

dynaco

SE-10 EQUALIZER

SERIAL NUMBER

This number must be mentioned in all communications concerning this equipment.

INSTRUCTIONS FOR ASSEMBLY OPERATION



dynaco inc.

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CAUTION: For continued protection, replace power fuse with the same type and rating as indicated.

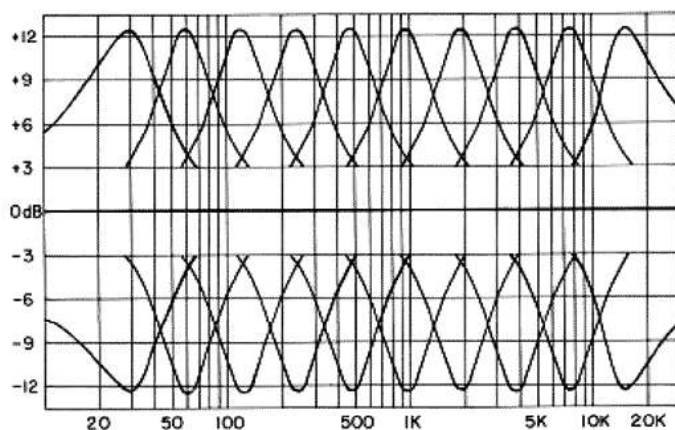
WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.

SPECIFICATIONS

Slide Controls at zero, 2 volts rms output,
into 10k ohm load paralleled with 1000 pf.

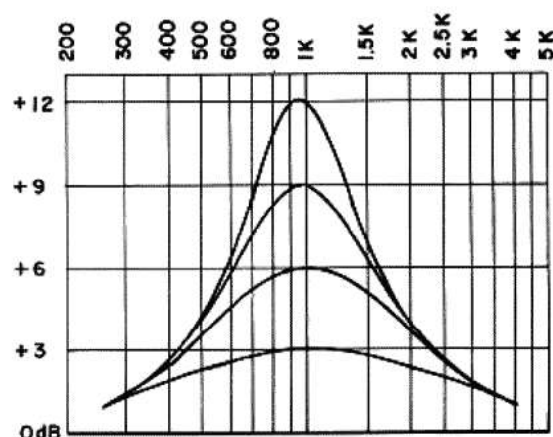
Equalizer range:	± 12 dB at octave intervals from 30 Hz to 15 kHz
Maximum Output:	8 volts
Total Harmonic Distortion:	0.04% (typically less than 0.01%)
Intermodulation Distortion:	0.02% (typically less than 0.005%)
Frequency Response:	± 1 dB, 10 Hz to 35 kHz
Gain:	-12 dB to +6 dB
Hum and Noise:	85 dB below 2 volts output (10 Hz to 80 kHz)
Input Impedance:	50k ohm
Output Impedance:	600 ohms
Inputs:	Tape Monitor, Line 1, Line 2
Outputs:	Tape Out (same as Line 1 input), Line 1, Line 2

TYPICAL EQUALIZER RESPONSE CHARACTERISTICS



SINGLE SLIDE CONTROL BOOST CURVES

(invert diagram for cut curves)



INTRODUCTION

The Dynaco SE-10 Equalizer is such a versatile product that we are tempted to think of it as the creative component. We believe it may be helpful to provide you with a list of some of its uses. If you can supply us with more applications for the SE-10, we will be pleased to incorporate them in future printings of this manual:

- Listening rooms seldom have excellent or even uniform acoustical properties. The judicious use of the Dynaco Equalizer can improve listening realism by compensating for excessive reflection or absorption of certain frequencies.
- The SE-10 Equalizer can help make a fine speaker system extraordinary, by smoothing normal variations at crossover points and between drivers.
- Although all discs use a standard RIAA playback characteristic curve to obtain "flat" response, virtually every disc is also equalized during the recording session or when "mixing down". This is most often accomplished by the choice of a microphone which possesses frequency shaping for a given instrument, or by actually altering the frequency spectrum. The SE-10 can be used to restore the disc to its "natural" sonic state.
- The Dynaco Equalizer can be used as a very effective rumble and high frequency filter, and it can help to minimize radio interference problems. Because each slider

controls a narrow band of frequencies, it is much more effective than even the most extensive filter designs in preamplifiers.

- Many broadcasts on FM do not seem to possess that quality of liveness which can be obtained from tapes and discs in your own playback system. That "live quality" can be at least partially restored with the SE-10.
- When dubbing old records to tape, the SE-10 can bring out and restore much of their inherent brilliance, and it can selectively suppress excessive noises.
- The Dynaco Equalizer, when employed by the professional installer, can help to eliminate feedback, adjust for balance, and obtain higher apparent acoustic level.
- The bass and treble frequency response of some speakers can be extended by using the SE-10.
- Certain instruments or voices can be selectively accentuated with the SE-10.
- Live recordings made in less than ideal acoustic environments can be sonically improved with the Dynaco Equalizer.

AUDIO CONNECTIONS

Six pairs of audio inputs and outputs are provided in two rows, each pair marked for function. Three pairs are inputs, and the other three are outputs. The top row is for the left channel; the bottom row is for the right channel. Each requires connection by a single conductor shielded cable.

Tape In / Tape Out

These connections replace the same tape input and tape output facilities—the monitor circuit—on the preamplifier, control amplifier or receiver to which the SE-10 Equalizer is hooked up. The *Tape In* is for playback from a tape deck. The labeling for the output of tape decks varies somewhat, but they are usually called "line output", "preamp output", or simply "output".

Connect the *Tape Out* to the recording input of a tape deck which has already been connected for playback purposes to the *Tape In* input on the SE-10. Recording input labeling varies somewhat, but "line input", "high level", "radio", or just "input" are typical nomenclature. Microphone inputs cannot be used, however, because their sensitivity is too high. These connections are designed as replacements for the tape monitor circuit on your preamplifier, and therefore they do not provide for audio equalization. They are a flat, high level input and output combination.

If the Dynaco PAT-5 preamplifier is used, the *Tape In* and *Tape Out* connections on the equalizer become a third

tape monitor for the high fidelity system. In the PAT-5, the SE-10 is hooked up to the E.P.L. output/input combination.

Line 1 In / Line 1 Out

These are the normal input and output combination between the preamplifier, control amplifier or receiver and the SE-10 for connection of the equalizer circuits. Connect from the tape output on the preamplifier to the *Line 1 In* on the SE-10. Also connect from the *Line 1 Out* on the equalizer to the tape input on the preamplifier. Remember to engage the monitor circuit on the preamp to activate the SE-10. If more than one tape output/tape input combination is supplied on the preamplifier, choose the set least used.

If the PAT-5 preamplifier is used, connect from E.P.L. Out on the preamp to *Line 1 In* on the SE-10. Also connect from *Line 1 Out* on the equalizer to E.P.L. In on the PAT-5. To activate the E.P.L. circuit, push on the E.P.L. button switch on the front of the preamp.

If your integrated amplifier or receiver does not have any tape monitor facility, yet it includes a "preamplifier out" and "amplifier in" circuit, the equalizer may connect to them with the possibility of some reduction in overall signal to noise ratio. The short cables which connect between "preamp out" and "amplifier in" should first be removed. Then connect "preamp out" to *Line 1 In*, and *Line 1 Out* to "amplifier in".

Line 2 In / Line 2 Out

This input and output combination is identical in operation and function to *Line 1 In/Line 1 Out*, except for the tape monitor facility. It permits the switchable connection of a second program for equalization purposes—to a tape deck, for example, to provide equalization during the recording process, without the necessity of plugging and unplugging cables. It can also be used to switch equalization between two high fidelity systems.

AC CONNECTION AND POWER SWITCH

There are two AC convenience outlets. One switches on and off with the front panel POWER switch, and the other remains on if the equalizer is connected to a constant source of AC line voltage. We suggest connecting the line cord of the SE-10 to a "switched" convenience outlet on the preamp, since it is likely that you will wish it to turn on and off with the rest of the high fidelity system. With the front panel POWER switch pushed in, the SE-10 will turn on and off with the main power switch for the system. However, you may turn the SE-10 on or off at any time without experiencing transient thumps or noises, which are typical of other equalizer designs, because the SE-10 incorporates an all-solid state transient suppression circuit.

The small amount of heat in the SE-10 is generated by the power transformer and the integrated circuit voltage regulators. No ventilation holes in the equalizer are supplied, and therefore normal air circulation provides adequate ventilation. It is perfectly satisfactory, for example, to house the SE-10 in a wood cabinet, such as the Dynaco single and double walnut cabinets.

FRONT PANEL CONTROLS AND SWITCHES

The following descriptions of the controls and switches on the front panel of the equalizer will function as described when the audio cables have been connected between the preamplifier, control amplifier or receiver and the SE-10, as described in the INSTALLATION portion of this manual.

Input / Tape Switch

This button switch replaces the tape monitor circuit switch on the preamplifier. It enables direct comparison of the program source with the same signal played back from the playback amplifier of a tape deck. This feature is effective when recording through the high fidelity system to a tape deck which has separate record and playback heads (known as "3-head" decks), and when the deck is designed for simultaneous playback during recording.

In its normal released (out) position, the INPUT/TAPE switch provides the program source. When pushed in, this switch permits listening to the just-recorded signal from the tape deck. This switch should be pushed in only when monitoring a recording or when listening to the playback from the tape deck. Otherwise, the INPUT/TAPE switch should remain in its normal out position.

If the PAT-5 preamplifier is used, the INPUT/TAPE switch on the SE-10 becomes yet a third tape monitor circuit for a third tape deck, should you own more than two. Its operation is as described above.

EQ. 1 / EQ. 2 Switch

This button switch chooses between the *Line 1* and *Line 2* input and output combinations on the back panel of the SE-10. Normally this switch remains out to provide equalization for the high fidelity system (whose hookup is to the *Line 1* connections). When pushed in, it provides equalization to the *Line 2* connections. If there are no connections to the *Line 2* input and output combination, this switch may be used as a by-pass for the entire equalizer (audio and equalizer circuits).

If you wish to provide equalization for a tape deck which is connected to the *Tape In* and *Tape Out* monitor sockets on the SE-10, first connect a short audio cable (per channel) between *Tape Out* and *Line 2 In* on the equalizer. Then use *Line 2 Out* as the tape out. When thus connected and the EQ. 1/EQ. 2 switch is pushed in, the equalized signal is fed to the tape deck. When this switch is released (out), the equalizer is connected to the high fidelity system.

When using the SE-10 with the PAT-5 preamplifier, you may easily provide tape feed equalization. Connect between *Tape Out* on the PAT-5 and *Line 2 In* on the SE-10. *Line 2 Out* is now the tape output, and when the EQ. 1/EQ. 2 switch is pushed in, the equalized signal is fed to the tape deck. When released (out), the equalizer connects to the high fidelity system.

EQ. In / Defeat Switch

This button switch determines whether the equalizer circuits are active or by-passed. When this switch is normally released (out), the audio and equalizer circuits of the SE-10 are connected and active. When this switch is pushed in, the equalizer circuits are disconnected, irrespective of the positions of the octave slide controls. The audio portion of the circuit remains connected, however, when this switch is pushed in.

Equalizer Octave Slide Controls

There are 10 individual slide controls for each channel, which operate *only* when the EQ. IN/DEFEAT switch is in its normal out position. The center of the frequency of boost or cut is indicated on the front panel above each slide control. Those on the left side adjust the left (or A) channel; those on the right side adjust the right (or B) channel. The lowest center of frequency boost or cut is 30 Hz, which increases in octaves to the highest center frequency, 15,360 Hz (which is indicated on the front panel as 15K).

The "flat" or "O" position is centered, with increasing action (boost) toward the top of the front panel, and decreasing action (cut) toward the bottom. The amount of boost and cut is ± 12 decibels (dB) from center, and is nominally indicated in 2 dB increments.

When using a slide control, each control will have some influence on adjacent octaves. Therefore, if a slide control is altered by more than 2 dB, it will probably be helpful to also change the slide controls above and below it to a lesser extent to achieve an overall smooth boost or cut.

Do *not* position all the slide controls at full boost or full cut in an attempt to obtain 12 dB of uniform boost or cut. In their extreme positions, the overall frequency response is not flat, but rather scalloped shaped every octave, as can be seen in the curves on page 2 of this manual.

Left Gain / Right Gain

These two slide controls change the output volume or level from the SE-10 over a range of -12 dB to +6 dB. Notice that the "O" position is slightly to the left of center for each control.

Normally it is desirable to set these controls approximately to "O" before adjusting the octave slide controls from their flat positions. Once the octave controls have been adjusted as desired, you may wish to calibrate the overall gain of the equalizer by comparing the signal without equalization to the signal with equalization in circuit. By adjusting the LEFT GAIN/RIGHT GAIN slide controls, you may adjust the

equalizer system gain so that no apparent level change occurs when switching the equalizer in and out of the system—known as sonic unity gain. Note, however, that the LEFT GAIN/RIGHT GAIN controls remain effective irrespective of the position of the EQ. IN/DEFEAT switch; therefore, the comparison should be made with the tape monitor circuit on your preamp, by the E.P.L. switch on the PAT-5, or by the EQ. 1/EQ. 2 switch on the SE-10.

Because of the unusually high input and output acceptance levels before distortion rises, it is not *essential* to adjust for sonic unity gain in the SE-10. Many other equalizer circuit designs will severely distort if the gain is not set properly. Nevertheless, you will undoubtedly find that operation with sonic unity gain is logical and most useful.

OPERATION

Now that each control and switch function has been described, you are ready to operate the unit. Plug in the AC line cord, push in the POWER switch, and observe that the red pilot lamp glows on the equalizer. Also check to see that the tape monitor circuit on your preamplifier, control amplifier, or receiver is in its "tape" or "tape monitor" position. If the PAT-5 is used, see that its E.P.L. button switch is pushed on.

If the SE-10 is to operate in a conventional manner with your high fidelity system, and it has been connected in accordance with the INSTALLATION instructions, the three center button switches at the bottom of the front panel remain out. Variations from normal operation have been indicated in the FRONT PANEL CONTROLS AND SWITCHES section.

Operating the Octave Slide Controls

"Wiggle all those knobs" is the initial tendency, and we suggest doing just that! You will quickly hear how each frequency-centered slide control alters the sonic balance. Also, you will soon learn that subtle use of the slide controls yields greater sonic dividends, unless you wish to deliberately create an effect which does not occur in live music.

If it were possible for us to outline on the basis of scientific information how to set up *any* equalizer without a significant amount of very costly instrumentation, we would be pleased to supply it to you. Various manufacturers of equalizers have offered several inexpensive methods, including the use of test discs, meters, and noise evaluation. None of these is satisfactory, because most of these methods ask the ear to be a measuring instrument. Although the ear can discern very subtle changes or variations in level, response and distortion, it cannot adequately function as a sound pressure level instrument. We find, therefore, that the inexpensive methods confuse, more than clarify, your own judgment. The best results are achieved by careful listening and adjusting with familiar discs or tapes.

There are, however, some general guidelines to set up and use your SE-10 Equalizer. They are based on listening to many high fidelity systems in many listening situations. They are meant as a starting point only for equalizing your own home music system.

30 Hertz

There are very few loudspeakers which deliver the bottom octave of bass response—30 Hz—at comparable output level to the upper octaves. However, some speakers can have

their real bass response improved by boosting the 30 Hz slide control. This includes Dynaco speakers. Try boosting 2 to 4 dB, and play a disc which has very deep bass response. Note any changes in sound. If the bass seems somewhat boomy or tends to sound mushy, you may have induced acoustic feedback between the phonograph and the speakers. Back off on the slide control until the feedback is gone; a more desirable approach is to isolate the phonograph from the speakers to eliminate the feedback. If you have no problems with acoustic feedback, and you have a speaker system which can handle greater amounts of bass power, try boosting more than 4 dB. For many bookshelf systems, 4 dB of boost is about the limit.

60 and 120 Hertz

Many woofers in quality speaker systems, even those in the expensive category, possess a rise in response at or near system resonance. The Dynaco A-35 is an exception, however. This is known as the "apparent bass" region, because many listeners mistake it for lower frequency bass response. It occurs between 60 Hz and 120 Hz. If the bass in your speaker sounds a bit muddy or indistinct, try subtly cutting the 60 Hz and 120 Hz slide controls. Experiment with 60 Hz first, and note the change. Then try 120 Hz alone, and finally experiment with both simultaneously. When using a single woofer system with a reputation for smooth response, a change of slide control position by 1 dB may provide a significant change in bass balance.

When two, four or even more identical speakers are employed to obtain higher listening levels, as with the Dynaco Dynamax modular concept, coupling of the woofers' response is very great in the 60 Hz to 120 Hz region. With multiple speakers, an even more drastic cutting of these slide controls may be necessary to restore natural bass balance.

240 and 480 Hertz

Although a woofer or midrange driver may indicate flat on-axis response in the 200 Hz to 500 Hz region, quite a few listening rooms exaggerate or suck out this vicinity of the audio spectrum. This is the so-called "warmth region" of the system, the portion which defines whether the cello and the trombone sound real or whether they sound fat or lean. Very subtle adjustment of the 240 Hz and 480 Hz slide controls may provide a corrected sound for these instruments in your room.

3800 Hertz

Aside from the 30 Hz slide control, no other slide control will be more employed than the one for "presence", 3800 Hz. This control is the one most easily heard, because the ear is the most sensitive in this region. It is also an area of the audio spectrum which is affected readily by how the listening room is furnished, its size and shape, and where the speakers are located in the room. While other sliders may, at your option, be adjusted in tandem for both channels in

a stereo system, adjustment of each 3800 Hz slide control should be handled individually. Listen to a monophonic disc, if at all possible. If a stereo disc is used and it has very wide separation, listening to this disc in mono (combined channels) will reduce the apparent high frequency response because of random phase cancellation. Adjustment in this very critical region should be accomplished by listening to one channel at a time of the stereo information, if you do not have any mono discs on hand.

ASSEMBLY INSTRUCTIONS

GENERAL ASSEMBLY INFORMATION

Construction of the SE-10 is very simple when compared to other kits. The printed circuit board has been pre-assembled to save you much of the work, and the assembly that remains is in an open, uncluttered layout to make wiring quick and easy. The construction time will be several hours. It is better to work slowly and carefully rather than concern yourself about the time.

When you unpack the kit, check off the components against the parts list on page 24. Separate the hardware items in an egg carton or similar container. You can identify unfamiliar parts by checking them against the Pictorial Diagram, bearing in mind that the drawing is necessarily somewhat distorted for visual separation.

Have the proper tools at hand before starting construction.

The tools necessary are:

1. A pencil-type soldering iron with a 3/16" tip or smaller of 40 to 60 watts rating, with a tip temperature of 700 to 800° F.
2. A damp sponge or cloth to wipe the tip of the iron.
3. 60/40 rosin core solder not larger than 1/16" diameter.
4. A medium sized screw driver (1/4" blade).
5. Long nosed and side cutting pliers.
6. Heavy "slip joint" pliers.
7. A single edged razor blade or inexpensive wire stripping tool for removing insulation.
8. Wood toothpicks.
9. Transparent or masking tape.
10. Mineral spirits or lighter fluid.

We do *not* recommend using a soldering gun. Not only can a gun provide more heat than is necessary—an unskilled user might damage printed circuit board—but also many users tend to make poor solder connections, simply because they do not wait long enough for the gun to reach its operating temperature each time. Use a conventional pencil type iron.

A good solder connection does not require a large amount of solder around the joint. A well-made connection looks smooth and shiny because the solder *flows into the joint* when both parts are hot enough.

There are four steps to making a good solder connection:

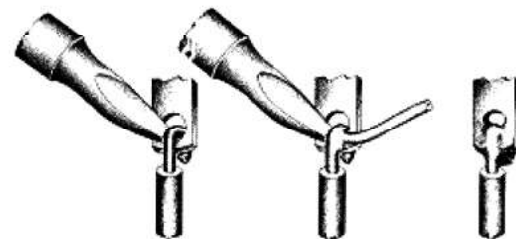
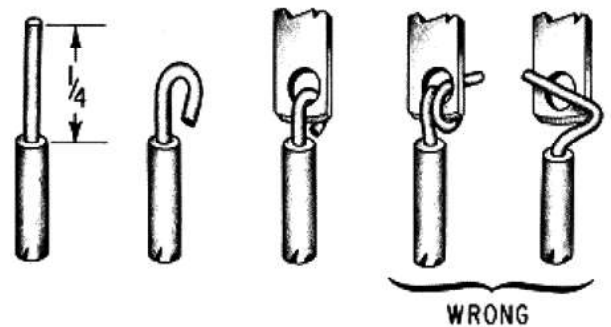
1. Make a good mechanical connection.
2. Heat *both* parts with the tip of the iron at the *junction*.
3. Apply solder to the *junction* until it melts and flows.
4. Allow the connection to cool undisturbed.

ALL SOLDERING MUST BE DONE WITH A GOOD GRADE OF ROSIN CORE SOLDER

Under no circumstances should acid core solder be used. Unmarked solder, cheap solder or any of doubtful origin should be discarded, and *separate solder fluxes should never be used*. The warranty is voided on any equipment in which acid core solder or acid type fluxes have been used. Silver solder is not suitable. The recommended solder is 60/40 (60% tin, 40% lead) *ROSIN CORE*. Do not confuse this with 40/60, which is harder to use.

You should realize that many of the more delicate components are less likely to be damaged in the soldering process if you use a hot iron for a short time, rather than a cooler iron for a longer period. You will also make a better connection with the hot iron. If you keep the iron clean by wiping the tip frequently, and occasionally add a small amount of solder to the tip, it will aid the transfer of heat to the connection. Do not allow too much solder to build up on the tip though, or it may fall onto adjacent circuitry.

One of the best ways to make a good mechanical connection is to bend a small hook in the end of the wire, and then to crimp the hook onto the terminal lug. The amount of bare wire exposed need not be exactly 1/4 inch, but if it is too long, the excess might touch another terminal lug or the chassis. Do not wrap the wire around the lug more than one time, as this makes the connection difficult to remove if an error is made.



Many of the wiring steps will call for "preparing" a wire of a certain length and color. This involves cutting the necessary length of wire and stripping $\frac{1}{4}$ inch of insulation from each end. This is most easily done with wire strippers, but diagonal cutters can be used if you are careful not to nick the wire and weaken it.

When soldering a wire to a numbered, plated-through hole on a circuit board, push the wire through the hole first. *Do not push the wire all the way into the hole up to the insulation.* Apply the solder and the hot iron at the same time to the junction of the hole and wire. The solder should melt very quickly; it should flow easily and fully into the hole and completely around the wire. Remove the iron and allow the connection to cool. It is *essential* to have a smooth, shiny flow of solder from the wire to the plated circuitry on the board.



WIRING THE KIT

The position of all wire leads should follow the diagram closely, bearing in mind that the Pictorial Diagram has necessarily been distorted somewhat to show all connections clearly. See that uninsulated wires do not touch each other unless, of course, they are connected to the same point. It is especially important that uninsulated wires or component

leads or terminals do not touch the chassis accidentally.

Whenever one wire is to be soldered to a connection such as a lug terminal or hole, the instructions will indicate this by the symbol (S). If more than one wire is to be soldered to the same point, the instructions will cite the number of wires that should be connected to that point when it is to be soldered. If no soldering instruction is specifically given, do not solder; other connections will be made to that point before soldering is called for.

Check your work after each step, and make sure the entire step has been completed. When you are satisfied that it has been correctly done, check the space provided and go on to the next step. Be sure you read carefully the explanatory paragraphs in the assembly instructions.

Where stranded wire is used, as on the transformer leads, be very careful not to cut through the strands when stripping the end. Where stranded wire is supplied for hookup wire in the kit, the strands will be bonded together to minimize this likelihood and make handling easier.

All mounting screws are installed from the *outside*, and a nut with lockwasher attached, called a **KEP** nut, is used except when otherwise specified.

TAKE THE TIME TO BE NEAT AND ACCURATE, and your equalizer will operate properly at first, and for many years.

MECHANICAL ASSEMBLY

Much of the hardware used to mount parts in this kit is #4-40 x $\frac{3}{8}$ ". If no mention is made of the type of hardware, use this size. A set is one screw and one **KEP** nut.

- 1() Select the painted back panel. Notice on the inside that one area has no paint. You may wish to clean this area with a suitable solvent to remove any sticky material so that proper grounding may be achieved. Common mineral spirits or lighter fluid is satisfactory.
- 2() Select the two 6-socket input strips, and eight each #4 screws, **KEP** nuts, and lockwashers. The quickest installation method is to insert all 8 screws from the *outside*, and then hold them in place temporarily on the outside with transparent tape as the rest of the parts are assembled on the inside. A lockwasher is placed over each screw on the *inside*; next install the input strips (they mount in either direction); finally fasten with a nut on each screw. Remove the tape, and firmly tighten the hardware.
- 3() Select a 2-lug terminal strip, and one set of #4 hardware. Install the strip on the inside between the 6-socket strips, parallel to the top and bottom of the back panel, as shown in the Pictorial Diagram, and tighten the hardware securely. You may now wish to bend the strip at a 45° angle toward the bottom of the back panel so that the lugs of this strip are equidistant from the 6-lug strips.
- 4() Select the two black AC outlets. Press them into place from the *outside* of the back panel. No hardware is necessary.

Set this assembly aside, and place the main chassis bottom plate in front of you, flanges down.

- 5() Select the four rubber feet, and four sets of hardware. Insert a screw through each foot, and then mount a foot at each corner of the chassis on the *outside*. Turn the chassis over, push a screw through each hole, and tighten with the **KEP** nuts on the inside.
- 6() Select the fuse holder, and a set of hardware. Insert the screw from the outside, and install the fuse holder over the hole at the center back of the chassis. See that the holder is parallel to the back of the chassis in front of the two nearby chassis "dimples". Tighten the hardware. To make later connections easier, bend the two end lugs up to about 45° with pliers.
- 7() Select another 2-lug terminal strip, the cardboard insulator sheet with a small hole in it, and a set of hardware. Bend the insulator in an "L" shape at its score marking. Insert a screw from the outside in the hole which is 2" behind the left front foot, and fit the insulator in position over the screw on the inside. Install the terminal strip on top of the insulator, position the parts as shown in the Pictorial Diagram, and secure firmly with the hardware.

Set the chassis bottom aside.

Place the black front panel in front of you. You may wish to mark on the inside of the front panel the letter designations of the control and switch cutouts shown in the Pictorial Diagram (PS, PL, DB, LG, RS1, LS1, etc.) to facilitate assembly. These components will be referred to in this abbreviated form.

When handling the slide controls, use care to avoid wiping off any of the silicon compound on the slide tracks.

- 8() Select the two slide controls, 50K—#160503, and install one control in position RG, and the other in position LG. Note the location of the solder lugs in the Pictorial Diagram. Insert the two mounting tabs on the front of the control fully through the panel from the *inside* (they snap in place when fully seated), and twist each tab from the *outside* $\frac{1}{4}$ turn to lock the control in place. Twist tightly so that the controls do not move when wiggled.
- 9() Select the red neon pilot lamp, and the spring steel Tinnerman™ nut. Trim the leads of the lamp to $2\frac{3}{8}$ " (60 mm), and prepare their ends by removing $\frac{1}{4}$ " (6 mm) of insulation from each lead. Install the lamp from outside the panel in position PL so that the lamp's metal ring is against the panel on the outside. The lamp is a tight fit in the hole. Secure the lamp on the inside by pushing the spring nut over the leads and body, against the panel.



- 10() Select the single-button switch, and two #4 screws. Insert the screws from the outside in position PS, and carefully install the switch from the inside so that the black side points toward the top edge of the panel. Nuts are not required on the inside because this switch (as well as the 3-position switch in the next step) is supplied with threaded mounting holes.
- 11() Select the 3-position button switch, and two *short* #6 screws (large size hardware). Carefully install the switch from the inside in the center bottom rectangular cutout with the screws from the outside. The lugs point toward the panel top.
- 12() Select the chassis bottom, and four black self-tapping screws. Place the front panel in position about $\frac{3}{8}$ " (10 mm) behind the front lip of the chassis with the front panel inside the chassis sides. Insert two screws on each side of the chassis. The screws cut their own thread and therefore some force is required. Tighten the screws completely.
- 13() Select the back panel, and two black self-tapping screws. Place the back panel in position adjacent to the back lip of the chassis. Insert the screws only in the *corner* hole at each end. Do not tighten the screws completely so that the panel can be tilted outward at about a 45° angle for working. You may wish to "pre-thread" the other hole at each end to make upright panel mounting easier in the future.

WIRING THE INPUTS AND OUTPUTS

- 1() Cut six black wires each 2" (50 mm) long. Prepare them by removing $\frac{1}{4}$ " (6 mm) of insulation from both ends of each wire.

These wires are connected to pairs of *short* or *long* lugs on the input strips. Both halves of each short ground lug must be connected together when soldering is called for. The *short* lugs are labeled by the numbers of the adjacent *long* lugs, such as short lug #7-8.

- 2() Connect one end of the first wire to *short* lug #7-8, and the other end to short lug #9-10.
- 3() Connect one end of the second wire to short lug #9-10, and the other end to short lug #11-12.
- 4() Connect one end of the third wire to short lug #1-2, and the other end to short lug #3-4.
- 5() Connect one end of the fourth wire to short lug #3-4, and the other end to short lug #5-6.
- 6() Connect one end of the fifth wire to *long* lug #8 (S). Connect the other end to long lug #10.
- 7() Connect one end of the last wire to long lug #2 (S). Connect the other end to long lug #4.

Each lug of the 2-lug terminal strips T-1, T-2 and T-3 has two holes, the conventional one at the tip, and the other at the base through the insulating material. For ease of connection, soldering will be indicated to the *tip* or to the *base* of a lug on these terminal strips. The two holes will be soldered independently.

- 8() Remove the insulation from a $2\frac{1}{4}$ " (55 mm) black wire. Pass one end of the bare wire through T-1 lug #1 at the *base*, and connect that end to short lug #9-10 (S-3). Connect the other end to short lug #3-4 (S-3).
- 9() Prepare *two* 10" (255 mm) black wires, by removing the conventional $\frac{1}{4}$ " (6 mm) of insulation from both ends of each wire. Connect one end of both wires to T-1 lug #1 at the *base* (S-3). You may wish to twist these wires uniformly together for a neat appearance. Position both wires to the left of the input strips against the back panel. The other ends will be connected later.
- 10() Remove the insulation from a 1" (25 mm) black wire. Bend the bare wire in a $\frac{1}{2}$ " (13 mm) wide "U", and connect one end to T-1 lug #1 at the *tip*. Connect the other end to T-1 lug #2 at the tip.

The next several steps will call for the connection of the shielded audio cable. To prepare this cable for connection, first remove $\frac{3}{4}$ " (20 mm) of the outer plastic insulation from both ends. Use care doing this so that you do not cut the fine strands of wire underneath. With the insulation carefully removed, draw the fine "shield" wires to one side. At one end only, twist the shield wires together. At the other end, cut off the shield wires flush with the *outer* insulation, and then work the outer insulation over the cut off wires until *all traces* of the shield wires are covered at this

end. This is most easily accomplished by grasping the cable tightly with one hand at the end where the shield wires remain, and pulling the insulation toward the other end with the other hand. The insulation should be moved about $\frac{1}{8}$ " (3 mm).

Now remove the conventional $\frac{1}{4}$ " (6 mm) of insulation from the inner center wire at each end, and also twist together these strands of wire. Finally, "tin" the shield and center strands with your hot iron and a very small amount of solder to prevent fraying.

All of these cables connect between the 6-socket input strips or T-1 on the back panel and the 3-button switches on the front panel. The shield wire ends all connect to the back panel.

Because the lugs on the 3-button switches are small, do *not* attempt to bend a hook in the end of the wire before inserting. Simply push the straight wire end through the lug hole, solder, and then cut off excess wire on the other side with your side cutters. Use care when cutting the excess wire.

- 11() Prepare *five* $11\frac{5}{8}$ " (295 mm) shielded cables, as just described.
- 12() Select one of the prepared shielded cables. Connect the shield wire to short lug #7-8 on the back panel (S-2). Connect the corresponding center wire to long lug #7 (S). Connect the center wire at the free end to MB lug #3 on the front panel (S).
- 13() Select the second prepared shielded cable. Connect the shield wire to T-1 lug #1 at the tip. Connect the corresponding center wire to long lug #9 (S). Connect the center wire at the free end to EB lug #20 (S).
- 14() Select the third shielded cable. Connect the shield wire to T-1 lug #1 at the tip. Connect the corresponding center wire to long lug #10 (S-2). Connect the center wire at the free end to MB lug #1 (S).
- 15() Select the fourth shielded cable. Connect the shield wire to T-1 lug #2 at the tip. Connect the corresponding center wire to long lug #11 (S). Connect the center wire at the free end to EB lug #11 (S).
- 16() Select the fifth shielded cable. Connect the shield wire to short lug #11-12 (S-2). Connect the corresponding center wire to long lug #12 (S). Connect the center wire at the free end to EB lug #8 (S).
- 17() Prepare *five* 13" (330 mm) shielded cables, exactly as before.
- 18() Select one of the prepared cables. Connect the shield wire to short lug #1-2 (S-2). Connect the corresponding center wire to long lug #1 (S). Connect the center wire at the free end to MB lug #6 (S).
- 19() Select the second shielded cable. Connect the shield wire to T-1 lug #1 at the tip (S-4). Connect the corresponding center wire to long lug #3 (S). Connect the center wire at the free end to EB lug #14 (S).
- 20() Select the third shielded cable. Connect the shield wire to T-1 lug #2 at the tip. Connect the corresponding center wire to long lug #4 (S-2). Connect the center wire at the free end to MB lug #4 (S).

- 21() Select the fourth shielded cable. Connect the shield wire to T-1 lug #2 at the tip (S-4). Connect the corresponding center wire to long lug #5 (S). Connect the center wire at the free end to EB lug #5 (S).
- 22() Select the last shielded cable. Connect the shield wire to short lug #5-6 (S-2). Connect the corresponding center wire to long lug #6 (S). Connect the center wire at the free end to EB lug #2 (S).

This completes the connection of the shielded cable. Before continuing to the next step, now is the time to check that each lug on the 6-lug strips and T-1 is soldered, that there are no solder runs or blobs, and that any excess wire ends are cut short. On EB and MB, observe that no wire touches other than the intended lug. Finally, recheck all the connections you have made:

Long lug #1 to MB lug #6;
long lug #2 to long lug #4;
long lug #3 to EB lug #14;
long lug #4 to MB lug #4;
long lug #5 to EB lug #5;
long lug #6 to EB lug #2;
long lug #7 to MB lug #3;
long lug #8 to long lug #10;
long lug #9 to EB lug #20;
long lug #10 to MB lug #1;
long lug #11 to EB lug #11;
long lug #12 to EB lug #8.

- 23() Select three of the plastic ties. Group all ten shielded cables together which connect from the back to the front. Bind them together with the ties, one in the middle, another behind EB, and the last one 2" (50 mm) in front of the back panel. Slip the male end of a tie under the grouping of cables, push the male end through the female end, and tighten the tie. Cut off any excess tie. The bundled cables will be positioned against the chassis when the back panel is in its final upright position.

The next several steps refer to connection of wires on the front panel.

- 24() Strip about $1\frac{1}{2}$ " (40 mm) of insulation from the roll of black wire. Feed the stripped end through EB lug #13 across the switch to EB lug #1, and solder both lugs. Cut off the wire close to the right side of EB lug #13.
- 25() In a similar manner, feed the stripped wire end through EB lug #18 to EB lug #6. Solder both lugs, and cut off the wire on the right side of EB lug #18.
- 26() In a similar manner, feed the stripped end through EB lug #19 to EB lug #7. Solder both lugs, and cut off the wire on the right side of EB lug #19.
- 27() Finally, feed the stripped end through EB lug #24 to EB lug #12. Solder both lugs, and cut off the wire on the right side of EB lug #24.
- 28() Prepare a $2\frac{3}{8}$ " (60 mm) yellow wire, by removing only $\frac{1}{8}$ " (3 mm) of insulation from each end. Connect one end of the wire to MB lug #5 (S). Connect the other end to EB lug #17 (S).

- 29() Prepare a $2\frac{3}{8}$ " (60 mm) blue wire, by removing $\frac{1}{8}$ " (3 mm) of insulation from each end. Connect one end of the wire to MB lug #2 (S). Connect the other end to EB lug #23 (S).
- 30() Prepare a 3" (75 mm) yellow wire, by removing the conventional $\frac{1}{4}$ " (6 mm) of insulation from each end. Feed one end through EB lug #16 to EB lug #15, and solder both lugs. You may wish to twist these lugs slightly to easily feed the wire between them. Bend a small hook in the wire at the other end, and connect it to LG lug #1 (S). Notice that the lugs of the slide controls do not have holes for attaching wires. Hook the wire end around the lug as you solder.
- 31() Prepare a $5\frac{3}{4}$ " (145 mm) blue wire, by removing the conventional $\frac{1}{4}$ " (6 mm) of insulation from each end. Feed one end through EB lug #22 to EB lug #21, and solder both lugs. Pass the wire from the right under EB, bend a small hook at the other end, and connect it to RG lug #1 (S).

The following several steps connect wires to DB and EB, whose other ends will be connected later. Follow the directions in the step for positioning of the free end.

- 32() Prepare a $3\frac{1}{4}$ " (83 mm) black wire, by removing $\frac{1}{4}$ " (6 mm) of insulation from each end. Feed one end through EB lug #4 to EB lug #3, and solder both lugs. Position the wire to the right across the top of EB and the back edge of MB.
- 33() Prepare an 8" (200 mm) black wire, by removing $\frac{1}{4}$ " (6 mm) of insulation from each end. Feed one end through EB lug #10 to EB lug #9, and solder both lugs. Position the wire to the left and parallel to the chassis.

Before continuing, check to see that each lug on EB and MB is connected. Make certain that no solder blobs or excess wire connects other than the intended lug.

Each wire connected to DB should be prepared by removing $\frac{1}{4}$ " (6 mm) of insulation from one end, and $\frac{1}{8}$ " (3 mm) from the other.

- 34() Prepare a $2\frac{3}{8}$ " (60 mm) yellow wire. Connect the short stripped end to DB lug #7 (S). Position the wire toward the top of the front panel.
- 35() Prepare a $3\frac{1}{2}$ " (90 mm) blue wire. Connect the short stripped end to DB lug #8 (S). Position the wire to the right across the top of EB and the back edge of MB.
- 36() Prepare a 10" (255 mm) yellow wire. Connect the short stripped end to DB lug #9 (S). Position the wire to the right under the back edge of EB toward the back corner of the chassis.
- 37() Prepare a $3\frac{1}{2}$ " (90 mm) yellow wire. Connect the short stripped end to DB lug #10 (S). Position the wire next to the other yellow wire which points toward the top of the front panel.
- 38() Prepare a $3\frac{1}{4}$ " (83 mm) black wire. Connect the short stripped end to DB lug #11 (S). Position the

wire to the right across the top of EB, and the back edge of MB.

- 39() Prepare a 10" (255 mm) blue wire. Connect the short stripped end to DB lug #12 (S). Position the wire to the right under the back edge of EB toward the back corner of the chassis.
- 40() Prepare a $1\frac{1}{2}$ " (40 mm) blue wire. Connect the short stripped end to DB lug #1 (S). Position the wire next to the yellow wires which point toward the top of the front panel.
- 41() Prepare a 7" (180 mm) blue wire. Connect the short stripped end to DB lug #2 (S). Position the wire to the left and parallel to the chassis.
- 42() Prepare a $3\frac{3}{4}$ " (95 mm) yellow wire. Connect the short stripped end to DB lug #3 (S). Position the wire to the right across the top of EB and the back edge of MB.
- 43() Prepare a $3\frac{1}{2}$ " (90 mm) black wire. Connect the short stripped end to DB lug #4 (S). Position the wire next to the three wires which point toward the top of the front panel.
- 44() Prepare a 7" (180 mm) yellow wire. Connect the short stripped end to DB lug #5 (S). Position the wire to the left and parallel to the chassis.
- 45() Prepare a $3\frac{1}{2}$ " (90 mm) blue wire. Connect the short stripped end to DB lug #6 (S). Position the wire to the right across the top of EB and the back edge of MB.

Before continuing, check to see that one wire is connected to each lug on DB. Make certain that no solder blobs or excess wire connects other than the intended lug.

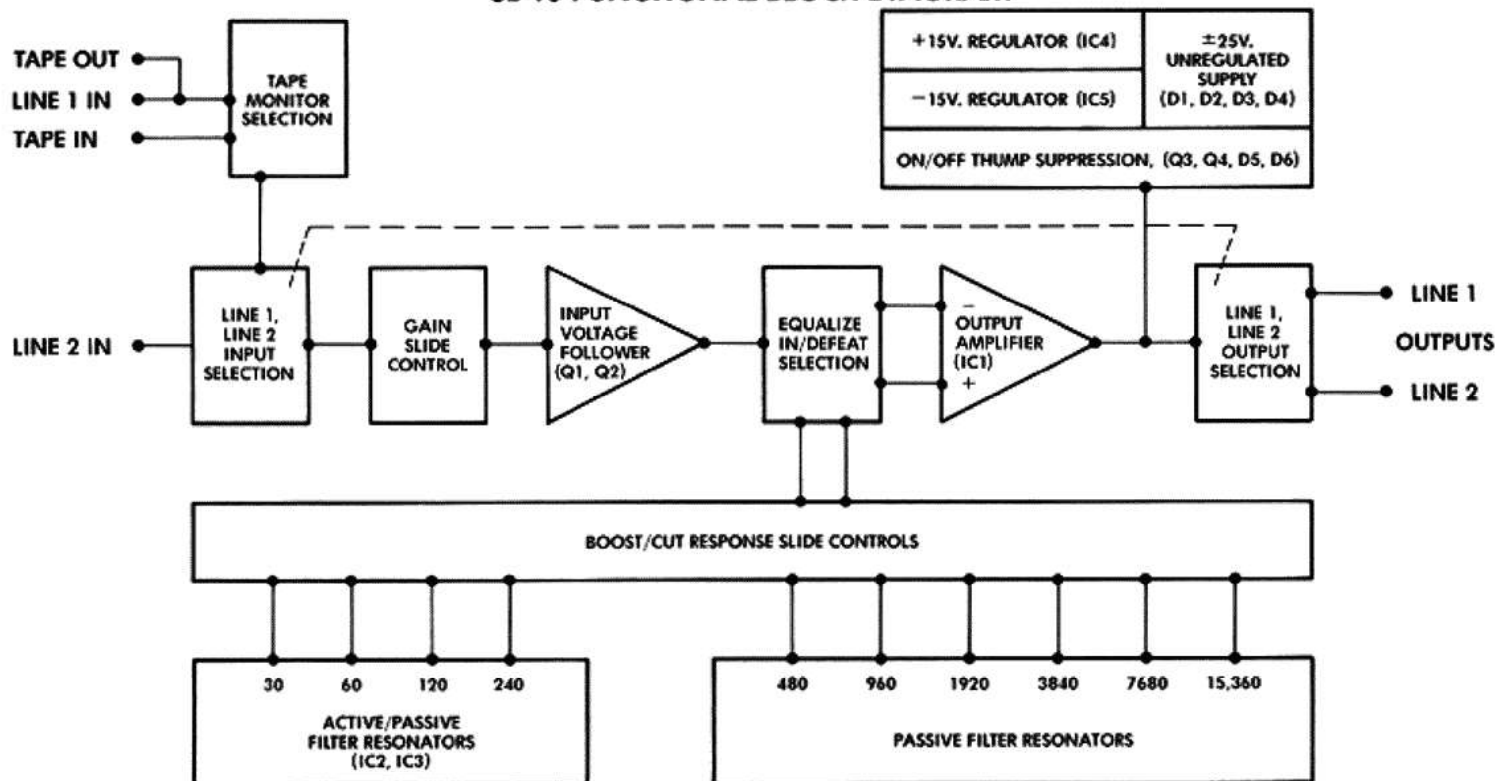
- 46() Select the 20 slide controls, 10K—#160103, and install them all on the front panel in positions RS-1 through RS-10, and LS-1 through LS-10. Note the location of the solder lugs in the Pictorial Diagram. Insert the two mounting tabs on the front of the control fully through the panel from the inside (they snap in place when fully seated), and twist each tab from the outside $\frac{1}{4}$ turn to lock the control in place. Twist tightly so that the controls do not move when wiggled.

With side cutters, you may now wish to snip off about half the length of the three solder lugs on all 22 slide controls, so that $\frac{1}{4}$ " (6 mm) of the lug remains. If you do, some silicon compound will have adhered to the lugs, and therefore the cut off ends may stick in the circuitry. Make certain that each cut end is removed. Avert your face as the lugs are snipped to protect your eyes.

- 47() Remove the insulation from a 6" (155 mm) length of blue wire. Bend a small hook at one end of the bare wire, and connect it to LS-10 bottom lug #30 (S). "Weave" the wire alternately above and below each bottom lug on LS-9, LS-8, LS-7, LS-6, LS-5, LS-4, LS-3 and LS-2. Solder all eight lugs. Bend a small hook at the free end, and connect it to LS-1 lug #3. (Do not solder.)

NOW TURN TO PAGE 15

SE-10 FUNCTIONAL BLOCK DIAGRAM



CIRCUIT DESCRIPTION

The components in the SE-10 are of the highest quality, and all parts are operated conservatively with close tolerances to assure proper operation for many years. All the semiconductors have been thoroughly researched and selected for minimum noise and distortion with sustained use. The printed circuit board, which contains all the audio circuitry and the power supply components (except for the power transformer), has been pre-tested to ensure that every unit will meet the laboratory prototype-like specifications.

AUDIO CIRCUITRY

Audio signals are first applied to a voltage follower containing a PNP-NPN direct coupled transistor pair, Q1 and Q2. This stage has a high input impedance and a fixed low impedance output. It generates a fixed source impedance for the subsequent equalizer circuitry, regardless of the source impedance of the input signals. This stage has unity gain.

Signals from the input follower drive a high performance operational amplifier, IC1, which is the entire gain element. It provides equalizer output signals.

The boost/cut response slide controls connect the individual filter resonators to either the inverting (summing point), or the non-inverting inputs of the output amplifier, IC1. Boost action occurs when the wiper of a slide control is moved toward the amplifier's summing point; cut action takes place when the wiper of a slide control is shifted toward the non-inverting point. Boost action occurs when the gain of the output amplifier is increased in a frequency selective manner, because the resonator impedance, through slide control movement, approaches the summing point of the output amplifier. Frequency selective attenuation of the signal at the input of the output amplifier causes cut action. The amount of boost or cut in a given octave is determined by the position of the associated slide control.

Both active and passive filter resonator components are used. All of the filter capacitors for resonant action are close tolerance, polyester dielectric types. Both real and simulated inductors are employed. Gapped pot core inductors are used for the octave bands from 480 Hz through 15,360 Hz. Simulated active inductors have been selected for the 30 Hz through the 240 Hz bands. The simulated inductor circuits employ two operational amplifiers for each inductance.

POWER SUPPLY

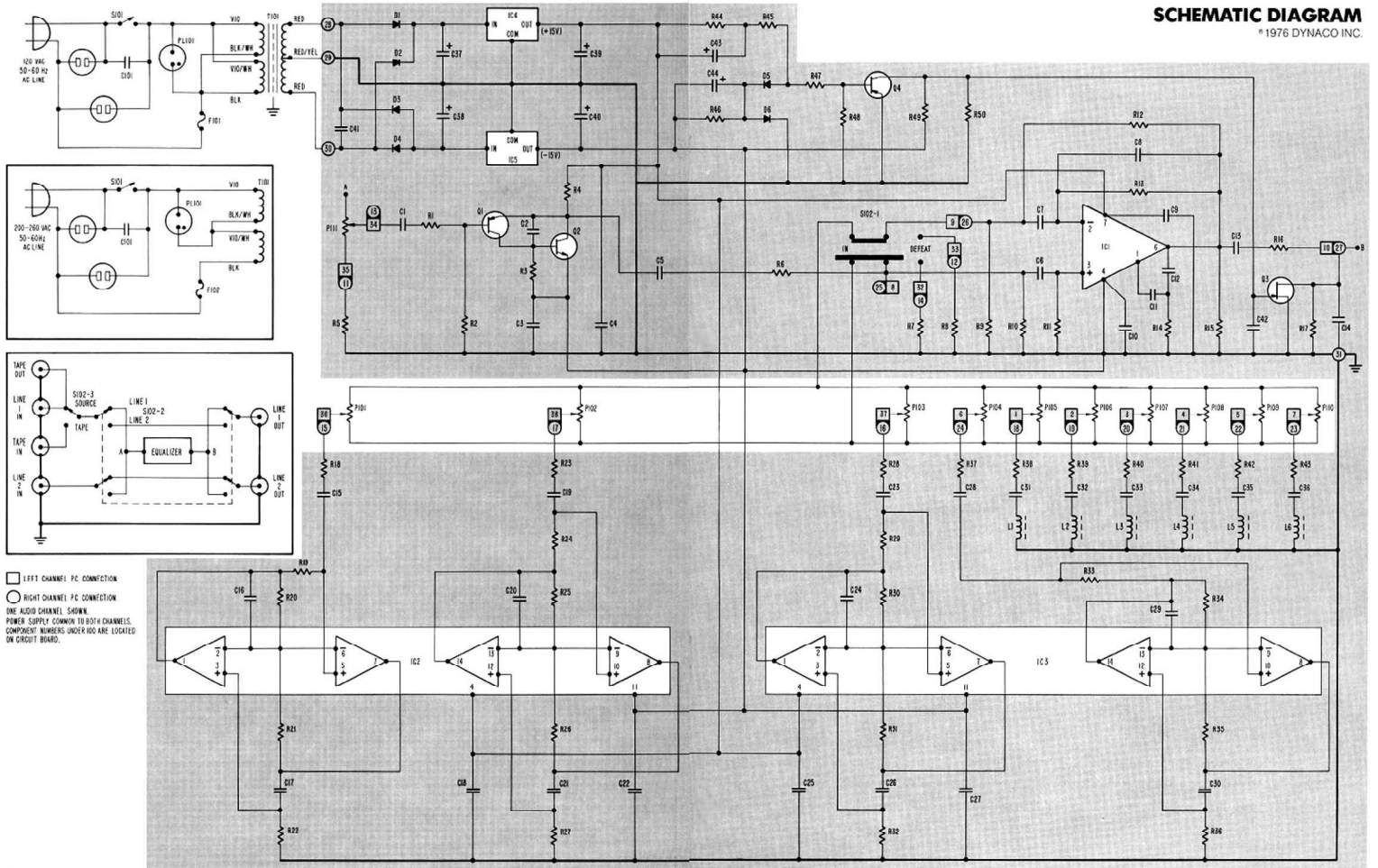
A full wave bridge supply generates a nominal ±25 volts DC unregulated output with 120 (alternately 240) volts AC line input. Further filtering and regulation are achieved by a pair of integrated circuit regulators, IC4 and IC5. For AC line inputs between 100 and 130 (alternately 200 and 260) volts, the outputs will be +15 volts/-15 volts, ±1 volt. The IC regulators are thermally and short circuit protected. Under high temperature or shorted output conditions, they will turn off and then return to normal operation once the problem has been corrected.

A fully regulated supply is used so that AC line variations will have no effect on audio performance. This is particularly important if a very powerful amplifier is used, where its current demands can exceed the wall outlet capability.

In addition, potentially annoying turn-on and turn-off noises are attenuated at the output by the low "on" resistance of the FET, Q3. During normal (on) operation of the SE-10, Q3 is biased "off". Q3's gate signal is fed from Q4. The time constants and divider networks for Q4 are selected so that, at turn-on and supply turn-off, Q3 will be in its normal "on" state.

The nominal output impedance of the SE-10 is 600 ohms unbalanced. It can be used with long output cables and is relatively non-critical of load impedance. Its specifications are based on a load impedance of 10,000 ohms or higher, which means that virtually every solid state preamplifier, control amplifier or receiver may connect to it. If a lower impedance load is connected, there will be some reduction in the maximum output level at low distortion.

SCHEMATIC DIAGRAM
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COMPONENT VALUES

All resistors are 1/4 watt, 5% unless otherwise indicated.

R 1	470 ohms	119471	C 16	100 pf, 500 v., 5%, mica	245101
R 2	510,000 ohms	119514	C 17	1.2 mfd, 100 v., 5%, mylar	264125
R 3	10,000 ohms	119103	C 18	.01 mfd, 100 v., 20%, disc	234103
R 4	1,000 ohms	119102	C 19	3.3 mfd, 100 v., 5%, mylar	264355
R 5	6,800 ohms	119682	C 20	100 pf, 500 v., 5%, mica	245101
R 6	3,300 ohms	119332	C 21	1.5 mfd, 100 v., 5%, mylar	264155
R 7	510 ohms	119511	C 22	.01 mfd, 100 v., 20%, disc	234103
R 8	510 ohms	119511	C 23	1.5 mfd, 100 v., 5%, mylar	264155
R 9	5,100 ohms	119512	C 24	100 pf, 500 v., 5%, mica	245101
R 10	51,000 ohms	119513	C 25	.01 mfd, 100 v., 20%, disc	234103
R 11	680,000 ohms	119684	C 26	.68 mfd, 100 v., 5%, mylar	264684
R 12	6,800 ohms	119682	C 27	.01 mfd, 100 v., 20%, disc	234103
R 13	680,000 ohms	119684	C 28	.82 mfd, 100 v., 5%, mylar	264824
R 14	10,000 ohms	119103	C 29	100 pf, 500 v., 5%, mica	245101
R 15	47,000 ohms	119473	C 30	.47 mfd, 100 v., 5%, mylar	260474
R 16	560 ohms	119561	C 31	.39 mfd, 100 v., 5%, mylar	264394
R 17	47,000 ohms	119473	C 32	.22 mfd, 100 v., 5%, mylar	264225
R 18	430 ohms	119431	C 33	.10 mfd, 100 v., 5%, mylar	264103
R 19	13,000 ohms	119133	C 34	.047 mfd, 100 v., 5%, mylar	264473
R 20	220,000 ohms	119224	C 35	.022 mfd, 100 v., 5%, mylar	264221
R 21	220,000 ohms	119224	C 36	.012 mfd, 100 v., 5%, mylar	264123
R 22	220 ohms	119221	C 37	250 mfd, 35-40 v., electrolytic	283247
R 23	360 ohms	119361	C 38	250 mfd, 35-40 v., electrolytic	283247
R 24	12,000 ohms	119123	C 39	100 mfd, 15-18 v., electrolytic	281101
R 25	220,000 ohms	119224	C 40	100 mfd, 15-18 v., electrolytic	281101
R 26	220,000 ohms	119224	C 41	.01 mfd, 500 v., 20%, disc	228103
R 27	120 ohms	119121	C 42	.001 mfd, 100 v., 10%, disc	240102
R 28	330 ohms	119331	C 43	5 mfd, 15-18 v., electrolytic	281505
R 29	15,000 ohms	119153	C 44	20 mfd, 15-18 v., electrolytic	281205
R 30	220,000 ohms	119224	C101	.02 mfd, 500 v., 20%, disc	227203
R 31	220,000 ohms	119224	D 1	Silicon diode, 200 ma, 200 prv	544012
R 32	120 ohms	119121	D 2	Silicon diode, 200 ma, 200 prv	544012
R 33	9,100 ohms	119912	D 3	Silicon diode, 200 ma, 200 prv	544012
R 34	220,000 ohms	119224	D 4	Silicon diode, 200 ma, 200 prv	544012
R 35	220,000 ohms	119224	D 5	Silicon diode, 1N4148	543148
R 36	120 ohms	119121	D 6	Silicon diode, 1N4148	543148
R 37	360 ohms	119361	L 1	Inductor, gapped pot core, 282 mh	453003
R 38	240 ohms	119241	L 2	Inductor, gapped pot core, 125 mh	453004
R 39	300 ohms	119301	L 3	Inductor, gapped pot core, 68.7 mh	453005
R 40	330 ohms	119331	L 4	Inductor, gapped pot core, 36.5 mh	453006
R 41	330 ohms	119331	L 5	Inductor, gapped pot core, 19.5 mh	453007
R 42	360 ohms	119361	L 6	Inductor, gapped pot core, 8.95 mh	453008
R 43	430 ohms	119431	Q 1	PNP transistor, EN3962	562962
R 44	150,000 ohms	119154	Q 2	NPN transistor, SE4020	572020
R 45	75,000 ohms	119753	Q 3	FET transistor, 2N5638	597463
R 46	330,000 ohms	119334	Q 4	PNP transistor, BC308	567070
R 47	75,000 ohms	119753	IC 1	Integrated circuit, LM301AH	587710
R 48	470,000 ohms	119474	IC 2	Integrated circuit, LM348N	587011
R 49	100,000 ohms	119104	IC 3	Integrated circuit, LM348N	587011
R 50	2,200,000 ohms	119225	IC 4	Integrated circuit/voltage regulator, LM341P-15	587013
C 1	10 mfd, 15-18 v., N.P. electrolytic	281126	IC 5	Integrated circuit/voltage regulator, LM320MP-15	587009
C 2	12 pf, 500 v., 5%, disc	244120	F101	Fuse, .1 ampere, Slo-blo	342101
C 3	.01 mfd, 100 v., 20%, disc	234103	F102	Fuse, 1/16 ampere, Slo-blo (alternate)	342062
C 4	.01 mfd, 100 v., 20%, disc	234103	P101	Slide control, 10,000 ohms	160103
C 5	10 mfd, 15-18 v., N.P. electrolytic	281126	P110	Slide control, 50,000 ohms	160503
C 6	10 mfd, 15-18 v., N.P. electrolytic	281126	P111	Pilot lamp, red neon	521021
C 7	10 mfd, 15-18 v., N.P. electrolytic	281126	PL101	Switch, power	338006
C 8	180 pf, 100 v., 5%, mica	254181	S101	Switch, 3-station, button	338005
C 9	.01 mfd, 100 v., 20%, disc	234103	T101	Transformer, power	464025
C 10	.01 mfd, 100 v., 20%, disc	234103			
C 11	5.6 pf, 500 v., ±.5 pf, NPO disc	244050			
C 12	33 pf, 500 v., 10%, disc	247330			
C 13	50 mfd, 10 v., N.P. electrolytic	282506			
C 14	1000 pf, 300 v., 5%, mica	255102			
C 15	8.2 mfd, 100 v., 5%, mylar	264825			

- 48() Bend a small hook at the free end of the yellow wire from DB lug #7, and connect it to LS-1 lug #3 (S-2). Do not confuse this with the yellow wire connected to DB lug #10.
- 49() Remove the insulation from another 6" (155 mm) blue wire. Bend a small hook at one end, and connect it to LS-10 top lug #28 (S). As before, weave the bare wire alternately above and below each top lug on LS-9, LS-8, LS-7, LS-6, LS-5, LS-4, LS-3 and LS-2. Solder all eight lugs. Bend a hook at the free end, and connect it to LS-1 lug #1.
- 50() Bend a small hook at the free end of the yellow wire from DB lug #10, and connect it to LS-1 lug #1 (S-2).
- 51() Remove the insulation from another 6" (155 mm) blue wire. Bend a small hook at one end, and connect it to RS-1 bottom lug #3 (S). Weave the bare wire alternately above and below each bottom lug on RS-2, RS-3, RS-4, RS-5, RS-6, RS-7, RS-8 and RS-9. Solder all eight lugs. Bend a hook at the free end, and connect it to RS-10 lug #30.
- 52() Bend a small hook at the free end of the blue wire from DB lug #1, and connect it to RS-10 lug #30 (S-2).
- 53() Remove the insulation from another 6" (155 mm) blue wire. Bend a small hook at one end, and connect it to RS-1 top lug #1 (S). Weave the bare wire alternately above and below each top lug on RS-2, RS-3, RS-4, RS-5, RS-6, RS-7, RS-8 and RS-9. Solder all eight lugs. Bend a hook at the free end, and connect it to RS-10 lug #28.
- 54() Bend a small hook at the free end of the black wire from DB lug #4, and connect it to RS-10 lug #28 (S-2).

Notice that the top and bottom lugs on all 20 RS and LS sliders are connected and soldered. There are now no connections to the third "center" lugs on any of these 20 sliders.

- 55() Prepare a 4 $\frac{3}{4}$ " (120 mm) black wire, by removing the conventional $\frac{1}{4}$ " (6 mm) of insulation from both ends. Bend a small hook at one end, and connect it to RG lug #2 (S). Position the wire toward the top of the front panel. The other end will be connected later.
- 56() Prepare a 4 $\frac{3}{4}$ " (120 mm) yellow wire, by removing the conventional insulation from both ends. Bend a small hook at one end, and connect it to RG lug #3 (S). Position the wire toward the top of the front panel. The other end will be connected later.
- 57() Prepare a 6" (155 mm) black wire, bend a small hook at one end, and connect it to LG lug #2 (S). Position the wire to the right back corner and parallel to the chassis. The other end will be connected later.
- 58() Prepare a 6" (155 mm) blue wire, bend a small hook at one end, and connect it to LG lug #3 (S). Position the wire next to the black wire from the previous step. The other end will be connected later.

AC INPUT WIRING

The next few steps connect wires to the parts in the power supply.

- 1() Select the power transformer, the last 2-lug terminal strip, the last two short #6 screws, and two #6 KEP nuts. Insert the screws from outside (under) the chassis, install the power transformer on the inside, followed by the terminal strip on the left screw, and fasten with the KEP nuts. Note the position of the transformer leads and the terminal strip, as well as the angular transformer mounting. Tighten the hardware very firmly.

The transformer leads have been cut to their correct lengths. It is not necessary to shorten them.

- 2() Select the green transformer lead, and connect it to T-3 lug #2 at the tip (S).
- 3() Select the black and the black-white transformer leads, twist them uniformly together, and connect them both to fuse holder lug #2.

NOTE: If this unit is to be used with a 200-260 volt AC line, connect only the black lead to fuse holder lug #2. Then twist together the black-white and the violet-white leads, and connect them both to T-3 lug #1 at the tip.

- 4() Select the violet and the violet-white leads, twist them uniformly together, and connect them both to convenience outlet "A" lug #1.

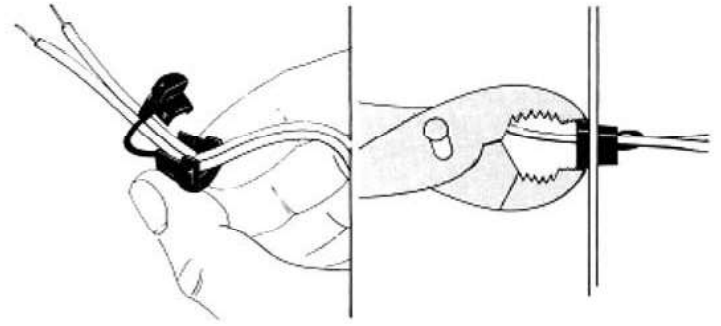
NOTE: If this unit is to be used with a 200-260 volt AC line, connect only the violet lead to outlet "A" lug #1.

The red-yellow and the two red leads from the transformer will be connected later. You may wish to wind these leads around the transformer and secure them with tape to get them temporarily out of the way.

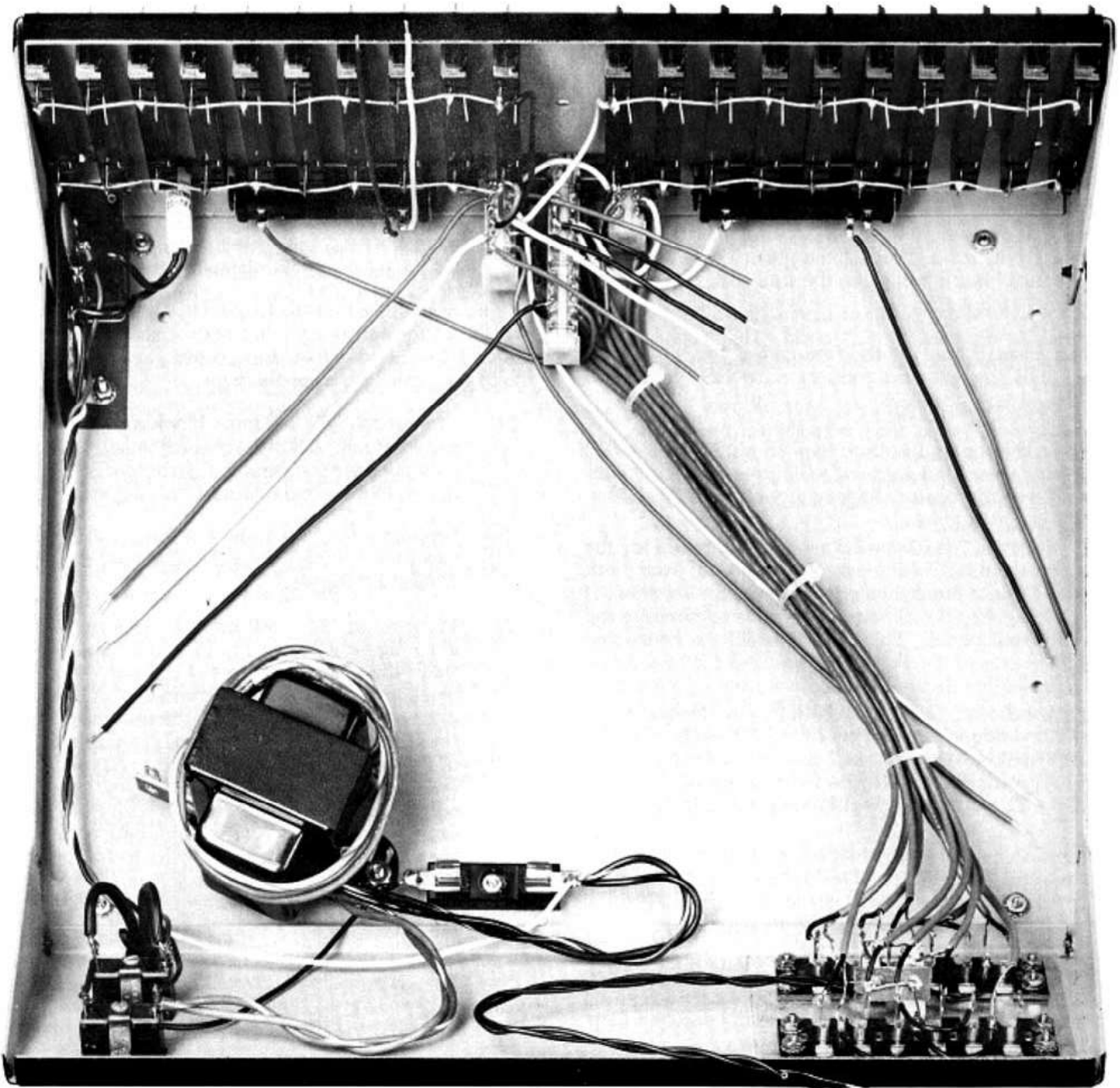
- 5() Prepare a 5 $\frac{1}{2}$ " (140 mm) black wire, by removing the conventional $\frac{1}{4}$ " (6 mm) of insulation from both ends. Connect one end to fuse holder lug #1 (S). Connect the other end to outlet "A" lug #2.
- 6() Prepare a 1 $\frac{1}{2}$ " (40 mm) black wire. Connect one end to outlet "A" lug #2 (S-2). Connect the other end to outlet "B" lug #4.
- 7() Prepare an 11" (280 mm) blue wire, a 13 $\frac{1}{2}$ " (343 mm) black wire, and a 14" (355 mm) yellow wire. Start with the blue wire $\frac{1}{2}$ " (13 mm) longer than the black wire, and the black wire $\frac{1}{2}$ " (13 mm) longer than the yellow wire. Twist them uniformly together three turns every 2" (50 mm) to within 2" (50 mm) of the other end of the blue wire. At this end connect the yellow wire to fuse holder lug #2 (S-3), the black wire to outlet "A" lug #1 (S-3), and the blue wire to outlet "B" lug #3. At the other end, connect the blue wire to PS lug #2, the black wire to PS lug #3, and the yellow wire to T-2 lug #1 at the tip. Make certain that the yellow wire connects to T-2 lug #1 and *not* lug #2.

NOTE: If this unit is to be used with a 200-260 volt AC line, do not connect the yellow wire to fuse holder lug #2. Instead trim 4" (100 mm) from this wire, prepare its end, and connect it to T-3 lug #1 at the tip (S-3). Also solder the black transformer lead at fuse holder lug #2.

- 8() Select the leads of the neon lamp, twist the wire strands together and "tin" them lightly with solder so there is no possibility of a loose strand touching an adjacent lug. Connect one (either) lead to PS lug #3. Connect the other lead to T-2 lug #1 at the tip (S-2).
- 9() Select the .02 mfd disc capacitor, and trim its leads to $\frac{3}{8}$ " (10 mm) each. Connect one lead to PS lug #2 (S-2). Connect the other lead to PS lug #3 (S-3).
- 10() Select two black self-tapping screws. Tilt the back panel into its upright position, and secure it to the chassis with the screws. Tighten all four black screws used to secure the back panel to the chassis.
- 11() Separate the two conductors of the line cord for about 2" (50 mm). Remove $\frac{1}{4}$ " (6 mm) of insulation from each (unless the line cord was supplied with stripped ends). Mark the line cord $2\frac{1}{2}$ " (63 mm) from the stripped end with a pencil or pen. Bend the cord sharply back on itself at the marking so that a "V" is formed. Install the strain relief as shown in the sketch



above. The small end of the strain relief faces the stripped end of the wire. With heavy pliers, crimp the two halves of the strain relief together around the wire to partially form the wire before insertion. Now grasp the larger diameter portion of the strain relief with the tips of the pliers, squeeze it fully closed, and insert the combination from the outside of the back panel in the remaining large hole. Notice that the hole has flat vertical sides, and therefore the strain relief installs easily in the cutout with the cord horizontal. The strain relief snaps into its locked position when fully inserted.



- 12() Select one conductor of the line cord, and connect it to outlet "B" lug #4 (S-2). Select the other conductor, and connect it to outlet "B" lug #3 (S-2).

The work you have finished should look much like the accompanying photograph.

WIRING THE CIRCUIT BOARD

Prior to mounting the PC-47 circuit board, it is necessary to complete four steps.

- 1() Select the tubular woven light shield, and slip it over the red portion of the neon lamp. About $\frac{1}{8}$ " (3 mm) of the red plastic should be exposed on the front.
- 2() Select the decorative aluminum front plate, the five *short* tubular spacers, the four $\frac{3}{4}$ " (20 mm) hexagonal fasteners with internal threads, and one #6 KEP nut. Install a spacer on each of the five threaded studs on the back of the front plate. Fit the front plate onto the black front panel with the spacers separating them. Carefully guide the plastic shafts of the sliders through their respective slots in the front plate. You may also need to adjust the neon lamp as the front plate is positioned. Secure the assembly on the inside first with the KEP nut over the center stud, and then with the hex fasteners over the four corner studs. The fasteners are a close fit, and will contact the adjacent sliders as the fasteners are turned. When tightening each fastener, stop with two sides vertical to avoid pressure on the sliders.
- 3() Reposition the free ends of the four *short* wires from DB and the *short* black wire from EB toward the top of the front panel. See that the two wires from RG also point upwards.
- 4() Select the four 2" #6 screws, the four *long* tubular spacers, and four #6 KEP nuts. Insert the screws from outside (under) the chassis, slip a spacer on each screw on the inside, and secure firmly with a KEP nut over each spacer.

Be particularly careful handling the preassembled circuit board, for it represents a substantial portion of the cost of the SE-10. Some of the components stand upright on the board, and careless handling can unduly flex and possibly break their leads.

- 5() Select the PC-47 circuit board, the four flat washers, and the last four #6 KEP nuts. Install the board over the nuts, spacers and screws from the previous step, positioned so that numbered holes #28, #29, #30 and #31 are nearest the back panel with the components facing away from the chassis. Place a washer on each screw over the board, and fasten securely with the KEP nuts.

In succeeding steps connections will be made to numbered, plated-through holes on PC-47. A good connection is more certain if the tip of the wire is first "tinned" by heating it and applying a *very small amount* of solder before it is connected to the hole. Insert the wire in the hole so that bare wire is visible on *both* sides of the board. Let the soldering iron contact the junction of wire and board circuitry as you feed solder to the junction. Solder should flow smoothly from the circuitry, *around the hole* to completely surround the wire.

Keep the wire steady while the connection cools, and then wiggle it to make sure the connection is secure. If in doubt, reheat the connection and add more solder.

Do *not* add solder to the holes before a wire is inserted. If you do, it will be difficult to find the hole to clear it. However, should you solder a wire in error to a wrong hole, first remove the wire by using the iron, and while the solder is still hot, push a toothpick through the hole to clear it.

You will now connect free ends of wires lying on the chassis to the under (foil) side of the board.

- 6() The long blue wire on the left side from DB lug #2 to hole #25 (S). Hole #25 is on the left edge of the circuit board near the front.
 - 7() The long yellow wire on the left side from DB lug #5 to hole #26 (S).
 - 8() The long black wire on the left side from EB lug #10 to hole #27 (S).
 - 9() The *long* blue wire on the right back side from DB lug #12 to hole #33 (S). Hole #33 is on the back edge near the right.
 - 10() The long yellow wire on the right back side from DB lug #9 to hole #32 (S).
 - 11() The black wire on the right side from LG lug #2 to hole #34 (S).
 - 12() The blue wire on the right side from LG lug #3 to hole #35 (S).
 - 13() Select the two red and the red-yellow leads from the power transformer, and twist the three leads together. Do not shorten the wires. Connect either red wire to hole #28 (S). Hole #28 is on the back edge in the center. Connect the red-yellow lead to hole #29 (S). Connect the other red lead to hole #30 (S).
 - 14() Select the two black wires which have been twisted together from T-1 lug #1 at the tip, and connect them both to hole #31 (S-2).
 - 15() Select the remaining plastic tie. Bend the five wires from the previous two steps in a small loop, and bind them together with the tie for a neat appearance. Cut off any excess tie. The additional lead length permits servicing the board without disconnecting the power transformer and main ground, should that time ever occur.
- You will now connect the free ends of wires which have been positioned toward the top of the front panel. They connect to the top (component) side of the board. The holes are grouped together near the front edge in the center.
- 16() The black wire from RG lug #2 to hole #13 (S).
 - 17() The black wire from EB lug #4 to hole #10 (S).
 - 18() The blue wire from DB lug #6 to hole #12 (S).
 - 19() The black wire from DB lug #11 to hole #9 (S).
 - 20() The yellow wire from RG lug #3 to hole #11 (S).
 - 21() The blue wire from DB lug #8 to hole #8 (S).

22() The yellow wire from DB lug #3 to hole #14 (S).

The free ends of all the wires should now be connected to holes on the circuit board.

You will now connect the final 20 wires to the board. They all connect to the top side, and most of them along the front edge of the circuit board. Use extreme care when soldering the wires along the front to avoid burning components or wires on the board, and to avoid dropping solder randomly onto the board. Keep your soldering iron clear of all solder until the iron touches the junction of wire and hole. When the solder has melted, withdraw the iron, and clean it immediately with a damp sponge so that the iron is ready for the next connection.

Prepare the wires by removing $\frac{1}{4}$ " (6 mm) of insulation from both ends.

23() Prepare a $4\frac{3}{4}$ " (120 mm) yellow wire. Connect one end to hole #24 (S). Bend a small hook at the other end, and connect it to RS-7 lug #20 (S). Position this wire along the front edge of the circuit board.

24() Prepare a $2\frac{3}{4}$ " (70 mm) black wire. Connect one end to hole #23 (S). Bend a small hook at the other end, and connect it to RS-1 lug #2 (S).

25() Prepare a 3" (75 mm) blue wire. Connect one end to hole #22 (S). Bend a small hook at the other end, and connect it to RS-2 lug #5 (S).

26() Prepare a $3\frac{1}{4}$ " (83 mm) yellow wire. Connect one end to hole #21 (S). Bend a small hook at the other end, and connect it to RS-3 lug #8 (S).

27() Prepare a $3\frac{1}{4}$ " (83 mm) black wire. Connect one end to hole #20 (S). Bend a small hook at the other end, and connect it to RS-4 lug #11 (S).

28() Prepare a $3\frac{1}{2}$ " (90 mm) blue wire. Connect one end to hole #19 (S). Bend a small hook at the other end, and connect it to RS-5 lug #14 (S).

29() Prepare a $3\frac{5}{8}$ " (93 mm) yellow wire. Connect one end to hole #18 (S). Bend a small hook at the other end, and connect it to RS-6 lug #17 (S).

30() Prepare a $2\frac{1}{4}$ " (57 mm) blue wire. Connect one end to hole #17 (S). Bend a small hook at the other end, and connect it to RS-9 lug #26. Do not confuse this with RS-8, which will be called for in the next step.

31() Prepare a 3" (75 mm) black wire. Connect one end to hole #16 (S). Bend a small hook at the other end, and connect it to RS-8 lug #23 (S).

32() Prepare a $2\frac{1}{4}$ " (57 mm) yellow wire. Connect one end to hole #15 (S). Bend a small hook at the other end, and connect it to RS-10 lug #29 (S).

Connections have now been completed to all RS slide controls.

33() Prepare a 2" (50 mm) black wire. Connect one end to hole #7 (S). Bend a small hook at the other end, and connect it to LS-1 lug #2 (S).

34() Prepare a $5\frac{1}{4}$ " (135 mm) yellow wire. Connect one end to hole #6 (S). Bend a small hook at the other end, and connect it to LS-7 lug #20 (S). Position this wire along the front edge of the circuit board.

35() Prepare a 2" (50 mm) blue wire. Connect one end to hole #5 (S). Bend a small hook at the other end, and connect it to LS-2 lug #5 (S).

36() Prepare a 2" (50 mm) yellow wire. Connect one end to hole #4 (S). Bend a small hook at the other end, and connect it to LS-3 lug #8 (S).

37() Prepare a $2\frac{1}{4}$ " (57 mm) black wire. Connect one end to hole #3 (S). Bend a small hook at the other end, and connect it to LS-4 lug #11 (S).

38() Prepare a $2\frac{1}{4}$ " (57 mm) blue wire. Connect one end to hole #2 (S). Bend a small hook at the other end, and connect it to LS-5 lug #14 (S).

39() Prepare a $2\frac{3}{8}$ " (60 mm) yellow wire. Connect one end to hole #1 (S). Bend a small hook at the other end, and connect it to LS-6 lug #17 (S).

40() Prepare a $2\frac{1}{2}$ " (63 mm) blue wire. Connect one end to hole #38 (S). Bend a small hook at the other end, and connect it to LS-9 lug #26 (S). Do not confuse this with LS-8, which will be called for in the next step.

41() Prepare a $2\frac{3}{4}$ " (70 mm) black wire. Connect one end to hole #37 (S). Bend a small hook at the other end, and connect it to LS-8 lug #23 (S).

42() Prepare a $2\frac{3}{4}$ " (70 mm) yellow wire. Connect one end to hole #36 (S). Bend a small hook at the other end, and connect it to LS-10 lug #29 (S).

This completes the wiring of your Dynaco Equalizer. You should check carefully for any insecure connections, and for any possibility of bare wires contacting other than the intended lug or circuit board hole. See that each of the 38 holes on the circuit board is securely soldered. Position the wires to holes #25, #26 and #27 away from PS and PL. Turn the unit upside down and shake out any bits of solder or pieces of wire or insulation.

The general placement of wires should conform closely to the photograph opposite.

43() Install the fuse in the fuse holder.

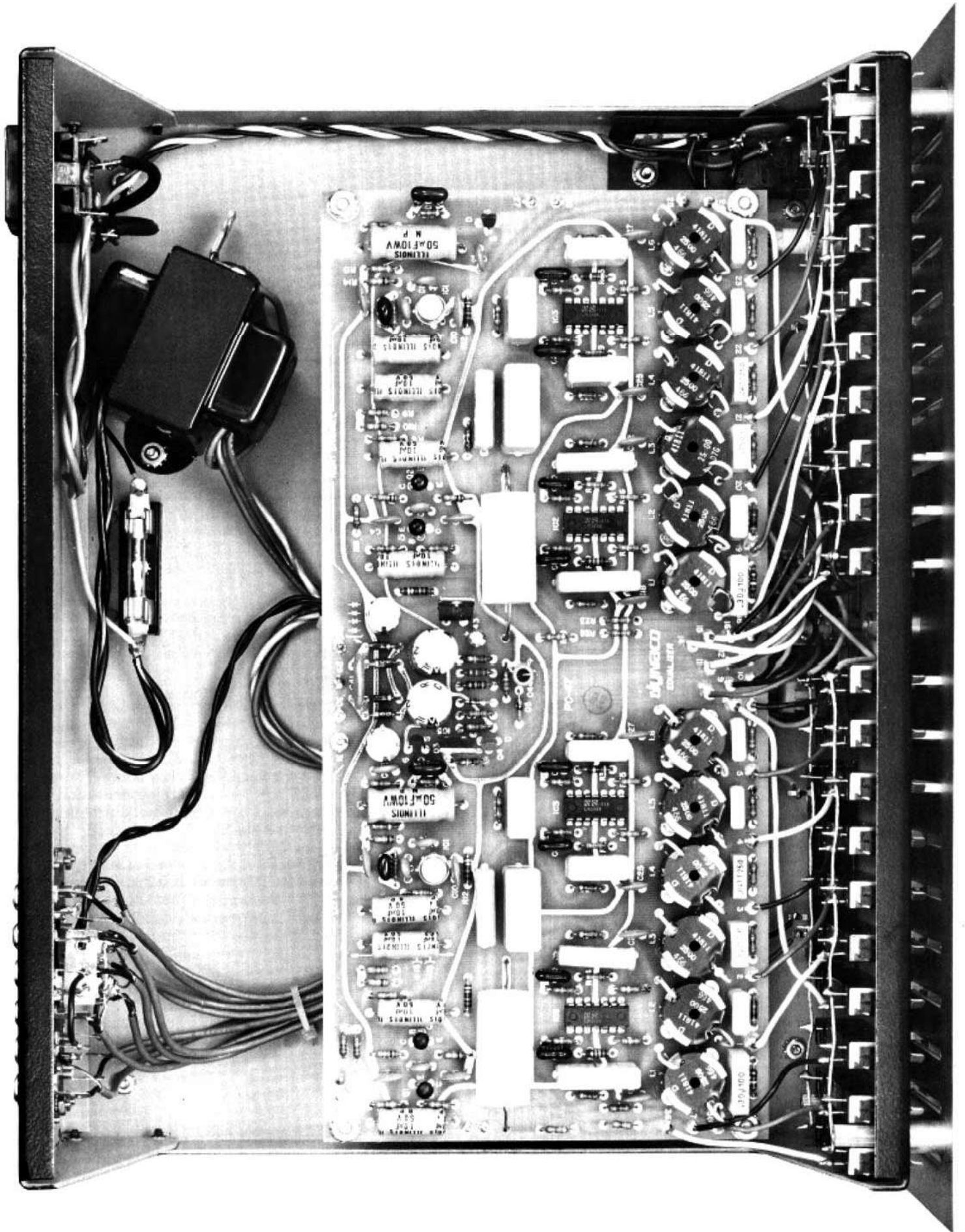
44() See that the back panel on the outside to the right of convenience outlet "B" is clean. Remove the backing from the serial number label, and affix it to the back panel.

NOTE: If this unit was obtained in Canada, also remove the backing from the fuse replacement label, and affix it inside the chassis in front of the fuse holder.

45() Install the four round knobs by simply pushing them into place on the square shafts.

46() Install the 22 slider knobs by also pushing them into place on the rectangular shafts.

47() Slide the cover over the equalizer, and secure it with five black self-tapping screws. The fifth one is installed at the center of the back panel.

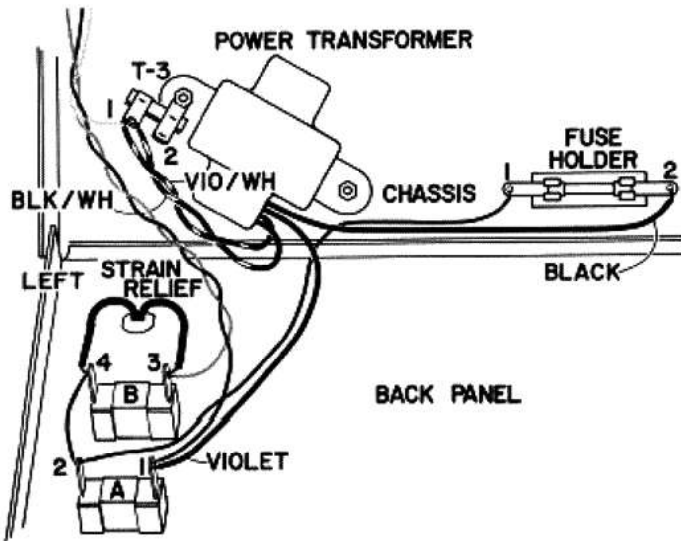


200-260 VOLTS AC LINE CONNECTIONS

The power transformer supplied in the SE-10 may be connected for 200-260 volts AC line, as well as for the standard 100-130 volts AC line (the transformer is wired for 100-130 use unless this manual and the outer shipping carton are stamped "240 volt"). The transformer has dual primary windings. They are connected in parallel for 100-130 volts, and in series for 200-260 volts. The notes to steps 3, 4 and 7 on page 15, the sketch on this page, and the schematic diagram on pages 12 and 13 detail the 200-260 volts connections.

The .1 ampere (100 ma) slo-blo fuse supplied with 100-130 volt wiring should be replaced with a $\frac{1}{16}$ ampere (63 ma) slo-blo fuse when it is wired for 200-260 volts use.

The SE-10 is designed for use with either 50 or 60 Hz current.



VOLTAGES

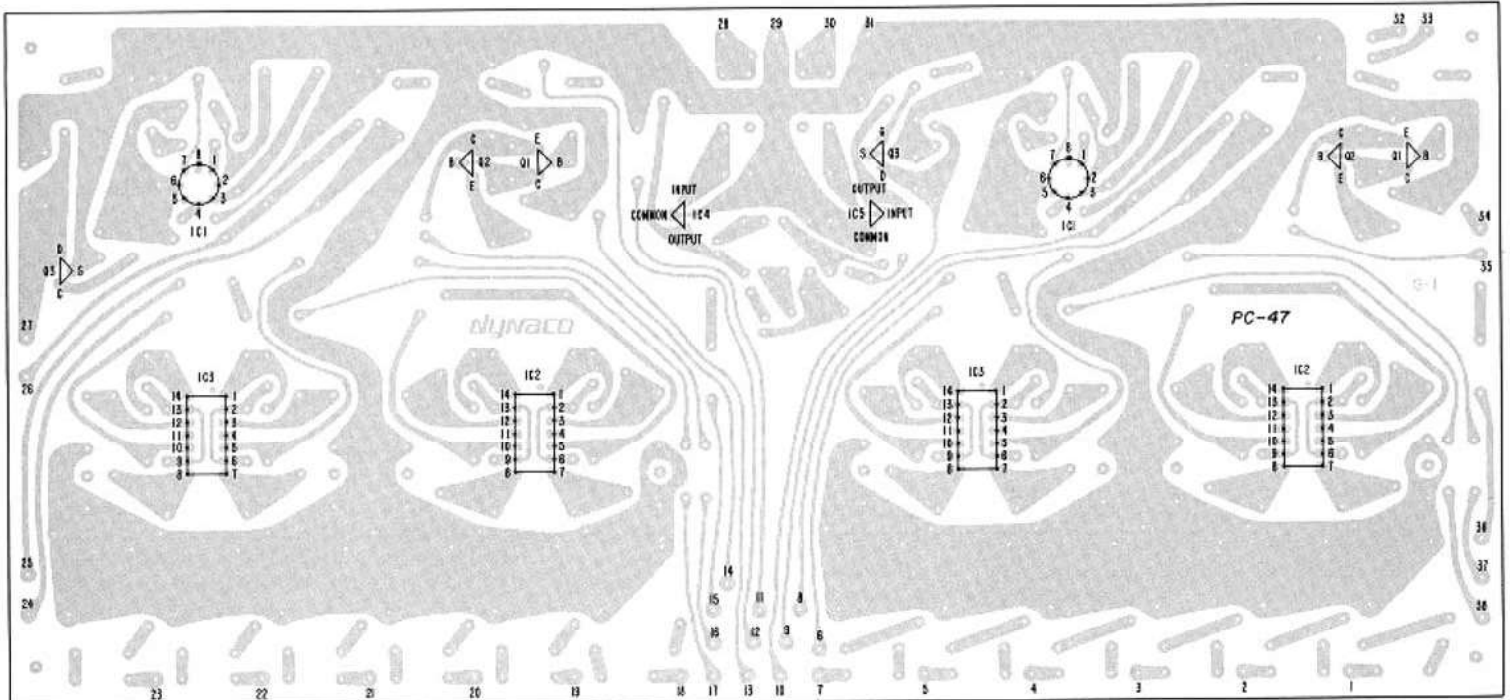
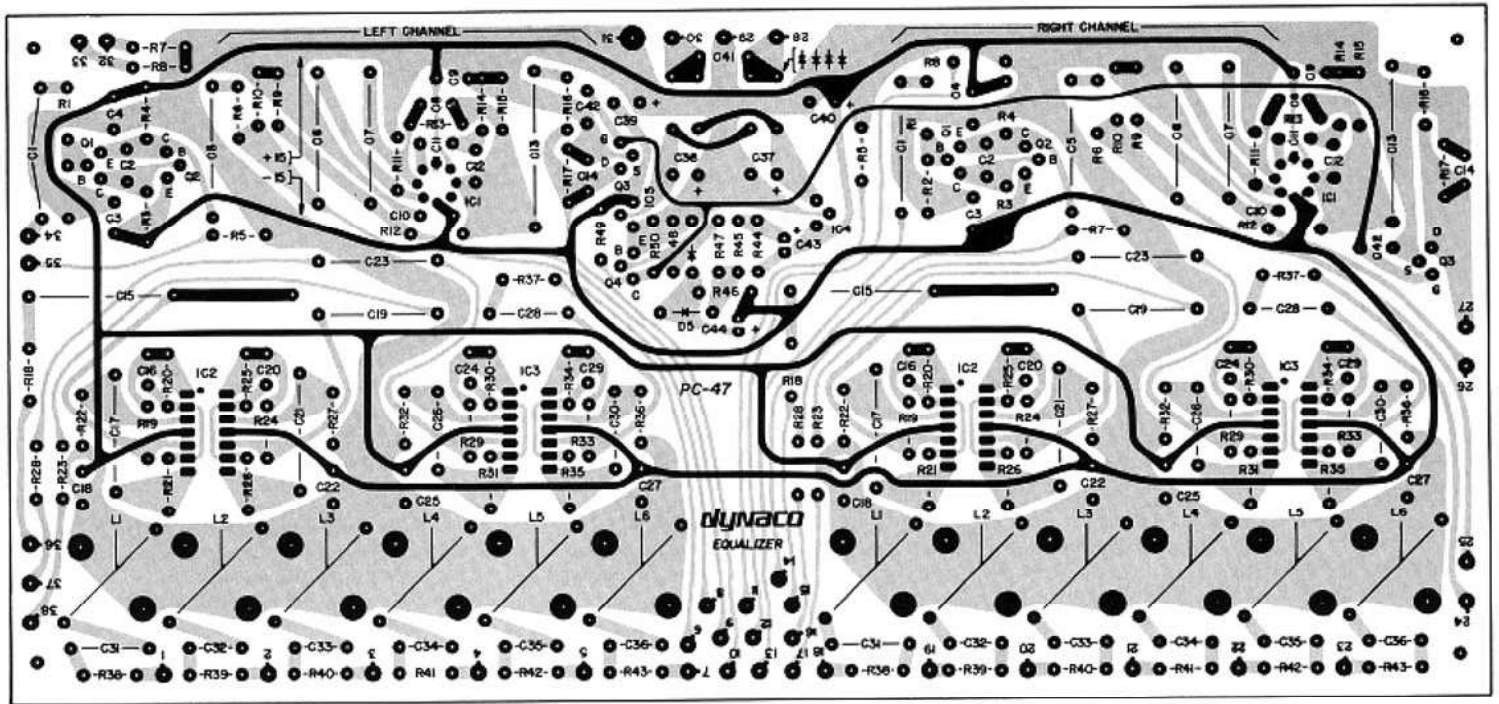
All voltages on PC-47 should be stable with incoming AC line variations from 100 to 130 volts, 60 Hz, unless indicated otherwise. All voltages are nominal $\pm 20\%$ unless specified. Condition of test: shorted input. NOTE: 0 means less than ± 10 millivolts; -V = -15 supply measurement.

SEMI-CONDUCTOR	DC VOLTAGE
Q1	
E	.7
B	.15
C	(-V) + .7
Q2	
E	-15, ± 1
B	(-V) + .7
C	.7
Q3	
S	0
G	-15
D	0
Q4	
E	0
B	-.7
C	-15

SEMI-CONDUCTOR	DC VOLTAGE
IC1	
1	-13
2	< ± 50 mv
3	< ± 50 mv
4	-15, ± 1
5	-13
6	< ± 50 mv
7	+15, ± 1
8	-.6
IC2/IC3	
1	< ± 50 mv
2	0
3	0
4	+15, ± 1
5	0
6	0
7	< ± 50 mv
8	< ± 50 mv
9	do not measure*
10	0
11	-15, ± 1
12	0
13	do not measure*
14	< ± 50 mv
IC4	
INP	≈ 1.5 v pp ripple +25 depends on line
OPT	+15, ± 1 (< 2 mv pp ripple)
IC5	
INP	≈ 1.5 v pp ripple -25 depends on line
OPT	-15, ± 1 (< 2 mv pp ripple)

*May cause unstable condition

NOTE: When measuring voltages, it is important to take volt meter accuracy into account. Most volt meters are specified for accuracy with respect to the range selected. This means, for example, that a voltage reading on a $\pm 5\%$ meter could be off by ± 1.5 volts on the 30 volt range. In the SE-10 this could imply an incorrect indication when measuring the regulated 15 volt supply, which has been specified ± 1 volt. Even if the supply were exactly 15 volts, a $\pm 5\%$ meter reading could indicate a voltage from 12.5 to 17.5 and still be within the specifications of both the meter tolerance and the voltage tolerance. It is therefore necessary to always consider the tolerances of *both* the voltage being measured and of the measuring instrument.



IN CASE OF DIFFICULTY

If there is an initial fault with your component system, or one develops in use, separate units enable relatively easy diagnosis of the source of the problem. Before blaming the electronics, check the connections on all components, particularly carefully on the preamplifier. See that the connections agree with the instructions supplied for each component. If a Dynaco PAT-4 preamplifier is employed and the SE-10 is connected to it, check to see that the monitor switch is in its "tape" position. If the PAT-5 is used, see that its E.P.L. switch is pushed on. On the SE-10, observe that the three button switches at the bottom of the front panel remain out.

If neither channel works with any program source (phono, tuner and tape), it is unlikely that all sources would be faulty. Electrically disconnect the SE-10 from the rest of the high fidelity system by restoring the monitor switch on the preamplifier to its "input" position (on the PAT-5, release the E.P.L. switch). If the system now operates, double check the connections between the preamplifier and the SE-10. Also substitute audio cables, for it is possible that one or a pair is defective (open or shorted).

A fault in only one channel of the SE-10 suggests interchanging audio cables at both ends of the cables. If the other channel now operates when the cables are interchanged, a cable is defective. If the fault remains in the same channel, one channel of the SE-10 is faulty.

Because 90% of the difficulties which are encountered in kit-built units can be attributed to incorrect wiring or to poor solder connections, it is strongly recommended that you ask someone else to check your wiring against the Pictorial Diagram, since frequently the builder will make the same error in checking as he did when building the unit.

There are certain general precautions to be observed when servicing any semiconductor equipment.

1. Never make circuit changes of any kind when the SE-10 is plugged in.
2. Be particularly careful not to short any semiconductor leads to each other or to the chassis when the SE-10 is turned on.
3. Exercise caution when soldering and unsoldering semiconductor leads to avoid excessive heat.

If circuit difficulties are encountered with the SE-10, the average builder will not likely be able to locate the source of the problem. **DO NOT ATTEMPT TO SERVICE THIS EQUALIZER UNLESS YOU HAVE THE KNOW-HOW AND SUITABLE TEST EQUIPMENT.**

CHECKING SEMICONDUCTORS

An ohmmeter can sometimes serve as a gross check for transistor or diode failure. The device must be removed from the circuit. Diodes should have a high resistance in one direction (probe polarity) and a low resistance in the other.

Transistor types vary widely in resistance, but a (near) short circuit indicates probable failure. Readings from base to collector should be similar to those from base to emitter. Both will have a higher reading with one probe polarity than with the reverse orientation. **NOTE:** Some types of solid state meters do not provide enough probe voltage to forward bias a silicon junction. Hence, a high resistance reading may be obtained in both directions.

Such gross checks can only ascertain clearly faulty semiconductors. More sophisticated test equipment, or direct substitution, is necessary to qualitatively evaluate their performance.

PROBLEM	INPUT	TEST POINT	SIGNAL @ TEST POINT	POSSIBLE CAUSE (SEMI-CONDUCTORS)*
1. No Output Either Channel	Shorting Jack	D1, D2; Cathode	+25 v DC (Line Dependent) ≈ 1.5 v Peak-to-peak Ripple	D1, D2, D3, D4 IC-4 (Shorted)
		D3, D4; Cathode	-25 v DC (Line Dependent) ≈ 1.5 v Peak-to-peak Ripple	D1, D2, D3, D4 IC-5 (Shorted)
		IC-4; Output Terminal	+15 v, ±1 v <4 mv Peak-to-peak Ripple	IC-4 +15 v Supply Line Shorted
		IC-5; Output Terminal	-15 v, ±1 v <4 mv Peak-to-peak Ripple	IC-5 -15 v Supply Line Shorted
2. Output Present but Greatly Attenuated	Any	SE-10 Output	≈ 22 dB Below Input Level	Q3, Q4
3. No Output	1 v Sine Wave @ 1 kHz	Q2; Collector	1 v	Q1, Q2
		IC-1; Pin 3	≈ 130 mv	IC-1
		IC-1; Pin 6	≈ 2 v	
4. Incorrect Equalization 30 or 60 Hz	.25 v Sine Wave @ 30 or 60 Hz	SE-10 Output	≈ 2 v	IC-2
5. Incorrect Equalization 120 or 240 Hz	.25 v Sine Wave @ 120 or 240 Hz	SE-10 Output	≈ 2 v	IC-3

CHART NOTES:

*Chart indicates possible defective semi-conductors, but associated components should also be investigated.

Problem, #2, #3, #4 and #5—Control Settings:

- Left/Right Gain Controls: +6 dB
- Input/Tape Switch: Input Position (out)
- EQ. 1/EQ. 2 Switch: EQ. 1 Position (out)
- Power Switch: On Position (in)
- Connect to: Line 1 Input

Problem #2 and #3 Only—Control Settings:

- Boost/Cut Slide Controls: Any Position
- EQ. In/Defeat Switch: Defeat Position (in)

Problem #4 and #5 Only—Control Settings:

- Boost/Cut Slide Controls: Slide control under test at full boost
All other slide controls at 0
- EQ. In/Defeat Switch: Equalize Position (out)

SERVICE POLICY AND LIMITED WARRANTY

The SE-10 has been carefully engineered to provide many years of musical enjoyment without difficulty. Each factory-assembled SE-10 has been subjected to a full complement of performance tests prior to shipment. Nevertheless, through damage in transit, faulty kit assembly, or human error, service may sometimes be required.

To provide rapid and reliable service, Dynaco has authorized competent, well-equipped service facilities in several localities in the United States and Canada, in addition to its service facility at the factory. These stations are authorized to make repairs in and out of warranty under the terms listed below. Service is always available at the factory, but you will often find a more convenient facility locally. A current list of these facilities is enclosed. Write to Dynaco for the name of the service station nearest you.

It is the owner's responsibility to *take or send the unit freight prepaid to the service facility. A dated bill of sale must be submitted.* In the event that you incorrectly diagnose which unit is faulty, please understand that you will be responsible for a check-out charge on any properly performing kit or factory-assembled unit submitted for testing.

Shipment should be made via United Parcel Service (Express in Canada), whenever possible. **DO NOT USE PARCEL POST FOR IT IS NOT A SAFE METHOD OF SHIPPING ELECTRONIC EQUIPMENT.** Should damage occur because of parcel post shipment, repairs will be made at the owner's expense, as neither the factory nor the service stations has the facilities to process parcel post claims. Insure the carton for the full value of a *factory wired SE-10.*

When shipping the equalizer, use the original carton with all the styrofoam inserts and plastic bag. Include with the returned unit the following information:

1. Your name and complete shipping address (Post Office box numbers are not suitable);
2. The serial number (from the cover of this manual), *together with a copy of your dated bill of sale;*
3. The symptoms, complete, but preferably brief. If the problem is intermittent, this *must* be noted.

Once service work has been performed, an additional 90 day warranty on the service work is provided.

Warranties apply to the original purchaser only; they are not transferable. They do not apply to units which have been physically or electrically abused, or to units which have been modified without prior written factory authorization. The use of non-Dynaco replacement parts may in some instances void the warranty. If you suspect a defect in a transformer, the leads must be unsoldered, not cut for its return. The warranty on the transformer is void if the leads have been cut too short for re-use.

Dynaco maintains a Technical Services Department to help you locate the source of, and possibly correct a problem yourself. When writing, mention the serial number of the SE-10 and any tests you have performed.

WARRANTY FOR KIT-BUILT UNITS

The components in a SE-10 kit are warranted for a full year from the purchase date. If a defective component is found in a completed circuit board module, or kit, simply return that individual part to the *factory* prepaid, and it will be replaced at no charge. Local service stations are not obligated to supply separate parts.

If you cannot locate the source of the difficulty, ship the entire SE-10 to the nearest authorized service station or to the factory for service. A dated bill of sale must be submitted. In-warranty parts will be replaced at no charge, although a service fee will be charged for the labor to diagnose, correct, and test the unit to ensure that it meets factory specifications. Shipping charges to and from the service facility are the owner's responsibility. Units will be returned on a COD basis via United Parcel Service wherever possible.

The return of the PC-47 circuit board for service to the factory or to an authorized service station is not adequate to assure proper operation, and a single circuit board submitted for repair will be returned unserviced.

The warranty is void if the kit has not been completely assembled, or if other than rosin core solder has been used. Units assembled with acid core solder or paste flux will be returned unserviced.

WARRANTY FOR FACTORY ASSEMBLED UNITS

The SE-10 is warranted for a full year from the purchase date, including parts and labor, and shipment costs *from* the service facility to the owner (within the U.S. or Canada). The owner is responsible for shipment *to* the service facility, and must submit a copy of the dated bill of sale.

SERVICE BEYOND THE WARRANTY PERIOD

Dynaco establishes maximum labor fees which may be charged by its service facilities (plus the cost of parts, and shipping charges) without prior approval by the owner. A current list of authorized service stations, and the current established fee for any unit will be supplied by Dynaco on request. Dynaco cannot assume responsibility for service at other than *Dynaco authorized service stations.*

Dynaco reserves the right to limit the service facility or the established fees to two years from the date of purchase. Dynaco assumes no liability or responsibility for injury or damages sustained in the assembly or operation of this equipment, or for damages to other equipment connected to it. Dynaco reserves the right to make design changes without the obligation to revise prior versions. Prices and specifications subject to change without notice.

PARTS LIST

Parts of a similar type which do not change performance will sometimes be included as a matter of expediency. This will account for slight variations in value and appearance. To avoid a shortage, extra hardware may be included for some sizes.

	PART #
1 Back panel, black, steel	711059
1 Chassis, black, steel	711057
1 Cover, black, steel	711027
1 Front panel, black, steel	711058
1 Front plate, decorative, aluminum	769047
1 Circuit board assembly, PC-47	957047
1 Transformer, power	464025
2 AC outlet, convenience, black	351012
2 Cable, audio, pair	321073
20 Control, slide, 10,000 ohms	160103
1 Fuse holder	341003
1 Insulator, cardboard sheet	805016
1 Label, serial number	898011
1 Label, caution, fuse replacement (Canada only)	898019
1 Lamp, pilot, red neon	521021
1 Line cord	322092
2 Socket strip, 6-input	355007
1 Switch, 3-position, button	338005
1 Switch, single-position, button	338006
3 Terminal strip, 2-lug	372004
1 Cable, shielded, audio, 12 feet	
1 Wire, #20 hookup, black, 11 feet	
1 Wire, #20 hookup, blue, 8 feet	
1 Wire, #20 hookup, yellow, 8 feet	
1 Warranty Card	
1 Manual, instruction	
<i>Slide Control and Knob Assembly</i>	997178
2 Control, slide, 50,000 ohms	160503
22 Knob, slider control	764199
<i>Fuse-Capacitor Assembly</i>	997179
1 Capacitor, .02 mfd, disc	227203
1 Fuse, .1 ampere Slo-blo	342101
4 Knob, push button switch	814051
1 Strain relief	895001
4 Wire tie, plastic	894003
<i>Spacer Assembly</i>	997180
1 Lamp shield, tubular	883000
4 Foot, rubber	859001
5 $\frac{3}{8}$ " Dia. x .4" tubular spacer	660262
4 $\frac{3}{8}$ " Dia. x 1 $\frac{1}{2}$ " tubular spacer	660263
<i>#1 Hardware Assembly</i>	997181
17 #4-40 x $\frac{3}{8}$ " oval head machine screw	611265
15 #4-40 KEP nut (lockwasher attached)	615244
8 #4 lockwasher	617205
4 #6-32 x 2" oval head machine screw	611324
4 #6-32 x $\frac{3}{8}$ " oval head machine screw	611330
<i>#2 Hardware Assembly</i>	997182
11 #6-32 KEP nut (lockwasher attached)	615304
13 #6 black self-tapping screw	613349
4 #6-32 x $\frac{3}{4}$ " hexagonal fastener	660264
4 #6 x $\frac{3}{8}$ " Dia. flat washer	616364
1 Tinnerman™ nut, spring steel	615080