40 WATT UNIVERSAL STEREO AUDIO AMPLIFIER

Ramsey Electronics Model No. UAM4

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- **Unique Patented Spread-Spectrum Mode**
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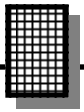

KIT ASSEMBLY
AND INSTRUCTION MANUAL FOR

40 Watt Universal Stereo Audio Amplifier

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RAMSEY ELECTRONICS, LLC
590 Fishers Station Drive
Victor, New York 14564
Phone (585) 924-4560
Fax (585) 924-4555
www.ramseykits.com

INTRODUCTION

The UAM4 is a state of the art stereo audio amplifier with a maximum output of 40 watts, 20 watts per channel in stereo mode, or 40 watts in mono mode. The UAM4 is designed to be configurable in a number of different ways to suit your requirements and allow you to experiment and learn about the capabilities of the Maxim MAX9708 amplifier integrated circuit. After you finish this kit, all you need to do is supply power, an audio signal and speakers and you are ready to go!

HOW IT WORKS

The UAM4 is a class D amplifier. The letter *D* is simply the next letter after *C*, and does not stand for digital. Class D and Class E amplifiers are sometimes mistakenly described as "digital" because the output waveform superficially resembles a pulse-train of a digital signal, but a Class D amplifier merely converts an input waveform into a continuously pulse-width modulated (square wave) analog signal. (A digital waveform would be pulse-code modulated.)

Class D amplifiers are much more efficient than Class AB power amplifiers. As such, Class D amplifiers do not need large transformers and heavy heat sinks, which means that they are smaller and lighter in weight than an equivalent Class AB amplifier. All power devices in a Class D amplifier are operated in on/off mode. The term usually applies to devices intended to reproduce signals with a bandwidth well below the pulse switching frequency which is the case of the UAM4 is about 200kHz..

The heart of the UAM4 is the Maxim MAX9708 amplifier IC. The MAX9708 converts the input signal to a sequence of pulses whose averaged value is directly proportional to the instantaneous amplitude of the signal. The frequency of the pulses is typically ten or more times the highest frequency of interest in the input signal. The pulse frequency in the UAM4 is around 200kHz or 10 times 20kHz. The output of such an amplifier contains unwanted spectral components (that is, the pulse frequency and its harmonics) which must be removed by a passive filter. The resulting filtered signal is then an amplified replica of the input. For the UAM4 the filtering is handled by the patented technology of the Maxim MAX9807 amplifier chip and the speaker. The design uses a unique filterless modulation and spread-spectrum switching mode. This eliminates the need for large inductors and capacitors on the output.

Typical class D amplifiers use a simple modulation method called ‘Fixed-Frequency Modulation’ (FFM). This simply means that a switching frequency is selected and that is the frequency at which the output is switched. The MAX9708 can use this method, but it also has a special method called ‘Spread-Spectrum Modulation’ (SSM). With this method the switching

frequency is actually changed around a center frequency, in this case +- 4% of 200kHz. Using this method the MAX9708 is able to reduce the noise generated by typical class D amplifiers and as such, the need for large filters described above is minimized. How this is accomplished is beyond the scope of this manual, but interested readers can find information on the web by searching for 'spread spectrum' and checking the Maxim web site at "www.maxim-ic.com" for the MAX9708 data sheet.

The main advantage of a class D amplifier is power efficiency. Because the output pulses have a fixed amplitude, output devices (MOSFETS, in the case of the MAX9708) are switched either on or off, rather than operated in linear mode. This means that very little power is dissipated by the transistors, except during the very short interval between the on and off states. The MAX9708 is capable of achieving up to 87% efficiency. The wasted power, the remaining 13%, is low because the instantaneous power dissipated in the transistor is the product of voltage and current, and one or the other is almost always close to zero. The lower losses permit the use of a smaller heat sink while the power supply requirements are lessened too.

A TOUR OF THE UAM4

Now let's take a quick tour of the signal path from input to output. Looking at the schematic (pg. 18) you will notice a large rectangle in the middle. This represents the MAX9708 and aside from a transistor, LED and zener diode, it is the major active component in the UAM4. The input signal(s) are applied to the left and right inputs at the right side of the schematic. These inputs have the advantage of being able operate in either balanced or un-balanced modes. Read on for explanations of unbalanced vs. balanced signals.

Unbalanced Signals

Most home entertainment audio devices (at least the ones that don't use optical connections) are using unbalanced signals. Unbalanced means there is a signal line for each signal (or channel), and a common ground for them all. This is fine for consumer audio, but sometimes problems with noise on the signal and/or ground loops can occur. There is only one signal line available, so any noise that manages to get onto that line is amplified and passed to the output, in this case the speakers.

Balanced Signals

In the case of a balanced input signal, each input actually has two signal lines which are opposite in phase or polarity. That means that when one line increases the other decreases. The amplifier input uses both of these signals by amplifying the difference between them to produce an output. If the signal on both lines is the same the amplifier essentially doesn't have anything to amplify. The advantage of this is that it is very unlikely that any noise on both lines would be out of phase and therefore the amplifier will essentially reject

it. Balanced signal lines are mainly used in professional equipment and signals that are run through very long 'transmission' lines.

If your audio source is un-balanced, this means only one of the input lines, (either the '+' or '-') is used, and the other is simply tied to ground. Usually the '+' line is used and is called the non-inverting input. This means that when the signal on the input increases with respect to ground the '+' terminal on the speaker output will increase with respect to the '-' speaker terminal for that channel. If the '-' input terminal is used the output will be just the opposite. For most home audio applications this really doesn't matter as long as both inputs and outputs are connected the same way. See the "**USING YOUR UAM4 AMPLIFIER**" section later in this manual for more information about connecting the inputs and speakers.

Getting back to the circuit, the input signal is applied to the MAX9708 through capacitors C1, C2, C3, and C4. These capacitors are called coupling capacitors, and are used to isolate the MAX9708 inputs from any possible DC levels that might appear on the input signal lines and allow the actual signal, which is an AC signal, to pass through.

Once the signal reaches the MAX9708 there isn't a lot more to say, other than it performs the "magic" of increasing the power level of the signal (as explained earlier, by converting it to a bunch of pulses and turning on and off the output transistors) letting you connect to the speakers and hear the music. The speakers are connected to the output terminals shown in the upper right corner of the schematic.

What follows is an interesting little side note about the output signal for those of you that might want to look at the output with test equipment. If you place an oscilloscope on the output terminals of the UAM4 you won't find a nice clean looking signal... In fact it will look like a lot of noise! Fear not, because this is what it is suppose to look like. Remember that the signal is actually a modulated square wave that changes in proportion to the signal. The signal is even more 'messed up' because in the factory default spread-spectrum mode of operation the frequency used to switch the output transistors is actually changing up to +- 4% around the center frequency of about 200kHz. This is done to help reduce the interference produced by the output stage transistors. This, along with other factors, is why there are not any large filter components needed on the UAM4. The speakers, because they are an electro mechanical device, also act as a sort of filter and end up producing a nice clean audible reproduction of the applied input signal.

That's it as far as the basic operation of the UAM4. But what about all those other components on the schematic? Well lets take a look at them! Most of them are used to configure the MAX9708. First look for a label just to the right

and below the input connections call 'INPUT MODE'. This is a jumper, H3, used to set up for either stereo or mono mode. If is not installed the UAM4 will be in stereo mode. The left and right channels are independent and operate as two separate amplifiers. If the jumper, H3, is installed the UAM4 will operate in mono mode. Only the signal applied to the right channel input will be used and the left and right outputs will be identical. They can be used as either two 20 watt amplifier outputs and used to drive two separate speakers or you may also set up the UAM4 to operate as a 40 watt amplifier when mono mode is selected. This is done by placing jumpers between the 'L+' and 'R+' and between 'L-' and 'R-' jumper locations on the board just below the speaker output terminals. These jumper points are located near the upper right corner of the MAX9708 in the schematic. In this configuration the left and right output terminals are connected in parallel and may be used to drive one speaker at a power level of 40 watts. It is important to note that you **NOT** simply connect the left and right speaker terminals together, either at the terminals or any other point other than the jumper points on the board. Doing so may cause nasty things to happen due to the output switching frequency and the length of wire between the output and remote connection point. **Use only the on-board jumpers for this configuration**

The 'GAIN' jumpers, H4 and H5, are used to adjust the gain of the UAM4. Below the 'GAIN' jumpers is the 'THERMAL THRESHOLD' jumpers, H6, H7 and H8. These set up the temperature at which the actual chip in the MAX9708 will cause the device to go into a shutdown mode. Basically if the MAX9708 gets too hot it will automatically shut itself off. The signal on pin #32 of the MAX9708 is used to turn on transistor Q1 and light the LED, D1, when the temperature set by these jumpers is reached. This signal may also be used to place the UAM4 into either 'MUTE' or 'SHUTDOWN' mode when an over temperature condition occurs.

The 'AUTO SHUTDOWN' jumper H9 to the left of the 'GAIN' jumpers is used to select if the over temperature described above that will cause the MAX9708 to go into mute or shutdown mode. If no jumper is installed on H9 then the over temperature condition will simply turn off the MAX9708 output transistors internally.

The 'MUTE' and "SHUTDOWN' input terminals located below the left and right channel inputs may be used to place the UAM4 into the indicated mode. The mute mode causes the output transistors to stop switching. This may be used to silence the UAM4 with the advantage of a built in click/pop suppression feature of the MAX9708. Shutdown mode reduces the power consumption of the UAM4 to a very low level, about 0.1uA. This is handy for battery operated applications to increase battery life. Both of these input controls are logic level signals and are pulled to a level of 7.5 volts supplied on the UAM4 board by zener diode, D1, and resistor R7 which can be found in the lower left corner of the schematic. By connecting the respective pins to ground the mode is

activated. This may be accomplished by a simple switch contact or an external logic level device.

The last set of jumpers, 'SWITCHING FREQUENCY', H1 and H2, set up the frequency and modulation mode of the MAX9708. As described above, a class D amplifier uses pulse width modulation to switch the output transistors on and off. These jumpers determine the frequency as well as the mode, either Fixed-Frequency Modulation or Spread-Spectrum Modulation. The frequency range is between 160kHz and 250kHz. Typically the factory default mode of Spread-Spectrum Modulation is recommended but we have made the other modes available for you to experiment with.

Additional information about configuring the UAM4 and its jumper settings is available in the "**DETAILED INPUT/OUTPUT INFORMATION**" section of this manual.

The remainder of the components are simply support components required by the MAX9708 and are mostly used to provide stable voltages and signals generated within the MAX9708. Again, if you want more in depth information about the MAX9708 go to "www.maxim-ic.com" and locate the data sheet.

RAMSEY Learn-As-You-Build KIT ASSEMBLY

There aren't that many solder connections on the UAM4 printed circuit board, but you should still practice good soldering techniques.

- Use a 25-watt soldering pencil with a clean, sharp tip.
- Use only rosin-core solder intended for electronics use.
- Use bright lighting; a magnifying lamp or bench-style magnifier may be helpful.
- Do your work in stages, taking breaks to check your work. Carefully
- brush away wire cuttings so they don't lodge between solder connections.

We have a two-fold "strategy" for the order of the following kit assembly steps. First, we install parts in physical relationship to each other, so there's minimal chance of inserting wires into wrong holes. Second, whenever possible, we install in an order that fits our "Learn-As-You Build" Kit building philosophy. This entails describing the circuit that you are building instead of just blindly installing components. We hope that this will not only make assembly of our kits easier, but help you to understand the circuit you're constructing.

For each part, the word "Install" always means these steps:

1. Pick the correct part value to start with.

2. Locate the correct PC board location.

3. Orient it correctly, follow the PC board layout drawing (page 24) and the written directions for all parts - especially when there's a right way and a wrong way to place it on the board. (Diode bands, electrolytic capacitor polarity, transistor shapes, dotted or notched ends of IC's, and so forth.)

4. Solder all connections unless directed otherwise. Use enough heat and solder flow for clean, shiny, completed connections.

SURFACE MOUNT(SMT) COMPONENT SOLDERING INSTRUCTIONS:

You'll notice that the circuit board contains only a few holes for component leads to pass through. This is because the SMT components will be affixed to the "solder" side of the PC board, the side with the white lettering or 'TOP'. Be aware that the component view for assembly is looking at the 'TOP' side of the PC board. Patience is the key when installing surface mount components!

Typically, the first step (after identifying the component) is to "tin" one of the PC traces that will connect to the part. Once this is accomplished, the part can be installed by holding it with tweezers in contact with the "tinned" trace and re-heating the solder. Another commonly used technique is to glue the surface mount components to the printed circuit board before soldering. The procedure is to take a small amount of glue (usually with a pin or toothpick) and "dab" the circuit board in the place where the component will be affixed. Be careful not to apply too much glue as when the part is placed it may "squash" the glue underneath the soldering tabs of the component. Carefully place the part into position, and when the glue dries, solder the connection.

This may go a little "against the grain" at first, but it is by far the easiest method. Notice also that when reheating the solder that the iron tip does not come in contact with the "tab" on the body of the chip component. Over heating of this solder tab can cause a fracture of the bond to the component, causing an intermittent connection.

Parts List

Capacitors
2– 10uF electrolytic marked 106 (C12, C17)
4– 47uF electrolytic marked 476(C5, C6, C13, C14)
1– .01uF (no marking)
4– .1uF (no marking)(C7, C11, C15, C16)
1– .47uF (no marking)(C9)
5– 1uF (no marking) (C1, C2, C3, C4, C10)

Resistors
3– 1K ohm marked 102 (R2, R3, R7)
4– 10K ohm marked 103 (R1, R4, R5, R6)

Semiconductors
1– MAX9708 audio amplifier (U1) *factory installed on board*
1– 7.5 volt zener diode marked 7.5M or Z8 (D2)
1– LED (red) (D1)
1– MMBT3906 PNP transistor marked 2A (Q1)

Misc Components/Hardware
4– Screw terminals (J6, J7, J8, J9)
1– 2.1 mm power jack (J5)
2– 3 position terminal blocks (J1, J2)
2– 2 position terminal blocks (J3, J4)
8– 3 position jumper headers (H1, H2, H4, H5, H6, H7, H8, H9)
1– 2 position jumper header (H3)
9– Jumper blocks
1– 24awg stranded insulated jumper wire
1– 24awg solid insulated jumper wire
1– UAM5 circuit board
1– UAM4 manual (if you're reading this you have the manual:-)

Components:	46
Thru Hole Solder Points:	57
SMT Solder Points:	54
Solder points:	111 (not including 57 points on MAX9708)

Pre-Assembly

Make sure to check that all components are present and identify them before starting to assemble your UAM4. The small capacitors are not marked and are in separate packages with each value in its own pack. Be careful and don't remove them from their package until you are ready to install them, as it will be very difficult to determine which is which if they get mixed up! The

electrolytic capacitors and resistors are marked so it will be easier to determine their values. The SMT components are small and occasionally decide to take a flying trip. Because of this we include some extra parts in these packages.
A good magnifier will help in the assembly process. Here in the lab and factory we use the visor mounted magnifier (The OptiVisor in the Ramsey Catalog) to assemble and troubleshoot equipment. You'd be surprised what you can't see on boards like the UAM4 without them!

Position the board in front of you with the word 'TOP' readable in the upper right hand corner.

U1 has been installed at the factory for your assembly convenience. Please be careful when soldering some of the components near it, (C10, C11, C15 and C16 in particular), as it is easy to slip and cause a solder bridge on its connections. (I know this from my own experience!) If this happens, do not attempt to remove the solder unless you are absolutely confident you can do it. U1's connections are actually underneath the package and it is difficult to remove bridges without damaging either the board or U1 itself. Call our technical support for information before you attempt to do anything associated with U1 if you have even the slightest doubt.

Assembly

Steps 1-18 deal with surface-mount components (SMT). SMT components are soldered directly onto the top of the board. First we'll install all of the small non-electrolytic surface mount capacitors. Because these components are not marked they are in individual marked packages. Be careful not to mix them up.

- ❒ 1. Install 1uF capacitor C1, located near the bottom edge of the board.
- ❒ 2. Install 1uF capacitor C2, located near the bottom edge of the board.
- ❒ 3. Install 1uF capacitor C3, located near the bottom edge of the board.
- ❒ 4. Install 1uF capacitor C4, located near the bottom edge of the board.
- ❒ 5. Install 1uF capacitor C10 located near the lower left corner of U1.
- ❒ 6. Install 0.1uF capacitor C11, near the left edge of U1.
- ❒ 7. Install 0.1uF capacitor C15, near the left edge of U1.
- ❒ 8. Install 0.1uF capacitor C7 located to the right of C9 below U1.
- ❒ 9. Install 0.1uF capacitor C16 near upper right edge of U1.

❒ 10. Install 0.47uF capacitor C9 located near the middle lower edge of U1.

❒ 11. Install 0.01uF capacitor C8 near lower left edge of U1.

Next we'll install the other small surface mount components. Unlike the capacitors the value is marked on them.

❒ 12. Install the MMBT3906 PNP transistor Q1 (marked 2A) located to the right of C6.

❒ 13. Install 1K resistor R2 (marked 102) located to the left and above Q1.

❒ 14. Install 1K resistor R3 (marked 102) located to the left and above Q1.

❒ 15. Install 1K resistor R7 (marked 102) near the left center edge of the board near the pattern for J5.

❒ 16. Install 10K resistor R5 (marked 103) near lower right corner of the board.

❒ 17. Install 10K resistor R6 (marked 103) near lower right corner of the board.

❒ 18. Install 10K resistor R1 (marked 103) located below Q1 on the left of the board.

❒ 19. Install 10K resistor R4 (marked 103) located between and above the patterns for J1 and J2 on the lower edge of the board.

❒ 20. Install the 7.5 volt zener diode D2 (marked 7.5M) on the left edge of the board below the pattern for J5.

Now would be a good time to take a few moments and check over your work. Check that all components are placed properly and there are no solder bridges between components and traces.

The last of the surface mount components will now be installed. These capacitors are electrolytic, so they must be installed in the correct orientation. You will notice that there is a band or mark on one end of the capacitors. This indicates the '+' side and must be installed on the board toward the '+' indication on the board. These are large components and will be a cinch to install now that you're an expert!

❒ 21. Install 10uF capacitor C12 near the left edge of the board (marked 106).

❒ 22. Install 10uF capacitor C17 (marked 106) near R7 on the left of the board.

❒ 23. Install 47uF capacitor C5 (marked 476) near the lower right corner of U1.

❒ 24. Install 47uF capacitor C6 (marked 476) near the lower right corner of U1.

❒ 25. Install 47uF capacitor C13 (marked 476) to the left of U1.

❒ 26. Install 47uF capacitors C14 (marked 476) to the right of U1.

The rest of the parts are “through-hole” components, which means they will be placed on the board from the top and soldered on the bottom. Make sure that the 2 and 3 pin terminal blocks are installed so the holes to insert the wiring into are positioned toward the outside edge of the board.

❒ 27. Install 2 position terminal block J3 with connection points facing the edge of the board, located on the bottom edge of the board.

❒ 28. Install 2 position terminal block J4 with connection points facing the edge of the board, located on the bottom edge of the board.

❒ 29. Install 3 position terminal block J1with connection points facing the edge of board, located on the bottom edge of the board.

❒ 30. 3 position terminal block J2, with connection points facing the edge of board, located on the bottom edge of the board.

❒ 31. Install screw post output terminal J6 located across the top edge of the board.

❒ 32. Install screw post output terminal J7 located across the top edge of the board.

❒ 33. Install screw post output terminal J8 located across the top edge of the board.

❒ 34. Install screw post output terminal J9 located across the top edge of the board.

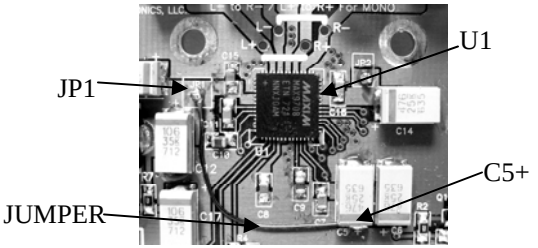
❒ 35. Install LED D1 located on the right edge of the board. Note that there is a flat side on the body of the LED and also the lead on that side is shorter than the other. Make sure you install the LED so it matches the pattern on the board and the short lead is placed through the hole with a rectangular silver pad around it.

❒ 36. Install 3 pin header H4, located along the right edge of the board.

❒ 37. Install 3 pin header H5, located along the right edge of the board.

❒ 38. Install 3 pin header H6, located along the right edge of the board.

- ❒ 39. Install 3 pin header H7, located along the right edge of the board.
- ❒ 40. Install 3 pin header H8, located along the right edge of the board.
- ❒ 41. Install 3 pin header H9, located along the right edge of the board.
- ❒ 42. Install 3 pin header H1, located on the lower left edge of the board.
- ❒ 43. Install 3 pin header H2, located on the lower left edge of the board.
- ❒ 44. Install 2 pin header H3. This is located near the lower center edge of the board.
- ❒ 45. Install the 2.1mm power jack J5 located on the left middle edge of the board.
- ❒ 46. Locate the provided heavy insulated 24awg stranded jumper wire and install it on the bottom of the board between JP1, located near the power connector, J5, side near C12 and C13, and JP2 located near the upper right of U1 between C16 and C14.
- ❒ 47. Locate the light weight 24awg solid insulated jumper wire. This wire has an enamel type insulation. By applying a bead of solder on your iron and then holding the tip of the wire tight against the soldering iron in the solder bead this insulation will 'melt' after a few seconds and the solder will coat the copper wire. Cut the wire to the length required, prepare the ends as described and then install it on the top side of the board between JP1, located near the power connector J5, C12, C13, and the "+" side of C5 by first soldering one end to JP1. Now solder the other end to the '+' side of capacitor C5, located off the lower right corner of U1, by carefully flowing a little extra solder on the "+" side of C5 and then solder the wire to this point. Lay the wire against the board so it is routed somewhat away from the components along it's path. See the picture below for more detail.



Once again check over all of your work. Check that all components are placed properly and there are no solder bridges between components and traces.

That's all folks!!! (For the assembly that is…)

USING YOUR UAM4 AMPLIFIER

Now that you have your UAM4 assembled all you need to do is follow the steps below and you will be enjoying 40 watts of audio power.

Required items

- A Power supply able to provide between 10 and 18 volts DC at least 2.6 amps - A lower current rating will work but you will not be able to achieve the 40 watts of power output at 18 volts. We recommend the SPS183 power supply, available from Ramsey.

- An audio source - This may be either a balanced signal or a single ended unbalanced signal such as provided by the record, or line level output provided by many audio system components.

- Two speakers for stereo operation – (Obviously for mono operation you only need one speaker…) Make sure they have enough power handling capability for the UAM4!

- Although not absolutely required, you may want a case or mount to hold your UAMA4.

Connecting Your UAM4

In order to connect your UAM4 you need to first decide a few things about the type of equipment you are going to use it with and how you want to use it. To do this we'll ask you a few questions. Based on your answers, we can point you to the set up instructions best suited to your needs. In all configurations the connections to the UAM4 are made with Euro style screw terminals. You will need to prepare appropriate connecting cables to match the output of your equipment. Just read through and follow the instructions below to determine the required connections.

INPUT SETUP

First we need to set up the UAM4 for either stereo or mono input. If you are going to be using your UAM4 as a stereo, (two input signals) amplifier continue reading the "STEREO INPUT" steps below. If you are going to use the UAM4 as a mono (one input signal) amplifier, go to the "MONO INPUT" section.

STEREO INPUT

- ❒ Remove the jumper from jumper block H3 labeled 'JUMPER FOR MONO' located above and between the input connectors, J1 and J2, if it is installed.
- ❒ Make sure there are no jumpers installed between the 'L+', 'R+' and between the 'L-' and 'R-' jumper points just below the speaker connection terminals.
- ❒ Since you are using your amplifier in stereo mode you will be using

both the left and right input connections.

- ❒ Proceed to the "**SELECTING BALANCED OR UN-BALANCED INPUT**" steps on the next page.

MONO INPUT

- ❒ Place a jumper across the pins of jumper block H3 labeled 'JUMPER FOR MONO' located above and between the input connectors J1 and J2.

Your UAM4 may be used in one of two mono out modes. You may use it as a simple 40 amplifier or you may use it as if it is two 20 watt amplifiers with a common input. In this way you can use it to drive two independent speakers with 20 watts each. If you will be using it as a 40 watt amplifier see the "40 WATT MONO OPERATION" steps below. If you want to use it as two separate 20 watt amplifiers go to the "DUAL 20 WATT MONO OPERATION" steps.

40 WATT MONO OPERATION

- ❒ Solder a jumper between jumper points 'L-' and 'R-' located just below the speaker terminals.
- ❒ Solder a jumper between Jumper points 'L+' and 'R+' located just below the speaker terminals.
- ❒ Now go to the "**SELECTING BALANCED OR UN-BALANCED INPUT**" section.

DUAL 20 WATT MONO OPERATION

- ❒ Make sure there are no jumpers between 'L-' and 'R-' and between 'L+' and 'R+'.

SELECTING BALANCED OR UN-BALANCED INPUT

Now we need to determine if your audio input is an un-balanced or balanced signal. The most common sources are un-balanced. (For a more detailed description of the differences between balanced and un-balanced signals please refer to the "**A TOUR OF THE UAM4**" section in the beginning of this manual.) The following steps will take you through how to connect the inputs for both balanced and un-balanced signals.

An un-balanced signal has only one wire and a common ground for each signal. One wire is the actual signal and the other will be a ground which is common to all signals. So for a stereo signal there is a left and right signal and a common ground for them. Usually these signals use an RCA Phono type connector for each channel, (usually white for left and red for right). These are commonly used on home audio component system, CD players, TV's and cable/satellite receivers.

It may also use a single 3.5mm or ¼ in stereo phone plug with both left, (the tip connection) and right, (the small ring connection), and a common ground which is the remaining sleeve of the connector. The 3.5mm jack is typically used for computer and portable CD/MP3 player outputs. So far all these signal sources are un-balanced.

If the equipment you are connecting to is not the usual consumer home or computer equipment then you may have a balanced signal source. This type signal has two signal lines and a ground for each one. It is probably best to read the "**A TOUR OF THE UAM4**" section in the beginning of this manual for a more detailed description of balanced signals. Also the operator manual for the equipment will be of help if you have problems.

If you are going to use your UAM4 as a stereo amplifier then you will be using both the left and right channel inputs. If you are using your UAM4 as a mono amplifier either as a single 40 watt amplifier or as two 20 watt amplifiers you will use only the right channel input in the following steps.

SELECT INPUT TYPE

Based on the above information, if your input is an un-balanced type , continue reading. If your input is balanced go to the "BALANCED INPUTS" steps.

UN-BALANCED INPUTS

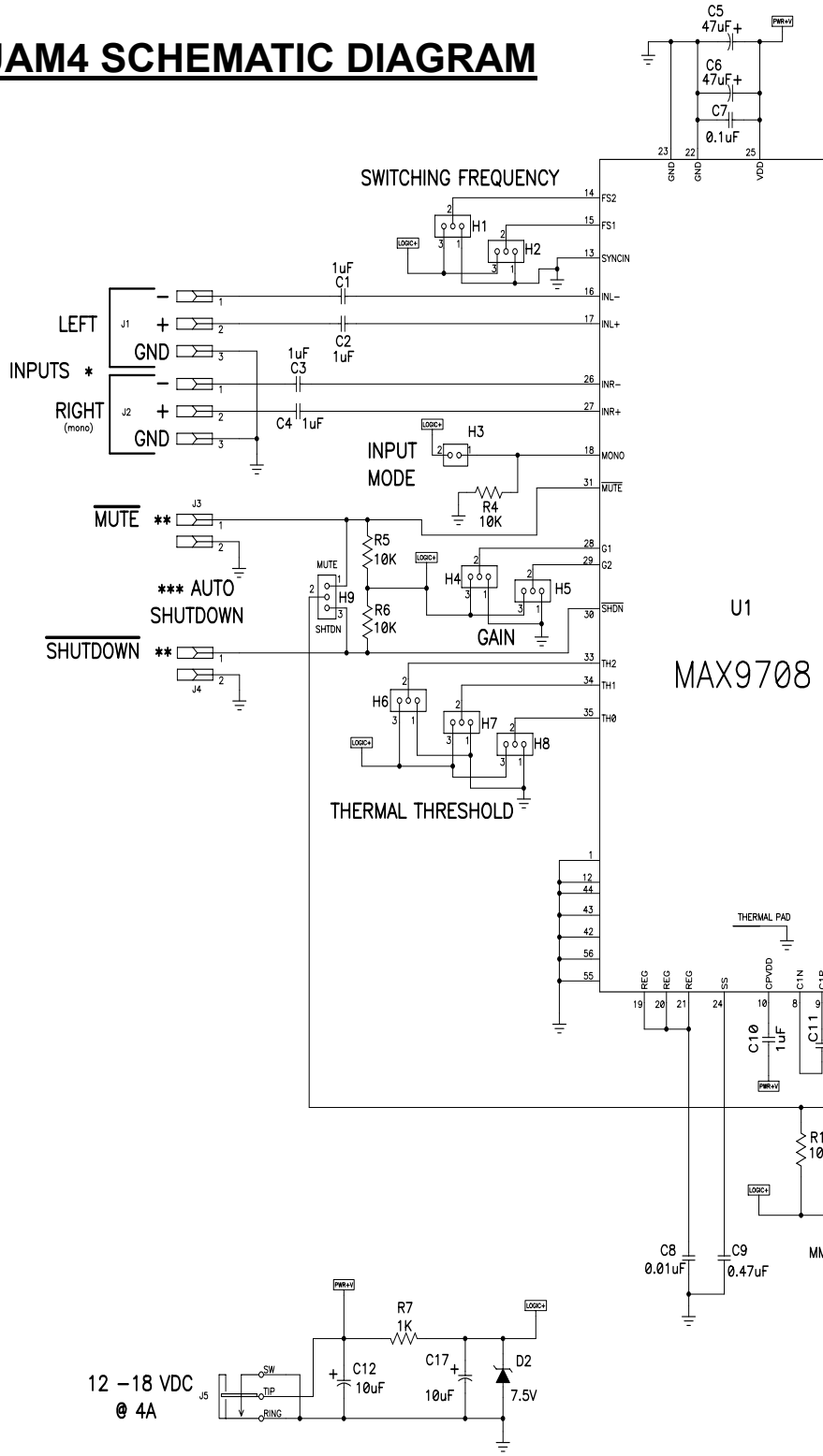
- ❒ Place a short jumper wire from the '-' terminals to the 'GND' terminal on the left, J1, and right, J2, input connectors.
- ❒ Connect the signal line from each source to the '+' terminals on the left, J1, and right,J2, input connectors.
- ❒ Connect the ground or shield wire to the 'GND' terminals on these connectors.

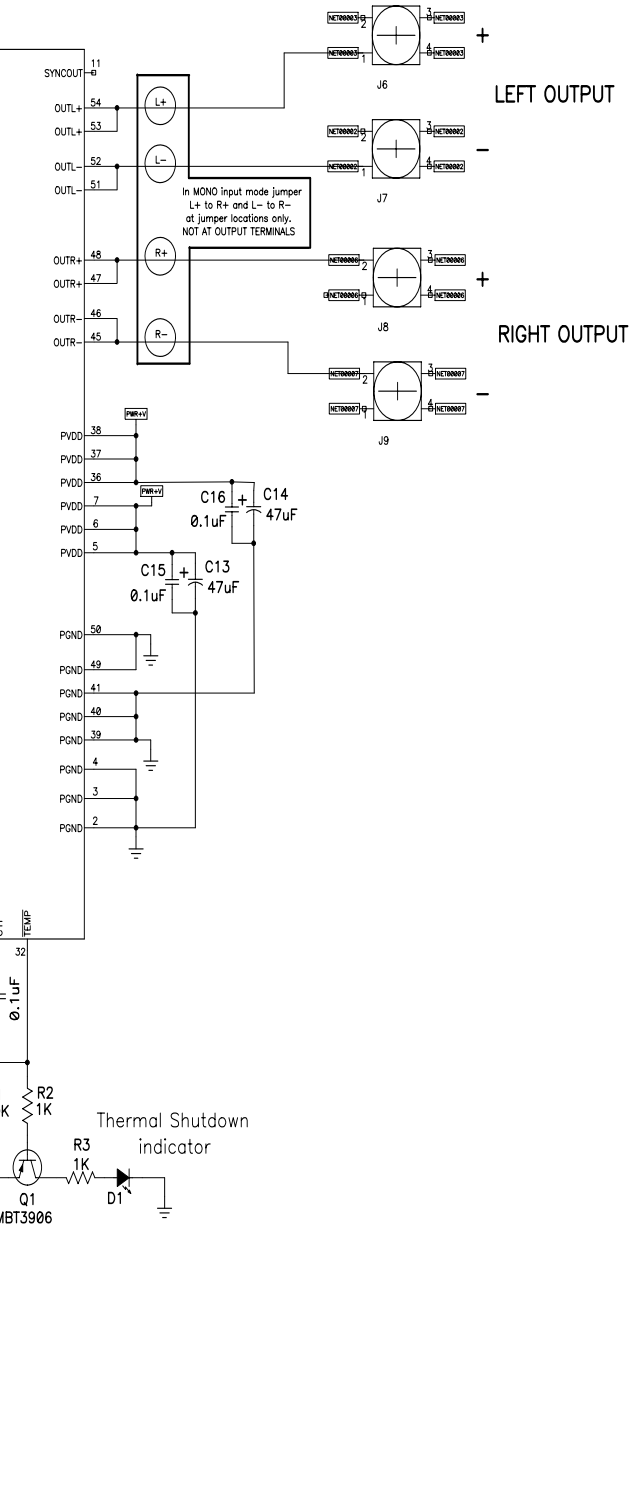
That's it for the un-balanced input connections. Now it's time to connect your speakers. Go to the "**CONNECTING YOUR SPEAKERS**" section.

BALANCED INPUTS

Your input signal source is a balanced type signal. There should be 3 wires associated with each signal. One is the ground connection and the other two are the + and – signal lines. You should refer to the owner's manual of your equipment to determine the configuration of the signal lines. Connection to the UAM4 is straight forward once the configuration is known. Simply connect the corresponding +, - and ground lines to the +, - and GND terminals on the UAM4 input connections J1 and J2.

UAM4 SCHEMATIC DIAGRAM




SYNCOUT
11
OUTL+
54
OUTL+
53
OUTL−
52
OUTL−
51
OUTR+
48
OUTR+
47
OUTR−
46
OUTR−
45
L+
L−
R+
R−
In MONO input mode jumper
L+ to R+ and L− to R−
at jumper locations only.
NOT AT OUTPUT TERMINALS
J6
J7
J8
J9
+
−
+
−
LEFT OUTPUT
RIGHT OUTPUT
PWR+V
PVDD
36
37
36
7
6
5
C16
0.1uF
C14
47uF
C15
0.1uF
C13
47uF
PGND
50
49
41
40
39
4
3
2
TEMP
32
0.1uF
R2
1K
R3
1K
Thermal Shutdown
indicator
Q1
MBT3906
D1

CONNECTING YOUR SPEAKERS

You're down to the last few connections and your UAM4 will be ready to go. Your speakers are going to be connected to the speaker output terminals J6, J7, J8, and J9. If you are using your UAM4 as a stereo amplifier keep reading. If you are operating your UAM4 in mono mode, go to the "**MONO SPEAKER CONNECTION**" section.

STEREO SPEAKER CONNECTION

If you are using your UAM4 as a stereo amplifier then you will connect the left speaker to the 'LFT+', J6, and 'LFT-', J7 terminals and the right speaker to the 'RT+', J8, and 'RT-', J9, terminals. It is important that the speakers be connected to these terminals with the proper polarity. In other words look at your speakers and you should see there is a red and black terminal on each one. (It is possible that your speakers have some other polarity indication on them but this is the most common. Consult the owner's manual if they are different.) It is important that the two speakers be connected with the same polarity, (red terminal to LFT+ or RT+ and Black terminals to LFT- and RT- for example), to the UAM4. While it will not damage the speakers or UAM4 if they are connected with different polarity, the sound will not be as expected. Please refer to the "**DETAILED INPUT/OUTPUT INFORMATION**" and "**NEAT-TO-KNOW INFORMATION: Determining Speaker Phase**" sections of this manual for more detailed information.

(*continued on page 20*)

That's it for the speaker connection. Now go to the "**POWER SUPPLY CONNECTION**" section.

MONO SPEAKER CONNECTION

If you are using your UAM4 as a mono amplifier then your speakers will still be connected to the speaker output terminals J6, J7, J8, and J9 but there will only be one channel input, (which is applied to the right input terminals), instead of the stereo left and right channels. Select the mono configuration below that you set up in the previous sections and follow the instructions.

40 WATT MONO OPERATION SPEAKER CONNECTIONS

In the 40 watt mono configuration the output terminals are connected in parallel. In other words the 'LFT+' and 'RT+' terminals are the same and 'LFT-' and RT-' terminals are the same. The speaker(S) may be connected to these two sets of terminals. Please note that these terminals are connected together on the UAM4 board.

Warning: DO NOT remove the jumpers between 'L+' and 'R+' and between 'L-' and 'R-' jumper points and simply connect the output terminals or speaker leads to together at any point off the board. Doing so may cause undesired results, (distortion, feedback, etc.) and damage to the UAM4.

DUAL 20 WATT MONO OPERATION SPEAKER CONNECTIONS

In the dual 20 watt mono configuration the UAM4 is actually set up as two 20 watt amplifiers with a common input which is applied to the right input terminals. This means that the 'LFT+' and 'LFT-' are the output of one 20 watt amplifier output and the 'RT+' and 'RT-' terminals are another 20 watt amplifier output. Speakers connected to these outputs will have the same output audio but are driven by two separate amplifiers.

Warning: in this mode of operation there must not be any connection between the plus and minus output terminals. Connecting these may cause undesired results (distortion, feedback, etc.) and/or damage the UAM4!

POWER SUPPLY CONNECTION

The UAM4 is designed with a standard 2.1mm power jack with a center pin positive connection. A power supply voltage between 10VDC and 18VDC may be used to power your UAM4. At full power the required current is about 2.6 amps. Full power (40 watts) is possible using the maximum 18VDC voltage input. Lower voltages will result in reduced power output and will also require a lower maximum current. We recommend the SPS183 power supply (available from Ramsey) but any suitable supply such as a 12VDC car battery, or other supply capable of supplying the required current, is acceptable.

While the UAM4 has built in pop/click reduction, you may find there is a slight pop heard when power is first applied. This may be reduced by insuring that the input audio source is connected prior to applying power. Keeping the 'MUTE', J4, and/or 'SHUTDOWN', J3, terminals on the UAM4 at ground during power up and power down will also eliminate the popping.

That's all there is to it. You are ready to enjoy your UAM4 amplifier!

DETAILED INPUT/OUTPUT INFORMATION

Left And Right Inputs (J1, J2)

Terminal connectors J1 and J2 are the left and right channel inputs respectively. They can be used as a single ended unbalanced input or as balanced inputs from a balanced signal source. To use the inputs as simple single ended inputs either the '+' or '-' terminal must be connected to the 'GND' terminal. Just make sure you set up both inputs the same way. The signal is then applied to the remaining '+' or '-' terminal and 'GND' for each channel.

To use the inputs as a differential balanced inputs simply connect the '+', '-' and ground or shield leads from the source to the corresponding terminals of

each input.

These inputs are high impedance which means they can be bridged or connected in parallel with other equipment inputs.

Left And Right Outputs (J6, J7, J8, J9)

These are the output connections to the speakers. They are labeled 'L+', 'L-', 'R+' and 'R-'. The polarity is important when connecting the speakers in order to assure the speakers are 'phased' correctly with respect to each other. If they are connected opposite each other, any sound centered between the two channels will 'appear' to be coming from each speaker rather than from a location between them. It also indicates the 'phase' with respect to the input. Either terminal of the output may be connected to either terminal of the speaker but each speaker should be connected in the same way. See the '**Neat-To-Know Information**' section at the end of this manual to learn how to determine the 'phase' of a speaker if it isn't labeled.

Power Input (J5)

This is the power supply input connector. You may use any power supply with an output voltage of 10VDC to 18VDC and a current rating of at least 2.6 amps. It is possible to use a supply with a current rating of less than 2.6 amps, but you won't get the full 40 watts of output at 18 volts. When the UAM4 was being developed, we used a supply with less than 1 amp capacity and it still gave us plenty of power for initial testing purposes (plus helped protect the circuit against mishaps, (which never happen during design stages!), and let us see what was going on without the possibility of producing flames on the bench.

It is important that you observe the polarity of the connections. The positive lead of the supply MUST be connected to the center pin terminal and the negative MUST be connected to the outside shell of the jack. Failure to follow this will most likely result in damage to the amplifier.

Mute And Shutdown Connectors (J3, J4)

These connectors provide access to the 'MUTE' and 'SHUTDOWN' functions of the MAX9708. The lines are a digital type input and have a high level of 7.5 VDC applied to them when not active. By connecting these lines to ground the function is activated. Activation can be accomplished by simply connecting the two terminals on the desired function connector together with an external switch or even an external logic signal to ground. Note that if a jumper is installed on the 'Auto Shutdown' on jumper 'H9' the 'OVER TEMP' LED will light when the selected function is activated from the 'MUTE' or 'SHUTDOWN' connector. If no jumper is installed on 'H9' then activation of either function will not activate the LED.

DETAILED JUMPER SETUP INFORMATION

In the following explanations and tables, an 'X' in two adjacent columns indicates a jumper is installed between those two adjacent pins of the header. The factory default/recommended modes for the options are indicated by '**' placed before the option setting.

Input Mode selection

Stereo and monophonic input modes are selected with the 'INPUT MODE' jumper 'H3' located near the input connectors 'J1' and 'J2'. For stereo operation no jumper is installed on H3. Mono operation is enabled by installing a jumper on H3.

For stereo mode the jumpers between the L (left) and R (right) jumper locations near the output terminals MUST NOT be installed. For mono mode you may use the left and right outputs as separate channels at 20 watts each by not connecting the 'L' and 'R' jumpers. By installing the 'L' and 'R' jumpers as indicated you will have a single output at 40 watts. These jumpers MUST be installed in the provided locations on the circuit board. DO NOT simply connect the outputs together at the output terminals as damage to the AX9708 may result. In mono mode the input is applied to the right channel input. Any signal on the left input is ignored.

INPUT MODE JUMPER CONFIGURATION

Mode	H3		L+ to R+	L- to R-	Input	
	1	2			J1	J2
Mono 1x40W	X	X	X	X		X
Mono 2x20W	X	X				X
**STEREO					X	X

Audio Gain Selection

Jumpers 'H4' and 'H5' set the UAM4 gain. The input signal level will determine how these are configured. If you are wondering just what 'dB' is, it stands for 'decibels' and it is a unit of measure for sound intensity or level. To give a very simple explanation, every 3dB of voltage gain represents an output voltage increase of 1.4 times the input voltage. Therefore with a gain of +3dB an input voltage of .1 volt will produce an output of .1 x 1.4 = .14 volts. A gain of +22dB will produce an output voltage of (22 / 3) x .1 x 1.4 = 1.03 volts with the same .1 volt input. For power calculations a gain of 3dB is simply a gain of 2. So for a gain of +22dB with a 1 watt input the power output will be (22/3) x 2 x 1 = 14.67watts. If you want to learn more about decibels we suggest you search the internet for the key word 'decibels'. There are many good resources available that will give more in depth information.

AUDIO GAIN JUMPER CONFIGURATION

GAIN	H4			H5		
	1	2	3	1	2	3
+22	X	X			X	X
+25		X	X		X	X
+29.5		X	X	X	X	
**+36	X	X		X	X	

Auto Shutdown Mode Selection

The UAM4 provides a feature that allows it to be either muted or put in a shutdown state by applying a low to either the 'MUTE'(J4) or 'SHUTDOWN'(J3) connectors. These features can also be used in conjunction with the temperature sensing feature of the MAX9708 amplifier. By placing a jumper on 'H9' located just above the 'MUTE' and 'SHUTDOWN' connectors you can have the UAM4 go into either mute or shutdown when the over temperature sensor on the MAX9708 activates. This can be handy in order to prevent damage to the UAM4 should the MAX9708 overheat. We recommend you install the 'H9' jumper in either mode.

What's the difference between 'MUTE' and 'SHUTDOWN'?. If you select the 'MUTE' option the UAM4 will turn off the input amplifiers of the MAX9708, but leave power applied to the output stages connected to your speakers. In 'SHUTDOWN' mode the power to the output stages is turned off and the MAX9708 goes into a very low input current (0.1uA) state. In either case the UAM4 will return to normal operation when the temperature returns to a safe level. No matter which mode you select, it is still possible to either mute or shutdown the UAM4 manually using the provided connectors.

AUTO SHUTDOWN MODE JUMPER CONFIGURATION

(shutdown on over temperature)

MODE	H9		
	1	2	3
MUTE	X	X	
SHUTDOWN		X	X
**NONE			

Thermal Threshold Selection / 'OVER TEMP' LED

The MAX9708 contains a temperature sensor which activates a signal when the internal, (chip), temperature of the MAX9708 reaches the a specified level. Note that this is not the ambient air temperature of the surrounding air but the

internal temperature of the MAX9708. We have included an LED, labeled 'OVER TEMP' that will light if this condition occurs. This signal can be used to either mute or put the UAM4 in shutdown mode as explained in the previous section. This threshold is set at the factory for 100 degrees C and this should be acceptable for most applications. If you find the over temperature condition occurring frequently, you may select any of the higher settings. This should be done carefully in single level steps until the condition stops. You should select the lowest possible setting in order to provide maximum protection. If you cannot find an acceptable setting please check the troubleshooting section of this manual. It is possible you may need to provide additional heat sinking for the UAM4.

When the 'AUTO SHUTDOWN' jumper 'H9' is installed you will notice that the 'OVER TEMP' LED will be turned on if the selected mode is activated from the corresponding input terminal. This is normal operation and does not indicate an over temperature condition.

Do not install jumpers between pins 2 and 3 on all headers at the same time. This is an invalid condition and may result in damage to the UAM4.

THERMAL THRESHOLD JUMPER CONFIGURATION

Temp (deg C)	H6			H7			H8		
	1	2	3	1	2	3	1	2	3
80	X	X		X	X		X	X	
90	X	X		X	X			X	X
**100	X	X			X	X	X	X	
110	X	X			X	X		X	X
120		X	X	X	X		X	X	
129	X	X		X	X			X	X
139		X	X		X	X	X	X	
#NA#		X	X		X	X		X	X

Switching Frequency Selection

The MAX9708 is a Class D, or "switch-mode" amplifier. In simple terms this means that the amplifier takes the input signal and performs some electronic magic which modulates a high frequency signal, around 200KHz, and then uses the high frequency signal to produce an output. There are different ways to accomplish this. We won't go into the technology involved but the method used is determined by the particular application. For most purposes we suggest using the factory default method called 'spread-spectrum switching' at a frequency of 200KHz. You are welcome to select one of the other modes/

frequencies to see if you experience any differences, but chances are you won't notice a change. The primary reason for changing the mode would be interference on nearby electronic equipment or (this is very unlikely) if your neighbor starts complaining that your amplifier is interfering with his Hi-Fi system. We have provided the ability to change the mode mainly for your learning/experimental purposes. If the MAX9708 is placed in a system that is sensitive to the high frequency signal or uses the same frequency as the MAX9708, the ability to change the mode may come in handy. If you want to learn more about this technology, a lot of excellent resources can be found on the internet by searching for "Class D amplifier" and/or "switch mode amplifier."

SWITCHING FREQUENCY JUMPER CONFIGURATION

FREQ (KHz)	H1			H2		
	1	2	3	1	2	3
200	X	X		X	X	
250		X	X	X	X	
160	X	X			X	X
**200(SSM)		X	X		X	X

TROUBLESHOOTING

If you find that your UAM4 is not functioning as expected the first thing to do is make sure there are no solder bridges between components and board traces. Since most of the components in this kit are surface mount and some are placed very close to each other there is a good possibility a bit of solder has found its way to the wrong place. Also make sure all of the components are installed in the correct direction and locations. Over 95% of the problems found with returned kits are caused by solder bridges and components installed improperly. A visual check with a good magnifying glass will often reveal the problem.

- ❒ Check that the jumper between 'JP1' and 'JP2' is installed on the bottom of the board and soldered.

- ❒ Check that the Jumper between JP1 and C 5 is installed properly.

- ❒ Check all of the resistor values. There are only two resistor values used in the UAM4. They are a 1K ohm, marked as 102, and a 10Kohm, marked as 103. While the UAM4 will *probably* still work even with an incorrect resistor, it is important that these two values are present and they are in the correct locations.

- ❒ The small surface mount capacitors are not marked, which makes it a little

difficult to determine if the correct value is in the correct place. While it is not an absolute indication, a comparison of the size of each capacitor with respect to others of the same value may reveal a placement error. Generally the larger the value of the capacitor the larger the component. There are only 4 values of non polarized capacitors in this kit - the 1uF devices, C1, C2, C3, C4 and C10 will be the largest. C9 is smaller, and C7, C11, C15, and C16 are smaller than C9. Finally, C8 should be the smallest.

❒ Make sure all the other capacitors are installed in the correct direction. These are electrolytic capacitors, meaning they have a voltage polarity requirement. The marked band on one side of the capacitor indicates the positive side, so use this to make sure they are oriented correctly.

❒ The Zener diode, D2 and transistor Q1 look very similar. Refer to the parts list for the markings on these components and make sure they are installed in the correct locations.

❒ There is a 7.5 volt regulated voltage generated on the UAM4 board. This is done with the circuit consisting of zener diode D1, capacitor C17 and resistor R7. If there is no output, check, to see if the 7.5 volts is present. Connect a multimeter negative lead to the UAM4 ground and check the voltage on pin 3 of jumpers H1, H2, H4, H5, H6, H7 and H8. If you find there is more than +7.5 VDC on these pins, or no voltage at all, there is a problem with D2, C17, or R7. Check to make sure these components are installed correctly.

❒ If you don't see anything wrong the next step is to check for shorted and open connections using a multimeter set to measure resistance. Using a magnifying glass and very fine probes (a straight pin connected to the meter using clip leads works great) check for any connection between adjacent components and between traces that are near each other. (Be very careful when checking with the pin - some of the traces on the UAM4 board are so small that a simple poke with a pin could actually break them!) The best way to check between traces is to find a place that has exposed conductor (silver in color) on the trace and connect the meter leads between the points of interest. The green color on the board is called a solder mask and helps prevent solder bridges between components and traces. It is best to avoid damage to the mask. When probing, look for readings that are very low, near zero ohms. If a reading is higher than a few ohms the chances are that it is OK and caused by the various components in the circuit.

CAUTION!!!.. DO NOT PROBE THE CONNECTIONS DIRECTLY ON U1 AS DAMAGE TO THE CHIP OR CIRCUIT BOARD MAY OCCUR. VISUAL INSPECTION IS BEST!

- ❒ Make sure that there are no bridges between the connections of U1, the MAX9708 IC. U1 has been installed at the factory because without specialized equipment it is almost impossible to solder into the circuit. While it is doesn't happen often, it is possible that a problem with the installation of U1 occurred at the factory. Since it's not possible to test the installation until the UAM4 is completely assembled, it may slip past our normal QA testing. We don't suggest that you do any measurements directly between the connections on U1, as damage to the device and/or board can occur. If you observe what appears to be a solder bridge or bad connection on U1, please call our tech support before proceeding! Unless you are experienced in working with this type of device and have the proper equipment, you will probably destroy the device and/or the UAM4 circuit board. If we find that a returned UAM4 has been damaged due to an attempt to repair a problem with U1, the repair may not be covered under warranty. A thorough visual inspection of U1 installation was done before the board was packed into your kit, and it is very easy to tell if a problem occurred in the field or here at the factory.

What if the 'OVER TEMP' LED keeps coming on?

If the light appears to come on or flicker with the input signal level the first thing to check for is a shorted connection to the speakers. A short between the '+' and '-' terminals or anywhere in the speaker connections can cause the MAX9708 to overheat and the over temperature safety to activate.

Using normal voice and music signal inputs the UAM4 should be able to handle all the power output you will need using the factory setting for the thermal threshold, with no additional heat sink installed. However if you are using the UAM4 with an input signal such as a pure sine wave or in an enclosure where the ambient temperature is high, it is possible the threshold may need to be adjusted. If you find that the 'OVER TEMP' LED is lighting frequently during operation you may need to adjust the thermal threshold point. This is done with the 'TEMP' headers H6, H7, & H8. Refer to the description of these settings and change the setting one step at a time. When the problem seems to be corrected stop at that setting and try operating the UAM4 under normal conditions for a while. If you can't correct the problem using this procedure, return the jumpers to the factory default positions and try adding a heat sink to the UAM4.

Installing a Heat Sink

If you don't have the UAM4 mounted on a metal surface using metal

spacers and the 4 mounting holes on the corners, try mounting the board to a piece of aluminum or some other metal and see if the problem is solved. You can also use the 2 holes located between the output screw terminals and U1 to mount to a metal plate. These are closer to U1 and will dissipate the heat faster. You may need to adjust the threshold once the heat sink is installed. Remember to use metal spacers and the absolute lowest setting of the threshold necessary.

NEAT-TO-KNOW INFORMATION: Determining Speaker Phase

A speaker is an electromechanical device that converts electrical impulses to sound waves. This is done with a magnet and a coil of wire. When an electrical current is passed through a wire, a magnetic field is produced. If the wire is made into a coil and attached to, for example, a piece of paper, and a magnet is placed inside the coil, we have the components of a speaker. When a changing electrical current (like an audio signal from the UAM4, for instance) is applied to the coil a changing magnetic field is produced in the coil which interacts with the magnetic field of the magnet and the coil moves, thus moving the paper. Moving the paper causes the air around it to move at the rate of the applied signal and sound is produced. The paper is the cone of the speaker, and the coil is called the voice coil. Current in one direction will cause the cone to move in one direction and the opposite direction when the current is reversed.

To determine which way the cone moves with a given current polarity applied you will need a battery such as a 'AA' cell and a resistor with a value of 10 to 100 ohms. You will also need to be able to see the cone of your speaker. Using clip leads connect one to one lead of the resistor and the other to a terminal of the speaker. Connect the other lead to the other speaker terminal. The resistor value is not critical but is necessary to prevent allowing too much current to flow in the voice coil and damaging it. Now the fun begins!

Connect the clip lead with out the resistor to the '-' terminal of the battery and then connect the free lead of the resistor to the '+' lead of the battery while watching the cone. If the cone moves toward the front of the speaker, mark the speaker terminal with the resistor with a '+'. If it moves the other way mark the terminal attached to the battery '-'as "+'.

Repeat this same procedure on the other speaker. When you connect the speakers, simply connect the marked lead of each speaker to the '+' terminal of the desired channel, (left or right), output terminals and the other to the corresponding '-' terminal and you will have a properly connected set of speakers! It really doesn't matter which lead you mark on the speaker, since as long as you mark both speakers the same way they will be in phase.

What if you can't see the speaker cone, don't have a battery or resistor or are

just too lazy to go through the above procedure? Here's a simple solution. If you find that when you connect the same signal to both the left and right inputs and the sound seems to be coming from each speaker separately and not in a place between them, the speakers or input signals are out of phase. Check that you have applied the input signal in the same way to both inputs. If they are correct then your speakers are connected out of phase. Simply reverse the speaker wires on one of the speakers and the sound will now be in phase and appear between the speakers!

CONCLUSION

We sincerely hope that you will enjoy the use of this Ramsey product. As always, we have tried to compose our manual in the easiest, most "user friendly" format that is possible. As our customers, we value your opinions, comments, and additions that you would like to see in future publications. Please submit comments or ideas to:

Ramsey Electronics, LLC
Attn. Hobby Kit Department
590 Fishers Station Drive
Victor, NY 14564
or email us at: techsupport@ramseyelectronics.com

Specifications:

Power Supply:

Voltage	10VDC to 18VDC
Current	2.7A max @ 18VDC
Connector	2.1mm center positive

Audio Output:

Power	2 x 21W Max @ 18VDC input voltage (stereo mode) (8 ohm load, THD = 10%) 1 x 42W Max @18VDC input voltage (mono mode) (4 ohm load, THD = 10%)

Efficiency:

Up to 87%

Audio Input:

Connector	Euro style screw terminals
Impedance (each channel)	Greater than 10K ohms balanced or unbalanced

Gain:

Selectable	22dB, +25dB, +29.5dB, +36dB

Distortion:

O.1% THD + N

Modulation Scheme:

Selectable fixed frequency (FFM) or Spread-spectrum (SSM)

Clock frequency

FFM	200kHz, 250kHz, 160kHz
SSM	200kHz +- 4kHz

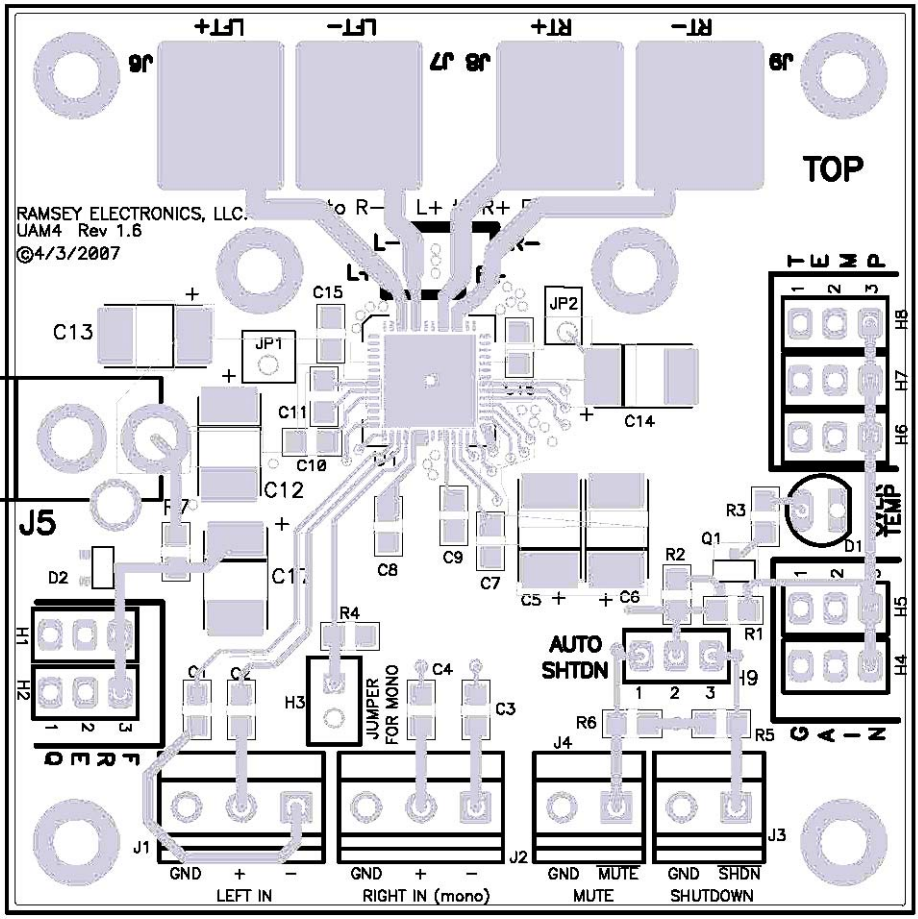
MAX9708 Junction Temperature (degrees C)

Selectable	80, 90, 100, 110, 120, 129, 139, 150

Dimensions:

Board	2.6in x 2.6in x .6in
Corner mounting	4 ea .125 diameter spaced 2.2in x 2.2in x 2.2in x 2.2in
Aux heat sink	2 ea .125in diameter spaced 1.075in apart

UAM4 BOARD PARTS LAYOUT DIAGRAM



NOTES

NOTES

THE RAMSEY KIT WARRANTY

1. GENERAL:
Notice that this is not a "fine print" warranty. We want you to understand your rights and ours too! All Ramsey kits will work if assembled properly. The very fact that your kit includes this new manual is your assurance that prior to release of this kit, a varied group of knowledgeable people have assembled this kit from scratch using this manual. During this process, changes and additions are noted by each assembler and integrated into the final version of the manual…which you have! If you need help, please read through your manual carefully, all information required to properly build and test your kit is contained within the pages! However, customer satisfaction is our goal, so in the event that you do have a problem, please note the following:

2. DEFECTIVE PARTS:
It's always easy to blame a part for a problem in your kit. Before you conclude that a part may be bad, thoroughly check your work. Today's semiconductors and passive components have reached incredibly high reliability levels, and it's sad to say that our human construction skills have not! But on rare occasions a sour component can slip through. All of our kit parts carry the Ramsey Electronics Warranty that they are free from defects for a full ninety (90) days from the date of purchase. Defective parts will be replaced promptly at our expense. If you suspect any part to be defective, please mail it to our factory for testing and replacement. Please send only the defective part(s), not the entire kit. The part(s) MUST be returned to us in suitable condition for testing. Please be aware that testing can usually determine if the part was truly defective or damaged by assembly or usage. Don't be afraid of telling us that you "damaged it" or "burned it out", we're all human and in most cases, replacement parts are very reasonably priced. Remember, our goal for over three decades is to have a happy customer, and we're here to work WITH you, not AGAINST you!

3. MISSING PARTS:
Before assuming a part value is missing, check the parts listing carefully to see if it is a critical value such as a specific coil or IC, or whether a RANGE of values is suitable for the component (such as a "100 to 500 uF capacitor"). Often times, common sense will solve a mysterious missing part problem. If you're missing five 10K ohm resistors and received five extra 1K resistors, you can pretty much be assured that the "1K ohm" resistors are actually the "missing" 10 K parts ("Hum-m-m, I guess the orange band really does look red!") Ramsey Electronics project kits are packed with pride in the USA by our own staff personnel. While separate QC checks are made on all product kits, we too are human, and once in a great while there is a chance something can get through those checks! If you believe we packed an incorrect part or omitted a part clearly indicated in your assembly manual for your Ramsey kit, please contact us with information on the part you need. Contact our Repair Department via telephone, email or writing. Please have your invoice number and date of purchase handy.

4. REFUNDS:
All Ramsey products, kit or factory assembled units have an unconditional 10 day (from the date of purchase) return policy to examine our products. If you are not satisfied for any reason, you may return your unassembled kit with all the parts and instructions, or your factory assembled and tested product, together with your proof of purchase to the factory for a full refund less shipping. The return package should be packed securely. Insurance and tracking is highly recommended. A reminder, this applies to unassembled kits. They must be in the same new condition as received, not partially assembled! Assembled kits cannot be returned for credit. No RMA's are required; simply return to Ramsey Electronics LLC, Attn: Product Returns, 590 Fishers Station Drive, Victor, NY, 14564. If you have any questions, please contact us at 585-924-4560.

5. FACTORY REPAIR OF ASSEMBLED KITS:
Most of us at Ramsey are technically oriented and we do realize that things happen! Even following the best practices, with all of the best intentions, there is that chance that your kit doesn't work when you have completed it. Each manual goes into detailed troubleshooting based on the specific kit to help you troubleshoot the problem. We have found that 95% of returned kits involved wrongly installed components (wrong part or backwards polarity). This section of the warranty assumes you have gone through all those steps, and have now reached the point that you need to send it back.

To qualify for factory repair of customer assembled kits, the following conditions apply:

1. Kits must not be assembled with acid solder flux
2. Kit boards or circuits must not be modified in any manner from the version received
3. Kits must be fully assembled, not partially assembled. Our warranty does not include "finishing" your kit!
4. Must include a full description of the problem encountered including the troubleshooting steps you have already done.
5. Must not include non-standard, non-Ramsey accessories, cases, enclosures, knobs, etc. or any batteries.
6. Must include the minimum repair fee of $25 USD in the form of check, money order or credit card authorization.
7. Ramsey Electronics, LLC reserves the right to refuse any repair due to excessive errors in construction methods.
8. If, due to customer construction methods, the repair is estimated to exceed the minimum flat rate, Ramsey Electronics, LLC will contact the customer to discuss the repairs needed and to receive authorization and payment for repair prior to repair.
9. In the unlikely case that a defective part is found to be the cause of the problem, the repairs will be made at no-charge to the customer, and any payments received for repair will be returned or credited back to the customer.
10. Properly pack your kit, insure the package, and use a carrier that can be tracked. Ramsey Electronics, LLC is not responsible for any loss or damage in shipment. Send the package together with your repair fee to the return address below. No RMA is required.

6. FACTORY REPAIR FEES:
Please understand that our Tech Support Group personnel are not volunteers! They are a dedicated group of highly trained technicians each configured with a very properly equipped test bench. Upon receipt of a repair, the setup, testing, diagnosis, repair, paperwork, and repacking of your kit requires nearly an hour of their time regardless of the size or complexity of the kit! The minimum repair fee represents ½ hour Tech Support time at $50/hour USD. We try to keep all kit repairs within the realm of the $25 flat rate whenever possible…and trust us; we exceed that time spent on most kits received more often than not!

7. CONTACT INFORMATION AND RETURN ADDRESS:

Technical Questions

RAMSEY ELECTRONICS, LLC
Attn: Tech Support
590 Fishers Station Drive
Victor, NY 14564
585-924-4560; 585-924-4886 Fax
techsupport@ramseyelectronicscom

Product Repair & Returns

RAMSEY ELECTRONICS, LLC
Attn: Repairs
590 Fishers Station Drive
Victor, NY 14564
585-924-4560; 585-924-4886 Fax
repairs@ramseyelectronics.com

QUICK REFERENCE

REQUIRED TOOLS

- Soldering Iron
- Thin Rosin Core Solder
- Needle Nose Pliers
- Small Diagonal Cutters

ADDITIONAL SUGGESTED ITEMS

- Helping Hands Holder
- Desoldering Braid
- OptiVisor Magnifier

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590 Fishers Station Drive
Victor, New York 14564
Phone (585) 924-4560
Fax (585) 924-4555
www.ramseyelectronics.com

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Assembly and Instruction manual for:
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