ATMASPHERE
M-60

assembly manual

Atma-Sphere M-60 Mk 3.2
assembly manual

Rev. 2014.05.09

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Introduction

In 1980, we built the first prototype of the Atma-Sphere M-60. That same prototype unit is still in service today with over 20,000 hours on the original power tubes. If you take your time and build them with care, your amplifiers will last as long, and then some.

Before you begin building your amplifiers, be sure to read through the manual and familiarize yourself with the layout of the components. Components and wiring must be done in the order shown or construction will be more difficult in the final steps. We recommend that you complete one chassis completely before moving on to the next, since it is easier to correct mistakes in the one chassis and then build the second correctly.

Finally, try to build your kit in the neatest possible manner. Form really does follow function, and the most efficient, compact, and robust construction techniques will be the easiest to service later down the road.

Assembly Notes

- Be careful not to overtighten nuts on the PEM studs (the threaded screws fastened to the chassis) or they are likely to break off.
- Do not run AC wiring past the driver circuit. Use the wiring layout shown for optimal performance.
- Add wires to a solder terminal starting from the bottom hole first. In this way you can easily add to a joint as you build.

Reading the wiring diagrams

• Twisted pairs are indicated by a black wire with a colored wire running parallel.

• For schematic purposes, some wiring is shown routed in a sub-optimal path to enhance readability. This is moslty limited to top layer flying wires and flattened front/rear panel wiring

• Construction steps are shown layer by layer, in the order they should be completed. Previously shown layers are hidden for clarity; see the next page for an idea of what the final wiring should look like

• The ground buss (labeled) runs across the two central terminal strips and is soldered to each terminal in series. This acts as a central ground buss that all grounding wires connect to.

• Wires passing through the chassis to the other side terminate in a circle. Twisted pairs are labeled at that termination by the same number or letter and differentiated by color.

Soldering tips

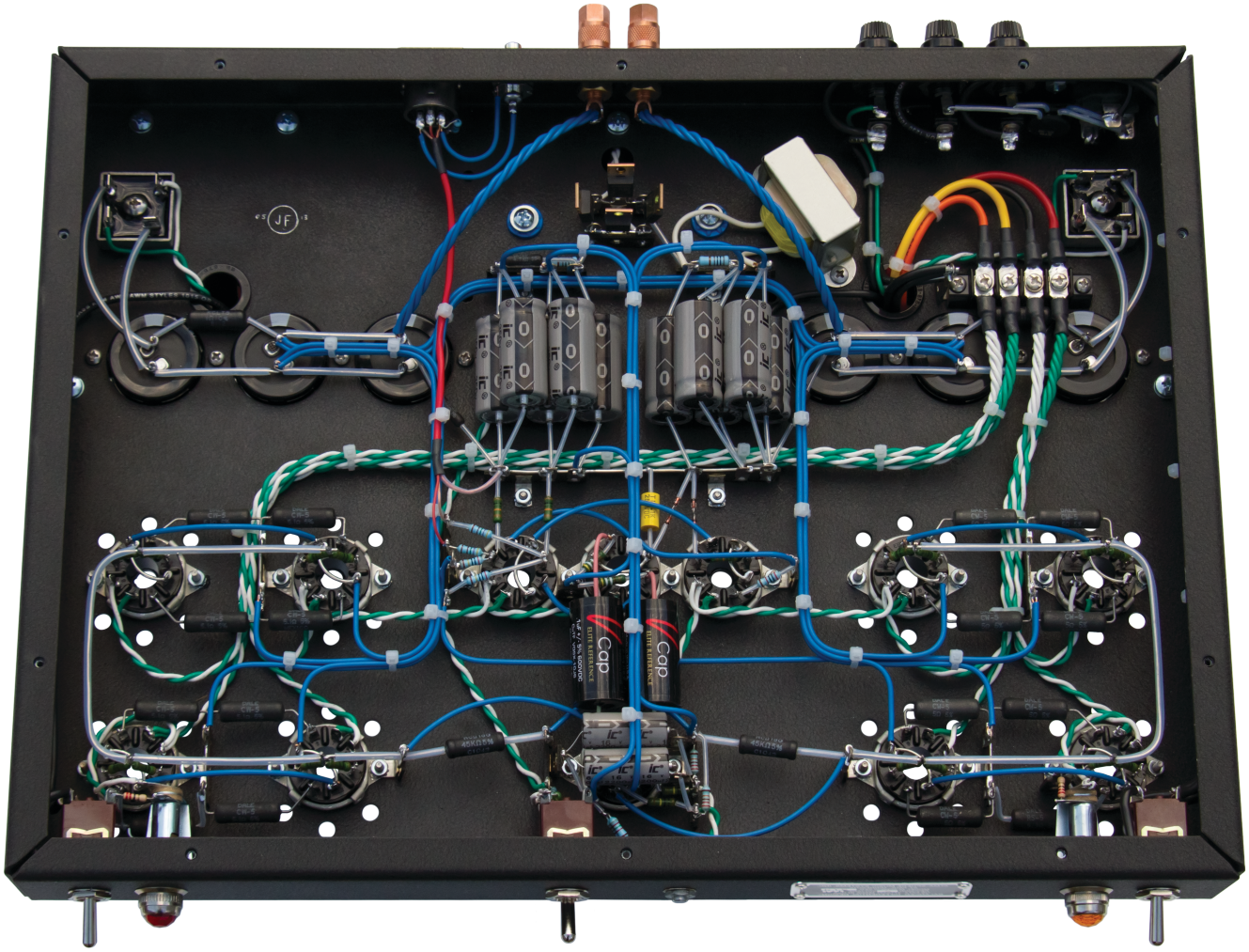
• Use a temperature-controlled soldering station. Do not use a soldering gun or a simple plug-in soldering iron, because the solder joints, and finished amplifier, will suffer for it.

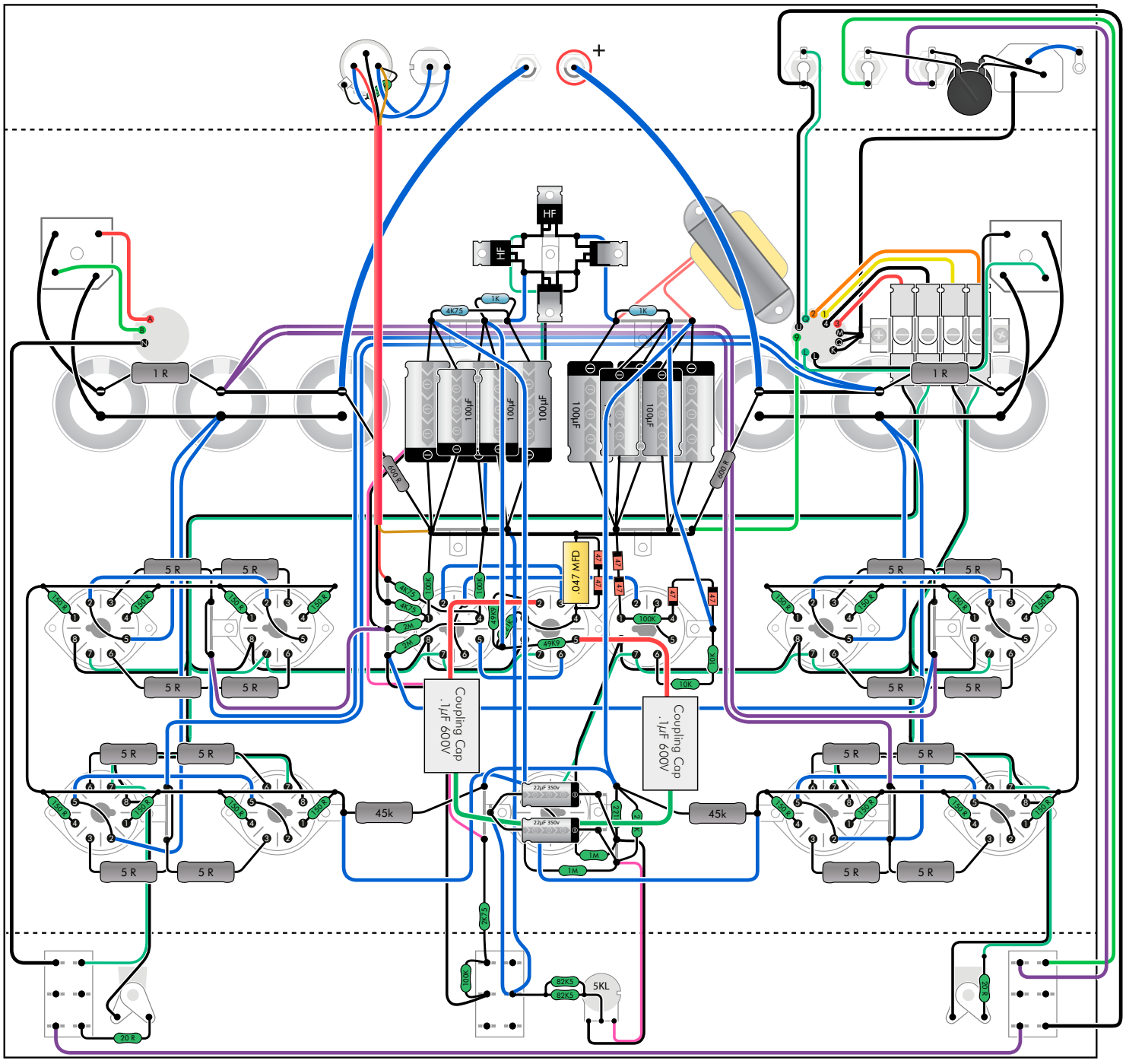
• Before soldering, components and wires should always have a good mechanical connection; that is, wires and leads should be put through the eyelet and wrapped around using a needle-nose pliers.

• Do not solder until all connections to a point have been made. Otherise, additional connections will become more difficult and the solder joint will be poor.

• It is also a good idea to fill the eyelet of the terminal to prevent corrosion and improve heat tolerance, but do not oversolder.

• The ideal solder for connections that do not use gold, silver, or rhodium is SN63. Do not use SN60 solder.




HF
HF
1K
4K75
1K
1 R
1 R
100µF
100µF
100µF
100µF
100µF
.047 MFD
5 R
5 R
5 R
5 R
5 R
5 R
5 R
5 R
5 R
5 R
5 R
5 R
Coupling Cap .1µF 600V
Coupling Cap .1µF 600V
45k
45k
22µF 350v
22µF 350v
1M
1M
5KL
20 R
20

Chassis Assembly

(see diagram on page 7)

Attach transformer cover backplate to top of chassis using 5x #10-32 screws so that the backplate is flush with the side of the chassis. Doing this step first will protect protruding components and make your amps easier to work on.

Next, make sure the chassis holes have been prepared before you start mounting parts. Most likely, we will have done this for you in advance at the factory. However, if this has not happened, a hole diagram is included on page 7, just in case. Make sure your chassis matches this diagram on before you proceed to mounting parts.

If the holes are not present, use the driver transformer, choke, and name badge as a placement templates for drilling their mounting holes. Also check to see that the RCA and Cardas posts fit properly before proceeding.

Mounting Components

(see diagram on page 8-9)

Install the following components to the inside of the chassis:

- 12 octal tube sockets, using #4-40 screws and locknuts, observing pin orientations shown on page 8. Keep nuts loose.
- Four-position barrier strip, using #6-32 screws and nuts. Thread a one position terminal strip on the left mounting screw, on top the barrier strip.
- Remaining terminal strips to be placed as shown on page 8, some using the same PEM studs as the tube sockets. Tighten the nuts at this point but be careful not to overtighten as the PEMs can break off.
- Install the AC input connector using #6-32 screws & nuts. The middle pin should be towards the bottom of the chassis. Before threading on the nuts, mount a solder tab between the nut and the bare chassis, as prepared earlier.
- Install the panel mount fuse holder assemblies, with the rubber washer on the outside, and the lockwasher and nut on the inside. Mount the fuseholders so that both solder terminals are facing up.
- Install the Cardas speaker binding post, with the (+) side towards the fuseholders. The insulating standoff goes on the outside of the chassis and the isoation washers on the inside. Do not tighten nuts at this point.

Chassis Assembly (continued)

Diagram on page 9:

• Install the RCA input connector. Place one insulating washer on the outside of the chassis and one on the inside. Reverse the red and the white washer on the second chassis to label the channels.

• Install the XLR balanced input connector using #4-40 screws. Orient pin #3 towards bottom of chassis.

• Install the front panel toggle switches as shown. Leave one nut tighented down the base of the switch as a spacer, then mount the switch using a lockwasher and nut on the outside of the chassis. To avoid scratching the chassis paint, poke a hole in a plastic bag and place it over the toggle switch before tightening down the nut.

• Install indicator lamp holders on the left and right. The amber indicator goes on the left side of the chassis, when viewing chassis rightside up. Be sure this part is secure.

• Install 5K DC Offset potentiometer, positioning the terminals towards the toggle switch as shown. If the pot has an index tab, file it off before installation or it will not sit flush.

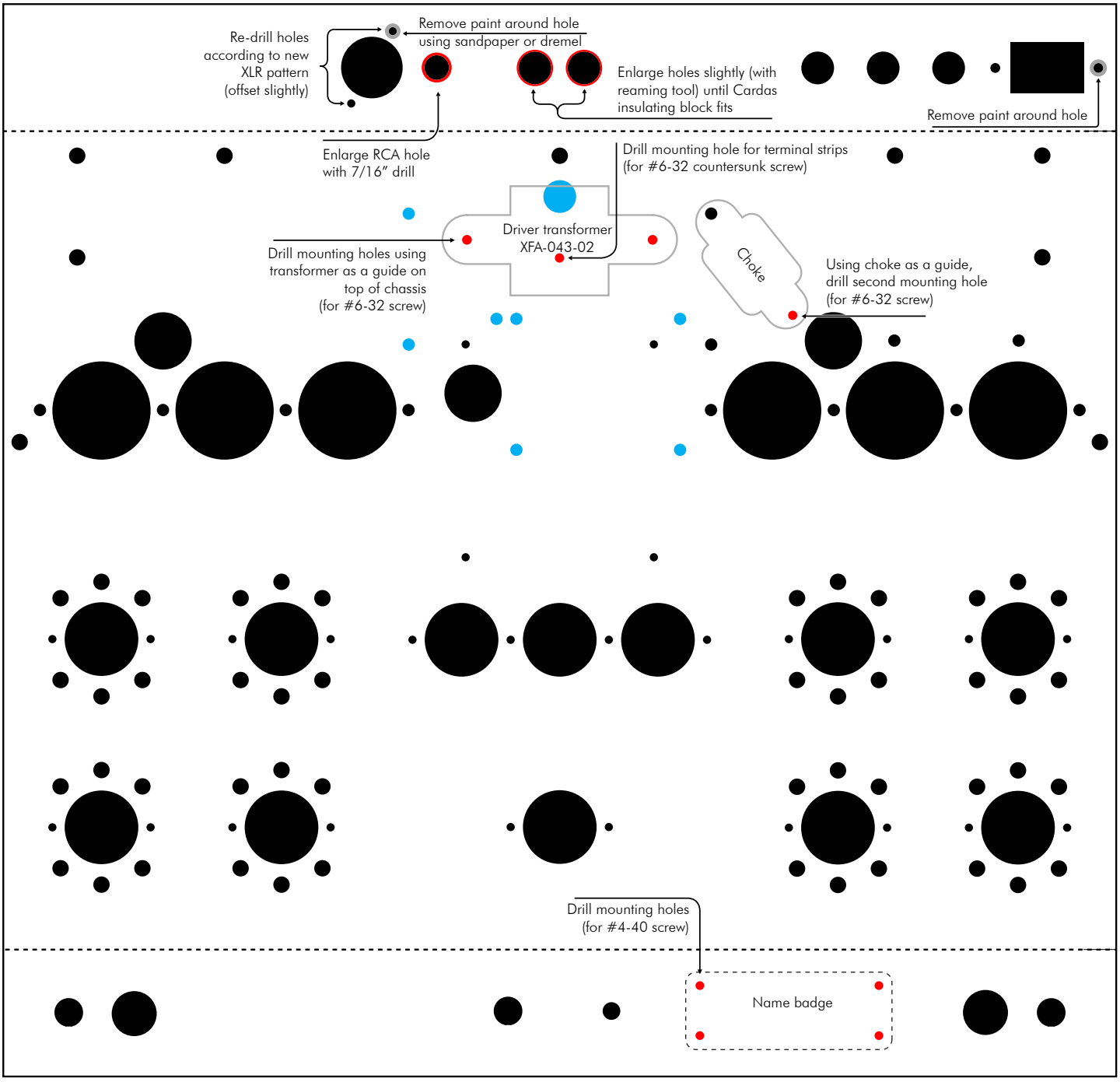
• Install 3x plastic grommets with the flush side on inside of chassis.

• Mount 6x capacitor clamps. Install on top of chassis, using #6-32 phillips screws and nuts. Fit clamp closures with longer #6-32 slotted head screws and nuts. Position so that all clamping screws can be tightened from the front of the chassis.

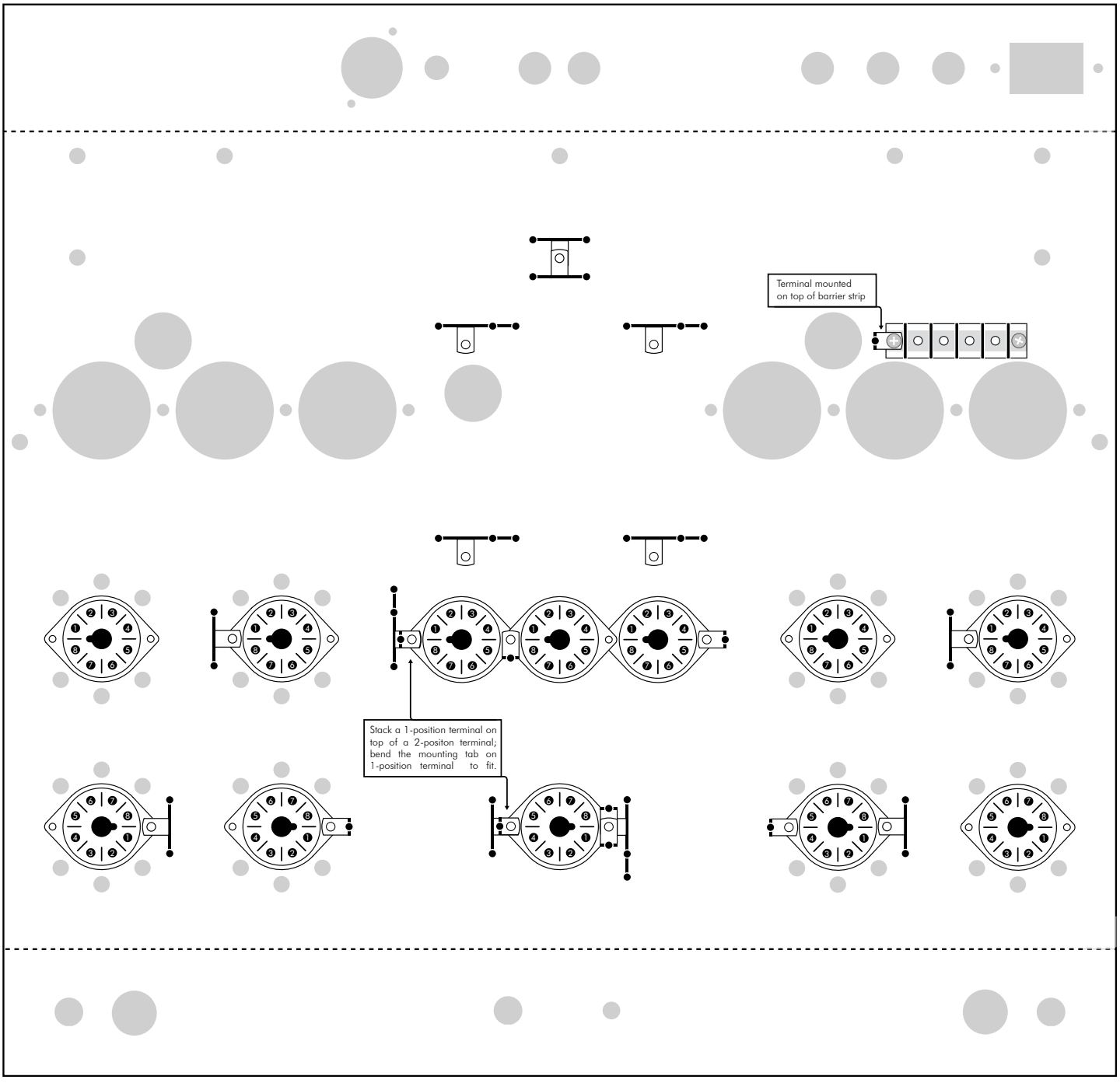
• Install 6x 2200μF electrolytic capacitors in clamps on the topside of the chassis. They should protrude into the chassis roughly 1/4 inch with their leads pointing downwards. Maintain physical orientation, with respect to polarity, with the (+) terminal towards the rear of the chassis.

• Bolt 2x rectifiers to the chassis with long #10-32 screws. The head of the screw should be on the inside of the chassis and the locknut on the opposite side. Note orientation of rectifier terminals. If you so desire, apply a thin layer of heat sink compound to the bare surface of the rectifier before attaching it to the chassis.

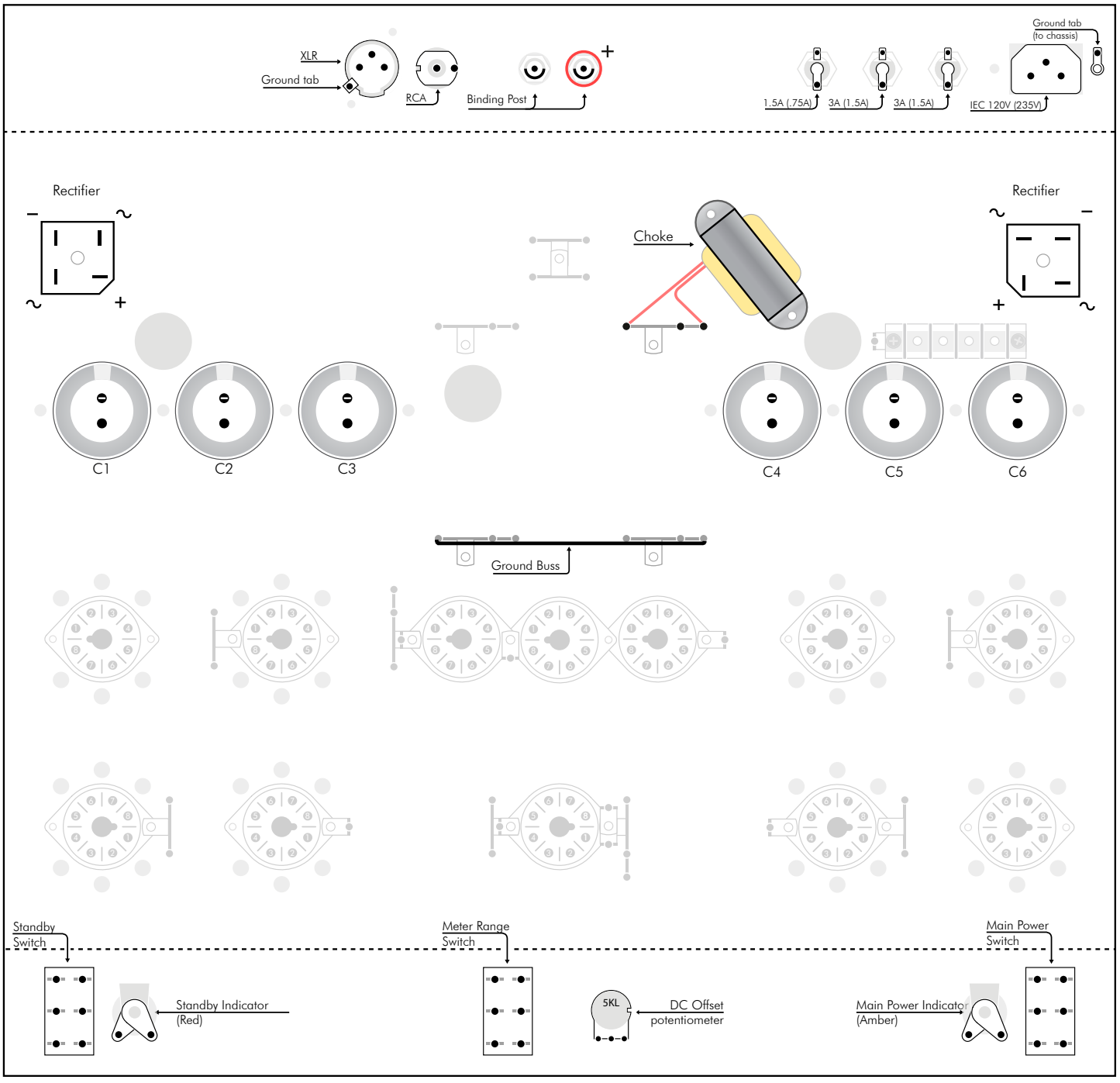
• Mount the choke on the inside of the chassis as shown.



- The M-60 chassis, viewed from the bottom; the front and rear panels are shown as though unfolded.
- Holes that need to be drilled or enlarged with are marked in red.
- Holes that are unused are shown in blue, and will not be shown in any other drawings.



• Note the orientation of the sockets; the key (center hole with slot) in the top row of sockets are all pointed left, and the keys on the bottom are pointed right.



• Notice the orientation of the bridge rectifiers; the positive corners should face the center bottom.

Filament Wiring

(see diagram on page 11)

Using the 22ga. white and green twisted pair wire and the smaller ring lugs, construct two wiring harnesses for the output tube filaments as shown. The procedure below is for one such harness:

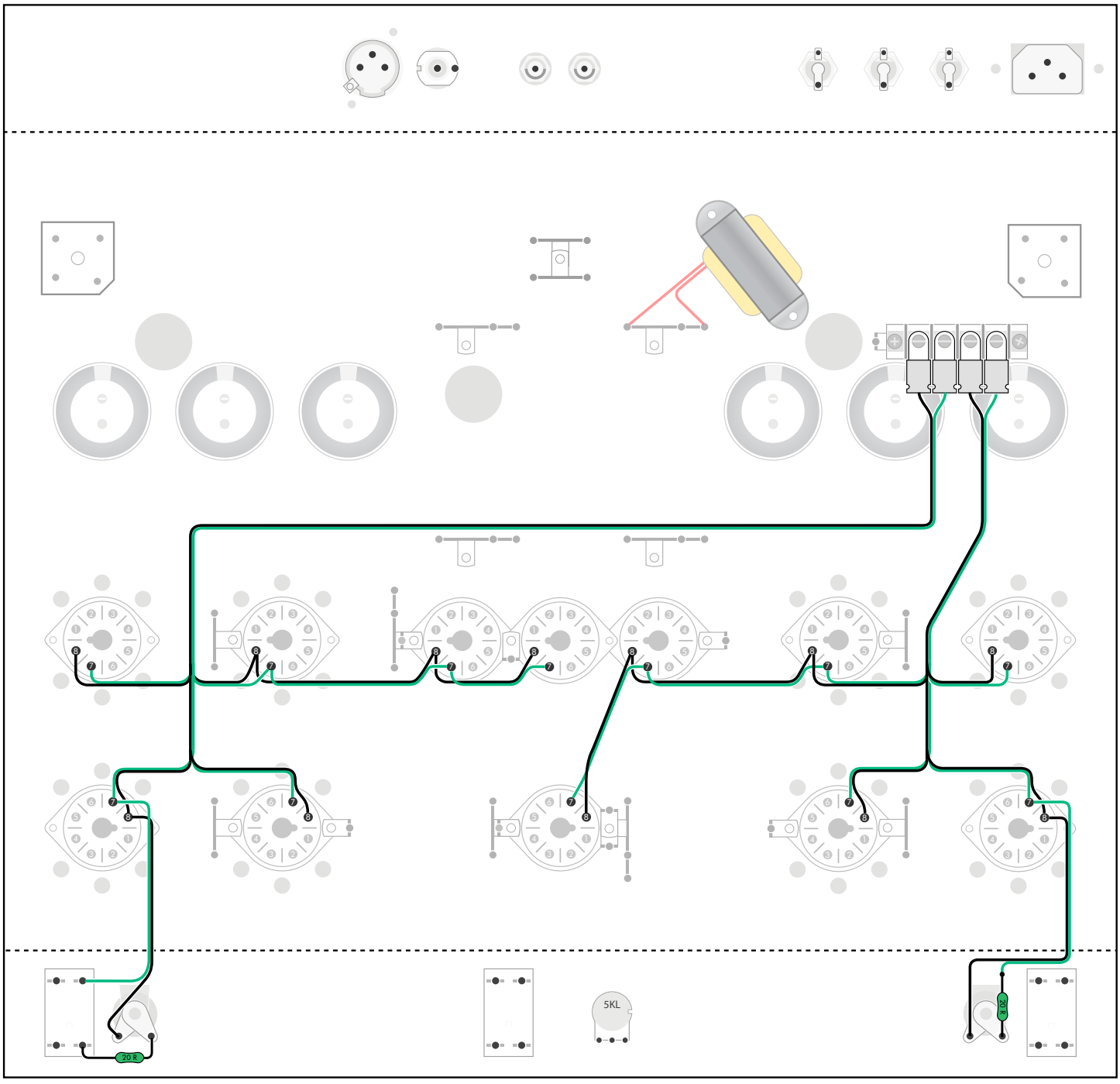
First, position and cut the wires to length so that the layout is as shown in diagram. Use a seperate twisted pair for each output tube. Then, unwrap the twisted pairs about one inch. Strip the ends to roughly 1/4 inch, and twist the stripped ends of the like colors together. Place the pigtail in the previously mentioned ring and crimp. Cut off any wire extending into the ring, then fill the crimped end with solder by hearting the lug where the ring meets the sleeve. Do this quickly to avoid melting the insulation.

Use the first and second connections on the barrier strip for the left hand output tubes and the third and fourth connections for the right hand output tubes.

NOTE: When wiring the driver filaments in the following steps, wire ALL pins of the same number consistently with the same color wire, to maintain phase. The particular color you chose is not important; but consistency is. Failure to follow this procedure could result in hum.

Install wiring harnesses to 4-position barrier strip and pins 7 and 8 of the output tube sockets (V5-V12) as shown in diagram. These wires can be neatly bundled between the rows of output tubes. To finish the wire bundle, tie the bundle together with zip ties spaced evenly 1.5-2 inches apart.

Make the rest of the filament connections using the same 22ga. twisted pair wire. For the connection between V10 to the Main Power indicator, solder a 20Ω resistor inline and heat shrink the resistor and soldered leads.


20 K
5KL
20 K

Transformer Wiring

(see diagrams on page 13-14)

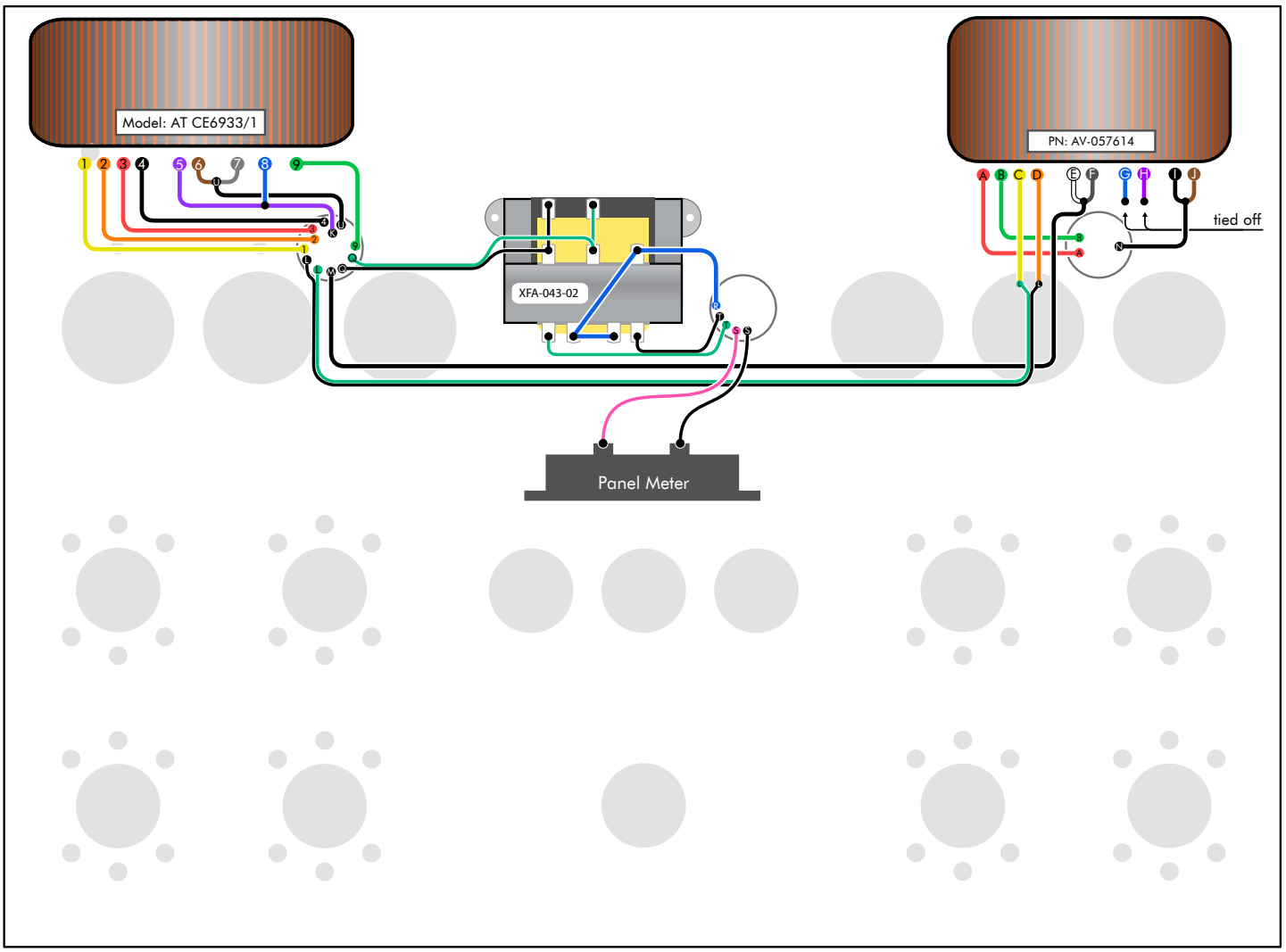
- Mount the power (AV-057614) and filament (AT CA6570/1) transformers to inside of rear transfromer hood using 1/4-20 carriage bolts, fender washers, and nylock nuts. Place the foam side against the chassis.
- Mount the Driver transformer (XFA-043-02) as shown using the isomeric mounting kit. First, push the blue vibration damping grommets through the holes in the chassis. Then mount the transformer with the locknut and washer on the inside of the chassis. Tighten the nuts until the washer contacts the grommet. DO NOT overtighten! If mounted properly, the blue grommets should be only very slightly compressed and you should be able to should rock the transformer back and forth slightly. If over tightened, the grommet will lose its damping properties.
- Consult either the diagram on either page 13 or 14 depending on the voltage you are building your amplifiers for.

Some wires will need to be extended to pass through the chassis. For these wires, use the black 16 or 14ga. included. A Western Union line splice is ideal for this kind of connection. Solder the joint, and apply heatshrink. Remember to place heatshrink on the wire before both ends of the wire are soldered.

For wires that need to be tied off (i.e. not connected to anything), cut off any bare wire on the end, fold 3/4 inch of wire over and place heat shrink tubing over the end, overhanging the folded wire by 1/4 inch on either side.

Transformer Wiring, 120VAC

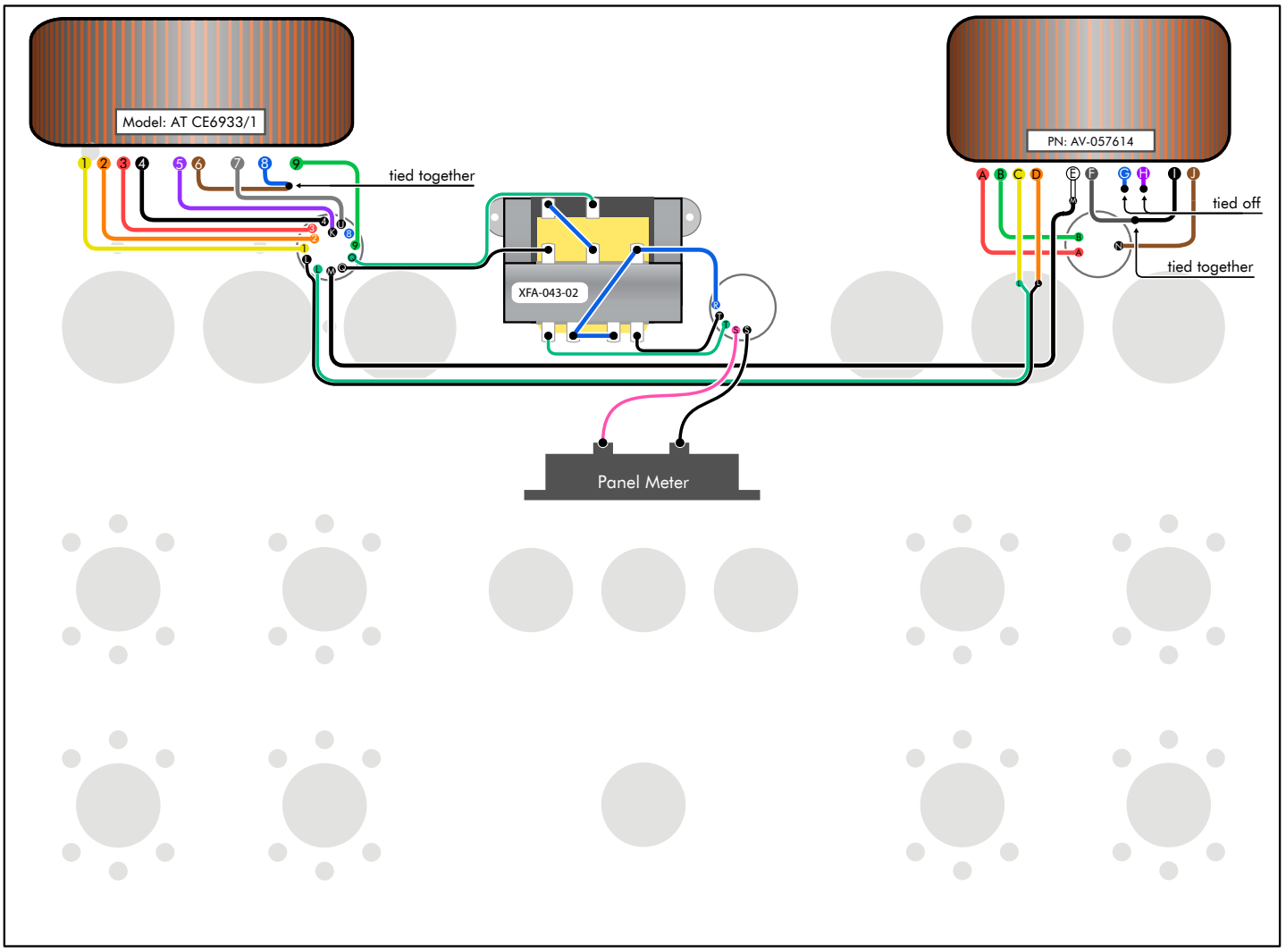
(viewed from top)



Note the orientation of the chassis; this is viewed from the top, so left and right are reversed relative to the other diagrams.

Transformer Wiring, 220VAC

(viewed from top)



Wiring and component placement

(see diagrams on pages 16-20)

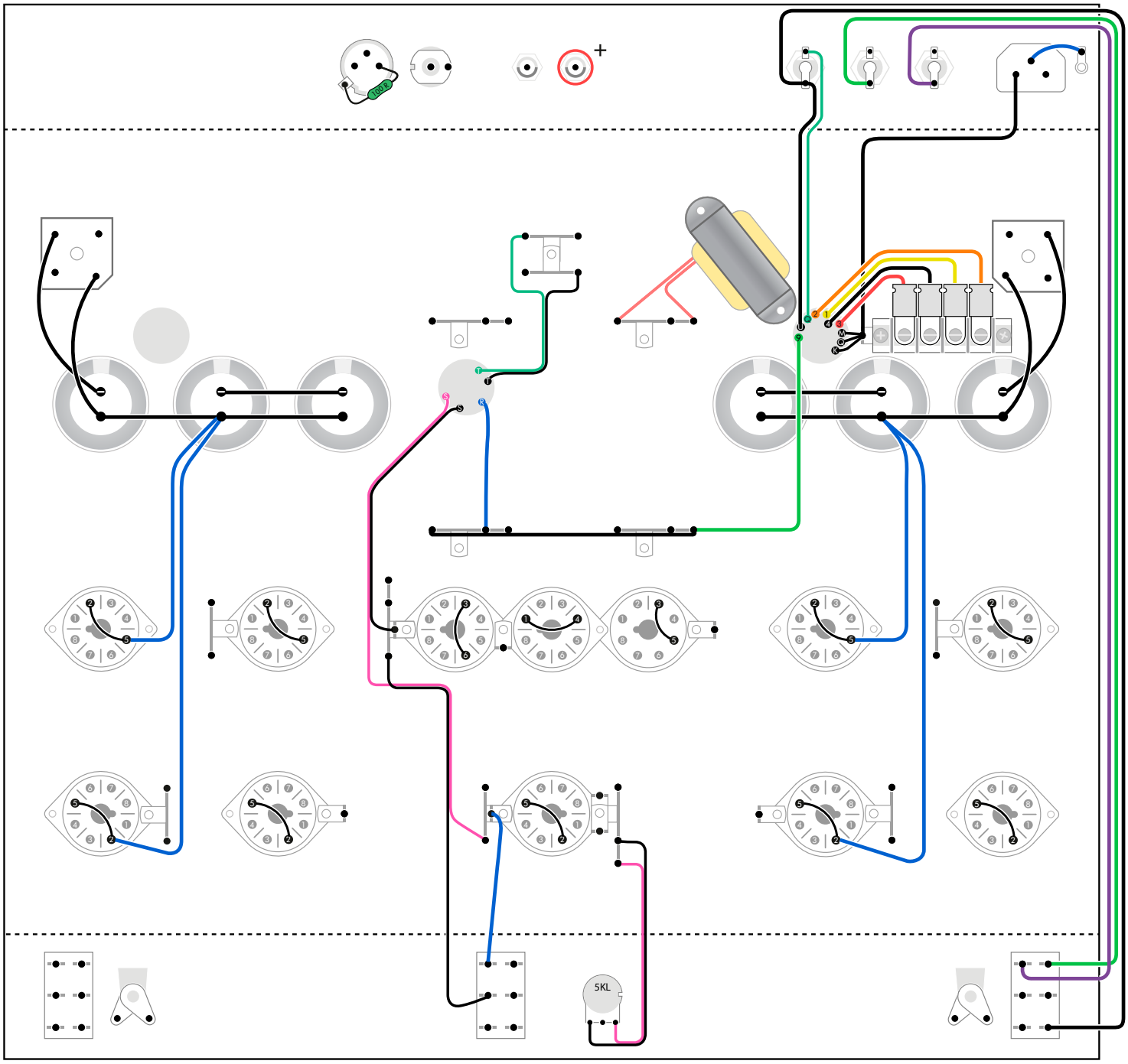
For all wiring, except where noted, use the blue solid-core copper wire. Using the diagrams as a guide, wire the following connections.

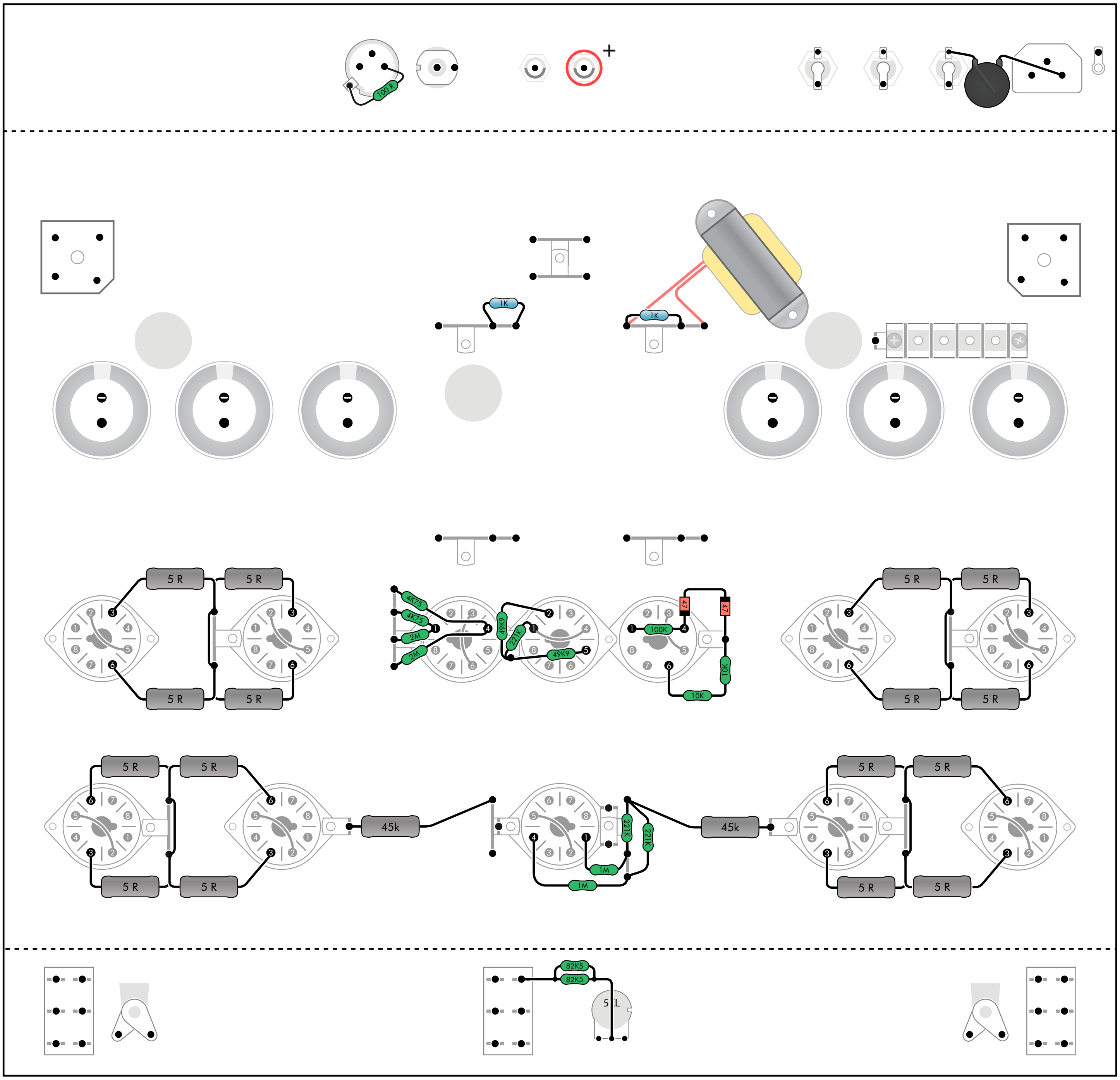
- Use the black 16 or 14ga. wire for the rectifier and capacitor connections (shown in black), and the fuses to the panel switches, as shown.
- Use the solid, uninsulated buss wire to make tube socket jumpers, terminal strip jumpers, the ground buss wire.
- The twisted pair labeled "S" passes through the chassis to the panel meter. Use the green and white twisted pair wire. Be sure to leave enough length to remove the hood and faceplate assembly with the meter attached.
- The two-conductor shielded Mogami wire (red) is to be used for the input from the XLR or RCA. To remove the outer layer of insulation, use a razor blade or hobby knife to make a shallow cut around the wire, but take care not to nick the inner wire insulation or shield. The shield wires are connected on one side to the ground buss, and on the other to pin 1 of the XLR. Place a 1/2 inch piece of heat shrink on either end, centered where the black and red wires exit the outer red insulation.
- For the speaker output wires connected to the Cardas binding posts, twist two pieces of blue wire to double the current-carrying capability of the wire. To solder them to the binding post, remove the speaker cable nuts on the outside of the amp, as they act as a heat sink. After both joints are soldered, you may then tighten the nuts holding the binding to the amp. If you tighten them before soldering, they will loosen from heat deformation.

Place teflon tubing or fiberglass insulation over bare component leads which pose a risk of shorting to the chassis or other components. This includes:

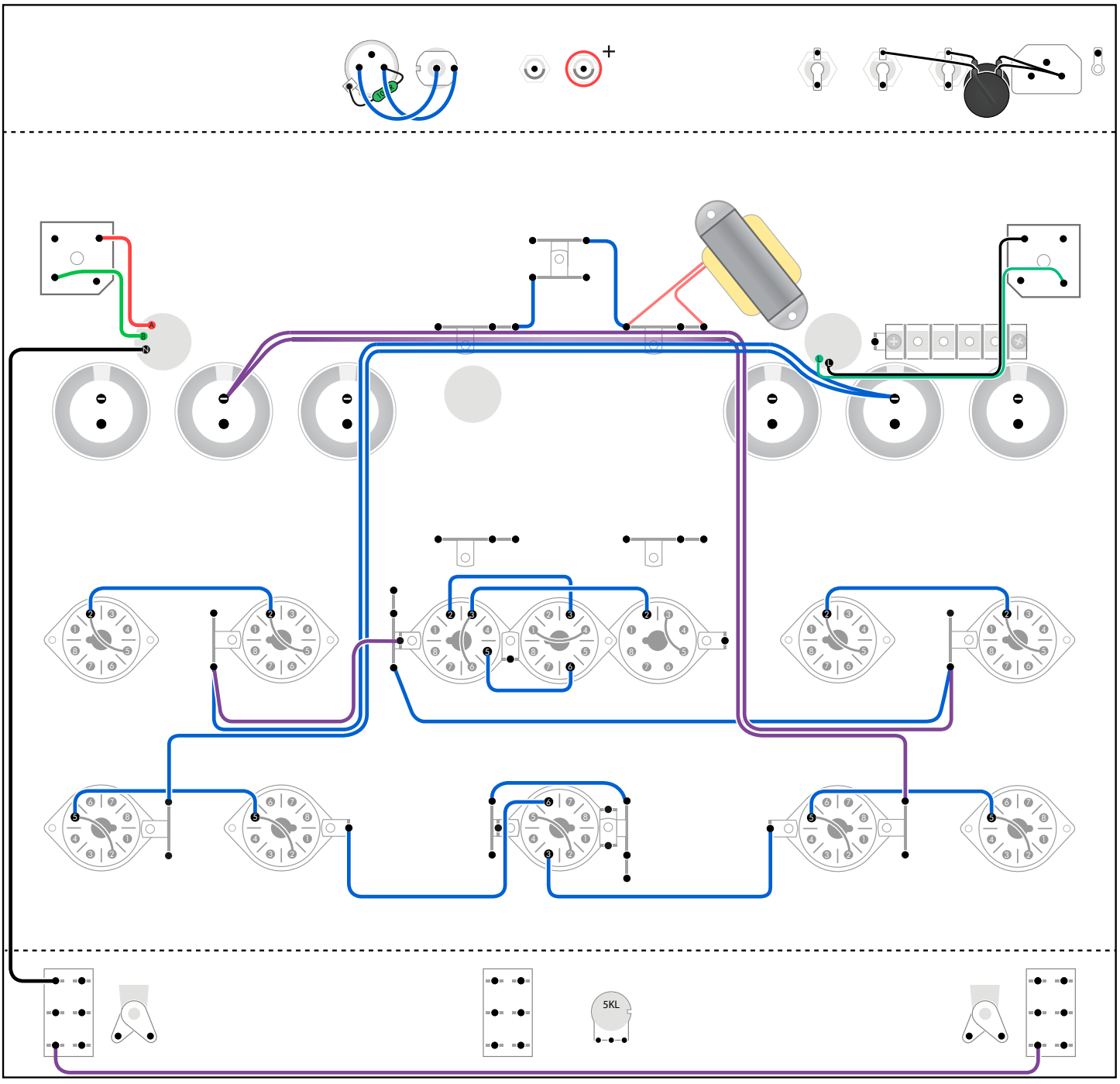
- On the U-shaped buss wire connecting the grid resistors of the power tubes (pins 1 and 4).
- The 5Ω resistor leads connected to pins 3 and pin 6 of the power tubes.
- Both sides of the 600Ω resistors connected to the ground buss.
- The 2x inrush current limiters on the AC return.
- The resistors on V1 pin 4.
- The 1Ω resistors across the capacitors.

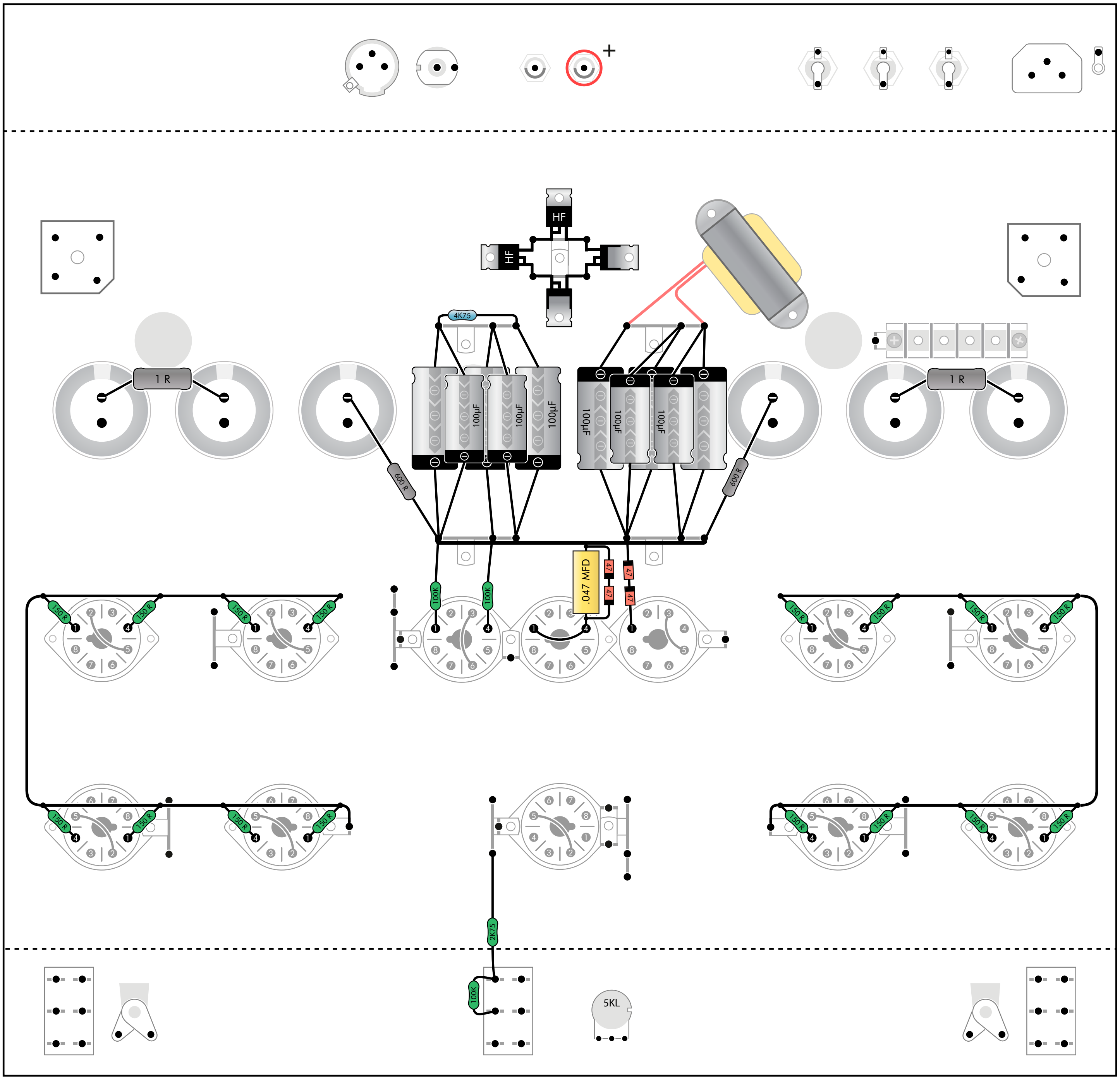
Insulate other connections as you see fit.

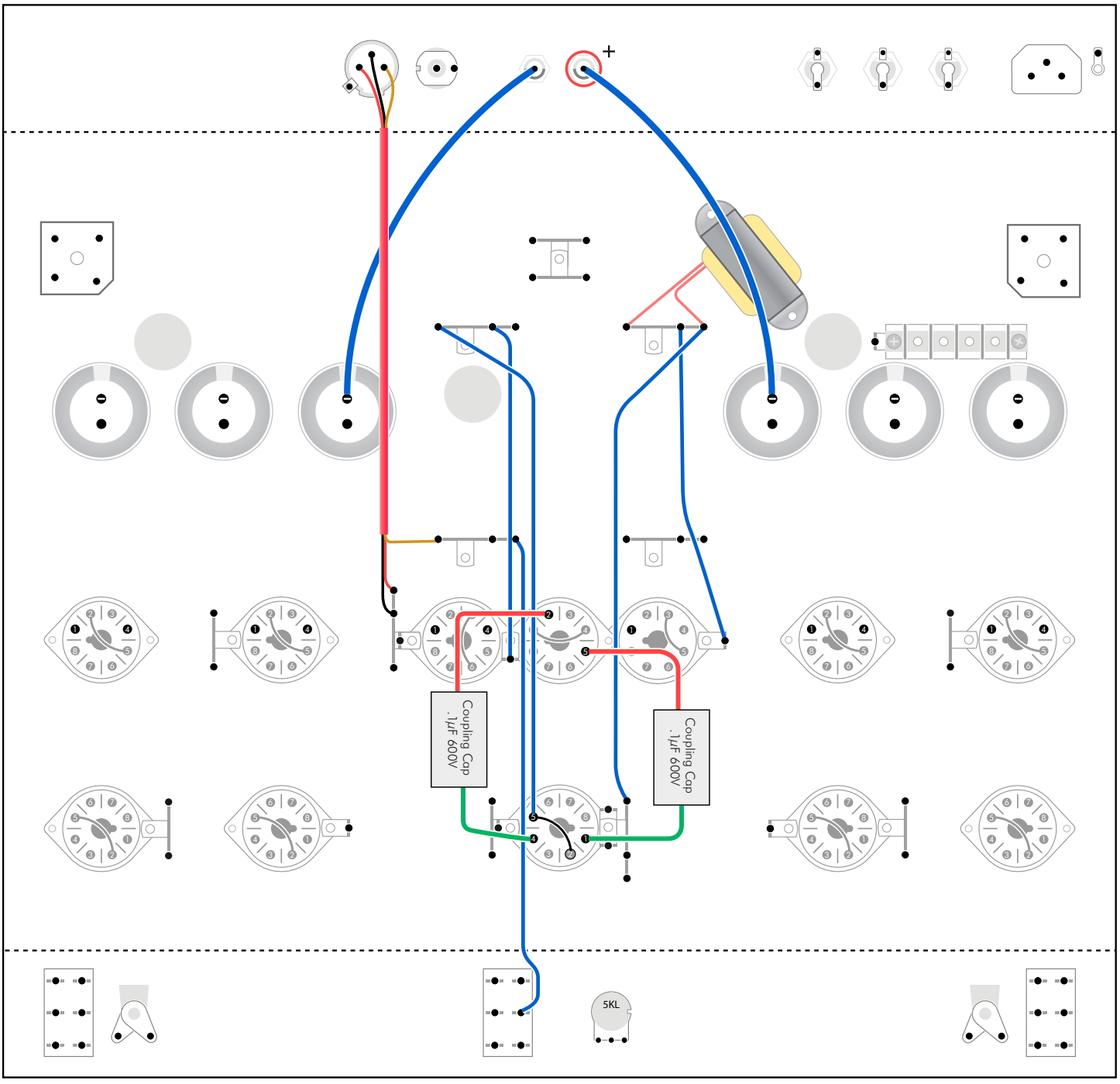

5KL



100 R
+
1K
1K
5 R
4K75
4K75
2M
2M
49K9
221K
49K9
100K
47
47
10K
10K
45k
45k
221K
221K
1M
1M
82K5
82K5
5 L


5KL


HF
HF
4K75
1 R
1 R
100µF
100µF
100µF
100µF
100µF
100µF
600 R
600 R
100K
100K
.047 MFD
47
47
47
150 R
2K75
100K
5KL


+
Coupling Cap
.1µF 600V
Coupling Cap
.1µF 600V
5KL

Check Out Procedure

DANGER! HAZARDOUS AND LETHAL VOLTAGES PRESENT.
IF YOU ARE NOT QUALIFIED, REFER THIS SECTION TO
QUALIFIED SERVICE PERSONNEL!

If your amplifier does not behave properly at each step turn off immediately and look for the cause of the problem.

1. Install all fuses. If possible, use an autotransformer (Variac™) for this procedure. Connect the amplifier to AC power, with both power switches in OFF position.

2. Locate driver stage power supply. Attach meter to ground (connection between the two driver filter caps near rear panel). Turn amp on to STANDBY (Left switch ON, amber indicator illuminated) and immediately back to OFF. Verify that there is a nominal DC voltage on each driver supply filter of correct polarity.

3. If voltage from step 2 was present AND polarity is correct, engage STANDBY switch. Voltage should be about +315 +/-10 volts and -315 +/-10 volts.

4. Switch unit to full power (Right switch ON, red indicator illuminmated) and then immediately back to standby. Verify similar to Step 2 for the output section filter capacitor banks (C3&4, C5&6).

5. If OK, engage full power. Both lamps should be lit. Both filter caps banks should show about 135 to 150 volts.

6. Turn unit off. Install all tubes. Engage STANDBY. Output & driver tubes should light. Measure grid voltage (pin 1 or 4) of output tubes after suitable warmup. It should be about -70 volts and adjustable by DC offset controls.

6a. Same voltages should be present at pins 3 and 6 of V4 (6SN7).

7. Measure voltage at pins 2 and 5 of V2. About +160 to +190 volts is OK.

8. Pins 1 and 4 of V2 should be about 90 Volts. If very low check Zener diodes polarity and condition.

8a. Pins 3 and 6 of V2 should be a little higher.

9. Pins 3 and 6 of V1, and pin 5 of V3 should be positive and around 2 volts.

10. Pin 6 of V3 should be about -215 volts. Pin 4 should be slightly more negative (such as -218). The jumper between pin 3-5 should be around -90.

Check Out Procedure

(continued)

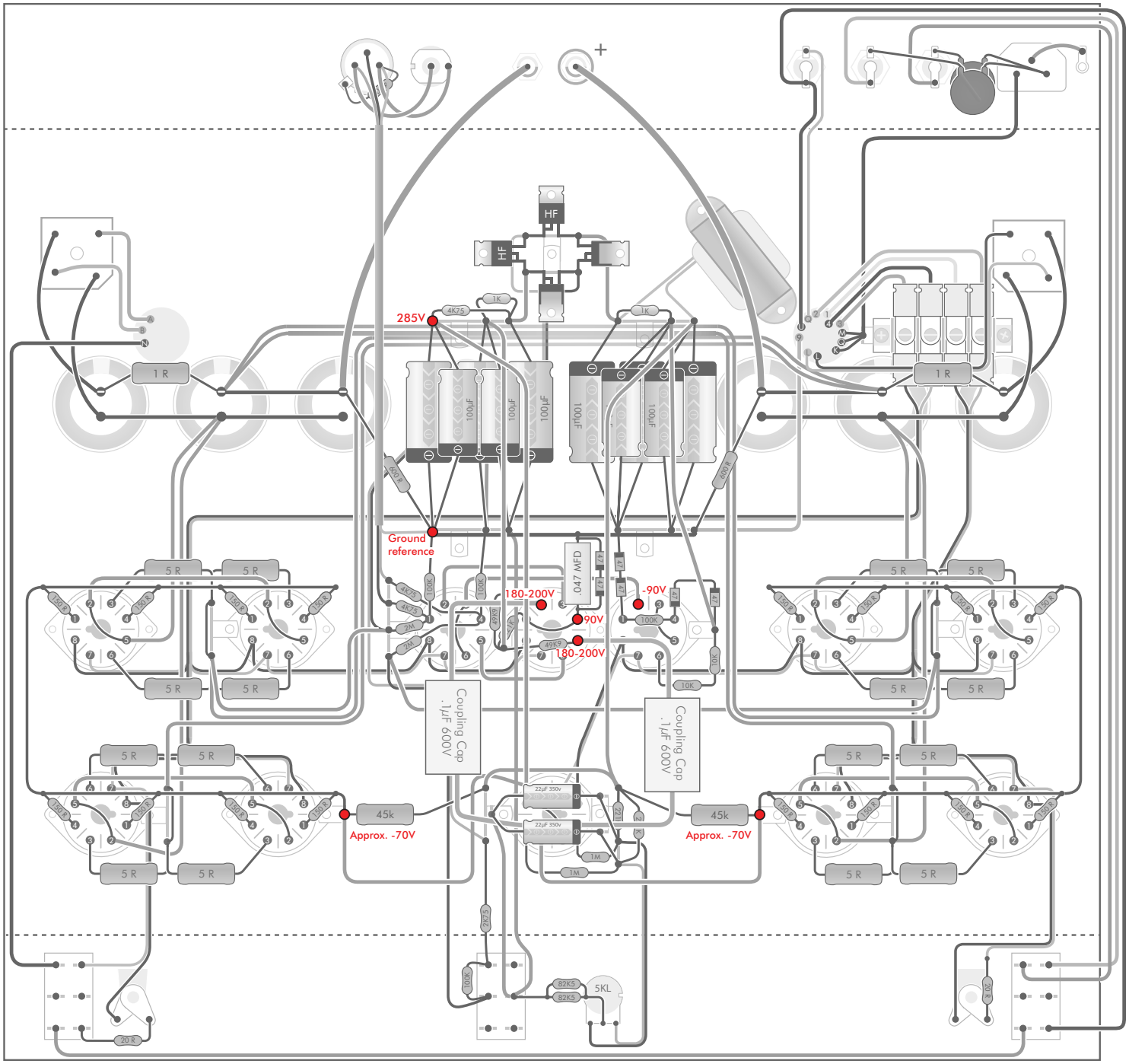
DANGER! HAZARDOUS AND LETHAL VOLTAGES PRESENT.
IF YOU ARE NOT QUALIFIED, REFER THIS SECTION TO QUALIFIED SERVICE PERSONNEL!

11. Attach a resistive 8 ohm load across the speaker terminals. An inexpensive speaker serves nicely. Engage full power. Follow DC offset procedure in owner's manual.

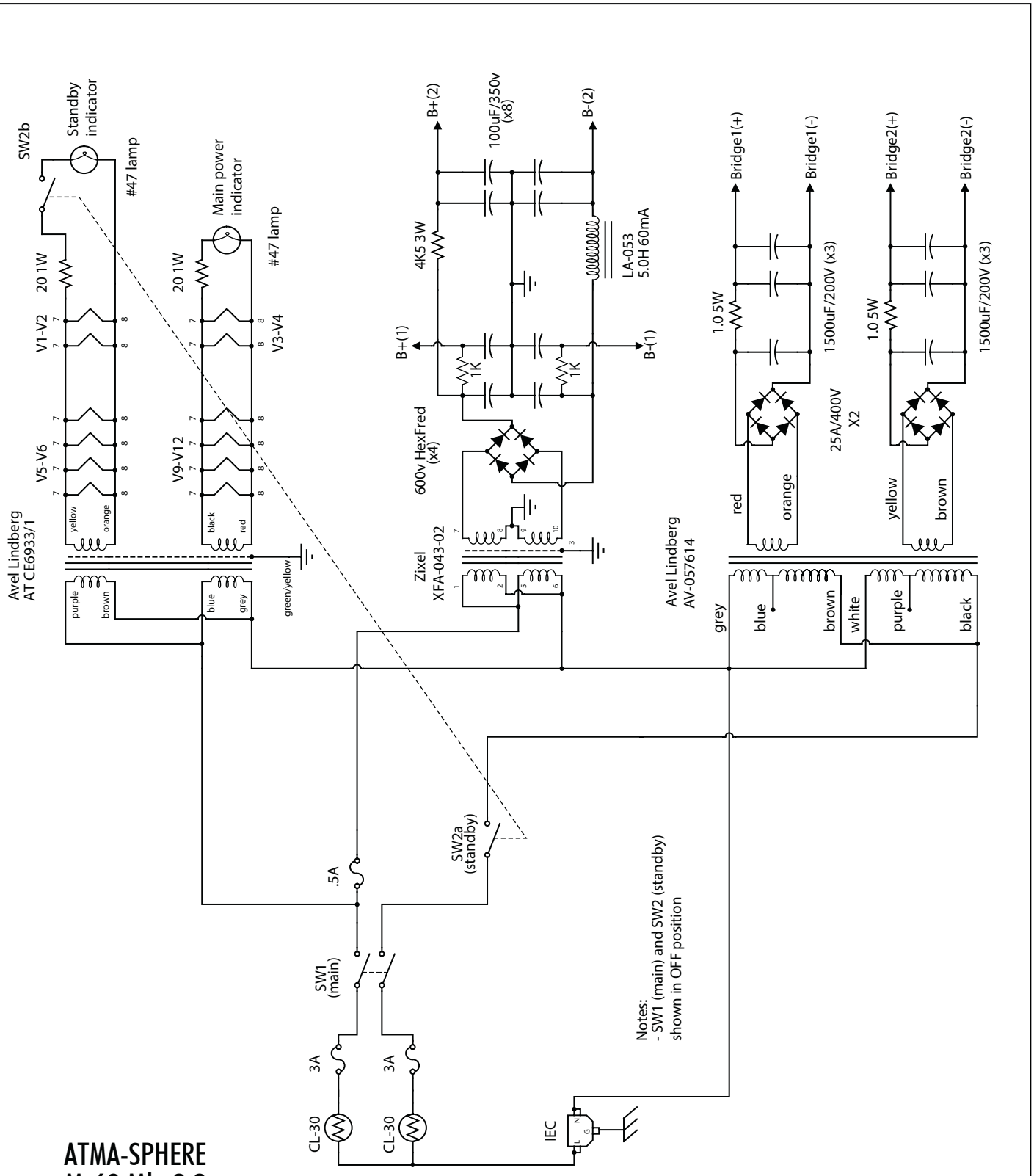
12. If all is OK, attach the feet to the bottom cover with the #10-32 screws and locknuts.

12a. Install the bottom cover with #4-40 screws.

13. Refer to owner's manual for operation. Allow about 150 hours of play time for your amplifier to break in properly. Enjoy!



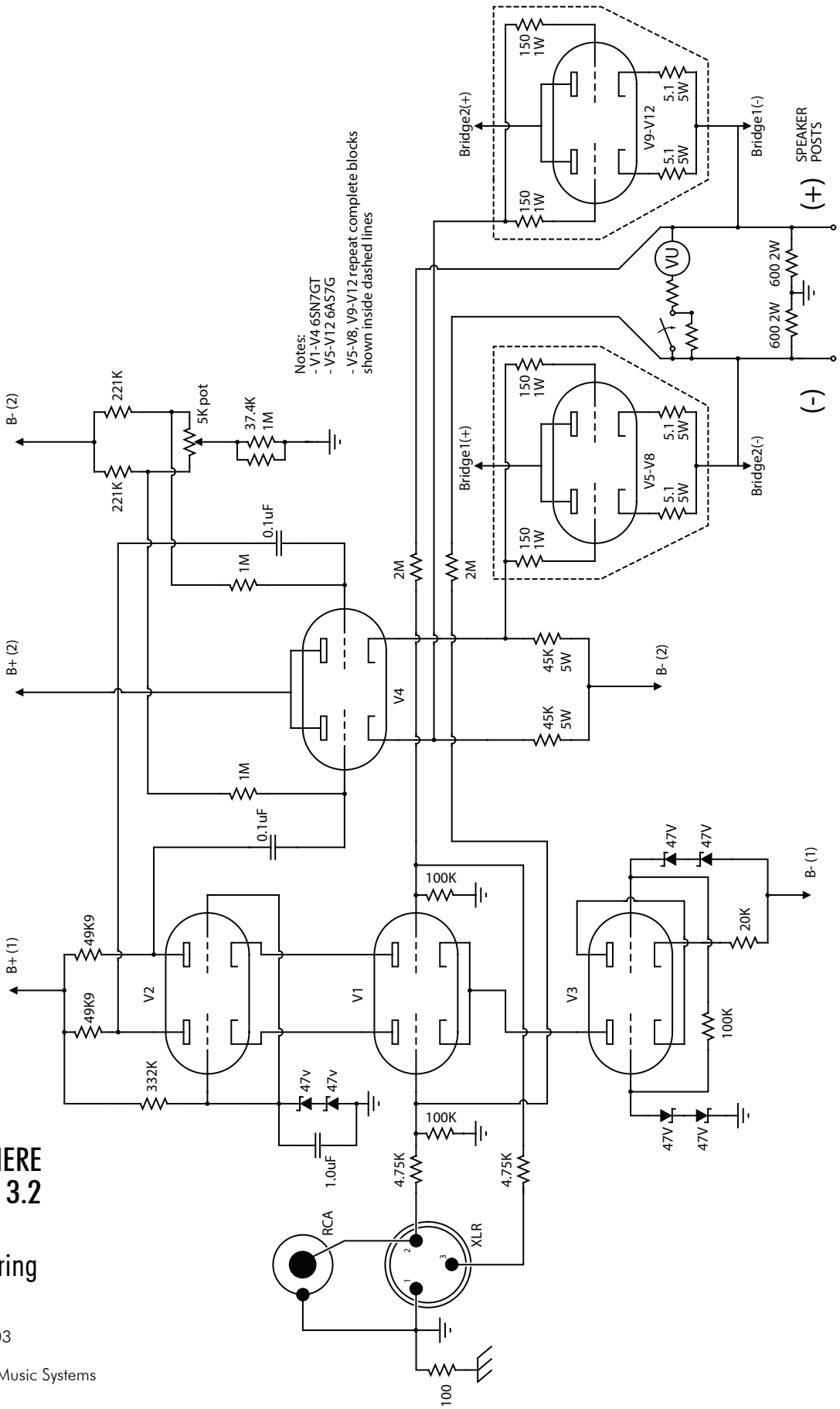
•Test points with voltages; all test points referenced to main ground buss.



ATMA-SPHERE
M-60 Mk. 3.2

Power Supply & AC Wiring
117V configuration

2013-06-03



ATMA-SPHERE
M-60 Mk. 3.2

Signal Wiring

2013-06-03

M-60 Mk. 3.2 Specifications

Output power	60 watts per channel 45 watts per channel 80 watts per channel	8 Ω load 4 Ω load 16 Ω load
Output impedance	4.1 Ω	
Power bandwidth	2Hz-75KHz	within ½ dB
Input impedance	100 KΩ 200 KΩ	Single-ended
Input sensitivity	2.83 V	full output
True balanced inputs	RCA XLR	
Tube complement	8 x 6AS7G 4 x 6SN7	output tube driver tube
Total Harmonic Distortion (THD)	< 5%	
Intermodulation (IM) distortion	< .04%	
Phase shift	< 1° @ 20KHz	
Gain	16dB	
Output section risetime	600 V/μs	
Feedback	1 dB	
Power consumption	300 watts	per chassis
Power Supply storage	140 Joules	per chassis
Frequency response	20 Hz squarewave tilt; unmeasureable 1Hz-100KHz	1 watt, open loop within 3 dB
Dimensions	13 x 17 x 8 inches *33 x 43 x 20 cm*	per chassis
Weight	30 lbs *13.6 kg*	per chassis, without tubes

M-60 Mk. 3.2 Parts List

		Type	Quantity Per chassis	Quantity Total
Screws	#4-40 stainless		10	20
	#6-32 countersunk		6	12
	#6-32 long		2	4
	#6-32 short		12	24
	#10-32 short		7	14
	#10-32 long		2	4
	#¼-20 carriage bolt		2	4
Nuts and Washers	#4-40 nut w/ captive lock washer		32	64
	#6-32 nut w/ captive lock washer		14	28
	#10-32 nut w/ captive lock washer		2	4
	#¼-20 nylock nut		2	4
	Fender washer, stainless	1″	2	4
	Driver transformer isomeric mounting kit (blue grommets, lock nuts, screws, washers)		2	4
Chassis	Main Chassis		1	2
	Transformer cover		1	2
	Back Panel		1	2
	Bottom Panel		1	2
	Front Panel		1	2
	Name Badge		1	2
Hardware	Switch, DPDT		3	6
	Lamp Assembly	red	1	2
	Lamp Assembly	amber	1	2
	IEC connector, female		1	2
	Fuse holder, w/ hardware		3	6
	Speaker binding post		1	2
	Capacitor clamps		6	12
	Barrier Strip	4-position	1	2
	Terminal Strip	1-way	9	18
	Terminal Strip	2-way	7	14
	Terminal Strip	3-way	6	12
	RCA Jack		2	4
	Plastic chassis pass-through bushing		3	6
	Grounding solder tab		2	4
	XLR Jack (with shorting jumper for single-ended use)		1	2
	Crimp-on connector, ring terminal, (for panel meter)	large	2	4
	Crimp-on connector, ring terminal, (for barrier strip, IEC ground)	small	9	18
	IEC Cable, 18AWG		1	2
	Feet, rubber		4	8
Inductors	Transformer, B+ supply (AV-057614)		1	2
	Transformer, Filament supply (AT CE6933/1)		1	2
	Choke		1	2
	Transformer, Driver supply (XFA-043-02)		1	2
	Panel Meter, VU, with hardware		1	2

M-60 Mk. 3.2 Parts List (continued)

		Type	Quantity Per chassis	Quantity Total
Capacitors	2,200uF 200V B+ power supply caps		6	12
	100uF 350V driver power supply caps		10	20
	.1uF 600V coupling cap		2	4
	.1uF 400V bypass cap (substitute .047uF)		1	2
	22uF 350V Bias network bypass cap		2	4
Misc Electronics	Current Inrush Limiter (thermistor)		2	4
	Hex Fred rectifier		4	8
	Bridge Rectifier		2	4
	Zener Diode	47V	6	12
	Fuse, 125V	3A	2	4
	Fuse, 125V	1/2A	1	2
	Lamp Bulbs		2	4
Resistors	5K Ω Bias Potentiometer		1	2
	5 Ω	5W	16	32
	1 Ω	5W	2	4
	45K Ω	5W	2	4
	4.7K Ω (sub with roughly 3KΩ)	2W	1	2
	1K Ω	2W	2	4
	150 Ω	1/2W	16	32
	221K Ω	1/2W	3	6
	100K Ω	1/2W	4	8
	2Meg Ω	1/2W	2	4
	1Meg Ω	1/2W	2	4
	49.9K Ω	1/2W	2	4
	4.75K Ω	1/2W	2	4
	82.5K Ω	1/2W	2	4
	2.75 Ω	1/2W	1	2
	20 Ω	1/2W	2	4
	100 Ω	1/2W	1	2
	20K Ω (substitute 2x10KΩ in series)	1/2W	1	2
	600 Ω	2W	2	4
Wire and Insulation	18 AWG, black, stranded copper			
	22 AWG, stranded copper, twisted pair			
	Buss wire, solid core			
	22 AWG, solid core OFC, blue			
	Teflon tubing			
	Fiberglass insulating sheathing, black			
	Two conductor shielded, balanced signal wire	12"		
	Zip ties		50	100
	Heat Shrink, black	small diameter		
Vacuum Tubes	Power Triode	6AS7	8	16
	Driver Triode	6SN7	4	8