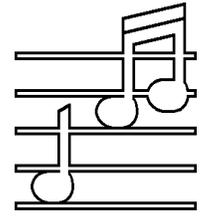


AUDIO BASICS



A MONTHLY NEWSLETTER OF AUDIO INFORMATION
VOLUME THIRTEEN NUMBER THREE MARCH 1994

A problem solving low cost construction project.

We will get back to describing a rational method for evaluating high fidelity products next month, but first a project that cannot wait because it is likely to be so useful to you and because it can *substantially lower the price* of all our other Versa-Kit variations too.

This project originated because a client had a CD player (not ours) that simply could not cope with his tape deck. He had one of our vacuum tube preamplifiers and his system sounded great with the tape deck disconnected, but awful when it was hooked up. The problem was that his CD player was distorting when it was connected to his turned-off cassette deck. With a vacuum tube unit there is not internal space for special tape buffer/isolation active circuitry so the selector switch connects the chosen source to the line circuits in the preamp and the tape deck at the same time to allow for tape monitoring. If the CD player (or other source) cannot cope with the tape deck load (and the load may be worse when the tape deck is turned off) then there may be musical problems as in this case.

It dawned on me that our Versa-Kit multi-purpose amplifier circuit could easily be configured as an external tape buffer and solve his problem, but he was reluctant to pay for the expensive PFT chassis we have been using. So I looked for a lower cost alternative and discovered that our PC-392 R1 board is a tight but tidy fit into the universally available and easy to use Radio Shack 270-253 metal chassis box. So here is the Ω mega II Versa-Kit Buffer, the universal musical problem solver.

What does the Ω mega II Buffer do?

The Ω mega II Buffer provides a consistent, resistive high impedance ($1M\Omega$) load to all sources connected to it and provides high drive current (> 50 mA peak) and a consistent low output impedance ($1K\Omega$) at a very high slew rate ($200V/\mu S$) into all loads connected to it. It isolates marginal components from tough loads thus lowering their distortion and significantly improving the musical fidelity of the system. It can be used in the tape loop to prevent sources from looking directly at the strange impedances of turned off tape decks and/or processors. It can be used between the preamp and the power amplifier to drive long cables and low input impedance amplifiers. Two can be used to correctly isolate the inputs of two amplifiers for A-B testing. It can be used to allow older high output impedance vacuum tube preamps to work with modern power amplifiers. It can be used with a "passive" preamp switch-box/volume control to prevent cable capacitance from causing high frequency roll-offs.

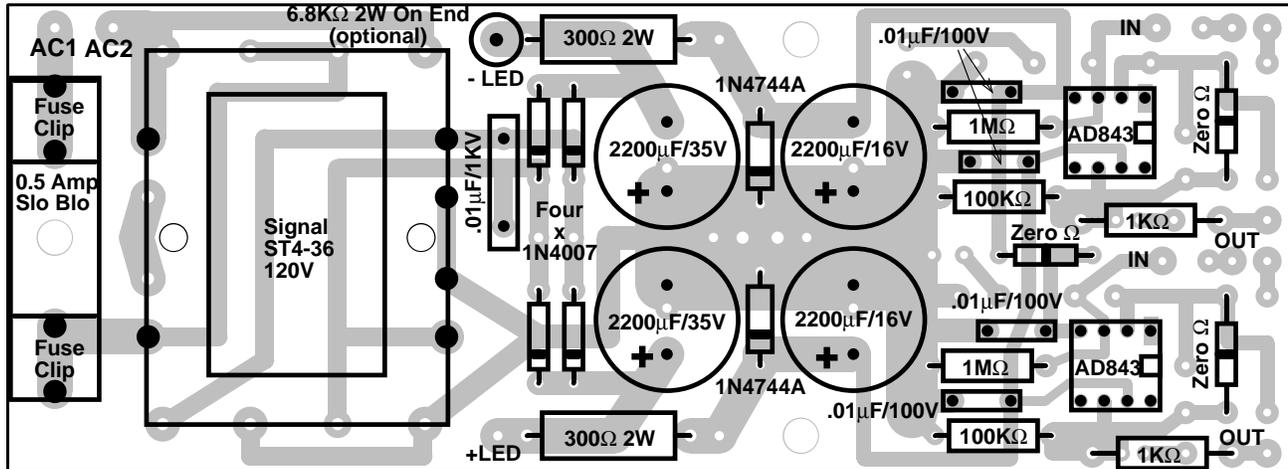
Although the version of the Ω mega II Buffer described herein is set at unity gain (no signal amplification), it is easy to re-configure the PC card to provide signal ampli-

fication. Then the buffer can also be used to boost low level signals (such as those from a video source) to match the rest of the system. Call us for details or refer back to the Versa-Kit Line Preamp project in the August, 1992 issue.

The following is the complete construction plans, parts list, schematic, and wiring diagrams for the Ω mega II Versa-Kit Buffer. All you really need from us is the PC card (\$20 including shipping for our PC-392 R1 card in the USA, \$25 to the rest of the world). The R1 revision is to accommodate alternate power transformers, not an audio circuit change.

The complete buffer kit (Radio Shack chassis box and all) is \$125. Note that the Phase Inverter kit is also now available with the Radio Shack chassis instead of the PFT chassis for \$130. The headphone amplifier and the line preamplifier versions with the Radio Shack chassis are \$150 due to the extra cost of the precision volume control. Add \$10.00 for shipping in the USA, \$30.00 in the rest of the world. And finally, if you want us to build it for you, add \$50. But let's get started on the project, it is really pretty easy for you to do yourself.

BOARD STUFFING GUIDE FOR PC-392 R1 VERSA-KIT BUFFER



PARTS LIST FOR ΩMEGA II VERSA-KIT BUFFER

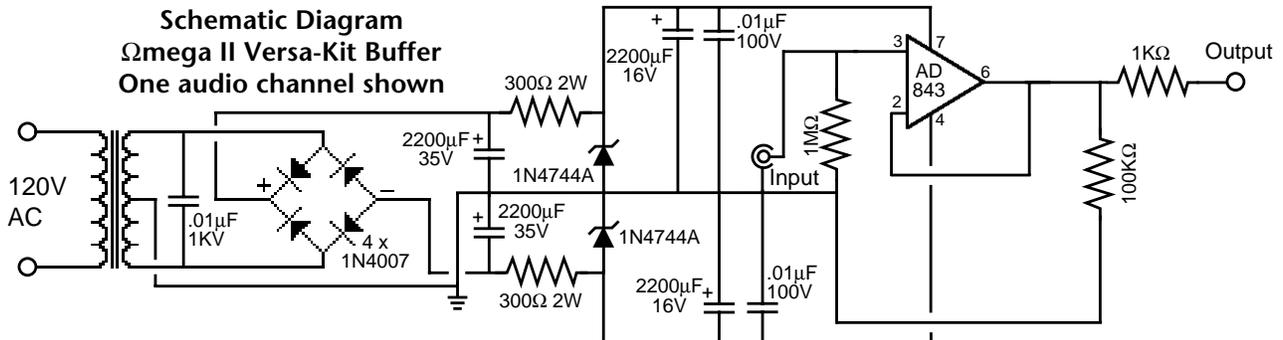
Circuit Board Parts

- 1 Circuit Board AVA PC-392 R1
- 3 Zero Ω Jumper
- 2 300 Ω 2W
- 2 1 KΩ 1/2W (1001F)
- 1 6.8 KΩ 2W
- 2 100 KΩ 1/2W (1003F)
- 2 1 MΩ 1/2W (1004F)
- 4 1N4007 Silicon Diode
- 2 1N4744A Zener Diode
- 4 0.01 µF 100V Disc (.01M)
- 1 0.01 µF 1KV Disc(.01M 1KV)
- 2 2200 µF 16V electrolytic
- 2 2200 µF 35V electrolytic
- 2 8-pin IC Socket
- 2 Analog Device AD843 Fet Input IC
- 1 Transformer Signal ST4-36 (120V)
- 2 Black Nylon Nut
- 2 Black Nylon Screw
- 2 Fuse clip

- 1 0.5A Fuse Slo-blo
- 6 #6-32 1/4" Pan Head Screw
- 3 #6-32 1/2" Hex Spacer

Chassis Mounted Parts

- 1 Radio Shack #270-253 chassis box
- 3 RCA Phono Jack Red
- 3 RCA Phono Jack Black
- 5 1/4" internal toothed Lockwasher
- 1 1/4" solder lug
- 1 Power Cord 18 gauge non-polarized
- 1 Strain Relief HHS 822
- 1 LED Indicator
- 10' Ersin 20 Gauge Multicore Solder
- 3' Wire Red 22 gauge
- 3' Wire Green 22 gauge
- 1' Wire Black 20 gauge
- 1 Construction manual
- 1 Serial Number sticker
- 1 Owner's manual



Proprietary Notice: This print contains information considered proprietary by Audio by Van Alstine and is furnished on a confidential basis for identification purposes only. April 15, 1994 FVA

Omega II Versa-Kit Buffer Assembly Instructions

The Audio by Van Alstine Versa-Kit Buffer provides you with all of the parts and instructions necessary for you to assemble your very own complete new state of the art multi-purpose stereo buffer amplifier.

Successful completion of this project will require your careful attention to following directions. **Our first direction is that you read through all of this manual before actually starting the work.** Learn about the entire scope of the project before digging into it.

Your new buffer will give you long term quiet, durable, and satisfyingly musical results if you take care to follow these directions with quality workmanship. Our circuit design has minimal turn on or turn off thumps and operates very conservatively for long service life and low heat. It is only up to you to accurately assemble the high quality components we have provided.

Tools.

You will need a low wattage solder pencil, a wire cutter, a wire stripper, a needle nose pliers, a large pliers, and flat blade and Phillips screwdrivers. You will need an electric drill with 1/4" and 1/2" bits that will make round smooth holes in sheet metal. We have supplied very high quality solder that wets and flows easily and makes reliable and durable connections. Do not substitute solder. Some solder compounds may have too high a melting temperature or use a corrosive or inadequate flux, causing permanent and possibly non-repairable damage to connections and parts. Use only the solder we have supplied.

Factory Support and Free Bench Checkout.

You may return your completed Omega II Buffer to us for a free bench checkout. We urge you to do this before you ever plug it in. Assuming your unit does not need repairs, the charge will be \$10 for return shipping via UPS surface in the continental USA.

If your unit does need repairs, you will be advised of the costs and options before we proceed. If the unit is being sent to us for a checkout from outside the continental USA, call us first to determine what payment to include for return shipping.

Factory advice regarding the rebuild process is available **if you call us at 612-890-3517** during normal central time zone business hours. The better you describe your problem, the more helpful we can be. Sorry, we simply do not have the time available to respond in writing to letters detailing kit building problems. You must call us for service support and for return authorization before shipping a unit here for our service and/or free checkout.

Limited Warranty.

Our limited warranty is 90 days (starting with the date we shipped the kit) on properly installed parts only. Return the defective part to us, prepaid, and we will send you a prepaid replacement. We cannot warrant your workmanship and we cannot warrant parts that have been damaged by improper installation.

Check Out All the Parts First.

You will find it is nice to know that everything is there now, rather than at 1:00 am Sunday morning when you are trying to finish the project and you don't know if that last little resistor rolled off the table and a gnome ate it or if a part was missing in the first place. Call us at 612 890-3517 (during normal business hours only) if you have questions.

We reserve the right to substitute parts of equivalent (or better) quality in order to maintain reasonable production schedules. For example, you may receive resistors of a greater wattage rating than specified and/or capacitors of a higher voltage rating than specified.

An Overview of the project.

1. First the main chassis bottom is drilled for the PC card using the bare PC card as a drill guide.
2. Next you will use the template supplied and drill the back panel for the six gold plated phono jacks and the power cord.
3. Then drill a 3/16" mounting holes in the front panel for the LED.
4. Referring to the *PC 392 R1 board stuffing guide*, you will install and solder all the parts on the printed circuit board next and then do all the pre-wiring to the board.
5. Install the AC power cord with enough slack inside to allow connection to the PC card before it is mounted in place. Then mount the board in the chassis.
6. Make the connections to the jacks
7. Wire in the LED and the wiring is completed.
8. Finally install the fuse, and the cover, and feet.
9. Think again now about our free checkout service before you ever plug it in. *Mistakes may be much less expensive for us to correct if the unit has never been turned on.* Power to the wrong places because of assembly errors can do expensive non-warranty damage.
10. If you don't want to send the unit to us first, now is the time to give it a trial run. Plug it in and power it up on the bench. If the LED lights and the 1/2 ampere slow-

blow fuse holds you most likely have a working unit. Install the cover and put it through its paces in your audio system. You will be amazed and pleased at how much this great little package enhances your enjoyment of your high fidelity system.

11. Enjoy your great new buffer.

If after reading this manual you now have second thoughts, we will build or complete your kit for you. Return the complete Ω mega II Buffer kit to us and we will build it like our other premium factory wired units. *You must call us before you send it for an estimate of the cost of our services and for our special packaging and shipping instructions.*

If you are ready to start the project, set aside a clear and well lighted work space and proceed. We think you will have fun.

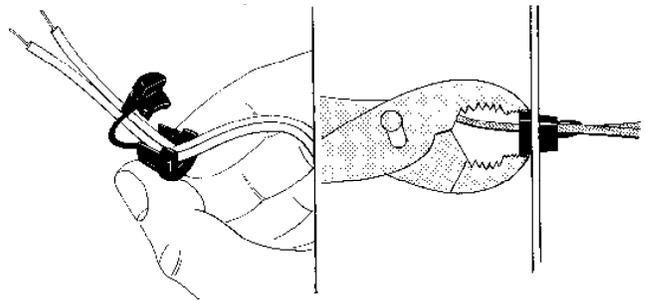
Preparation of main chassis.

1. Select the grey metal main chassis section. Locate the blank PC-392 R1 board in the chassis (foil side down) in accordance with the Pictorial Diagram. It fits in diagonally as shown.
2. Use the board to mark the location of the three mounting holes (one at the fuse and one on each side). Drill 5/32" holes in the chassis bottom at these three locations. Align the board over the holes to check your work.
3. Put a layer of masking tape on the outside surface of the back panel section to protect against scratching in drilling. Cut out and tape the back panel drill guide to the outside. Use this to locate the centers of the seven holes to be drilled. For most accurate results, first drill very small "starter" holes at each location. Then drill the 6 1/4" holes and the 1/2" hole. We find that Black and Decker "Bullet Bits" (available at many hardware and discount stores) work very well and make round clean holes without skidding. Pull the masking tape when you are done.

Drill a 3/16" hole in the front panel to mount the LED. Note that the flat on the plastic rim of the LED marks the negative lead, while the longer lead is the positive lead.
4. Now sand away the paint on the inside of the chassis at the 6 jack locations so that a good ground contact will be made between the hardware and the chassis.
5. Note that your phono jacks may be supplied with small gold plated solder lugs and small gold plated washers already held on the jacks by their nuts. These small gold plated lugs and washers are not used. Discard them when you remove the nuts to mount the

jacks (save the nuts). We provide larger toothed lockwashers for the 6 jacks.

6. Mount the 6 jacks (red at the bottom for the right channel, black at the top for the left channel). Five of the jacks are mounted with 1/4" lockwashers on the inside of the chassis. The sixth jack (one of the right channel output jacks as shown) is mounted with a 1/4" solder lug on the inside of the chassis for a ground connection to the PC card. Tighten each firmly but not excessively. Too loose will cause channel drop-outs later on, too tight will break the jacks. An 11/32" nut-driver is useful for this operation.



7. Select the line cord and the plastic strain relief. Separate the two conductors at the end of the line cord for about 2", and mark the cord with a pencil 7" from the end. Twist together the separate strands of each conductor. Bend the cord sharply back on itself at the pencil mark, and squeeze the bend with pliers to form a sharp "V". Install the strain relief at the "V" as shown in the sketch, with the small end of the strain relief nearest the bared wire ends. Use pliers to squeeze the two halves of the strain relief together around the wire, to partially shape the wire before insertion. Then grasp only the larger diameter part of the relief with the tips of the pliers as shown, squeeze it fully closed, and insert the bared wire ends and the relief from outside the back panel through the remaining hole in the panel. The relief will snap into its locked position when fully inserted.
8. Mix some two part 5 minute epoxy to hold the LED in place and to keep the AC power cord strain relief from twisting. Tape the LED in place temporarily from the front and epoxy it and the power cord strain relief on the inside of the panels.

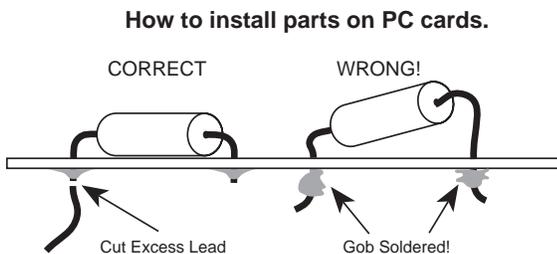
Assembly of the PC-392 Circuit Board.

Refer to the *Board Stuffing Guide* and the Circuit Board Parts section of the parts list and prepare to assemble this main circuit board.

All of the parts are installed on the component side and are soldered to the foil side. Note that the diagram shows the board looking down on the component side. Note that the PC card is not shown to exact size or scale.

We assume you already know how to solder or you would not have ordered a do-it-yourself kit. If you find that you just don't have the knack of making clean smooth solder joints that flow from component lead to foil without lumps, solder balls, grey or grainy blobs, or scorch marks then quit while you are ahead and let us do it for you. We are sorry we have to be so serious about this. The finished PC card represents a very substantial portion of the cost of the finished buffer. If you build it correctly it will give you many years of reliable service. If you are impatient or sloppy, expensive repairs may be necessary.

The sketch below shows the detail of how parts are properly installed on a PC card.



1. Install the 6 diodes in their indicated locations on the board (one set of four 1N4007 power supply diodes near the transformer location and one set of two 1N4744A zener diodes near the supply capacitor locations). Note that each diode has a banded (marked) end. Each diode must be installed with the banded end pointing in the direction indicated on the placement guide.
2. Install the three zero ohm jumpers (small tan body with centered black strip) in their locations as shown on the board.
3. Install six 0.5 watt resistors (two 1K Ω , two 100K Ω , and two 1M Ω) on this board in the locations indicated flush against the board surface. *Place each resistor with the four digit value marking facing up so you can read it when the resistor is on the board.* If you cannot read the values later, it makes finding and correcting mistakes nearly impossible. Make sure each resistor goes in the correct place. Mixing them up will damage the circuit operation. The holes for the leads are all 1/2" apart (the first bend if you have a standard resistor lead bending ladder available). Make sure you do not block the mounting holes for not yet

installed parts while soldering. If you do flow solder across and block a pad, careful use of a round wood toothpick and your solder pencil will clear it. Caution, excess heat or force can damage the foil traces and lift pads from the fiberglass board.

4. Install the two 8-pin IC sockets in their locations. Orientate the sockets so the marked ends are located as shown in the drawing. Solder all 8 pins of each socket being careful to avoid solder bridges (flowing a stray strand of solder from one pin to another close by – thus making an erroneous and likely harmful circuit connection).
5. Install the two 300 ohm 2 watt resistors as indicated.
6. Install the two fuse clips (closed ends out) firmly against the board. To hold the clips in place correctly for soldering, turn the board upside down, and push it against a flat surface to hold the clips evenly while soldering. Allow the joint to cool before letting go.
7. Install the five small bodied capacitors (the four .01 μ F/100V discs and the .01 μ F/1KV) on the board in their indicated locations.
8. The single 6.8K Ω 2 watt resistor is installed "standing on end" in the "-LED" hole, with the end of the body flush against the board with one lead only soldered to the board. The upper lead can be trimmed to about 1/2". A wire will be soldered to the top of the resistor later.

Note that the value of this resistor determines the brightness of the LED Indicator. If it shines too brightly for you when the project is finished, replace this resistor with one of a higher value (about 15K Ω 2W) for a dimmer LED.

9. Install the two 2200 μ F/16V electrolytic capacitors and the two 2200 μ F/35V making sure the + leads go in the + holes as shown on the stuffing guide. These electrolytic capacitors are polarized. *Backwards installation will destroy the parts. The case is marked with a light colored stripe to identify the - lead.* The + lead is longest. There is one extra hole for each capacitor to allow the board to accommodate two different physical sizes of capacitor for production reasons. Use the holes that are appropriate for the parts supplied in your kit.
10. Install the power transformer. Unless otherwise specified the kit is furnished with a 120V AC transformer with 6 leads. The transformer is installed with the 4 lead edge nearest the diodes, and the 2 lead edge nearest the fuse clip. Only the six holes shown with black dots on the stuffing guide are used with the 120V transformer. *If you ordered the 240V version of*

the kit, a different transformer will be supplied and you must refer to its supplementary installation instructions. The 240V transformer is not usable on 120V and vice versa. After soldering, secure the transformer to the board with the two black plastic screws and nuts supplied (the nuts on the bottom of the board). Trim excessive screw length from the bottom with a wire cutter after these plastic parts are installed and tightened.

11. You now have a completed audio circuit card – the “guts” of your new buffer. You can use Ronseal lighter fluid and a toothbrush to dissolve and clean the rosin from your solder connections on the foil side to tidy up your work and make bad joints and solder bridges easy to spot and correct.
12. Install the two AD843 integrated circuits in their sockets on the board. The marked end of the IC points towards the nearest end of the PC card (aligns with the marking on the pictorial and the socket). Inspect to ensure that no leg folded over or missed the socket. If in doubt use a small screwdriver between the IC and the socket to lift it up and out, gently straighten any bent legs, and try again.

Pre-wiring the PC-392 Board.

It is necessary to install seven wires on the circuit board before placing it in the chassis as the foil side is not easily accessible afterwards.

The wires are installed from the component (top side) pointing up and are soldered on the foil side. After soldering trim excess lead on the foil side so it cannot touch the chassis bottom when the board is installed.

We have specified wire lengths. The lengths will be slightly on the long side (only the Red Cross has a wire stretcher) so they can be trimmed to fit neatly as desired.

Be careful not to nick the wire when stripping off about 1/4" of insulation. Nicked wires may break off later.

1. Prepare one 6" black wire. Refer to the Pictorial Diagram and solder one end to the board in the middle (the ground connection common to the four power supply capacitors).
2. Prepare three red wires (one 3.5", one 4", and one 7"). Refer to the Pictorial Diagram and solder the 7" wire to the free end (top) of the 6.8K Ω resistor at the -LED eyelet, solder the 4" wire to the right channel IN eyelet on the PC card, and solder the 3.5" wire to the right channel OUT eyelet on the PC card.
3. Prepare three green wires (two 5" and one 4.5"). Refer to the Pictorial Diagram and solder one end of a 5" wire to the +LED eyelet, solder a second 5" wire

to the left channel IN eyelet on the board and solder the 4.5" wire to the left channel OUT eyelet.

Final Assembly.

1. Install the three 1/2" #6-32 hex spacers inside the bottom panel in the three holes you drilled with slotted pan head #6-32 screws. Only secure the spacers finger tight at this time.
2. Tightly twist the bare strands from each AC power cord conductor so they cannot fray and insert one lead into the AC1 eyelet on the board and the other into the AC2 eyelet. Solder both and be sure no bare wires can touch together or any other parts.
3. Place the completed PC-392 board over the spacers. The three screw holes in the board will line up with the spacers. Fasten the board to the spacers with three pan head screws.
4. Tighten all three screws and then tighten the three screws previously installed with the spacers. Go back and forth until both the inside and outside screws are tight.
5. Refer to the pictorial and install the 1/2 amp slo-blo fuse in the clips on the PC board.
6. Select the green wire from the + LED eyelet and the red wire from the -LED eyelet (the 6.8K Ω resistor). Make sure the bare end at the 6.8K Ω resistor cannot come into contact with the power transformer body. Connect the red lead to the shorter lead of the LED and connect the green lead to longer lead of the LED. Solder both connections and make sure bare wires cannot touch anything else.

Chassis signal wiring.

In making solder connections at the phono jacks do not use excess solder. Make sure the solder cannot run into and block the inner hole so that a cable cannot be installed. If in doubt, use an old interconnect cable inserted into each jack before it is soldered to ensure that the jack cannot be blocked with solder. You may trim the wires from the PC card shorter to fit for a tidy layout.

1. Connect the 4" red wire from R IN on the PC card to the Right Input jack and solder.
2. Connect the 5" green wire from L IN on the PC card to the Left Input jack and solder.
3. Connect the remaining 3.5" red wire from R OUT on the PC card to a Right Output Jack. Connect this jack to the other Right Output Jack with a short red wire. Solder all connections.
4. Connect the remaining 4.5" green wire from L OUT on the PC card to a Left Output Jack. Connect this

jack to the other Left Output Jack with a short green wire. Solder all connections.

5. Connect the remaining 6" black wire from Ground on the PC card to the ground lug at one right output jack on the back panel and solder.
6. Shake out all the solder blobs, metal filings, and missing tools.
7. Install the cover and feet with the Radio Shack hardware package provided with the chassis box.

Final Inspection and Testing.

Don't put your fingers inside with the cover off and the unit plugged in or on. The high voltages could injure you!

Think again now about our free checkout service (you must call us first for return authorization at 612 890-3517) before you ever plug it in. *Mistakes may be much less expensive for us to correct if the unit has never been turned on.* Power to the wrong places because of assembly errors can do expensive non-warranty damage.

If you don't want to send the unit to us first, now is the time to give it a trial run. Plug it in and power it up on the bench. If the power switch lights and the 1/2 ampere slow-blow fuse holds you most likely have a working unit. Put it through its paces in your audio system. You will be amazed and pleased at how much this great little package enhances your enjoyment of your high fidelity system.

If the fuse blows or the power switch does not light up, you should promptly turn the unit off, unplug it, and contact us for repair service. About 99% of kit problems are assembly errors and our experience is that the builder has a very difficult time discovering their own mistakes. Perhaps have a friend go over the kit and the directions without your help – a second opinion can be very useful.

If all tests well, sign and install your bottom panel label, install the cover and put your new Ω mega II Buffer into service.

If you have problems, please call (don't write) us at 612 890-3517 and we will do our best to help you.

Operation and Use

For use as a tape buffer, connect one set of tape outputs from your preamp to the inputs on the Ω mega II Buffer with a relatively short interconnect cable set. Connect the outputs on the buffer to your tape deck and or processor inputs. Connect the outputs from your tape deck and or processor back to the tape inputs on the preamp. Make sure the Ω mega II buffer is plugged in and on any time you use the audio system.

For use as a line buffer, connect the line outputs on your preamp or passive switcher/volume control to the inputs on the Ω mega II Buffer with a relatively short interconnect cable set. Connect either pair of outputs on the buffer to the inputs on your power amplifier. Make sure the buffer is plugged in and on any time you use the audio system.

Enjoy your new buffer amplifier and thank you for doing business with us.

Used Equipment

Only one piece this month, a very nice Dyna FM-5 FM tuner with our Super Tuner Two circuit boards (newly upgraded with Ω mega II audio circuits). This is a very musical tuner with a good front end and a clean original Dyna chassis and gold faceplate. \$250 plus \$10 shipping in the USA and a 90 day parts and labor warranty.

Frank and Darlene Van Alstine

