

I. Introduction

Thanks for your purchase of our ST-70 Driver Restoration PC Board. It has been designed to provide an exact replacement for the original Dynaco input driver card (Dyna PC-3) using dramatically improved construction materials (Mil Spec FR-4 fiberglass). It has been designed to drop into the original PC-3 position without any electrical or mechanical changes to your ST-70. Once installed, the reliability of your ST-70 will be greatly improved and its stability significantly enhanced.

This document describes the specific instructions and steps associated with our Dynaco Upgrade board (PC-3R). Additional documents referenced (and available from our web page) are:

- 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)

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

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-PC3U) you will first assemble the components onto that board. Next, you will remove the original Dynaco PC-3 board and carefully label each of the associated wires. You will then install the CAE replacement upgrade PC Board and reconnect the original wires to their corresponding terminals followed by a few electrical tests and power up sequence.

Finally you will check and set the bias of the output stage.

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

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:

- 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 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). This can’t be overemphasized.

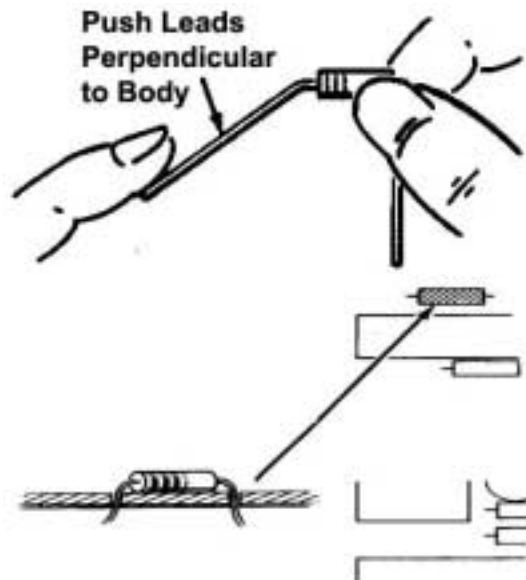
III. Assembly

A. Building the PC Board (PC-3R)

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 $\frac{1}{2}$ Watt resistors. There are a total of 16 $\frac{1}{2}$ Watt resistors specified. 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 $\frac{1}{2}$ 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.

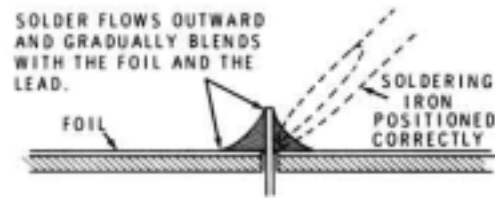


2. Install the Six (12) 3 Watt metal Oxide resistors. You should also gently bend the leads of these resistors similar to the $\frac{1}{2}$ Watt resistors (but of course with a greater radius). But unlike the $\frac{1}{2}$ Watt resistors, the 3 Watt Resistors should be spaced away from the plane of the PC Board by $\frac{1}{16}$ " to allow for heat dissipation.

4. Install the 2 nine (9) pin miniature tube sockets. 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. Install the 10 capacitors. There are 6 large values and 4 small values.

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.
8. Install the 2 7199 Tubes.



B. Removing the Original Dynaco Stereo 70 PC-3 Board

OK – that was pretty easy.

1. To begin removing the original Dynaco PC-3 board, 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 (and label them for reinstallation later). I recommend that you clean the dust and grime from the topside both inside and outside of the amplifier. A vacuum cleaner with a soft paintbrush will work very well here.
3. Next begin desoldering each wire from the original PC-3 card. The original Dynaco wires were solid PVC insulated. The PVC is not very tolerant of heat and therefore you should be very careful not to melt the insulation. Normally a “wetted” soldering iron tip will have better thermal transfer causing the solder to melt quickly before the heat travels up the lead of the wire compromising the PVC insulation. Also, when you remove the wire from the PC Board, it is not uncommon for the wire to “snap” at the other end. I suggest having some replacement wire available. You can use solid PVC wire as in the original however if possible, however I strongly recommend using 22 ga. stranded Teflon Insulated wire in this application. Please do not use anything larger – it is not necessary and it will compromise the reliability of your amplifier as you attempt to make reliable connections on terminals unable to withstand the strain. Note that you may encounter original wiring that is “less than professional” in its execution, If so, it may be necessary to lengthen or replace one or more of the original wires.
4. Desolder each wire and using masking tape (a temporary identifier) label each wire to make installation of the replacement module much easier.

5. After you have desoldered all of the wires from the original Dynaco driver board (PC-3) remove it by removing the four (4) 4-40 nuts from the bottom of the board. The board should fall loose (if not identify if any other wires still remain).
6. Remove the two (2) 470K ohm connected to the audio input connector tabs. These resistors are no longer necessary.

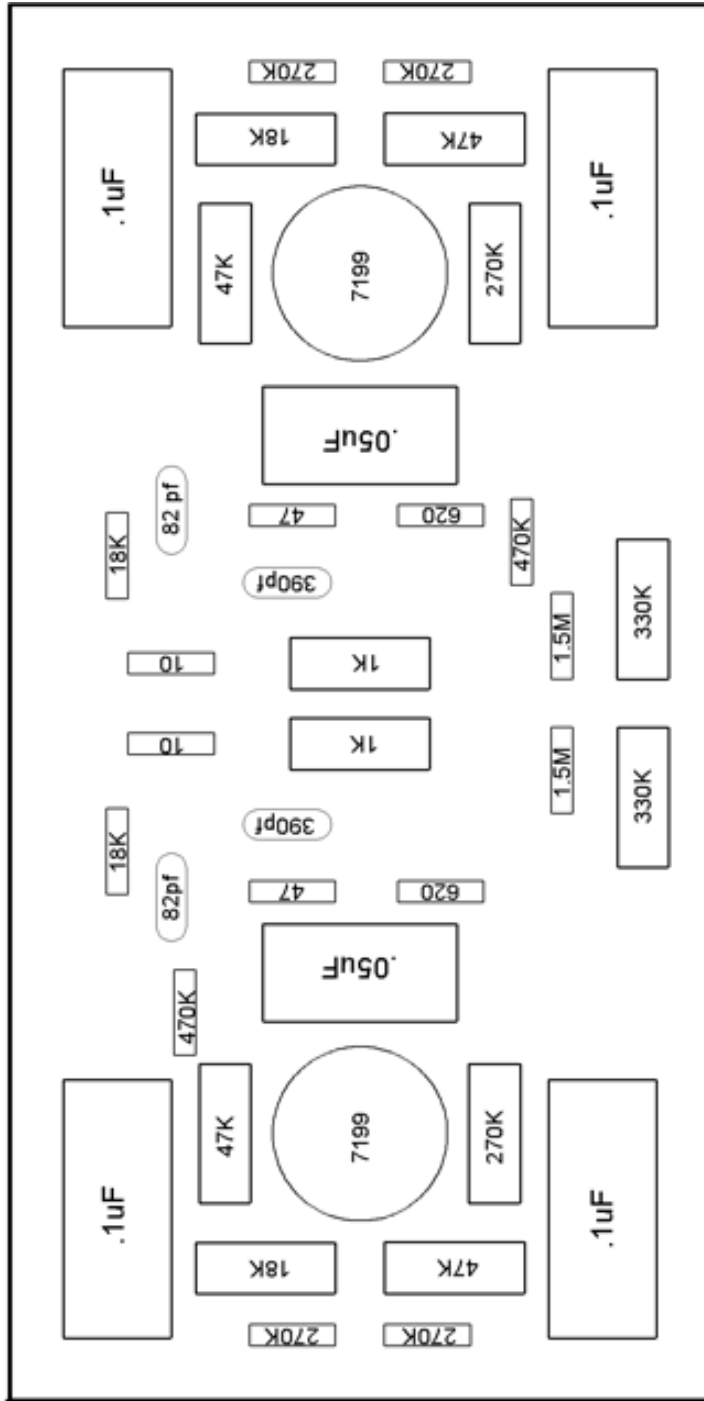
C . Installation of the New CAE Stereo 70 Driver Board (CAE-PC-3R)

1. Locate the CAE replacement Driver board (PC-3R) and orient it so that the TWO 330K ohm 3 Watt resistors are near the rear of the amplifier (nearest the amp center). The board should be mounted so that the top surface of the PC Board rests inside the Dynaco ST-70 chassis cutout (as per the original). Be careful not to capture any wires and secure the board in places with the original 4, 4-40 screws/nuts.
2. Begin reconnecting the wires originally removed for the original Dynaco PC-3 board to the corresponding terminal on the CAE replacement Board (PC-3R). I suggest placing the stripped and tinned wire into the hole in the board and then quickly soldering the wire to the terminal. Be sure to inspect each connection as discussed before. As you complete each wire, remove its masking tape identifier. Although I have designed the replacement board's terminals to be very near the original board, some amplifiers may have been constructed so that lengthening may be required.
3. 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).
2. If you haven't already, remove the rectifier tube. Plug in and turn on the amplifier. Examine the filaments on the new replacement driver board. All three should be illuminated. If the center tube is not illuminated, turn off the amplifier (remove the plug from the AC socket) and reverse the wires labeled "4" & "5" on the replacement board. Reapply power – all three driver tube filaments should be illuminated. Remove power from the amplifier.
3. Remove the three driver tubes and insert the rectifier tube and 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 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 1.56 volts. Remove power.
4. 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.
5. Install the two small 7199 signal driver tubes.
6. Replace the cover and enjoy.

Figure 1



CAE Stereo 70 Restoration Module

7-02 R0

Stereo 70 Restoration Module, CAE# ASM-3R

PAGE 1 of 1

DESIG	DESCRIPTION	QNTY	PART NUMBER	VAL / VOLT
C1 & C2	CAPACITOR, MYLAR or POLYPRO	2		0.05uF/200VDC
C3, C4, C5, C6	CAPACITOR, MYLAR or POLYPRO	4		0.1uF/400VDC
C7 & C8	CAPACITOR, MICA	2	MSR#5982-5-300V390	390pF, 5%
C9 & C10	CAPACITOR, MICA	2	MSR#5982-5-300V82	82pF, 5%
R1, R2, R3, R4	RESISTOR, METAL OXIDE	4	DK#P47KW-3BK-ND	47 K , 3W
R5, R6	RESISTOR, CARBON FILM	2	MSR#29SJ500-18K	18K, 1/2 W
R7, R8, R9, R10	RESISTOR, CARBON FILM	4	MSR#29SJ500-270K	270K, 1/2W
R11 & R12	RESISTOR, CARBON FILM	2	MSR#29SJ500-10	10, 1/2 W
R13 & R14	RESISTOR, METAL FILM	2	MSR#29MF500-47.5	47.5, 1/2 W
R15 & R16	RESISTOR, METAL OXIDE	2	DK#P1KW-3BK-ND	1 K , 3W
R17 & R17	RESISTOR, METAL OXIDE	2	DK#P330KW-3BK-ND	330 K , 3W
R19 & R20	RESISTOR, METAL OXIDE	2	DK#P270KW-3BK-ND	270 K, 3W
R21 & R22	RESISTOR, METAL FILM	2	MSR#29MF500-620	620, 1/2 W
R22 & R23	RESISTOR, CARBON FILM	2	MSR#29SJ500-470K	470K, 1/2 W
R24 & R25	RESISTOR, METAL FILM	2	MSR#29MF500-1.5M	1.5 MEG, ½ W
R26 & R27	RESISTOR, METAL OXIDE	2	DK#P18KW-3BK-ND	18 K, 3 W
V1 & V2	PREMIUM TUBE	2	7199	
X1	PRINTED CIRCUIT BOARD	1	CAE# PWB-3R	
X4	PC BOARD TUBE SOCKETS, 9 PIN	2	CAE# PC-9	

NOTES:

CAE# - Curcio Audio Part Number

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

AES# - Antique Electronic Supply Part Number

Dynaco ST-70 Restoration Module Assembly, Installation, and Adjustment Manual

CAE Dynaco Driver Restoration Module PC-3R – R0: 7-02

VOLTAGE TEST POINTS

Pin #	Any EL-34	GZ-34	Either 7199
1	1.56	—	*
2	—	435	*
3	—	—	*
4	410	380 ac	—
5	415	—	—
6	-32**	390 ac	1.0
7	-32**	—	0
8	1.56	435	*
9	—	—	*

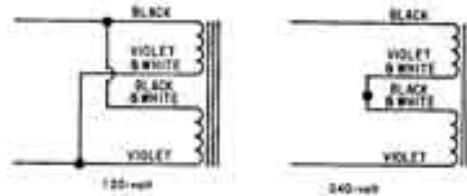
6.4 ac 0.4 ac

*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 #15
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.

