

Dynaco ST-120 with VTA driver board Kit instruction manual

Triode/Pentode version

Congratulations on your purchase of the Dynaco ST-120 with VTA driver board kit. Every effort has been made to give you the finest sounding, most reliable and best looking 60 watt per channel kit presently available. ALL parts in this kit are NEW – there are no “recycled” parts from older original Dynaco amplifiers. Your Dynaco kit features the following items which are all upgrades from the original Dynaco kits.

1. A new STAINLESS STEEL chassis that is identical in size, shape and markings to the older original nickel plated steel frame. This chassis is NON-MAGNETIC and removes any magnetic interference effects of a steel chassis on the audio circuitry.
2. Quality USA made A-260-120 custom wound output transformers which are interleaved/layer-wound and incorporate high quality M-6 grain oriented laminations.
3. A more robust PA-060-120 power transformer rated at 120 volts, having 420-0-420 secondaries and a 450 milliamp current transfer capability.
4. Quality Celanex™ tube sockets
5. All stainless steel screws with zinc plated kep nuts
6. An 80, 40, 30, 20 main electrolytic cap with a 525 volt continuous use rating.
7. An all triode VTA driver board made of mil-spec epoxy fiberglass. This board also contains an on board bias supply for the output tubes and eight premium Sprague 716P film and foil coupling caps.
8. Gold plated input and output terminals.
9. A dual choke system rated at 400 milliamps
10. Triode/pentode switches to allow the amp to run in two modes of operation
11. A supplementary cap module with ESL reduction capacitors

The KIT comes with a very easy to follow instruction manual and a clear pictorial specific to the VTA driver board. All you need is to complete the kit is a soldering pencil, some rosin core solder, a screwdriver, pliers and a wire cutter/stripper to build your own Dynaco ST-120. The kit takes about 10-12 hours to build depending on your skill level and any previous experience with kit building.

List of Parts

- 1 - Stainless Steel chassis frame with bottom cover
 - 1 - VTA driver board with parts set
 - 7 - 8 pin Celanex™ octal tube sockets
 - 1 – USA made PA-060-120 power transformer
 - 4 - hard rubber isolation washers for power transformer
 - 2 - A-260-120 USA made custom interleave/layer wound output transformers
 - 2 - C-354 chokes
 - 1 - multi section 525 volt rated (80, 40, 30, 20) quadruple capacitor
 - 1 - three lug terminal strip
 - 1 - one lug terminal strip
 - 1 - pair of gold plated RCA input jack jacks with mounting board
 - 2 - pair of gold plated output binding posts with mounting board
 - 1 - rubber grommet
 - 1 - fuse post with 5 amp SLO-BLO fuse
 - 2 - SPST slide switches
 - 1 - 13 amp rated AC power cord
 - 2 - .022 Mfd 600 volt capacitors
 - 4 - 1000 ohm 1 watt resistors
 - 4 - 10 ohm 2 watt bias resistors
 - 1 - 6800 ohm 2 watt resistor for quad cap
 - 1 – Supplementary Cap Module (SCM)
 - 1 – Set of ESL reduction capacitors
 - 1 - hardware kit for amp
 - 1 - 22 foot coil of 20 gauge tinned solid core copper wire
 - 1 – triode/pentode kit (2 DPDT switches, two 2 lug terminal strips, 4 X 100 ohm 1 watt resistors)
- OPTIONAL > One tube set – 4 X 6550 or KT88, 3 X 12AT7, 1 X GZ34 rectifier

Optionally painting the transformers

Power and output transformers come from the factory with minor surface imperfections. You may, as an option, paint your transformers for a better appearance with some type of heat resistant paint. Recommended, are any type of paint used to paint automobile engine blocks (engine enamel) or paint used to paint barbecue grilles. To most people a semi-gloss paint looks best on transformers. Use a spray can – don't brush it on.

Recommended paints are Krylon BBQ and Stove paint (Krylon # 1618) OR any type of semi-gloss automobile engine enamel in a spray can. This is carried by Wal-Mart and many other stores. Go to an auto supply store for engine enamel.

1. Obtain SIX 8 X 32 machine screws 2 ½ to 3 inches long with nuts.
2. Remove one transformer 8 X 32 nut, nylon spacer(s) and screw and replace it with one of the six machine screws and nut. Tighten the nut securely.
3. Do the same for the transformer screw on the opposite diagonal corner of the transformer.
4. Remove the other two 8 X 32 screws, nylon spacers and nuts on that transformer.
5. Repeat steps 2 through 4 for the other two transformers.
6. Sand any imperfections in the factory paint off the three transformers with 100 grit paper. Sand again with 220 grit paper
7. Remove all sanding dust from the outer surface of the transformer.
8. Cover the transformer wires by placing them in a plastic bag. Use some masking tape near the transformer to hold the bag on the wires.
9. Spray 3 light coats on each transformer and allow to dry overnight.
10. Remove the plastic bags that cover the wires
11. Reinstall all the original screws, spacers and nuts.

ASSEMBLY INSTRUCTIONS

NOTE – You may or may not want to construct the VTA driver board BEFORE or AFTER you attach the chassis parts. If you wish to construct the VTA driver board at this time skip ahead to the VTA driver board instructions which are inside the VTA package and proceed with its construction. When you are through come back to this point and begin mounting the chassis parts.

Obtain the chassis. Remove the four stainless steel 6 X 32 screws. Taped inside the chassis are four one inch round rubber “feet” which you may stick on the outside of the chassis bottom cover over the four holes in the cover. Orient the chassis with the power transformer cutout facing you and mark “V1”, “V2”, “V3”, “V6” and “V7” with a felt tip marker on the inside of the chassis next to the appropriate tube socket as marked on the pictorial. The symbol “(S)” means to solder that connection at that time. If you don’t see the symbol do not solder that connection at that time.

- 1. Mount the FIVE octal sockets that fit on the chassis TOP from the BOTTOM OF THE CHASSIS with ¼ inch long 4-40 stainless steel screws and 4-40 kep nuts. Use the pictorial to orient the keyway of each tube properly. On V2, V3 and V6 mount a GROUND LUG around the outside screw closest to the side of the chassis and face the lug towards pin 8. On V7 mount TWO GROUND LUGS around the outside screw – face one towards pin 8 and one towards pin 2. Tighten all nuts securely. DO NOT MOUNT the two front power take off tube sockets at this time.**
- 2. Disassemble the two gold plated speaker binding posts from the mounting plates. Attach the LEFT and RIGHT mounting plates to the back INSIDE of the amp with 4-40 hardware. Reassemble the speaker binding posts on to the mounting plates. One of the black spacers with rounded edges goes INSIDE the chassis and the other black spacer goes OUTSIDE the chassis. Make sure that the BLACK terminal is on the side that says “G” on the outside of the chassis frame. Tighten the two studs with the gold plated nuts provided.**
- 3. Mount the rubber grommet in the 3/8 inch hole in the back CENTER of the chassis.**
- 4. Mount the fuse holder in the "D" shaped hole in the back of the chassis. Tighten the nut but do not over tighten as this may cause the plastic threads to break. Check and make sure that the 5 amp SLO-BLO fuse is inside the fuse holder.**
- 5. Mount the SPST on/off switch on the REAR of the chassis with 4-40 hardware. Make sure that the two terminals on this switch are close to the UNDERSIDE OF THE CHASSIS TOP SURFACE. Check the pictorial.**
- 6. Place the 4 rubber isolation washers on the ends of each of the four bolts of the PA-060-120 power transformer. Mount the power transformer in the large center cut out. The wires should face the FRONT of the chassis. Fasten the power transformer to the chassis with four 8-32 kep nuts. In the original amp a metal cable clamp was used on each of the two front bolts as seen on the pictorial. These clamps are not really necessary as the wires will stay in place fine when soldered.**
- 7. Assemble the Supplementary Cap Module (SCM)**
 - A. Obtain the four lug terminal strip from the SCM kit plastic bag**
 - B. Hold the strip with the grounded lug that attaches to the chassis towards you - that grounded lug is lug 1 and the next three lugs are lugs 2, 3 and 4.**
 - C. Connect a 330K resistor between lugs 1 and 2 - have the resistor straight in line with the terminal strip and not on the side of the lug.**
 - D. Connect a jumper wire between lugs 2 and 3 - have the jumper straight in line with the terminal strip and not on the side of the lug.**
 - E. Connect a 330K resistor between lugs 3 and 4 - have the resistor straight in line with the terminal strip and not on the side of the lug.**
 - F. Connect a 4 inch wire to lug 4 and run the wire to the side opposite the ground lug attachment hole.**
 - G. Obtain one of the two supplementary caps and connect the NEGATIVE terminal of this cap (the terminal with the BLACK STRIPE next to it) to lug 1 of the terminal strip. Connect it on the side OPPOSITE the chassis attachment hole. (S) Fit the other lug of this cap into lug 2 of the terminal strip (S)**
 - H. Fit the OTHER supplementary cap on the OTHER SIDE of the terminal strip with the NEGATIVE terminal (the terminal with the BLACK STRIPE next to it) in lug 3 (S) and the POSITIVE terminal in lug 4 (S)**

8. Mount the first C-354 choke and the SCM on the RIGHT side of the chassis with two 8-32 screws and matching kep nuts. The SCM (not seen on the pictorial but seen in color photo) is attached under the left screw and nut. Make sure that the two choke leads and the wire from pin 4 of the SCM face towards the FRONT of the chassis.
9. Mount the THREE lug terminal strip on the LEFT side of the chassis with a single 4-40 screw and kep nut as shown on the pictorial. Use the screw hole closest to the power transformer.
10. Mount the RIGHT A-260-120 output transformer with 8-32 hardware. The side of the transformer with the YELLOW-ORANGE-BROWN-BLACK leads must face the BACK of the amp. Mount the LEFT output transformer and fit the SECOND C-354 choke under the far left nut closest to the FRONT of the chassis. NOTE – This choke mounts with just that ONE nut and screw. The two wires on the choke should face the INSIDE of the chassis. Check the pictorial and/or photo.
11. Mount the quadruple section filter capacitor in the special cutout. It is IMPORTANT that the quad cap be properly oriented. The 80 Mfd SECTION which is designated with a HALF CIRCLE symbol must face the BACK of the amp. Fasten by twisting each of the four mounting tabs one-quarter turn.
12. Mount the ONE LUG terminal strip in the hole just to the left of the quad cap. This will be your main grounding point for the entire amp. The original amp had two grounding tabs as is seen in the pictorial.
13. Please refer to the triode/pentode pictorial for installing the triode/pentode switches. Obtain the two non shorting DPDT switches from the triode/pentode kit bag. Install the switches in the two chassis holes where the original Dynaco ST-70 bias controls use to be. These two 3/8” holes are not shown on the main pictorial. The switches are a loose fit in the holes and must be centered in the hole before they are tightened.
14. Remove the outside nut and larger flat washer from the switch. The smaller flat washer goes against the INSIDE of the chassis. Place the larger flat washer on the chassis TOP and nut on top of the flat washer. On the inside of the chassis make sure that the six terminals on the switch face from the front to the back of the amp so that the switch toggle on the top may be switched from FRONT to BACK and not side to side. Again – refer to the triode/pentode pictorial
15. Center the two switches in the holes and tighten the nuts lightly with square nosed slip-joint pliers. Check alignment of the two switches. If alignment is not correct move the switches slightly until alignment is correct. Make your final tightening but DO NOT OVERTIGHTEN THIS NUT OR YOU WILL BREAK THE SWITCH
16. Mount the two TWO lug terminal strips back to back in the single central 4-40 hole between the two triode/pentode switches. Try to keep the strips straight and parallel to the sides of the amp as you tighten the screw. Check the color photo.
17. NOTE – At this time DO NOT MOUNT the two front power takeoff sockets, the front slide switch which fits into the stereo/mono slot or the input jacks. These three items must be mounted after installation of the VTA driver board.

WIRING – Each length of hookup wire specified should have approximately ¼ inch of insulation stripped from each end unless otherwise specified. Wires from the three transformers should be shortened appropriately to the correct length to reach their terminal point. Again, as with the original Dynaco manual, if you see the symbol “(S)” this means to solder that connection at that time. If the symbol is not there DO NOT SOLDER that connection at that time. The 20 gauge solid core copper wire supplied with this kit is the recommended wire to use. Only rosin core solder is recommended for soldering. Always make a solid mechanical connection with your pliers to the terminal point before soldering. Always keep the chassis and transformers on a soft surface like a towel so they won't get scratched. Orient the chassis so that the power transformer is towards you. Oriented this way the, the LEFT channel is on your LEFT and the RIGHT channel is on your RIGHT.

1. Twist the pair of WHITE leads from the power transformer together and dress to socket V1. Connect one lead to pin #2 of V1 (S) and one lead to pin #8 of V1. NOTE – These leads are yellow on the color photograph.
2. Twist the pair of RED leads from the power transformer together and dress to socket V1. Connect one lead to pin # 4 of V1 (S). Connect the other lead to pin # 6 of V1 (S)
3. Twist the pair of GREEN leads from the power transformer together and dress to socket V2. Connect one green lead to pin # 2 of V2 and one green lead to pin # 7 of V2.
4. Twist the pair of BROWN leads from the power transformer together and dress to socket V7. Connect one brown lead to pin #2 of V7 and the other brown lead to pin #7 of V7.
5. Twist the BROWN/YELLOW and GREEN/YELLOW wires from the power transformer and dress to the 3 lug terminal strip. Connect the BROWN/YELLOW lead to lug # 3 - the lug closest to the power transformer. Connect the GREEN/YELLOW wire to lug # 1 – the lug furthest from the power transformer.
6. Connect the RED/YELLOW lead to the one lug terminal strip next to the quad cap filter capacitor.
7. Dress the RED lead from the LEFT OUTPUT TRANSFORMER and the RED lead from the RIGHT OUTPUT TRANSFORMER to the 80 Mfd terminal on the QUAD CAP having the HALF CIRCLE symbol. This is the terminal that faces the REAR of the amp.
8. Shorten (if necessary) and connect the 4 inch wire from lug 4 of the Supplementary Cap Module (SCM) to the same 80 Mfd terminal on the quad cap having the HALF CIRCLE symbol as described in the step above.
9. Twist together the two CHOKE leads from right side choke. Connect one choke lead to 80 Mfd terminal on the quad cap having the HALF CIRCLE symbol and the other choke lead to the 40 Mfd terminal on the quad cap having the SQUARE symbol. Twist together and connect the two choke leads from the choke that is mounted on the left side of the chassis to the same 80 and 40 Mfd terminals on the quad cap. You MAY have to lengthen the two leads from the second choke slightly by adding 2 or 3 inches of wire to each lead. If you have to lengthen these leads be sure to insulate the connection with black electrical tape or Teflon shrink tubing.
10. Dress the two BLACK leads from the power transformer around the power transformer as shown in the pictorial. Connect one BLACK lead to lug “A” of the fuse post (S) and one BLACK lead to lug # 1 of the on/off switch (S).

INCOMPLETE MANUAL

ST-120 voltage readings

* Note # 1 – Make sure you have your meter set to AC or DC as mentioned below. Ground is any point on the chassis frame. Place the black or negative probe on the chassis and the red or positive probe on the point mentioned. All tubes should be plugged in, inputs shorted or connected to your preamp, speakers connected and no signal should be running through the amplifier. *Be careful not to cross two pins with the positive probe !*

* Note # 2 – Readings very slightly above or very slightly below the range are not normally a sign of a problem. Line voltages vary slightly throughout the country. Differences in the rectifier can cause variations also.

Weber Copper Cap or a GZ34

Pin 4 to ground – 400 - 425 volts AC

Pin 6 to ground – 400 - 425 volts AC

Any 6550/KT88

Pin 1 to ground – approx .550 volts DC (depends on bias setting)

Across pins 2 and 7 – 6.0 – 6.5 volts AC

Pin 3 to ground – 470 - 500 volts DC

Pin 4 to ground – 470 - 500 volts DC

Pin 5 to ground – *minus* 50 to *minus* 60 volts DC

Pin 6 to ground – *minus* 50 to *minus* 60 volts DC

Pin 8 to ground – approx .550 volts DC (depends on bias setting)

Quad cap – Section # 1 (SQUARE symbol) ----- 480 – 505 volts DC

Section # 2 (HALF CIRCLE symbol) --- 470 – 500 volts DC

Section # 3 (NO symbol) ----- 470 – 500 volts DC

Section # 4 (TRANGLE symbol) ----- 400 – 430 volts DC

Central 12AT7 – Pin 1 or pin 6 to ground > 130 – 160 volts DC

Two outer 12AT7's – Pin 1 or pin 6 to ground > 255 – 285 volts DC

Any 12AT7 – across the two incoming heater wires > 6.0 - 6.5 volts AC

“-50 VAC” on driver board > 48 – 55

“B+” on driver board > 400 – 430

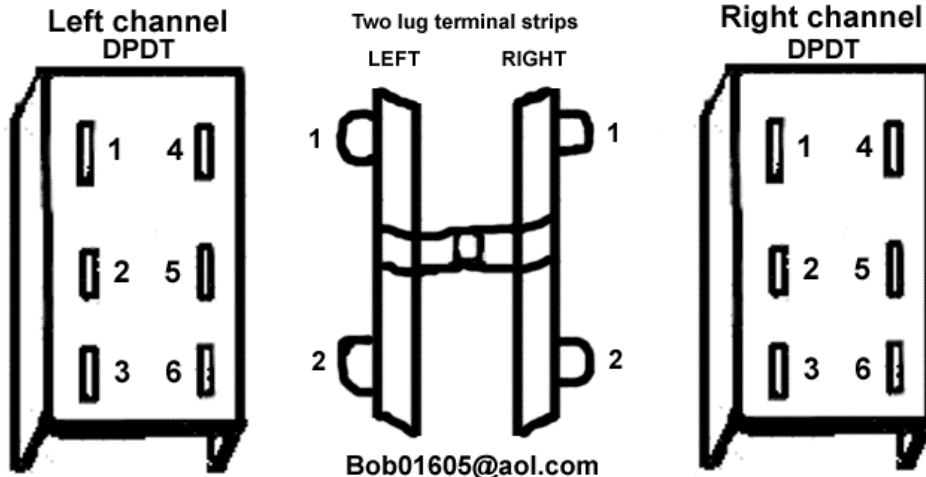
“G” on driver board > 0 volts AC or DC

Triode/Pentode switch pictorial

NOTE: Disregard any pin number markings on the switches themselves and use the pin numbers listed below

↑
PCB cutout

DPDT Triode/pentode switches



Bob01605@aol.com

Pin 1 - green wire from LOPT
 Pin 2 - wire to pin 4 of V3
 Pin 3 - 100 ohm to pin 1 of LTS
 Pin 4 - grn/wht wire from LOPT
 Pin 5 - wire to pin 4 of V2
 Pin 6 - 100 ohm to pin 2 of LTS
 LOPT = LEFT output transformer
 LTS = LEFT terminal strip

LEFT terminal strip
 pin 1 - 100 ohm from pin 3 of left DPDT
 and wire TO pin 3 of V3
 pin 2 - 100 ohm from pin 6 of left DPDT
 and wire TO pin 3 of V2

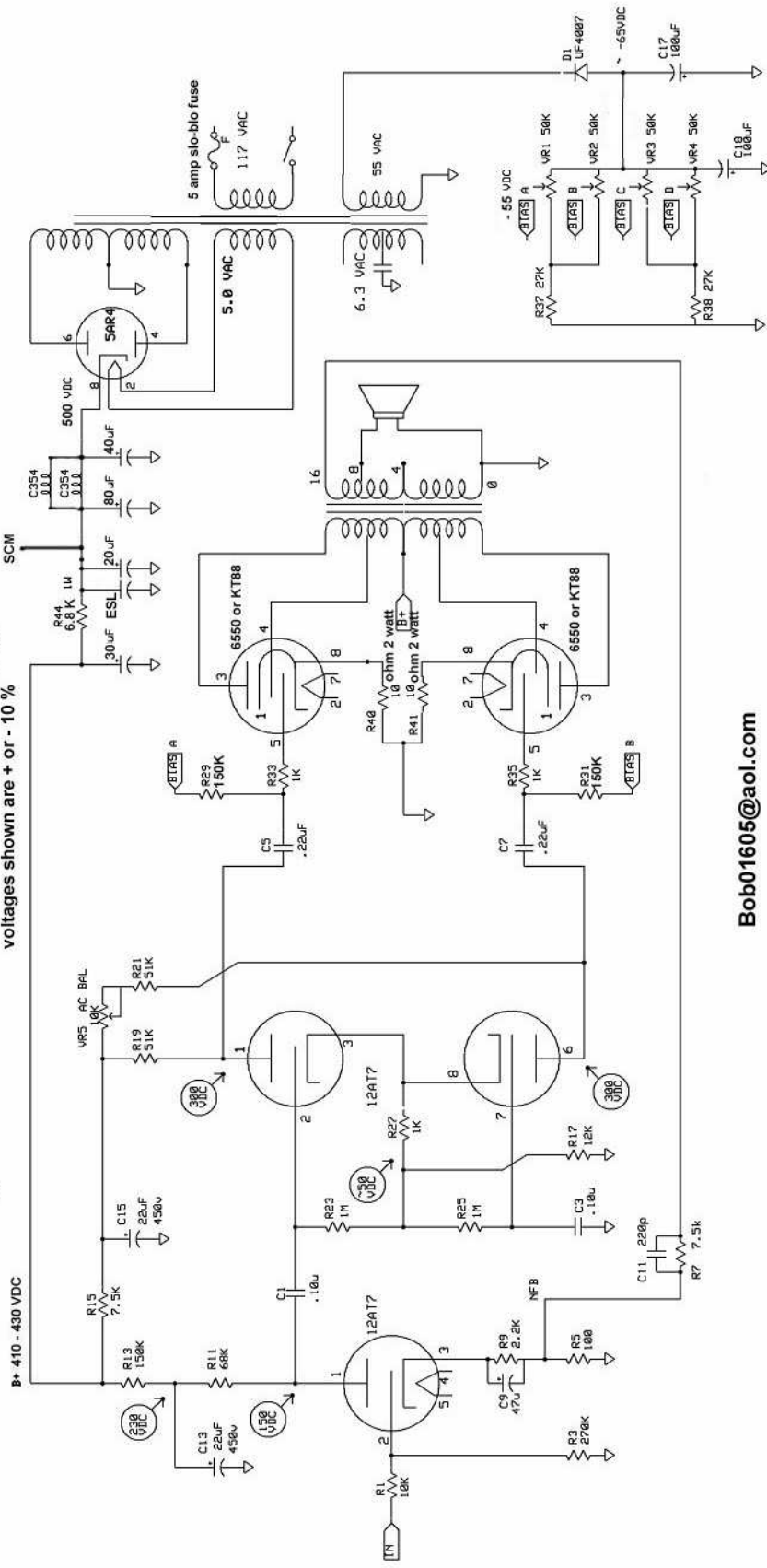
Pin 1 - green wire from ROPT
 Pin 2 - wire to pin 4 of V6
 Pin 3 - 100 ohm to pin 1 of RTS
 Pin 4 - grn/wht wire from ROPT
 Pin 5 - wire to pin 4 of V7
 Pin 6 - 100 ohm to pin 2 of RTS
 ROPT = Right output transformer
 RTS = RIGHT terminal strip

RIGHT terminal strip
 pin 1 - 100 ohm from pin 3 of right DPDT
 and wire TO pin 3 of V6
 pin 2 - 100 ohm from pin 6 of right DPDT
 and wire TO pin 3 of V7

Power Transformer



Schematic
Dynaco ST-120 with VTA driver board - power supply and one channel shown
 voltages shown are + or - 10 %



Bob01605@aol.com

