Stereo-70 System on Board Upgrade Version
Assembly & Instruction Manual

I. Introduction

Thank you for your purchase of our Dynaco Stereo-70 System on Board Upgrade. In concert with existing Dynaco-70 chassis, output tubes and transformers, it provides a complete power amplifier system on a board (SoB). This includes:

- ☐ High Voltage Power Supply w/ rectification and all filtering
- ☐ Output Stage Bias Supply w/ rectification, filtering and Bias-Set Control potentiometers
- ☐ Independent Current legs for all four Output Tubes
- ☐ Cascode-SLPI Driver stage w/ Optional AC Balance control
- ☐ Optional Output Tube DC Balance Option

In addition to providing a dramatic audible performance improvement, system reliability is dramatically improved. Users can be assured that their amplifier will continue to perform at peak performance year after year. Our Cascode – SLPI design has earned a solid reputation in the Dynaco community for both purity and musicality. It retains the wonderful midrange from the original Dynaco amplifier and extends this performance into the highest frequencies while dramatically improving the bass performance. Its design includes a careful selection of all components in concert with our circuit topology to provide consistent balance across the entire audible spectrum. The board layout has been designed with instrumentation grounding / signal transmission consideration to minimize distortion and noise and deliver outstanding objective performance. It is important that you follow our instructions carefully to take advantage of this technology.

This document describes the specific instructions and steps associated with the Stereo-70 System on Board Upgrade. In addition, you should visit our web page and download the following tech notes:

a. General Overview Assembly Notes (CAE Tech Note # 1)
b. Soldering Tutorial (CAE Tech Note # 2)
c. Recommended Tools & Test Instruments (CAE Tech Note # 3)

These documents have been prepared from our own assembly experience and will greatly reduce your chances for error if not to make the project much more fun. Of particular importance are the use of quality tools and soldering procedure

In the following sections we will guide you through several project phases. Each section has been carefully prepared with our own notes and comments from our customers to be sure that any anticipated question has been considered. The sequence is identical to that which we follow when we complete the fabrication for our customers. Please follow the same sequence to maximize efficiency and eliminate errors. It is also very helpful to read each section before beginning to gain a visual idea of the progression.

First you will assemble and prepare the pc board module(s). This is a very important project phase as the board modules contain nearly all of the circuitry for your project. There are several important factors to remember:

a. **Proper soldering is crucial**. Please refer to our soldering tutorial and practice on surplus boards until you master the technique. Be especially careful to avoid solder bridges or “cold” solder joints. Our experience shows that nearly **95% of all problems are associated with soldering related errors**.
b. Diodes, transistors, IC’s, (all semiconductors) and many capacitors (always electrolytic types) are polar - this means that **there is a right and wrong way to insert polarized components in the board**. If placed backwards, the component and probably others nearby will be damaged upon initial power application. Double check each step associated with these parts and once again later after you have had a chance to take a break.

c. Some components are color coded with their value (mostly resistors, but there may be others). If you are not proficient at reading these codes, use your digital voltmeter to double check the value of each resistor before insertion. It is very easy to confuse a 100 ohm metal film resistor with a 1000 ohm resistor or worse with a 100K ohm resistor.

Once completed, the boards will be placed into the chassis and wired to each other and the associated panel mounted components (switches, connectors, transformers, output tubes, etc.)

Next, you will prepare the amplifier chassis. This phase will involve the removal of old parts and pc boards and preparation of the chassis for the new boards and or parts. You can take advantage of the stripped down chassis to access tight nooks and crannies that would otherwise be difficult to reach and clean dirt and grime that my have accumulated over time. New hardware, connectors and pc boards are then installed.

Next, the newly installed connectors, sockets and pcb boards will be connected followed by a visual inspection before power is applied. Finally, you will initially apply power and take the initial measurements and complete any adjustments.

An Important Note About Internal Wiring

Unless otherwise specified, **you should use 20 to 22 gauge stranded wire with teflon insulation**. This is a perfect example where investing a little extra will have a huge return in both performance and most importantly, reliability. The Teflon will permit you to apply sufficient thermal energy to the solder connection for proper solder joint formation without worrying about melting the insulation. Don't use thicker wire or solid wire – it will just cause problems - if not now (too much strain on the boards or parts) or later (reliability issues). I really cannot overemphasize the importance of this advice.

In many steps, you will be directed to "prepare" a length of wire. The preparation process requires you to take 3 steps: 1) Cut the wire to the length indicated, 2) Strip ¼" of insulation from each end and, 3) "Tin" each end of the wire. Please don't try to save time by skipping the tinning step.

In some steps I have specified connections be completed in two wire twisted pairs (TP). In these cases you will use a pair of wires together to make an electrical connection at two nearby and related terminals (such as signal + and signal -). It is much easier to prepare a master length of pairs at the beginning of your project and then when required, cut the designated length from this master.

For this project, we recommend that you prepare one pair each of Red/Black, Green/Black, Black /White twisted pairs at approximately 3 feet each. To prepare each pair, use the following method:

1. Take the ends of the wires in the group and clamp them in a pair of "vice grip" or other device that can secure the ends of the wires firmly. Now, secure the vice grip.
2. Take the other ends of the wires in the group and stretch them to about 10% greater than the desired length. Cut them at that point and then place them in the jaws of a ¼" variable speed drill. Make sure all wires are of equal length - and while keeping the group taut, begin to slowly twist the assembly. Continue slowly until the turns ratio is about 2 to 3 turns per inch.
3. While keeping the twisted group taut, run your hand along the length of the assembly to stress relieve the elements.
4. Let the assembly sit for about 5 minutes and then release.

During the assembly process when you are directed to use twisted pairs, simply cut the length designated and strip ¼" insulation (unless otherwise directed) and "tin" each conductor.

II. Printed Board Assembly

Unless otherwise noted, components are to be inserted on the non-foil side and soldered on the foil side. The sequence of assembly has been chosen so that the components with the lowest profile (such as jumpers, low power resistors, IC's etc.) are installed first with higher profile components added until the highest profile components are installed last.

You should begin by getting the parts list for this board, opening your kit and grouping the components into categories as follows:

1. PCB Jumpers
2. PCB Turrets
3. ¼ Watt Resistors (Metal and Carbon Film)
4. ½ Watt Resistors Metal & Carbon Film)
5. ** Diodes (Signal, Power, Zener)
6. ** IC Sockets
7. ** Signal IC's (8, 14, 16, 20 & 28 pin dips)
8. Small Capacitors (disc, silver mica, polystyrene etc.)
9. ** Small Signal Transistors & IC's (Plastic Packages such as TO-92)
10. Pots
11. Power Resistors (1, 2, 3 ad 5 Watt Resistors)
12. ** Power Transistors (TO-220 Metal Tab & Plastic Body)
13. ** Electrolytic Capacitors (Always Polarized)
14. Hardware (Spacers, Angle Brackets, etc.)

The items tagged (**) are polarized – during installation on to the pc board, you must be sure they are installed correctly and positioned as shown in the diagram.

Now that you have grouped the items, note that they are grouped in similar physical sizes with group 1 being the smallest and progressing upwards to the larger components. Your assembly of the pc board should begin with the items in group 1 and proceed sequentially upwards to the larger components. Note that unless otherwise noted, the components will be mounted on the non-foil side of the board and solder terminated on the foil side. There are two Assembly diagrams – one showing the top view components by Name, the other showing the component Values. You may use either as you find convenient. In both cases the diagrams are full size so they may be used to precisely locate specific components.

Refer to Figure 1a (Names) or 1b (Values) – PC Assembly Diagram

□ Beginning with group 1, install the single pc board jumper. The jumper is shown in the assembly diagram as either as a solid line or as a rectangular box with a "jumper" label.

□ Install the two pc board turrets (connection or test terminals). These are not shown on the assembly diagram. To identify the correct location, examine the foil side of the board and install at the terminals labeled "TP-R" and " TP-L" located near the long edge (front edge) of the pc board. Be sure that you insert them in the correct positions as these turrets will fit in several holes not intended for terminations. The turrets should be held in place for soldering using an automatic center punch to flare out the base (on the foil side) before soldering

□ Next install all of the non-power resistors (1/2 Watt). There are approximately 33 ½ watt resistors on the SoB board.

> NOTE - in some cases, the components shown on the Value diagram indicates two values – one values is indicated normally and the alternate values is shown in (parenthesis). The value shown in (parentheses) is to be used if you are using either the DC Balance or AC Balance options. The value not shown in parenthesis is the STANDARD (non-option) value.

To resistance value of each resistor is indicated with the color bands on the body of the part. You will need to refer to the color code diagram (Figure 8) to help you identify the resistor values. Note that the carbon film (and all 5%) resistors fall into the 4 color band system while the metal film (and all 1%) resistors fall into the 5 color band system. To be certain I strongly recommend using a digital multimeter (DVM) to confirm value before insertion into the pc board. You can install most (if not all) of the resistors on the board and bend the leads of the resistors outward to keep them in place until you solder the entire group at one time. If desired, you can separate this into smaller groups to facilitate soldering.

☐ ** Polarized Component Alert – Install all (quantity 5) of the power diodes next. These are about the same size as a ¼ W resistor BUT they have a band indicating their cathode lead. Be sure you install as shown in the assembly diagram – if you insert these incorrectly you can guarantee yourself hours of repair time.

☐ Install the small disc capacitors next. There are 4 radial lead disc caps in this project.

☐ Next install the 3 Watt Metal Oxide power resistors (quantity 12). Those of you using the AC Balance Option should use the resistor values shown in (parenthesis) - otherwise use the values NOT shown in parenthesis. These resistors should be mounted so that there is approximately ¼" space between the component body and the pc board surface. This aids thermal dissipation. Refer to the color code diagram to help you identify the resistor values - note that these are all 5% resistors and therefore use the 4 band color band system. To be certain I strongly recommend using a digital multimeter to confirm value before insertion into the pc board.

☐ If you are installing the DC Balance Option, now install the 500K potentiometer (shown in parentheses). Otherwise, do not install anything (leave this position blank). The pot used in this project is roughly square and is supplied in the vertical orientation package.

☐ Next, install the three 9-pin tube sockets. Be sure that you have fully inserted the leads before you solder into place.

☐ Next, install the 6 film capacitors. These are not polarized however some folks believe that there is an audible benefit to placing the outside foil near the lowest voltage potential (I have not found this to be the case).

☐ Next, install the 2 BIAS-SET pots. These are horizontal orientation and mount perpendicular to the PC board and are shown in the figure WITHOUT the parenthesis designation (near the front edge of the PC Board).

☐ If you are installing the AC Balance Option, there are an additional two 10K horizontal pots nearby indicated with the (parenthesis) designation. These are also horizontal orientation (perpendicular to the PC Board) devices.

NOTE: If you are NOT installing the AC Balance option you will need to place a jumper across the two outer holes (the bottom of the triangle formed by the three holes) for each potentiometer.

☐ ** Polarized Component Alert – Install all 10 electrolytic capacitors next. The electrolytic capacitors used in this project are all in radial lead packages. It is important to be sure you have correctly identified the capacitance value, voltage rating and orientation for each capacitor. Note that the 47uF @ 350VDC and 100uF @ 250VDC look identical – be sure you install the correct capacitor at the designated location (and orientation). Carefully examine each capacitor - one lead (usually the negative lead, but not always) should be clearly marked – sometimes with a black stripe or designating arrow (usually pointing to the negative lead). Be sure you have identified the leads correctly – this is critically important with electrolytic capacitors. Insert the part as described on the assembly drawing – the positive lead is indicated in the assembly figure with a "+" symbol. Solder the parts into place and as a final QC, perform a visual inspection to be sure that the parts are installed correctly.

☐ All of your electrical components should now be installed. Depending on the amplifier and mounting scheme, you can now install any remaining hardware items such as mounting spacers or angle brackets.

III. Chassis Preparation

Before you install your SoB-UG module, you will need to prepare your amplifier to clear out the parts of your amplifier that are being replaced and make some changes to tie into your new SoB.

Preparation will essentially involve:

1. Removing and discarding the stock Stereo-70 driver board (the small PC Board with the two 7199 tubes)
2. Removing and discarding the front panel Octal Sockets (look like tube sockets)
3. Removing & discarding the original front panel Stereo-Mono switch
4. De-solder all wires and prepare original RCA Input connector (or replace with hi-quality Input connectors)
5. Removing & discarding the stock tube rectifier socket (GZ34 / 5AR4)
6. Removing the wires from the original Dynaco Quad electrolytic capacitor (the 1.25" cylindrical can thingy). You can remove and discard or keep in place if you like for aesthetic (if you think this looks good??) reasons.
7. De-solder the two (non-transformer) wires at both the Left and Right speaker terminals. These wires were originally feeding the stock driver board.
8. Removing and discarding the original bias circuit including the original selenium rectifier, bias pots, filter caps, resistors & 7 Pin Terminal Strip (if desired).
9. De-soldering and cleaning up all ground leads from the ground tab (near the Quad capacitor) and prepare for future connections.
10. Removing & replacing the four output tube sockets. In this step you will also remove and discard the two 15.6 ohm cathode bias resistors and all components mounted on these four sockets. Although it is possible to retain the original sockets the reliability of your amplifier will dramatically suffer and therefore retention is not addressed in this document.

□ First remove all tubes (small and large) and place in a safe location.

□ Next, remove the stock Dynaco driver PC Board (PC-3). The easiest way to do this is to simply cut all of the wires attached to this PC Board right at the board itself. After all of the wires have been cut, remove the board (held in place with four 4-40 screws & nuts).

□ Next, cut all of the wires (and component leads) connected to the front panel octal sockets. After all of wires and leads have been cut, remove both sockets (each held in place with two 4-40 screws and nuts).

□ Next, cut all of the wires (and component leads) connected to the front panel Stereo-Mono switch. After all of wires and leads have been cut, remove (held in place with two 4-40 screws).

□ If you are replacing the Dual RCA Input connector, cut all wires and remove and replace with the hi-reliability connector. If you are retaining the original Dual RCA input connector, de-solder all of the wires and component leads connected to the front panel RCA input connector. See Figure 3:

- Prepare a 2" Red wire, strip and tin both ends to 1/8" and connect one end to the Right hot (center) connector tab.
- Prepare a 2" Black wire, strip and tin both ends to 1/8" and connect one end to the Right Ground (Outside) connector tab.
- Prepare a 2" Green wire, strip and tin both ends to 1/8" and connect one end to the Left hot (center) connector tab.
- Prepare a 2" Black wire, strip and tin both ends to 1/8" and connect one end to the Left Ground (Outside) connector tab.

□ Next, locate the tube rectifier (5AR4 / GZ34) octal socket (near the center of the chassis). De-solder the two power transformer White leads. If your transformer leads are worn, you should label each (PWR-WHT). Cut all remaining leads and remove the socket (held in place with two 4-40 screws & nuts).

Locate the stock Dynaco Quad electrolytic capacitor (1.25" Dia cylindrical can).

□ De-solder the choke leads.

□ De-solder the Output Transformer RED Leads. There will be two Red leads – one from each output transformer. If these are worn, you should label (OPT-RED).

□ Cut any remaining wires and component leads from any of the 8 tabs (four inner, 4 ground).

□ If you like, remove this cap. To remove, you will need to locate the four mounting taps (at its perimeter) and twist each until it is tangent to the outside of the capacitor. It should be free at this point however some effort may be required.

□ Locate the two (Left & Right) Speaker Connector terminals at the back side of your amplifier. Remove any NON-TRANSFORMER wires (there should be one connected to the "16 OHM" lug and another connected to the "GND" terminal. The associated output transformer leads (Yellow & Black) should remain in place.

□ Locate your Red/Black twisted pair previously prepared and measure and cut off 18 inches. At one end, prepare (strip and tin) the red and black leads. At the RIGHT Channel, connect the Red lead to the "16 OHM" lug (same as the OPT Yellow lead. Connect the Black lead to the "GND" lug (same as the OPT Black lead). Route the TP along the outer right edge of your amplifier – it will be connected later.

□ Locate your Green/Black twisted pair previously prepared and measure and cut off 18 inches. At one end, prepare (strip & tin) the green and black leads. At the LEFT channel, connect the Green lead to the "16 OHM" lug (same as the OPT Yellow lead. Connect the Black lead to the "GND" lug (same as the OPT Black lead). Route the TP along the outer left edge of your amplifier – it will be connected later.

We will now remove all of the stock bias supply circuitry (this is all replaced with your SoB module). Removal involves the elimination of the stock selenium rectifier, original Bias Set Pots, filter caps (2) and other associated resistors (2).

□ First, you will need to remove the original bias rectifier. It is located near the center of the amplifier and looks like a stack of rectangular plates with two terminals and a clearance mounting hole down the center.

De-solder the power transformer Red-Black (stripe) lead and cut any remaining wires or component leads. If your transformer Red-Black (stripe) lead is worn to the extent that it may be difficult to identify later, take some time to label this lead (Red-Blk). Remove and discard the stock selenium rectifier.

□ Next, locate the 7 Pin Terminal strip – it is located below chassis under the left output transformer. Find the two axial leaded capacitors - these are axial leaded components, cylindrical, and approximately 1" in diameter & 2" long. Cut both leads (at the TS) from the two bias filter caps and discard.

□ At the same 7 Pin Terminal strip, remove (cut the leads) the two remaining bias power supply resistors.

□ At the 7 Pin TS, de-solder the Power transformer leads Green / Yellow (stripe) and label if it is worn.

□ At the 7 Pin TS, de-solder the Power transformer leads Brown / Yellow (stripe) and label if it is worn.

□ Finally, cut all of the wires from the original Bias Adjustment potentiometers (located near the center of the amplifier) and remove.

□ You may want to remove the 7 Pin Terminal Strip for aesthetic reasons however this is not required.

□ Locate the two ground lugs mounted to the chassis (near the stock Dynaco electrolytic quad capacitor). You will be re-using these ground lugs so it is necessary to de-solder all of the leads and prepare for re-use.

Note – removing the original wires can be difficult especially if the original builder folded the leads around the terminal. I find that the use of the "Solder-Sucker" and the soldering tool to loosen the wire while applying heat is a good technique. I would caution against using your soldering iron tip as a prying tool as this will chip away the iron plating and significantly shorten its life.

- Re-secure tightly this ground lug(s) to the chassis. Use star washers to be sure that you have a solid, tight and secure mount.
- Re-attach the Power transformer Yellow / Red (stripe) lead to the restored ground lug.
- Cut a 4" length of Black wire, strip and tin both ends, and connect one end to the ground lug.

We will now replace the original output tube sockets (octal). The stock amplifier has components that are replaced and are located on the SoB PC board therefore all of these components can be discarded.

□ For the left channel – De-solder the four transformer leads (Blue, Green, Blue/White, Green/White) connected to the left (V1 & V2 in Figure 3) output tube sockets. If your leads are worn, be sure to label accordingly.

□ Repeat for the Right (V3 & V3 in Figure 3) Channel Output Tube sockets

Referring to Figure 2, install the four new ceramic output tube sockets. The sequence of hardware should be (from the top side of the amplifier):
1. 4-40 screw
2. Chassis surface
3. Ceramic socket
4. Retaining clip (with channel facing out)
5. 4-40 nut (should sit inside retaining clip channel)

We will now wire the replacement output tube sockets. Refer to Figure 2.

Important Note: You will be using Figure 2 to guide you as you make the solder terminations to your SoB PC Board. The colors shown in Figure 2 are NOT THE SAME as the actual colors required – they have been chosen for clarity and contrast.

□ Locate a resistor wire scrap, fold into a "U" shape and connect Pins 1&8 on output tube socket V1.

□ Repeat for the remaining 3 output tube sockets (V2, V3 V4).

□ Prepare a 3" Black wire, tin both ends and connect on end to Pin 2 output tube socket V1. Connect the other end to Pin 2 output tube socket V2.

□ Prepare a 3" Black wire, tin both ends and connect on end to Pin 7 output tube socket V1. Connect the other end to Pin 7 output tube socket V2.

□ Prepare a 3" Black wire, tin both ends and connect on end to Pin 2 output tube socket V3. Connect the other end to Pin 2 output tube socket V4.

□ Prepare a 3" Black wire, tin both ends and connect on end to Pin 7 output tube socket V3. Connect the other end to Pin 7 output tube socket V4.

□ Prepare a 3.5" Black wire, tin both ends and connect one end to V1, Pin 1. The remaining end will be connected later.

□ Repeat for the remaining 3 output tubes (V2, V3 and V4). The remaining end will be connected later.

□ Prepare a 3" length of White wire, tin at both ends and connect one end to V1, Pin 5. The remaining end will be connected later.

☐ Repeat for the remaining 3 output tubes (V2, V3 and V4). The remaining end will be connected later.

☐ Prepare a 7” Green wire, tin both ends and connect one end to V1, Pin 4. The remaining end will be connected later.

☐ Prepare a 7” Green wire, tin both ends and connect one end to V3, Pin 4. The remaining end will be connected later.

☐ Locate your Black/ White twisted pair previously prepared and measure and cut off 8 inches. At one end, prepare (strip & tin) the white and black leads. Connect the White lead to Pin 7 of V1. Connect the Black lead to Pin 2 of V2. The remaining ends will be connected later.

☐ Locate your Black/ White twisted pair previously prepared and measure and cut off 8 inches. At one end, prepare (strip & tin) the white and black leads. Connect the White lead to Pin 2 of V3. Connect the Black lead to Pin 7 of V4. The remaining ends will be connected later.

We will now make all of the output transformer connections (both right channel and left channel). You will be instructed to locate the output transformer lead, trim to length, strip (1/4”) and tin – be sure to tin each of these leads since the oxidation can be quite robust and make final soldering difficult. During tinning, you will need to apply heat vigorously and use the flux in the solder to cut through the oxide layer.

☐ Locate the Left Output Transformer Blue /White (stripe) lead, trim to length, tin and connect to Pin 3 of Output tube socket V2.

☐ Locate the Left Output Transformer Green /White (stripe) lead, trim to length, tin and connect to Pin 4 of Output tube socket V2.

☐ Locate the Left Output Transformer Blue lead, trim to length, tin and connect to Pin 3 of Output tube socket V1.

☐ Locate the Left Output Transformer Green lead, trim to length, tin and connect to Pin 4 of Output tube socket V1.

☐ Locate the Right Output Transformer Blue /White (stripe) lead, trim to length, trim and connect to Pin 3 of Output tube socket V7.

☐ Locate the Right Output Transformer Green /White (stripe) lead, trim to length, tin and connect to Pin 4 of Output tube socket V4.

☐ Locate the Right Output Transformer Blue lead, trim to length, tin and connect to Pin 3 of Output tube socket V3.

☐ Locate the Left Right Transformer Green lead, trim to length, tin and connect to Pin 4 of Output tube socket V3.

☐ Locate the two Green Leads from the Power Transformer. Twist along their entire length and route towards V2. Connect one lead to Pin 2 of Output tube socket V2. Connect the other to Pin 7 of output tube socket V2.

☐ Locate the two Brown Leads from the Power Transformer. Twist along their entire length and route towards V4. Connect one lead to Pin 2 of Output tube socket V4. Connect the other to Pin 7 of output tube socket V4.

OK –Your chassis is now prepared for the installation and final wiring of your BCS module.

IV. BCS Output Tube Bias Control System Module Installation & Final Wiring

Locate your assembled SoB-UG module. You will now position it inside of your amplifier.

□ Locate the four 1.25” threaded spacers (4-40 thread). From the bottom of the chassis, place one each at the two holes originally used to mount the stock Dynaco PC-3 PC Board. They are located near the front center of the chassis (on the top surface) in the 3/8” of metal shelf above the RCA input connector. Place the screws into the top of the chassis, through the chassis and into the spacer(s).

□ The two remaining 1.25” spacers can be mounted on the component side of your SoB-UG PC Board. The mounting holes can be identified by placing your board on top of the component locator in Figure 1a or 1b. Secure with 4-40 screws.

□ Install your SoB-UG PC Board inside of your chassis. It should be oriented as shown in figure 3. Secure with the 4-40 hardware at the location of the four 1.25” spacers. Route all of the twisted pair wires neatly aiming towards their associate end termination points (output tubes and power transformer center).

Important Notes:

1. You will be using Figure 3 to guide you as you make the solder terminations to your SoB PC Board. The colors indicated have been chosen for clarity and contrast and ARE NOT the same as the wire colors that have been described in the documentation.
2. When Transformer leads are specified, Be certain that you do not confuse the PWR XFMR (power transformer) leads with the Left OPT XFMR (Left Output Transformer) or Right OPT XFMR (Left Output Transformer) Leads. In particular each transformer has Red leads – be careful to identify the correct device.
3. Some leads from the transformers or choke may need to be extended to reach the targeted connection points. Use Teflon wire, solder the connection and cover with shrink tubing (preferred) or high quality electrical tap when you make these extensions.
4. To attach all external wire connections to the SoB PC Board you will first create a pool of solder at the connection point. The connection should be made by melting the pool of solder and placing the wire(s) into the heated pool and securing until it is solidified. A good connection will be indicated when the surface of the connection is shiny (not dull).

Make all of the connections from V1 to the SoB-UG PC Board. This includes:

- □ Connect the White wire from V1, Pin 5 to PCB terminal V1-5 (near the V1 edge of the PC Board).
- □ Connect the Green wire from V1, Pin 4 to PCB terminal V1-4 (near the center of the PC Board).
- □ Connect the Black Wire from V1, Pin 1 to PCB terminal V1-8 (near the V1 edge of the PC Board).
- □ Find the Black/White twisted pair connects to V1, Pin 7 and V2, Pin 2. Trim to length if needed and connect the White wire to PC terminal FL1. Connect the Black Wire to PC Board FL2.

Make all of the connections from V2 to the SoB-UG PC Board. This includes:

□ Connect the White wire from V2, Pin 5 to PCB terminal V2-5 (near the V2 edge of the PC Board).

□ Connect the Black Wire from V2, Pin 1 to PCB terminal V2-8 (near the V2 edge of the PC Board)

Make all of the connections from V3 to the SoB-UG PC Board. This includes:

□ Connect the White wire from V3, Pin 5 to PCB terminal V3-5 (near the V3 edge of the PC Board).

□ Connect the Green wire from V3, Pin 4 to PCB terminal V3-4 (near the center of the PC Board).

□ Connect the Black Wire from V3, Pin 1 to PCB terminal V3-8 (near the V3 edge of the PC Board).

□ Find the Black/White twisted pair connects to V3, Pin 2 and V4, Pin 7. Trim to length if needed and connect the White wire to PC terminal FR1. Connect the Black Wire to PC Board FR2.

Make all of the connections from V4 to the SoB-UG PC Board. This includes:

□ Connect the White wire from V4, Pin 5 to PCB terminal V4-5 (near the V2 edge of the PC Board).

□ Connect the Black Wire from V4, Pin 1 to PCB terminal V4-8 (near the V2 edge of the PC Board)

We will next connect the two choke leads to the PC Board. If you have the wire length available, your project will have a cleaner look if you twist the choke leads along their length (not mandatory) and route along the bottom (long edge) of the PC Board.
Trim to length, strip ¼" inch of insulation, and tin to prepare the lead(s).

□ Connect one lead to PC Board terminal "L-A".

□ Connect the remaining choke lead to PC Board terminal "L-B"

□ Next, locate the Black lead you installed earlier that is connected to the chassis ground lug. Connect to PC board terminal "CT".

The two Output Transformer Red leads will be connected next. Once again, route as neatly as possible (extending if required), strip and tin to prepare each lead.

□ Connect the Right Output Transformer lead to PC Board terminal "OT-R"

□ Connect the Right Output Transformer lead to PC Board terminal "OT-R"

Finally, we will connect all of the remaining Power Transformer leads to the PC Board.

□ Locate one of the Power Transformer White leads (originally connected to the tube rectifier socket). Trim to length. Strip (1/4"), and tin and connect to PC Board terminal "5-A".

□ Locate the remaining Power Transformer White lead (originally connected to the tube rectifier socket). Trim to length. Strip (1/4"), and tin and connect to PC Board terminal "5-B".

□ Locate the Power Transformer Green / Yellow (stripe) lead (originally connected to the 7 Pin Terminal strip). Trim to length. Strip (1/4"), and tin and connect to PC Board terminal "FC-L".

□ Locate the Power Transformer Brown / Yellow (stripe) lead (originally connected to the 7 Pin Terminal strip). Trim to length. Strip (1/4"), and tin and connect to PC Board terminal "FC-R".

□ Locate the Power Transformer Red / Black (stripe) lead (originally connected to the Selenium Rectifier). Trim to length. Strip (1/4"), and tin and connect to PC Board terminal "BAC".

□ Locate the Power Transformer Red leads (there are two). These were originally connected to the tube rectifier tube socket. Trim to length. Strip (1/4"), and tin and connect one of them to PC Board terminal "H1". Connect the remaining lead to PC board terminal "H2".

Locate the Red/Black twisted pair that originates at the Right speaker terminal. This TP should be routed along the right channel inside edge of your amplifier running along V3 & V4 and finally arriving near the front center of the PC Board. After you have cleanly routed as described, trim to length. Strip and tin both wires.

□ Connect the Red wire to PC Board terminal "FBR".

□ Connect the remaining Black wire to adjacent terminal "GR". Note that there are two "GR" terminals – you should connect the black wire to the "GR" adjacent to the "FBR" terminal.

Locate the Green/Black twisted pair that originates at the Left speaker terminal. This TP should be routed along the left channel inside edge of your amplifier running along V1 & V2 and finally arriving near the front center of the PC Board. After you have cleanly routed as described, trim to length. Strip and tin both wires.

□ Connect the Green wire to PC Board terminal "FBL".

□ Connect the remaining Black wire to adjacent terminal "GL". Note that there are two "GL" terminals – you should connect the Black wire to the "GL" adjacent to the "FBL" terminal.

You will now connect the four wires connected to the RCA input connector. It is easiest to make these connections through the PC Board (like they are component leads) and solder below – however if you find it convenient to terminate on the underside of the pc board there is no harm in this method.

☐ Locate the Red wire connected to the right center (hot) connector. Connect to the PC Board "INR" terminal.

☐ Locate the Black wire connected to the right outer (ground) connector. Connect to the PC Board "GR" terminal (along the front edge of the amplifier).

☐ Locate the Green wire connected to the left center (hot) connector. Connect to the PC Board "INL" terminal.

☐ Locate the Black wire connected to the left outer (ground) connector. Connect to the PC Board "GL" terminal (along the front edge of the amplifier).

OK- you have completed the installation of your SoB-Upgrade Module. Double check all wiring against figure 3 to be certain that you have not made any errors.

☐ V. System Checkout

The purpose of this section is to perform a cursory check on the assembly and installation of your SoB-UG module. Additionally, we will make the initial adjustment of the BIAS SET Pots (located on the front edge of the SoB board and accessible from the front of the amplifier via the original octal socket holes.).

You will be making voltage measurements using your Digital Voltmeter for these tests. All tests will be made relative to ground – this means that you will connect the black lead of your DVM to the chassis for all of these tests. Voltage measurements are indicated in DCV (DC Volts) or ACV (AC Volts). Please adjust your meter accordingly.

Once you have confirmed that the voltages are within spec, you will be installing the output tubes one at a time and finally setting the bis voltage (adjusting the Bias pots accessable from the front of your amplifier).

You will be using a common Digital Voltmeter (DVM) to measure resistance as well as DC and AC Voltages. All tests will have you connect the Black Lead of your DVM to ground (chassis). Resistance measurements are indicated in OHMS or KOHMS. Voltage measurements are indicated in DCV (DC Volts) or ACV (AC Volts). Please adjust your meter accordingly.

SAFETY NOTICE

To personal harm and/or equipment harm, please take the following preparations & precautions:

- Before you begin these tests and measurements, be sure that you WAIT 20 MINUTES to be sure all amplifier capacitors have been discharged.
- Remove all tubes – small signal tubes & Output Tubes.
- Rotate the Bias Adjust Pots FULLY COUNTERWISE (as seen from the front of your amplifier).
- Temporarily replace the power fuse – use a 0.5AMP SLO-BLO fuse
- Familiarize yourself with the test point locations on the SoB-UG module before you take your measurement.
- Voltage tests will be made with the power applied. Very high DC & AC voltages will be present all over the SoB PC Board as well as the output tube sockets – use the appropriate safety precautions.

Voltage Test Measurements

Warning: Lethal voltages will be present during the subsequent tests. Please exercise the greatest care to avoid any contact with any components.

☐ Be sure to set you DVM to the DC Volts (NOT AC Volts) position. Except for the Bias Voltage setting, all voltages given are not exact (the reading you get will be a function of the line voltage and the brand and model of DVM you are using) therefore it is not critical that the reading be exact but rather that there are no significant differences. Be concerned only if your measurement is significantly different than indicated.

☐ Replace the normal (3A) fuse in your amplifier with the 0.5A slo-blow fuse.

☐ Install all three driver tubes (small tubes on the SoB PC Board)

☐ Apply power to your amplifier. Make sure your hands are in your pockets - be observant for any signs of stress (do this in a quiet location) including any sounds of stress. Be prepared to remove power if you see any signs of a problem.

Using the Red (positive lead of your DVM) take the following voltage measurements:

☐ Test Point L-B = 425VDC to 600VDC
☐ Test Point L-A = 425 VDC to 600VDC
☐ Test Point 1 = - 45VDC +/- 7VDC (Note – this is a NEGATIVE voltage)
☐ Test Point 3 = - 23VDC +/- 7VDC (Note – this is a NEGATIVE voltage)
☐ Test Point 2: As you monitor this DC Voltage using your DVM, rotate the Right Bias set pot from one end to the other. The voltage should change and range from the voltages you measured in the last two steps. After you complete the measurement, rotate this pot full counter-clockwise (to the point of the highest NEGATIVE voltage).
☐ Test Point 4 = 45VDC +/- 7VDC (Note – this is a NEGATIVE voltage)
☐ Test Point 6 = - 23VDC +/- 7VDC (Note – this is a NEGATIVE voltage)
☐ Test Point 5: As you monitor this DC Voltage using your DVM, rotate the Right Bias set pot from one end to the other. The voltage should change and range from the voltages you measured in the last two steps. After you complete the measurement, rotate this pot full counter-clockwise (to the point of the highest NEGATIVE voltage).

☐ Power down and wait 20 minutes for all of the capacitors to discharge.
☐ Remove the three driver tubes (small located on SoB PC Board)

System Operation Tests

☐ Insert ONE of your Output Tubes. Place it in position V1.

☐ Connect the BLACK lead of your DVM to chassis ground. Connect the Red lead of your DVM to V1 Pins 1&8. Make sure your DVM is set to the DC Volts measurement selection and that you can resolve accurately 0.5 Volts (500mV) – usually this is the 2Volt range selection – but not always.

☐ Apply power and monitor the voltage on your DVM. After approximately 10 to 40 seconds, the voltage reading should begin rising slightly – it should never exceed 1 VDC – if it does, immediately remove power. After about 60v seconds rotate the left Bias set potentiometer to obtain approximately 300mV (0.3VDC) reading on your DVM. Allow the amplifier to run for a few minutes for this reading to stabilize. After you have performed this adjustment, power down and wait several minutes for the capacitors to discharge.

☐ Insert your second output tube in socket V2.

☐ Connect the BLACK lead of your DVM to chassis ground. Connect the Red lead of your DVM to V2 Pins 1&8. Make sure your DVM is set to the DC Volts measurement selection and that you can resolve accurately 0.5 Volts (500mV) – this should be the same from your previous test.

☐ Apply power and monitor the voltage on your DVM. After approximately 10 to 40 seconds, the voltage reading should begin rising slightly – it should never exceed 1 VDC – if it does, immediately remove power. The reading should be approximately 300Mv (0.3VDC) from the last test and adjustment. Unless it is significantly different, (>50mV) the voltage is acceptable unless it is significantly different (> 50mV) from the previous setting.

☐ If you have installed the optional DC Balance setting, adjust the Right Balance pot (located on the PC Board) so that you have the same voltages on V1 Pins 1&8 and V2 Pins 1&8. You will need to move your measurement probe from V1 to V2 alternatively as you make small adjustments and until the voltages are approximately the same.

Remove output tubes V1 & V2. Be sure you label them so that they can be inserted in their previous locations.

- ☐ Insert your third Output Tube. Place it in position V3.

- ☐ Connect the BLACK lead of your DVM to chassis ground. Connect the Red lead of your DVM to V3 Pins 1&8. Make sure your DVM is set to the DC Volts measurement selection and that you can resolve accurately 0.5 Volts (500mV) – usually this is the 2Volt range selection – but not always.

- ☐ Apply power and monitor the voltage on your DVM. After approximately 10 to 40 seconds, the voltage reading should begin rising slightly – it should never exceed 1 VDC – if it does, immediately remove power. After about 60v seconds rotate the Right Bias set potentiometer to obtain approximately 300mV (0.3VDC) reading on your DVM. Allow the amplifier to run for a few minutes for this reading to stabilize. After you have performed this adjustment, power down and wait several minutes for the capacitors to discharge.

- ☐ Insert your fourth (and final) output tube in socket V4.

- ☐ Connect the BLACK lead of your DVM to chassis ground. Connect the Red lead of your DVM to V4 Pins 1&8. Make sure your DVM is set to the DC Volts measurement selection and that you can resolve accurately 0.5 Volts (500mV) – this should be the same from your previous test.

- ☐ Apply power and monitor the voltage on your DVM. After approximately 10 to 40 seconds, the voltage reading should begin rising slightly – it should never exceed 1 VDC – if it does, immediately remove power. The reading should be approximately 300mV (0.3VDC) from the last test and adjustment. The voltage reading is acceptable unless it is significantly different (> 50mV) from the previous setting.

- ☐ If you have installed the optional DC Balance setting, adjust the Left Balance pot (located on the PC Board) so that you have the same voltages on V3 Pins 1&8 and V4 Pins 1&8. You will need to move your measurement probe from V3 to V4 alternatively as you make small adjustments and until the voltages are approximately the same. Power down and wait a few minutes for all of the system capacitors to discharge.

- ☐ Re-install output tubes V1 & V2.

- ☐ Install RCA shorting plugs in the RCA inputs of your amplifier.

- ☐ Insert your 3 small driver tubes.

- ☐ Replace your 0.5A fuse with the normal 3A fuse.

- ☐ Apply power to your amplifier. Watch for any signs of stress or problems as before. Permit your amplifier to run without any input signal for approximately 20 minutes.

- ☐ After the 20 minute period using your DVM set both the left and right BIAS Set potentiometers so for 0.9VDC at the front panel test point (located immediately adjacent to the BIAS Set pot). Both are easily accessible from the front panel of your amplifier.

Congratulations – your SoB-Upgrade amplifier is now compete and ready to provide you with years of worry free musical enjoyment.

VI. Troubleshooting

Should any of the tests fail to provide the results defined, you should immediately stop and begin to diagnose the problem. Going further is certain to cause additional problems.

Nearly all of the problems encountered with initial start up are related to poor connections and soldering. Therefore it is imperative that you visually examine all of your connections. If any connection appears suspect follow the instructions in our soldering tech note to repair the connection. Pay particular attention to possible solder bridges especially on the BCS module especially near the wire termination points.

The second most troublesome problem is with components that have been inserted incorrectly (polarity). Be sure the diodes, transistors, integrated circuits, and electrolytic capacitors are in the proper location and correctly oriented. Once again a visual inspection compared against the stuffing guide will resolve a great number of problems.

Finally, on several occasions, we have seen components installed that are not the correct value. This is most common with color coded parts such as resistors. For example a 100 ohm 1% metal film resistor has color bands - brown/black/black/black/brown while a 1000 ohm 1% metal film resistor has color bands - brown/brown/black/black/brown. It is very easy to confuse the two.

If you assembled your pc boards as suggested (in component type groups) hopefully you measured the value of each resistor with your ohmmeter before insertion as described. Also check capacitor values carefully. It would be easy to mistake a 0.001 uF disc capacitor with a 100 pf capacitor.

Infrequently wiring errors arise. If you have confirmed the previous items you can begin checking suspect wiring by either 1) tracing each wire mechanically or 2) by resistance checks with you ohmmeter set to its lowest setting. Look for 0 OHMS from end to end. If you obtain a reading of 10 ohms or so you are probably not looking at the same lead. Where you have used twisted groups be sure you have not interchanged the wiring. This is most common with twisted pairs where the “WHITE” lead is reversed with the “BLACK” lead. Check for 0 OHMS readings from closely adjacent PC board terminals to check for solder bridging.

Once you have located a suspect component(s) always power down and wait 20 minutes for the electrolytic capacitors to discharge - then replace the part. During the process be careful not to disturb the wiring - always examine the integrity of the wiring after you have made the repair to avoid creating additional problems.

If you should encounter a defective part, be sure to consider both the cause and the effect. If for example you find an overheated resistor, consider what may have caused it to overheat and replace that part as well.

These steps will usually resolve 90 % of all problems. However if you prefer not to get into this kind of diagnosis, please feel free to call us for preparation for return to our lab for resolution.

Figure 1a – SoB-UG Assembly (Component Names)

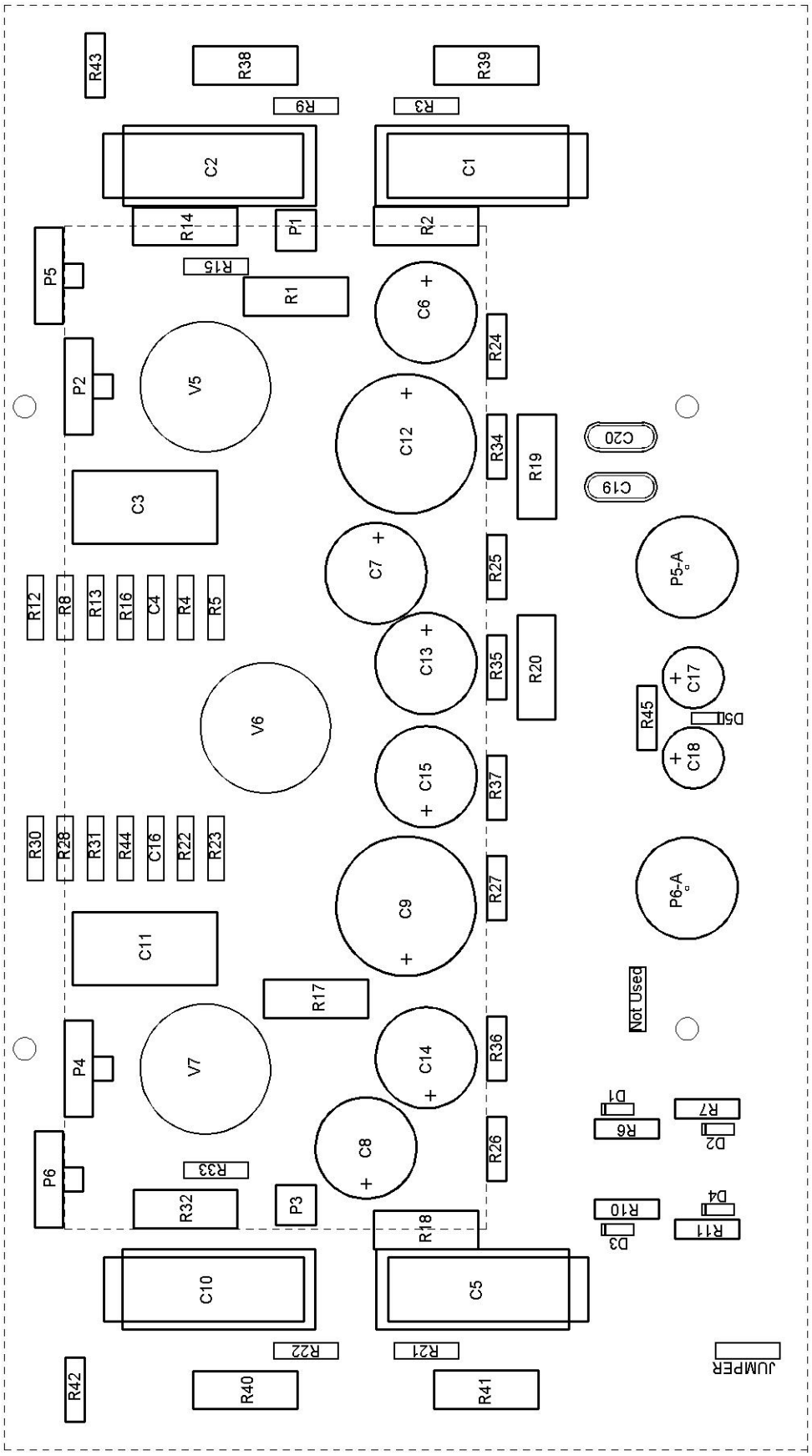

Figure 1b – SoB-UG Assembly (Component Values)

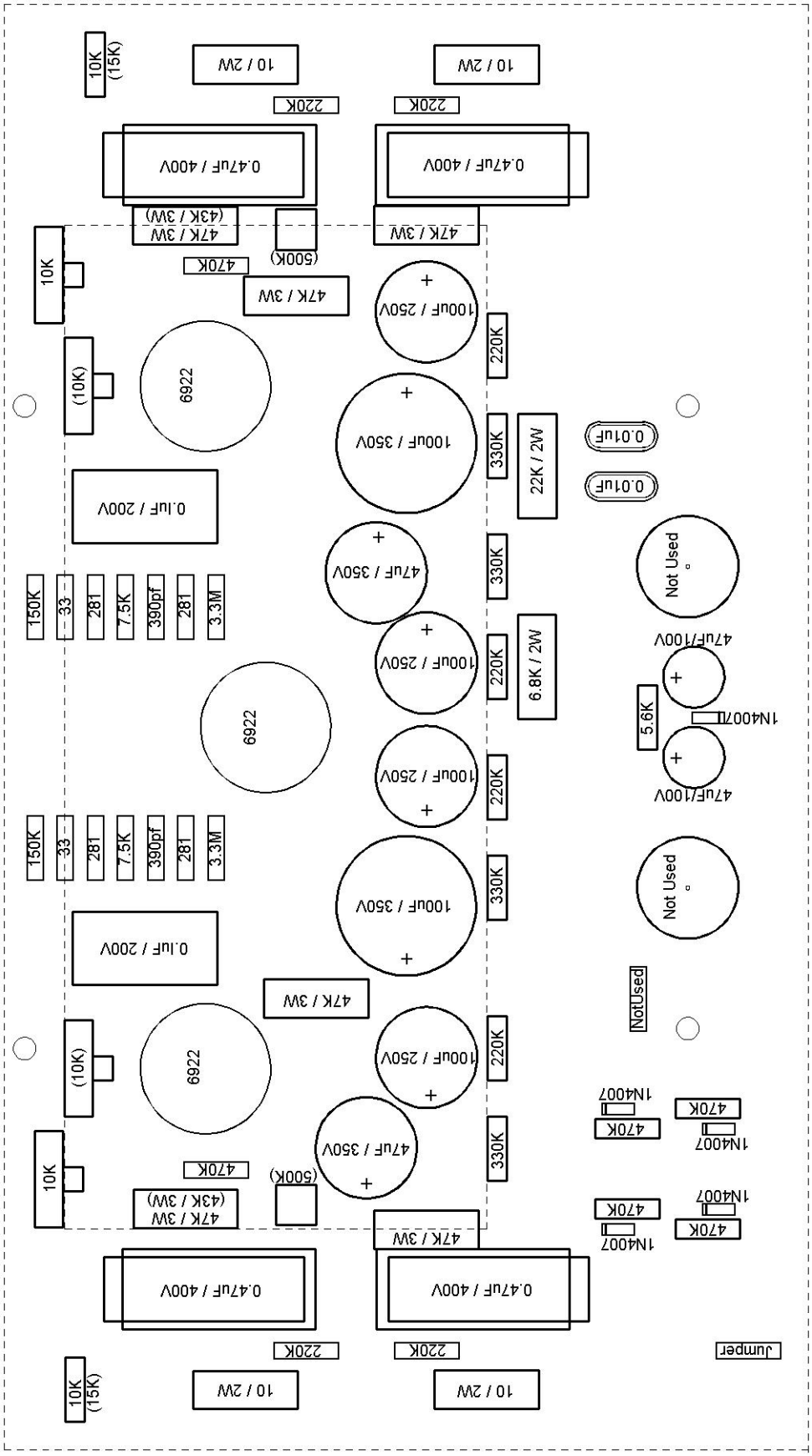

Figure 2 – Dynaco Stereo 70 Output Tube Chassis Preparation
Output Tube Wiring Diagram

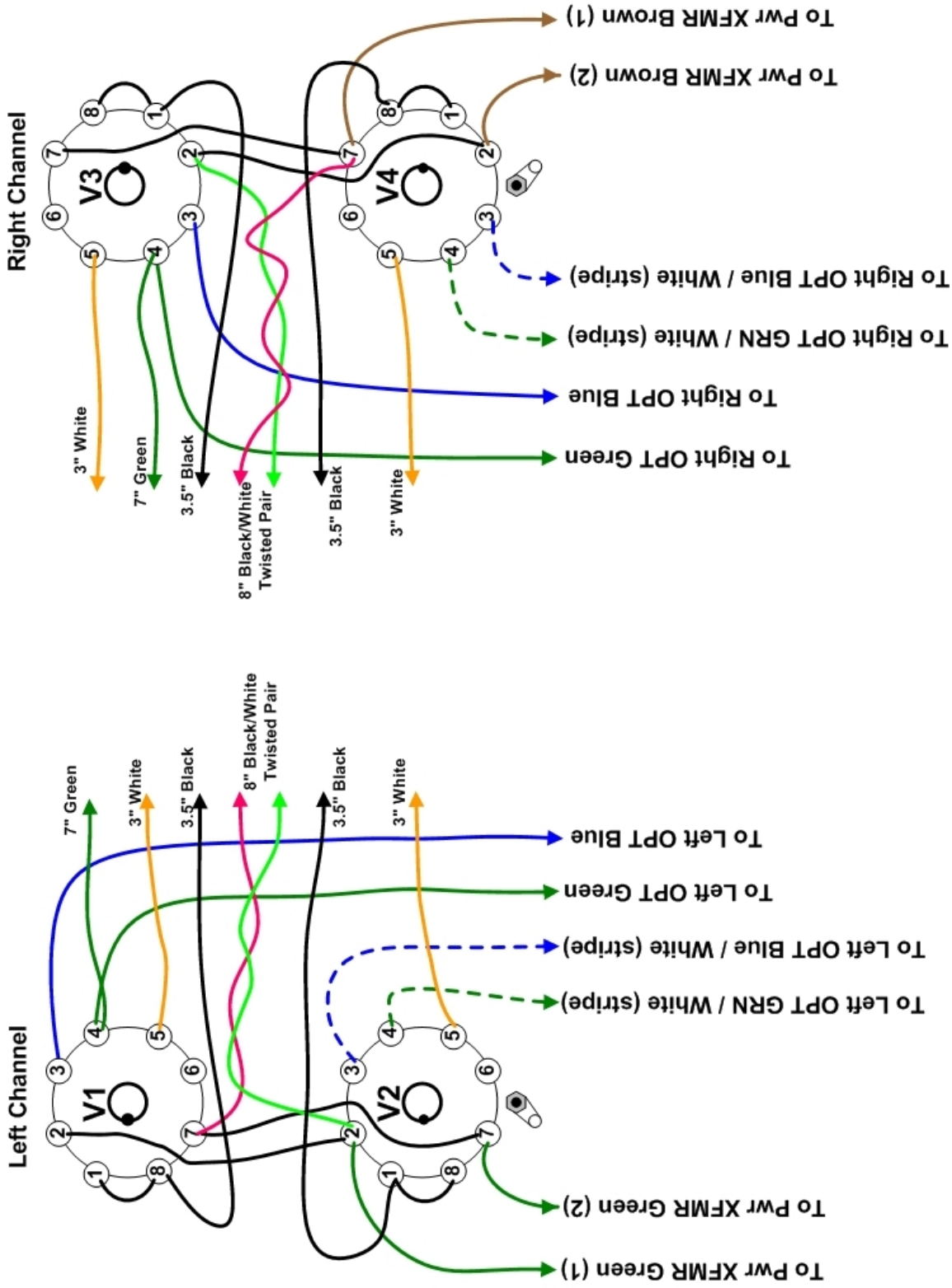

Figure 3 – Stereo-70 System on Board -Upgrade
PC Board Installation & Wiring Diagram
Note: Wire Colors Shown for Clarity Only

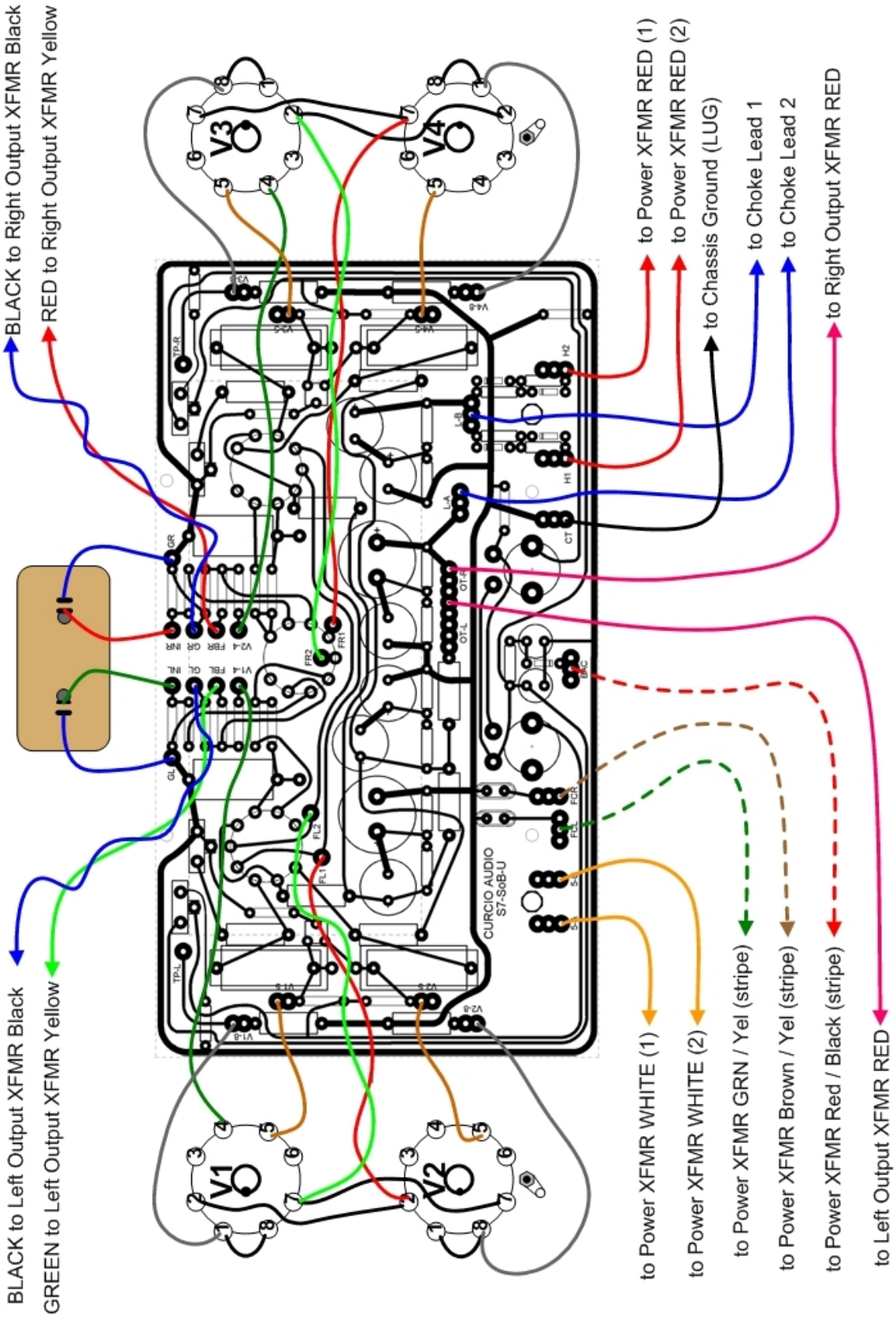

Figure 4 – Stereo-70 System on Board -Upgrade
Test Points

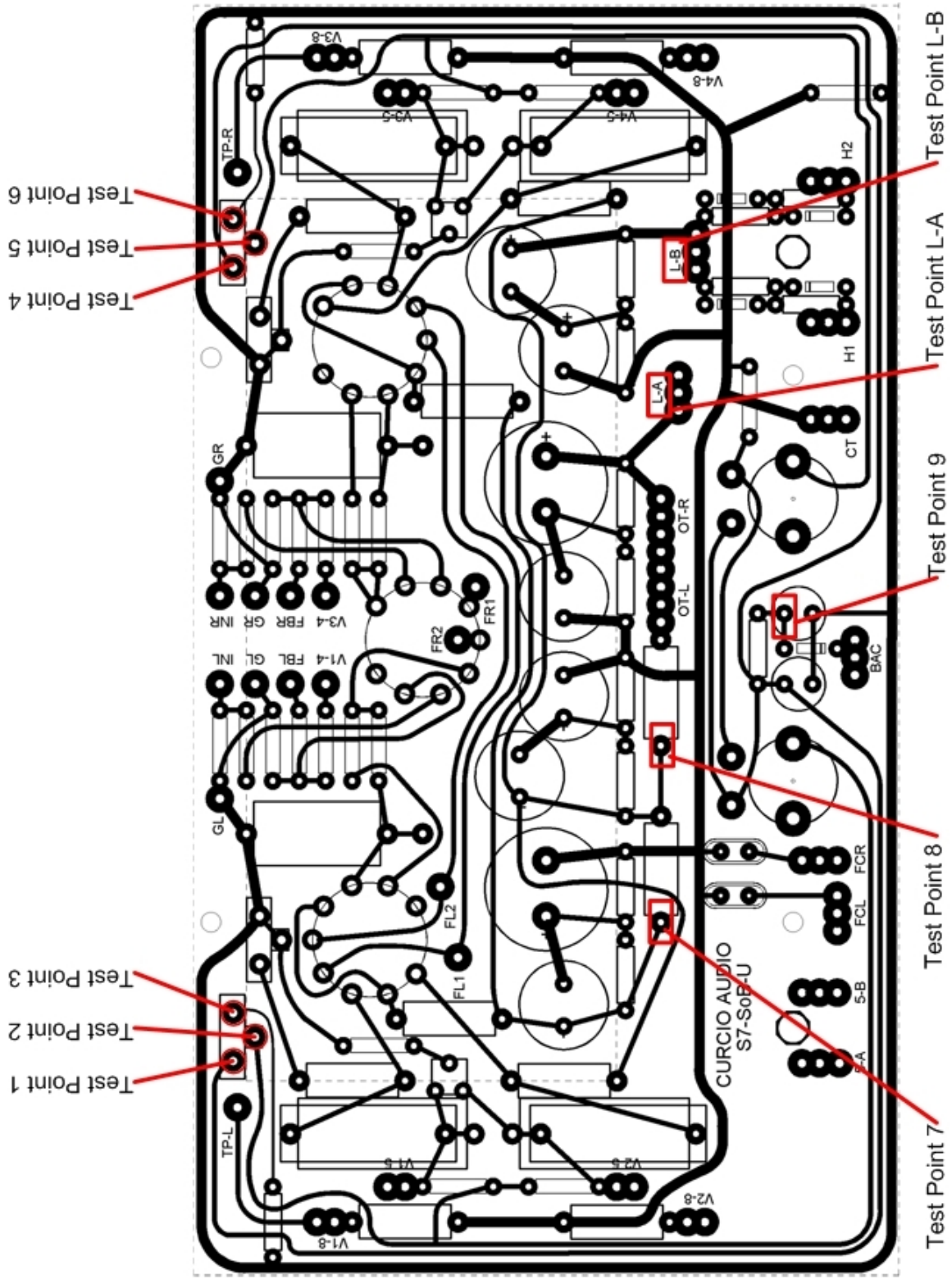

Figure 5 – Stereo-70 System on Board Upgrade Schematic Diagram

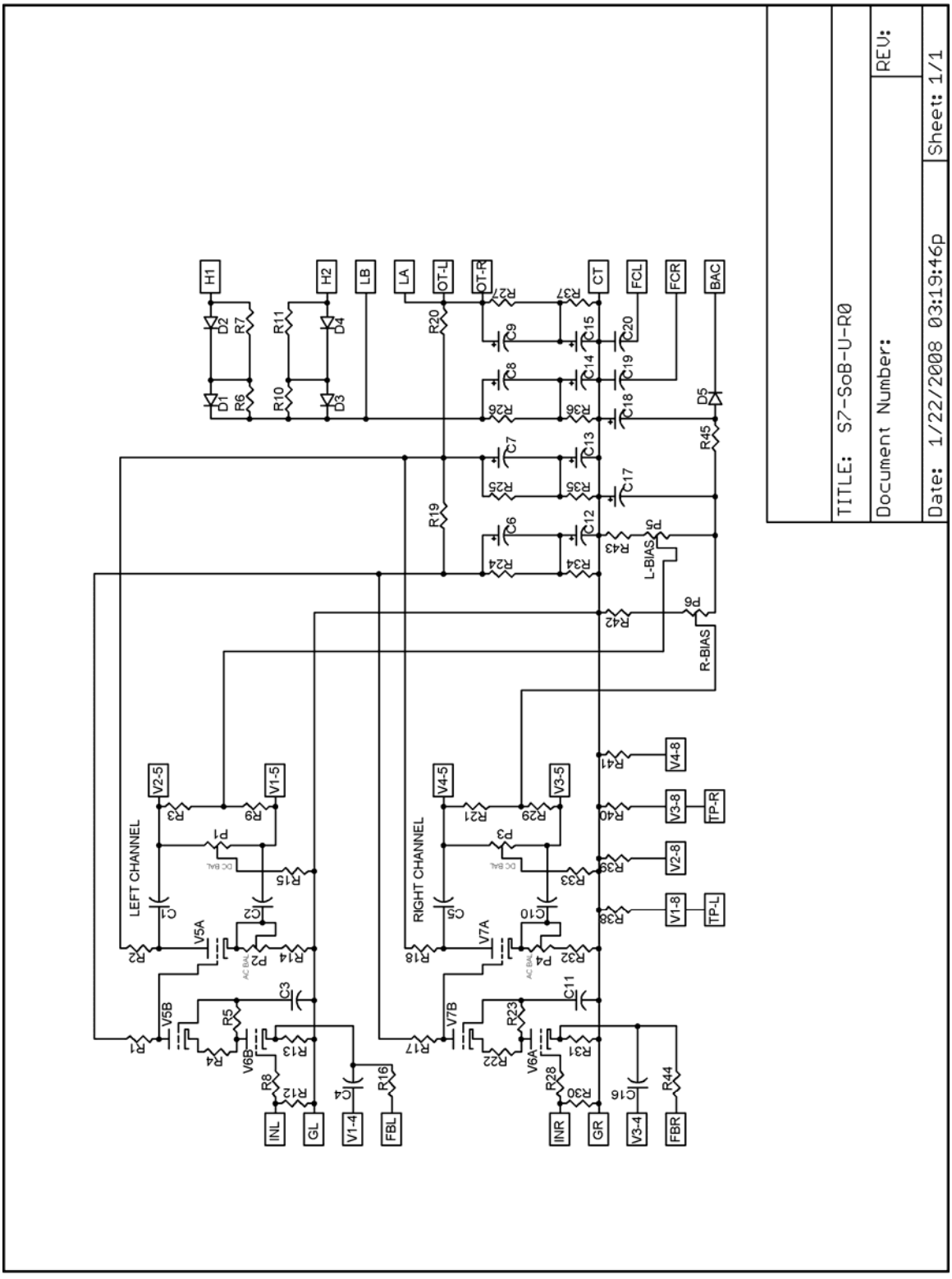

Figure 6 – Stereo-70 System on board Upgrade Bill of Materials

CAE Stereo 70 Upgrade System

R0

Stereo 70 System on Board - Upgrade, CAE# ASM-S7-SoB-U

PAGE 1 of 1

DESIG	DESCRIPTION	QNTY	PART NUMBER	VAL / VOLT
PPC STD - C1, 2, 5, 10	CAPACITOR, MYLAR	4	MSR#5989-400V.1	0.47uF/400VDC
PPC STD - C3, C11	CAPACITOR, MYLAR	2	MSR#5989-400V.1	0.1uF/200VDC
C4, C16	CAPACITOR, DISC	2	MSR#140-102P6-391K-RC	390PF / 1KV
C6, C13, C14, C15	CAPACITOR, ELECTROLYTIC (RADIAL)	4	MSR#140-XRL-250V100	100uF/250VDC
C7, C8	CAPACITOR, ELECTROLYTIC (RADIAL)	2	MSR#140-XRL-350V47	47uF/350VDC
C9, C12	CAPACITOR, ELECTROLYTIC (RADIAL)	2	MSR#140-XRL-350V100	100uF/350VDC
C17, C18	CAPACITOR, ELECTROLYTIC (RADIAL)	2	MSR#140-XRL-100V47	47uF/100VDC
C19, C20	CAPACITOR, DISC	2	MSR#140-100Z5-203Z-RC	0.01uF / 100V
D1 - D5	DIODE, POWER	5	MSR#583-1N4007	1000 V / 1A
R1, R2, R17, R18	RESISTOR, MET OXIDE	4	MSR#283-47K-RC	47K, 3W
ACB STD - R14, R32	RESISTOR, MET OXIDE	2	MSR#283-47K-RC	47K, 3W
R3, 9,21,24,29,35,36,37	RESISTOR, CARBON FILM	8	MSR#293-220K	220K, 1/2 W
R4, 13, 22, 31	RESISTOR, METAL FILM	4	MSR#273-280	281, 1/2 W
R5, R23	RESISTOR, CARBON FILM	2	MSR#293-3.3M-RC	3.3M OHMS- 0.5 W
R6, 7, 10, 11, 15, 33	RESISTOR, CARBON FILM	6	MSR#293-470K	470K, 1/2W
R8, R28	RESISTOR, CARBON FILM	2	MSR#293-33-RC	33 OHMS- 0.5 W
R12, R30	RESISTOR, METAL FILM	2	MSR#273-150K	150K, 1/2W
R16, R44	RESISTOR, METAL FILM	2	MSR#273-7.5K	7.5K, 1/2 W
R19	RESISTOR, METAL OXIDE	1	MSR#281-22K-RC	22K, 1W
R20	RESISTOR, METAL OXIDE	1	MSR#281-6.8K-RC	6.8K, 1W
R25, 26, 27, 34	RESISTOR, CARBON FILM	4	MSR#293-330K	330K, 1/2 W
R38, 39, 40, 41	RESISTOR, METAL OXIDE	4	MSR#281-10-RC	10 OHMS, 1W
R42, R43	RESISTOR, CARBON FILM	2	MSR#293-4.7K	4.7K, 1/2 W
R45	RESISTOR, METAL OXIDE	1	MSR#281-10K-RC	10K, 1W
P5, P6	POTENTIOMETER, PCB VERTICAL	2	MSR#531-PT15B-10K	10K
STD - X1	SOCKET, 9 PIN TUBE	3	CAE # PC-9(3)	
X2	PRINTED CIRCUIT BOARD	1	B-S7-SoB-UG	
X3	THREADED SPACERS	4	MSR # 534-8407	4-40 x 1.25 "
X4	PC BOARD TURRETS	2	CAE # PC-TURRET	
X5	HI-REL CERAMIC OP TUBE SOCKETS	4	CAE# SKT-80 (4)	
X6	TEFLON WIRE KIT	1	CAE# TWK	
X7	DUAL RCA INPUT CONNECTOR	1	CAE# RCA-IN-S7	
PPC OPT - C1, 2, 5, 10	CAPACITOR, POLYPRO (SPRAGUE 715)	4	MSR#75-715P400V0.47	0.47uF/400VDC
PPC OPT - C3, C11	CAPACITOR, POLYPRO (SPRAGUE 715)	2	MSR#75-715P200V0.1	0.1uF / 200VDC
			CAE# OPT-S7-PPC	
DCB OPT -P1,P3	POTENTIOMETER	2	DK#D4AA55-ND	500K
			CAE# OPT-S7-DCB	
ACB OPT - R14, R32	RESISTOR, MET OXIDE	2	MSR#283-43K-RC	43K, 3W
ACB OPT - P2, P4	POTENTIOMETER, PCB VERTICAL	2	MSR#531-PT15B-50K	50K
			CAE# OPT-S7-ACB	
V3 OPT - V1,2,3	TUBE, PREMIUM DUAL TRIODE	3	**CAE# OPT-V3**	
X1 9PM OPT	HI-REL CERAMIC SOCKET, 9 PIN TUBE	3	**CAE# OPT-PC9(3)**	
OPTIONAL	OUTPUT TUBE SET (4)	4	**CAE# OPT-EL34(4)**	
OPTIONAL	LINE CORD	1	**CAE# LC**	
OPTIONAL	FUSE HOLDER	1	**CAE# FH-S7**	
OPTIONAL	PREM RCA INPUT CONNECTOR KIT	1	**CAE# S7-RCA-PREM**	

NOTES : CAE# - Curcio Audio Part Number

DK# - DigiKey Part Number MSR# - Mouser Part Number

Figure 7 – Stock Dynaco Stereo 70 Wiring Diagram

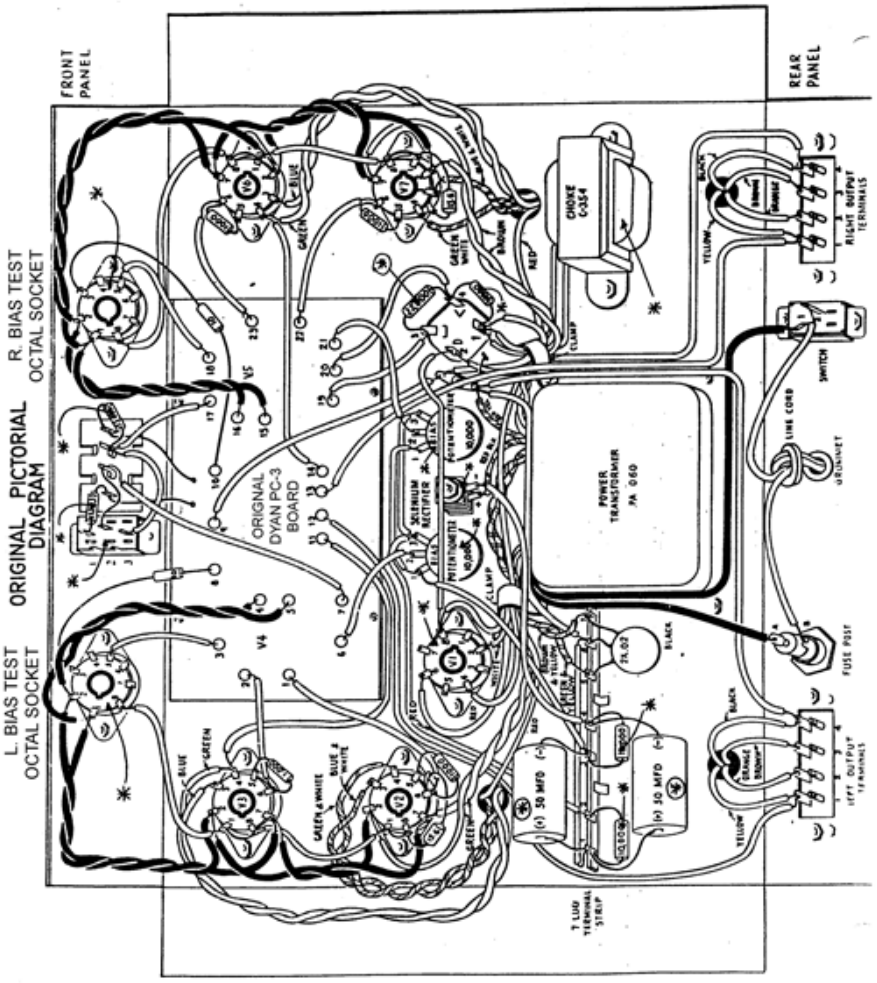

Figure 8 – Resistor Color Code