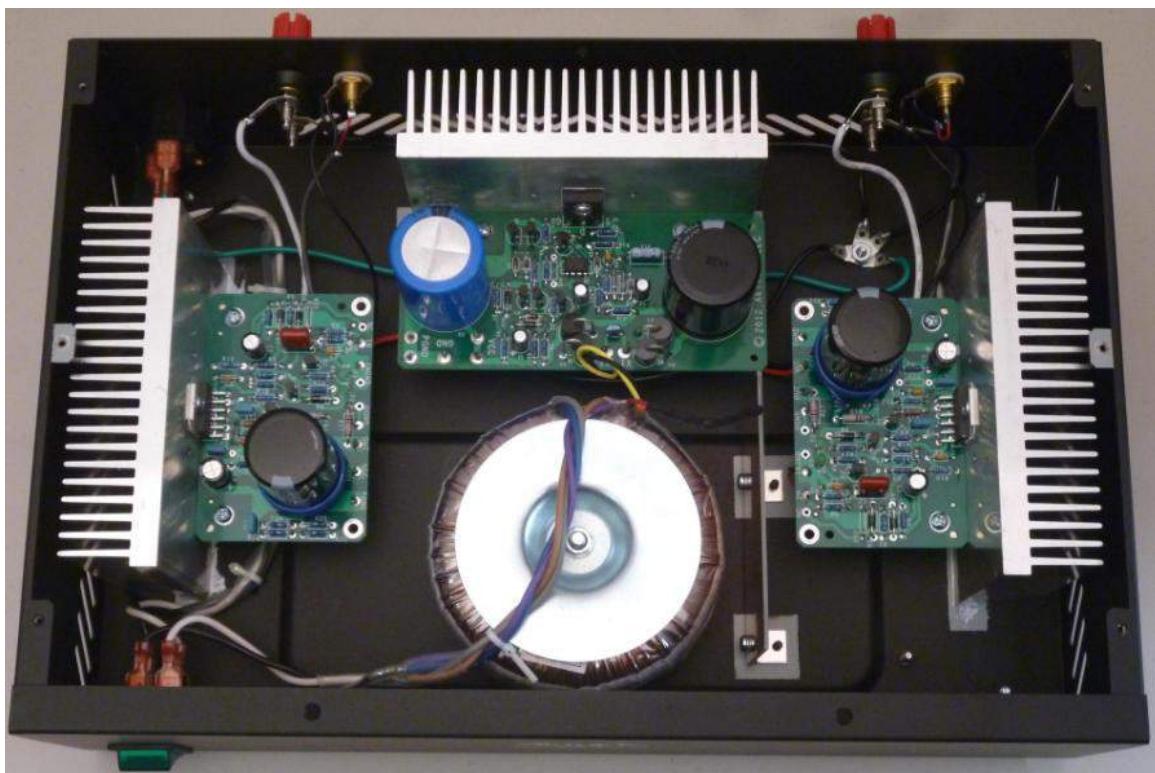


# AkitikA

**GT-101 STEREO**

**AUDIO POWER AMPLIFIER**

**ASSEMBLY MANUAL**



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## **Section 1: About This Manual**

This manual gives the information needed to build Akitika LLC's GT-101 Stereo Power Amplifier.

### ***Who Should Attempt this Project?***

You can build this kit if you can:

1. solder (using normal rosin core solder and a soldering iron).
2. use simple hand tools like screwdrivers, wire cutters, and pliers.
3. read and follow directions.

It helps if you:

1. know a bit about electronics, or
2. have a friend who knows a bit about electronics
3. can get to YouTube to watch a few helpful videos about the assembly process

### **Tools You'll Need**

You'll need the following tools:

1. Phillips screwdriver (#1 and #2)
2. pliers or nut drivers suitable for #6 hardware (5/16" nut driver or hex wrench).  
Note that the 5/16" nut driver is also the correct size for the speaker binding post nuts.
3. needle nose pliers (helpful, but not strictly necessary)
4. pencil type soldering iron of 25 to 50 Watts (no huge honking soldering guns or blowtorches)
5. wire cutters and strippers
6. multi-meter (helpful, but not strictly necessary)
7. magnifying glass, if you're over 42!

## **Project Overview**

The project consists of the following steps:

1. Build the Power Supply Regulator Board
2. Build left and right channel amplifier circuit boards.
3. Install and wire the circuit boards, switches, and connectors into the chassis.

## **Important Safety Notes**

By purchasing, using, or assembling this kit, you have agreed to hold AkitikA, LLC harmless for any injuries you may receive in its assembly and/or use. To prevent injuries:

- Wear safety glasses when soldering to prevent eye injuries.
- Always unplug the power before working on the amplifier.
- Large capacitors hold lots of energy for a long time. Before you put your hands into the amplifier:
  - Pull the AC plug!
  - Wait 2 full minutes for the capacitors to discharge!
- Remove jewelry and rings from your hands and wrists, or anything that might dangle into the amplifier.
- If working in the amplifier, keep one hand in your pocket, especially if you're near the power supply or power supply wires. This can prevent serious shocks.
- Build with a buddy nearby. If you've ignored all the previous advice, they can dial 911 or get you to the hospital.

## **About Components**

We reserve the right to make design and/or component changes at any time without prior notification.

## **Recommended Solder**

The kit must be assembled with 60/40 Rosin Core solder. The recommended diameter is 0.032 inches. Among many such sources of solder, I have used Radio Shack part number 64-009. It contains 8 oz. of solder, which is much more than you'll need to assemble the GT-101 kit.

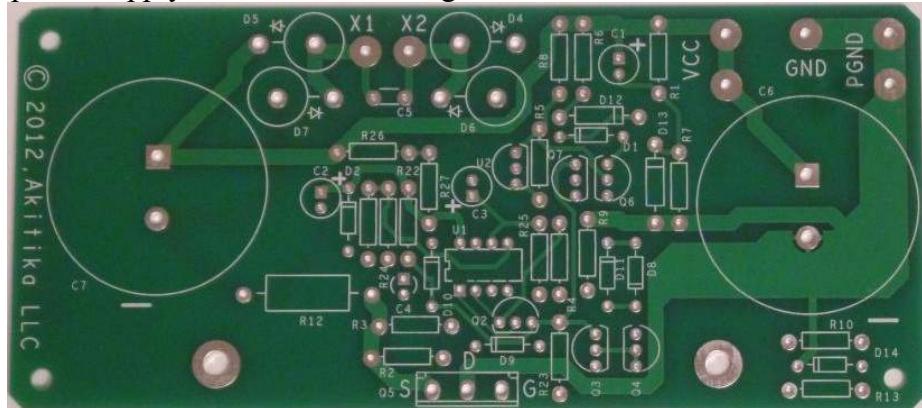
## **Warranty**

With the exception of fuses, Akitika will replace for free any parts of a correctly assembled GT-101 that fail within one year of the date of purchase when the amplifier has been used in home stereo applications. It is the responsibility of the kit builder to install the replacement part(s). This warranty applies to the original purchaser only. It does not apply to units that have been physically or electrically abused, modified without prior factory authorization, or assembled with other than 60/40 Rosin Core solder. Akitika LLC's liability shall in no event exceed the cost paid to Akitika LLC for the kit.

## Section 2: Building the Power Supply PCB

This section details the process of building the power supply circuit board. We start with an overview on this page. The specifics you need to start building begin on the next page.

The bare power supply PCB is shown in Figure 1.



**Figure 1-Component side of power supply PCB before loading**

Begin by carefully emptying the contents of the envelope marked “GT-101 PSU Module” into a broad soup bowl, as shown below. In general, you’ll start with the components that lay closest to the board, working your way towards the taller components. You will:

1. Install the resistors (all but one power resistor, left for later)
2. Install the diodes
3. Install the capacitors
4. Install the integrated circuits.
5. Install the transistors
6. Install the pass transistor Q5 as you mount the PCB to the heat sink.

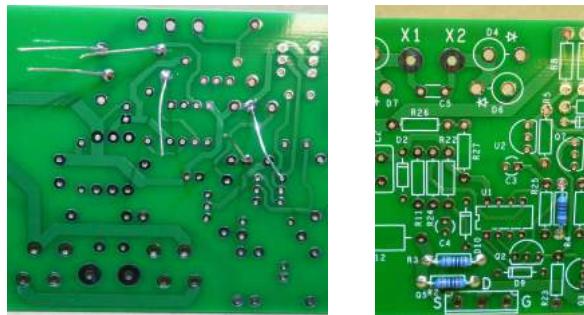


### **Component Order**

You’ll notice that the component designations in the directions don’t go exactly in order. We have grouped them so that all components with the same value appear together. This makes assembly easier. You’ll find in the parts kit that similar parts, e.g. 3 1K resistors, are typically (though not always) taped together.

### **Install the Resistors**

In general, you install the resistors by placing the body on silk screen side of the board, and the leads through the indicated holes. Bend the leads over on the back of the board to keep the resistors from falling out until your solder them in place. Try to bend the leads in a direction that won’t lead to solder bridges between traces that should remain disconnected.



**Figure 2-Installing resistors**

We recommend the following procedure:

1. Insert all the resistors of the same value, e.g. R2, R3 and R4.
2. Bend the leads as described above.
3. Solder the leads on the back of the board.
4. Clip the leads.

Track your progress by placing a check-mark in the done column as you install each resistor. Check resistor values with a meter, or by reading the color code<sup>1</sup>. Orient the resistor with the fat brown band on the right, then you can read both the Color Code column and the resistor from left to right.

1/4 Watt, 1% resistors			
Designation	Value	Color code	Done? (✓)
R2	1K	Brown, Black, Black, Brown, Brown	
R3	1K	Brown, Black, Black, Brown, Brown	
R4	1K	Brown, Black, Black, Brown, Brown	
R6	10K	Brown, Black, Black, Red, Brown	
R26	10K	Brown, Black, Black, Red, Brown	
R27	10K	Brown, Black, Black, Red, Brown	
R8	20K	Red, Black, Black, Red, Brown	
R9	20K	Red, Black, Black, Red, Brown	
R1	15K	Brown, Green, Black, Red, Brown	
R5	140K	Brown, Yellow, Black, Orange, Brown	
R7	5K76	Green, Violet, Blue, Brown, Brown	
R10	26K1	Red, Blue, Brown, Red, Brown	
R11 <sup>2</sup>	3K48	Orange, Yellow, Gray, Brown, Brown	
R13	3M01	Orange, Black, Brown, Yellow, Brown	
R22	165K	Brown, Blue, Green, Orange, Brown	
R23	100	Brown, Black, Black, Black, Brown	
R24	95K3	White, Green, Orange, Red, Brown	
R25		This location remains empty	

We will defer installation of R12, a 0.1 Ohm power resistor, for a bit later in the assembly process.

<sup>1</sup> See “Appendix 1 - Resistor Color Code” on page 42 to see how to read resistor color codes.

<sup>2</sup> See next page for location of R11. The R11 designation is missing from the silk-screen.

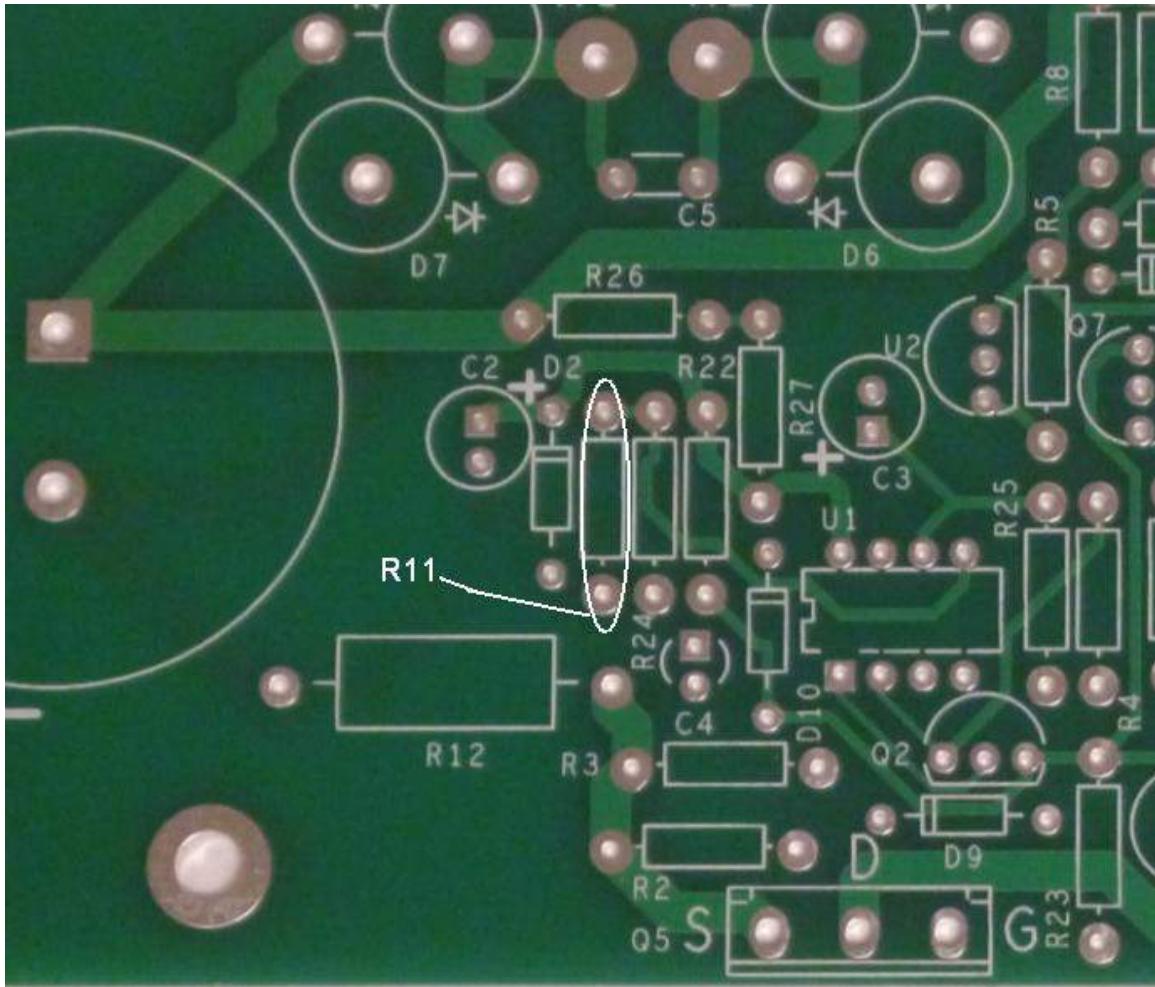


Figure 3-R11 location (PCB's are missing the silk screen for R11)

## Install the Diodes

Now install the diodes. Be careful to observe the polarity markings on the diodes. You'll notice that one end of the diodes has a band. That band indicates the cathode of the diode. Match the banded end of the diode with the banded end of the silk screen. The following information should help you identify the diodes.

## Identifying the glass body diodes

The glass body diodes have the following identifying marks. If your vision is like mine, you may need good light and a magnifying glass.

- 1N4148, D8-D11, has the number 48 visible
- BZX55B33B, D1 and D14, has the number 33 visible
- BZX79-B10, D2, has the number 10 visible

Also, typically when these diodes are packed, you can preliminarily identify the types because:

- The 4 1N4148 diodes will typically be taped together
- The 2 BZX55B33B diodes will typically be taped together
- The 1 BZX79-B10 diode will be by itself

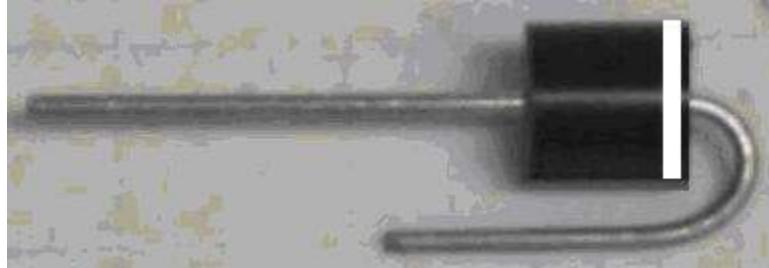
D4-D7, opaque black plastic package	D12, D13, package type DO-41, opaque black plastic package	D1, D2, D8-D11, D14, package type DO-35, glass package

Keep track of the diodes as you install them using the following table. Remember to watch the polarity of the diodes, matching the banded end of the diode to the banded end of the silk screen.

Designation	Type, Package	Description	Done? (✓)
D1	BZX55B33, DO-35	33 Volt 2% zener diode	
D14	BZX55B33, DO-35	33 Volt 2% zener diode	
D2	BZX79-B10, DO-35	10 Volt 2% zener diode	
D8	1N4148, DO-35	0.2 A, 100 PIV, switching diode	
D9	1N4148, DO-35	0.2 A, 100 PIV, switching diode	
D10	1N4148, DO-35	0.2 A, 100 PIV, switching diode	
D11	1N4148, DO-35	0.2 A, 100 PIV, switching diode	
D12	1N4004, DO-41	1A, 400 PIV, rectifier diode	
D13	1N4004, DO-41	1A, 400 PIV, rectifier diode	

Warning: Don't cut the leads of D4-D7 until after the leads have been formed and the diodes have been soldered into the PCB.

Form the leads of D4-D7 as shown in Figure 4. Solder one lead of each diode while attempting to keep the body perpendicular to the plane of the board. Ideally, the anodes of D4-D7 should sit about 1/8" to 1/16" off the board.



**Figure 4-Form the cathodes of D4-D7 as shown (banded end denotes cathode)**

Designation	Type, Package	Description	Done? (✓)
D4	6A4, R-6	6A, 400 PIV, rectifier diode	
D5	6A4, R-6	6A, 400 PIV, rectifier diode	
D6	6A4, R-6	6A, 400 PIV, rectifier diode	
D7	6A4, R-6	6A, 400 PIV, rectifier diode	

### **Install the Last Resistor**

R12 should be air-mounted, with the bottom of its body about 1/8" above the PCB.

2 Watt, 5% resistor			
Designation	Value	Marking	Done? (✓)
R12	0.1	0.1	

### **Install the Small Capacitors**

Now install the small capacitors:

*C1, C2, and C3 are polarized, showing a minus sign (-) on the negative end of the capacitor. Make sure that the minus sign faces away from the plus sign (+) marked on the silk screen for each of the capacitors.*

Designation	Value	Description	Done? (✓)
C1	10 µF	100V electrolytic (polarized), cylindrical shape	
C2	10 µF	100V electrolytic (polarized), cylindrical shape	
C3	10 µF	100V electrolytic (polarized), cylindrical shape	
C4	100 nF	50V, Z5U, +/- 20%, marked 104	
C5	10 nF	400V, film, 20%, box shaped	

## Install the Integrated Circuits

Install the integrated circuits.

*Orient U1 so that pin 1 on the chip matches pin 1 on the silk screen.*

*Orient U2 to match the silk screen outline.*

Designation	Type	Description	Done? (✓)
U1	LM258 or LM358	8 Pin DIP	
U2	TL431, TO-92	Programmable shunt regulator	

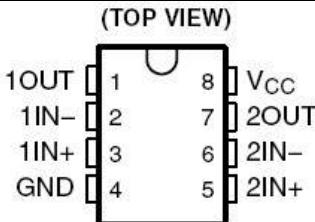


Figure 5-Pinout of U1, viewed from the top

## Install the Transistors

You may have to spread the outside leads a bit to make it easier to insert them into the board. Do not install Q5 now. It will be installed later.

*Orient the transistor so its body shape matches the silk-screen outline. Leave the top of the transistor about  $\frac{1}{2}$ " off the board! The lead length prevents stress on the body and keeps the transistor safe from too much heat during the soldering operation.*

Designation	Type	Description	Done? (✓)
Q2	2N3904, TO-92	60 V NPN bipolar transistor	
Q3	2N3904, TO-92	60 V NPN bipolar transistor	
Q4	2N3904, TO-92	60 V NPN bipolar transistor	
Q6	2N5401, TO-92	150 V PNP bipolar transistor	
Q7	2N5401, TO-92	150 V PNP bipolar transistor	

*Don't use too much solder on the transistor leads. This is one place where the spacing is close enough that extra solder might cause short circuit between two leads on a given transistor. Note that Q4's collector and base are connected by the circuit board.*

## Install the Big Capacitors

Install C6 and C7.

*C6 and C7 are polarized. Be careful to get the polarity correct. Double check their polarity before you solder them in place. They have large terminals, so it will take a fair amount of heat and solder.*

Designation	Type	Description	Done? (✓)
C6 <sup>3</sup>	4700 $\mu$ F/80V	Electrolytic capacitor	
C7	2200 $\mu$ F/160V	Electrolytic capacitor	

*Caution: C6 and C7 are not identical! Be sure to put each in its correct place!*

<sup>3</sup> If you purchased the 10KUF101 upgrade, this will be a 10,000  $\mu$ F 80 Volt capacitor.

## **Final Inspection of the Circuit Board**

After you've taken a break, look over your completed circuit board one more time. Looking on the component side, double check:

1. polarity (banded end) of diodes matching the banded end on the silk screen.
2. polarity of C1, C2, C3, C6 and C7 (minus sign away from the indicated plus sign on the silk screen).

If you get one of these polarities wrong, there is a good chance that the power supply won't work, or there will be damage when you power it up.

Look at the solder side of the board. Make sure that:

1. All component leads are soldered (it's easy to forget one or two, and that will cause either unreliable operation, or no operation at all!)
2. There are no solder bridges between pads which should be isolated. Solder bridges may stop the power supply from working correctly.

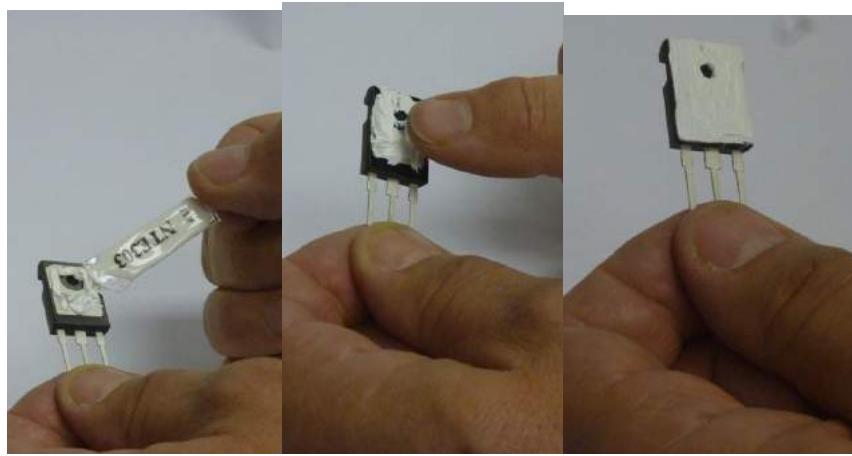
## **Power Supply Final Assembly**

In this section, you'll install Q5 while you mount the power supply circuit board to one of the three finned heat sinks. Note that the three heat sinks are identical.

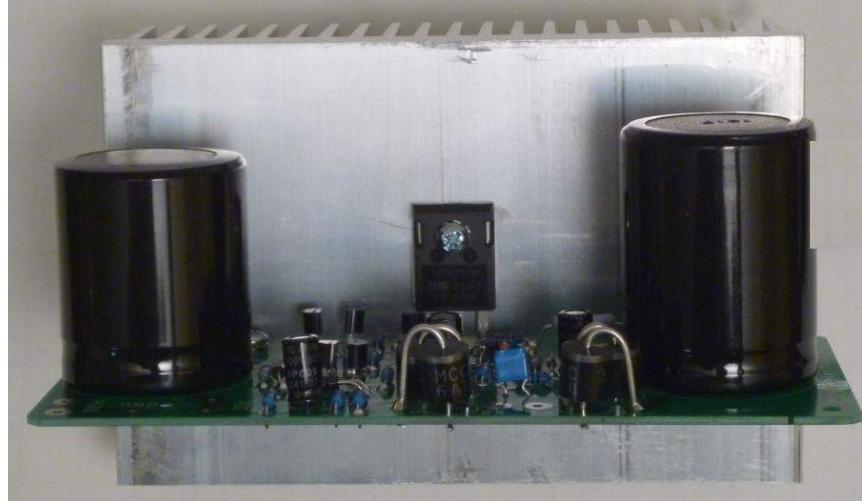


**Figure 6-Note the rounded brackets used for the power supply heatsink and PCB**

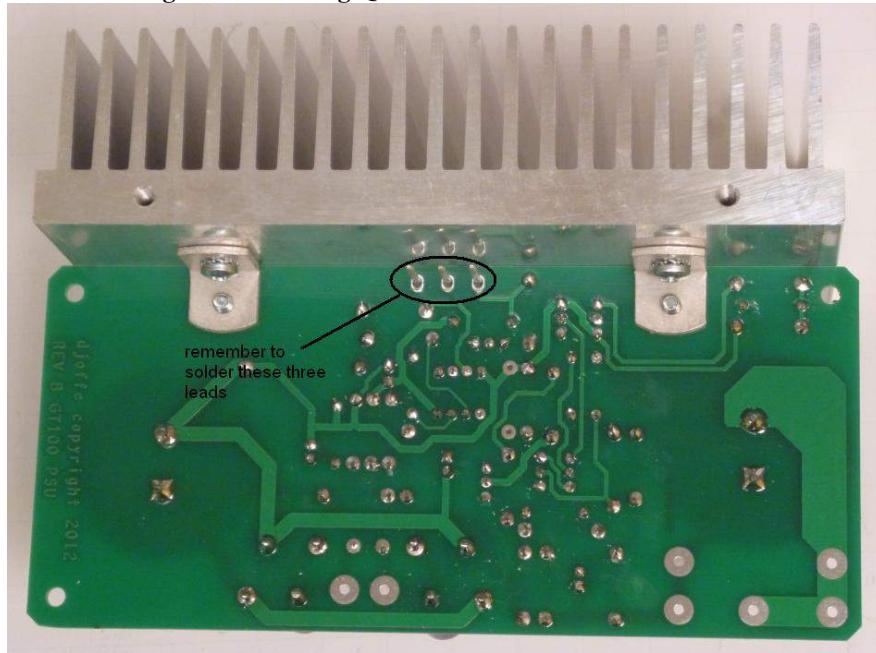
1. Use two 6-32x3/8" screws to fasten a pair of mounting brackets to the heat sink, placing the screw through the 9/64" clearance hole in the bracket. Note that one hole in the mounting bracket is a 9/64" clearance hole, the other hole is threaded to accept a 6-32 screw. Don't tighten the screws yet. *Make sure you use the brackets with the rounded edges to mount the power supply PCB.*
2. Use two 6-32x1/4" screws to fasten the PCB to the mounting brackets and heat sink. Don't tighten the screws yet. One of the screws is visible in Figure 19, the other is hidden behind the large output capacitor.
3. Place a thin film of thermal compound on the metal tab surface of Q5 as shown in Figure 7. Inset Q5 into the circuit board as shown in Figure 8. Secure it in place with a #6-32x1/2" screw, just finger tight for now. The side with the thermal compound must attach to the heat sink.
4. The previous step uses just a small amount of the thermal compound in the squeeze tube. Put the squeeze tube in a safe place, as you may choose to use the rest of its contents when you Fasten the Power Supply to the Chassis.



**Figure 7-Placing thermal compound on Q5**



**Figure 8-Installing Q5 on the heatsink and to the PCB**



**Figure 9-Remember to solder Q5's leads**

5. Line up the PCB, brackets, and Q5 so everything is square and fits comfortably, then tighten the 5 screws:
  - a. 2 that hold the brackets to the PCB
  - b. 2 that hold the brackets to the heatsink
  - c. 1 that holds Q5 to the heatsink.
6. Solder the three leads of Q5 on the component side of the board, and clip the leads. Inspect your work from both the top and the bottom of the board to make sure there are no solder bridges between the leads.

Once the power supply/heat sink module is completed, set it aside and proceed to the next section, where you will build the amplifier modules.



Figure 10-Assembled Power supply mounted on heat sink

### Section 3: Assembling the Amplifier Circuit Boards

This section details the process of building the amplifier module circuit boards. We start with an overview on this page. Begin by carefully emptying the contents of one of the envelopes marked “GT-101 Amplifier Module” into a broad soup bowl, as shown in Figure 11.

In general, you’ll start with the components that lay closest to the board, working your way toward the taller components. You will:

1. Install the resistors
2. Install the small capacitors
3. Install the diodes
4. Install the LEDs
5. Install the medium size capacitors
6. Install the transistors
7. Install the big capacitor
8. Wind and install the output inductor.
9. Install the LM3886.



Figure 11-Empty the amplifier components into a soup bowl



Figure 12-Closeup of Completed Amplifier board

### Install the Resistors

In general, you install the resistors by placing the body on the silk screen side of the board, and the leads through the indicated holes. Bend the leads over on the back of the board to keep the resistors from falling out until your solder them in place. Try to bend the leads in a direction that won't lead to solder bridges between traces that should remain disconnected.

We recommend the following procedure:

5. Insert all the resistors of the same value, e.g. R14, R19, R20, and R21.
6. Bend the leads as described above.
7. Solder the leads on the back of the board.
8. clip the leads.

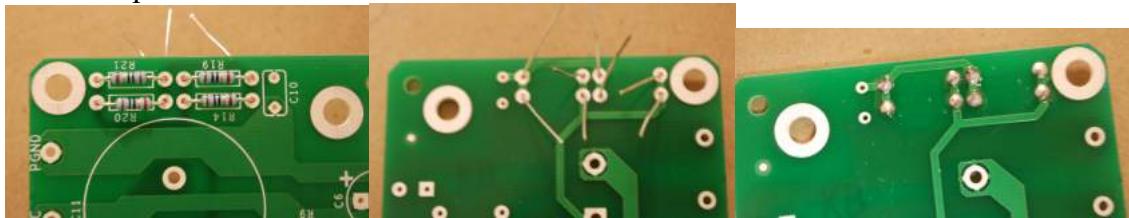


Figure 13-First four resistors are installed, leads bent on the back side, soldered, then clipped.

Turn the page for specific directions about each resistor.

*When you have completed this section, there will only be one empty resistor slot, R16, a no-load, which will remain empty.*

To track your progress, place a check-mark in the done column as each resistor is installed. Check resistor values with a meter, or by reading the color code<sup>4</sup>. Orient the resistor with the fat brown band on the right, then you can read both the Color Code column and the resistor from left to right.

*Note: The GT-101 is a dual channel amplifier. Thus you will build two identical channels. We've provided two Done columns, Done1 for the first channel you build, and Done2 for the second channel. We recommend that you build the channels one at a time, completing the first channel, then returning to this point to build the second channel.*

Designation	Value	Color Code	Done 1	Done 2
R14	10	Brown, Black, Black, Gold, Brown		
R19	10	Brown, Black, Black, Gold, Brown		
R20	10	Brown, Black, Black, Gold, Brown		
R21	10	Brown, Black, Black, Gold, Brown		
R13	100	Brown, Black, Black, Black, Brown		
R1, see <sup>5</sup>	46K4	Yellow, Blue, Yellow, Red, Brown		
R2	51K1	Green, Brown, Brown, Red, Brown		
R3	100K	Brown, Black, Black, Orange, Brown		
R5	100K	Brown, Black, Black, Orange, Brown		
R7	9K09	White, Black, White, Brown, Brown		
R8	11K	Brown, Brown, Black, Red, Brown		
R12	20K	Red, Black, Black, Red, Brown		
R4	1K	Brown, Black, Black, Brown, Brown		
R6	1K	Brown, Black, Black, Brown, Brown		
R9	1K	Brown, Black, Black, Brown, Brown		
R18	1K	Brown, Black, Black, Brown, Brown		
R10	1K, 0.1%	Brown, Black, Black, Brown, Violet; In some kits, the resistor may have numbers: 1K 0.1% on a brown body		
R11	20K, 0.1%	Red, Black, Black, Red, Violet In some kits, the resistor may have numbers: 20K 0.1% on a brown body.		
R17	1K (1 Watt) 5%	Brown, Black, Red, Gold (there are less stripes on a 5% resistor) <sup>6</sup>		
R15	10 (1 Watt) 5 %	Brown, Black, Black, Gold. This resistor has a larger body.		
R16		This Location Remains Empty		
R22	0 Ohms	Use one of the cut resistor leads from a previous step to span the R22 mounting holes, making a 0 Ohm resistor.		

Note: R8 and R18 are near each other on the board. Be careful not to mix them up!

<sup>4</sup> See “Appendix 1 - Resistor Color Code” on page 42 to see how to read resistor color codes.

<sup>5</sup> Earlier versions used a 51K1 or 48K7 resistor here. 46K4 maximizes output power before clipping.

<sup>6</sup> The resistor body of this “1 Watt” resistor seems small to me, but the manufacturer’s data sheet swears that it’s a 1 Watt resistor. In most cases, it will be called on to dissipate considerably less.

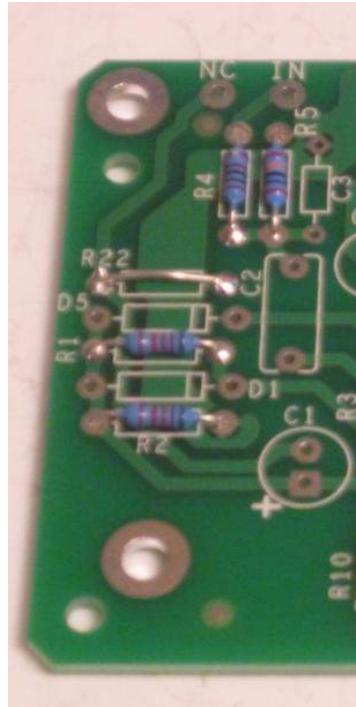


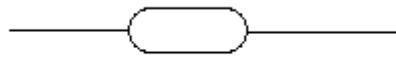
Figure 14-Zero Ohm R22 installation detail

### **Install the Small Capacitors and the Diodes**

Now we'll install the following small capacitors:

Designation	Value	Marking	Done 1	Done 2
C3	220 pF	221		
C4	220 pF	221		
C9	47 pF	470		

Here's what these three caps look like (not to scale):



Next we install diodes D1, D4 and D5.

*Be careful! Diodes have a polarity. Make sure the band on the diode aligns with the banded end of the silk screen!*

Designation	Value	Marking	Done1	Done2
D1	1N4004	4004		
D4	1N4004	4004		
D5	1N4004	4004		

Here's what the diodes look like (not to scale):



Next we install LEDs D2 and D3 (Light Emitting Diodes – the green light from these LEDs will be of medium brightness, and thus visible in a normally lightened room.

*Be careful! Light Emitting Diodes have a polarity, also! Read carefully to make sure you're putting the diodes in the right way! The cathode of the LED is indicated by a bar (negative sign) molded into the package. On some packages, there is no bar, but seen from the top, the circular outline with have a flat side. That flat side is the cathode. Finally, if the leads are uncut, the shorter of the two leads will be the cathode.*

Designation	Value	Marking	Done1	Done2
D2	T1 style	none		
D3	T1 style	none		

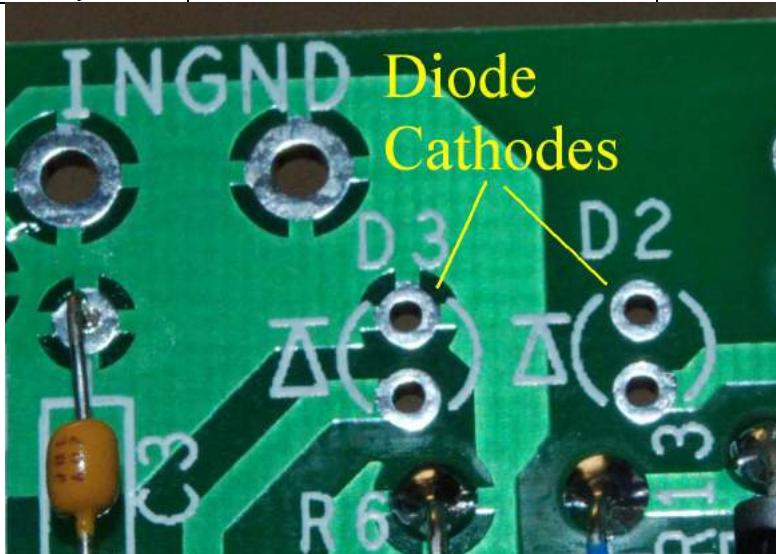


Figure 15-showing LED cathode orientation

### Last Capacitors and the Transistors

Now, the medium tall polarized electrolytic capacitors:

*C1 and C6 are polarized. Make sure the negative sign on the capacitors faces away from the positive sign on the silk screen!*

Designation	Value	Marking	Done 1	Done 2
C1	100 $\mu$ F, 50 V	100 $\mu$ F, 50 V, and minus sign for polarity		
C6	47 $\mu$ F, 100 V	47 $\mu$ F, 100 V, and minus sign for polarity		

And the non-polarized capacitors:

Designation	Value	Marking	Done 1	Done 2
C2	1 $\mu$ F, 63 V or 100V	105K, 63 V or 100V (pillow shaped mylar capacitor)		
C5	0.1 $\mu$ F, 100V	$\mu$ J100, small blue box shape		
C8	0.1 $\mu$ F, 100V	$\mu$ J100, small blue box shape		
C10	0.1 $\mu$ F, 100V	$\mu$ J100, small blue box shape		

Install the transistors. Spread the outside leads a bit to make it easier to insert them into the board.

*Orient the transistor so its body shape matches the silk-screen outline. Leave the top of the transistor about  $\frac{1}{2}$ " off the board! The lead length prevents stress on the body and keeps the transistor safe from too much heat during the soldering operation.*

Designation	Value	Marking	Done 1	Done 2
Q1	2N5551, NPN	2N5551		
Q2	2N5551, NPN	2N5551		
Q3	2N5551, NPN	2N5551		

Now install the speaker coupling capacitor:

*Watch the polarity! Make sure the minus sign faces away from the plus sign on the silk screen. That puts the minus side of the cap along the outer edge of the circuit board.*

Designation	Value	Marking	Done 1	Done 2
C11	10000 uF 63V	10000 uF, 63 WVDC		

The speaker coupling capacitor will either snap or push into place. Verify once more that you have polarity correct, and then solder both speaker terminals to the circuit board.

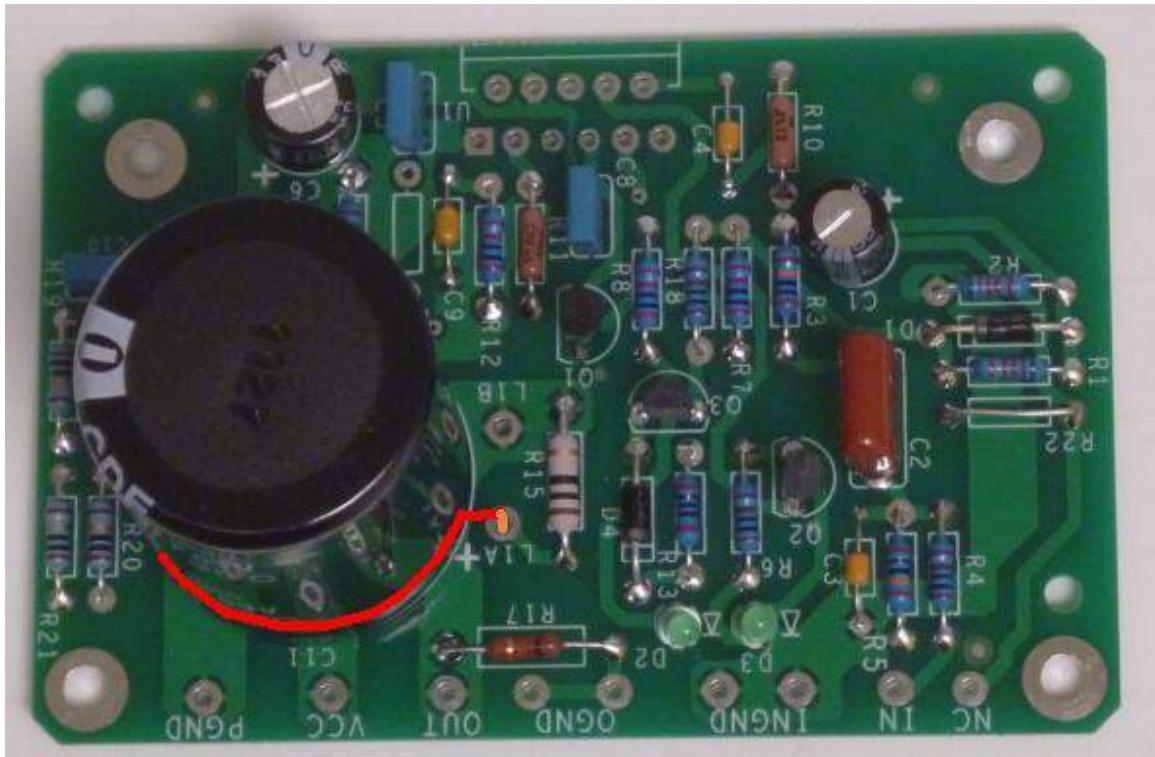
This will probably take more heat, time, and solder than anything you have soldered up to now.

## ***Winding the Output Inductor***

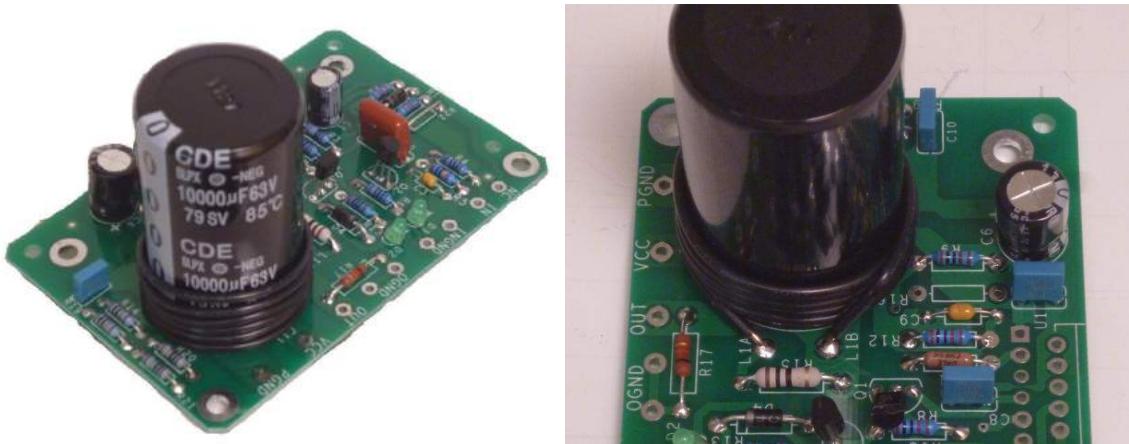
This step takes just a bit of finesse, but if you've come this far, you have nothing to worry about. If you're a bit frazzled, take a break before proceeding.

There...feel better? OK, let's go. Just follow these steps, ***measuring the wire length carefully if you want to succeed the on first shot.***

1. Cut a 24 3/8" length of 18 AWG solid wire supplied with the kit. (The color may vary from the photo. The length will be about 30", so you'll have to carefully measure and cut the wire).
2. Strip back 3/8" of insulation from both ends of the wire. Be careful not to nick the conductors.
3. From the component side, place one stripped end of the wire into the L1A terminal. Bend it on the solder side to retain it, but don't solder it yet. Route it around the output capacitor as shown by the red line in Figure 16.
4. Wind 6 turns of wire, closely spaced, so it looks like Figure 17. When you get to the end of the coil, fold the end across the existing turns, toward the L1B hole.
5. Pull the end of the wire through the L1B hole, and solder it on the back of the board.
6. Solder the L1A side of the inductor.



**Figure 16-Starting to wind the output inductor**



**Figure 17-finishing step for the output inductor**

### **Final Inspection of the Circuit Board**

After you've taken a break, look over your completed circuit board(s) one more time. Looking on the component side, double check:

3. polarity (banded end) of D1 and D4 matching the banded end on the silk screen.
4. polarity (flat end, or molded bar end) of LEDs D2 and D3, placed toward the outside edge of the board.
5. polarity of C1 (minus sign away from the indicated plus sign on the silk screen).
6. polarity of C6 (minus sign away from the indicated plus sign on the silk screen).
7. polarity of C11 (minus sign close to the edge of the board).

If you get one of these polarities wrong, there is a good chance that the amplifier won't work, or there will be damage when you power it up.

Look at the solder side of the board. Make sure that:

3. All component leads are soldered (it's easy to forget one or two, and that will cause either unreliable operation, or no operation at all!)
4. There are no solder bridges between pads which should be isolated. Solder bridges may stop the amplifier from working correctly.

### ***Installing the LM3866 and Mounting the Amplifier Board to the Heat Sink***



**Figure 18-Mounting assembled PCB to heat sink**

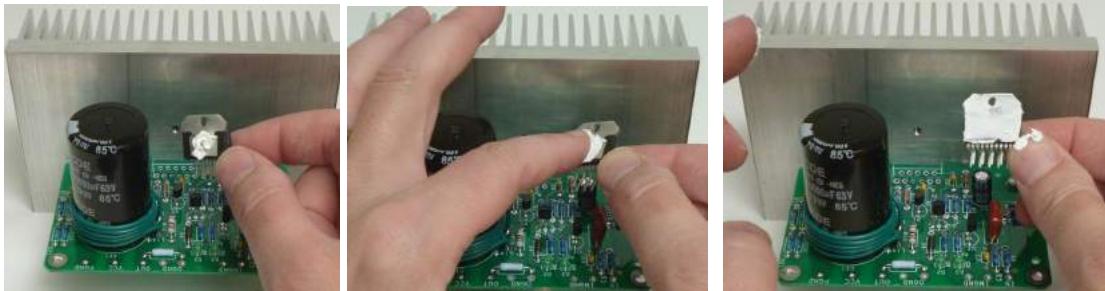
1. Use two 6-32x3/8" screws to fasten a pair of mounting brackets to the heat sink, placing the screw through the 9/64" clearance hole in the bracket. Note that one hole in the mounting bracket is a 9/64" clearance hole, the other hole is threaded to accept a 6-32 screw. Don't tighten the screws yet.
2. Use two 6-32x1/4" screws to fasten the PCB to the mounting brackets and heat sink. Don't tighten the screws yet.



**Figure 19-mounting the PCB to the heat sink**

3. Place a dab of thermal compound on the back of the LM3886 and spread it into a thin film, being careful to keep the leads clean. This step uses just a small amount of the thermal compound in the squeeze tube. Put the squeeze tube in a safe place,

as you may choose to use the rest of its contents when you fasten the amplifier module to the chassis.

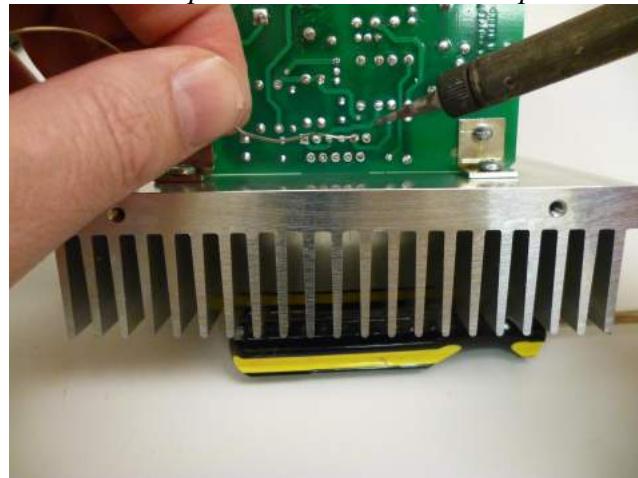


4. Fasten the LM3886 to the heatsink using a 6-32x3/8" screw. Tighten all the mounting screws as you make sure that the LM3886 is parallel to the plane of the board.



**Figure 20-a completed amplifier module**

5. Remember to tilt the board up and solder the LM3886 pins!



**Figure 21-solder the LM3886 pins**

6. Inspect your soldering from both sides, making sure that there are no solder bridges between the leads of the LM3886.
7. You have just completed the first of two amplifier modules. Return to page 14 to repeat the process to build the amplifier module for the second channel.

## Section 4: Wiring it All Together

Get out the trusty soup bowl, and empty the contents of the “Top Level Hardware” envelope into it. Locate and have ready the “GT-101 Wiring Kit” envelope, as it’s the source of all the wire used in this section.



The kit has three kinds of black single conductor wire:

1. 18 AWG stranded (the thickest)
2. 20 AWG solid (thinner, the insulation of which is used in preparing the shielded cables)
3. 22 AWG stranded (thinnest)

If you compare the black wires side by side, it will become quickly apparent which is which.

Figure 22-from left to right, #6 lug, #10 lug, RCA connector ground lug

### Attach the Power Supply Ground Wire

1. Cut an 8 ½” length of black 18 AWG stranded wire. Strip 1/4” of insulation from both ends of the wire.
2. Insert one end of the wire into the GND eyelet (this is different from the PGND eyelets!) of the power supply PCB. Insert it from the solder side and solder it on the component side.
3. Tin the other end of the wire and insert it into the eyelet of a #6 lug. Crimp the wire and solder it to the lug.



Figure 23-power supply with attached ground wire

Note: The X1, X2, VCC, and PGND eyelets will remain open until a later assembly step.

### Attach the Amplifier Module Wires

Designate one of the completed amplifier modules as LEFT, and the other as RIGHT. To prevent errors, it may help to make and apply LEFT and RIGHT masking tape lapels to the amplifier modules.

*Orient the amplifier module wires that you are about to install perpendicular to the plane of the PCB for neatest wiring.*

#### Attaching LEFT Module Wires

4. For the module designated as LEFT, cut a 6 1/2” overall length of Red/Black 18 AWG zip cord.
5. Separate the Red and Black wires about 1 inch at each end.
6. Remove about 1/4” of insulation from each of the four ends and tightly twist the copper strands together.

7. From one end of the Red/Black wire, insert the Red wire into the VCC eyelet, entering from the solder side. Solder the wire on the component side.
8. From that same end of the Red/Black wire, insert the Black wire into the PGND eyelet, entering from the solder side. Solder the wire on the component side.
9. Cut a 7" length of black 22 AWG wire, remove 1/4" of insulation from both ends, and twist the strands tightly. Tin both ends of the black wire.
10. Insert the black wire into the OGND hole near the center of R17, inserting it from the solder side, and soldering it on the component side.
11. Prepare a 5 1/2" length of shielded cable per the directions that begin on Page 43. Prepare both ends per those directions. Twist and tin the four ends of the cable.



**Figure 24-shielded cable for left channel. Right channel has overall length of 10 inches.**

12. Working with one end of the shielded cable, insert the red wire into the IN eyelet, inserting it from the solder side, and soldering it on the component side.
13. Working from that same end, insert the drain wire into the INGND eyelet closest to the IN eyelet. Once again, insert it from the solder side, and solder it on the component side.
14. Cut a 8" length of 18 AWG stranded white wire. Remove 1/4" of insulation from both ends.
15. Insert the first end of the white wire into the OUT eyelet of the PCB, inserting it from the solder side, and soldering it on the component side.
16. Tin the remaining end of the white wire and insert it through the eyelet of a #10 lug. To be sure you have the #10 lug, the toothed portion should slide smoothly over the screws in the Red and Black speaker binding posts.
17. Crimp the white wire on the lug, and solder it in place.

## Attaching RIGHT Module Wires

1. For the module designated as RIGHT, cut an 8 1/2" overall length of Red/Black 18 AWG zip cord.
2. Separate the Red and Black wires about 1 inch at each end.
3. Remove about 1/4" of insulation from each of the four ends and tightly twist the copper strands together.
4. From one end of the Red/Black wire, insert the Red wire into the VCC eyelet, entering from the solder side. Solder the wire on the component side.
5. From that same end of the Red/Black wire, insert the Black wire into the PGND eyelet, entering from the solder side. Solder the wire on the component side.
6. Cut an 8" length of black 22 AWG wire, remove 1/4" of insulation from both ends, and twist the strands tightly. Tin both ends of the black wire.

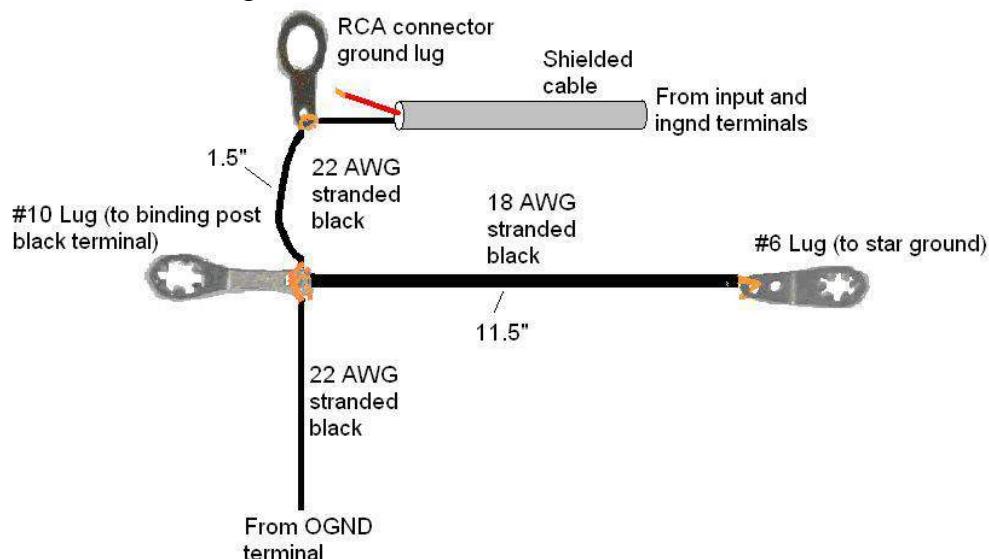
7. Insert the black wire into the OGND hole near the center of R17, inserting it from the solder side, and soldering it on the component side.
8. Prepare a 10" length of shielded cable per the directions that begin on Page 43. Prepare both ends per those directions. Twist and tin all four ends of the cable.
9. Working with one end of the shielded cable, insert the red wire into the IN eyelet, inserting it from the solder side, and soldering it on the component side.
10. Working from that same end, insert the drain wire into the INGND eyelet closest to the IN eyelet. Once again, insert it from the solder side, and solder it on the component side.
11. Cut an 8" length of 18 AWG stranded white wire. Remove 1/4" of insulation from both ends.
12. Insert the first end of the white wire into the OUT eyelet of the PCB, inserting it from the solder side, and soldering it on the component side.
13. Tin the remaining end of the white wire and insert it through the eyelet of a #10 lug. To be sure you have the #10 lug, the toothed portion should slide smoothly over the screws in the Red and Black speaker binding posts.
14. Crimp the white wire on the lug, and solder it in place.

### **Build the Ground Harnesses**

The left and right channels have different lengths in their ground harnesses. The pictures below show the details for both, and how they tie into the amplifier wires that you installed in the previous section.

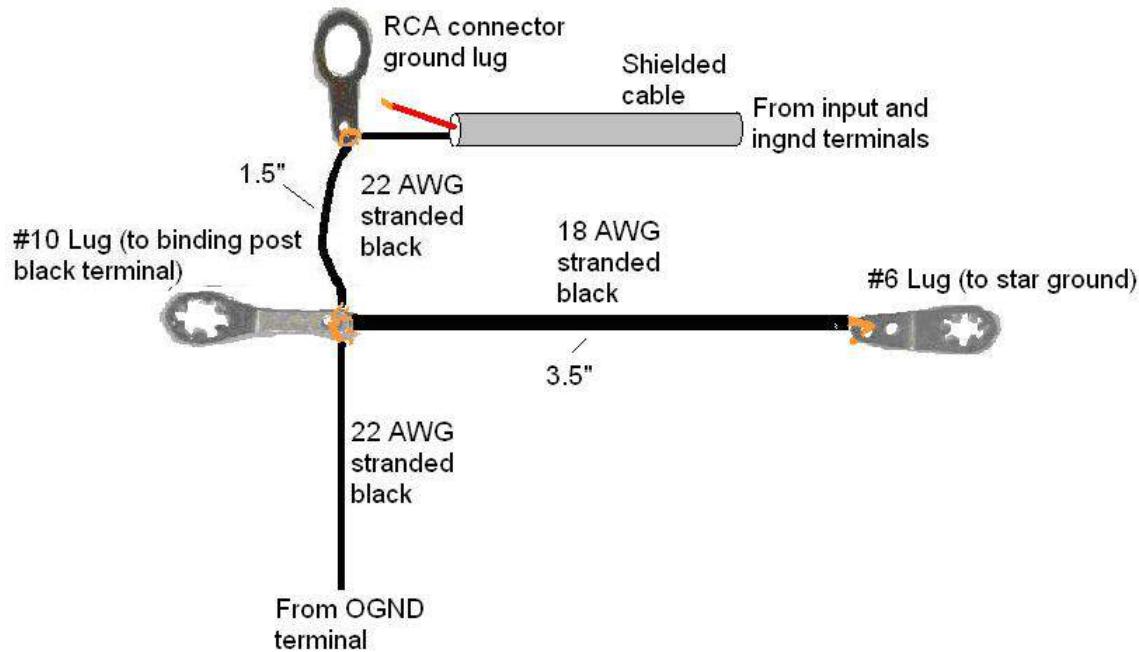
The wire lengths called out on the figure specify the before-stripping lengths of the wires. Just build each harness per the Figures. This will make final assembly quick and easy. When this section is completed, you'll have both left and right channel amplifier modules with all the necessary wires connected, ready for installation in the chassis.

Unscrew the retaining nut from the RCA connectors to make the RCA connector ground lugs available for building the harnesses. Make sure to save the connector and nut.



**Figure 25-Left Channel Grounding Harness (some lengths differ from the right channel)**

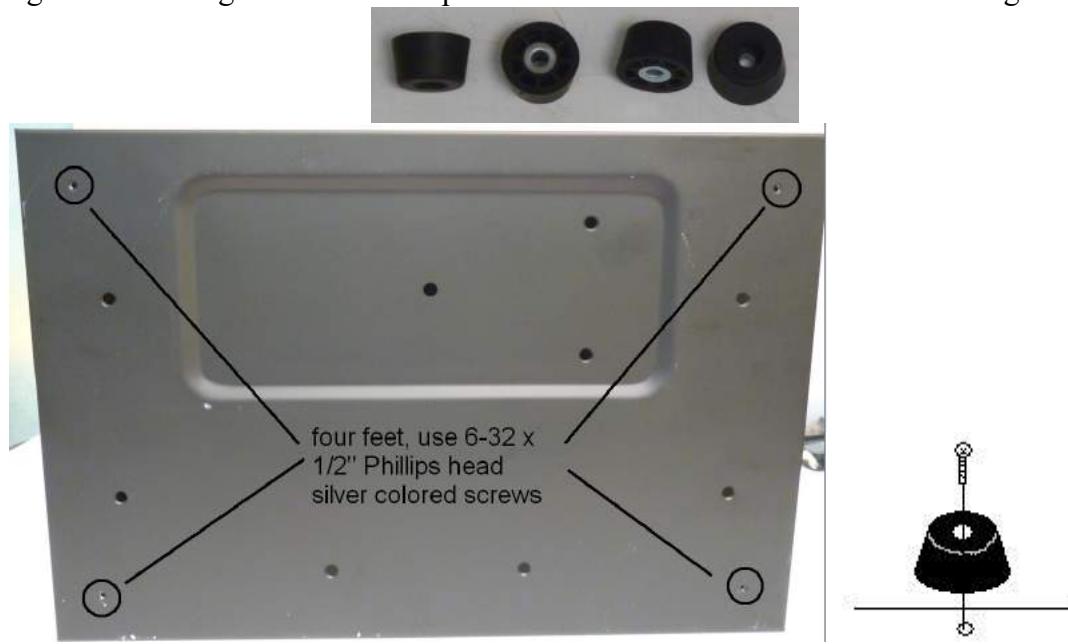
You'll get the best results if you've tinned the stripped ends of the wires before you crimp them into the solder lugs. Once all the connections are crimped in place on a given lug, solder the lugs using enough heat to make the solder flow. When you do this, the wires should be straight, as the heat will encourage the insulation to back off a bent wire.



**Figure 26-Right Channel Grounding Harness (some lengths differ from the left channel)**

### **Install the Feet**

Install the four feet into the corners of the bottom of the chassis using 6-32x  $\frac{1}{2}$ " Phillips head screws (these are zinc-plated, so will look silver). Snug the screws, but don't overtighten. Installing the screws will protect the bottom of the chassis from damage.



**Figure 27-Install the feet here**

## **Install the Speaker Binding Posts**

The two speaker output connectors are heavy duty 5-way binding posts. Remove both nuts and the washer from each binding post. Install them into the chassis according to the following diagram. Make sure that the Red binding post is on the top. You'll use only one nut and washer to retain each binding post for now. Return the other nuts to the soup-bowl for safe-keeping. They will be used in a later step, when they are re-installed to fasten a solder lug to the terminal.

The black plastic insulators have shoulders that fit inside the mounting holes. Make sure that the shoulders are centered in the mounting holes. They keep the binding post studs from shorting to the chassis. The binding post wire-insertion holes should be horizontal, see below.



Figure 28-Install both left and right binding posts (only right channel is shown here)

## **AC Power Wiring**

1. Locate the green 18 AWG stranded wire with a FASTON terminal installed on one side. Cut the green wire to a length of 14". Remove 1/4" of insulation from the plain end of the green wire. Crimp and solder a #6 lug to the end of the green wire.
2. Locate the prefabricated power harness. It's about a foot long, with white and black wires, the central 8" sheathed in tubing, with FASTON connectors on the ends. (Note some kits may use clear tubing, some may use black tubing.)

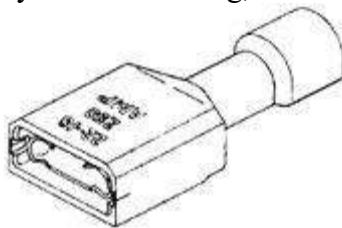


Figure 29-FASTON connector

3. Slide the FASTON terminals onto the IEC power connector as shown in Figure 30.
  - i. Black wire to L (line) terminal.
  - ii. White wire to N (neutral) terminal.
  - iii. Green wire to the ground terminal  $\pm$ .
4. Starting outside the chassis, insert the black white and green wires (already connected to the IEC power connector) into the hole in the back left corner of the

- chassis as shown in Figure 31. **Make sure that the writing on the power connector is right side up!** Push until it clicks in place. It's easy to get it in, and tough to get it out, so double check the orientation before you install it.
5. Dress the black/white jacketed pair with FASTONs as shown in Figure 31. Run it along side the tie points stamped in the bottom of the chassis. ***Install the cable ties loosely for now*** around the jacketed portion of the black/white pair. We will tighten them later. Insert the free end with the FASTONs through the rectangular switch hole in the front panel.
  6. Dress the green wire as shown in Figure 31 next to the tie down points. ***Loosely loop cable ties as shown. We will tighten them later.*** Place the lug over the ground stud. Tighten down a #6 nut on the stud to hold the ground wire in place.



Figure 30-Wiring IEC power connector

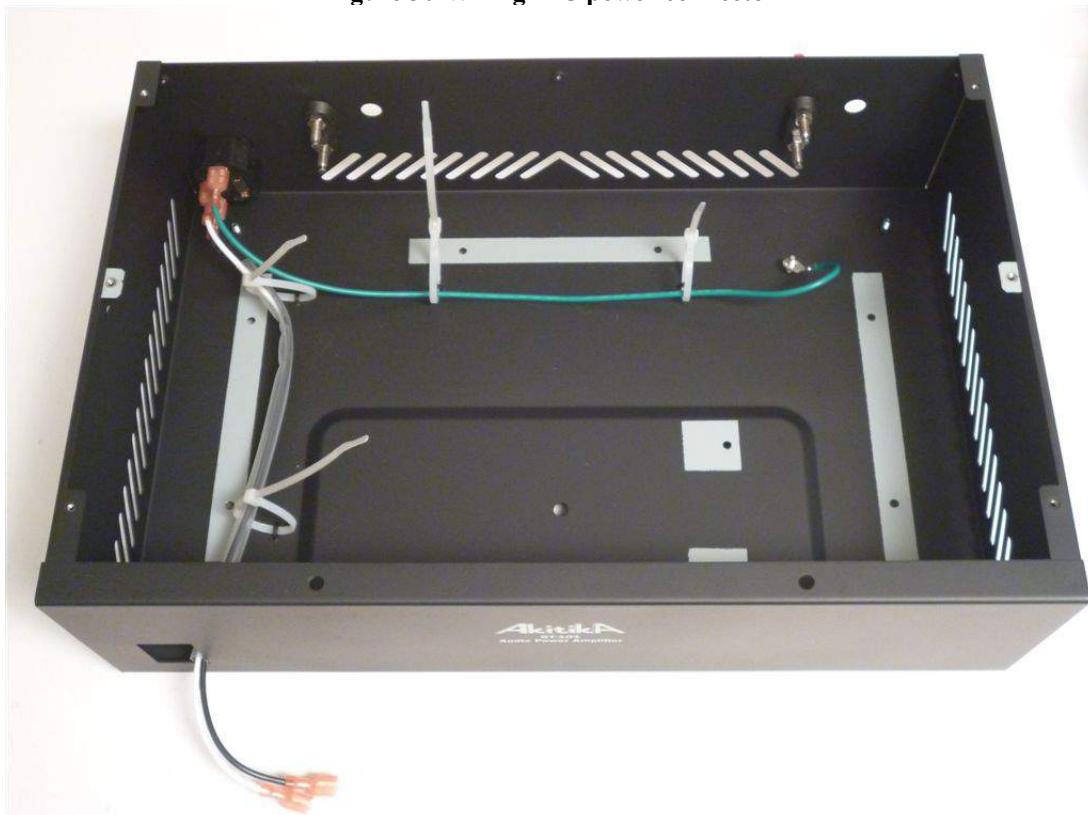


Figure 31-Power wiring with IEC connector installed into chassis

- Starting with the switch outside the chassis, push the FASTONs on the bottom switch terminals as indicated in Figure 32. The black or white wire may be on either side of the switch, so long as they both attach to the *bottom row* of contacts.

This Side UP

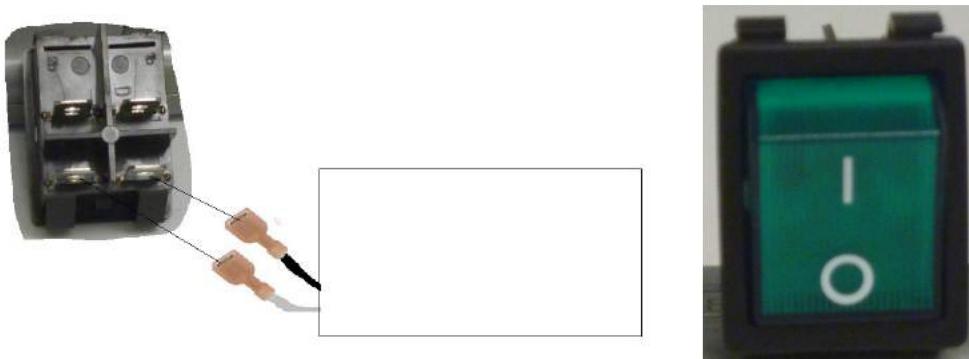


Figure 32-Installing power wires on the switch

- Leave the switch dangling outside the amp for now!!!***

## Installing Amplifier Modules into the Chassis

*Be careful not to flex the chassis. It's a bit "squishy" with the top off, but becomes quite stout once the top is installed and screwed in place. You may want to place a towel on your work surface to avoid scratching the paint as you complete this section.*

*We will connect the amplifier module wires before we screw them to the chassis. This leaves room to use a 5/16" nut driver on the speaker binding post connections. Be careful not to put undue stress on the wires where they connect to the PCB.*

### Left Amplifier Module

- Identify by wire lengths (or masking tape tags, if you made them) the left amplifier module (e.g. the amplifier that installs in the left hand side of the chassis as viewed from the front).
- Trial fit the left amplifier module in place. Make sure that the black and white jacketed power wires don't interfere with the 3/8" wide ridge of the heat sink. Once you're sure there is clearance, snug the two cable ties and clip the tails.
- Slip the #10 lug from the left channel ground harness (black 18 AWG wire) over the black binding post stud. Position the lug as shown in Figure 33, then use a binding post nut (5/16" nut driver) from the soup bowl to hold the lug in place.
- Run the #18 AWG black wire from this lug along the crease where the bottom and back walls of the chassis meet, and place end with the #6 lug over the ground stud in the right rear corner of the chassis.
- Slip the #10 lug from the white #18 AWG white wire that connects to the amplifier module OUT terminal onto the RED speaker binding post stud. Position the lug as shown in Figure 33, then use a binding post (5/16" nut driver) nut from the soup bowl to hold the lug in place.
- Insert the RCA jack and the *two insulating washers* as show in Figure 33. The ground lug already has two black wires attached. Tighten the mounting nut.
- Solder the (pre-tinned) red wire of the shielded cable to the center terminal of the RCA jack.

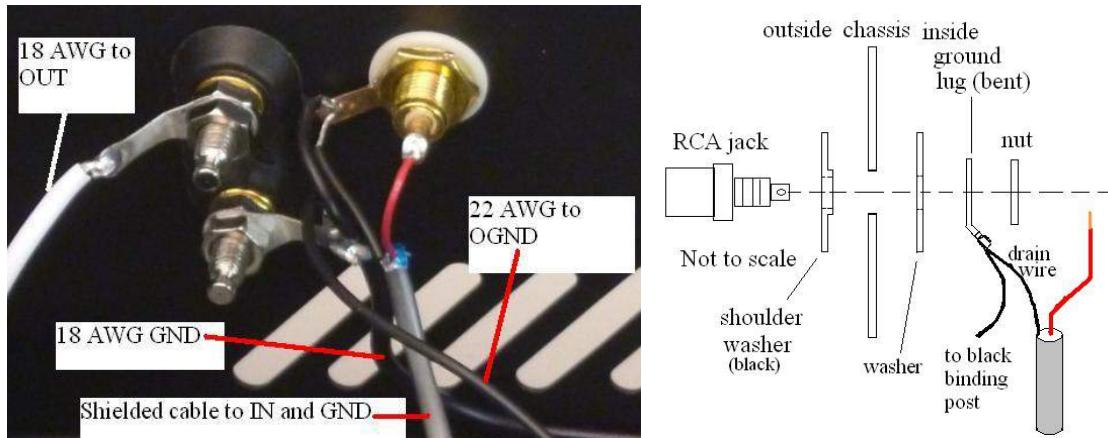


Figure 33-I/O Connector wiring

8. This step can be a bit messy, and is considered optional. Completing this step assures the maximum transfer of heat into the chassis. You're also likely to smear white thermal compound on the inside of the amplifier as you set it into place. We'll leave the choice up to you (a little more available output power versus a little prettier insides of the amp). Spread a thin film of thermal compound on the 3/8" wide ridge of the heatsink (the side with two 6/32 mounting holes).

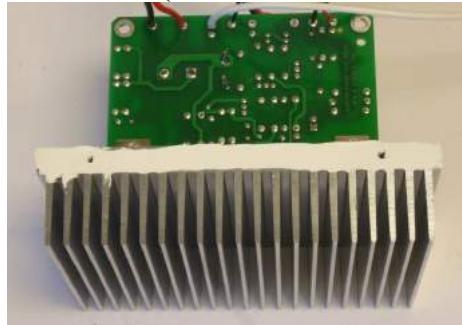


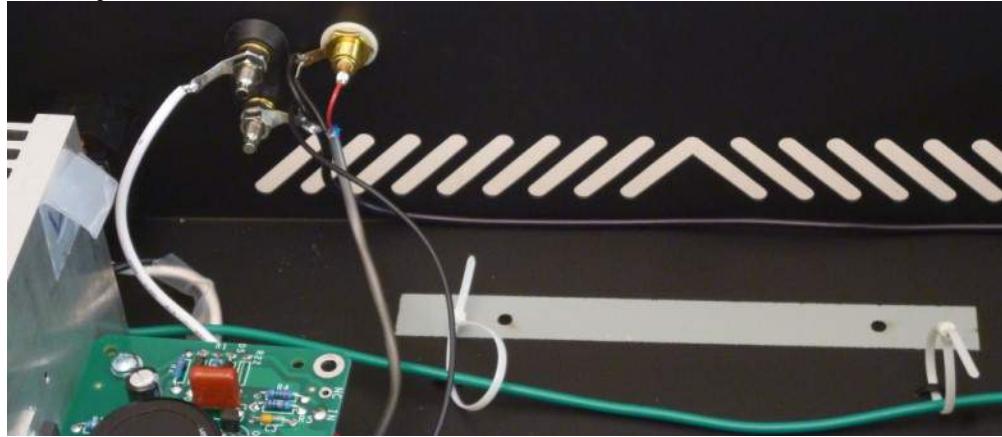
Figure 34-spread thermal compound on the 3/8" wide ridge

9. Place the amplifier module into the chassis and secure it in place using two black 6-32x3/8" pan-head Phillip screws inserted from the bottom of the chassis. (Turning the amp on its left side panel may be the easiest way to do this. Make sure that the towel is present to avoid scratching the amp).

#### Right Amplifier Module

1. Identify by wire lengths the right amplifier module (e.g. the amplifier that installs in the right hand side of the chassis).
2. Slip the #10 lug from the right channel ground harness (black 18 AWG wire) over the black binding post stud. Position the lug as shown in Figure 33, then use a binding post nut from the soup bowl to hold the lug in place.
3. Run the free end of the 18 AWG wire with the #6 lug to the ground stud, and place it over the ground stud. (Adding the final wire and nut happens later).
4. Slip the #10 lug from the white #18 AWG white wire (amplifier module OUT terminal) onto the RED speaker binding post stud. Position the lug as shown in Figure 33, then use a binding post nut from the soup bowl to hold the lug in place.
5. Insert the RCA jack as shown in Figure 33. The ground lug will already have two black wires attached. Tighten the mounting nut.

- Solder the (pre-tinned) red wire of the shielded cable to the center terminal of the RCA jack.



**Figure 35-amps installed, wiring not complete**

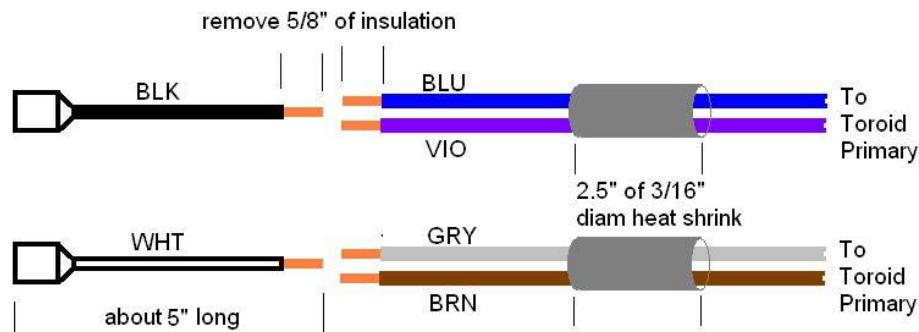
Position the washer and lug as shown in Figure 33.

- Spread a thin film of thermal compound on the 3/8" wide ridge of the heatsink (the side with two 6/32 mounting holes).
- Place the amplifier module into the chassis and secure it in place using two black 6-32x3/8" flat-head screws inserted from the bottom of the chassis.

## Transformer Preparation

The directions in this section cover 120 Volt wiring. For 240 Volt wiring, you'll need the V240 kit. This kit has the parts and directions to wire the transformer for 240 volt power. The kit builder must supply a country-specific 240 Volt power cord.

Locate the 5" long black and white 18 AWG wires with FASTON connectors pre-installed on one end. Also locate the 3/16" diameter (clear) heat shrink tubing. For 120 Volt<sup>7</sup> wiring, the FASTON and toroidal primary wires will be connected as shown in Figure 36.



**Figure 36-Wiring toroidal transformer for 120 Volt operation**

- Cut a 2.5" length of 3/16" diameter heat shrink tubing. Slide it over the blue and violet leads of the power transformer. Slide it as far from the cut ends of the wire as possible.
- Cut a second 2.5" length of 3/16" diameter heat shrink tubing. Slide it over the gray and brown leads of the power transformer. Slide it as far from the cut ends of the wire as possible.

<sup>7</sup> For 240 Volt wiring, see the directions that come with the V240 kit.

3. Cut  $\frac{1}{4}$ " off the tips of the blue, violet, gray and brown transformer wires. This removes the portion of the wire that has solder from the manufacturing process. Doing so allows you to make a smooth Western Union splice, shown below.
4. Remove  $\frac{5}{8}$ " of insulation from the following 6 wires:
  - i. Black 4" FASTON wire
  - ii. White 4" FASTON wire
  - iii. Blue Transformer wire
  - iv. Violet Transformer wire
  - v. Gray Transformer wire
  - vi. Brown Transformer wire
5. Twist together the brown and gray transformer wires
6. Twist together the blue and violet transformer wires.
7. Make a Western Union splice between the brown-gray and the 4" white FASTON wire.
  - i. Solder the splice.
  - ii. Slide the heat shrink tubing evenly over the splice
  - iii. Use the tip or the barrel of the iron to shrink the heat shrink tubing.
8. Make a Western Union splice between the blue-violet and the 4" black FASTON wire.
  - i. Solder the splice.
  - ii. Slide the heat shrink tubing evenly over the splice
  - iii. Use the tip or barrel of the iron to shrink the heat shrink tubing.

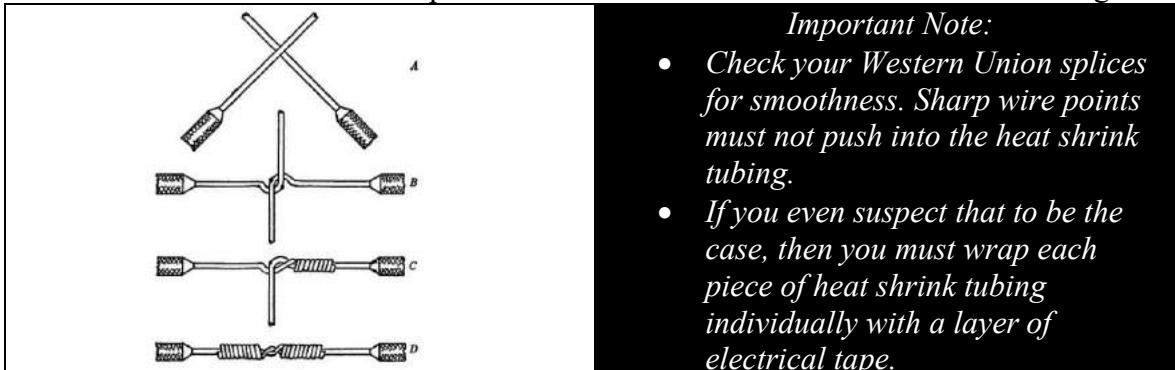


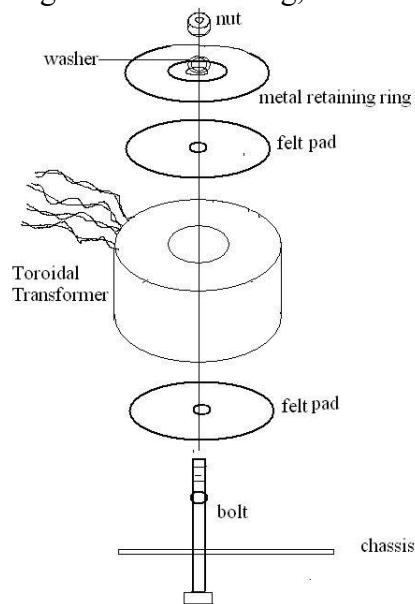
Figure 37-Western Union splice has diameter less than the insulated wires and no sharp points

9. Cut the red and orange transformer wires to a length of about 2".
10. Remove  $\frac{3}{8}$ " of insulation from the red and orange transformer wires.
11. Twist the insulated parts of the orange and red wires together. Now twist the bare ends together and solder them to each other. Slide a 2" piece of  $\frac{1}{8}$ " diameter (black) heat shrink tubing over the pair of wires, about half on, and half off.
12. Use the tip or the barrel of the soldering iron to shrink the heat-shrink tubing all along its length.
13. Once the heat-shrink tubing has cooled, test your work by tugging on the heat shrink to assure that it will remain in place.
14. Cut the black and yellow transformer wires to a length of 3.5". Twist together the insulated portion of the black and yellow transformer wires. Twisting the pair reduces hum.

15. Strip 3/8" of insulation from the black and yellow wires of the transformer. Twist and tin each wire, preparing them for installation into the power supply in a later step.

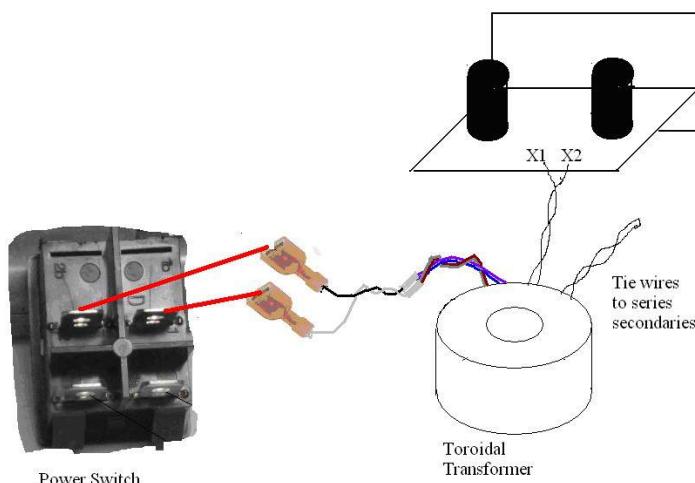
## Transformer Installation

1. Mount the toroidal transformer to the chassis using the hardware shown in Figure 38. Orient the toroid and power wiring as shown on the front cover of this manual. Make sure the mounting hardware and toroid are centered before tightening the mounting bolt. Make it snug, but do not over-tighten.



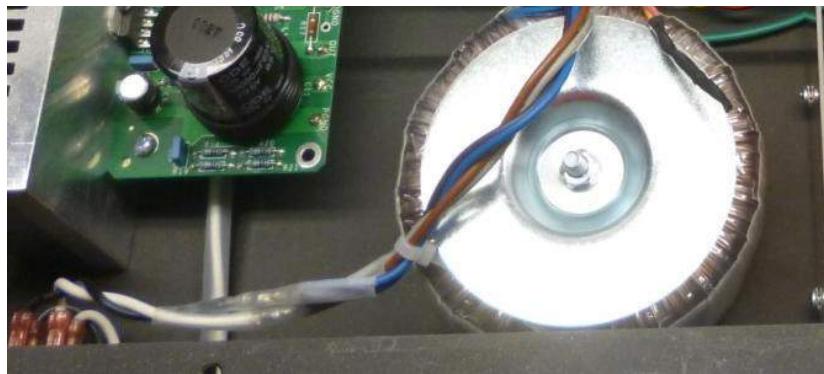
**Figure 38-Toroidal Transformer Mounting**

2. Twist the transformer primary leads (that's the transformer wires with the FASTON connectors) together to form a twisted pair. Slide the FASTON connectors from the toroidal power transformer thru the switch cut-out in the front panel. Connect them to the indicated switch terminals. Place black over black and white over white.



**Figure 39-connecting up the power transformer**

3. Insert the switch in from the front of the chassis. It may be a snug fit. Make sure that the | is at the top of the opening before you insert the rocker switch into the chassis. Push the rocker switch in the rectangular opening; it will click into place.
4. Dress the transformer primary leads as shown on the front cover of this manual. If they don't seem to lay well, you can use a cable tie as shown in Figure 40. Cut the cable tie's tail to about 1.5", and capture it between the metal dished washer and the felt washer.
5. Lay the power supply assembly into the case, fin side down, centered along the back of the chassis. The solder side of the circuit board should face the front of the chassis.
6. Insert the black and yellow transformer wires into the X1 and X2 terminals of the power supply PCB, inserting them from the solder side and soldering them on the component side. Connect black to X1 and yellow to X2, but it doesn't matter if they are reversed.



**Figure 40-orient the transformer wires as shown**

## **Testing the Power Supply**

- Make sure that green ground wire from the IEC power entrance connector in the back left corner of the chassis connects to the grounding stud in the right rear of the chassis with a tightened 6-32 nut.
  - Make sure that the power supply module PCB does not touch the chassis at any point.
1. Open the fuse drawer in the IEC power connector and make sure that the fuse is installed in the back half of the drawer. It was placed there when the kit was packed to keep the glass fuse cartridge safe during transport. Close the fuse drawer. The fuse and fuse drawer is retained by the force of the contacts. If the fuse drawer flops open, you probably have placed the fuse in the spare location, as opposed to the active location.
  2. Make sure that the power switch is in the off position (the bottom part of the rocker switch, labeled with a 0, is flush with the front panel).
  3. Locate the supplied IEC power cord. Make sure it is NOT connected to the AC wall socket yet. Connect one end to the IEC power connector on the chassis.
  4. Standing well away from the amplifier, connect the plug into the AC wall socket. Keeping one hand in your pocket, use the other hand to turn on the power switch.
  5. The power switch should light up, but very little else observable should happen.

6. Observe the power supply, transformer, and wiring for any signs of heating or distress.
7. If everything seems cool (please pardon the pun), then probe the VCC and PGND eyelets on the power supply PCB with a DC volt meter. The voltage should be 72 volts (+/- 4 Volts) DC.
8. If the previous test is correct, then:
  - a. Turn off the power switch
  - b. Pull the power cord from the wall socket
  - c. Remove the power cord from the power entrance connector on the chassis
  - d. Go away from the amp for five minutes to celebrate and let the output capacitors discharge.

The raw power supply has only light bleeder resistors. It may take 5 minutes for the main filter capacitors to discharge.

## **Final Amplifier Wiring**

In this section, you'll wire the amplifier modules to the power supply. A quick look at the cover illustration will clarify anything not made clear by the following instructions.

### **Wiring Amplifier Power**

1. Identify the red/black zip cord that connects to the left amplifier module VCC and PGND pins. Route them along the chassis floor and toward the VCC and PGND pins of the power supply.
  - a. Insert the red wire into the VCC pin closest to the large capacitor, C6, from the solder side of the PCB and solder it on the component side. Don't let your soldering iron slide into C6.
  - b. Insert the black wire into the PGND pin closest to the large capacitor, C6, from the solder side of the PCB and solder it on the component side. Don't let your soldering iron slide into C6.
2. Identify the red/black zip cord that connects to the right amplifier module VCC and PGND pins. Route them along the chassis floor and toward the VCC and PGND pins of the power supply.
  - a. Insert the red wire into the remaining VCC pin from the solder side of the PCB and solder it on the component side.
  - b. Insert the black wire into the remaining PGND from the solder side of the PCB and solder it on the component side.

### **Fasten the Power Supply to the Chassis**

1. Tighten the cable ties that hold the green ground wire in place. Make sure that as positioned, it will not interfere with mounting the power supply heat sink. Cut the long tails of the cable ties.
2. This step is optional, but it is recommended if you listen for long periods at high levels. Spread a thin film of thermal compound on the 3/8" wide ridge of the heatsink (the side with two 6/32 mounting holes).
3. Place the power supply module onto the chassis and secure it in place using two black 6-32x3/8" pan-head Phillips screws inserted from the bottom of the chassis.

### 1. Ground Stud

- a. The ground stud already has a #6 lug, the green wire from the IEC power connector, and a #6-32 nut holding the lug in place. Make sure the nut is tight.
- b. Above that nut, place these three #6 ground lugs:
  - i. From the ground eyelet of the power supply PCB
  - ii. From the ground (black) binding post of the left amplifier.
  - iii. From the ground (black) binding post of the right amplifier.
- c. Place another #6-32 nut on top of the lugs, and tighten the nut to secure the grounding lugs in place.

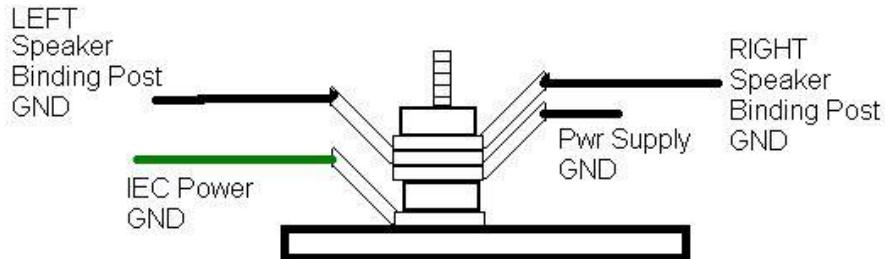


Figure 41-Grounding Stud Detail

You have now completed wiring of the amplifier.

### Visual Inspection

Check for the following items:

1. Power Supply wiring from the power supply to both amplifier modules is in place.
2. ***Double check the polarity of the power supply wiring!***

### Install the Shield

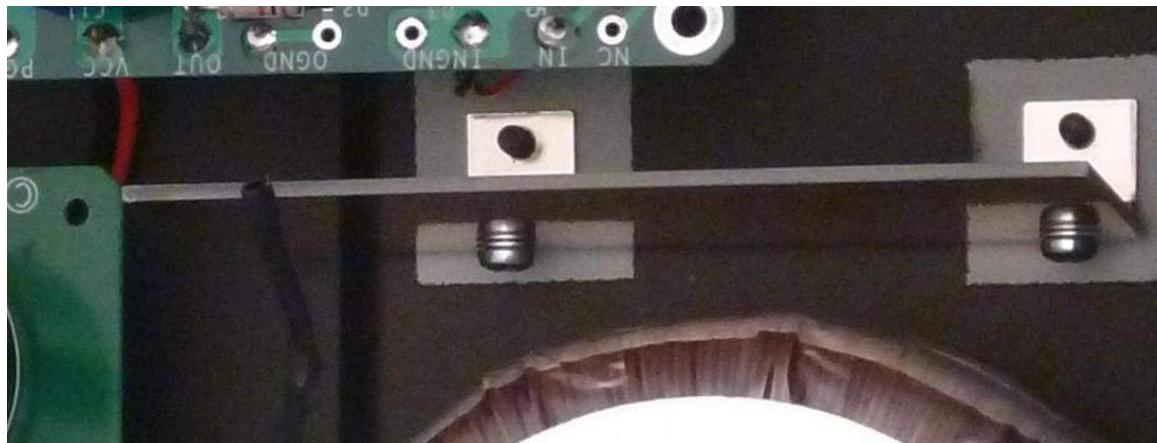


Figure 42-Shield Installation

Locate the following items:

1. shield PCB (about the size of a playing card, double side copper, with two holes)
2. 2 mounting brackets (have two 6-32 threaded mounting holes)
3. 2 6-32x1/4" Phillips pan-head zinc plated sem screws (captive lockwasher)
4. 2 6-32x3/8" Phillips pan-head black screws

Install the shield two the chassis using the diagram of Figure 42.

## Section 5: Testing It Out and Installing the Top

*Be careful. The amplifier will be energized with the top off, and hazardous voltages will be present in the amplifier. Use appropriate precautions to avoid injury.*

Once the visual inspection looks ok and any shortcomings have been corrected, you can apply power to the amplifier and check for the lack of smoke. If this is successful, then perform the following additional steps:

1. Measure the DC voltage between the red and black speaker binding posts (with no speaker connected). The voltage should slowly and steadily decrease toward zero volts. Given the large output coupling capacitor, this may take a few minutes if no speaker is connected. This is normal and not a concern. It will happen in a few seconds when a speaker is in place.
2. Turn the power off.

### Install the Top

Slide the top in place. Install the 11 #4-40x1/4" black flat-head Phillips head screws that keep the top in place.

1. Connect an input source to the RCA input jacks with the preamp volume down.
2. Connect a pair of speakers to the amplifier. Depending upon how long you have waited from the previous step, there may be a pop when you connect the speakers.
3. Turn the power on. There will be a soft-medium click in the speaker as the amp powers up. With inputs disconnected, the speakers should be quite quiet.
4. Turn the amplifier on. The amplifier takes around 15 seconds for the bias voltages to stabilize. Turn up the preamp volume, and enjoy what may be the sweetest sound you've ever built.

## Section 6: Using the GT-101

- Don't block the ventilation holes on the sides or the top of the amplifier.
- The amplifier takes about 15 seconds to reach full warm-up.
- Protection circuits will shut the amplifier down in case of overload or abuse. If this happens:
  - Turn off the power
  - Remove the overload condition
  - Turn down the input level
  - Turn on the amplifier, and in 15 seconds, you're ready to listen again.
- The amplifier may have a soft pop/thump on turn-on. This is normal.
- The amplifier may have a soft pop/thump at turn-off. This is normal<sup>8</sup>.

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<sup>8</sup> Complete elimination of turn-on and turn-off artifacts would require the addition of speaker relays. I decided against doing so to avoid the cost and/or possible impact on the sound that a relay might cause.

## Section 7: Specifications and Schematics

Output Power:

- greater than 50 Watts per channel into 8 Ohms
- nearly 100 Watts per channel at 1 kHz into a 4-Ohm load (1 channel driven)
- more than 80 Watts per channel at 20 Hz into a 4-Ohm load (1 channel driven)

Small Signal Bandwidth: wider than 5 Hz to 50 kHz at -3 dB points

Damping Factor @ 1 kHz wrt 8 Ohms > 80

Signal to Noise Ratio: 110 dB below 50 Watts into 8 Ohms, referred to a shorted input.

Harmonic Distortion: typically 0.003% at 50 Watts into 8 Ohms at 1 kHz. Clipping occurs at a bit more than 60 Watts into 8 Ohms at 1 kHz.

Intermodulation Distortion (typ): 0.004%, SMPTE 60 Hz, 7 kHz, 4:1

Separation: more than 80 dB for any frequency below 20 kHz.

Input Impedance: 51 K Ohms

Sensitivity: 1 Volt RMS input produces 20.59 Volts RMS output

Input Power: IEC connector (North America style power cord supplied)

Input Power Fuse Rating and type:

- 120 Volt Operation - 3 Amp Slow Blow, 5x20 mm
- 240 Volt Operation – 1.5 Amps Slow Blow, 5x20 mm

Idle Power Drain (120 Volt Operation) – 17.5 Watts

Operating Temperature Range: 0 to 40 C Ambient

Dimensions: 15" Wide x 10" Deep x 4.5" Height (includes height of the feet)

Weight: 15.5 lbs



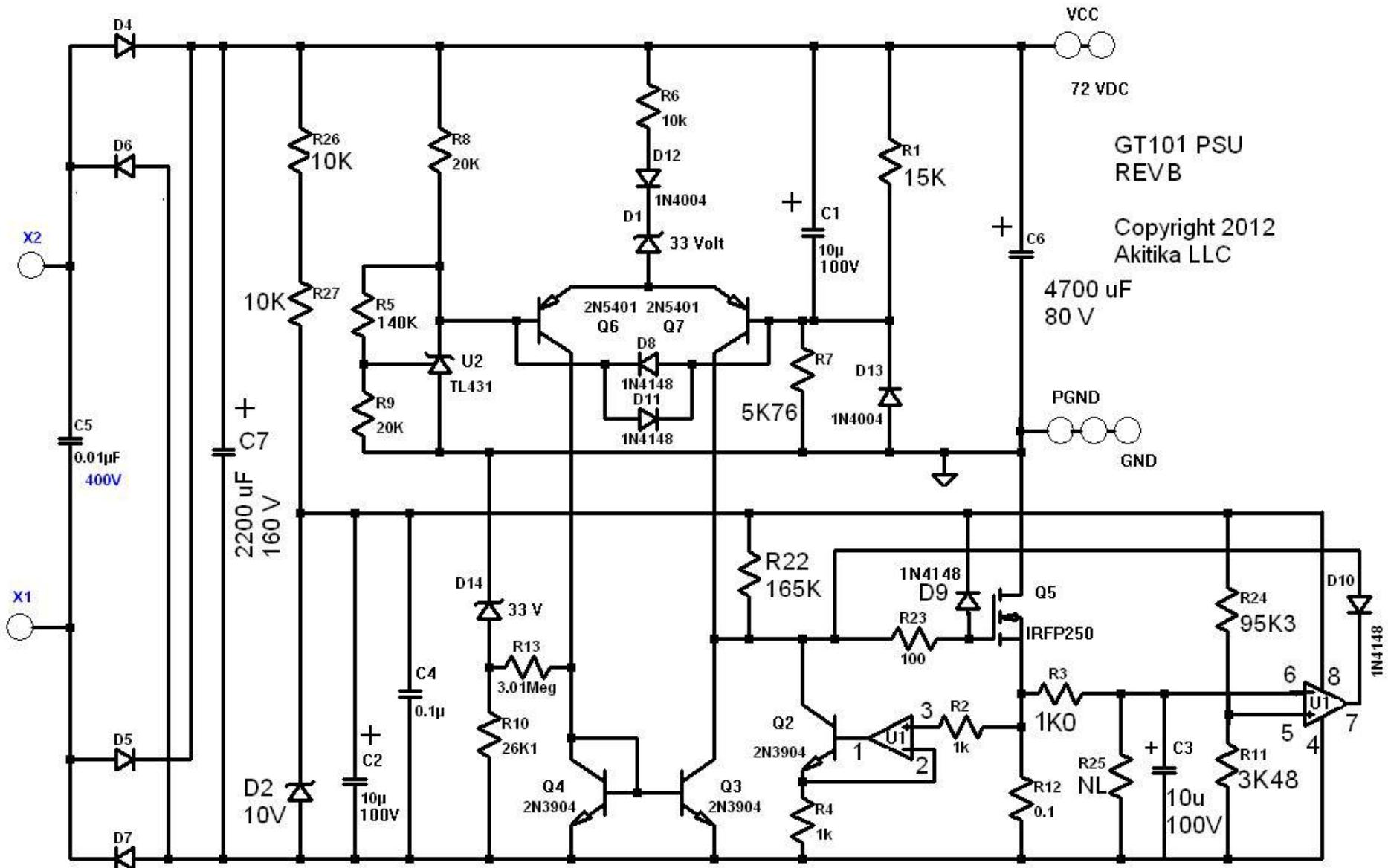


Figure 43-Power Supply Schematic

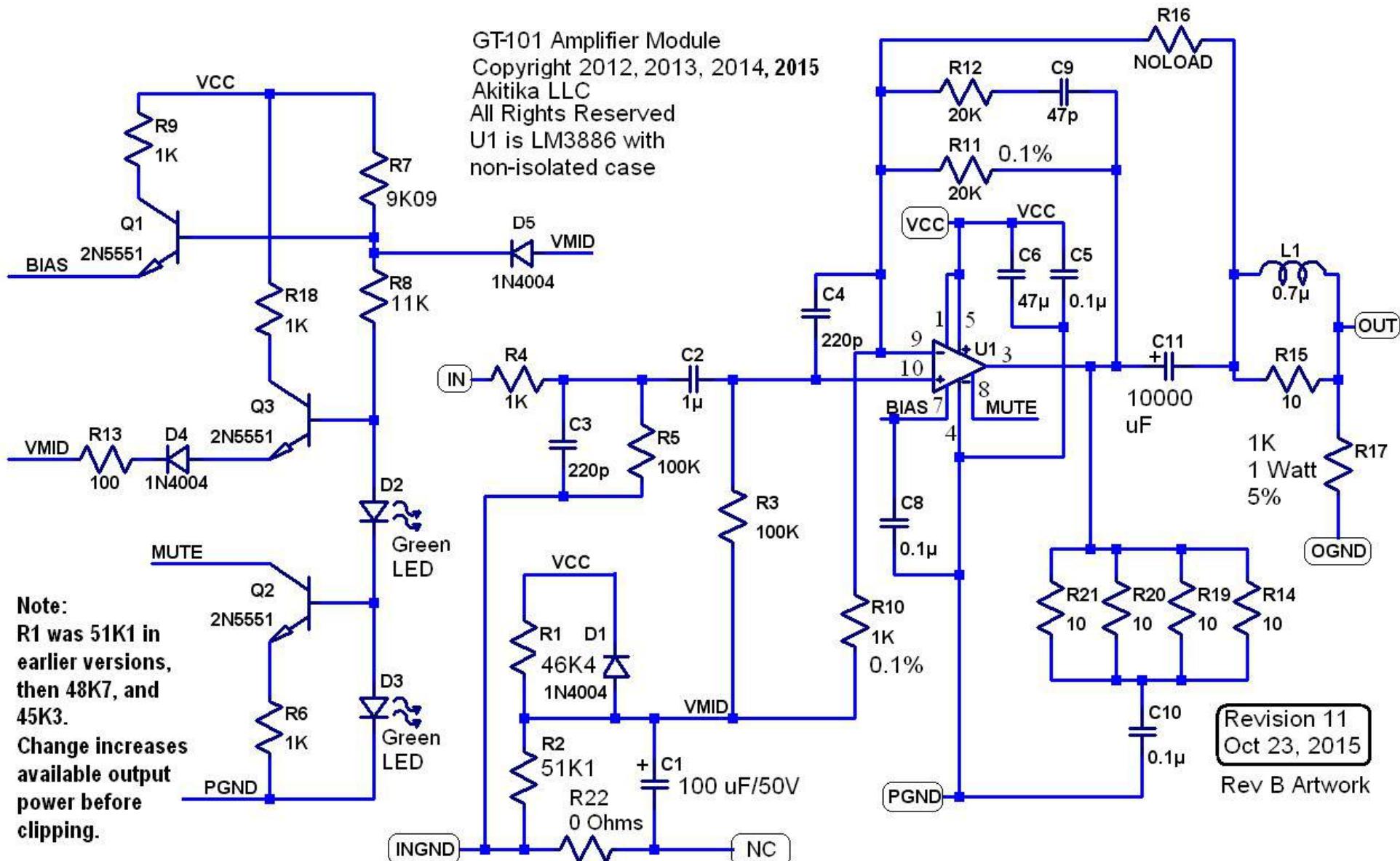


Figure 44-Amplifier Module Schematic

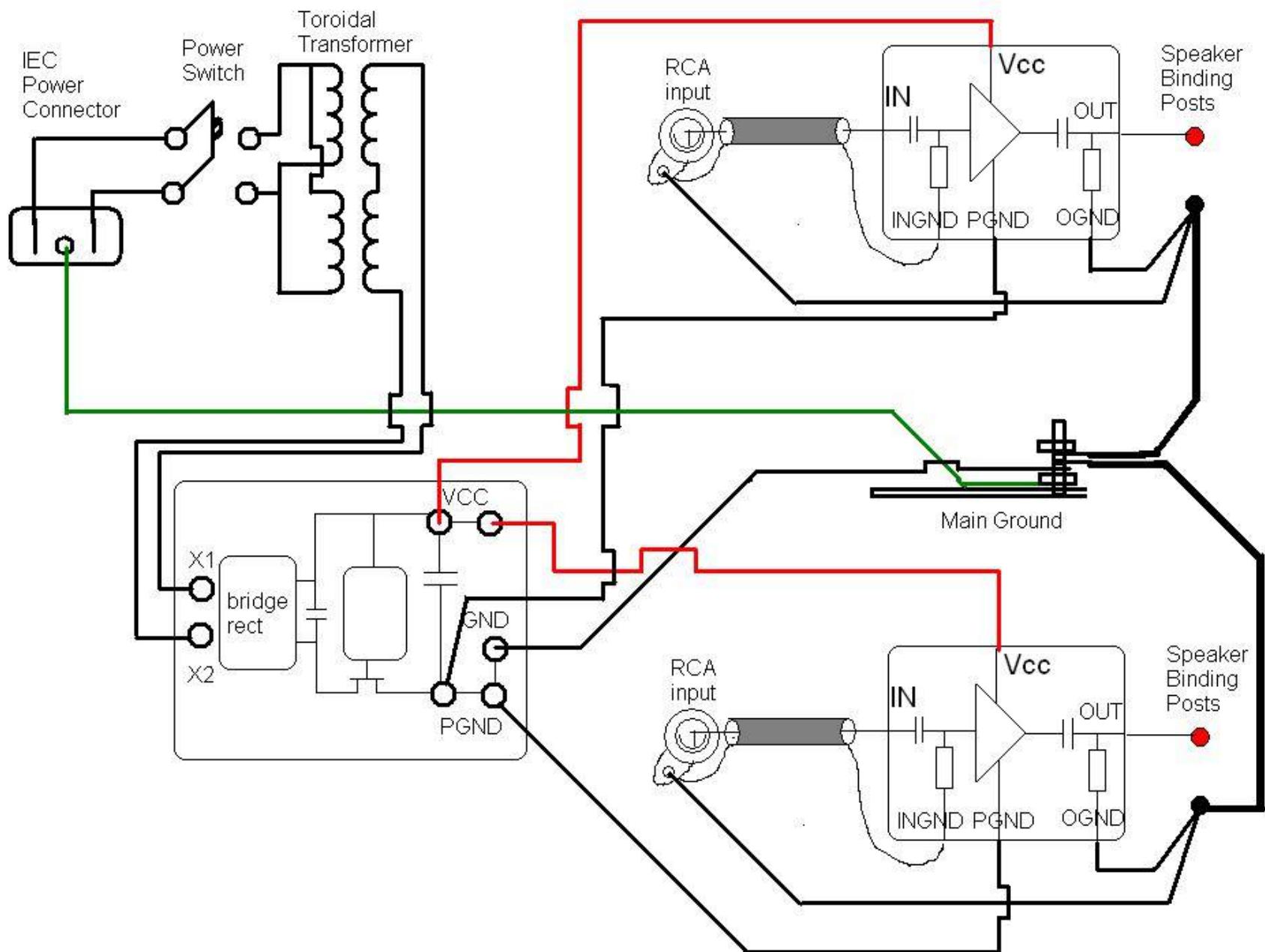


Figure 45-Overall Wiring (power transformer is wired for 120 VAC)

## Appendix 1 - Resistor Color Code



Figure 46-demonstrating the resistor color code

Here's an extreme close-up of a  $\frac{1}{4}$  W metal film 20K (20,000) Ohm resistor, designated by the standard resistor color code.

The colors map to numbers:

Color	Number
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

The color band positions have the following meaning:

Position	Meaning
1	Left-most Digit (e.g. most significant)
2	Next digit to the right
3	Next digit to the right.
4	Number of zeros that follow the three digits, unless: <ul style="list-style-type: none"><li>• Band 4 is gold =&gt; multiply by 0.1</li><li>• Band 4 is silver=&gt; multiply by 0.01</li></ul>
5	Tolerance: <ul style="list-style-type: none"><li>• Violet =&gt; 0.1%</li><li>• Brown =&gt;1%</li><li>• Red =&gt; 2%</li><li>• Gold=&gt; 5%</li><li>• Silver=&gt;10%</li></ul>

## **Appendix 2 - Preparing a Shielded Cable End**

This section tells how to prepare the ends of the shielded cable. This process will be repeated four times, at both ends of both input cables (although the cables will have different overall lengths).

1. Cut the shielded cable to the overall required length.
2. Use a utility knife with a new, sharp blade to cut the plastic jacket of the shielded cable 1" back from the end. Hold the blade perpendicular to the cable, and draw it across the cable lightly as you rotate the cable along its long dimension. This creates a scored line through the plastic jacket. With a sharp blade, not much pressure is needed. You may need a bit of practice to get the feel.



3. If you've scored the jacket carefully, you can separate the jacket at the score line without using tools. Pull the insulating jacket off, exposing the cable, showing the foil shield, the drain wire, and the fuzzy string. The result is shown here, with the foil shield showing.



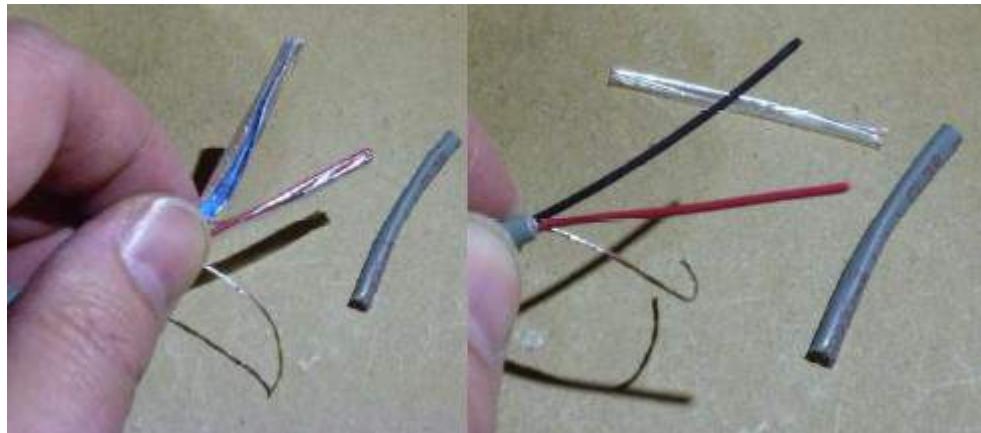
4. Cut off the fuzzy string



5. Separate and twist the drain wire.



6. Peel back and remove the foil. Remove the plastic wrap from the red and black wires. The drain (bare wire), red, and black wires are exposed now that gray insulating jacket, foil shield, and plastic over-wrap have been removed.
7. Pull the black wire out of the shielded cable.



8. Locate the #20 solid black wire in the wire kit. Remove 5/8" of the black insulation.
9. Slip the insulation from the previous step over the drain wire. This should leave 3/8" of bare drain wire exposed. It works best if you twist the insulation in the same direction as the drain strands are twisted. If it's difficult to get it started, then cut off a little bit of the end of the drain wire. That gives you a clean end, making it easier to start the insulation onto the drain wire.
10. Remove 3/8" of insulation from the red wire. Twist its strands tightly. Twist and tin the ends of the red wire and the drain wire.
11. Repeat the end preparation process for the other end of the shielded cable.



**Figure 47- Shield wire end prep completed**

Note – the “black wire” you see in Figure 47 is the really the drain wire covered by insulation taken from the 20 AWG solid black wire.