WINSKY

SERIAL NUMBER

21146226

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

dynaco SCA-80Q

INSTRUCTIONS FOR ASSEMBLY OPERATION

Price $1.00

patents pending

929521

dynaco INC. 3060 Jefferson St., Philadelphia, Pa. 19121 U.S.A.

CONTENTS

SPECIFICATIONS

FREQUENCY RESPONSE: (at 1 watt output)
High level inputs: ±0.5 db from 15 Hz to 50 kHz.
Phono input: ±0.5 db of RIAA equalization.

POWER RESPONSE: 40 watts per channel into an 8 ohm load with less than 0.5% total harmonic distortion from 20 Hz to 20 kHz. IHF Power Bandwidth 8 Hz to 50 kHz half power output at less than 0.5% harmonic distortion into 8 ohms. Distortion decreases at lower power levels.

INTERMODULATION DISTORTION: Less than 0.1% at any power level up to 40 watts per channel into 8 ohms with any combination of test frequencies. Distortion decreases at lower power levels.

NOISE: High level inputs: 80 db below rated output.
Phono input: More than 60 db below rated output.

INPUTS: RIAA magnetic phono: 47,000 ohms; 3 mv.
Special low level: (2nd phono); 47,000 ohms; 3 mv.
High level: (radio tuner, tape amp, spare); 100,000 ohms; 0.13 volt.

OUTPUTS: Front or Main Speakers: 4 to 16 ohms.
Rear Speakers: 8 ohms, or as Remote: 8 or 16 ohms.
Front panel headphones: 4 ohms or higher.
Tape output: 600 ohms from phono input (same as source on high level inputs).

TONE CONTROL RANGE: ±12 db at 50 Hz and 10 kHz.

CONTROLS: Selector Switch, Volume, Balance, Bass, Treble, Tape Monitor Switch, Loudness Compensation Switch, Filter Switch, Stereo-Mono-Blend Switch, Speaker Switch, Power Switch.

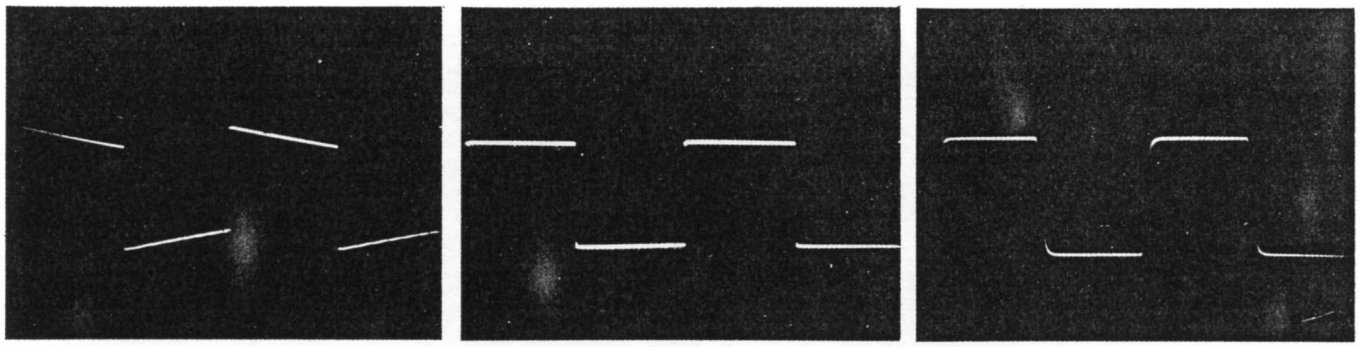
SEMICONDUCTOR COMPLEMENT: 20 transistors; 10 diodes.

DAMPING FACTOR: Greater than 40 from 20 Hz to 10 kHz.

SEPARATION: 65 db by IHF standards;
50 db or more from 20 Hz to 10 kHz.

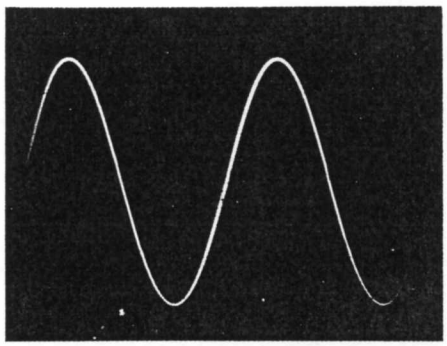
SIZE AND WEIGHT: 13½" x 4¼" x 10" deep.
16 pounds (7.2 kg.).

POWER CONSUMPTION: 250 watts maximum; 35 watts quiescent; 50/60 Hz @ 100, 120, 220, or 240 volts AC.

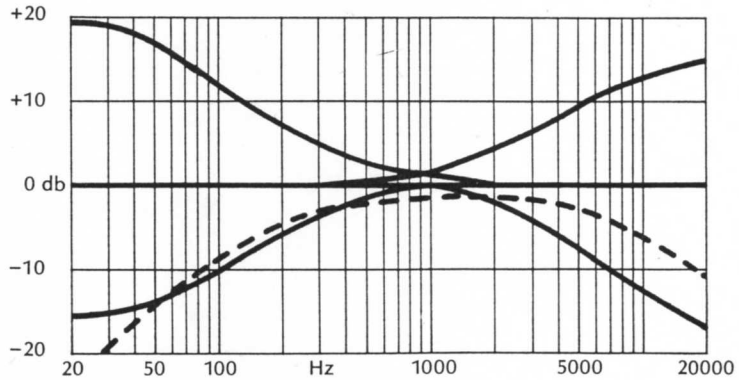


100 Hz 1 kHz 10 kHz

SQUARE WAVE PERFORMANCE: This is a good indication of linearity from 10 Hz to 100 kHz, since good square wave reproduction requires bandwidth in excess of 1/10th to 10 times displayed frequency.



LOW POWER FREEDOM FROM DISTORTION: at 1/10th watt, a 20 kHz sine wave (the most difficult audio frequency) shows absolutely no signs of crossover or notch distortion.



TONE CONTROL RANGE
Narrow band filter characteristic shown as broken line.

THE DYNACO SCA-80Q

Do not attempt to install or use this amplifier until the section "Operating Instructions" has been carefully read.

The Dynaco SCA-80Q is an all silicon solid state stereo control amplifier of exceptionally high quality. It functions as the control center for all mono or stereo signal sources, such as a record player, radio tuner, tape recorder, television sound, etc., and provides output connections from two 40 watt power amplifiers for either two or four loudspeakers, as well as a front panel jack for stereo headphones. Thoughtful planning has provided exceptional flexibility with remarkable ease of operation.

The SCA-80Q incorporates special circuitry which enables Dynaquad™ 4-dimensional playback for increased realism from a four speaker system without any additional electronics. Alternatively it may be used as a conventional two channel stereo amplifier with provision for optional connection of a second pair of speakers in a remote location.

The SCA-80Q has been designed to be used under normal conditions without special safety precautions, just as if it were a high grade tube amplifier. There are no circuit breakers, speaker fuses, or other resettable devices to impede the use of the SCA-80Q under any reasonable conditions of use or abuse. This is achieved by using novel circuits (on which patents are pending) which automatically and instantly protect the amplifier.

The components in the SCA-80Q are of the highest quality to protect against failure, both now and for many years in the future. The transistors have been selected for minimum noise and distortion in sustained use. All parts are used conservatively with close tolerances to assure proper operation, and all four etched circuit modules in the kit have been pretested under actual use conditions to ensure that every unit, after assembly, will meet the specifications normally associated with laboratory prototypes.

The specifications of the SCA-80Q speak for themselves. The distortion at low levels is comparable to that of the finest tube designs, while the high power distortion remains inaudible. Specifications do not reveal all the facets of sound quality, however. In use with varying program material, the SCA-80Q justifies its design efforts to have qualities of ease and naturalness always sought and rarely achieved in solid state designs. There is no extra brightness or stridency which is unfortunately sometimes attributed to high fidelity sound, but rather there is an impression of limitless range and effortless handling of the highest power peaks.

Like any precision equipment, the superior capabilities of the SCA-80Q will best be realized when it is properly connected and operated. Therefore, read these instructions, and make the specified connections to the input audio source and to the loudspeakers *before connecting the amplifier to a source of AC power.*

OPERATING INSTRUCTIONS

Connection from Phonograph

The pair of input sockets marked *Phono* provide RIAA equalization for magnetic phonograph cartridges. They may be used with all normal magnetic cartridges having maximum inputs up to 80 millivolts and designed for a load impedance of 47,000 ohms. The upper row of input connections is intended for the *left* channel.

Special Input

This input provides a second low level option which is normally wired for a second magnetic cartridge with RIAA phonograph equalization, enabling the connection of two record players—a turntable and a record changer, for example. Other connections are possible with internal wiring changes, as described in the section "Optional Connections" later in this manual.

Ground Connection

Some record players or tape machines have an extra wire which is to be attached to the preamplifier chassis. A grounding screw *Gnd* is provided for this purpose. Under some unusual conditions of use, where it is advisable to ground the system to a water pipe or similar earth connection, this screw can serve as the connection point.

In general, it is advisable to use the *minimum* number of separate ground leads necessary to achieve lowest hum. Some experimentation may be necessary, but extra leads often cause an increase in the hum level of the system.

Connection from Radio Tuner and other High Level Sources

The *Tuner* and *Spare* inputs are identical and receive flat high level signals from AM/FM/Multiplex radio tuners, additional tape recorders, audio signals from a TV set, etc., via regular shielded cables.

Connection from Tape Recorder

Most tape machines available today include playback preamplifiers. The cables from their "preamp output" or "line output" sockets should be connected to the *Tape Amp* inputs, and the selector switch turned to *Tape* on the SCA-80Q. This input can also be selected by the *Monitor* switch, as described later.

If you have a tape deck which does not contain playback electronics, it is possible to add the necessary equalization components to enable such playback through the *Special* input. See "Optional Connections" later in this manual.

Connection to Tape Recorder

If your tape machine has recording facilities, audio cables should be connected from the *Tape Out* sockets on the SCA-80Q to the "radio," "high level" or "line" inputs on the recorder. The recorder inputs should require signal levels nominally between 100 millivolts and one-half volt for full recording level. Microphone inputs on a recorder are not suitable because their sensitivity is too high.

Tape Out connections are made in the SCA-80Q ahead of all controls except the selector switch so that these controls may be operated to adjust the amplifier signal to the speakers during the recording process without affecting the signal going to the tape recorder. These outputs are at the same level and impedance as the source for all high level inputs, and are low impedance outputs from the phono preamplifier stages. They are ahead of the *Mode* switch too, so each output is independent. They should *not* be externally connected together with a Y adapter for monophonic recording from a stereo source.

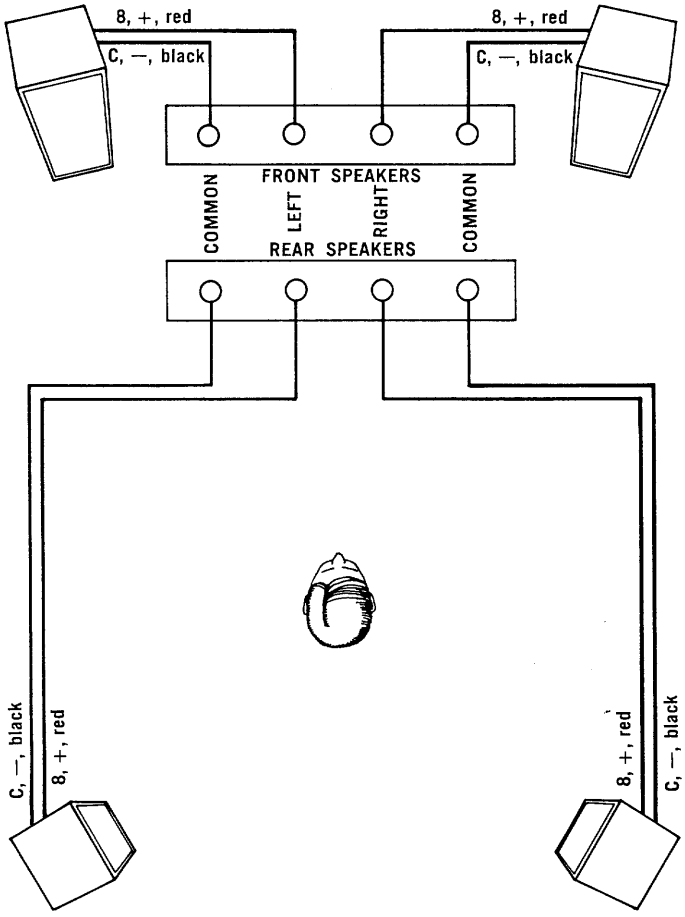
If you wish to record monophonically from a stereo phono cartridge, it will be necessary to parallel the outputs of the cartridge itself in accordance with the manufacturer's instructions. Then one audio cable from either

(but not both) *Tape Out* socket may be connected to the single input on the recorder. If extensive mono recording from stereo phono sources is likely, see "Optional Connections" in this manual. Mono recordings from high level sources such as a tuner present no problems because the tuner output can be switched to mono.

The SCA-80Q does not provide the equalization and bias requirements of a complete tape recording preamplifier. It therefore cannot be used as such.

Connection to Loudspeakers

The SCA-80Q is provided with four pairs of black and gold output terminals, each indicated by a loudspeaker symbol. If one pair of speakers is used for conventional two-channel stereo, connect them to the top row of terminals. A second pair of speakers *located in the same room* enables the benefits of Dynaquad™ 4-dimensional reproduction. These rear speakers are connected to the bottom row of output terminals.



If you prefer to use the second pair of speakers in a remote location, so that conventional two-channel stereo is heard in both rooms, the remote speakers are connected to the bottom row of output terminals, and *in addition* a short piece of wire (jumper) must be connected from the top left *common* terminal to the bottom left *common* terminal.

Each speaker is connected to a black or *common* terminal and to the adjacent gold or *live* terminal. The black terminals are connected together internally, so you can use other equipment which requires common output grounds. *You must be certain that the polarity of such output connections is never reversed, and that the* live *sides are never accidentally connected together in accessory equipment.*

"Spade lugs" are provided for attaching to the speaker wires to assure a good connection to the terminals. These can be simply crimped over the bared end of the wire, but if a soldering iron is available, soldering them on will make a more secure connection. If stranded wire (as with lamp cord) is used, the wire strands should first be twisted together or "tinned" with solder to avoid fraying. Make certain that no wire strands are able to touch another terminal or the chassis *before you turn the amplifier on.*

The front speakers may be 4, 8 or 16 ohms rated impedance. The rear speakers of a 4-D system should be 8 ohms; they should be identical models; they should have very uniform impedance characteristics; and their efficiency and sonic characteristics should be similar to those of the front speakers. If the rear speakers are 16 ohms, the 10 ohm resistor inside the back panel should be replaced with a 20 ohm, 10 watt unit. If the second pair of speakers is connected for remote use, they may be either 8 or 16 ohm impedance. Only one speaker should be connected to each pair of terminals.

For speaker cables of less than 50 feet, ordinary #18 lamp cord may be used. For longer distances it is suggested that heavier cable (#16 or #14) be used. The terminals on loudspeakers are marked in different ways, and sometimes are not identified. Corresponding terminals may be marked (+), (8 ohms), (1) or in red. It is important that the "sense" of the wiring to each speaker be consistent, so that all speakers will be connected *in phase.* With lamp cord this is easy because one lead is coded—usually either with a tracer thread wound around one of the wires, or with a slight molded ridge on the outer plastic insulation of one conductor, or with different color conductors.

Two speakers are connected in phase when maximum low frequency output is heard when they are driven from a monophonic source. Lowered output is observed when the connection to *one* of the speakers is reversed (out of phase, or reversed polarity). This is most apparent when the speakers are connected to the same amplifier channel, and are placed side by side, or facing each other a short distance apart for test purposes. In a 4-D system, each of the speakers should be compared in turn with the original if there is any doubt of their phasing.

Speakers which require electrical equalization (through the Tape Amp monitor input and the Tape Output) may be used in a 4-D system *only* if all speakers require the same equalizing networks in the amplifier stages. It is *not* feasible to mix equalized speakers with conventional speakers connected to the same amplifier.

The nominal power rating of the SCA-80Q is based on a load impedance of 8 ohms. Loudspeakers with impedances of 4 or 16 ohms may also be used, with some reduction of the maximum power capability at some frequencies. With a 16 ohm speaker load, maximum power can be expected to be about 26 watts per channel. A more detailed explanation of amplifier power output characteristics is available on request from Dynaco.

Selector Switch

This rotary switch selects your choice of program source in both channels simultaneously. It also enables you to select playback from a tape recorder, differing from the more common arrangement which requires that you operate a separate *Monitor* switch to select the recorder. The SCA-80Q also provides a *Monitor* switch (described later), but selection of the recorder for routine playback is made in the same way as all other inputs to avoid confusion.

Volume Control

The output level of both channels is adjusted simultaneously by this control, with close tracking of the two stereo channels so that the program material will remain in balance over most of its range. This control has been designed to provide a slow increase in volume over the first half of its rotation, and a more rapid volume increase above 12 o'clock. This enables most satisfactory operation with both high efficiency and low efficiency speakers, and with both high and low output phono cartridges.

The relative position of the volume control on different pieces of equipment is not an accurate indication of the power output, because it is affected by input levels and speaker efficiency.

Balance Control

The balance control is normally centered for equal signals in both channels. Rotation to the right shifts the sound source to the right by reducing the left channel level, and conversely. This control has a very gradual change for the first 90° either side of center to facilitate delicate adjustments, but one channel is silenced at either extreme of rotation.

A conventional two speaker stereo system requires a balance control to correct for differing speaker efficiencies, or inequities in room energy distribution, as well as occasional program variations.

A 4-dimensional system utilizes the balance control to achieve precise electrical symmetry in the system, and thus to attain maximum separation. With a 4-D system the balance control is no longer used for shifting left-to-right emphasis. The listener is advised to shift his position to adjust for such inequities.

Tone Controls

The special design of the separate bass and treble tone controls is a patented Dynaco arrangement which assures that the tone controls are "out of the circuit" when they are centered. This provides the perfectionist's performance goal with the convenience of continuously variable correction without the complication of extraneous disabling switches.

The normal or "flat" position is centered, with increasing effect to the right, and decrease to the left. Tone controls alter the original signal to suit the user; but these alterations are deviations from truly accurate reproduction. The reference point should always be the center, which gives no frequency discrimination. The tone controls also help to correct for record compensation characteristics of older discs which do not follow the present RIAA standard playback curve.

Monitor Switch

This switch enables direct comparison of the source signal indicated by the selector switch, with the same signal played back from a separate playback amplifier of a tape recorder. This feature is applicable when recording through the SCA-80Q to a tape recorder which has separate playback preamplifiers and three or more heads designed for simultaneous playback while recording. For example, while recording from a radio tuner, the selector switch is turned to *Tuner,* and *Tape Out* is connected to the recorder input. The playback output of the recorder is connected to *Tape Amp.* You will hear the tuner directly when the Monitor switch is in its normal position, marked *Input.* When the Monitor switch is on *Tape* you will hear the program a fraction of a second after it has been recorded, now being played back from the tape. For this, the tape recorder's own monitor switch must be left in the *tape, compare, playback* or *monitor* position.

You must remember to keep the Monitor switch on *Input* normally, or you will get no signal from any of the other program sources selected by the selector switch. The Monitor switch serves no purpose when the *Selector Switch* is turned to *Tape.*

Loudness Switch

The *Loudness* switch is normally left *off,* but it may be used at lower settings of the volume control to provide an increase in bass to compensate for the ear's lack of sensitivity to low frequencies at low sound levels. The high fidelity purist usually avoids any such compensation; but many listeners will find this switch, used in moderation, adds listening enjoyment at low levels. This sonic correction does not add boom or muddiness to the reproduction.

Filter Switch

With good program material the filter switch will be left in the *flat* position, or effectively out of the circuit. The *rumble* setting provides attenuation below 100 Hz, minimizing low frequency disturbances. The *narrow band* position rolls off both high and low frequencies simultaneously. It thus makes listening to poorer program material more enjoyable since it does not shift the original tonal balance. High frequencies are attenuated above 6 kHz.

Mode Switch

This switch will normally be left in the *stereo* position with stereo program material, providing full separation of the two channels.

The *blend* position reduces the normal stereo separation to 6 db, as for example when the two speakers are spread too far apart for realistic reproduction of a solo instrument. When using headphones, this position frequently provides more realism by reducing the excessive sonic spread.

The *mono* position parallels the two channels, and is the proper position for listening to monophonic records played by a stereo cartridge, as it eliminates the vertical noise components of the signal. When listening to a monophonic radio broadcast with some tuners, too, some improvement may be noted in this position. If a monophonic source, such as TV sound, is connected to one channel input, this signal will be available through both speaker channels when this switch is in the mono position.

Speakers Switch

The *Front* position of this switch plays through only the pair of speakers connected to the upper terminal strip. The *Four* (middle) position connects all speakers, either in the normal 4-D arrangement, or as equivalent-signal Main and Remote pairs when the connecting wire jumper is installed on the back panel as indicated there.

The spring-return *Null* position is used for balancing the 4-D system. First play the program at the normal volume setting, and then while you hold the switch against the spring, adjust the Balance control *slowly* for a precise null (no sound). Then release the switch, and you will have 4-D sound. Occasionally, differing program sources or changes in the volume control setting make it advisable to rebalance for best 4-D results.

Headphone Output

A standard 3-circuit phone plug fits this output, wired so that the tip connection is the left channel. Series resistors attenuate the power amplifier output, and headphones of 4 ohms or higher impedance may be used. When headphones are connected, all speaker outputs are automatically silenced. You should *not* have headphones connected when the Speakers switch is in the *Null* position.

Power Switch

This switch has the obvious function of turning the SCA-80Q on and off, and contains an integral pilot light. It also switches whatever is connected to the black (switched) AC outlet on the back panel, such as a radio tuner. The red AC back panel outlet, which is always *on*, is used for a record player or tape recorder. Their drive mechanisms cannot then be damaged if the amplifier power is turned off without disengaging the machine.

INSTALLING YOUR SCA-80Q

The SCA-80Q generates some heat in normal use—mostly from the power supply resistors—so adequate ventilation must be provided to ensure long trouble-free life. As with any transistorized amplifiers, higher power outputs increase the heat output proportionately, so you must never limit the air flow through and around the SCA-80Q. Do not set anything on top of the perforated cover. Vertical (face up) mounting is not encouraged, since the heat dissipation is not as effective as in the normal horizontal placement. If the unit *must* be mounted face up, a fan is recommended, and some provision for supporting the weight of the power transformer should be made to avoid distorting the front panel.

If the SCA-80Q is inadvertently left on for a lengthy period of time, no problems will be encountered, for the transistors remain cool except under high signal conditions. With sustained high power output, it is normal for the bottom to get much warmer than the cover, for the heat sinks dissipate heat through the chassis. As with all solid state amplifiers, maximum heat is generated at about half the maximum power output. At full power output from both channels a transistorized amplifier must dissipate as much heat as an equivalently powered tube amplifier. At full power, the SCA-80Q puts out as much heat as a 250 watt light bulb.

Panel mounting requires a single rectangular cutout $13\frac{1}{16}$" by $3\frac{15}{16}$". The rubber feet are removed for such use. You can simply provide a shelf flush with the bottom of the opening. Be sure to cut out the shelf in the area of the ventilation slots on the chassis. Or, an accessory PBK bracket kit is available from Dynaco for $2 postpaid. No COD's please. The brackets take the place of the shelf, and can accommodate panel thicknesses up to one inch. Instructions accompany the kit, but note that the hole for one of the mounting bolts is located underneath C7L, and this bolt will be secured *only* by the wing nut provided with the kit. Be sure that C7L is properly clamped flush to the chassis after the bolt is installed.

Cautions to be observed

The SCA-80Q contains circuits which will provide nearly complete protection against abuse (including the cautions noted below), but you should not challenge fate. We all know that parachutes are quite safe—but why jump to test one? The need for protective circuitry in solid state equipment is a direct result of its inherent susceptibility to failure compared with the ruggedness of vacuum tube equipment. You will avoid possible damage to costly transistors and other components if you follow these few simple rules:

1. Do not connect or disconnect inputs or outputs when the amplifier power is on.
2. If you hear any abnormal noises, turn off the equipment and locate and eliminate the source of the noises before using the SCA-80Q. These noises may result from partially connected audio cables or similar faults not connected with the SCA-80Q, but they can be signals or symptoms of signals of excessive amplitude.
3. Do not operate a tape recorder in the fast wind or rewind mode when the volume control is advanced, as this could produce large signals at inaudible frequencies.
4. Avoid any output connection system which risks directly connecting the "live" side of one channel to the "live" side (gold terminal) of the other channel when stereo (different) signals are involved. This is not likely in any properly wired system or accessory, but an accidental change of polarity in the connections to a system requiring common ground connections could be costly. Of particular note: headphone junction boxes.
5. Avoid shorting together the two wires to a loudspeaker, and do not use any switches in the output of the shorting type. Be sure that no strands of connecting wires are free to touch anything except the intended terminal.
6. Do not operate the amplifier if excessive temperature rise is noted.

OPTIONAL CONNECTIONS

The design of the SCA-80Q makes it easy to "customize" in several ways to suit individual needs. A supplementary data sheet is available on request from Dynaco which outlines the necessary changes to provide the following variations.

The normal wiring of the selector switch provides RIAA equalization for a second magnetic phono cartridge on the *Special* input. Other equalization can be provided, so that the *Special* input can accommodate either direct playback from a tape head, or a microphone, provided that the input load impedance remains at 47,000 ohms.

To enable the *Special* position on the selector switch to be used as a second equalization position for the one phono input, the switch has been designed so that the phono input is not shorted when in the *Special* position. By installing appropriate components on the preamplifier circuit board and connecting a jumper on the back panel from the phono input to the special input socket, a second equalization position is available.

If you wish to tape record monophonically from stereo records, the *Special* input can be wired so that it parallels the two phono inputs and provides a monophonic signal at the tape output jack.

If you wish to *reduce* the sensitivity of the *Phono* input by 6 db, alternative wiring of the equalization components is included in the above data sheet.

If headphones are chosen which require either more or less output level, appropriate value resistors can replace the 120 ohms resistors on the headphone jack.

LISTENING TO DYNAQUAD SOUND

When a monophonic music system is changed to two channel stereo reproduction the broadened sound source and added "liveness" is apparent. Part of this enhancement is in the directional characteristics, but much is the result of an improved spatial sense, which is more subtle. Dynaquad 4-D sound provides both added front-to-rear directionality and marked improvement in recreating the ambience or "hall sound" of the original location. The apparent direction of each sound source is a function of the phase and amplitude relationships of its direct and reflected signals. A two-speaker stereo system is incapable of reproducing all of these signal combinations. The added back speakers in the Dynaquad circuit uncover substantial additional recorded material in normal two channel sources, heretofore hidden, by reproducing *all* of these interrelated signals.

We have long recognized that a soloist appears to be centrally located between the left and right speakers when this signal is recorded equally on both channels. The Dynaquad technique includes a simple method for introducing rear information in a complementary fashion, and a way to reduce the front signals when the two channels are reproduced through the back speakers. This enhances the proportion of rear and reflected sound information in the back speakers, and thus adds front-to-back directionality as well as ambience to the reproduction.

The listener should be centrally located in the rear ⅓ of the room as the general level of the back speakers is 6 db lower than the front speakers. The back speakers will face the listener from behind, usually are widely separated, and if possible, are best located above ear level. Although lower cost limited range speakers can be used in back, irregular response from poor speakers will cloud the capabilities of the main speakers, and weaken the reproducing chain. The back information includes signal components in the full audio spectrum. The lowest bass frequently contributes the most in added ambience—those characteristics which define the acoustics of the recording hall. The higher frequencies provide localization. As new recordings include specific rear sources, proper reproduction dictates comparable quality speakers in that sector.

The degree of increased realism which the Dynaquad system provides over conventional two channel stereo will vary with the program material. With existing two-channel material the benefits you will derive are largely random and will depend on the particular recording techniques employed. However, such benefits are dramatic on many recordings, and it is a rare performance which does not show some improvement.

From your current recorded library select material which was recorded "live" with an audience, as well as recordings made in halls particularly noted for their fine acoustics. Among the pop material, look for selections which employ special sonic effects, too. Works which employ sizeable choral ensembles are also good candidates for 4-dimensional benefits, as well as material noted for unusually wide stereo separation.

Begin by playing the selection with the Speakers switch in the Front position, and then switch to 4-D. Audience participation, including applause, will surround you, rather than appearing in front of you. In pop material, you may even find certain instrumentalists coming from behind you —the result of unintentional microphone misphasing. Organ works will frequently reveal added low end power. On many classical recordings, the initial impression when switching from two to four dimensions may not seem so dramatic, but after extended listening in 4-D, conventional playback will seem dry and lifeless by comparison. It is not uncommon to find that the transition from 4-D back to normal stereo loses more realism than the switch from stereo to mono.

The benefits of 4-dimensional sound will often be most apparent in smaller rooms, where space restrictions were previously a significant handicap in reproducing really deep bass, or in creating any sense of "hall sound".

You should not expect (or want) to hear four separate and distinct channels, as this would be in essence 4-channel monophonic sound. Realistic musical reproduction implies a relationship between all sound channels and significant overlap, or commonality between them. The Dynaquad system takes advantage of this principle to develop the full reproduction potential of the two sound channels and of their phase and amplitude interrelationships. In effect, more information has always been on the record or tape than has been previously reproduced, ever since stereo recordings began. Recording engineers have long striven to find microphone pickup techniques and performer placement in the studio or hall which could uncover more of the "flavor" of the live performance on playback. What no one realized until now was that the prime restriction lay in the basic concept of stereo playback as a two-speaker environment, rather than in the lesser limitations of a dual-channel transmission medium.

The Dynaquad system provides normal stereo reproduction from the front speakers. If you switch off the back speakers, you will hear the same left-to-right separation you always had. If a soloist was recorded in a central location, blended into the two channels, the solo will come from a virtual front center location between the front speakers. A monophonic program played through the Dynaquad system will likewise appear as a centered front source.

Normal Dynaquad program reproduction (in the absence of a specific back signal source) will provide somewhat lower signal levels from the back speakers. This assures that in the usual listening environment, where the listener sits nearer the back speakers, proper placement of instruments or voices will be retained on the sound stage in front of you. Since the back speakers are closer, and form a wider listening angle, the fact that each back speaker reproduces some of the left or right channel information, in addition to the reflected sounds from the rear, provides the more sharply defined differences in intensity which preserve maximum directionality. In effect, the ear senses greater effective aural separation than the electrical signals apparently provide.

The 4-dimensional effects are achieved because the information in front and rear speakers is *different*—not because there is some front information appearing with reduced level in the rear. The added back speakers make it possible for the ear to perceive *new* signal information which contributes to realism, but which has previously gone unnoticed.

Four dimensional sound cannot improve poor recordings or inadequate equipment. The better the reproducing system, the more it may show up any shortcomings. As one example, the proper azimuth alignment of tape heads is essential to full recovery of 4-dimensional information. As the quality of a music system's components goes up, so do the benefits of 4-D sound.

TECHNICAL INFORMATION

CIRCUIT DESCRIPTION

The SCA-80Q has a number of unique circuit features on which there are patent applications. They contribute to the amplifier's exceptionally low distortion, long term reliability, resistance to abuse, and to its remarkable degree of reproducibility which marks a truly successful design. Those not interested in the technology may omit this section. A more detailed technical description for servicing will be found in a later section of this manual.

Each preamplifier channel of the SCA-80Q uses two pairs of *npn* transistors in similar configurations. On each circuit board the first pair is the low level preamplifier for the Phono and Special inputs. The input transistors are selected low noise types. The phono input can handle signals up to 100 millivolts without overload.

The other pair of preamplifier transistors comprises the tone control stage. They operate at the higher signal levels of tuners, tape recorders, etc., as well as from the output of the phono preamplifier stage. The two sections of the preamplifier are interconnected by the selector switch, and all other controls and switches are located after the low level circuitry.

Each pair of transistors has a DC feedback loop to stabilize operating conditions, as well as an AC feedback loop to provide optimum audio performance. The operating parameters of each stage have been critically adjusted to achieve the lowest possible distortion levels.

The special feedback tone control system of the SCA-80Q is an exclusive Dynaco development which provides continuous adjustment of the frequency extremes while providing a specific "center-flat" setting. When the controls are set to the normal mid-point of rotation, they are effectively out of the circuit and have no effect whatsoever on performance. This is accomplished by special Dynaco-designed potentiometers. When the tone controls are operated away from the "flat" center point, the frequency response is varied by changes in the amount of feedback at the frequency extremes.

The amplifier portion of the SCA-80Q includes unique circuitry to provide an unusual amount of protection while delivering exceptional performance. Transistors Q1 and Q2 are a direct-coupled feedback pair providing a high degree of stability and great linearity. This pair drives the power section, Q3 through Q6, which are direct-coupled and include DC feedback stabilization. These four transistors act as a push-pull power transformer in that they do not have voltage gain, but they transform the signal from high impedance to low impedance. All transistors in the driver and power sections are included in one overall feedback loop.

The amplifiers are designed to *reduce*—not just limit—the current through the output stage when there is any tendency to exceed a reference limit as a result of excessive drive signals or heavy loads. This protects both the load (the loudspeaker) and the source (the output transistors).

In the SCA-80Q the output transistors are operated *without quiescent current* and without the consequent heat rise caused by the bias current, eliminating the need for temperature compensating devices. However, the SCA-80Q does not exhibit any signs of the "Class B notch" commonly attributed to a lack of bias current.

The output signal is taken from the junction of Q5 and Q6 through coupling capacitor C7, which prevents DC from reaching the speaker. An output capacitor large enough to assure unrestricted low frequency response was chosen instead of the conventional and less costly plus-minus output circuit. It eliminates any need for balance adjustments or matching of components, and assures speaker protection in the event of output transistor failure.

All of the large capacitors used in the SCA-80Q are special high-purity "computer grade" electrolytics chosen for maximum reliability. The output capacitors also serve as convenient forms for small value air-core chokes in the output which, in conjunction with an R-C circuit, roll off the response in the RF region (above 500,000 Hz), reducing interference and affording absolute stability under all circuit conditions.

PERFORMANCE TESTS

Special care must be taken when subjecting transistorized amplifiers to laboratory tests. Solid state circuits draw much more current at the frequency extremes than in the mid-band, and tests with other than the 8 ohm load for which the amplifier is designed may also draw higher current. High current raises transistor temperatures, causing increased current demand, so tests must be performed quickly under these conditions to avoid the action of the protective cut-back circuits which limit the current in the SCA-80Q for safety reasons. The action of the protective circuitry may yield erroneous results, such as a notably lower apparent power output for rated distortion.

High power measurements should first be "set up" with a low input signal, and then raised to a previously determined level for a quick reading. The extended power and frequency response of the SCA-80Q requires that even low power tests above and below the audible range be made quickly to avoid protective cut-back. This limits the duration of high frequency square wave tests, for example.

Prolonged tests at high power levels, at the frequency extremes, or with abnormal load impedances require adequate thermal recovery time. Without it, the transistors are rendered more susceptible to subsequent overload, and the safety margin afforded by the protective circuits is sharply reduced. Callous disregard of these effects may result in eventual failure, for there is no such thing as absolute protection against deliberate abuse.

Some of the heat generated is dissipated through the heat sinks to the chassis, so the bottom of the amplifier will get quite hot during tests. The maximum dissipation in transistorized circuits occurs at about half power.

The line fuse in the SCA-80Q has been chosen to provide maximum protection while allowing short duration currents in excess of its rating. The current demand for both channels operating at full power steady-state at 20 kHz (the severest test), for example, will slightly exceed the fuse rating, but the slo-blo fuse will handle this for several seconds.

When making full power tests at the frequency extremes, it is important that the line voltage be corrected for power line drop because of the high current demand. The capability of the supply will be limited by excessive line losses, and the indicated distortion may rise at maximum power when both sides are driven simultaneously.

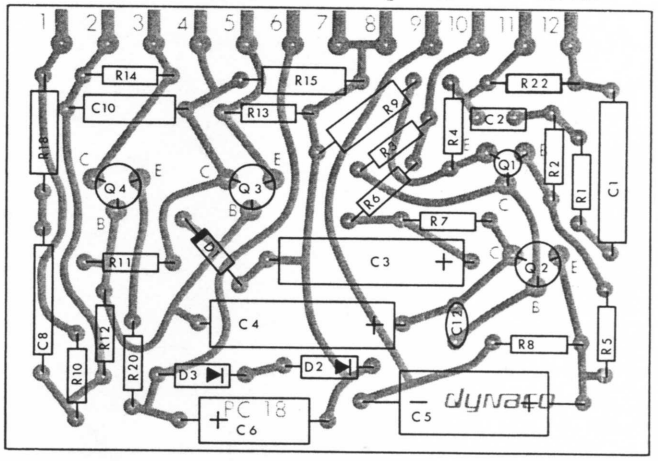
COMPONENT VALUES

All resistors are ½ watt, 5% unless otherwise indicated.

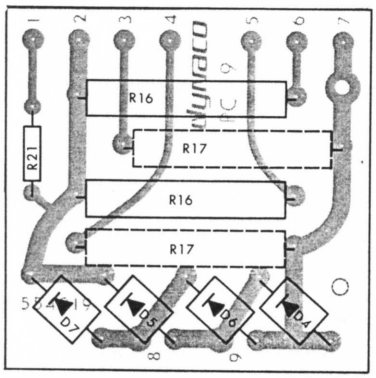
		PART #
R 1	4,700 ohms	113472
R 2	4,700 ohms	113472
R 3	27,000 ohms	113273
R 4	150 ohms	113151
R 5	100,000 ohms	113104
R 6	1,000 ohms	113102
R 7	1,500 ohms	113152
R 8	330 ohms	113331
R 9	2,200 ohms, 1 watt	116222
R10	1,000 ohms	113102
R11	10,000 ohms	113103
R12	10,000 ohms	113103
R13	68 ohms	103680
R14	68 ohms	103680
R15	2,200 ohms, 1 watt	116222
R16	400 ohms, 7 watt, 5%	120401
R17	400 ohms, 7 watt, 5%	120401
R18	4.7 ohms, 1 watt, 10%	125040
R19	0.47 ohms, 2 watt, 10%	128004
R20	3.3 ohms	103030
R21	68 ohms	103680
R22	10,000 ohms	113103
R23	8,200 ohms	113822
R24	18,000 ohms	113183
R25	4,700 ohms	113472
R26	33,000 ohms	113333
R27	3,300 ohms	113332
R28	47,000 ohms	113473
R29	4,700 ohms	113472
R30	56,000 ohms	113563
R31	120 ohms	113121
R32	330 ohms	113331
R33	33,000 ohms	113333
R34	3,300 ohms	113332
R35	4,700 ohms	113472
R36	390 ohms	113391
R37	120,000 ohms	113124
R38	270 ohms	113271
R39	4,700 ohms	113472
R40	68 ohms, 10%	112680
R41	4,700 ohms	113472
R42	10,000 ohms	113103
R43	120 ohms	113121
R44	47,000 ohms	113473
R45	10,000 ohms	113103
R46	10,000 ohms	113103
R47	10 ohms, 10 watt, 10%	120100
C 1	0.33 mfd	263334
C 2	220 pf	245221
C 3	35 mfd, 30v., non-polarized	283366
C 4	35 mfd, 30v., non-pol.	283366
C 5	500 mfd, 15v.	283507
C 6	50 mfd, 10v., non-polarized	282506
C 7	5000 mfd, 80v.	284508
C 8	0.1 mfd	264104
C 9	5000 mfd, 80v.	284508
C10	0.01 mfd, 100v.	244104
C11	700 mfd @ 75v. ▲	
	700 mfd @ 60v. ■	
	800 mfd @ 20v. ●	294228
C12	27 pf	244271
C13	0.01 mfd	244104
C14	5 mfd, 15v.	283505
C15	0.01 mfd, 5%	265103
C16	3300 pf, 5%	265332
C17	0.022 mfd	265223
C18	5 mfd, 15v.	283505
C19	100 pf, 5%	245101
C20	50 mfd, 25v.	283516
C21	0.015 mfd, 5%	265153
C22	0.056 mfd, 5%	265563
C23	100 mfd, 2v.	281107
C24	50 mfd, 25v.	283516
C25	0.33 mfd	263334
C26	220 pf	245221
C27	50 mfd, 25v.	283516
C28	500 mfd, 2v.	281507
C29	0.068 mfd	265683
C30	0.1 mfd	264104
C31	0.015 mfd, 5%	265153
C32	0.22 mfd	265224
C33	27 pf	244271
C34	0.02 mfd	227203
C35	0.02 mfd	227203

		PART #
F 1	Fuse, 2 amp slo-blo	342020
F 2	Fuse, 1 amp slo-blo (alternate)	342010
L 1	114 inches of #16 insulated wire	319913
T 1	Dynaco power transformer 10490E	464019
D 1	zener diode, 5.1 volt, 5%, 400 mw	540405
D 2	silicon diode, 0.8 volt max. drop @ 100 ma.	544015
D 3	silicon diode, 0.8 volt max. drop @ 100 ma.	544015
D 4	silicon diode, 3 amperes, 200 prv.	544322
D 5	silicon diode, 3 amperes, 200 prv.	544322
D 6	silicon diode, 3 amperes, 200 prv.	544322
D 7	silicon diode, 3 amperes, 200 prv.	544322
Q 1	BC108A 170-260 Beta	572108
Q 2	2N5320 140-260 Beta, 90 V_{cer}, r=5KΩ	572002
Q 3	2N5320 100-200 Beta, 90 V_{cer}, r=5KΩ	572001
Q 4	2N5322 100-160 Beta, 90 V_{cer}, r=5KΩ	562671
Q 5	2N3772 40-90 Beta @ 1 A, 100 V_{cer}, r=100Ω	571844
Q 6	2N3772 40-90 Beta @ 1 A, 100 V_{cer}, r=100Ω	571844
Q 7	BC109B 240-500 Beta @ 5 volts, .2 ma	572109
Q 8	BC109B 240-500 Beta @ 5 volts, .2 ma	572109
Q 9	BC109B 240-500 Beta @ 5 volts, .2 ma	572109
Q 10	BC109B 240-500 Beta @ 5 volts, .2 ma	572109

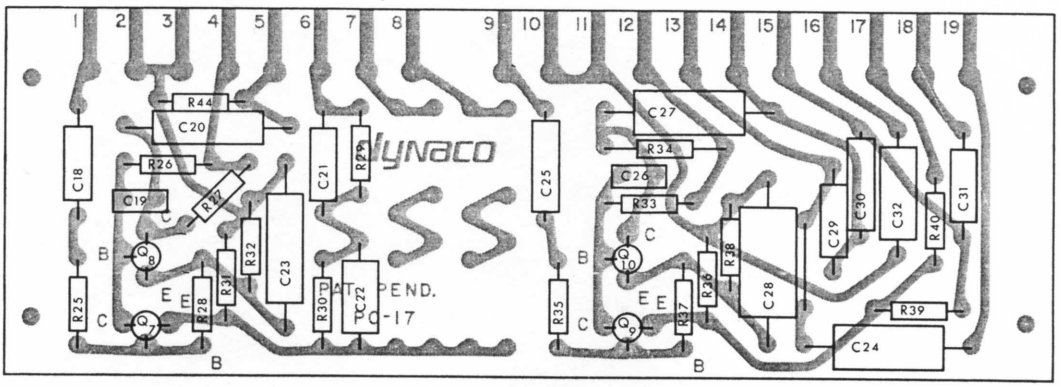
		PART #
Volume control	250,000 ohms tapped	177254
Balance control	220,000 ohms special	167224
Bass control	50,000 ohms special	167514
Treble control	40,000 ohms special	167404



PC-18



PC-19



PC-17

67(X) Prepare a 4″ black wire. Tin one end and connect it to eyelet #9 (forward) of the front PC-18. (S). Connect the other end to ground lug E of C11.

68(X) Prepare a 6¾″ black wire. Tin one end and connect it to eyelet #9 (forward) of the rear PC-18. (S). Connect the other end to ground lug E of C11.

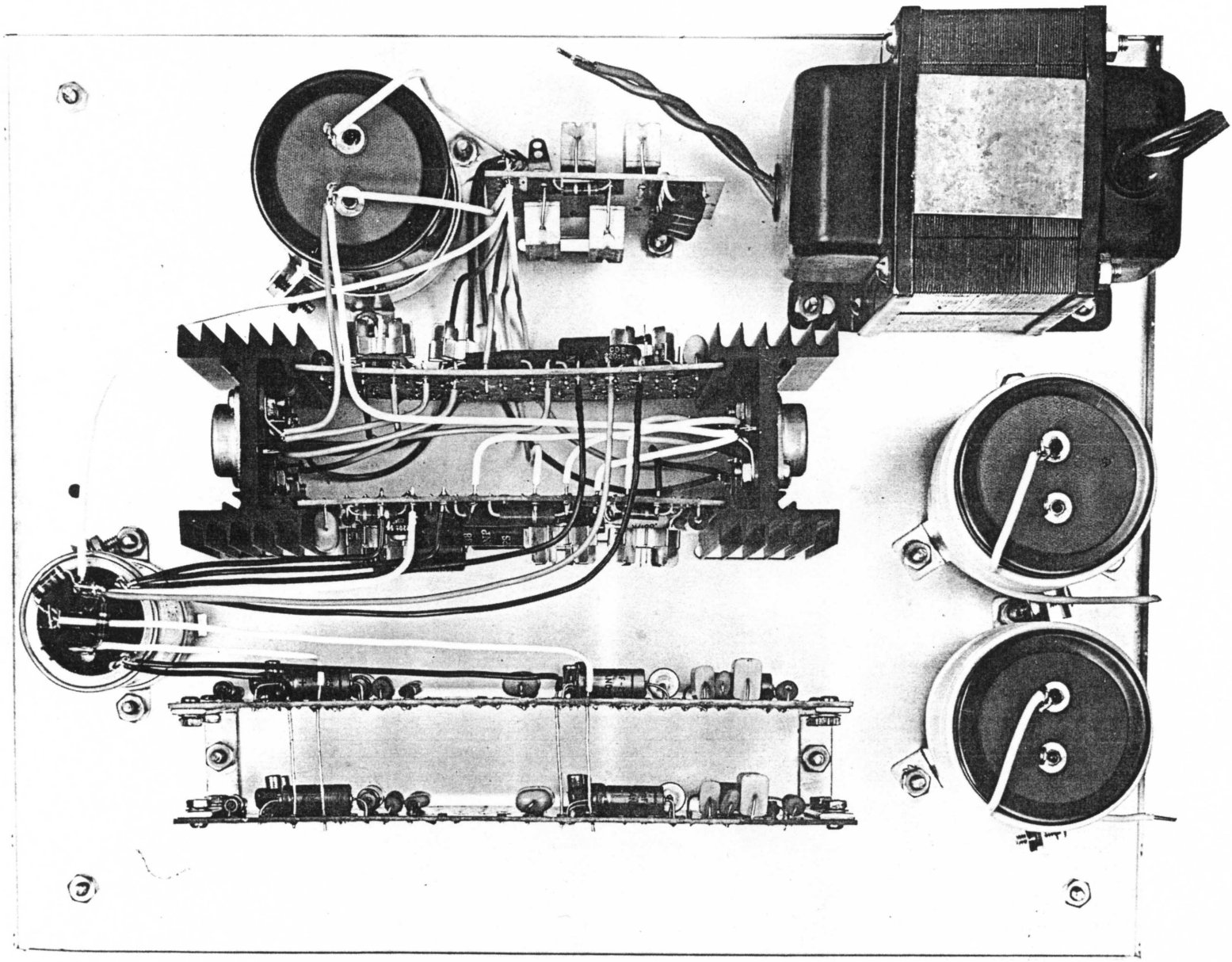
69(X) Prepare a 7½″ black wire. Tin one end and connect it to eyelet #11 (forward) of the rear PC-18. (S). Connect the other end to ground lug E of C11. (S-4). Be sure all of these wires are soldered.

70(X) Prepare a 4¼″ red wire. Tin one end and connect it to eyelet #10 (forward) of the front PC-18. (S). Connect the other end to lug A (triangle) of C11.

71(X) Prepare a 7½″ green wire. Tin one end and connect it to eyelet #10 (forward) of the rear PC-18. (S). Connect the other end to lug A (triangle) of C11.

72(X) Prepare an 8″ red wire. Tin one end and connect it to eyelet #1 (forward) of the power supply board PC-19. (S). Connect the other end to lug A (triangle) of C11. (S-5). Be sure all these wires are soldered.

Your SCA-80Q is now nearly half completed. The chassis should look much like the accompanying photograph. Set it aside for the present, and place the front panel before you.

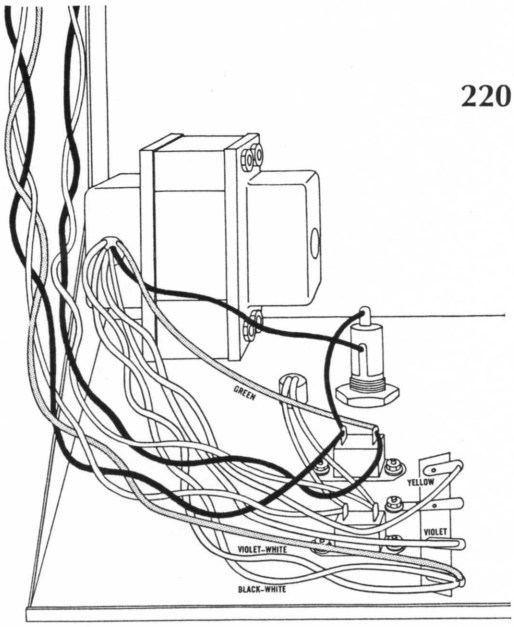


ALTERNATE AC LINE VOLTAGE CONNECTIONS

The power transformer supplied in the SCA-80Q has dual tapped primary windings which are connected in parallel for 100 or 120 volts, and in series for 220 or 240 volts. Assembled SCA-80Q/A amplifiers are connected for 120 volts unless this manual is stamped to indicate another voltage.

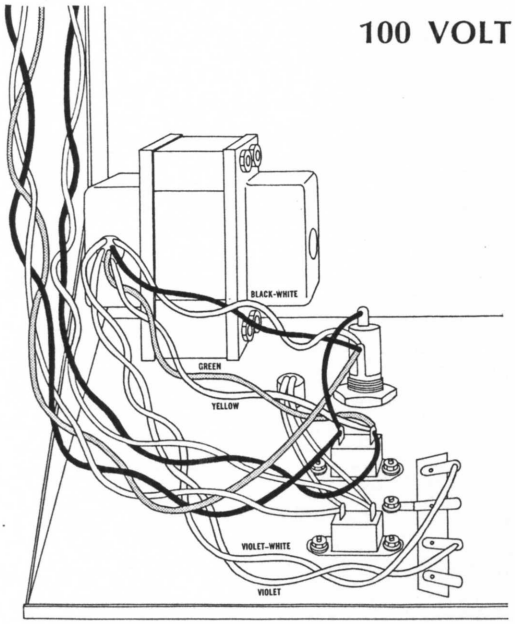
The 2 ampere slo-blo fuse supplied for standard 120 volt wiring or for the 100 volt option should be replaced with a 1 ampere slo-blo fuse when the amplifier is wired for 220 or 240 volt AC lines. The SCA-80Q is designed for use with either 50 Hz or 60 Hz current.

Steps 23 through 27 on page 24 of this manual describe the 120 volt connections. Optional connections are diagrammed and described below. In *all cases* the red and black wires from the power switch are connected to the red and black AC outlets as described in the instructions. The AC line cord is connected to the red AC outlet terminals. A wire connects AC outlet lug #4 to the tip of the fuse holder. The *black* transformer lead is connected to the top (side) lug of the fuse holder. No connection is normally made to lug #2 of the 4-lug terminal strip. It is provided in the event that a grounded 3-wire power cord is to be used.



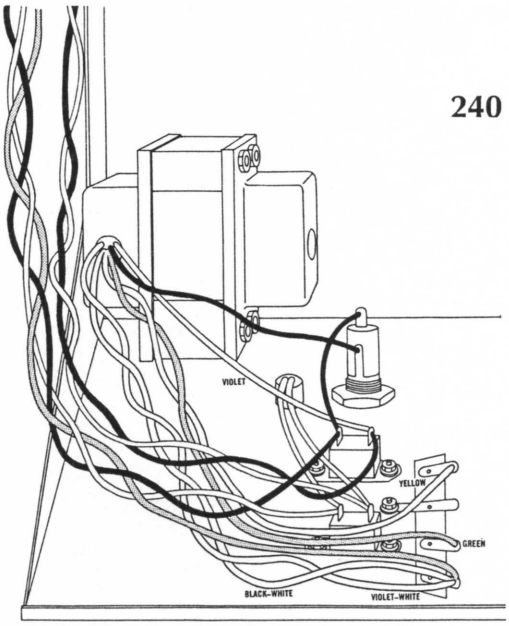
220 volt AC line

Twist the violet-white and the black-white leads together and connect them both to lug #4 of the 4-lug terminal strip. Connect the green wire from the power switch to lug #4 of the 4-lug terminal strip. Twist the violet and the yellow leads together and connect the violet lead to lug #3, and the yellow lead to lug #1 of the 4-lug terminal strip. Connect the green transformer lead to AC outlet lug #3.



100 volt AC line

Twist the black-white lead with the black lead and connect them both to the top (side) lug of the fuse holder. Connect the green wire from the power switch to the top (side) lug of the fuse holder. Twist the green and the yellow transformer leads together and connect them both to AC outlet lug #3. Twist the violet and the violet-white leads together and connect the violet lead to lug #3, and the violet-white lead to lug #1 of the 4-lug terminal strip.



240 volt AC line

Twist the violet-white and the black-white leads together and connect them both to lug #4 of the 4-lug terminal strip. Connect the green wire from the power switch to lug #4 of the 4-lug terminal strip. Twist the green and yellow transformer leads together and connect the green lead to lug #3, and the yellow lead to lug #1 of the 4-lug terminal strip. Connect the violet lead to AC outlet lug #3.

IN CASE OF DIFFICULTY

Your SCA-80 should function properly after assembly, and you can usually assume that if it functions to your satisfaction, it is meeting all of its specifications. Sometimes a wiring error, poor solder connection, or defective component may require trouble-shooting. Because 90% of the difficulties which are encountered in kit-built units can be attributed to incorrect wiring or a poor solder connection, it is strongly recommended that you ask someone else to check your wiring against the pictorial diagram, as frequently one person will make the same error repeatedly.

The SCA-80 has been carefully designed to provide exceptional accessibility for the serviceman. The average kit-builder should confine his servicing to the basic suggestions given here, after checking to make sure the fuse is intact. Audio transistors, unlike tubes, cannot be easily checked locally for any other than gross defects, and even this should be left to the qualified technician. For this reason your SCA-80 is considered to have "no user-serviceable parts inside."

Each of the 4 amplifier and preamplifier circuit boards, and all 4 power transistors have been in-circuit tested to assure that they meet specifications prior to shipment, so routine trouble-shooting can eliminate these as the *source* of the trouble, although they could have been subsequently damaged.

There are certain general precautions to be observed in servicing any transistorized equipment:

1. Never make circuit changes (connections or disconnections) of any kind when the amplifier is turned on.
2. Be particularly careful not to short any transistor leads to each other or to the chassis when the power is on.
3. When using test equipment, you must avoid transient voltage peaks and excessive test voltages.
4. Exercise caution when soldering and unsoldering transistor and diode leads to avoid excessive heat.

Check the connections at each eyelet along the edge of the circuit boards. There must be a smooth flow of solder from the wire, across the eyelet, onto the circuit board. If in doubt, reheat the connection and add more solder if necessary, but a lot of solder can conceal a poor connection. Look for flecks or splashes of solder on the circuit side of the board which may be causing unwanted connections. Make sure the large capacitors are seated firmly to the chassis, so that their lugs cannot contact the cover.

Check the selector switch to make sure that the two wafers are aligned, and that double lugs are soldered together. The #9 lug has separate front and rear sections with independent connections. Make sure the rear portion of this lug has not been twisted on the wafer. If difficulty is in the input to one channel, the selector switch deserves special attention. If you have no signal at all, check the *Monitor* and *Speakers* switches.

A systematic checking procedure will enable you to localize the problem area. A problem common to both channels is cause to suspect the power supply section, comprised of the line cord, power switch, fuse, power transformer, PC-19, C9 and C11.

If a VTVM (or TVM) is available, a voltage variation of more than 10% will help to pinpoint a problem. A higher than normal voltage at the collector of one of the transistors, for example, is possibly indicative that it is open and requires replacement. Voltages at the transistor leads, where shown, may vary ± 20 % and still be normal.

Power Supply

Measuring the AC voltage between eyelets 8 and 9 on PC-19 will check the power transformer. A defective rectifier or poor solder connection on the rectifier diode bridge may cause the power transformer to emit an audible mechanical vibration. The DC voltage measured across C9 will be about 75 volts if the rectifier diodes are functioning properly. The most likely cause for a blown fuse will be a shorted rectifier diode.

You may be able to isolate a fault in one power amplifier channel by removing the wire to one of the amplifier heat sinks from the red lug of C9. If the other channel then functions normally, the disconnected channel is suspect. Similarly, low voltage on a section of the C11 capacitor may indicate excessive current drain from one or the other channel, and disconnecting one board may localize the problem.

Power Amplifiers

It is possible to operate the SCA-80 monophonically in the event of difficulty with one power amplifier channel. The problem heat sink and circuit board assembly then may be removed from the circuit and returned to Dynaco for test and service by unsoldering 10 wires. For safety, these should be disconnected at the "far end" so that no unattached wires will be left in the amplifier. If you wish, the wires may be unsoldered from the assembly, and each insulated with electrical tape.

Do not return the circuit board alone unless you are *certain* that the output transistors and the power supply resistors R16 and R17 are performing normally and that the fault has not affected the preamplifier section. It is normal for the R16 and R17 resistors to run warm—in fact, they put out most of the heat from a normally functioning amplifier at average power levels—but if one runs much hotter than the other in the same channel, it indicates output transistor or diode failure. Excessive discoloration of any resistor also is a sign that it should be replaced.

When packing a circuit board and/or heat sink, be sure the packing adequately protects the board from damage, and protects the transistors so that their *leads are not bent or crushed.* Because the assembly is light in weight, it may be shipped by air if desired, saving a large part of the normal service delay time.

Preamplifiers—Tone Controls

A problem in the preamplifier section should include careful checking of the selector switch because it interconnects the low level preamp stages with the tone control sections. A systematic check can localize a problem in one channel to the preamp or tone control sections. For example, if there is insufficient output on the left channel phono input, see if this channel operates properly through the tuner input. If it does, the problem is in the low level section of the left channel. If there is no output from either left channel input, then the low level section can be tested with some ingenuity. If you realize that the "Tape Out" signal is available before the volume and tone controls, you can connect the left channel tape output into the identical input on the right channel as the program source you are using on the left channel. If you then have suitable signal level, the trouble lies in the left tone control section.

You can also interchange channels internally by connecting the output of the preamplifier (eyelet 19) to the opposite power amplifier input (eyelet 12).

Hum and Noise

The SCA-80 is inherently hum-free, and if any is detected, the inputs should first be unplugged. If there is no hum with the cables removed at the same volume setting as when the hum was noted, the problem must be corrected in the associated equipment. Sometimes the addition of a ground wire from the record player chassis or tone arm, or from a tape recorder, to the SCA-80 *Gnd* screw will eliminate hum, but it is generally advisable to use the fewest ground wires which achieve the desired result to avoid ground loops.

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. Sometimes simply placing the record player so that the cartridge is not so near any power transformer may alleviate the hum.

Hum which is common to both channels of the SCA-80 itself is almost certainly in the power supply. Be sure the cover is in place, however, for external fields will affect the results.

When there are no cables connected to the low level inputs, it is normal to have a high hiss level at high volume settings on Phono and Special. With sources connected, hiss should be inaudible at normally used volume settings, though some hiss may be evident at much higher settings of the volume control.

Beyond the most rudimentary checks, servicing of transistorized equipment should be left to the qualified technician. The SCA-80 needs no maintenance in normal use, and there are no adjustments required during the life of the amplifier. Improper servicing can impair its performance or damage it, so it is very important that the technician familiarize himself with the Circuit Description and with the Service Information which follows, before proceeding. Unless you are confident that a local repairman has the specialized knowledge and equipment for servicing high quality solid state audio equipment, *factory service is strongly recommended.*

SERVICE INFORMATION FOR THE TECHNICIAN

(FOR QUALIFIED PERSONNEL ONLY)

Before servicing the SCA-80, be sure to read the circuit description in the front of this manual, as well as the preceding section, for some of the amplifier's unique features may not be immediately apparent when examining this essentially simple circuit. A systematic check of voltages and signal paths, based on an understanding of the circuit, will lead to rapid diagnosis.

Preamplifiers—Tone Controls

The voltage chart does not specify voltages on the eyelets of the preamplifier boards because they are not significant, and may vary widely with individual transistors. If the problem 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 there is a point after which hum occurs, and before which there is silence, you have located the trouble area.

The tone control potentiometers are of unusual construction, and cannot be measured by the usual continuity check. The bass control has a dual wiper, and the treble control has a discontinuous element.

Objectionable hiss at normal listening levels may be caused by a faulty Q1 transistor, unless it occurs on both channels. If there is hiss on both low level inputs of one channel, you can interchange Q1 with one of the other transistors, but return them to their original positions if this is not the trouble. The transistors in the tone control stages are not likely to be a source of objectionable hiss.

Amplifiers

The left and right audio channels are electrically identical. Each amplifier has two basic sections. The direct-coupled pair Q1 and Q2 is the Class A amplifier-driver with a DC feedback loop from the second emitter to the input base. Audio signals at the input base of Q1 are amplified and appear at the collector of Q2 to drive the four-transistor Class B power output section.

Q3 and Q4 are a complementary-symmetry driver directly coupled to Q5 and Q6 output power transistors. The Class B section provides a power gain, but no voltage gain. The input junction of Q3 and Q4, and the output junction of Q5 and Q6 swing together through the signal cycle. The ability of the output junction to follow the input junction (and the consequent linearity of this section) depends on the feedback path from the collector of Q6 to the emitter of Q4. Variations at Q4 emitter compared to its base potential will create a corrective signal for Q6, which makes the output follow the input.

Diodes D2 and D3 are in this feedback path, in a direction which would not be conductive (breaking the feedback path) were it not for the forced current through bleeder resistors R16 and R17. When the current in Q4 reaches that in R16 and R17, the diodes D2 and D3 no longer conduct, and the feedback path is broken. Simultaneously D1 starts conducting and makes a short circuit between the input of Q3 and Q4, and the output of Q5 and Q6.

Thus when the current demand in the feedback loop exceeds the limit determined by the bleeder resistors, the ability of the circuit to drive is restricted, and excessive currents cannot be induced in Q5 and Q6. The action of D1 short circuits the drive from Q2, reducing the drive until the cause of the high current demand is corrected. Thus an excessive drive signal, or too heavy a load on the output, which would require excessive current, switches the circuit to a configuration which prevents damaging current flow through the output and driver transistors.

Trouble-shooting the amplifiers

Any signs of scorched resistors or wire should be a basis for further investigation. If either R13 or R14 is burned, or smokes when the amplifier is on, then at least one of the transistors Q5 or Q6 and possibly Q3 or Q4 has been damaged, and replacement will be required. It must be emphasized that *if one of the transistors in the Class B section (Q3, Q4, Q5, Q6) is defective, the other three must be tested before proceeding further* to avoid possible repetitive breakdown. Resistors R16 and R17 on the power supply board normally get hot because of the reference bleed current. If only one of the pair is hot, Q5 or Q6 may be shorted, or D2 or D3 may be open. Heat observed under no signal conditions indicates excessive bias drop or oscillation (either internal, or from the source).

The voltage at the positive terminal of C7 should be about 36 volts (one half of the supply voltage). If this voltage is far off value, this can be a sign of trouble in one or more of the Class B transistors, and all should be checked.

If the voltage at the input bases of Q3 and Q4 is significantly different (more than 1.5 volts) from the voltage at C7, the voltage at the other end of C4 should be checked to determine if something is wrong in the Class A section, Q1 and Q2. A fault in either of these transistors can change the voltage at the collector of Q2 (input of C4), and this can be reflected in an incorrect potential at the bases of Q3 and Q4, which is further reflected in the junction of Q5 and Q6 (the positive terminal of C7). Voltages at either end of C4 may be inter-related when C4 is in the circuit. If one end of C4 is lifted, the voltage deviations from normal at either end will indicate whether a fault lies before or after C4.

It is unlikely that all voltages in the audio section are correct if there is no signal. However, if this condition occurs, it is most likely an open input capacitor C1, or coupling capacitors C4 or C7, or a shorted C2.

A signal which has some distortion, or is limited in power output, is more difficult to diagnose. See the section relating to performance tests. This requires a distortion analyzer and an oscilloscope to check the signal, and then routine signal tracing should locate the fault.

Checking transistors

An ohmmeter is all that is required to locate a transistor which has failed. Small transistors must be removed from the circuit board for test. The power transistors need not be removed from the heat sinks, but the wires to their terminals must be detached for measuring. All transistors can be considered (for this test procedure) to be two diodes connected in series with common elements tied together. The junction point represents the base of the transistor. The identification of the larger power transistors is shown in the photograph of each heat sink. The smaller ones, observed from the bottom, have the collector, base and emitter arranged counter-clockwise, with the collector attached directly to the case.

With one ohmmeter probe connected to the base, the other probe should be touched to the collector and emitter in turn. Readings from the base to the collector, and from the base to the emitter should be similar. With one orientation of the probes, there should be a high resistance reading (almost an open circuit). When the polarity of the probes is reversed, there should be a relatively low reading. The high reading will appear with one orientation of the probes for a pnp transistor, and with the opposite orientation for an npn transistor. Then the ohmmeter should be connected from collector to emitter, and a high resistance (almost open circuit) should be read, regardless of the orientation of the probes. If all of these qualifications are met, the transistor does not exhibit any gross defects. Qualitative evaluation of acceptable transistors requires equipment beyond the scope of local service facilities.

In similar fashion, diodes can be checked by verifying that they have a high resistance in one direction, and low resistance in the other.

When replacing transistors, the small ones with the finned radiators should have the radiators transferred to the replacement. The silicon grease between transistor and radiator should be transferred to the new transistor. Be careful to insert the leads into the proper eyelets. Do not use excessive heat on the leads—let the heat go to the eyelet instead. When replacing the power transistors on the heat sinks, maintain the mica insulator between the transistor and the heat sink. Spread some of the silicon grease, which is a heat transfer compound, between the mica insulator and the transistor, as well as between the heat sink and the insulator. Be sure to use the nylon insulators around the mounting screws.

When making replacements, standard types can be used provided they are screened beyond the manufacturer's routine specifications. This is necessary because transistors of a given type vary far more widely than do tubes. The requirements for each transistor are given in the parts list with the schematic diagram. No screening will be necessary for transistors obtained from Dynaco if the application (Q-number) or the Dynaco part number is specified. If emergency needs require substitution of an unscreened transistor, the audio circuits will function but the effectiveness of the protective circuitry may be somewhat reduced. The Dynaco audio circuit has been designed so that no matching of transistors is required.

While the parts list does not show all of the possible transistor options, under no circumstances should unlisted transistors be used unless factory-approved in advance.

FACTORY SERVICE AND WARRANTY

The SCA-80Q has been designed to provide reliable, trouble-free operation for a long period of time when it has been properly assembled and installed. It incorporates unprecedented circuit protection against failure caused by abnormal operation. So conservative is its design that it will deliver specified performance with the maximum variations in AC line voltage (110 to 130) permitted in normal use.

Despite these precautions, service may sometimes be needed, and you should be sure to return the warranty card promptly to validate your warranty. Dynaco maintains a complete factory test and repair facility for which no return authorization is required. Unless specifically authorized in advance by the factory, Dynaco cannot assume any responsibility for local service charges. In addition to the factory, independent authorized service facilities are available in several U.S. cities and in Canada. Write Dynaco for the one nearest you.

A factory assembled SCA-80Q/A is warranted to be free of defects in materials and workmanship for a period of one year from the date of purchase. During the warranty period, no charge will be made for testing or servicing any defective factory assembled SCA-80Q/A returned to Dynaco.

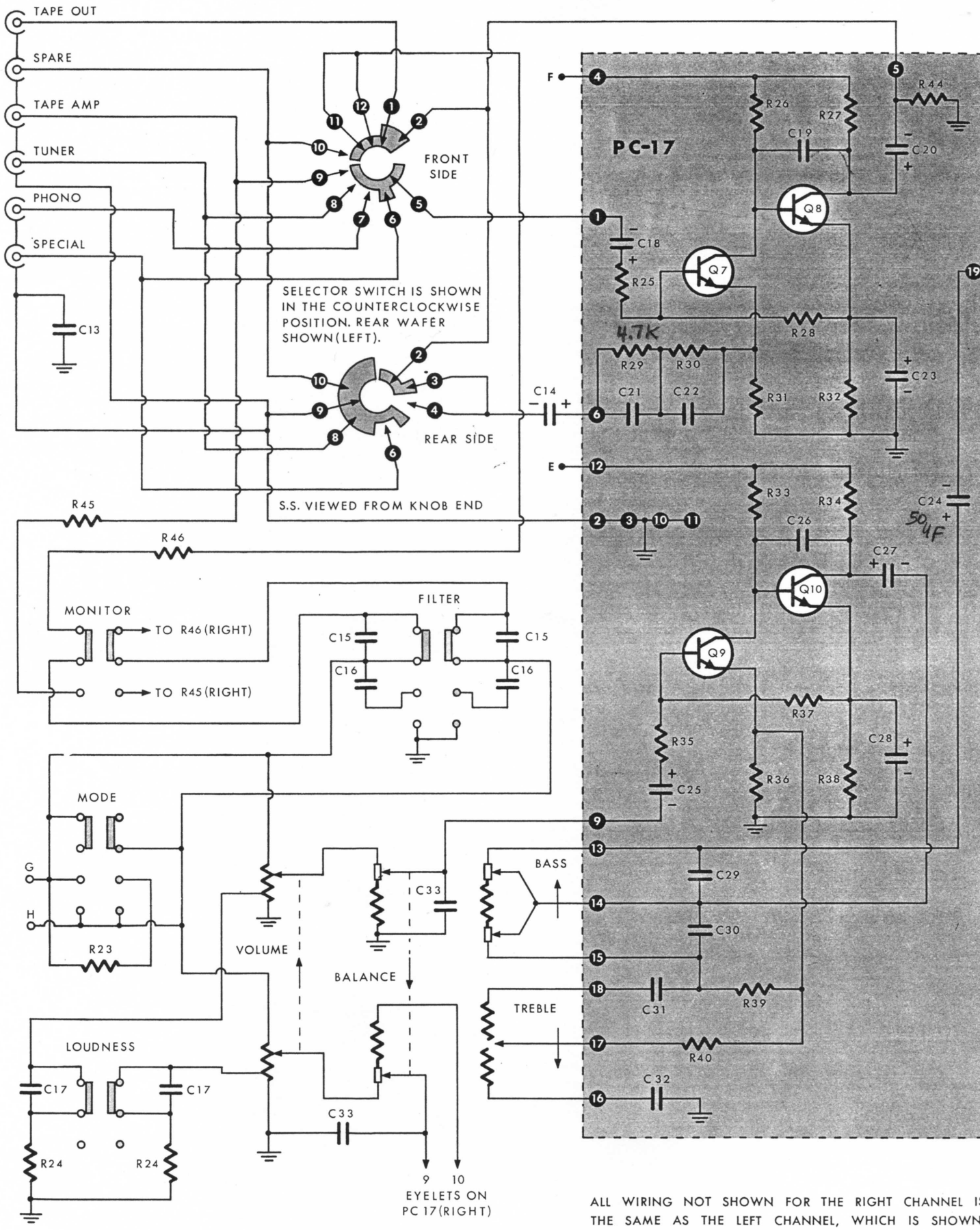
All parts used in an SCA-80Q kit are warranted to be free of manufacturing defects for one year from the date of purchase. Defective parts will be replaced promptly at no charge upon receipt for inspection at the factory. After the warranty period has passed, Dynaco will supply any nonstandard parts at net prices. Standard parts can generally be obtained from a local electronics supply store.

The warranty does not apply to other than the original purchaser, nor to units which have been subjected to neglect, abuse, misuse or accident.

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.

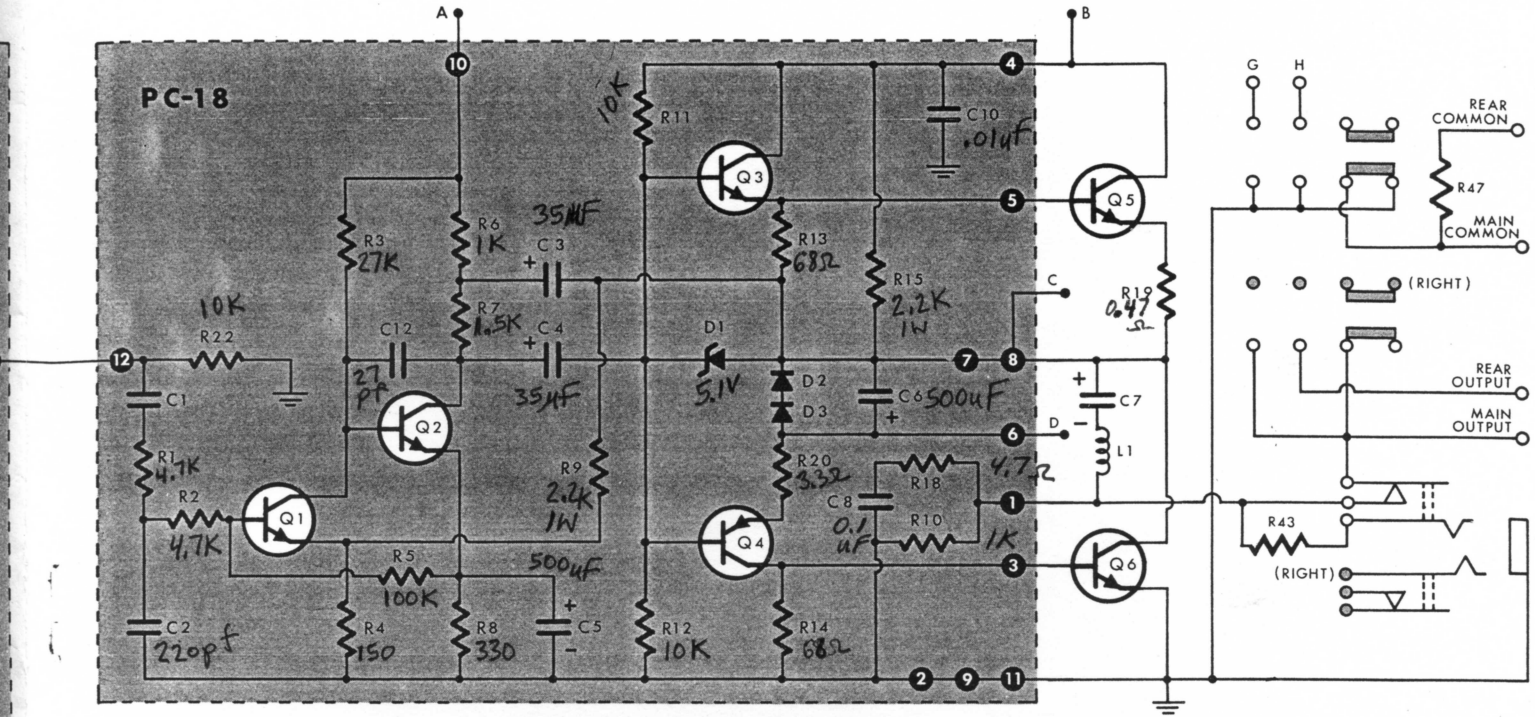
If the kit has been completely assembled, yet does not function properly, or if difficulty develops after some use, Dynaco will service the SCA-80Q for a *maximum* charge of $17.50. After one year, assembled units and kits are subject to the same charge, plus the cost of parts.

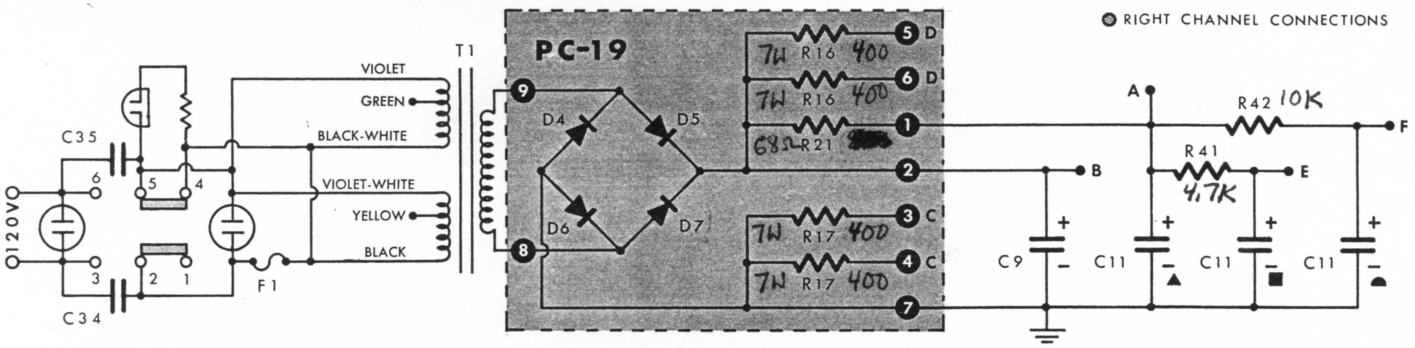
As described elsewhere in this manual, the power amplifier circuit board assembly and related heat sink can be removed and returned for service *at the factory*. The ser-

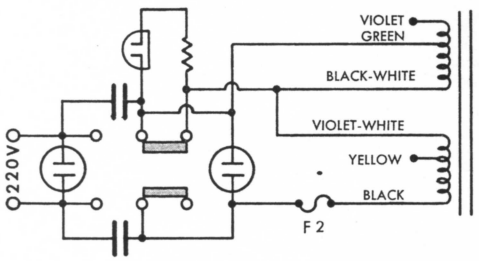


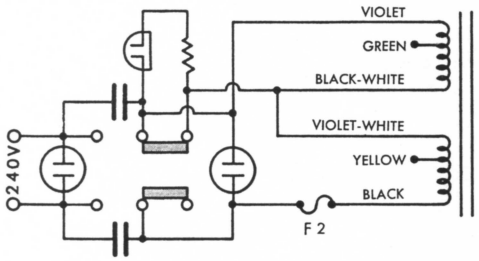
ALL WIRING NOT SHOWN FOR THE RIGHT CHANNEL IS THE SAME AS THE LEFT CHANNEL, WHICH IS SHOWN

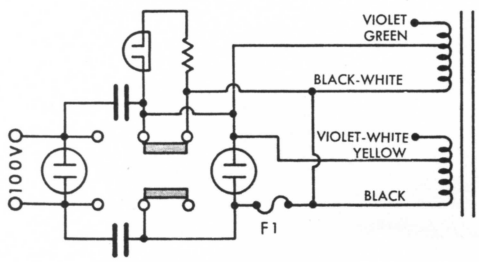
RESISTOR AND CAPACITOR NUMBERS ARE THE SAME FOR THE PARTS ON BOTH CHANNELS.











VOLTAGE TEST POINTS

Measured with VTVM (TVM) at rated AC line voltage, 8 ohm load, shorted input. All voltages are DC unless specified AC. Voltages not shown are not significant for servicing purposes, as they may vary widely with different transistors and still be normal. Transistor lead voltages shown may vary ±20% or more. Other points should be within ±10%.

PC-18		
#1	0	
#2	0	
#3	<0.5	
#4	74	
#5	36.5	
#6	37.5	1.4 to
#7	36	1.6*
#8	36	
#9	0	
#10	71	
#11	0	
#12	0	

PC-19		
#1	71	
#2	74	
#3	36	
#4	36	
#5	37.5	
#6	37.5	
#7	0	
#8	54 AC*	
#9		

*Measured between eyelets

	Q7	*Q8*	*Q9*	*Q10*
E	.1	.8	.3	1.2
B	.7	1.5	.94	1.8
C	1.5	10	1.8	9.4

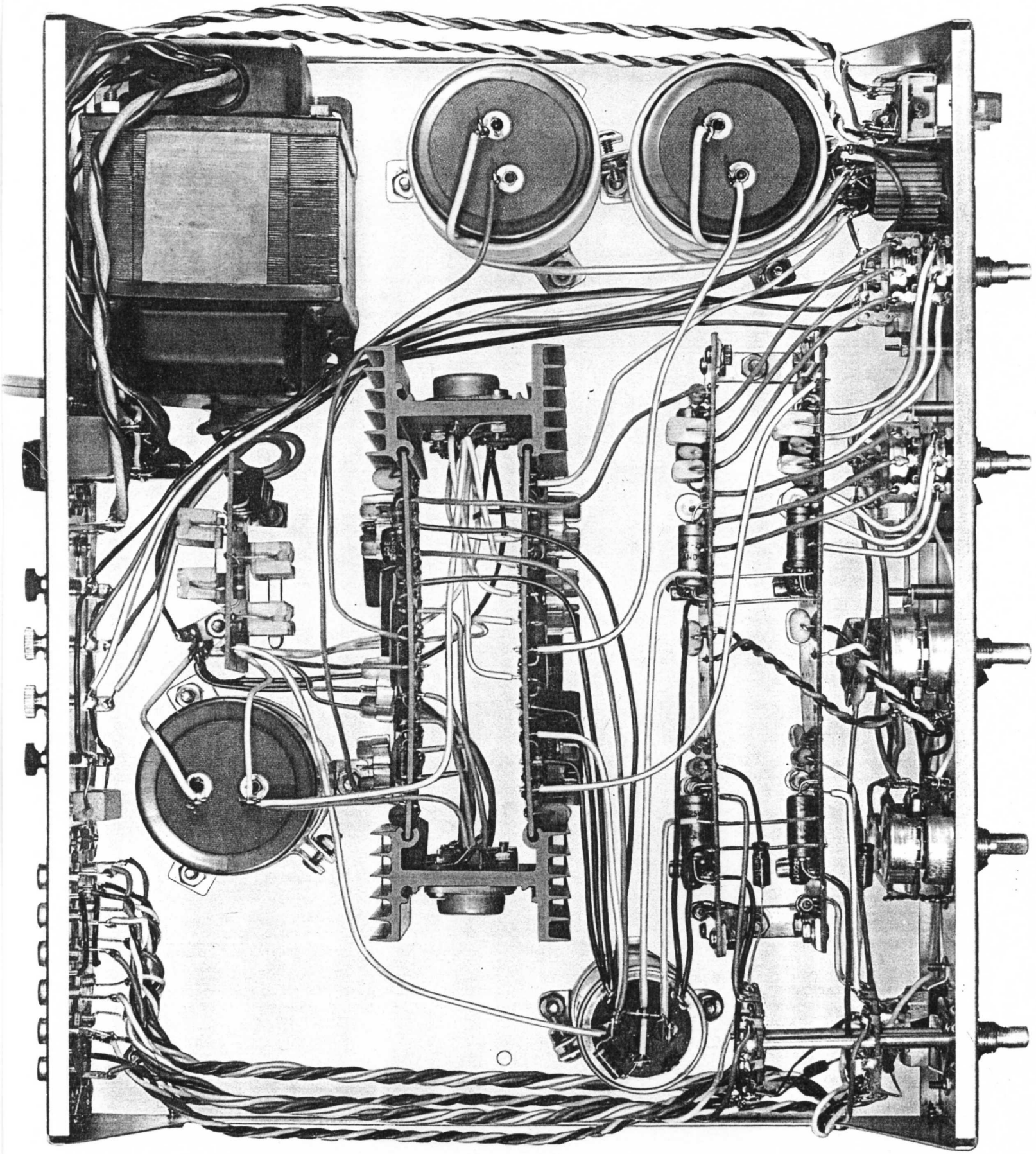
Capacitor C-11

▲ 71

■ 24

◗ 17.5

SCHEMATIC DIAGRAM



Printed in U.S.A.

Some information on the NPN output transistors: (not part of the manual)

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.17	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CEV}	Collector Cut-off Current (V_{BE} = -1.5V)	for **2N3771** V_{CB} = 50 V for **2N3772** V_{CB} = 100 V for all V_{CB} = 30 V T_j = 150 °C			2 5 10	mA mA mA
I_{CEO}	Collector Cut-off Current (I_B = 0)	for **2N3771** V_{CB} = 30 V for **2N3772** V_{CB} = 50 V			10 10	mA mA
I_{CBO}	Collector Cut-off Current (I_E = 0)	for **2N3771** V_{CB} = 50 V for **2N3772** V_{CB} = 100 V			4 5	mA mA
I_{EBO}	Emitter Cut-off Current (I_C = 0)	for **2N3771** V_{CB} = 5 V for **2N3772** V_{CB} = 7 V			5 5	mA mA
$V_{CEO(sus)}$*	Collector-Emitter Sustaining Voltage (I_B = 0)	I_C = 0.2 A for **2N3771** for **2N3772**	 40 60			 V V
$V_{CEV(sus)}$*	Collector-Emitter Sustaining Voltage (V_{EB} = -1.5V)	I_C = 0.2 A R_{BE} = 100 Ω for **2N3771** for **2N3772**	 50 80			 V V
$V_{CER(sus)}$*	Collector-Emitter Sustaining Voltage (R_{BE} = 100 Ω)	I_C = 0.2 A for **2N3771** for **2N3772**	 45 70			 V V
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	for **2N3771** I_C = 15 A I_B = 1.5 A I_C = 30 A I_B = 6 A for **2N3772** I_C = 10 A I_B = 1 A I_C = 20 A I_B = 4 A			 2 4 1.4 4	 V V V V
V_{BE}*	Base-Emitter Voltage	for **2N3771** I_C = 15 A V_{CE} = 4 V for **2N3772** I_C = 10 A V_{CE} = 4 A			 2.7 2.7	 V V
h_{FE}*	DC Current Gain	for **2N3771** I_C = 15 A V_{CE} = 4 V I_C = 30 A V_{CE} = 4 V for **2N3772** I_C = 10 A V_{CE} = 4 V I_C = 20 A V_{CE} = 4 V	 15 5 15 5		 60 60	
h_{FE}	Small Signal Current Gain	I_C = 1 A V_{CE} = 4 V f = 1 KHz	40			
f_T	Transition frequency	I_C = 1 A V_{CE} = 4 V f = 50 KHz	0.2			MHz
$I_{s/b}$	Second Breakdown Collector Current	V_{CE} = 25 V t = 1 s (non repetitive)	6			A

* Pulsed: Pulse duration = 300µs, duty cycle ≤2 %

1) 1A/7.68 mA = 130
2) .95A/12.12 mA = 78.38
3) 1.0/10.98 mA = 91.07
4) .59/12.2 mA = 98.36
5) 1.0/8.5 mA = 117.65

1/7.37 = 136
.97/12.1 = 80.16
1/10.4 = 96.15
.63/12.2 = 51.64
1/8 = 125