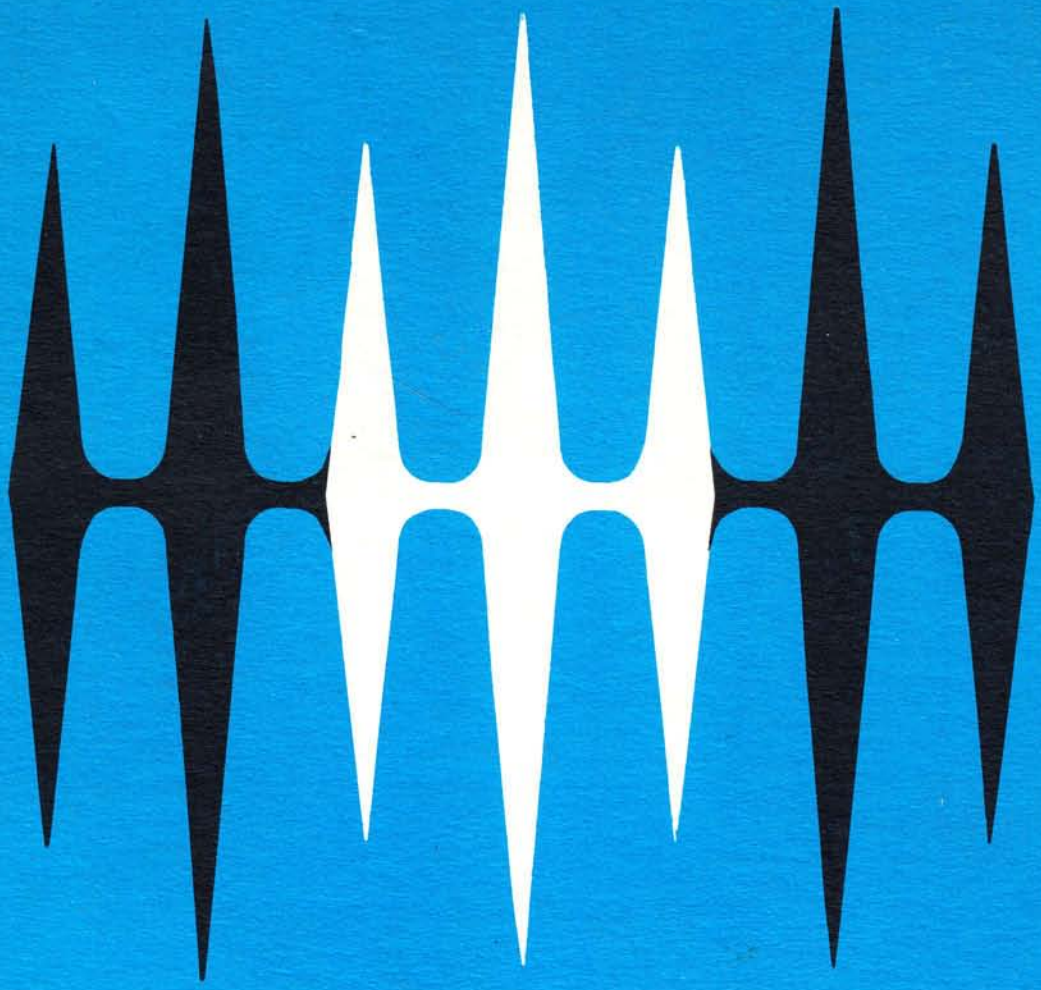
15- $2

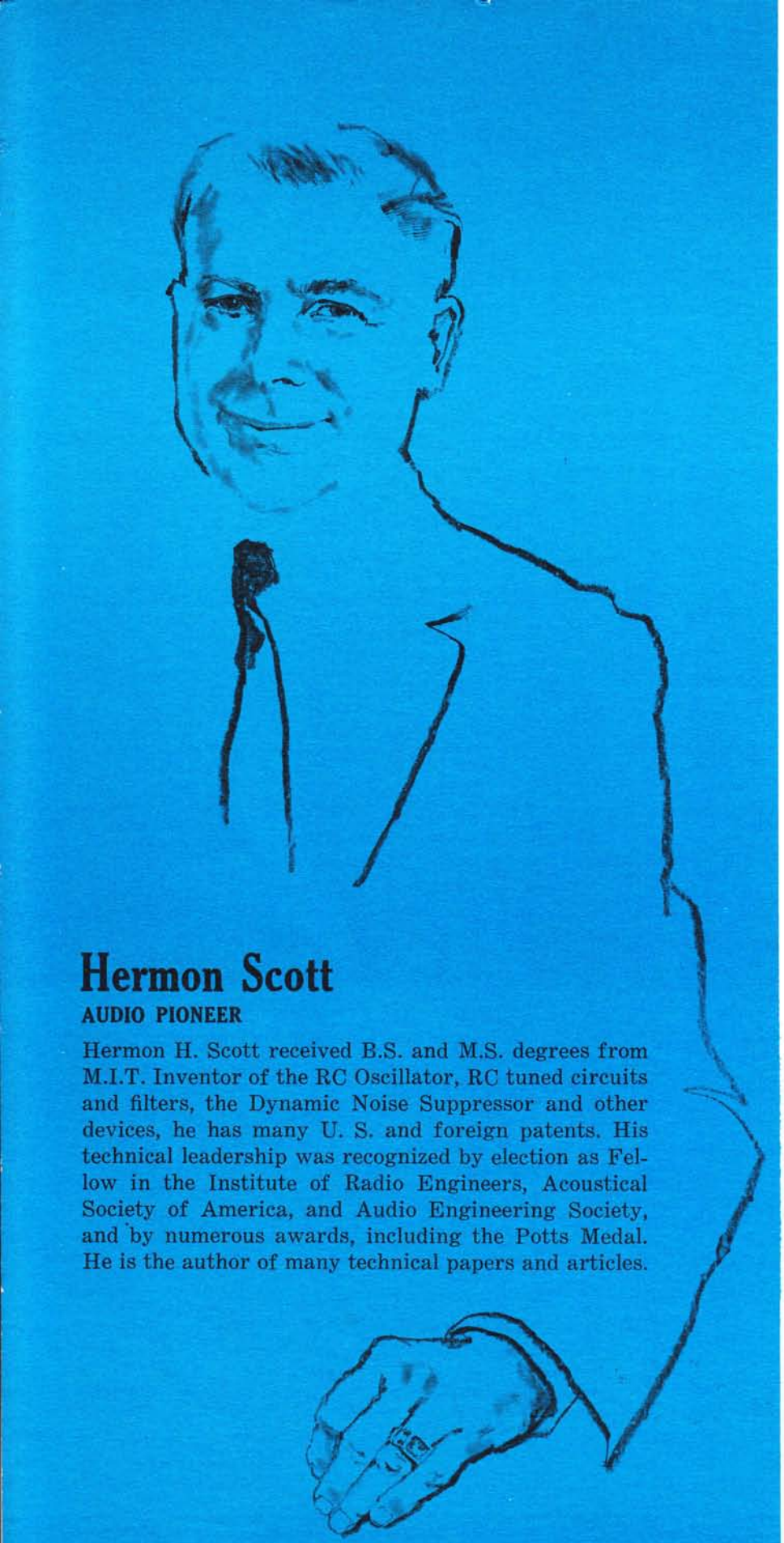


INSTRUCTION BOOK

H·H·SCOTT

LEADER IN AUDIO ENGINEERING AND DESIGN

Model LC-21



Hermon Scott

AUDIO PIONEER

Hermon H. Scott received B.S. and M.S. degrees from M.I.T. Inventor of the RC Oscillator, RC tuned circuits and filters, the Dynamic Noise Suppressor and other devices, he has many U. S. and foreign patents. His technical leadership was recognized by election as Fellow in the Institute of Radio Engineers, Acoustical Society of America, and Audio Engineering Society, and by numerous awards, including the Potts Medal. He is the author of many technical papers and articles.

Important Firsts . . .

BY H. H. SCOTT

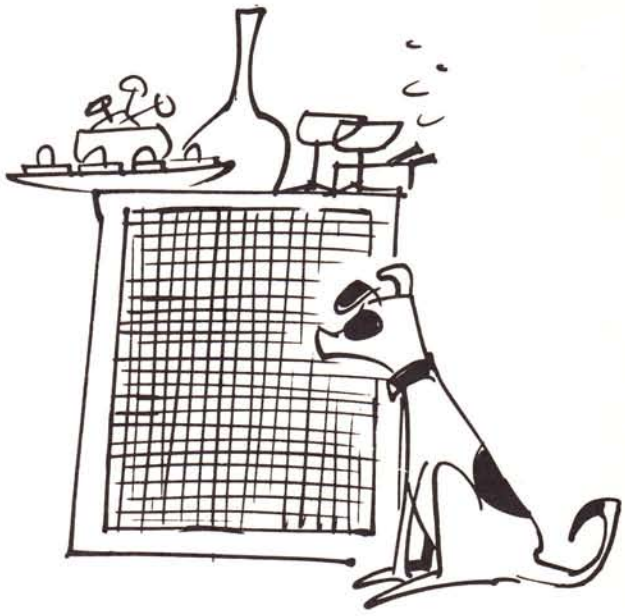
First high fidelity AM-FM Stereo tuner using wide range AM design. First to successfully use wide-band circuitry in high-fidelity FM tuners. First to market The Stereo-Daptor, a stereo control unit that prevents obsolescence. First to provide center channel ouput on Stereo amplifiers for added realism in playback.

Introduction

The first true high fidelity complete amplifier appeared in 1947, H. H. Scott's Model 210A. This remarkable instrument introduced a score of unusual design features, which today are accepted and used by all manufacturers. The engineering innovations introduced in the 210A are typical of H. H. Scott, a company which has continued to pioneer in designing and producing new and better audio instruments. The exceptional design and careful manufacture that went into the 210A have been proven over the years . . . most of them are *still* in service, after more than 13 years. They work perfectly and compare favorably to products available today.

H. H. Scott's philosophy is not only to develop new and better instruments, but also to produce equipment that will last. There is no built-in obsolescence in H. H. Scott products. These brief notes try to indicate how this is accomplished by using the latest example of the H. H. Scott engineering laboratories, the LC-21.

How does the Control Center Work



What is the function of a Preamplifier Control Center

The purpose of the preamplifier control center is two-fold. First, it takes the exceptionally small output from the conventional magnetic phono pickup (3 to 16 millivolts in most cases) and steps it up to a level where it can be properly accepted by the power amplifier. The outputs of FM tuners, complete tape recorders, and crystal pickups are sufficiently strong so they do not need this preliminary preamplification.

The second function of the preamplifier control center is to permit the user to vary the sound to suit his taste. It permits him to increase or decrease the treble, bass, and volume. It permits him to select a wide range of program sources, reduce record scratch, and adjust record or tape equalization.

Your LC-21 offers on one compact chassis, two pieces of precision equipment. There is a preamplifier control center for the left channel (Channel A), and a pre-amplifier control center for the right channel (Channel B). It is actually a remarkable accomplishment in engineering design, to have such outstanding laboratory performance on so simple and compact a unit.

Preamplifier Stage

The very weak signals coming from the magnetic cartridge or tape head are fed into Mag Inputs. They go to the first duo-triode 12AX7 tubes (V1 for the left or A channel, V2 for the right or B channel), where pre-amplification occurs.

Any noise or hum that creeps in at this critical stage will be amplified along with the program material and will be audible in the resultant sound. To avoid introducing noise, special pre-selected low noise tubes are used. Hum is usually caused by the 60-cycle AC used to heat the tubes. On all H. H. Scott amplifiers, DC is used instead of AC, so there is no possibility of hum appearing from this source. This DC is derived from the selenium rectifier, SRI, on your LC-21.

Another major cause for high hum level is radiation from the power supply. This has been eliminated in your LC-21 by two means: 1) The power transformer includes a copper strap to reduce the magnetic field, and 2) the power supply is separated from the rest of the circuit by an aluminum shield underneath the chassis. These methods are so effective that it becomes virtually impossible to measure or hear any hum with conventional methods.

In addition to the preamplification, equalization is also accomplished. Equalization involves correcting for the bass cut and treble boost introduced on all phonograph records and prerecorded tapes to allow their manufacture. The equalization characteristic is always within 1 db of the record manufacturer's (RIAA) specification on H. H. Scott amplifiers.

Naturally, any distortion introduced at this first stage would be amplified along with the music in the subsequent stages. To keep distortion down to virtually unmeasurable amounts, negative feedback is employed in every stage of your LC-21.

Feedback is a method whereby part of the output signal is fed back into the input. Negative feedback indicates that the resultant input signal is reduced in strength. While this causes a loss in gain, it also virtually eliminates distortion.

Tone Control Audio Stage

The preamplified signal goes to the tone control audio stage, another duo triode 12AX7 (V3 for Channel A, V4 for Channel B). The signal from tuners, complete tape recorders, crystal cartridges, and other high level program sources being much stronger, bypasses the preamplifier stage and goes directly to this first audio stage. Here the signal is further amplified and modified (if desired) by the tone controls. H. H. Scott uses feedback-type tone controls, giving the advantage of low distortion, of not affecting the midrange response, and of *being flat* when the control is in the flat position (flat position is "O" on the front panel, indicating that there is no tone control boost or attenuation).

Subsonic Filter

The tone control audio amplifier stage also includes the low-frequency filter. The human ear cannot hear signals below 20 cycles per second. However, even a good turntable or record will contain noises of lower frequency. These noises, which you cannot hear, are capable of being reproduced by the amplifier. Often these subsonic sounds will generate such enormous signals that they will waste much of the amplifier's power and adversely affect its ability to reproduce the desirable program material. The special filter used by H. H. Scott eliminates all these subaudible noises and permits the amplifier to concentrate its power in the audible range of 20 to 20,000 cycles per second.

If the LC-21 is to be used for laboratory measurements, such as square waves, or for any purpose that requires flat response to below 10 cycles per second, this filter can be removed from the circuit. When you reach this stage in the assembly instructions we will refer you back to this introductory statement. At that time you can decide whether or not you wish to include the subsonic filter. If the LC-21 is to be used only for home music listening, we recommend its inclusion.

Output Stages

The signal is now ready to be sent to the power amplifier. However, the output impedance of this signal must be reduced to permit you to use long cables between the LC-21 and the power amplifier, if you desire. If the impedance is not reduced, you will lose high frequencies.

The impedance matching is accomplished by a circuit known as an "anode follower." One of the additional advantages of this method is that it provides an extra 30 db of feedback which further reduces distortion and allows you to use cables up to 30 feet in length with no harmful effects on the high frequencies. One-half of V5 is the anode follower for Channel B and one-half of V6 is the anode follower for Channel A.

Special Features

The LC-21 incorporates a phase reverse switch. This permits you to check your loudspeakers to see if they are properly phased. In the Operating Instructions for the LC-21 this matter is discussed in considerable detail. Unless your speakers are in phase, much of the stereo effect is ruined. In the LC-21, the other half of V5 provides this feature.

The LC-21 also incorporates a Derived Center Channel Output, with an associated level control. This is the sum of both the right (Ch. A) and left (Ch. B) channels, and can be used either to provide a fill between your right and left speakers, or as a source of complete monophonic music to be fed throughout the house. The Derived Center Channel Level on the front panel controls the volume of this signal. The other half of V6 provides the amplification.

Power Supply

In order to supply the necessary voltages to all the stages of the preamplifier a rugged power supply is needed. The husky oversize power transformer along with the 6X4 rectifier and SRI selenium rectifier comprise the heart of the power supply. The electrolytics (condenser cans) are all specially designed and conservatively operated. These are other factors in the long life you can expect from the LC-21.

Heat can be a problem in any preamplifier. Under normal conditions you can expect the preamplifier to use about 35 watts of electricity. This will generate some heat.

Most amplifier chassis are steel which is an inexpensive material. Unfortunately steel is not a good conductor of heat so such units will have their stages overheating. Aluminum is an excellent conductor of heat, so it rapidly conducts the heat away to other parts of the chassis where it can be readily transferred to the air.

In fact you may notice that your aluminum front panel is warm to the touch. This means that the heat is being transported away from the heat sources and that your preamplifier is operating safely.

Another advantage of the aluminum chassis is that it is nonmagnetic so acts as a shield against induced hum. Conventional chassis made of steel, which is magnetic, are much more prone to this type of difficulty.

Conclusion

There are many ingredients involved in designing a high quality complete stereo control center. However, as this discussion has attempted to show, compromise is not one of them.

LC-21 Parts List

1	LC-21-M1	Main Chassis
1	LC-21-M2	Front Chassis
1	LC-21-M3	Control Shield
1	LC-21-M4	Bottom Cover
1	AB-$\frac{9}{16}$	Clip
3	A-GR-6	Rubber Grommets
1	D-LK-10	Owner's Name Plate
1	E-LT-AVY	Solder Pack
1	E-LT-SD	Screw Driver
6	EV-9MA-1	Tube Shield
2	F-3AG ½	Fuse
4	H-DLW-8	Cup Washers (F/TR-5-2)
6	H-N-⅜ x ½	Pot and Switch Hex Nuts
4	H-N-832	Nut (F/TR-5-2)
1	H-NK-632	Kep Nut (F/SR-1)
1	H-MS-632 x 10	Mach. Screw (F/SR-1)
16	H-SMS-6 x ¼HW	Sheet Metal Screws
2	I-NS-2	Small Nylon Sleeve
8	I-NS-8	Large Nylon Sleeve
1	KN-P-6	Knob
3	KN-P-6C	Knob
2	KN-P-8	Knob
4	KN-P-9C	Knob
1	N-LC-21-1	Front Panel
1	SR-25/600B	Rectifier (SR-1)
1	TR-5-2	Transformer
1	V-6 X 4	Tube (V7)
6	V-12 AX 7	Tube (V1, V2, V3, V4, V5, V6)
2	WAC-6A	Cables

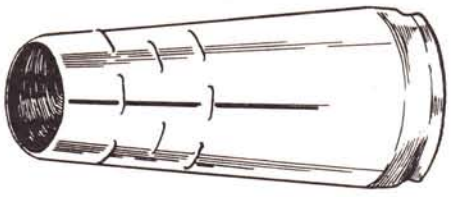

AB-916
CLIP


A-GR-6
RUBBER GROMMET


H-DLW-8
CUP WASHER


H-SMS-6 x ¼ HW
SHEET METAL SCREW


H-MS-632 x 1B
MACHINE SCREW


EV-9MA-1
TUBE SHIELD

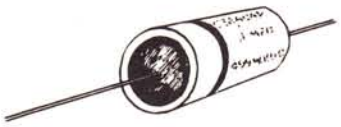

H-N-832
HEX NUT


H-NK-632
LOCK NUT

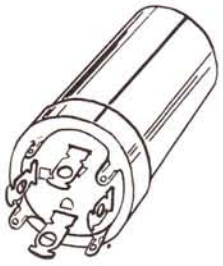

H-N-⅜ x ½
HEX NUT

2	CC-.001		Ceramic Capacitor
4	CC-.005		Ceramic Capacitor
1	CC-.01/10KV		Ceramic Capacitor
2	CC-5NPO		Ceramic Capacitor
6	CM15-47		Mica Capacitor
2	CM15-150		Mica Capacitor
2	CM15-270		Mica Capacitor
4	CM20-560		Mica Capacitor
8	CPM-.1		Tubular Condenser
4	CPM-.022		Tubular Condenser
2	CPM-.01		Tubular Condenser
4	CPM-.047		Tubular Condenser
4	CPM-.0068		Tubular Condenser
1	CEC-2 x 20/2 x 25		Electrolytic (C3)
2	CEC-2 x 300/2 x 10		Electrolytic (C1 & C2)
8	RC21-1.5K .	Brown/Green/Red	½ Watt Resistor
4	RC21-2.7K .	Red/Purple/Red	½ Watt Resistor
2	RC21-10K .	Brown/Black/Orange	½ Watt Resistor
2	RC21-22K .	Red/Red/Orange	½ Watt Resistor
2	RC21-47K .	Yellow/Purple/Orange	½ Watt Resistor
2	RC21-82K .	Grey/Red/Orange	½ Watt Resistor
8	RC21-100K .	Brown/Black/Yellow	½ Watt Resistor
3	RC21-220K .	Red/Red/Yellow	½ Watt Resistor
7	RC21-270K .	Red/Purple/Yellow	½ Watt Resistor
3	RC21-330K .	Orange/Orange/Yellow	½ Watt Resistor
1	RC21-390K .	Orange/White/Yellow	½ Watt Resistor
4	RC21-470K .	Yellow/Purple/Yellow	½ Watt Resistor
2	RC21-560K .	Green/Blue/Yellow	½ Watt Resistor
1	RC21-680K .	Blue/Grey/Yellow	½ Watt Resistor
6	RC21-1M .	Brown/Black/Green	½ Watt Resistor
7	RC21-2.2M .	Red/Red/Green	½ Watt Resistor
2	RC21-10M .	Brown/Black/Yellow	½ Watt Resistor
2	RC21-2.7M .	Red/Purple/Green	½ Watt Resistor
2	RC31-2.7 .	Red/Purple/Gold	1 Watt Resistor
1	RC31-1K .	Brown/Black/Red	1 Watt Resistor
1	RC31-47K .	Yellow/Purple/Orange	1 Watt Resistor
8	RC31-100K .	Brown/Black/Yellow	1 Watt Resistor
1	RW7-12 .	7 Watt	Wire Wound Resistor
2	RC31-3.3K	Orange/Orange/Red	1 Watt Resistor

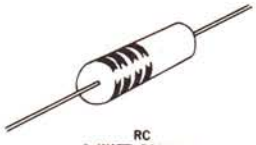
CC
CERAMIC
CAPACITOR

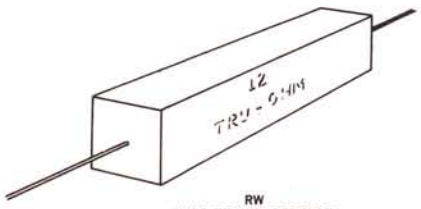

CPM
MOLDED TUBULAR
CAPACITOR

CM
MICA
CAPACITOR


CEC
ELECTROLYTIC
CAPACITOR

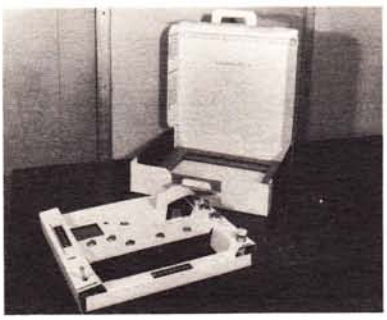

RC
½ WATT RESISTOR


RC
1 WATT RESISTOR

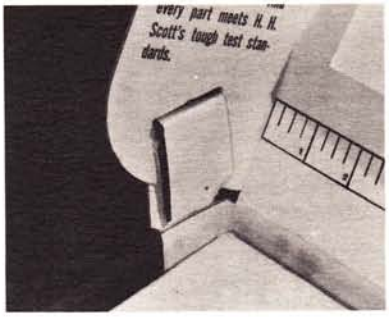


RW
WIRE WOUND RESISTOR

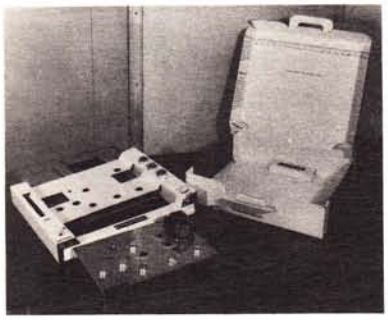
1. Remove book, part charts, front panel and chassis. Pull off knobs to avoid loss.



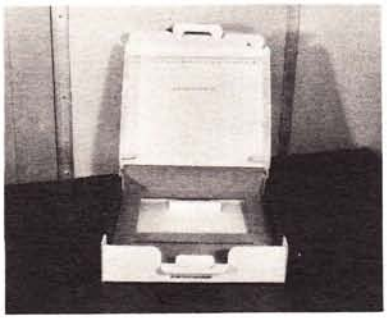
2. Remove white platform with all parts. Separate chassis and tube carton from platform, but leave all other parts in place.



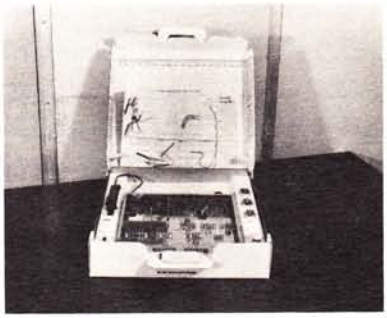
3. The back cover of your kit will stay open when you insert special flap through slits in cover.



4. Remove remaining parts and cardboard pad in the bottom. Place tube carton in back rear.



5. Turn over brown cardboard pad and lift up flap in rear.



6. Replace white platform. Remove transformer from chassis and place chassis in center with instruction booklet behind flap.

FIGURE 1

Instruction for the Model LC-21 Stereo Control Center

The LC-21 is a complete two-channel preamplifier and control unit on one compact chassis. It incorporates every meaningful operating feature and gives unexcelled performance. Engineering concepts that have long made H. H. Scott components the standard of the industry are incorporated in the LC-21. Conservatively designed, this unit will bring you years of listening pleasure.

IMPORTANT: Every effort has been made to insure that this kit, when assembled, will perform perfectly. In order to achieve this result, you must read all of the instructions and follow them precisely. Let us repeat . . . READ ALL INSTRUCTIONS CAREFULLY . . . FOLLOW THEM EXACTLY.

Unpacking your Kit-Pak

Figure 1 demonstrates the step by step procedure in unpacking your kit, as well as the extremely simple procedures involved in setting it up as a convenient work bench. With the Kit-Pak you can work on any table in the house. When it is time to stop working for the evening, all you have to do is close the cover and turn off the soldering iron. Everything is put away in minutes.

You are now ready to begin the construction. After reading these introductory notes, place the instruction booklet into the groove between the cardboard flap and the box cover. In this way the instructions will be in front of you at all times for easy reference.

Check the parts

On page fifty-nine of this manual is a descriptive list of the parts included. Before beginning the assembly it is recommended that you check all the parts with this list. It will insure that there are no missing parts, and will help you become familiar with the various items.

If you should accidentally damage or misplace any parts, write to the LABORATORY KIT SERVICE DEPARTMENT at the factory immediately.

A two foot length of insulated wire has been supplied. It is to be used to replace any missing wires or ones accidentally damaged. Simply cut off the length required (a convenient ruler is printed on the inside cover) and strip off ¼" of insulation at each end.

Occasionally we may make minor substitution of parts. Such substitutions are carefully checked and the parts supplied will work as satisfactorily as those specified in the manual. These changes will be obvious and are mentioned here only to prevent confusion in checking the parts list. For example, .005 μf. capacitors are used interchangeably with .0047 μf. capacitors.

Tools Required

A small screwdriver is provided. In addition, you will need a pair of long nose pliers, a regular size screwdriver, a pair of wirecutters, and a soldering iron or gun. A 35 watt (or more) pencil type soldering iron is actually the easiest to use. The iron should be supplied with a small tip. If a soldering gun is used, it should also have a small tip, and should be used carefully because of the enormous heat it supplies.

Simplified soldering and wiring instructions

All the solder needed to assemble the unit is supplied. If for any reason additional solder is needed, make sure that you obtain 60/40 ROSIN CORE SOLDER. Under no circumstances should you use Acid Core solder. *All guarantees are voided if Acid Core solder is used.*

Here's how to solder joints correctly (see Fig. 2):

1. Before using the soldering iron or gun, the tip must be tinned for ease of use. First heat up the iron. Then when the tip is hot, wipe with a cloth till bright and shiny, and apply a generous amount of solder. Remove any excess. Repeat this process for all sides of the tip.
2. Make sure that all leads (wires) and terminals to be soldered are completely clean. Do not use fluxes or paste of any sort.
3. The leads should be mechanically secure before soldering. This does not mean wrapping leads around the contacts several times. It means a single turn around the contact which is then pinched tightly with the long nose pliers. If the wire is too large for bending, position the wire so that a good solder connection can still be made.
4. Leads on resistors, capacitors, and similar components are generally much longer than they need to be to make the indicated connections. In these cases, the excess leads should be cut off before the part is added to the chassis. In general, the leads should be long enough to reach their termination allowing for a little left over to make a good mechanical joint. A very handy way of gauging the length of lead to trim off is to superimpose the capacitor or resistor right on the pictorial. The pictorials are all full scale, so by placing the component over its picture and allowing about ¼" extra on each end for the mechanical joint, you can shorten the leads quickly and accurately.
   Sometimes a lead will not seem quite long enough to reach the desired mounting point. In such a case, the terminal lug can be bent slightly to make the connection possible.

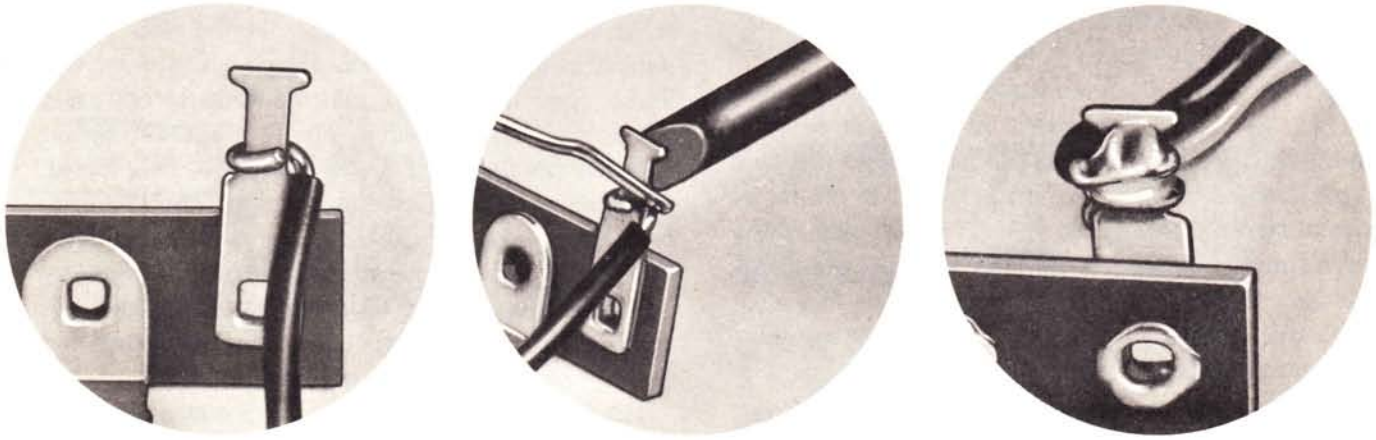


FIGURE 2

5. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.
6. Place the solder against the heated terminal (with the soldering iron still in contact) and it will immediately flow over the joint. Use only enough solder to thoroughly wet the joint. Too much solder may cause short circuits. The soldering iron does not actually come into contact with the solder, only with the joint. It is the heated joint that melts the solder.
7. As soon as sufficient solder has flowed, remove the solder tube and then a second later, the iron. Use care not to move the leads until the joint has hardened (about 5 seconds). A good solder joint should appear to be bright and shiny. Check the joint for rigidity. If it is not firm and tight, reheat the joint and permit the solder *already present* to flow again. Sometimes a little more solder will have to be added.
8. When soldering certain of the components, such as diodes and resistors, it is advisable to use no more heat than is necessary. Excessive heat can damage these components.
9. Keep the soldering iron clean and bright by occasionally wiping with a rag. The iron does not have to be cooled for this purpose.
   If you have never done any soldering before, it would be an excellent idea to practice on scraps of wires before beginning.

Basic electrical assembly procedure

Your kit includes two separate sub-assemblies: the front (with all the controls and knobs), and the main (with all the tube sockets). The symbol *F* refers to the front, and *M* to the main.

Each terminal, tube, transformer, etc. has a code number (i.e. T1, V2, and so forth). Every pin on each of these terminals, or tube sockets is also numbered (i.e. pin 1, pin 2, and so forth). The instructions will call for a wire to be connected to pin 3, V4, for example. With the instructions will be a pictorial, clearly showing in full color the connection to be made and its location. With this information you should experience no difficulty in making the correct connection.

A series of Part-Charts are provided with all the necessary resistors and capacitors mounted. Each chart applies to a particular page of the electrical assembly instructions.

For example — in the instructions that follow you will find a page marked " Assembly Group BM-1." The " B " indicates that this is part of the electrical assembly. The " M " indicates that you will be working on the " main." The " 1 " means that this is the first page of instructions for electrical assembly of the main. In the bag of Part-Charts you will find a Part-Chart BM-1. Take this out and keep it next to you when working on this page. The first step on the page is called BM1-1 and refers to a CC .005. The first part on the Part-Chart is a CC .005. The pictorial on the top of the page will show exactly where this part will go. The part is mounted as directed and the step is checked off as completed.

The many wires used in the preamplifier kit are packed in a small plastic envelope. This envelope contains two separate bundles, clearly marked. For example — Assembly Group BF-1 involves connecting a group of wires of different colors and lengths. Open the bundle of wires marked " front," and spread them out near you. The first step, BF1-1, calls for a 4" yellow wire. From the yellow wires select the ones of the approximate length and hold them up to the ruler printed on the inside cover of the Kit-Pak. Once you have the correct one, you may proceed as above.

IT IS IMPORTANT TO POSITION THE WIRES OR COMPONENTS IN THE SAME POSITION AS SHOWN IN THE PICTORIAL.

If the symbol — (S-) appears in the instructions after any connection, it means that the particular connection with all other wires on the same pin, should be soldered. After the " S " will appear a number. This number indicates exactly how many leads or wires are supposed to be connected to the terminal or pin in question. For example: connect an orange wire to pin 2, V6 (S-3). The soldering number (S-3) will always be printed in red, so it can be found quickly. It indicates that there should be 3 wires or leads (including the orange one) connected to pin 2, V6, and that all three of them are to be soldered. This provides an additional check for wiring errors.

Do not solder any connection that is not marked with an (S-). Other connections are yet to be made to this pin before it can be soldered. Frequently one end of a lead or component will be soldered while the other end will not (for the moment). The (S-) will only appear after the description of the end that is to be soldered. After completing the soldering, cross out the (S-) symbol with your pencil indicating that it has been done. This is in addition to checking off each step. In this way you can glance over the assembly instructions and spot any (S-) that has not been crossed out, indicating that you may have overlooked a joint to be soldered.

The instructions which follow have been arranged in a logical order to insure perfect results. Follow them exactly, checking off each step as completed.

For easy reference keep this instruction manual on the inside of the top cover of your KIT-PAK as shown in Fig. 1.

What to do if you make a mistake

No matter how careful you may be, it is still possible to break something accidentally or to cut a lead too short. We might add that if you work when tired, or try to do too much, too fast, then the possibility of mishap increases greatly. Nevertheless, it is easy to correct most common errors.

1. Cutting a wire or lead too short — If you cut the wire from one of the components too short you can easily correct it by taking a small piece of uninsulated wire (buss wire) and splicing it on as shown in Fig. 3. If a wire supplied is damaged, you can cut off a replacement from the 2 feet of spare wire supplied.

2. Breaking a terminal strip — The terminal strips are quite sturdy and will withstand a great deal of handling. Nevertheless, if you are extremely rough, a terminal pin can be broken off. If this happens, make all connections to the small hole below the broken pin. Be careful to avoid having any of the bare wires touch the chassis. If the phenolic material cracks but does not break off, you can continue on as the wires themselves will keep the broken piece in place.

In the unlikely circumstance that the entire terminal strip breaks off, it is necessary to replace it. Write to the parts department at the factory for a replacement. Drill out the rivet holding the broken strip, using a number 28 drill. Mount the replacement with a regular 6-32 x ¼" machine screw, lockwasher, and nut.

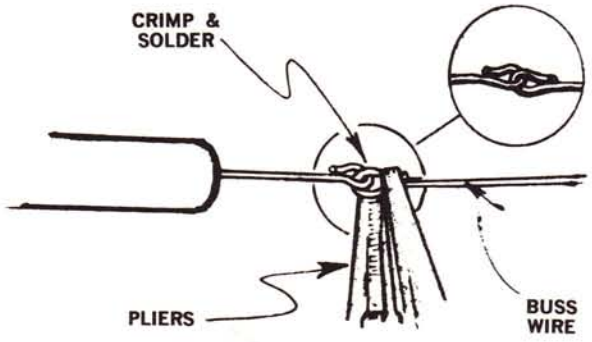


FIGURE 3

Electrical Assembly

INTRODUCTORY NOTES

To obtain the really fine performance this amplifier is capable of, all lead lengths from components (resistors and capacitors) must be as short as possible. Follow the diagrams closely. Keep all parts as close to the chassis as possible. This refers to all components and insulated wires. Bare wires, of course, should not touch the chassis, unless instructions indicate otherwise.

The biggest source of mishaps, next to poorly soldered joints, are short circuits. A short circuit occurs when two uninsulated wires that are not supposed to, accidentally touch each other. It can also happen when a wire going towards one pin accidentally touches another pin or the metal chassis nearby. The main body of a resistor or a capacitor is fully insulated so it does not matter if this part touches something. It is only the bare wires on the ends that you have to watch for. As the number of parts in the amplifier starts to increase, you will realize how possible it is for short circuits to occur.

Extra quantities of black insulation material (spaghetti) have been supplied. Whenever you suspect that a short circuit may occur (either to the chassis, to another bare wire, or to another pin), slide a small piece of spaghetti over the bare wires in question. If you position the parts exactly as shown in the pictorials, you will not need to use spaghetti very frequently. However, it is better to be on the safe side if you have any doubts.

Check off each step as soon as it is completed. Cross off each (S) as soon as the soldering required is done. Connect your soldering iron now so that it will be ready.

Do not proceed unless you have read all the instructions given above

Assembly Group BF-1

There is an envelope of wires supplied marked " FRONT ". Open this envelope and spread out the wires near you. Use the ruler printed on the inside cover of the Kit-Pak to check the proper length. The term " buss wire " refers to short pieces of uninsulated wire which can be found in the hardware bag. Several of the potentiometers (controls) have two decks. You will notice in the pictorial above that this included P1, P2, P3, and P4. Pins P1, P2, P3, and P4 are on the bottom deck (closer to the chassis) while Pins P5, P6, P7, and P8* are on the top deck (further away from the chassis). To avoid confusion the word " top " or " bottom " will be inserted after the pin number to insure that you will use the right pin. Remember, do not solder unless you see the solder instructions in (red).

* There is no Pin P8 on control P2.

BF1-1. Connect a 4" yellow wire from Pin 3, SS1 (S1), to Pin 1 (bottom), P1.

BF1-2. Connect a 3" green wire from Pin 6, SS1 (S1), to Pin 5 (top), P1.

BF1-3. Connect a 2½" black wire from Pin 2 (bottom), P1, to Pin 1, P2.

BF1-4. Connect a 1¾" black wire from Pin 5, SS2 (S1), to Pin 1, P2.

BF1-5. Connect a 3" black wire from Pin 1, P2 (S3), to Pin 3 (bottom), P2.

BF1-6. Connect a 4¾" green wire from Pin 2, SS2 (S1), to Pin 2 (bottom), P2.

BF1-7. Connect a 4" orange wire from Pin 1, SS3, to Pin 6 (top), P3.

BF1-8. Connect a 4" orange/white wire from Pin 3, SS3 (S1), to Pin 5 (top), P3. Position this wire up away from the chassis

BF1-9. Connect a 5¾" orange wire from Pin 4, SS3, to Pin 6 (top), P4. Position close to the chassis.

BF1-10. Connect a 5¾" orange/white wire from Pin 6, SS3 (S1), to Pin 5 (top), P4. Position close to the chassis.

BF1-11. Connect a 5¼" yellow/white wire from Pin 1, SS4 (S1), to Pin 7 (top), P3. Position this wire up away from the chassis.

BF1-12. Connect a 3¼" yellow wire from Pin 4, SS4 (S1), to Pin 7 (top), P4.

BF1-13. Connect an 8¾" blue wire from Pin 4 (bottom), P1, to Pin 5 (top), P4.

BF1-14. Connect a 4½" orange/white wire to Pin 1, SS5 (S1). Do not connect other end.

BF1-15. Connect a 4½" orange wire to Pin 4, SS5 (S1). Do not connect other end.

BF1-16. Connect a 4" black wire to Pin 3, SW1. Do not connect other end.

BF1-17. Add a ½" piece of black insulation (spaghetti) to a buss wire and connect from Pin 1, SS6, to Pin 9, SS6 (S1). A roll of black insulation (spaghetti) will be found in the hardware bag.

BF1-18. Connect a buss wire from Pin 3, SS6, to Pin 7, SS6 (S1).

BF1-19. Add a ½" piece of black insulation to a buss wire and connect from Pin 4, SS6, to Pin 12, SS6 (S1).

BF1-20. Connect a buss wire from Pin 6, SS6, to Pin 10, SS6 (S1).

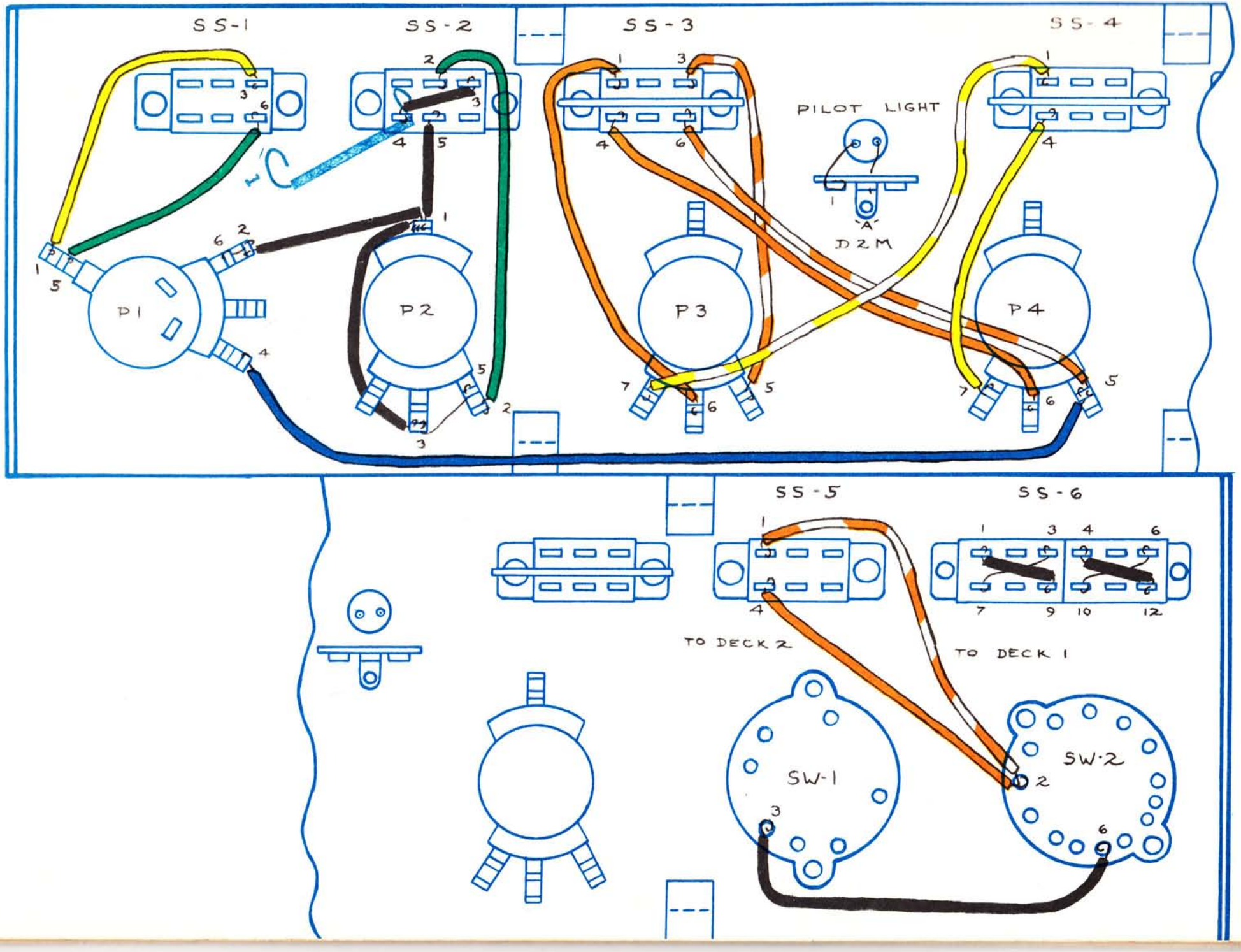
BF1-21. Connect a buss wire from Pin 2 (bottom), P1, to Pin 6 (top), P1.

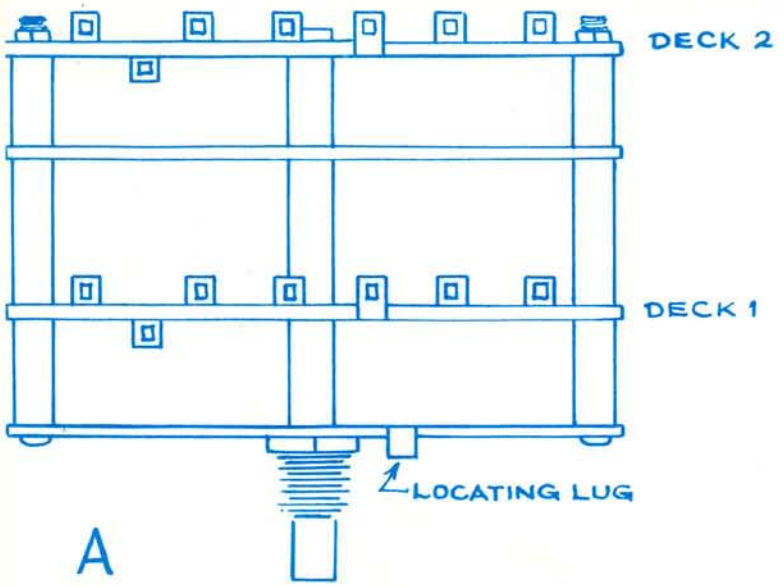
BF1-22. Connect a buss wire from Pin 3 (bottom), P2, to Pin 5 (top), P2.

BF1-23. Connect a 4" blue wire to Pin 4, SS2 (S1)
Add a ½" piece of black insulation (spaghetti) to a buss wire and connect the buss wire from Pin 3, SS2, to Pin 4, SS2 (S1).

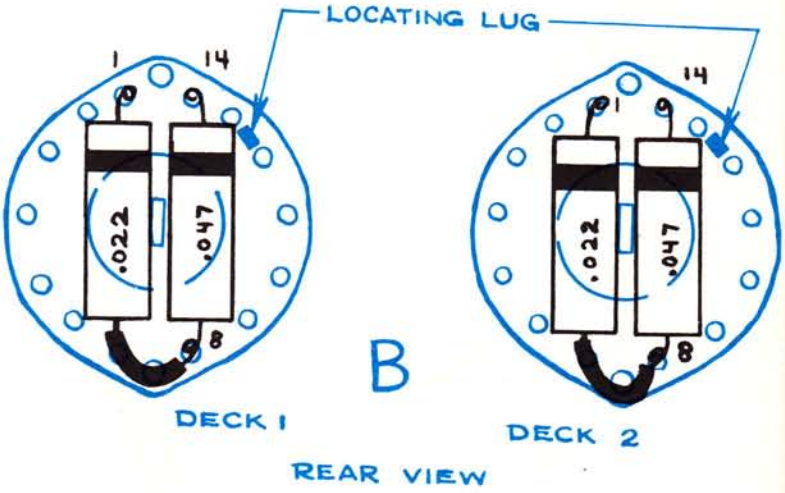
BF1-24. Connect either one of the bare wires coming from the pilot light to Pin 1, D2M. Trim off the excess wire. Connect the other bare wire to ground lug "A", D2M (S1). Trim off the excess wire length.

(The term " ground lug " refers to that part of the terminal strip that is riveted to the chassis. You will observe that there is a small hole going through this metal strip which is ideal for inserting and soldering the wires or leads.)


SS-1
SS-2
SS-3
SS-4
PILOT LIGHT
D2M
P1
P2
P3
P4
SS-5
SS-6
TO DECK 2
TO DECK 1
SW-1
SW-2

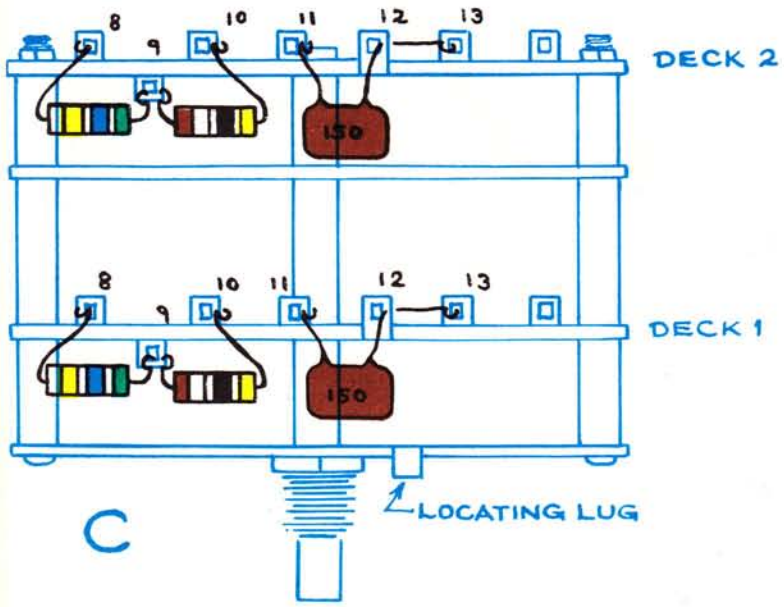


A

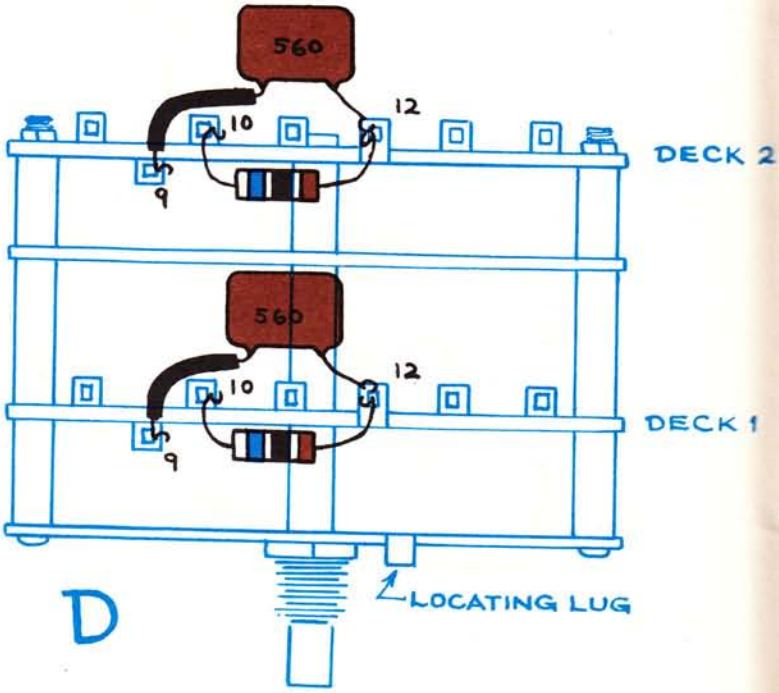


B

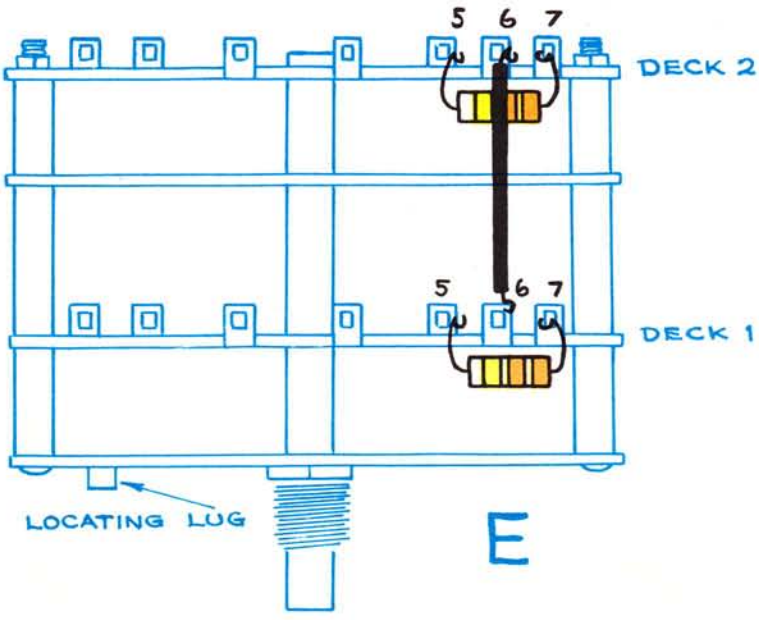
REAR VIEW



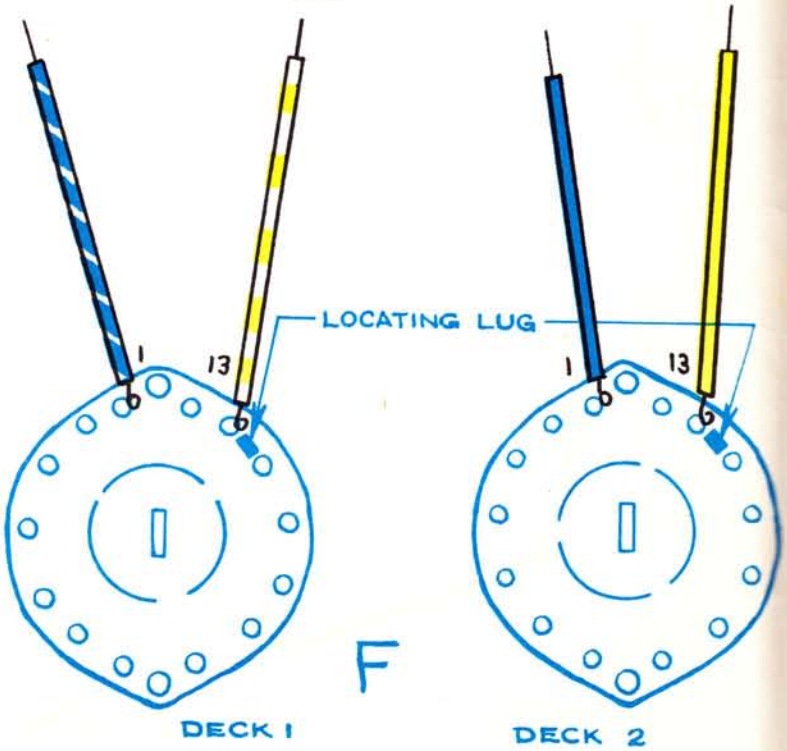
C



D



E



F

Assembly Group BF-2

You will now assemble the Input Selector Switch. This is SW2 on your Chart AF-1, or the control on the extreme left, bottom row as you look at the front chassis from the front. Unthread the machine nut holding the control in place and remove it from the front chassis. Put the front chassis aside.

The input selector switch will prove to be one of the two most difficult parts of the entire assembly, but if you exercise care it should offer no real problem. Keep the leads coming from the capacitors and resistors as short as possible. Watch out for short circuits. When positioning the large CPM .022's make sure that you do not accidentally bend up the tabs that are to make contact with the rotor (see Figure 4).

You will find it very helpful when you have to do any soldering on this switch if you place it shaft down in the hole marked Screwdriver on the white platform in your Kit-Pak. This will leave you with both hands free to hold your solder and soldering iron (see Figure 5).

The parts needed for the following steps will be found on Part-Charts identified with the same Assembly number as the written instructions below. Keep all leads short and make small mechanical jonts. Be careful of short circuits.

To help you locate the correct tabs we have provided you with a series of illustrations. The first one (A) shows the switch as you originally receive it. Note that Deck 1 is the front section and Deck 2, the rear. The second illustration (B) shows the switch viewed from the rear after steps BF2-1 through BF2-4 have been completed. *Carefully observe the position of the locating lug on* the piece of metal in front of Deck 1 so that you can orient the switch properly.

☒ **BF2-1.** Connect the black band end of a CPM .022 to Pin 1, Deck 1. Connect the other end with ½" of black *insulation material to Pin 8, Deck 1.*

☒ **BF2-2.** Connect the black band end of a CPM .047 to Pin 14, Deck 1 (S1). Connect the other end to Pin 8, Deck 1.

☒ **BF2-3.** Connect the black band end of a CPM .022 to Pin 1, Deck 2. Connect the other end with ½" of black insulation material to Pin 8, Deck 2.

☒ **BF2-4.** Connect the black band end of a CPM .047 to Pin 14, Deck 2 (S1). Connect the other end to Pin 8, Deck 2.

Now look at assembly illustration "C". Pick up the switch in your hand and hold it in front of you so that the locating lug is towards you and the switch is in the identical position shown. You will note that tab 12 has two metal tabs rather than just one. Any leads going to tab 12 must pass through *both* tabs, and any soldering must affect both tabs. For the following six steps, BF2-5 through BF2-10, refer to this illustration.

☒ **BF2-5.** Connect a CM150 from Pin 11, Deck 1, (S1) through Pin 12, Deck 1, and connect to Pin 13, Deck 1.

☒ **BF2-6.** Connect a 100K resistor (brown-black-yellow) from Pin 9, Deck 1 to Pin 10, Deck 1.

☒ **BF2-7.** Connect a 560K resistor (green-blue-yellow) from Pin 8, Deck 1, (S2) to Pin 9, Deck 1.

☒ **BF2-8.** Connect a CM150 from Pin 11, Deck 2, (S1) through Pin 12, Deck 2, and connect to Pin 13, Deck 2.

☒ **BF2-9.** Connect a 100K resistor (brown-black-yellow) from Pin 9, Deck 2 to Pin 10, Deck 2.

☒ **BF2-10.** Connect a 560K resistor (green-blue-yellow) from Pin 8, Deck 2, (S2) to Pin 9, Deck 2.

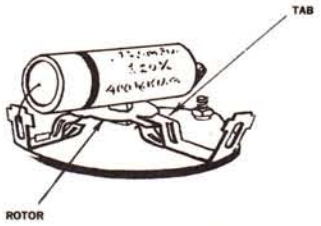


FIGURE 4

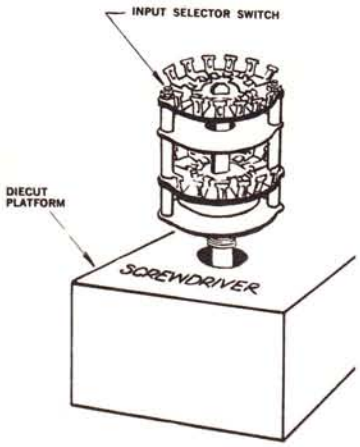


FIGURE 5

Assembly Group BF-3

Now refer to illustration "D" and use part-chart BF3.

☑ **BF3-1.** Connect a 10M resistor (brown-black-blue) from Pin 10, Deck 1 (S2), to Pin 12, Deck 1.

☒ **BF3-2.** Add a ¾" piece of black insulation to one end of a *CM560 and connect to Pin 9, Deck 1 (S3). Connect* the other end to Pin 12, Deck 1 (S1).

☒ **BF3-3.** Connect a 10M resistor (brown-black-blue) from Pin 10, Deck 2, (S2) to Pin 12, Deck 2.

☒ **BF3-4.** Add a ¾" piece of black insulation to one end of a CM560 and connect to Pin 9, Deck 2 (S3). Connect the other end to Pin 12, Deck 2 (S1)*.

Now refer to illustration "E". For these steps, you must rotate the switch so that the locating lug is away from you as shown.

☒ **BF3-5.** Connect a 330K resistor (orange-orange-yellow) from Pin 5, Deck 1 (S1) to Pin 7, Deck 1 (S1).

☒ **BF3-6.** Connect a 330K resistor (orange-orange-yellow) from Pin 5, Deck 2 (S1) to Pin 7, Deck 2 (S1).

☒ **BF3-7.** Connect a 2" black wire from Pin 6, Deck 1 to Pin 6, Deck 2.

For the last four steps, use assembly picture "F". Note that this is the view from the rear. In particular make sure that the locating lug is in the same position as shown.

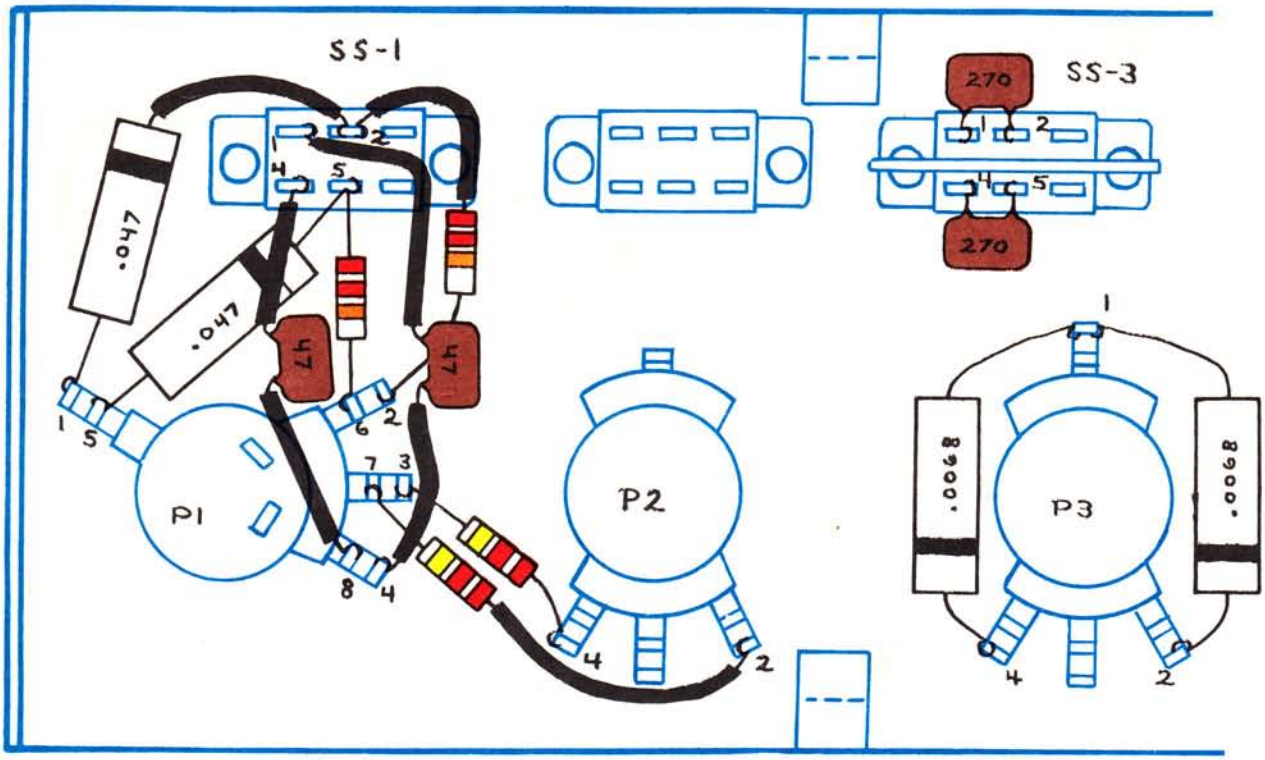
☒ **BF3-8.** Connect a 6" blue/white wire to Pin 1, Deck 1 (S2). Do not connect other end.

☒ **BF3-9.** Connect a 4¾" blue wire to Pin 1, Deck 2 (S2). Do not connect other end.

☒ **BF3-10.** Connect a 6" yellow/white wire to Pin 13, Deck 1 (S2). Do not connect other end.

☒ **BF3-11.** Connect a 4½" yellow wire to Pin 13, Deck 2 (S2). Do not connect other end.

*The lead from the CM150 passes *through* this pin so it counts as *two* (2) leads when adding up the total to be soldered.



Assembly Group BF-4

The Input Selector Switch can now be reinserted into the front chassis, and the machine nut threaded on to hold it in place. You will note that the locating lug on the switch fits into the small opening on the front chassis to insure the correct position. Continue working on the front as in BF1.

Look back at pictorial on page 11.

☒ Connect the end of the orange/white wire coming from Pin 1, SS5 to Pin 2, deck 1, SW2.

☒ Connect the end of the orange wire coming from Pin 4, SS5 to Pin 2, deck 2, SW2.

☒ Connect the end of the black wire coming from Pin 3, SW1 to Pin 6, deck 1, SW2.

There is a Part-Chart labelled BF4 for this page. You will find yourself soldering terminal pins that have more than one wire connected. It is important to make sure that the solder flows over **all** the wires and leads, and that they are all secure.

☒ **BF4-1.** Add a piece of 1″ black insulation to the black band end of a CPM .047 and connect this end to Pin 2, SS1. Connect the other end to Pin 1 (bottom), P1 (~~S2~~).

☒ **BF4-2.** Connect the black band end of a CPM .047 to Pin 5, SS1. Connect the other end to Pin 5 (top), P1 (~~S2~~).

☒ **BF4-3.** Add a 1″ piece of black insulation to one end of a 22K resistor (red-red-orange). Connect this end to Pin 2, SS1 (~~S2~~). Connect the other end to Pin 2 (bottom), P1 (~~S3~~).

☒ **BF4-4.** Connect a 22K resistor (red-red-orange) from Pin 5, SS1 (~~S2~~) to Pin 6 (top), P1 (~~S2~~).

☒ **BF4-5.** Connect a 220K resistor (red-red-yellow) from Pin 3 (bottom), P1 (~~S1~~) to Pin 4 (bottom), P2.

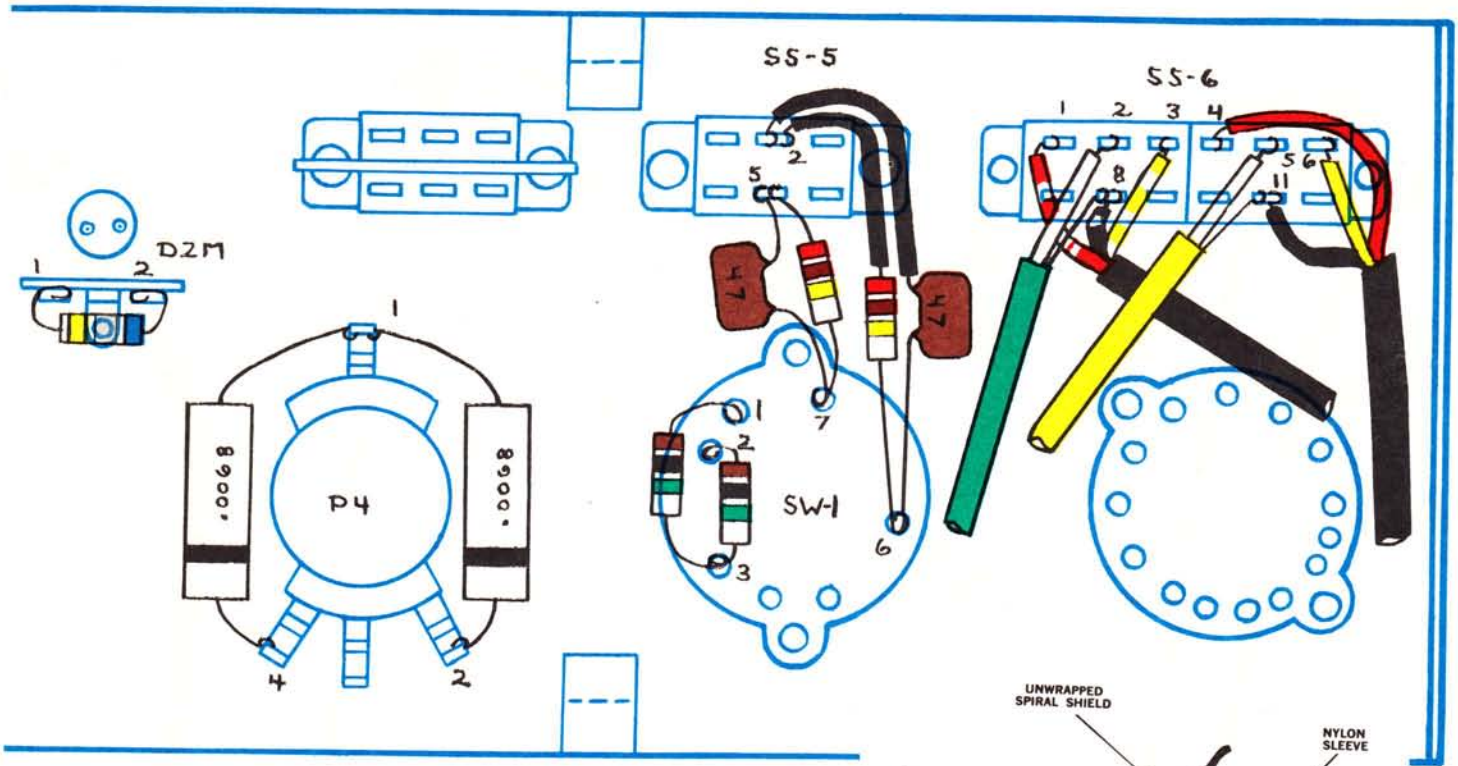
☒ **BF4-6.** Connect one end of a 220K resistor (red-red-yellow) to Pin 7 (top), P1 (~~S1~~). Add a piece of 1¼″ black insulation to the other end and connect to Pin 2 (bottom), P2 (~~S2~~).

☒ **BF4-7.** Add a 1″ piece of black insulation to each end of a CM 47 and connect from Pin 1, SS1 (~~S1~~) to Pin 4 (bottom), P1 (~~S2~~).

☒ **BF4-8.** Add a 1″ piece of black insulation to each end of a CM 47 and connect from Pin 4, SS1 (~~S1~~) to Pin 8 (top), P1.

☒ **BF4-9.** Connect a CM 270 from Pin 1, SS3 (~~S2~~) to Pin 2, SS3 (~~S1~~).

☒ **BF4-10.** Connect a CM 270 from Pin 4, SS3 (~~S2~~) to Pin 5, SS3 (~~S1~~).



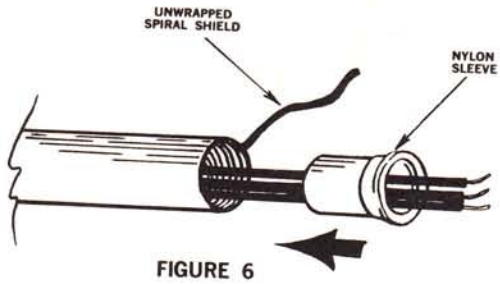


FIGURE 6

Assembly Group BF-5

☒ **BF5-1.** Connect the black band end of a CPM .0068 to Pin 4 (bottom), P3. Connect the other end to Pin 1 (bottom), P3.

☒ **BF5-2.** Connect the black band end of a CPM .0068 to Pin 2 (bottom), P3. Connect the other end to Pin 1 (bottom), P3 (S2).

☒ **BF5-3.** Connect the black band end of a CPM .0068 to Pin 4 (bottom), P4. Connect the other end to Pin 1 (bottom), P4.

☒ **BF5-4.** Connect the black band end of a CPM .0068 to Pin 2 (bottom), P4. Connect the other end to Pin 1 (bottom), P4 (S2).

☒ **BF5-5.** Connect a 680K resistor (blue-grey-yellow) from Pin 1, D2M (S2) to Pin 2, D2M.

☒ **BF5-6.** Connect a 1M resistor (brown-black-green) from Pin 1, SW1 to Pin 3, SW1.

☒ **BF5-7.** Connect a 1M resistor (brown-black-green) from Pin 2, SW1 to Pin 3, SW1 (S3).

☒ **BF5-8.** Connect a CM 47 from Pin 5, SS5 to Pin 7, SW1.

☒ **BF5-9.** Connect a 270K resistor (red-purple-yellow) from Pin 5, SS5 (S2) to Pin 7, SW1 (S2).

☒ **BF5-10.** Add a piece of 1¼" black insulation to one end of a 270K resistor (red-purple-yellow). Connect this end to Pin 2, SS5. Connect the other end to Pin 6, SW1.

☒ **BF5-11.** Add a piece of 1¼" black insulation to one end of a CM 47. Connect this end to Pin 2, SS5 (S2) and connect the other end to Pin 6, SW1 (S2).

The following four steps utilize the long black cables and the long colored wires provided for use with the Front Assembly.

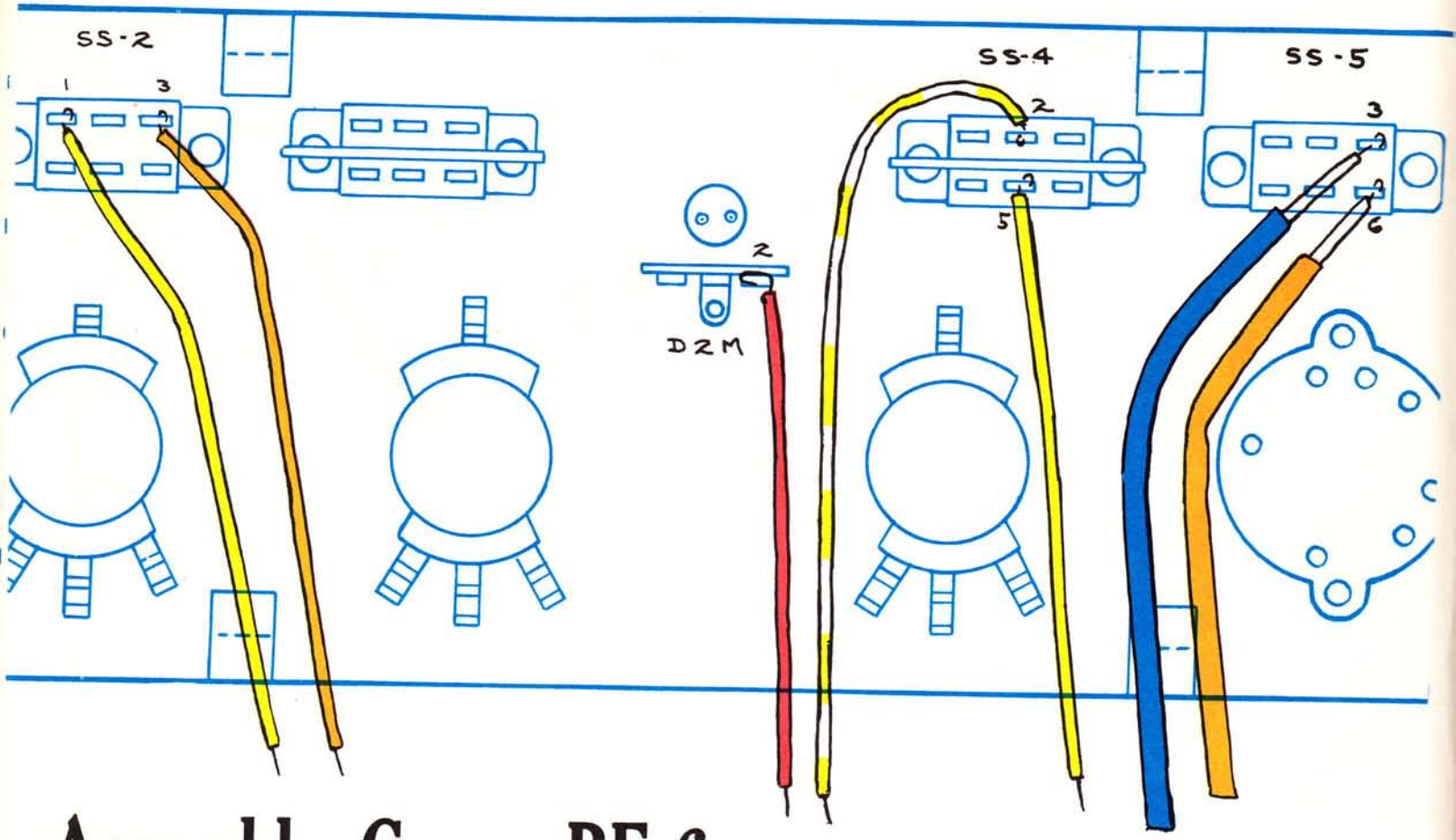
☒ **BF5-12.** Slip an 11" piece of black shielded cable over a 14¼" red wire, a 13¾" yellow wire, and a 12¾" black wire. Insert a nylon sleeve into one end of the cable as shown in Figure 6 and make the following connections with the leads on this end: Connect the red wire to Pin 4, SS6 (S2), the yellow to Pin 6, SS6 (S2), and the black to Pin 11, SS6. DO NOT CONNECT OTHER ENDS.

☒ **BF5-13.** Slip an 11½" piece of black shielded cable over a 15¾" red/white wire, a 15½" yellow/white wire, and a 14¼" black/white wire. Insert a nylon sleeve into one end of the cable as shown in Figure 6 and make the following connections with the leads on this end: Connect the red/white wire to Pin 1, SS6 (S2), the yellow/white wire to Pin 3, SS6 (S2) and the black/white wire to Pin 8, SS6. DO NOT CONNECT OTHER ENDS.

☒ **BF5-14.** Connect the insulated wire of a 6" yellow mic lapel* to Pin 5, SS6 (S1). Connect the bare wire at this end to Pin 11, SS6 (S2).

☒ **BF5-15.** Connect the insulated wire of a 5½" green mic lapel to Pin 2, SS6 (S1). Connect the bare wire at this end to Pin 8, SS6 (S2).

* Mic lapel refers to a type of cable with the inner wire insulated by a clear plastic covering, and the outer uninsulated wire simply lying between the clear plastic and the outer colored cover. The mic lapel wire appearing in the Assembly Pictorial above should give you a good idea of its looks.



Assembly Group BF-6

Only one end of all wires used in this group will be connected at this time. The other ends will not be connected until later on. When soldering a lug, make sure that all wires going to that lug are fully soldered.

☒ **BF6-1.** Clip out the bare uninsulated wire at one end of a 12½″ orange mic lapel wire and connect the insulated wire at this end to Pin 6, SS5 (~~S1~~).

☒ **BF6-2.** Clip out the bare wire at one end of a 13½″ blue mic lapel wire and connect the insulated wire at this end to Pin 3, SS5 (~~S1~~).

☒ **BF6-3.** Connect a 3½″ yellow wire to Pin 5, SS4 (~~S1~~).

☒ **BF6-4.** Connect a 5″ yellow/white wire to Pin 2, SS4 (~~S1~~).

☒ **BF6-5.** Connect a 6″ red wire to Pin 2, D2M (~~S2~~).

☒ **BF6-6.** Connect a 6″ yellow wire to Pin 1, SS2 (~~S1~~).

☒ **BF6-7.** Connect a 4″ orange wire to Pin 3, SS2 (~~S2~~). ~~S1~~

You have now completed most of the work on the front. It is time to read Page 35 of the Instruction Booklet as it applies to double checking your work. Use Chart AF-1 to get the proper count.

On Chart AF-1 you will note that some numbers have circles around them. The circled number indicates that more wires will be connected to this pin later. For double checking at this time only refer to numbers *not* circled.

Mechanical Assembly Group A-1

Take the main chassis and mount the parts outlined below. Refer to Chart AM-1 which shows the location of all these items.

A1-1. Mount the SR-1 underneath in the space provided (Figure 7) using an HMS-6-32 x 1" machine screw and a lock nut to secure it in place. Make sure that you have the correct surface facing upward, by observing the position of the + and — signs on AM-1.

A1-2. Mount the three large condenser cans C1, C2, and C3 in the space indicated in the chart. C1 and C2 are both CECs 2X300, 2 X 10; C3 is a CEC 2X20, 2 X 25 (these figures are etched on the sides of the cans). Position the cans so that the little symbols stamped or punched on the bottom of the cans (triangle, square, semi-circle) are in exactly the same position as shown on the chart. After the cans have been mounted, lock them in by turning the lugs 90 degrees with your long nose pliers (see Figure 8).

A1-3. Assemble the front chassis to the main as shown in Figure 9 by using six 6 x ¼" sheet metal screws. Position the long black cable as shown in the illustration. When using sheet metal screws do not be afraid to use a little force to get them in position.

A1-4. Insert the three identical rubber grommets (GR-1, GR-2, and GR-3) in the holes in the power supply shield (see Chart AM-1). Sometimes it helps to push them in position with the small screwdriver.

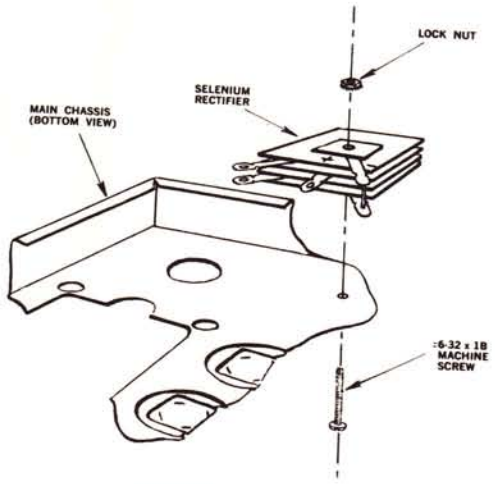


FIGURE 7

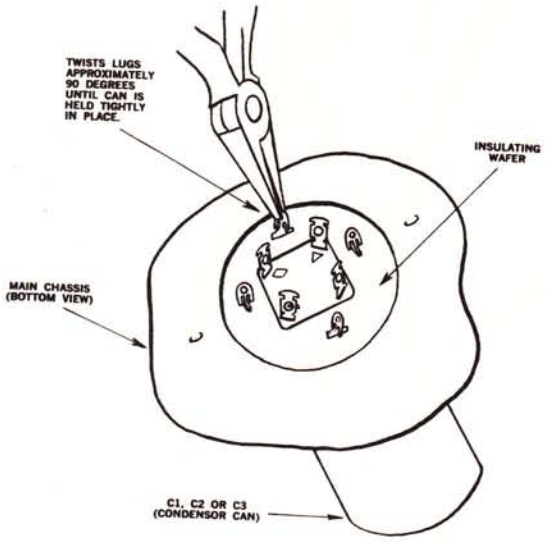


FIGURE 8

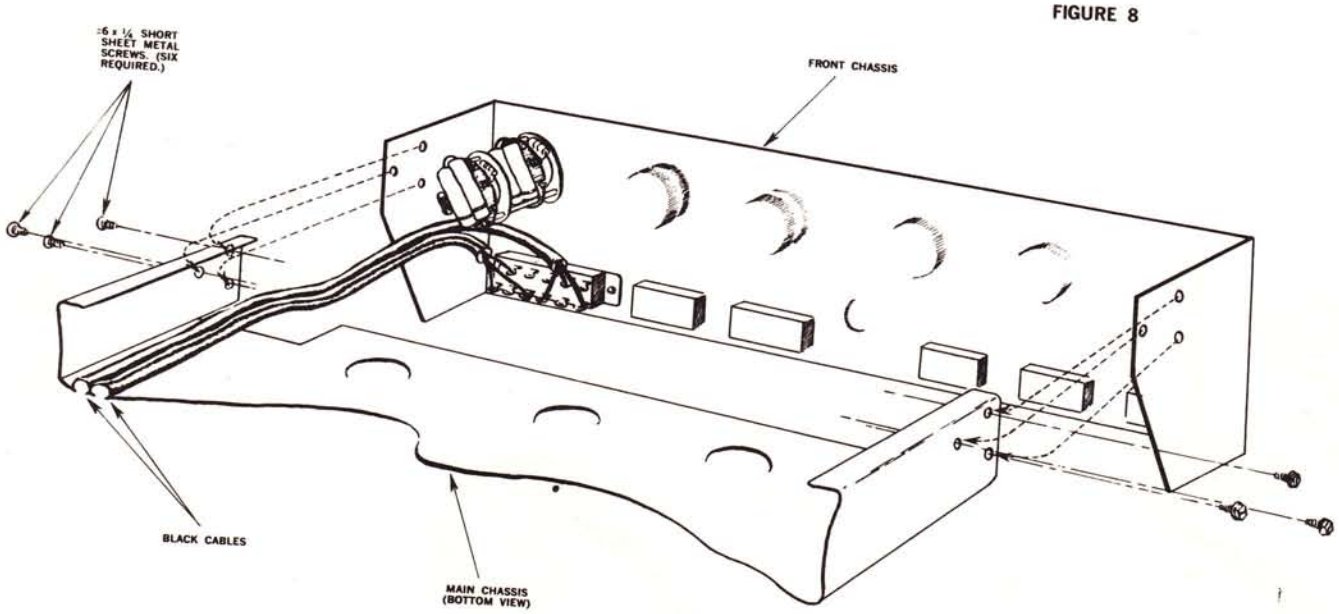
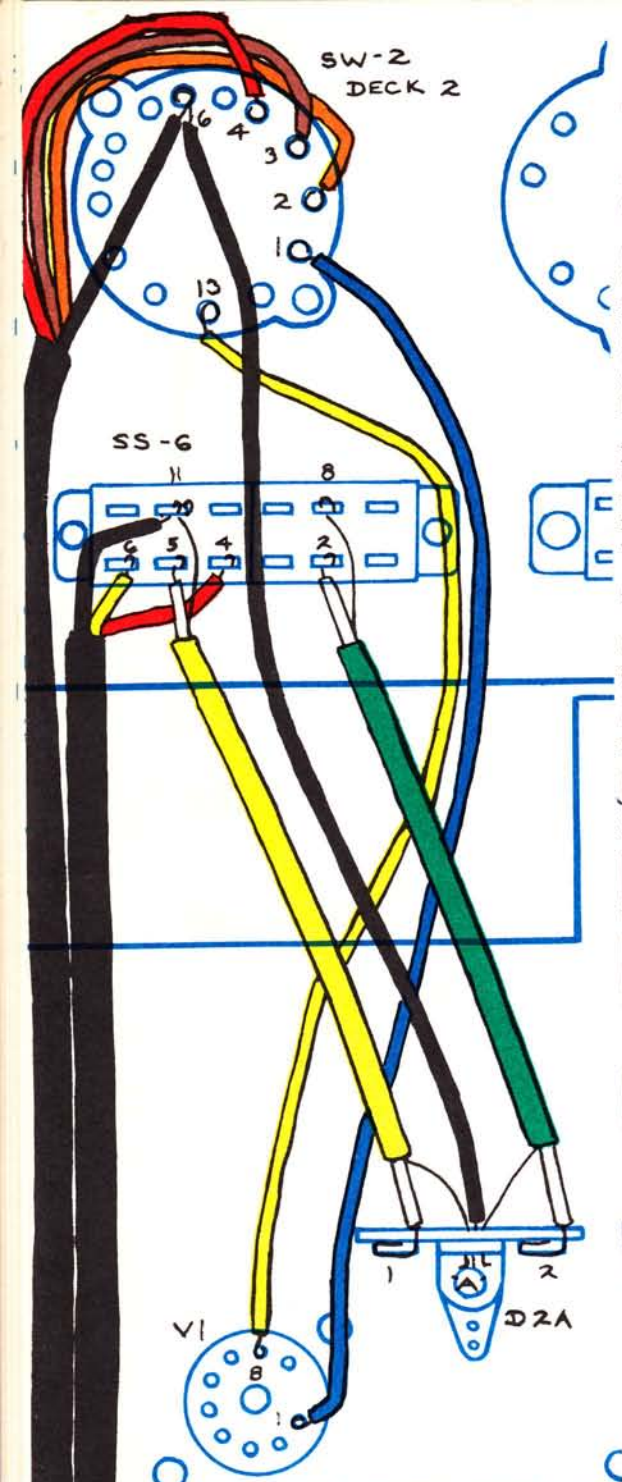


FIGURE 9

Assembly Group BM-1



Now you will be working with the entire unit. On the next few pages you will be making connections in some tight corners of the rear (where the input jacks are). This is the second of the two difficult portions in the assembly. It will simplify getting to the rear terminals if you prop the chassis up vertically. You can use the Kit-Pak box to hold it in this position. Except when you work on the rear, the chassis should lie flat, bottom side up, with the front part away from you.

Use good light and watch where you hold your soldering iron so you will not damage any other wires or components. You may want to move aside some wires when using your soldering iron. Make sure you reposition them afterwards.

The wires for the following steps will be found in the bundle marked " MAIN ".

Make small mechanical connections. In some cases, as many as 4 or 5 wires will be attached to a single terminal or tube socket pin. If you make large mechanical joints, you increase the chance for short circuits and make it more difficult to add all the wires.

☒ **BM1-1.** Connect a 2" buss wire from Pin 1, J1, to Pin 1, J2.

☒ **BM1-2.** Connect a 2" buss wire from Pin 4, J1, to Pin 4, J2.

☒ **BM1-3.** Connect a 5½" buss wire from Pin 1, J3 (S1), through the hole in Pin 1, J4, through the hole in Pin 1, J5, through Pin 1, J6, and connect to Pin 1, J7 (S1).

☒ **BM1-4.** Connect a 5½" buss wire from Pin 4, J3 (S1), through the hole in Pin 4, J4, through the hole in Pin 4, J5, through Pin 4, J6, and connect to Pin 4, J7.

☒ **BM1-5.** Look over the unsoldered ends of the long black cables connected to the front chassis. You will observe that there is a metal shield inside the black insulation. Carefully unwrap about ½" of the shield of the black cable containing the red, yellow and black wires. Insert a nylon sleeve. Solder the end of the black wire inside the cable to the unwrapped shield as shown in Fig. 10 (S1). Connect the red wire to Pin 2, J1 (S1). The yellow wire to Pin 1, D2B, and the shield to Pin 1, J2 (S2). Pins 2 and 3 of J1, J2, J3, J4, J5, J6 and J7 have two holes at the end where connections can be made. If possible always use the hole near the end.

☒ **BM1-6.** Slip a 12½" piece of black shielded cable over a 16" orange wire, an 18" brown wire, a 15¾" red wire, and a 14½" black wire. Insert nylon sleeve in one end. Make the following connections on this end: Connect the orange wire to Pin 2, deck 2, SW2 (S2) . . . you will note that there is another orange wire already connected to this Pin. This will help you identify Pin 2. Connect the brown wire to Pin 3, deck 2, SW2 (S1); the red to Pin 4, deck 2, SW2 (S1); and the black to Pin 6 (skip Pin 5), deck 2, SW2. Unwrap about ½" of the shield at the other end. Insert nylon sleeve. Wrap the uninsulated part of the black wire around the shield (S1), (Fig. 10) and connect to Pin 1, J5 (S3). Connect the orange wire to Pin 2, J5 (S1); the brown to Pin 2, J3 (S1); and the red to Pin 2, J4 (S1).

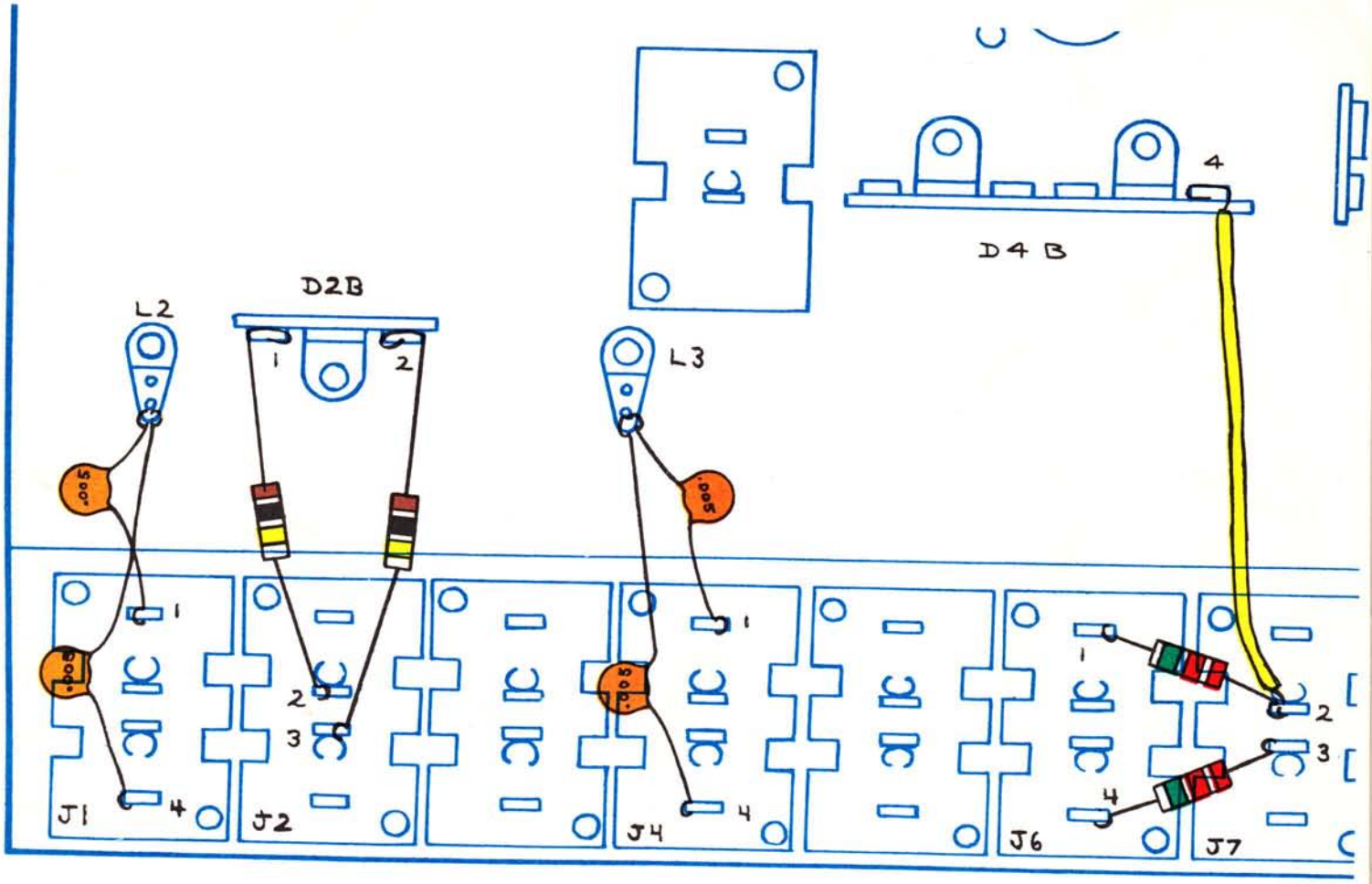
☒ **BM1-7.** Connect a 4¾" black wire from Pin 6, deck 2, SW2 (S3), to ground lug "A" D2A.

☒ **BM1-8.** Connect the insulated wire of the yellow mic lapel coming from SS-6 to Pin 1, D2A. Connect the bare wire to ground lug "A" D2A.

☒ **BM1-9.** Connect the insulated wire of the green mic lapel coming from SS-6 to Pin 2, D2A. Connect the bare wire to ground lug "A" D2A (S3).

☒ **BM1-10.** Connect the yellow wire coming from deck 2, SW2, to Pin 8, V1.

☒ **BM1-11.** Connect the blue wire coming from deck 2, SW2, to Pin 1, V1.



Assembly Group BM-2

When soldering any terminal with more than one lead attached, make sure the solder flows over **all** leads.

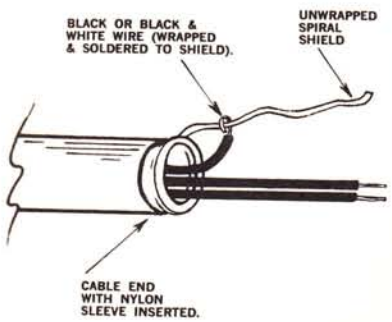
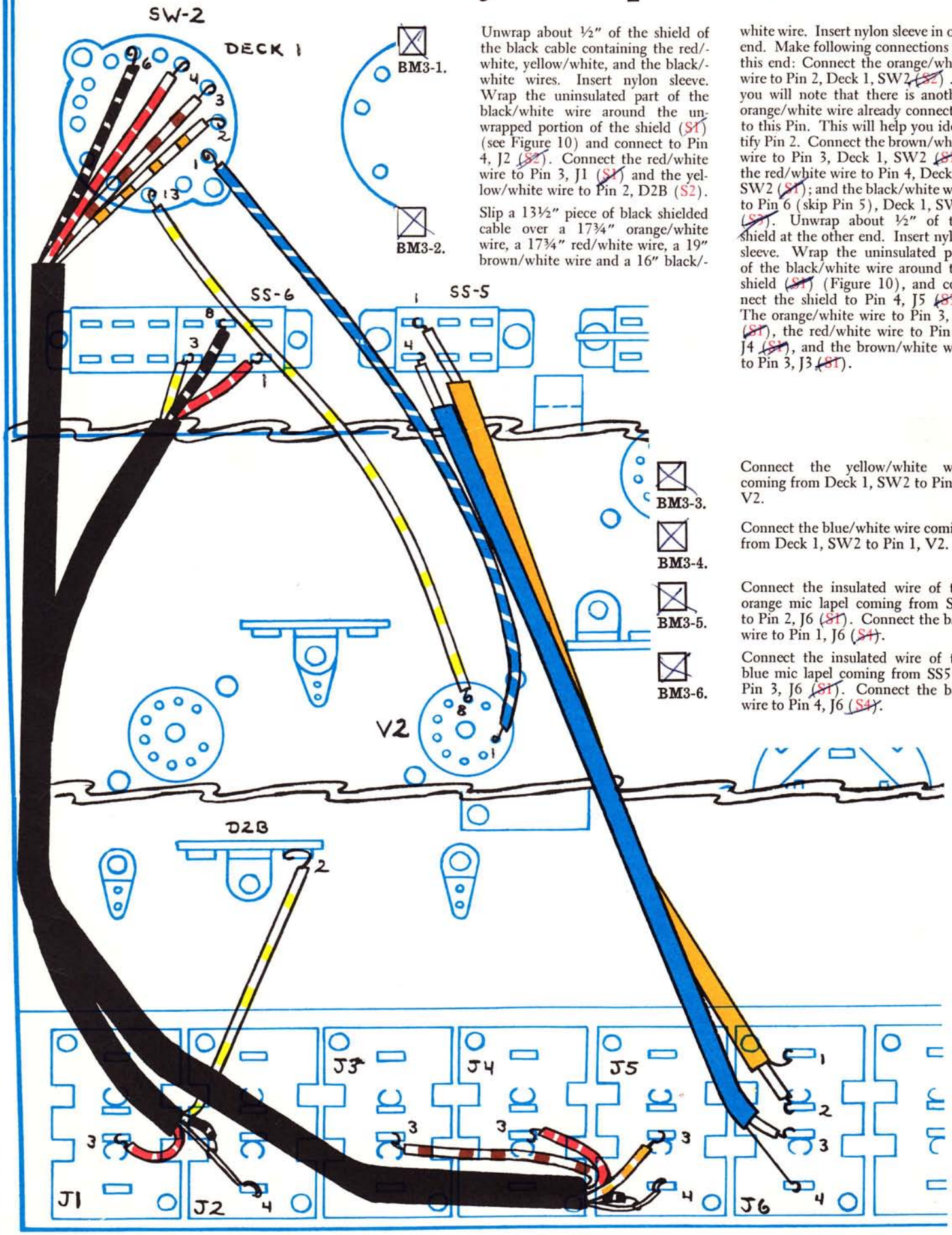


FIGURE 10

- [x] **BM2-1.** Connect a CC.005 from Pin 1, J1 (~~S2~~) to L2.
- [x] **BM2-2.** Connect a CC.005 from Pin 4, J1 (~~S2~~) to L2 (~~S2~~).
- [ ] **BM2-3.** Connect a 100K resistor (brown-black-yellow) from Pin 2, J2 (~~S1~~) to Pin 1, D2B (~~S2~~).
- [x] **BM2-4.** Connect a 100K resistor (brown-black-yellow) from Pin 3, J2 (S1) to Pin 2, D2B.
- [x] **BM2-5.** Connect a CC.005 from Pin 1, J4 (~~S3~~) * to L3.
- [x] **BM2-6.** Connect a CC.005 from Pin 4, J4 (~~S3~~) * to L3 (~~S2~~).
- [x] **BM2-7.** Connect a 2.2M resistor (red-red-green) from Pin 1, J6 to Pin 2, J7.
- [ ] **BM2-8.** Connect a 2.2M resistor (red-red-green) from Pin 4, J6 to Pin 3, J7.
- [x] **BM2-9.** Connect a 3" yellow wire from Pin 4, D4B to Pin 2, J7 (~~S2~~).

* Don't forget that the buss wire you passed through these terminal lugs previously counts as 2 when you add up the total number of wires connected.

Assembly Group BM-3



BM3-1.

BM3-2.

Unwrap about ½" of the shield of the black cable containing the red/-white, yellow/white, and the black/-white wires. Insert nylon sleeve. Wrap the uninsulated part of the black/white wire around the unwrapped portion of the shield (S1) (see Figure 10) and connect to Pin 4, J2 (S2). Connect the red/white wire to Pin 3, J1 (S1) and the yellow/white wire to Pin 2, D2B (S2).

Slip a 13½" piece of black shielded cable over a 17¾" orange/white wire, a 17¾" red/white wire, a 19" brown/white wire and a 16" black/-white wire. Insert nylon sleeve in one end. Make following connections on this end: Connect the orange/white wire to Pin 2, Deck 1, SW2 (S2) . . . you will note that there is another orange/white wire already connected to this Pin. This will help you identify Pin 2. Connect the brown/white wire to Pin 3, Deck 1, SW2 (S1); the red/white wire to Pin 4, Deck 1, SW2 (S1); and the black/white wire to Pin 6 (skip Pin 5), Deck 1, SW2 (S2). Unwrap about ½" of the shield at the other end. Insert nylon sleeve. Wrap the uninsulated part of the black/white wire around the shield (S1) (Figure 10), and connect the shield to Pin 4, J5 (S3). The orange/white wire to Pin 3, J5 (S1), the red/white wire to Pin 3, J4 (S1), and the brown/white wire to Pin 3, J3 (S1).

BM3-3.

Connect the yellow/white wire coming from Deck 1, SW2 to Pin 8, V2.

BM3-4.

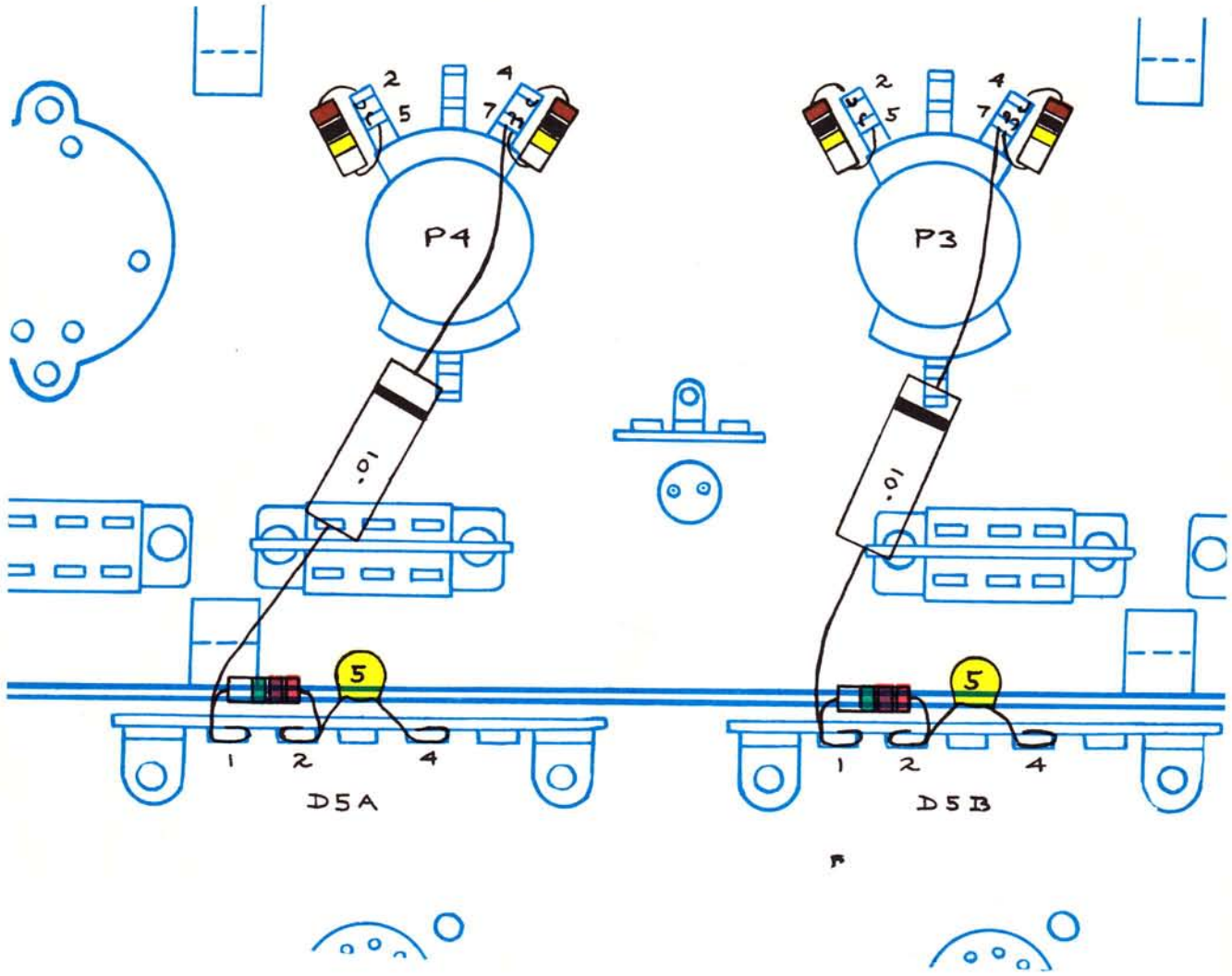
Connect the blue/white wire coming from Deck 1, SW2 to Pin 1, V2.

BM3-5.

Connect the insulated wire of the orange mic lapel coming from SS5 to Pin 2, J6 (S1). Connect the bare wire to Pin 1, J6 (S4).

BM3-6.

Connect the insulated wire of the blue mic lapel coming from SS5 to Pin 3, J6 (S1). Connect the bare wire to Pin 4, J6 (S4).



Assembly Group BM-4

With a few minor exceptions which we will call to your attention, you have finished with the difficult part of the assembly. There are still a good many parts to connect, but you will find this to be quite a bit simpler.

Keep all leads short and make small mechanical joints. If you wrap too much wire around the terminals you may well have a piece sticking out that will cause a short circuit. Make sure that all wires going to a terminal that you are soldering are fully soldered.

☒ **BM4-1.** Connect a 100K resistor (brown-black-yellow) from Pin 2, P4 (~~S2~~) (bottom) to Pin 5 (top), P4.

☒ **BM4-2.** Connect a 100K resistor (brown-black-yellow) from Pin 4 (bottom), P4 (~~S2~~) to Pin 7 (top), P4.

☒ **BM4-3.** Connect a 100K resistor (brown-black-yellow) from Pin 2 (bottom), P3 (~~S2~~) to Pin 5 (top), P3.

☒ **BM4-4.** Connect a 100K resistor (brown-black-yellow) from Pin 4 (bottom), P3 (~~S2~~) to Pin 7 (top), P3.

☒ **BM4-5.** Connect a 2.7M resistor (red-purple-green) from Pin 1, D5A to Pin 2, D5A.

☒ **BM4-6.** Connect a CC 5 from Pin 2, D5A to Pin 4, D5A.

☒ **BM4-7.** Connect a 2.7M resistor (red-purple-green) from Pin 1, D5B to Pin 2, D5B.

☒ **BM4-8.** Connect a CC 5 from Pin 2, D5B to Pin 4, D5B.

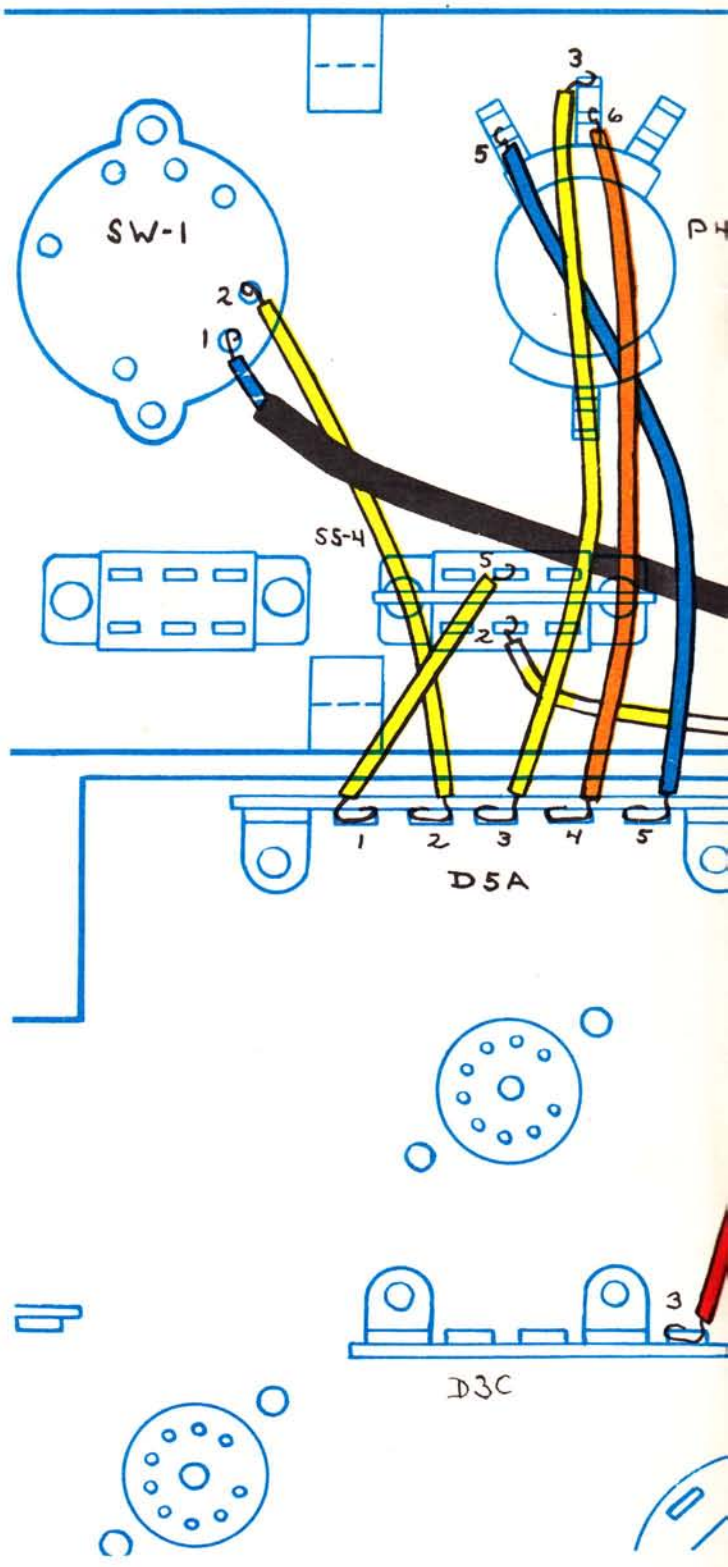
☒ **BM4-9.** Connect the black band end of a CPM.01 to Pin 7 (top), P4 (~~S3~~). Connect the other end to Pin 1, D5A.

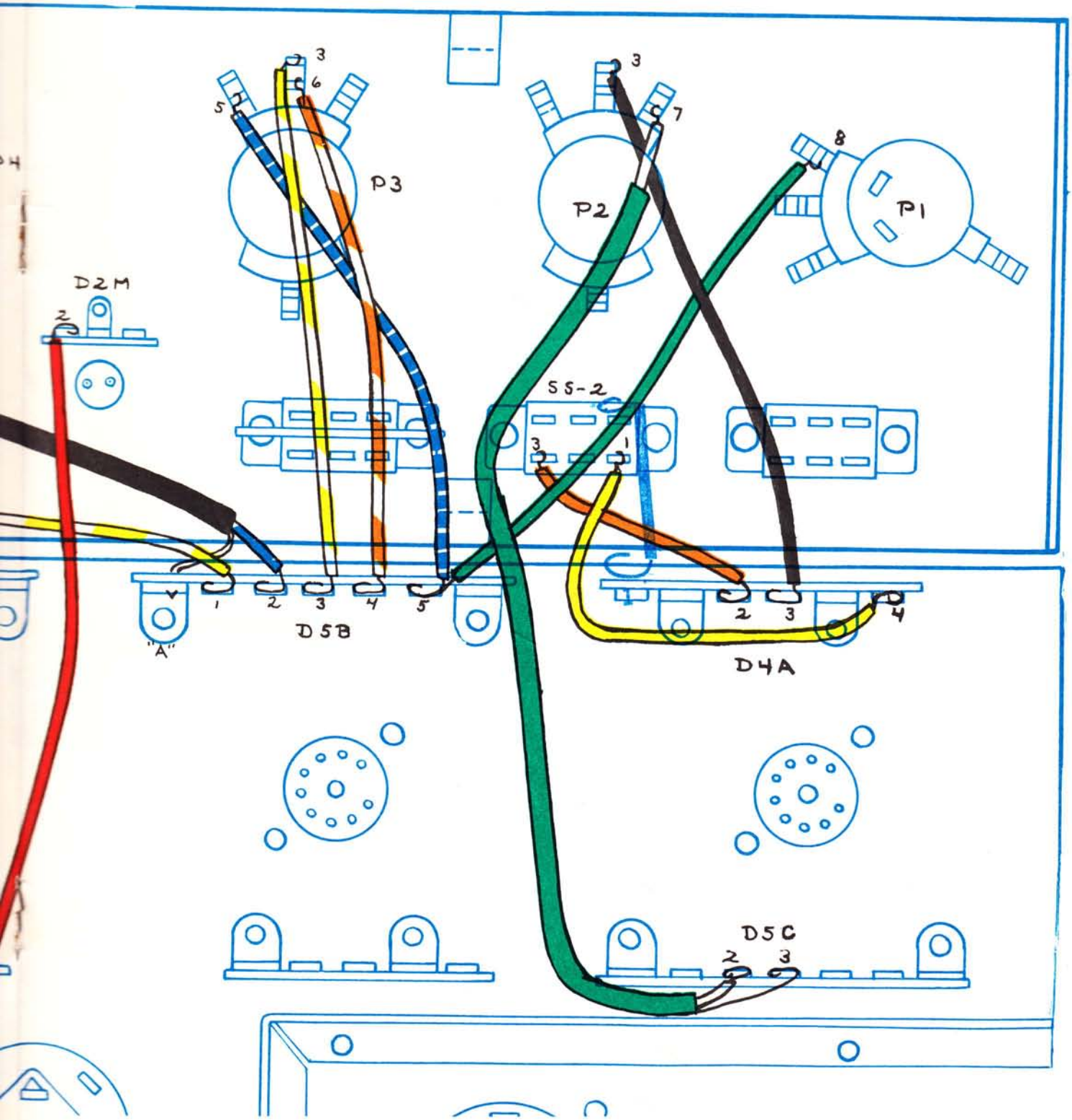
☒ **BM4-10.** Connect the black band end of a CPM.01 to Pin 7 (top), P3 (~~S3~~). Connect the other end to Pin 1, D5B.

Assembly Group BM-5

Some of the wires referred to in the following group are already connected to the front chassis. Some of the wires are in the assortment of wires that you are to use for the Main. The wording of each step should provide sufficient information to indicate which of these two cases applies.

- ☒ **BM5-1.** Connect a 2½″ yellow wire from Pin 2, SW1 (~~S2~~) to Pin 2, D5A.
- ☒ **BM5-2.** Connect a 6¼″ blue/white wire to Pin 1, SW1 (~~S2~~). Insert a *small* nylon sleeve over the end of a 3¾″ piece of black shielded cable. Slide the cable over the blue/white wire. From the other end, unwrap about ¾″ of the shield. Insert small nylon sleeve. Connect the blue/white wire to Pin 2, D5B and the shield to Ground Lug "A", D5B (~~S1~~).
- ☒ **BM5-3.** Connect the yellow wire coming from SS4, to Pin 1, D5A.
- ☒ **BM5-4.** Connect the yellow/white wire coming from SS4 to Pin 1, D5B.
- ☒ **BM5-5.** Connect a 2¼″ blue wire from Pin 5 (top), P4 (~~S4~~) to Pin 5, D5A.
- ☒ **BM5-6.** Connect a 1¾″ orange wire from Pin 6 (top), P4 (~~S2~~) to Pin 4, D5A.
- ☒ **BM5-7.** Connect a 2¼″ yellow wire from Pin 3 (bottom), P4 (~~S1~~) to Pin 3, D5A.
- ☒ **BM5-8.** Connect the red wire coming from D2M, to Pin 3, D3C.
- ☒ **BM5-9.** Connect a 3″ blue/white wire from Pin 5 (top), P3 (~~S3~~) to Pin 5, D5B.
- ☒ **BM5-10.** Connect a 2¼″ orange/white wire from Pin 6 (top), P3 (~~S2~~) to Pin 4, D5B.
- ☒ **BM5-11.** Connect a 2½″ yellow/white wire from Pin 3 (bottom), P3 (~~S1~~) to Pin 3, D5B.
- ☒ **BM5-12.** Connect a 4″ green wire from Pin 5, D5B to Pin 8 (top), P1 (~~S2~~).
- ☒ **BM5-13.** Connect the orange wire coming from SS2, to Pin 2, D4A.
- ☒ **BM5-14.** Connect the yellow wire coming from SS2, to Pin 4, D4A.
- ☒ **BM5-15.** Connect a 3½″ black wire from Pin 3 (bottom), P2 (~~S3~~) to Pin 3, D4A.
- ☒ **BM5-16.** Clip out the bare wire at one end of a green mic lapel. Connect the insulated wire at this end to Pin 7 (top), P2. Connect the insulated wire at the other end to Pin 2, D5C and the bare wire to Pin 3, D5C.
- ☒ BM5-17 Connect the blue wire coming from SS-2 to Pin 1, D4A.




P3
P2
P1
D2M
S5-2
D5B
"A"
D4A
D5C

Assembly Group BM-6

BM6-1. Connect a 3″ white wire from Pin 9, V1 (S1) to Pins 4 and 5, V2 (S1). (Just pass the uninsulated end *through* Pin 4 and connect it to Pin 5. Solder **both** Pins.)

BM6-2. Connect a 3¼″ white wire from Pin 9, V2 (S1) to Pins 4 and 5, V3 (S1). (See note after BM6-1.)

BM6-3. Connect a 2¼″ orange wire from Pin 1, D3A to Pin 3, D3A.

BM6-4. Connect a 2¼″ orange wire from Pin 3, D3A to Pin 1, D3B.

BM6-5. Connect a 2¼″ orange wire from Pin 1, D3B to Pin 3, D3B.

BM6-6. Connect a 3¼″ orange wire from Pin 3, D3B to Pin 6, C3 (S1).

BM6-7. Connect a 3¾″ black wire from L1 to Pin 2, D3A.

BM6-8. Connect a 3¾″ black wire from L1 to Pin 2, D3B.

BM6-9. Connect a 4½″ black wire from Pin 2, D3B to Pin 2, D3C.

BM6-10. Connect a 2½″ black wire from Pin 2, D3C to Pin 1, C3.

BM6-11. Connect a 10¾″ black wire from Pins 4 and 5, V1 (S1) (see note after BM6-1), through grommet GR-1 to Pin 5, C2 (S1).

BM6-12. Connect a 9¾″ black/white wire from L1 through GR-1 to Pin 7, C2.

BM6-13. Connect a 4½″ yellow wire from Pin 8, V3 (S1) to Pin 2, C3.

BM6-14. Connect a 2¼″ red wire from Pin 1, D3C to Pin 3, D3C.

BM6-15. Connect a 5″ black wire from Pins 4 and 5, V4 (see note after BM6-1) (S1) through GR-2 to Pin 3, C2 (S1).

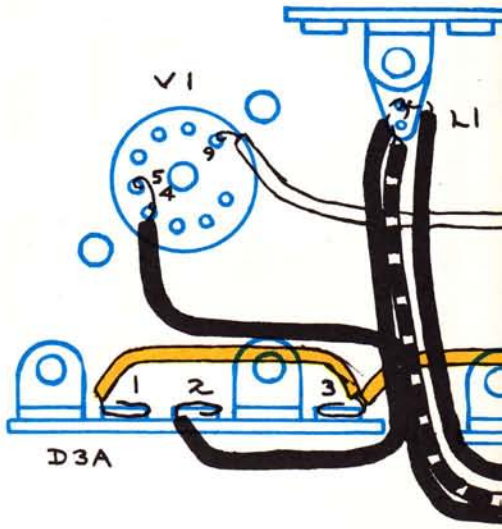
BM6-16. Connect a 5¼″ red wire from Pin 5, C3 through GR-1 to Pin 1, C2.

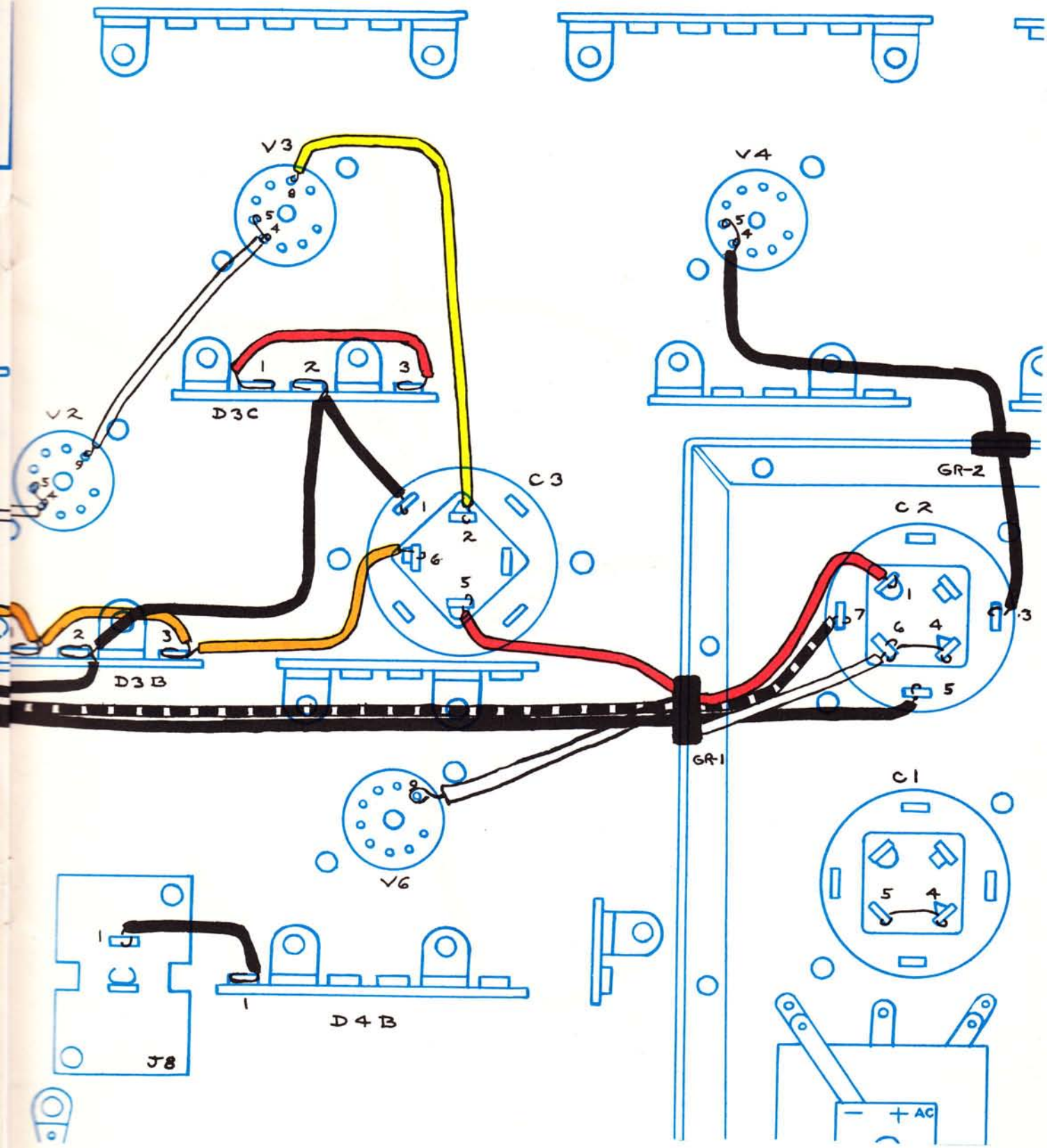
BM6-17. Connect a 4½″ white wire from Pin 9, V6 through GR-1 to Pin 6, C2.

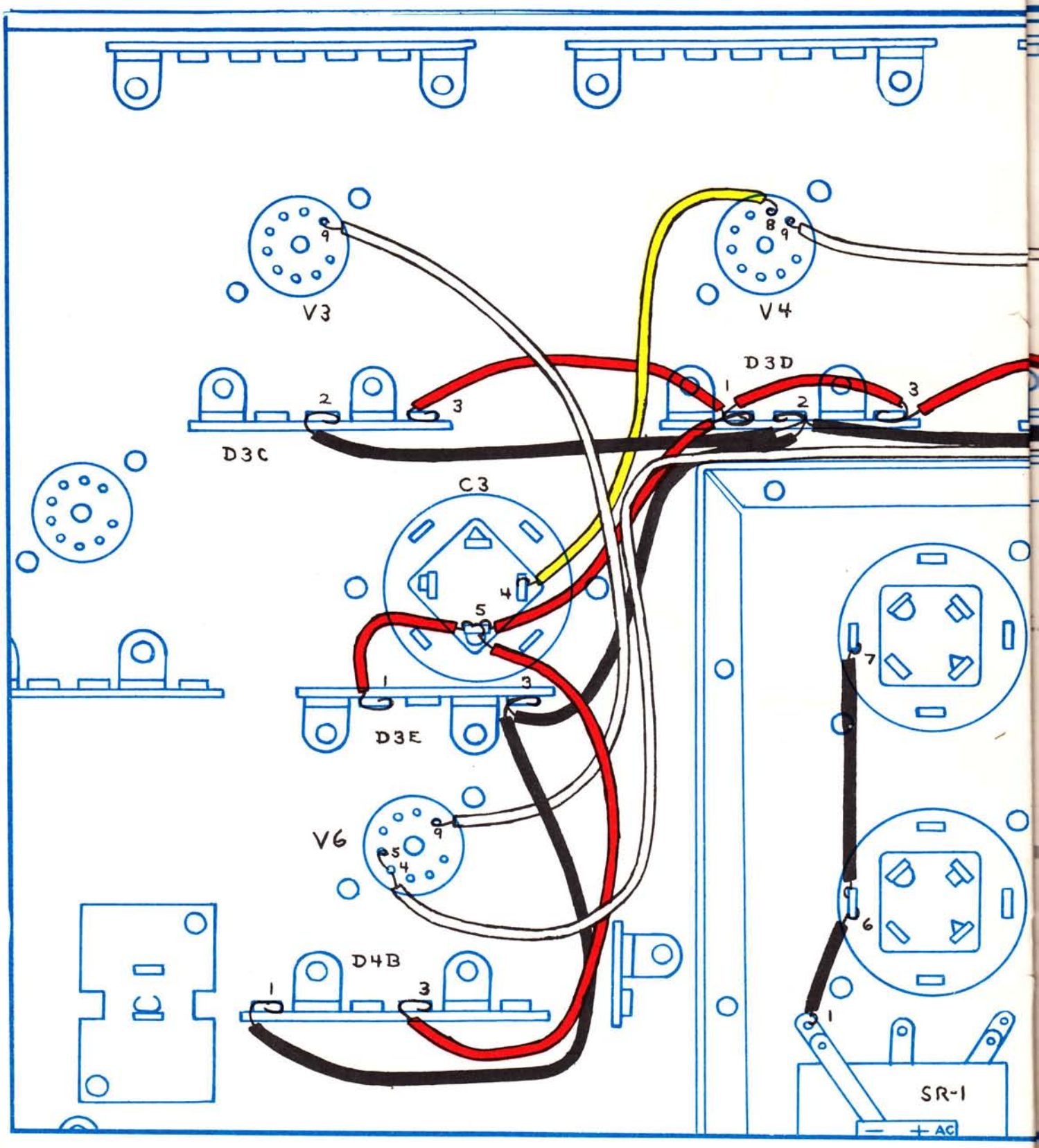
BM6-18. Connect a 2″ black wire from Pin 1, J8 (S1) to Pin 1, D4B.

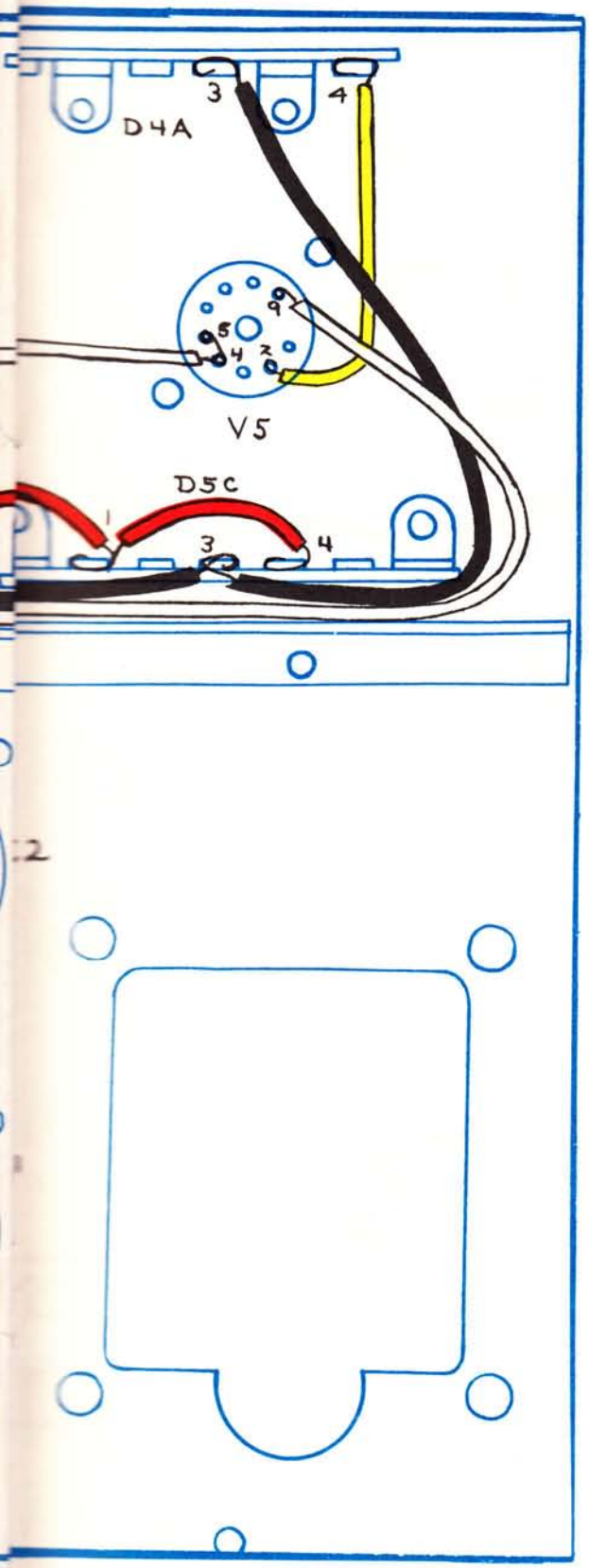
BM6-19. Connect a 1½″ buss wire from Pin 4, C2 (S1) to Pin 6, C2.

BM6-20. Connect a 1½″ buss wire from Pin 4, C1 to Pin 5, C1.




V3
V4
V2
D3C
D3B
C3
C2
C1
GR-2
GR-1
V6
D4B
J8
AC


V3
V4
D3D
D3C
C3
D3E
V6
D4B
SR-1
AC



Assembly Group BM-7

BM7-1. Connect a 3¾″ red wire from Pin 3, D3C to Pin 1, D3D.

BM7-2. Connect a 2¼″ red wire from Pin 1, D3D to Pin 3, D3D.

BM7-3. Connect a 3¼″ red wire from Pin 3, D3D to Pin 1, D5C.

BM7-4. Connect a 2½″ red wire from Pin 1, D5C to Pin 4, D5C.

BM7-5. Connect a 5¼″ yellow wire from Pin 8, V4 (S1) to Pin 4, C3.

BM7-6. Connect a 4″ white wire from Pin 9, V4 (S1) to Pins 4 and 5, V5 (S1) (see note after BM6-1).

BM7-7. Connect a 7″ black wire from Pin 3, D4A to Pin 3, D5C.

BM7-8. Connect a 5″ black wire from Pin 2, D3C to Pin 2, D3D.

BM7-9. Connect a 4¾″ black wire from Pin 2, D3D to Pin 3, D5C.

BM7-10. Connect a 5″ black wire from Pin 2, D3D to Pin 3, D3E.

BM7-11. Connect a 4½″ red wire from Pin 1, D3D to Pin 5, C3.

BM7-12. Connect a 2¼″ red wire from Pin 5, C3 to Pin 1, D3E.

BM7-13. Connect a 7″ white wire from Pin 9, V3 (S1) to Pin 9, V6 (S2).

BM7-14. Connect a 6″ black wire from Pin 3, D3E to Pin 1, D4B.

BM7-15. Connect a 5½″ red wire from Pin 5, C3 (S4) to Pin 3, D4B.

BM7-16. Connect a 13¾″ white wire from Pin 9, V5 (S1) to Pins 4 and 5, V6 (S1) (see note after BM6-1).

BM7-17. Connect a 2¾″ black wire from Pin 7, C2 (S2) to Pin 6, C1.

BM7-18. Connect a 2″ black wire from Pin 6, C1 (S2) to Pin 1, SR1 (S2). (Connect it to the buss wire joining the two pins. Count as one lead.)

BM7-19. Connect a 3″ yellow wire from Pin 4, D4A to Pin 2, V5.

Mechanical Assembly A-2

Mount the transformer as shown in Figure 11, using the 4 cup washers and 4 hex nuts. Make sure the wires come out on the side towards the rear.

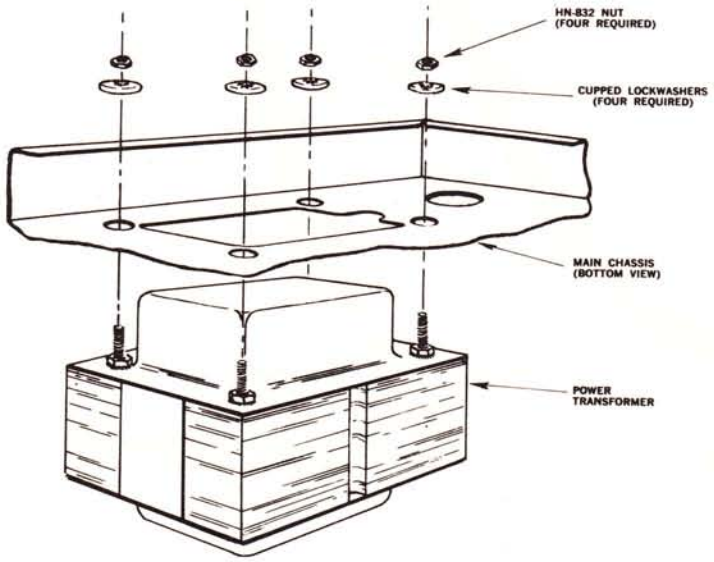


FIGURE 11

Assembly Group BM-8

The first few steps call for connecting the leads coming from the transformer. Some of these connections call for a fair amount of dexterity. It might be helpful to use a pair of tweezers to make the mechanical joints rather than the long nosed pliers.

BM8-1. Twist the two blue transformer wires and connect one to Pin 3, SR-1 (S1) and the other to Pin 4, SR-1 (S1).

BM8-2. Twist the two green transformer wires and connect one to Pin 4, V7 (S1) and the other to Pin 3, V7 (S1).

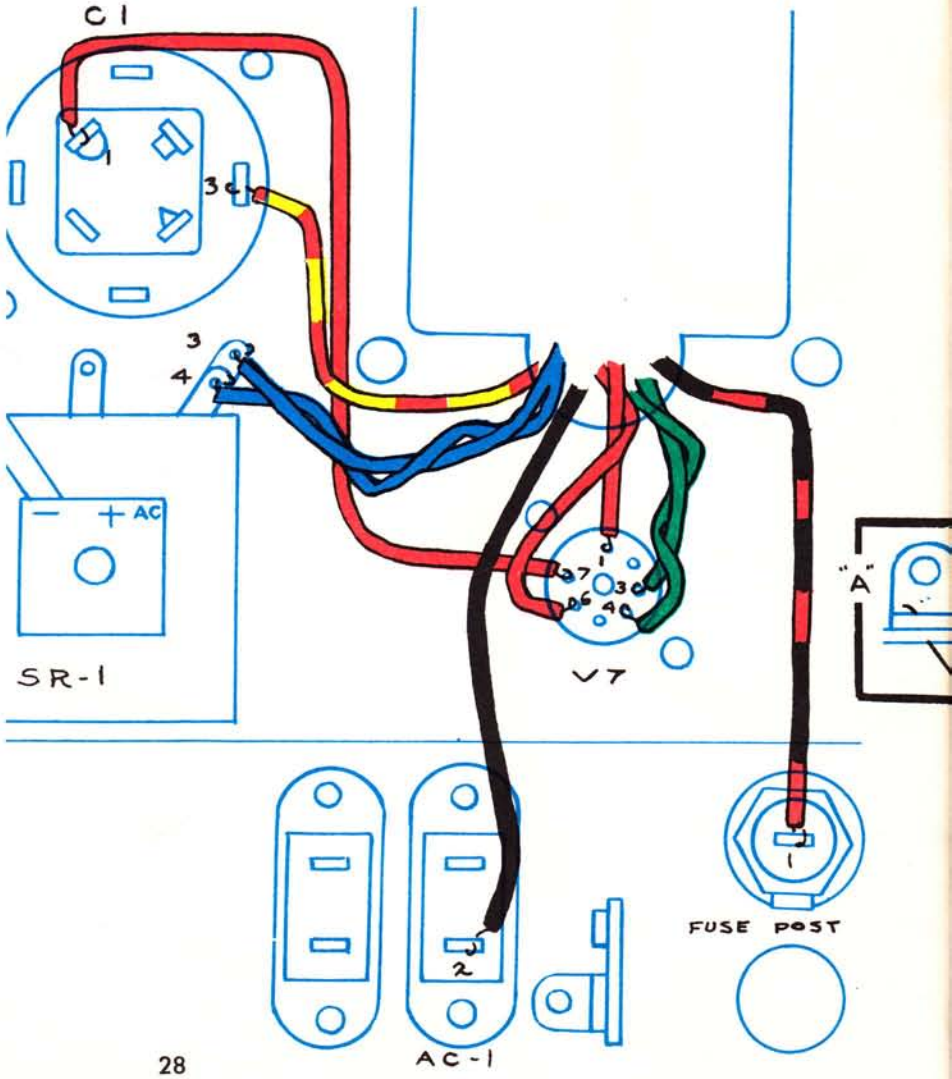
BM8-3. Twist the two red wires and connect the longer one to Pin 6, V7 (S1) and the other to Pin 1, V7 (S1).

BM8-4. Connect the red/yellow transformer wire to Pin 3, C1 (S1).

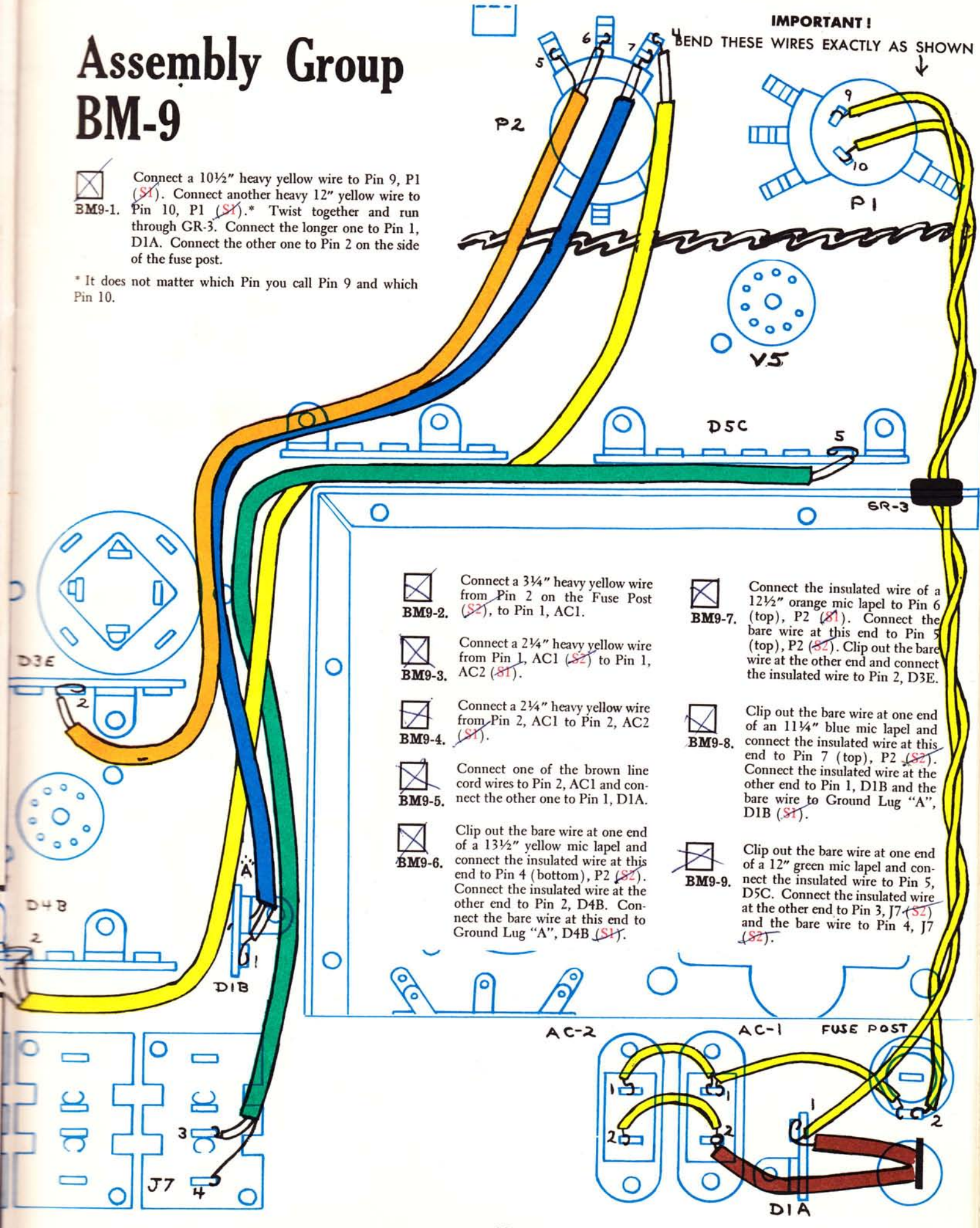
BM8-5. Connect the black/red wire to Pin 1 on the tip of the fuse post (S1).

BM8-6. Connect the black wire to Pin 2, AC1.

BM8-7. Connect a 6" red wire from Pin 1, C1 to Pin 7, V7 (S1).



Assembly Group BM-9



BM9-1. Connect a 10½" heavy yellow wire to Pin 9, P1 (S1). Connect another heavy 12" yellow wire to Pin 10, P1 (S1).* Twist together and run through GR-3. Connect the longer one to Pin 1, D1A. Connect the other one to Pin 2 on the side of the fuse post.

* It does not matter which Pin you call Pin 9 and which Pin 10.

BM9-2. Connect a 3¼" heavy yellow wire from Pin 2 on the Fuse Post (S2), to Pin 1, AC1.

BM9-3. Connect a 2¼" heavy yellow wire from Pin 1, AC1 (S2) to Pin 1, AC2 (S1).

BM9-4. Connect a 2¼" heavy yellow wire from Pin 2, AC1 to Pin 2, AC2 (S1).

BM9-5. Connect one of the brown line cord wires to Pin 2, AC1 and connect the other one to Pin 1, D1A.

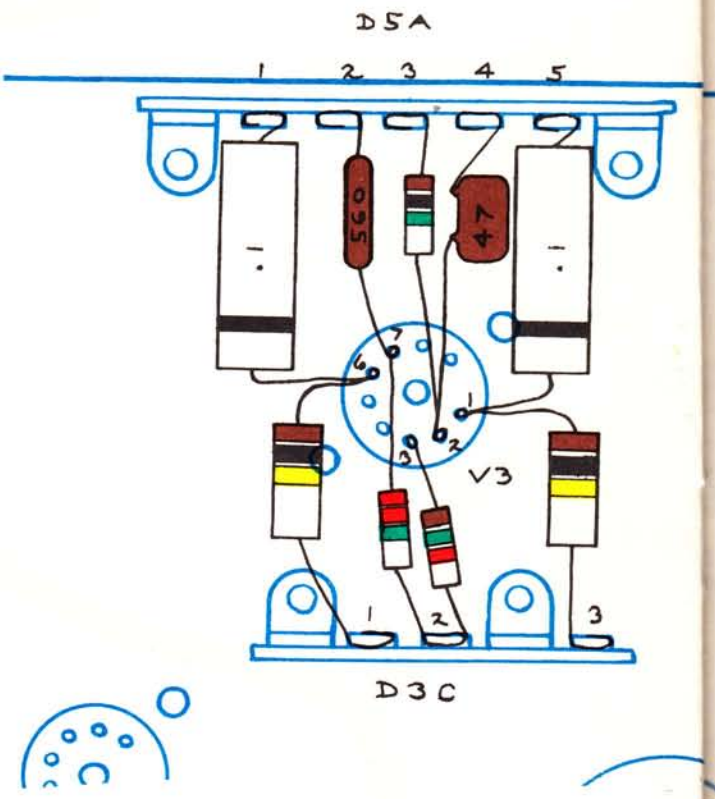
BM9-6. Clip out the bare wire at one end of a 13½" yellow mic lapel and connect the insulated wire at this end to Pin 4 (bottom), P2 (S2). Connect the insulated wire at the other end to Pin 2, D4B. Connect the bare wire at this end to Ground Lug "A", D4B (S1).

BM9-7. Connect the insulated wire of a 12½" orange mic lapel to Pin 6 (top), P2 (S1). Connect the bare wire at this end to Pin 5 (top), P2 (S2). Clip out the bare wire at the other end and connect the insulated wire to Pin 2, D3E.

BM9-8. Clip out the bare wire at one end of an 11¼" blue mic lapel and connect the insulated wire at this end to Pin 7 (top), P2 (S2). Connect the insulated wire at the other end to Pin 1, D1B and the bare wire to Ground Lug "A", D1B (S1).

BM9-9. Clip out the bare wire at one end of a 12" green mic lapel and connect the insulated wire to Pin 5, D5C. Connect the insulated wire at the other end to Pin 3, J7 (S2) and the bare wire to Pin 4, J7 (S2).

Assembly Group BM-10



BM10-1. Connect the black band end of a CPM.1 to Pin 6, V3. Connect the other end to Pin 1, D5A (S4).

BM10-2. Connect a CC.001 or a CM 560* from Pin 2, D5A (S4) to Pin 7, V3.

BM10-3. Connect a 1M resistor (brown-black-green) from Pin 3, D5A (S2) to Pin 2, V3.

BM10-4. Connect a CM 47 from Pin 4, D5A (S3) to Pin 2, V3 (S2).

BM10-5. Connect the black band end of a CPM.1 to Pin 1, V3. Connect the other end to Pin 5, D5A (S2).

BM10-6. Connect a large 100K resistor (brown-black-yellow) from Pin 1, D3C to Pin 6, V3 (S2).

BM10-7. Connect a 2.2M resistor (red-red-green) from Pin 7, V3 (S2) to Pin 2, D3C.

BM10-8. Connect a 1.5K resistor (brown-green-red) from Pin 3, V3 (S1) to Pin 2, D3C (S5).

BM10-9. Connect a large 100K resistor (brown-black-yellow) from Pin 1, V3 (S2) to Pin 3, D3C (S4).

* For laboratory use, where response down below 10 cycles is required, use the CC.001. For normal music listening in the home use the CM 560. See page 2, Subsonic Filter.

Assembly Group BM-11

BM11-1. Connect the black band end of a CPM.1 to Pin 6, V4. Connect the other end to Pin 1, D5B (S4).

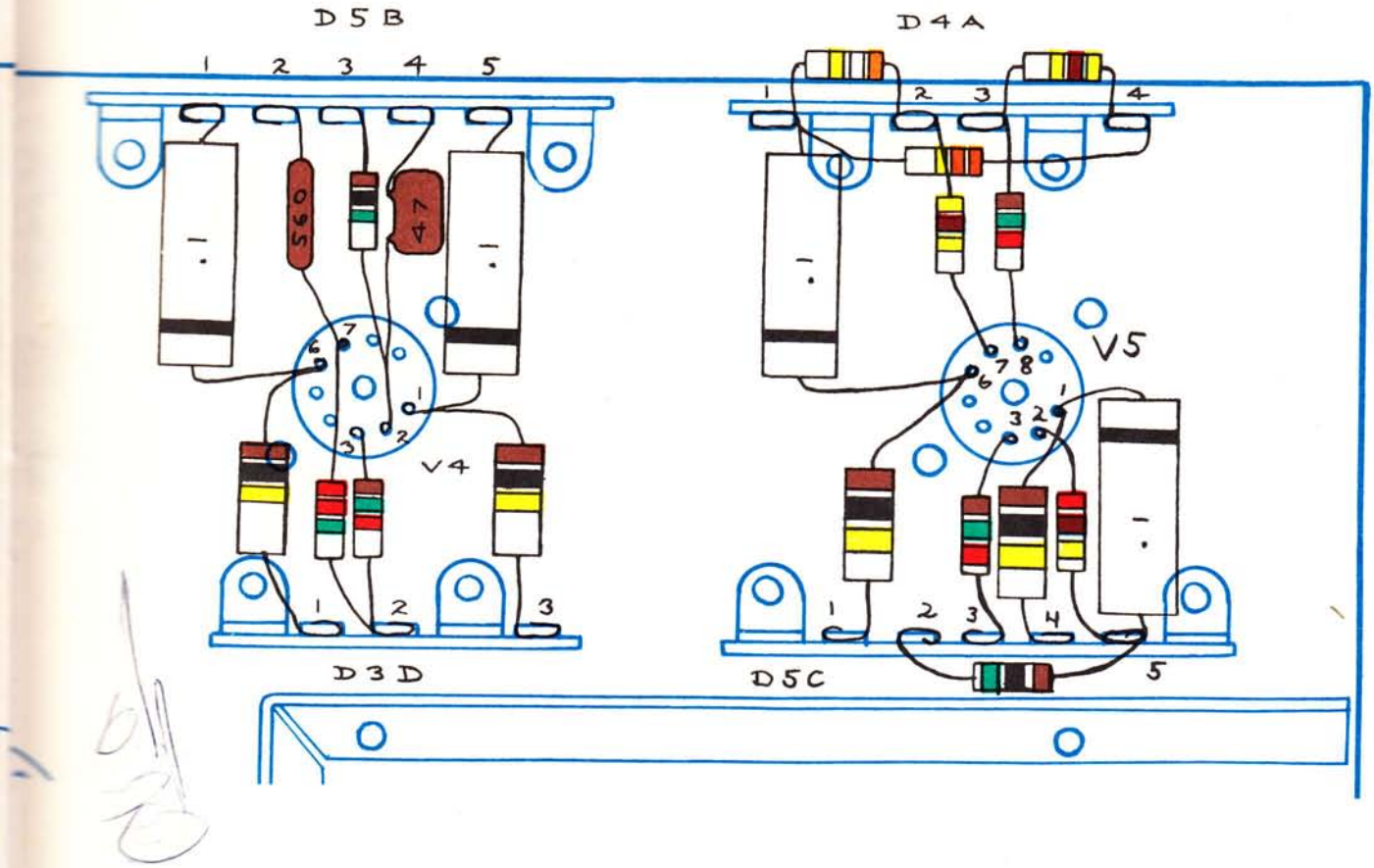
BM11-2. Connect a CC.001 or a CM 560* from Pin 2, D5B (S4) to Pin 7, V4.

BM11-3. Connect a 1M resistor (brown-black-green) from Pin 3, D5B (S2) to Pin 2, V4.

BM11-4. Connect a CM 47 from Pin 4, D5B (S3) to Pin 2, V4 (S2).

BM11-5. Connect the black band end of a CPM.1 to Pin 1, V4. Connect the other end to Pin 5, D5B (S3).

* For laboratory use, where response down below 10 cycles is required, use the CC.001. For normal music listening in the home use the CM 560. See page 2, Subsonic Filter.



BM11-6. Connect a large 100K resistor (brown-black-yellow) from Pin 6, V4 (S2) to Pin 1, D3D (S4).

BM11-7. Connect a 2.2M resistor (red-red-green) from Pin 7, V4 (S2) to Pin 2, D3D.

BM11-8. Connect a 1.5K resistor (brown-green-red) from Pin 3, V4 (S1) to Pin 2, D3D (S5).

BM11-9. Connect a large 100K resistor (brown-black-yellow) from Pin 1, V4 (S2) to Pin 3, D3D (S3).

Assembly Group BM-12

BM12-1. Connect a 390K resistor (orange, white, yellow) from Pin 1, D4A, to Pin 2, D4A.

BM12-2. Connect a 470K resistor (yellow, purple, yellow) from Pin 3, D4A, to Pin 4, D4A.

BM12-3. Connect a 330K resistor (orange, orange, yellow) from Pin 1, D4A, to Pin 4, D4A.

BM12-4. Connect the black band end of a CPM .1 to Pin 6, V5. Connect the other end to Pin 1, D4A (S4).

BM12-5. Connect a 470K resistor (yellow, purple, yellow) from Pin 2, D4A (S3), to Pin 7, V5 (S1).

BM12-6. Connect a 1.5K resistor (brown, green, red) from Pin 3, D4A (S4), to Pin 8, V5 (S1).

BM12-7. Connect a large 100K resistor (brown, black, yellow) from Pin 1, D5C (S3), to Pin 6, V5 (S2).

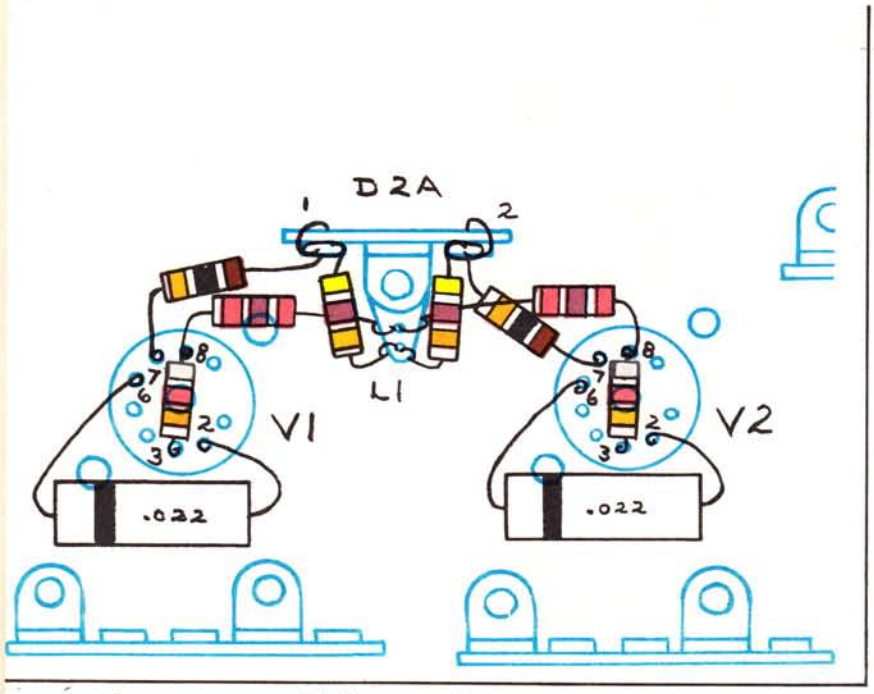
BM12-8. Connect a 1.5K resistor (brown, green, red) from Pin 3, D5C (S4), to Pin 3, V5 (S1).

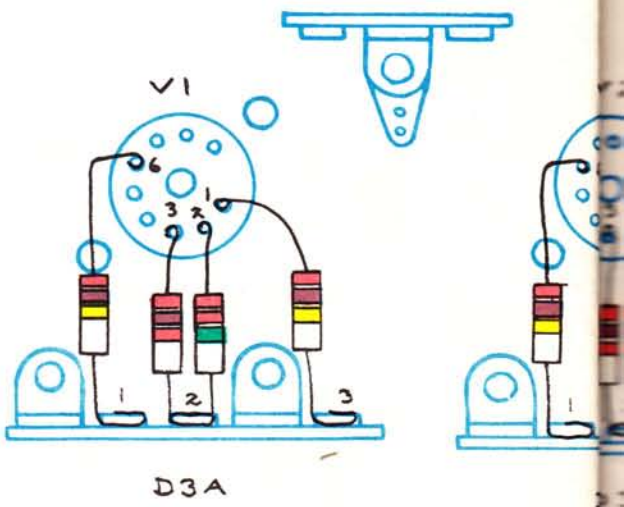
BM12-9. Connect a large 100K resistor (brown, black, yellow) from Pin 4, D5C (S2), to Pin 1, V5.

BM12-10. Connect the black band end of a CPM .1 to Pin 1, V5 (S2). Connect the other end to Pin 5, D5C.

BM12-11. Connect a 270K resistor (red, purple, yellow) from Pin 5, D5C, to Pin 2, V5 (S2).

BM12-12. Connect a 1M resistor (brown, black, green) from Pin 2, D5C (S2), to Pin 5, D5C (S4).





Assembly Group BM-13

BM13-1. Connect a 10K resistor (brown, black, orange) from Pin 7, V1 (S1), to Pin 1, D2A. Run it through the hole in the bottom of Pin 1, and then bring it up and wrap around the pin itself.

BM13-2. Connect a 10K resistor (brown, black, orange) from Pin 7, V2 (S1), to Pin 2, D2A. Connect the same as in step BM13-1.

BM13-3. Connect a 2.7K resistor (red, purple, red) from Pin 8, V1, to L1.

BM13-4. Connect a 2.7K resistor (red, purple, red) from Pin 8, V2, to L1.

BM13-5. Connect a 47K resistor (yellow, purple, orange) from Pin 1, D2A (S3), to L1.

BM13-6. Connect a 47K resistor (yellow, purple, orange) from Pin 2, D2A (S3), to L1 (S3).

BM13-7. Connect an 82K resistor (grey, red, orange) from Pin 8, V1 (S2), to Pin 3, V1.

BM13-8. Connect an 82K resistor (grey, red, orange) from Pin 8, V2 (S3), to Pin 3, V2.

BM13-9. Connect the black band end of a CPM .22 to Pin 6, V1. Connect the other end to Pin 2, V1.

BM13-10. Connect the black band end of a CPM .022 to Pin 6, V2. Connect the other end to Pin 2, V2.

Assembly Group BM-14

BM14-1. Connect a 270K resistor (red, purple, yellow) from Pin 6, V1 (S2), to Pin 1, D3A (S2).

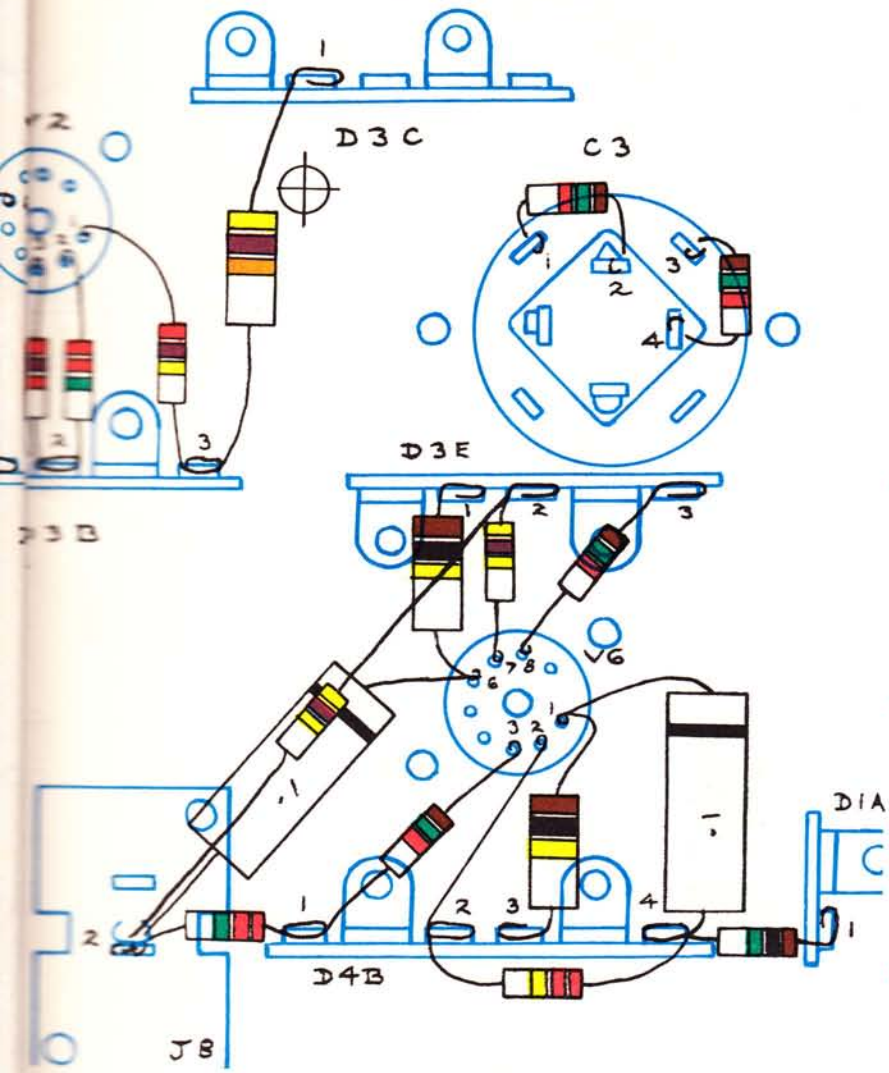
BM14-2. Connect a 2.7K resistor (red, purple, red) from Pin 3, V1 (S2), to Pin 2, D3A.

BM14-3. Connect a 2.2M resistor (red, red, green) from Pin 2, V1 (S2), to Pin 2, D3A (S3).

BM14-4. Connect a 270K resistor (red, purple, yellow) from Pin 1, V1 (S2), to Pin 3, D3A (S3).

BM14-5. Connect a 270K resistor (red, purple, yellow) from Pin 6, V2 (S2), to Pin 1, D3B (S3).

BM14-6. Connect a 2.7K resistor (red, purple, red) from Pin 3, V2 (S2), to pin 2, D3B.



Assembly Group BM-15

BM15-1. Connect the black band end of a CPM.1 to Pin 6, V6. Connect the other end to Pin 2, J8.

BM15-2. Connect a large 100K resistor (brown, black, yellow) from Pin 1, D3E (S2), to Pin 6, V6 (S2).

BM15-3. Connect a 470K resistor (yellow, purple, yellow) from Pin 2, D3E, to Pin 7, V6 (S1).

BM15-4. Connect a 1.5K resistor (brown, green, red) from Pin 3, D3E (S3), to Pin 8, V6 (S1).

BM15-5. Connect a 470K resistor (yellow, purple, yellow) from Pin 2, D3E (S3), to Pin 2, J8.

BM15-6. Connect a 2.2M resistor (red, red, green) from Pin 2, J8 (S3), to Pin 1, D4B.

BM15-7. Connect a 1.5K resistor (brown, green, red) from Pin 3, V6 (S1), to Pin 1, D4B (S4).

BM15-8. Connect a large 100K resistor (brown, black, yellow) from Pin 1, V6, to Pin 3, D4B (S2).

BM15-9. Connect the black band end of a CPM.1 to Pin 1, V6 (S2). Connect the other end to Pin 4, D4B.

BM15-10. Connect a 1M resistor (brown, black, green) from Pin 4, D4B, to Pin 1, D1A (S2).

BM15-11. Connect a 220K resistor (red, red, yellow) from Pin 2, D4B, to Pin 4, D4B (S4).

BM15-12. Connect a 2½" buss wire from Pin 2, D4B (S3), to Pin 2, V6 (S1).

BM14-7. Connect a 2.2M resistor (red, red, green) from Pin 2, V2 (S2), to Pin 2, D3B (S4).

BM14-8. Connect a 270K resistor (red, purple, yellow) from Pin 1, V2 (S2), to Pin 3, D3B.

BM14-9. Connect a large 47K resistor (yellow, purple, orange) from Pin 3, D3B (S4), to Pin 1, D3C (S3).

BM14-10. Connect a 1.5K resistor (brown, green, red) from Pin 1, C3 (S2), to Pin 2, C3 (S2).

BM14-11. Connect a 1.5K resistor (brown, green, red) from Pin 3, C3 (S1), to Pin 4, C3 (S2).

Assembly Group BM-16

BM16-1. Connect a large 1K resistor (brown, black, red) from Pin 1, C2 (S2), to Pin 2, C2.

BM16-2. Connect a large 1K resistor (brown, black, red) from Pin 2, C2 (S2), to Pin 2, C1.

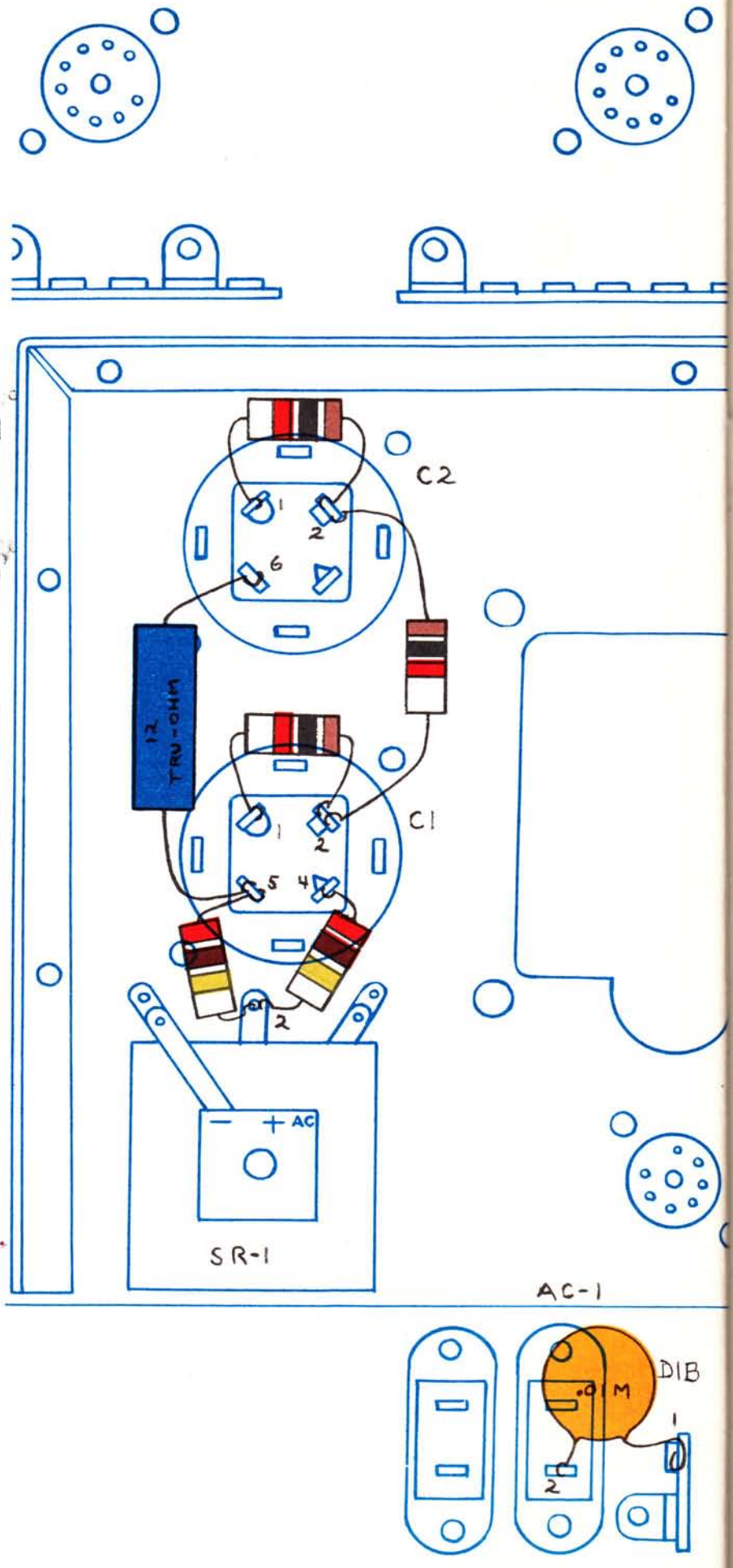
BM16-3. Connect a large 1K resistor (brown, black, red) from Pin 1, C1 (S2), to Pin 2, C1 (S2).

BM16-4. Connect an RW12 from Pin 6, C2 (S3), to Pin 5, C1.

BM16-5. Connect a large 2.7 ohm resistor (red, purple, gold) from Pin 5, C1 (S3), to Pin 2, SR-1.

BM16-6. Connect a large 2.7 ohm resistor (red, purple, gold) from Pin 4, C1 (S2), to Pin 2, SR-1 (S2).

BM16-7. Connect a CC.01M from Pin 2, AC1 (S4), to Pin 1, D1B (S3).



Very Important! the Double Check System

The electrical assembly is now complete. It is time to pause for a moment and make sure that there are no errors, and that every joint has been soldered properly. It is quite understandable that at this stage of the assembly there will be a tremendous incentive to forge ahead quickly to finish the job. Unfortunately this attitude can cause you to overlook a small error that will lead to serious and expensive damage to your amplifier.

In extensive evaluation tests, we had LC-21 kits built by a wide variety of people. Over 90% of the kits worked perfectly upon completion. Of this percentage, virtually everyone had taken the trouble to follow this double checking procedure, and most of them reported catching small errors. In those units that did not work we discovered that malfunction could, in every case, be traced directly to skipping of the double-check. Simple miswiring errors or short circuits prevented proper operation of the amplifier. Stop for a moment, RELAX, and be sure to check over your work.

An easy method of doing this has been provided. Call in a friend or another member of the family. Have them look over charts AF1, and AM1. On this diagram of the underside of the chassis, a series of numbers have been placed next to each pin or terminal. These numbers indicate the number of wires and leads (including those from resistors or capacitors) that have been soldered to that pin. If circled and uncircled numbers are given, use the circled numbers as all connections have now been made. While you count off the number of leads on each pin and terminal, your assistant can check your count against the chart. When you count the leads going to pin 1 of V3, your helper will observe that this agrees with his chart and place a small check mark on it. This will be continued until the entire unit is checked over. It will seldom take more than 20 minutes for this complete check.

While you are counting the wires, you can also be checking for short circuits and proper soldering. It would be very handy if you had a tool with a small sharp point (like an ice pick) to probe the connections and make certain they are soldered properly. A pencil with a sharp point can also be used. Even the most meticulous worker can make a mistake or have a poorly soldered joint. LOOK SHARP! Move every lead and wire a little bit to insure it is not accidentally causing a short circuit with some other wire or pin.

If a mistake is caught and it involves a component which is now too short to reach the correct pin, refer to Fig. 3 on splicing a piece of buss wire. This will work quite well and eliminate the need for purchasing a replacement.

Mag Input Sensitivity

If you follow the assembly procedure of this manual exactly, Mag 1 input on the rear of the amplifier will provide the necessary gain for low output stereo cartridges (2 to 6 mv.), tape heads, and low output microphones. Mag 2 input has less gain to match high output stereo cartridges (7 mv. on up) and high output microphones. In the following operating instructions the choice of Mag 1 or Mag 2 input depends on what cartridge, microphone, or tape deck you are using.

The pickup selector switch on the front panel permits you to use more than one phono, or a phono and a tape deck, or a microphone-phono combination. Both Mag 1 and Mag 2 can be used, for the pickup switch will choose either one as you desire.

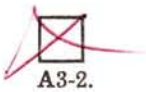
If your choice of sources is such that both Mag 1 and Mag 2 inputs have to supply gain for low output devices, you can change Mag 2 input. Simply replace the two 100 K resistors on Steps BM 2-3 and BM 2-4 with two pieces of buss wire.

Final Assembly A-3

Turn the chassis over and shake it violently. This is to get all the little pieces of wire out of the unit. Make certain that there are no pieces caught in any crevices or in the tube sockets or condenser can bases. This could cause short circuits.


A3-1

Unscrew the cap of the fuse post. Take one of the fuses provided (one is a spare), and insert the fuse into the cap. Then put the fuse into the post, push in the cap firmly, and rotate it clockwise in order to fasten securely.


A3-2.

Insert the tubes. The tube sockets are identified by the screening right on the chassis. At this point you should check out the preamplifier. Turn the preamplifier so it is resting on its side. Make sure the Loudness control is pushed in. Insert the line cord into an AC outlet (do not use with DC) and pull the Loudness control towards you until the unit

is turned on. The tubes should all light up slowly and there should be no sign of overheating, either below the chassis or on top. The tubes should not glow bright red or flash. At the first sign of trouble, turn the unit off and refer to the section entitled " In Case of Difficulty." If all seems right, turn the unit off, remove line cord from AC outlet and continue.

☒ A3-3. Place a tube shield over tubes V1, V2, V3, V4, V5, and V6. Press down hard with a counterclockwise motion to get the shield on.

☐ A3-4. Assemble the control shield with three 6 x ¼" sheet metal screws (see Fig. 12)

☐ A3-5. Assemble the bottom cover with four #6 sheet metal screws as in Fig. 13. Be careful that this bottom cover does not touch bare uninsulated wires inside.

☐ A3-6. Mount the front panel and knobs as shown in Fig. 14. Put the panel in place and thread on the nuts to hold the panel on. Be careful not to scratch the panel. Then put on the knobs with the small screwdriver supplied. The illustration indicates which knobs to use on each control.

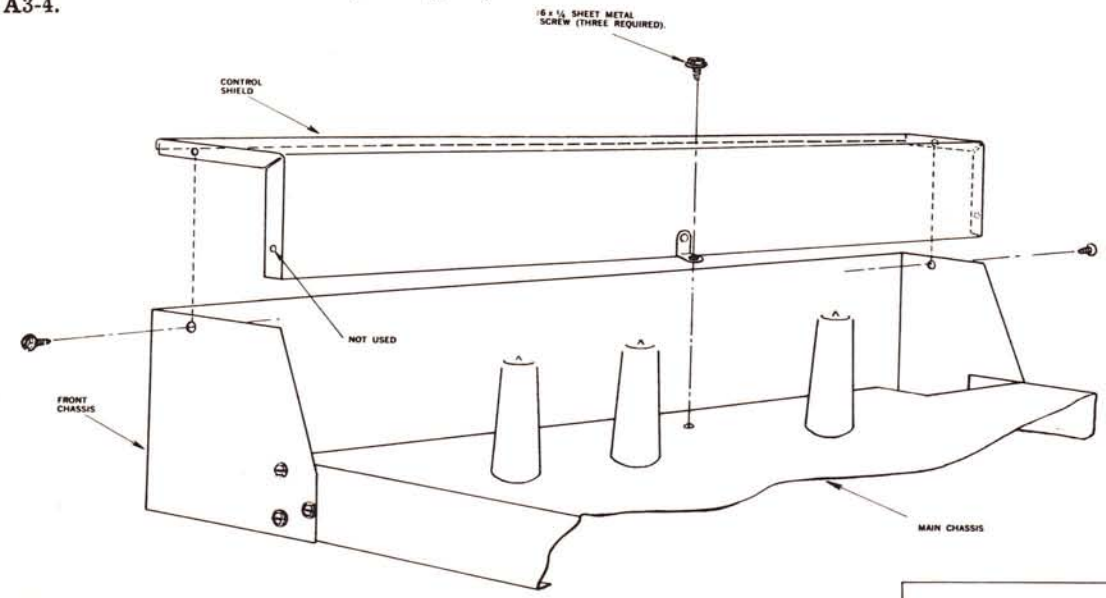


FIGURE 12

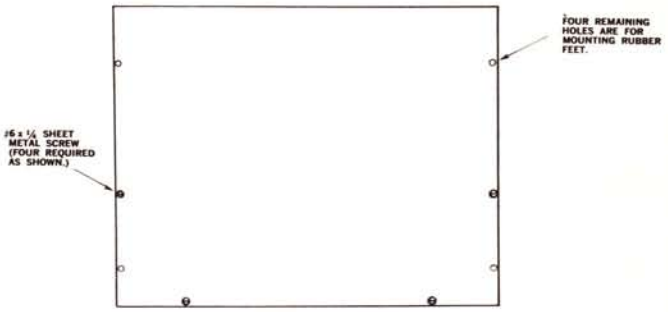


FIGURE 13

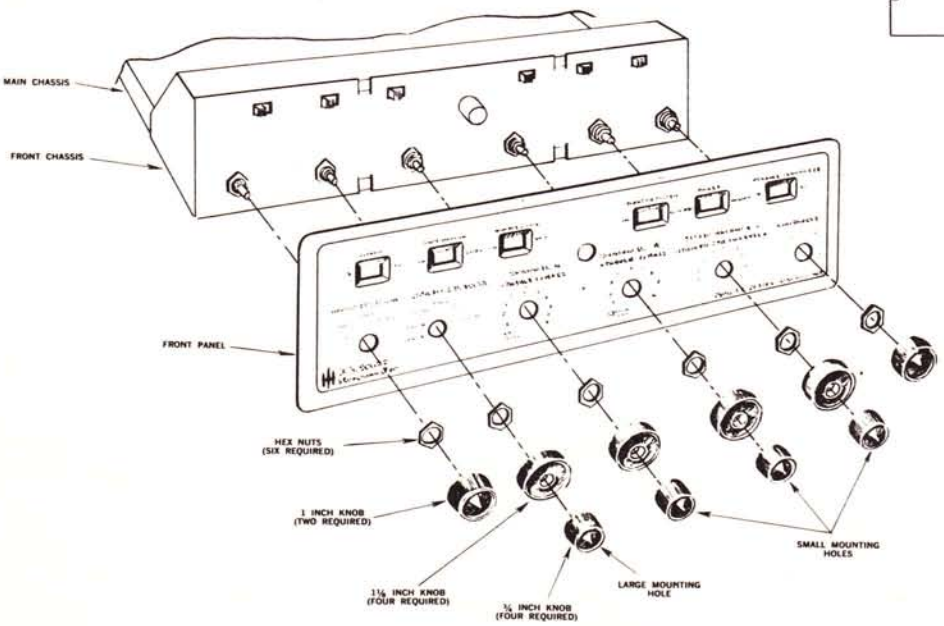


FIGURE 14

Congratulations!

Now . . . sign your personal label " This kit was built by —— " . . . connect your amplifier into the rest of your system (see next few pages) . . . relax . . . with one of the finest preamplifiers ever made.

Instructions for Using the Model LC-21 Stereophonic Control Center

The LC-21 is extremely flexible and offers a wide variety of operating features, yet it is easy to use. Careful reading of these instructions will enable any member of the family to operate the LC-21.

INSTALLATION

The LC-21 can be placed on a table or bookshelf, in existing furniture like an end-table, buffet, or room divider, or in a specially designed equipment cabinet. A handsome hand rubbed wood accessory case is available from your dealer in finishes to blend with your decor.

Wherever the LC-21 is placed, adequate provision should be made for ventilation. If this is not done, the life of the internal components will be appreciably shortened. By adequate ventilation we mean some space above and behind the unit where air may circulate freely, or, if it is installed in a cabinet, an open back. Remember that this model draws about 35 watts of electricity, and if you placed a 35 watt bulb in a cabinet, you would need a fair amount of moving air to keep it from getting too warm.

To help disperse heat rapidly, the LC-21 employs aluminum in the construction of the chassis and panel. Aluminum is an excellent conductor of heat. Therefore, the panel may seem warm to the touch. As long as the unit is adequately ventilated, this is not of any consequence.

CONNECTIONS

(Refer to connection diagram at end of section illustrating all of the following connections)

Power

The power cord should be plugged into any 105 to 125 volt, 50 to 60 cycle AC source. DO NOT attempt to use with DC.

How to Connect Your Amplifiers

For stereophonic use, two power amplifiers (or a stereophonic power amplifier such as the H. H. Scott LK-150) are required. Connect a shielded audio cable from Output A on the back of the LC-21 to the audio input of the power amplifier. Channel A refers always to the left channel, so use the amplifier that feeds the left speaker (as you face them). Connect a second audio cable from Output B on the back of the LC-21 to the power amplifier that feeds the right hand speaker. When using the LC-21 with H. H. Scott amplifiers that have two sets of inputs, called 0.5 and 1.5, use the 1.5 V input. With the LK-150 set level to 2.5 V.

If you are using a center channel speaker or have extension speakers in other rooms, connect another shielded audio cable from the " Ctr. Chan output " on the top of the LC-21 to the audio input of the center channel amplifier. For more information about this mode of operation, refer to the section on **Derived Center Channel Output.**

The LC-21 stereo control center has exceptionally high output: three to four times greater than most preamplifiers. This is particularly desirable because it affords a very high signal to noise ratio which gives a much cleaner signal. This is an example of the advanced circuit design in your new LC-21.

How to Connect Your Record Player *(with magnetic cartridge)*

The shielded leads from your stereo record player should be connected either to Mag 1 or Mag 2 inputs on the back of the LC-21 (see the section entitled: " Mag Input Sensitivity "). The lead carrying the left channel information should be inserted in the Channel A jack; the lead carrying the right channel information should be inserted in the Channel B jack. If you have both a turntable and a changer, one set of leads should go into Mag 1 inputs, and the other into Mag 2 inputs. By moving the **Pickup** switch on the front panel, you can select either of the two record players.

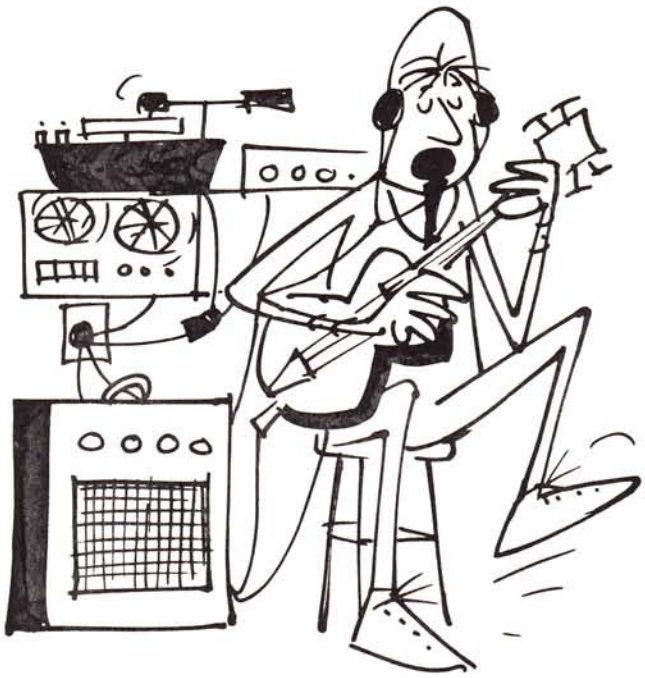
If only a monophonic cartridge is being used, the single shielded lead should be inserted in Channel A input. The **Stereo Selector Control** on the front panel should then be set to *Channel A.*

If the cartridge is not completely shielded against hum, it is suggested that the two leads be twined around each other. Also, it would be advisable to keep the record player at least two feet away from the power amplifier.

How to Connect Your Record Player *(with crystal or ceramic cartridge)*

Magnetic cartridges produce low outputs. Crystal and ceramic cartridges produce stronger signals on the order of ¼ to over 1 volt. With record players using these cartridges, the shielded leads should be inserted in the Extra inputs. The lead carrying the left channel information should go into the Extra A input, while the lead carrying the right channel information should go into the Extra B input. The **Input Selector** on the front panel should, of course, be set to *Extra* whenever you want to listen to the phonograph.

Otherwise, the information given in the previous section is applicable here, too.



How to Connect Your Tape Recorder

For playback of pre-recorded tape on a tape recorder with stereo playback preamplifiers, the shielded leads from the tape machine should be inserted in the Playback input jacks on the back of the LC-21. The lead containing the left channel information should be inserted into the Playback A jack, while the lead containing the right channel information goes to the Playback B jack. The **Tape Monitor Switch** on the front panel should be in the *In* position. It now will make no difference where the **Input Selector** is set; the pre-recorded tape will be heard through the speakers regardless. *Remember, unless you are listening to tape, the* **Tape Monitor Switch** *must be in the Out position.*

If the pre-recorded tape is to be played on a Tape Deck, a different system should be employed. A tape deck is a mechanism which consists simply of the tape transport and heads with no recording or playback amplifiers or preamplifiers whatsoever. Such a device produces a very small electrical signal similar to that obtained from a magnetic phonograph cartridge. Because of this, the connections are made to Mag 1 or Mag 2 on the back panel. (See section on Mag Input Sensitivity.)

The system is then considered identical to a standard phonograph and the same rules apply as outlined before. The **Input Selector** on the front panel should be placed in the *NAB Tape* Position.

If monophonic tape is being played on a stereo tape recorder or tape deck, the connections described above still apply. The only change is that the **Stereo Selector** is set to either *Channel A* or *Channel B* as the case may be. If a monophonic tape deck or tape recorder is used there is only one shielded lead to connect, and this should go into the Channel A input.

To record directly from the LC-21, a special set of outputs is available on the back panel. These are the Tape Output jacks. Connect a shielded wire from the A jack to the Radio or high level input of the Tape recorder. The Tape recorder will automatically record directly from the LC-21, whatever is playing over Channel A of the system (be it FM, phonograph, etc.) completely unaffected by any of the unit's controls. If the lead is connected from the Tape Output B jack, then the recorder will receive whatever is on Channel B of the system (be it AM, phonograph, etc.). If a *stereo record* tape recorder is used, then a pair of leads will be required . . . one from Channel A and one from Channel B of the Tape Output. It is now possible to record stereophonically any program material being carried by the LC-21.

If your tape recorder has separate erase, record, and playback heads you can take advantage of the special monitoring provisions of the LC-21. This will be discussed under TAPE MONITOR operation.

Microphone

Provision is made for the connection of a microphone to the LC-21. Use either Mag 1 or Mag 2 inputs (refer to section on Mag Input Sensitivity). If a single microphone is used, connect it to the Ch. A input. If two microphones are being used for stereo, connect the second microphone to the Ch. B input. The *pickup* selector switch on the front should be set for 1 or 2, and the **Input Selector** to *Mic.*

Tuner

To connect an AM or FM tuner, insert one end of a shielded lead into the audio output of the tuner and the other end into the Tuner A input on the back of the LC-21. The **Stereo Selector** switch should then be set for *Channel A*, in order for the FM signal to appear at both speakers. If the tuner has a level control, this should be adjusted so that the overall volume does not vary when rotating the **Input Selector** from RIAA, NAB, ORTHO to *Tuner.*

With H. H. Scott tuners, Model 310 B and 311 A, B, and C, both a high level (or audio) output and a low level (or tape) output are present. It is advisable to use the low level (or tape output) on these models. In addition, on Models 310 C, 310 D, 311 D, 314, 320, 350, and LT-10 there are sets of Channel A and Channel B outputs. With these tuners, connect one shielded lead from the Channel A output to the tuner A input on the LC-21. Connect another lead from the Channel B output to the tuner B input on the LC-21. With this exclusive H. H. Scott feature it is NOT necessary to turn the **Stereo Selector** to *Channel A* in order for the FM signal to ap-

pear at both speakers. The **Stereo Selector** switch can now be left in the *Stereo* position when using the tuner. If you are using your tuner with a multiplex adaptor follow the instructions provided with the adaptor.

Extra

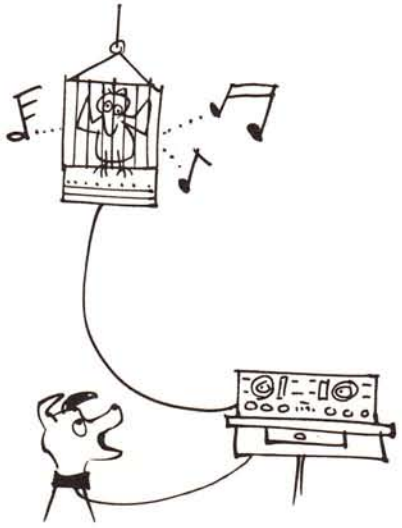
The extra input can be used for any high level source such as sound from TV, phonograph with crystal or ceramic cartridge, etc. Instructions for connections were given under the section for connecting a record player with crystal or ceramic cartridge.

Derived Center Channel Output

One of the many exclusive stereo features pioneered by H. H. Scott is the derived third (or middle) channel. This extra output is used in conjunction with an auxiliary amplifier to fulfill several important needs: 1. It gives fuller sound, particularly in large rooms where it is desired to separate speakers by more than eight feet. 2. It allows ideal seating for full stereo in a much greater portion of your listening room giving you greater freedom in placement of speakers and furniture. 3. It lets you feed a full signal to extension speaker systems in other rooms like kitchen, den, porch, bedroom or bath. With an ordinary two channel system you feed just half the signal to an extension speaker.

Connect the Derived Center Channel Output jack to the input of the power amplifier. Use the 1.5 volt input on H. H. Scott power amplifiers and a high level input (such as tuner, extra, etc.) on complete amplifiers. Set the level control so that the center channel loudspeaker's sound is lower in volume than the left and right stereophonic speakers. If the derived center channel is driving extension speakers, the individual loudspeakers can be equalized by using individual T pads on each speaker.

The output is controlled by the **Derived Center Channel Level** and all the front panel controls. It is essential that the center channel speaker be in phase with the right and left channel speakers for proper operation. The proper method will be described later.



Accessory Outlet

Two accessory switched 117 volt outputs are available on the back panel to supply current for a phonograph or tape recorder motor. When the LC-21 is turned off, all items plugged into these outlets will also be turned off. The power amplifiers should be connected to these outputs and their on-off switches left in the " on " position so that they can be controlled from the LC-21.

DESCRIPTION AND USE OF CONTROLS

On-Off Switch

The LC-21 is turned on by pulling the **Loudness Control** towards you. IMPORTANT: Unless the LC-21 is being used to play back tape, **Tape Monitor Switch** must be in the *Out* position.

Input Selector

This control selects the sound source for your system.

Mic — When a microphone is being used with the LC-21.

NAB TAPE — For a tape deck.

RIAA, NAB, ORTHO — For all phono records, monophonic or stereo. For older records use tone controls for optimum sound.

Tuner — For FM, AM, or FM multiplex tuner.

Extra — For anything connected to the extra inputs.

Stereo Selector

Controls the mode of operation of the LC-21.

Bal A — Both channels coming into the LC-21 are combined and sent only to the left speaker.

Bal B — Both channels coming into the LC-21 are combined and sent only to the right speaker.

(Use of these positions for balancing output will be discussed under **Stereo Balance.**)

Monophonic Records — If a stereophonic cartridge is being used to play monaural (or, more properly, monophonic) records, use this position. It automatically combines the dual outputs of the stereo cartridge, effectively cancelling out any vertical rumble and noise in the signal.

Stereo — Whenever the LC-21 is being used stereophonically, the control should be in this position.

Stereo Reverse — Basically this is identical with the above position except that it permits the user to " move the violins from the left side of the orchestra to the right, and the drums from the right side to the left " if he desires.

Channel A — When switch is in this position, the Channel A signal source you selected with the **Input Selector** switch will play over both power sections and speakers. In other words, if the **Input Selector** is set to tuner, Channel A of the tuner will go through both amplifiers and into both speakers.

Channel B — Same as above, except that now the

Channel B input source will be transmitted to both amplifiers and speakers.

Channel A and B, Treble and Bass

These controls modify the sound to suit the user's taste, the room acoustics, and the program material being used. H. H. Scott provides a separate set of controls for each channel, permitting the operator to adjust for differences between speakers, and differences due to room placement. The bass control modifies the low frequencies, while the treble control modifies the high notes. Rotating the controls clockwise causes an increase in the amplitude of the frequencies, while rotating counter-clockwise causes a reduction.

Feel free to use these controls as you see fit. You are the one who must be satisfied with the over-all sound, and the tone controls are the principal way of seeing that you are. However, boosting the treble will accent surface noise on phonograph records and hiss on tapes, while boosting the bass will emphasize record player motor noise.

Stereo Balance

Whether the system is being used stereophonically or monophonically, it is important that the sound from the two speaker systems be of equal volume. They may sound different because of any of the following reasons: room acoustics, differences in speaker efficiencies, differences in output between the two channels of a stereo cartridge, speaker placement, slight discrepancies between the two channels of the source material, and a multitude of other possibilities. The **Stereo Balance** is designed to correct this. By rotating the knob clockwise, the right or B channel will be increased in volume in comparison to the left or A channel. Rotating counter-clockwise will have the opposite effect. By moving the control to its extreme position, it is possible to completely eliminate one channel if desired.

To simplify the balancing operation, the LC-21 incorporates the unique H. H. Scott balancing circuit. Unlike other methods, this insures that you will *hear* equal sound level from each speaker system. Turn on any program material and rotate the **Stereo Selector** switch to *Bal A* and then to *Bal B*. Quickly switch back and forth between these two positions, while at the same time varying the **Stereo Balance.** At the position of the **Stereo Balance** where *Bal A* and *Bal B* sound equally loud, the system is in balance. Unless there are discrepancies introduced by faulty program material or cartridges, the control should not have to be varied appreciably.

Loudness and On/Off

Pulling the control towards you will turn on the LC-21. This control also varies the volume of sound emanating from the system. As the knob is turned clockwise, the volume will increase. Ordinarily, the control should be pointing to 2 or higher at normal listening level. The actual position is not important as long as it is at least 2. If the control cannot be turned past *1* without the sound becoming too loud, it would be advisable to make sure that the **level** controls are correctly adjusted on your tuner and that the proper phono input is being utilized. Also check the input level on the power amplifier.

Pickup Switch

In position *1* this switch will select whatever is connected to Mag 1 on the rear panel. In position 2 the switch will select whatever is connected to Mag 2 on the rear panel.

Tape Monitor Switch

The switch should always be in the Out position except when you are listening to the playback of tape, in which case it would be moved to In.

If your tape recorder incorporates a separate playback head it is possible to listen to the recording a fraction of a second after it is made as a quality check. Let us assume that a recording is being made from an AM-FM tuner. The **Input Selector** will be in the *Tuner* position. With the **Tape Monitor** switch in the Out position, the system will be playing the actual broadcast. With the switch moved to In, the system will now be listening to the tape recording of the broadcast as it is being recorded. By moving the switch back and forth it is possible to hear whether the recording is equivalent to the actual broadcast.

This method will work only for recorders with separate record and playback heads.

Scratch Filter

If the surface noise of a phonograph record is particularly objectionable, move the **scratch filter** to *In*. It will reduce the high frequencies. On especially old records (such as 78's), it may be necessary to turn down the **treble controls,** too.

Rumble Filter

All turntable motors make some noise. If the noise is so prominent that it can be clearly heard through the speakers, moving the rumble switch to *In* will considerably reduce this problem. However, the use of this switch will reduce the low frequencies as well.

Derived Center Channel Level

This control permits easy adjustment of the volume of your center channel speaker. If you are using the center channel output to supply sound to extension speakers you can control their volume without affecting the sound in your main listening room.

The level of the center channel output is also controlled by the **Loudness Control.** If the **Loudness Control** is set too low, it will not be possible to get adequate volume from the center channel output.

Phase Switch

A loudspeaker cone produces sound by moving back and forth, pushing the air. When two loudspeakers are in operation in a stereo system, it is essential that the speaker cones move back and forth at the same time. If the right speaker is moving forward at the same instant that the left speaker is moving backward, there will be a noticeable reduction in bass response as well as a poor stereophonic effect.

To insure that the system is in phase at all times, the LC-21 incorporates a **phase reversal switch** on the front panel. To set this switch properly, the following method is suggested:

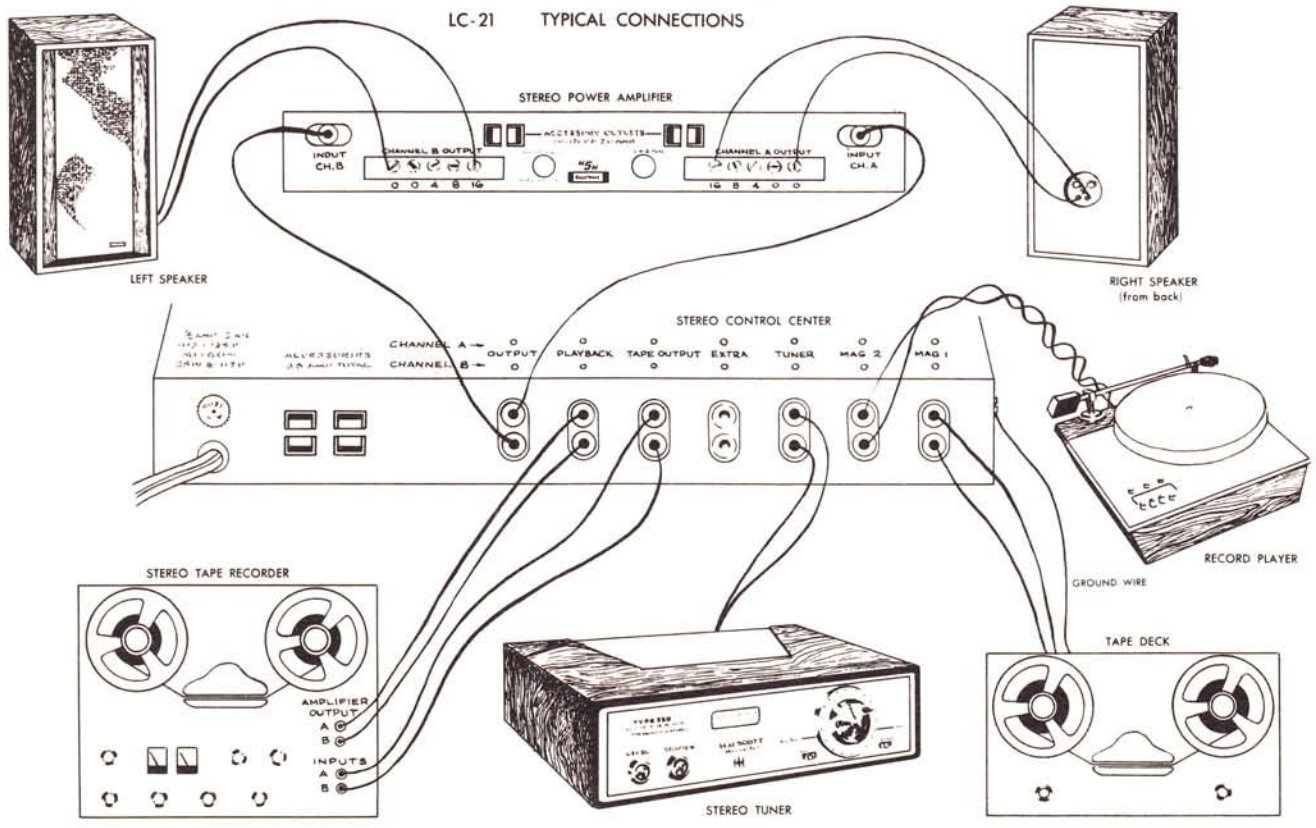
Tune in a monophonic broadcast with a male voice speaking, or else play a monophonic record with a male singing voice. Set **Stereo Selector** so that the program material is heard through both speakers. Turn the volume to full room level. Stand in front of the two speaker systems and midway between them. Have someone slide the **Phase** switch back and forth. In one position, the voice will sound full and appear to be coming from directly between the two speakers. In the other position, the voice will lose some of its bass response and will appear to be coming from both speakers. The first is the correct position, the second is the incorrect one. If the correct position occurs when the slide switch is in *Rev* position, reverse the speaker wire connections on **one** of the speakers. The correct phase position will now be *Norm*.

If a center channel speaker is used, the same procedure can be employed except that the **Stereo Selector** should be turned to *Bal A*. The lead to the center speaker is then reversed until the center and left speakers are in phase.

Once the speakers are properly phased, it should not be necessary to move the **Phase** switch for most records or broadcasts. Occasionally a phonograph record will be recorded out of phase accidentally, or a stereo broadcast will be transmitted out of phase. This can be corrected by simply moving the **Phase** switch to *Rev*. After some experience in listening to stereo broadcasts it will not be hard to detect when the program material is in or out of phase. Having the control on the front panel makes it easier to keep your system in phase.

Loudness-Volume Switch

It is a phenomenon of the human hearing mechanism that when volume is low, the ear is less sensitive to extreme low notes and extreme high notes. Thus, whenever the system is being operated at a low level, the sound will not seem to be as good as it is at higher levels. To compensate for this deficiency, the LC-21 incorporates a special circuit which automatically boosts the extreme lows and highs whenever the volume is reduced. To introduce this compensating network into the system, move the slide switch to *L*. When the sound level is increased, this compensation automatically decreases since it is no longer needed. When the switch is in the V position the compensation network is out of the circuit.



In Case of Difficulty

No matter how careful you are, a mistake is possible. Don't panic! First, make sure each tube is in the proper location. Then go back to the assembly notes and check off each step with the written instructions and the pictorials. Or if possible, have someone else do this for you. Often a fresh approach may disclose mistakes that you might be consistently overlooking. While checking for errors, carefully probe each and every wire, lead, component, and part to make sure there are no short circuits or poor solder joints.

In case the fuse has blown (the tubes will not light up) it is very likely that there is a short circuit. Before replacing the fuse search for the cause.

In case the tubes light up but the unit does not operate properly, voltage readings are supplied on the schematic. If you can obtain a good vacuum tube voltmeter (VTVM) use the voltage readings for locating the portion of the circuit that is malfunctioning.

As this is a preamplifier control center, it is possible that most of the unit will be functioning with sound heard from one channel but not the other. To help locate the portion malfunctioning when this occurs, try the following: (1) Connect speakers to both Channel A and Channel B speaker terminals on the amplifier. (2) Connect a stereo phono to Channel A and Channel B Mag inputs, or a tuner to both Channel A and Channel B tuner inputs. (3) Set the Input selector to either Tuner or Phono as the case may be. (4) Rotate stereo selector between Bal A and Bal B. If sound is heard in the Bal A position but not in Bal B, then the Channel B power amplifier is not functioning (or vice versa). (5) Rotate stereo selector between Channel A and Channel B. If sound is heard in the Channel A position but not in the Channel B position, then the latter's preamplifier control center section is malfunctioning (or vice versa). See schematic for parts that may be involved.

If none of the above suggestions help in curing the problem you should write to our Laboratory Kit Service Dept. for prompt assistance. There is no charge for this help. The engineers in this department are thoroughly familiar with all aspects of the kit, and can probably localize the cause of your difficulty. However, you must be very explicit in describing your problem. Mention all the approaches you have undertaken to cure it. Describe all the symptoms and signs that may be involved. With complete information supplied, the possibilities of a cure through the mail are greatly increased.

Service

When all else fails the facilities of the H. H. Scott Laboratory Kit Service Department and the vast network of Authorized Warranty Service Stations are available to you. You will be charged a fixed fee of $10.00 for each unit that is submitted either to the factory or to a Warranty Station within the warranty period. This fee will be in addition to any parts that have to be replaced. If the unit is still within the 90 day warranty period (see description of the Warranty Policy below), then the charge for parts will be governed by this policy. A list of Warranty Service Stations is included with this kit.

Many H. H. Scott dealers have service facilities and are fully competent to repair this kit. These dealers are not governed by our price policy and can charge any fee they wish. This fee should be ascertained before service is begun.

The service policies described above only apply to completely assembled instruments constructed according to the instructions supplied. Any unit that is not complete, or has been modified in any way will not be accepted. Instruments showing the use of fluxes and acid core solder will also not be accepted.

Warranty

To protect your investment, H. H. Scott, Inc. warrants that for a period of three months from the date of purchase, all parts shall be free of defects in materials and workmanship under normal use and service. H. H. Scott, Inc. will replace any defective parts upon the return of same to the factory, either by the customer, the dealer, or a warranty service station. There will be no charge for this replacement.

This warranty does not apply to any parts damaged during the course of handling and assembling the kit. No other warranty, either expressed or implied, shall apply to this unit.

Packing For Shipping

If it becomes necessary to return the instrument to the factory, obtain a sturdy carton, large enough to hold the LC-21 and place protective material around it. Crumpled newspapers, Kimsul, or similar packing material can be used. Make sure the preamplifier is in tight so that it does not shake around. Mark: FRAGILE DELICATE ELECTRONIC EQUIPMENT on the outside of the carton. Insure for its full value and ship, prepaid, by Railway Express to:

Laboratory Kit Service Dept.
H. H. Scott, Inc.
111 Powder Mill Road
Maynard, Mass.

Choosing Your Stereo Power Amplifier

If you do not already have a stereo power amplifier, or are thinking of making a change, then the obvious choice is the Model LK-150 Stereo Power Amplifier kit. With 130 watts of clean, undistorted power, the LK-150 at normal listening levels will provide a clarity of sound that you will not believe possible. The LK-150 is engineered to exactly complement your LC-21 control center.

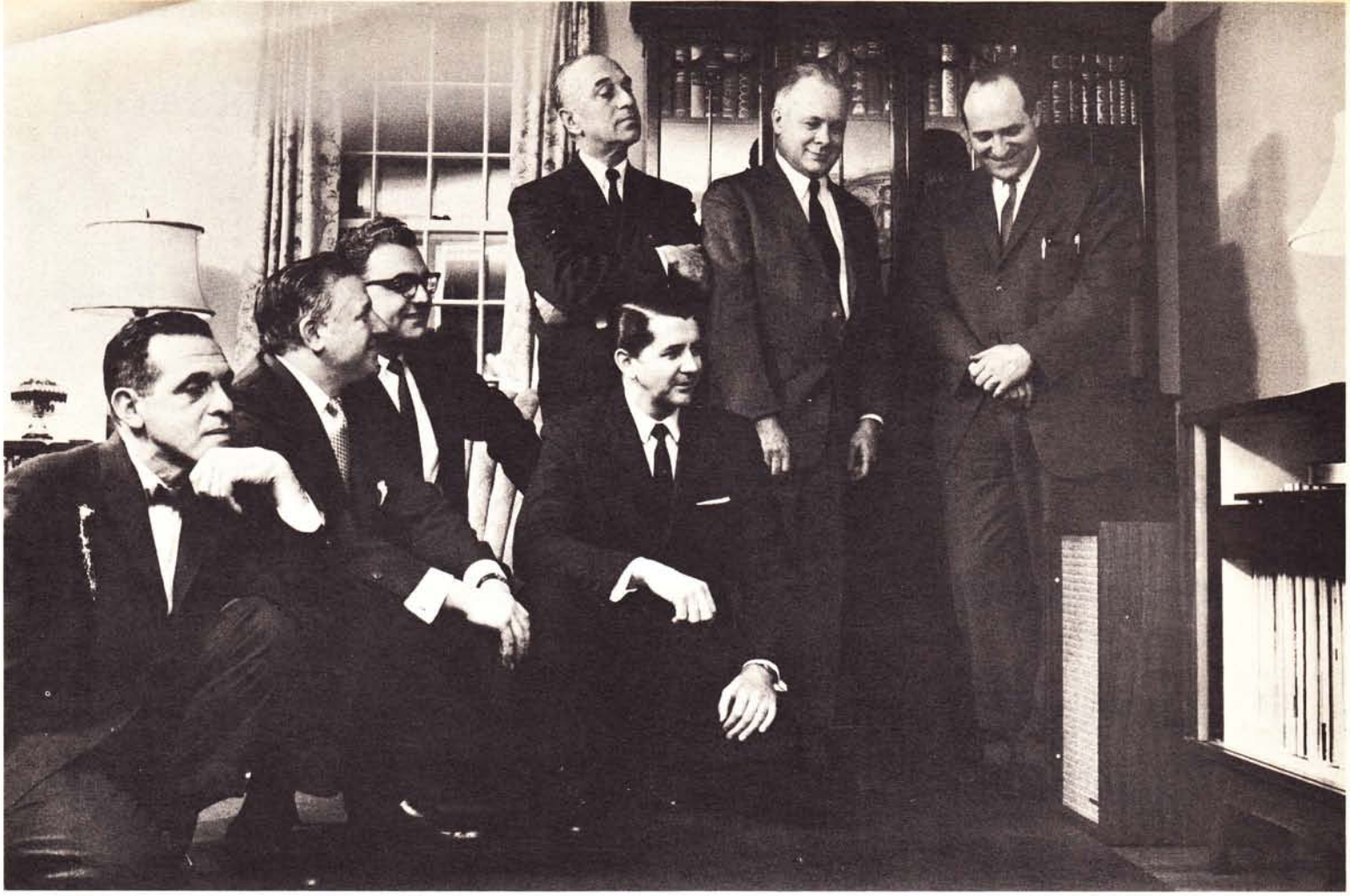
Choosing Your Tuner

Your new LC-21 is the finest preamplifier kit available. It is designed with the precision that has made the name H. H. Scott a synonym for quality in the component field.

But a fine high fidelity system is only as good as its weakest link. Therefore we suggest that you invest in an H. H. Scott tuner when you are ready to expand your present system.

All H. H. Scott tuners are a perfect match to your new LC-21 both in appearance and performance. Where a tuner has knobs of different finish from your LC-21, an accessory knob kit is available for your tuner.

An ideal tuner would be the H. H. Scott LT-10 FM tuner kit. It is a perfect match to your LC-21 and is even easier to build.



Distinguished panel of musicians from Boston's famous symphony orchestra evaluate speaker performance in home of Hermon Hosmer Scott, Lincoln, Mass. Left to right, kneeling: Leonard Moss (Violin), James Stagliano (Horn), Berj Zamkochian (Organ), Everett Firth (Tympani). Standing: Bernard Zighera (Piano), Hermon Scott, Roger Voisin (Trumpet).

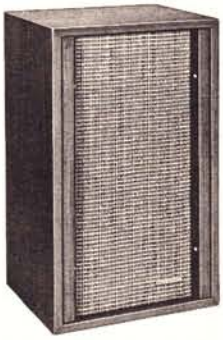
Famous musicians first to hear remarkable new H. H. Scott speakers!

To assure perfection in his new speaker systems, Hermon Scott subjected them to home listening as well as technical tests. For the listening test he invited the most critical audience available . . . highly skilled professional musicians from Boston's famous symphony orchestra . . . to hear their *own* performances reproduced over the new H. H. Scott speakers. Here are their enthusiastic reactions:

"*The closest I have heard to the true sound of the violin. I was not even aware I was listening to a recording.*" **Leonard Moss,** Violinist. "*The trumpet sound was uniform and consistent in every range, from the lowest to the highest note . . . a feat virtually unheard of in any other speaker.*" **Roger Voisin,** First Trumpet; Recording Artist, Kapp Records. "*I have never heard any reproduction of organ which sounded so faithful to the original. I felt I was sitting in the center of Symphony Hall.*" **Berj Zamkochian,** Organist. "*Every other speaker I ever heard sounded nasal and artificial. This was the first one that did not.*" **Bernard Zighera,** First Harpist and Pianist. "*I was in the control room when this recording was made. Played through these new speakers, the reproduction was closer to the original performance than I've ever heard before.*" **James Stagliano,** First Horn; Recording Artist, Boston and Kapp Records. "*The percussion came through with amazing clarity. The cymbals, the snare drum, the tympani and the bass drum all were equally true to the way they sound when I play.*" **Everett Firth,** First Tympanist.

As with its tuners and amplifiers, H. H. Scott uses new techniques in both construction and testing that represent a significant advance in the state of the art. New construction methods assure excellence in performance . . . New testing techniques and quality controls substantially reduce variations in quality from speaker to speaker, common until now.

Every H. H. Scott speaker is individually tested to assure rigid adherence to specifications. Each speaker carries a 2 year guarantee. Hear the new S-2 and S-3 at your dealer soon. We are sure you will agree that these speakers are the finest musical reproducing systems ever made.



H. H. SCOTT MODEL S-2 WIDE RANGE SPEAKER SYSTEM:
This four-driver, acoustic compliance system consists of a low resonance, high excursion woofer, two dual-cone mid-range units, and a special wide dispersion spherical tweeter mounted in a matched cabinet. Mid-range units acoustically isolated to eliminate undesirable coupling and intermodulation. Actual impedance 16 ohms. Dimensions: 23¾" H x 14½" W x 12½" D. Available in mahogany, oil finish walnut, fruitwood and unfinished.

H. H. SCOTT MODEL S-3 WIDE RANGE SPEAKER SYSTEM:
A three-way acoustic compliance system of true book shelf size. Consists of a specially designed low resonance woofer, a mid-range unit and a wide-dispersion super-tweeter, mounted in a matched enclosure. Actual impedance 16 ohms. Dimensions: 23½" H x 11¾" W x 9¾" D. Available in mahogany, oil finish walnut, fruitwood and unfinished.

H·H·Scott . . .

a history of leadership in the Acoustic field

To insure that every H. H. Scott component meets the highest standards of quality, H. H. Scott maintains this ultra modern plant for the design and manufacture of all its components.

This new plant, located in Maynard, Massachusetts, includes a machine shop, sheet metal facilities, coil and transformer department, electrical assembly department and fully equipped laboratories for design and research.

The engineering department is staffed by 12 graduate engineers who are primarily concerned with developing new and better components for high fidelity sound.

Every high fidelity component receives over 50 electrical and mechanical tests before it leaves the factory. Special electrically shielded "screen rooms" are used for aligning FM tuners. There are life test facilities where components are run for thousands of hours under strict controls to test their durability.

These extensive investments in facilities back up H. H. Scott's philosophy that there will never be any compromise with quality.