



Frequently Asked Questions

Q1: You removed the Rectifier tube in the Dyna-70 Ultimate Upgrade; isn't this essential to the ST-70 sound signature?

There are lots of opinions on use of Rectifier tubes. Often these “opinions” are just that and not based on sound engineering principles. In general, use of a Rectifier tube keeps the ST-70 “stock”- the way Dynaco designed it. For purists, we endorse using a “good” Rectifier tube in a stock ST-70, if that's what you appreciate and enjoy listening to. However, there are limits you likely already know about in access to “good” rectifier tubes, especially if you already own an ST-70 amplifier. Let's review several aspects of Rectifier tubes in ST-70's:

- First, supplies of RCA, Mullard, and Telefunken 5AR4/GZ34 Rectifier tubes are scarce. Not everyone can afford \$100+ (Q1/23) for a NOS Rectifier tube. Let's also face the reality that new production Rectifier tubes come from countries that are not friendly to the United States or “the West”. The better, new production GZ34/5AR4 tubes such as Gold Lion, Sovtek or Tung Sol are well over \$50-60. Ideally an ST-70 today needs 2 Rectifier tubes given how highly loaded it is and how poorly most new production GZ34's perform, leading to the next point.
- Second, most new production, imported 5AR4/GZ34's are not as well made as North American and Western European 5AR4/GZ34's were made. There are several new production 5AR4/GZ34's, which New-in-Box (NIB) can barely power an ST-70 without stressing the tube and blowing fuses. Search the internet; you will find many reports of NIB imported 5AR4/GZ34's that fail after a few weeks to a couple of months use in ST-70's. As a ST-70 owner, likely you've experienced this already.
 - If you're committed to using a Rectifier tube in your ST70, we suggest use of a Tung Sol, Sovtek or Gold Lion 5AR4/GZ34 for a new production Rectifier tube.
- Third, there some who argue that they prefer a Rectifier tube because it produces “sag” and “distortion” or it “sounds better”. Here is the unabashed truth about Rectifier tubes in a piece of stereo equipment designed for high-fidelity sound reproduction: You want stability and consistency in the Power Supply. You want no variation (sag, distortion, voltage drop, etc.) in the power supply of your stereo equipment - PERIOD!
 - NOTE: Rectifier tubes in Guitar amplifiers are a different issue! *Often* Guitar players want their amplifiers to intentionally distort upon command. However, musicians are *creating music*, not *reproducing* it. Musicians want sound “effects” to make their "signature" sound when they play. *This is exactly the opposite of what we want in sound reproduction from a stereo system.*

- Forth, in the 1960's some of the most iconic tube stereo amplifiers from renowned companies such as McIntosh, Dynaco, and Fisher and utilized solid-state Rectifiers in several amplifier designs. A sample list includes the following amplifiers / integrated amplifiers (most will agree these are some good sounding tube audio pieces):

Dynaco: SCA-35 & ST-35
 Fisher: X-100-B, X-100-A
 McIntosh: MC-225, -240 and -275

- Finally, the best reason for removing the 5AR4/GZ34 Rectifier is that it does not have enough current to power the 3 added 6SN7 tubes, even with elimination of the Rectifier tube, a stock ST-70 Power Supply just doesn't have the power to run all the heater filaments required in the Dyna-70 Ultimate Upgrade (Capt. Kirk: Scotty, we need more power!)
- In summary, most new tube amplifier-based audio designs today do not use a Rectifier tube and depend upon solid-state rectification for DC power. Here are just a few samples of U.S. designed and manufactured stereo amplifiers with solid-state rectification:

Audio Research: VT-100, VT-200, VTM-200, REF-110, REF-150/150SE, REF 160M
 Conrad Johnson: LP125sa, CL62/SE, CL120/SE
 Miller Audio LLC: Dyna-70 Ultimate ST-70 Upgrade
 Rogue Audio: Stereo 90 /100, Atlas Magnum, Cronus Magnum, M-180

Q2: You removed the Capacitor Can, why?

There was no single reason for eliminating the "cap can"; it's a combination of factors that influenced us to move away from a cap can. Some of those considerations were:

Working Voltage: When used in a "stacked" manner (i.e., 2 or more capacitors in parallel) we can increase the working voltage of the capacitors in our circuit to 700-900 volts upon turn on, settling to 375-400V nominal operating voltage. Most cap cans are limited to about 525-600 V turn-on voltage, settling down to 400-475V nominal operating voltage.

Tolerance: Most multi-section cap cans used in audio today are designed with a tolerance of approx. +50% / -10%. We use discrete capacitors on our Dyna-70 Circuit Card Assembly (CCA) that have a tighter tolerance variation (usually +/- 10% or 20%, max).

Temperature Rating: Many multi-section cap cans are rated for 85°C. Considering the proximity of both power and signal tubes with the Dyna-70 upgrade PCB, and operation with the Tube Cage in-place (which we highly recommend), we sought a modest increase in operating temperature margin as a design goal, and therefore used 105°C rated parts.

Cost: 4-Section electrolytic capacitor cans for the ST-70 are approximately \$50+; roughly \$12.50 per section (not including taxes and S&H fee's). We can use discrete caps rated for 450V and 105°C and execute a better capacitor filter network and improve voltage and temperature design margins at a lower cost than using a multi-section cap can.

Space: Finally, execution of the Dyna-70 Ultimate Upgrade design, we needed "real estate" between the tubes to host all components, as well as three 6SN7 preamp signal tubes. Likewise, we also had to

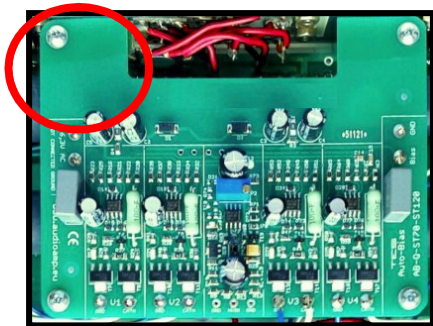
incorporate the Auto Bias Module and its status LEDs, while maintaining a PCB layout which is common to both the manual and auto bias component layout and follows the same basic assembly process.

Q3: *ANOTHER ST-70 driver upgrade? What makes Miller Audio LLC's upgrade better than other ST-70 Driver upgrades now available?*

Great question. If not obvious from this FAQ and website information, a lot of effort was invested in the Dyna-70 Ultimate Upgrade. The field of ST-70 upgrades is vast with several providers who have been in the ST-70 and Dynaco upgrades for 20+ years. However, we believe we have the best ST-70 audio upgrade available on the market today. A simple claim, but one listening session is all it takes to make a believer of you too.

Q4: *I've seen Forum discussions about the Auto Bias module, weren't there some problems with these? I've seen reports of failure with the Auto Bias modules on the web...*

It's true. Several years ago (approx. 2018/2019) with the first generation of AB modules, there were problems with the 6.3VDC power circuit which powers the module. This was addressed through the addition of a 6.3V matching Transformer to the module. This is either a black or gray molded "brick" that was not used on the first-generation bias modules, ref. pics below.



A- First Generation Module



B- Second Generation Module w/ Transformer

Q4: Comparison of First & Second Generation Auto Bias Modules

It was also necessary to protect the Auto Bias module in case of tube failure. The latest generation of AB modules has built-in protection on the control module PCB to protect the module in case of tube failure. You'll note minor differences in components between photo's A & B on the Auto Bias module providing this protection. If you are concerned about the AB function and want to save a few dollars, you can always purchase the Manual Bias kit and use the dollars to help pay for the required larger PA-060 Power Transformer. There is no difference in sound quality between a Manual or Auto Bias equipped unit.

Q5: *What does the Dyna-70 Ultimate Upgrade kit cost?*

Frankly, the Dyna-70 Ultimate Upgrade is expensive. In fact, our Dyna-70 Ultimate Upgrade is one of the more expensive ST-70 upgrades available. However, it is also much more than just a driver stage with tubes that are easier to find than 7199's! We addressed a design-to-cost compromise Dynaco made with the ST-70: its low-cost power supply system with a single rectifier tube. We upgraded the

power supply and made that upgrade using our Dyna-70 PCB, whereas most providers of ST-70 driver updates, only update the drive PCB and the tubes on the PCB. In upgrading the power system, we gave the ST-70 what it really needed to perform on par with a McIntosh, Audio Research or Conrad Johnson product: MORE POWER!

Dyna-70 Ultimate Upgrade w/ Manual Bias \$324.95 MSRP

Dyna-70 Ultimate Upgrade w/ Auto Bias Module \$459.95 MSRP

Manual or Auto Bias PCB \$60.00 MSRP

(For those who want to purchase a Dyna-70 PCB and populate with your own choice of components)

Kits include all parts required to assemble the Dyna-70 circuit card; a Printed Circuit Board for either Manual or Auto Bias configuration, electronic components, fasteners, wire and shrink wrap to complete integration with your ST-70.

Kits do not include tubes, so these are also an additional cost item required to complete the Dyna-70 upgrade.

We offer a complete compliment of tubes for ST-70's, as well as film cap options for coupling caps in the audio circuit. We also offer a Trade-In program for your tired, rusty old ST-70 for a completely new ST-70 with the Dyna-70 Ultimate Upgrade already integrated in it. Ask for details on our ST-70 amplifier Trade-In option.

Q6: Wow, \$325+ for an ST-70 Upgrade? That's seems high...

Perhaps, however you get what you pay for. There is "more of everything" when comparing a Dyna-70 Ultimate Upgrade to other ST-70 upgrades. Most importantly, you will hear the difference the first time you listen to our Dyna-70 Ultimate Upgrade- we promise!

Another perspective: Have you seen what ST-70's are selling for? 5-6 years ago, used ST-70's were \$300-\$600; today decent ST-70's bring \$800-1200 or more, with restored or newly built ST-70's going for \$1500-\$2000 and higher. The truth is that ST-70's have appreciated to the point that one can justify spending more on upgrades because they are worth more today, modified or not.

Finally, we'll leave you this thought on prices of audio equipment: "...Great, high quality audio products aren't cheap; and cheap audio products aren't great..."

Q7: Your upgrade costs more than that- one must buy a bigger, more expensive PA-060 Power Supply Transformer, right?

Correct, there is no way around it- to get an ST-70 to really "sing" it needs more power, it's that simple. One cannot power our Dyna-70 Ultimate Upgrade without using a larger Power Supply Transformer. However, you will hear the results the first time you play your favorite tunes on a Miller Audio Dyna-70 upgraded ST-70. Again, we promise or your money back (it's that simple too).

The good news is that if you were to buy a new ST-70 amplifier kit today, it already comes with the larger PA-060 Power Supply Transformer as standard equipment; everyone realizes the ST-70 needed more stable power to perform well.

Q8: Have a Question? Send us your question(s) - if we use in this FAQ section, we'll give you a 10% discount on your next order...