

80( ) Connect one end of a 3 $\frac{3}{4}$ " green wire to lug #3 (S). Insert the other end into eyelet #7 (S).

81( ) Connect one end of a 4" green wire to rear lug #2 (S). Insert the other end into eyelet #8 (S).

Now fasten the back panel in place with 4 sheet metal screws.

82( ) Connect one end of a 6" green wire to lug #6 (S). Bend the other end of this wire over to identify it later.

83( ) Connect one end of another 6" green wire to lug #7 (S).

84( ) Connect one end of a 4" green wire to lug #8 (S).

85( ) Position the 3 green wires from lugs #6, #7 and #8 together with the black wire from lug #9 straight off the side of the switch. Carefully twist them together, and bend the group to the rear toward the upper input sockets.

86( ) Connect one end of a 5" green wire to lug #1 (S). Connect the other end to lug #1 of the 2-lug terminal strip on the back panel (S-2).

87( ) Connect one end of another 5" green wire to lug #11 (S). Connect the other end to input socket #8 (S).

88( ) Connect one end of another 5" green wire to lug #10 (S). Connect the other end to socket #7 (S).

89( ) Connect one end of a 6" green wire to front lug #9 (S-2). Connect the other end to socket #6 (S).

90( ) Of the group of 4 twisted wires, connect the black wire to the *short ground lug* of socket #1 (S-3). Make sure these bare leads do not touch the adjacent hardware.

91( ) Connect the short green wire to socket #1 (long lug) (S-2).

92( ) Connect the green wire with the bent end to socket #4 (S).

93( ) Connect the last green wire to socket #5 (S).

This completes the wiring of your PAT-4. Check to see that there are no unattached wires and no unsoldered connections. Clip off any excessive stubs of wires to make a neat job. Check to make sure that the wires to each eyelet on the circuit boards show a smooth flow of solder to the eyelet and to the circuitry.

Now turn the chassis over and shake out any bits of wire or solder. Check the 220 ohm resistor on the electrolytic capacitor, to be sure it is clear of the red wire which connects to the lug beneath it. See that the red wire and the green wire from lugs #1 of the selector switch to the 2-lug terminal strip are kept clear of adjacent wiring.

Take a moment to see that the general placement of wires is similar to the photograph of the inside of the chassis. The pictorial diagram has necessarily been distorted so that you can trace individual wires, with the result that it does not provide an accurate indication of how your wiring should look upon completion. Be sure that the specified twisted groups of wires have been followed, and properly positioned.

Check the separate rear lugs #2, #5 and #9 on the selector switch (both wafers) to see that the wiring has not strained them so that the contacts are twisted off center. The phono input will not function, for example, if the #5 rear lug is not properly positioned.

Make sure that red and green wires do not parallel each other closely for any distance, for such a condition will reduce the separation between right and left channel signals. A separation of one half inch is usually sufficient. In particular, keep the red wires from the front panel switches to the volume control and input jack close to the panel, and the green wires behind the switches. Also, separate the red and green wires which connect the monitor switch to the selector switch. The red wires between the back panel and the selector switch should be kept close to the chassis, and the green wires high.

94( ) Insert a sheet metal screw into the hole in the back panel marked "GND". This is the point to which separate ground wires from the record player, tape player, etc. may be connected.

95( ) Insert the fuse into the fuse holder.

96( ) Two phono plugs are included in the kit, which are to be used as "shorting plugs" in the left and right inputs marked "Tape Head" if a tape playback deck is not connected to these inputs. To make each into a shorting plug, strip two 1 $\frac{1}{2}$ " pieces of wire bare, and crimp over one end of each to form a *very tight "U"*. Slide the crimped end down into the center conductor of each plug from the large end. The crimped end prevents the wire from sliding out the other end. Solder the other end of the wire to the "handle". Now solder the wire inside the center conductor by flowing solder into it, while the iron heats the side.

97( ) Install the front plate, securing it with a  $\frac{3}{8}$ " nut on shafts SS, BAL and FS. Be sure the jacks IJ and OJ protrude very slightly, to avoid scarring the panel when plugs are inserted. The fit of the front plate over the jacks and switches is tight. If the plate does not seat properly, you can loosen the mounting hardware and shift the jacks or switches slightly.

98( ) Set screws are included in the bag with each knob. Install these first. The large knobs are positioned on shafts SS and VC so that the set screw engages the flat on the shaft. The small single knobs go on BAL and FS. Position BAL so that rotation is symmetrical from center. The set screw of FS engages the flat on the shaft. Then install the double knobs on BC and TC so that rotation is symmetrical from center.

99( ) Slide the cover on after checking to make sure the holes in the side line up with the chassis. Secure it with the 4 sheet metal screws.

#### ADDITIONAL STEREO CONTROL FUNCTIONS

Those who are experimentally inclined may wish to add phase reversal and/or channel reversal switches to their music system, though standardization of program material makes them unnecessary. Instructions for incorporating double-pole-double-throw switches in the speaker connections to the power amplifier for either of these functions is available on request from Dynaco.

#### IN CASE OF DIFFICULTY

Although your PAT-4 has been designed to be as free from trouble as possible, there is always the chance that a defective component or improper assembly will cause difficulty. However, because the circuit is essentially simple, and the layout accessible, it should not be difficult to locate and correct the source of trouble.

Because 90% of the difficulties which are encountered in kit-built units can be attributed to incorrect wiring or to poor solder connections, it is strongly recommended that you ask someone else to check your wiring against the pictorial diagram, as frequently one person will overlook the same error repeatedly. Unless a wiring error has been made which would cause the breakdown of one or more parts, it is highly unlikely that inoperation upon completion will be caused by a faulty component on either of the circuit boards, since these have been in-circuit tested prior to shipment.

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

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

The average kit-builder should confine his servicing to the basic suggestions given here, after first checking to make sure the fuse is intact. Audio transistors, unlike tubes, cannot be easily checked locally for any other than gross defects, and even this should be left to the qualified technician.

First, construction problems should be eliminated by close inspection and rechecking. Trace the wiring, and examine solder connections closely. Look for small flecks of solder, especially on the back (etched circuit side) of the boards, which may be causing improper connections. Sometimes a connection which appears solid between an eyelet and the wire will not have a smooth flow of solder from the wire to the eyelet and also from the eyelet to the board. The positions of the wires should be essentially as shown in the photograph, since the pictorial diagram must necessarily be distorted for clarity.

Second, a systematic procedure should be followed to trace the source of the trouble, once you understand the basic circuit configuration of the PAT-4.

#### Power Supply

The power supply section includes the line cord, power switch, power transformer, the rectifier diodes on the 5-lug terminal strip, and the large electrolytic capacitor (C-29). If the voltages at the lugs of this capacitor, measured with a VTVM, are reasonably close to those indicated on the voltage chart, then the power supply must be operating satisfactorily. However, if they measure more than 25% low, detach the wires which connect each PC-16 board to the capacitor at eyelets #4 and #12 to see if the voltages go to normal or above. If they do, some fault in connection with one or the other circuit board is imposing an excessive load on the supply, and the fault is not in the supply. Try connecting only one or the other board to the capacitor to localize the trouble area.

#### Preamplifier—Tone Controls

All four pairs of transistors are used in essentially similar configurations. On each circuit board, the first pair is the low level preamplifier for the Phono, Tape Head and Special inputs. The second pair is the tone control and output section. High level inputs, such as for Tuner, Tape Amp, and Spare connect directly to this section. Most of the other controls and switches are located after the low level circuitry with the exception of the Hi Filter which is placed at the output of the tone control section. The two pairs of transistors which comprise each channel are interconnected by the selector switch. A problem can thus be localized to one or the other channel, and then to the preamp or tone control sections.

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

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

An additional aid is to compare voltages measured with a VTVM with the chart in this manual. A higher than normal voltage at the collector of one of the transistors, for example, is possibly indicative that it is open and requires replacement.

If the problem is one of little or no signal, then simple signal tracing, following the signal path carefully and injecting some hum by touching each connection in turn, is advisable. If there is a point after which hum occurs, and before which there is silence, you have localized the trouble.

Check especially the double (front and rear) lugs #2, #5 and #9 on each wafer of the selector switch (and particularly #5 if you get no phono signal) to make sure they have not been twisted in their insulated mountings on the rear of each wafer.

As another example, if you have signal on both channels with the hi-filter in the flat position, but the left channel signal drops sharply when you switch to one of the high frequency cut positions, remember that this switch is at the output of the preamp, so everything prior to it must be working properly. Examining the circuit shows that the choke coil L-71 is in series with the output signal, but is shunted out when the switch is in the flat position. Therefore, a break in its coil would prevent signal from passing until the switch is "off," when the shunt permits the signal to pass. Replacing L-71 would correct the trouble.

#### Hum and Noise

The PAT-4 is inherently hum-free, and if any hum is detected the inputs should be unplugged to see if the hum disappears. If there is no hum with the cables removed, at the same volume setting which produced hum when cables were attached, the problem must be corrected in the associated equipment. Frequently hum which is injected via the phonograph cables can be eliminated by connecting a ground wire between the record player chassis and the preamp. Some phono cartridges are more hum

susceptible than others, and may not be suitable in certain installations where they are close to power transformers, AC power lines, etc.

Hum traced to the PAT-4 may indicate power supply problems. If it is common to both channels, it is almost certainly in the supply, which should be checked carefully, including bridging additional capacity across the large electrolytic filter capacitor to determine if any of the three sections are ineffective. Hum tests should be made with the cover in place, however, for external hum fields will affect the results.

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

Objectionable hiss at normal listening levels may be caused by a faulty input transistor Q1, unless it occurs on both channels. If there is hiss on all low level inputs of one channel, you can interchange transistor Q1 between channels to determine if one is defective. The transistors in the tone control stages will not be a source of objectionable hiss.

### Checking Transistors

An ohmmeter is all that is required to locate a transistor which has failed. Transistors must be removed from the circuit board for test. All transistors can be considered (for this test procedure) to be two diodes connected in series with common elements tied together. The junction point represents the base of the transistor. Observed from the bottom, the collector, base and emitter are arranged counterclockwise, with the collector attached directly to the case.

With one ohmmeter probe connected to the base, the other probe should be touched to the collector and emitter in turn. Readings from the base to the collector, and from

the base to the emitter should be similar. With one orientation of the probes, there should be a high resistance reading (almost an open circuit). When the polarity of the probes is reversed, there should be a relatively low reading. Then the ohmmeter should be connected from collector to emitter, and a high resistance (almost open circuit) should be read, regardless of the orientation of the probes. If all of these qualifications are met, the transistor does not exhibit any gross defects. Determination of more subtle defects than "opens" or "shorts" requires specialized transistor testers and/or curve tracers.

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

When replacing transistors, the larger ones with the finned radiators should have the radiators transferred to the replacement. The silicon grease between transistor and radiator should be transferred to the new transistor. Be careful to insert the leads into the proper eyelets. Do not use excessive heat on the leads—let the heat go to the eyelet instead.

When making replacements, standard types can be used provided they are screened beyond the manufacturer's routine specifications. This is necessary because transistors of a given type vary far more widely than do tubes. The requirements for each transistor are given in the parts list with the schematic diagram. No screening will be necessary for transistors obtained from Dynaco if the application (Q-number) or the Dynaco part number is specified.

While the parts list does not show all of the possible transistor options, Q1, Q2 and Q3 are selected for low noise, low leakage and high Beta. Q4 is a high Beta selection from the 2N3053 type. While almost any low power *npn* transistor can be temporarily substituted for Q1, Q2 or Q3, optimum performance will not be assured unless all specifications are met.

### FACTORY SERVICE AND WARRANTY

The PAT-4 has been designed to provide reliable operation for a long time when it has been properly assembled and used. Nonetheless, through damage in transit, faulty kit assembly, or human error, service may sometimes be required.

To provide fast, reliable service, Dynaco has authorized service facilities in the U.S. and Canada, in addition to its factory service facility. These stations are authorized to make repairs in or out of warranty under the terms below. A current list of these facilities is available on request.

It is the owner's responsibility to take or send the unit freight prepaid to the service station. In the event you incorrectly diagnose which unit is faulty, you will be responsible for a check-out charge on any unit tested.

Shipment should be made via United Parcel Service or Bus Package Express (or CN or CP Express in Canada) if possible. REA Express is an alternative. DO NOT USE PARCEL POST. IT IS NOT A SAFE METHOD OF SHIPPING ELECTRONIC EQUIPMENT. The service facilities cannot handle Parcel Post claims, so repairs thus incurred will be made at the owner's expense at net prices.

Pack the unit properly in the original carton with all the protective inserts. Or, double-pack it with adequate cushioning between the cartons. Insure it for \$160. Include the

following information: 1) Your name and complete shipping address (Post Office box numbers are not adequate); 2) the serial number from the cover of this manual, together with a copy of the dated bill of sale; 3) the symptoms, in brief, but complete. Specifically note any intermittent problem.

Warranties apply to the original purchaser only. They do not apply to units which have been physically or electrically abused, or used contrary to the Operating Instructions, or to units which have been modified without prior factory authorization. If you suspect a defect in the power transformer, cutting the leads too short for re-use may void its warranty.

Dynaco maintains a Technical Services Department to help you locate the source of, and possibly correct a problem yourself. You may write or telephone. When writing, include the serial number, and describe any tests you have performed.

The components of a PAT-4 kit are warranted against manufacturing defects for one full year from the purchase date. If a defective component is found in a completed circuit board, or kit, simply return that individual part to the factory prepaid, and it will be replaced at no charge. Local service stations are not obligated to supply separate parts.

If you cannot locate the source of the difficulty, ship the entire PAT-4 to the nearest service station. Parts in warranty will be replaced at no charge, although a nominal service fee (currently \$10.00) will be charged for the labor to diagnose, correct, and test the unit to ensure that it meets factory specifications.

Shipping charges to and from the service facility are the owner's responsibility. Units will normally be returned on a COD basis via UPS. A 90 day warranty is provided on the service work performed, including shipment both ways, labor and parts.

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

After the warranty period Dynaco establishes maximum labor fees which may be charged by its service facilities (plus the cost of parts, and shipping fees) without prior approval by the owner. This current PAT-4 fee is \$10.00. Dynaco reserves the right to limit the service facility or the established fees to two years from the date of purchase.

Dynaco cannot assume responsibility for service at other than Dynaco authorized service facilities. Dynaco assumes no liability or responsibility for damages or injuries sustained in the assembly or operation of this equipment.

### PARTS LIST

Parts of similar type which do not change performance will sometimes be included as a matter of expediency. This will account for slight variations in value and appearance.

	PART #
1 Chassis	711024
1 Back panel	711025
1 Cover	711022
1 Front plate, gold	769018
2 Circuit board assembly, PC-16	556016
1 Selector switch	334602
1 Filter switch	334603
1 Power transformer 10415	464018
1 Line Cord	322092
2 Shielded audio cable	321072
1 Wire, hookup, black	
1 Wire, hookup, green	
1 Wire, hookup, red	
1 Capacitor, electrolytic, C-29	294228
1 Bracket, 1 3/8" diameter	717001
2 Bracket, "U" shape	717010
2 Knob, large with set screw	764186
2 Knob, small solid with set screw	764185
2 Knob, small dual with 2 set screws front rear	764234 764235
2 Socket strip, 5 inputs	355005
4 Socket strip, 3 inputs	355003
1 Terminal strip, 5 lugs	375002
1 Terminal strip, 2 lugs	372002
1 250 K dual volume control	177254
1 220 K dual balance control	167224
1 40 K dual treble control	161403
1 50 K dual bass control	161503
1 Switch, power, lighted rocker	334001
5 Switch, rocker, DPDT	334005
2 Circuit module, PEC, 5 leads	555005
2 Jacks, phone	355014
1 Fuse holder with hardware	341001
2 AC outlet, black	351001
2 AC outlet, red	351002

### ENVELOPE #1

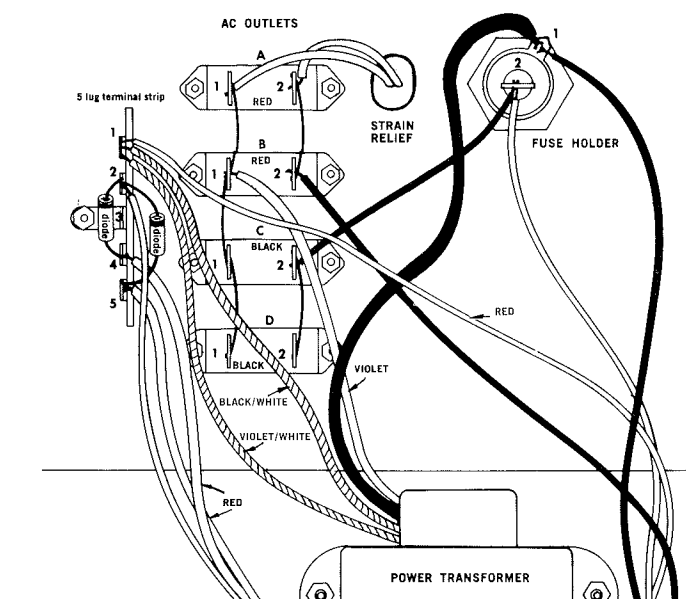
4 Foot, rubber	859001
1 Fuse, 1/10 amp, slo-blo	342101
40 Lockwasher, #4	617205
10 Lockwasher, #6	617305
2 Lockwasher, 3/8"	617165
2 Lug, ground	639308
42 Nut, hexagonal, #4-40	614245
11 Nut, hexagonal, #6-32	614355
11 Nut, hexagonal, 3/8"	614065
2 Plug, phono	361044
54 Screw, machine, #4-40 x 1/4"	611245
11 Screw, machine, #6-32 x 1/2"	611385
9 Screw, sheet metal, #6 brass	612339
1 Strain relief, plastic	895001
2 Washer, flat 3/8"	616165

### ENVELOPE #2

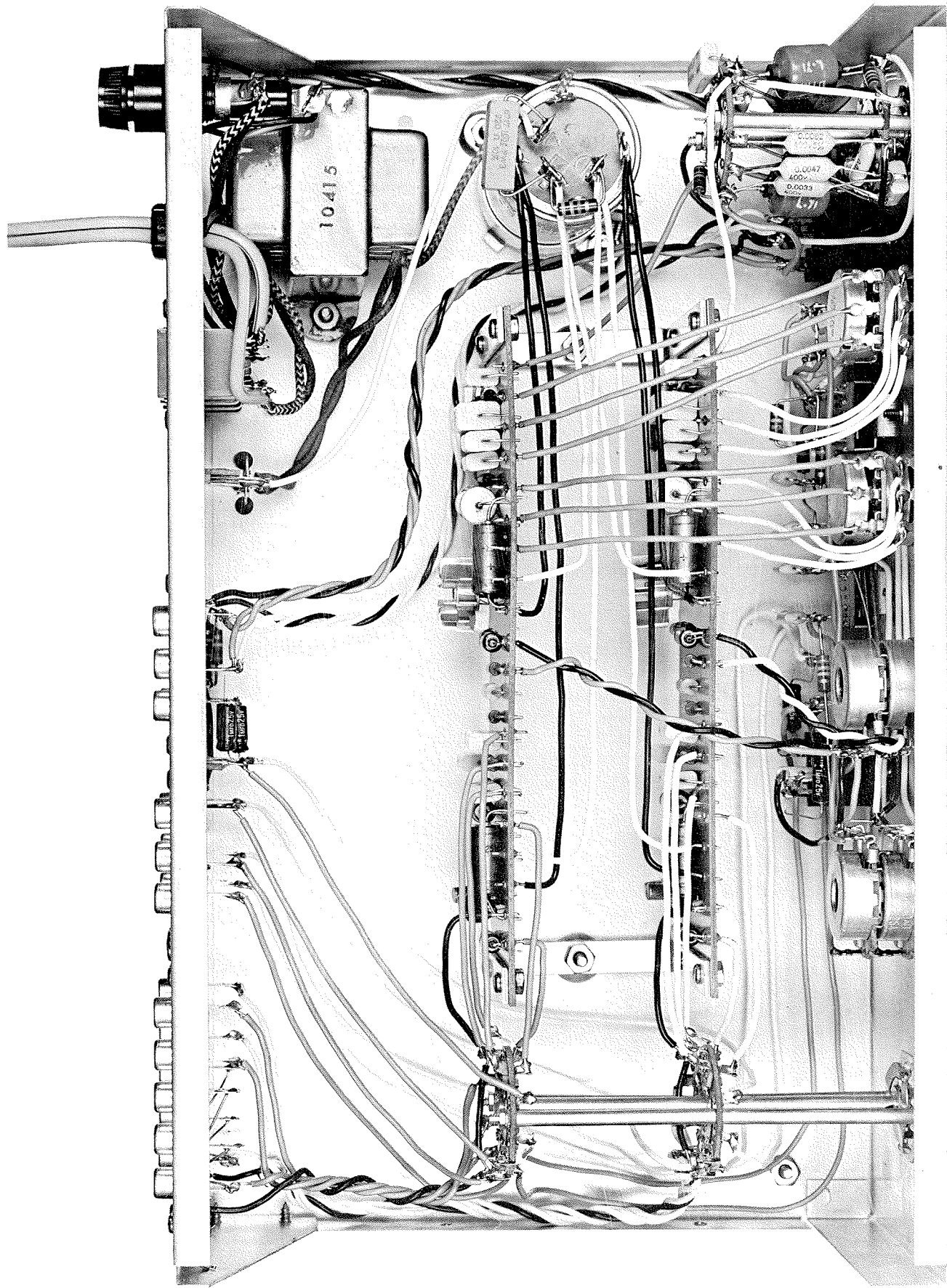
2 Rectifier diode, 200 ma, 200 prv	544012
<i>Capacitors</i>	
2 .01 mfd mylar	265103
1 .02 mfd disc	227203
2 .022 mfd mylar	265223
4 1.0 mfd tubular electrolytic	283105
<i>Resistors</i>	
1 3,300 ohm (orange-orange-red)	113332
4 10,000 ohm (brown-black-orange)	113103
2 18,000 ohm (brown-gray-orange)	113183
1 7,500 ohm (violet-green-red)	113752
1 220 ohm, 3 watt	120221

### ENVELOPE #3

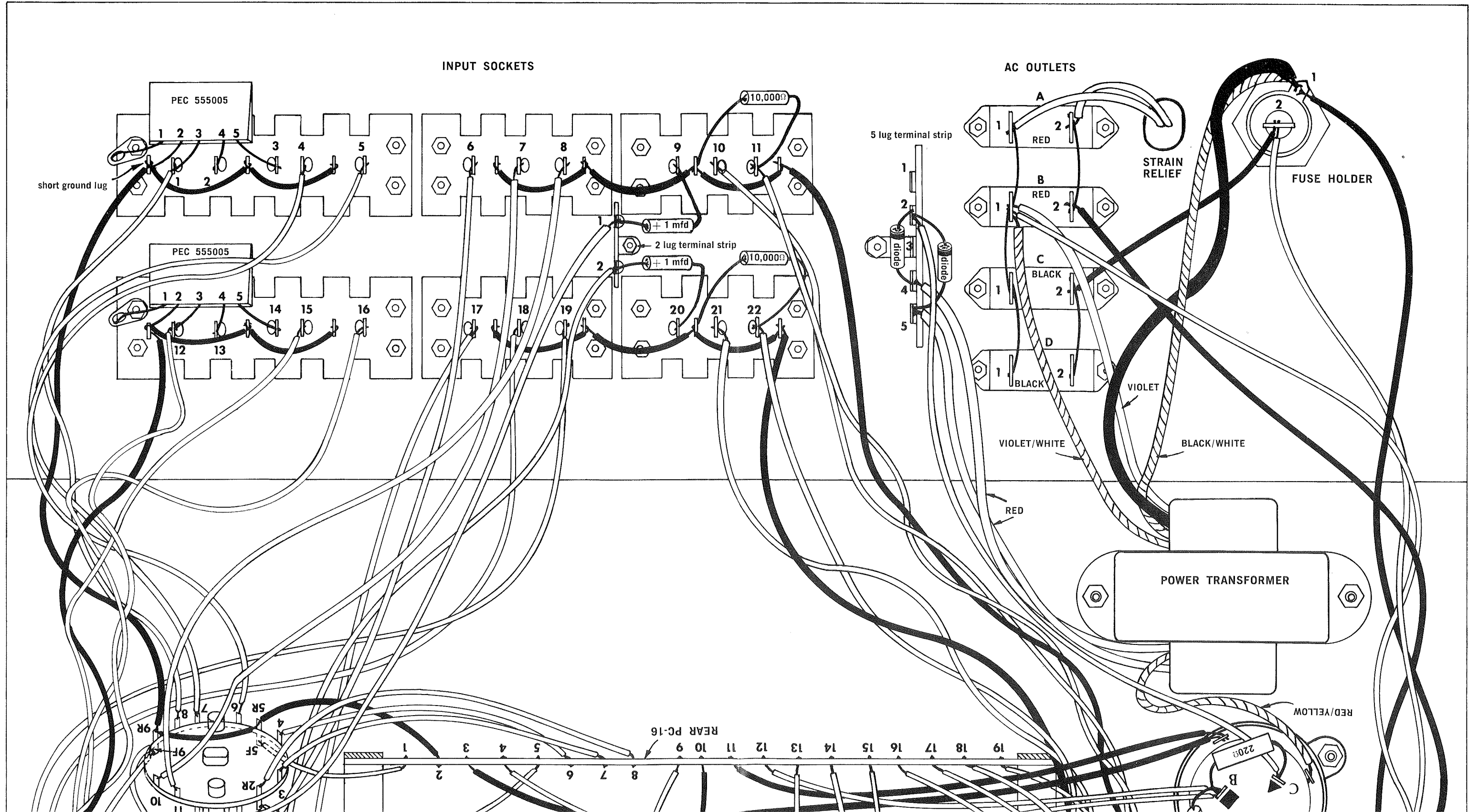
2 Choke coil, L-71	422530
<i>Capacitors</i>	
2 .0033 mfd mylar	265332
2 .0047 mfd mylar	266472
2 .0082 mfd mylar	266822
2 .01 mfd mylar	265103
2 .015 mfd mylar	265153
2 .027 mfd mylar	266273
<i>Resistors</i>	
4 15,000 ohm (brown-green-orange)	113153
2 18,000 ohm (brown-gray-orange)	113183

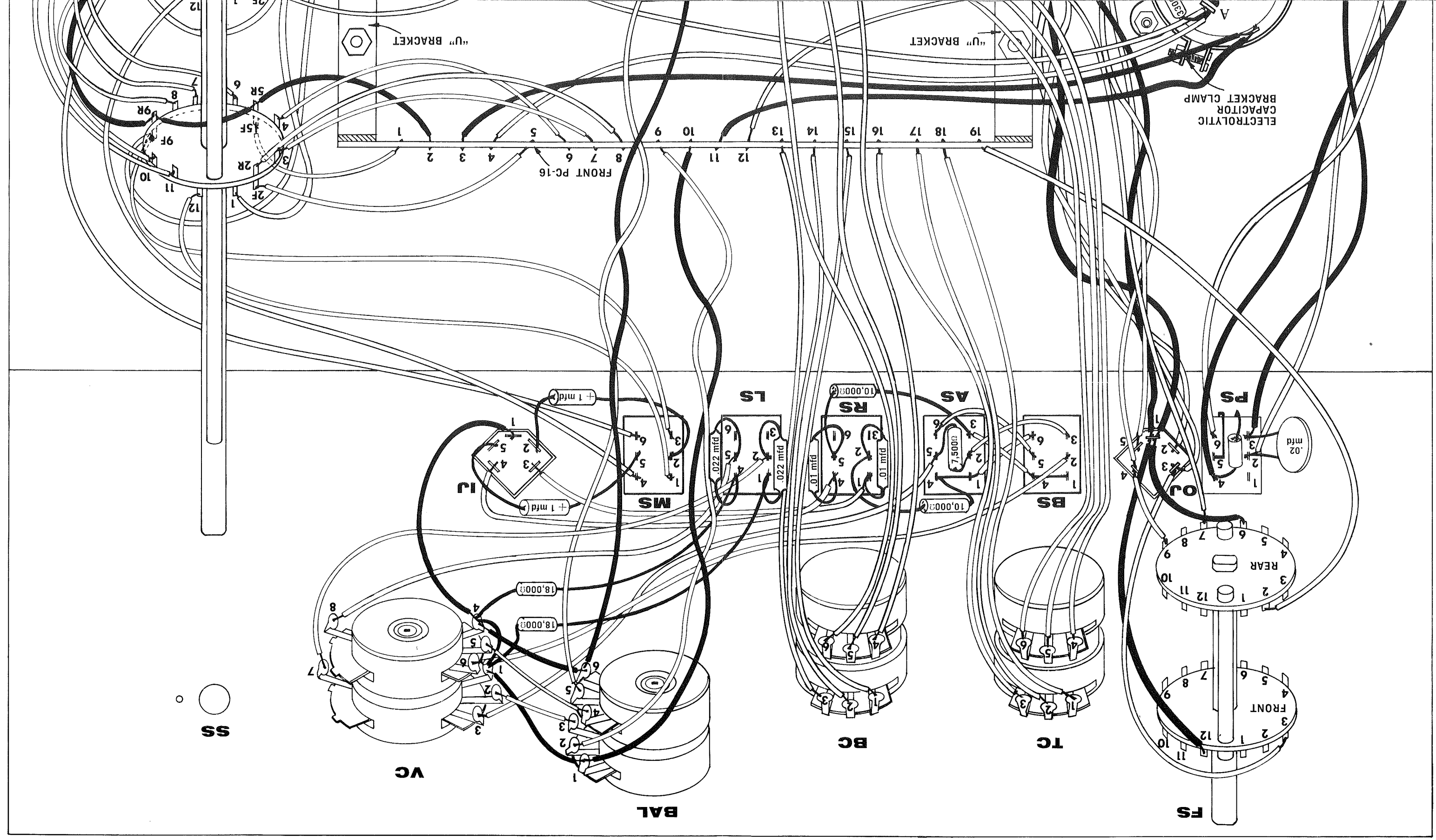
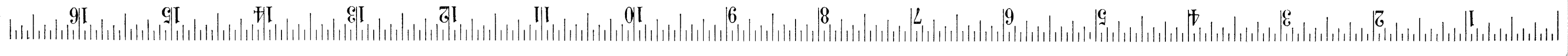


WIRING FOR 240 VOLT AC LINE



# PICTORIAL DIAGRAM





"U" BRACKET

"U" BRACKET

ELECTROLYTIC  
CAPACITOR  
BRACKET CLAMP

FRONT PC-16

SS

VC

BAL

MS

IU

LS

BC

RS

AS

BS

TC

PS

OU

FS

FRONT

REAR