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AUDIO DESIGN

Octal 6A
Triplex Stereo Preamplifier Kit

Assembly and Users' Manual

Rev. June 3/03

Mapletree Audio Design
Lloyd Peppard
R. R. 1, Seeley's Bay, Ontario, Canada, K0H 2N0
(613) 387-3830
MapletreeAD@aol.com
http://hollowstate.netfirms.com

Introduction

The Mapletree Audio Design Octal 6A Stereo Line Preamplifier offers the kit builder a number of unique features:

- Proven, low-distortion octal signal tubes are used throughout. Although the tube types are available only as new old stock (NOS), they can still be obtained at modest cost from several suppliers. The tubes provided are brand-name NOS types and should exhibit a very long life in this application.

- Three complete preamp circuits are incorporated: a classic common-cathode/cathode-follower cascade (CF), a shunt-regulated push-pull (SRPP) circuit, and a zero-loss passive path. Output and input switching permits any of the three input sources to be routed to either of these three preamp. A separate set of record outputs enables source switching directly to a tape recorder or CD burner. Alternatively, the record outputs can be wired as a second set of normal outputs for bi-amp applications, feeding a separate headphone amplifier, etc.

- All tube heaters are supplied with dc voltage for minimum hum induction.

- A punched, painted chassis is provided. A bottom cover plate is included to provide complete shielding and safety protection.

- Silver-plated copper, Teflon-insulated wire is used for signal paths.

- All parts, tubes, hardware, wire, solder, fuses, and knobs are included. Only a few standard tools and a soldering iron are necessary for construction.

- High quality components are used throughout: Xicon carbon film resistors, Solen polypropylene film coupling capacitors, Beyschlag-Centralab metal film resistors and electrolytic capacitors, Clarostat level control potentiometers, and Hammond and Tamura power transformers.

Before you Start

Tools required:

- Soldering iron or gun - 40 W min.
- Wire cutters
- Long-nose pliers
- Pocket knife or wire strippers
- Ruler
- Small adjustable wrench
- Philips screwdriver
- Small (1/8") blade screwdriver

Soldering:

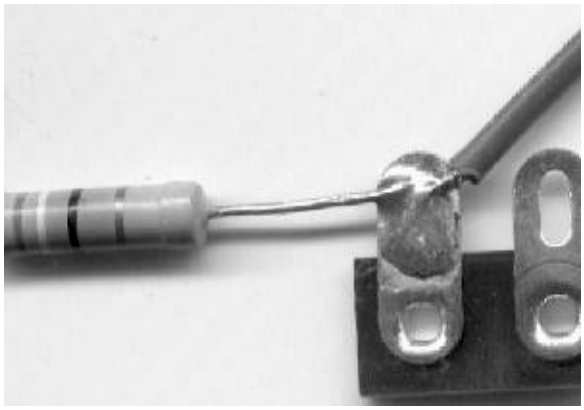
- Your soldering iron should be fitted with either a pointed or wedge shaped copper tip that must be kept clean and "tinned" at all times. The tip will pit and oxidize through normal use and proper maintenance is essential. If you are using your iron for the first time, apply solder to the tip as soon as it is hot enough to melt. The shiny "tinned" surface will now protect the tip from oxidation. To keep the tip clean during use, wiping on a wet sponge is recommended. To prepare a pitted or oxidized tip for use, first file or sand the tip to the desired shape, removing all pitted material and oxidation from the surface. Then proceed to tin the tip as described above. Use only electronic grade solder similar to that supplied which is composed of 40% lead and 60% tin. Silver solder, containing a few percent silver is also acceptable.

- Most of the interconnections are made at solder lugs or pins—on a tube socket, terminal strip, switch, or potentiometer. Lugs have openings into which the component leads and wires are inserted. Pins require the wires or component leads to be crimped around the pin with long-nosed pliers. While it is not necessary to wrap the wires tightly around the lugs before soldering, a short right-angle bend at the end of each wire will secure it to the lug until all connections can be soldered permanently in place. When all the wires are in place at a particular lug or pin, the instruction to apply solder will be stated as [S(n)] where n is the number of wires and component leads which should be terminated at that point. If the number does not agree with what you see, then you should go back and correct your work before proceeding. When you are ready to make a soldered connection, place the tip of your iron against the lug or pin to heat it and the terminating wires so that solder will melt against them. *Note that solder is applied to the lug and wires, not to the solder tip*. You may however find that the transfer of heat from the tip to the joint is enhanced if a small amount of solder is melted on the tip before applying it to the joint.

- An alternate technique for soldering connections, especially when excessive heat applied to a component is to be avoided (e.g. a rectifier bridge or diode), is to pre-tin the component lead by applying the tip of the iron to the end of the lead and quickly melting a small amount of

solder on the wire. The lead should be held by needle nose pliers which act as a heat sink. A solder lug can also be pre-tinned by applying enough solder to completely fill the hole. Then the pre-tinned lead(s), held by needle nose pliers, is inserted into the lug as the solder is re-melted by application of the iron tip.

- A properly soldered connection should be smooth and shiny. Solder should fill all openings in the lugs, visibly adhering to each wire. Dull looking joints ("cold joints") should be re-heated, a small amount of fresh solder applied, and let cool without any movement of the wires involved. If you are new to soldering, screw the extra lug terminal strip supplied to a board and practice with some spare wire until you are satisfied with your technique. The photo below shows a properly soldered lug connection.



Wire:

- The wire supplied is either 20 gauge stranded copper or 22 gauge silver-plated copper/Teflon (for signal paths). The wire colors supplied and specified in the instructions make it easier to check your work and to troubleshoot should problems arise later.

- Wire preparation involves cutting to length and stripping the insulation from each end. The lengths of wires are given in the instructions. Unless otherwise stated, the ends of each wire should be stripped to expose 1/4" or slightly less of bare wire using a small pocketknife or wire strippers. This allows for a 1/8" bend in the wire to permit attachment to a solder lug or wrapping around a pin. Keep the strands together by twisting them with your fingers. *When stripping wire, be careful not to cut into the wire strands, which will greatly reduce the current-carrying capability and strength of the wire.*

Preparation:

- A clear, clean, well-lit work surface is essential for kit assembly. An adjustable lamp that can be brought close to the work when necessary is a real advantage. You will need access to an

electrical outlet for your soldering iron.

- The chassis has been carefully primed, painted, and baked but the surface can still be damaged by abrasion during assembly. This can be avoided by placing a clean towel or similar covering on the work surface. The chassis will be placed upside down for most of the assembly and should rest on the power transformer enclosure once this has been installed.

- Layout all the parts and make sure you can identify each one by making an inventory against the parts list at the end of this manual or the packing list enclosed with the kit. Verify the values or the resistors using the color codes given in the parts list.

- The assembly will proceed in several phases, each of which represents a reasonable amount of work for one session. For clarity, the wiring diagrams show only the components and connections relevant to a particular phase. The schematic diagram for the complete circuit is shown at the end of this manual. While it is useful in describing the overall circuit and in identifying the voltages at various points in the circuit, unless you are very experienced, you should assemble the kit following the wiring diagrams rather than the schematic, although they are electrically equivalent. The layout and wiring schemes are designed to yield not only a properly functioning unit but a visually satisfying result as well. It is important to enjoy the assembly process—so take your time!

Phase 1: Mechanical Assembly

In referring to the instructions and wiring diagrams, unless otherwise stated, it is assumed that the chassis is oriented on your work surface (protected by a towel as suggested above) upside down with the front panel (narrow side) toward you. You should check off each of the following steps as you complete them. Refer to Wiring Diagrams 1 and 2.

1. Mount power transformer TR1 on the top side of the chassis, with the pins pointing up, with two 6-32 ¾" machine screws threaded into the holes near the corners of the transformer from underneath the chassis. Make sure the transformer pin numbers are oriented as shown.

2. Mount power transformer TR2 on the top side of the chassis with the pins pointing up with two 8-32 1" machine screws threaded into the holes near the edges of the transformer from underneath the chassis. Bridge rectifier BR1 is fastened under the screw nearest the side of the chassis as shown *with its flat corner* (+) *positioned toward the side of the chassis.* Terminal strip T1 is fastened under the screw nearest the center of the chassis. Make sure the transformer pin numbers are oriented as shown.

3. Trim the four leads of the bridge rectifier BR1 to about ½" and bend them outwards slightly. The four leads are denoted as pins 1 to 4 as shown in the diagram.

4. Mount the 10 RCA jacks on the rear panel with the ground lugs under the hex retaining nuts. Tighten the nuts using a small adjustable wrench or socket. Bend the solder lugs of J5a and J3b away from the chassis by slipping a knife blade under the lug. Note that the left channel jacks (e.g. J1a) are nearest the top of the chassis.

5. Mount the six octal tube sockets using 6-32 x 3/8" machine screws and hex nuts. Make sure the sockets are oriented with their keys as shown. Note that the socket lug terminals are numbered clockwise from the key as viewed from the bottom. Mount the two-lug terminal strips T2 and T3 under the hex nuts of sockets for V4 and V1 as shown in the diagram.

6. Mount the fuse holder FU1 as shown, tightening the hex nut with an adjustable wrench or pliers. The white washer should be on the inside.

7. Mount the AC receptacle J6 on the back panel with two 6-32 x 3/8" machine screws and hex nuts. Orient J6 so the center lug (lug 2) is nearest the open side of the chassis.

8. Snap the AC power switch SW1 into place on the front panel in the position shown. The white dot should be toward the top of the chassis.

9. Mount potentiometer P2 (Volume Control) on the front panel, with the flat washer under the hex nut. The six lugs should be facing the open side of the chassis.

10. Mount potentiometers P1a and P1b (Level Controls) on the front panel, with the hex nuts supplied. The pins should face toward the open side of the chassis.

11. Mount switch SW3 (Topology Selector), and switch SW2 (Source Selector) on the front panel, with the shake-proof washers under the hex nuts. With the switches in their mid positions, the flat sides of the shafts should be facing toward the open side of the chassis.

This completes Phase 1. Plug in your soldering iron.

Phase 2: Power Supply Wiring

For the following steps, refer to Wiring Diagrams 1 and 2.

1. Turn the chassis top side up so you can access the transformers TR1 and TR2.

Connecting wires to transformer pins: Make a hook in the stripped end of the wire and slip it over the pin. Crimp it around the pin with your long-nose pliers to make a secure connection until you are ready to apply solder. Use the same technique for attaching wires to the pins of BR1, P1a, and P1b.

1. Connect a short length of bare wire between pins 2 [S(1)] and 4 of transformer TR1.

2. Prepare ("prepare" means cut to length and strip ¼" or a bit less of insulation from each end) a 2" length of black wire. Connect one end to pin 1 of TR1 [S(1)] and the other end to pin 3 of TR1.

3. Prepare a 1½" length of white Teflon wire. Connect one end to pin 6 of TR1 [S(1)] and the other end to pin 7 of TR1 [S(1)]

4. Locate the four SF4007 diodes and take note of the *band* around one end (black band if the diode body is silver; white band if the diode body is black). The diodes must be oriented properly using this band which indicates the polarity (the banded end is the cathode). The diodes are designated D1-D4 in the wiring diagram corresponding to the schematic diagram.

Soldering diode leads: When soldering the diodes, it is important to limit the heat transferred to the diode from the soldering iron. You should grip the lead near the diode body with long-nose pliers during soldering to act as a heat sink. When two leads are involved, you can grip both with your pliers or use a hemostat (available at a drugstore) clamped on the leads.

5. Trim both leads of all four diodes to ¾".

6. Make a small loop in the lead from the *banded* end of one diode (D4) and slip it over pin 5 of TR1. Make a small loop in *unbanded* end of one diode (D1) and slip it over pin 5 of TR1 [S(2)].

7. Make a small loop in the lead from the *banded* end of one diode (D3) and slip it over pin 8 of TR1. Make a small loop in *unbanded* end of the last diode (D2) and slip it over pin 8 of TR1 [S(2)].

8. Slip ½" of insulation tubing over the *unbanded leads* of diodes D3 and D4, leaving about ¼" of lead exposed at the ends. Twist the bare ends together with your long-nose pliers

and solder the connection.

"Pre-tinning" wires/leads: One technique you may want to try as an aid to making good solder connections is to heat the end of a wire or lead with your iron and apply a small amount of solder to it beforehand. After it is inserted into a lug, the application of your iron and a bit more solder will quickly complete the connection. It takes less heat to re-melt the solder than to heat the wire itself.

9. Prepare a 4" length of white Teflon wire. Pre-tin one end of this wire and solder to the twisted ends of diodes D3 and D4 by re-melting the joint with your iron. Slip a ¾" length of heat shrink tubing over the white wire and push it over the soldered connection you have just made. Apply heat with your soldering iron or a match near the heat shrink tubing so it contracts over the connection. Push the white wire through the hole nearest the front of the chassis.

10. Slip ½" of insulation tubing over each of the *banded* leads of D1 and D2 and twist the bare ends together with your long-nose pliers and solder the connection.

11. Prepare a 3½" length of white Teflon wire. Pre-tin one end of this wire and solder to the twisted ends of diodes D1 and D2 by re-melting the joint with your iron. Slip a ¾" length of heat shrink tubing over the white wire and push it over the soldered connection you have just made. Apply heat with your soldering iron or a match near the heat shrink tubing so it contracts over the connection. Feed the white wire through the hole nearest the rear of the chassis.

12. Connect a short length of bare wire between pins 9 [S(1)] and 10 [S(1)] of TR2.

13. Prepare a 1½" length of black wire and connect between pins 1 and 4 of TR2.

14. Prepare a 1½" length of black wire and connect between pins 3 and 6 of TR2.

15. Prepare a 1¾" length of black wire and connect between pin 4 of TR2 [S(2)] and pin 4 of TR1 [S(2)].

16. Prepare a 1¾" length of black wire and connect between pin 6 of TR2 [S(2)] and pin 3 of TR1 [S(2)].

17. Prepare a 4" length of black wire and connect from pin 1 of TR2 [S(2)], through the hole nearest the rear of the chassis, to lug 1 of ac jack J6 [S(1)].

18. Prepare a 2" length of green wire and connect from pin 7 of TR2 [S(1)], through the hole next to TR2, to pin 4 of rectifier bridge BR1 [S(1)].

19. Locate resistor R11 (1 Ohm 5% 2W: brown-black-gold-gold) and trim each lead to ¾". Make a loop at the end of one lead with your long-nose pliers and connect to pin 12 of TR2 [S(1)]. The resistor body is positioned on end against the side of TR2 as shown.

Bend the bottom lead of R11 at right angles and make a loop at the end. There should be at least ¼" clearance to the top of the chassis.

20. Prepare a 3" length of green wire and connect to the bottom lead of R11 [S]. Slip a ¾" of heat shrink tubing over the solder joint and heat with your soldering iron or a match. Feed the free end of the wire through the hole next to TR2 and connect to pin 2 of rectifier bridge BR1 [S(1)].

21. Locate the twisted pair of black wires. At the end with the wires the same length, connect one end to each lug of power switch SW1 (which lug to which wire is not important). Solder the connections at both lugs.

22. Route the twisted pair down the side of the chassis and connect the shorter lead to terminal 2 of fuse holder FU1 [S(1)]. Push the longer lead through the hole nearest the rear of the chassis and connect to lug 3 of TR2 [S(2)].

23. Attach the transformer cover box with two #6 sheet metal screws from the underside of the chassis, making sure it is centered and square.

24. Prepare a 2½" length of green wire. Connect one end to the solder lug of RCA jack J5a [S(1)] and the other end to lug 2 of the ac receptacle J6 [S(1)].

25. Prepare a 1½" black wire. Connect one end to lug 3 of J6 [S(1)] and the other end to lug 1 of the fuse holder FU1 [S(1)].

26. Locate the 4700µF/16V capacitor C7. Note the polarity markings (the negative lead is identified by black stripe down one side). Connect the negative (striped) lead of C7 to pin 1 of BR1 and the other lead to pin 3 (flat corner) of BR1.

27. Prepare a 5" length or red wire and connect from pin 3 of BR1 [S(2)] to lug 2 of tube socket V3.

28. Prepare a 8" length of red wire and connect from lug 2 of V3 [S(2)] to lug 2 of V5.

29. Prepare a 2½" length of red wire and connect from lug 2 of V5 [S(2)] to lug 7 of V4.

30. Prepare a 5½" length of red wire and connect from lug 7 of V4 [S(2)] to lug 7 of V1.

31. Prepare a 2½" length of red wire and connect from lug 7 of V1 to lug 2 of V2 [S(1)].

32. Prepare a 7½" length of green wire and connect from pin 1 of BR1 [S(2)] to lug 7 of V6.

33. Prepare a 3" length of green wire and connect from lug 7 of V6 [S(2)] and lug 7 of V5.

34. Prepare a 2½" length of green wire and connect from lug 7 of V5 [S(2)] to lug 8 of V4.

35. Prepare a 5" length of green wire and connect from lug 8 of V4 [S(2)] to lug 8 of V1.

36. Prepare a 2½" length of green wire and connect from lug 8 of V1 to lug 7 of V2 [S(1)].

37. Connect a length of bare wire from lug 1 of V3 [S(1)] to lug 7 of V3.

38. Connect a length of bare wire between lugs 1 [S(1)] and 2 of V6.

39. Connect a length of bare wire between lug 6 [S(1)] and lug 3 of volume control P2.

40. Locate the heavy copper wire ground bus. Connect the end with the short bend to lug 4 of terminal strip T1 [S(1)]. Connect the other end to lug 3 of P2 [S(2)].

41. Connect a length of bare wire from lug 7 of V3 [S(2)] to the ground bus [S].

42. Connect a length of bare wire from lug 2 of V6 [S(2)] to the ground bus [S].

43. Connect the white wire coming from the hole nearest the rear of the chassis to lug 1 of terminal strip T1.

44. Connect the white wire coming from the hole nearest the front of the chassis to the ground bus [S].

45. Locate capacitor C4 (47uF, 350V) and note the black band near one end. Trim the leads of C4 as necessary and connect the lead at the banded end to the ground bus [S] and the other lead to lug 1 of T1.

46. Locate resistor R8 (2.7K Ohms (2K7) 5% 5W), trim the leads as necessary and connect from lug 1 of T1 [S(3)] and lug 2 of T1.

Reading resistor color codes: The value of a resistor is usually indicated by a series of color bands which give not only the value in Ohms but the % precision, and sometimes the temperature characteristics. For the smallest resistors in you kit, which are rated at 0.6 W, the precision is 1%. Only the four color bands needed to read the actual value are given in the instructions. If you look closely at one of these resistors, you can see that one of the end bands is slightly wider than the other. The value is read from the end with the narrower band. For the larger resistors (1W and 2W, 5%), the color code consists of three color bands plus a gold 5% precision band. For 5 W resistors, the value is labeled on the resistor body. For information on reading the code, see the Appendix of this manual.

47. Locate resistor R9 (5.1K 2W 5%: green-brown-red-gold). Trim the leads as necessary and connect from lug 2 of T1 to lug 3 of T1.

48. Locate capacitor C5 (47uF, 350V) and note the black band near one end. Trim the leads of C5 as necessary and connect the lead at the banded end to the ground bus [S] and the other lead to lug 2 of T1 [S(3)].

49. Locate capacitor C6 (47uF, 250V) and note the light blue strip down one side denoting the negative lead. Connect the negative lead to the ground bus [S] and the other lead to lug 3 of T1.

50. Prepare a 5½" length of white Teflon wire. Connect one end to lug 3 of T1 and the other end to lug 3 of V3.

51. Prepare a 4" length of white Teflon wire. Connect one end to lug 3 of T1 [S(4)] and the other end to lug 3 of V6.

This completes the wiring of the power supply portion of your *Octal 6A*. Double-check your work against the wiring diagrams. Make sure all of the solder joints are clean and shiny and that solder fills each lug leaving no voids.

Phase 3: Signal Circuit Wiring

For the following steps, refer to Wiring Diagram 3. Resistors and other components duplicated in each channel are labeled with an "a" for the left channel (right side of the chassis in the wiring diagram) and "b" for the right channel (left side of the chassis in the wiring diagram).

1. Locate the three parts of the pilot light assembly identified in the photo below. Press the holder into the hole next to the power switch. Note that there is a short and a long lead coming from the rear of the green light emitting diode (LED) D5. Push D5 into the holder from inside the chassis with the short lead oriented toward the side of the chassis as shown in the diagram. It should seat securely in the holder. You may need to push it in with the aid of your long-nose pliers. Slip the retaining ring over the rear of the LED and holder and press it tightly up against the chassis. Trim each of the leads of D5 to about ¾" and make a small loop in the end of each with your long-nose pliers.

2. Prepare a 5½" length of white Teflon wire. Connect one end to lug 3 of V6 and the other end to lug 5 of V4 [S(1)].

3. Prepare a 5½" length of white Teflon wire. Connect one end to lug 3 of V3 and the other end to lug 5 of V1 [S(1)].

4. Connect lengths of bare wire between lugs 4 and 5 of V6 and between lugs 4 and 5 of V3.

5. Connect a length of bare wire from lug 4 of V6 to the ground bus [S].

6. Connect a length of bare wire form lug 5 of V3 [S(2)] and the ground bus [S].

7. Locate resistors R3a and R3b (20K 1W 5%: red-black-orange-gold). Trim the leads of R3b as necessary and connect from lug 8 of V6 to the ground bus [S].

8. Trim the leads of R3a as necessary and connect from lug 8 of V3 to the ground bus [S].

9. Locate capacitors C2a and C2b (1uF, 250V). Trim the leads of C2b as necessary and connect from lug 8 of V6 [S(2)] to lug 6 of V6.

10. Trim the leads of C2a as necessary and connect from lug 8 of V3 [S(2)] to lug 6 of V3.

11. Locate resistors R4a and R4b (1M 0.6W 1%: brown-black-black-yellow). Trim the leads of R4b as necessary and connect between lug 6 of V6 and lug 4 of V6 [S(3)].

12. Trim the leads of R4a as necessary and connect between lug 6 of V3 and lug 4 of V3.

13. Locate resistors R2a and R2b (110K 1W 5%: brown-brown-yellow-gold). Slip insulation tubing over both leads of R2b leaving a bit less than ¼" of lead exposed. Connect one lead to lug 3 of V5 and the other lead to lug 3 of V6 [S(3)].

14. Trim the leads of R2a as necessary and slip insulation tubing over one lead. Connect this lead to lug 3 of V3 [S(3)] and the other lead to lug 3 of V2.

15. Locate the prepared grid cap/cables for V6 and V3. Push the leads through the grommets near V5 and V2. Connect the shield wire (with black insulation tubing) of one cable to lug 5 of V6 [S(2)] and the signal wires (red and white) of the same cable to lug 3 of V5 [S(2)]. Connect the shield wire of the other cable to lug 4 of V3 [S(3)] and the signal wires of the same cable to lug 3 of V2 [S(2)].

16. Prepare a 3" length of white Teflon wire. Connect one end to lug 5 of V5 [S(1)] and the other end to lug 1 of V4.

17. Prepare a 3" length of white Teflon wire. Connect one end to lug 5 of V2 [S(1)] and the other end to lug 1 of V1.

18. Prepare a 3½" length of white Teflon wire. Connect one end to lug 1 of V5 and the other end to the ground bus [S].

19. Prepare a 2½" length of white Teflon wire. Connect one end to lug 1 of V2 and the other end to the ground bus [S].

20. Locate resistors R1a and R1b (2.7K 1W 5%: red-violet-red-gold). Trim the leads of R1b as necessary and connect between lug 8 of V5 and the ground bus [S].

21. Trim the leads of R1a as necessary and slip insulation tubing over one lead. Connect this lead to lug 8 of V2 and the other lead to the ground bus [S].

22. Locate capacitors C1a and C1b (47uF, 25V) and note the stripe down the side denoting the negative lead. Trim the leads of C1b to about ¾" and connect the negative (striped) lead to lug 1 of V5[S(2)]. Connect the other lead to lug 8 of V5 [S(2)].

23. Trim the leads of C1a to about ¾" and connect the negative (striped) lead to lug 1 of V2[S(2)]. Connect the other lead to lug 8 of V2 [S(2)].

24. Locate resistors R5a and R5b (1K 0.6W 1%: brown-black-black-brown). Trim the leads of R5b as necessary and connect between lug 6 of V4 and lug 2 of V4.

25. Connect a short length of bare wire between lug 2 of V4 [S(2)] and lug 4 of V4 [S(1)].

26. Trim the leads of R5a as necessary and connect between lug 6 of V1 and lug 2 of V1.

27. Connect a short length of bare wire between lug 2 of V1 [S(2)] and lug 4 of V1 [S(1)].

28. Locate capacitors C3a and C3b (1uF, 250V). Trim the leads of C3b as necessary and connect from lug 6 of V4 [S(2)] to lug 1 of terminal strip T3.

29. Connect a short length of bare wire from lug 1 of T3 [S(2)] and lug 2 of T3.

30. Trim the leads of C3a as necessary and connect from lug 6 of V1 [S(2)] to lug 1 of terminal strip T2.

31. Locate resistors R7a and R7b (1M 0.6W 1%: brown-black-black-yellow). Trim the leads of R7b as necessary and connect from lug 2 of T3 to the ground bus [S].

32. Trim the leads of R7a as necessary and connect from lug 1 of T2 to the ground bus [S].

33. Locate resistors R6a and R6b (1K 0.6W 1%: brown-black-black-brown). Trim the leads of R6b as necessary and connect from lug 3 of V4 [S(1)] to the ground bus [S].

34. Slip insulation tubing over one lead of R6a. Connect this lead to lug 3 of V1 [S(1)] and the other lead to the ground bus [S].

35. Locate resistor R10 (1K 1W 5%: brown-black-red-gold). Slip insulation tubing over one lead and connect this lead to lug 7 of V1 [S(3)]. Connect the other end to the loop in the long lead of pilot light D5 [S].

36. Prepare a 2½" length of green wire. Connect one end to lug 8 of V1 [S(3)] and the other end to the loop in the short lead of D5 [S].

This completes the wiring of Phase 3. Double check all your wiring against Wiring Diagram 3 and make sure all solder joints are shiny and secure. If you need to re-solder a connection, heat the old solder and add a bit of fresh solder.

Phase 4: Input/Output Wiring

Note that the lugs of selector switches SW2 and SW3 are numbered as they appear on the rear of the switches. The left section lugs are designated 10, 11, 12, and D and the right section lugs are designated 1, 2, 3, and A. Terminals A and D are the switch selector elements for the two sections.

If you plan to wire the extra outputs as record outputs, refer to Wiring Diagram 4A for the following steps. If you plan to wire them as a second set of main outputs, refer to Wiring Diagram 4B.

1. Prepare a 1¾" length of white Teflon wire. Connect from lug A of SW2 to pin 1 of level control P1b [S(1)].

2. Prepare a 2¾" length of white Teflon wire. Connect from lug D of SW2 to pin 1 of level control P1a [S(1)].

3. Prepare a 2½" length of white Teflon wire. Connect from pin 2 of P1b [S(1)] to lug 4 of volume control P2 [S(1)].

4. Prepare a 1½" length of white Teflon wire. Connect from pin 2 of P1a [S(1)] to lug 1 of volume control P2 [S(1)].

5. Prepare a 2½" length of white Teflon wire. Connect from pin 3 of P1b [S(1)] to the ground bus [S].

6. Prepare a 2" length of white Teflon wire. Connect from pin 3 of P1a [S(1)] to the ground bus [S].

7. Prepare a 4" length of white Teflon wire. Connect from lug 1 of V4 [S(2)] to lug 5 of P2.

8. Prepare a 3" length of white Teflon wire. Connect from lug 1 of V1 [S(2)] to lug 2 of P2.

9. Prepare a 2" length of white Teflon wire. Connect from lug 2 of P2 [S(2)] to lug 10 of SW3 [S(1)].

10. Prepare a 2" length of white Teflon wire. Connect from lug 5 of P2 [S(2)] to lug 1 of SW3 [S(1)].

If you intend to wire the record outputs (J4a,b) as a second set of main outputs (following Diagram 4B), skip the next 2 steps.

11. Prepare a 14" length of white Teflon wire. Connect one end to the center lug of jack J4a [S(1)]. Connect the other end to lug D of SW2 (re-melt the solder and add the wire)

[S(2)].

12. Prepare a 15" length of white Teflon wire. Connect one end to the center lug of jack J4b [S(1)]. Connect the other end to lug A of SW2 (re-melt the solder and add the wire) [S(2)].

If you are wiring J4a,b as record outputs (following Diagram 4A) skip the next step.

13. Connect short lengths of bare wire from the center lugs of J4a [S(1)] and J4b [S(1)] to the center lugs of J5a and J5b respectively.

For the following steps, refer to Wiring Diagram 5.

14. Prepare a 12½" length of white Teflon wire. Connect one end to the center lug of J5a [S(1)] ([S(2)] if wired for dual outputs). Route the wire down the path of the ground bus and connect the other end to lug D of SW3 [S(1)].

15. Prepare a 12½" length of white Teflon wire. Connect one end to the center lug of J5b [S(1)] ([S(2)] if wired for dual outputs). Route the wire down the path of the ground bus and connect the other end to lug A of SW3 [S(1)].

16. Prepare a 8½" length of white Teflon wire. Connect one end to lug 6 of V6 [S(3)]. Route the wire down the path of the ground bus and connect the other end to lug 3 of SW3 [S(1)].

17. Prepare a 6¾" length of white Teflon wire. Connect one end to lug 6 of V3 [S(3)]. Route the wire down the path of the ground bus and connect the other end to lug 12 of SW3 [S(1)].

18. Prepare a 5" length of white Teflon wire. Connect one end to lug 2 of terminal strip T3 [S(3)] and the other end to lug 2 of SW3 [S(1)].

19. Prepare a 2½" length of white Teflon wire. Connect one end to lug 1 of terminal strip T2 [S(3)] and the other end to lug 11 of SW3 [S(1)].

20. Secure the white Teflon wires running down the ground bus to the bus with two cable ties.

21. Prepare a 13½" length of white Teflon wire. Connect one end to the center lug of J3a [S(1)]. Route down the side of the chassis and connect the other end to lug 10 of SW2 [S(1)].

22. Prepare a 14" length of white Teflon wire. Connect one end to the center lug of J3b [S(1)]. Route down the side of the chassis and connect the other end to lug 1 of SW2 [S(1)].

23. Prepare a 12½" length of white Teflon wire. Connect one end to the center lug of J2a [S(1)]. Route the wire down the side of the chassis and connect the other end to lug 11 of SW2 [S(1)].

24. Prepare a 13½" length of white Teflon wire. Connect one end to the center lug of J2b [S(1)]. Route down the side of the chassis and connect the other end to lug 2 of SW2 [S(1)].

25. Prepare a 11½" length of white Teflon wire. Connect one end to the center lug of J1a [S(1)]. Route down the side of the chassis and connect the other end to lug 12 of SW2 [S(1)].

26. Prepare a 12½" length of white Teflon wire. Connect one end to the center lug of J1b [S(1)]. Route down the side of the chassis and connect the other end to lug 3 of SW2 [S(1)].

27. Prepare a 22" length of white Teflon wire. Connect one end to the ground lug of J3a [S(1)]. Spiral wrap the wire around the white wires running down the side of the chassis to SW2 with a ¾" spacing between wraps. Bundle the wires tightly. Wrap as far as possible toward SW2, then connect the free end of the wire to the ground bus near volume control P2.

This completes the wiring of your *Octal 6A*. Go over all your wiring with reference to the wiring diagrams. Look for and correct any dull or imperfect solder joints.

28. Install the knobs on the control shafts using a small blade screwdriver to tighten the set screws. The small knobs go on the two level controls and should be aligned to point to 12 o'clock when rotated fully clockwise.

Checkout

- Insert one of the fuses in the fuse holder FU1.
- Insert the six vacuum tubes in their correct sockets (refer to the outline drawing at the end of this manual). Rotate each tube to align the key in the socket and then carefully apply pressure while rocking the tube slightly to seat it in the socket.
- Connect the grid caps to the top caps of V3 and V6 (6R7).
- Connect the ac line cord to the ac receptacle J6.
- If you have access to a multimeter, you should carefully turn the chassis upside down and clip the black meter lead to the ground bus and the red meter lead to lug 1 of terminal strip T1. Monitor dc volts on a scale of 400 V or more.
- Plug in the ac line cord.
- Press the power switch and check that the green pilot lamp comes on.
- If you have connected a meter, the dc voltage at lug 1 of T1 should settle at around 310 VDC. Other dc voltages are shown on the schematic diagram. These should be found to be within 10% of the values shown.
- Check that the heaters of all the tubes are glowing with a dull orange color.
- Check for any unusual odors that might indicate an overheated component. Leave the preamp on for a few minutes until you are satisfied that it is in a stable condition (i.e. no smoke!).
- Turn the preamp off and unplug the line cord.
- Attach the bottom plate using the 6-32 sheet metal screws. Apply the four stick-on feet to the corners of the bottom plate.

You are now ready to test the signal portion of your preamp. A single source such as a CD player will suffice for checking all inputs and switch positions.

- Connect both channels of the source to the input 1 jacks—J1a (left) and J1b (right).
- Connect the main output jacks to your power amplifier inputs. Set the level controls to their full clockwise position, the volume control to the minimum position, the topology switch to PASSIVE, and the source switch to input 1.
- Turn on the preamp, and after 30 seconds or so, activate the source signal and carefully turn up the volume control. Check that sound comes from both channels and that the level

controls function properly. Switching the source switch to inputs 2 or 3 should mute the output from both channels.

- Turn the volume control to the minimum position and the source switch to input 1. Move the topology switch to SRPP (shunt regulated push pull) and turn up the volume control. You should be aware of greater amplification for a given volume control setting than for the PASSIVE switch position.

- Repeat the above step for the topology switch in the CF position. The amplification should be somewhat greater than for the SRPP position.

- Repeat the above 4 steps for the source connected to inputs 2 and 3 and the source switch set to the appropriate position.

This completes the formal checkout procedures. Congratulations on a successful project!

Troubleshooting

- If the fuse blows when you turn the preamp on, unplug the line cord and check the ac wiring as above, plus all the dc and heater power supply wiring of phase 2. Look for possible shorts between an exposed wire and the chassis. Don't plug the preamp in again until you have identified the source of the problem. If you have access to an ohmmeter, check the resistance from lug 1 of T1 to the chassis or ground bus. The meter reading should increase to a high value as the filter capacitors charge up. A zero or a few thousand Ohms reading indicates a short circuit somewhere in the dc power supply section—check your wiring from phase 2.

- If a tube fails to light up (may not be visible in a bright room), check the heater wiring from phase 2. If you have a dc voltmeter, you should read approximately 12.5 VDC across the heater pins 7 and 8 of V1 and V4, and pins 2 and 7 of V2 and V5. You should read approximately 6 VDC across the heater pins 2 and 7 of V3 and V6.

- If everything seems normal except you get no sound on one or more switch settings, check that you have wired the selector switches SW2 and SW3 and that the input/output jacks are wired correctly. Check if moving the input selector switch to a different input restores the sound. This indicates a wiring error in the selector switch or input jack area.

- If you are unable to determine the source of a problem with the simple tests above, contact Mapletree Audio Design by email or telephone before proceeding further. Describe the symptoms of the problem as clearly and completely as possible. A rapid diagnosis should be possible in most cases.

Appendices

Resistor Color Code

Parts List

Tube Locations

Tube suppliers

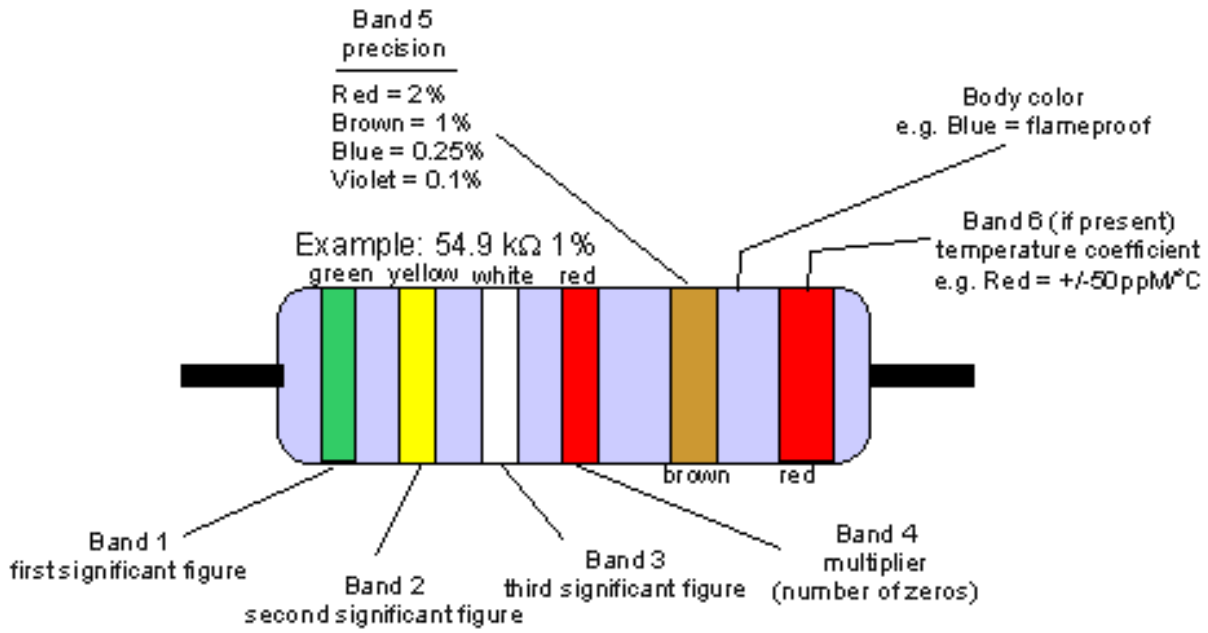
Schematic Diagram

Circuit Description

Specifications

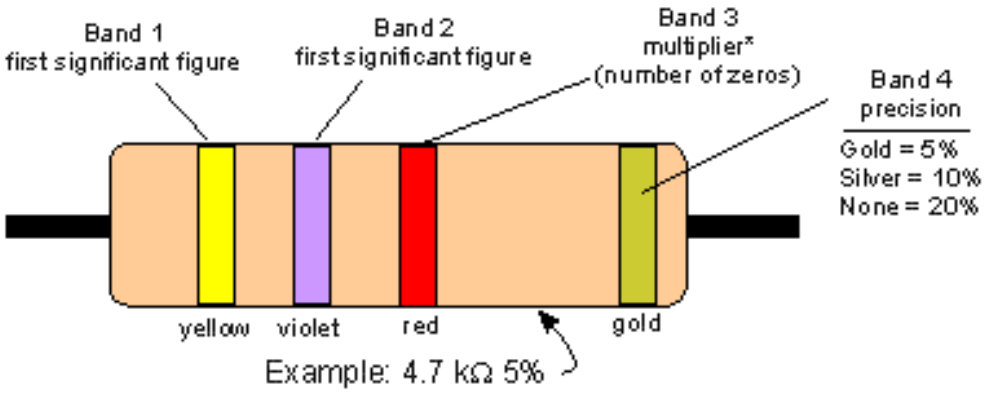
Resistor Color Codes

Precision Metal Film Resistors
5 or 6-band code



Black = 0
Brown = 1
Red = 2
Orange = 3
Yellow = 4
Green = 5
Blue = 6
Violet = 7
Grey = 8
White = 9

Standard Precision Metal/Carbon Film/Metal Oxide Resistors
4-band code

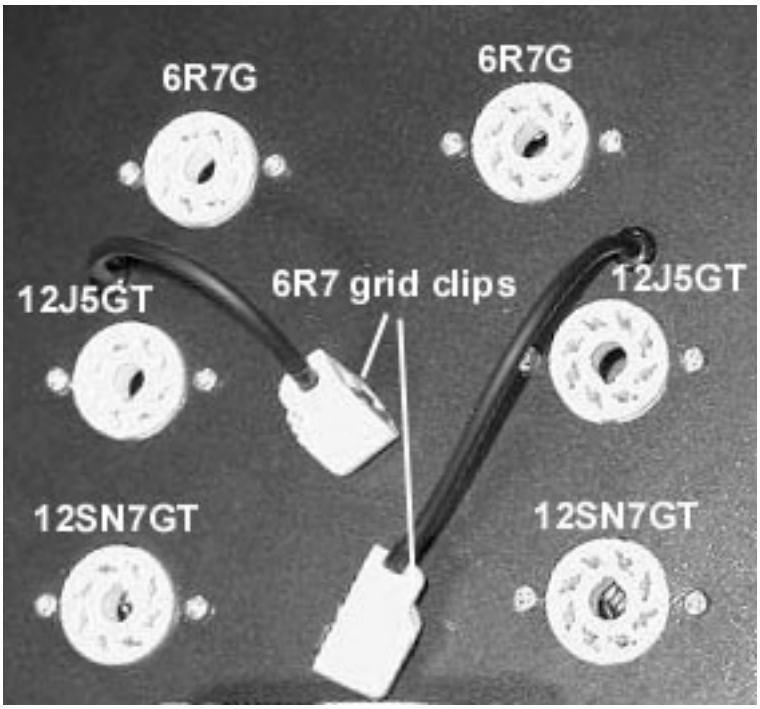


* Gold (Band 3) = 0.1, Silver (Band 3) = 0.01 (e.g. brown-black-gold-gold = 1 Ω 5%)

Parts List

Reference	Description	Quantity
BR1	3A bridge rectifier	1
C1a,b	47uF/25V electrolytic capacitor	2
C2a,b, C3a,b	1uF/250V polypropylene film capacitor	4
C4, C5	47uF/350V electrolytic capacitor	2
C6	47uF/250V electrolytic capacitor	1
C7	4700uF/16V electrolytic capacitor	1
D1–D4	SF4007 1000V/1A fast recovery diode	4
D5	Green LED pilot light with holder and retaining ring	1
FU1	0.5 A 1-1/4" fuse + spare	2
J1a,b–J5a,b	RCA gold plated phono jack	10
J6	IEC ac receptacle	1
P1a,b	100K linear potentiometer (levels)	2
P2	100K dual audio potentiometer (volume)	1
R1a,b	2.7K 1W 5% carbon film res. (red-violet-red-gold)	2
R2a,b	110K 1W 5% carbon film res. (brown-brown-yellow-gold)	2
R3a,b	20K 1W 5% carbon film res. (red-black-orange-gold)	2
R4a,b, R7a,b	1M 0.6W 1% metal film res. (brown-black-black-yellow)	4
R5a,b, R6a,b	1K 0.6W 1% metal film res. (brown-black-black-brown)	4
R8	2.7K 5W 5% wire-wound resistor	1
R9	5.1K 2W 5% metal oxide resistor (green-brown-red-gold)	1
R10	1K 1W 5% carbon film resistor (brown-black-red-gold)	1
R11	1 Ohm 2W 5% metal film resistor (brown-black-gold-gold)	1
SW1	SPST switch (power)	1
SW2, SW3	3 position 2 pole rotary switch	2
T1	4-lug terminal strip	1
T2, T3	2-lug terminal strip	2
	Spare terminal strip for soldering practice	1
TR1	Power transformer 230V/25mA	1
TR2	Filament transformer 12.6 V/1.6A	1
	Power transformer enclosure	1
V2, V5	12J5GT tube	2
V3, V6	6R7G tube	2
V1, V3	12SN7GT tube	2
	Grid clip, cap, and cable for 6R7G	2
	Octal tube socket	6
	Chassis with wood side panels	1
	Chassis bottom plate	1
	Knob	5
	Fuse holder	1
	Rubber feet	4
	Line cord	1
	6-32 3/8" machine screws/hex nuts	14
	6-32 ¾ " machine screws (for TR1)	2
	8-32 1" machine screws (for TR2)	2
	6-32 sheet metal screws	6
	Cable ties	2
	Solder	
	Red hookup wire	2 ft
	Silver-plated Teflon hookup wire (white)	21 ft
	Green hookup wire	3 ft
	Black hookup wire	2 ft
	Insulation tubing	8"
	Heat shrink tubing	4"
	Bare wire	1 ft
	Ground bus wire (pre-formed)	1
	Instruction Manual	1

Vacuum Tube Locations -- Top View



Tube Replacement

The new old stock (NOS) tubes supplied with your Octal 6 kit should be good for many thousands of hours of listening. At some point, however, you may find it necessary to replace them. Some users like to experiment with different manufacturer's tubes to obtain subtle differences in audio quality. You may also wish to purchase a spare set for future needs. Note that the 12J5GT and 12SN7GT tubes may have a suffix, such as A or B, which is not important for this circuit. The British OM4 tube is electrically equivalent to the 6R7G but is straight sided and is coated with a grey or red sprayed-on shield. You can replace with either type. Metal versions of both the 6R7 (no suffix) and 12J5 (no suffix) are also available. While these have not been evaluated for audio quality in this preamp, they are electrically compatible and a good area for experimentation. The following suppliers are three of many sources of NOS tubes of the types required.

Pacific T.V.
480 South Joffre St.
Victoria, B.C.
Canada V9A 6C8
Phone: (250) 386-4283
http://www.pacifictv.ca/

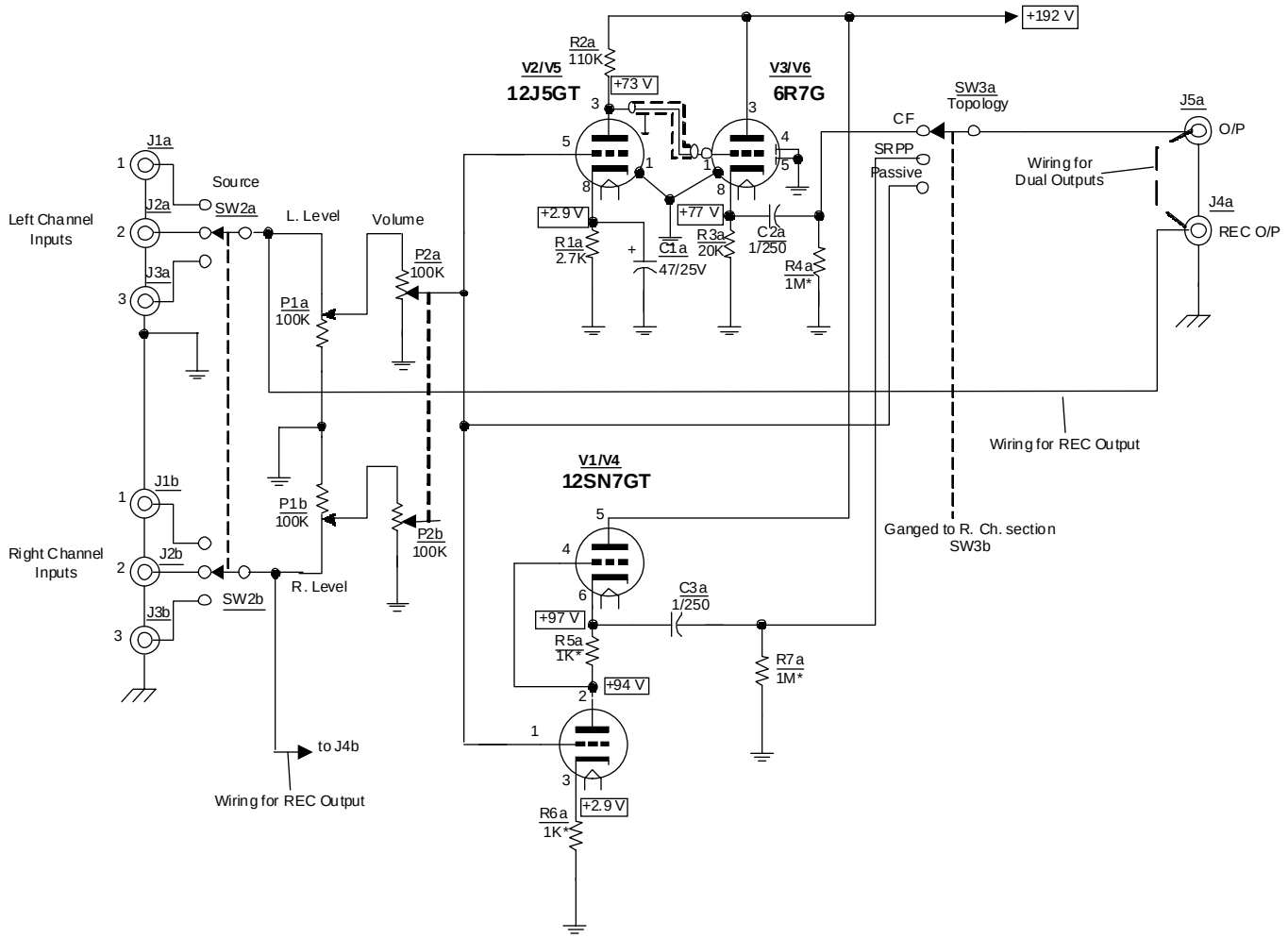
Antique Electronics Supply
6221 South Maple Avenue
Tempe, AZ 85283
Phone: (480) 829-5411
http://www.tubesandmore.com/

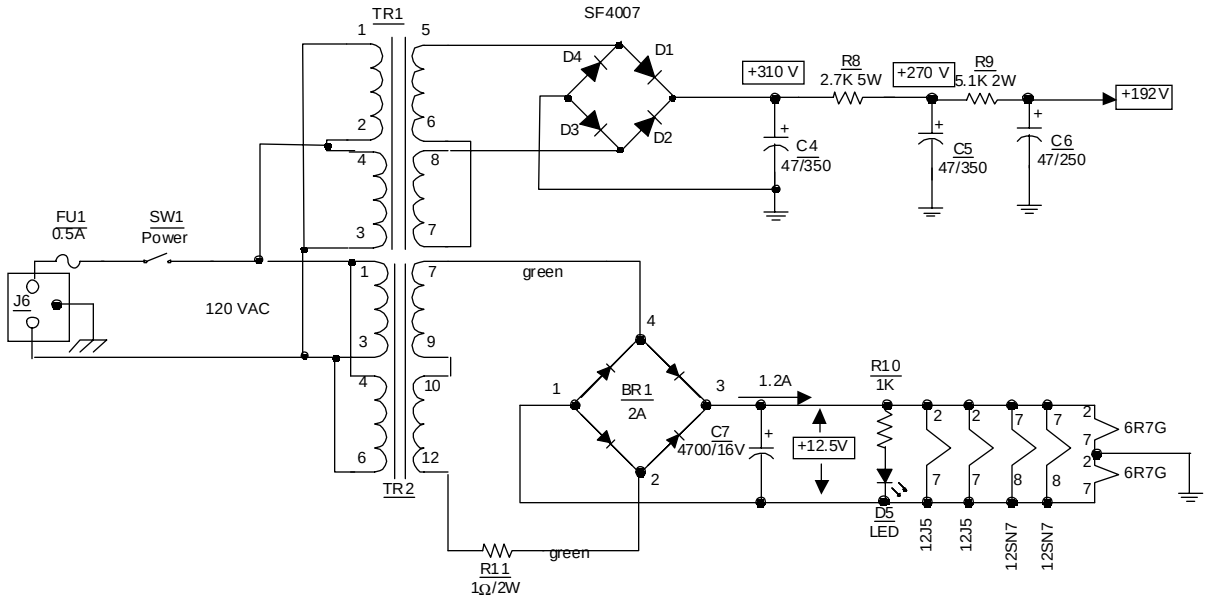
David Boardman Tubes
10 Lemaistre
Sainte-Foy, Québec
Canada G2G 1B4
Phone: (418) 877-1316
http://www.dbtubes.com/

Mapletree Audio Design Octal 6A Line Preamplifier

Rev. June 3/03

Left channel shown. Right channel components have "b" suffix.
All resistors 1 W 5% carbon film except where noted.
Resistors marked (*) are 0.6W 1% metal film.





Circuit Description

For simplicity, the schematic diagram shows only the left channel and the power supply. Both channels are identical. The inputs for each channel are applied to the three input jacks J1, J2, and J3. Switch SW2 selects one of the three source signals and passes it on to the level control P1, which attenuates the signal when moved away from its maximum clockwise position. The signal is then routed to the volume control potentiometer P2 which serves as the grid return resistance for the input triodes of each circuit.

The signal from the wiper of volume control potentiometer is applied to the inputs of two parallel preamp circuits. The first (top circuit in schematic) consists of a common cathode gain stage followed by a cathode follower output buffer. For convenience, this circuit is simply referred to as a cathode follower (CF) topology. The common cathode gain stage employs a 12J5GT medium mu triode (V2) with self-bias and a cathode bypass capacitor to maximize the voltage gain. The output is taken from the plate of this tube and directly coupled to the grid of the 6R7G cathode follower stage (V3). This tube was designed as a detector/first audio tube in classic radios and includes two diode plates. These are grounded and only the medium mu triode section is used. The stage is self-biased by cathode resistor R3 while the plate is connected directly to the B+ supply. The signal is taken from the cathode and is capacitor coupled to the load. The 1M Ohm resistors R4 and R7 discharge the coupling capacitors C2 and C3 to prevent audible clicks when the outputs of the two circuits are switched. This stage offers high voltage gain and a very low output resistance, making it suitable for driving low impedance loads while maintaining wide bandwidth.

The second circuit (lower circuit in schematic) is a shunt regulated push-pull (SRPP) stage. The two halves of the 12SN7GT medium mu triode (V1) carry the same bias current which flowing through identical resistors R5 and R6 sets up equal grid bias for each triode. The output of the lower triode is directly coupled to the grid of the upper triode which operates 180 degrees out of phase with the lower triode (hence the term “push-pull”). The upper triode is configured as a cathode follower with the output taken from the cathode but it also serves as the load resistance for the lower triode. Since it presents a high load resistance, the voltage gain of the lower triode stage is maximized. The output resistance, while not as low as for the pure cathode follower, is much lower than if the output were taken from the plate of the lower triode. The SRPP stage offers high gain, relatively good drive capability, good linearity, and simplicity.

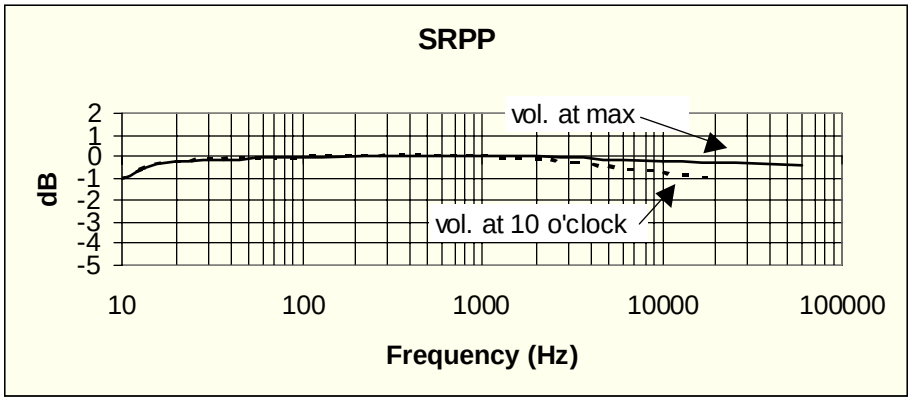
The outputs from the CF and SRPP circuits, plus a passive path from the volume control potentiometer, are selected by switch SW3 and the signal is then transferred to the output jack J5. Output jack J4 may be connected directly to the output of the source selector switch and used as a record output. Alternatively, J4 can be wired in parallel with J5 for use with bi-amplification systems or a separate headphone amplifier.

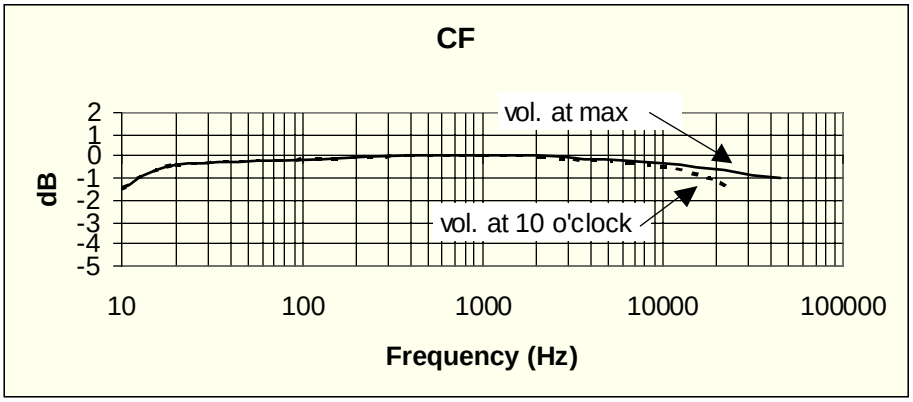
The B+ dc power supply uses a 230VAC transformer secondary together with a full-wave bridge rectifier (four fast recovery diodes D1–D4). A capacitor input filter is used comprised of C4, C5, C6 and R8 and R9, which provides a B+ supply voltage of approximately 210V for both channels. The heater voltage is derived from a 12.6 VAC transformer secondary voltage. This is full-wave rectified by bridge BR1 and filtered by capacitor C7. Resistor R11 sets the heater dc voltage to approximately 12.5 VDC. The heaters of V3 and V6 (6R7G) are connected in series across the 12.5 VDC with the mid-point grounded. All other heaters are connected in parallel.

MAD Octal 6A Specifications Rev. May 10/03

Voltage gain (100K load, max volume): SRPP: 18.5 dB at 1 kHz
CF: 23 dB at 1 kHz
Passive: 0 dB at 1 kHz

Frequency response (2.4V out, 100K load, 3 ft. shielded cable, vol. at max): SRPP: 14 Hz–60 kHz (–0.5 dB)
CF: 17 Hz–20 kHz (–0.5 dB)
Passive: 0–110 kHz (-.5 dB)





Noise (100K load): SRPP: < 0.5 mV
CF: < 0.4 mV
Passive: < 0.1 mV (power on)

Maximum output voltage (100K load): SRPP: 15 V rms
CF: 24 V rms

Output impedance (1 kHz): SRPP: 5.4 kΩ
CF: 660 Ω
Passive: less than 25 kΩ at all volume settings. At full volume, it is governed by the source impedance.

Total harmonic distortion (1 V output, 1 kHz, 100K load): Less than 0.1 %

Power consumption: 20 W