

## I. Introduction

Thanks for your purchase of our ST-70 Quad Electrolytic Capacitor Replacement Board. It has been designed to replace the original Dynaco Quad (4 section) Aluminum electrolytic capacitor. No longer in production, these original equipment capacitors have become nearly impossible to replace. Those that are available exhibit high leakage due to their age further compromising the amplifier reliability. Another problem with the original capacitor contributing significantly to their poor reliability is the marginal voltage rating (500VDC) that is frequently challenged even under typical conditions. Finally, the original capacitor exhibits a rising impedance characteristic well within the audio spectrum causing loose bass response and dull high frequencies.

The CAE replacement PC board solves all of these problems with the use of a high quality capacitor bank that not only increases the voltage rating (to 600VDC) but also increases the value. Most important to audiophiles, it uses contemporary high quality capacitors that provide both low and flat impedance capacitors. The net result is an amplifier that provides deeper bass, and more extended highs.

The CAE PC-S7U PC board includes provisions to include a completely new bias supply and optional solid state rectification if desired. The revised bias supply is more stable than the original resulting in consistent tube operation thereby extending their lifetime.

This document describes the specific instructions and steps associated with our Dynaco Upgrade board (PC-3U). Additional documents referenced (and available from our web page [www.curcioaudio.com](http://www.curcioaudio.com) ) are :

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

Please take the time to familiarize yourself with all of these documents in particular Tech Note # 1.

**Also, please note that this module houses components that have lethal voltages present on their leads and cases. Please take the appropriate care in both installing and operating this module.**

## II. General Overview

Take time to review all of the documentation provided including the aforementioned tech notes related to soldering technique and proper tools and test equipment. 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 construction.

Your project will be built in stages:

- If you have purchased the PC Board in its unassembled form (PWB-S7U) you will first assemble the components onto that board.
- Next, you will remove original Dynaco Aluminum QUAD Aluminum Electrolytic “Can” and the original “selenium” rectifier (the bias supply rectifier) and carefully label each of the associated wires.
- You will then install the CAE replacement PC-S7U Board and reconnect the original wires to their corresponding terminals followed by a few electrical tests and power up sequence.
- Finally you will readjust the bias pots for each channel.

Although you are unlikely to encounter any problems, should they occur they would almost certainly be based on an improper assembly of the PC Board or the wiring to the Stereo 70. Therefore to avoid the time consuming and frustrating task of troubleshooting afterwards please remember these simple suggestions:

- **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.**
- Diodes & Capacitors (the project is full of them) 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.
- 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 an ohmmeter 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.

## III. Internal Wiring

Unless otherwise specified, **you should use 20 to 22 gauge stranded wire with Teflon insulation**. Thicker wire, solid wire, or PVC insulation will cause problems - if not now (too much strain on the boards or parts) or later (reliability issues). We can't overemphasize this issue.

## III. Assembly

### A. Building the PC Board (PC-S7U)

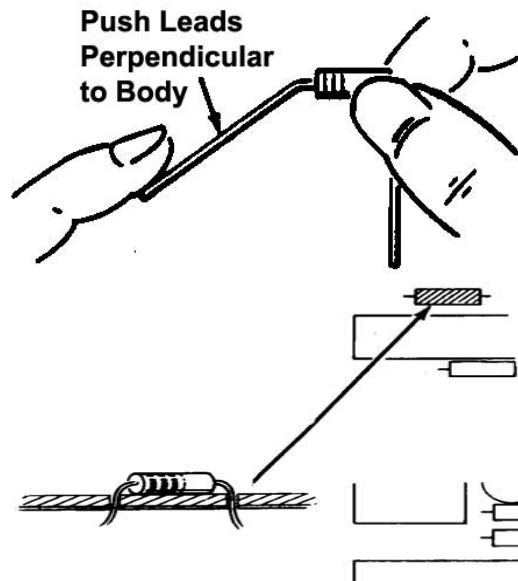
Components are to be inserted on the non foil side and soldered on the foil side. The sequence of assembly has been chosen so that the components with the lowest profile (such as jumpers, low power resistors, IC's etc.) are installed first with higher profile components added until the highest profile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

Refer to the component placement drawing (figure 1). Be sure to observe correct orientation of polar components (capacitors). Be sure also to check with an ohmmeter resistor values if you are not absolutely sure of how to read metal film resistor color codes.

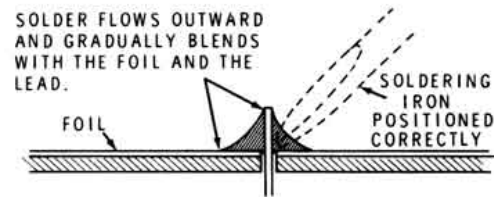
1. Begin by installing all of the ½ Watt resistors. There are a total of 10 ½ Watt resistors (14 if you are installing the solid state rectifier option). Refer to Figure 1 (Top View PC Board Component Placement Diagram). The board has been designed so that a gentle radius near the body of the resistor will position the leads in alignment with the associated holes in the PC Board.

Note that the ½ Watt resistors should be inserted so that the body of the resistor rests gently against the PC Board. After inserting the resistor leads thru the board, a slight bending outward of the leads will hold the part in place until you can solder it in place.

2. Install the single 1N4007 diode (D5) for the bias supply. It is located furthest from the capacitor grouping and points (band side) towards the edge of the board. If you will be using the solid state rectifier option, install the four 1N4007 diodes (D1 thru D4). These point in the opposite direction from D5.



3. Install the Two (2) 3 Watt metal Oxide resistors. You should also gently bend the leads of these resistors similar to the ½ Watt resistors (but of course with a greater radius). But unlike the ½ Watt resistors, the # Watt Resistors should be spaced away from the plane of the PC Board by 1/16" to allow for heat dissipation.
4. Install the eight (8) electrolytic capacitors (4X 100@250VDC & 4X 100uF@350VDC). Be very careful to observe the correct polarity and voltage rating. The 350VDC 100uF caps are 7/8" diameter. The black band on the capacitor represents the negative lead (the board is marked with a "+" to indicate the positive (opposite) lead). Be careful to insure that the leads fully extend thru the PC Board and that you have sufficient tab length to obtain a solid solder connection.
5. Finally install the two remaining electrolytic capacitors (2X 47uF @ 10VDC – these are about ½" in diameter) for the bias supply. Note the polarity as shown in Figure 1.
6. Visually inspect all of your solder connections. Refer to the adjacent diagram. Quality solder connections should be smooth and shiny. Dull surface or large blobs on the PC board should be cleaned and resoldered. In this case remove the old solder with solder wick or similar and resolder the connection.



## B. Removing the Original Dynaco QUAD Capacitor & Bias Rectifier

1. To begin removing the original Dynaco Quad Capacitor, remove the top cover (should be held in place with either 4 or six screws (depending upon the vintage) along the side. These screws will release both the top perforated metal cage and the bottom "U" cover.
2. Remove the 4 output tubes, the rectifier tube, and the two 7199 driver tubes (and label them for reinstallation later). I recommend that you clean the dust and grime from the amplifier both topside and below where you will be doing most of your work. A vacuum cleaner following the path of a soft paintbrush will work very well here.
3. Turn the amplifier over and locate the wire connected to Quad capacitor section "A". The other end should be connected to the Dynaco driver PC board (PC-3) terminal number "19". Desolder the wire at the PC board (you can leave the other end connected to the Quad Capacitor. Note - There is also a 22K resistor connected to capacitor lug "A" – we will discard it so feel free to leave it connected.

4. Next locate the wire connected to Quad capacitor section “B”. The other end should be connected to the Dynaco driver PC board (PC-3) terminal number “20”. Desolder the wire at the PC board (you can leave the other end connected to the Quad Capacitor. Note – There are two resistors connected to lug “B” – ignore them as they will be discarded.
5. Next, desolder the wires connected to capacitor section “B”. There are 3: the choke lead, and one RED lead from each of the output transformers. There is also the other side of the 6.8K resistor referenced in the last step – it can remain. Label each of these wires “C”.
6. Next, at Quad capacitor lug “D”, there are two wires: the other lead from the choke and a wire going to pin 8 of the rectifier tube. Desolder the wire going to pin 8 of the rectifier tube at the rectifier tube. Desolder the choke lead and label it “D”. For your reference, you can identify pin 8 by counting clockwise from the bottom of the tube starting at the tab.
7. Next, remove the two wires connected to the posts of the selenium rectifier (located near the center of the amplifier). There are two: a wire leading to the power transformer – label this wire “RED-BLK”. The other wire leading to the terminal strip under the right channel output transformer will not be used – cut it at both ends and discard. You can now remove the selenium rectifier and its associated hardware (1/4” nut & 1.25” screw).
8. All the connections to the original electrolytic “can” capacitor should be removed at this time. This capacitor is held in place by 4 tabs that are either twisted and / or soldered to the chassis. You will need to remove the solder (using a vacuum “solder sucker”) to easily remove it. This is perhaps the most difficult step of the process. Make sure your soldering iron tip is clean and “wetted” with a fresh shot of solder and immediately begin to heat the connection. Wait until the solder is fully molten (this may take a minute or so) and then place the solder vacuum pump in a position to suck the greatest quantity of solder. Once you have removed the solder, using gas pliers you can twist the tabs to the position (face perpendicular to the center of the can) that will release the capacitor.
9. Remove the ground lug that is located between the right channel bias pot & the original Quad capacitor. Do not desolder the wires to this lug – it will be reattached soon.
10. The bias potentiometers are located near the center of the amplifier flanking the original selenium rectifier. On one of the potentiometers (most likely the left channel) on the two outer terminals (not the center terminal) there are long wires that route to a terminal strip located below the left channel power transformer.

There should be two wires; one for each outer terminal. Remove both of these wires completely and discard (cut both of these wires at both ends). Be careful to keep intact the connections at the bias pot terminals that connect both of the pots outer terminals together – these must remain.

11. At your discretion you may remove all of the original bias components hardwired on the terminal strip below the left output transformer. This includes everything but the three terminal ceramic disc capacitor.

## C . Installation of the New CAE Stereo 70 QUAD Capacitor Board (CAE-PC-S7U)

1. Locate the CAE replacement Driver board (PC-S7U). There are 8 wires (or 10 if you are using the solid state rectifier option) wires that need to be connected to this board that interface with the amplifier. They are:
  - “BIAS – “ - one wire connecting to the set of bias potentiometers
  - “BIAS + “ - one wire connecting to the set of bias potentiometers
  - “RD-BLK” - one wire connecting to the Power Transformer Red-Black Stripe lead
  - “A” - one wire connecting to terminal 19 of the Dynaco PC-3 board
  - “B” - one wire connecting to terminal 20 of the Dynaco PC-3 board
  - “C” - one wires that will connect to the choke and the 2 output transformers
  - “D” - one wire connecting to the rectifier tube pin 8
  - “GND” - one wire connecting to the chassis
  - “RD” - one wire each connecting to one of the RED power transformer leads if solid state rectification options is used
  - & “RD” - one wire each connecting to the other RED power transformer leads if solid state rectification options is used
2. Most of the original wires will be too short to reach the terminals of the replacement capacitor board once in place. I suggest preparing a set of 8 (10 if you are using the solid state rectifier option) wires to connect from the PC-S7U replacement cap board to the associated connections inside the amplifier. To do this, cut 11 (or 12) 12” lengths of 22 ga. stranded wire (preferably Teflon insulated) and strip 3/8” of insulation from one end of each wire. Tin the wire and connect one wire each to the PC-S7U terminals “RD-BLK”, “BIAS-“, “BIAS +”, “A”, “B”, “D”, & “C”. If you are using the solid state rectifier option connect one wire each to terminal “RD” and another to the other terminal “RD”. Label each wire according to the terminal nomenclature.
3. Group the wires and insert the bundle from the top of the amplifier through to the bottom through the hole originally occupied by the Dynaco Quad capacitor. Orient the PC-S7U so that the diode area is nearest the right output transformer

and insert the two threaded standoffs into the holes previously occupied by the selenium rectifier and the ground lug. The two large holes in the PC-S7U board should align with the two bias potentiometers so that you can access them with a long flat screwdriver. Secure the PC-S7U in places with two 4-40 nuts. Be sure to capture the ground lug with one of the nuts.



You will now connect the PC-S7U to the amplifier in the following steps:

1. Locate the wire from the PC-S7U board labeled “A”. Trim to length and strip ¼” insulation from the end. Connect to terminal 19 on the Dynaco PC-3 driver board.
2. Locate the wire from the PC-S7U board labeled “B”. Trim to length and strip ¼” insulation from the end. Connect to terminal 20 on the Dynaco PC-3 driver board.
3. Locate the wire from the PC-S7U board labeled “BIAS+” (Bias POSITIVE). Trim to length and strip 3/8” insulation from the end. Connect this wire to the rightmost terminal of the bias right channel bias potentiometer (the one nearest the Quad Cap cutout).
4. Locate the wire from the PC-S7U board labeled “BIAS-” (Bias NEGATIVE). Trim to length and strip 3/8” insulation from the end. Connect this wire to the leftmost terminal of the bias right channel bias potentiometer (the one nearest the Quad Cap cutout).
5. Locate the wire from the PC-S7U board labeled “GND”. Trim to length and strip 3/8” insulation from the end. Connect this wire to the ground lug near the Quad Cap cutout.
6. Locate the wire from the PC-S7U board labeled “D”. Trim to length and strip 3/8” insulation from the end. Connect this wire to pin 8 of the rectifier tube. You can identify pin 8 by counting clockwise from the bottom of the tube starting at the tab.
7. Connect one end of the choke also to pin 8 of the rectifier tube. It will probably be necessary to increase the length of this wire. To do so splice, solder, and cover the splice with electrical tape or heat shrink tubing.
8. Locate the wire from the PC-S7U board labeled “RD-BL”. Trim to length and strip 3/8” insulation from the end. Splice this wire to the power transformer lead labeled “RED-BLK”. Solder to secure and finish with either electrical tape or heat shrink tubing.
9. The next step will involve splicing together 4 wires: the two output transformer red leads, the remaining choke lead, and PC-S7U wire labeled “C”. Clean the old solder from the two transformers leads and the choke lead. Cut to length the wire labeled “C” and strip 3/8” insulation from the end. Twist all four together and secure with a quality solder connection. Cover the end with electrical tape or heat shrink tubing.



10. If you will be using the solid state rectifier option perform the following two steps:
  - Locate one of the wires from PC-S7U labeled “RD”. Trim to length, remove 3/8” insulation, and connect to pin 6 of the rectifier tube
  - Locate the other wire from PC-S7U labeled “RD”. Trim to length, remove 3/8” insulation, and connect to pin 4 of the rectifier tube.

Once completed, inspect each connection again and carefully look for signs of melted insulation near adjacent wires.

## D . Final Checkout & Initial Power Application

1. Replace the power fuse (3A Slo-Blo) with a 1A AGC (quick trip). Install the two driver tubes (7199).
2. If you are not using the solid state rectifier option, plug in the rectifier tube. Please note, if you are using the solid state rectifier option do not install the rectifier tube. Connect a voltmeter to pin 8 of the rectifier tube. The negative lead (Black) should be connected to the amplifier chassis. The positive lead (Red) should be connected to pin 8 of the rectifier tube. Set the voltmeter to measure 500 Volts DC.
3. Plug in and apply power to the amplifier. The voltage reading should be approximately 475 to 550 VDC. If you are using a tube rectifier, this reading should appear after approximately 30 seconds – if you are using the solid state option, it should appear immediately.
4. Measure the voltages at the outer terminals of one of the bias potentiometers. At one terminal (the – BIAS) you should measure approximately – 39 VDC. At the other terminal (the + BIAS) you should measure approximately – 26 VDC. A reading within 10% is acceptable. If you do not measure these values do not proceed – check out the bias capacitors and the wiring associated with power transformer lead “RED-BLK”. Power down and wait 15 minutes.
5. Place RCA shorting plugs into both left and right signal inputs of your Stereo 70. Install the two left channel output tubes. Do not install the right channel output tubes right now. Replace the original 3A fuse. Rotate both original Bias Potentiometers fully counterclockwise. Connect your DC Voltmeter to monitor the current thru the output tubes by measuring the voltage across the 15.6 ohm resistor located at pins 1 & 8 of the output tubes - connect the negative lead (Black) to the chassis and connect the Positive lead (Red) to the junction of the

15.6 ohm resistor and the Output Tube pins 1 & 8. Monitor the voltage as the tubes reach operating temperature. If the voltage begins to exceed 2.5 volts quickly remove power. Otherwise adjust the Bias pot to obtain 15.6 volts. Remove power.

6. Install the right channel output tubes, apply power, and repeat the procedure outlined in step 3. Recheck the bias on the left channel. Remove power.
7. Replace the cover and enjoy.

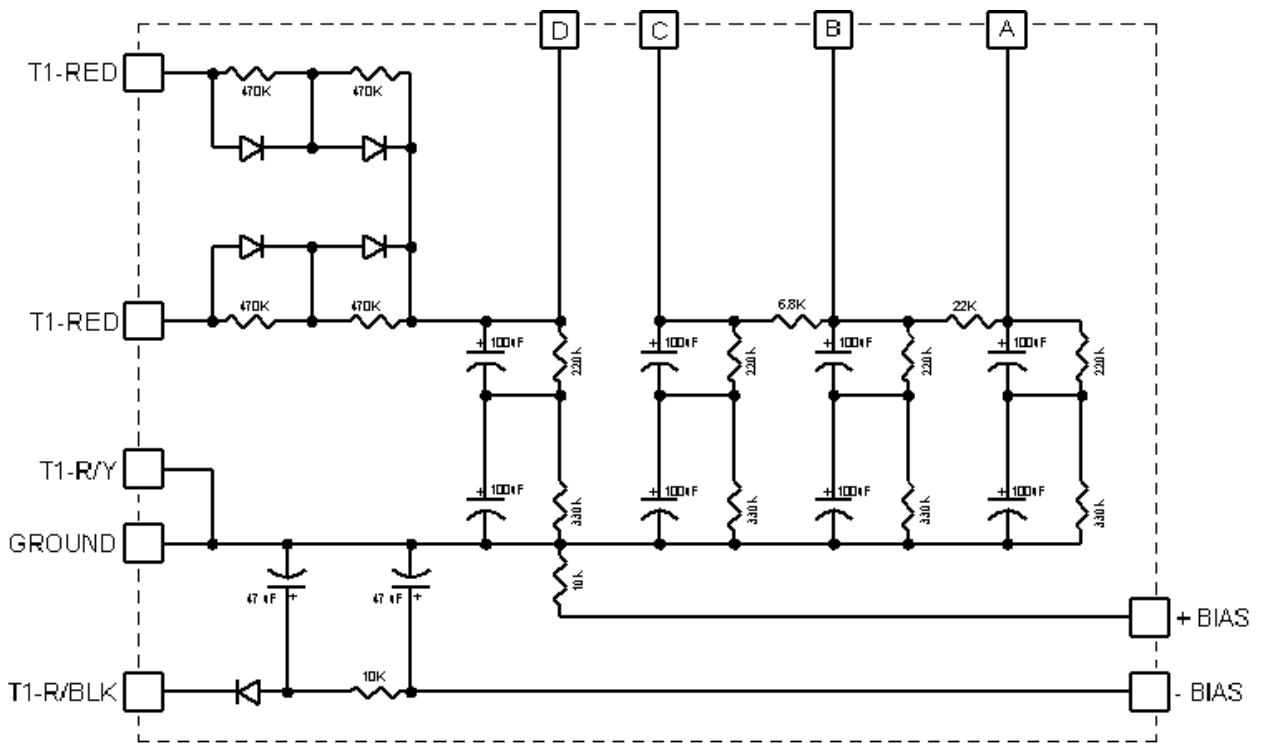
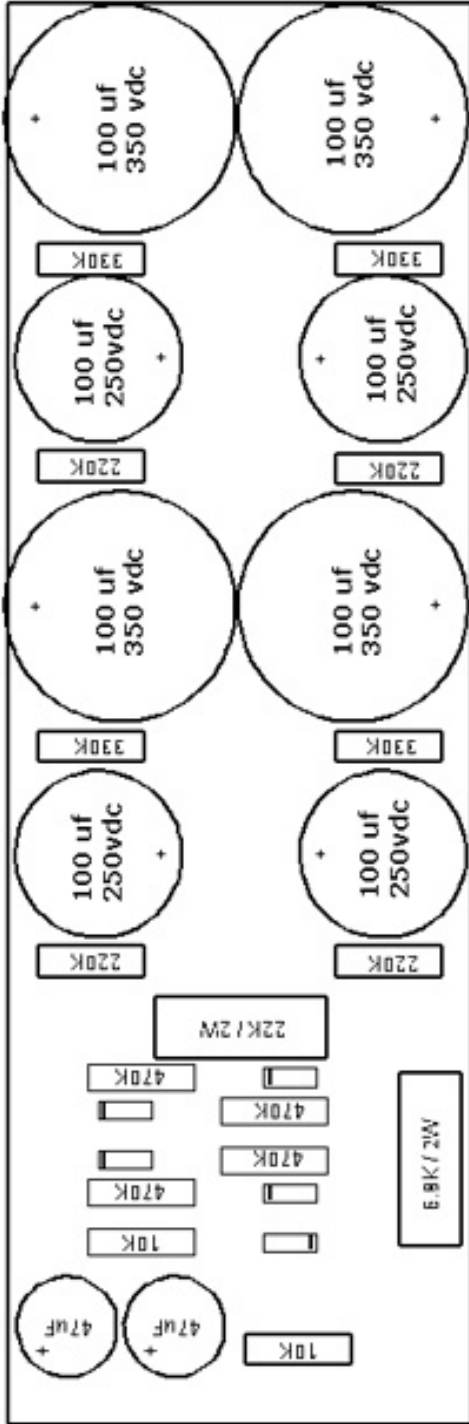
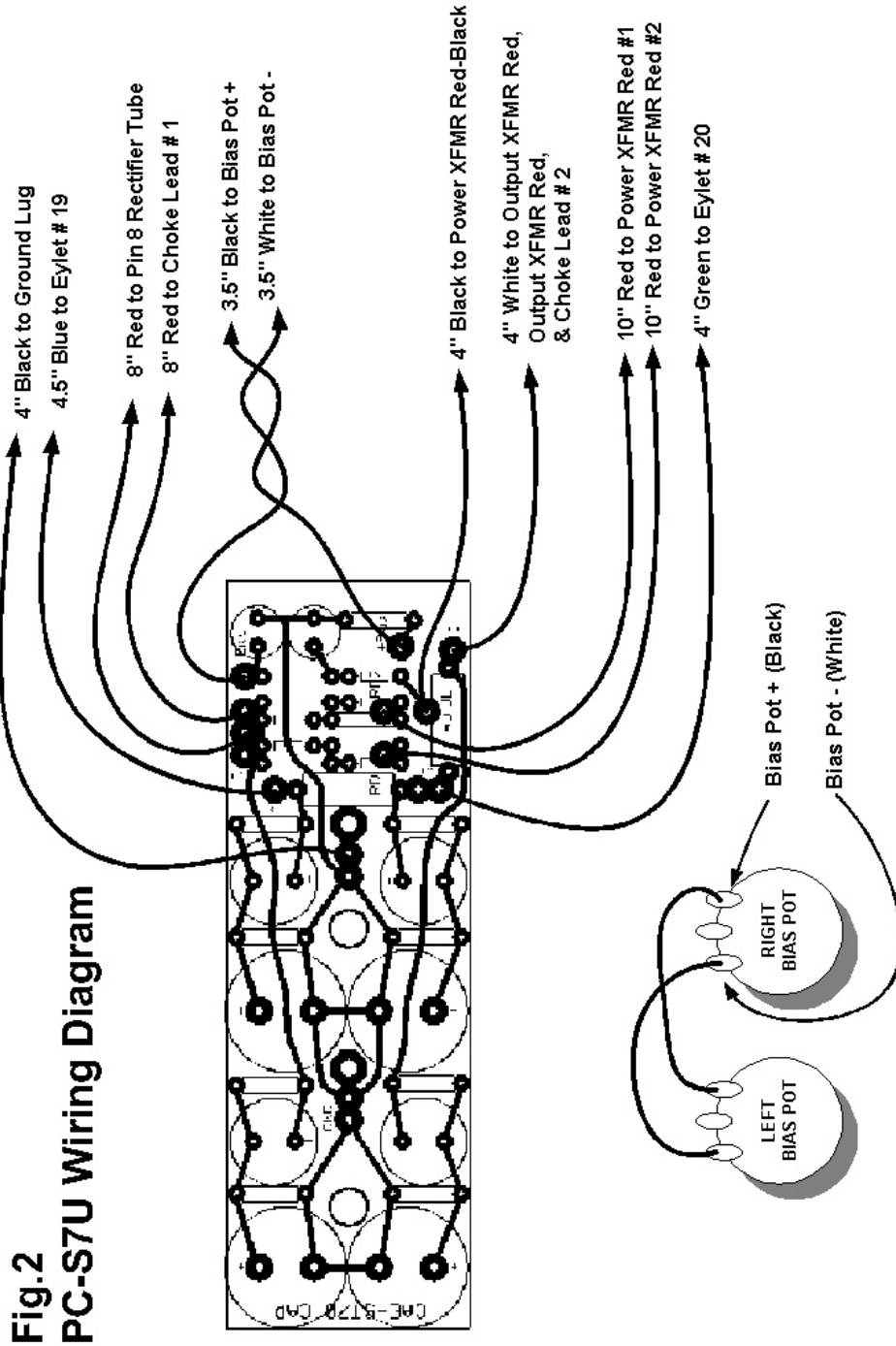


Fig 1 PC-3U Component Placement Diagram (Top View)





## CAE QUAD Cap & Bias Module

6-04 R2

Stereo 70 QUAD Capacitor & Bias Supply Module, CAE# ASM-S7U

PAGE 1

DESIG	DESCRIPTION	QNTY	PART NUMBER	VAL / VOLT
C1, C3, C5, C7	CAPACITOR, ELECTROLYTIC (RADIAL)	4	MSR# 140-XRL-250V100	100uF/250VDC
C2, C4, C6, C8	CAPACITOR, ELECTROLYTIC (RADIAL)	4	MSR# 140-XRL-350V100	100uF/350VDC
C9,C10	CAPACITOR, ELECTROLYTIC (RADIAL)	2	MSR#140-XRL-100V47	47uF/100VDC
D1 To D5 (OPT)	DIODE, POWER, HIGH SPEED	5	MSR#583-1N4948	1000 V / 1A
R1,R2,R3,R4	RESISTOR, CARBON FILM	4	MSR#293-470K	470K, 1/2W
R5, R7, R9, R11	RESISTOR, CARBON FILM	4	MSR#293-220K	220K, 1/2 W
R6, R8, R10, R12	RESISTOR, CARBON FILM	4	MSR#293-390K	390K, 1/2 W
R13	RESISTOR, METAL OXIDE	1	MSR#283-6.8K	6.8K, 3W
R14	RESISTOR, METAL OXIDE	1	MSR#283-22K	22K, 3W
R15, R16	RESISTOR, METAL OXIDE	2	MSR#283-10K	10K, 3W
X1	PRINTED CIRCUIT BOARD	1	CAE# PC-S7U	
X3	PC BOARD STANDOFFS, THREADED	3	CAE# 512-5011	

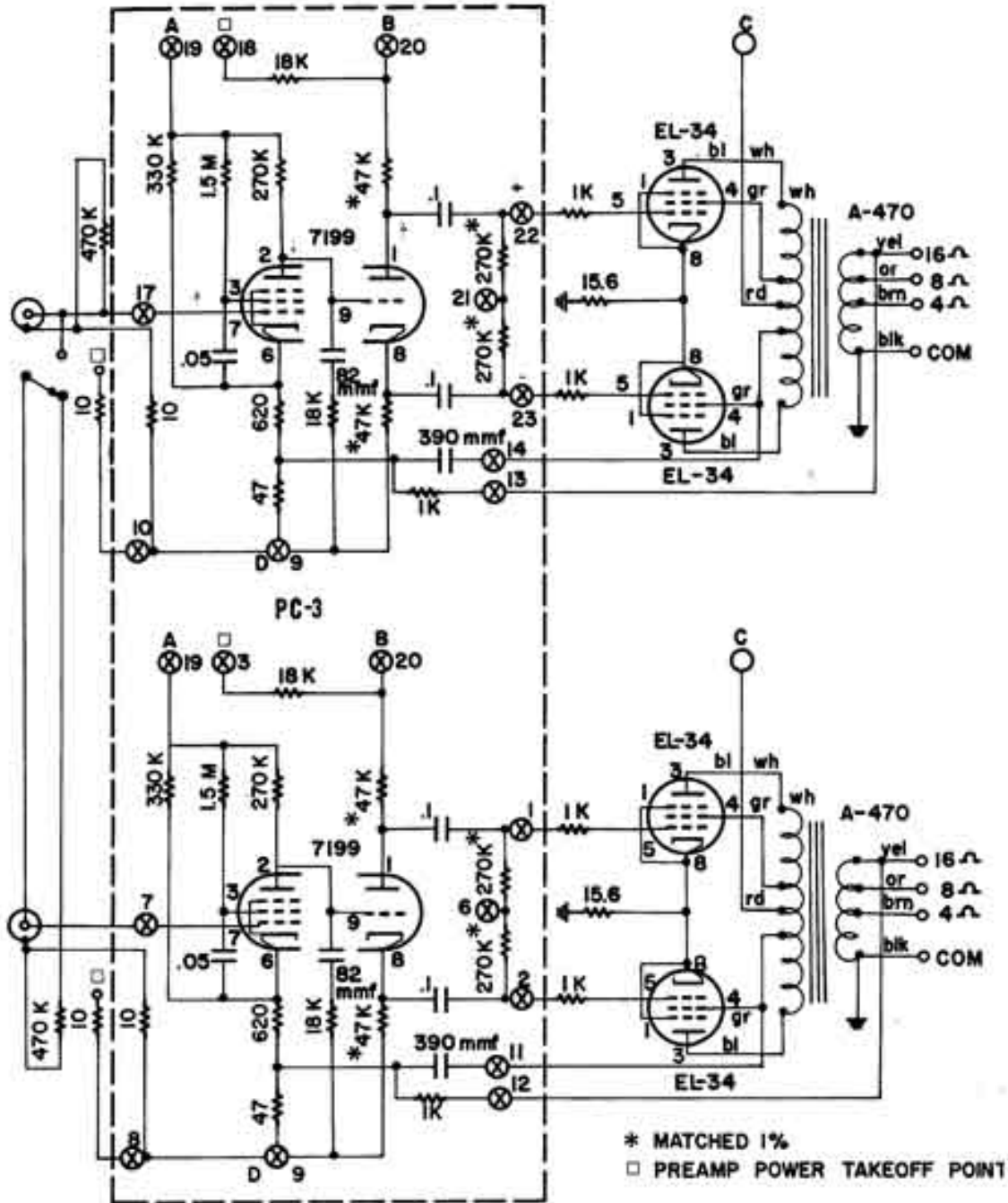
NOTES:

CAE# - Curcio Audio Part Number

DK# - DigiKey Part Number

MSR# - Mouser Part Number

## ORIGINAL DYNACO STEREO 70 SCHEMATIC



# Dynaco ST-70 Quad-Cap Upgrade Assembly, Installation & Setup Manual

CAE Dynaco QUAD Cap Replacement Module PC-S7U R2, 4-04

### VOLTAGE TEST POINTS

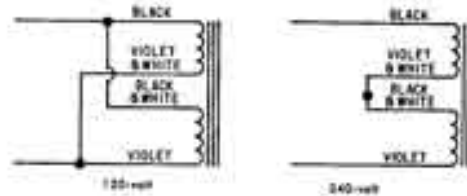
Pin #	Any EL-34	GZ-34	Either 7199
1	1.56	—	*
2	—	435	*
3	—	—	*
4	410	—	*
5	415	360 ac	0.4 ac
6	-32**	—	1.0
7	-32**	360 ac	0
8	1.56	435	*
9	—	—	*

\*Measurements at these points vary from tube to tube and do not indicate whether performance is normal.

\*\*Measurements at these points can only be made with a vacuum tube voltmeter. The two tubes in a pair should have identical readings.

Capacitor lug	Selenium rectifier	Printed circuit
A ■ 305	Bottom (+) lug 50 ac	Eyelets #3 and #18
B ▲ 375	Top (-) lug -65 dc	370 volts dc
C ▲ 415		
D ▲ 435		

### SPECIAL INSTRUCTIONS FOR OPTIONAL 120-240 VOLT POWER TRANSFORMERS



Stereo 70s supplied with power transformer PA-521 may be connected for either 120 volt or 240 volt AC operation as follows:

#### For 120 Volt Operation

- 1 ( ) Twist together the black and black-white leads, and connect both to lug A of the fuse post (S).
- 2 ( ) Twist together the violet and violet-white leads, and connect both to lug #1 of the on-off switch (S).

#### For 240 Volt Operation

- 1 ( ) Connect the black lead to lug A of the fuse post (S).
- 2 ( ) Connect the violet lead to lug #1 of the on-off switch (S).
- 3 ( ) Twist together the violet-white and the black-white leads, and solder them together. Insulate this connection with electrical tape.

When connected for 240 volt operation, a 1½ ampere slow blow fuse should be used.

