dynaco

PAT-5 BI-FET™ PREAMPLIFIER

SERIAL NUMBER

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

INSTRUCTIONS FOR ASSEMBLY OPERATION

BI-FET IS A REGISTERED TRADEMARK OF NATIONAL SEMICONDUCTOR.

dynaco inc. COLES ROAD & CAMDEN AVENUE / POST OFFICE BOX 88
BLACKWOOD, N. J. 08012, U.S.A.

PAT-5 TYPICAL HOOKUP

LEFT CHANNEL SHOWN
RIGHT CHANNEL IDENTICAL

WIRING SYMBOLS

SHIELDED AUDIO CABLE ——

LAMP ("ZIP") CORD - - - -

TAPE DECK 2

INPUT OUTPUT

TAPE DECK 1

LINE IN LINE OUT

TUNER

TURNTABLE 2

TURNTABLE 1

TURNTABLE
UNSWITCHED
SWITCHED

OUTLET
TOTAL
15A. MAX.
120 V. ~

TUNER
SWITCHED

AMPLIFIER

TO WALL OUTLET

CAUTION—TO PREVENT ELECTRICAL SHOCK, DO NOT REMOVE COVER.
NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL

LEFT
RIGHT
OUTPUT 2
OUTPUT 1
TAPE OUT 2
TAPE OUT 1
E.P.L OUT
E.P.L IN
SPARE
TAPE 2
TAPE 1
TUNER
PHONO 2
PHONO 1
GND
PHONO GAIN

PAT-5 STEREO PREAMPLIFIER

AMPLIFIER
LEFT RIGHT
OUTPUT INPUT

A-"MAIN" SPEAKERS
LEFT
RIGHT

B-"REMOTE" SPEAKERS
LEFT
RIGHT

EQUALIZER
OUTPUT INPUT

DYNACO PAT-5 SOLID STATE STEREO PREAMPLIFIER

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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.

The DYNACO PAT-5 is the control center and preamplifier for your high fidelity stereo system, which is used in conjunction with a power amplifier, such as the Dynaco Stereo 416 or other basic power amplifier, and pairs of speakers. When the outputs from the amplifier are connected to the preamplifier, two pairs of speakers may be selected, and any impedance headphones may be connected to the front panel of the preamplifier.

The PAT-5 provides flexibility and features not found in many other preamplifiers. Therefore, please read the INSTALLATION and OPERATION instructions thoroughly, and correlate them with the hookup diagram opposite as connections are made.

INSTALLATION

AUDIO CONNECTIONS

Twelve *pairs* of audio inputs and outputs are provided in two rows, each pair marked for function. The top row is for the left (A) channel; the bottom row is for the right (B) channel. Each requires connection by a single conductor shielded cable.

We believe that there will be less confusion if connections are made in the order given here. However, if a different sequence is followed, *always* see that the POWER switch of the PAT-5 is turned off, and then connect the line cord.

Phono 1 / Phono 2

These identical inputs are for connection from phono cartridges requiring preamplification and the standard RIAA equalization. Connect *Phono 1* to the turntable most used, because it is conveniently placed next to the *Tuner* input on the SELECTOR switch. *Phono 2* is connected to a second turntable, if one is used, or remains unconnected.

Between these inputs is a switch marked *Phono Gain*. The LO or normal position supplies proper gain for nearly all magnetic cartridges made. The LO position should be employed, unless a moving coil cartridge is used. In the HI position, 6 decibels more gain is provided to accommodate some brands of moving coil cartridges without using additional transformers or electronics.

When a turntable has an extra lead for grounding, a screw GND is provided for this purpose. It is advisable, however, to use the *minimum* number of separate ground leads to achieve lowest hum. Extra leads sometimes cause more hum, and some experimentation may therefore be required.

Tape 1 / Tape 2

These two inputs receive flat high level signals. They are for *playback* from two tape decks. *Tape 1* is connected to the deck most used or if only one deck is employed, because of its position adjacent to *Tuner* on the SELECTOR switch. They are otherwise identical in operation and level.

The labeling for the output of tape decks varies somewhat, but they are usually called "line output", "preamp output", or simply "output".

Tuner / Spare

These two identical inputs also receive flat high level signals. Connect the *Tuner* input to the output from AM/FM/Multiplex radio tuners. A tuner with an output of about 0.5 volt or greater @ 100% modulation is suitable. Connect the *Spare* input from a third tape deck, audio signals from a television set, or leave unconnected.

Tape Out 1 / Tape Out 2

Connect *Tape Out 1* to the recording input of the tape deck which is already connected for playback purposes to the *Tape 1* input on the PAT-5. Similarly connect *Tape Out 2* to the input of the deck already connected to the *Tape 2* input on the PAT-5.

Recording input labeling varies somewhat, but "line input", "high level", "radio", or simply "input" are typical nomenclature for tape decks. These inputs should require signal levels between 100 millivolts and one volt for full recording level. Microphone inputs therefore cannot be used, because their sensitivity is too high.

Tape Out 1 and *Tape Out 2* are located *before* the volume, balance, filter and tone control circuits so that these controls will have no effect on the signal out to the tape decks during recording. These controls may, therefore, be adjusted as desired for listening without affecting the recording process.

If you wish to alter tonal balance for recording purposes, see the description further on under *Output 1* and *Output 2*.

The PAT-5 does not provide the equalization and bias requirements of a complete recording preamplifier. It therefore cannot be used for this purpose.

E.P.L. Out / E.P.L. In and E.P.L. Switch

This output/input combination is designed for use with a separate speaker or octave equalizer such as the Dynaco Equalizer. This pair of connectors is located before the volume and balance controls, in parallel with the tape outputs and inputs, and is controlled by the E.P.L. switch (External Processor Loop) on the front panel. Connect from *E.P.L. Out* to the input of the separate equalizer, and from the output of the equalizer to *E.P.L. In*. When the E.P.L. switch is pushed on, the equalizer is connected in the circuit. When this switch is out, the equalizer is by-passed (as if it were not connected at all), even though plugged into the PAT-5. Therefore, if an external equalizer is used, the E.P.L. switch must always be pushed on. If these connections are not used, the E.P.L. switch must remain out or there will be no output from the PAT-5.

This pair of outputs and inputs may be used for connection of an active "4-channel" matrix decoder. *E.P.L. Out* is connected to the input of the decoder, the front channel output of the decoder is connected to *E.P.L. In*, and the rear channel output of the decoder is connected as directed in the decoder's instructions to another control amplifier or basic amplifier.

It is also possible to use these connections as a channel reverse switch. To do this, connect a short shielded audio cable from the left *E.P.L. Out* to the right *E.P.L. In*, and a second audio cable from the right *E.P.L. Out* to the left *E.P.L. In*. When thus connected, pushing on the E.P.L. switch will reverse *Output 1* and *Output 2* channels of the PAT-5 (*Tape Out 1* and *Tape Out 2* are unaffected).

It is possible to rewire the *E.P.L. Out* and *E.P.L. In* connections at another circuit location, if needed. See the SPECIAL OPTIONAL MODIFICATION section on page 29.

Output 1 / Output 2

Connect *Output 1* via the shielded audio cables supplied to the audio input of the power amplifier. *Output 2* may be used to connect a second amplifier, if desired, or to a tape deck if the full facilities of the PAT-5 are needed for recording purposes. Otherwise, *Output 2* remains unconnected.

There are no electrical differences between *Output 1* and *Output 2*. They are connected in parallel. Both provide low impedance, unbalanced signal output. If longer shielded cables are required, any length up to 50 feet may be used.

If you wish to alter tonal balance for recording onto a tape deck, all the controls on the PAT-5 can be used if *Output 1* or *Output 2* is used. The VOLUME control will then change not only the speaker and/or headphone level, but also the signal level going onto the tape deck. The filters, stereo-mono switches, tone controls and even a separate equalizer (through E.P.L.) may be helpful when transfering older discs to tape, for example. A higher signal level can also be obtained from these outputs, but it will be necessary to advance the VOLUME control somewhat, which may provide too much signal for simultaneous listening over speakers or headphones. You may therefore wish to turn off the power amplifier once the proper tonal correction has been achieved.

AMPLIFIER AND SPEAKER/ HEADPHONE CONNECTIONS

Six *pairs* of terminals are supplied on the PAT-5 to enable front panel selection of two sets of speakers and operation of headphones. These terminals are 3-way binding posts, which will accept single "banana plugs", professional double banana plugs with ¾" spacing, spade lugs, or simply stranded wire. The "hot" binding posts are red; the "ground" or common posts are black. Six red and 6 black single banana plugs are supplied to aid in this connection.

The black binding posts are all tied together. They are *not* connected to the chassis to avoid the possibility of hum loops. All Dynaco tube and solid state amplifiers have their output common terminals connected together, and therefore they may be connected to the PAT-5. (There are a very few amplifiers which cannot have their common terminals thus connected. The outputs of such amplifiers cannot be connected to the PAT-5 for speaker selection or headphone use. If in doubt, contact the maker of the amplifier.) Lamp cord ("zip cord"), #18 or #16 gauge, available from hardware and electrical supply stores, is suitable for this hookup. Proper phase sense is easily maintained with lamp cord, because one conductor is coded with a molded ridge on the outer insulation.

If only one stereo pair of speakers is planned, and headphones are not used, these connections need not be made. Instead, hookup may be made directly from the amplifier to the speakers.

Left Amplifier / Right Amplifier

Attach a red banana plug to the one conductor of lamp cord coded with a molded ridge, and attach a black banana plug to the other conductor next to it. Connect the red plug to the red *Left Amplifier* binding post on the PAT-5, and the black plug to the black *Left Amplifier* binding post. Connect the *coded* conductor at the other end to the left "hot" output on the amplifier (coded red on all Dynaco solid state amplifiers), and the remaining free conductor to the left common or ground output on the amplifier.

In a similar manner, connect the red and black *Right Amplifier* binding posts on the PAT-5 to the "hot" and common outputs on the right channel of the amplifier.

Once this connection is made, the circuit is complete for front panel use of headphones.

A-L / A-R / B-L / B-R Speakers

Connection from these binding posts on the PAT-5 via the remaining banana plugs and lamp cord will enable front panel selection of speakers "A" or "B", or "A + B" simultaneously. Usually speakers "A" are the most commonly used stereo pair and "B" the least used, although electrically it makes no difference.

Connect the red and black binding posts marked *A-L* to the left "A" speaker. Be sure to maintain similar wiring sense for each speaker, so that all speakers will be connected *in phase*. Normally the black common PAT-5 binding post is connected to the (−), common or ground terminal on each speaker, and the red "hot" binding post to the other speaker terminal. As mentioned before, proper phasing sense is easily attained with lamp cord because one conductor has a molded ridge on the insulation.

In the same manner, connect the red and black binding posts *A-R* to the right "A" speaker. Similarly connect *B-L* and *B-R* to a second pair of stereo speakers.

AC CONNECTIONS AND POWER SWITCH

There are four AC outlets. Three are switched on and off with the front panel POWER switch, and one remains on at all times. Connect the power cords from associated equipment as follows:

1. The amplifier to one of the *switched* outlets. If the amplifier has a 3-wire power cord, such as the Dynaco Stereo 416, an adapter with a separate green ground wire may be obtained locally. You may wish to experiment reducing system hum by soldering an insulated extension to the green ground wire and attaching it to the center screw of the same wall outlet plate to which the PAT-5 will be connected.
2. The tuner to a *switched* outlet.
3. The equalizer to a *switched* outlet.
4. The turntable to an *unswitched* outlet. Many turntables and changers have idler wheels and pulleys which are disengaged through use of their on-off switches.
5. The tape deck to an *unswitched* outlet, since all decks have idler wheels which normally engage and retract by mechanical means on the deck.

Once connected, as outlined, the amplifier, tuner and equalizer power switches may be turned on at all times. Thereafter the POWER switch on the PAT-5 will turn them on and off.

After making certain that the POWER switch is turned off (lever down), plug the power cord from the PAT-5 into a *wall outlet* providing 120 volts (alternately 240 volts), 50/60 Hz on a 15 ampere (minimum) circuit if the Stereo 416 or other high power amplifier is used. If an extension to the power cord is needed, use only a heavy duty two conductor type (15 Amp. rating or heavier).

It is very important to use the POWER switch on the PAT-5 to turn the high fidelity system on and off. A separate wall switch or relay-activated switch box, used rarely with installations, should NEVER be employed, because the *circuits of the preamplifier are designed to remain on at all times,* regardless of the position of the POWER switch on the PAT-5. Moreover, if you want to unplug the PAT-5 for any reason, make certain that its POWER switch is turned off prior to removing the plug. When reinstalling the plug, leave the POWER switch turned off until the plug is connected. This is to avoid a circuit transient from passing through the amplifier and speakers.

The PAT-5 generates very little heat. Normal air circulation provides adequate ventilation. However, since the circuits of the preamplifier remain on at all times once it has been connected to a wall outlet, its exterior surfaces will become sightly warmer than the surrounding air temperature. Leaving the circuitry connected provides several benefits: 1) The slight heat generated by power supply resistors helps to drive off moisture; shortly after installation, the PAT-5 thus forms its own stable internal environment; 2) The electrolytic capacitors stay at operating voltage and are constantly "formed" so that potentially annoying start up control and switch noises and transients are virtually eliminated; 3) The components will last far longer, because they are not being cycled on and off. The unit draws 12 watts—the same current as three electric clocks. Energy conservation purists may, however, alternatively connect the PAT-5 for fully off switching, as noted in the manual under SPECIAL OPTIONAL MODIFICATIONS on page 29.

OPERATION

The Dynaco PAT-5 is provided with functional, useful controls and switches on its front panel, together with a logical layout commensurate with good engineering design. For example, the two most-used controls—SELECTOR and VOLUME—have larger knobs than the others. The eye therefore tends to focus on them, which helps the uninitiated to use the preamplifier properly at the outset.

Following are descriptions of the controls and switches on the PAT-5. Some are common to all preamplifiers. Several are familiar, but operate different from other units. A few are altogether new.

SELECTOR Switch

This switch connects a choice of program source, both channels simultaneously, together with proper equalization for magnetic phonograph. All program sources, including tape deck playback, are selected by this switch. In the PAT-5 there are a pair of monitor switches as well (described later), but routine playback from a tape deck is handled the same way as all other inputs to simplify usage.

VOLUME Control

The output of both channels is controlled simultaneously by this control, with close tracking of the two stereo channels so that the program source remains in balance over most of its range. The taper rate of the VOLUME control has been chosen to provide a slow increase in gain over the first half of rotation and a more rapid gain increase above 12 o'clock. This enables most satisfactory operation with both low and high efficiency speakers.

BALANCE Control

This control is normally turned to the position that provides equal signal strength to both channels. Its position will vary somewhat from one program source to another, depending upon the accuracy of balance of the source. Rotation to the right shifts the apparent sound to the right by reducing the left channel level, and conversely to the left. This control has a very gradual action in the first 90° of rotation either side of center, but its action increases rapidly to the extremes of rotation, where one channel or the other is silenced.

A BALANCE control is required for those sources which are not accurately balanced, and further it is possible that the speakers used may have different efficiencies, or some rooms may absorb more sound energy from one speaker than from the other. A certain amount of adjustment is

If a tape deck(s) does not have a separate playback head and facilities for playback monitoring, whether the INPUT/MONITOR switch is out or on will provide only the program source. Recordings made on decks with only two heads cannot monitor during recording. They have to be listened to after the tape copying is completed.

2. To record onto *one* tape deck from a tuner or turntable, set up as in Example 1, except that before recording it is good practice to engage the TAPE 1/TAPE 2 switch to the appropriate position. Monitoring, as before, is obtained by pushing on the INPUT/MONITOR switch.

3. Tape dubbing (recording from one tape deck to another) is equally easy and may be achieved in either direction.

Tape 1 (playback) to *Tape 2* (recording) dubbing sequence:

(a) Turn SELECTOR switch to *Tape 1*;

(b) Push on TAPE 1/TAPE 2 switch (Do not release this switch during recording; see note below);

(c) Begin recording;

(d) Release INPUT/MONITOR switch to hear the source or push on to hear the tape copy.

Tape 2 to *Tape 1* dubbing sequence:

(a) Turn SELECTOR switch to *Tape 2*;

(b) TAPE 1/TAPE 2 switch out (Do not push on during recording; see note below);

(c) Begin recording;

(d) Release INPUT/MONITOR switch to hear the source or push on to hear the tape copy.

IMPORTANT NOTE: *Tape decks connected to the PAT-5 should always be kept in their tape playback modes unless you wish to actually record with them. In addition, the sequence of record and playback monitoring should be followed faithfully, as given in the above examples, or it is possible that* electrical *feedback may occur in the* tape deck, *because the output of the deck is being fed back through the PAT-5 to the input of the deck. Thus the tape outputs on the PAT-5 are always "live", irrespective of the position of the* SELECTOR *switch. The resulting squeal of feedback will be on the tape copy, if you are recording, but in any case may pin the meters on the deck, and may even damage the power amplifier, headphones or speakers from excessive level.*

This admonition applies equally to 2- and 3-head tape decks.

In short, use the tape monitoring facilities on the PAT-5 only when recording. Otherwise, the INPUT/MONITOR *switch should remain in its out position.*

If a third tape deck is connected to SPARE for playback, it is not possible to record onto this deck from either deck connected conventionally to the PAT-5, or from any other program source.

If you wish to dub from one tape deck to another while listening to a source other than the decks, it is advisable to directly connect the decks separate from the PAT-5.

STEREO / MONO Switches

This pair of switches normally remain in the stereo mode, with each switch in its out position. Three additional choices are provided: 1) The *left* input channel "L" is switched through both outputs by pushing on switch *L* (*R* remains out); 2) The *right* input channel "R" is switched through both outputs by pushing on switch *R* (*L* remains out); 3) An "L + R" or combined mono signal is obtained when both switches are pushed on.

If 6 dB of separation is wanted instead of a pure mono signal when the two switches are pushed on, directions for making this change will be found in this manual under SPECIAL OPTIONAL MODIFICATIONS on page 30. This amount of separation is useful to restore more nearly normal stereo perspective when listening with headphones.

LOW FILTER Switch

When pushed on, the LOW FILTER reduces the level of low frequencies at the rate of 6 dB per octave below 30 Hz, and conforms to the newly revised RIAA phono playback curve to reduce rumble and other low frequency disturbances in discs.

HIGH FILTER Switch

The HIGH FILTER, when pushed on, provides a very smooth, sharp reduction of high frequencies at the rate of 15 dB per octave (−10 dB @ 10 kHz). It is beneficial in reducing unwanted noise in tape, disc and broadcasting sources without materially affecting the musical content.

HEADPHONE Jack

This output jack uses the universal headphone symbol. A standard 3-circuit phone plug fits this jack, wired so that the tip connection is the left channel (in accordance with the unofficial U.S. "standard"). Low and medium impedance dynamic stereo headphones (4 ohms to 2000 ohms) may be directly connected when the output from the power amplifier is connected to the PAT-5, as described earlier. If electrostatic headphones are used, or if the headphones seem to be too loud or too soft, information for changes will be found in this manual under SPECIAL OPTIONAL MODIFICATIONS on page 30. If quadraphonic headphones are used, it will be possible to connect only the phone plug identified for "front" supplied with the headphones.

Panel Mounting and Wood Cabinets

The PAT-5 may be mounted in any position—even face up in a cabinet. For panel mounting, an accessory PBK bracket kit is available for $3.00 post paid. No COD's please. A singular rectangular cutout 13″ x 3-13/16″ is required in any panel up to 1″ thick. An accessory RMA bracket kit is also available to mount this unit in a standard 19″ rack. Its cost is $19.95 post paid.

Two types of accessory walnut wood finish cabinets are available for the PAT-5. There is a single cabinet for the preamplifier alone, and a double cabinet to house any Dynaco tuner atop the PAT-5.

If a tape deck(s) does not have a separate playback head and facilities for playback monitoring, whether the INPUT/MONITOR switch is out or on will provide only the program source. Recordings made on decks with only two heads cannot monitor during recording. They have to be listened to after the tape copying is completed.

2. To record onto *one* tape deck from a tuner or turntable, set up as in Example 1, except that before recording it is good practice to engage the TAPE 1/TAPE 2 switch to the appropriate position. Monitoring, as before, is obtained by pushing on the INPUT/MONITOR switch.

3. Tape dubbing (recording from one tape deck to another) is equally easy and may be achieved in either direction.

Tape 1 (playback) to *Tape 2* (recording) dubbing sequence:

(a) Turn SELECTOR switch to *Tape 1*;

(b) Push on TAPE 1/TAPE 2 switch (Do not release this switch during recording; see note below);

(c) Begin recording;

(d) Release INPUT/MONITOR switch to hear the source or push on to hear the tape copy.

Tape 2 to *Tape 1* dubbing sequence:

(a) Turn SELECTOR switch to *Tape 2*;

(b) TAPE 1/TAPE 2 switch out (Do not push on during recording; see note below);

(c) Begin recording;

(d) Release INPUT/MONITOR switch to hear the source or push on to hear the tape copy.

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This output jack uses the universal headphone symbol. A standard 3-circuit phone plug fits this jack, wired so that the tip connection is the left channel (in accordance with the unofficial U.S. "standard"). Low and medium impedance dynamic stereo headphones (4 ohms to 2000 ohms) may be directly connected when the output from the power amplifier is connected to the PAT-5, as described earlier. If electrostatic headphones are used, or if the headphones seem to be too loud or too soft, information for changes will be found in this manual under SPECIAL OPTIONAL MODIFICATIONS on page 30. If quadraphonic headphones are used, it will be possible to connect only the phone plug identified for "front" supplied with the headphones.

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Two types of accessory walnut wood finish cabinets are available for the PAT-5. There is a single cabinet for the preamplifier alone, and a double cabinet to house any Dynaco tuner atop the PAT-5.

CIRCUIT DESCRIPTION

The components in the PAT-5 are of the highest quality to protect against failure, and all parts are operated conservatively with close tolerances to assure proper operation for many years. The transistors and integrated circuits have been thoroughly researched and selected for minimum noise and distortion in sustained use, and the printed circuit boards associated with audio signals have been pretested in the circuit to ensure that every unit will meet the laboratory prototype-like specifications.

The written specifications can only begin to convey the audio performance of the PAT-5. It achieves sonic accuracy without stridency of any kind, and its utter neutrality gives the impression of direct contact with the original signal, such as a fine camera/lens combination achieves in photography.

Each audio channel of the PAT-5 basically consists of three circuit elements: preamplifier-equalizer circuit, control circuit, and tone control-output circuit. The power supply is fully regulated.

The preamplifier-equalizer is a direct coupled NPN/NPN transistor pair operated at 42 volts B+. Parameters have been adjusted for optimum noise, gain, frequency response, input acceptance, stability, and distortion. All feedback is DC connected. The input stage is not affected by the source impedance of the phonograph cartridge so that the cartridge cannot alter the RIAA equalization.

The control section of the circuit, which comprises volume, balance, stereo-mono, low and high filter functions, is driven by a voltage follower containing a PNP/NPN direct coupled transistor pair at low impedance.

The tone control-output section uses a high performance operational amplifier integrated circuit as the entire gain element. DC feedback around the operational amplifier is constant in all modes; only AC feedback is altered for tone control operation. The high frequency RC filter network utilizes an active, low noise two transistor NPN/NPN configuration.

The multiple-stage power supply uses a series regulator transistor with a separate zener diode generated reference voltage for the + 42 volts used for the preamplifier circuit. The ± 15 volt supplies utilize shunt design zener diode regulation for the control and tone control-output circuits, and + 15 volts for the active RC filter network. A fully regulated supply has been chosen so that variations of line voltage from 100 to 130 volts AC (alternately 200 to 260 volts) 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. The audio circuits of the PAT-5 therefore always remain stable, because the outputs from the power supply do not "pump" or shift in voltage.

The nominal output impedance of the PAT-5 is 600 ohms unbalanced, which enables it to be used with long output cables and to be 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 tube or solid state amplifier may connect to it. If a lower impedance load is connected, there will be some reduction in the maximum output level which can be obtained with low distortion.

ASSEMBLY INSTRUCTIONS

GENERAL ASSEMBLY INFORMATION

Construction of the PAT-5 is exceptionally simple when compared to other kits. The printed circuit boards for audio have been preassembled and tested 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 worry about the time.

When unpacking your kit, check off the components against the parts list at the back of the manual. You can identify unfamiliar parts by matching them to the pictorial diagram or photograph.

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 screwdriver (¼" blade).
5. Long nosed and diagonal cutting pliers.
6. Heavy "slip joint" pliers.
7. A single edged razor blade or inexpensive wire stripping tool for removing insulation.
8. A few wood toothpicks to remove solder from eyelets.
9. A wood or cardboard match with its head removed.
10. Transparent tape.
11. 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 boards—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.

You should realize that delicate components such as transistors are less likely to be damaged in the soldering process if you use a hot iron 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.

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.

When the instructions refer to "tinning" a wire, apply the solder to the wire so that the solder lightly coats the wire. This makes it easier to get a good connection when the wire is inserted into an eyelet, for example.

Whenever one wire is to be soldered to a connection such as a lug or an eyelet, 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 so state. (S-2), for example, indicates that 2 wires are to be soldered to the named lug. If no symbol is shown, do not solder; further connections will be made to that point before soldering is called for.

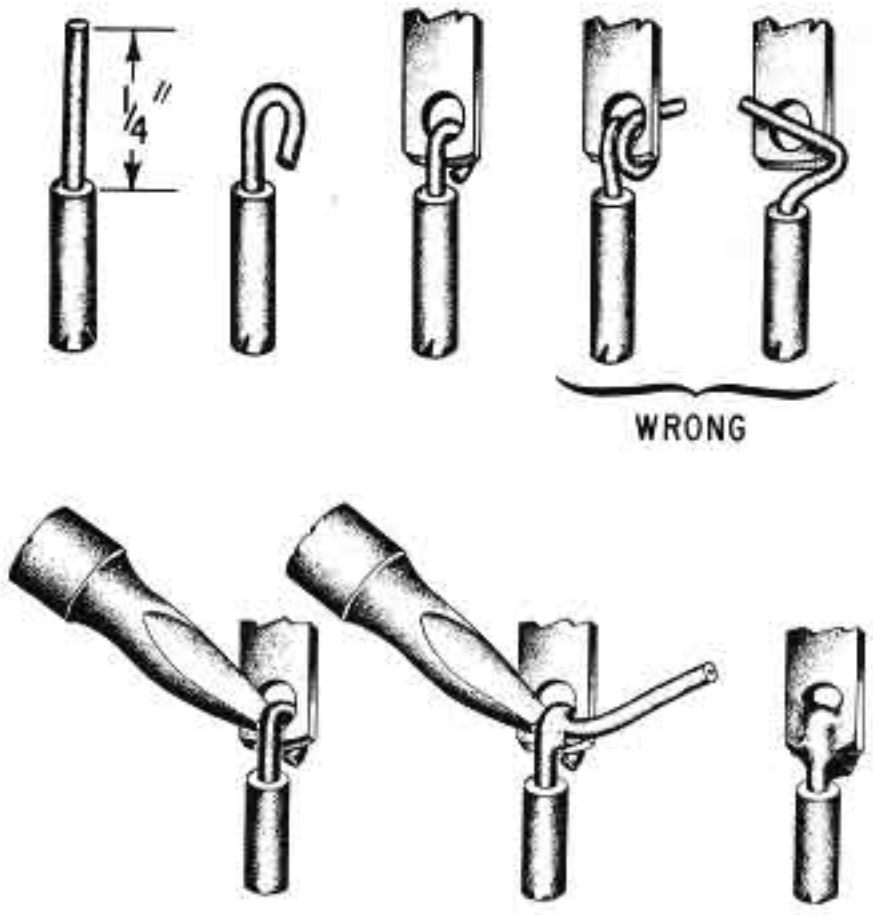
Components such as resistors and capacitors are marked individually with their values, or with a color code. The color code will be given in the instructions when needed. The first color band on a resistor is the one nearest the end.

All mounting screws are installed from the *outside* of the chassis, and a nut with lockwasher attached, called a KEP nut, is used, except where otherwise indicated.

A number of steps begin, "Prepare one end of a wire . . .", with the length of wire specified. In each case, first cut a piece of the correct color wire to the specified length, and then remove about ¼" of insulation from *each* end before making the connection. This is easiest with wire strippers, but diagonal cutters can be used if you are careful not to nick the wire and weaken it. With stranded wire such as transformer leads and line cords, be particularly careful not to cut the strands when stripping the ends.

The position of all wire leads should follow the diagram and photograph 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.

Check your work after each step. 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.



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 ¼-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.

When soldering a lead to an eyelet on the circuit board, the PAT-5 makes it easy to apply the iron to one side of the board while the tinned wire end is pressed into the solder-filled eyelet from the opposite side. When the eyelet is heated, the wire enters easily, but be careful that you *do not push the wire all the way into the eyelet up to the insulation.* If you do, you will not be able to see if you have made a secure connection, or if more solder is needed to provide a smooth flow from the wire, to the eyelet, and onto the circuitry on the board.

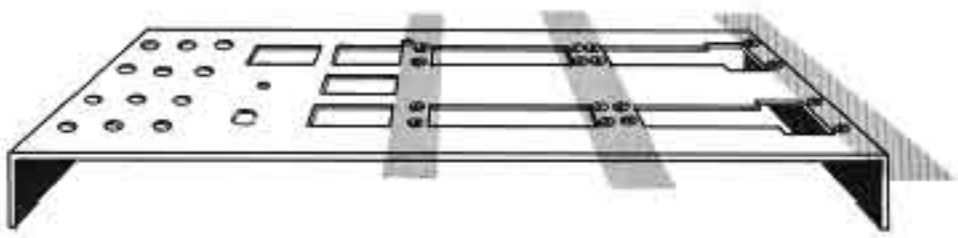
Transistor equipment, unlike much tube equipment, will not tolerate wiring errors, sloppy or incomplete soldering. TAKE THE TIME TO BE NEAT AND ACCURATE, and your preamplifier will operate properly at first, and for many years to come.

BACK PANEL ASSEMBLY

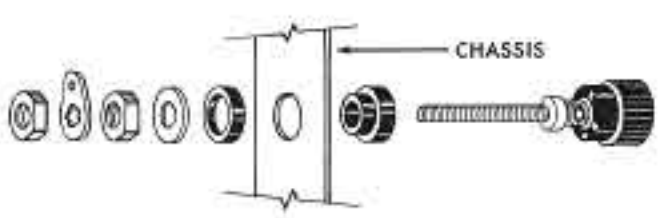
Most of the hardware used to mount parts in this kit is #4-40 x 5/16". Use this size, unless otherwise indicated.

1( )Select the painted back panel. Notice on the inside that two areas, one large and the other small, have no paint. Clean these two areas 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 four 6-socket input strips, sixteen each screws and KEP nuts, the twelve lockwashers, three ground lugs, and the 2-lug terminal strip. The quickest installation method is to insert all 16 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*. See the sketch below. The 2-lug terminal or a ground lug is used first on the inside on the corner screw for each of the 4 strips, as shown in the Pictorial Diagram, and the lockwashers on the remaining 12 screws. Next install the input strips (they mount in either direction) and fasten with a KEP nut on each screw. Remove the tape, orient the 2-lug terminal and the ground lugs as shown in the Pictorial Diagram, and tighten the screws firmly.



3( )Install the six *red* binding posts in positions 1, 2, 3, 7, 8 and 9. See the sketch below. A shoulder piece goes on the outside of the back panel with the smaller diameter portion protruding through the hole. The insulating plastic ring fits over it inside the back panel, followed by the washer. Before tightening the first nut, unscrew the outside knurled end and observe the hole in the metal shaft. For greatest convenience in connecting leads to these posts later, rotate the assembly so that this hole is in a vertical position. Slip the L-shaped Allen wrench through the hole for easy observation as you firmly tighten the first nut. Slide on the connecting lug, and fasten with the second nut. Position each connecting lug as shown in the Pictorial Diagram, and keep the Allen wrench vertical as you firmly tighten the second nut.



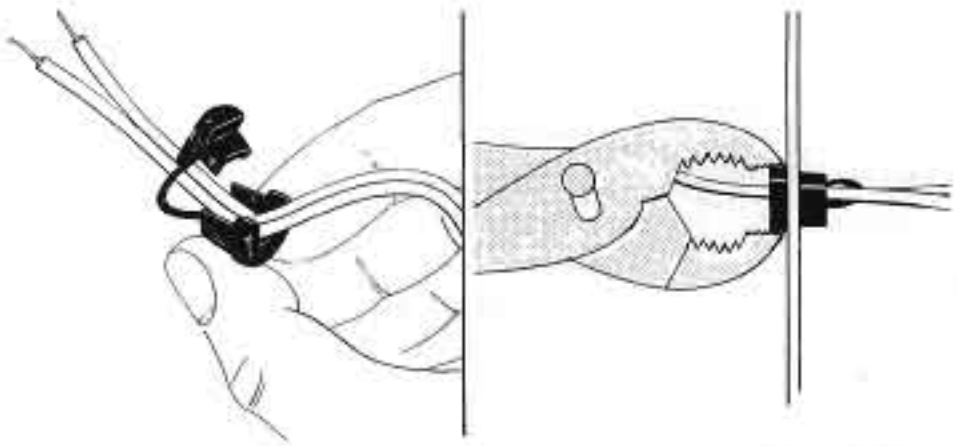
4( )In a similar manner, install the six *black* binding posts in positions 4, 5, 6, 10, 11 and 12. Keep the hole in the metal shaft vertical, and note the correct lug placement in the Pictorial Diagram.

5( )Select the four black AC outlets. Press them into place from the *outside* of the back panel. No hardware is necessary.

6( )Select the remaining ground lug, a screw and a nut. Mount the ground lug on the inside of the back panel as shown, and tighten firmly.

7( )Select the 6-lug switch with a chrome toggle. Mounting hardware is supplied with it. Screw a nut 5/16" onto its threaded shaft, followed by the lockwasher. Mount the switch from inside the panel, orient the slot in the shaft toward the top of the panel, and secure it on the outside with the other nut. See that the switch is positioned as shown, and carefully tighten the outside nut (if a locating washer is supplied with the switch, discard it).

8( )Separate the two conductors of the line cord for about 2". Strip 1/4" of insulation from each (unless the line cord was supplied with stripped ends). Mark the line cord 3½" 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 below. 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 very slightly flat vertical sides, and therefore the device installs easily in the cutout with the cord horizontal. The strain relief snaps into its locked position when fully inserted.



9( )Select one #6 black sheet metal screw, and install it in the GND hole from the outside. This screw cuts its own thread, and therefore some force is required.

10( )Cut 10 black wires each 2" long. Prepare them by removing 1/4" of insulation from the end of each wire.

These wires are connected to ground lugs "L", and to pairs of *short* ground 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 #3-4.

11( )Connect one end of the first wire to *short* lug #3-4, and the other end to short lug #5-6.

12( )Connect one end of the second wire to short lug #5-6, and the other end to lug L-2.

13( )Connect one end of the third wire to lug L-2 (S-2). Connect the other end to short lug #7-8.

14( )Connect one end of the fourth wire to short lug #7-8, and the other end to short lug #9-10.

15( )Connect one end of the fifth wire to short lug #9-10 (S-2). Connect the other end to short lug #11-12.

16( )Connect one end of the sixth wire to short lug #15-16, and the other end to short lug #17-18.

17( )Connect one end of the seventh wire to short lug #17-18, and the other end to lug L-3.

18( )Connect one end of the eighth wire to lug L-3 (S-2). Connect the other end to short lug #19-20.

19( )Connect one end of the ninth wire to short lug #19-20, and the other end to short lug #21-22.

20( )Connect one end of the tenth wire to short lug #21-22 (S-2). Connect the other end to short lug #23-24.

21( )Select a 470 pf capacitor and cut its leads to ½". Connect one lead to short lug #11-12 (S-2). Connect the other lead to *long* lug #12.

22( )Select the remaining 470 pf capacitor and cut its leads to ½". Connect one lead to short lug #23-24 (S-2). Connect the other lead to long lug #24.

23( )Select a .01 μf (mfd), 100 v. *small* disc capacitor with ¼" spacing and cut its leads to ½". Do not confuse this capacitor with the larger .01 μf capacitor, which has ⅜" spacing. Connect one lead to short lug #1-2, and the other lead to lug L-1 (S).

24( )Select a second .01 μf small disc capacitor and cut its leads to ½". Connect one lead to short lug #13-14, and the other lead to T-1 lug #2 (S). This lug is through the base material of T-1.

25( )Select a 412 ohm resistor (yellow-brown-red-black) and cut its leads to ⅜". Connect one lead to T-1 lug #1 (tip lug), and the other lead to GS lug #3 (S).

26( )Select the remaining 412 ohm resistor (yellow-brown-red-black) and cut its leads to ⅝". Connect one lead to T-1 lug #3 (tip), and the other lead to GS lug #6 (S).

27( )Cut 4 *heavy* white wires each 1½" long, and prepare their ends as usual.

28( )Connect one end of the first wire to lug #1 of AC outlet A, and connect the other end to lug #1 of outlet B.

29( )Connect one end of the 2nd wire to lug #1 of outlet B (S-2). Connect the other end to lug #1 of outlet C.

30( )Connect one end of the third wire to lug #2 of outlet A, and connect the other end to lug #2 of outlet B.

31( )Connect one end of the 4th wire to lug #2 of outlet B (S-2). Connect the other end to lug #2 of outlet C.

32( )Prepare a 2½" heavy white wire. Connect one end to lug #1 of outlet A, and the other end to lug #1 of outlet D.

33( )Select the 56,000 ohm resistor (green-blue-orange), and cut its leads to ⅜". Connect one lead to lug #1 of outlet A (S-3). Connect the other lead to lug #2 of outlet A (S-2).

NOTE: If this unit is to be used with a 240 volt AC line, do not install the resistor. Instead, (S-2) lug #1 of outlet A, and (S) lug #2 of outlet A.

34( )Select a .0082 μf disc capacitor (may be marked 8200 pf), and cut its leads to ⅝". Connect one lead to lug #1 of outlet D, and the other lead to lug L-4.

35( )Select the remaining .0082 μf disc capacitor, and cut its leads to ⅝". Connect one lead to lug #2 of outlet D, and the other lead to lug L-4.

36( )Prepare a 4" white wire. Connect one end to lug #2 of outlet D. Although the other end will be connected later, position this wire straight down toward the bottom of the back panel.

37( )Connect one end of the line cord to lug #1 of outlet D (S-3). Be *certain* all wire strands are soldered.

38( )Connect the remaining end of the line cord to lug #2 of outlet D (S-3).

39( )Strip a 2" piece of black wire bare. Connect one end to the lug on the #4 black binding post. Position this wire across the #5 post lug, and connect the other end to the #6 post lug. Solder the wire at lugs *#4 and* #5.

40( )Strip another 2" piece of black wire bare. As above, connect one end to the #10 post lug, across the #11 lug, and connect the other end to the #12 lug. Solder at lugs #10 and #11.

41( )Prepare a 2½" black wire as usual. Connect one end to the #12 post lug (S-2). Connect the other end to post lug #6.

42( )Prepare an 11½" black wire. Connect one end to post lug #6 (S-3). The other end will be connected later. For convenience, this wire may be temporarily bent over the adjacent end of the back panel and across the outside of the panel.

43( )Prepare a 7½" black wire. Connect one end to input short lug #17-18 (S-3). Position this wire straight down toward the bottom of the back panel. The other end will be connected later.

44( )Prepare a 10" black wire. Connect one end to short lug #5-6 (S-3). Position this wire straight down toward the bottom of the panel. The other end will be connected later.

The next four steps describe the connection of twisted *pairs* of wires to the back panel. One wire of each pair carries signal and is therefore connected and soldered at both ends. The second wire of each pair is used as a shield and is thus connected and soldered to ground at the back panel only. The other end of this shield wire remains without connection.

These twisted pairs, as well as the other twisted wires in this kit, should be uniformly twisted 3 full turns every 2".

45( )Cut a 12" blue signal wire and remove ¼" of insulation from *both* ends. Cut an 11½" black wire for shielding by removing insulation from only *one* end. Start with the two prepared ends even (insulation removed from each), and twist these wires uniformly together to within ¾" of the other end of the *blue* wire. The small amount of remaining black wire should be twisted once around the blue signal wire to form a circle, and then cut off any excess black shield wire. Connect the black shield wire from the prepared end to short lug #19-20. Connect the corresponding blue signal wire to long lug #19 (S). Position this pair straight down toward the bottom of the panel. The other end will be connected later.

46( )In a similar manner, prepare an 11½" yellow signal wire, and an 11" black shield wire. Twist together as before to within ¾" of the other end of the *yellow* wire. Twist the black around the yellow wire in a circle, and cut off any excess black wire. Connect the black shield wire to short lug #19-20 (S-4). Connect the corresponding yellow wire to long lug #20 (S). Position this pair straight down adjacent to the blue and black pair for later connection.

47( )Similarly prepare a 15" blue signal wire, and a 14½" *yellow* shield wire. Twist together within ¾" of the other end of the blue wire, form a circle of yellow shield wire, and cut off any excess yellow wire. Connect the yellow shield wire to short lug #7-8, and the corresponding end of the blue signal wire to long lug #7 (S). Position this pair slightly to the right of the other two pairs and straight down for later connection.

48( )Prepare a 14½" black signal wire, and a 14" yellow shield wire, as before. Twist together, form a circle of *yellow* shield wire, and cut off any excess yellow wire. Connect the yellow shield wire to short lug #7-8 (S-4), and the black signal wire to long lug #8 (S). Position this pair adjacent to the yellow and blue pair for later connection.

This completes the mechanical assembly of the back panel and over half of its wiring. Set this assembly aside.

FRONT PANEL ASSEMBLY

Place the main chassis with integral front panel in front of you, oriented as in the Pictorial Diagram.

You may wish to mark on the chassis with a pencil the letter designations of the control and switch cutouts shown in the Pictorial Diagram (SS, VOL, SP, TB, TCB, HJ, etc.) to facilitate assembly. These components will be referred to in this abbreviated form.

The 6-position and 2-position button switches mount with self-tapping screws and do not require either lockwashers or nuts for installation.

1( )Select the four rubber feet, and four sets of #6 x ⅜" hardware (larger diameter than #4). [A set comprises a screw and a KEP nut.] A foot is mounted in the hole in each corner of the chassis by turning the chassis over, placing the foot over the hole, and pushing the screw through the foot until the screw head is recessed. From the inside, tighten with a nut on each screw.

2( )Select the 2-position button switch, two of the ¾" self-tapping screws with tapered ends, and two of the ⅜" (short) tubular spacers. Insert the screws through the panel in position TB/MB (small horizontal rectangle), slip the spacers over the screws, and carefully install the switch so that the solder lugs point upward.

3( )Select the 6-position button switch, the two remaining ¾" screws, and the two remaining short spacers. Carefully install the switch in the large rectangular cutout with the screws and spacers. The lugs point upward.

4( )Select the fuse holder and one set of #4 hardware. Install the fuse holder in the left rear hole of the chassis. Note its orientation before tightening the hardware. To make later connections easier, bend the two end lugs up to about 45° with pliers.

The next steps describe connection of wires to some of the lugs on the 2-position and 6-position switches. These lugs are close to one another and are *more fragile* than the other lugs encountered in this kit. Wherever possible, the wiring sequence describes connection of *both* wire ends to reduce the possibility of lug strain by an unconnected wire end. When this is not possible, follow the instructions and Pictorial Diagram closely so that the direction of the wire may be formed *prior to soldering* to avoid undue lug strain and flexing.

Because the lugs 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.

5( )Prepare a 1¾" blue wire. One end is to be connected to MB lug #6, and the other end to TB lug #5. Form the wire prior to inserting through the lug holes to avoid strain. Then insert the wires, solder both lugs, and cut off the excess wire ends.

6( )Prepare a 1¾" yellow wire. Form the wire prior to inserting, and connect one end to MB lug #3 (S). Connect the other end to TB lug #2 (S). Cut off excess wire.

7( )Prepare a 1¼" yellow wire, but remove ½" of insulation from one end and the usual ¼" from the other end. Form the wire, and feed the longer bared end through RMB lug #7 across to RMB lug #1. Solder RMB lug #7 only. Connect the other end to LMB lug #3 (S). Cut excess wire.

8( )Prepare a 1¼" blue wire and similarly remove ½" of insulation from one end. Feed the longer bared end through LMB lug #1 to LMB lug #7, and solder LMB lug #1 only. Connect the other end to RMB lug #9 (S). Cut excess wire.

9( )Prepare a 1¾" black wire, remove ½" of insulation from one end, and feed the longer end through LMB lug #2 to LMB lug #8. Solder both. Cut excess wire. Connect the other end to RMB lug #3.

10( )Prepare a 1¼" black wire as usual. Connect one end to LMB lug #9 (S). Connect the other end to RMB lug #8 (S). Cut excess wire.

11( )Strip about 1½" of wire bare from the roll of black wire. Feed the wire through PLB lug #7 to PLB lug #1, solder both, and cut the excess wire.

12( )Similarly connect PLB lug #10 to PLB lug #4. Solder both, and cut the excess wire.

13( )Similarly connect HFB lug #7 to HFB lug #1. Solder both, and cut the excess wire.

14( )Similarly connect HFB lug #10 to HFB lug #4. Solder both, and cut the excess wire.

15( )Prepare a 2" yellow wire. Form the wire in a small arc toward the front panel, and connect one end to RMB lug #2 (S). Cut excess wire. Connect the other end to LFB lug #7.

16( )Prepare a 2¼" blue wire. Form the wire in an arc toward the front panel, and connect one end to RMB lug #3 (S-2). Cut excess wire. Connect the other end to LFB lug #1.

17( )Prepare a 7¼" yellow wire. Form the wire against the front panel just above the two switches. Connect one end *from the right* to PLB lug #8 (S). Connect the other end *also from the right* to MB lug #5 (S). Cut excess wire.

18( )Prepare a 7" blue wire. Form the wire against the panel, too. Connect one end from the right to PLB lug #11 (S). Connect the other end from the left to MB lug #2 (S). Cut excess wire. This blue wire and the yellow wire from step 17, should lie flat against the panel ¼" to ⅜" apart.

19( )Prepare a 1¼" yellow wire. Form it in an arc, and connect one end to LFB lug #8. Connect the other end to LFB lug #12.

20( )Prepare a 3¾" yellow wire. Connect one end from the right to LFB lug #8. Bend the other end over the top of the front panel between BC and BAL before soldering both wires at LFB lug #8. Cut excess wire. The other end is connected later.

21( )Prepare a 1¼" blue wire. Form it in an arc, and connect one end to LFB lug #2. Connect the other end to LFB lug #6.

22( )Prepare a 4¾" blue wire. Connect one end from the left to LFB lug #2. Form the wire toward the front and then horizontally to the right under the hole for BAL. Solder both wires at LFB lug #2. Cut excess wire. The other end is connected later.

23( )Select a 1.5 μf capacitor, but do not cut its short leads. Bend the leads 90° to its body, position the part above LFB, and connect one lead to LFB lug #7 (S-2). Connect the other lead to LFB lug #12 (S-2). Cut excess wire.

24( )Select the remaining 1.5 μf capacitor, but do not cut its leads. Bend the leads 90° to its body, position this part next to the other capacitor above LFB, and connect one lead to LFB lug #1 (S-2). Connect the other lead to LFB lug #6 (S-2). Cut excess wire.

25( )Install the balance control #160303 in the *lower* hole at the position BAL (if more than one hole is supplied), and fasten with a ⅜" nut. Note the tab on the control which engages a small hole in the panel to assure correct positioning.

Double check to be sure that you install each control in its correct location, and that the lugs are positioned as shown in the Pictorial Diagram. If the locating tab of a control is bent flat, raise it with a screwdriver to properly engage the hole. Ignore the two ⅜" holes between the button switches, if supplied.

Each of the four control potentiometers have their lugs numbered as follows: When viewed from the rear (inside the chassis), the numbers increase clockwise from 1 to 3 on the front section (right channel, generally yellow wire) and from 4 to 6 on the rear (left or usually blue wire).

26( )Connect the free end of the blue wire from LFB lug #2 to BAL lug #6 (S). Use care not to flex this wire on LFB to avoid straining the lug. You may wish to hold the middle of the wire temporarily against the front panel with your finger as you manipulate the free end into final position.

27( )In a similar manner, connect the free end of the yellow wire from LFB lug #8 to BAL lug #1 (S). Avoid straining the lug on LFB.

28( )Install the volume control #160153 in the *lower* hole at position VOL (if more than one hole is supplied), and fasten with a ⅜" nut. The tab on the control engages a small hole in the panel to assure correct positioning.

29( )Prepare a 5½" yellow wire, and connect it from the left to VOL lug #2 (S). Position this wire against the front panel and connect the other end to HFB lug #8 (S). Cut excess wire.

30( )Prepare a 6" blue wire, and similarly connect it from the left to VOL lug #5 (S). Position this wire against the front panel and connect the other end to HFB lug #11 (S). Cut excess wire.

31( )Install the bass control #160104 in the *lower* hole at position BC (if more than one hole is supplied), and fasten with a ⅜" nut. The tab on the control engages a small hole in the panel to assure correct positioning.

32( )Prepare a 3¾" yellow wire, and connect it from the left to BC lug #3. Do *not* solder. Position it against the panel and connect the other end to TCB lug #7 (S). Cut excess wire.

33( )Prepare a 3½" black wire, and connect it from the left to BC lug #1. Position it against the panel and connect the other end to TCB lug #8 (S). Cut excess wire.

34( )Prepare a 4½" blue wire, and connect it from the right to BC lug #6. Position it against the panel under BC and connect the other end to TCB lug #10 (S). Cut excess wire.

35( )Prepare a 3¼" black wire, and connect it from the left to BC lug #4. Connect the other end to TCB lug #11 (S). Cut excess wire.

36( )Install the treble control #160104 in the *lower* hole at position TC (if more than one hole is supplied), and fasten it with a ⅜" nut. The tab on the control engages a small hole in the panel to assure correct positioning.

37( )Select a 15 pf small disc capacitor and cut its leads to ⅜" each. Connect one lead to TC lug #2, and the other lead to TC lug #1.

38( )Prepare a 3½" yellow wire, and connect it from the left to TC lug #2 (S-2). Position this wire close to TC against the panel, and connect the other end to TCB lug #3 (S). Cut excess wire.

39( )Select the remaining 15 pf capacitor and cut its leads to ⅜" each. Connect one lead to TC lug #5, and the other lead to TC lug #4.

40( )Prepare a 3½" blue wire, and connect it from the left to TC lug #5 (S-2). Position this wire close to TC, and connect the other end to TCB lug #6 (S). Cut excess wire.

41( )Prepare a 1¾" yellow wire, and connect one end to VOL lug #3 (S). Connect the other end to BAL lug #2 (S).

42( )Prepare a 4½" black wire, but remove 1" of insulation from one end. Feed the longer bared end from the right through VOL lug #1 to BAL lug #3. Solder both lugs. Bend the other end over the top of the front panel, for it will be connected later.

43( )Prepare a 1¾" blue wire, and connect one end to VOL lug #6 (S). Connect the other end to BAL lug #5 (S).

44( )Prepare a 1¾" black wire, and connect one end to BAL lug #4 (S). Connect the other end to VOL lug #4.

45( )Select the back panel assembly, and two #6 black sheet metal screws. Place the back panel in position, after bending the several single and twisted pairs of leads away from the panel at the bottom. Insert the screws only in the *corner* hole at each end. The screws cut their own threads and therefore some force is required. Do not tighten the screws completely so that the panel can be tilted outwards 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.

46( )Position each twisted pair of wires connected to the back panel down to the chassis and across to the right end of the 6-button switch, and then sharply left to their approximate final locations on switch PLB. Try to keep the pairs ⅜" to ½" apart as they cross the chassis. It is not possible to keep them separate at PLB.

47( )Connect the blue signal wire from input socket #7 (the yellow wire twisted with this blue wire is for shielding) to PLB lug #3 (S). Avoid straining the PLB lug, and see that the yellow shield wire remains unconnected. Cut excess wire.

48( )In a similar manner, connect the black wire from input #8 to PLB lug #9 (S). The yellow wire is shield. Do not strain the lug, and cut excess wire.

49( )Similarly connect the blue wire from input #19 to PLB lug #6 (S). The black wire is shield. Do not strain the lug, and cut excess wire.

50( )As before, connect the yellow wire from input #20 to PLB lug #12 (S). The black wire is shield. Do not strain the lug, and cut excess wire.

SELECTOR SWITCH ASSEMBLY

The lug numbers of the selector switch increase clockwise from left to right, as shown in the Pictorial Diagram, and each section adjacent to a printed circuit board comprises two "wafers". For example, the first section behind the front panel consists of two wafers, "AF" (A-section, F-front), and "AR" (A-section, R-rear). Most of the lugs are located on the top half of the wafers for easy connection.

1( )Install the selector switch in the *lower* hole at position SS (if more than one hole is supplied), and fasten only finger tight with a ⅜" nut. Then select the 1½" wide, L-shaped switch brace, two screws, and four KEP nuts. Mount the brace on the two screws protruding from the back of the selector switch. Use the *lower* holes, if more than one set is supplied. Fasten the brace to the switch with nuts, and then fasten the brace to the chassis with 2 sets of hardware. Firmly tighten all the brace hardware, and finally the ⅜" nut on the front.

2( )Connect the longer black wire from the back panel *short* lug #5-6 to selector switch wafer AR lug #7. Do not solder.

3( )Connect the remaining shorter black wire from short lug #17-18 to BR lug #7.

4( )Prepare a 6½" yellow wire, and connect one end to MB lug #1 from the left (S). Cut excess wire. Position the wire carefully in an arc toward the chassis and connect the other end to BF lug #1 on SS.

5( )Prepare an 8¾" yellow wire, but remove ¾" of insulation from one end. Connect the shorter prepared end to BF lug #1 on SS (S-2). Position the wire toward the chassis, and connect the longer prepared end through input lug #21 to input lug #22. Solder both lugs.

6( )Prepare a 4″ blue wire, and connect one end to MB lug #4 from the right (S). Cut excess wire. Position the wire in an arc *under* the selector switch and connect the other end to AF lug #1 on SS.

7( )Prepare a 10½″ blue wire, but remove ¾″ of insulation from one end. Connect the shorter prepared end to AF lug #1 on SS (S-2). Position this wire just under the lugs on the left side of SS and connect the longer prepared end through input lug #9 to input lug #10. Solder both lugs.

8( )Prepare a 12″ blue wire and a 10½″ yellow wire, but remove ½″ of insulation from one end of each wire. Start with the longer prepared ends even, and twist them uniformly together to within ½″ of the other end of the yellow wire. Connect the blue wire from the longer prepared end through BR lug #8 to BF lug #2 on SS, and solder both lugs. Connect the corresponding yellow wire through BR lug #9 to BF lug #5 on SS, and solder both lugs. Position the twisted pair toward the chassis to the right of SS to the back panel. Connect the other end of the yellow wire to input lug #15 (S). Connect the remaining blue end to input lug #18 (S).

9( )Prepare a 6″ yellow wire, and connect one end to TB lug #3 from the left (S). Cut excess wire. Position the wire about 1″ off the chassis adjacent to the left side of SS, and connect the other end to BF lug #3 on SS.

10( )Prepare a 10½″ yellow wire, and a 10¼″ black wire but remove insulation from *one end only* of the black wire. Start with the two prepared ends and twist them uniformly together to within ¾″ of the other end of the yellow wire. Twist the black around the yellow wire to form a circle, and then cut off any excess black wire. Connect the yellow wire from the prepared ends to input lug #17 (S). Connect the corresponding black wire to short lug #15-16. Position this pair around the right end of SS, adjacent to the blue and yellow twisted pair, and connect the other end of the yellow wire to BF lug #3 on SS (S-2). The black end remains without connection.

11( )Prepare a 10½″ blue wire, and a 10¼″ black wire, but remove insulation from only one end of the black wire. In a similar manner, twist the two wires uniformly together to within ¾″ of the end of the blue wire, form a circle of black wire, and cut off any excess wire. Connect the blue wire from the prepared ends to input lug #16 (S). Connect the corresponding black wire to short lug #15-16 (S-3). Position this pair adjacent to the other two twisted pairs, and connect the other end of the blue wire to BF lug #4 on SS. The black end is unconnected.

12( )Prepare a 6½″ blue wire, and connect one end to TB lug #1 from the left (S). Cut excess wire. Position the wire about 1″ off the chassis just to the left of the selector switch, and connect the other end to BF lug #4 on SS (S-2).

13( )Prepare a 6″ blue wire, a 6″ yellow wire, and an 8″ black wire. Start with the black wire ¼″ longer than the other two wires, and twist all three uniformly together to within ½″ of the other ends of the blue and yellow wires. The black wire at this end is about 1½″ longer. Connect the black wire from the end protruding ¼″ to short lug #13-14 (S-2). Connect the corresponding blue wire to input lug #13 (S). Connect the corresponding yellow wire to input lug #14 (S). Connect the yellow wire at the other end to DR lug #8 on SS (S). This lug is *below* the frame on the selector switch. Connect the corresponding blue wire to DR lug #7 on SS (S). Connect the longer black wire to DR lug #6 on SS.

14( )Prepare a 6½″ black wire, and connect one end to T-1 tip lug #3 (S-2). Also prepare a 7″ yellow wire, and connect one end to GS lug #5 (S). Group this pair together, position them toward the chassis, and to the left behind SS. Twist them together twice for neatness. The other ends will be connected later.

15( )Prepare a 7½″ black wire, and connect one end to T-1 tip lug #1 (S-2). Also prepare a 7½″ blue wire, and connect one end to GS lug #2 (S). Group this pair together, position them toward the chassis, around the left end of SS toward the front panel. Twist them twice together for neatness. The other ends will be connected later.

16( )Prepare an 11½″ blue wire and a 10″ yellow wire, but remove ½″ of insulation from one end of each wire. Start with the longer prepared ends, and twist them uniformly together to within ½″ of the other end of the yellow wire. Connect the blue wire from the longer prepared end through AR lug #8 to AF lug #2 on SS, and solder both lugs. Connect the corresponding yellow wire through AR lug #9 to AF lug #5 on SS, and solder both lugs. Position the twisted pair to the right of SS above the chassis to the back panel. Connect the other end of the yellow wire to input lug #3 (S). Connect the remaining blue end to input lug #6 (S).

17( )Prepare a 4¼″ yellow wire, and connect one end to TB lug #6 from the right (S). Cut excess wire. Position the wire counterclockwise around SS, and connect the other end to AF lug #3 on SS.

18( )Prepare a 10½″ yellow wire, and a 10¼″ black wire, but remove insulation from only one end of the black wire. Start with the two prepared ends and twist them together to within ¾″ of the other end of the yellow wire. Twist the black around the yellow wire to form a circle, and then cut off any excess black wire. Connect the yellow wire from the prepared ends to input lug #5 (S). Connect the corresponding black wire to short lug #3-4. Position this pair along the right center of SS, and connect the other end of the yellow wire to AF lug #3 on SS (S-2). The black end is not connected.

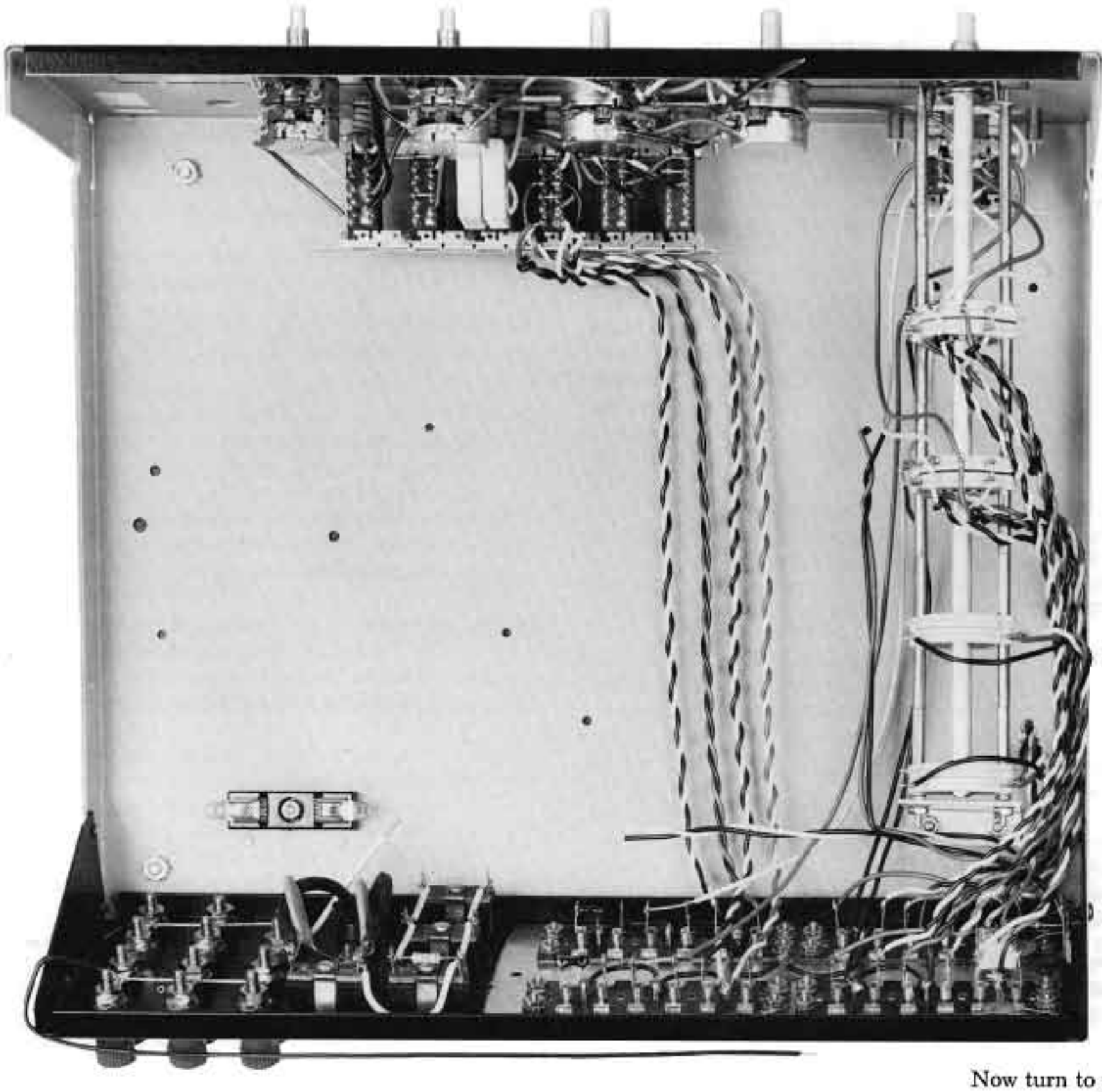
19( )Prepare 10½″ blue wire, and a 10¼″ black wire, but remove insulation from only one end of the black wire. In a similar manner, twist the two wires together to within ¾″ of the end of the blue wire, form a circle of black wire, and cut off any excess black wire. Connect the blue wire from the prepared ends to input lug #4 (S). Connect the corresponding black wire to short lug #3-4 (S-3). Position this pair adjacent to the other twisted pairs connecting to the front wafers on SS, and connect the other end of the blue wire to AF lug #4 on SS. The black end is not connected.

20( )Prepare a 4¼″ blue wire, and connect one end to TB lug #4 from the right (S). Cut excess wire. Position the wire counterclockwise around SS, and connect the other end to AF lug #4 on SS (S-2).

21( )Prepare a 6″ blue wire, a 6″ yellow wire and an 8″ black wire. Start with the black wire ¼″ longer than the other two wires, and twist all three uniformly together to within ½″ of the other ends of the blue and yellow wires. The black wire at this end is about 1½″ longer. Connect the black wire from the end protruding ¼″ to short lug #1-2 (S-2). Connect the corresponding blue wire to input lug #1 (S). Connect the corresponding yellow wire to input lug #2 (S). Connect the yellow wire at the other end to CR lug #8 on SS (S). This lug is below the frame on SS. Connect the corresponding blue wire to CR lug #7 on SS (S). Connect the longer black wire to CR lug #6 on SS.

This completes most of the wiring to the selector switch, and all wiring to TB and MB. Now is a good time to check that each lug on TB and MB is soldered, that there are no solder runs or blobs and that any excess wire ends are cut short. One wire should be soldered to each of the six lugs on TB and MB.

Your PAT-5 is more than half completed. The work you have finished should look much like the accompanying photograph.



Now turn to page 21.

PAT-5 FUNCTIONAL BLOCK DIAGRAM

PC-33

PC-32

PC-34

PHONO 1

PHONO 2

INPUT SELECTOR

FEEDBACK SELECTOR

LOW LEVEL GAIN BLOCK Q201, Q202

RIAA FEEDBACK

FLAT FEEDBACK

+42 VOLT REGULATOR Q101, D103

+15 VOLT REGULATOR D101

−15 VOLT REGULATOR D102

±65 V. UNREGULATED SUPPLY D104, D105, D106, D107

TONE CONTROL FEEDBACK

FLAT FEEDBACK

D.C. FEEDBACK

FEEDBACK SELECTION

TUNER

TAPE 1

TAPE 2

SPARE

TAPE OUT 1

TAPE OUT 2

E.P.L. OUT

E.P.L. IN

INPUT SELECTOR

TAPE MONITOR SELECTION

EXTERNAL PROCESSOR LOOP (E.P.L.)

INPUT VOLTAGE FOLLOWER Q301, Q302

HIGH FILTER Q303, Q304

HIGH LEVEL GAIN BLOCK IC 301

MAIN PREAMP OUTPUTS

FROM OTHER CHANNEL VOLTAGE FOLLOWER

STEREO MONO SWITCHING

TO OTHER CHANNEL

LOW FILTER AND SELECTION

BALANCE CONTROL

VOLUME CONTROL

HIGH FILTER SELECTION

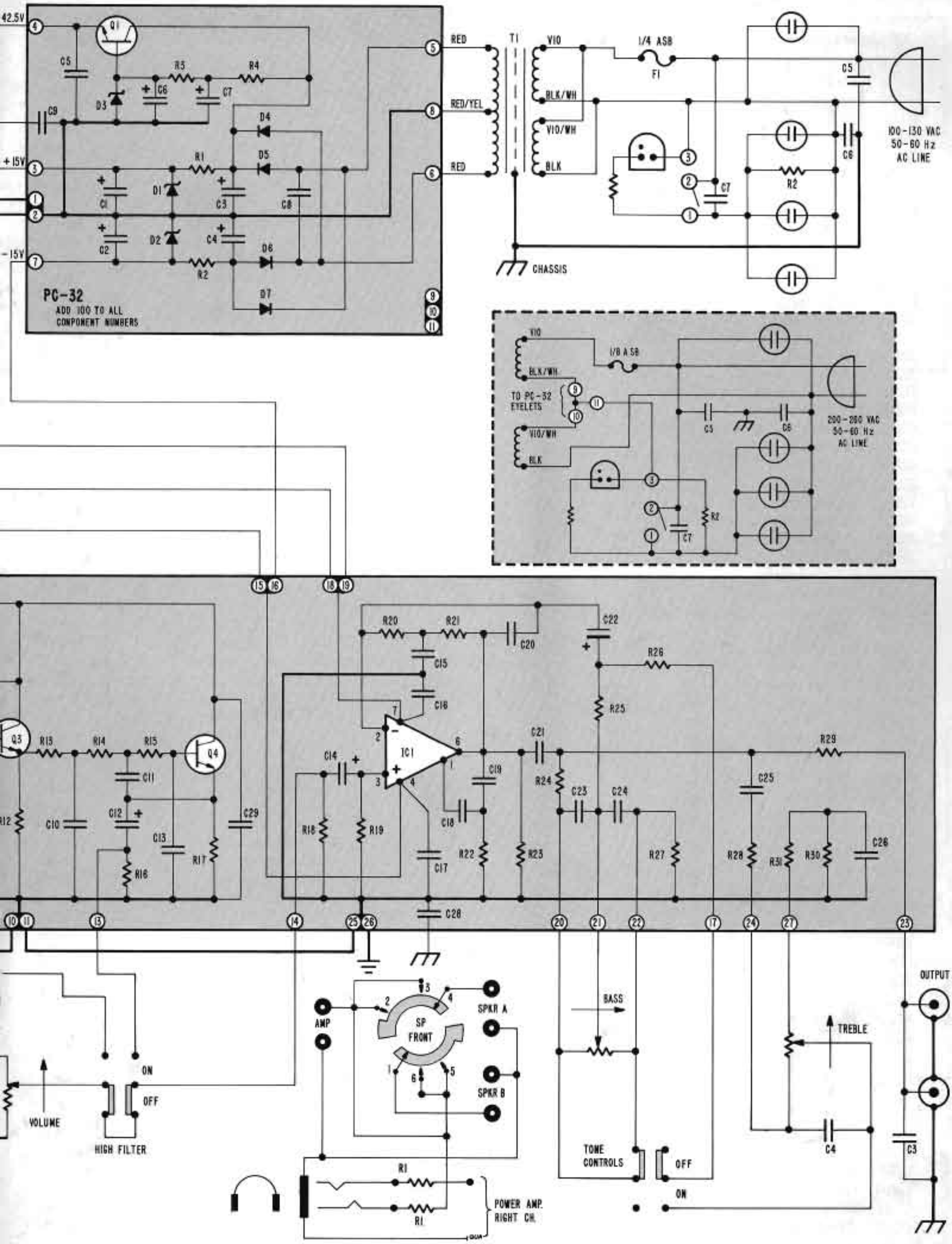
SCHEMATIC DIAGRAM

*1977 DYNACO INC.

ROTARY SWITCHES SHOWN MAXIMUM COUNTER CLOCKWISE POSITION FROM KNOB END.

PUSH BUTTON SWITCHES SHOWN IN OUT POSITION.

ONLY LEFT CHANNEL SHOWN WHERE RIGHT CHANNEL IS IDENTICAL.


42.5V
+15V
-15V
PC-32
ADD 100 TO ALL
COMPONENT NUMBERS
RED
RED/YEL
RED
T1
VIO
BLK/WH
VIO/WH
BLK
1/4 ASB
F1
CHASSIS
100-130 VAC
50-60 Hz
AC LINE
TO PC-32
EYELETS
1/8 A SB
200-260 VAC
50-60 Hz
AC LINE
IC1
SP
FRONT
AMP
SPKR A
SPKR B
VOLUME
ON
OFF
HIGH FILTER
POWER AMP.
RIGHT CH.
BASS
TREBLE
TONE
CONTROLS
OUTPUT

COMPONENT VALUES

All resistors are ¼ watt, 5% unless otherwise indicated.

R 1	150 ohms, 1 watt, 5%	116151
R 2	56,000 ohms, ½ watt, 5%	113356
R 3	412 ohms, ⅛ watt, 1%	130412
R101	820 ohms, 5 watt, 10%	120821
R102	1,000 ohms, 5 watt, 10%	120107
R103	2,200 ohms	119222
R104	2,200 ohms	119222
R201	150,000 ohms	119154
R202	470 ohms, ⅛ watt, 5%, metal film	130471
R203	100,000 ohms, ⅛ watt, 5%, metal film	130105
R204	10,000 ohms, ⅛ watt, 5%, metal film	130103
R205	470 ohms, ⅛ watt, 5%, metal film	130471
R206	27,000 ohms, ⅛ watt, 5%, metal film	130273
R207	18,000 ohms, ⅛ watt, 5%, metal film	130183
R208	10,000 ohms, ⅛ watt, 5%, metal film	130103
R209	100 ohms, ⅛ watt, 5%, metal film	130101
R210	2,200 ohms, ⅛ watt, 5%, metal film	130222
R211	470 ohms, ⅛ watt, 5%, metal film	130471
R212	27,000 ohms, ⅛ watt, 5%, metal film	130273
R213	470,000 ohms	119474
R214	68,000 ohms, ⅛ watt, 5%, metal film	130683
R215	1,000 ohms	119102
R216	470,000 ohms	119474
R217	220,000 ohms	119222
R301	100,000 ohms	119104
R302	1,200 ohms	119122
R303	100,000 ohms	119104
R304	1,000 ohms	119102
R305	10,000 ohms	119103
R306	470,000 ohms	119474
R307	1,000 ohms	119102
R308	1,000 ohms	119102
R309	150,000 ohms	119154
R310	120,000 ohms	119124
R311	120,000 ohms	119124
R312	2,200 ohms	119222
R313	1,000 ohms	119102
R314	10,000 ohms	119103
R315	10,000 ohms	119103
R316	150,000 ohms	119154
R317	4,700 ohms	119472
R318	51,000 ohms	119513
R319	1,000,000 ohms	119105
R320	470,000 ohms	119474
R321	470,000 ohms	119474
R322	10,000 ohms	119103
R323	10,000 ohms	119103
R324	10,000 ohms	119103
R325	10,000 ohms	119103
R326	1,000 ohms	119102
R327	1,000 ohms	119102
R328	4,700 ohms	119472
R329	560 ohms	119561
R330	2,000,000 ohms	119205
R331	750 ohms	119751
Q101	NPN Transistor, SE6020	577021
Q201	NPN Transistor, BC414C	577019
Q202	NPN Transistor, BC414B	577015
Q301	PNP Transistor, EN3962	562962
Q302	NPN Transistor, SE4020	572020
Q303	NPN Transistor, SE4010	572010
Q304	NPN Transistor, BC 239C	577018
IC301	Integrated Circuit, LF357	587740
C 1	.01 mfd, 100 v., disc	234103
C 2	1.5 mfd, 100 v., 5%, mylar	264155
C 3	470 pf, 500 v., 5% mica	257471
C 4	15 pf, 5%, NPO disc	234150
C 5	.0082 mfd, 1400 v., disc	238822
C 6	.0082 mfd, 1400 v., disc	238822
C 7	.01 mfd, 500 v., disc	228103
C 8	220 pf, 500 v., 5%, mica	245221
C101	100 mfd, 16 v., electrolytic	281101
C102	100 mfd, 16 v., electrolytic	281101
C103	220-250 mfd, 100 v., electrolytic	284251
C104	220-250 mfd, 100 v., electrolytic	284251
C105	.1 mfd, 100 v., disc	224104
C106	1 mfd, 50 volt, electrolytic	283103
C107	220-250 mfd, 100 v., electrolytic	284251
C108	.01 mfd, 500 v., disc	228103
C109	.01 mfd, 100 v., disc	234103
C201	10 mfd, 16 v., tantalum	282100
C202	47 pf, 1000 v., disc	224470
C203	1000 mfd, 6-10 v., electrolytic	281102
C204	2700 pf, 500 v., 2%, mica	257272
C205	8200 pf, 500 v., 2%, mica	257822
C206a	100 mfd, 50 v., electrolytic	284101
C206b	100 mfd, 50 v., electrolytic	283107
C207	1.5 mfd, 50 v., tantalum	283155
C301	11 mfd, 15 v., N.P. tantalum	281115
C302	.01 mfd, 100 v., disc	234103
C303	12 pf, 1000 v., 5%, disc	244120
C304	.01 mfd, 100 v., disc	234103
C305	100 mfd, 16-25 v., electrolytic	281101
C306	.01 mfd, 100 v., disc	234103
C307	11 mfd, 15 v., N.P. tantalum	281115
C308	10 mfd, 16 v., tantalum	282100
C309	10 pf, 1000 v., disc	234100
C310	.022 mfd, 100 v., 5%, mylar	260223
C311	.0047 mfd, 100 v., 5%, mylar	264472
C312	10 mfd, 16 v., tantalum	282100
C313	.001 mfd, 300 v., 5%, mica	255102
C314	6 mfd, 15 v., N.P. tantalum	281605
C315	.15 mfd, 100 v., 10%, mylar	265154
C316	.01 mfd, 100 v., disc	234103
C317	.01 mfd, 100 v., disc	234103
C318	10 pf, 1000 v., disc	234100
C319	68 pf, 500 v., disc	237680
C320	12 pf, 1000 v., 5%, disc	244120
C321	60 mfd, 10 v., N.P. tantalum	281606
C322	6 mfd, 15 v., N.P. tantalum	281605
C323	.047 mfd, 100 v., 5%, mylar	264473
C324	.47 mfd, 100 v., 5%, mylar	260474
C325	820 pf, 100 v., 5%, mica	254821
C326	.0082 mfd, 100 v., 5%, mylar	264822
C327	.01 mfd, 100 v., disc	234103
C328	.01 mfd, 100 v., disc	234103
C329	120 pf, 1000 v., disc	228121
D101	Zener diode, 15 v., 1 w., 5% (1N4744A)	540115
D102	Zener diode, 15 v., 1 w., 5% (1N4744A)	540115
D103	Zener diode, 43 v., 0.5 w., 5% (1N5260B)	540543
D104	Silicon diode, 200 ma, 200 prv	544012
D105	Silicon diode, 200 ma, 200 prv	544012
D106	Silicon diode, 200 ma, 200 prv	544012
D107	Silicon diode, 200 ma, 200 prv	544012
Volume control, 15,000 ohms		160153
Balance control, 30,000 ohms		160303
Bass control, 100,000 ohms		160104
Treble control, 100,000 ohms		160104
Power transformer		464080
Fuse, ¼ ampere, slo-blo, 3AG		342009

AUDIO CIRCUIT BOARD ASSEMBLY

Prior to mounting the PC-34 printed circuit boards, it is necessary to connect the final wires to lugs on the 6-button switch, so that the other ends of these wires may be easily connected after the boards have been installed.

The following six steps connect wires to the switch, whose other ends will be connected to the *front* PC-34 board. Each wire should be temporarily formed so that it lies just above and to the rear of the switch, and then to the right at about a 45° angle in the same plane as the front panel. This forming helps to prevent undue strain on the lugs of the switch when connected to the board.

1( )Prepare a 4¾" yellow wire. Connect one end from the right to RMB lug #1 (S-2). Cut excess wire, but note that RMB lugs #1 and #7 are connected.

2( )Prepare a 6" blue wire. Connect one end from the left to PLB lug #2 (S). Cut excess wire.

3( )Prepare a 5½" black wire. Connect one end from the right to HFB lug #9 (S). Cut excess wire.

4( )Prepare a 5½" blue wire. Connect one end from the left to HFB lug #2 (S). Cut excess wire.

5( )Prepare a 5½" yellow wire. Connect one end from the left to HFB lug #3 (S). Cut excess wire.

6( )Prepare a 5¼" black wire. Connect one end from the left to TCB lug #5 (S). Cut excess wire.

The next six steps connect wires to the switch, whose other ends will be connected to the *rear* PC-34 board. Each wire should be formed from the switch to the chassis, and to the right on a 45° angle on the chassis. 2" to the rear of the switch, bend each wire straight up.

7( )Prepare a 7¼" yellow wire. Connect one end from the right to LMB lug #7 (S-2). Cut excess wire, but note that LMB lugs #1 and #7 are connected.

8( )Prepare a 7¾" blue wire. Connect one end from the left to PLB lug #5 (S). Cut excess wire.

9( )Prepare a 7¾" black wire. Connect one end from the right to HFB lug #12 (S). Cut excess wire.

10( )Prepare a 7¾" blue wire. Connect one end from the left to HFB lug #5 (S). Cut excess wire.

11( )Prepare a 7¾" yellow wire. Connect one end from the left to HFB lug #6 (S). Cut excess wire.

12( )Prepare an 8" black wire. Connect one end from the left to TCB lug #2 (S). Cut excess wire. This wire passes under the left rear side of TCB.

Now is a good time to check the connections on the 6-button switch. See that no solder blobs or excess wire connects other than the intended lug. The following are lugs which do *not* have connections: TCB lugs #1, #4, #9 and #12; LFB lugs #3, #4, #5, #9, #10 and #11; RMB lugs #4, #5, #6, #10, #11 and #12; LMB lugs #4, #5, #6, #10, #11 and #12.

Set the chassis and back panel assembly aside. You will now prepare the printed circuit board assemblies for installation. In this section, whenever you prepare a wire, "tin" the end to be connected to an eyelet on a circuit board by heating it and applying a small amount of solder before installation. It will make connection easier to the eyelets on the boards.

In most cases, it is easiest to heat the solder-filled eyelet until the solder melts, and then insert the wire, making sure the iron now touches both the eyelet and the bared wire so that a smooth flow of solder is apparent. Then remove the iron and hold the wire steady while the connection cools. Afterward wiggle the wire to be sure the connection is secure and no movement is apparent from the other side of the board. There should be a smooth, shiny flow of solder from the wire to the eyelet and from the eyelet to the foil circuitry on the board, obscuring the eyelet. If in doubt, reheat the connection and add a bit more solder. Use reasonable care, for grossly excessive heat may cause the circuitry to separate from the board. If this happens, you can make a repair by soldering a piece of bare wire along the affected area.

Be very careful not to "bridge" solder across adjacent eyelets where they are closely spaced. Also do not allow any excess solder to fall onto the boards where it could create a bridge on the circuitry which would cause a malfunction and be very difficult to locate, to say nothing of possible damage to components.

13( )Select both PC-34 circuit boards. Lay the boards components side down with the numbered eyelets toward you. While the 27 eyelets on each board will already be filled with some solder, we suggest adding a small amount of additional solder while heating each eyelet with your iron. Once soldered, clean out the following solder-filled eyelets on each board with a wood toothpick so that later connection of wires will be easier: Eyelets #6, #8, #16, #19 and #26.

14( )Prepare two 1¾" black wires. From the *foil* side connect one end of one wire to eyelet #3 on one of the boards (S). Notice that eyelets #2, #3 and #4 are not numbered, but eyelet #3 is below the other eyelets (electrically these three eyelets are identical). Connect the other end of this wire to eyelet #10 (S). Position the wire away from the row of eyelets down on the foil side. Similarly solder the second wire between eyelets #3 and #10 on the other PC-34 board.

15( )Prepare two 3¾" black wires. In a similar manner connect one wire between eyelets #11 and #25 on one board, and solder both. Connect the remaining wire between eyelets #11 and #25 on the second board, and solder both. Position these wires away from the eyelets.

16( )Select two U-shaped brackets, 8 sets of hardware, and the two PC-34 boards. Install the brackets on the components side of the boards (not the foil side) so that both boards face the same way, with the row of eyelets at the top (the open parts of the U-brackets). Firmly tighten the hardware.

17( )Place the chassis and back panel assembly in front of you, and mount the bracket and board assembly in the chassis so that the components face the front and the foil sides face to the rear. The six longer unconnected wires from the 6-button switch (all are straight up) should be fed between the two boards and between the brackets. The remaining six wires bent parallel to the front panel should lie between the switch and the *front* PC-34. Use two sets of hardware to install the assembly. Insert the screws from outside (under) the chassis.

You will now connect the free ends of the wires from the switch to the *rear* board. Each wire is connected from the components side of the board, and soldered from the foil side.

18( )The black wire from TCB lug #2 to eyelet #17 (S).

19( )The blue wire from HFB lug #5 to eyelet #14 (S).

20( )The yellow wire from HFB lug #6 to eyelet #13 (S).

21( )The black wire from HFB lug #12 to eyelet #12 (S).

22( )The yellow wire from LMB lug #7 to eyelet #5 (S).

23( )The blue wire from PLB lug #5 to eyelet #1 (S).

Each of these wires should be positioned away from its eyelet to about midway between the two boards, and down to the chassis.

You will now connect the free ends of the wires from the switch to the front board. As before, each wire is connected from the components side.

24( )The black wire from TCB lug #5 to eyelet #17 (S).

25( )The blue wire from HFB lug #2 to eyelet #14 (S).

26( )The yellow wire from HFB lug #3 to eyelet #13 (S).

27( )The black wire from HFB lug #9 to eyelet #12 (S).

28( )The yellow wire from RMB lug #1 to eyelet #5 (S).

29( )The blue wire from PLB lug #2 to eyelet #1 (S).

Each of these wires should be positioned away from its eyelet to about midway between the front board and the switch, and down to the switch. This completes the wiring of the switch to the boards.

30( )Prepare a 5¼" yellow wire, and connect one end to TC lug #3 (S). Connect the other end to eyelet #27 on the *rear* board (S).

31( )Prepare a 6" blue wire, and connect one end to TC lug #1 (S-2). Connect the other end to eyelet #24 on the rear board (S).

32( )Prepare a 3" yellow wire, and connect one end to TC lug #6 (S). Connect the other end to eyelet #27 on the *front* board (S).

33( )Prepare a 3¾" blue wire, and connect one end to TC lug #4 (S-2). Connect the other end to eyelet #24 on the front board (S).

34( )Prepare a 2¾" yellow wire, and connect one end to BC lug #6 (S-2). Connect the other end to eyelet #22 on the front board (S).

35( )Prepare a 2¾" blue wire, and connect one end to BC lug #5 (S). Connect the other end to eyelet #21 on the front board (S).

36( )Prepare a 3" black wire, and connect one end to BC lug #4 (S-2). Connect the other end to eyelet #20 on the front board (S).

37( )Prepare a 5" yellow wire, and connect one end from the right to BC lug #3 (S-2). Connect the other end to eyelet #22 on the rear board (S).

38( )Prepare a 5¼" blue wire, and connect one end from the right to BC lug #2 (S). Connect the other end to eyelet #21 on the rear board (S).

39( )Prepare a 5½" black wire, and connect one end from the right to BC lug #1 (S-2). Connect the other end to eyelet #20 on the rear board (S).

40( )Prepare a 2" yellow wire, and connect one end to eyelet #8 on the front board from the *foil side.* Connect the other end straight across to eyelet #8 on the rear board from the *components* side. Solder both eyelets.

41( )Prepare a 2" blue wire, and connect one end to eyelet #6 on the front board from the foil side. Connect the other end straight across to eyelet #6 on the rear board from the components side. Solder both eyelets.

42( )Prepare a 3" yellow wire, and connect one end to eyelet #18 on the rear board from the foil side (S). Connect the other end to eyelet #9 on the same board from the foil side (S). Position this wire away from the eyelets down the foil side.

43( )Prepare a 2¾" blue wire, and connect one end to eyelet #15 on the rear board from the foil side (S). Connect the other end to eyelet #7 on the same board from the foil side (S). Position this wire away from the eyelets.

44( )Prepare a 2" black wire, and connect one end to eyelet #2 on the rear board from the foil side (S). Connect the other end to BR lug #7 on SS (S-2).

45( )Prepare another 2" black wire, and connect one end to eyelet #2 on the front board from the foil side (S). Connect the other end to AR lug #7 on SS (S-2).

46( )Connect the free end of the black wire from VOL lug #1 to eyelet #4 on the front board (S). See that the three black wires to eyelets #2, #3 and #4, which are connected together, are securely soldered.

47( )Prepare a 5½" black wire, and connect one end to VOL lug #4 (S-2). Connect the other end to eyelet #4 on the rear board (S). See that the three black wires to eyelets #2, #3 and #4 are securely soldered.

Set the chassis and back panel assembly aside for a moment.

48( )Select both PC-33 boards, and lay the boards components side down with the eyelets toward you. Add a small amount of additional solder to each of the nine eyelets. Once soldered, clean out solder-filled eyelets #4 and #8 on each board with a toothpick to make future connection easier.

49( )Prepare *two* 2½" yellow wires, but remove ⅜" of insulation from one end of each wire, and the usual amount from the other. Connect the longer prepared end of one wire to eyelet #1 on one of the boards from the foil side (S). Allow 3/16" of bare wire to be exposed on the *foil* side (a future step will hook a wire around this bare section). Connect the other end to eyelet #6 (S). Similarly solder the second wire between eyelets #1 and #6 on the other PC-33 board. Also expose 3/16" of bare wire on the foil side at eyelet #1. Position these wires under the row of eyelets on the foil side.

50( )Select two U-shaped brackets, 8 sets of hardware, and the boards. Install the brackets on the components side of the boards so that the boards face the same way, with the row of eyelets at the top. Firmly tighten the hardware.

51( )Place the chassis assembly in front of you, and mount the bracket and board assembly in the chassis so that the components face to the front and the foil side to the rear. The four twisted pairs of wires from the back panel should pass under the assembly, and the four single wires from the back panel to the selector switch should pass to the right of the assembly, between it and the selector switch. Use two sets of hardware. Insert the screws from outside (under) the chassis.

52( )Prepare a 2" yellow wire, and connect one end to eyelet #8 on the front PC-33 board from the foil side. Connect the other end straight across to eyelet #8 on the rear PC-33 board from the components side. Solder both eyelets.

53( )Prepare a 7¼" blue wire, and connect one end to eyelet #7 on the front board from the components side (S). Position the wire under the selector switch, and connect the other end to AF lug #6 on SS (S).

54( )Prepare a 7¼" yellow wire, and connect one end to eyelet #7 on the rear board (S). Position the wire under the selector switch, and connect the other end to BF lug #6 on SS (S).

55( )Prepare a 2" blue wire, and connect one end to eyelet #2 on the front board (S). Connect the other end to CR lug #5 on SS.

56( )Select a 220 pf capacitor, and cut its leads to ⅜". Connect one lead to CR lug #5 on SS (S-2). Connect the other lead to CR lug #6 on SS.

57( )Prepare a 2¾" black wire, but remove ⅜" of insulation from one end and the usual amount from the other. Connect the longer prepared end to eyelet #3 on the front board (S). 3/16" of bare wire should be exposed on the foil side (the next step will hook a wire around this bare section). Connect the other end to CR lug #6 on SS (S-3).

58( )Locate the blue and black wires twisted together from GS lug #2 and T-1 lug #1. Form a small hook in the end of each, and connect the black end to the bare wire protruding from eyelet #3 on the front board (S). Connect the blue end to the bare wire protruding from eyelet #1 on this board (S). Be certain these wires do not touch any other parts of the etched circuitry, and that eyelets #1 and #3 are securely soldered.

59( )Prepare a 2" yellow wire, and connect one end to eyelet #2 on the rear board (S). Connect the other end to DR lug #5 on SS.

60( )Select the remaining 220 pf capacitor, and cut its leads to ⅜". Connect one lead to DR lug #5 on SS (S-2). Connect the other lead to DR lug #6 on SS.

61( )Prepare a 2¾" black wire, but remove ⅜" of insulation from one end and the usual amount from the other. Connect the longer prepared end to eyelet #3 on the rear board (S). 3/16" of bare wire should be exposed on the foil side. Connect the other end to DR lug #6 on SS (S-3).

62( )Locate the yellow and black wire twisted together from GS lug #5 and T-1 lug #3. Form a hook in the end of each, and connect the black end to the bare wire protruding from eyelet #3 on the rear board (S). Connect the yellow end to the bare wire protruding from eyelet #1 on this board. These wires should not touch any other parts of the board, and eyelets #1 and #3 should be securely soldered.

This completes the wiring of the selector switch. The following lugs on SS are unconnected: AR lugs #10 and #11; BR lugs #10 and #11; CF lugs #1, #2, #3 and #4; DF lugs #1, #2, #3 and #4. AF lug #2 and AR lug #8 are connected together; BF lug #2 and BR lug #8 are similarly connected. AF lug #5 and AR lug #9 are connected together; BF lug #5 and BR lug #9 are similarly connected together. All other connected lugs should not touch any other lug, or the frame of the switch.

63( )Prepare an 8" yellow wire, but remove ¾" of insulation from one end. Connect the shorter prepared end to eyelet #23 on the rear *PC-34* board from the foil side (S). Feed the longer prepared end from the left through input lug #24 (S-2) to input lug #23 (S). Position the wire on the chassis adjacent to the left side of the PC-33 boards.

64( )Prepare an 8¾" blue wire, but remove ¾" of insulation from one end. Connect the shorter prepared end to eyelet #23 on the front PC-34 board from the foil side (S). Feed the longer prepared end from the left through input lug #12 (S-2) to input lug #11 (S).

POWER SUPPLY BOARD WIRING

You will next install all the power supply parts on circuit board PC-32. White markings and lines on the board indicate the placement of each part and where the leads of the parts are inserted. Most of the parts are installed from this marked side. Only two resistors, R101 and R102, are mounted on the foil side of the board. *Except where specifically indicated otherwise,* mount the parts against the board, just as the parts are mounted on the preassembled circuit boards. Each part is identified by a part number, color code, or written value. Bend the leads as required to fit the space between the marked holes (the upright parts, including the Q101 transistor, do not need bending). Then push the leads through the holes and spread them slightly to hold the part in place for soldering. Solder each lead carefully to the foil side of the board, making certain that the solder flows all around the lead and smoothly onto the foil, without any bridges to other parts of the circuitry. Cut off all excess leads. There is no substitute for good soldering technique.

1( )To make connections to the eyelets easier, "tin" all 11 numbered eyelets along the top edge and the 4 eyelets without numbers near the center of the board. Make certain that there is a smooth flow of solder all around each eyelet onto the foil pathways, but avoid solder bridges between points which are not common. Once soldered, clean out the 4 solder-filled eyelet holes for R101 and R102 with a wood toothpick so that the 5 watt resistors may be mounted easily in future steps.

2( )Install the two 2200 ohm ¼ watt resistors (red-red-red) in positions R103 and R104. Solder all 4 leads.

3( )Install the four diodes, part #544012 (1N4003), in positions D104, D105, D106 and D107. The sketch below shows the diodes more than twice size. Their cathode end is marked with a stripe, an arrow head, or a colored tip. Install each so that the arrow head on the board points toward the marked end of the diode. Note that these diodes point in alternate directions. Solder all 8 leads.

4( )Install the two zener diodes, part #540115 (1N4744A), in positions D101 and D102. Install each so that the arrow head on the board points toward the marked end of the diode. Note that these diodes point in opposite directions. Solder all 4 leads.

5( )Install the single zener diode, part #540543 (1N5260B), in position D103. Install the diode so that the arrow head on the board points toward the marked end of the diode. Solder both leads.

6( )Install the transistor, part #577021 (SE 6020), in position Q101. The flat on the transistor faces toward eyelet #1. *Do not place it against the board, but mount it about ⅛" above the board.* A match stick can be used as a spacer between the transistor and the board until the leads are soldered. Note that if the transistor leads are not bent by force, they will fit easily into the board holes only one way. Solder all 3 leads.

7( )Install the .1 μf disc capacitor in position C105 (do not confuse it with the two .01 μf disc capacitors). Solder both leads.

8( )Install the *smaller* .01 μf disc capacitor (with ¼" lead spacing) in position C109. Solder both leads.

9( )Install a *larger* .01 μf disc capacitor (may be marked 103M) in position C108. Solder both leads.

10( )Install the 820 ohm 5 watt resistor in position R101 on the <u>*reverse (foil) side*</u> of the board. *Do not mount it against the board, but allow the leads to support it ⅛" to ¼" above the board.* Solder the 2 leads to the already soldered eyelets, but make absolutely *certain* that you have a smooth flow of solder from each lead to its eyelet, and from the eyelet to the foil circuitry. *A good solder connection is essential.* An incomplete connection here, or to the resistor in the next step, is the most common error in assembling this kit. Care will avoid a costly repair.

11( )Install the 1000 ohm (1K) 5 watt resistor in position R102 on the <u>reverse</u> side of the board, ⅛" to ¼" above the board, as in the previous step. Solder both leads. Again, double check the soldering from the lead to eyelet to circuitry.

12( )Select the 1 μf, 50 volt small electrolytic capacitor for position C106. Before mounting this part and the capacitors in the two following steps, notice that they are marked for polarity with a (+) sign, a (−) sign, or sometimes both symbols. Some capacitors have an arrow surrounding the symbol to further identify lead polarity. The board indicates a (+) symbol only for correct orientation. Note that this capacitor may be supplied in either an upright or a laydown format and, as a result, there are two holes on the board in position C106 for the (−) lead. Only one of these holes is used, depending on the shape of the part. Install the capacitor, and solder both leads.

13( )Install the two 100 μf, 16 volt upright capacitors in positions C101 and C102. Note that their orientations are reversed, and observe polarity. Solder all 4 leads.

14( )Install the three large 220 (or 250) μf, 100 volt electrolytic capacitors in positions C103, C104 and C107. Observe polarity. Solder all 6 leads.

Before continuing, double check your work to see that all leads (and the 4 eyelets holding R101 and R102) are securely soldered to the circuitry, that no bridges of solder occur between isolated parts of the circuit, and that all leads are cut short. Each solder connection should be shiny and smooth. If in doubt, go over the connections again with a hot iron and a very small amount of additional solder.

Set aside the wired PC-32 board temporarily, and place the chassis assembly in front of you.

FINAL ASSEMBLY

Before mounting PC-32 and the front-to-back brace, it will ease construction to connect some wires to the other circuit boards. The following four steps connect wires to PC-33 and PC-34 boards, whose other ends will be connected in a later step. Each free end should be temporarily positioned toward the selector switch.

1( )Prepare a 9" blue wire, but remove 2" of insulation from one end. Feed the longer prepared end through eyelet #16 on the rear PC-34, across to eyelet #16 on the front PC-34. Solder both eyelets.

2( )Prepare a 7½" yellow wire, but remove 2" of insulation from one end. Feed the longer prepared end through eyelet #19 on the rear PC-34 board from the foil side, straight across to eyelet #19 on the front PC-34. Solder both eyelets.

3( )Prepare a 5¼" black wire, but remove 2" of insulation from one end. Again feed the longer prepared end through eyelet #26 on the rear PC-34, across to eyelet #26 on the front PC-34, and solder both.

4( )Prepare a 7" black wire, but remove 2" of insulation from one end. Feed the longer prepared end through eyelet #4 on the front PC-33 from the components side, across to eyelet #4 on the rear PC-33. Solder both eyelets.

5( )Select the PC-32 board, the remaining U-bracket, the L-bracket, and 4 sets of hardware. Install the brackets pointing away from the board, mounted on the components side. The U-bracket is on the right side (eyelet #1) and the L-bracket on the left, with the eyelets at the top. Firmly tighten the hardware.

6( )Select the large front-to-back brace, the PC-32 assembly, and six sets of hardware. The top surface of the brace is flat, while the bottom has two cutouts, one at either end. The end with the taller cutout mounts on the front. Install the U-bracket on the brace with two sets of hardware. Tighten the hardware. Next install the U-bracket and the L-bracket to the chassis with two more sets of hardware. Then install the brace to the front with the remaining hardware. Make sure that adjacent wires are clear of the brace. Tighten the hardware. The back panel to brace hardware is not yet installed.

7( )Install the length of rubber extrusion on the top edge of the brace, as shown in the Pictorial Diagram. The rubber is open on one side and simply slips on the brace.

8( )The free ends of the four wires from PC-33 and PC-34 connect as follows to eyelets on PC-32:
a( )The black wire from PC-34 to eyelet #2 (S);
b( )the yellow wire to eyelet #3 (S);
c( )the blue wire to eyelet #7 (S);
d( )the black wire from PC-33 to eyelet #1 (S).

9( )Prepare a 5¼" yellow wire, and connect one end to eyelet #9 on the front PC-33 (S). Connect the other end to eyelet #4 on PC-32 (S).

10( )Install the headphone jack at position HJ on the front panel, and fasten with a ⅜" nut. Orient the lugs as shown in the Pictorial Diagram, and avoid excessive force as the nut is tightened, since the threads and body of the jack are plastic.

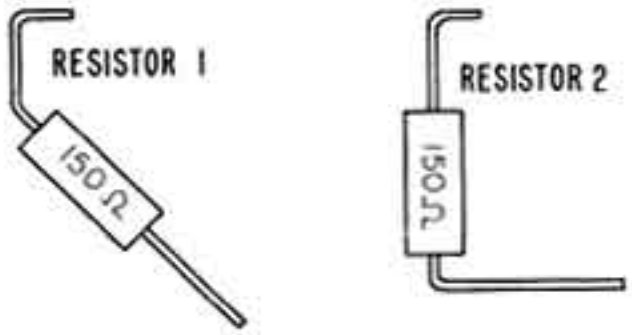
11( )Install the power switch with integral light at position PS, and observe that the dark red jewel for lighting is oriented toward the *bottom* of the chassis. Press it into place from the outside. No hardware is used.

It will be helpful to connect a few short wires to the speaker switch SP prior to installing it. For orientation, the front panel locating tab is in line with lugs #6 and #12. If electrostatic headphones are to be used, see HEADPHONES on page 30 before step 14 below.

12( )Select the speaker switch. Prepare a 2½" black wire, but remove 1" of insulation from one end. Feed the longer prepared end through SP lug #5 to lug #6 (front wafer). Solder lug #5 only. Feed the free end of the wire between the front wafer and the mounting flange of SP, and connect the other end to SP lug #3.

13( )Prepare another 2½" black wire, but remove 1" of insulation from one end. In a similar manner, feed the longer prepared end through SP lug #11 to lug #12 (rear wafer). Solder lug #11 only. Connect the other end to SP lug #9.

14( )Select a 150 ohm, 1 watt resistor (brown-green-brown). Bend and cut its leads as shown in the full size sketch next, identified as Resistor #1. Connect the lead with the bend in it to lug #6 (S-2). Note on the Pictorial Diagram that the other end will be connected to HJ lug #2, and orient the resistor in the correct direction.



15( )Select the remaining 150 ohm resistor; bend and cut its leads as shown for Resistor #2. Connect the lead with the bend *at the end* to lug #12 (S-2). Orient the resistor correctly for connection to HJ lug #1.

16( )Install the speaker switch in the *lower* hole at position SP (if more than one hole is supplied). Note the tab on the control which engages a small hole in the panel to assure correct positioning. Before fastening with a ⅜" nut, feed the free end of the resistor from SP lug #6 to HJ lug #2, and the free end of the resistor from SP lug #12 to HJ lug #1. Tighten the nut. Solder the connections at HJ lug #1 and HJ lug #2, and cut off excess leads.

17( )Select the power transformer, the two #6 x 1" screws, the two remaining #6 nuts, and the two ¾" tubular spacers. Insert the screws from outside (under) the chassis, slip the spacers over the screws on the inside, install the power transformer, and fasten with the nuts. Note the orientation of the transformer leads, the *angular* mounting of the transformer, and that the transformer itself is mounted off the chassis on the spacers.

NOTE: If this unit is to be used with a 240 volt AC line, also select a 2-lug terminal strip, and install it on top of the spacer which is nearest the left chassis edge, followed by the transformer and then the nut. Orient the terminal strip as shown in the sketch on page 33, and tighten the hardware.

18( )Twist together the two red and the red-yellow leads from the power transformer. Connect the red-yellow lead to eyelet #8 on PC-32 (S). Connect one red lead to eyelet #6 (S). Connect the remaining red lead to eyelet #5 (S).

19( )Feed the green wire from the transformer clockwise around it at the chassis, then counterclockwise around the left end of PC-32, and connect the free end to lug L-4 on the back panel (S-3).

20( )Prepare a 12" *heavy* white wire, and connect one end to lug #2 of AC outlet C (S-2). Position the wire on the chassis just in front of the fuse holder to the left edge of the chassis, and connect the other end to PS lug #1 on the front panel.

21( )Select the remaining .01 μf/500 V disc capacitor, and cut its leads to ½" each. Connect one lead to PS lug #1 (S-2). A considerable amount of heat is necessary to solder the PS lugs. Connect the other lead to PS lug #2. You may wish to position this capacitor against the left side of PS.

NOTE: If this unit is wired for 240 V AC line, *also* connect one lead of the 56,000 ohm resistor (green-blue-orange) to PS lug #1 (S-3). Connect the other resistor lead to PS lug #3.

22( )Prepare an 11½" heavy white wire, and connect one end to PS lug #2 (S-2). Position this wire next to the other heavy wire and connect the other end to fuse holder lug #1.

23( )Connect the free end of the heavy wire from lug #2 of outlet D to fuse holder lug #1 (S-2).

24( )Prepare a 12¾" black wire, and connect one end to PS lug #3 (S). Position this wire next to the pair of heavy wires and connect the other end to lug #1 of outlet C.

NOTE: If this unit is to be used with a 240 volt AC line, select instead the 43,000 ohm resistor (yellow-orange-orange) and cut its leads to ⅜". Connect one lead to a tip lug of the terminal strip mounted over the transformer hardware, and the remaining lead to the other tip lug of this terminal strip. Now prepare a 4" black wire, and connect one end to PS lug #3 (S-2). Position this wire next to the pair of heavy wires and connect the other end to the nearest tip lug of the terminal strip (S-2). Prepare another 4" black wire, and connect one end to the remaining tip lug of the terminal strip (S-2). Connect the other end to eyelet #11 on PC-32 (S).

25( )Twist together the black and the black-white leads from the power transformer. Feed this pair clockwise around the transformer at the chassis, and counterclockwise around the left end of PC-32. Twist the lead ends together and connect both to lug #1 of outlet C (S-4).

NOTE: If this unit is to be used with 240 volt AC line, connect only the black lead to lug #1 of outlet C (S-2). Then twist together the black-white and the violet-white leads. Connect one lead to eyelet #10 on PC-32 (S), and connect the other lead to eyelet #9 on PC-32 (S).

26( )Twist together the violet and the violet-white leads. Feed this pair around the transformer and PC-32 adjacent to the others, and connect both leads to fuse holder lug #2 (S-2). If these two leads seem excessively long, shorten them to fit.

NOTE: If this unit is used with a 240 volt AC line, connect only the violet lead to fuse holder lug #2 (S).

27( )Select one of the plastic wire ties, and slip the male end under the group of 8 wires between the end of PC-32 and the edge of the chassis. Push the male end through the female end of the tie, and tighten the tie. Cut off any excess tie.

28( )Select another tie, and slip the male end under the group of 5 wires at fuse holder lug #1. Tighten the tie and cut off the excess.

29( )Install the fuse in the fuse holder.

30( )Connect the free end of the long black wire from binding post lug #6 to HJ lug #3 on the front panel (S).

31( )Prepare a 12" black wire, but remove ⅝" of insulation from one end. Feed the longer prepared end from the left through SP lug #2 (S) to SP lug #3 (S-2). Connect the other end to binding post lug #3 (S).

32( )Prepare an 11" black wire, but remove 5/8" of insulation from one end. Feed the longer prepared end from the left through SP lug #8 (S) to SP lug #9 (S-2). Connect the other end to post lug #9 (S).

33( )Prepare a 12½" blue wire, and connect one end to SP lug #4 (S). Connect the other end to post lug #2 (S).

34( )Prepare an 11½" blue wire, and connect one end to SP lug #10 (S). Avoid contact with the mounting hardware of SP. Connect the other end to post lug #8 (S).

35( )Prepare a 12" yellow wire, and connect one end to SP lug #1 (S). Connect the other end to post lug #1 (S).

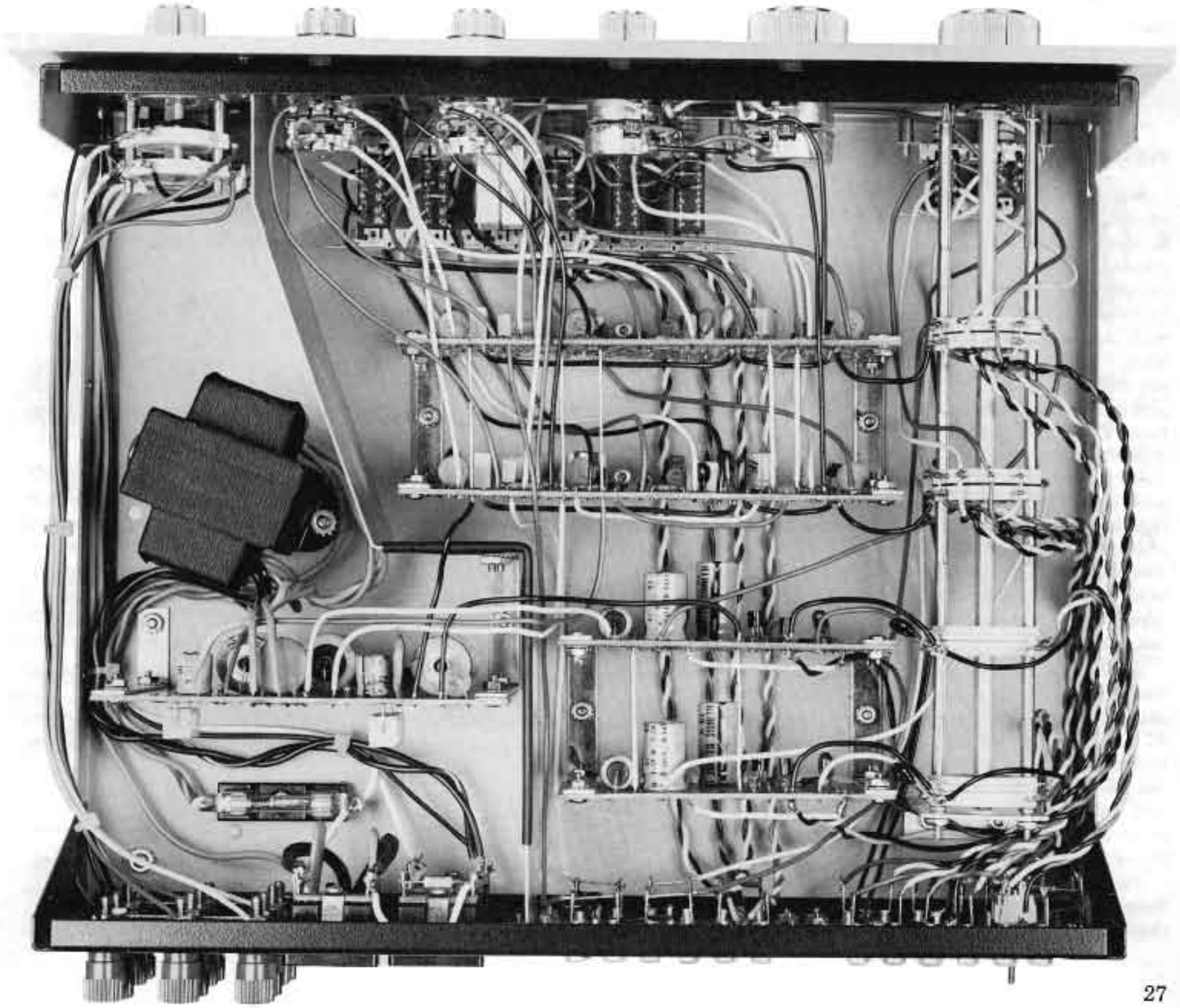
36( )Prepare an 11" yellow wire, and connect one end to SP lug #7 (S). Avoid contact with the mounting hardware of SP. Connect the other end to post lug #7 (S).

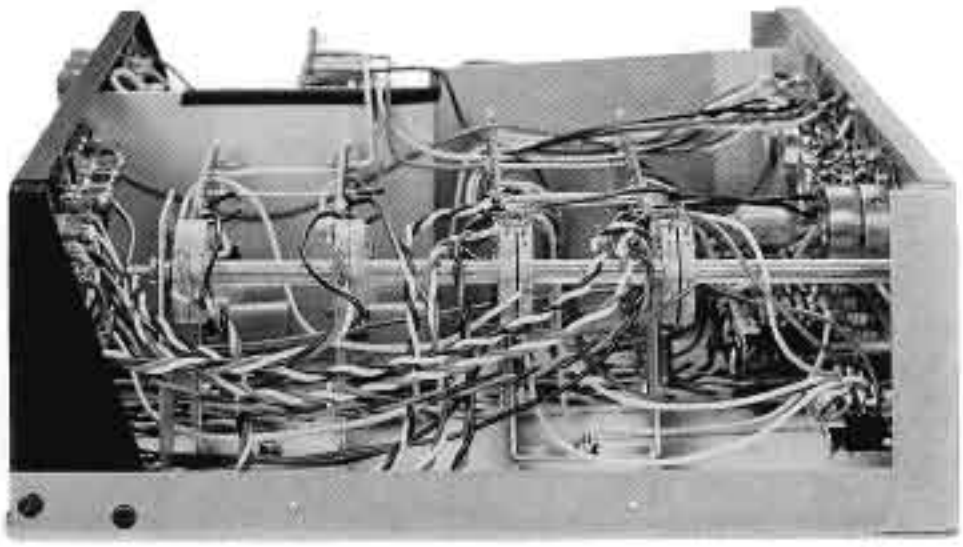
This completes the wiring of your BAT-5. You should check carefully for any insecure connections, and for any possibility of bare wires contacting other than the intended terminal. Turn the unit upside down and shake out any bits of solder or pieces of wire or insulation.

37( )Select two black sheet metal screws, and the remaining two sets of hardware. Tilt the back panel into its upright position and secure it to the chassis with the sheet metal screws. Use the hardware to affix the front-to-back brace to the panel.

38( )Select the remaining three plastic ties. Group all 7 wires together which connect the speaker switch, headphone jack and the binding posts, and position them about 2" above the chassis. Bind them together with the ties, one in the middle, another one behind the speaker switch, and the last one in front of the binding posts. Cut off any excess ties.

The general placement of wires should conform closely to the photograph below, and the wires to the selector switch should look like the photo on page 28.





39( )Clean the underside of the chassis near the back panel. Remove the backing from the serial number label and affix it to the chassis near 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 adjacent to the fuse holder.

40( )Install the front plate by securing it with a ⅜" nut on shafts SS, BAL and SP. Be sure that HJ protrudes very slightly. If the front plate does not seat properly, loosen the mounting hardware and move the switches or jack slightly.

41( )Press the 8 push buttons onto the square switch shafts. If they seem loose, a small amount of rubber (paper) cement on the shaft will keep them tight without making them impossible to remove.

42( )Insert a set screw in each knob if this has not been done. The large knob on shaft SS, and the small single knob on shaft SP are positioned on the shafts so that the set screw engages the flat on the shaft. The remainder of the knobs fit on the shafts so that rotation is symmetrical from center (counterclockwise rotation is at 7 o'clock, and clockwise rotation is at 5 o'clock, relative to a clock face).

43( )Slide the cover over the preamplifier, and secure it with 5 black sheet metal screws. The 5th one is installed at the center of the back panel.

44( )Remove the backing from the phono gain label. Position it so the word HI is top, and affix it on the back edge of the cover adjacent to the GND screw.

SPECIAL OPTIONAL MODIFICATIONS

PHONO INPUT CAPACITANCE

Some cartridges perform at their best if they are connected to an optimum amount of capacitance, in addition to the standard 47,000 ohm magnetic phono input impedance. The effect of the total capacitive load, particularly in midrange linearity and high frequency response, has now become apparent when certain brands of cartridges are used with state of the art high fidelity components. The capacitance "seen" by the cartridge is the *sum* of the input capacitances of the preamplifier, of the tone arm harness, and of the cables between the tone arm and the preamplifier. The input capacitance of the phono inputs of the PAT-5, *Phono 1* and *Phono 2*, is 220 picofarads (pf). This value was chosen, because it accommodates an "average" wide range of cartridges for flattest response. However, this capacitance may be changed to exactly match your chosen cartridge, if desired. The pair of 220 pf capacitors on the selector switch should first be removed, if another value is optimum. The capacitors should be mica types, 100 volts or greater, 5% tolerance. Dynaco does not stock them.

For *Phono 1* inputs, solder the chosen value capacitor on the selector switch of the PAT-5 between wafer CR lug #7 and CR lug #6 for the left channel, and between DR lug #7 and DR lug #6 for the right channel. For *Phono 2* inputs, solder the capacitor between CR lug #8 and CR lug #6 for the left channel, and between DR lug #8 and DR lug #6 for the right channel. Capacitor leads should be as short as permissible, and we recommend using insulating sleeving on the leads.

The capacitors soldered in place for *Phono 1* inputs will have no effect on *Phono 2* inputs, and vice versa. It is therefore practical to employ different values of capacitance for the two phono inputs to optimize results for two different brands of cartridges, if required.

Dynaco has canvassed the manufacturers of cartridges and turntables sold in U.S.A. Those replying have been tabulated in two separate lists, one for cartridges and the other for tone arms/turntables. In the cartridge table, we have not listed moving coil designs, because they are immune to capacitance effects. With these cartridges do not add any capacitance to the PAT-5. Manufacturers not listed may be contacted directly for their recommendations.

CARTRIDGE MANUFACTURER	MODEL	OPTIMUM CAPACITANCE
ADC	All	270 pf
AKG	All	470 pf
AUDIO-TECHNICA	All	100 pf
BANG & OLUFSEN	MMC-3000, MMC-4000, MMC-6000	<350 pf stereo <200 pf CD-4
EMPIRE	4000D series 2000Z & 2000T All others	100 pf or less 300 pf 500 pf
GRACE	All stereo All CD-4	250 pf 100 pf
MICRO-ACOUSTICS	All	Not affected
ORTOFON	All, except moving coil	400 pf
PICKERING/ STANTON	All stereo All CD-4	275 pf 100 pf
SHURE	All stereo M24H	450 pf 100-250 pf stereo 100 pf CD-4
SONUS	All Blue & Silver P	<400 pf stereo <250 pf CD-4

TURNTABLE MANUFACTURER	MODEL	CAPACITANCE VALUE
ADC BSR GLENBURN	Accutrac All All	Tone Arm: 50 pf Stereo Cables: 225 pf CD-4 Cables: 50 pf
AR	All	135 pf
B.I.C.	All	100 pf
BREUER	Tone Arm	50 pf
DUAL	All	150 pf
EMPIRE	598 & 598II 598III & 698	210 pf 4 ft—100 pf, 5 ft—210 pf
FORMULA 4	Tone Arm	112 pf
GARRARD	Most old units All Zero 100 All new series	180 pf 150 pf 110 pf
GRACE	Tone Arms	80 pf
HARMON-KARDON	ST-7 ST-6	110 pf 115 pf
INFINITY	Tone Arm	50 pf
MARANTZ	6100, 6200 6300	90 pf 68 pf
SHURE-SME TONE ARMS	3009 Series II Series II Improved	130 pf 115 pf std. 75 pf w/LCLA cables
SONY	All	71 pf
TECHNICS	SL1300, SL1200 SL1100	56 pf* 79 pf*
THORENS	All Units New Units Old Units	300 pf stereo 100 pf w/LCC1 cables 140-160 w/LCC1 cables
YAMAHA	YP800 YP701/YP450	78 pf 108 pf

* Excludes running cables

MICROPHONE INPUT

It is possible to change both *Phono 1* and *Phono 2* inputs to flat, high gain inputs, suitable for connection of high impedance (50,000 ohms nominal), unbalanced microphones. To modify both inputs simultaneously, simply move the wire soldered at eyelet #6 to eyelet #5 on each PC-33 circuit board.

It is also possible to modify only *Phono 2* input to a flat, high gain input for microphone (*Phono 1* remains RIAA equalized). The following wiring changes are needed:

1. Unsolder the wire connected to eyelet #6 on the front PC-33. Do not disconnect the other end, but solder the free end to CF lug #1 on the selector switch SS. Similarly, unsolder the wire to eyelet #6 on the rear PC-33, and solder it to DF lug #1 on SS.
2. Prepare two 1½" wires. Connect one wire between CF lug #2 on SS and CF lug #3 on SS. Solder lug #2 only. Connect the second wire between DF lug #2 on SS and DF lug #3 on SS. Solder lug #2 only.
3. Prepare two 4¾" wires. Solder one wire between eyelet #6 on the front PC-33 and CF lug #3 on SS. (There are two wires soldered at lug #3.) Solder the second wire between eyelet #6 on the rear PC-33 and DF lug #3 on SS. (There are two wires soldered at lug #3.)
4. Prepare two more 4¾" wires. Solder one wire between eyelet #5 on the front PC-33 and CF lug #4 on SS. Solder the remaining wire between eyelet #5 on the rear PC-33 and DF lug #4 on SS.

POWER SWITCH

The circuitry of the PAT-5 has been designed to remain on at all times to eliminate turn on and turn off transients economically, and to prolong component life.

If you wish to modify the wiring for fully off switching, please understand that more than one large transient will occur at turn on and at turn off, which may be harmful to your amplifier and speakers. Once modified, the power amplifier should not be plugged into the PAT-5. Turn on the PAT-5 *first*, wait 10 seconds, and then turn on the amplifier. At turn off, shut down the amplifier, wait 10 seconds, and then turn off the PAT-5. The POWER switch may *not* be used to turn both units on and off simultaneously under this condition of use.

To modify for fully off switching:

1. Unsolder the wire connected to AC outlet D lug #2, but do not disconnect the other end from fuse holder lug #1. Solder the free end to AC outlet C lug #2.
2. Unsolder the wire connected to fuse holder lug #1, but do not disconnect the other end from power switch lug #2. Solder the free end to AC outlet D lug #2.

If you wish to install a relay network in the PAT-5 for operation in an emergency situation—actual loss of electrical power—Dynaco makes available the RCT-5 Relay Assembly Kit. Its cost is $29.95. It may be obtained through your dealer, or from the factory by attaching your check in prepayment when ordering.

E.P.L. CIRCUIT

The *E.P.L.* output and input combination is normally wired after the monitor switches, but before the input follower circuit for the volume and balance controls. However, it is possible to connect *E.P.L.* after the follower circuit ahead of the volume and balance controls, if the chosen equalizer has an input impedance of 10,000 ohms or more, together with an output impedance of 1000 ohms or less. This provides a buffer to isolate the equalizer circuit from the selected program source and permits the use of longer than conventional 6 foot audio cables between the equalizer and the PAT-5.

This change requires some dexterity and care to avoid excessive flexing of the lugs on the 2- and 6-button switches.

1. Unsolder and remove the wire connected between switch PLB lug #8 and MB lug #5. Similarly, remove the wire connected between PLB lug #11 and MB lug #2.
2. Unsolder the wire connected to PLB lug #2. Do not disconnect the other end, but solder the free end to MB lug #5. Similarly, unsolder the wire connected to PLB lug #5, and solder it to MB lug #2.
3. Unsolder the wire connected to RMB lug #1. Do not disconnect the other end, but solder it to PLB lug #8.
4. Unsolder the wire connected to LMB lug #7. Do not disconnect the other end, but solder to PLB lug #11.
5. Prepare a 2" wire. Solder one end to PLB lug #2, and solder the other end to RMB lug #1. (There are two wires soldered at lug #1.)
6. Prepare a 3" wire. Solder one end to PLB lug #5, and solder the other end to LMB lug #7. (There are two wires soldered at lug #7.)

HEADPHONES

If headphones are chosen which require either more or less output level, appropriate value resistors can replace the 150 ohm resistors, R1, on the headphone jack. Reducing the resistor value will increase headphone level; increasing the resistor value will reduce headphone level. Values from 50 ohms to about 300 ohms are useful for low impedance headphones (4 to 50 ohms), but up to 5000 ohms may be required for 600 to 2000 ohms impedance headphones. One watt, 5% tolerance resistors are recommended.

Electrostatic headphones, self-energized only with transformers in their ear pieces, may be connected if R1 is replaced with 2-3 ohm, *10 watt,* 5% resistors. Electrostatic phones with transformers in a separate box must be connected to the power amplifier according to the headphone's directions. Usually it is not possible to operate speakers and electrostatic phones simultaneously with most amplifiers. Check with the amplifier manufacturer in this regard.

6 dB SEPARATION

If you wish to have 6dB of separation instead of complete blending (A + B) when both STEREO-MONO switches are pushed on, the following steps are required:

1. Remove the bare wire between LMB lugs #2 and #8.
2. A wire is connected between RMB lug #3 and LFB lug #1. Unsolder the end connected to RMB lug #3, and instead connect it to unused RMB lug #4.
3. Connect a 1¼" wire between RMB lug #4 (S-2), and LMB lug #8.
4. Solder a 910 ohm, ¼ watt, 5% tolerance resistor between LMB lugs #2 and #8.

200-260 VOLTS AC LINE CONNECTIONS

The power transformer supplied may be connected for a 200-260 volt AC line (50 or 60 Hz current), as well as for the standard 100-130 volt 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—connected in parallel for 100-130 volts, and in series for 200-260 volts. The notes to steps 21, 24, 25 and 26 on page 26, the pictorial diagram on page 33, and the schematic diagram on page 19 detail the 200-260 volt connections. When thus wired, the ¼ ampere (250 ma) fuse should be replaced with a ⅛ ampere (125 ma) slo-blo fuse.

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 problem. Before blaming the electronics, check the connections on all components, particularly carefully on the PAT-5. See that the connections agree with the INSTALLATION instructions. Also check that the *Input/Monitor* and *E.P.L.* switches are in their normal "out" positions (if either is pushed on, there will be no output from the PAT-5).

If neither channel works with any program source (phono, tuner and tape), it is not likely that all sources would be faulty. Temporarily connect the audio cables from the tuner or tape deck to the amplifier inputs. Use the volume control or level set on the tuner or deck to adjust volume. If the system works without the preamplifier, even after double checking all connections to the PAT-5, the preamplifier is probably at fault. If the system does not work, the fault is in the amplifier, speaker wires or speakers.

A fault in only one channel suggests interchanging the audio cables between channels to determine the problem. If the fault occurs with only one sound source, such as phonograph, interchange its cables at the PAT-5. If the fault reverses channels, the problem is in the source. Check the phono cables, the connection of the cartridge in its mounting shell, and the connecting pins between the shell and the tone arm. Next check with a tuner or a tape deck by interchanging its cables at the PAT-5. Once again, if the problem reverses channels, the fault is in the source or its cables. If the fault remains in the same channel, the source is all right. Check the cables between the amplifier and the PAT-5. If not shorted or open, interchange the cables at the PAT-5. If the problem reverses channels, one channel of the PAT-5 is faulty. If the fault remains on the same channel, further logical testing of the amplifier, speaker wires and speakers will determine the fault.

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 in 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 PAT-5 is plugged in. (Remember to *unplug* the PAT-5, because its POWER switch does not turn off the unit.)
2. Be particularly careful not to short any transistor leads to each other or to the chassis when the PAT-5 is plugged in.
3. Exercise caution when soldering and unsoldering transistor and diode leads to avoid excessive heat.

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 semi-

conductors. More sophisticated test equipment, or direct substitution is necessary to qualitatively evaluate their performance.

AUDIO SECTION—GENERAL

All low level signals through *Phono 1* and *Phono 2* inputs, are amplified and equalized first by the PC-33 circuit board, and are then sent on to the high level section, PC-34 board, via the selector switch and control section. All high level signals through *Tuner, Tape 1, Tape 2,* and *Spare* connect directly to the PC-34 board from the selector switch. Most control and switching circuitry is located after PC-33, but ahead of PC-34. A fault can therefore be localized to one or the other channel, and then to the low level or high level section.

For example, if there should be insufficient output on the left channel with the phonograph playing, see if this channel is operating properly with a tuner input. If it is, then the trouble is in the low level section of the left channel (*front* PC-33).

Again, if there is no output on the right channel from any sound source, then the low level section can be tested by exercising some ingenuity. If you realize that the "Tape Out" output signal is available ahead of the volume and tone controls, you can connect the right channel tape output directly to the power amplifier (if the amplifier has input level controls), or into the identical input on the left channel as the program source you are switched to on the right channel. If you then have suitable signal level, you have determined that the fault lies in the right channel tone control and output section (*rear* PC-34).

An additional aid is to compare voltages measured with a VTVM against the charts in this manual.

If the fault is one of little or no signal, then simple signal tracing, following the signal path carefully and injecting some hum by touching each connection in turn, is advisable. If hum occurs at one connection, yet does not occur at the previous connection, the problem is at the previous connection.

For exact signal tracing, refer to the block diagram on page 17, and to the schematic on pages 18 and 19.

HUM AND NOISE

The PAT-5 is inherently hum-free. If any hum is detected, the inputs should be unplugged to see if the hum disappears. If there is no hum with the cables removed, at the same volume setting which produced hum when cables were attached, the fault lies in the associated equipment. Frequently, hum which is injected via the phonograph cables can be eliminated by connecting a ground wire between the turntable chassis and the GND screw on the PAT-5. Some phono cartridges are more hum susceptible than others, and may not be suitable in certain installations where they are close to power transformers, AC power lines, etc.

Hum traced to the PAT-5 may indicate a power supply problem. If it is common to both channels, it is almost certainly in the power supply. Check voltages and all solder connections on PC-32. Hum tests should be made with the cover in place, however, for external hum fields may affect the results.

When there are no cables connected to the *Phono 1* and *Phono 2* inputs, it is normal to have a high hiss level at higher volume settings when the selector switch is turned to these inputs. With the usual sound sources connected, the hiss should not be audible at the settings used in normal listening, although at much higher settings, some residual hiss may be evident.

Objectionable hiss at normal listening levels with phono may be caused by a faulty input transistor Q201, unless the hiss occurs on both channels. If there is hiss on both low level inputs of *one* channel, you can interchange Q201 between the PC-33 boards to determine if one is defective.

PC-33 LOW LEVEL AMPLIFIER

If the PAT-5 does not function properly in both *Phono 1* and *Phono 2* modes, the PC-33 boards are probably at fault. However, a quick check of phono operation can be made by connecting "Tape Out" on the PAT-5 directly to the input of the power amplifier. If the phono operates under this condition of test, the PC-33 boards are operating normally; if not, then investigation of the PC-33 boards will be required. However, connecting "Tape Out" to the amplifier requires input level controls on the amplifier, since these outputs on the PAT-5 are at a fixed level.

Each PC-33 board comprises one preamplifier of the direct coupled NPN-NPN configuration. One PC-33 board should draw approximately 3.5 milliamperes from the +42.5 volt supply. If there are voltage or current variations, all parts in the associated circuitry should be checked.

PC-34 HIGH LEVEL SECTIONS

Each PC-34 board comprises three separate circuits: Input Voltage Follower; High Filter; and Tone Control/Output. Each section may be checked independently by measuring DC voltages and signal tracing.

The Input Voltage Follower, Q301 and Q302, provides unity voltage gain, but has an approximate 50 to 1 input to output impedance ratio. Its input is at eyelet #1; its output is at eyelet #5. Hence, the signal appearing at eyelet #5 should be the same as eyelet #1.

The active High Filter, Q303 and Q304, provides nearly unity gain for audio signals up to approximately 5 kHz when the HIGH FILTER switch is pushed on. The filter should attenuate the signal about 10 dB at 10 kHz with reference to a 1 kHz signal. When this switch is released, the filter network is by-passed.

The Tone Control/Output comprises only one multiple-element active device, IC301. This section normally provides 20 dB of gain from 10 Hz to 50 kHz with the TONE CONTROL switch out.

When the TONE CONTROL switch is pushed on, only AC signal feedback is changed. There should be no effect on the DC voltage measurements.

Each PC-34 draws approximately 20 milliamperes from the +15 volt supply, and about 17 milliamperes from the −15 volt supply.

POWER SUPPLY

With exception of the power transformer, all power supply components are located on the PC-32 circuit board. The voltage chart below lists the voltage tolerances, location of the test points, and approximate peak-to-peak ripple voltages, as well as what components may be at fault if the voltages are out of specification. First check the AC voltage and the unregulated ± 65 DC voltages, and then the regulated voltages. The voltages followed by (*) are unregulated, and therefore will vary with the incoming AC line. The values given are based on a 120 volt, 60 Hz line. All voltages are with respect to circuit ground.

VOLTAGE	TOLERANCE	PEAK TO PEAK RIPPLE	CIRCUIT LOCATION (PC-32)	RELATED COMPONENTS
51 v. AC*	±5 v.	—	Eyelets 5 or 6	Pwr. Transformer AC Primary Wiring
+65 v.*	±7 v.	1.5 v.	+ Side C103	D104, D105, C103
−65 v.*	±7 v.	1.2 v.	− Side C104	D106, D107, C104
+42.5 v.	±2.5 v.	1 mv.	Eyelet 4	R103, R104, C105, C106, C107, D103, Q101
+15 v.	±1 v.	5 mv.	Eyelet 3	R101, C101, D101
−15 v.	±1 v.	3 mv.	Eyelet 7	R102, C102, D102

REGULATED VOLTAGES

All voltages on PC-33 and PC-34 should be stable with incoming AC line variations from 100 to 130 volts, 60 Hz. Unless specified, all voltages are nominal ±20%. Conditions of test: Selector switch turned to *Phono 1*; Shorting plugs connected to *Phono 1* and *Tape Out*. NOTE: 0 means less than ±10 millivolts.

SEMICONDUCTOR	DC VOLTAGE
Q201	
E	+ .65 v.
B	+1.25 v.
C	+5 v.
Q202	
E	+4.4 v.
B	+5 v.
C	+20 v.
Q301	
E	+.6 v.
B	+.3 v.
C	−14.6 v.
Q302	
E	−15 v.±1 v.
B	−14.6 v.
C	+.6 v.

SEMICONDUCTOR	DC VOLTAGE
Q303	
E	+5.3 v.
B	+5.9 v.
C	+12 v.
Q304	
E	+4.6 v.
B	+5.2 v.
C	+12 v.
IC301	(±30%)
1	−13.7 v.
2	− .05 v.
3	− .05 v.
4	−15 v.±1 v.
5	−14 v.
6	0
7	+15 v.±1 v.
8	− .6 v.

PC-33 BOARD

EYELET NUMBER	DC VOLTAGE
1	+.65 v.
2	0
3	0
4	0
5	+20 v.
6	+.65 v.
7	0
8	+42.5 v.±2.5 v.
9	+42.5 v.±2.5 v.

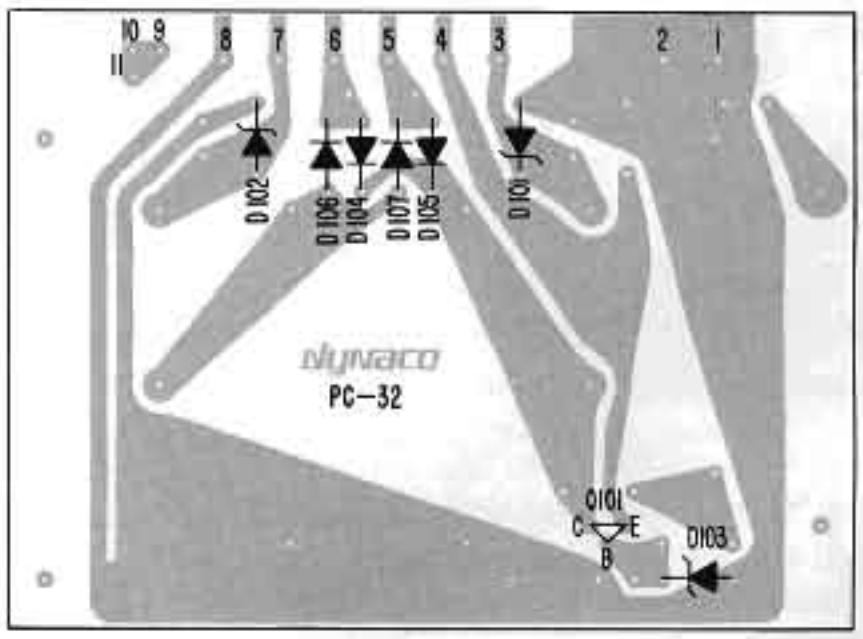
PC-34 BOARD

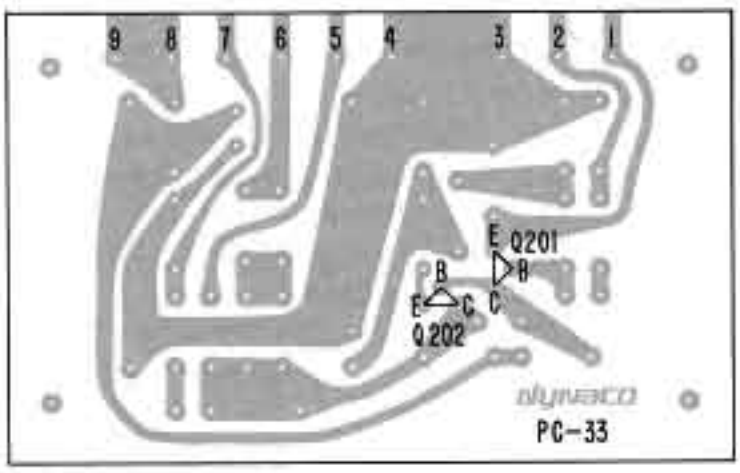
EYELET NUMBER	DC VOLTAGE
1	0
2,3,4	0
5	0
6,7	−15 v.±1 v.
8,9	+15 v.±1 v.

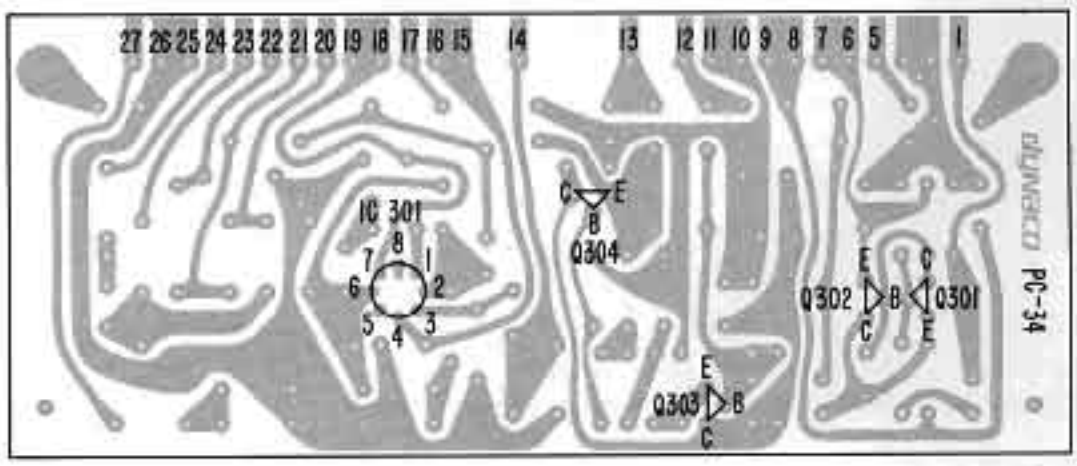
PC-34 BOARD

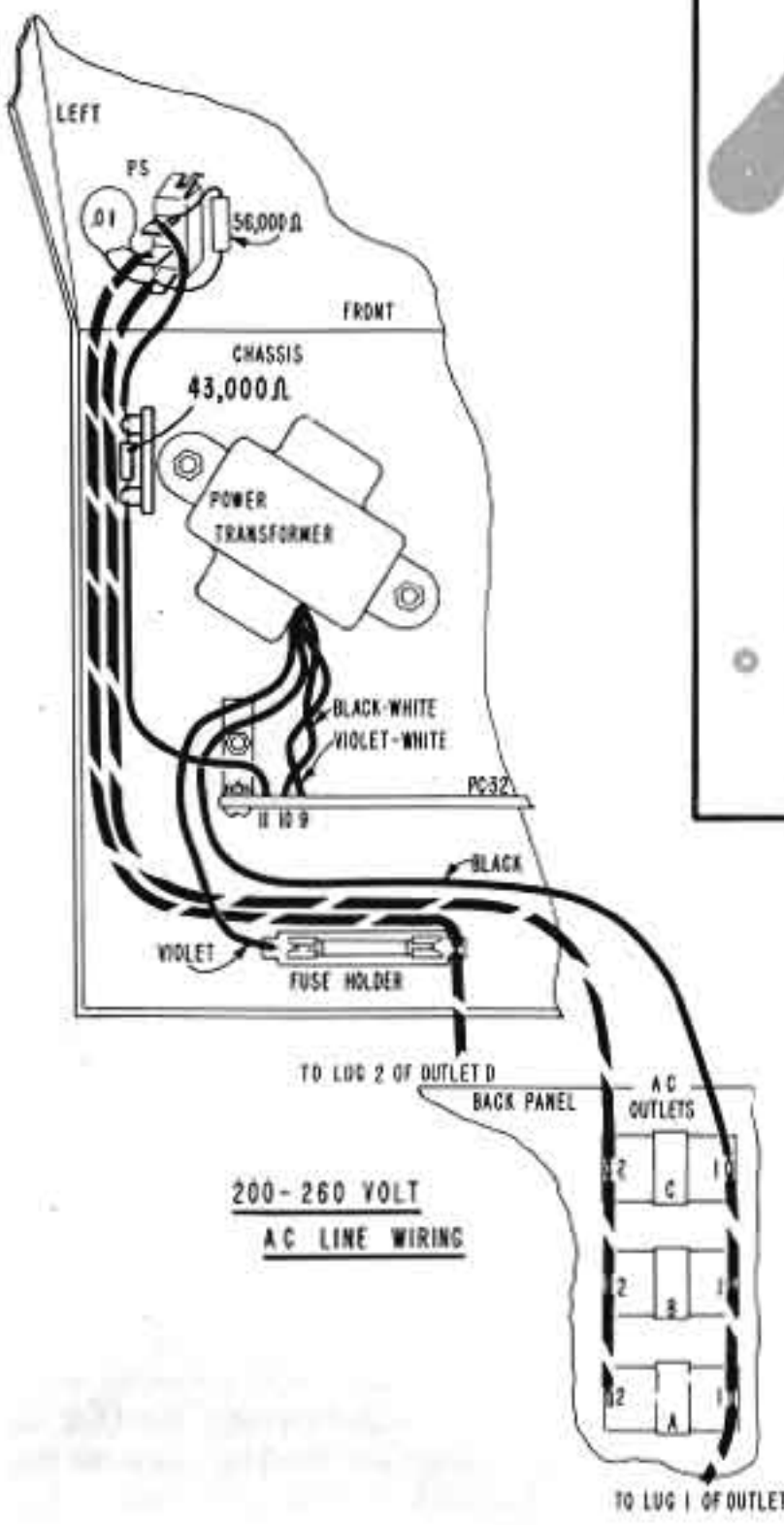
EYELET NUMBER	DC VOLTAGE
10,11	0
12	0
13	0
14	0
15,16	−15 v.±1 v.
17	0
18,19	+15 v.±1 v.
20	0
21	0
22	0
23	0
24	0
25,26	0
27	0

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 ±5% meter could be off by ±5 volts on the 100 volt range. In the PAT-5 this could imply an incorrect indication when measuring the regulated 42.5 volt supply, which has been specified ±2.5 volts. Even if the supply were exactly 42.5 volts, a ±5% meter reading could indicate a voltage from 37.5 to 47.5 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.

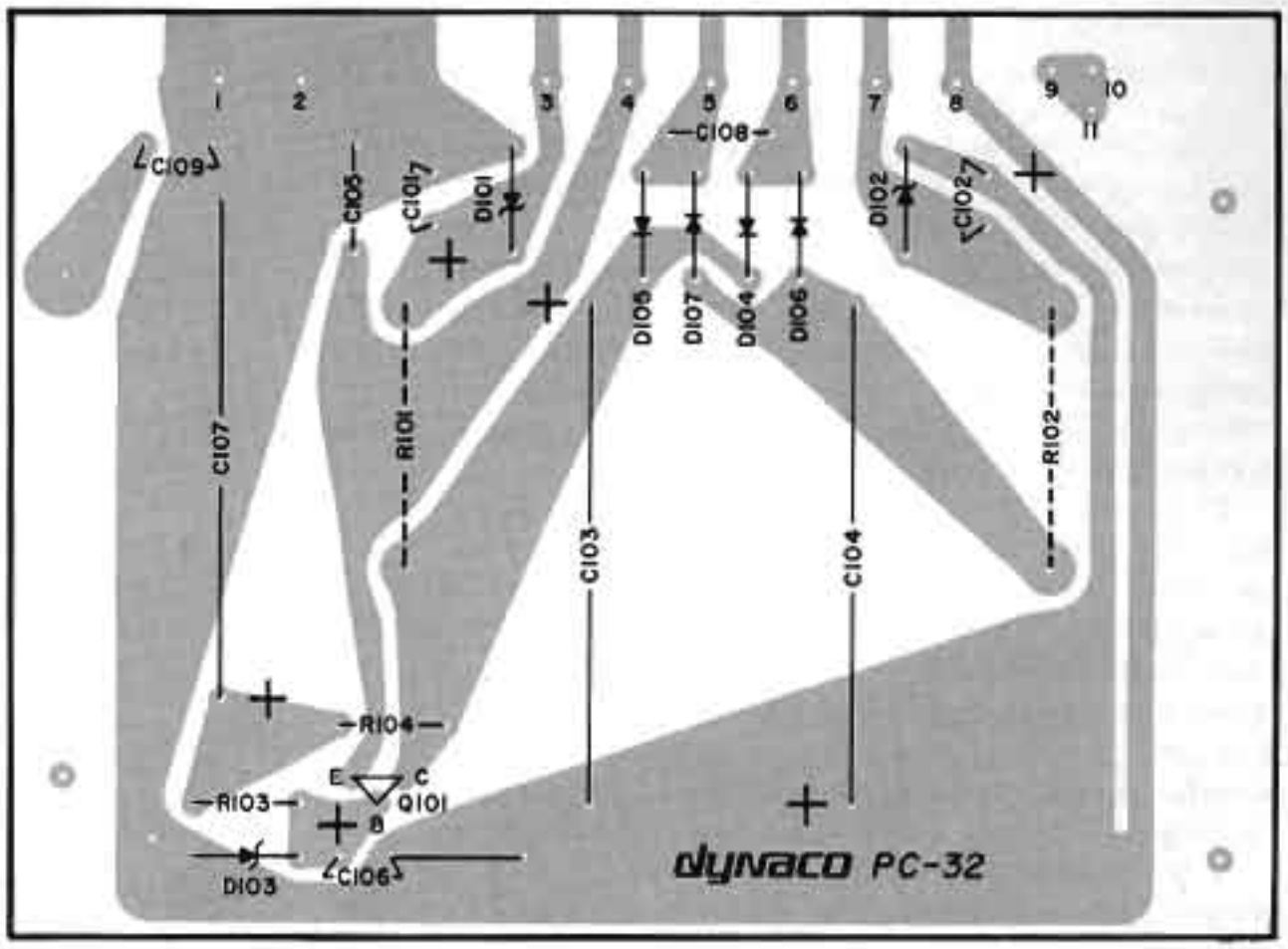


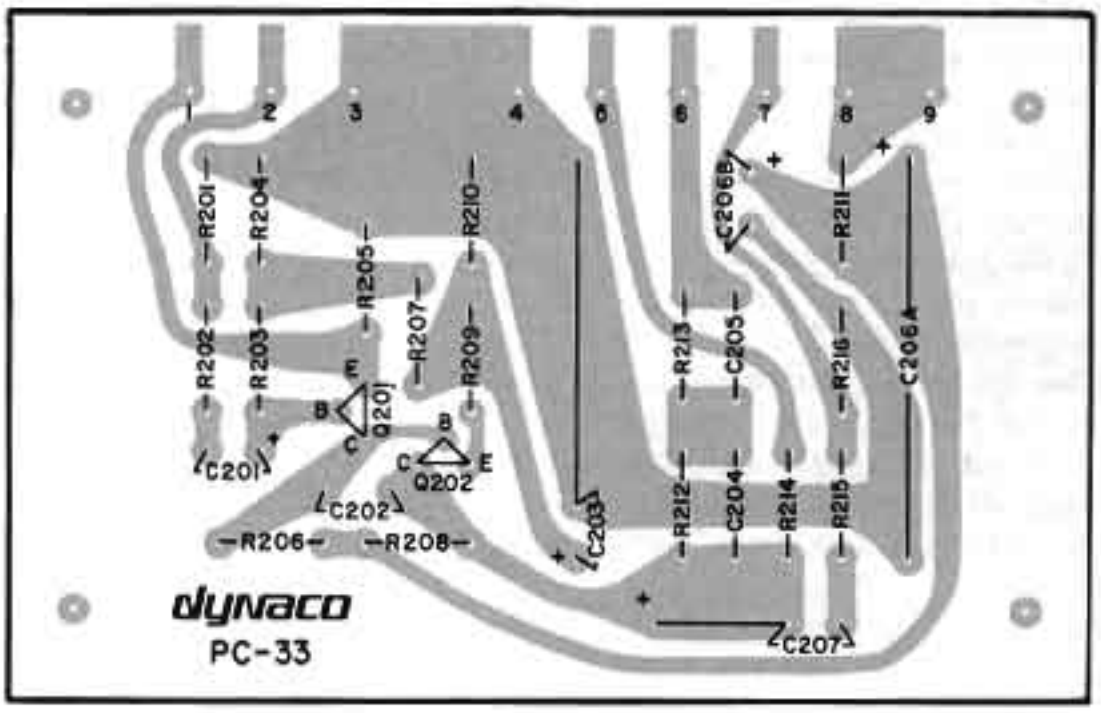


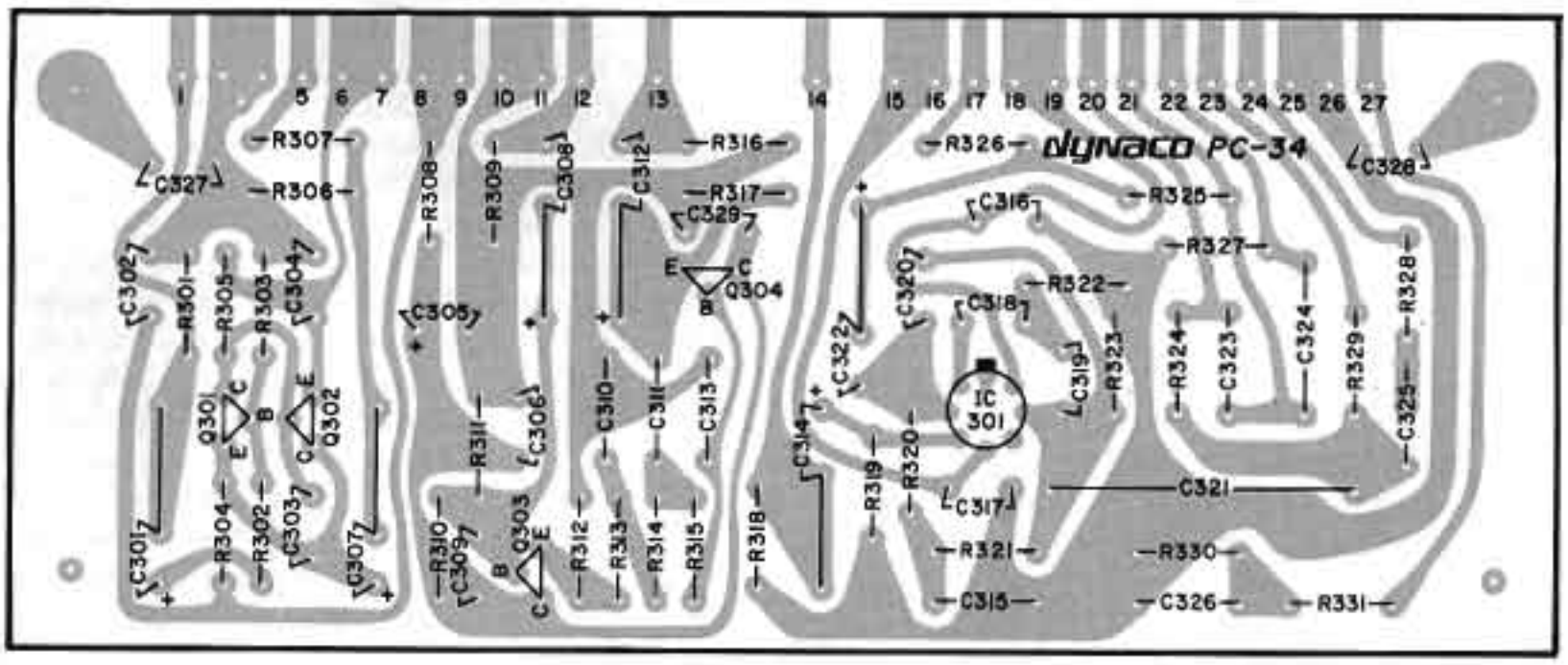




200-260 VOLT
AC LINE WIRING







SERVICE POLICY AND LIMITED WARRANTY

The PAT-5 has been carefully engineered to provide many years of musical enjoyment without difficulty. Each factory-assembled PAT-5 has been subjected to a full complement of performance tests prior to shipment. Each PC-33 and PC-34 circuit board in the kit has been tested and adjusted in operation as a fully functioning unit to verify its performance capability. 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* PAT-5.

When shipping the preamplifier, 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 the power 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 PAT-5 and any tests you have performed.

WARRANTY FOR KIT-BUILT UNITS

The components in a PAT-5 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 PAT-5 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 UPS wherever possible.

The return of a single 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.

This 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 PAT-5A 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.

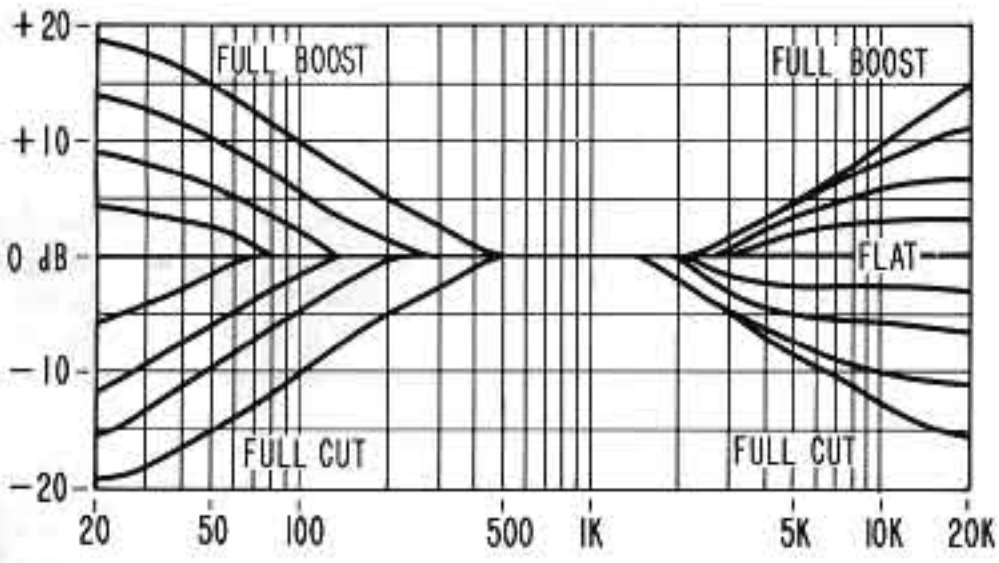
SERVICE BEYOND THE WARRANTY PERIOD

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.*

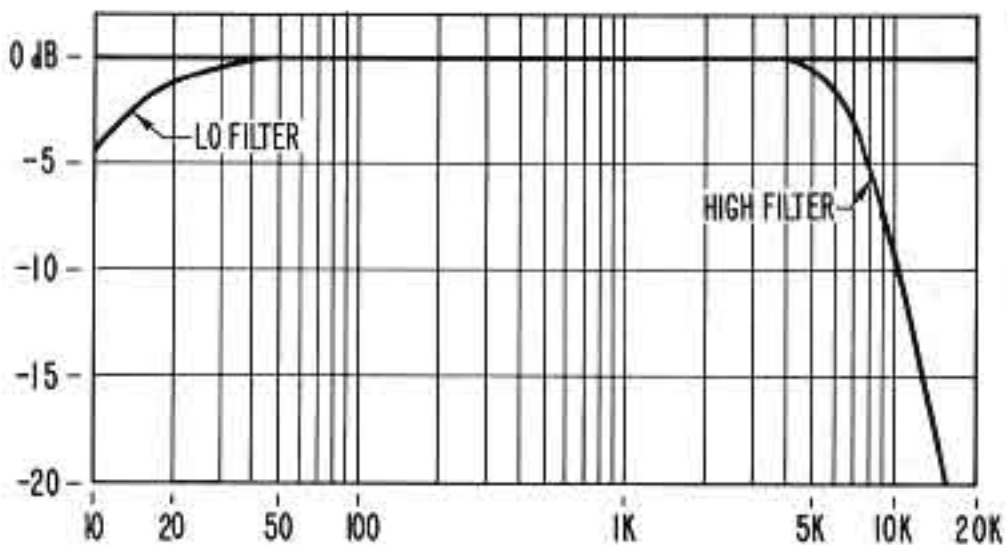
Dynaco reserves the right to limit the service facility or the established fees to two years from the date of purchase. Dynaco assumes no liability or responsibility for injury or damages sustained in the assembly or operation of this equipment, or for damage to other equipment connected to it. Dynaco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

SPECIFICATIONS

Frequency Response:	High Level Inputs: ±1 dB, 10 Hz to 50 kHz. Low Level Inputs: 0.5 dB of RIAA curve.
Distortion at 2 Volts Output into 10,000 ohms in parallel with 1000 pf:	THD 0.007% or less, 20 Hz to 20 kHz. IM 0.007% or less, with any combination of frequencies.
Hum and Noise:	Magnetic Phono: 70 dB below at 10 mv input, at 1000 Hz. High Level: 90 dB below a 0.5 volt input.
Gain:	Magnetic Phono (LO) to Audio Out: 57 dB at 1 kHz. Magnetic Phono (HI) to Audio Out: 63 dB at 1 kHz. Magnetic Phono (LO) to Tape Out/E.P.L. Out: 37 dB at 1 kHz. Magnetic Phono (HI) to Tape Out/E.P.L. Out: 43 dB at 1 kHz. High Level to Audio Out: 20 dB High Level to Tape Out/E.P.L. Out: Unity.
Phono Input Acceptance:	LO: Greater than 115 millivolts at 1 kHz. HI: 45 millivolts at 1 kHz.
Tone Controls:	Bass: Greater than ±10 dB at 50 Hz. Treble: Greater than ±10 dB at 15 kHz.
Filters:	Low: — 4 dB at 10 Hz; 6 dB per octave (conforms to newly revised RIAA phono playback curve). High: —10 dB at 10 kHz; 15 dB per octave.
Voltage Output:	7 volts minimum into 10,000 ohms or greater. 4.5 volts minimum into 1000 ohms.
Impedances:	Magnetic Phono: 47,000 ohms in parallel with 220 pf. High Level: 50,000 ohms. Tape Output: From phono inputs, 15,000 ohms or greater may be connected; From high level inputs, same as source. Audio Output: Less than 600 ohms.
Separation at 2 volts output into 10,000 ohms; undriven input terminated in 5K:	20 Hz: 70 dB minimum. 2 kHz: 70 dB minimum. 20 kHz: 45 dB minimum.
Semiconductor Complement:	13 transistors; 2 integrated circuits; 3 zener diodes; 4 diodes.
Dimensions:	13½" x 4¼" x 11¾" deep.
Power Consumption:	12 watts, 120 v or 240 v, 50/60 Hz AC.
Shipping Weight:	13 lbs. (5.9 kilos.)



TONE CONTROL RANGE



FILTER ACTION

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	Chassis	711117
1	Back panel	711118
1	Cover	711027
1	Transformer, power	464080
1	Circuit board, bare, power supply, PC-32	950032
2	Circuit board assembly, preamplifier, PC-33	993028
2	Circuit board assembly, control, PC-34	993029
4	AC outlet, black	351012
6	Banana plug, single, black	361046
6	Banana plug, single, red	361045
6	Binding post with hardware, black	315001
6	Binding post with hardware, red	315002
1	Brace, front-to-back	711019
1	Brace, selector switch	711116
5	Bracket, "U" shape	717038
1	Bracket, "L" shape	710422
2	Cable, audio	321072
3	Capacitor, electrolytic, 220/250 mfd	284251
2	Control, 100 K CCW log, bass and treble	160104
1	Control, 15 K, 20% log, volume	160153
1	Control, 30 K special, balance	160303
1	Front plate	769046
1	Fuse holder	341003
1	Jack, headphone	355013
2	Knob, large	764188
2	Knob, small	764187
2	Knob, small dual, front	764201
	rear	764202
8	Knob, push-on	814053
1	Label, phono gain	898042
1	Label, serial number	898011
1	Label, caution, fuse replacement (Canada only)	898018
1	Line cord	322091
1	Rubber extrusion, 5" length	854001
8	Set screw, Allen, #5-40 x 3/16"	613834
4	Socket strip, 6 input	355007
1	Strain relief, Heyco	895010
1	Switch, AC, lighted	331103
1	Switch, selector, rotary	333166
1	Switch, speaker, rotary	333167
1	Switch, toggle	331104
1	Switch, 6-position button	338001
1	Switch, 2-position button	338002
1	Terminal strip, 2-lug	372002
1	Wire, #20 hookup, black, 29'	
1	Wire, #20 hookup, blue, 23'	
1	Wire, #20 hookup, yellow, 23'	
1	Wire, #16 hookup, white, 3'-6"	
1	Warranty card	
1	Manual, instruction	

		PART #
#1 Hardware assembly		997198
12	Lockwasher, #4	617205
54	Nut, #4-40, KEP (with lockwasher)	615244
52	Screw, machine, #4-40 x 5/16"	611254
#2 Hardware assembly		997199
4	Foot, #707 rubber	859001
4	Lug, ground, #4	639311
10	Nut, 3/8"	614065
6	Nut, #6-32 KEP	615304
11	Screw, self-tapping, #6 black	613349
4	Screw, machine, #6-32 x 3/8"	611330
2	Screw, machine, #6-32 x 1"	611395
4	Screw, self-tapping, #4-40 x 3/4" (or 5/8")	612201
4	Spacer, 1/4" O.D. x 3/8"	660261
2	Spacer, 3/8" O.D. x 3/4"	660062
5	Wire ties, plastic	894003
1	Wrench, Allen set screw #5	968522
Capacitor-resistor assembly		997200
2	Capacitor, disc, 15 pf, 5% NPO	234150
2	Capacitor, disc, .01 mfd/100 v.	234103
2	Capacitor, disc, .0082 mfd/1.4 kv.	238822
1	Capacitor, disc, .01 mfd/500 v.	228103
2	Capacitor, mica, 220 pf, 5%	245221
2	Capacitor, mica, 470 pf, 5%	257471
2	Capacitor, mylar, 1.5 mfd, 5%	264155
1	Fuse, slo blo, 1/4 ampere 3AG	342009
1	Resistor, 56 K, 1/2 watt (green-blue-orange)	113563
2	Resistor, 150 ohm, 1 watt 5% (brown-green-brown)	116151
2	Resistor, 412 ohm, 1/8 watt, 1% (yellow-brown-red-black)	130412
PC-32 assembly		997533
1	Capacitor, disc, .01 mfd, 100 v., 1/4"	234103
1	Capacitor, disc, .01 mfd, 500 v., 3/8"	228103
1	Capacitor, disc, 0.1 mfd, 100 v.	224104
1	Capacitor, electrolytic, 1 mfd, 50 v.	283103
2	Capacitor, electrolytic, 100 mfd, 16 v.	281101
4	Diode, silicon, 200 ma, 200 prv (1N4003)	544012
1	Diode, zener, 43 v., 0.5 w., 5%; 1N5260B	540543
2	Diode, zener, 15 v., 1 w., 5%; 1N4744A	540115
2	Resistor, 2.2 K, 1/4 w., 5% (red-red-red)	119222
1	Resistor, 820 ohm, 5 w., 10%	120821
1	Resistor, 1 K, 5 w., 10%	120107
1	Transistor, NPN; SE6020	577021