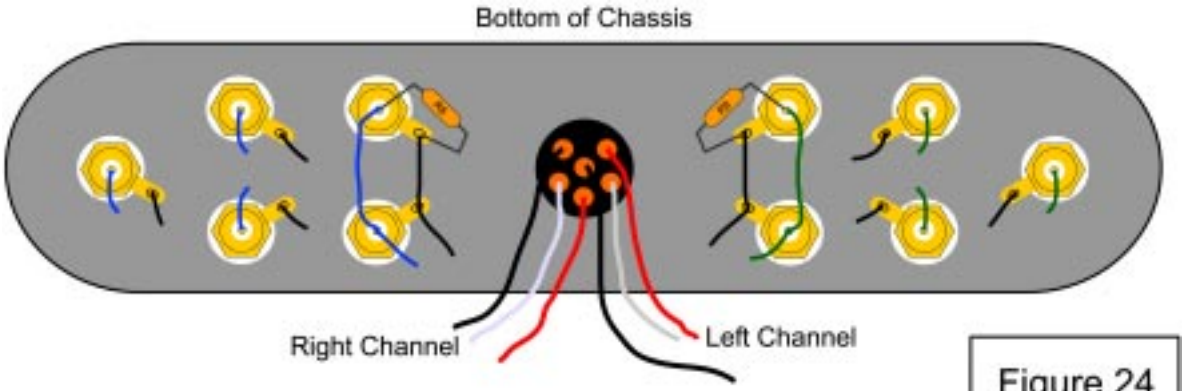
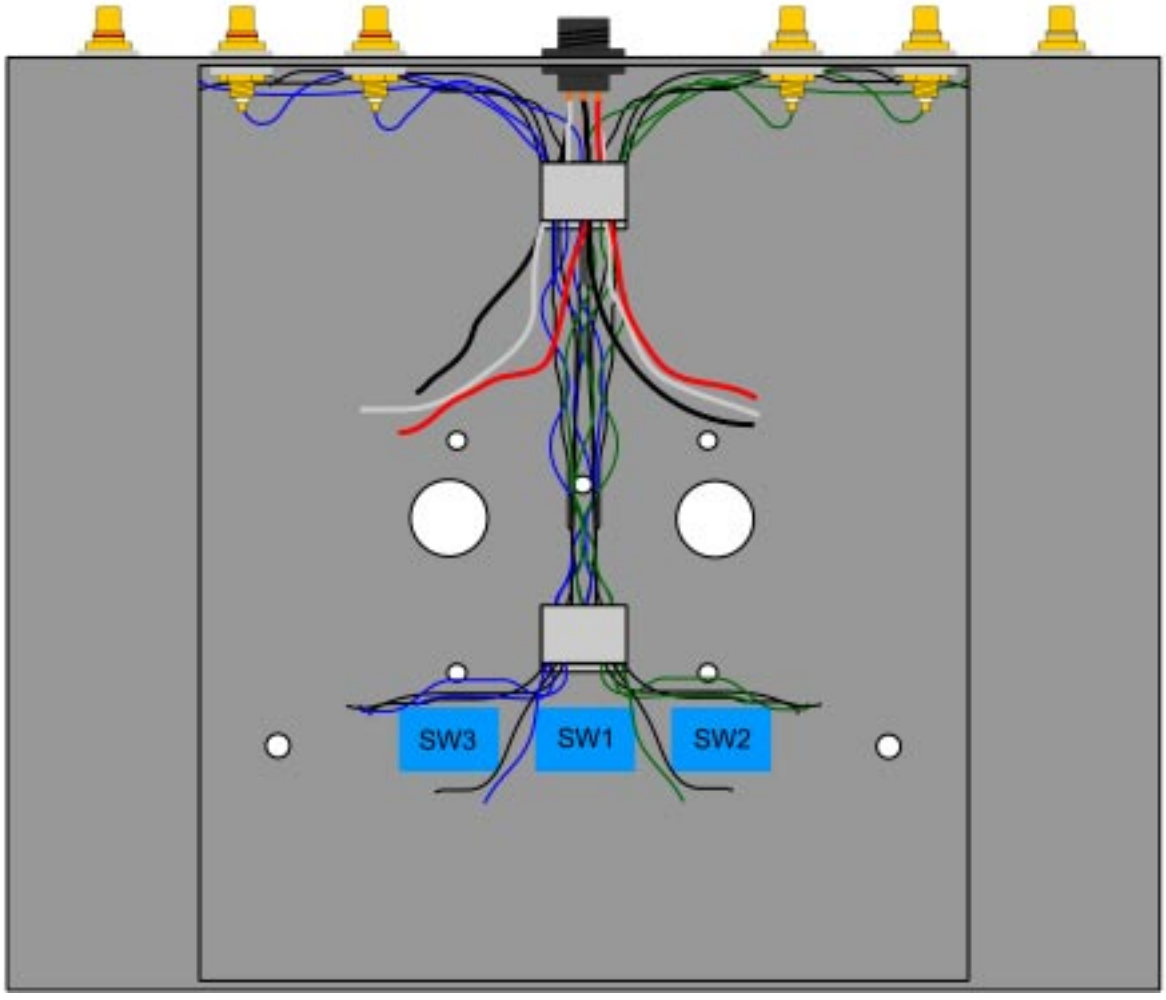


Figure 24



If you have the Basic Version *ULTRAPATH*, proceed with the following steps. If you have the Ultimate Version *ULTRAPATH*, proceed to page 31.

Now you will begin making the connections to the selector switches. Shown in Figure 25 is a second set of switches with their contacts labeled “A, B, C, D, etc”. We will use this labeling to help you during the assembly process.

Locate the bag marked “R5, R6, R7” and remove the resistors. Bend the leads as shown in Figure 25 below. Cut the leads to a length of approximately 3/8” and solder them to the selector switch lugs as shown below. Make sure the leads of adjacent resistors do not make contact with each other.

Locate the 20ga. solid core hookup wire (blue, green, black). Cut 4 pieces of the black hookup wire to a length of 1.5”. Strip 1/4” of insulation from each end and solder one wire between the following switch lugs: SW1B to SW3B, SW1B to SW2B, SW1C to SW3C and SW1C to SW2C. Be careful not to overheat the switch contacts as the plastic can easily melt possibly causing damage to the switch.

Cut 2 pieces of the blue hookup wire to a length of 1.5”. Strip 1/4” of insulation from each end and solder one wire between the following switch lugs: SW3A to SW1A, SW1A to SW2A.

Cut 2 pieces of the green hookup wire to a length of 1.5”. Strip 1/4” of insulation from each end and solder one wire between the following switch lugs: SW3D to SW1D and SW1D to SW2D.

Trim away any excess lead material around the switch contacts.

Cut one piece of the green hookup wire to a length of 6” and solder one of it to SW2D.

Cut one piece of the blue hookup wire to a length of 3” and solder one end of it to SW3A.

Using your fingers, you can now fold these wires down against the side of the switch.

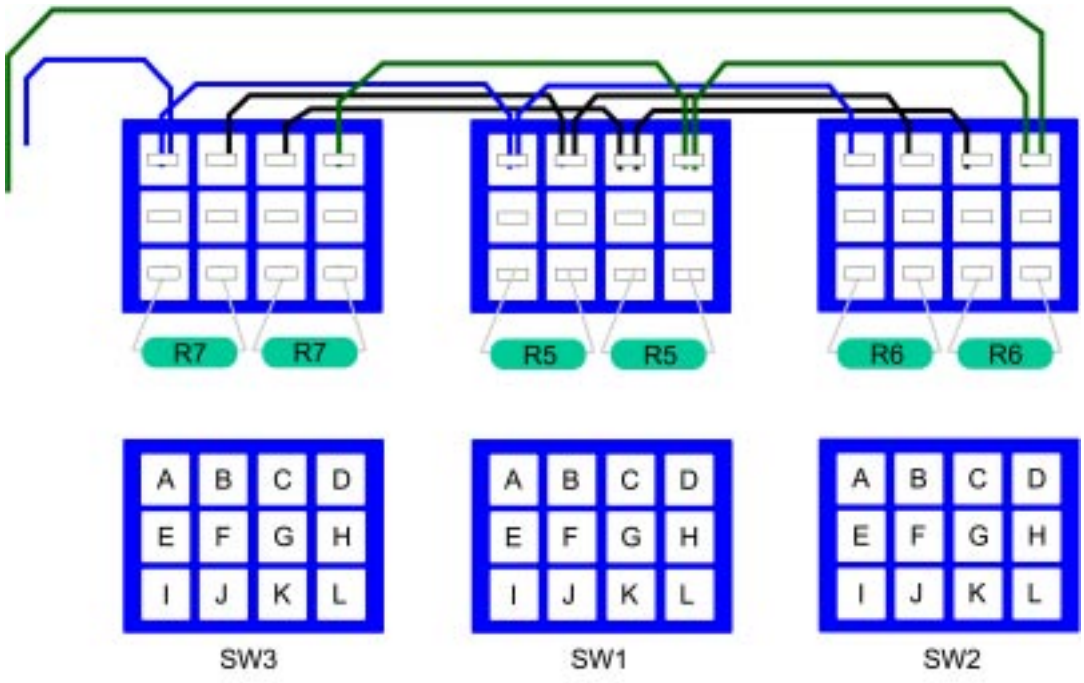


Figure 25

Separate the signal and ground wire connected to the right channel TUNER rca jack (the right channel has the red-banded rca jacks). Cut to length and solder the blue wire to SW3E and the black wire to SW3F as shown below in Figure 26.

Separate the signal and ground wire connected to the left channel TUNER rca jack (the left channel has the white-banded rca jacks). Cut to length and solder the green wire to SW3H and the black wire to SW3G as shown below in Figure 26.

Separate the signal and ground wire connected to the right channel CD rca jack. Cut to length and solder the blue wire to SW1E and the black wire to SW1F as shown below in Figure 26.

Separate the signal and ground wire connected to the left channel CD rca jack. Cut to length and solder the green wire to SW1H and the black wire to SW1G as shown below in Figure 26.

Separate the signal and ground wire connected to the right channel AUX rca jack. Cut to length and solder the blue wire to SW2E and the black wire to SW2F as shown below in Figure 26.

Separate the signal and ground wire connected to the left channel AUX rca jack. Cut to length and solder the green wire to SW2H and the black wire to SW2G as shown below in Figure 26.

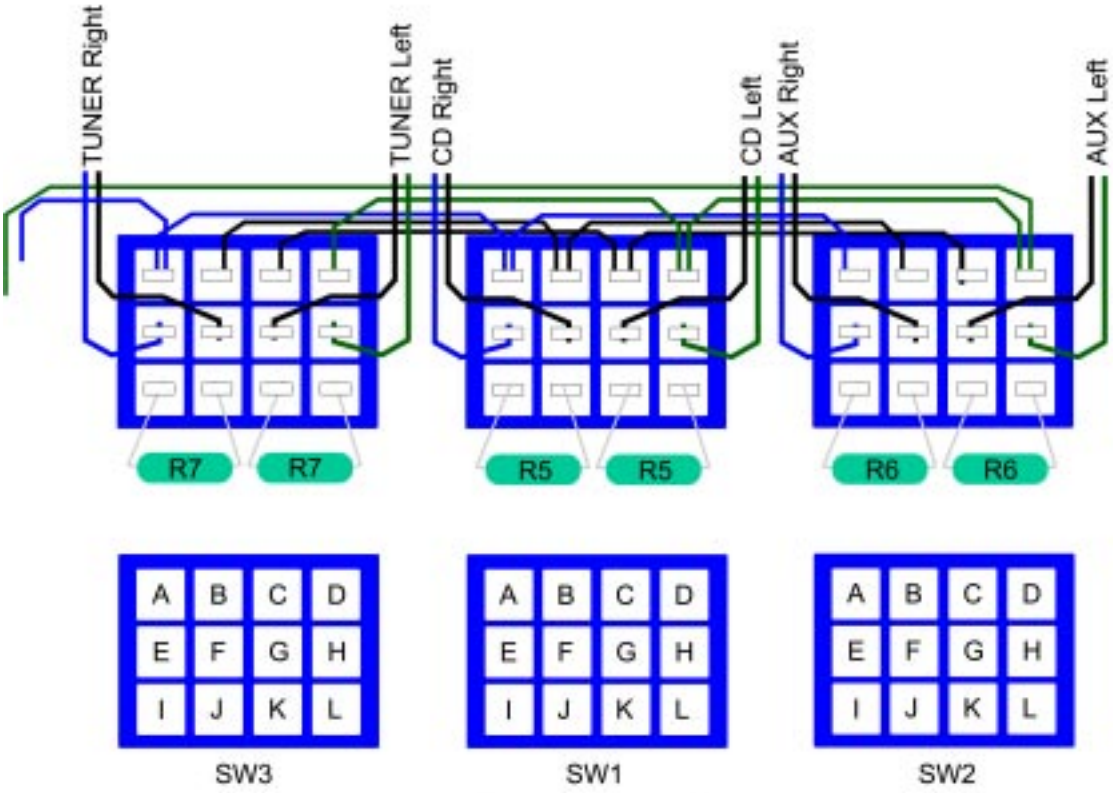


Figure 26

If you have the Ultimate Version *ULTRAPATH*, proceed with the following steps. If you have the Basic Version *ULTRAPATH*, proceed to page 33.

Now you will begin making the connections to the selector switches. Shown in Figure 27 is a second set of switches with their contacts labeled “A, B, C, D, etc”. We will use this labeling to help you during the assembly process.

Locate the bag marked “R5, R6, R7” and remove the resistors. Bend the leads as shown in Figure 27 below. Cut the leads to a length of approximately 3/8” and solder them to the selector switch lugs as shown below. Make sure the leads of adjacent resistors do not make contact with each other.

Locate the 23ga. solid core silver hookup wire (red and white). Cut 4 pieces of the white hookup wire to a length of 1.5”. Strip 1/4” of insulation from each end and solder one wire between the following switch lugs: SW1B to SW3B, SW1B to SW2B, SW1C to SW3C and SW1C to SW2C. Be careful not to overheat the switch contacts as the plastic can easily melt possibly causing damage to the switch.

Cut 2 pieces of the red hookup wire to a length of 1.5”. Strip 1/4” of insulation from each end and solder one wire between the following switch lugs: SW3A to SW1A, SW1A to SW2A.

Cut 2 pieces of the red hookup wire to a length of 1.5”. Strip 1/4” of insulation from each end and solder one wire between the following switch lugs: SW3D to SW1D and SW1D to SW2D.

Trim away any excess lead material around the switch contacts.

Cut one piece of the red hookup wire to a length of 3” and solder one of it to SW2D.

Cut one piece of the red hookup wire to a length of 3” and solder one end of it to SW3A.

Using your fingers, you can now fold these wires down against the side of the switch.

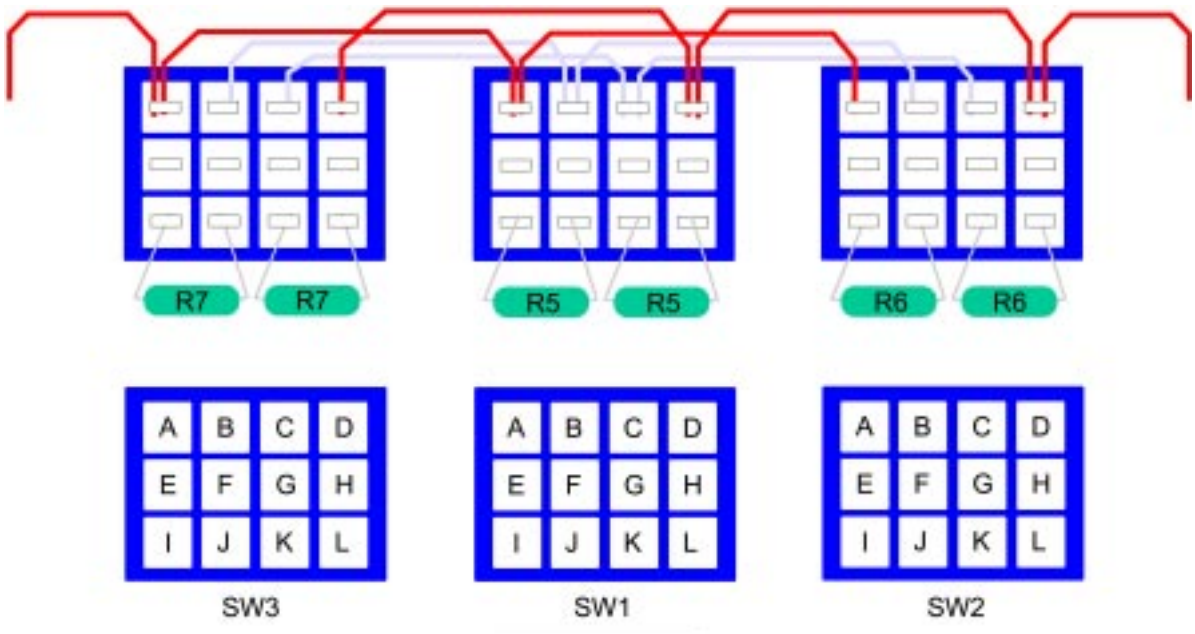


Figure 27

Separate the signal and ground wire connected to the right channel TUNER rca jack (the right channel has the red-banded rca jacks). Cut to length and solder the red wire to SW3E and the white wire to SW3F as shown below in Figure 28.

Separate the signal and ground wire connected to the left channel TUNER rca jack (the left channel has the white-banded rca jacks). Cut to length and solder the red wire to SW3H and the white wire to SW3G as shown below in Figure 28.

Separate the signal and ground wire connected to the right channel CD rca jack. Cut to length and solder the red wire to SW1E and the white wire to SW1F as shown below in Figure 28.

Separate the signal and ground wire connected to the left channel CD rca jack. Cut to length and solder the red wire to SW1H and the white wire to SW1G as shown below in Figure 28.

Separate the signal and ground wire connected to the right channel AUX rca jack. Cut to length and solder the red wire to SW2E and the white wire to SW2F as shown below in Figure 28.

Separate the signal and ground wire connected to the left channel AUX rca jack. Cut to length and solder the red wire to SW2H and the white wire to SW2G as shown below in Figure 28.

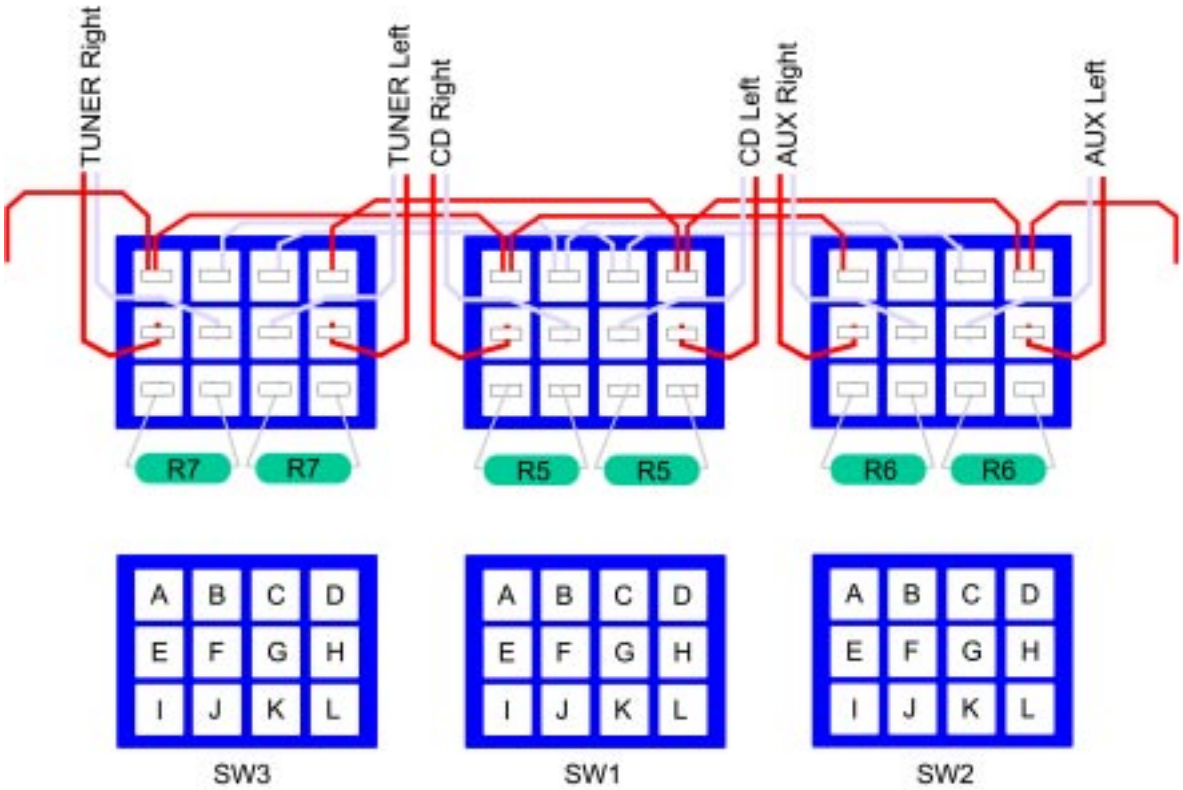


Figure 28

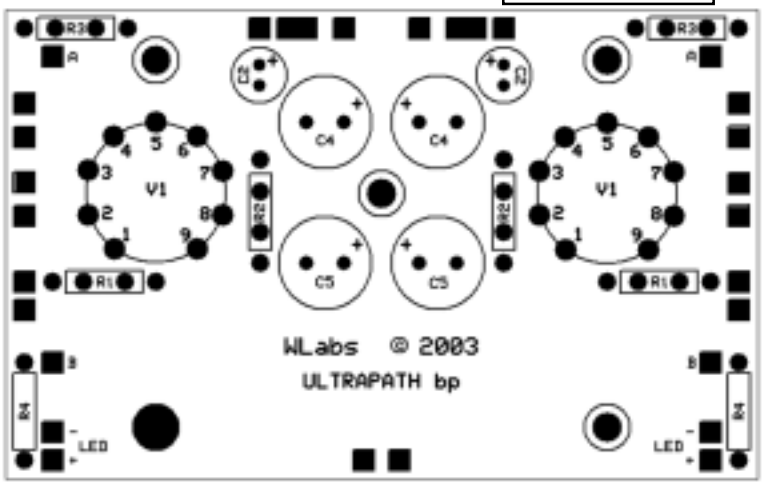
These next steps apply to both the Basic and Ultimate versions.

Next you will assemble the preamp circuit board. Locate the circuit board and the bags marked “H/W1” and “ST” containing the metal standoffs. Attach the four standoffs to the corners of the circuit board using four of the screws. The standoffs should be on the side of the board opposite the lettering side. Install the 5th standoff in the middle of the circuit board.

You will mount all components flat on the surface of the circuit board and on the side with the lettering except for the tube sockets which will mount on the opposite side of the board.

Refer to the component placement guide Figure 29 for the following steps:

Figure 29



Install and solder resistors R1 and R3.

Install and solder resistor R2.

Install and solder resistor R4.

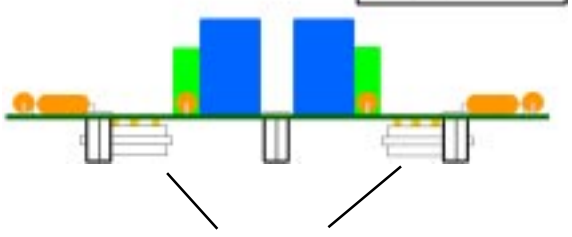
Install and solder capacitor C2. Note the polarity on the component body and placement guide. The white stripe on the body of the capacitor points to the negative terminal.

Install and solder capacitors C4 and C5. Note the polarity on the component body and placement guide. The white stripe on the body of the capacitor points to the negative terminal.

You will note on each half of the circuit board there are two pads marked “A” and two pads marked “B”. Cut a short piece of the black 20ga. solid core hookup wire, strip each end and solder one wire between pads “A” and “B”. Repeat this step for the other two pads marked “A” and “B”. It might be easier if you solder these wires on the bottom side of the circuit board.

Next locate the bag marked “S1”. Remove the tube sockets and solder them to the bottom side of the circuit board as shown below in Figure 30. Make sure the socket’s solder tabs are completely through the circuit board pads and the sockets are level once soldered to the board.

Figure 30



Tube Sockets

Using the remaining black button head screws from the bag marked “H/W1” and the star washer “STAR”, install the circuit board onto the chassis as shown below in Figure 31. The star washer should be installed between the chassis and metal standoff closest to SW3.

Cut two very short pieces of the black 20ga. solid core hookup wire, strip each end and solder one wire from SW1B to the circuit baord pad as shown below. Solder the other wire from SW1C to the circuit board pad as shown below.

Referring back to Figure 24 and Figure 31, solder the right channel umbilical wires from CON1 to the circuit board pads as shown below. And then solder the left channel umbilical wires from CON1 to the circuit board pads as shown below.

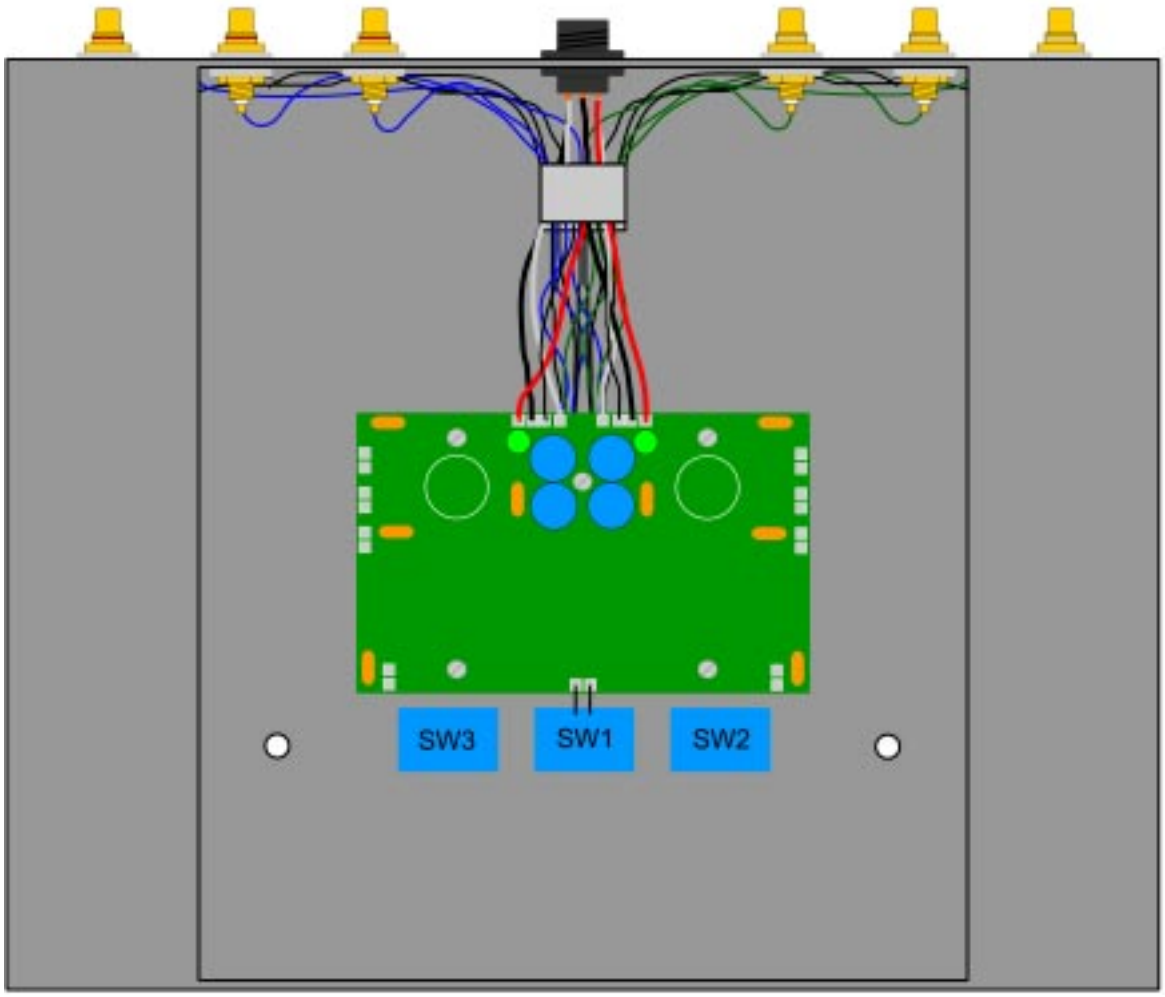
There is a ground wire soldered to each of the OUT 1 rca jacks. Solder the right and left channel ground wires as shown below.

To summarize the last two steps, the wires should be soldered to the following pads from left to right:

Right channel red wire from CON1
Right channel black wire from CON1
Right channel black ground wire from OUT 1 rca jack (this wire is white in the Ultimate Version)
Right channel white wire from CON1

Left channel white wire from CON1
Left channel black ground wire from OUT 1 rca jack (this wire is white in the Ultimate Version)
Left channel black wire from CON1
Left channel red wire from CON1

Figure 31



Next, locate the bag marked “LH”. These are the connector wires and connector for the LEDs. Measured from the back of the black connector end, cut each wire to a length of 2.5”. Strip 1/4” of insulation from each white and black wire. Solder the white wire to the pad marked “LED+” and the black wire to the pad marked “LED-” as shown in Figure 32.

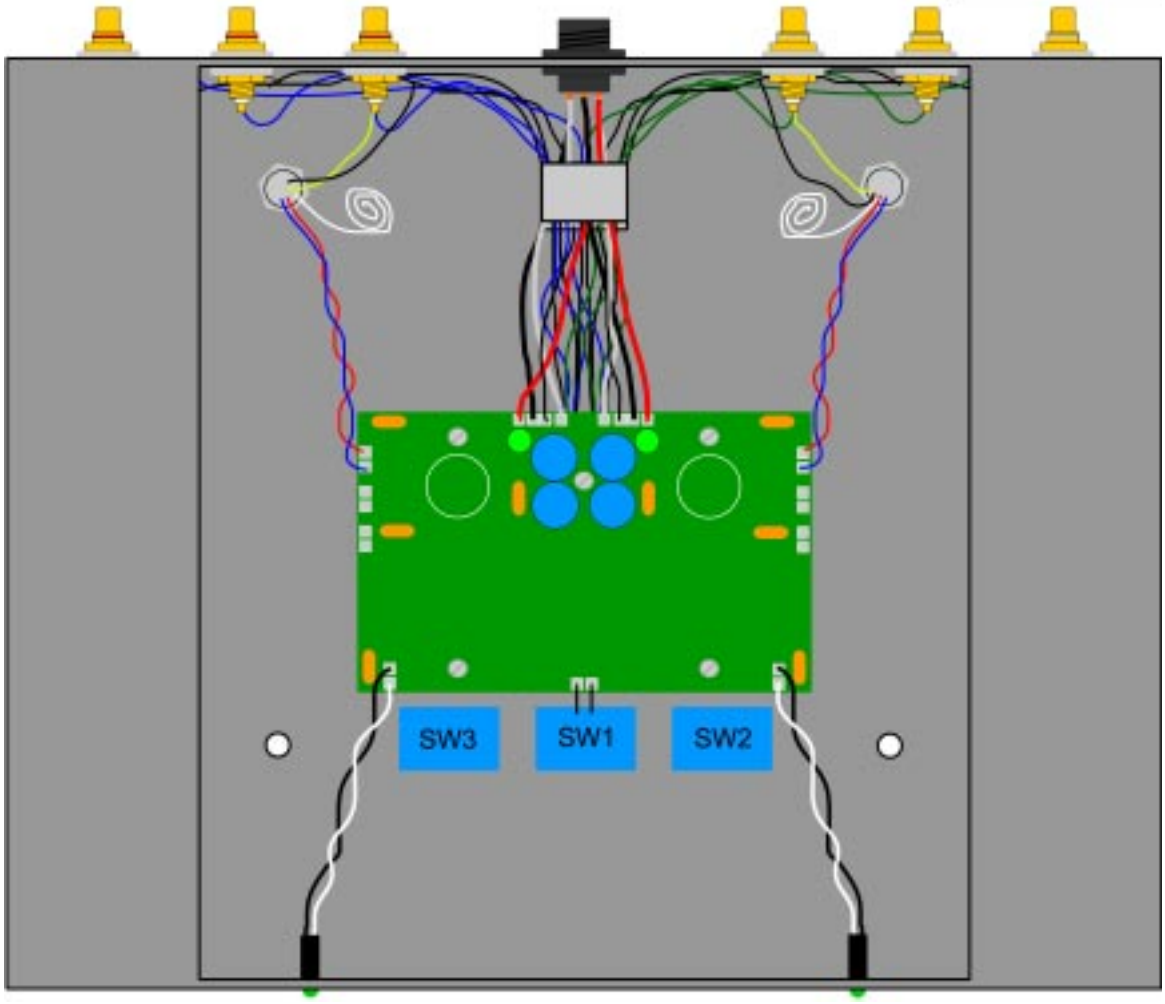
Locate the bag marked “LED”. Take the two LEDs and cut their leads to a length of 3/8” from the bottom of the diode base. Insert each LED into the black connector located on the end of the LED harness as you did for the battery supply LEDs. You will note that at the base of each LED there is a flattened side, the lead wire closest to this flattened side should be inserted into the harness connector pin associated with its black wire. You can now push the LED and its harness connector into the back of the preamp chassis. Approximately 1/8” of the LED should protrude through the chassis wall. The LED is a press fit and should be held in place. If it is loose and does not stay in place, you can apply a very small amount of super glue to the LED harness connector and glue it to the back of the preamp chassis. Do not do this though until we have tested the preamp and are certain the LEDs are installed and operating properly.

Now it is time to install the output transformers. Remove them from their protective bags and remove the 3/8” nut. Route the wires through the chassis and secure each transformer to the chassis with the nut. Finger tighten the nut and be careful not to scratch the outside surface of the chassis. You can then tighten the nut further with a wrench. Be careful not to overtighten the nut. Approximately one full turn of the wrench should be all that is necessary.

Solder the red and blue wire of each transformer to the circuit board pads as shown below. Solder the yellow wire of each transformer to the signal pin of the OUT 1 rca jack and solder the black wire to the ground tab of OUT 1 as shown below. The white wire is the headphone output connection. If you will not be using this connection you can cut it short and tape the end or apply a small length of heatshrink tubing to it.

If you have the Basic Version ULTRAPATH with standard volume control, skip to page 39.

Figure 32



Assemble Series Attenuator

If you have the upgraded series stepped attenuator, proceed with the following steps. If you have the upgraded ladder attenuators or the Ultimate Version ULTRAPATH, skip to page 37.

Start by filing down the small tab located adjacent to the threaded bushing (see Figure 33A). File it down until flush with the bushing base. This will allow the control to mount flat on the chassis surface.

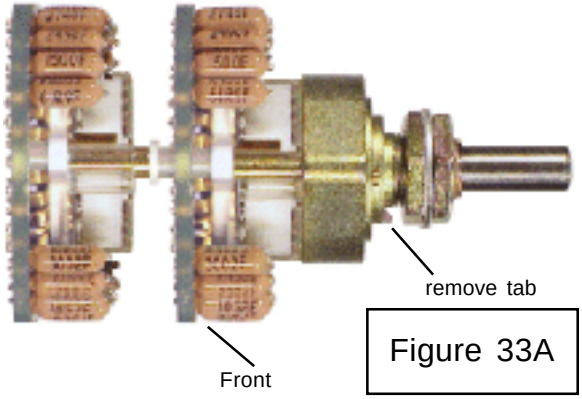


Figure 33A

Locate the bags with the resistors marked “R1” through “R23”. Note that each bag has two resistors inside. Each stereo attenuator has a front and a rear PC board, as shown in Figure 33A, so you will install one R1 in each board, one R2 in each board, one R3, etc.

Bend the resistor leads as shown in Figure 33B and trim them to about 1/2”.

Install the resistors in the front circuit board first. Install one resistor at a time (beginning with R1) into its designated place, bend the leads away from each other, slightly, to hold the resistor in place and then solder the leads on the opposite side of the circuit board.

Figure 33B

Ensure the solder flows onto the leads and circuit board pad evenly and be careful not to form any solder bridges between adjacent pads on the board.

Trim away the excess lead material and proceed in sequence with the next resistor. Next install the resistors on the back circuit board.

When completed your solder joints should resemble those in Figure 33C and your attenuator should look like the one pictured in Figure 33D.

Proceed to page 40 for installation instructions for the series attenuator.

Figure 33C

Figure 33D

Assemble Ladder Attenuator

Start by filing down the small tab located adjacent to the threaded bushing(see Figure 33A). File it down until flush with the bushing base. This will allow the control to mount flat on the chassis surface.

Each mono attenuator has a front and a rear PC board. Each switch position of these attenuators uses a pair of resistors: an Input resistor (RA) and a Ground resistor (RB), as shown in Figure 34A. You must install all of the Input resistors first. This is because they are installed underneath (inside) the outer circle of Ground resistors (see Figure 34B). The inner circle of pads (the ones with the numbers next to them), is for the Input resistors. The outer circle of pads is for the Ground resistors. Also note that there are 3 locations which are to have buss wires installed, not actual resistors.

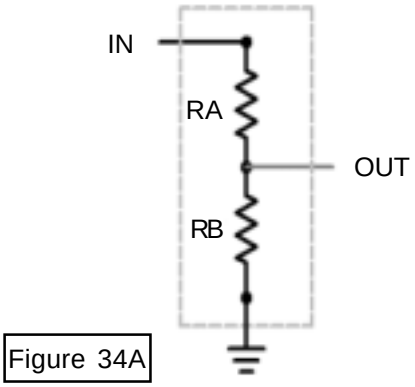
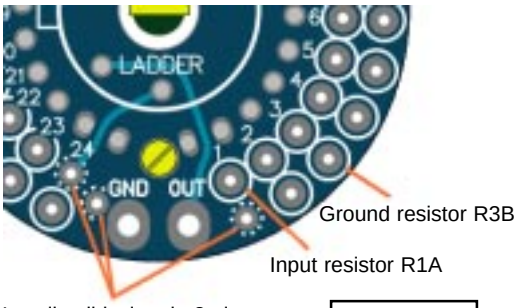


Figure 34A

Trim each resistor to proper length before installing it. The overall resistor length should be: 1.0", = 25.4 mm.

A lead length measuring tool can be cut from a piece of cardboard, using an x-acto knife, as shown in Figure 34C. To use this tool, lay the resistor body into the rectangular cutout, holding the tool and the resistor with the thumb and index finger of one hand. Then, trim the leads flush to the edges of the tool. The cardboard tool will last for hundreds of resistors if you keep the cutters from pressing too hard against it.

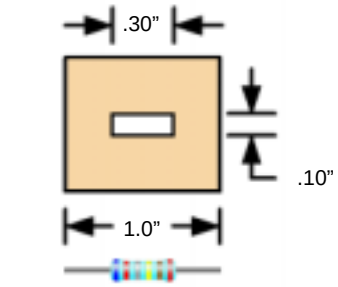


Install solid wires in 3 places
(R24A and R1B are 0 ohms)

Figure 34B

Select resistor R1A and trim its leads to proper length.

Install it into the pads which have the "1" right next to them. Slip one lead all the way into a pad hole, then "pull it back" as the other lead is inserted into the corresponding pad hole on the other wafer. Due to the insertion angle, you will have to bend the first lead inserted for each Input resistor, and then straighten it out after pulling the other lead into place. (Use needle nose pliers with smooth, non serrated jaws for straightening resistor leads.) Also, it is a good idea to orient all the resistors in the same direction. Do this so that you can read all of the resistor values left to right or right to left.



Resistor with trimmed leads

Figure 34C

Center the resistor between the wafers. (You may want to make another cardboard tool for holding the resistors centered while soldering them.)

Solder only the rear wafer connection at this time. This is because you will want to carefully check to ensure all of these "inner circle" Input resistors are the correct ones before you cover them up with the resistors on the "outer circle" (Ground resistors). If you have to remove one, it is a lot easier to do if only one lead was soldered.

Continue as above for R2A and the rest of the Input resistors. (You may find it easier to install 5 or 6 in sequence, solder their rear wafer connections, then do the next 5 or 6, etc.) The last Input resistor (R24A) is 0.0 ohm - so install buss wire or a clipped lead for it. After installing R24A, also install the buss wire next to the pad labeled Gnd, and the buss wire used for R1B.

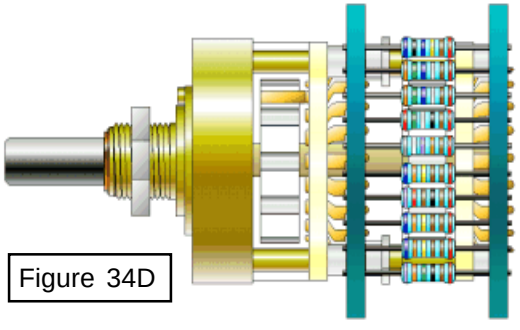


Figure 34D

Attenuator with row A resistors installed

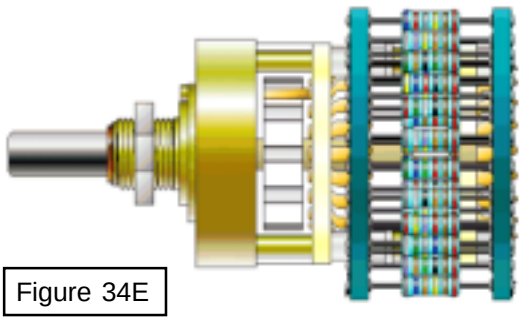


Figure 34E

Attenuator with row B resistors installed

When all the Input resistors are installed, check their values against the parts list. You may also want to check the installed resistor values with an ohm meter. Then, look them over and straighten any leads, if necessary.

Install Ground resistors R1B through R24B. R1B is 0.0 ohms (a buss wire), and is located next to R1A but on the outer circle of pads (see figure 34E). (Again, you may find it easier to install 5 or 6 in sequence, solder their rear wafer connections, then do the next 5 or 6, etc.) Then, check their values against the parts list and/or with an ohm meter, and straighten any leads, if needed. Solder all resistor connections on the front wafer. The following order is recommended:

It is not essential to clean off excess solder flux from the PC board pads, but it does look better. If you choose to do it, use Q-tips and solder flux remover. (99% isopropyl rubbing alcohol is great for removing excess flux. Fingernail polish remover can also be used for this.)

Do not let ANY solvents run or drip onto the switch contacts or their clear plastic covers.

Exercise the new attenuator by turning it fully clockwise, then counter-clockwise about 20 times. This provides initial wear-in, giving it slightly smoother turning action.

Proceed to page 41 for installation instructions for the ladder attenuators or page 42 if you have the Ultimate Version ULTRAPATH.

If you have the Basic Version ULTRAPATH, proceed with the following steps.

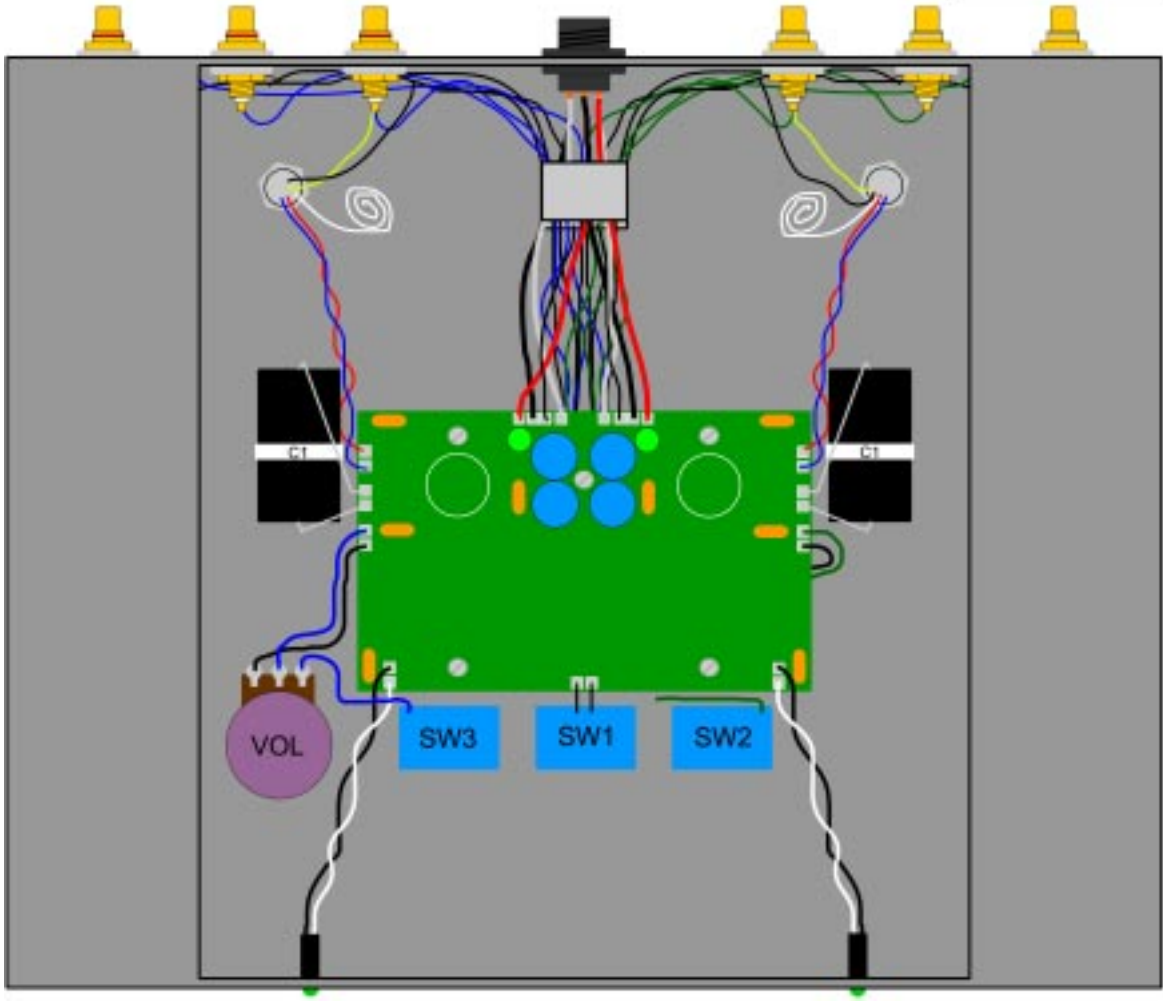
Locate the bag marked “VOL” and remove the volume control. You can break or cut off the small metal tab adjacent to the threaded bushing. Using the supplied nut and washer, install the control onto the chassis as shown below in Figure 35.

Note the volume control has two rows of tabs. One row is for the left channel and the other row is for the right channel. Using the 24ga stranded hookup wire (blue, green and black) cut to length the wires and solder the blue and black wires between the pads on the circuit board and tabs on the volume control as shown below. The black wire should be soldered to the far left tab and the blue wire to the middle tab. Solder these wires to the front row of tabs. Now solder the blue wire previously attached to SW3A to the right tab on the volume control as shown below. Now cut to length and solder a green and black wire between the pads on the right side of the circuit board and tabs on the volume control as shown below. The black wire should be soldered to the far left tab and the green wire to the middle tab. These two wires can be routed underneath the circuit board and soldered to the back row of tabs on the volume control. Now solder the green wire previously attached to SW2D to the right tab on the volume control as shown below.

Locate the bags marked “C1” and “CLIP2”. Bend the leads of C1 as shown below and solder them to the remaining pads on the circuit board as shown in Figure 35. Note: This capacitor is not polarized. Once soldered in place, install an adhesive backed clip and tie wrap under each capacitor and secure them to the chassis. If you have purchased the Oil Cap upgrade, see page 42 for installation instructions.

Proceed to page 43.

Figure 35



If you have the Basic Version ULTRAPATH with the Series Attenuator upgrade, proceed with the following steps.

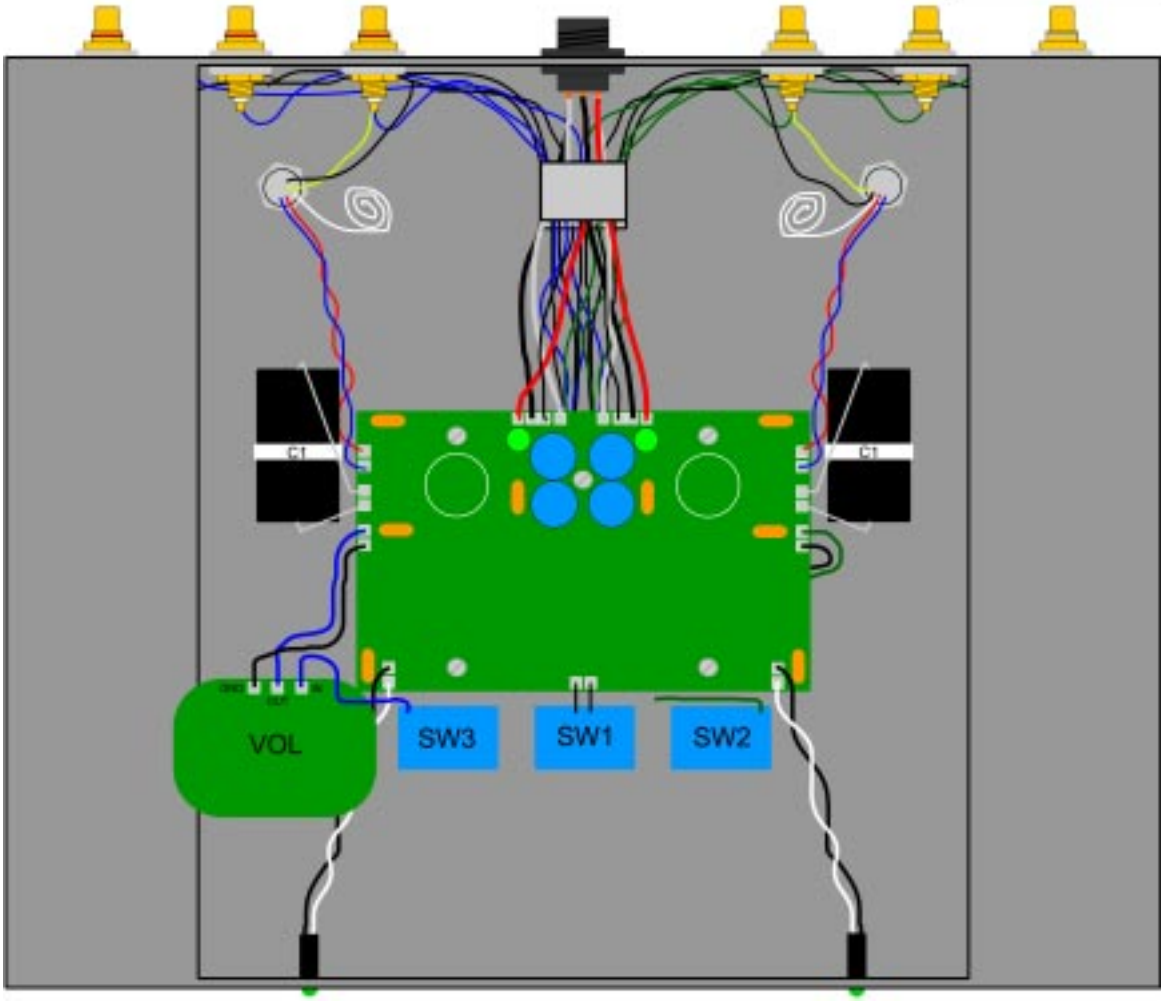
Using the supplied nut and washer, install the attenuator onto the chassis as shown below in Figure 36.

On each attenuator circuit board there are three pads labeled “IN”, “OUT” and “GND”. Using the 24ga stranded hookup wire (blue, green and black) cut to length the wires and solder the blue and black wires between the pads on the main circuit board and the “OUT” and “GND” pads on the control as shown below. The black wire should be soldered to the “GND” pad and the blue wire to the “OUT” pad on the control. Now solder the blue wire previously attached to SW3A to the “IN” pad on the control as shown below. Now cut to length and solder a green and black wire between the pads on the right side of the main circuit board and pads on the control as shown below. The black wire should be soldered to the “GND” pad and the green wire to the “OUT” pad on the control. These two wires can be routed underneath the circuit board and soldered to the back circuit board on the control. Now solder the green wire previously attached to SW2D to the “IN” pad on the control circuit board as shown below.

Locate the bags marked “C1” and “CLIP2”. Bend the leads of C1 as shown below and solder them to the remaining pads on the circuit board as shown in Figure 36. Note: This capacitor is not polarized. Once soldered in place, install an adhesive backed clip and tie wrap under each capacitor and secure them to the chassis. If you have purchased the Oil Cap upgrade, see page 42 for installation instructions.

Proceed to page 43.

Figure 36



If you have the Basic Version ULTRAPATH with the Ladder Attenuator upgrade, proceed with the following steps.

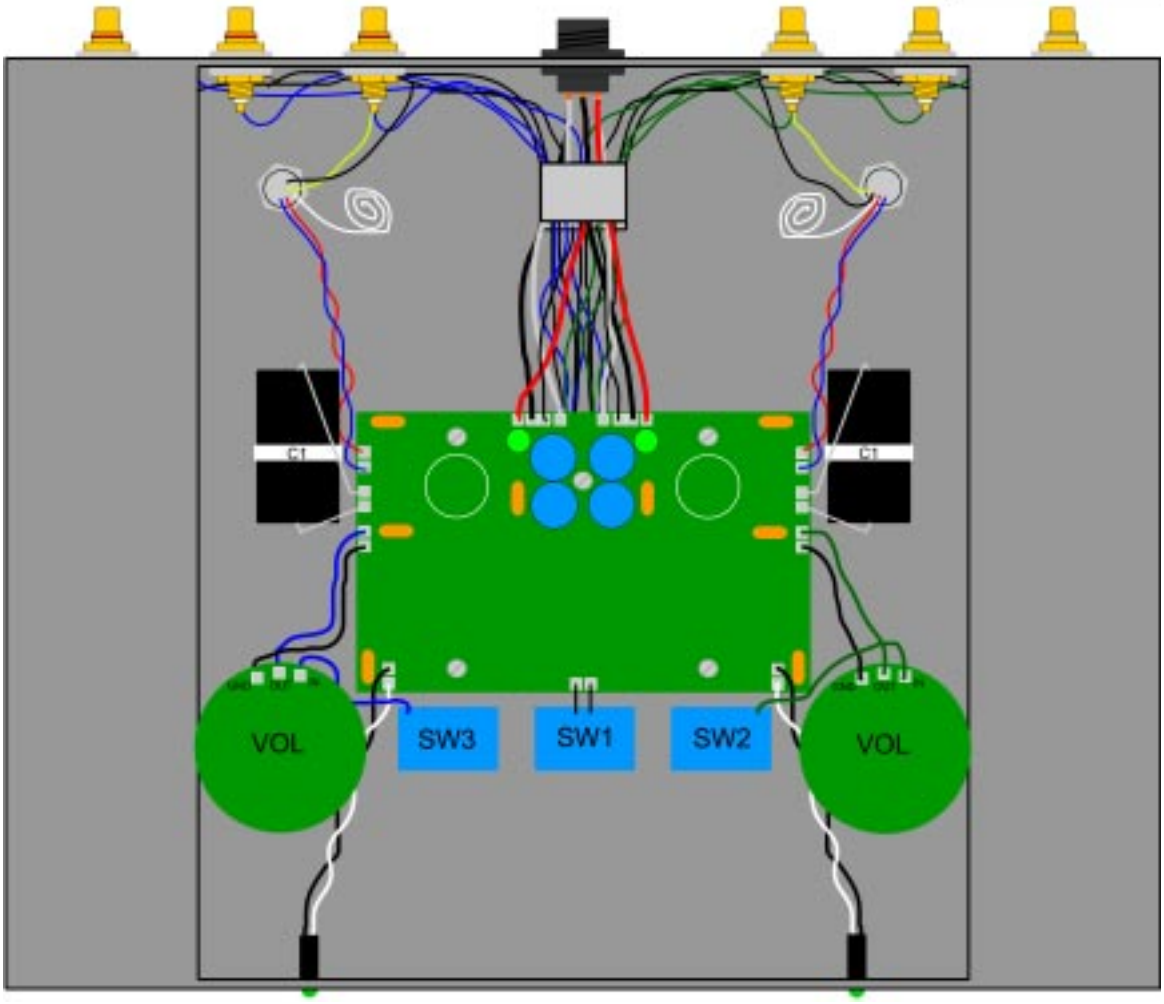
Using the supplied nut and washer, install the attenuators onto the chassis as shown below in Figure 37.

On each attenuator circuit board there are three pads labeled “IN”, “OUT” and “GND”. Using the 24ga stranded hookup wire (blue, green and black) cut to length the wires and solder the blue and black wires between the pads on the main circuit board and the “OUT” and “GND” pads on the control as shown below. The black wire should be soldered to the “GND” pad and the blue wire to the “OUT” pad on the control. Now solder the blue wire previously attached to SW3A to the “IN” pad on the control as shown below. Now cut to length and solder a green and black wire between the pads on the right side of the main circuit board and pads on the control as shown below. The black wire should be soldered to the “GND” pad and the green wire to the “OUT” pad on the control. Now solder the green wire previously attached to SW2D to the “IN” pad on the control circuit board as shown below.

Locate the bags marked “C1” and “CLIP2”. Bend the leads of C1 as shown below and solder them to the remaining pads on the circuit board as shown in Figure 37. Note: This capacitor is not polarized. Once soldered in place, install an adhesive backed clip and tie wrap under each capacitor and secure them to the chassis. If you have purchased the Oil Cap upgrade, see page 42 for installation instructions.

Proceed to page 43.

Figure 37



If you have the Ultimate Version ULTRAPATH with the Ladder Attenuator upgrade, proceed with the following steps.

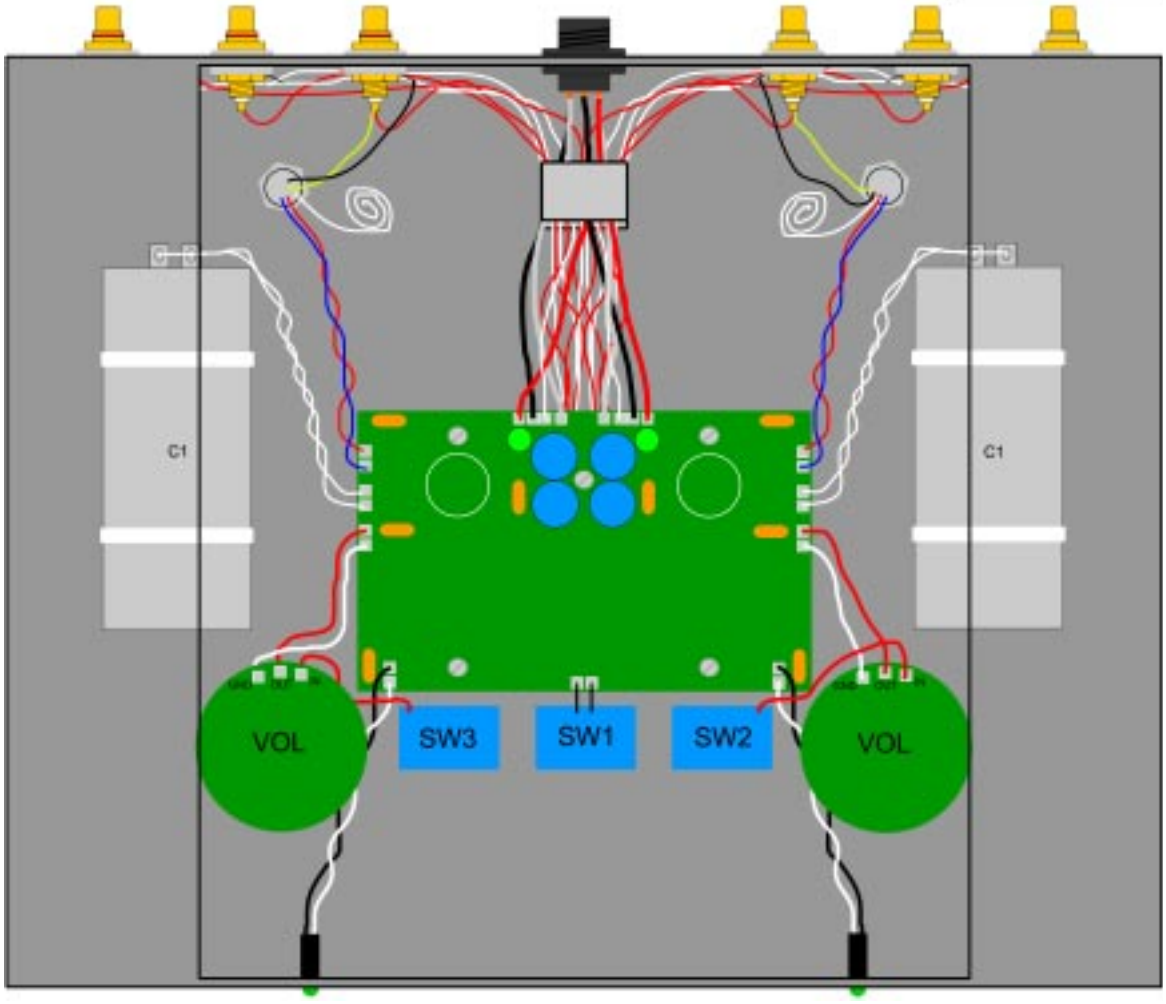
Using the supplied nut and washer, install theattenuators onto the chassis as shown below in Figure 38.

On each attenuator circuit board there are three pads labeled “IN”, “OUT” and “GND”. Using the 23ga silver solid core hookup wire (red and white) cut to length the wires and solder the red and white wires between the pads on the main circuit board and the “OUT” and “GND” pads on the control as shown below. The white wire should be soldered to the “GND” pad and the red wire to the “OUT” pad on the control. Now solder the red wire previously attached to SW3A to the “IN” pad on the control as shown below. Now cut to length and solder a red and white wire between the pads on the right side of the main circuit board and pads on the control as shown below. The white wire should be soldered to the “GND” pad and the red wire to the “OUT” pad on the control. Now solder the red wire previously attached to SW2D to the “IN” pad on the control circuit board as shown below.

Locate the bags marked “C1” and “CLIP2”. The big oil caps each have two posts and each post has four terminals. You will only need to solder to one of the terminals on each post. Note: This capacitor is not polarized. You can use whatever wire you have remaining in the kit. If you have the Ultimate Version and have some silver wire left over, use it. Install two of the adhesive backed clips and tie wraps under each capacitor and secure them to the chassis. Then solder two wires from each capacitor to the two remaining circuit pads as shown below.

Proceed to page 43.

Figure 38



Umbilical Cord Assembly

The final assembly procedure involves building the umbilical cord. Locate the two female umbilical cord connectors “CON2” and the 4’ section of gray cable.

Decide how long you want your umbilical cord to be (the shorter the better) and shorten the cable if necessary. Remove approximately 3/4” of the gray jacket from one end of the cable. Strip 1/4 inch of insulation from one end of each wire. Solder one wire to each of the connector pins as shown below in Figure 39. Use just enough solder to make the connection. Lightly pre-tinning the end of the wire first sometimes helps. Make certain there are no solder burrs that can come in contact with an adjacent connector pin.

Once all of the wires are soldered, slip the locking nut over the wires and onto the plug. Slip the strain relief bushing over the wires and into the plug, it should snap into place. Next slide the rubber boot over the wires and onto the plug. Slip a piece of the 1/2” black heatshrink tubing over the back of the rubber boot and cable and heat with a hair dryer.

Before soldering the other plug to the wires, first slide a piece of the heatshrink tubing, then the other plug’s rubber boot, strain relief bushing and locking nut onto the cord.

Remove approximately 3/4” of the gray jacket from the other end of the cable. Cut the ends of the wires flush with each other and strip 1/4 inch of insulation from each end. Solder the ends of the wires to the connector pins as shown in Figure 39. Each colored wire should be soldered to the same pin on both plugs. Once all of the wires are connected, install the locking nut, strain relief bushing and rubber boot and then apply heat to the heatshrink tubing.

Now would be a good time to test the umbilical cord. Using a VOM set for reading “OHMS” check each connector pin for continuity on both ends of the cable. With the test leads of the meter connected to the same pin location on each end of the cable you should obtain a reading of approximately 0 ohms. Now move to the next pin location and test it. Test all 6 connector pins.

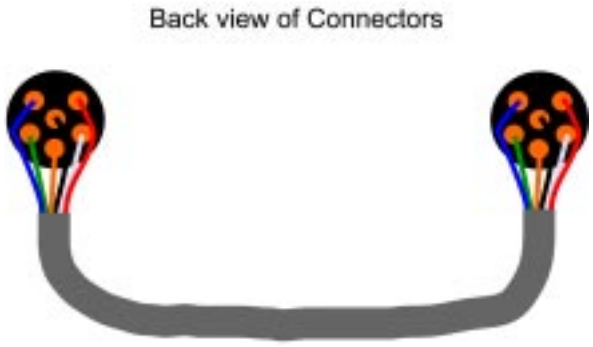


Figure 39

This completes the assembly of the ULTRAPATH preamp. Now is a good time to go back and inspect your work.

Power Up and Test Procedure

With the preamp turned upside down, install the umbilical cord between the preamp and battery supply. Before installing the umbilical cord, make sure the battery supply transfer switches are switched to the charge mode.

To install the umbilical connectors, push the male connector onto the female as far as it will go, then push the connector forward again while rotating the locking nut in the clockwise direction. The nut should lock after 1 turn. If you assembled all of the connectors properly you should be able to mate the connectors without having to twist the umbilical too much.

Install the 6GM8/ECC86 tubes into the preamplifier. Power-on one channel at a time by flipping the transfer switch on the battery supply. Perform the following measurements with your voltmeter:

The LED for the powered-on channel should light and the LED on the Battery Supply should turn off.

For each channel, set the meter for a range of 10 volts “DC” or more. .....Place the multimeter’s red “+” test probe on the circuit board pad labeled “+6 volts” and the black “-” test probe on one of the pads marked “Gnd” as shown below in Figure 40. You should measure approximately 6 volts dc.

For each channel, set the meter for a range of 30 volts “DC” or more. .....Place the multimeter’s red “+” test probe on the circuit board pad labeled “+24 volts” and the black “-” test probe on one of the pads marked “Gnd” as shown below in Figure 40. You should measure approximately 24-26 volts dc.

Visually inspect the tubes; are they glowing?

If the above voltages measure good turn the unit off and install the bottom cover. Locate the bag marked “FEET”. Insert the bottom cover into the chassis. Two ends of the bottom cover have a lip with threaded inserts. These lips should be installed such that they are inside the chassis and the threaded inserts line up with the four holes on the bottom of the chassis. Push one 6-32 screw through the hole in the rubber foot and then screw it into the threaded insert. Once all four feet and their screws are installed, the bottom plate should be flush with the bottom surface of the chassis.

You can now connect the ULTRAPATH bp linestage to your system and listen to music.

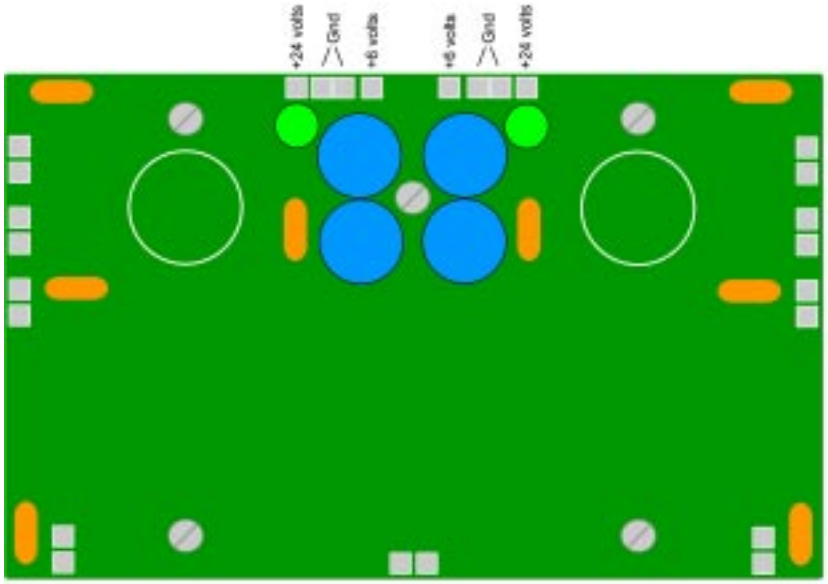


Figure 40

Troubleshooting

Problem:

Low or no 6V reading:	Check the polarity of all electrolytic capacitors. Make sure the batteries are fully charged.
Low or no 24V reading:	Check the polarity of all electrolytic capacitors. Make sure the batteries are fully charged.
No Sound	Are the tubes glowing? Are your speakers connected?
Excessive Hum	Check all wiring. Loosen the nut on the output transformer and very slowly rotate the transformer while listening to the hum. If the hum is eliminated in one position, stop and retighten the nut.

Headphone Operation

The ULTRAPATH's output transformer has a second set of low impedance taps that can be used with headphones. These are the coiled white wires depicted in Figure 35. You have two recommended options for connecting this second set of outputs.

1) You can install a "normally closed" phonojack on the ULTRAPATH chassis which has the signal normally connected to the main rca output jacks. When you plug in your headphones to this jack it interrupts this circuit and connects the headphone tap to your headphones and at the same time disconnects the signal going to your amplifier(s).

2) You can use the second set of ULTRAPATH outputs (OUT 2) for your headphones and install a DPDT switch to toggle the preamp signal between OUT 1 and OUT 2.

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If you have difficulty building or troubleshooting your equipment, drop us an email. We will be glad to help you get your equipment running. We have a very high success rate at troubleshooting equipment problems via email and it will help if you have taken the time to write down as many symptoms as possible and also take and record some voltage measurements at key nodes in the circuit. If all else fails, you can send your linestage to us, however this should be your last resort.

We have built and tested this linestage many times over and it works and therefore we have to assume that if your linestage does not work, it is most likely something you did wrong during assembly. Please be prepared to pay a flat rate fee of $40 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 contact us. We really want you to complete this project.

Final Notes

The ULTRAPATH bp linestage is designed to require a minimum amount of maintenance. There are no adjustments to make, you just plug the unit into your system and enjoy. You should obtain at least two years of operation from a set of batteries.

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.

No doubt many of you will look at this linestage with an eye on making component changes or circuit modifications. If you purchased this linestage pre-assembled, this will void the warranty. If you have built the kit version, then go for it!

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 ULTRAPATH bp Linestage

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.

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ULTRAPATH bp

Battery Powered
Vacuum Tube Linestage

Owners & Assembly Manual

Welborne Labs