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WM8 Installation Instructions



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SPECIFICATIONS*

Frequency Response	2 Hz-100kHz
(Boost=0, Qs=Qb)	
Harmonic Distortion	<.01% (1 kHz)
Signal/Noise Ratio	>110 dB (Ref. 10 V)
Input Impedance	80 k Ω
Output Impedance	10 Ω
Maximum Output Voltage	25 V (P-P)
Output Load Capability	100 Ω (min.)
Bass Boost Range	0-24 dB
Net Q Range	.25 - 1.0
Dimensions	17"W x 8.5"D x 3.5"H

*Specifications subject to change without notice.

INTRODUCTION

The BASSIS is a specialized electronic equalizer which enables acoustic-suspension (closed-box) loudspeakers to take on a wide range of alternative bass responses improving some vented (bass-reflex) designs.

By adjusting the front panel controls, the line-level audio signal is equalized as the exact inverse of a given loudspeaker's bass response, and the new bass cutoff frequency and damping are defined. The filtered signal is then passed to the power amp and on to the speakers, where the existing bass response is cancelled and replaced by the desired bass response. Figure 1 illustrates the frequency response at various points in the signal path.

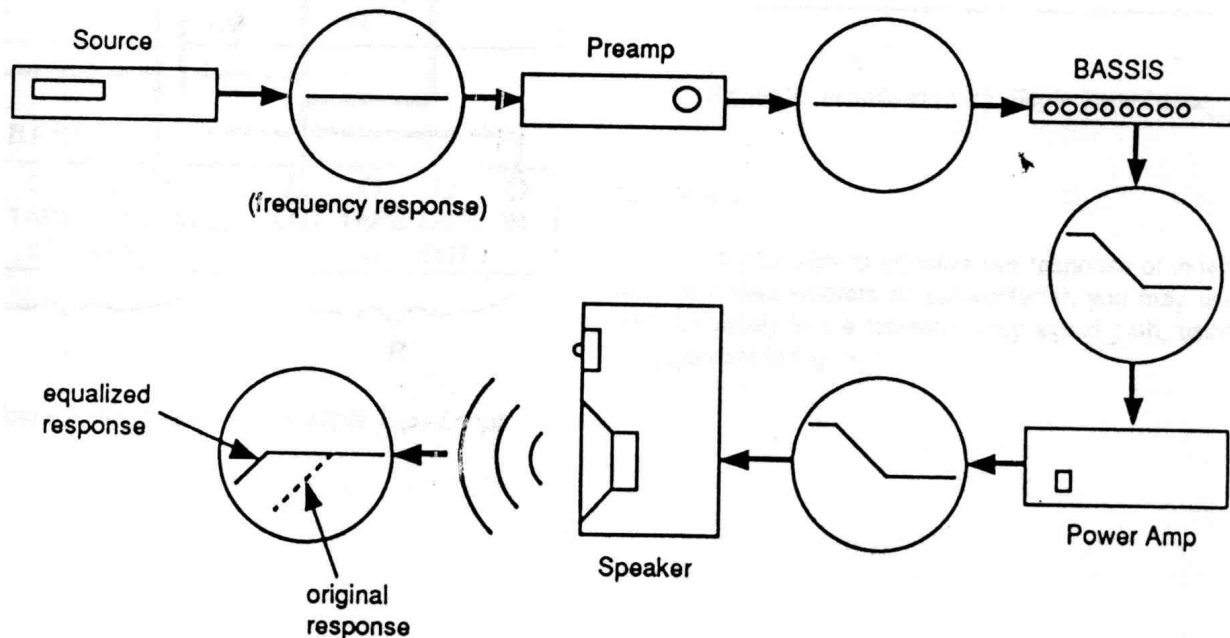


Figure 1. Installation with Separate Components

INSTALLATION

There are several ways of connecting the BASSIS to your system, depending upon your present setup. In any case, *make sure all components are turned off while making connections, and read the rear panel labelling carefully.* Do not apply power to the unit when installation is complete. You must make the adjustments described in "Operation" first.

SEPARATE COMPONENTS

If you own a separate preamp/power amp combination, you can use the arrangement shown in Figure 1, where the **OUTPUT** from the preamp is connected to the BASSIS' **INPUT** jacks, and the BASSIS' **OUTPUT** jacks are connected to your power amp's **INPUTS**. The **BYPASS** switch removes the BASSIS circuitry from the signal path by connecting the **INPUT** directly to the **OUTPUT**. This allows easy evaluation of the equalizer's effectiveness.

If you own an integrated amplifier or receiver with **PREAMP OUT** and **POWER AMP IN** jacks, the same connection as for separates can be used.

MULTIPLE TAPE LOOPS

If your integrated amp or receiver has an unused tape loop (or a dedicated signal-processing loop), you may connect the BASSIS as shown in Figure 2, below.

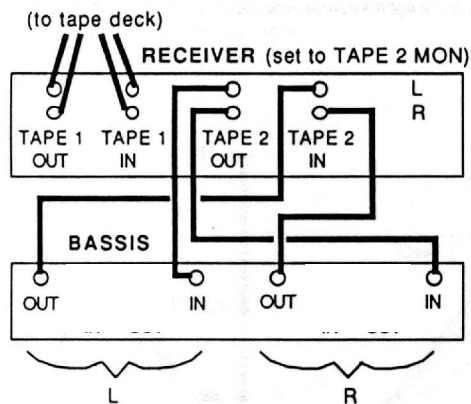


Figure 2. Installation with Multiple Tape Loops

Be sure to press the **TAPE 2 MON** button on your receiver. You can remove the BASSIS from the signal path in two ways now: (1) turn off the **TAPE 2 MON** button on your receiver, or (2) use the **BYPASS** switch on the BASSIS.

BIAMPING

If you wish to equalize the response of independently amplified woofers or subwoofer(s), you may use the BASSIS solely in the low-frequency signal path, using the arrangement in Figure 4.

OPERATION

The various controls on the BASSIS must be adjusted to match your system's requirements *before* power is applied to the unit. If the 24 dB (factor of 16) maximum **BOOST** setting is applied incorrectly, damage to your speakers and/or amplifier may result.

SETTING Qs

Figure 5 shows the bass response of various acoustic-suspension loudspeakers. If the speaker's Q is greater than 0.7, the response may reach a peak at the "resonant frequency", then fall off at a rate of 12 dB/octave at lower frequencies. If your speaker has a "boomy" or "heavy" sound, then it is likely that its Q is in the "underdamped" range from 1.0 to 1.6. On the other hand, speakers whose Q is .5 or .6 will be "well-damped", with a "tight" or even "lightweight" sound (due to the prematurely-falling bass response).

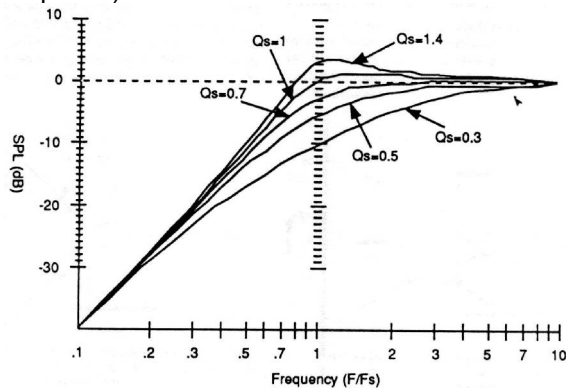


Figure 5. Damping of Various Acoustic-Suspension Loudspeakers

You must adjust the Left and Right channel controls labelled **Qs** (Speaker Q) according to your own speakers' characteristics. (You will ordinarily use the same settings for Left and Right channels.) Choose a value which approximates the damping for your speakers, as suggested above. If in doubt, use a setting around .7, corresponding to the value most speaker designers aim for. You can later fine-tune the setting if necessary.

Setting Fs

You must now set the Left and Right channel **Fs** (Speaker Corner Frequency or -- less accurately -- Resonant Frequency) controls. If you have frequency response specifications for your loudspeakers of the form: "55 Hz to 18 kHz \pm 3dB" or ".3 dB point at 75 Hz", you can approximate **Fs** by making use of Figure 5 and your estimate for **Qs**. For example, if your

speaker's value for **Qs** is .5, then Figure 5 shows that its -3 dB point is near $1.6 \times Fs$. Thus, if your specs indicate a -3dB point of 75 Hz, then a setting of $Fs = 75/1.6 = 45\text{Hz}$ should be used. On the other hand if your speaker has **Qs** = 1.4 (boomy-sounding), then Figure 5 indicates its -3 dB point is near $.65 \times Fs$. Hence if its specifications indicate a frequency response like: "52 Hz to 22 kHz \pm 3dB", then you should use a setting of $Fs + 52/.65 = 80\text{Hz}$. Finally, if you assume **Qs** = .7 for your speakers, then **Fs** equals the specified -3 dB point.

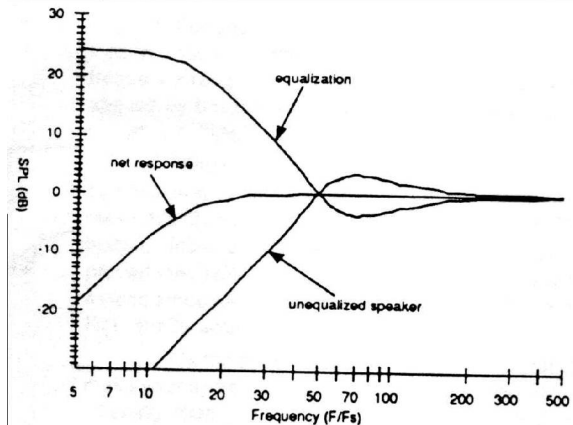


Figure 6. BASSIS effect with $Qb = .7$

If you have no frequency response specs for your loudspeakers, or if the specs are of the form "50 Hz to 20 kHz" (without \pm x dB limits) then you will have to estimate **Fs**. Most medium-size "bookshelf" speakers have **Fs** around 65 Hz; compact speakers (enclosure less than 14" high) may have **Fs** closer to 80 Hz; large speakers (greater than 30" high) may have **Fs** around 40-50 Hz. For those tiny die-cast speakers like Radio Shack's Minimus 7, try a value of 100 Hz or higher for **Fs**, with **Qs** around .8 or .9.

While these settings are not too critical, it is important to get in the ballpark of the correct setting before using the BASSIS. The settings may be fine-tuned later if necessary. As an example of the effect of a severe mismatch, suppose your speaker has $Fs = 50\text{ Hz}$, and $Qs = 1$, and suppose that you incorrectly set the BASSIS according to $Fs = 100\text{ Hz}$, $Qs = .5$. If you make the remaining adjustments (Boost and Qb , as described below) to try to extend the bass response, the BASSIS will give a 6 dB boost

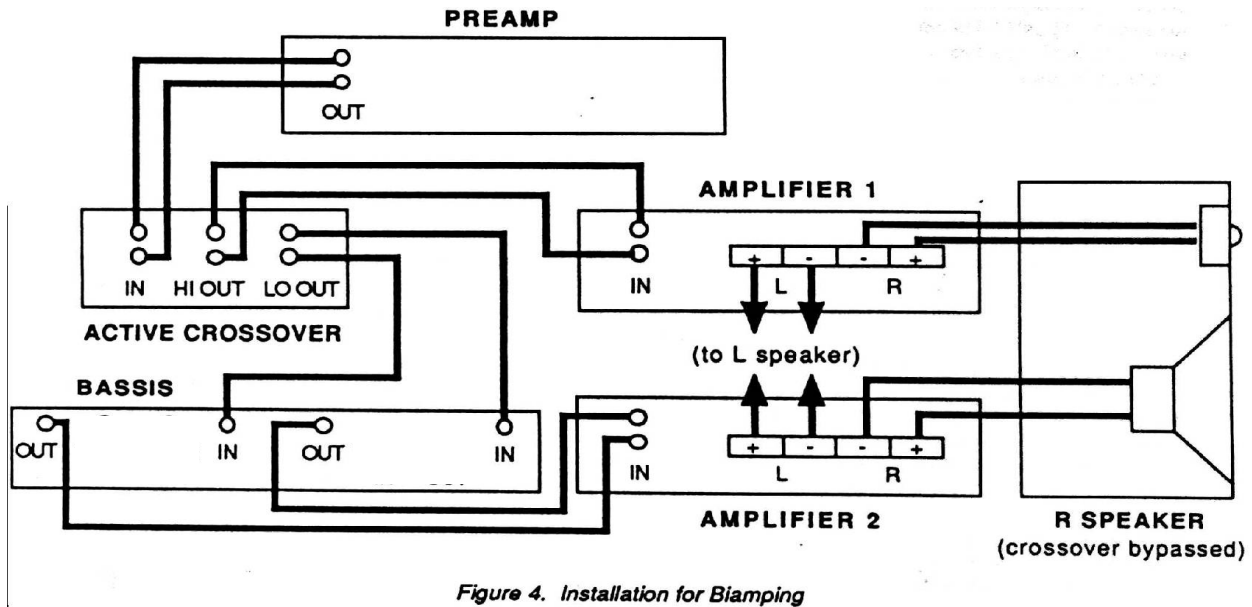


Figure 4. Installation for Biamping

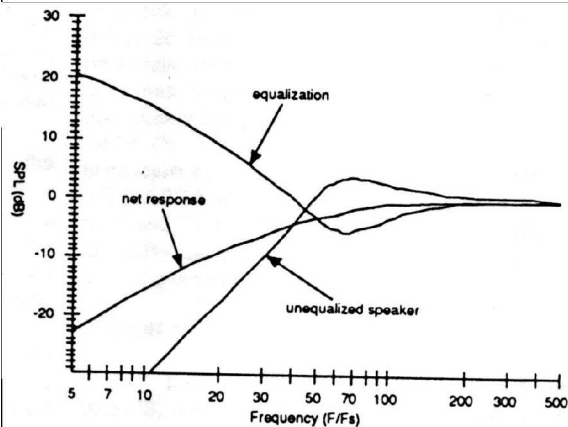


Figure 7. BASSIS effect with $Q_b = .25$

In the net response at 100 Hz and more than 12 dB too much bass at 50 Hz. (This speaker would be nearly flat to 50 Hz. without equalization.) The unnecessary bass boost will give a very "heavy" sound to most recordings, and may damage the speakers or cause distortion when listening at high levels.

SETTING BOOST

Once the correct settings of F_s and Q_s have been made to match your loudspeakers, you may never need to readjust these controls. However, the remaining controls -- **BOOST** and Q_b -- may be adjusted to give the best results with your choice of listening levels and source material. **BOOST** indicates the amount by which low frequency signals are amplified. If the F_s and Q_s setting are correct, only those frequencies where your speaker is deficient will be amplified, so that the effect is to extend bass response. (In

contrast, the BASSIS control on your receiver or preamp indiscriminately boosts the entire low-frequency portion on the signal, often leading to a "boomy" or "heavy" quality.) A setting of **BOOST** = 0 dB will not extend the bass, but will allow you to effectively adjust your woofer's damping by changing Q_b as described below. A setting of **BOOST** = 12 dB will extend bass response one octave lower, and a setting of **BOOST** = 24 dB will extend bass by two octaves.

SETTING Q_b

The best setting for Q_b is largely dependent upon your taste and on the listening-room acoustics. This control adjusts the Q (see Figure 5) of the new bass response dictated by the BASSIS. If you want a very "tight" sound, choose a $Q_b = .5$ or smaller. If you want a "looser", more "full" bass, use $Q_b = 1$. $Q_b = .7$ gives the "maximally-flat" response. Figures 6 and 7 show the results when the BASSIS is used to correct a somewhat boomy-sounding speaker whose response drops below 60 Hz ($Q_s = 1.4$, $F_s = 60$). In both cases **BOOST** = 24 dB is used, but in Figure 6 a setting of $Q_b = .7$ is used, while in Figure 7 $Q_b = .25$ is used.

It is interesting to note that settings of $Q_b \leq .5$ give a transient response with absolutely no "ringing", so that the BASSIS allows you to achieve a "non-resonant" bass response without need for a refrigerator-sized "transmission-line" loudspeaker enclosure.

VENTED SPEAKERS

The BASSIS can be used to reduce the boominess of poorly tuned vented ("ported", "bass-reflex", or "passive radiator") speakers. In this case, use a setting of **BOOST** = 0 dB (*never* boost the bass below the resonant frequency of a vented speaker!), **Qs** = 1.4, and adjust **Qb** to your taste. Or, you can plug the vent and forego the efficiency advantage of the vented design, allowing you to use the entire range of equalization options as you would for an acoustic-suspension loudspeaker.

FINAL ADJUSTMENTS

You are now ready to apply power to your system including the BASSIS. Advance your **VOLUME** control slowly to make sure the unit is working properly. If you have difficulties, see the "Troubleshooting" section of this manual (Appendix F). There are a few additional points to keep in mind to obtain optimum performance.

If your source material is LP records, you should test your system's sensitivity to record warps. Remove the grilles from your speakers. With the **VOLUME** control set low and the BASSIS set with **BOOST** = 24 dB, play the silent lead-in observing your woofer cones. If a significant "pumping" motion is visible at your normal **VOLUME** setting, engage the **20 HZ CUT** filter on the BASSIS.

Even when properly adjusted, the bass extension offered by the BASSIS must be used with discretion. While the BASSIS can give a 6-1/2" woofer the same bass response as that of a 12" woofer, it cannot increase the *power handling* of small speakers. Do not engage your preamp or receiver's **LOUDNESS** button or make excellent use of the **BASS** tone control while using the BASSIS. When listening at high **VOLUME** levels to material with significant low-bass content, it is wise to reduce the **BOOST** setting, reduce **Qb**, or **BYPASS** the unit entirely.

Fortunately, the low-bass content of most recordings is much smaller than the content of the remaining frequency range. In these cases the low-frequency boost applied by the BASSIS will not impair the speaker or amplifier power capabilities.

When using the BASSIS, don't expect to hear the sort of elevated bass produced by turning up your preamp or receiver's **BASS** tone control or pressing the **LOUDNESS** button. Instead, the mid-bass will be reproduced with improved neutrality and "openness", and the response will

extend smoothly into the lower bass, particularly when using high-quality source material.

On the other hand, extending the bass response will make your system more sensitive to "standing waves" in the listening room. You may have to experiment with new locations for your loudspeakers or listening seat to obtain the smoothest overall bass response.

TECHNICAL DESCRIPTION

The equalization offered by the BASSIS can be described in terms of the biquadratic *transfer function*:

$$G(s) = \frac{w_s^2 + 2 d_s w_s s + s^2}{w_b^2 + 2 d_b w_b s + s^2}$$

where w_s and d_s are the corner frequency and damping ratio of the woofer and w_b and d_b are the new corner frequency and damping ratio chosen by the user ($w = 2\pi f$ and $d = 0.5/Q$). The numerator cancels the 2nd-order high-pass effect of the acoustic-suspension woofer and the denominator defines the new 2nd-order cutoff.

CIRCUIT

The circuitry for each channel of the BASSIS is contained on an individual printed circuit board (PC board), using high-speed op-amps and close-tolerance passive components. A power supply is contained on a third board. The schematic diagram of a single channel is shown in Appendix A.

The heart of the circuit is a 4-amplifier biquadratic filter, supplemented with additional op-amps to allow the independent adjustment of the damping and cutoff frequency parameters. Op-amps IC1, IC2 and IC3 provide the equalization, while IC4A is part of the **20 Hz CUT** filter. Op-amp IC4B provides low output impedance and high current capability, to allow long cable runs with minimal loading effects.

Dual potentiometer VR3 adjusts the frequency matching the speaker's corner frequency over the range: $F_s = 30 \text{ Hz to } 130 \text{ Hz}$. Potentiometer VR2 adjusts the damping which exactly cancels the speaker's response, for speakers with Q_s from .4 to 1.6. Potentiometers VR1 and VR4 set the corner frequency and damping of the new bass response over the range: $F_b = F_s \text{ to } F_s/4$ and $Q_b = .25 \text{ to } 1$. Since each octave of bass extension requires 12 dB of amplification at low

frequencies, pot VR1 is actually labelled BOOST, with a range of 0 to 24 dB.

Switch S1 activates the **20 HZ CUT** (high-pass, infrasonic, or "subsonic") filter with an 18 dB/octave slope below 20 Hz, to avoid the amplification of inaudible but potentially destructive low-frequency signals. Switch S2 combines the Left and Right channels at frequencies below the speaker's original corner frequency (provided the settings for **Fs**, **Qs**, **BOOST**, and **Qb** are identical for both channels) to cancel out-of-phase **RUMBLE** signals. Switch S4 provides a **BYPASS** function to eliminate the equalizer from the signal path, and Switch S3 allows the user to regain tape monitoring capability, in the event that the BASSIS is used in the sole tape loop of a receiver or preamp.

OPTION 1

If you are constructing your own enclosure for the BASSIS, you may choose to calculate the values of fixed resistors which reflect your particular speaker's **Fs** and **Qs**, and which provide a fixed amount of boost. This allows you to eliminate all but a

Single potentiometer -- which controls the damping (**Qb**). Since the setting of the **Qb** control influences the level of bass about the new corner frequency (compare Figures 6 and 7), you retain control of the net bass extension. To implement this option, follow the assembly procedure detailed in the next section of this manual, *except*: (a) leave out the Molex connectors which attach the **BOOST** and **Fs** pots to the PC board; (b) wire only that part of Molex connector P2 which attaches the **Qb** pot to the PC board; (c) recalculate the values of resistors R7, R8, R16, R4, and R26 according to your speakers' characteristics and the desired amount of boost:

$$R_7 = R_8 = 1/(6.28 \times F_s \times C_1)$$

$$R_{16} = R_{19} \times Q_s$$

$$R_4 = R_{26} = R_{28} \times 10^{\text{boost}/40}$$

Where BOOST is given in dB. Now you can use a dual 10k linear pot to adjust the damping (**Qb**) of the Left and Right channels simultaneously. Or, if you want to eliminate the remaining control as well, remove VR4 and recalculate R11 for the desired (fixed) value of **Qb**:

$$R_{11} = R_2 \times Q_b.$$

OPTION 2

There is space in the standard BASSIS enclosure for an additional power supply for constructors interested in true dual-mono

operation. Simply follow the steps in the "Assembly" section of this manual, but wire the inputs of a second ± 15 V power supply to the power cord as well, and power the Right-channel PC board from this power supply.

OPTION 3

On the other hand, if the BASSIS is to be used with a single-channel, independently-amplified subwoofer, then only a single PC board need be assembled, and a smaller enclosure may be employed. Assembly is the same as described in this manual, except that the switches may be SPDT rather than DPDT.

ASSEMBLY (KIT VERSION)

The parts for a stereo implementation include: two BASSIS printed circuit boards and components, one ± 15 V power supply assembly (such as Marchand Electronics' Model PS10), and one enclosure with hardware. The Appendices of this manual contain a detailed Overall Parts List as well as a PC Board Parts List. You will first assemble the circuit boards, then mount them in the enclosure and attach the front panel controls.

GENERAL WIRING PRACTICE

The tools necessary to assemble the BASSIS include: a 15 - 30W soldering pencil, rosin-core solder, wire cutters, and a Phillips-head screwdriver. Other useful tools are: a desoldering tool or solder wick (to remove excess solder), a project holder, long-nose pliers, and a wire stripper. A clean, well-lit working area will minimize frustrations.

When soldering a component to the circuit board, first mount the component so that it fits snugly against the silkscreened side of the board. Next, heat the component lead and the circuit board trace (on the foil side) simultaneously with the soldering pencil and apply solder until it melts and flows around the component lead. With practice the entire process should take only 5 seconds or so. Remove the pencil and allow the connection to cool for a few seconds before moving. Cut off the excess lead close to the solder joint. If a solder bridge was inadvertently made to another trace, remove the solder carefully with a desoldering bulb or braid. Keep the tip of the soldering pencil clean by wiping on a damp sponge every few minutes.

Components can be identified as follows. Resistors use the 4-band color code in the chart shown below. The fifth band is always brown, indicating 1% tolerance. For example, a resistor

marked Brown-Black-Black-Gold-Brown is a 10 Ω resistor with 1% tolerance.

1st, 2nd, & 3rd Bands		4th Band	
Black	0	Black	x 1
Brown	1	Brown	x 10
Red	2	Red	x 100
Orange	3	Orange	x 1000
Yellow	4	Yellow	x 10,000
Green	5	Green	x 100,100
Blue	6	Blue	x 1,000,000
Violet	7	Silver	/ 100
Gray	8	Gold	/ 10
White	9		

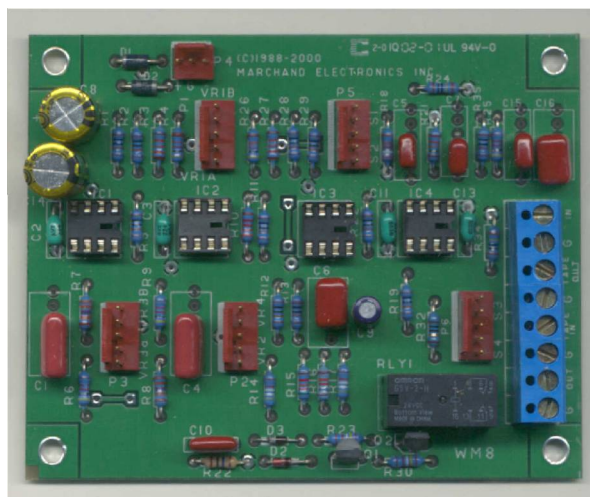
Figure 8. Resistor Color Code

Capacitors and diodes are individually marked, though somewhat cryptically. C1 and C4 may be labelled "393", while C5, C7, and C15 are marked "104K".

Before beginning assembly, it is suggested that you compare the components to the Parts List and sort them accordingly. (Look inside the heat-shrink tubing if anything is missing!)

PC BOARD ASSEMBLY

Assembly of the BASSIS is simplified by a guide which has been silkscreened on to the printed circuit boards. Appendix B repeats this layout diagram. To mount components onto the boards, observe the placement shown on the layout diagram and on the silkscreen pattern, and match with the values shown on the PC Board Parts List in Appendix D. The following checklist should be completed, for both the Left and Right channels.



L R

[] [] 1. Bend the leads of resistors R1-R35 and solder them in place as shown on the layout diagram. Cut off the excess leads as you go.

[] [] 2. Deleted.

[] [] 3. Mount diodes D1-D4 and solder them in place. Be sure to observe the correct polarity by positioning the side with the band as shown in the diagram.

[] [] 4. Mount and solder the four (4) IC sockets in place on the circuit board. Be sure the side with the notch is oriented as shown. Do not insert the op-amps into these sockets yet.

[] [] 5. Install the aluminum electrolytic capacitors C8 and C14, being careful to orient the + and - leads as shown. Install the nonpolar electrolytic capacitor C9 with either orientation.

[] [] 6. Install the remaining polypropylene, polyester and ceramic capacitors C1-C7, C10-C-13, and C15-C16. (These can be oriented either way.)

[] [] 7. Install Q1, 2N5087.

[] [] 8. Install Q2, 2N2222.

[] [] 9. Mount the 3-pin male Molex connector and the five (5) 5-pin male Molex connectors according to the diagram. The edge with the plastic protrusion corresponds to the band on the layout diagram.

[] [] 10. Press op-amps 1C1-1C4 into the four IC sockets, being sure to orient them so that the notch matches the notch on the sockets, as shown on the diagram. You may need to (gently) bend the leads inward slightly to match the holes in the sockets. If you resolder any of the socket leads later, remove the corresponding op-amp first to protect it from excessive heating.

Now inspect the foil side of the board for solder splashes or bridges and remove them with the desoldering tool. Check for any empty holes, possibly indicating a missing component. (Some unused holes may remain, to allow substitution of capacitors with differing physical dimensions.) Double-check the orientation of the aluminum electrolytic capacitors, diodes, transistors, connectors, and ICs.

CHASSIS WIRING

At this point you should have assembled the Left and Right channel PC boards, and a ± 15 V power supply. The Overall Parts List in Appendix E details the parts needed for assembling the BASSIS chassis. Appendix C sketches the interior of the unit after completion of a single channel.

Do not apply power to the unit until all the assembly is complete and you've read the "Operation" section of this manual.

[] 11. Mount the BASSIS PC boards and power supply inside your enclosure with standoffs and #6 screws. The PS 10-power supply should be oriented with the transformer closer to the rear panel.

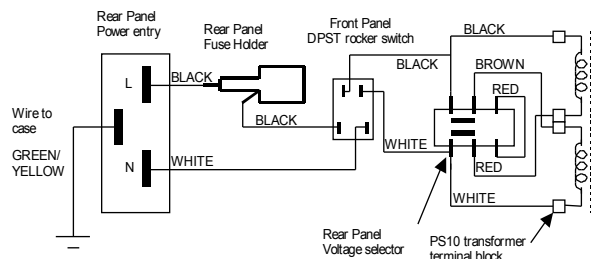
[] 12. Mount potentiometers VR1-VR4 for each channel (total of eight (8) pots on the inside of the front panel. The dual pots (VR1 and VR3) correspond to the **BOOST** and **Fs** labels on the front panel. The pots should have their solder lugs facing up.

[] 13. Mount the fuseholder on the rear panel but do not insert the fuse yet.

[] 14. Mount the power entry connector onto the rear panel.

[] 15. Mount the DPDT voltage selector switch on the rear panel.

[] 16. Mount the RCA bukhhead connectors on the rear panel. Two have black insulators and two have red insulators. Mount the red connectors in the right channel and the black ones in the left channel.



Power entry with voltage selector switch on rear panel and rocker switch on front panel.



Power entry with voltage selector switch.

The PS10 power supply of the crossover should be grounded to the cabinet through a power resistor.

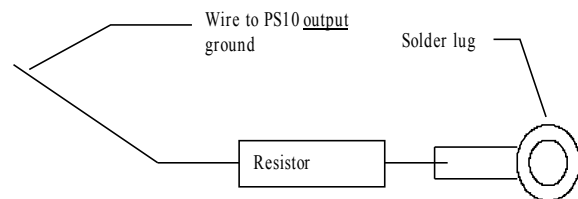
Solder one lead of the 2400 Ohm power resistor to the solder lug.

Solder a 3" length of wire to the other end of the power resistor.

Install the shrink tubing over the resistor and part of the solder lug.

Attach the solder lug to the cabinet using one of the 6-32 screws on the front panel.

Insert the free end of the wire in the center terminal of the three position terminal block of the PS10 output. This is the neutral DC output.



Now the **AC power wiring** will be hooked up to the power supply.

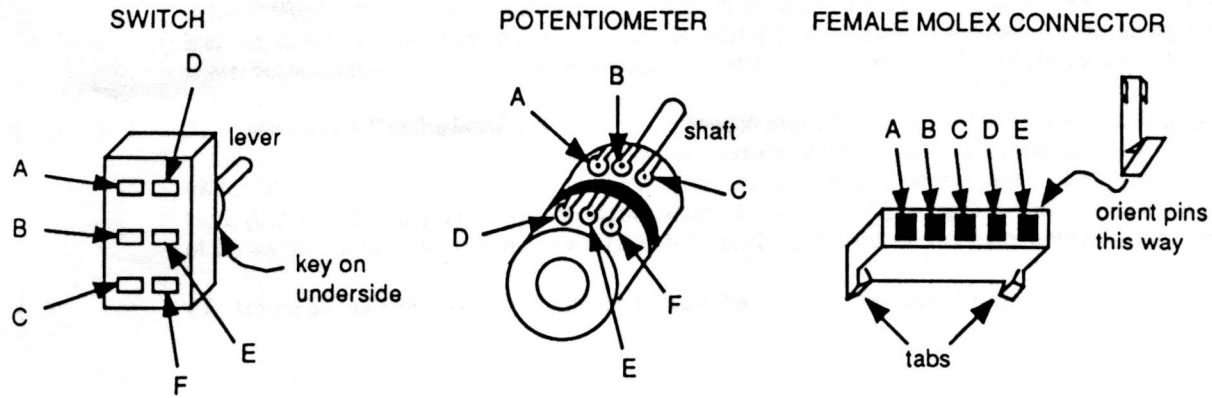
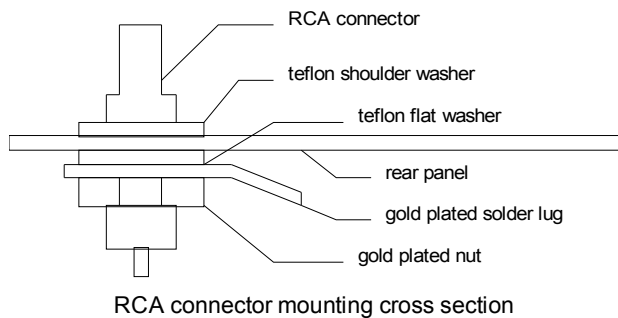


Figure 9. Wiring Codes

Use high voltage (thick insulation) #22 hookup wire to make the connections between the power entry connector, the power switch on the front panel and the power selector switch on the rear panel and the fuse holder. Install heat shrink tubing over all junctions. Use wire colors as shown.

Make sure to securely install the grounding wire between the ground terminal on the power entry connector and the chassis. Solder a 3" piece of green/yellow hookup wire to one of the solder lugs provided. Solder the free end of the wire to the ground terminal and secure the solder lug to the chassis with one of the 6/32 screws holding the rear panel.

Set the voltage selector switch to the proper voltage before proceeding.



Install a **1A fuse** in the fuse holder.

We will now **test the power supply**. Plug the cord in and turn on the power switch. The two LED indicators on the power supply and the front panel LED indicator should light up.

UNPLUG the power cord before proceeding.

[] 17. Cut a 4" piece of brown wire and 4" of red wire, strip 1/4" from each end, and attach a spade lug to one end of each wire. Slide a 1-1/2" piece of heat-shrink tubing onto the other end of each

wire. Solder the brown wire to the cathode lead of the front panel LED (the cathode is the lead closer to the flattened edge of the LED). Solder the red wire to a 10k resistor. Solder the other end of this resistor to the remaining LED lead. Slide the heat-shrink over the exposed leads and heat with a match. Mount the LED in the appropriate socket on the front panel. Leave the other ends of these wires loose for now.

For the remaining steps, the codes shown in Figure 9 will be used to refer to the lugs on the potentiometers, switches and Molex connectors.

[] [] 18. For the Left and Right channel circuit boards, cut pieces of red, brown, and orange wire long enough to reach from male Molex connector P4 on the circuit board to the output terminals on the power supply (with a few inches to spare). Strip 1/4" from each end. Attach spade lugs to one end of each of the three wires and twist the wires together for neatness (-- unless you're color-blind, in which case you should attach the wires one at a time to keep track!). Attach Molex terminal pins to the other end of each wire. Using the coding in Figure 9, press the pin attached to the brown wire into jack A in a 30pin female Molex connector, and press the pins on the red and orange wires into jacks B and C, respectively. Snap the female connector onto P4.

[] [] 19. Screw the spade lugs attached to the brown wires for each channel to the -15 V terminal of the power supply, along with the spade lug attached to the cathode of the front panel LED. Screw the spade lugs attached to the red wires to the Ground terminal on the power supply. Screw the spade lugs attached to the orange wires to the + 15 V terminal of the power supply, along with the spade lug attached to the anode of the front panel LED. *These connections are critical.* Double check that you've linked jack A of

the Molex connector to the - 15 V terminal, jack B to Ground, and jack C to + 15 V.

[] [] 20. Using a short piece of bared wire link lugs C and F together on the **BOOST** pots, and link lugs A and D together on the **Fs** pots.

[] [] 21. Cut 5 wires of different colors, long enough to reach from male Molex connector P1 on the circuit board to the corresponding **BOOST** pot. Strip 1/4" from each end and twist the wires together for neatness. Attach Molex terminal pins to one end of each wire, and slide a 3/4" piece of heat-shrink tubing onto the other end. Press the terminal pins into a 5-pin female Molex connector as shown in Figure 9. Solder the other end of each wire to the lugs of the **BOOST** pot, observing the colors so that (see Figure 9): jack A on the Molex connector connects to solder lug D on the pot, jack B connects to lug E, jack C connects to lug F, jack D connects to lug B, and jack E connects to lug A. Slide the heat-shrink over the solder joint and heat with a match. Snap the female Molex connector onto male connector P1.

[] [] 22. Using the same procedure as in Step 21 (don't forget the heatshrink tubing), connect jack A of the female Molex connector you will use with P3, to lug F on the **Fs** pot. Connect jack B to lug E, jack C to lug D, jack D to lug B and jack E to lug C. Snap the Molex connector onto P3 on the circuit board.

[] [] 23. Using the same procedure as in Step 21, connect jack A of the female Molex connector corresponding with P2, to lug A on the **Qb** pot. Connect jack B to lug B on the same pot. Connect jack C to lug C on the same pot, and use a short piece of wire to attach lug C of the **Qb** pot to lug C of the **Qs** pot. Now connect jack D to lug B of the **Qs** pot and jack E to lug A of the **Qs** pot. Snap the Molex connector onto P2 on the circuit board.

[] [] 24. Using the same procedure, connect jack A of the female Molex connector corresponding to P5, to lug D (Left channel) or lug A (Right channel) of a DPDT switch (see Figure 9). Be sure you are holding the switch so that the keyhole tab is on the *underside* of the shaft. Connect jack B to lug E (Left channel) or lug B (Right channel). Connect jack C to lug F (Left channel) or lug C (Right channel) of the same switch. *Skip jack D on the Molex connector.* Snap the Molex connector onto P5 on the circuit board. When both channels are completed, mount the DPDT switch in the **20 HZ CUT** hole.

[] [] 25. Connect jack A of the Molex connector P6 to lug F (Left channel) or lug C (Right channel) of the remaining DPDT switch. Connect jack D of the Molex connector to lug E (L channel) or lug B (R channel) of the switch. Connect jack E to lug D (L channel) or lug A (R channel) of the switch. Mount this switch in the **BYPASS** hole on the front panel.

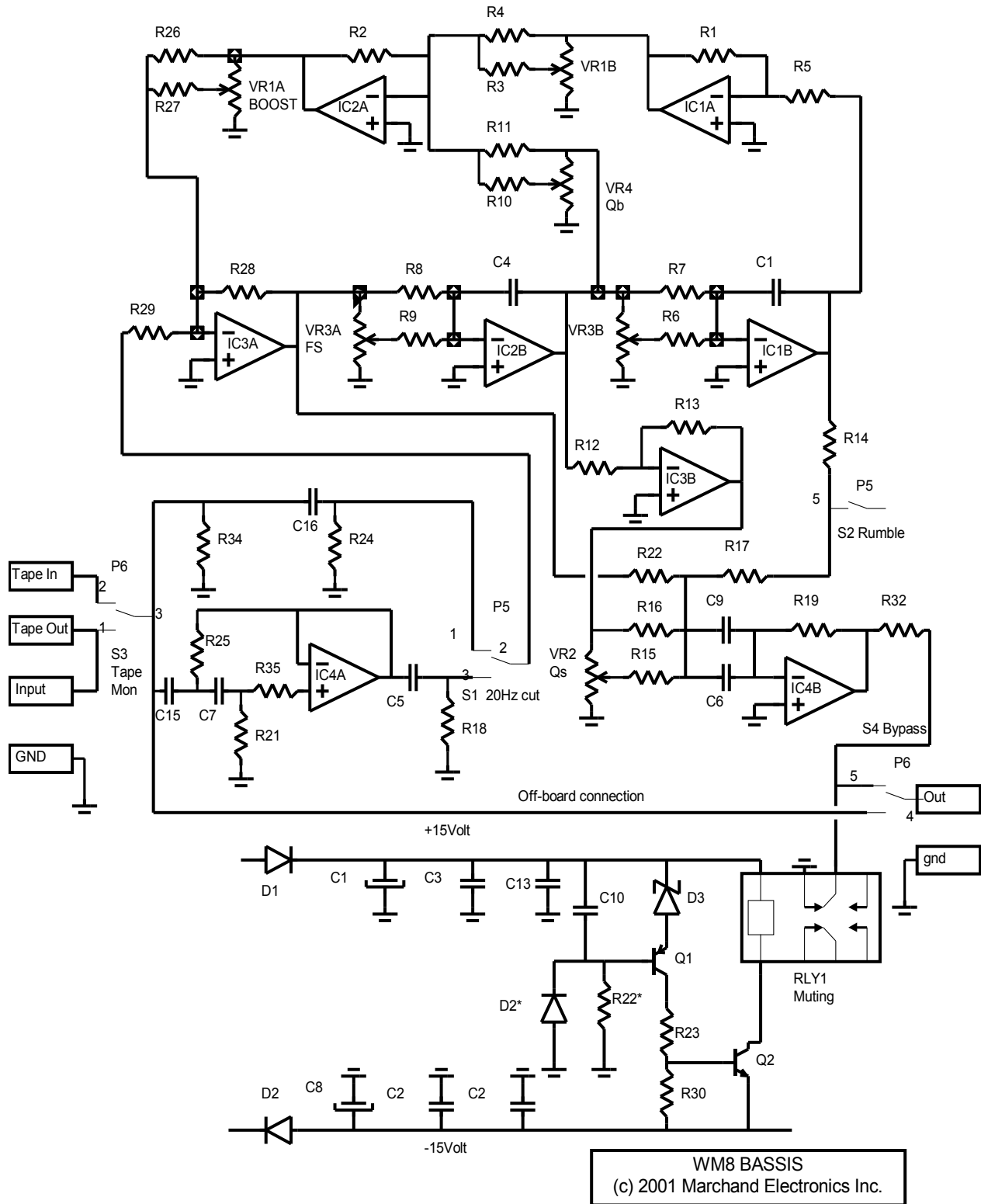
[] [] 26. Install a jumper wire between jack B of connector P6 and jack C of same. Snap the Molex connector onto P6 on the circuit board.

[] [] 27. Install a jumper wire between the tape-in and tape-out terminals of the 8-position blue terminal block on the WM8 circuit boards.

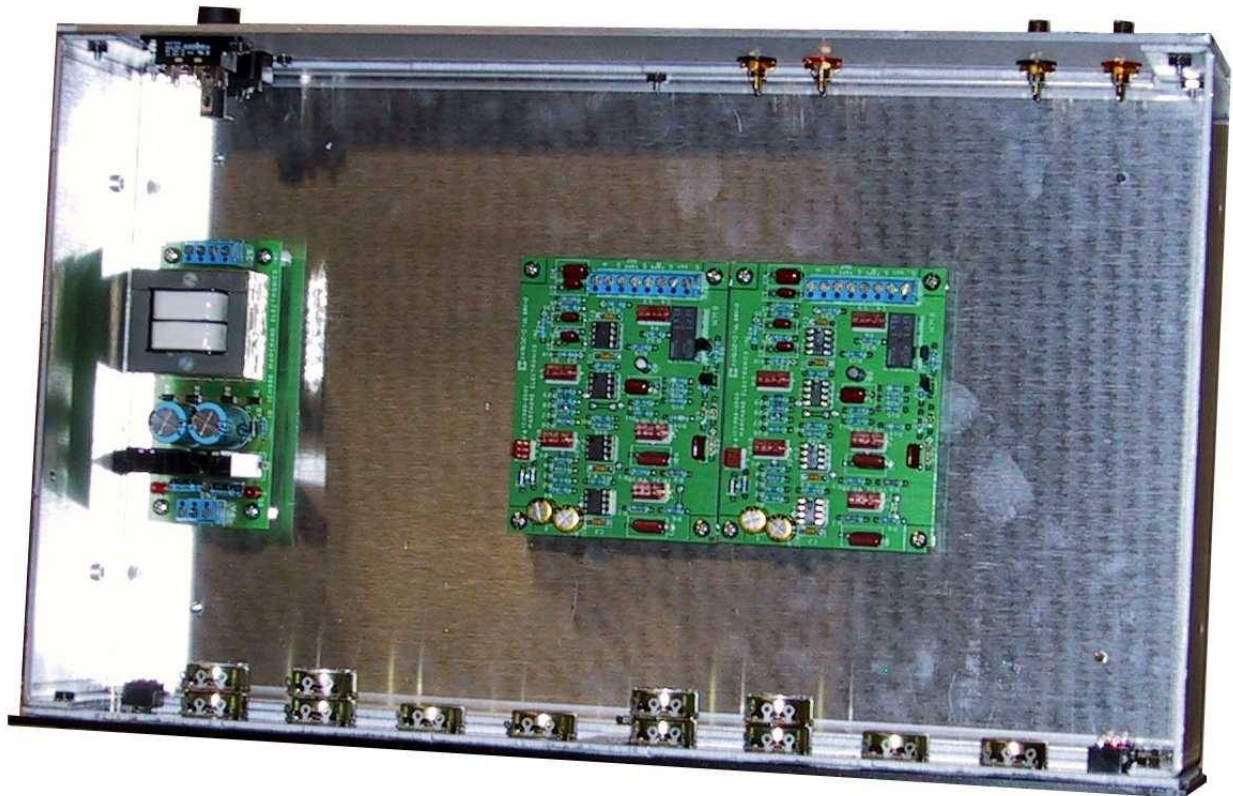
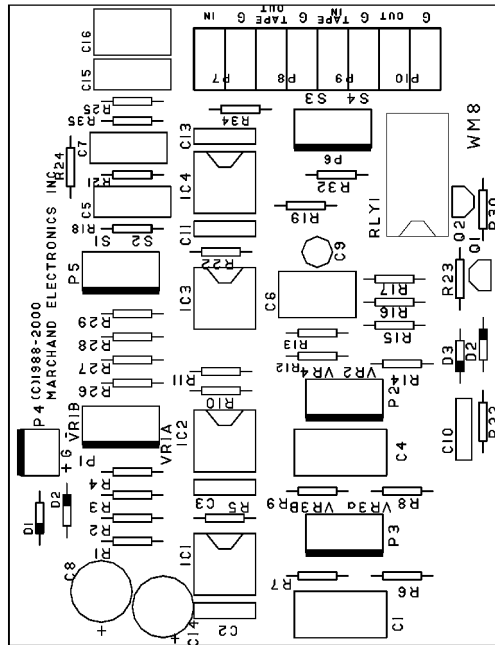
[] [] 28. Mount all the knobs onto the pots, and insert the fuse into the fuseholder. Note that the knobs are mounted so that they will turn the same angle fully clockwise as fully counterclockwise.

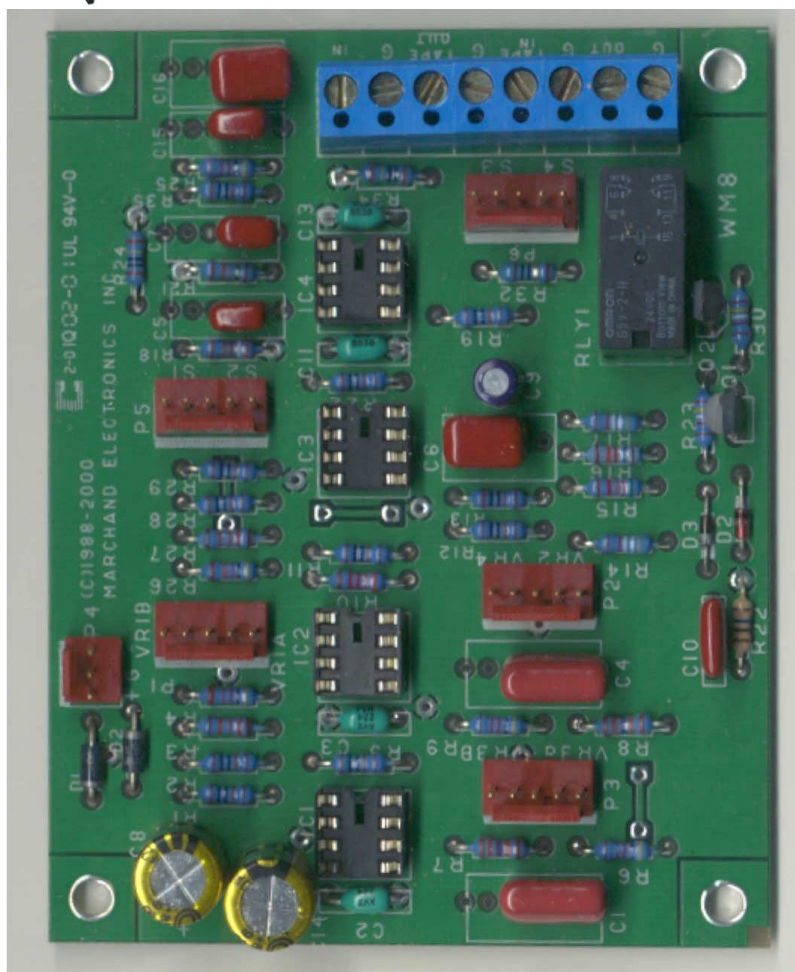
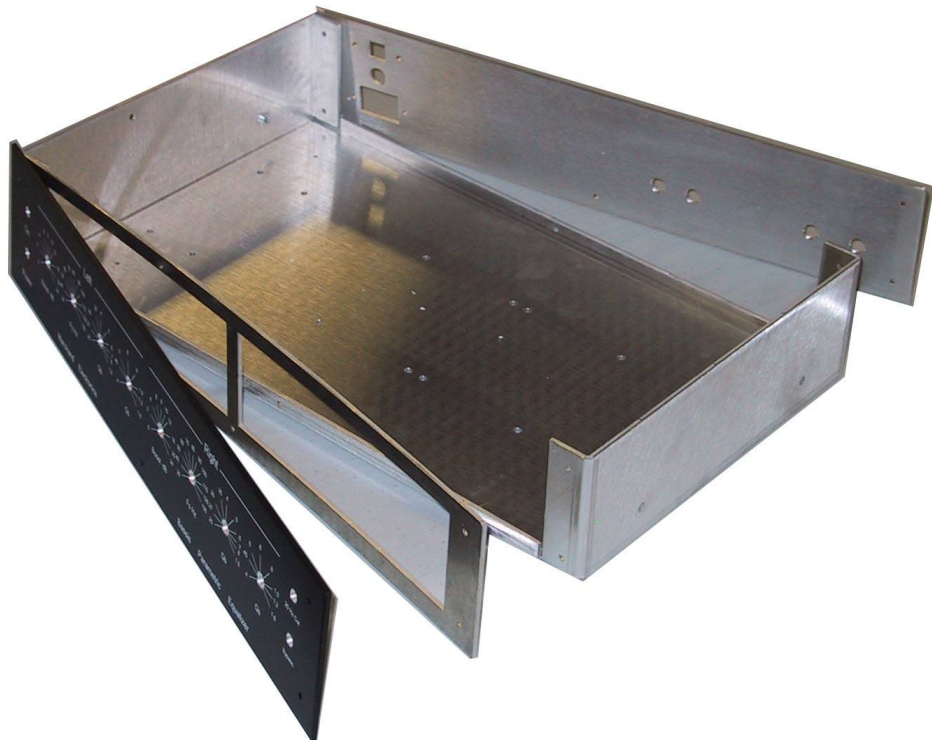
You have now completed the assembly of your BASSIS. Double check that you've completed all the steps. At this point you may plug the unit into a wall outlet and turn on the **POWER** switch to observe whether the power light comes on. However, do NOT attach it to your system until you've made the adjustments discussed in "Operation".

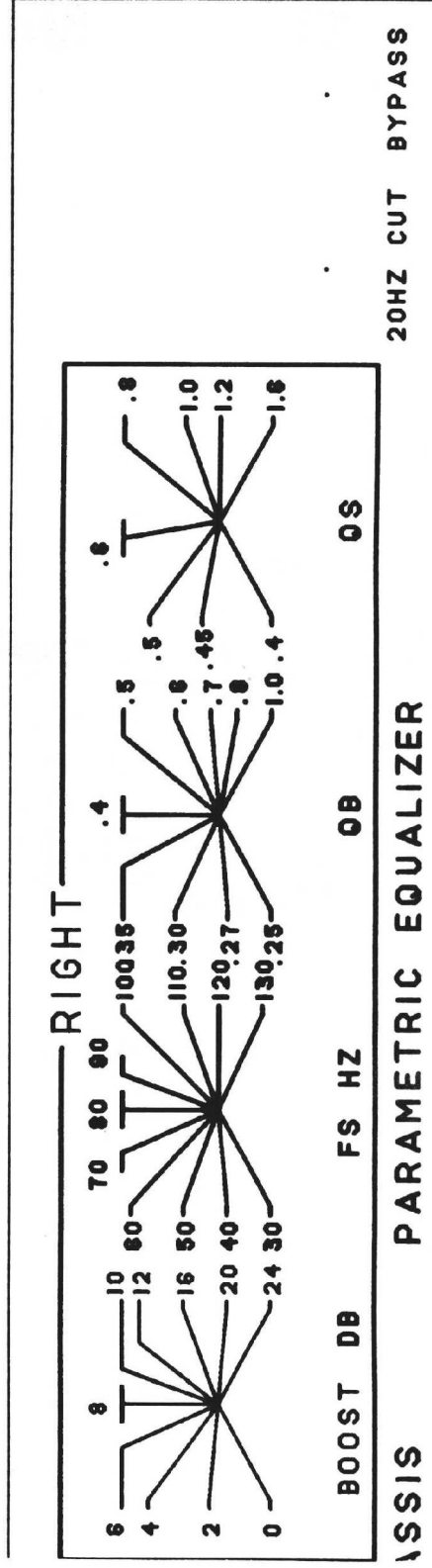
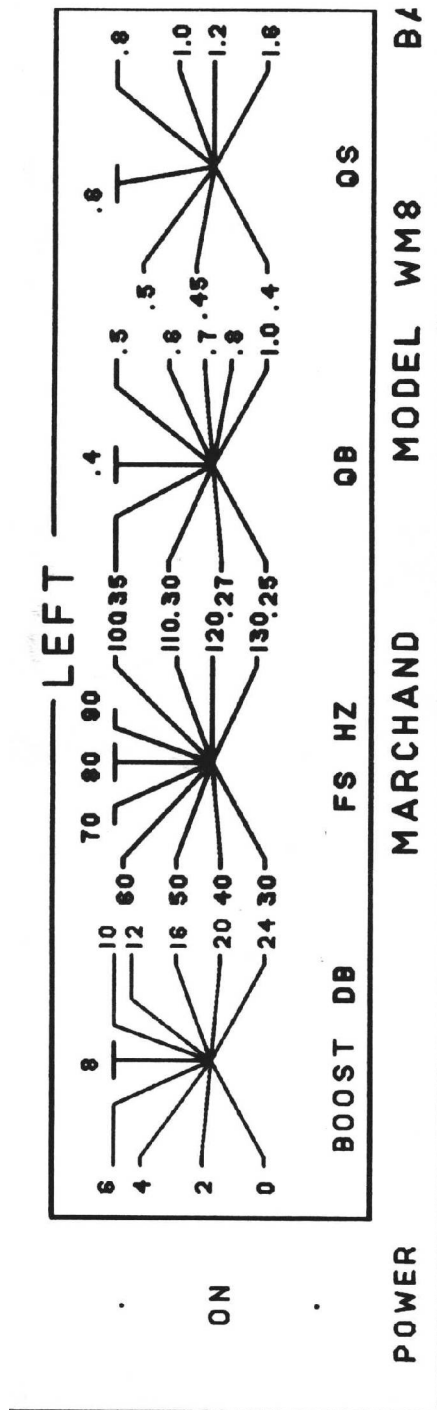
APPENDIX A Schematic Diagram



APPENDIX B PC board Layout







Typical cabinet front panel layout

Parts list for WM8-K board

Bag #1			

R32	1	10.0 Ohm	1% Metal Film
R23, R30	2	24.9K	1% Metal Film
R10	1	33.2K	1% Metal Film
R25	1	40.2K	1% Metal Film
R14, R17, R6, R9	4	49.9K	1% Metal Film
R15	1	52.3K	1% Metal Film
R1, 2, 5, 11, 12, 13, 19, 22, 28, 29, 35	11	100 K	1% Metal Film
R3, R27	2	133 K	1% Metal Film
R7, R8, R16, R21	4	162 K	1% Metal Film
R4, R18, R26	3	402 K	1% Metal Film
R24, R34	2	1.00M	1% Metal Film
R22*	1	10M	5% Carbon Film
C1, C4	2	0.033uF,	2% Polypropylene
C2, C3, C11, C13	4	0.1 uF,	Ceramic Axial
C10	1	0.22 uF,	Stacked Film
C5, C7, C15	3	0.1 uF,	Polypropylene
C8, C14	2	330 uF,	25V Aluminum
C9	1	10 uF,	25V Aluminum, Non-Polar
C6, C16	2	1.0 uF,	Stacked Film
D1, D2	2	1N4937	1A fast
D2*	1	1N4148	small signal
D3	1	1N5232B	(5.6V zener diode)
Q1	1	2N5087	
Q2	1	2N2222	
IC1, IC2, IC3, IC4	4	OPA2134PA	
	4	IC socket,	8pin
	1	Molex connector,	3pin, male
	5	Molex connector,	5pin, male
	1	Molex connector,	3pin, female + pins
	5	Molex connector,	5pin, female + pins
	1	DPDT relay,	24V coil
	1	8 pos terminal	block
	1	Circuit board	WM8, 3.2" * 4.15"

NOTE: D2* and R22* are marked D2 and R22.
D2* and R22* are located near diode D3.

Bag #2			

	For dual	single	
VR1, VR3	4	2	10 K Dual Pot., Linear
VR2, VR4	4	2	10 K Pot., Linear
	1	1	DPDT rocker switch
	2'	1'	1/8" shrink tubing
	6'	3'	Hookup wire, stranded, 22AWG, Brown
	6'	3'	Hookup wire, stranded, 22AWG, Red
	6'	3'	Hookup wire, stranded, 22AWG, Orange
	6'	3'	Hookup wire, stranded, 22AWG, Yellow
	6'	3'	Hookup wire, stranded, 22AWG, Green

Parts list for WM8- KK, full kit

 Bag #3

2	Bag-1, WM8-KK board kit
1	Bag-2, Dual model
1	PS10-K Power supply kit
1	Fuseholder, D type
1	Fuse, 1A
1	DPST Rocker Power switch
1	Voltage Selector Switch
1	Power Entry Connector
2	#6 solder lug
1	2.4K, 1W resistor
2	Gold plated RCA jacks, red
2	Gold plated RCA jacks, black
1	Line cord, 3-wire IEC
8	Knob
4	4/40 x 3/8" philips head machine screw
4	4/40 locknut
12	Standoff, 1/2", #6
12	6-32 x 1/4" philips head machine screw
16	6-32 x 1/4" philips head machine screw, black
5	6-32 x 1/2" philips head machine screw
5	6-32 x 5/8" button head cap screw
2'	Hookup wire, stranded, 22AWG, Brown
2'	Hookup wire, stranded, 22AWG, Red
2'	Hookup wire, stranded, 22AWG, Orange
1'	HV wire Yellow/Green
2'	HV wire white
2'	HV wire blk
1'	HV wire red
1'	HV wire brown
6"	1/4" heatshrink tubing
1	Hex wrench 1/16"
1	Hex wrench 5/64"
1	Cabinet base
1	Cabinet front
1	Cabinet front adapter plate
1	Cabinet rear
1	Cabinet top
4	Rubber bumper + screw