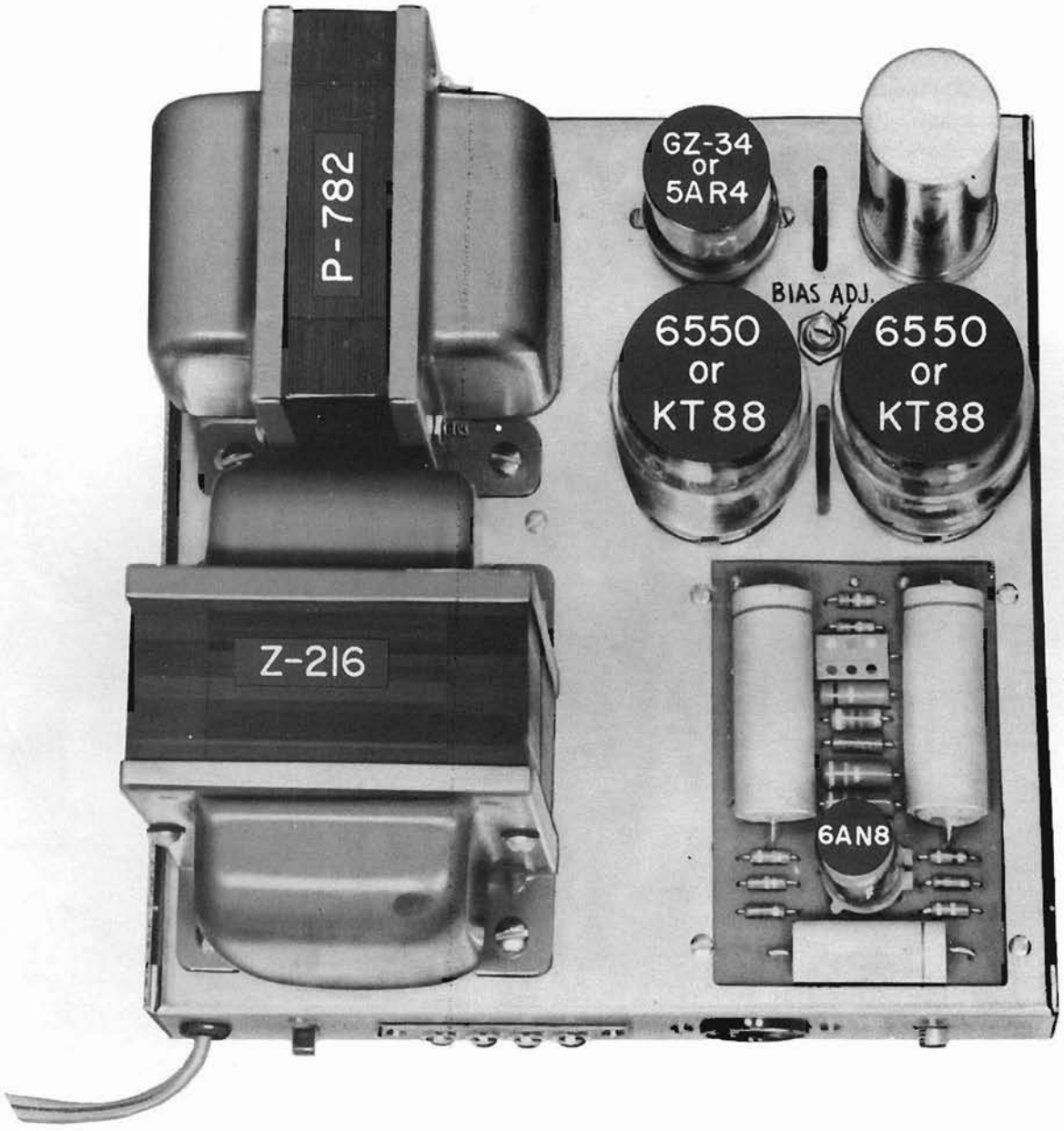
dynaco MARK III

SERIAL NUMBER

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



PATENTED

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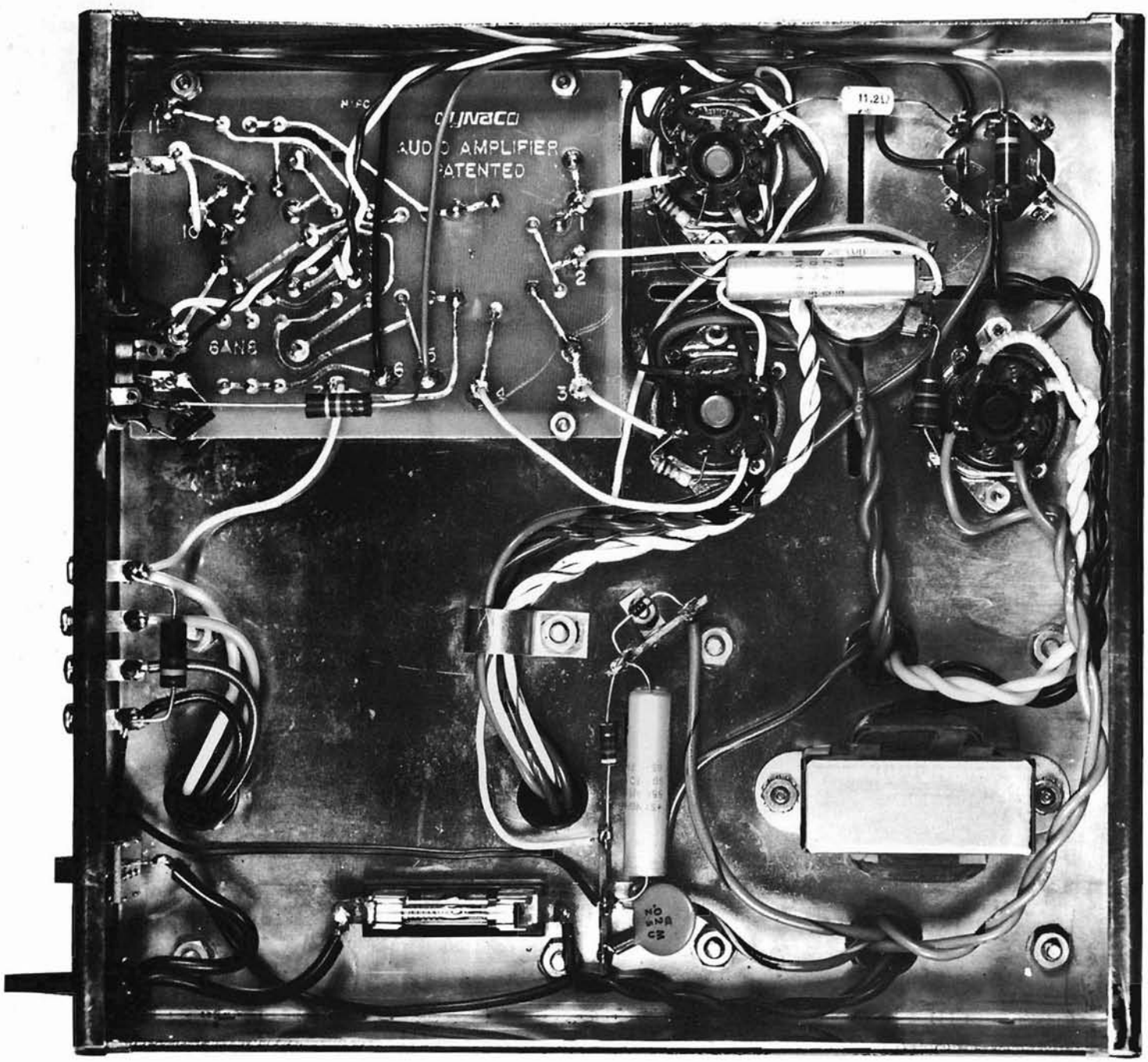
dynaco INC. COLES ROAD & CAMDEN AVENUE / POST OFFICE BOX 88
BLACKWOOD, N. J. 08012, U.S.A.


DYNACO
AUDIO AMPLIFIER
PATENTED
6AN8
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THE DYNAKIT MARK III

DESCRIPTION

Your Dynakit Mark III is a complete 50 watt power amplifier kit which offers the highest possible fidelity, at low cost and in a compact arrangement. It uses a circuit of outstanding performance characteristics, along with top quality parts, including the Dynaco Z-216 output transformer—the finest available. The measured specifications show that the Dynakit is a amplifier of unequalled performance, and its listening quality is also unrivalled by any regardless of price.

The design features of your Dynakit which contribute to its superior listening quality do not show up in the usual steady-state laboratory specifications. For example, the Dynakit does not exhibit bounce and flutter when pulsed because of its wide margin of stability. The Dynakit, unlike other amplifiers, has been designed to provide its specified performance on a loudspeaker load, not just a resistive load as in the laboratory. In particular, the connection of a loudspeaker does not distort the high frequency square wave performance. In addition, the Dynakit's power handling capabilities are maintained over the entire audio band without the sharp rise in distortion which characterizes most amplifiers at the low and high frequencies.

The Mark III uses a novel and simple circuit. A pentode voltage amplifier, with parameters adjusted for minimum distortion, is directly coupled to a cathodyne phase inverter. High frequency compensation is employed in a capacitive feedback loop, which corrects the inherent unbalance of this type of phase inverter. The inverter drives the output tubes which are operated with fixed bias. The connection of the output tubes includes a small percentage of screen loading which improves the regulation of the stage and makes it comparatively uncritical of load impedance. The impedance match and bias conditions utilized in the output stage provide minimum distortion operation over a very wide dynamic range. In addition, 20 db of negative voltage feedback lowers the distortion to an unmeasurable proportion at normal listening levels and to less than 1% IM at 60 watts output.

Phase compensation at both high and low frequencies is incorporated into the circuit arrangement to provide a wide margin of stability and to make construction uncritical. This feature of the design means that there is no tendency toward motorboating or oscillation under any conditions of use.

SPECIFICATIONS

Power Output Rating	In accordance with F.T.C. rating requirements, including specified preconditioning, 50 watts average continuous power output into 4, 8, or 16 ohms at any frequency between 50 Hz and 10,000 Hz at less than 1% total harmonic distortion. Distortion decreases at lower power levels.
Intermodulation Distortion	Less than 1% at any power level up to 60 watts into 8 ohms with any conventional combination of test frequencies. Distortion decreases at lower power levels.
Frequency Response	±0.5 dB from 6 Hz to 60 kHz at 1 watt into 8 ohms. ±0.1 dB from 20 Hz to 20 kHz at any power level between 1 milliwatt and 60 watts into 8 ohms.
Square Wave Response	Essentially undistorted 20 Hz to 20 kHz on loudspeaker load.
Input Impedance	500,000 ohms.
Sensitivity	1.6 volts rms input for 60 watts output.
Hum and Noise	Better than 90 db below rated output.
Damping Factor	15.
Output Impedances	4, 8, or 16 ohms.
Tubes	6550 (2), 6AN8, GZ-34.
Size	9" by 9" by 6¾" high.
Net Weight	28 pounds.
Maximum Power Consumption	140 watts.

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

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

ASSEMBLY INSTRUCTIONS

Assembly of the Mark III is exceptionally simple when compared to other kits. The preassembled printed circuit board has saved you about half of the work, and the assembly that remains is in an open, uncluttered layout that makes wiring easy. The construction time will be only a few hours, but it is best to work slowly and carefully rather than worry about the time.

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

Components such as resistors and capacitors are individually marked with their values, or with a color code. The color code will be given in the instructions when needed. The first color band is nearest the end. Only the first 3 colors are significant.

Have the proper tools at hand before starting assembly. You will need a pencil-type soldering iron of 30- to 60-watt rating with a small tip, long nosed pliers, diagonal cutting pliers, a medium-sized screwdriver, and 60/40 *rosin core* solder not larger than 1/16" diameter. You will also find a damp sponge or cloth helpful to wipe the tip of the iron clean periodically. An inexpensive wire stripping tool is helpful, but some people prefer a single-edged razor blade for removing the insulation.

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

There are four steps to making a good solder connection:

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

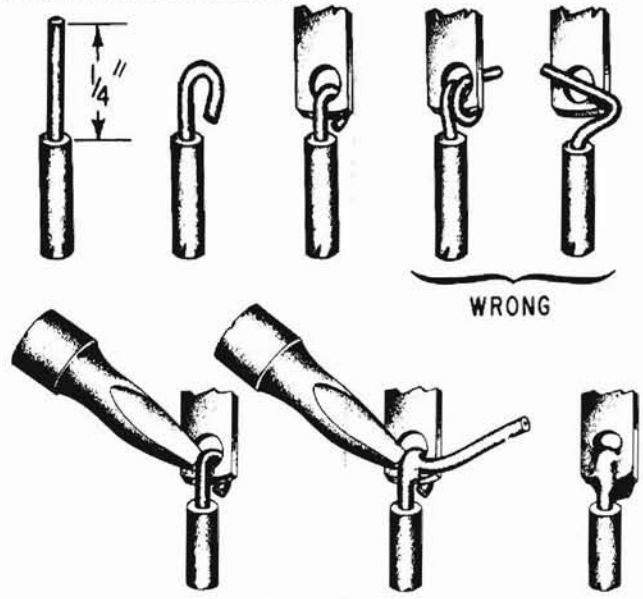
ALL SOLDERING MUST BE DONE WITH A GOOD GRADE OF ROSIN CORE SOLDER.

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

If you have a soldering gun, it should be used with care, especially when working on the circuit boards. A soldering gun can provide more heat than is necessary, with some risk that an unskilled user might damage the board, and because it requires some time to heat each time the trigger is squeezed, many users tend to make poor solder connections simply because they do not wait long enough for it to reach its operating temperature each time.

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

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



WIRING THE KIT

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

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

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

Many of the wiring steps will call for "preparing" a wire of a certain length. This involves cutting the necessary length of wire and stripping 1/4 inch of insulation from each end. This is most easily done with wirestrippers, but diagonal cutters can be used if you are careful not to nick the wire and weaken it. With stranded wire such as transformer leads and line cords, be particularly careful not to cut the strands when stripping the ends.

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

ASSEMBLY

The following components should be mounted as shown in the pictorial diagram using #4 x ¼" screws. A lockwasher should be used under the nut, and screws should be inserted from the outside of the chassis.

1( ) Screw terminal strip (mount so that insulating material is *outside* the chassis).

2( ) Slide switch (note lug position in pictorial diagram). Use long nose pliers to hold the nut in place while turning the screw until the thread catches.

3( ) Input socket.

4( ) Four octal sockets (note orientation of keyways in the socket center hole).

5( ) Install the 2-lug terminal strip (no center terminal) near the center of the chassis, and the 3-lug terminal strip near the edge. See pictorial diagram for proper orientation.

6( ) Mount the fuse holder as shown in the pictorial diagram using a #4 x ⅜" screw with the lockwasher and nut recessed into the body of the fuse holder.

7( ) Mount the potentiometer. Place a ⅜" lockwasher on the shaft first, then mount the potentiometer on the chassis followed by ⅜" nut. See the pictorial diagram for correct orientation of potentiometer lugs.

8( ) Select the silicon diode and trim each lead to ½". One end (the cathode) will be marked with a stripe, arrow head, or colored tip. Connect this marked end to lug terminal #5. Connect the other end to lug terminal #4. See pictorial diagram.

9( ) Mount the quadruple section electrolytic capacitor in the cut-out provided. Note that the orientation of the capacitor is indicated by the engraved markings at the base of each lug. The lug marked with a semicircle should be placed in the position indicated as #1 on the pictorial diagram. Insert the mounting tabs fully and twist each tab ¼ turn to lock it in place. Twist tightly so that the can is held firmly against the chassis and does not move when wiggled.

10( ) Prepare a 2½" wire. Connect it from the ground lug on V1 socket (use the lug nearest pin #2) (S) to the mounting tab on the electrolytic capacitor (see pictorial diagram).

11( ) Mount the C-354 choke (part #423354) using #8 screws, nuts, and lockwashers. Note that the two leads should be on the side of choke which faces toward the quadruple section capacitor.

12( ) Mount the Z-216 output transformer using #8 screws, nuts and lockwashers. See the pictorial diagram for correct placement of the transformer leads below the chassis. Use the cable clamp and place the leads under it as shown in the pictorial diagram.

Please note on the pictorial diagram the identification of the various parts and their respective terminal numbers. These identifications will be used when specifying connections.

Make the following connections from the output transformer:

13( ) Connect the blue wire to pin #3 of V2 (S).

14( ) Connect the green wire to pin #4 of V2.

15( ) Connect the blue-white wire to pin #3 of V1 (S).

16( ) Connect the green-white wire to pin #4 of V1 (S).

17( ) Connect the red wire to capacitor lug #2.

18( ) Connect the yellow wire to screw terminal #4.

19( ) Connect the orange wire to screw terminal #3 (S).

20( ) Connect the brown wire to screw terminal #2 (S).

21( ) Connect the black wire to screw terminal #1.

22( ) Mount the P-782 power transformer with #8 screws, nuts and lockwashers. See the pictorial diagram for correct placement of the transformer leads below the chassis.

Make the following connections from the power transformer:

23( ) Connect the long black wire to switch lug #1 (S).

24( ) Connect the short black wire to closest lug on fuse holder (S).

25( ) Connect one red wire to pin #4 of V3 (S).

26( ) Connect the other red wire to pin #6 of V3 (S).

27( ) Connect one yellow wire to pin #2 of V3 (S).

28( ) Connect the other yellow wire to pin #8 of V3.

29( ) Connect the red-yellow wire to lug terminal #2.

30( ) Connect the red-black wire to lug terminal #5 of the 2-lug terminal strip. (S-2). This is the cathode (marked) end of the diode.

31( ) Twist the two green wires together and connect one to pin #2 and the other to pin #7 of V2.

32( ) Connect the yellow-green wire to lug terminal #1.

33( ) Prepare two 5" wires. Connect one end of one wire to pin #2 on V2 (S) and one end of the second wire to pin #7 on V2 (S). Twist these two wires together and connect the free end of one wire to pin #2 on V1 and the free end of the second wire to pin #7 on V1.

34( ) Cut both leads on the .02 mf capacitor to ½" each and connect it from lug terminal #1 (S-2) to lug terminal #2.

35( ) Prepare a 5" wire, except strip ½" of insulation from each end. Pass one end through pin #8 of V1 and connect it to pin #1 of V1. Pass the other end through pin #8 of V2, and connect it to pin #1 of V2. Solder both pins on V2. Place this wire down against the chassis.

36( ) Connect the 11.2 ohm resistor from pin #1 on V1 (S-2) to the electrolytic capacitor mounting tab (S-2). See pictorial.

37( ) Prepare an 8½" wire and connect it from pin #8 on V1 (S-2) to pin #8 on the preamplifier power socket (S).

38( ) Cut both leads on a 1000 ohm resistor (brown-black-red) to ½" each and connect it from pin #5 on V2 (S) to pin #6 on V2.

39( ) Cut both leads on a second 1000 ohm resistor (brown-black-red) to ½" each and connect it from pin #5 on V1 (S) to pin #6 on V1.

40( ) Prepare a 3¼" wire and connect it from the electrolytic capacitor lug #1 (S) to pin #8 on V3.

41( ) Connect one lead from the choke to pin #8 on V3 (S-3) and the other lead to the electrolytic capacitor lug #2.

42( ) Cut both leads on the 6800 ohm resistor (blue-gray-red) to ¾" each and connect it from electrolytic capacitor lug #2 (S-3) to electrolytic capacitor lug #4.

43( ) Cut both leads on the 18,000 ohm resistor (brown-gray-orange) to ¾" each and connect it from potentiometer lug #1 (S) to the ground lug on V3 socket (S). See pictorial diagram.

44( ) Cut both leads on the 4700 ohm resistor (yellow-violet-red) to 1" each and connect it from lug terminal #3 to lug terminal #4.

45( ) Prepare a 7" wire and connect it from lug terminal #3 (S-2) to potentiometer lug #3 (S).

46( ) Shorten the leads appropriately on a 50 mf capacitor and connect it from potentiometer lug #2 to the ground lug on V1 socket (S). Make sure that the *positive* (+) side of the capacitor goes to ground. The capacitor is mounted over the potentiometer where it is clear of other parts.

47( ) Shorten the leads appropriately on the remaining 50 mf capacitor and connect the negative (−) side to lug terminal #4 of the 2-lug terminal strip. (S-3). Connect the positive (+) side to lug terminal #2 of the 3-lug terminal strip. Place the capacitors so their bare leads cannot touch adjacent terminals or hardware.

CONNECTING THE PC-1 PRINTED CIRCUIT BOARD

When soldering a wire to an eyelet on the printed circuit board, first "tin" the wire by applying the iron to the bared end and, once the wire is hot, touch solder to the wire so that a small amount of solder coats the wire. Then you may wish to add a bit more solder to the solder-filled eyelet. Then heat the eyelet and allow the wire to enter, but be careful that you *do not push the wire all the way into the eyelet up to the insulation.* If you do, you will not be able to see if you have made a secure connection, or if possibly more solder is needed to provide a smooth flow from the wire to the eyelet and onto the circuitry on the board.

1( ) Mount the printed circuit board from underneath the chassis as shown in the pictorial diagram with the tube socket close to the input socket. Use #4 screws, nuts and lockwashers.

2( ) Prepare a 3¾" wire and connect it from potentiometer lug #2 (S-2) to eyelet #2 (S).

3( ) Prepare a 1¼" wire and connect it from pin #6 on V1 (S-2) to eyelet #1 (S).

4( ) Prepare to 1½" wire and connect it from pin #6 on V2 (S-2) to eyelet #3 (S).

5( ) Prepare a 3¼" wire and connect it from screw terminal lug #4 to eyelet #7 (S).

6( ) Prepare another 3¼" wire and connect it from pin #4 on V2 (S-2) to eyelet #4 (S).

7( ) Prepare a 9½" wire and connect it from the electrolytic capacitor lug #4 (S-2) to eyelet #5 (S). Place the wire as shown in the pictorial diagram.

8( ) Prepare another 9½" wire and connect it from the electrolytic capacitor lug #3 (S) to eyelet #6 (S). Place the wire as shown in the pictorial diagram.

9( ) Prepare two 7" wires. Connect one end of one wire to pin #2 on V1 (S-2) and one end of the second wire to pin #7 on V1 (S-2). Twist these wires together for almost their full length and connect the free end of one wire to eyelet #8 (S) and the free end of the remaining wire to eyelet #9 (S). Place the wires as shown in the pictorial diagram.

10( ) Prepare a 1¼" wire and connect it from input socket *center* lug (S) to eyelet #10 (S).

11( ) Prepare a 1½" wire and connect it from input socket *side* lug (S) to eyelet #11 (S).

12( ) Prepare a 5" wire and connect it from screw terminal lug #1 to lug terminal #2 (S-4).

13( ) Shorten the leads appropriately on the 680 ohm resistor (blue-gray-brown) and connect it from screw terminal lug #1 (S-3) to screw terminal lug #4 (S-3).

14( ) Insert the rubber grommet in the ⅜" chassis hole next to the slide switch.

15( ) Insert the free end of the line cord through the grommet from the outside toward the inside.

16( ) Tie a knot in the line cord about 2½" from the free end, and separate the two sections of the line cord up to the knot.

17( ) Connect one end of the line cord to the unused lug on the fuse holder (S).

18( ) Connect the other end of the line cord to switch lug #2 (S).

19( ) Insert the fuse in fuse holder.

The three final steps include the connections which furnish power to the DYNACO Monophonic tube preamplifier (no longer made). If you are going to use this preamplifier, complete these steps. If you plan to use another preamplifier, such as any of our stereo preamplifiers, which are all self-powered, you may skip this section and your Mark III wiring is completed.

1( ) Prepare two 3½" wires. Connect one end of one wire to eyelet #8 on the printed circuit board (S-2) and one end of the second wire to eyelet #9 on the circuit board (S-2). Twist these wires together for almost their full length and connect the free end of one wire to the preamp power socket pin #1 (S) and the free end of the remaining wire to the power socket pin #2 (S).

2( ) Cut both leads on the 10 ohm resistor (brown-black-black) to ½" each and connect it from power socket pin #3 (S) to the closest ground lug on the side of the socket (S).

3( ) Shorten the leads on the 22,000 ohm resistor (red-red-orange) a little and connect it from printed circuit board eyelet #5 (S-2) to power socket pin #5 (S).

You have now completed the wiring. It is now wise to go back and check all connections, and for any possibility of bare wires contacting other than the intended terminal. We suggest that you test the security of each solder connection by pulling at each wire going to the connection with long nosed pliers. Any suspect connections should be resoldered with a small amount of additional solder. Turn the unit upside down and shake out any bits of solder, pieces of wire or insulation.

INITIAL ADJUSTMENT

Plug in the 6550 (KT-88) output tubes in V1 and V2, and also the 6AN8 into the printed circuit board socket. *Do not plug in the GZ-34 (5AR4) rectifier tube.* Plug the line cord into a conventional 120 volt ac line and push the switch on. While the tubes are becoming warm, set the bias potentiometer to its center of rotation. This is approximately the correct setting and may be used as an *emergency* operating adjustment if no test instruments are available. HOWEVER, OPERATION WITHOUT CORRECT BIAS SETTING (BIASET) IS NOT RECOMMENDED, FOR IT WILL RESULT IN POOR PERFORMANCE AND SHORT LIFE TO THE COMPONENTS IN THE AMPLIFIER.

Your Mark III includes a unique way of setting the bias on the output tubes, which greatly simplifies the adjustment. We call it Biaset, on which patents have been granted. It can be done with the simplest and least expensive type of dc meter so long as it has a rating of 1000 ohms per volt or higher. The correct setting of the bias provides a total cathode current of 140 ma for the pair of output tubes. This current through the precision 11.2 ohm resistor produces a voltage drop of exactly 1.56 volts dc, and this voltage is checked at pin #8 on the preamplifier power socket. 1.56 volts is also the voltage furnished by an ordinary "D" type flashlight dry cell. Thus any *fresh* cell of this type can be used for an accurate reference standard for setting the bias.

The procedure for setting the bias is to measure the voltage output of a "D" type dry cell and note the reading on your meter. Then insert the positive meter probe into pin #8 on the preamplifier power socket (the chassis is marked *1.56 v Biaset*). The negative meter probe should be connected to the chassis of the amplifier. Plug in the GZ-34 (5AR4) rectifier tube and in about 10 seconds there will be a current flow which will cause a meter deflection. As the rectifier warms up the reading will increase. The Biaset control should be adjusted until the meter reading at pin #8 is the same as across the dry cell (this reading will be 1.56 volts dc if the meter is accurate). There may be some drifting of the reading as the tubes heat, but this will stabilize within 15 minutes after which no further adjustment is required at this time. Since this voltage is in direct proportion to the line variations, it is normal for there to be small changes. These will have no effect on performance.

Although the adjustment of Biaset is semi-permanent, it is good procedure to check this voltage three or four times during the useful life of the output tubes. Of course, this must be reset at times of output tube replacement or other types of repair or maintenance work.

The Biaset adjustment must be made when no signal is going through the amplifier, for it is normal for this voltage measurement to increase and vary considerably with signal going through the amplifier.

If in the course of setting Biaset it is found that the control range of the potentiometer is insufficient to obtain the correct setting, do not operate the amplifier until the cause of the difficulty has been established. Operation with incorrect Biaset can lead to damage to the output tubes and/or to other components.

PROTECTIVE COVER

The perforated cover has been designed to be both functional and good looking. The normal heat dissipation of the 6550 (KT-88) output tubes is very great and because of the exposed printed circuit board, there is moderately high voltage on the top of the chassis. The cover should therefore be used at all times. Also the amplifier should be placed where there is adequate ventilation. If your Mark III is placed on a shelf, leave air space all around so that the "chimney effect" of the cover can function properly. *NEVER* place magazines, records or other objects on top of the amplifier.

The cover and base are affixed by first putting the base in place. Place the chassis upright on the base and slip the cover in place (screw holes in the cover should be lined up with chassis and base holes). Then lock together the base, cover and chassis with four sheet metal screws.

PREAMPLIFIERS AND CONNECTIONS

The Dynakit Mark III may be used with the Dynaco PAM-1 mono preamplifier if the power takeoff socket on the amplifier is wired for this preamp. In this case, the octal (8 pin) plug supplied with the PAM-1 is plugged into the power takeoff socket on the Mark III, and a shielded audio cable is connected from the *Audio Out* socket on the preamplifier to the *Input* on the amplifier. The line cord on the Mark III is connected to one of the *Switched* AC outlets on the preamp, and then the line cord on the preamp is connected to a convenient wall outlet. If the power switch on the amplifier is kept on, the power switch on the PAM-1 will turn both units on and off together.

If the Mark III is used with a self-powered preamplifier (this means all brands of stereo preamps, including Dynaco units), the power takeoff socket on the amplifier is simply unused (except of course for measuring Biaset). A shielded audio cable is connected from the preamplifier output to the *Input* on the amplifier. The line cord on the Mark III is connected to one of the *Switched* outlets on the preamp, and then the line cord on the preamp is connected to a nearby wall outlet. Turn the power switch on in the amplifier and thereafter the power switch on the preamp will turn both units on and off together.

It should be noted here that it is perfectly safe to use only one channel of any tube or solid state preamplifier without connecting anything to the unused output. In the case of Dynaco stereo preamplifiers, we suggest using the Channel A (left) output, set the mode switch to mono and turn the balance control fully counterclockwise (left).

A tuner or tape deck with playback volume controls may be connected directly to the input of the Mark III without the benefit of a preamplifier, if desired, provided the sound source has enough gain to drive the amplifier properly. The amplifier requires 1.6 volts for full output and therefore the tuner or tape deck should put out somewhat in excess of that amount.

A loudspeaker or speaker system is connected to the C (common) and 4, 8 or 16 ohm terminals on the output of the amplifier.

IN CASE OF TROUBLE

Your Mark III has a well-earned reputation for being trouble free. However, a mistake in assembly or a defective component can affect its performance or make it inoperative. Some trouble-shooting procedures are suggested in case difficulty is encountered. Naturally the wiring should be checked step-by-step to make certain that all the connections have been made in accordance with these instructions. Since many times the builder will tend to make the same error in checking his work as when building the amplifier, the best procedure is to have someone familiar with the product check out your work against the instructions.

The tubes should begin to glow after a few seconds of warmup. If they do not, it is probable that there is no ac voltage getting into the amplifier, which may indicate a blown fuse.

Fuse Failure

If the fuse fails without apparent cause, you should always replace it with a 3 Ampere Slo-Blo type. Never use a larger fuse.

If the fuse fails within about 30 seconds of turning the amplifier on, remove the GZ-34 (5AR4) rectifier tube to see if this cures the problem. If it does, the rectifier may be bad and another should be tried. However, if the fuse fails immediately at turn-on even with the rectifier tube removed, there is either gross miswiring or a defective P-782 power transformer.

If the GZ-34 is not at fault, the quadruple section filter capacitor may be shorted. Generally shorts in this section of the amplifier will show up in a measurement of resistance from the capacitor sections to ground (chassis). The amplifier must be unplugged from the 120 volt line. The resistance should exceed 100,000 ohms.

Tube Failure

If one or both of the 6550 (KT-88) output tubes glow a bright red after warmup, it is possible that the tube is defective, or there may be a fault in the bias supply which supplies negative voltage to the 6550's, measurable at pin #6 of each 6550 (with a high impedance meter such as a VTVM). The actual value of the negative voltage will depend on the setting of the bias potentiometer. With the Biaset reading the correct 1.56 volts dc, the negative voltage at the output tubes should be within 20% of minus (−) 55 volts. If the two tubes have different negative voltages at pin #6, as measured by a VTVM, there is a defective component or wiring. A small difference in voltage indicates either a runaway tube or a leaking 0.25 mf coupling capacitor on the printed circuit board. If one tube has no negative voltage, there almost has to be an open connection from the bias supply to this tube.

If no meter is available, it is possible to pin down the fault with a glowing tube by switching the tubes around. If the same *socket* exhibits the glow, the fault is in the circuitry. If the same *tube* glows in the transposed position, it is more than likely a bad tube (in this case, *both* tubes are suspect).

When it becomes necessary to change output tubes, replace with a *matched pair*. Moreover, even though only one tube of a pair may be bad, we recommend that both be replaced at the same time.

6550 or KT-88 output tubes in matched pairs may be used in this amplifier. There is no substitute for the 6AN8 tube or the GZ-34 (5AR4) rectifier.

No Signal

If there is no signal coming through the amplifier, it is advisable to remove the input cable to see whether insertion of the plug makes a "thump" through the loudspeaker. If so, then there is a defective audio cable, preamplifier or in other associated equipment, but not in the amplifier. However, if there is no "thump" when inserting the plug, then the amplifier is at fault.

If a meter is available, voltage measurements should be taken and compared with the voltage chart included in these instructions. With an incoming line voltage of 120 volts ac, departures of more than 10% from the values shown indicate probable malfunctioning of some of the circuit components.

Hum and Noise

If excessive hum or noise appear, it is necessary to determine whether they occur within the amplifier, for sometimes noise in a preamplifier will be blamed on the amplifier. The simple test is to remove the cable from the input of the amplifier and see if the same noise is present. If the noise is gone with the cable removed, it is in the preceding equipment which should then be checked. If the noise remains, it is probably in the amplifier.

With the amplifier off, remove the 6AN8 and then turn the amplifier on. With this tube removed, the feedback network is cut so that the noise *should* be higher than with the tube in place. If the noise remains the same or drops with this tube out, the problem lies in the tube or circuitry surrounding this tube on the printed circuit board. First try a replacement 6AN8.

If under the above test the noise does increase, then more than likely the 6AN8 and its associated circuitry are all right. The problem then lies either in the circuitry of the output stage, which would include the output tubes themselves, or in the power supply or bias supply. Excessive hum, for instance, can be caused by the failure of the GZ-34 rectifier tube, a defective section of the quadruple section electrolytic capacitor or the bias capacitors.

Sizzling sounds through the loudspeaker may come from poor contacts between circuit elements and the chassis. Make certain that ground connections are secure, and that the mounting lugs on the electrolytic capacitor are twisted tightly enough to assure a rigid mounting.

SERVICE POLICY AND LIMITED WARRANTY

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

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

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

Shipment should be made via United Parcel Service or Bus Package Express (or CN or CP Express in Canada) wherever possible. REA Express is an alternative (sometimes Air rates are lower than surface rates). DO NOT USE PARCEL POST FOR IT IS NOT A SAFE METHOD OF SHIPPING ELECTRONIC EQUIPMENT. Neither the factory nor the service stations have the facilities to process Parcel Post claims, so should damage occur due to Parcel Post shipment, any broken or damaged parts will be replaced at the owner's expense at net prices.

Always pack the *factory-wired* unit in the original carton with all the protective inserts. If the carton is not available, the amplifier should be doubled-packed with adequate cushioning material between the cartons.

The *kit* carton is *not* adequate for shipping purposes. This carton should be double-packed with the kit carton as the inner pack.

Insure the amplifier for the full factory-wired value when shipping. You may wish to stuff paper around the tubes to protect them in shipping before affixing the cover.

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

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

Dynaco maintains a Technical Services Department to help you locate the source of, and possibly correct a problem yourself. You may write or telephone. When writing, mention the serial number of the Mark III, the other equipment you are using and any tests you have performed.

WARRANTY FOR FACTORY ASSEMBLED UNITS

The Mark III/A is warranted for a full year from the purchase date, including parts and labor and shipment costs *from* the service facility to the owner (within the U.S. or Canada). The owner is responsible for shipment *to* the service facility, and must submit a copy of the dated bill of sale. A 90 day warranty is provided on the service work performed, including shipment both ways, labor and parts.

WARRANTY FOR KIT-BUILT UNITS

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

If you cannot locate the source of the difficulty, ship the entire Mark III to the nearest authorized service station or to the factory for service. In-warranty parts will be replaced at no charge, although a nominal service fee will be charged for the labor to diagnose, correct, and test the unit to ensure that it meets factory specifications. Shipping charges to and from the service facility are the owner's responsibility. Units will be returned on a COD basis via UPS wherever possible. A 90 day warranty is provided on the service work performed, including shipment both ways, labor and parts.

The return of the printed circuit board is inadequate to assure proper service, and therefore any PC-1 board submitted for repair will be returned without sevice.

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.

SERVICE BEYOND THE WARRANTY PERIOD

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

Dynaco reserves the right to limit the service facility or the established fees to two years from the date of purchase. Dynaco assumes no liability or responsibility for damages or injuries sustained in the assembly or operation of this equipment.

PARTS LIST

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

		Part #
1	Chassis	711303
1	Bottom plate	711203
1	Cover	711103
1	Z-216 output transformer	454216
1	P-782 power transformer	464003
1	C-354 choke	423354
2	KT-88 or 6550 tubes	517007
1	GZ-34 or 5AR4 tube	514034
1	6AN8 tube	512002
1	Circuit board assembly, PC-1	557001
1	Switch, slide, SPST	331102
1	Line Cord	322092
1	Socket, input	355006
1	Terminal Strip, 4 screw	374004
1	Terminal Strip, 3 lug	373001
1	Terminal Strip, 2 lug	372002
4	Socket, octal tube	398008
1	Silicon Diode	544012
1	Potentiometer, 10,000 ohm	145103
1	Fuse, 3 amp, slo-blo	342030
1	Fuse Holder	341003
1	Wire, hookup	

Capacitors

1	Quadruple section electrolytic filter, 525 volt	298906
2	50 mf	284506
1	.02 mf disc	227203

Resistors

		Part #
1	11.2 ohm precision	120110
1	10 ohm (brown-black-black)	111100
1	680 ohm (blue-gray-brown)	114681
1	6,800 ohm (blue-gray-red)	114682
2	1000 ohm (brown-black-red)	112102
1	4700 ohm (yellow-violet-red)	113472
1	18,000 ohm (brown-gray-orange)	115183
1	22,000 ohm (red-red-orange)	115223

Hardware Envelope

1	Cable Clamp	713001
1	Grommet, rubber, ½"	895003
1	Lockwasher, ⅜"	617065
10	Lockwasher, #8	617405
21	Lockwasher, #4	617205
1	Nut, hexagonal, ⅜"	614065
10	Nut, hexagonal, #8-32	614465
21	Nut, hexagonal, #4-40	614245
1	Screw, machine, #4-40 x ⅜"	611265
4	Screw, sheet metal, #6	612365
10	Screw, machine, #8-32	611465
20	Screw, machine, #4-40 x ¼"	611245

VOLTAGE CHECK POINTS

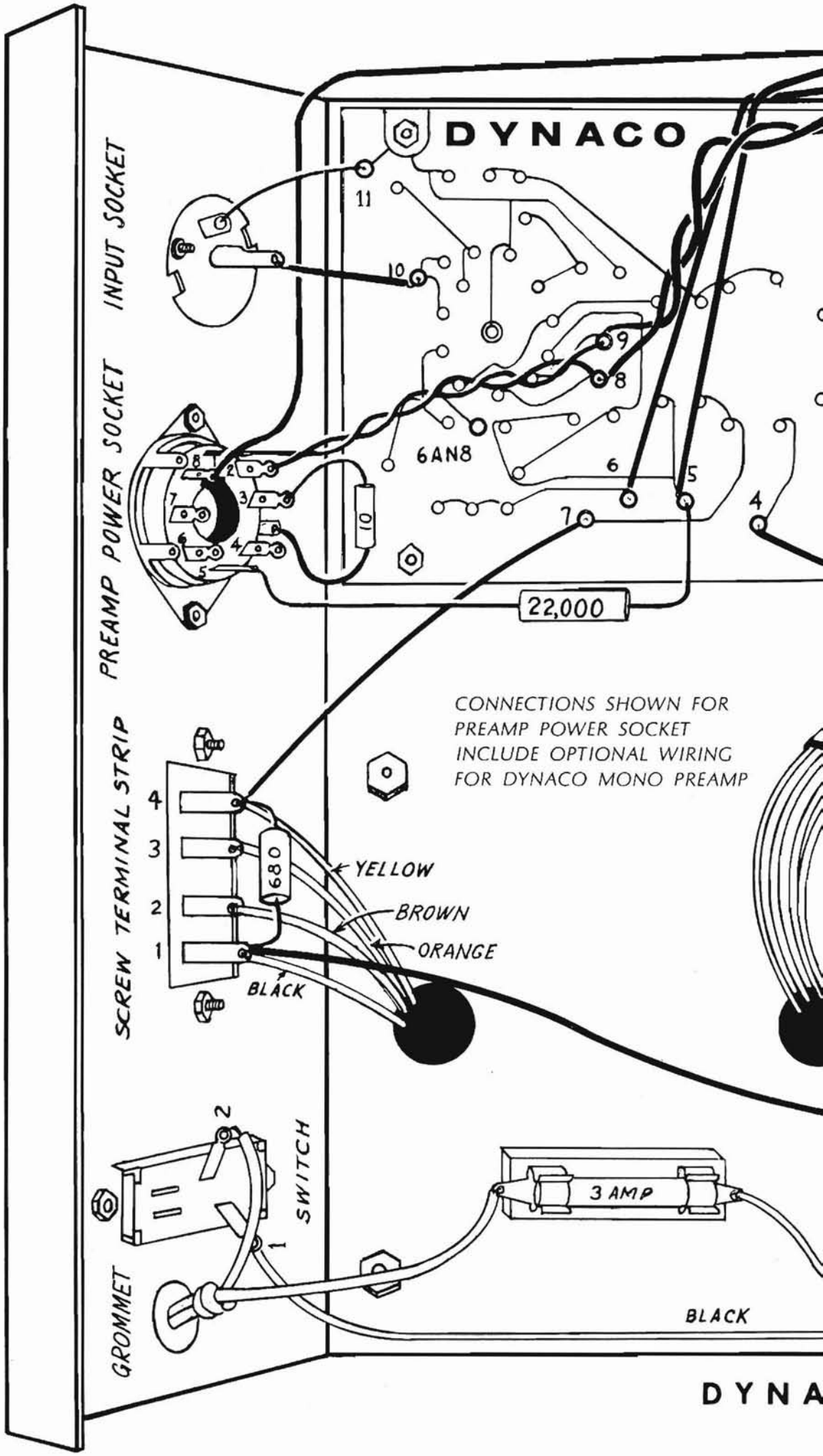
Voltages have been measured with a vacuum tube volt meter and with a 120 volt line. If a meter of lower impedance is used, some of the measurements will result in lower readings than those shown. Chassis is ground reference.

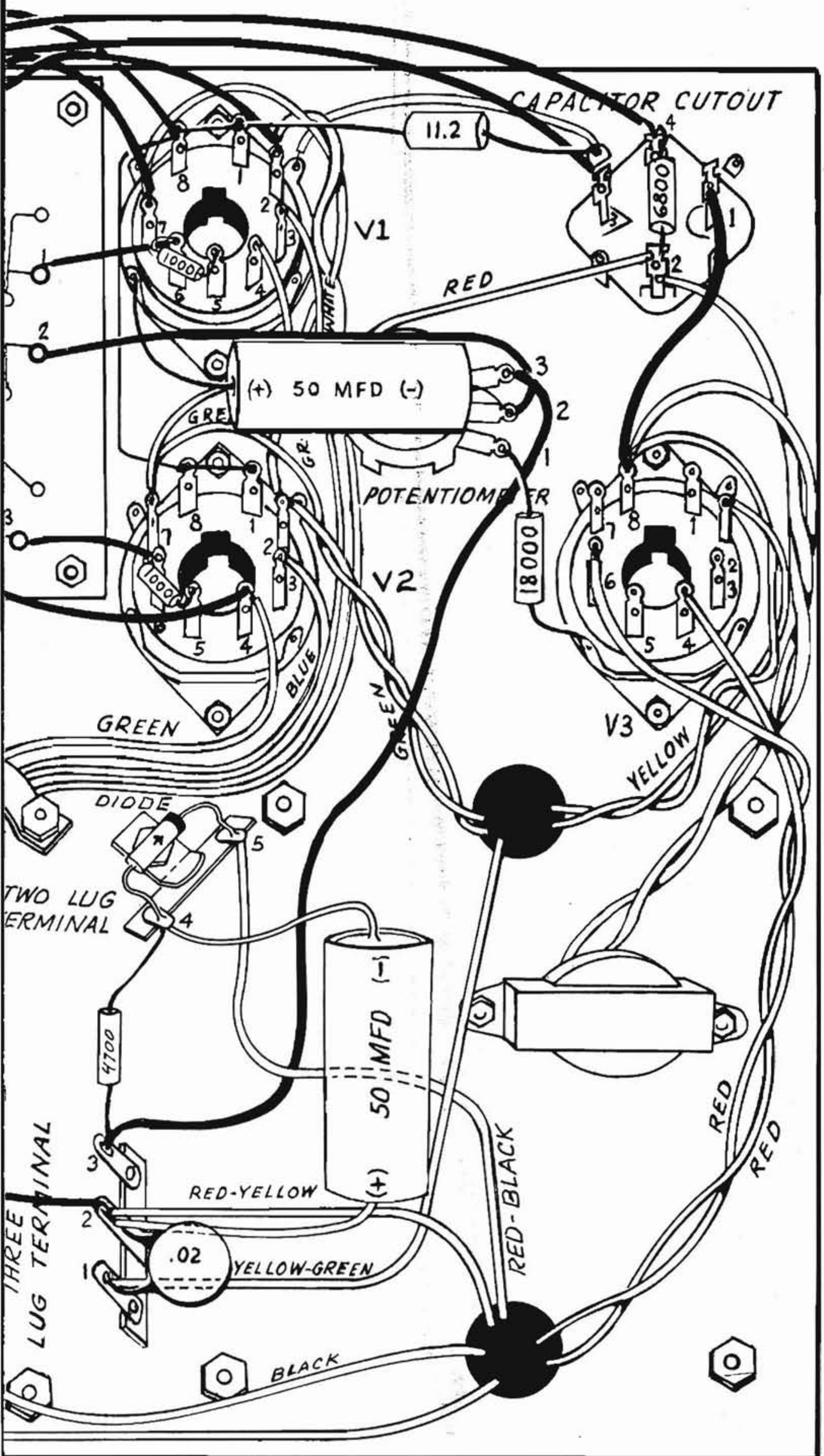
Pin #	6550/KT-88	GZ-34	6AN8
1	1.56	0	*
2		490	*
3	475	0	*
4	475	430 ac	
5	6.3 ac —55 **	0	6.3 ac
6	—55 **	430 ac	*
7		0	*
8	1.56	490	0
9	—	—	1.0
	Eyelet #4 475 —	Eyelet #5 445 —	Eyelet #6 380

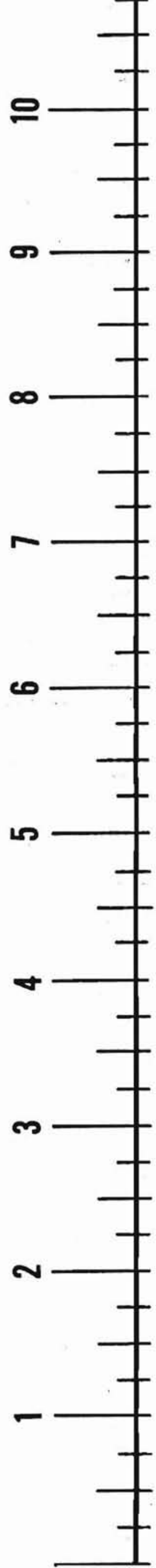
* *Minor variations in current drain of the 6AN8 tube will cause large changes in electrode voltages without detrimental effect on performance. Therefore, voltage checks are not applicable at these points.*

** *Do not make measurements at these points with other than a vacuum tube volt meter. Variations up to 20% do not indicate malfunctioning as long as readings at both tubes are the same.*

A minor change in components has been made in the Mark III kit in order to accommodate the newest type of KT-88 tubes which are now being used. This change replaces one of the 22,000 ohm resistors with an 18,000 ohm (brown-gray-orange) unit. This 18,000 ohm resistor should be inserted from potentiometer lug #[redacted] (S) to ground lug on V3 socket (S) where the instructions presently specify 22,000 ohms. This change does not affect the adjustment or use of the amplifier.


DYNACO
INPUT SOCKET
PREAMP POWER SOCKET
SCREW TERMINAL STRIP
GROMMET
SWITCH
6AN8
22,000
680
3 AMP
YELLOW
BROWN
ORANGE
BLACK
BLACK
CONNECTIONS SHOWN FOR
PREAMP POWER SOCKET
INCLUDE OPTIONAL WIRING
FOR DYNACO MONO PREAMP
DYNA


CAPACITOR CUTOUT
11.2
6800
V1
1000
RED
WHITE
(+) 50 MFD (-)
GRE
GR
POTENTIOMETER
18000
V2
1000
BLUE
GREEN
GREEN
V3
YELLOW
DIODE
TWO LUG
TERMINAL
4700
50 MFD
(-)
(+)
RED-BLACK
RED
RED
THREE
LUG TERMINAL
RED-YELLOW
.02
YELLOW-GREEN
BLACK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9
8
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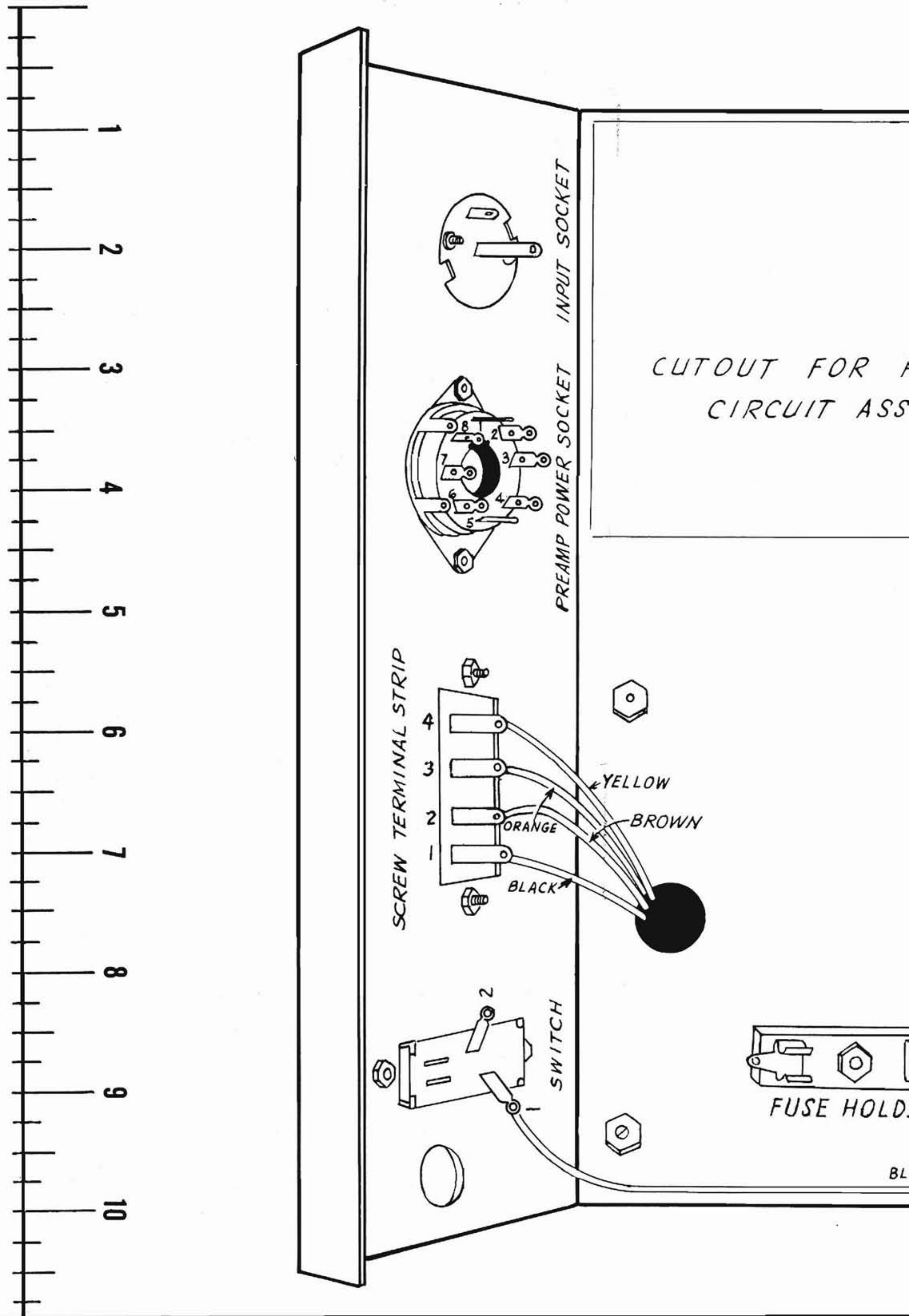
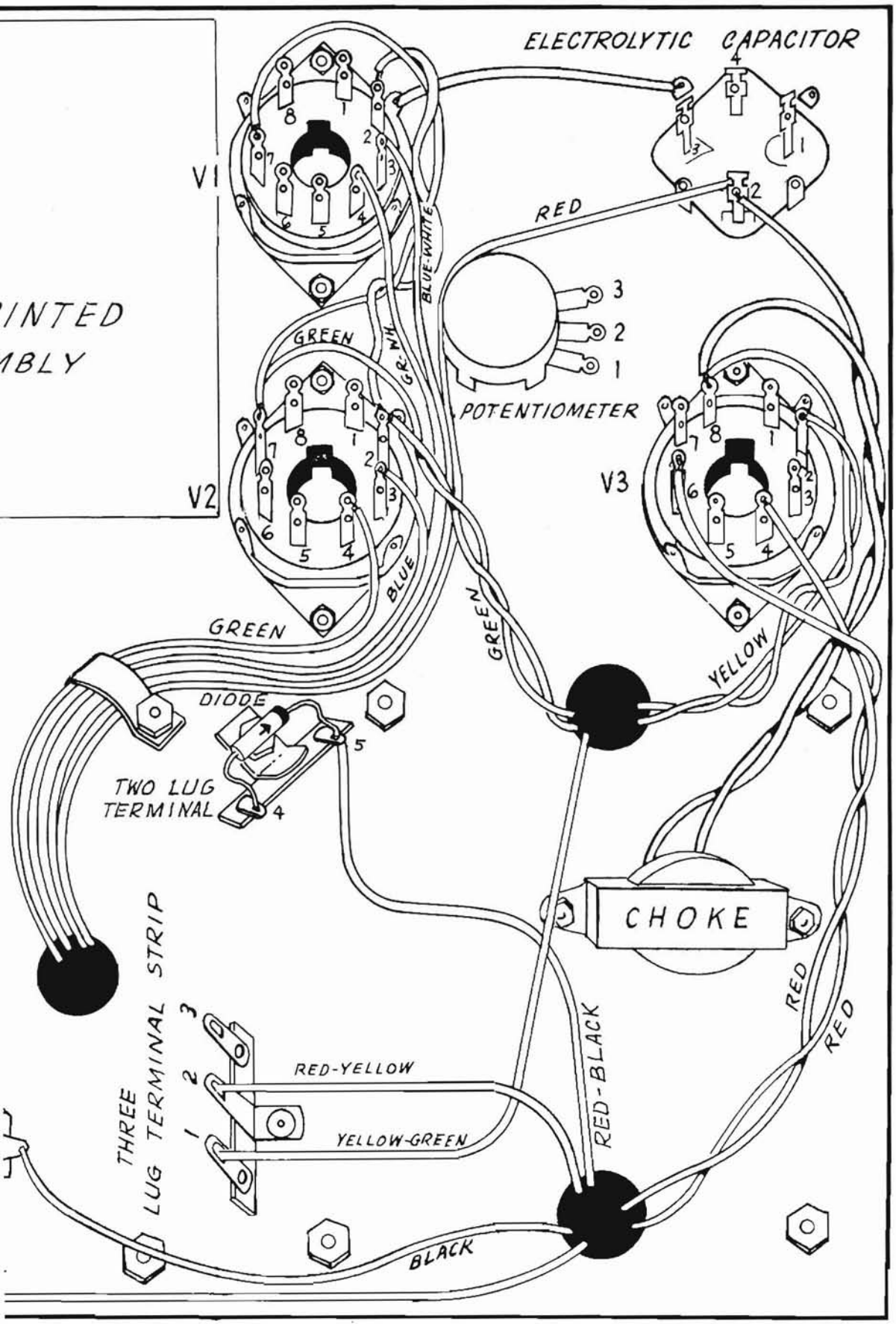
IT MARK III



INPUT SOCKET
PREAMP POWER SOCKET
CUTOUT FOR F
CIRCUIT ASS
SCREW TERMINAL STRIP
YELLOW
BROWN
ORANGE
BLACK
SWITCH
FUSE HOLD
BL



YNAKIT MARK III

DYNAKIT MARK III 60 WATT POWER AMPLIFIER