

ANALOGUE ASSOCIATES, LLC  
SUMMARY OF UPGRADES AVAILABLE FOR ACOUSTAT SERVOAMPLIFIERS  
AS OF JUNE 1, 2011

Description of Parts and Service	Reason for upgrade and improvement imparted	Cost Per Pair of Amplifiers*		
		Parts	Labor	Total
THE BASIC SERVOAMPLIFIER UPGRADES				
Installation of tube standoffs (only if not in amplifier currently)	Allows better cooling of the circuit board and longer life of components in area around tube. We still are able to get the original US Phelonic parts instead of the Chinese ceramic replacement. If you would rather have the Chinese parts, which are fine, we can order those. When these are replaced we always scrap all the carbonization around the sockets to reduce any chances of arcing between the pins. Also we have found a material that can be used to minimize, if not eliminate a major issue with these amps, arcing between the traces under the pcb. We have secured product which when painted over the traces increases the insulation between them and reduces any likely hood of arcing and damaging the pcb.	\$84.00	\$90.00	\$174.00
REVISED Upgrade of 150vt and 17vt power supply parts. Replace all zeners with HEXFREDs, the 22uf, 10uf in the 150vt side. For the Opamp's 17vt power supply we replace the and 1000uf capacitors. Results in much improved sonics for the opamp.	The original parts deteriorate over time and are often a source of false turn-ons. We stabilize the 150vt PS, and 17vt PS, a weak area in the original design. Upgrade capacitors in area of the tubes to higher ratings and move them for better cooling, replacing the 1n4004/6 with Fairchild HEXFREDs which are quieter and faster than the original zeners. The 22uf 250vt capacitors in the 150vt power supply are replaced with 80uf 450vt parts and the 1000uf in the 17vt power supply are replaced with a new better sounding part. All of these changes results in better sonics from the opamp, quieter and more stable amplifiers.	\$233.20	\$150.00	\$383.20
Install new IC and replace IC socket with gold plated, solid milled pin sockets. These are not required if you decide to go to the Discrete Opamp below.	The new IC is more linear, lower distortion, with a wider and deeper soundstage. Original IC pin sockets corrode over time and are another source of often mysterious problems and degrading sonics. Solid milled gold plated pins in new IC socket eliminate the corrosion common on the old stamped aluminum pin sockets.	\$30.00	\$30.00	\$60.00
The above items make up a Basic Upgrade for Stability and Sonics.		\$347.20	\$270.00	\$617.20

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<u>THE MAJOR SERVOAMPLIFIER UPGRADES</u>				
<b>NEW</b> , Replacement of the stock wire from the IEC receptacle, fuse holders and upgrade of fuses to Hi-Fi Fuses.	While you might think that the fuses would be part of the power supply section, this upgrade has a major sonic benefit and can be done independent of any major changes to the power supply. The stock brass fuse holders have had a yeoman's job and along with the fuses have really not attracted much attention in the past. With the advent of the German Hi-Fi fuses makes a very obvious change to the sound of the amplifiers at every level. The new fuse holders are Silver plate on Beryllium Copper Clip, much like the best parts being used in high end audio power cord plugs. They provide a tighter grip and better conductivity than the stock brass pieces. A must for anyone interested in getting the best sound out of these amplifiers. Now it becomes obvious that we need to replace the original cheap 18ga wire between the IEC receptical and the circuit board. It seem logical that we use the same wire the Galaxy uses for the primaries on the transformer. We use 14g silver plated copper lead in an Acryflex sheath and no surprise there is a noticable improvement in impact and detail in the overall sound of the amplifier.	\$177.80	\$90.00	\$267.80
Replacement of Gain Control with Fixed Resistor.	It makes sense that replacing a 30 year old carbon or film pot with a modern part would be of benefit, particularly one component as important as a gain control. We replace the pot with the best sounding resistor (and probably the most expensive) resistor available and the effect is unmistakable. It eliminates a nasty source of noise and distortion and provides for exact matching of gain between the amps. Very significant reduction in distortion, grain and noise in audio signal. Smoothes out all frequencies. More musical, less hi-fi.	\$33.00	\$30.00	\$63.00
Replacement of HF Control with custom 12 position Fixed Resistor Step switch.	This, like the replacement of the volume pot above, eliminates yet another nasty source of noise and distortion and provides for exact matching of frequency response between the amps. Very significant reduction in distortion, grain and noise in audio signal. Smoothes out high frequencies and while it does not extend the high frequency response, which is current limited, it does give the sonic impression of doing that. We can replace the pot with a fixed resistor like the gain control, but don't recommend it as the speaker can benefit from flexibility in this area.	\$90.00	\$20.00	\$110.00
<b>REVISED</b> Bypass auto turn-on circuit, install manual turn-on switches.	This is the motherlode. The original auto-turn on design required quite a few parts and one quadrant of the IC driven into saturation to keep HV powered up. This was done for user convenience, but had a significant negative audio impact. We install a switch which also allows us to remove the SCR which is used to power up the HV supply and bypasses the need for the opamp to be involved, dedicating it to audio only. Additionally the 17vt power supply now serves only half the original load. Sonic background now goes black, vs. dark gray, distortion drops another level of magnitude, dynamic range increases, speakers have better bass and play louder. No other change has as dramatic an effect unless this upgrade is performed and every other change benefits from it. Somewhat inconvenient since the amplifier must be manually turned on and off, but can be offset with longer runs of HV wire to panels which allows amps to be placed closer to other electronics. This cannot be done without the HF and Gain Control replacement above because we need to have a hole for the switch and we don't want to drill any holes unless necessary.	\$30.00	\$150.00	\$180.00
Replace the stock transistors with new High Speed, High Resolution Transistors	The sonic improvements are obvious. One area in particular that benefits is bass performance with an increase in low bass impact and detail. The overall level of grit is again reduced with improvements most noticeable in female vocals. These take about two weeks to fully break in, just the amp plugged into the wall is enough, but after the first day of breaking in they begin to show their true colors. Clipping symmetry should be adjusted after these are installed. If you have felt that the image from your Acoustats was too laid back in the past, these solve that as well. They extend the soundstage to a point between the listener and the panels.	\$40.00	\$45.00	\$85.00

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<b>REVISED</b> Replace Quad IC with completely new custom hand built Discrete Opamp Circuit. <u>These can only be used if the turn-on circuit bypass above is in place.</u> This opamp replacement consists of two ultra high resolution single opamps, with related circuitry, built onto a 14 pin socket adaptor. This assembly will plug directly into the upgraded IC socket. We are now using a different coupling capacitor than the original version which results in improved bass performance.	The quality of quad opamps has always been a limitation until now. With this update the barrier is broken. The sonic impact of this upgrade is hard to describe, but easy to hear. Everything is better. The parts take about 1 week to fully break in and will require the clipping symmetry be adjusted afterwards, which we do before the amps are shipped. The best analogy I can come up with is that it is comparable to changing from tired tubes to NOS in a preamplifier. Resolution takes another step up. The increase in musical energy is pronounced in micro-dynamics as well as large scale dynamics. Front to back depth with the spacing of instruments and width of image also benefit. The very definition of Palpability. I will tell you that the full benefit of this upgrade, and that of the High Speed, High Resolution Transistors, is limited without upgrading the High and Low Voltage resistors below. There is still a marked improvement in the sound, but the limiting factor becomes the resolution of the resistors. With the new capacitors bass performance is improved as well as the price being reduced.	\$345.00		\$345.00
	Total cost of Major Upgrade only	<u>\$715.80</u>	<u>\$335.00</u>	<u>\$1,050.80</u>
	Total of Basic and Major Upgrade of these amplifiers	<u>\$1,063.00</u>	<u>\$605.00</u>	<u>\$1,668.00</u>

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THE ULTIMATE SERVOAMPLIFIER UPGRADES				
ULTIMATE SERVOAMPLIFIER UPGRADES-AUDIO SECTION				
Custom built Polypropylene capacitors to replace all the capacitors in the low voltage audio circuit.	In factory stock amplifiers you see nearly every conceivable capacitor type, included the dreaded ceramics, the worst audio capacitors. For example, the very last component in the low voltage signal path before the tubes is most often a 220pf ceramic capacitor. There are five 220pf caps, all ceramic, in the signal path. Replacing these in an otherwise completely upgraded pair of amps results in bass that is huge, deeeep and thunderous. Voices become clear, no straining to understand lyrics, and liquid. Soundstage takes another step towards you. The closest analogy I can give you is the typical hallmark of a great audio system is that the musicians appear to be in the room with you. Well in this case, you are in the room with them instead, not a subtle difference. We are offering a complete set of custom capacitors to replace all of the capacitors in the low voltage signal path. There are 32 capacitors to be replaced in a pair of amplifiers. This is not a job for the inexperienced or faint hearted, rivaled in difficulty only by the 66 low voltage resistors. These parts will only be sold as a complete kit.	\$240.00	\$192.00	\$432.00
Replacement of all of the critical low voltage resistors (33 per amp) with Ultra High Grade Parts, Caddock TF020's or MK-132's. These are expensive but worth it. The labor involved is daunting and some of the solder work required is challenging to be kind about it, thus the high labor cost to install all 66 of them. If you want to upgrade these amps to sound their best, replacing the original resistors is required.	This is the most expensive, and most overlooked upgrade. All of the resistors supplied with the later amps are 1% radio shack quality metal film resistors. Even so, these were ahead of their time in 1978, no one else used 1% resistors. We have never pushed this upgrade hard because of the cost, but with the two newest upgrades, replacing the original resistors is now critical. These allow for the final pristine detail everyone expects, but rarely achieve, from an electrostatic speaker. It is like looking out of the window into a light mist and then having the sun break through. You know what a summer day is like after a cleansing rain, this is it audio style. Even with the mist the amplifiers are great, with these resistors in place, the mist is gone and the sound is unparalleled. The affect of this is more pronounced than ever with the revisions to the high voltage section. If your amp has the early 5% (gold banded) carbon firm resistors this upgrade is an absolute MUST. These resistors will not be sold individually, only as a complete kit.	\$300.00	\$220.00	\$520.00
<b>NEW</b> , replacement of 47uf electrolytic cap, c15, with a 30uf polypropylene with OHNO leads	When will this end, there comes a point where you think surely we have addressed all the major sources of improvement, but we continue to be surprised. We all know that electrolytics in the audio path is not the most desirable. One seemingly innocent part is C15, a 47uf electrolytic in the feedback curcuit around the gain opamp. Mike Elliott suggested that replacing this with a polypropylene would improve the sound of the amp and that a 30uf part would serve. Why not, but it is really just a dc rolloff capacitor, how big a change could it be. BIG improvement in all aspects of the sound of the amplifier, particularly bass impact and detail. So we are now replacing this with a new custom part made by Audience for us, a 50vt 30uf polypropylene capacitor with OHNO wire leads. It is too big to put in the postion occupied by the part it replaces, so we have to inelegantly mount in on a base attached to the underneath side of the chassis.	\$135.00	\$45.00	\$180.00
Replacement of all of the HV resistors (22 total) with High Precision Caddock 1% High Voltage Resistors.	The effect of this change is to further smooth out all frequencies, results in a marked increase in the transparency of the signal, but most of all they result in a more "off the panel" effect. The image drops away from the panels with a commensurate increase in the soundstage. Turn out the lights and the speakers cease as an apparent source of music. These are expensive but worth it. These will not be sold individually, but only as a complete kit.	\$336.00	\$160.00	\$496.00

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Custom built Polypropylene High Voltage output coupling capacitors.	We are having some custom output coupling capacitors made for us by one of the premier audio capacitor manufacturers. They are a major improvement over any of the caps supplied by Acoustat including the polypropylene caps Acoustat made available for a short time. These caps continue to flesh out voices, particularly female voices, and further the improvement in soundstaging brought on by the upgraded high voltage resistors. In combination with the high voltage resistor updates, these allow the amplifiers/speakers to play significantly louder before breaking up. Additionally we having special leads made up for these that will allow for the bypassing of two additional solder joints and the lead from the pcb to the output socket. These are large and have to be placed in a slighly different location for best cooling and to allow the chassis cage to function as normal. At \$37.50@ these represent probably the biggest bargain of all of the Ultimate upgrades.	\$190.00	\$70.00	\$260.00

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Polypropylene 10mf capacitors in the output stage.	Along with the new output coupling capacitors we can provide the same quality parts to replace the 10uf 450vt caps in the output section of the amplifier. These are of the same as the output coupling capacitors and since two of them are in the signal path, they have a significant impact on the sound of the amps. Two of these capacitors are in the output signal path and one is related to the 150vt power supply for V2 and V4. Overall the image is improved with shaper delineation of instruments within the sound stage, there is an obvious reduction in the noise floor resulting in yet a "darker" background, and the ability of the amplifier to sound at ease as well resolve instruments and music under demanding conditions is improved.	\$216.00	\$75.00	\$291.00
<b>NEW</b> , Upgrade of a/c wire to OHNO wire	This is beyond the upgrade of the wire in the IEC inlet described in the Major Upgrades. OHNO wire is a cast single crystal 21g copper wire. OHNO wire is used by Audience in the AU24 audio cables and PowerChords. When used to replace the ag/cu wire from the IEC plug to the board and between the power switch and the board. The result is rather impressive improvement is the sound of the amplifier. Why is this not the standard wire used in the Major Upgrade, because of the cost difference. The OHNO wire is 6 times the cost per foot of the ag/cu wire, requires 3 lengths of wire per lead (17ft total) to handle the load and each lead has to be hand twisted to form the proper configuration.	\$180.00	\$90.00	\$270.00
Replacement of the MOV's, vr1 and Vr2 in the output feedback loop.	Roger Sheker of Audience suggested some time ago to look at the MOV used in the feedback loop of the output section of the Servoamplifier. His point was that they tended to be non-linear and sound like, well, an MOV. I have never heard a good sounding MOV, so we build a replacement for this part using diodes and polystyrene capacitors of the appropriate value to retain the high frequency linearity of the amplifier. This takes a haze out of the high frequencies that anyone familiar with MOV's recognizes instantly. A cheap but effective fix.	\$20.00	\$22.50	\$42.50
Total cost of Ultimate Upgrade-Audio Section		<u>\$1,617.00</u>	<u>\$874.50</u>	<u>\$2,491.50</u>
Total of Basic, Major and Ultimate Audio Section Upgrades of these amplifiers		<u>\$2,680.00</u>	<u>\$1,479.50</u>	<u>\$4,159.50</u>

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<u>ULTIMATE SERVOAMPLIFIER UPGRADES-HIGH VOLTAGE POWER SUPPLY</u>				
Replacement of the 1uf 3kv High Voltage Power Supply capacitors and provide bypass capacitors.	The foundation of these amplifiers is the 5kv high voltage power supply for the tubes and to bias the diaphragm. We are beginning to see these capacitors short out due to age which brought us to our next logical step. We asked Audience to build a replacement for the four factory 1uf 3kv can capacitors. This turned out to be the biggest challenge we had presented to them yet. The results were beyond our wildest hopes. These capacitors gave the amplifiers what I call "scare factor" beyond anything I have heard to date. The amplifiers get quieter, with transients that explode out of nowhere. These bring a new definition to bass from an electrostatic speaker which is what you will first notice. Soon it becomes apparent that this same affect is happening across the entire frequency spectrum. We also had them build .01uf 3kv bypass capacitors for these which further expand the soundstage and present the instruments each unto themselves. The ultimate result is the music gets more involving with a sense of pace that I never felt was missing, but it was.	\$295.00	\$90.00	\$385.00
Replacement of the High Voltage Power Supply Rectifiers.	The high voltage diodes which are part of the power supply have proven to be weak over time and subject to failure when there is a voltage spike in the AC line. We have found a new soft recovery controlled avalanche (less spikes during transients) rectifier that has a significantly higher voltage, 7.5kv, and current limits, up to 20amps for spikes and 5amps repetitive peaks. Compare those specs to the 7kv 350 milliamps for the stock parts and you see the increased margin of safety. There are sonic benefits, but the point here is to increase the reliability of these amps. Most people have suggested just using diodes intended for kitchen microwave ovens, but they are noisy and at least as expensive. We suggest these (2 per amplifier, for a total of 4) be replaced as preventive maintenance, but feel that they are much more critical when doing the high voltage capacitor upgrade. There is no labor charge for installation when done with 1uf 3kv capacitor or the HV Transformer upgrade.	\$75.00	\$ -	\$75.00
REVISED, New 1963vt HV Transformers	The original HV EI transformer was subject to a few problems, most notably hum and eventual failure. This is a function of what they have to do, it is a tough job. It was sized for a specific footprint. We contracted with the manufacturer to build larger versions for us. While only 1/4" wider, it allowed for more steel, heavier gauge copper wire and more insulation. During this changeover it was found that one of the sources of the failure problems that had plagued these transformers was that the original design called for Kraft paper as insulation. This material harkens back to 1920's technology and serves well but is somewhat fragile. Current technology is to use Nomex, which while more expensive is slightly thinner and has a higher insulation value. At the same time it was decided that the output of the transformer could be safely increased to 1963vt vs. the original at 1820v. Not only is the voltage higher, but the transformer can provide more current. By itself or in combination with the new capacitors above, this solidifies the foundation of the sound of these amps. While this upgrade is listed in the Ultimate Upgrade section, it can be done at any time and still get a significant benefit in bass power and speed of dynamics at all frequencies. Installation requires some modification to the mounting ears on the new transformer, but otherwise it is a direct replacement. Installation of these transformers also requires installing the new high voltage diodes above.	\$598.00	\$ 90.00	\$688.00
The charges for the Ultimate Upgrades-High Voltage Power Supply only.		\$968.00	\$180.00	\$1,148.00
Total of Basic, Major and Ultimate Upgrades of these amplifiers		\$3,648.00	\$1,659.50	\$5,307.50

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THE GOD MODS				
Note: Both of these two upgrades include all of the parts in the Ultimate Upgrade-High Voltage Section.				
<b>NEW</b> , DOUBLE HV TRANSFORMERS IN A FULL WAVE RECTIFIER CONFIGURATION- To date we have only done this upgrade on fully modded amps, but I have no doubt that it should be one of the first upgrades anyone who is serious about wanting these amps to sound right should do.	While I doubt this will be the last modification for these amplifiers, it is fundamentally the most important. This modification involves installing a second High Voltage transformer and a Full Wave Rectifier circuit to bring them together. (If you would like an explanation of a Full Wave Rectifier, try <a href="http://www.allaboutcircuits.com/vol_3/chpt_3/4.html">http://www.allaboutcircuits.com/vol_3/chpt_3/4.html</a> ). I could try to tell you the difference in the sound of the Servo-Amplifier but I run out of superlatives. The first thing you will notice is that you thought you had bass before; but you really didn't until now, not just more but better, more articulate. You thought you had imagining before, but you didn't, think surround sound. You thought you had quiet before, but you didn't. You thought you had music before, but you do now. The change in the sound of the amplifier is like nothing I had heard before.			
<b>NEW, GOD MOD (1)</b> , The Best, but Most Expensive	We provide 4 new Upgraded HV transformers 1963vt output, 8 new HV diodes, 4-1.0uf 3kv Auricap capacitors with .01 bypass capacitors and install them in a neat package on the amplifiers. We will help with the cost by allowing you \$60@ for each working 380c transformer that are on the amps. So if you have 2 good ones, subtract \$120. This offer will hold as long as we have need for the transformers to allow us to do GOD MOD (2) upgrades below. The agreement to buy the functional 380c transformers will be made at the time the upgrade is ordered and is subject to Analogue Associates, LLC requirements at that time. Add \$150 if this upgrade is not done with any other category of upgrade.	\$1,688.04	\$225.00	\$1,913.04
Total of Basic, Major, Ultimate and GOD MOD (1) Upgrades of these amplifiers		\$4,368.04	\$1,704.50	\$6,072.54
<b>NEW, GOD MOD (2)</b> , The cost effective way to get there.	If you have 2 functional 380c HV transformers, given availability, we provide 2 used, but tested 380c high voltage transformers, 8 new HV diodes, 4 1.0uf 3kv Auricap capacitors with .01 bypass capacitors and install them in a neat package on the amplifiers. This offer will hold as long as we have the transformers to allow us to do GOD MOD (2). The agreement to do this mod will be made at the time the upgrade is ordered and is dependent upon availability of appropriate transformers. Add \$150 if this is not done with any other category of upgrade	\$715.00	\$225.00	\$940.00
Total of Basic, Major, Ultimate and GOD MOD (2) Upgrades of these amplifiers		\$3,395.00	\$1,704.50	\$5,099.50

NOTE: All of these prices are based upon beginning work on a functioning pair of amplifiers that have not received extensive modifications, are in effect stock with few minor changes, and do not include shipping. We reserve the right to reject any amplifier for upgrade that is so modified that it requires extensive work to restore to original working condition. Any amplifier with prior modifications should be described in as much detail as possible or pictures sent to allow for visual inspection prior to acceptance to avoid being returned at the owners expense. This is to protect both you and us from beginning something that we may not be able to complete to our mutual satisfaction. \*All Prices are subject to change without notice.