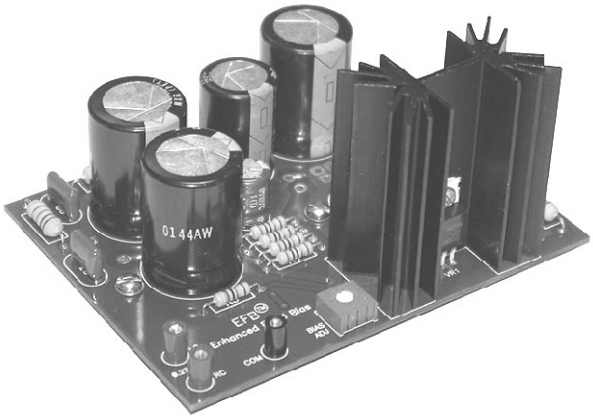
D. Gillespie Designs

SCA-35 Capacitor Board R02

with EFB™



Installation Manual

Revised Nov. 2025

Thank you for choosing our SCA-35 Capacitor Board with *EFB™. We feel it is the single most significant upgrade you can make to your SCA-35 and is designed to integrate easily into your amplifier without chassis modifications of any kind.

The SCA-35 Capacitor EFB™ Board replaces the original multi section power supply filter capacitors as well as all the associated resistors and high voltage rectifier diodes. Besides larger overall capacitance, additional metalized poly bypass capacitors have also been included. The original cathode bias resistor has been replaced with an innovative Enhanced Fixed Bias feature that allows your SCA-35 to perform to its full potential *with both channels driven*. Although rated at 17.5W per channel output power, this is really only true if only a single channel is driven. With both channels driven, however, power output is typically closer to 14W per channel, and distortion is significantly higher as well. This is largely due to various compromises related to the use of the simple, but economical, cathode bias system. *EFB™ is a new and innovative way to convert your SCA-35 to fixed bias operation and reveal its full potential. Rated power output will be maintained with both channels driven, and distortion significantly reduced. The *EFB™ feature, when combined with increased power supply capacity, provides an outstanding upgrade to your SCA-35.

Benefits of *EFB™

- Increased output power with both channels driven
- Reduced distortion
- Reduced bias current for longer tube life

NOTE:

The *EFB™ modified SCA-35 still requires a matched quad of output tubes. This was done on purpose to minimize the extent of changes required, to maintain as much of the original design concept as possible, and because it generates nearly all of the improvement possible. Also, this is always a worthwhile investment in achieving matched performance from both channels.

***EFB™ is a trademark of D. Gillespie Designs.**

Please follow this manual carefully to ensure a successful and safe installation.

While installation is quite straight forward, it does require that you possess reasonable soldering skills and equipment.

During installation you may want to refer to the original assembly manual. If you do not have one, a free copy may be downloaded from the Digital Doc section in Audio Forums at audiokarma.org.

Part of the EFB™ modification involves wiring changes and adding resistors to the output tube sockets. This is, perhaps, the most difficult part of the installation requiring the greatest soldering skills. In particular, care must be taken when unsoldering the wires going to the output transformers. Often the original builder will have left little or no extra length to allow you to just cut the wires off. To avoid unsightly and messy splicing these wires must be carefully unsoldered to preserve the length.

Useful Tools:

De-solder braid and a vacuum de-soldering pump are indispensable items when attempting to remove solder from existing connections, such as the tube sockets. They are inexpensive and available from suppliers such as DigiKey and Mouser Electronics

HIGH VOLTAGE WARNING

Vacuum tube amplifiers contain lethal voltages. Extreme care must be exercised at all times when working with the top or bottom covers removed. If you are not certain of your ability to safely perform the following installation steps it is advised that you seek the services of a qualified technician.

Installation Procedure

! Before beginning the installation process switch off your SCA-35 and disconnect the power cord from the AC outlet. Wait at least 30 minutes before removing the top and bottom covers. This will allow time for the voltage on the power supply capacitors to bleed off.

Remove the original power supply components:

Refer to Fig. 1 for the following steps:

☐ (1) Remove the top and bottom covers and locate terminal strip TS-1 on the bottom side of the chassis. Remove the two rectifier diodes located between terminals 2, 4 and 5 of TS-1. Leave the red wires on terminals 4 and 5.

☐ (2) Disconnect the red wire from terminal 2 of TS-1. This wire will no longer be used.

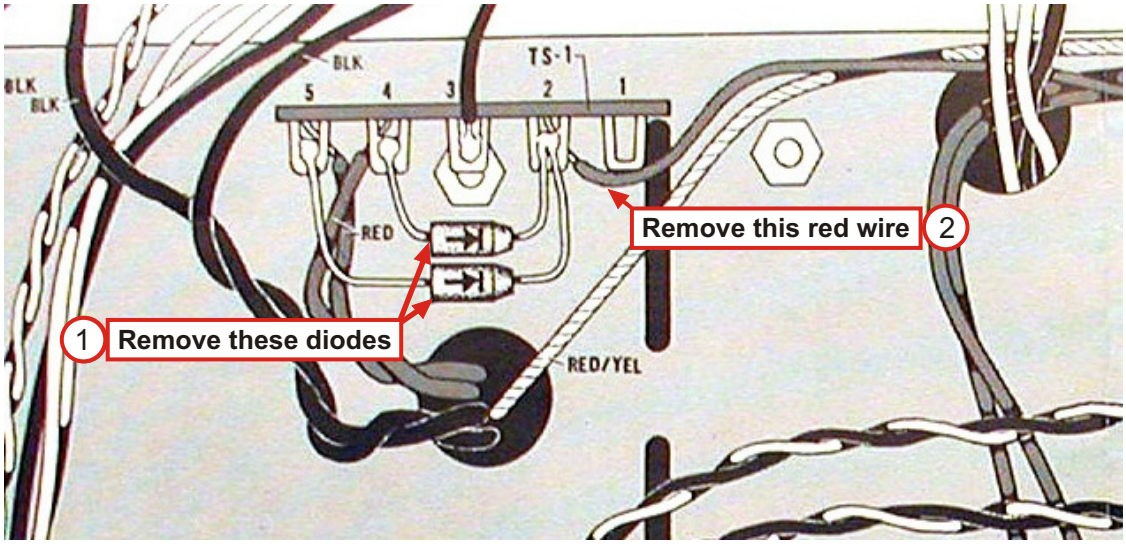


Fig. 1

Refer to Fig. 2 for the following steps:

- ☐ (3) Disconnect the red/yel wire and the black wire from terminal A of capacitor can C24. Label each wire as C24-A.
- ☐ (4) Disconnect the two red wires from terminal 4 of capacitor can C24. Label each wire C24-4.
- ☐ (5) Disconnect the two black wires from terminal C of capacitor can C24. Label each wire C24-C.
- ☐ (6) Disconnect the red wire from terminal 2 of capacitor can C24. Label it CATH LC.
- ☐ (7) Disconnect the black wire from terminal 2 of capacitor can C24. Label it HUM.
- ☐ (8) Cut the resistor free from terminal 2 of capacitor can C23.
- ☐ (9) Cut the black wire bridging terminals B and D on the capacitor cans.
- ☐ (10) Disconnect the red wire from terminal 2 on capacitor can C23. Label it C23-2.
- ☐ (11) Disconnect the red wire from terminal 1 on capacitor can C23. Label it C23-1.
- ☐ (12) Disconnect the black wire from terminal D on capacitor can C23. Label it C23-D.
- ☐ (13) Remove the screws and nuts that retain the mounting plates for the capacitor cans, then remove the cans and the components still connected to them from the chassis. Note: if your amplifier was factory wired the mounting plates will be retained by rivets. You will need to drill these out.

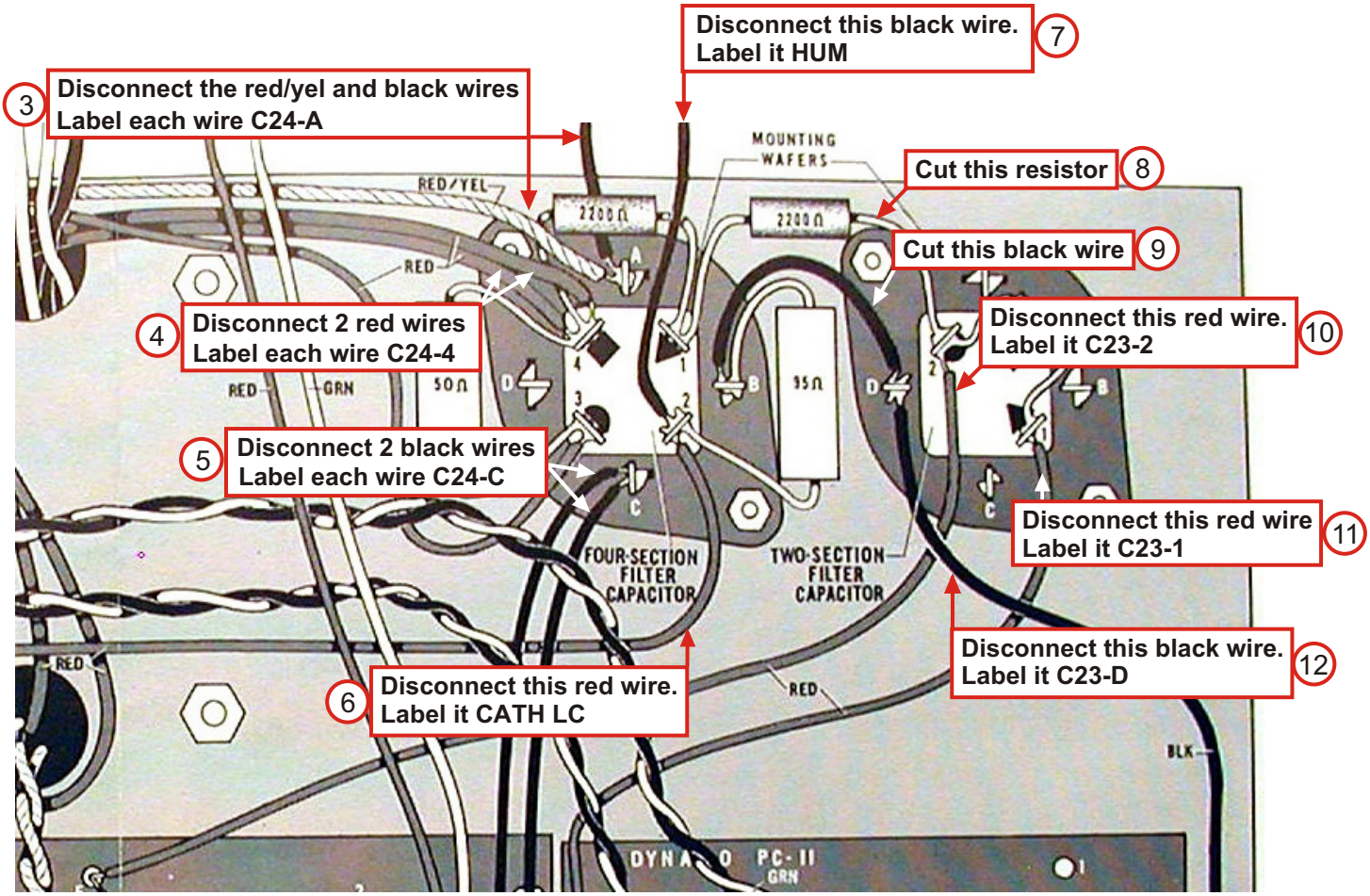


Fig. 2

Installing the Capacitor EFB™Board:

☐ (14) Use #4-40 x 1/4” screws and #4 lock washers to mount the Capacitor EFB™ board in place of the original twist lock cans in the orientation shown in Fig. 3. Tighten all screws securely.

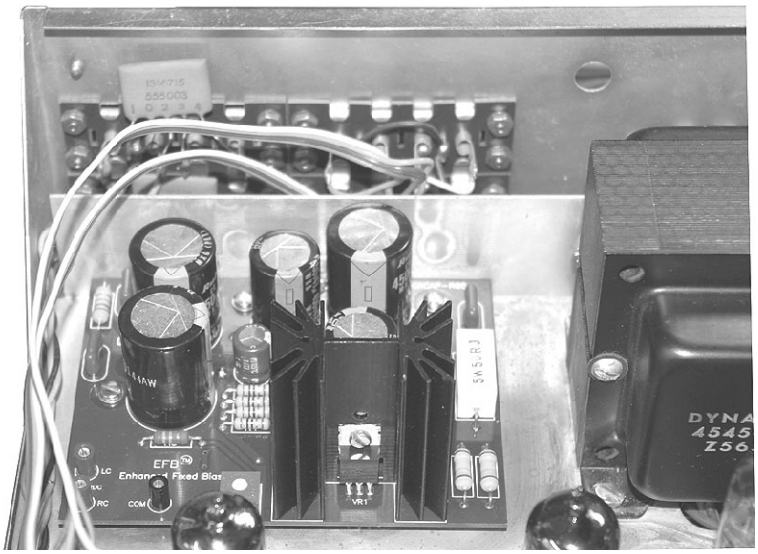


Fig. 3

☐ (15) Solder a 9" length of #20-22 guage red wire to TS-1 terminal 4. Solder another 9" length of #20-22 guage red wire to TS-1 terminal 5 as shown in Fig. 4. Label the wires TS-1-4 and TS-1-5. Twist the wires together and route them along the back side of the chassis (behind the yellow, orange and black wires from the output transformer), and in the direction of the capacitor board.

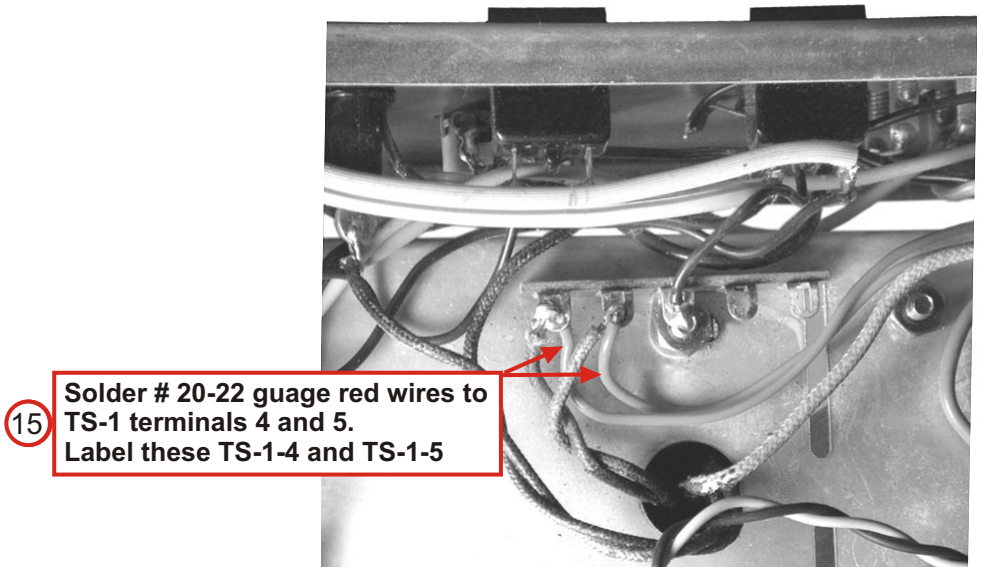


Fig. 4

Preparing the PC-10/PC-10A Boards

Refer to Fig. 5 for the following steps

The procedural steps for the PC-10 and PC-10A boards are identical, however there are differences in the values of certain resistors that will be incorporated into the wiring of the output tube sockets, as specified in steps 25 and 29. To avoid confusion that may arise in the case of a preexisting PC-10A installation, observe the notes in steps 16 and 17.

☐ (16) Remove the wires connecting pin 2 of V-6 to eyelet 8, and pin 2 of V-5 to eyelet 9.

Note: In a preexisting PC-10A installation, the wire connecting pin 2 of V-6 to eyelet 8 will have already been replaced by a 10K resistor. Leave the resistor in place as it is required per step 25.

☐ (17) Remove the wires connecting pin 2 of V-8 to eyelet 8, and pin 2 of V-7 to eyelet 9.

Note: In a preexisting PC-10A installation, the wire connecting pin 2 of V-8 to eyelet 8 will have already been replaced by a 10K resistor. Leave the resistor in place as it is required as per step 29.

☐ (18) Remove the red wire connecting pin 3 of V-6 to pin 3 of V-8.

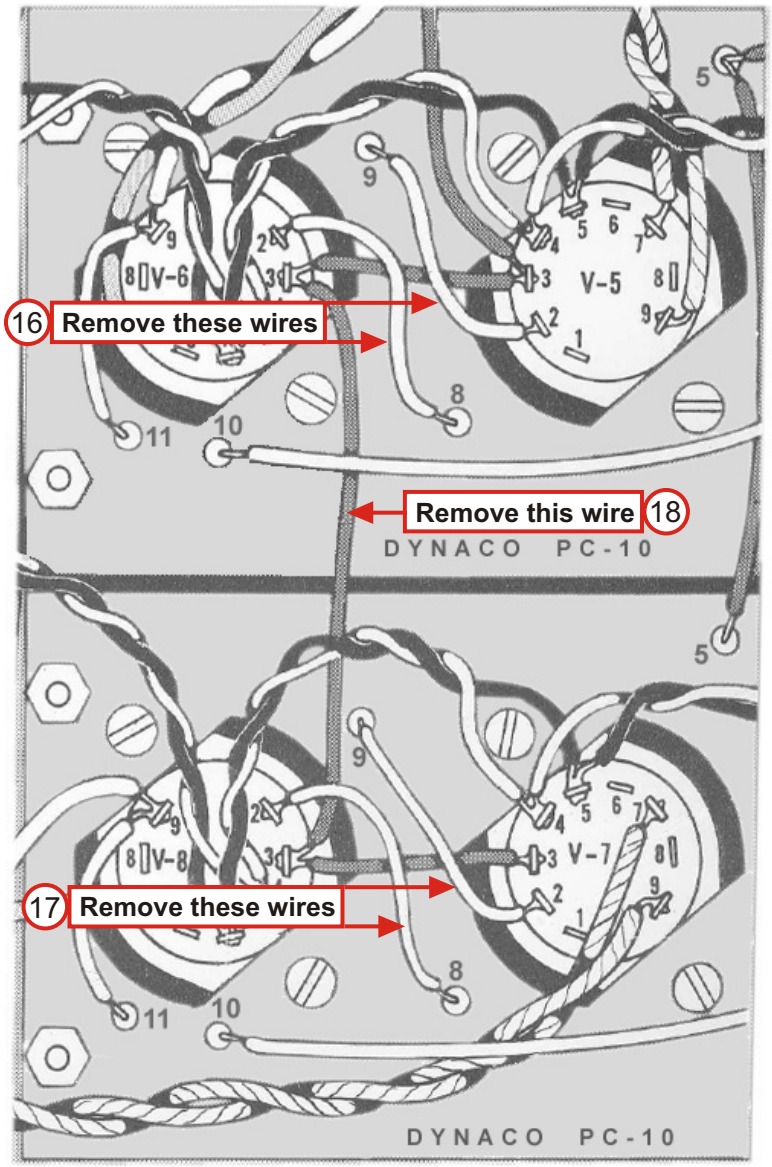


Fig. 5

Preparing the PC-10/PC-10A Boards Ctd.

Refer to Fig. 6 for the following steps.

☐ (19) Remove the two wires connected to pin 9 of V-6 and connect them to pin 8. Do not solder them yet.

☐ (20) Remove the wire connected to pin 9 of V-5 and connect it to pin 8. Do not solder it yet.

☐ (21) Remove the two wires connected to pin 9 of V-8 and connect them to pin 8. Do not solder them yet.

☐ (22) Remove the wire connected to pin 9 of V-7 and connect it to pin 8. Do not solder it yet.

Note: Depending upon the excess length left by the original kit builder, it may be necessary to add length to the transformer wires connected to pin 9 of sockets V-6 and V-7. If required, be sure to properly insulate the connection where the join is made (heat shrink tubing, etc.).

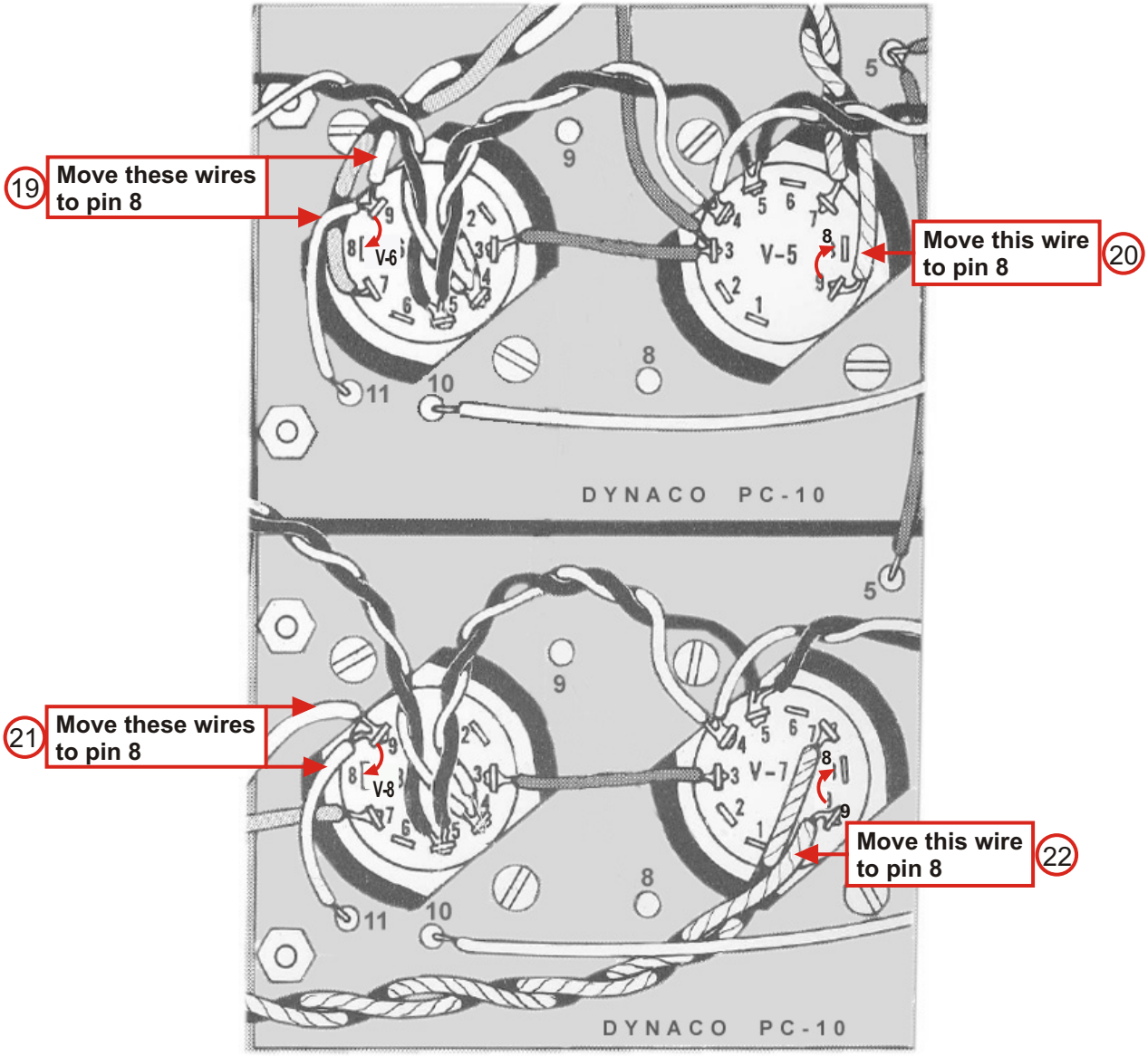


Fig. 6

Preparing the PC-10/PC-10A Boards Ctd.

Refer to Fig. 7 for the following steps

- ☐ (23) Connect and solder a new 8” red wire to pin 3 of socket V-8. Route the wire as shown in fig. 7 and label it as CATH RC.
- ☐ (24) Connect a 100 ohm 0.5W resistor between pins 8 and 9 of socket V-6. Solder both pins.
- ☐ (25) For PC-10: Connect a 1K 0.5W resistor between pin 2 of socket V-6 and eyelet 8. Solder both connections.
  For PC-10A: Connect a 10K 0.5W resistor between pin 2 of socket V-6 and eyelet 8. Solder both connections.
- ☐ (26) Connect a 1K 0.5W resistor between pin 2 of socket V-5 and eyelet 9. Solder both connections.
- ☐ (27) Connect a 100 ohm 0.5W resistor between pins 8 and 9 of socket V-5. Solder both pins.
- ☐ (28) Connect a 100 ohm 0.5W resistor between pins 8 and 9 of socket V-8. Solder both pins.
- ☐ (29) For PC-10: Connect a 1K 0.5W resistor between pin 2 of socket V-8 and eyelet 8. Solder both connections.
  For PC-10A: Connect a 10K 0.5W resistor between pin 2 of socket V-8 and eyelet 8. Solder both connections.
- ☐ (30) Connect a 1K 0.5W resistor between pin 2 of socket V-7 and eyelet 9. Solder both connections.
- ☐ (31) Connect a 100 ohm 0.5W resistor between pins 8 and 9 of socket V-7. Solder both pins.

!NOTE

25, 29 — 1K for PC-10, 10K for PC-10A

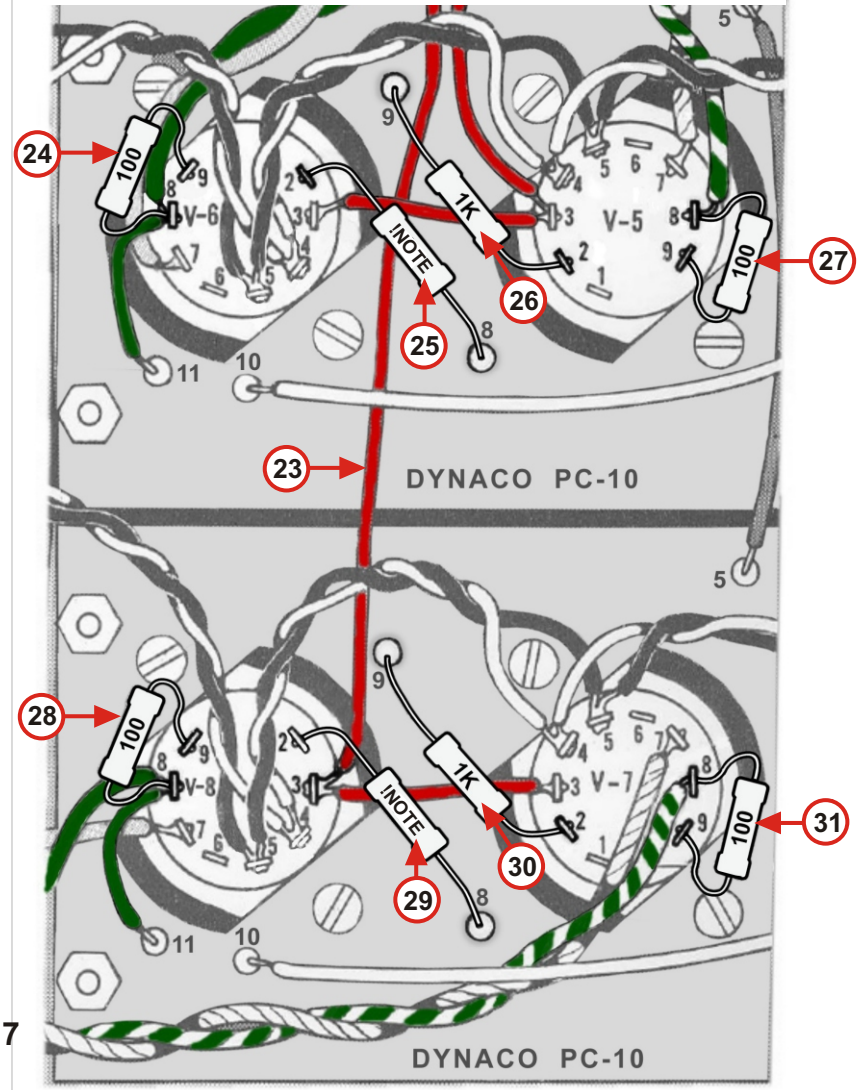


Fig. 7

Wiring the Capacitor EFB™ Board

Refer to Fig. 8 and Fig. 9 for the following steps:

The following solder connections are made to the eyelets on the bottom side of the Capacitor EFB™ board. In preparation for inserting and soldering to the board eyelets, wires should be stripped back no more than 1/8" and tinned. If the wires are stripped back too far they may contact components on the top side.

☐ (32) Locate the two red wires previously labeled as C24-4. Insert the wires into the eyelets labeled C24 4 and solder.

☐ (33) Locate the red wires from TS-1 previously labeled as TS-1-4 and TS-1-5. Trim these wires so that they will comfortably reach the eyelets labeled TS-1 4 and 5 on the capacitor board, but without too much excess. Solder them to eyelets TS-1 4 and 5.

☐ (34) Locate the red/yel wire previously labeled as C24-A. Insert the wire into one of the eyelets labeled C24 A-D and solder. These eyelets are all ground connections, so it doesn't really matter which one you choose. Note: the ground connections will require significant heat when soldering since they are connected directly to the PC board ground plane.

☐ (35) Locate the black wire previously labeled as C24-A. Insert the wire into one of the eyelets labeled C24 A-D and solder.

☐ (36) Locate the two black wires previously labeled as C24-C. Insert the wires into two of the eyelets labeled C24 A-D and solder.

☐ (37) Locate the red wire previously labeled as CATH RC. Insert the wire into the eyelet labeled CATH RC and solder.

☐ (38) Locate the red wire previously labeled as CATH LC. Insert the wire into the eyelet labeled CATH LC and solder.

☐ (39) Locate the red wire previously labeled as C23-2. Insert the wire into the eyelet labeled C23 2 and solder.

☐ (40) Locate the red wire previously labeled as C23-1. Insert the wire into eyelet C23 1 and solder.

☐ (41) Locate the black wire previously labeled as C23-D. Insert the wire into eyelet C23 D and solder.

☐ (42) Locate the black wire previously labeled as HUM. Insert the wire into eyelet HUM and solder. Note, in some cases it may be necessary to extend the length of the original wire.

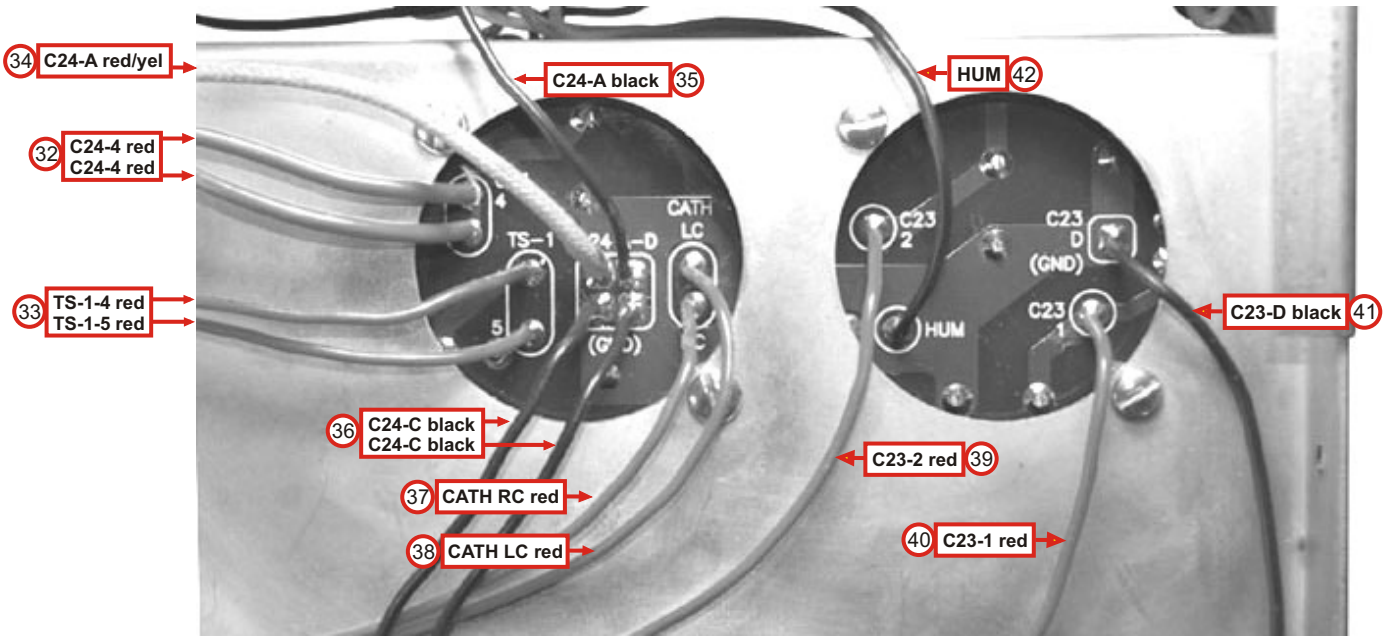


Fig. 8

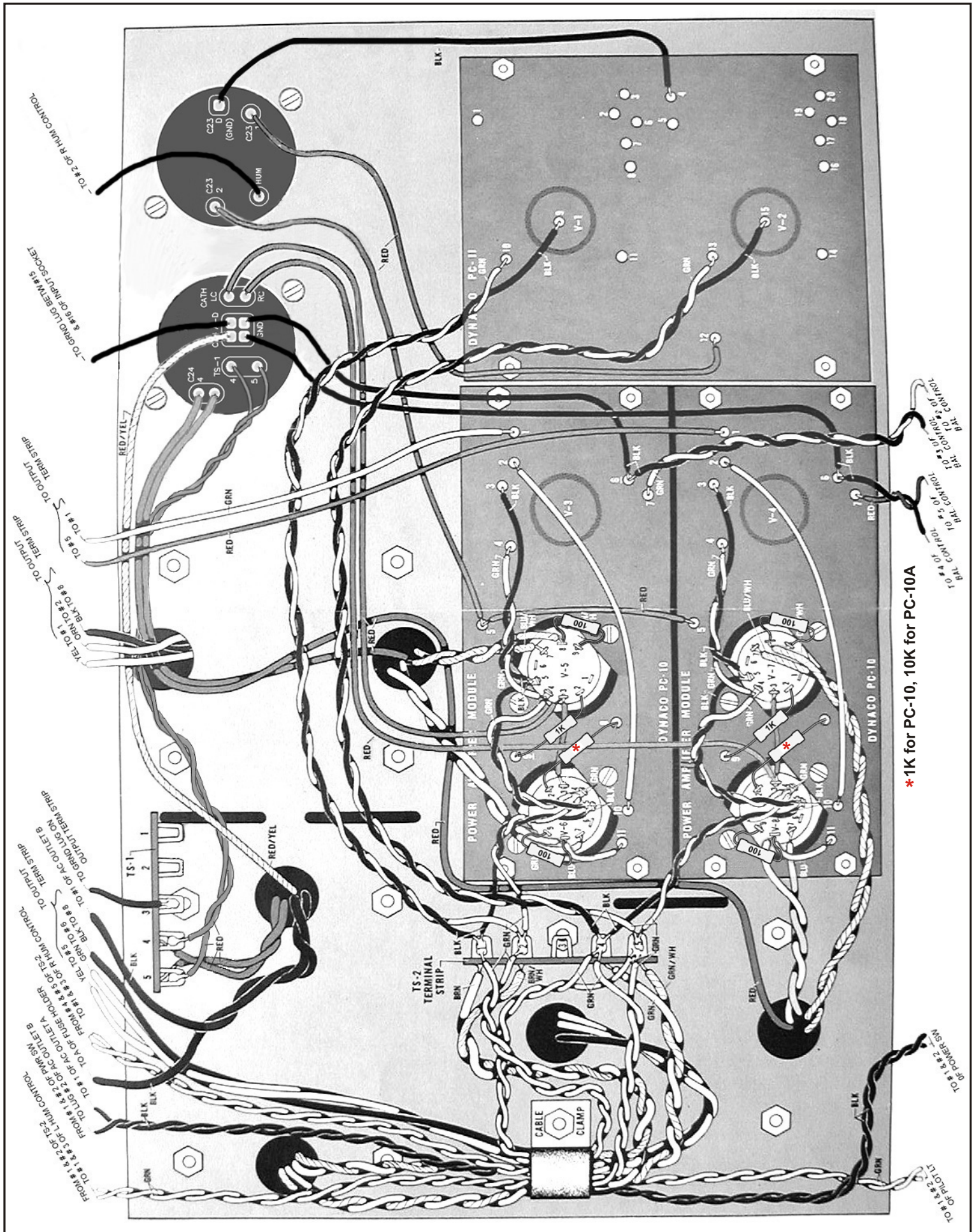


Fig. 9

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The installation of your new Capacitor EFB™ board is now complete. At this point it is highly recommended that you carefully double check your wiring for errors. Also check the eyelets on the TOP side of the capacitor board to make sure that none of the wires coming through are touching any components. In particular, that wires coming through eyelets are not touching and melted to the plastic insulation of any of the electrolytic capacitors.

Adjusting the Bias Current

Before putting your SCA-35 back ito service, the bias current must first be correctly adjusted. In this regard, the EFB™ circuit is also unique in that only a single bias potentiometer is employed although there are two bias measurement test points, one for the common cathode connection of each channel. Adjusting the bias current involves setting the bias potentiometer such that the ***average*** of the voltages measured at the LC and RC test points is 0.27VDC. For example, a reading of 0.28VDC at the LC test point and 0.26VDC at the RC test point results in an average 0.27VDC bias voltage. The 0.27VDC bias voltage results in a bias current of 27mA vs 35mA for the stock circuit, lowering power dissipation and extending tube life.

For best performance, and most balanced bias current, a well matched quad of output tubes should be installed. With old and/or mismatched output tubes, it may not be possible to achieve an average 0.27VDC at the bias voltage test points. The values of the bias divider string for the EFB™ voltage regulator were intentionally chosen to result in the bias control potentiometer being well off center for most tubes when properly adjusted. This will prevent problems resulting from being able to adjust the grid bias voltage too low. However, it also means that worn out tubes, or tubes that are well off the mark with regards to bias requirements may not be able to be brought up to the correct current flow setting. A well matched quad of EL84's, in good condition, should not present any problems in achieving the correct bias setting.

HIGH VOLTAGE WARNING

Extreme care must be exercised at all times when completing the following steps. High voltage will be present. If you are not certain of your ability to safely perform the following steps it is advised that you seek the services of a qualified technician.

Refer to Fig. 10 for the following steps:

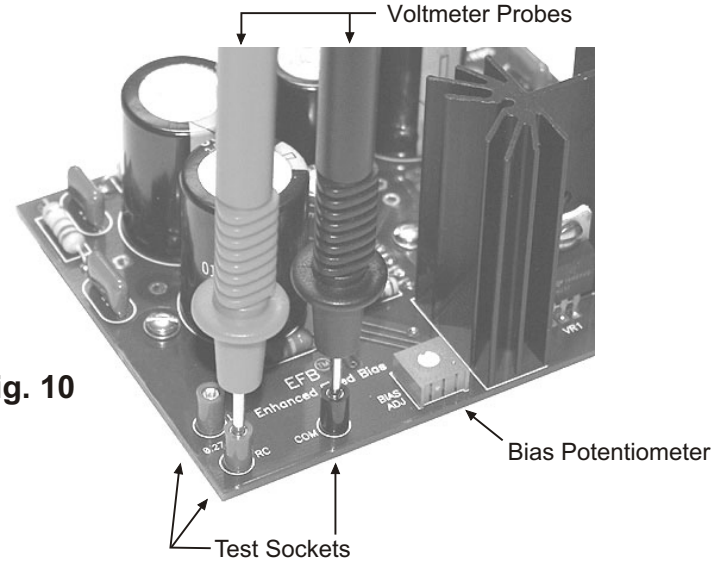


Fig. 10

☐ (43) Insert the negative probe of a digital voltmeter into test socket COM. Insert the positive probe into either test socket LC or RC.

☐ (44) Connect the power cord to an AC outlet and set the power switch to the Power on position.

☐ (45) Observe the reading on the voltmeter. Starting from cold, it will take approximately 15 seconds before the meter will begin to read, and the voltage will rise as the tubes warm up. After a minute or two, the reading should stabilize, then adjust the BIAS ADJ potentiometer for a reading of 0.27VDC.

Adjusting the Bias Voltage Ctd.

☐ (46) Carefully move the **positive** voltmeter probe to the other test jack and observe the voltage reading. If it is very close to 0.27VDC you need not make any further adjustment. If not, then adjust the BIAS ADJ potentiometer as required such that the **average** of the voltage readings taken at the LC and RC test points is 0.27VDC. This may require taking several alternate readings between LC and RC test points while making small adjustments to the bias potentiometer.

☐ (47) After completing the bias adjustment, switch off the power and disconnect the AC power cord. The top cover can now be installed and your updated SCA-35 is ready to use.

Operating Notes

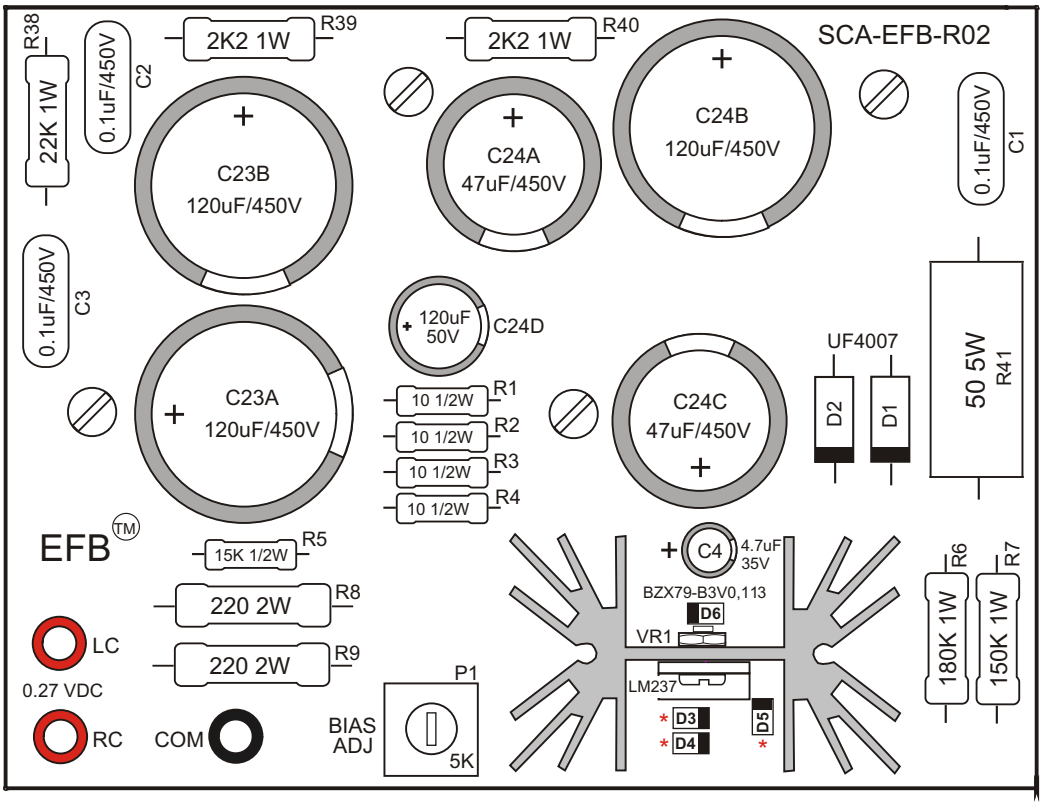
Ventilation:

When using the SCA-35 it is essential that it have adequate ventilation, and this is especially important now that the solid state EFB™ regulator is installed within the amplifier. Although the regulator is an industrial rated component, with a very high rated operating temperature, and is mounted to a substantial heat sink, at best it can only run as cool as the interior ambient temperature of the SCA-35. Providing adequate ventilation will ensure that the regulator will always operate well below its rated maximum temperature, even at sustained full volume levels, and will provide long term reliable service.

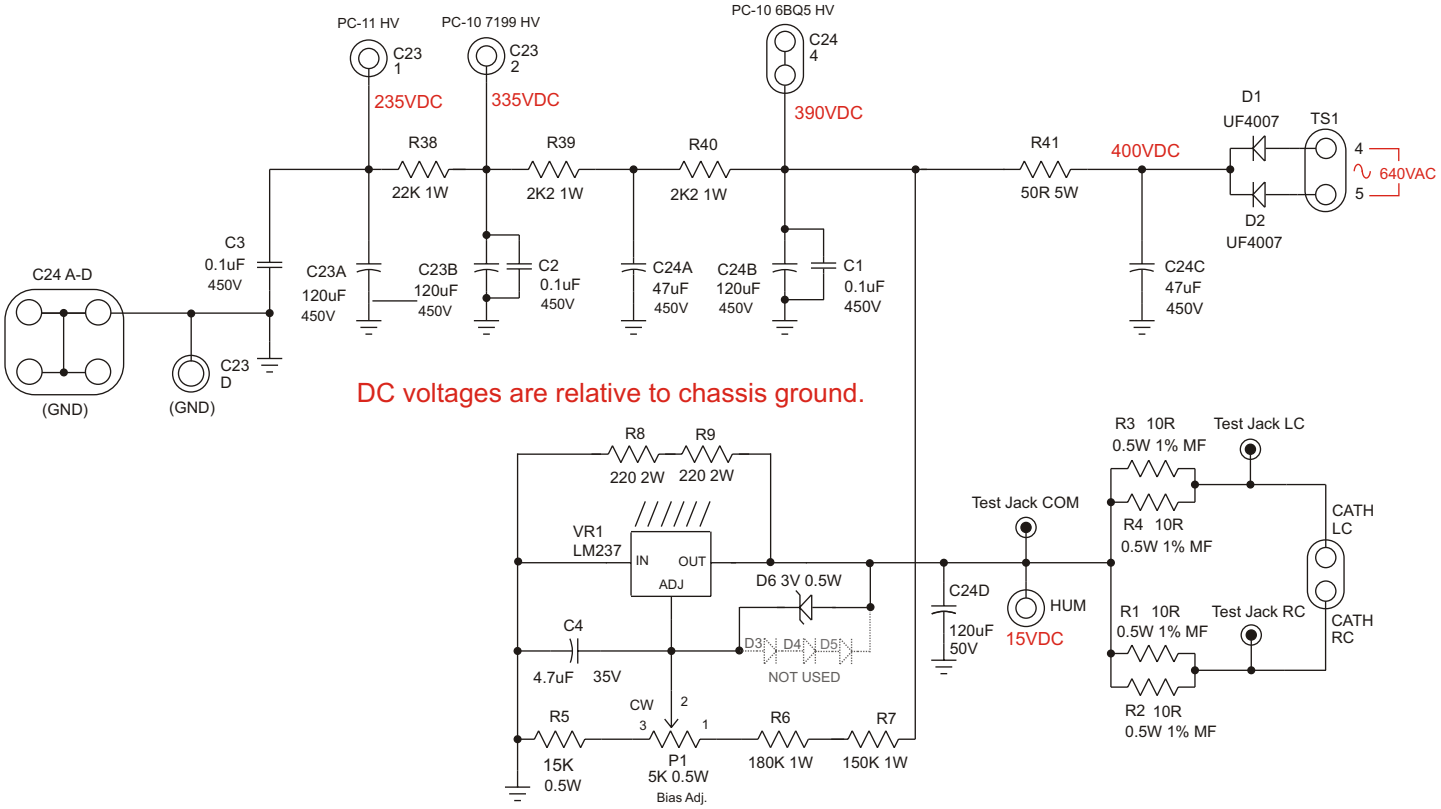
Never place anything directly on top of the cover when the amplifier is operating. There should always be several inches of air space above the unit and behind it. Do not remove the rubber mounting feet, or place the unit inside another type of enclosure (like a wood cabinet). The flow of air from above, and below, must never be restricted in any way or the intended cooling convection air flow will be impeded.

Bias Voltage:

It is desirable to check the bias voltage from time to time as it may change somewhat as the output tubes age. Repeat the steps under Adjusting the Bias Current and adjust the bias potentiometer as required.



* D3-D5 Not Used



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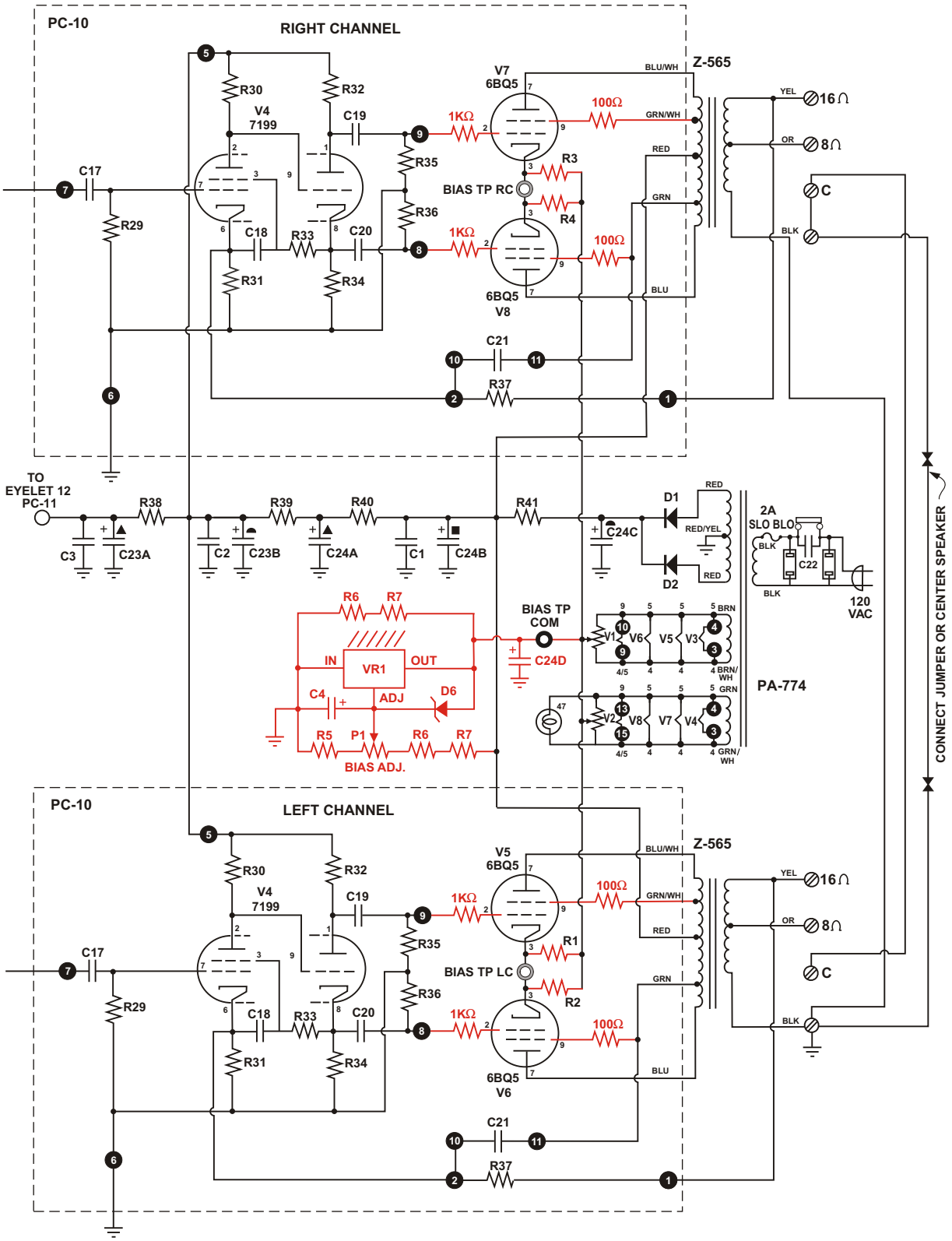
SCA-35 Capacitor Board with EFB™ R02

Board Layout & Schematic | Revised Nov. 2025

Schematic of the SCA-35 with EFB™ PC-10 Application

Modifications are shown in red



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SCA-35 Capacitor Board with EFB™ R02

PC-10 Application
Revised Nov. 2025

Schematic of the SCA-35 with EFB™ PC-10A Application

Modifications are shown in red