# The ST-150-BJ-1
# A Boak-Jung Modification of the Dynaco Stereo 150 Amplifier

*Reported by* PATRICK J. AMER

I FIRST DISCOVERED the pleasures and satisfactions of "hands-on" audio in 1976, when I purchased and assembled from kits the Dynaco Stereo 150 power amplifier, as well as a PAT-5 and an FM-5. The Stereo 150 power amplifier, introduced by Dynaco in 1975, is a neutral-sounding, good, 75 watts-per-channel amplifier. It was overshadowed however, by its big brother, the Dyna 400, and has generally been little regarded, both in the audiophile press and among audio amateurs and modifiers.

My first "modification" audio project was the ST-70-C3, the Audio Research Corporation modification of the Dynaco Stereo 70 (*TAA*, 4/77). The ST-70-C3, a clean and warm-sounding tube amplifier, had a cleaner, truer and more natural sound than the Stereo 150. It became my amplifier of choice, and the Stereo 150 went on the shelf.

In 1978 I began, and have since continued, a correspondence with Walt Jung, arising out of his modifications of the Dynaco PAT-5. In May of 1980, my ST-70-C3 was down for repairs. I wrote to Walt mentioning that the Stereo 150 was back in use and really sounded inferior. He wrote back with some suggestions for improving its sound.

Through Walt, I met Jim Boak, a *TAA* Contributing Editor, whose most recent published article is "A Family of Regulated Power Amplifier Power Supplies," (*TAA* 1/80), and who has moved recently into the Cleveland area. Jim listened to and looked at my Stereo 150, and also had a number of suggestions.

With guidance from Walt and Jim, I have completed the series of Stereo 150 modifications outlined in this article. The Stereo 150 sound is considerably cleaned up, its transient response tightened, and its power increased. It is now definitely my amplifier of choice.

The ideas and electronic details of this modification have come from Walt Jung or Jim Boak, both of whom have reviewed and corrected this article. The "hands-on" assembling and installation work, and thus the construction suggestions, are mine, and I volunteered to act as reporter for the project.

The modification as I executed it fell into four stages, each of which independently results in a clearly audible sonic improvement. Stages One, Two and/or Four can be implemented without doing Stage Three. A major attractive feature of the modification is that Stages One and Four are cheap and Stage Two almost free. The changes were implemented in the 1975 version of the Stereo 150, but may be adapted for implementation in the later post-1976 versions. I assume that the modifier will have at hand not only a Stereo 150 but Dynaco's *Instructions for Assembly and Operation* manual as well.

### STAGE ONE: Capacitor Changes

In their landmark article, "Picking Capacitors," in the February and March, 1980 *Audio*, Walt Jung and Dick Marsh demonstrated that the material or composition of a capacitor in an audio circuit has a significant effect on distortion in the audio circuit. The relevant factors were further illustrated in Dick Marsh's "Dielectric Absorption in Capacitors," *TAA* 4/80. Applying these principles, Walt Jung identified four key locations in the Stereo 150 most apt for capacitor changes, and these changes constitute Stage One of this modification.

**1.** $C_{101}$, the input coupling capacitor: if your preamplifier has (or all your preamplifiers have) an output coupling capacitor, the input coupling capacitor on the Stereo 150 is redundant, and you can jumper $C_{101}$. If you wish to retain the DC blocking function of the input coupling capacitor, remove $C_{101}$ (a 33$\mu$F 25V tantalum) and substitute a 5$\mu$F 100V (or more) polypropylene capacitor and a 0.47$\mu$F 250V polypropylene capacitor in parallel. The TRW types are recommended throughout. Use hookup wire and a terminal strip to outboard these capacitor pairs.

**2.** $C_{106}$, the capacitor on the feedback circuit: Remove $C_{106}$ (a 33$\mu$F 25V tantalum) and substitute the following capacitors in parallel:

**A.** a 220$\mu$F 50V aluminum electrolytic (exact value and voltage not critical; use a high quality unit, as recommended in Jung/Hollander, "St. Pooge and the Driaagon," *TAA* 1/81);

**B.** a 5$\mu$F 100+V polypropylene; and

**C.** a 0.47$\mu$F 250V polypropylene.

I suggest you mount these caps on a four-lug terminal strip for each channel and mount the terminal strips on the PC-36 mounting brackets (see *Photo 2*). This keeps these capacitors up and out of the way, and leaves chassis room for the regulators described in Stage Three.

If you have doubts about the practical effect of a capacitor change on the sound from your audio system, listen carefully before and after making this single change. I think you will be astonished at the increase in clarity and detail.

**3.** $C_{115}$, the output RC phase compensation capacitor: Remove $C_{115}$, a 0.1$\mu$F 100V disc, and substitute a 0.1$\mu$F 200+V polypropylene.

**4.** $C_{301}$ and $C_{302}$, the power supply electrolytic can capacitors: Install in parallel with each 10,000$\mu$F can a 5$\mu$F 100+V polypropylene and a 0.47$\mu$F 250V polypropylene. This step will be reversed and these capacitors used elsewhere if you go on to Stage Three. It will facilitate installation if you install a terminal lug under the mounting screw on the positive terminal of each can cap, and use the existing lugs on the negative terminals.

You should hear a significant improvement in clarity and spatial placement of sound as a result of these capacitor changes; I did.

### STAGE TWO:
### Power Supply & Output Wiring

A major feature of the Stereo 150 is its capacity to be connected as a 150 watt monophonic amplifier by moving a Molex connector on the power supply board and strapping the audio input between the channels. The price for this flexibility is a substantial complication of the internal wiring and a use of less than the fully available power supply in the stereo mode. Stage Two of the modification removes the mono strapping feature but gains some substantial and audible improvements in the power supply and output connections.

**1.** Remove the Molex connector from the PS board, and all the wires connected to the female connector (connections to diode block terminals $D_2$ and $D_4$, and to output speaker fuse holders). Remove the red-red leads of the power transformer from their connections at PC 37 holes 5 and 6, and solder them to diode block terminals $D_2$ and $D_4$. This increases the input voltage from 37V AC to a nominal 48V AC, and the rectified DC power supply from about ±48V DC to about ±61V DC.

**2.** Change the power supply fuses from 4A to 1A (or 1.5A). Get several extra fuses—I found I could blow a 1A power supply fuse with my tuner turnoff transient until I learned to lower the volume first. But 1.5A for each side of each channel gives signficant protection which the 4A fuses did not. With the additional protection of these substantially reduced power supply fuse levels, the output speaker fuses can be removed.

**3.** Wire the audio output from PC 36 holes 4 and 23 direct to the live speaker posts. Remove the speaker fuse assemblies. Note that this step eliminates three contact connections, a fuse, and about 18" of wire from each output connections—a major improvement.

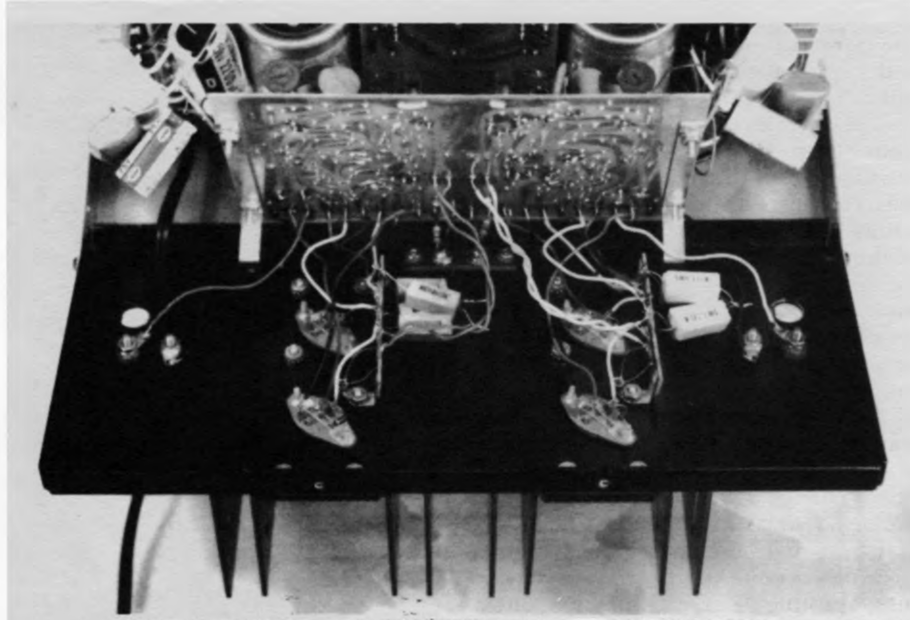

*Photo 1. Inside rear panel of the 150 hinged down, after modifications.*

**4.** Change the 0.33Ω 5W resistors $R_{302}$ and $R_{303}$ on the terminal strips mounted on the back panel to 0.2Ω, using two 0.1Ω 5W resistors in series for each side of each channel (see *Photo 1*). This will increase the level at which the limiting circuit of $Q_{J07}$ and $Q_{J08}$ comes into operation.

**CAUTION:** See Step 5 below before

you power up after this change. I didn't, and I could have fried eggs on my heat sinks!

5. The increased power supply voltage from Step 1 and reduced output resistance from Step 4 will increase the bias current through the output transistors well beyond the thermal capacity of the heat sinks unless you also adjust the bias current. The bias current, adjusted through $P_{102}$, a 1k trimpot, in series with $R_{110}$, a 2.7k resistor, needs to be made adjustable in the 2.3k to 2.6k range. I changed $R_{110}$ to 1k and $P_{102}$ to a 5k pot. Easier yet, change $R_{110}$ to 2k and leave the trimpot as is. A multi-turn pot is preferable to a one-turn pot, as a minor change in the pot setting produces a major swing in bias current.

Set the bias current in each channel by removing the positive power supply fuse, putting a DC ammeter on a 500mA scale across the fuse posts and trimming the pot for 300mA. Although the ST-150 manual recommends a bias current of 75mA, we found that a current of 300mA lets the heat sinks get warm but not uncomfortable to the touch, and 75mA seems much too low. Follow the procedure outlined in the Stereo 150 manual (except for the current level), allowing the amp to warm up for ten minutes, checking the DC center line voltage across the output terminals (having re-inserted the fuse), and then (removing the fuse) checking the bias current again.

As a general rule, changes in one or more of a number of components may affect the bias current. This modification proposes changes in resistors, capacitors and transistors, as well as source power, and a number of these changes affected bias current. To be safe, remember every time you power up after a component change to watch for bias current change by checking the heat sink from time to time.

Another way of checking which I found useful is to be aware of the time lag between power turnoff and the "thump" which the capacitors make when they discharge through the speakers. If this time lag is between two and four seconds, bias current and the temperature of the heat sinks will be in a reasonable range. If the caps discharge faster, the amp is operating too hot, and if they discharge more slowly, the bias current is too low and you are not taking sufficient advantage of the ability of the amp to operate in a Class A mode at lower power levels.

6. If you are going to do Stage Three, and if you acquire the Boak regulator kits from Old Colony, consider substituting the TCG 180 and 181 transistors supplied with the kit for the ST-150 output transistors, and using the original ST-150 output transistors for TR-2 on the regulators. The 180 and 181 transistors have a higher current capacity and better thermal characteristics. The following guide will be helpful:

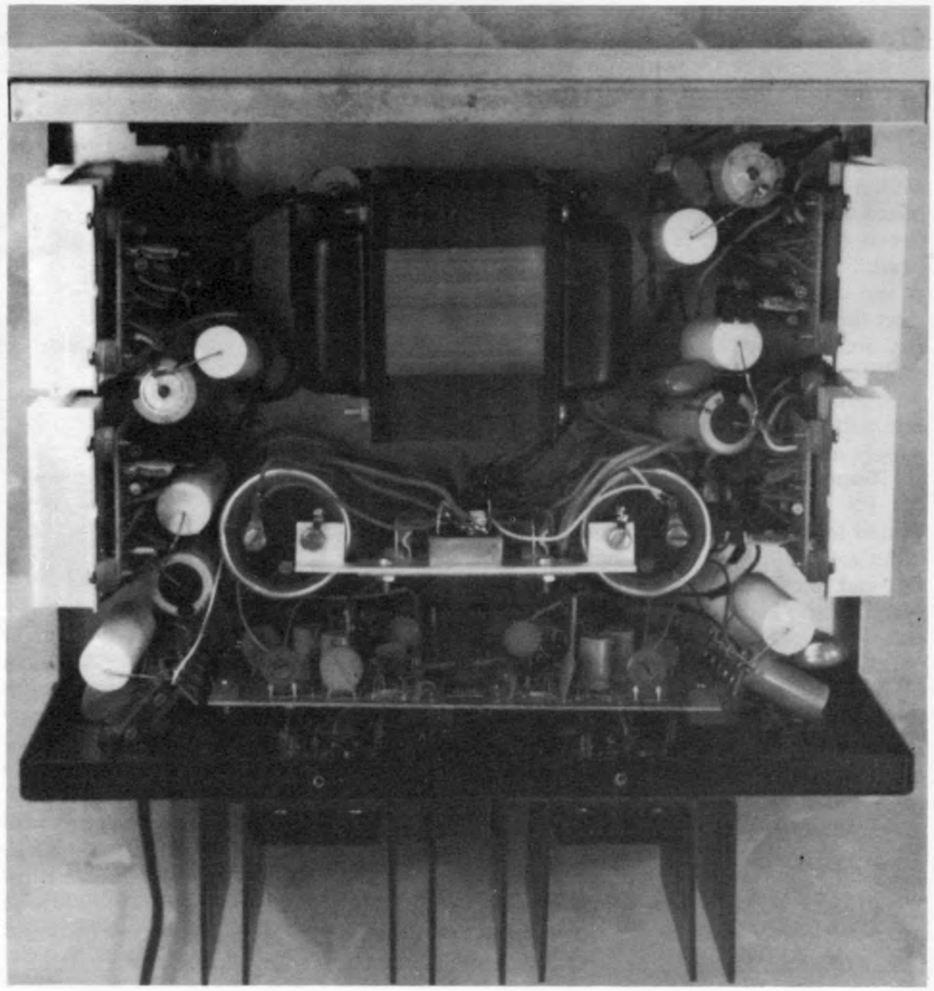

*Photo 2. Top view of the modified 150 showing the locations of the four power supply regulators and their heat sinks.*

| TR Type | Dynaco Part | New TR |
|---|---|---|
| PNP | 561356 or 357 | REN180 or TCG180 |
| NPN | 571104 or 105 | REN181 or TCG181 |

If you change output transistors, check very carefully to be sure the transistor leads seat firmly in the Dynaco TO-3 sockets on the back panel. I found that the substituted transistors, although fully in spec, touched, but did not seat firmly in the sockets. I finally changed sockets to be sure that good contact would be made and could be visually verified.

After making the above changes, you should hear a cleaner sound, with more impact on transients and sonic peaks.

### STAGE THREE: Power Regulation

In retrospect it is hard to believe the Stereo 150 was not designed with Jim Boak's power supply regulators in mind. The Boak regulator requires a raw power supply of about 20%-25% more raw DC voltage than the regulated output; the Stereo 150 has, from the red-red transformer output leads, after rectification, just the right amount of excess raw supply. The Boak regulator takes up space; the Stereo 150 has just enough space in the chassis to accommodate a positive and negative regulator for each channel, with associated heat sinks (see *Photos 2* and *3* ).

The general theory, circuit diagram, circuit board layout and stuffing guide for the Boak regulator are all set forth in *TAA* 1/80. What we have used complies with the Pass A-40 regulator as described in that article except as follows:

**a.** Use the ST-150 output transistors in place of the specified transistors at $TR_2$.

**b.** Set the current ratio between $TR_2$ and $IC_1$ at 3.3 to 1 by using a 0.33Ω 5W resistor at $R_5$ (use the 0.33Ω resistors removed from $R_{302}$ and $R_{303}$ in the ST-150 in Step 4 of the Stage Two changes).

**c.** Set the regulator range at 48-54 VDC by using for $Z_2$ a 33V 5% 1W zener diode.

The Old Colony kits (KL-1P) contain PC boards and all components, including the small board-mounted heat sinks, but not the large heat sink's, the transistor sockets or the output caps, so a trip to the parts store will be necessary.

After stuffing the regulator circuit boards with everything but $TR_1$, $TR_2$ and the regulator (being very careful to observe polarity), I mounted the two transistors and the IC on Radio Shack Universal heat sinks (RS No. 276-1361). The transistors, mounted with TO-3 sockets and silicon thermal compound, go on the heat sink in a straightforward manner (well, not so straightforward, but they fit, and they fit only one way). The sockets go on the side with the mounting flanges. Care must be taken to be sure the transistor cases do not touch the mounting hardware for the TO-3 sockets.

Mounting the IC was more tricky. I mounted it on the heat sink under the corner of the TO-3 socket used for $TR_2$, holding it in place with the socket mounting hardware. Be very careful here not to ground the regulator to the heat sink; check with your ohmmeter for infinite resistance between the regulator terminals and the heat sink. This assembly, while not ideal, keeps the IC in close proximity to $TR_2$, for good thermal regulation.

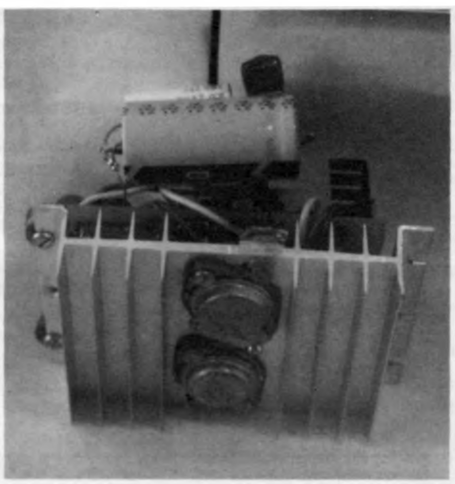

*Photo 3. One of four of the Boak power supply regulators adapted for use with the 150.*

I then connected a hookup wire to each connection point on each transistor socket and to each terminal of the IC (about 3½" to 4" for $TR_1$, 2½" for the others), making the wires long enough to go over the top of the PC board when mounted on the heat sink and to connect to the PC board from the top (component) side.

I found it helpful to use three different colors of hookup wire for B, C and E, and for ground, in and out, and to stick to the same color plan for all four regulators. Since the regulator terminals are exposed, I covered them with heat shrink tubing after attaching the hookup wires. Remember that the terminal pin arrangement on the negative regulator IC's is different from that on the positive.

I hooked up $TR_1$, but not $TR_2$ or the IC, and added input, output and ground wires of appropriate length, using 18 gauge wire for the output wires, and started on the testing procedures outlined in Jim Boak's article in *TAA* 1/80. You should be able to read voltages in the following ranges:

| | |
|---|---|
| A | 61 |
| B | 57-59 |
| C | 31-32 |
| D | 56-58 |
| D | with $D_3$ shorted, 26-30 |
| E | 36-37 |
| F | 47-55, adjustable to 50 |

Test the ability of the regulator to hold its voltage into a 42Ω load, and to drop output sharply when feeding a 10Ω load, both prior to connecting $TR_2$, as per the Boak article. Test output voltage both before and after installing in the chassis.

I mounted the regulator boards on the heat sinks, on the socket side, parallel to and spaced about ⅜" from the sinks, with a pair of #6x⅝" screws, the same screws as are used to mount the transistors, through the mounting flanges on one end of the heat sink, and a set of fiber washers from the hardware store. See the accompanying photos. The screws cut their own threads in the PC board.

I moved the AC input line fuse and fuse holder about 1½" closer to the transformer, drilled mounting holes in the chassis, and mounted each regulator on a single 1" L bracket, using a 7/32" x ½" stove bolt, nut, and lock washer. Two L brackets per regulator would make a more stable mounting.

Another word of caution—shield the fuse holder assembly *and* the lamp assembly from the regulators. The amp's sound design feature of keeping the raw AC current well away from the DC power components is violated by the location of these regulators, and an accidental contact between the regulators and the fuse assembly or the lamp assembly will wreak havoc on something or other.

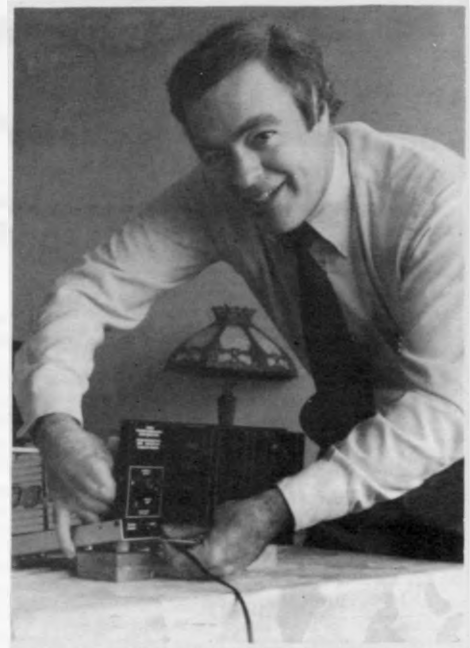

*Photo 4. Pat Amer and the 150 after modification.*

Connect the regulator inputs and outputs as follows:

| From PC 37 | to Reg. Input | Reg. Output | to PC 36 |
|---|---|---|---|
| 9 | A + | A + | 2 |
| 10 | A − | A − | 11 |
| 18 | B − | B − | 17 |
| 19 | B + | B + | 24 |

Connect regulator grounds to PC 37 ground, 11-17. The power and ground connections on PC-37 are soldered on both sides of the board, so it will require a little extra work to remove them, clear the holes, mount the new power and ground leads, and solder them on both sides.

At Jim Boak's suggestion, I mounted a 2200μF 50V aluminum electrolytic capacitor across the output of each assembly, mounting the cap on (actually dangling it from) the regulator. I was dissatisfied with the sound of the amp at

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## PARTS UPGRADING

| Location | Present Value | New Value |
|---|---|---|
| $R_{301}$ | 1k, ½W, 5% | 1k, RN55C (or D) |
| $R_{102}$ | 47k, ¼W, 5% | 47.5k, RN55C (or D) |
| $R_{107}$ | 24.3K, ⅛W, 1% | 24.3k, RN70C (or D) |
| $R_{108}$ | 1k, ⅛W, 1% | 1k, RN55C (or D) |
| $R_{127}$ | 1.2k, 2W, 10% | 1.21k, RN75D1211F |
| $R_{128}$ | 10Ω, 2W, 5% | 10Ω RN75010ROF (I used two 20Ω in parallel) |
| $C_{102}$, $C_{116}$ | 150pF, 100V 10% disc | 180pF polystyrene |
| $C_{104}$ | 56pF, 100V, 10% disc | 47pF polystyrene |
| $C_{105}$, $C_{109}$ | 22pF, 100V, 10% disc | two 47pF polystyrene in series |
| $C_{103}$, $C_{107}$, $C_{111}$, $C_{114}$ | 0.1μF, 100V, 20% disc | 0.1μF 160V polypropylene |
| $C_{112}$, $C_{113}$ | 0.01μF, 500V, 20% disc | 0.01μF polystyrene |

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this point. Following the Jung principles, I installed a 5μF polypropylene cap and a 0.47μF (or 0.1μF) polypropylene cap in parallel with the electrolytic on each regulator, taking two of the four required pairs from the 10,000μF cans. The improvement was quite audible.

After installing the regulators in the chassis, reset the bias current to about 300mA, and rebalance the DC center line voltage.

### STAGE FOUR: Upgrading Components

The final modification stage is to upgrade the resistors in the signal path to metal film type resistors, and the remaining capacitors on PC 36 to polypropylene and polystyrene types. Table A provides a guide to these component changes.

I suggest you mount $R_{301}$ on the PC board, where you will find a presently jumpered set of eyelets marked "$R_{101}$." Then connect the input jacks to PC-36 Nos. 12 and 15 with hookup wire rather than with the resistors. Why the resistors were used for a hookup function in the first place is hard to discern, but it is clearly a design decision made after the boards were laid out, and was probably related to the mono strapping feature removed in Stage Two of this mod.

Check bias current again after these changes. In addition, you may choose at this time to substitute gold-plated input phono jacks (which I did), and gold-plated speaker lead binding posts (which I have not done). Walt Jung recommends the ⅜" input phono jacks available from Old Colony: I used the ¼" externally mounted jacks from Reference Audio, Box 368M, Rindge, N.H. 03461, and I think you will have difficulty mounting larger jacks without cutting the ST-150 back panel.

### LISTENING TESTS

Well, with the modification completed, how does it test and how does it sound? In his accompanying article, Jim Boak has set forth the results of the electronic tests and measurements he made on my ST-150 amplifier, and his observations and comments on those results. I did my own listening tests, yielding the following observations and comments.

Since I made the above changes over a six-month period, it is hard to compare directly the sound of the Stereo 150 before and after the changes. As a next best way of measuring the audible effect of the changes, I made some careful listening comparisons among my amps and preamps before the changes, and similar comparisons after the mod was completed. I think my observations will shed some light on the kind of sonic improvements you might achieve with this mod.

In May, 1980, before I began modifying the Stereo 150, I compared my two amps, the stock ST-150 and the ST-70-C3, and my two preamps, a PAT-5/WJ-1A (*TAA* 1/78, with most but not all of the *TAA* 3/79 changes) and the Vorhis PAS-2 mod (*TAA* 1/74 and 2/76), in the four possible configurations. The all-tube configuration was warm, rich and smooth sounding, but with poor transient attack and percussives and loose bass. The all solid-state configuration was harsh, not rich, with more dynamic contrast and percussion but with less accurate rendering of the tone and timbre of live instruments. The clearly preferable configurations, by a wide margin, were the mixed tube and solid-state configurations, with a somewhat richer and warmer response from the PAS-2, ST-150 combination, and better detail from the PAT-5, ST-70-C3 combination.

I concluded at that time, after listening, that every musical note has a moment of attack and a moment of resonance; that solid-state equipment (at least my own solid-state equipment) was truer to the moment of impact or attack, and that tube equipment (my tube equipment, at any rate) was truer to the moment of resonance.

After completing the Stereo 150 mod described above, I repeated the test, listening to the two amps and the two preamps in the four possible configurations. In both tests, the cartridge was a Pickering XSV 4000, and the speakers IMF TLS 50 II's (an I.M. Fried design transmission line speaker of English manufacture, earlier called the Studio III). The turntable and arm in the earlier set of tests was a Dual 1249, and in the later series a KD-500 and a SME 3009 III. The PAS-2 and ST-70-C3 were completely unchanged between the times of the tests, and the PAT-5 was modified slightly in June.

I observed the following changes:

**Separation and Detail.** The modifications to the Stereo 150 have very much improved its ability to reproduce orchestral detail and correct separation of instrumental sounds. For example, in the first movement of Mahler's Third Symphony (Phil. 802 711/12, Haitink, Amsterdam Concertgebouw Orch.), the PAT-5, ST-70-C3 instrumental separation was very good, better than on either test with the PAS-2, but the PAT-5, ST-150 separation was even better, in that it was easier to tell what was going on in the parts of the orchestra which were not carrying the lead part at that time. The choirs and ranks of instruments were more distinct, each with more of its characteristic timbre and color. Prior to the modification of the ST-150, the PAT-5, ST-150 combination was blurred in detail, and in this respect the worst of the lot at that time.

**Transient Response.** Here the acid test is the sound of a piano, and an ultimate test among piano recordings is the direct-to-disc Japanese RCA "Appassionata" Sonata (Japan RCA RDC-4). On this recording, the all-tube combination sounded very bad, with no transient impact at all; the PAT-5, ST-70-C3 combination was better, but the notes sounded plucked, not struck. The ST-150 had much more transient impact with both preamps. Similarly, in the third movement of the Schubert "Trout" Quintet (DG 136 488), the piano was focussed and properly percussive in both tests with the modified ST-150, and liquid and somewhat recessed by comparison in the tests of the ST-70-C3. In this respect, the ST-150 was superior in the pre-mod state as well.

**Bass Response and Coherence.** While transient response seems principally an amplifier characteristic, bass response appears to require solid-state control in both the amp and pre-amp. The PAT-5, ST-150 configuration was the only one to reproduce the piano bass notes on the "Appassionata" recording with the distinctive sound of the lower register of a piano. The PAS-2, ST-150 combination by comparison had impact and resonance, but one was less certain of the pitch; and the PAT-5, ST-70-C3 combination produced accurate tone but did not seem to have the speed to keep the notes from running into one another.

A closely-allied characteristic of bass response is its coherence with the midrange and treble response. Here again, the modified ST-150, when driven by the PAT-5/WJ-1A, excelled, particularly on the "Appassionata" recording, but also on the lower strings in the "Trout." Prior to the modification, there was too much grundge and blur in the Stereo 150 sound to permit its ability to control bass sounds to be heard.

**Dynamic Contrast and Impact.** The ST-70-C3 is rated at 30 watts per channel, the unmodified ST-150 at 75, and the modified ST-150 at 140 watts per channel. I can now hear a greater dynamic range on my good records than I thought was there. The effect of having available a wider dynamic range was evident when listening to the first movement of Mahler's Third Symphony.

**Color and Warmth.** The most striking and surprising change in the sound of the Stereo 150 is the effect of the mod on color and warmth. A cleaner sound, with better separation and detail, was a change I expected to hear. Improvements in transient response, in bass coherence, and in dynamic contrast

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could be predicted from a paper description of the modification, and did in fact result. What I did not expect or predict, but what I clearly hear, is a significant improvement in the reproduction of the warmth and color of instrumental and vocal sounds.

As I observed above, I had come to accept as immutable my observations that tube equipment could reproduce more accurately the warmth and color of musical instruments, at the expense of impact and speed, and that, while solid-state equipment was better at transient response, it could not quite get the warmth of sound of a live performance. These observations are by no means new; audio reviewers have long been aware of the problems of "transistor sound," and many audiophiles have long preferred their old tube equipment, or modifications of old tube equipment, to any reasonably-priced solid-state equipment.

Let me state clearly that I am not expressing a personal preference for euphonious coloration of recorded sound. I attent live orchestra and chamber music concerts frequently, and at those concerts I listen to live unamplified music. An oboe is sweet, as is an english horn; a clarinet mellow. Violas and cellos are warm. Strings and piano are resonating wooden boxes and should sound wooden, not metallic.

Before modification, the Stereo 150 did not reproduce the warmth and color of live instruments, in contrast to my tube equipment: Jim Boak heard the Stereo 150 at that time and described what he heard as "typical transistor sound." After the modification, to my surprise and delight, the Stereo 150, driven by the PAT-5/WJ-1A, produces all the warmth and sweetness of tubes, with better detail: on hearing it, Jim Boak was surprised when he learned that there were no tube components in the hookup.

The effect is illustrated by listening to the first few bands of the remarkable Nonesuch recording, "Tenth Century Liturgical Chant" (None. H-71348), performed by a small schola of *a capella* male voices. The tube sound was warm and resonant; the solid-state equipment reproduces the consonants and vocal detail better and preserves the warmth and resonance as well, and the sum is a remarkable "presence" of the singers. The combination of warmth and superior detail, resulting in greater "presence," is also notable in the Mahler.

The modifications in my PAT-5/WJ-1A have included the replacement of all tantalum and disc capacitors with polypropylene and polystyrene caps, and metal film resistors throughout, as well as upgrading the volume and balance controls to Allen-Bradley pots, and conversion of the phono boards to non-inverting, transconductance mode of operation per Jung/White letters, *TAA* 2/80 pp. 51-53. In the Stereo 150 mod, all the capacitors and nearly all the resistors in the audio circuit have been so upgraded, but the transistors were not changed, nor were *any* changes made in the basic circuit design. The improvements in sound described here were achieved solely by using better "passive components" and upgrading and regulating the power supply. Perhaps what has been called characteristic "transistor sound" should be better called "capacitor sound!"

A final note: I have not compared the Stereo 150 with other high-end amplifiers, nor have I had the opportunity to use it to drive other speakers. My enthusiasm for the project should not obscure the fact that I can report only on a large *relative* improvement in quality of the Stereo 150, and cannot place the modified Stereo 150 in its ranking among other very good amplifiers. □