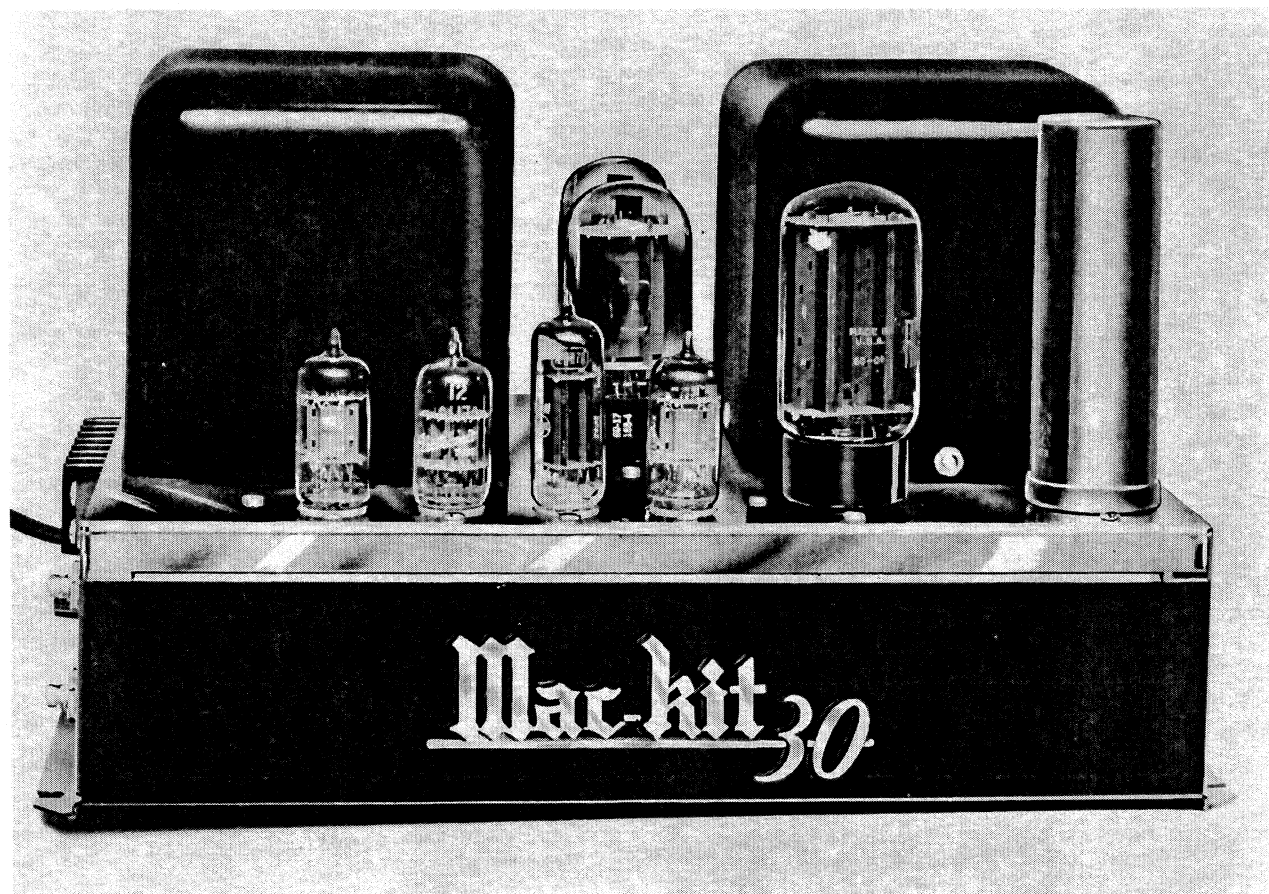


McINTOSH MacKIT 30

30-Watt Unity Coupled Amplifier Kit

The Finest Performance Attainable at the Present State of the Audio Art



STFT[®] INSTRUCTION MANUAL

STFT means "Success The First Time"

SPECIFICATIONS AND PERFORMANCE CHARACTERISTICS OF THE McINTOSH MacKIT 30-WATT AMPLIFIER

Power Supply:

117/125 volts, 50/60 cycles

Power Consumption:

135 watts at 30 watts output

105 watts at zero signal output

Input Level:

Input No. 1 (pin jack and screw terminals and pin No. 5 of preamp socket) .5 to 30 volts, with gain control

Input No. 2 (pin 2 of preamp socket) 2.5 volts

Frequency Range:

20 to 30,000 cycles \pm .1 db at 30 watts output

15 to 50,000 cycles \pm .5 db at 30 watts output

10 to 100,000 cycles \pm 1 db at 15 watts output

Harmonic Distortion:

Less than $\frac{1}{3}\%$ at 30 watts output or less from 20 to 20,000 cycles

Intermodulation Distortion:

Less than $\frac{1}{2}\%$ if instantaneous peak power is below 60 watts for any combination of frequencies from 20 to 20,000 cycles

Impulse Distortion:

Negligible

Noise and Hum Level:

90 db or more below rated output

Damping Factor:

12 or better for 4, 8, and 16-ohm output; 16 for 600 ohms

Input Impedance:

.25 megohm for .5-volt input; .13 megohm for 2.5-volt input at 20 to 40,000 cycles

Output Impedance:

4, 8, 16 and 600 ohms (600-ohm output is balanced to ground). Also 70.7 volts

Phase Shift:

3° at 20 cycles; 9° at 20,000 cycles

Tube Compliment:

Preamp 12AX7

Phase Inverter 12AU7

Voltage amplifier 12BH7

Driver 12AX7

Output two 6L6GC or 1614

Rectifier 5U4-GB

Dimensions:

13 ins. long, 8 ins. high, 8 ins. wide

Finish:

Chrome and black

Weight:

30.5 lbs. net

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McINTOSH LABORATORY, INC.
2 Chambers Street
Binghamton, N.Y.

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Instructions and illustrations
in this manual were prepared by
MILTON B. SLEEPER

What You Should Know about the McINTOSH MacKIT 30 AMPLIFIER

All the parts and materials supplied in this MacKIT MK-30 are identical with those used in the factory-built model. Assembled exactly in accordance with the STFT step-by-step instructions, this MacKIT can be used interchangeably with the factory-built MC-30, because the characteristics and performance are the same.

A Precision Laboratory Standard

The performance of the MacKIT MK-30 amplifier is the finest attainable at the present state of the audio art. No amplifier of any other make is "just like" the MacKIT 30/MC-30, or is equivalent in performance. The Unity Coupled output transformer and other circuit features, covered by U.S. and foreign patents issued¹ and pending, are available only in McIntosh amplifiers.

Developed originally as a laboratory standard for use by professional engineers, the parts, materials, and workmanship of the MC-30 are comparable to those of other precision electronic equipment. Thus, MC-30's are used for many unusual purposes in research and development laboratories for special tests and measurements, as well as for the very finest hi-fi stereo and mono systems, and public address installations.

The Economy of Quality

As an investment in audio performance, the MacKIT 30 is not expensive because it is designed to operate without deterioration year after year, even in continuous 24-hour service. To achieve such stamina, all circuit elements are operated far below their normal ratings. This applies to the tubes, as well as the component parts. While capacitors, resistors, transformers, or tubes may undergo changes from aging, the substantial tolerances provided are such that if changes do occur, no harmful overloading is caused which might alter the characteristics, or cause a circuit failure.

Purpose of Unity Coupling

The following explanation is provided so that you will understand exactly why this exclusive McIntosh circuit is employed, and the improvements achieved by its use:

In conventional push-pull amplifiers, one half of the primary winding in the output transformer is connected across the plate and cathode of one output tube. The other half is connected across the plate and cathode of the second tube, as in Fig. A. *These primary coils are wound in separate sections.*

One output tube conducts current during the first half of the audio-frequency cycle, and the other conducts current during the opposite half-cycle, thus inducing current in the output transformer secondary to which the loudspeaker or other load is connected.

At the end of each conducting half-cycle, as the current from the tube cuts off, an effect occurs which causes the current to continue to flow in the direction it was flowing. Then, due to the collapse of the leakage magnetic field, that current reverses. The result of that extra current flow (called notch distortion) is to cause a discontinuity in what should be a smooth transition of current flow from one tube to the other. This shows up as both intermodulation distortion and harmonic distortion, particularly at high frequencies.

Notch distortion is generally accepted as unavoidable, as there is no way to eliminate it in efficient amplifiers

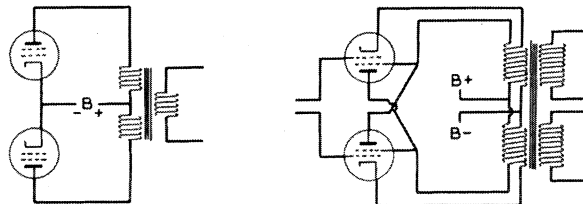


FIG. A, LEFT: CONVENTIONAL PUSH-PULL OUTPUT. FIG. B, RIGHT: McINTOSH UNITY COUPLED PUSH-PULL OUTPUT

except by employing unity coupling between the two halves of the output transformer primary.

That is exactly what is done in the McIntosh Unity Coupled output transformer. Instead of using separate primary coil sections in the conventional manner, the primaries are bifilar windings. That is, *the primaries are formed simultaneously by winding two wires side by side*, as shown in Fig. B. This provides such close coupling (virtually unity coupling) that there is no leakage magnetic field to cause notch distortion.

A further advantage is gained because the Unity Coupling loads the output tubes equally in their plate and cathode circuits, providing an additional 12 db of negative feedback. This is substantially more than is obtainable in conventional amplifiers, and contributes importantly to the performance of the MC-30.

The McIntosh Unity Coupled transformer incorporates another refinement of design that shows up at the very low and very high frequencies. The core is not made up in the usual manner by stacking flat, punched laminations. Instead, it is formed by a continuous winding of grain-oriented Hipersil ribbon, then split so that the two halves can be inserted in the transformer windings.

If flat, punched laminations were used, it would be necessary to increase the amount of iron in the core to obtain the same performance at low frequencies. However, this would have an adverse effect on the high-frequency characteristics.

Use of the Hipersil ribbon core, while more expensive, extends the flat response of the Unity Coupled output transformer at both ends, without loss at one end of the frequency range in order to gain advantage at the other.

¹U.S. patents No. 2,477,074 - 2,545,788 - 2,646,467 - 2,654,058. Others are pending.

PARTS LIST

Parts used in Stage 1:

- 1 parts board
- 2 angle brackets
- 2 1/4-in. 4-40 binding-head screws
- 2 locknuts 4-40
- 2 black wires 2 1/2 ins.
- 1 " " 2 3/4 ins.
- 1 " " 3 ins.
- 1 " " 3 1/4 ins.
- 1 " " 6 3/4 ins.
- 1 white-green wire 5 1/4 ins.
- 2 " " 5 1/2 ins.
- 1 white-yellow wire 5 ins.
- 1 " " 5 1/4 ins.
- 1 white-orange wire 5 3/4 ins.
- 1 " " 7 ins.
- 1 white-blue wire 3 1/4 ins.
- 1 " " 5 3/4 ins.
- 1 green wire 3 ins.
- 1 " " 3 1/4 ins.
- 1 " " 5 1/4 ins.
- 1 white-gray wire 4 ins.
- 1 " " 6 1/4 ins.
- 1 gray wire 4 ins.
- 1 " " 6 1/2 ins.
- 1 yellow wire 3 ins.
- 1 " " 6 3/4 ins.
- 1 red wire 7 3/4 ins.
- 2 blue wires 3 ins.
- 1 " " 3 3/4 ins.
- 1 orange wire 3 3/4 ins.
- 1 " " 6 ins.
- 1 coil of solder
- 1 yellow wire 5 ins.

Parts used in Stage 2:

- 1 rectifier
- 2 capacitors, fiber case, 8mfd., 250 W.V.
- 1 " " 100 mfd., 12 W.V.
- 1 capacitor, molded case, red-red-yellow-black-yellow, .22 mfd., 20%, 400V.
- 1 capacitor, molded case, brown-black-yellow-black-red, .1 mfd., 20%, 200V.
- 2 capacitors, molded case, yellow-violet-orange-white-blue, .047 mfd., 10% 600V.
- 2 capacitors, molded case, yellow-violet-yellow-black-red, .47 mfd., 20%, 200V.
- 2 capacitors, molded case, .22 mfd., 600 D.C.

Parts used in Stage 3:

- 1 capacitor, white-brown-violet-yellow, 470 mmfd.
- 4 resistors, green-blue-orange, 56K
- 1 " green-blue-orange-gold, 56K, 5%
- 1 " brown-black-yellow-gold, 100K, 5%
- 2 " brown-black-yellow, 100K
- 3 " brown-black-green, 1 meg.
- 1 " brown-red-red, 1.2K
- 2 " brown-red-orange, 2 watts 12K.
- 1 " brown-gray-orange, 1 watt 18K
- 1 " red-red-red-gold 2.2K, 5%
- 2 " red-red-yellow 220K
- 1 " red-red-green 2.2 meg.
- 1 " red-violet-orange-gold 27K, 5%
- 1 " red-violet-orange, 27K
- 1 " blue-gray-black-gold, 68 ohms, 5%
- 1 " blue-gray-yellow, 680K
- 1 " orange-orange-red, 3.3K
- 1 " orange-orange-yellow, 330K
- 1 " orange-black-orange-gold, 30K, 5%

Parts used in Stage 4:

- 1 chassis
- 1 power transformer M-152-E
- 1 output transformer M-150-D
- 3 8-pin sockets
- 4 9-pin sockets
- 16 1/4-in. 4-40 binding-head screws
- 16 4-40 locknuts
- 1 capacitor, 35 mfd., 80 mfd., 15 mfd.
- 1 capacitor mounting plate
- 1 choke, brown-green, 1.5 microhenries
- 1 " red-violet, 2.7 microhenries
- 1 resistor, 150 ohms, 10 watts
- 1 " 10,000 ohms, 10 watts
- 1 " orange-orange-yellow, 330K
- 1 red wire 3 ins.
- 3 brown wires 4 1/2 ins.
- 1 " 5 1/4 ins.
- 1 blue wire 3 ins.
- 2 bare wires 1 in.
- 1 " 4 1/4 ins.
- 1 " 4 1/2 ins.

Parts used in Stage 5:

- 1 terminal plate
- 4 1/2-in. 6-32 binding-head screws
- 4 6-32 locknuts
- 2 8-pin sockets
- 8 1/4-in. 4-40 binding-head screws
- 8 4-40 locknuts
- 1 fuse holder, nut, rubber washer, nickel-plated washer
- 1 3-amp. 250-volt fuse
- 1 line cord
- 1 strain-relief grommet
- 1 AC outlet
- 1 potentiometer, 250 ohms, nut, washer
- 1 " 250K, nut, washer
- 1 pin jack
- 1 white-green wire 3 1/4 ins.
- 2 green wires 2 1/2 ins.
- 1 " " 2 3/4 ins.
- 1 " " 3 1/4 ins.
- 1 white-brown wire 3 1/4 ins.
- 2 brown wires 2 ins.
- 1 " " 3 ins.
- 1 " " 3 1/4 ins.
- 1 " " 7 3/4 ins.
- 1 " " 8 3/4 ins.
- 2 black wires 3 ins.
- 1 " " 4 ins.
- 1 " " 11 1/2 ins.
- 1 red wire 14 1/2 ins.
- 1 bare wire 1 1/2 ins.
- 1 " " 2 ins.
- 1 piece of sleeving 2 ins.
- 1 bare wire 1 1/4 ins.

Parts used in Stage 6:

- 2 1/4-in. 4-40 binding-head screws
- 2 4-40 locknuts
- 3 beaded wire ties
- 1 bottom plate
- 6 1/4-in. hex-head self-tapping screws
- 2 12AX7 tubes
- 1 12AU7 tube
- 1 12BH7 tube
- 2 6L6GC or 1664 tubes
- 1 5U4-GB tube
- 2 8-pin plugs
- 1 pin plug

WHEN YOU UNPACK THE MacKIT-30

When you unpack this MacKIT, you may be tempted to start work on it immediately. But there's one thing you should do first of all: CHECK EACH PART AGAINST THE PARTS LIST! This is important for two reasons.

If you don't, and you have just one part left over when you have completed this instrument, even though it's only a screw or a length of wire, you won't know whether you made a mistake and left it out, or if it is an extra one.

In case it is a resistor or capacitor, you'll really be in trouble, for you will have to go through the instructions step by step to see if you forgot it and, if so, where it belongs.

Or suppose you are short an item. Things do get pushed off the workbench, or are put in places where they don't belong. You take a quick look and decide that it was omitted from the MacKIT. So your work is held up until you get another part. Then, two weeks later, some bright-

eyed member of your family may say: "I found this little thing today. Does it belong to you?"

If you had checked the parts in the beginning, you would have looked for it until you found it yourself. Yes, it pays to CHECK EACH PART AGAINST THE PARTS LIST before you go to work. The few minutes required may save hours or even days of delay in completing this MacKIT.

HOW TO WORK FROM THE MacKIT STFT* INSTRUCTIONS

There is no more gratifying experience than building a piece of electronic equipment and having it work properly the first time it is hooked up. The instructions for this MacKIT have been prepared with the greatest care to assure you of SUCCESS THE FIRST TIME. That is why they are called MacKIT STFT* Instructions.

*Success the first time. The letters STFT are a registered trademark for MacKIT instruction books.

Step-by-Step Procedure

To that end, the assembly and wiring diagrams have been prepared in a simplified style that is almost self-explanatory. Each diagram shows only the parts and wires added in the stage illustrated. Photographs corresponding to the diagrams are provided so that you can compare your work with the original model used in the preparation of these instructions.

A new plan has been employed for the step-by-step instructions. At each step, the part or wire to be used is specified first. Then there is an explanation of the work to be done, and a check-off box, followed by directions for soldering, if required, with another check-off box. These separate boxes are used because it is so easy to put on a wire and then forget to solder it.

As a double check on your work, the soldering instructions show the number of wires that should be on the lug or terminal when solder is applied. No connection should be soldered until it is called for in the instructions.

Special Notes are preceded by circles. Check these off, too, to make sure you have read them. They contain information for your guidance.

Notes on the Assembly and Wiring

The assembly and wiring diagrams in these MacKIT STFT Instructions are actual size. Thus, you can make exact comparisons between the parts and their locations as you proceed with the work, and the outlines on the diagrams.

Work from the step-by-step instructions, and carry them out in exactly the order they are presented. They have been planned from actual experience to simplify the assembly and wiring, and to enable you to reproduce the factory-built MC-30 right down to the last detail. **DO NOT TRY TO WORK FROM THE SCHEMATIC WIRING DIAGRAM.**

Do not cut off any of the wires supplied in the MacKIT, or the transformer leads. If they seem longer than necessary, it is because they will have to run around parts to be added subsequently.

The fixed capacitors have color bands or plus and minus signs. They must be connected with the same polarity shown on the diagrams. Watch this carefully. It is important!

Check the orientation of each socket before you mount it by comparing the position of the keyway in the center hole, or the blank contact hole with that shown on the corresponding diagram.

When you make a connection to one of the terminals on the parts board, put the bare wire through the hole in the terminal and use your long-nose pliers to wrap the wire a full turn around the left or right leg according to the instructions. Wrap the wire around the leg securely. This is particularly important if the connection is not to be soldered immediately. If the wire is loose, it may slip off before other wires are added and solder applied. Never depend on solder alone to hold a wire to a lug. That is a dangerous practice.

If the instruction step calls for soldering, be sure that the number of wires specified have been run to the terminal or lug.

USE ONLY ROSIN-CORE SOLDER. The use of any soldering flux other than rosin completely voids the McIntosh Warranty. An ample amount of rosin-core solder is supplied with this MacKIT.

While solder guns are widely used, a 40 or 60-watt soldering iron with a 3/16 or 1/4-in. tip is lighter in weight and will probably be found more convenient for work on this MacKIT.

Use no more solder than is needed for a smooth flow over the parts to be joined. Melt the solder against the iron where the iron touches the joint to be soldered, so that the solder will flow onto the wire and lug or terminal. Do not rub the iron on the parts. Keep it steady right where the heat is needed.

Try to work quickly, so that the least amount of heat will be conveyed to the resistors, capacitors, or sockets. Excessive heat or repeated heating may damage resistors or capacitors. But be sure you use enough heat to make the solder flow smoothly. If the solder has a rough appearance, the heat was insufficient.

If you are not already experienced in the use of a soldering iron, make a few test joints to get the knack of applying the right amount of heat and solder, and doing it quickly.

Inspect each joint to be certain that the solder has reached every part to be joined. This is particularly important when two or more wires run to a lug or terminal. When insufficient heat is applied, parts are sometimes held together only by the rosin. This results in an insulated joint, or an intermittent contact.

Keep the tip of your iron brightly tinned at all times. When it gets partly black, wipe it off with a cloth. If it becomes pitted, file it down to a new point and re-tin it thoroughly.

Most soldering irons are so made that you can slip the tip in or out by loosening a set-screw. If the tip does not seem hot enough, slide it back into the heating element. Or if it runs too hot, pull it out a little farther. **REMEMBER:** Your amplifier will be only as good as the soldered joints you make!

Inspection Procedures

Even the experts make mistakes occasionally. That is why inspectors are stationed at key points along factory assembly lines. If you make a mistake in your work on this MacKIT, and find it by the end of the stage in which it happened, you can correct it easily. Discovering and correcting it during a subsequent stage, or after the instrument has been completed may be difficult, and is sure to be annoying.

Accordingly, at the end of the instructions for each stage there is a step-by-step check list. Do not fail to make a thorough inspection of your work at the conclusion of every stage, using the check list as your guide.

Impatient as you may be to put the finished unit to use, going over each check list is sure to save your time in the end, and it will give you confidence in the accuracy of your workmanship. This is established, professional procedure. Only amateurs assume that they do not make mistakes!

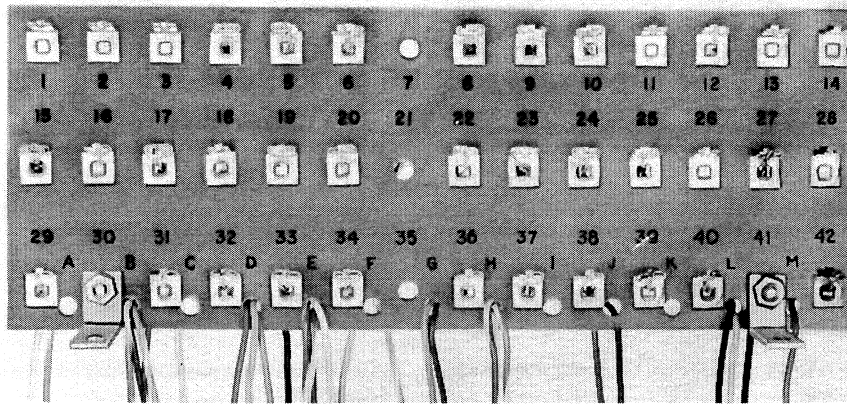


FIG. 2. FRONT VIEW OF THE PARTS BOARD, WITH STAGE 1 WIRING COMPLETED. COMPARE THIS PHOTO WITH FIG. 1 ON THE SHEET OF DIAGRAMS

STAGE 1: PARTS BOARD WIRING

- Note: Be sure to put a pencil check in each box as you complete the corresponding step. Also, check each circle when you have read the corresponding note. This will serve as a useful record of your progress.
 - Note: As you proceed with each step, compare your work with the drawing in Fig. 1, and the photographs in Figs. 2 and 3.
1. Parts board, two angle brackets, two $\frac{1}{4}$ -in. 4-40 binding-head machine screws, two locknuts
 - With the parts board positioned as in Fig. 1, fasten the shorter legs of the brackets to the parts board at holes 30 and 41, on the same side as the terminals.
 - Note: When you attach insulated wires to the terminals, put only the bare wire through the square hole. Then there will be just enough bare wire for a full turn around the leg of the terminal. Use your long-nose pliers to wind the wire tightly around the leg. Keep each wire as far down on the leg as possible, to allow space for other wires that may be added later.
 - Be sure that the end of each wire you connect to a terminal is stripped $\frac{5}{8}$ in.
 2. Black wire $3\frac{1}{4}$ ins. long
 - Put one end up through terminal 16, and around right leg, viewing the terminal with the parts board positioned as in Figs. 1 and 2.
 - Put the other end up through terminal 19, and around the right leg.
 - Note: Keep this wire away from the metal part of terminals 17 and 18, as indicated in Fig. 1. The metal will be heated when wires are soldered to 17 and 18, and the insulation on the black wire could be damaged, resulting in short-circuits at those points.
 3. Black wire $2\frac{3}{4}$ ins. long
 - Bend the wire at right angles $\frac{5}{8}$ in. from each end.
 - Put one end up through terminal 22, and around right leg.
 - Put the other end up through terminal 33, and around right leg.
 4. Black wire $2\frac{1}{2}$ ins. long
 - Bend the wire at right angles $\frac{5}{8}$ in. from each end.
 - Put one end up through terminal 23, and around right leg.
 - Put the other end up through terminal 39, and around right leg.
 5. Black wire $2\frac{1}{2}$ ins. long
 - Bend the wire at right angles $\frac{5}{8}$ in. from each end.
 - Put one end up through terminal 27, and around left leg.
 - Put the other end up through terminal 39, and around right leg.
 6. White-green wire $5\frac{1}{4}$ ins. long
 - Put the longer bare end up through terminal 4, and around right leg.
 - Bring the other end up through hole B.
 7. White-yellow wire 5 ins. long
 - Put the shorter bare end up through terminal 5, and around left leg.
 - Bring the other end up through hole E.
 8. White-orange wire $5\frac{3}{4}$ ins. long
 - Put the longer bare end up through terminal 6, and around right leg.
 - Bring the other end up through hole B.
 9. White-orange wire 7 ins. long
 - Put the longer bare end up through terminal 6, and around right leg.

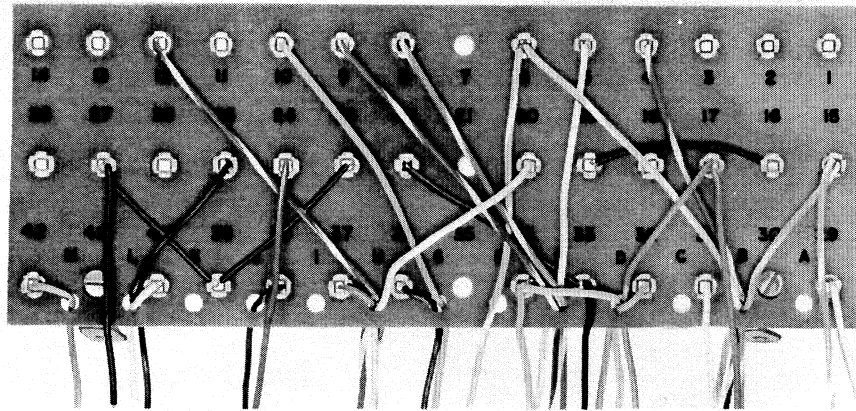


FIG. 3. REAR VIEW OF THE PARTS BOARD, WITH STAGE 1 WIRING COMPLETED. NUMBERS AND LETTERS CORRESPOND WITH THOSE ON THE FRONT

- Note: the other end of this wire does not go through a hole.
- 10. White-blue wire $5\frac{3}{4}$ ins. long
 - Put the longer bare end up through terminal 8, and around right leg.
 - Bring the other end up through hole E.
- 11. White-green wire $5\frac{1}{2}$ ins. long
 - Put the longer bare end up through terminal 9, and around left leg.
 - Bring the other end up through hole E.
- 12. Green wire $5\frac{1}{4}$ ins. long
 - Put the longer bare end up through terminal 10, and around right leg.
 - Bring the other end up through hole G.
- 13. White-green wire $5\frac{1}{2}$ ins. long
 - Put the longer bare end up through terminal 12, and around right leg.
 - Bring the other end up through hole H.
- 14. White-gray wire 4 ins. long
 - Put the longer bare end up through terminal 15, and around right leg.
 - Bring the other end up through hole B.
- 15. White-gray wire $6\frac{1}{4}$ ins. long
 - Put the longer bare end up through terminal 15, and around left leg.
 - Note: The other end of this wire does not go through a hole.
- 16. Gray wire 4 ins. long
 - Put the longer bare end up through terminal 17, and around right leg.
 - Bring the other end up through hole D.
- 17. Gray wire $6\frac{1}{2}$ ins. long
 - Put the longer bare end up through terminal 17, and around left leg.
 - Note: The other end of this wire does not go through a hole.
- 18. Yellow wire 5 ins. long
 - Put the shorter bare end up through terminal 20, and around right leg.
 - Bring the other end up through hole H.
- 19. Red wire $7\frac{3}{4}$ ins. long
 - Put the longer bare end up through terminal 24, and around left leg.
 - Note: The other end of this wire does not go through a hole.
- 20. Blue wire $3\frac{3}{4}$ ins. long
 - Put the longer bare end up through terminal 25, and around right leg.
 - Bring the other end up through hole L.
- 21. Black wire 3 ins. long
 - Put the longer bare end up through terminal 27, and around right leg.
 - Note: The other end of this wire does not go through a hole.
- 22. White-yellow wire 5 ins. long
 - Put the longer bare end up through terminal 29, and around right leg.
 - Note: The other end of this wire does not go through a hole.
- 23. Yellow wire $6\frac{3}{4}$ ins. long
 - Put the longer bare end up through terminal 31, and around right leg.
 - Note: The other end of this wire does not go through a hole.
- 24. Green wire 3 ins. long

- Put the longer bare end up through terminal 32, and around right leg.
 - Bring the other end up through hole D.
25. Black wire $6\frac{3}{4}$ ins. long
- Put the longer bare end up through terminal 33, and around left leg.
 - Note: The other end of this wire does not go through a hole.
26. Orange wire $3\frac{3}{4}$ ins. long
- Put the longer bare end up through terminal 34, and around right leg.
 - Bring the other end up through hole D.
27. Orange wire 6 ins. long
- Put the longer bare end up through terminal 34, and around left leg.
 - Note: The other end of this wire does not go through a hole.
28. Blue wire 3 ins. long
- Put the longer bare end up through terminal 36, and around right leg.

CHECK LIST FOR INSPECTING THE PARTS BOARD WIRING

At this point, make a thorough inspection of the work you have just completed. The following check list shows the connections you should have made. The numbers at the left correspond to those on the step-by-step instructions.

- 1. Brackets mounted at 30 and 41
- 2. Black wire, terminal 16 to terminal 19
- 3. Black wire, terminal 22 to terminal 33
- 4. Black wire, terminal 23 to terminal 39
- 5. Black wire, terminal 27 to terminal 39
- 6. White-green, terminal 4 to hole B
- 7. White-yellow, terminal 5 to hole E
- 8. White-orange, terminal 6 to hole B
- 9. White-orange, terminal 6
- 10. White-blue, terminal 8 to hole E
- 11. White-green, terminal 9 to hole E
- 12. Green, terminal 10 to hole G
- 13. White-green, terminal 12 to hole H
- 14. White-gray, terminal 15 to hole B
- 15. White-gray, terminal 15
- 16. Gray, terminal 17 to hole D

- Bring the other end up through hole G.
29. White-blue wire $3\frac{1}{4}$ ins. long
- Put the longer bare end up through terminal 37, and around right leg.
 - Bring the other end up through hole H.
30. Blue wire 3 ins. long
- Put the longer bare end up through terminal 38, and around right leg.
 - Bring the other end up through hole J.
31. Yellow wire $3\frac{1}{2}$ ins. long
- Put the longer bare end up through terminal 40, and around right leg.
 - Bring the other end up through hole L.
32. Green wire $3\frac{1}{4}$ ins. long
- Put the longer bare end up through terminal 42, and around right leg.
 - Bring the other end up through hole M.

THIS COMPLETES THE WIRING OF THE PARTS BOARD.

- 17. Gray, terminal 17
 - 18. Yellow, terminal 20 to hole H
 - 19. Red, terminal 24
 - 20. Blue, terminal 25 to hole L
 - 21. Black, terminal 27
 - 22. White-yellow, terminal 29
 - 23. Yellow, terminal 31
 - 24. Green, terminal 32 to hole D
 - 25. Black, terminal 33
 - 26. Orange, terminal 34 to hole D
 - 27. Orange, terminal 34
 - 28. Blue, terminal 36 to hole G
 - 29. White-blue, terminal 37 to hole H
 - 30. Blue, terminal 38 to hole J
 - 31. Yellow, terminal 40 to hole L
 - 32. Green, terminal 42 to hole M
- Note: There should be no connections to the following terminals: 1, 2, 3, 11, 13, 14, 18, 26, and 28.
 - Note: There should be no wires through the following holes: 7, 21, 35, and A, C, F, I, and K.
 - Note: See that no wires pass over the metal parts of terminals 17, 18, 19, 20, 23, 24, 25, 31, 32, 34, 36, 37, and 40.

THIS COMPLETES THE INSPECTION OF THE PARTS BOARD WIRING

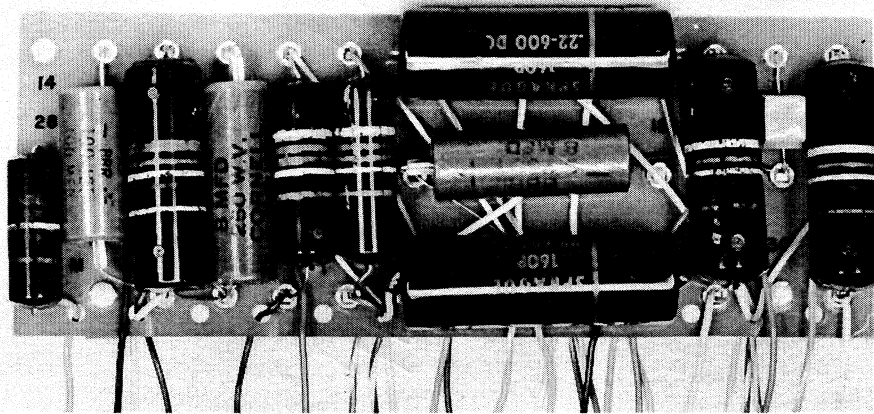


FIG. 5. REAR VIEW OF THE PARTS BOARD, WITH THE CAPACITORS AND RECTIFIER MOUNTED. COMPARE THIS PHOTO WITH FIG. 4 ON THE SHEET OF DIAGRAMS

STAGE 2: PARTS BOARD CAPACITORS

○ Note: As you proceed with the work of mounting the capacitors on the rear of the parts board, check their location as shown on the full-size drawing in Fig. 4, and the corresponding photograph, Fig. 5. Numbers on the rear of the parts board are the same as on the front. In Fig. 4, only the terminals used are numbered. Capacitors in molded cases are identified by color bands; those in fiber cases are marked with capacity and voltage ratings.

○ Note: To connect the capacitors, put the leads through the square holes in the terminals, positioning the capacitors exactly as shown in Fig. 4. Hold the capacitor firmly against the parts board, and wrap each lead a full turn around the terminal leg specified, as you look at the front of the board at the position shown in Fig. 1. Cut off the excess length of wire at the terminal.

1. Capacitor C₄, fiber case, 8 mfd. 250 W.V.
 - Connect + end to terminal 11, right leg;
 - end to terminal 39, left leg.
 - Line this capacitor up with 11 and 39, exactly as shown in Fig. 4.
2. Capacitor C₃, molded case, red-red-yellow-black-yellow bands.
 - Connect red-band end to terminal 12, right leg;
 - Yellow-band end to terminal 39, right leg.
 - Keep this capacitor up against C₄, as shown in Fig. 4.
3. Capacitor C₂, fiber case, 100 mfd. 12 W.V.
 - Connect the - end to terminal 13, right leg;
 - + end to terminal 40, left leg.
 - Keep this capacitor up against C₃.
 - Do not let adjacent blue and black wires touch the + lead.
4. Capacitor C₁, molded case, brown-black-yellow-black-red bands
 - Connect brown-band end to terminal 28, left leg;
 - Red-band end to terminal 42, left leg.
 - Keep this capacitor up against C₂.
5. Capacitor C₅, molded case, yellow-violet-orange-white-blue bands
 - Connect the yellow-band end to terminal 10, right leg;
 - Blue-band end to terminal 38, left leg.
 - Keep this capacitor against C₄.
6. Capacitor C₆, molded case, yellow-violet-orange-white-blue bands
 - Connect the yellow-band end to terminal 9, right leg;
 - Blue-band end to terminal 37, right leg.
 - Keep this capacitor against C₅.
7. Capacitor C₇, molded case, .22, 600 D.C., red band
 - Connect the red-band end to terminal 4, right leg;
 - Plain end to terminal 8, left leg.
8. Capacitor C₈, fiber case, 8 mfd. 250 W.V.
 - Connect the + end to terminal 22, left leg;
 - end to terminal 19, left leg.
 - Line up the end of the lug on C₈ with the left end of C₇, as shown in Fig. 4.
9. Capacitor C₉, molded case, .22, 600 D.C., red band
 - Connect the red-band end to terminal 32, left leg;
 - Plain end to terminal 36, left leg.
 - Locate this capacitor exactly as shown in Fig. 4.
 - Do not let the adjacent yellow wire touch the lead from the plain end.
10. Rectifier RECT
 - Connect the end with the red dot to terminal 2, right leg;
 - Unmarked end to terminal 16, left leg.
11. Capacitor C₁₀, molded case, yellow-violet-yellow-black-red bands

- Connect the yellow-band end to terminal 3, right leg;
- Red-band end to terminal 31, left leg.

12. Capacitor C11, molded case, yellow-violet-yellow-black-red bands

- Connect the yellow-band end to terminal 1, right leg;
- Red-band end to terminal 29, left leg.

THIS COMPLETES THE MOUNTING OF THE CAPACITORS

CHECK LIST FOR INSPECTING THE CAPACITORS MOUNTED ON THE PARTS BOARD

At this point, make a thorough inspection of the work you have just completed. The following check list shows the capacitors and the rectifier which should now be on the parts board, and the terminals to which they should be connected. The numbers at the left correspond to those on the step-by-step instructions.

- 1. C4, 8 mfd. 250 W.V., + end to terminal 11
- end to terminal 39
- 2. C3, red-red-yellow-black-yellow, red to terminal 12
Yellow to terminal 39
- 3. C2, 100 mfd. 12 W.V., - end to terminal 13
+ end to terminal 40
- See that blue and black wires do not touch + lead
- 4. C1, brown-black-yellow-black-red, brown to terminal 28
Red to terminal 42
- 5. C5, yellow-violet-orange-white-blue, yellow to terminal 10

- Blue to terminal 38
- 6. C6, yellow-violet-orange-white-blue, yellow to terminal 9
Blue to terminal 37
- 7. C7, .22 600 DC, red band to terminal 4
Plain end to terminal 8
- 8. C8, 8 mfd. 250 W.V., - end to terminal 19
+ end to terminal 22
- 9. C9, .22 600 DC, red band to terminal 32
Plain end to terminal 36
- See that the yellow wire does not touch the lead from the plain end.
- 10. RECT, red dot to terminal 2
Plain end to terminal 16
- 11. C10, yellow-violet-yellow-black-red, yellow to terminal 3
Red to terminal 31
- 12. C11, yellow-violet-yellow-black-red, yellow to terminal 1
Red to terminal 29

THIS COMPLETES THE INSPECTION OF THE CAPACITORS MOUNTED ON THE PARTS BOARD.

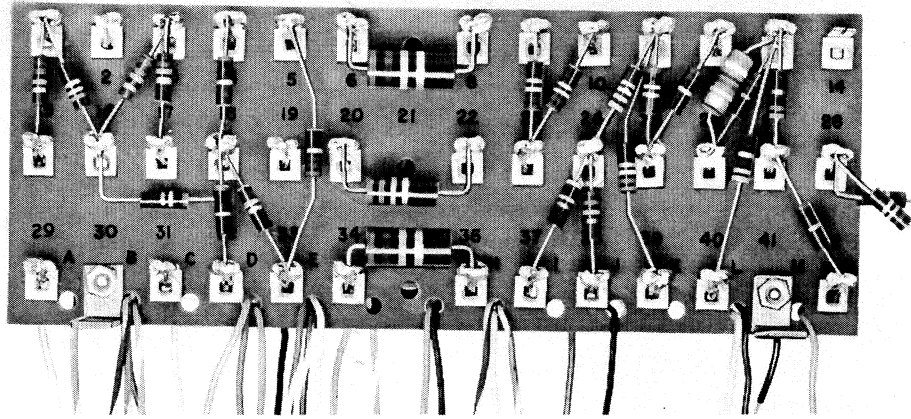


FIG. 7. THE COMPLETED PARTS BOARD, WITH THE RESISTORS AND ONE CONDENSER CONNECTED. COMPARE THIS PHOTO WITH FIG. 6 ON THE SHEET OF DIAGRAMS

STAGE 3: PARTS BOARD RESISTORS

○ Note: As you proceed with the work of connecting the resistors, check their exact location on the full-size drawing Fig. 6, and also on the corresponding photograph, Fig. 7. Following are the standard colors used on the resistors:

BLACK = 0 BROWN = 1 RED = 2 ORANGE = 3
 YELLOW = 4 GREEN = 5 BLUE = 6 VIOLET = 7
 GRAY = 8 WHITE = 9 GOLD = 5% SILVER = 10%

The silver band, which indicates $\pm 10\%$ tolerance, is not mentioned in the instructions. However, if a resistor has a gold band, it is specified, as this indicates that it is a special type, accurate to $\pm 5\%$ in its resistance value. All but three resistors are the small $\frac{1}{2}$ -watt size. When 1-watt or 2-watt resistors are called for, compare their size with the corresponding outline in Fig. 6.

○ Note: When you connect a resistor, position it between the terminals exactly as shown in Fig. 6. Wrap each lead a full turn around the terminal leg specified, clip off the extra wire, and press the end firmly against the terminal, using your longnose pliers. Do not apply solder until it is called for in the instructions. Then, before you solder the wires, check to be sure that the number of wires specified are connected to the terminal. If the number is not correct, you have omitted a wire, or connected it to the wrong terminal. Correct the error before you go on to the next step.

1. Resistor R1, green-blue-orange
 - Connect from terminal 1, left leg,
 - To terminal 15, left leg.
 - At 15, solder three wires.

2. Terminal 29
 - Solder two wires.

○ Note: Terminal 2 is not soldered until another wire is added in Stage 6.

3. Resistor R2, green-blue-orange
 - Connect from terminal 1, right leg.
 - To terminal 16, left leg.
 - At 1, solder three wires.
4. Resistor R3, brown-black-yellow-gold
 - Connect from terminal 16, right leg.
 - To terminal 18, left leg.
5. Resistor R4, green-blue-orange
 - Connect from terminal 3, left leg.
 - To terminal 16, right leg.
 - At 16, solder five wires.
6. Resistor R5, green-blue-orange
 - Connect from terminal 3, right leg.
 - To terminal 17, right leg.
 - At 3, solder three wires
 - At 17, solder three wires
7. Terminal 31
 - Solder two wires.
8. Resistor R6, brown-black-green
 - Connect from terminal 4, left leg,
 - To terminal 18, left leg.
 - At 4, solder three wires.
9. Resistor R7, green-blue-orange-gold
 - Connect from terminal 18, right leg.
 - To terminal 33, left leg.
10. Resistor R8, brown-black-green
 - Connect from terminal 18, right leg.
 - To terminal 32, right leg.
 - At 18, solder four wires.
 - At 32, solder three wires.
11. Resistor R9, brown-red-red
 - Connect from terminal 5, right leg.

- To terminal 33, right leg.
 - At 5, solder two wires.
 - At 33, solder four wires.
12. Terminal 19
 - Solder two wires.
 13. Resistor R10, brown-red-orange
 - Connect from terminal 6, left leg.
 - To terminal 8, right leg.
 - At 6, solder three wires.
 - At 8, solder three wires.
 14. Resistor R11, brown-gray-orange
 - Connect from terminal 20, left leg,
 - To terminal 22, right leg.
 - At 20, solder two wires.
 - At 22, solder three wires.
 15. Resistor R12, brown-red-orange
 - Connect from terminal 34, left leg,
 - To terminal 36, right leg.
 - At 34, solder three wires.
 - At 36, solder three wires.
 16. Resistor R13, red-red-yellow
 - Connect from terminal 9, left leg,
 - To terminal 23, left leg.
 - At 9, solder three wires.
 17. Resistor R14, red-red-yellow
 - Connect from terminal 10, left leg,
 - To terminal 23, right leg.
 - At 10, solder three wires.
 - At 23, solder three wires.
 18. Resistor R15, orange-black-orange-gold
 - Connect from terminal 24, left leg,
 - To terminal 37, left leg.
 - At 37, solder three wires.
 19. Resistor R16, red-violet-orange-gold
 - Connect from terminal 24, right leg,
 - To terminal 38, right leg.
 - At 38, solder three wires.
 20. Resistor R17, blue-gray-yellow
 - Connect from terminal 11, left leg,
 - To terminal 39, left leg.
 - At 39, solder five wires.
 21. Resistor R18, orange-orange-yellow
 - Connect from terminal 11, left leg,
 - To terminal 24, left leg.
 - At 24, solder four wires.
 22. Resistor R19, brown-black-yellow
 - Connect from terminal 11, right leg,
 - To terminal 25, right leg.
 - At 11, solder four wires.
 23. Resistor R20, red-red-green
 - Connect from terminal 12, left leg,
 - To terminal 25, right leg.
 - At 12, solder three wires.
 - At 25, solder three wires.
 24. Resistor R21, red-red-red-gold
 - Connect from terminal 13, left leg,
 - To terminal 26, left leg.
 25. Capacitor C12, white-brown-violet-yellow
 - Connect from terminal 13, left leg,
 - To terminal 26, left leg.
 - Note: Terminal 26 is not soldered until another wire is added in Stage 6.
 26. Resistor R22, orange-orange-red
 - Connect from terminal 13, right leg,
 - To terminal 40, right leg.
 - At 40, solder three wires.
 27. Resistor R23, blue-gray-black-gold
 - Connect from terminal 13, right leg,
 - To terminal 27, right leg.
 - At 13, solder five wires.
 28. Resistor R24, brown-black-green
 - Connect from terminal 27, left leg,
 - To terminal 42, right leg.
 - At 27, solder four wires.
 - At 42, solder three wires.
 29. Resistor R25, brown-black-yellow
 - Connect one lead to terminal 28, left leg, exactly as shown in Fig. 6. Do not cut off the other lead. It will be connected in Stage 6.
 30. Resistor R26, red-violet-orange
 - Connect one lead to terminal 28, right leg, exactly as shown in Fig. 6. Do not cut off the other lead. It will be connected in Stage 6.
 - At 28, solder three wires.

THIS COMPLETES THE PARTS BOARD RESISTOR CONNECTIONS.

CHECKLIST FOR INSPECTING THE RESISTOR CONNECTIONS

At this point, make a thorough inspection of the color bands on each resistor, to make sure that you have them as specified. Watch particularly for those with gold bands. The following check list shows the resistor connections, and the number of wires that should be soldered to each terminal. Numbers at the left correspond to those on the step-by-step instructions.

- 1. R1, green-blue-orange, terminal 1 to terminal 15
 - At 15, three wires soldered
- 2. Terminal 29, two wires soldered
- 3. R2, green-blue-orange, terminal 1 to terminal 16
 - At 1, three wires soldered
- Note: Terminal 2 should not be soldered.
- 4. R3, brown-black-yellow-gold, terminal 16 to terminal 18
- 5. R4, green-blue-orange, terminal 3 to terminal 16
 - At 16, five wires soldered
- 6. R5, green-blue-orange, terminal 3 to terminal 17
 - At 3, three wires soldered
 - At 17, three wires soldered
- 7. Terminal 31, two wires soldered
- 8. R6, brown-black-green, terminal 4 to terminal 18
 - At 4, three wires soldered
- 9. R7, green-blue-orange-gold, terminal 18 to terminal 33
- 10. R8, brown-black-green, terminal 18 to terminal 32
 - At 18, four wires soldered
 - At 32, three wires soldered
- 11. R9, brown-red-red, terminal 5 to terminal 33
 - At 5, two wires soldered
 - At 33, four wires soldered
- 12. Terminal 19, two wires soldered
- 13. R10, brown-red-orange, terminal 6 to terminal 8
 - At 6, three wires soldered
 - At 8, three wires soldered
- 14. R11, brown-gray-orange, terminal 20 to terminal 22
 - At 20, two wires soldered
 - At 22, three wires soldered
- 15. R12, brown-red-orange, terminal 34 to terminal 36
 - At 34, three wires soldered
 - At 36, three wires soldered
- 16. R13, red-red-yellow, terminal 9 to terminal 23
 - At 9, three wires soldered
- 17. R14, red-red-yellow, terminal 10 to terminal 23
 - At 10, three wires soldered
 - At 23, three wires soldered
- 18. R15, orange-black-orange-gold, terminal 24 to terminal 37
 - At 37, three wires soldered
- 19. R16, red-violet-orange-gold, terminal 24 to terminal 38
 - At 38, three wires soldered
- 20. R17, blue-gray-yellow, terminal 11 to terminal 39
 - At 39, five wires soldered
- 21. R18, orange-orange-yellow, terminal 11 to terminal 24
 - At 24, four wires soldered
- 22. R19, brown-black-yellow, terminal 11 to terminal 25
 - At 11, four wires soldered
- 23. R20, red-red-green, terminal 12 to terminal 25
 - At 12, three wires soldered
 - At 25, three wires soldered
- 24. R21, red-red-red-gold, terminal 13 to terminal 26
- 25. C12, white-brown-violet-yellow, terminal 13 to terminal 26
 - Note: Terminal 26 is not to be soldered until another wire is added in Stage 6.
- 26. R22, orange-orange-red, terminal 13 to terminal 40
 - At 40, three wires soldered
- 27. R23, blue-gray-black-gold, terminal 13 to terminal 27
 - At 13, five wires soldered
- 28. R24, brown-black-green, terminal 27 to terminal 42
 - At 27, four wires soldered
 - At 42, three wires soldered
- 29. R25, brown-black-yellow, terminal 28 only
- 30. R26, red-violet-orange, terminal 28 only
 - At 28, three wires soldered
- Note: Check again to see that no wires pass over the metal parts of terminals 17, 18, 19, 20, 23, 24, 25, 31, 32, 34, 36, 37, and 40.
- Note: Terminal 14 is not used for any purpose.

THIS COMPLETES THE INSPECTION OF THE RESISTOR WIRING.

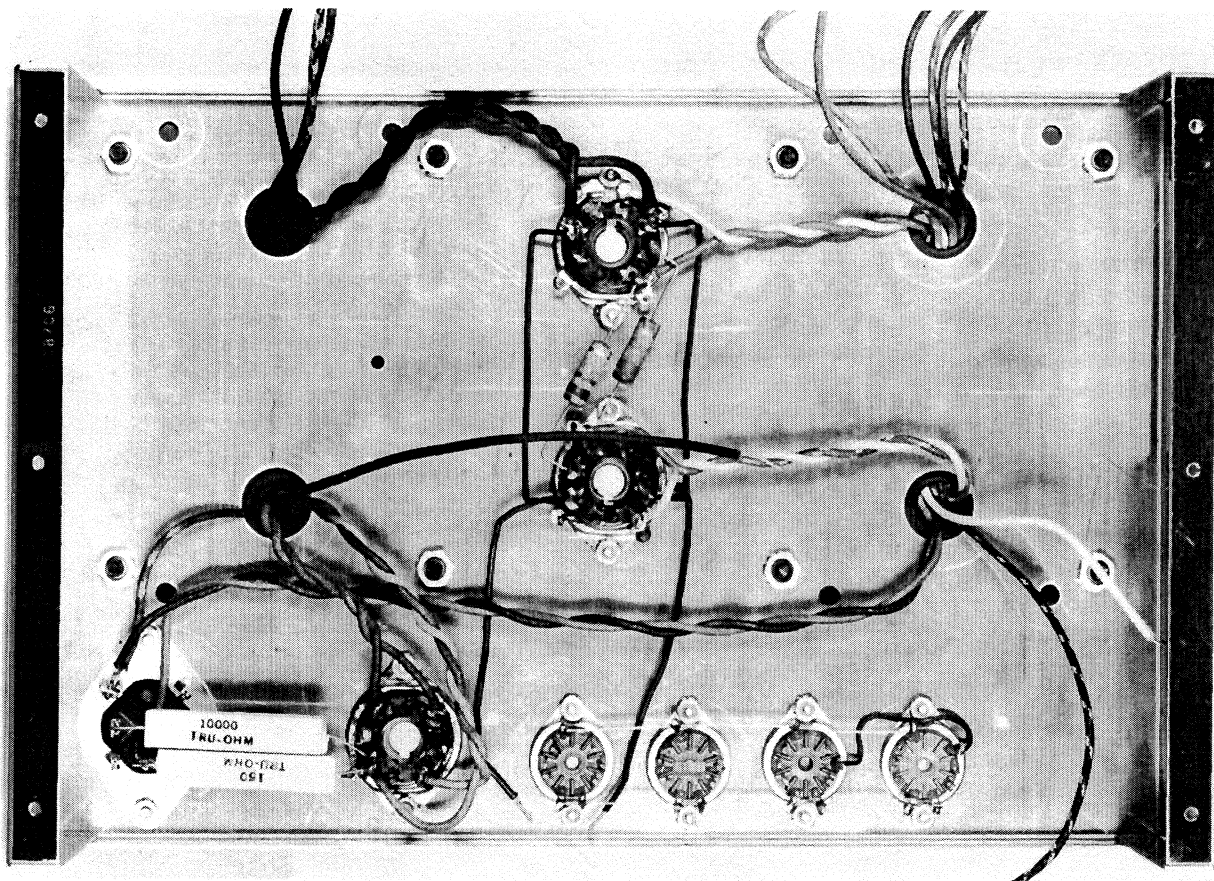


FIG. 9. UNDER SIDE OF THE CHASSIS AS IT APPEARS AT THE COMPLETION OF STAGE 4. COMPARE THIS PHOTO WITH FIG. 8 ON THE SHEET OF DIAGRAMS

STAGE 4: FIRST CHASSIS ASSEMBLY AND WIRING

- Note: Before you start on this stage, put a thick, soft cloth on your workbench, so that when the chassis rests on the tops of the transformers the finish on the cases will be protected.
 - Note: As you proceed with this stage, check the locations of the parts with both the diagram in Fig. 8 and the corresponding photograph in Fig. 9.
 - Note: wherever color is not indicated on wires in Fig. 8, use bare wires.
1. Holes H1 and H2
 - Check the leads coming through the chassis. From hole H1 there should be two green leads, one black, one red-black, and one yellow-black.
 - From hole H2, two red, two yellow, one blue, one red-yellow.
 - Note: If the leads do not check with this list, unfasten the transformer and make the change necessary.
 2. Holes H3 and H4
 - Check the leads coming through the chassis. From H3 there should be one each violet, white-violet, brown, white-brown, green, white-green, blue, and yellow.
 - From H4, one each black, red, white, white-black, white-blue, and white-yellow.
 - Note: If the leads do not check with this list, unfasten the transformer and make the change necessary.
 3. Capacitor mounting plate MTG, two ¼-in. 4-40 binding-head screws, two locknuts
 - With the chassis positioned as in Fig. 8, fasten the mounting plate in the lower left-hand corner.
 4. Electrolytic capacitor C13, 35 mf. 500 V., 80 mf. 500 V., 15 mf. 450 V.
 - Put the prongs on the capacitor through the slots in the mounting plate, making sure that the three lugs are oriented exactly as in Fig. 8. Then, pressing the capacitor firmly against the plate, twist each of the four prongs a quarter of a turn.
 - Solder prong 3 to the mounting plate. This provides a ground connection to the chassis.
 - Note: Apply enough heat to the mounting plate to make the solder flow freely. Otherwise, you may have only a rosin joint, which will insulate the prong from the chassis.
 5. Hole H2, red-yellow lead
 - Connect this lead to Capacitor C13, prong 1.

6. Hole H₄, red and black leads
 - Twist these leads together. When you do this, keep the open ends wide apart, so that the leads will be actually twisted together. Otherwise, one lead will run straight, and the other will be simply wound around it.
 - Connect the black lead to capacitor C₁₃, prong 1.
 - At C₁₃, prong 1 solder two wires.
 - Connect the red lead to Capacitor C₁₃, lug 6.
7. Socket S₁, two ¼-in. 4-40 binding-head screws, two locknuts
 - Note: of the five 8-lug sockets, there are two of one type, and three of another. Put the two similar sockets aside, as they will not be used until Stage 5. The three similar sockets will be called for in this stage, at S₁, S₂, and S₃.
 - Note: On each socket, bend all the ground lugs on the metal mounting frame away from the bakelite socket body.
 - Mount socket S₁ under the chassis, with the keyway in the center hole oriented as in Fig. 8.
8. Hole H₂, two red leads
 - Twist these leads together.
 - Connect the shorter lead to socket S₁, lug 4.
 - At S₁, lug 4 solder one wire.
 - Connect the longer lead to socket S₁, lug 6.
 - At S₁, lug 6 solder one wire.
9. Hole H₂, two yellow leads
 - Twist these leads together.
 - Connect the shorter lead to socket S₁, lug 8.
 - At S₁, lug 8 solder one wire.
 - Connect the longer lead to socket S₁, lug 2.
10. Red wire, 3 ins. long
 - Connect from socket S₁, lug 2,
 - To capacitor C₁₃, lug 5,
 - At C₁₃, lug 5 solder one wire.
11. Resistor R₂₇, square case, 150 ohms, 10 W
 - Connect from socket S₁, lug 2,
 - To capacitor C₁₃, lug 6.
 - At C₁₃, lug 6 solder two wires.
12. Resistor R₂₈, square case, 10 K, 10 W
 - Connect from socket S₁, lug 2.
 - To capacitor C₁₃, lug 4.
 - At S₁, lug 2 solder four wires.
13. Socket S₂, two ¼-in. 4-40 binding-head screws, two locknuts
 - Mount socket S₂ (same type as S₁) under the chassis, with the keyway in the center hole oriented as in Fig. 8.
14. Bare wire, 1 in. long
 - On socket S₂, bend out the ground lug on the mounting between lugs 1 and 2.
 - Connect lug 1 to the ground lug.
 - At S₂, lug 1 solder one wire.
 - At the ground lug solder one wire.
15. Hole H₁, two green leads
 - Twist these leads together.
 - Connect the shorter lead to socket S₂, lug 7.
 - Connect the longer lead to socket S₂, lug 8.
16. Hole H₃, yellow and blue leads
 - Twist these leads together.
 - Connect the yellow lead to socket S₂, lug 8.
 - Connect the blue lead to socket S₂, lug 4.
17. Socket S₃, two ¼-in. 4-40 binding-head screws, two locknuts
 - Mount socket S₃ (same type as S₁) under the chassis, with the keyway in the center hole oriented as in Fig. 8.
18. Bare wire, 1 in. long
 - On socket S₃, bend out the ground lug on the mounting between lugs 1 and 2.
 - Connect lug 1 to the ground lug.
 - At S₃, lug 1 solder one wire.
 - At the ground lug solder one wire.
19. Hole H₄, white-blue and white-yellow leads
 - Twist these leads together.
 - Connect the white-blue lead to Socket S₃, lug 4.
 - Connect the white-yellow lead to socket S₃, lug 8.
20. Choke CH₁, brown-green
 - Connect from socket S₂, lug 4,
 - To socket S₃, lug 3.
 - Position this choke exactly as in Fig. 8.
 - At S₃, lug 3 solder one wire.
21. Choke CH₂, red-violet
 - Connect from socket S₂, lug 3,
 - To socket S₃, lug 4
 - Position this choke exactly as in Fig. 8.
 - At S₂, lug 3 solder one wire.
22. Brown wire, 4½ ins. long
 - Connect from socket S₂, lug 7,
 - To socket S₃, lug 2.
 - At S₂, lug 7 solder two wires.
23. Brown wire, 4½ ins. long
 - Connect one end to socket S₃, lug 2
 - At S₃, lug 2 solder two wires.
 - Note: The other end of this wire is not connected until Stage 6, as it must pass through a hole in the parts board.
24. Brown wire, 4½ ins. long
 - Connect from socket S₂, lug 2,
 - To socket S₃, lug 7.
 - At S₂, lug 2 solder two wires.

25. Brown wire, $5\frac{1}{4}$ ins. long
- Connect one end to socket S₃, lug 7.
 - At S₃, lug 7 solder two wires.
 - Note: The other end of this wire is not connected until Stage 6, as it must pass through a hole in the parts board.
26. Sockets S₄, S₅, S₆, S₇, eight $\frac{1}{4}$ -in. 4-40 binding-head screws, eight locknuts
- Mount these four sockets under the chassis, with the blank lug spaces oriented as in Fig. 8.
27. Bare wire, $4\frac{1}{4}$ ins. long
- Twist lug 9 on sockets S₄, S₅, S₆, and S₇ as shown in Fig. 8.
 - Run this wire through lug 9 on each of the four sockets.
 - At S₅, lug 9 solder one wire.
 - At S₆, lug 9 solder one wire.
28. Bare wire, $4\frac{1}{2}$ ins.
- Twist lugs 4 and 5 on sockets S₄, S₅, S₆, and S₇ as shown in Fig. 8.
 - Run this wire through lugs 4 and 5 on each of these four sockets.
 - At S₄, lug 5 solder one wire.
 - At S₅, lugs 4 and 5 solder one wire.
 - At S₆, lugs 4 and 5 solder one wire.
 - At S₇, lug 5 solder one wire.
29. Blue wire, 3 ins. long
- Connect from socket S₆, lug 2,
 - To socket S₇, lug 1.
 - At S₆, lug 2 solder one wire.
30. Resistor R₂₉, orange-orange-yellow
- Connect from socket S₅, lug 2,
 - To socket S₅, lug 7.

THIS COMPLETES THE FIRST PART OF THE CHASSIS ASSEMBLY AND WIRING.

CHECK LIST FOR INSPECTING THE STEPS COMPLETED IN THIS STAGE

Before starting the next stage, make a thorough inspection of the work you have just completed. Careful inspection after each stage becomes increasingly important as more parts and wires are added.

- 4. C₁₃, prong 3 soldered to MTG
- 5. H₂, yellow-red to C₁₃, prong 1
- 6. H₄, red lead and black lead twisted
 - Red to C₁₃, lug 6
 - Black to C₁₃, prong 1
 - At C₁₃, prong 1 two wires soldered
- 8. H₂, two red leads twisted
 - Red to S₁, lug 4
 - At S₁, lug 4 one wire soldered
 - Red to S₁, lug 6
 - At S₁, lug 6 one wire soldered
- 9. H₂, two yellow leads twisted
 - Yellow to S₁, lug 8
 - At S₁, lug 8 one wire soldered
 - Yellow to S₁, lug 2
- 10. Red, S₁, lug 2 to C₁₃, lug 5
 - At C₁₃, lug 5 one wire soldered
- 11. R₂₇, 150 ohms, S₁, lug 2 to C₁₃, lug 6
 - At C₁₃, lug 6 two wires soldered
- 12. R₂₈, 10 K, S₁, lug 2 to C₁₃, lug 4
 - At S₁, lug 2 four wires soldered
- 14. Bare wire, S₂, lug 1 to ground lug
 - At S₂, lug 1 one wire soldered
 - At ground lug one wire soldered
- 15. H₁, two green leads twisted
 - Green to S₂, lug 7
 - Green to S₂, lug 2
- 16. H₃, yellow and blue leads twisted
 - Yellow to S₂, lug 8
 - Blue to S₂, lug 4
- 18. Bare wire, S₃, lug 1 to ground lug
 - At S₃, lug 1 one wire soldered
- At ground lug one wire soldered
- 19. H₄, white-blue and white-yellow leads twisted
 - White-blue to S₃, lug 4
 - White-yellow to S₃, lug 8
- 20. CH₁, brown-green, S₂, lug 4 to S₃, lug 3
 - At S₃, lug 3 one wire soldered
- 21. CH₂, red-violet, S₂, lug 3 to S₃, lug 4
 - At S₂, lug 3 one wire soldered
- 22. Brown, S₂, lug 7 to S₃, lug 2
 - At S₂, lug 7 two wires soldered
- 23. Brown, S₃, lug 2 only
 - At S₃, lug 2 two wires soldered
- 24. Brown, S₂, lug 2 to S₃, lug 7
 - At S₂, lug 2 two wires soldered
- 25. Brown, S₃, lug 7 only
 - At S₃, lug 7 two wires soldered
- 27. Bare wire, lug 9 on S₄, S₅, S₆, S₇
 - At S₅, lug 9 one wire soldered
 - At S₆, lug 9 one wire soldered
- 28. Bare wire, lugs 4 and 5 on S₄, S₅, S₆, S₇
 - At S₄, lug 5 one wire soldered
 - At S₅, lugs 4 and 5 one wire soldered
 - At S₆, lugs 4 and 5 one wire soldered
 - At S₇, lug 5 one wire soldered
- 29. Blue, S₆, lug 2 to S₇, lug 1
 - At S₆, lug 2 one wire soldered
- 30. R₂₉, orange-orange-yellow, S₅, lug 2 to S₅, lug 7
 - Note: In Fig. 8 thirteen leads are shown running out from the chassis at the right. Instruction for these will be given in Stage 5.
 - Note: The blue lead from H₂ and the white lead from H₄ are not connected until Stage 6.
 - Note: There should be no connections to the following socket lugs, as they are not used in this or subsequent stages: S₁, lugs 1, 3, 5, and 7; S₂, lug 6; S₃, lug 6; S₇, lugs 6, 7, and 8. Consequently, these lugs are not numbered in Fig. 8. If a lug is numbered but no connection to it is shown in Fig. 8, a connection will be made in a subsequent stage.

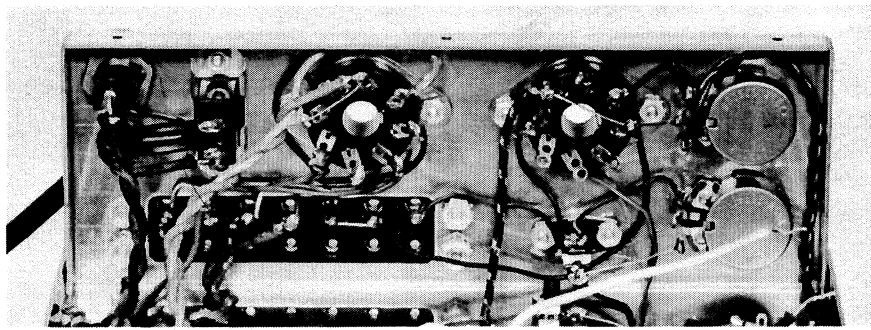


FIG. 11. END VIEW OF THE CHASSIS AS IT APPEARS AT THE COMPLETION OF STAGE 5. COMPARE THIS PHOTO WITH FIG. 10 ON THE SHEET OF DIAGRAMS

STAGE 5: SECOND CHASSIS ASSEMBLY AND WIRING

- Note: As you proceed with this stage, compare your work at each step with the diagram in Fig. 10, and the corresponding photograph, Fig. 11.
 - Note: For your convenience, some of the steps in this stage call for connecting wires to certain parts before the parts are mounted on the chassis.
1. Terminal plate TERM, white-green wire, $3\frac{1}{4}$ ins. long
 - Note: When you connect the following wires to the terminal plate, hold it in the position shown in Figs. 10 and 11, with the lugs up.
 - Connect this wire to terminal plate TERM, lug 1
 2. Green wire, $3\frac{1}{4}$ ins. long
 - Connect this wire to terminal plate TERM, lug 2.
 3. White-brown wire, $3\frac{1}{4}$ ins. long
 - Connect this wire to terminal plate TERM, lug 3.
 4. Brown wire, $3\frac{1}{4}$ ins. long
 - Connect this wire to terminal plate TERM, lug 4.
 5. Black wire, 4 ins. long
 - Connect the longer bare end to terminal plate TERM, lugs 5 and 6.
 - At TERM, lug 5 solder one wire.
 6. Black wire, 3 ins. long
 - Connect to terminal plate TERM, lug 6.
 - At TERM, lug 6 solder two wires.
 7. Green wire, $2\frac{3}{4}$ ins. long
 - Connect to terminal plate TERM, lug 7
 - At TERM, lug 7 solder one wire.
 8. Terminal plate TERM, four $\frac{1}{2}$ -in. 6-32 binding-head screws, four locknuts
 - Mount terminal plate TERM on the outside of the chassis, with the lugs toward the bottom.
 9. Socket S8, bare wire, $1\frac{1}{4}$ ins. long
 - Connect from S8, lug 5,
 - To S8, lug 7.
 - At S8, lug 5 solder one wire.
 10. Socket S8, two $\frac{1}{4}$ -in. 4-40 binding-head screws, two locknuts
 - Mount socket S8 inside the chassis, with the key-way in the center hole oriented as in Fig. 10.
 11. Hole H₃, green and white-green leads (see Fig. 8)
 - Twist these leads together
 - Connect the green lead to terminal plate TERM, lug 2.
 - At TERM, lug 2 solder two wires.
 - Connect the white-green lead to terminal plate TERM, lug 1.
 - At TERM, lug 1 solder two wires.
 12. Hole H₃, brown and white-brown leads (see Fig. 8)
 - Connect the brown lead to terminal plate TERM, lug 4.
 - At TERM, lug 4 solder two wires.
 - Connect the white-brown lead to terminal plate TERM, lug 3.
 - At TERM, lug 3 solder two wires.
 13. Black wire, one end already connected to terminal plate TERM, lugs 5 and 6
 - Connect to socket S8, lug 6.
 - At S8, lug 6 solder one wire.
 14. Brown wire, one end already connected to terminal plate TERM, lug 4
 - Connect to socket S8, lug 1.
 - At S8, lug 1 solder one wire.
 15. White-brown wire, one end already connected to terminal plate TERM, lug 3
 - Connect to socket S8, lug 2.
 - At S8, lug 2 solder one wire.
 16. Green wire, one end already connected to terminal plate TERM, lug 2
 - Connect to socket S8, lug 3.

- At S8, lug 3 solder one wire.
17. White-green wire, one end already connected to terminal plate TERM, lug 1
 - Connect to socket S8, lug 4.
 - At S8, lug 4 solder one wire.
 - Note: Press the two pairs of twisted leads from H₃ against the chassis, and down from the lugs on the terminal plate, so they will not be in the way of parts to be added later.
 - Note: Press the wires from the lugs of socket S8 down against the chassis, and keep them together as they run across from the terminal plate. This is shown in Fig. 11.
 18. Fuse-holder FUSE, rubber washer, lock washer, nut
 - Put the rubber washer on the fuse-holder.
 - Put the fuse-holder through the hole in the chassis, oriented as in Fig. 10.
 - Put on the lockwasher and nut. Tighten the nut until the fuse-holder is held firmly, but *be careful that you do not tighten the nut to the point where the molded case will be damaged.*
 19. Line cord, strain-relief grommet AC
 - To see exactly how the strain-relief grommet should be closed, try bending the closure piece into the slot where it fits. Then pry it out again.
 - Put the end of the line cord into the large-diameter part of grommet AC, and pull it through to 2¼ ins. measured from the entrance to the grommet.
 - Bend the rear closure into place, squeezing it down on the line cord with your long-nose pliers, and insert the cord and grommet in the chassis hole from the outside, as shown in Fig. 10. Push the grommet through the hole until the shoulder is against the chassis. It should hold the line cord securely.
 20. AC outlet OUT, two ¼-in. 4-40 binding-head screws, two locknuts
 - Mount the outlet OUT from inside the chassis, as shown in Fig. 10.
 - Note: you may have a little trouble putting the nuts on the screws, but be patient. It can be done!
 21. Brown wire, 3 ins. long
 - At fuse-holder FUSE, bend out lug 2, so you can put a wire through the hole in the lug.
 - Connect from fuse-holder FUSE, lug 2,
 - To AC outlet OUT, lug 1.
 - At FUSE, lug 2 solder one wire.
 22. AC line cord
 - Connect one wire to AC outlet OUT, lug 1.
 - At OUT, lug 1 solder two wires.
 - Connect the other wire to AC outlet OUT, lug 2.
 23. Hole H₁, red-black and yellow-black leads, black sleeving, 1½ ins. long (see Fig. 8)
 - Note: Only one of these leads will be used, depend-
 - ing upon the AC line voltage from which this amplifier is to be operated.
 - Note: For 125 volts, 50/60 cycles, use the red-black lead.
 - Note: for 117 volts, 50/60 cycles, use the yellow-black lead.
 - Slip the black sleeving over the lead you *will not use*. Double back 3 ins. of this lead, trim off any loose threads of insulation, and push the end into the sleeve a distance of 1 in., so there will be no chance that the bare wire can ever touch the chassis.
 24. Hole H₁, black lead (see Fig. 8)
 - Twist together the black lead and the lead selected in Step 24 that you *will use*.
 - Connect the black lead to fuse-holder FUSE, lug 1.
 - At FUSE, lug 1 solder one wire.
 - Connect the other lead of this twisted pair to AC outlet OUT, lug 2.
 - At OUT, lug 2 solder two wires.
 25. Hole H₃, violet and white-violet leads (see Fig. 8)
 - Twist these leads together.
 - Connect the violet lead to socket S8, lug 7.
 - At S8, lug 7 solder two wires.
 - Connect the white-violet lead to socket S8, lug 8.
 - At S8, lug 8 solder one wire.
 26. Socket S₉, two ¼-in. 4-40 binding head screws, two locknuts
 - Mount the socket on the inside of the chassis, with the keyway in the center hole oriented as in Fig. 10.
 27. Potentiometer POT 1, 250 ohms, one lockwasher, one nut
 - On the under side of the potentiometer you will see a square lug. Bend it out at right angles to the side of the metal cover, as it is not used.
 - Mount potentiometer POT 1 on the inside of the chassis, with the lockwasher and nut on the outside.
 - Orient the lugs as in Fig. 10. Be careful not to scratch the finish on the chassis when you tighten the nut.
 28. Potentiometer POT 2, 250 K ohms, one lockwasher, one nut
 - Bend out the square lug on the under side of the potentiometer, as directed in Step 27.
 - Mount the potentiometer POT 2 on the inside of the chassis, with the lockwasher and nut on the outside.
 - Orient the lugs as in Fig. 10. Be careful not to scratch the finish on the chassis when you tighten the nut.
 29. Input jack JACK, two ¼-in. 4-40 binding-head screws, two locknuts
 - Mount the jack on the inside of the chassis, with the lugs oriented as in Fig. 10.

30. Black wire, one end already connected to terminal plate TERM, lug 6
- Pry out lug 1 on input jack JACK, to make it more accessible.
 - Connect the black wire to input jack JACK, lug 1.
31. Bare wire, 1½ ins. long
- Connect from input jack JACK, lug 1.
 - To potentiometer POT 2, lug 3.
 - At POT 2, lug 3 solder one wire.
32. Black wire 3 ins. long
- Connect from socket S9, lug 1,
 - To input jack JACK, lug 1.
33. Black wire, 11½ ins. long
- Connect from input jack JACK, lug 1,
 - To capacitor C13, prong 2 (see Fig. 8).
 - At JACK, lug 1 solder four wires.
34. Green wire, one end already connected to terminal plate TERM, lug 7
- Connect to input jack JACK, lug 2.
35. Green wire, 2½ ins. long
- Connect from socket S9, lug 5,
 - To input jack JACK, lug 2.
 - At S9, lug 5 solder one wire.
36. Green wire, 2½ ins. long
- Connect from potentiometer POT 2, lug 1,
 - To input jack JACK, lug 2.
 - At POT 2, lug 1 solder one wire.
 - At JACK, lug 2 solder three wires.
37. Bare wire, 2 ins. long
- Connect from potentiometer POT 1, lug 2,
 - To socket S9, lug 6, and across to S9, lug 1.
 - At POT 1, lug 2 solder one wire.
38. Hole H4, white-black lead (see Fig. 10)
- Connect this lead to socket S9, lug 6.
- At S9, lug 6 solder two wires.
39. Red wire, 14½ ins. long
- Connect from socket S9, lug 4,
 - To capacitor C13, lug 4 (see Fig. 8).
 - At C13, lug 4 solder two wires.
40. Brown wire, 2 ins. long
- Connect from socket S9, lug 7,
 - To potentiometer POT 1, lug 1.
 - At S9, lug 7 solder one wire.
41. Brown wire, 2 ins. long
- Connect from socket S9, lug 8,
 - To potentiometer POT 1, lug 3.
 - At S9, lug 8 solder one wire.
42. Brown wire, 7¾ ins. long, and brown wire 8¾ ins. long
- Note: Read all the following instructions carefully before you start. Otherwise, you may be confused, and reverse the connections.
 - Connect the 7¾-in. brown lead to POT 1, lug 3.
 - At POT 1, lug 3 solder two wires.
 - Connect the 8¾-in. brown wire to POT 1, lug 1.
 - At POT 1, lug 1 solder two wires.
 - Bend both of these wires so that they point up from the end of the chassis. The wire from POT 1, lug 1 will be about 1½ ins. longer than the other.
 - Twist these wires together, and run them over POT 1 and down again, as in Fig. 10, spaced slightly from the side of the chassis, so that they will not be pinched when the bottom cover is attached.
 - Connect the shorter brown wire to socket S7, lug 4 (see fig. 8).
 - At S7, lug 4 solder two wires.
 - Connect the longer brown wire to socket S7, lug 9 (see Fig. 8).
 - At S7, lug 9 solder two wires.

THIS COMPLETES THE SECOND PART OF THE CHASSIS WIRING AND ASSEMBLY.

CHECK LIST FOR INSPECTING THE STEPS COMPLETED IN THIS STAGE

With still more parts and wiring added in this stage, it is absolutely necessary to check the work just completed. Thorough inspection at the end of each stage is your assurance that your amplifier will operate perfectly when you first connect it to your audio system. The numbers at the left correspond to those on the step-by-step instructions.

- 1. White-green TERM, lug 1
- 2. Green TERM, lug 2
- 3. White-brown TERM, lug 3
- 4. Brown TERM, lug 4
- 5. Black TERM, lugs 5 and 6
- At TERM, lug 5 one wire soldered
- 6. Black TERM, lug 6
- At TERM, lug 6 two wires soldered
- 7. Green TERM, lug 7
- At TERM, lug 7 one wire soldered
- 9. Bare wire S8, lug 5 to S8, lug 7
- At S8, lug 5 one wire soldered
- 11. H3, green lead and white-green lead twisted
- Green lead TERM, lug 2
- At TERM, lug 2 two wires soldered
- White-green lead TERM, lug 1
- At TERM, lug 1 two wires soldered
- 12. H3, brown lead and white-brown lead twisted

- Brown lead TERM, lug 4
- At TERM, lug 4 two wires soldered
- White-brown lead TERM, lug 3
- At TERM, lug 3 two wires soldered
- 13. Black S8, lug 6
- At S8, lug 6 one wire soldered
- 14. Brown S8, lug 1
- At S8, lug 1 one wire soldered
- 15. White-brown S8, lug 2
- At S8, lug 2 one wire soldered
- 16. Green S8, lug 3
- At S8, lug 3 one wire soldered
- 17. White-green S8, lug 4
- At S8, lug 4 one wire soldered
- 18. Remove the cap on the fuse-holder, and take out fuse. It should be stamped 3A, 250 volts.
- 19. Check the line cord to see that it is clamped firmly by the strain-relief grommet.
- 21. Brown FUSE, lug 2 to OUT, lug 1
- At FUSE, lug 2 one wire soldered
- 22. Line cord, one wire to OUT, lug 1
- At OUT, lug 1 two wires soldered
- Other wire to OUT, lug 2
- 23. H1, red-black and yellow-black leads, see that lead not used is insulated at the end with black sleeving.
- 24. H1, black lead and lead to be used from Step 24 twisted
- Black lead to FUSE, lug 1
- At FUSE, lug 1 one wire soldered
- Other lead to OUT, lug 2
- At OUT, lug 2 two wires soldered
- 25. H3, violet lead and white-violet lead twisted
- Violet lead to S8, lug 7
- At S8, lug 7 two wires soldered
- White-violet lead to S8, lug 8
- At S8, lug 8 one wire soldered
- 30. Black JACK, lug 1
- 31. Bare wire JACK, lug 1 to POT 2, lug 3
- At POT 2, lug 3 one wire soldered
- 32. Black S9, lug 1 to JACK, lug 1
- 33. Black JACK, lug 1 to C13, prong 2
- At JACK, lug 1 four wires soldered
- 34. Green JACK, lug 2
- 35. Green S9, lug 5 to JACK, lug 2
- At S9, lug 5 one wire soldered
- 36. Green POT 2, lug 1 to JACK, lug 2
- At POT 2, lug 1 one wire soldered
- At JACK, lug 2 three wires soldered
- 37. Bare wire POT 1, lug 2 to S9, lug 6 and lug 1
- At POT 1, lug 2 one wire soldered
- 38. H4, white-black lead to S9, lug 6
- At S9, lug 6 two wires soldered
- 39. Red S9, lug 4 to C13, lug 4
- At C13, lug 4 two wires soldered
- 40. Brown S9, lug 7 to POT 1, lug 1
- At S9, lug 7 one wire soldered
- 41. Brown S9, lug 8 to POT 1, lug 3
- At S9, lug 8 one wire soldered
- 42. Two brown wires, one from POT 1, lug 3 to S7, lug 4
- Other brown wire, POT 1, lug 1 to S7, lug 9
- Note: There should be no connection to S9, lugs 2 and 3
- Note: There should be no soldered connections to POT 2, lug 2; S9, lug 1; S9, lug 4.
- Note: Be sure that the GAIN potentiometer is 250,000 ohms, and the HUM ADJ. is 250 ohms.

THIS COMPLETES THE INSPECTION OF THE SECOND PART OF THE CHASSIS ASSEMBLY AND WIRING.

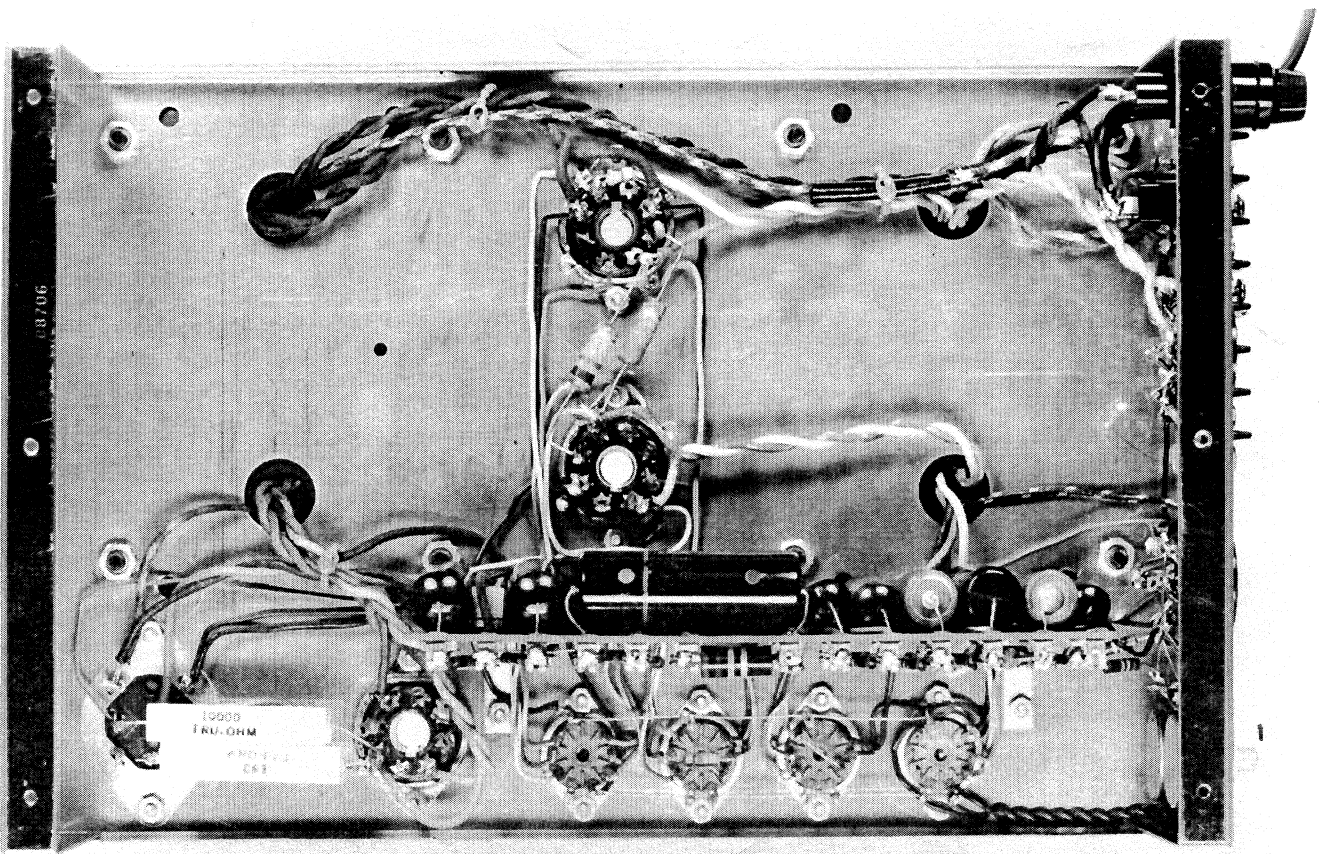


FIG. 12. THE COMPLETED AMPLIFIER, READY FOR THE BOTTOM PLATE AND THE TUBES. CHECK THE STEPS IN STAGE 6 WITH THIS PHOTO

STAGE 6: FINAL ASSEMBLY AND WIRING

- Note: Fig. 8 shows, in dotted lines, the position of the parts board when it is mounted under the chassis. Compare this with the photograph in Fig. 12.
 - Note: Part numbers and lug numbers for parts already mounted on the chassis will be found in Figs. 8 and 10.
1. Brown wire from socket S3, lug 2
 - With the parts board positioned as in Fig. 12, run this wire through hole C in the parts board.
 2. Brown wire from socket S3, lug 7
 - Run this wire through hole C in the parts board.
 3. Hole H4, white lead
 - Run this lead through hole K in the parts board.
 4. Parts board and brackets, two ¼-in. 4-40 binding-head screws, two locknuts
 - Mount the parts board under the chassis.
 - Note: Keep the wires running parallel with the parts board (see Fig. 8) behind the parts board. Be sure that none is clamped between the parts board and the chassis.
 5. White-gray wire at the rear of the parts board from terminal 15
 - Connect to socket S3, lug 5.
 - At S3, lug 5 solder one wire.
 6. White-yellow wire at the rear of the parts board from terminal 29
 - Connect to socket S3, lug 8.
 - At S3, lug 8 solder two wires.
 7. Brown wire from socket S3, lug 2 through hole C
 - Connect to socket S4, lug 9.
 - At S4, lug 9 solder two wires.
 8. Hole H2, blue lead
 - Put the end through terminal 2 on the parts board and around the left leg.
 - At terminal 2 solder two wires.
 9. White-gray wire from hole B
 - Connect to socket S4, lug 8.
 - At S4, lug 8 solder one wire.
 10. White-green wire from hole B
 - Connect to socket S4, lug 7.
 - At S4, lug 7 solder one wire.
 11. White-orange wire from hole B

- Connect to socket S4, lug 6.
 - At S4, lug 6 solder one wire.
12. Yellow wire at the rear of the parts board from terminal 31
 - Connect to socket S2, lug 8.
 - At S2, lug 8 solder two wires.
 13. Gray wire at the rear of the parts board from terminal 17
 - Connect to socket S2, lug 5.
 - At S2, lug 5 solder one wire.
 14. Brown wire from socket S3, lug 7 through hole C
 - Connect to socket S4, lug 4.
 - At S4, lug 4 solder two wires.
 15. Orange wire from hole D
 - Connect to socket S4, lug 1.
 - At S4, lug 1 solder one wire.
 16. Green wire from hole D
 - Connect to socket S4, lug 2.
 - At S4, lug 2 solder one wire.
 17. Gray wire from hole D
 - Connect to socket S4, lug 3.
 - At S4, lug 3 solder one wire.
 18. Black wire at the rear of the parts board from terminal 33
 - Connect to capacitor C13, prong 2.
 - At C13, prong 2 solder two wires.
 19. White-yellow wire from hole E
 - Connect to socket S5, lug 8, and across to lug 3.
 - At S5, lug 8 solder one wire.
 - At S5, lug 3 solder one wire.
 20. White-green wire from hole E
 - Connect to socket S5, lug 7.
 - At S5, lug 7 solder two wires.
 21. White-blue wire from hole E
 - Connect to socket S5, lug 6.
 - At S5, lug 6 solder one wire.
 22. Orange wire at the rear of the parts board from terminal 34
 - Connect to socket S2, lug 4.
 - At S2, lug 4 solder three wires.
 23. White-orange wire at the rear of the parts board from terminal 6
 - Connect to socket S3, lug 4.
 - At S3, lug 4 solder three wires.
 24. Blue wire from hole G
 - Connect to socket S5, lug 1.
 - At S5, lug 1 solder one wire.
 25. Green wire from hole G
 - Connect to socket S5, lug 2.
 - At S5, lug 2 solder two wires.
 26. Yellow wire from hole H
 - Connect to socket S6, lug 8, and across to lug 3.
 - At S6, lug 8 solder one wire.
 - At S6, lug 3 solder one wire.
 27. White-green wire from hole H
 - Connect to socket S6, lug 7.
 - At S6, lug 7 solder one wire.
 28. White-blue wire from hole H
 - Connect to socket S6, lug 6.
 - At S6, lug 6 solder one wire.
 29. Red wire at the rear of the parts board from terminal 24
 - Connect to socket S9, lug 4.
 - At S9, lug 4 solder two wires.
 30. Blue wire from hole J
 - Connect to socket S6, lug 1.
 - At S6, lug 1 solder one wire.
 31. Hole H4, white lead
 - Run this lead up from hole K to terminal 26.
 - At terminal 26 solder three wires.
 32. Blue wire from hole L
 - Connect to socket S7, lug 1.
 - At S7, lug 1 solder two wires.
 33. Yellow wire from hole L
 - Connect to socket S7, lug 3.
 - At S7, lug 3 solder one wire.
 34. Green wire from hole M
 - Connect to socket S7, lug 2.
 - At S7, lug 2 solder one wire.
 35. Resistor R25, brown-black-yellow, one end already connected to parts board terminal 28
 - Connect to socket S9, lug 2.
 - At S9, lug 2 solder one wire.
 36. Resistor R26, red-violet-orange, one end already connected to parts board terminal 28
 - Connect to POT 2, lug 2.
 - At POT 2, lug 2 solder one wire.
 37. Black wire at the rear of the parts board from terminal 27
 - Pull this wire up toward the top of the parts board, and connect to socket S9, lug 1.
 - At S9, lug 1 solder three wires.
 38. Three beaded wire ties
 - Put these wire ties around the leads at three points, as shown in Fig. 12. Slip the plain end through the

larger hole of the head end. Pull the tie as tight as possible. Then push the nearest space between two beads through the slot and into the smaller hole. Snip off the extra length.

FINAL INSPECTION: At this point, carry out the inspection procedure which follows, for the final step in this stage call for putting on the bottom chassis cover and inserting the tubes. Be very thorough in making this final inspection.

39. Bottom chassis cover, six 1/4-in. hexagonal-head self-tapping screws.
- Slide the bottom cover into place as in Figs. 15 and 16.
 - Put in the six screws that hold the cover. If the holes do not line up exactly, press in the end of the chassis.
40. Seven tubes
- Insert the seven tubes in their sockets. Each socket

is marked to show the tube type.

- Note: Three tubes have center posts on the bases, with keys that must fit into keyways in the sockets. Line up the keys and keyways before you press the tubes into the sockets. Do this carefully. Otherwise, you may break the posts.
- Note: Four tubes have thin pins that are readily bent, and can be broken. Examine each tube to make sure that the pins are all straight. There is a gap between two of the pins, and a corresponding space between two of the holes in each socket. Line up these spaces before you press the tubes into the sockets. Do not turn the tubes and expect the pins to drop into the holes. If you do, you will bend the pins, and you may break them.
- Note: Before you connect the associated equipment, read the section which explains the purposes of the terminals and sockets. Make sure you have the right connections!

THIS COMPLETES THE FINAL ASSEMBLY AND WIRING

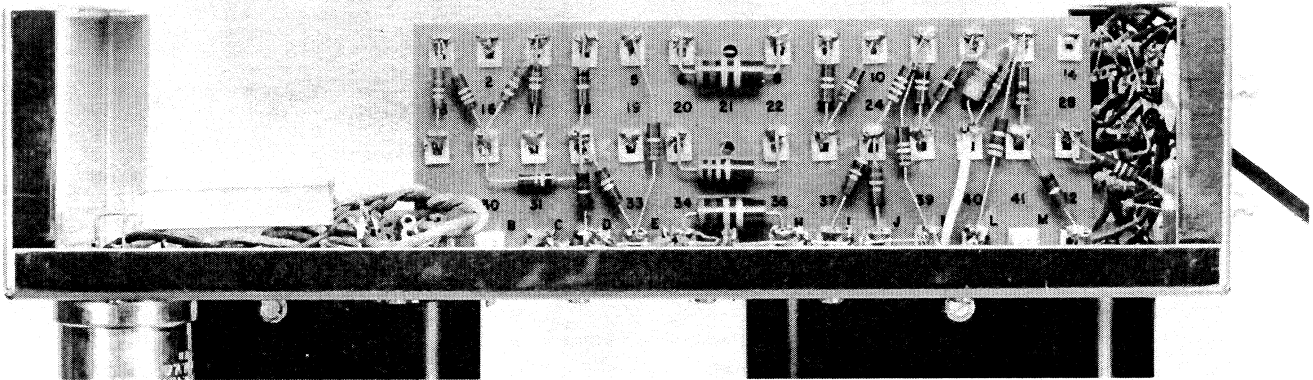


FIG. 13. SIDE VIEW OF THE CHASSIS, WITH THE PARTS BOARD IN PLACE, AND ALL THE WIRING COMPLETED

CHECK LIST FOR INSPECTING FINAL ASSEMBLY AND WIRING

In your haste to use your amplifier, don't skip over this last inspection procedure. If you have made a slip in the connections to the parts board, this is the time to find out and correct it. Follow professional practice. Don't *assume* that you are right. Make *certain!* Numbers on the left correspond to those on the step-by-step instructions.

- 4. See that no wires are caught between the chassis and the bottom edge of the parts board.
- 5. White-gray, rear of parts board, terminal 15 to S3, lug 5
 - At S3, lug 5 one wire soldered
- 6. White-yellow, rear of parts board, terminal 29 to S3, lug 8
 - At S3, lug 8 two wires soldered
- 7. Brown, S3, lug 2 through hole C to S4, lug 9
 - At S4, lug 9 two wires soldered
- 8. H2, blue lead to terminal 2
 - At terminal 2 two wires soldered
- 9. White-gray from hole B to S4, lug 8
 - At S4, lug 8 one wire soldered
- 10. White-green from hole B to S4, lug 7
 - At S4, lug 7 one wire soldered
- 11. White-orange from hole B to S4, lug 6
 - At S4, lug 6 one wire soldered
- 12. Yellow, rear of parts board, terminal 31 to S2, lug 8
 - At S2, lug 8 two wires soldered
- 13. Gray, rear of parts board, terminal 17 to S2, lug 5
 - At S2, lug 5 one wire soldered
- 14. Brown, S3, lug 7 through hole C to S4, lug 4
 - At S4, lug 4 two wires soldered
- 15. Orange from hole D to S4, lug 1
 - At S4, lug 1 one wire soldered
- 16. Green from hole D to S4, lug 2
 - At S4, lug 2 one wire soldered
- 17. Gray from hole D to S4, lug 3
 - At S4, lug 3 one wire soldered

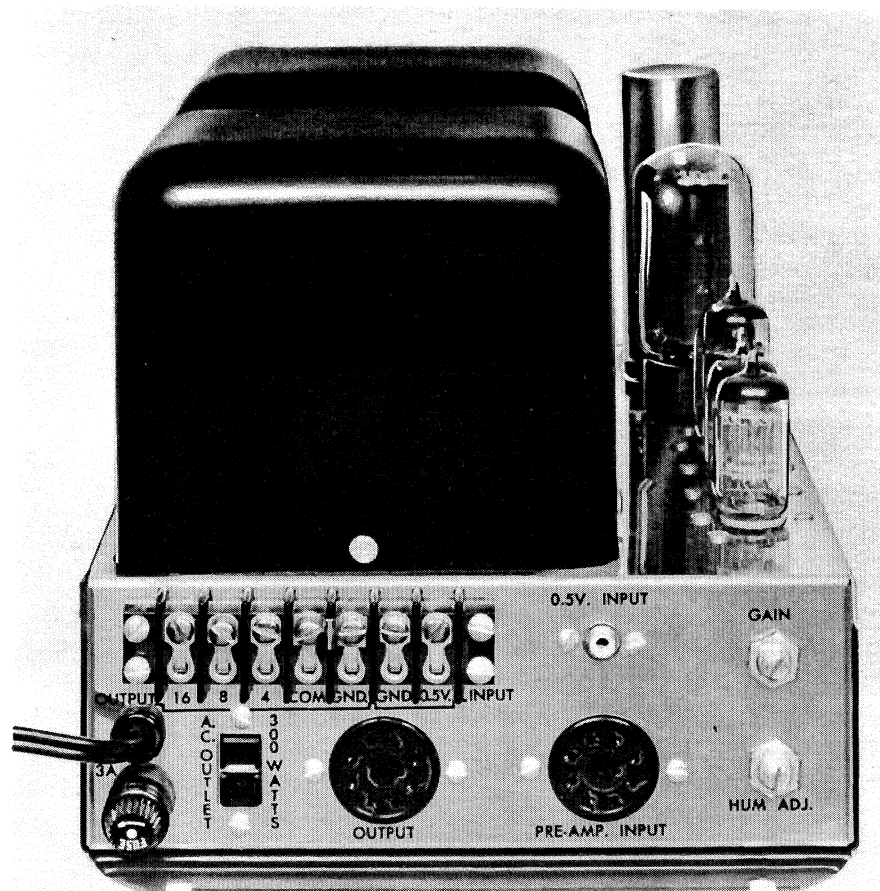


FIG. 14. END VIEW OF THE MK-30, SHOWING THE INPUT AND OUTPUT TERMINALS

- | | |
|--|--|
| <ul style="list-style-type: none"> <input type="checkbox"/> 18. Black, rear of parts board, terminal 33 to C13, prong 2 <input type="checkbox"/> At C13, prong 2 two wires soldered <input type="checkbox"/> 19. White-yellow from hole E to S5, lug 8 and lug 3 <input type="checkbox"/> At S5, lug 8 one wire soldered <input type="checkbox"/> At S5, lug 3 one wire soldered <input type="checkbox"/> 20. White-green from hole E to S5, lug 7 <input type="checkbox"/> At S5, lug 7 two wires soldered <input type="checkbox"/> 21. White-blue from hole E to S5, lug 6 <input type="checkbox"/> At S5, lug 6 one wire soldered <input type="checkbox"/> 22. Orange, rear of parts board, terminal 34 to S2, lug 4 <input type="checkbox"/> At S2, lug 4 three wires soldered <input type="checkbox"/> 23. White-orange, rear of parts board, terminal 6 to S3, lug 4 <input type="checkbox"/> At S3, lug 4 three wires soldered <input type="checkbox"/> 24. Blue from hole G to S5, lug 1 <input type="checkbox"/> At S5, lug 1 one wire soldered <input type="checkbox"/> 25. Green from hole G to S5, lug 2 <input type="checkbox"/> At S5, lug 2 two wires soldered <input type="checkbox"/> 26. Yellow from hole H to S6, lug 8 and lug 3 <input type="checkbox"/> At S6, lug 8 one wire soldered <input type="checkbox"/> At S6, lug 3 one wire soldered <input type="checkbox"/> 27. White-green from hole H to S6, lug 7 <input type="checkbox"/> At S6, lug 7 one wire soldered | <ul style="list-style-type: none"> <input type="checkbox"/> 28. White-blue from hole H to S6, lug 6 <input type="checkbox"/> At S6, lug 6 one wire soldered <input type="checkbox"/> 29. Red, rear of parts board, terminal 24 to S9, lug 4 <input type="checkbox"/> At S9, lug 4 two wires soldered <input type="checkbox"/> 30. Blue from hole J to S6, lug 1 <input type="checkbox"/> At S6, lug 1 one wire soldered <input type="checkbox"/> 31. H4, white lead through hole K to terminal 26 <input type="checkbox"/> At terminal 26 three wires soldered <input type="checkbox"/> 32. Blue from hole L to S7, lug 1 <input type="checkbox"/> At S7, lug 1 two wires soldered <input type="checkbox"/> 33. Yellow from hole L to S7, lug 3 <input type="checkbox"/> At S7, lug 3 one wire soldered <input type="checkbox"/> 34. Green from hole M to S7, lug 2 <input type="checkbox"/> At S7, lug 2 one wire soldered <input type="checkbox"/> 35. R25, brown-black-yellow to S9, lug 2 <input type="checkbox"/> At S9, lug 2 one wire soldered <input type="checkbox"/> 36. R26, red-violet-orange to POT 2, lug 2 <input type="checkbox"/> At POT 2, lug 2 one wire soldered <input type="checkbox"/> 37. Black, rear of parts board, terminal 27 to S9, lug 1 <input type="checkbox"/> At S9, lug 1 three wires soldered <input type="checkbox"/> 39. Wire ties, located as shown in Fig. 12 |
|--|--|

THIS COMPLETES THE INSPECTION OF THE FINAL ASSEMBLY AND WIRING.

HOW TO CONNECT THE MK-30

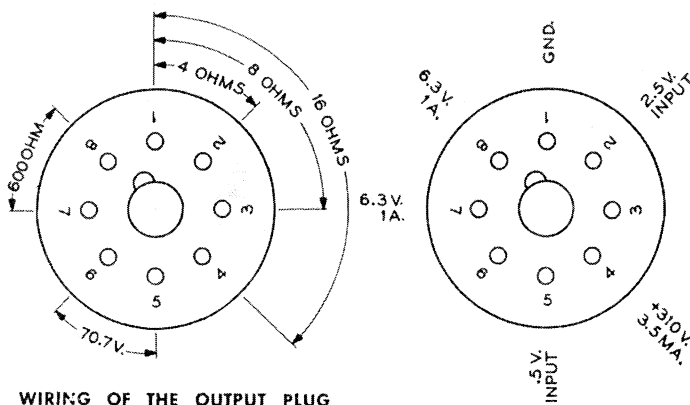
AC Power Line

The MK-30 MacKIT can be operated from any power line of 110 to 130 volts, 50 or 60 cycles. Use the 117-volt lead from the transformer for 110 to 120 volts, or the 125-volt lead for 120 to 130 volts. (See Stage 5, step 24.)

Speaker Connections

The speaker system can be connected to the terminals provided, or plugged into the output socket. A plug is furnished for that purpose. Here are the connections according to the load impedance:

SPEAKER	TERMINALS	OUTPUT SOCKET
3.2 to 6.5 ohms	COM. and 4	pins 1 and 2
6.5 to 13	COM. and 8	pins 1 and 3
13 to 32	COM. and 16	pins 1 and 4
600-ohm line		pins 7 and 8
70.7 volts		pins 5 and 6
		pin 6 is ground



WIRING OF THE OUTPUT PLUG

WIRING OF THE PRE-AMP INPUT PLUG

Preamp without Power Supply

A preamp that requires a separate power supply can be operated from the MK-30 provided the requirements do not exceed the ratings given below. Connections to the PRE-AMP. INPUT socket on the amplifier should be made through a cable to the plug furnished for this purpose. These connections should be made to the numbered pins:

1. Ground
2. 2.5 V. input from preamp
3. not used
4. + 310 V. at 3.5 milliamp.
5. .5 V. input from preamp
6. not used
7. 6.3 V. at 1 A.
8. 6.3 V at 1 A.

Preamp with Power Supply

Using a mono or stereo preamp that has its own power supply, and delivers at least .5-volt output, connect the preamp output to the .5-volt INPUT pin jack, or to the terminals marked INPUT, .5 V. and GND.

Tape Machine

A tape machine that has its own built-in preamp can be connected directly to the .5 V. input jack or the .5 V. input terminals on the amplifier. If it does not have its

own preamp, it must be connected to the amplifier through a separate preamp.

FM or AM Tuner

Any tuner can be connected directly to the amplifier if you desire. Use the .5 V. input jack or the .5 V. input terminals. This requires a volume control on the tuner.

Phono Pickup

The output of a magnetic pickup is not adequate to drive the MK-30 at its rated output. It must be connected to the amplifier through a preamp.

Gain Control

The GAIN adjustment on the amplifier is intended for use as a maximum-level control rather than as a volume control, although it can be used that way.

To set the GAIN adjustment for maximum level, follow this procedure exactly:

1. Turn the GAIN on the amplifier all the way down.
2. Set the volume control on your preamp or other input at the center of the scale.
3. Increase the GAIN on the amplifier until the volume from your speaker is at the average listening level. You will then have full volume-range control at the preamp without over-driving the amplifier.

Follow the same procedure if you have a tape machine or tuner connected directly to the amplifier.

Hum Adjustment

The control on the amplifier marked HUM ADJ. is ordinarily used only when the amplifier supplies power to a preamp. If you hear a slight hum in the speaker, adjust this control for minimum hum. If the hum persists, it is due to some source other than the amplifier.

Stereo Systems

The MK-30 is widely used in top-quality stereo systems. All necessary connections are provided so that two MK-30's can be driven from any stereo preamp.

Systems Using Electronic Crossover Networks

MK-30's are generally preferred for mono and stereo systems designed for the ultimate in reproduction quality. Use MK-30's for both the low-frequency and high-frequency speaker circuits.

IN CASE OF TROUBLE

If you carried out the inspection procedure set forth after the completion of each assembly and wiring stage, you virtually eliminated the possibility of trouble when you connect this MacKIT to your audio system. But if something should still be wrong, you can probably locate the cause, without the use of test instruments, by following these instructions:

Fuse Blows Immediately

If the fuse blows as soon as you plug the amplifier into the AC line,

1. This may be due to a mistake in wiring that puts a short-circuit across the power transformer, a ground on the filament circuit, or there may be a wrong connection of the high-voltage leads.

Go over the inspection step in Stages 4 and 5 with great care. If you find the error, put in a new 3-amp., 250-volt fuse and plug into the AC line again.

2. If the wiring checks out perfectly, have the 5U4-GB tube tested to see if it is defective.

Fuse Blows Slowly

If the fuse blows in 30 seconds to a minute after you plug into the AC line:

1. Connections to the bias rectifier may be reversed. Refer to Fig. 4 and Stage 2, step 10 of the instructions. Make sure that the end of the rectifier with the red dot is connected to terminal 2 on the parts board, and the unmarked end to terminal 16.

2. See if one of the resistors is excessively hot, or smoking. If so, look for a mistake in the way it is connected. If that is OK, go through the inspection steps for Stage 3. If the wiring is correct, the resistor may be defective. Replace it.

Squeals from the Speaker

If there is a steady squeal or howl from the loudspeaker when you plug in the amplifier:

1. Check the output transformer connections from holes 3 and 4 against Figs. 8 and 10, and the inspection steps

in stages 4, 5, and 6. Watch particularly for errors in the connections of the blue, white-blue, yellow, and white-yellow leads.

2. Check all the socket wiring against Figs. 8 and 10, and the inspection steps in Stages 4, 5, and 6.

3. Look for smoke caused by overheating. It is probably due to a wrong connection or a defective part.

Line-Voltage Tap

If you are not certain about your line voltage, ask your electric company or local electrician, to make sure that you select the correct line-voltage tap at Stage 5, step 24.

1. If your line voltage is 125, and you connected 117-volt yellow-black lead to OUT, lug 2, the amplifier will operate normally, but it will tend to run hot, and the tube life will be reduced.

If your line voltage is 115 to 117, and you connected the 125-volt red-black lead to OUT, lug 2, the amplifier will operate normally, but it may not deliver the full rated output of 30 watts.

TROUBLE-SHOOTING WITH A VOLTMETER

If the simple procedure explained above does not disclose the source of trouble, it will be necessary to measure the voltage across certain terminals, using a vacuum-tube voltmeter or a 20,000 ohms-per-volt meter. Slight variations are normal, but the readings should be close to these values:

VOLTAGE AND RESISTANCE CHART MEASURED TO GROUND

TUBE	PIN NO.	DC VOLTS NO SIGNAL	DC VOLTS AT 30W OUT	AC VOLTS AT 30W OUT	RESISTANCE UNIT OFF
12AX7 (INPUT)	1	134	120	1.3	330K*
	2	0	0	0.24	1M
	3	1.2	1.1	0.22	3.3K
	4 & 5	FIL	6.3 V. AC TO PIN 9	—	0 to 70
	6, 7, 8	—	—	—	—
	9	FIL	—	—	0 to 70
12AU7	1	270	235	9	40*
	2	134	120	1.3	330K*
	3 & 8	138	126	0.57	18K
	4 & 5	FIL	6.3 V. AC TO PIN 9	—	0 to 70
	6	270	235	9	43K*
	7	110	100	0	2.6M*
	9	FIL	—	—	0 to 70
12BH7	1	355	295	132	12K*
	2	0	0	9	220K
	3 & 8	16	14	0.32	1.2K
	4 & 5	FIL	6.3 V. AC TO PIN 9	—	0 to 70
	6	355	295	132	12K*
	7	0	0	9	220K
	9	FIL	—	—	0 to 70

12AX7	1	440	365	94	185*
	2	-46	-46	134	1M
	3	-45	-45	118	270K
	4 & 5	FIL	6.3 V. AC TO PIN 9	-	0 to 70
	6	440	365	94	185*
	7	-46	-46	134	1M
	8	-45	-45	118	270K
	9	FIL	-	-	0 to 70
	6L6GC	1	0	0	0
2		FIL	6.3 V. AC TO PIN 7	-	0 to 70
3		440	365	94	200*
4		440	365	94	200*
5		-45	-45	118	270K
6		-	-	-	-
7		FIL	-	-	0 to 70
8		1.1	2.7	94	25
5U4GB	1	-	-	-	-
	2	455	400	7.9 (RIPPLE)	0*
	3	-	-	-	-
	4	395 AC	385 AC	385	45
	5	-	-	-	-
	6	395 AC	385 AC	385	45
	7	-	-	-	-
	8	455	400	-	0*

*This resistance measured with unit off and pin 8 of 5U4GB grounded. Remove this ground before turning amplifier on.

LAST RESORT

If you encounter trouble that you cannot remedy, the McIntosh Laboratory, Inc. will be glad to help you. However, as a matter of your own convenience, you should make every effort to correct the trouble without sending the amplifier to the factory.

Should that be necessary, consult the dealer from whom you purchased the MacKIT about packing it. Be sure to use the original carton. INSECURE PACKING MAY

CAUSE SERIOUS DAMAGE, and McIntosh Laboratory, Inc. cannot be responsible for damage done while the MacKIT is in transit to the factory.

Shipment must be made by prepaid express. A charge of \$10.00 will be made for putting the MK-30 MacKIT in perfect working order. An additional charge will be made if parts must be replaced due to misuse, or damage in transit. The repaired unit will be returned by express, charges collect.

Note: Repair work cannot be undertaken on any unit if rosin-core solder was not used for the connections.

McINTOSH LABORATORY, INC.

2 Chambers Street
Binghamton, N.Y.

McINTOSH WARRANTY

All parts furnished in this McIntosh Labkit are identical with those used in the McIntosh MC-30 amplifiers.

McIntosh Laboratory, Inc. warrants the electrical performance and mechanical workmanship of the parts supplied in this MacKIT to be free of serious defects for a period of 90 days after purchase from an authorized McIntosh dealer, provided the warranty card was completed and returned to the McIntosh factory.

McIntosh Laboratory, Inc. further warrants the transformers furnished in this MacKIT to be free of manufacturing defects for a period of one year from date of shipment

from the factory, and will replace at no charge any such transformer failing to meet this warranty provided it is returned prepaid. This warranty does not extend to parts or transformers damaged by improper use, nor damaged in transit to and from the factory.

McIntosh Laboratory, Inc. assumes no responsibility or liability for injuries or damages experienced in the course of assembling this MacKIT, in the testing or use of the assembled instrument, or subsequent operation in conjunction with associated equipment.

If the instructions herewith are followed exactly, this MacKIT will be an exact duplicate of the factory-built design.

Output Socket Connections

- h ohms - pins 1 and 2
- 8 ohms - pins 1 and 1
- 16 ohms - pins 1 and 4
- 600 ohms - pins 7 and 4
- 70.7 volts - pins 5 and 6
- (pin 6 is ground and 600 ohm CT)

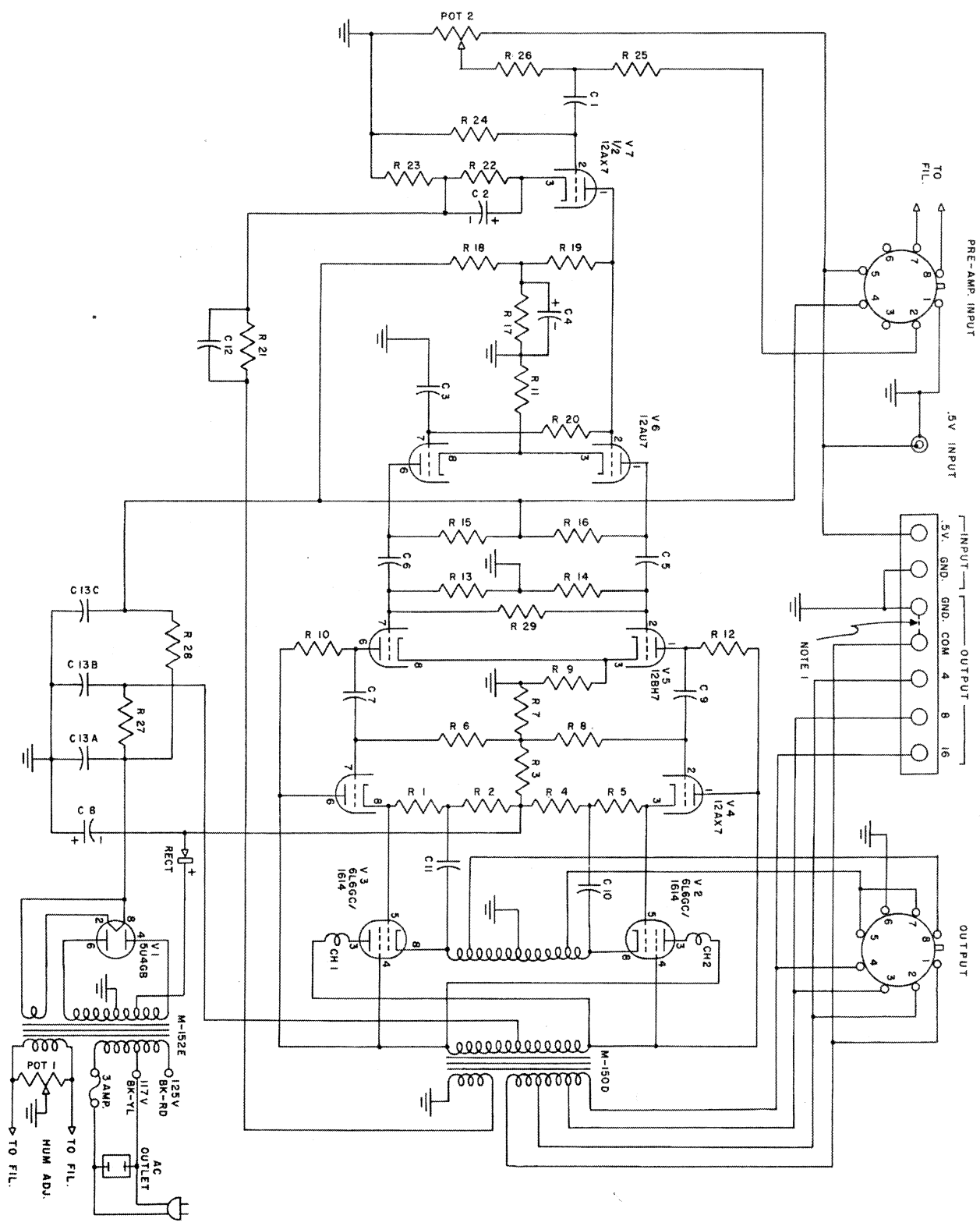
Preamp Input Socket Connections

- Pin 1 - ground
- Pin 2 - preamp input (2.5V)
- Pin 3 - not used
- Pin 4 - 310 V B+ at 3.5 MA
- Pin 5 - 0.5 volt input
- Pin 6 - not used
- Pin 7 and 8 - 6.3 V at 1A

- C1 - .1 mf, 200V
- C2 - 100 mf, 12V
- C3 - .22 mf, 100V
- C4 - 8 mf, 250V
- C5 - .047mf, 10V, 600V
- C6 - .047mf, 10V, 600V
- C7 - .22mf, 600V, 111m
- C8 - Bmf, 250V
- C9 - .22mf, 600V, 111m
- C10 - 1.7mf, 200V
- C11 - 1.7mf, 200V
- C12 - 1.7mf, 200V
- C13 - 35-80/15, 500A/50V

- R1 - 56K
- R2 - 56K
- R3 - 100K, 5%
- R4 - 56K
- R5 - 56K
- R6 - 1K
- R7 - 56K, 5%
- R8 - 1K
- R9 - 1.2K
- R10 - 12K, 2M
- R11 - 18K, 1K
- R12 - 12K, 2K
- R13 - 220K
- R14 - 20K, 5%
- R15 - 20K, 5%
- R16 - 48K, 5%
- R17 - 300K
- R18 - 100K
- R19 - 100K
- R20 - 2.2K
- R21 - 5.3K, 5%
- R22 - 1.2K
- R23 - 48 ohms, 5%
- R24 - 100K
- R25 - 27K
- R26 - 150 ohms, 10W
- R27 - 10K, 10W
- R28 - 310K
- R29 - 1.5 micro H
- CH1 - 2.7 micro H
- CH2 - 250 ohms, linear
- POT 1 - 250K, 10F
- POT 2 - 100 FTV, 10 MA

* Matched to 1%



MK-30 SERIAL NO. 0001A AND ABOVE

REVISIONS		DRAWN BY		MATERIAL	
NO.	DATE	BY	CHK'D	DATE	DRAWING NO.
1				5, 17 60	SC-111-133
2					
3					
4					
5					

MCINTOSH LABORATORY INC.
 2 CHAMBERS ST. BINGHAMTON, N.Y.
 SCALE: 5/17 60
 TRACKED: SC-111-133

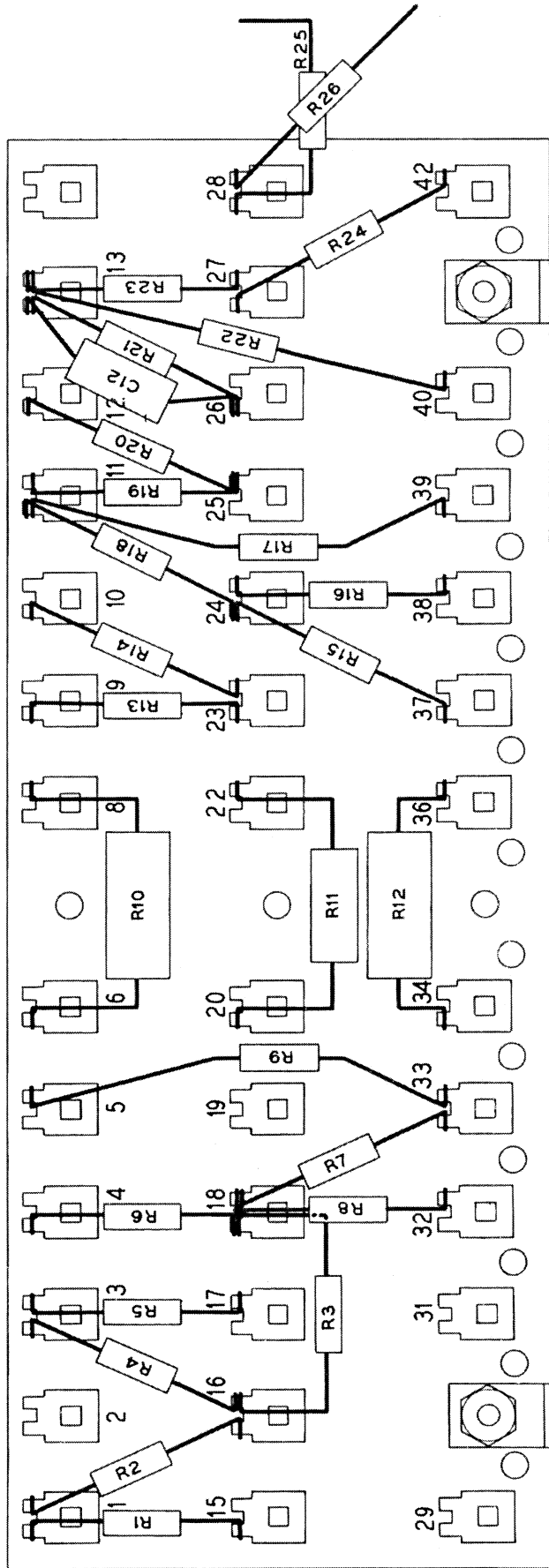


FIG. 6. FULL-SIZE DIAGRAM OF THE RESISTORS AND CAPACITOR MOUNTED ON THE FRONT OF THE PARTS BOARD

STAGE 3: PARTS BOARD RESISTORS

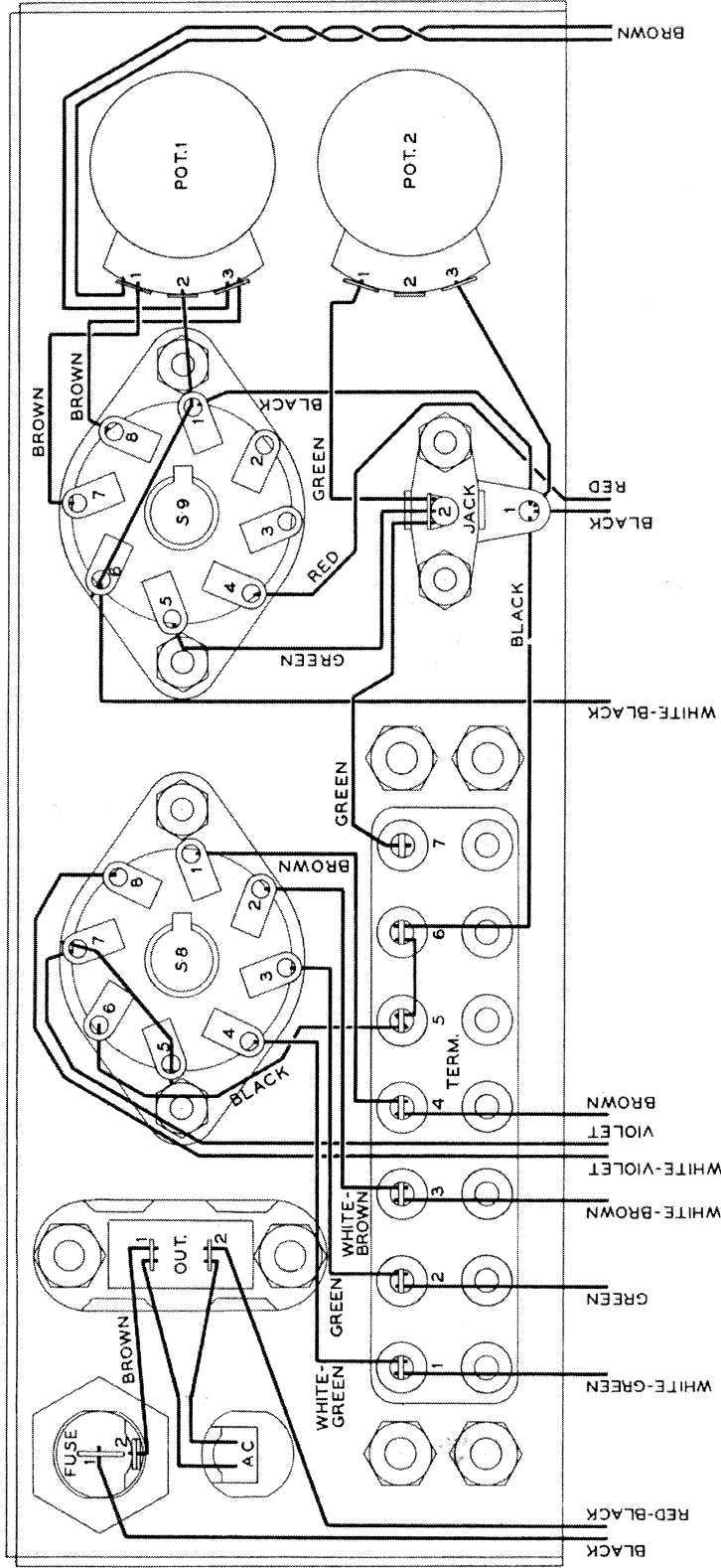


FIG. 10. FULL-SIZE DIAGRAM OF THE PARTS AND WIRING INSIDE THE RIGHT-HAND END OF THE CHASSIS

STAGE 5: INPUT AND OUTPUT CONNECTIONS

MackIT MK-30 THIRTY-WATT AMPLIFIER

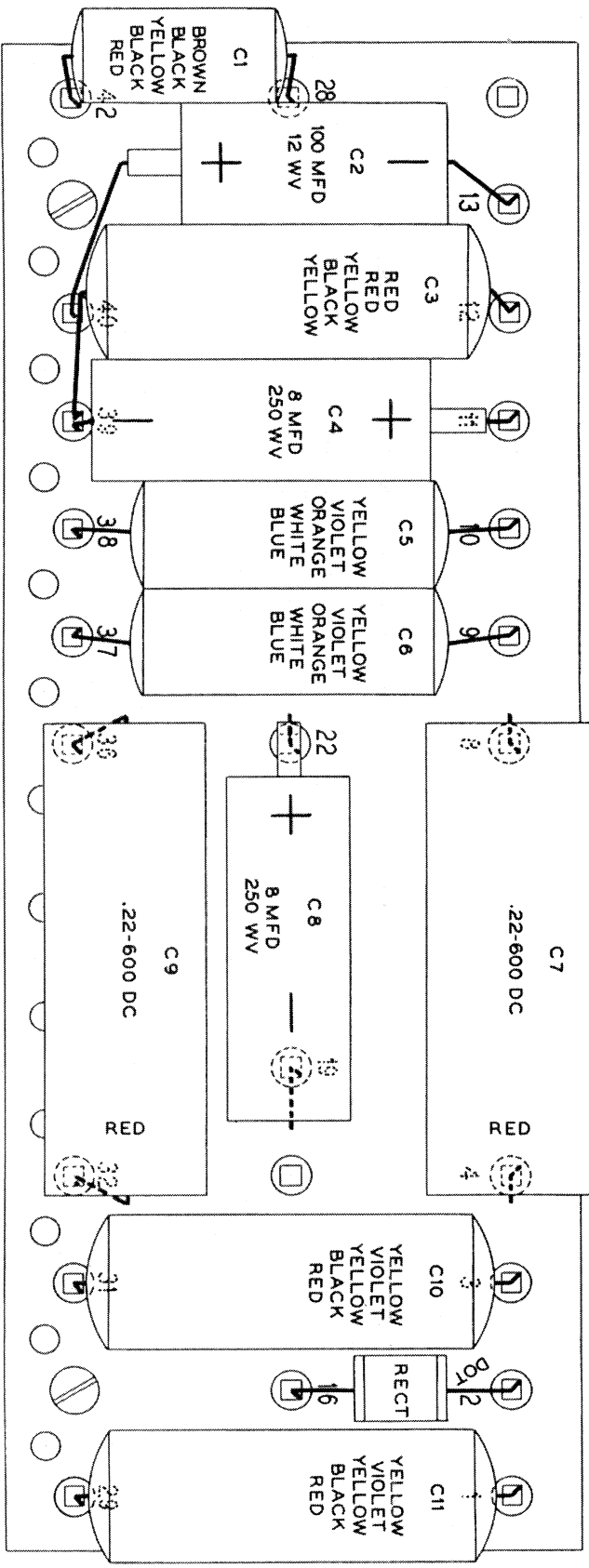


FIG. 4. FULL-SIZE DIAGRAM OF THE CAPACITORS AND RECTIFIER MOUNTED ON THE REAR OF THE PARTS BOARD

STAGE 2: PARTS BOARD CAPACITORS

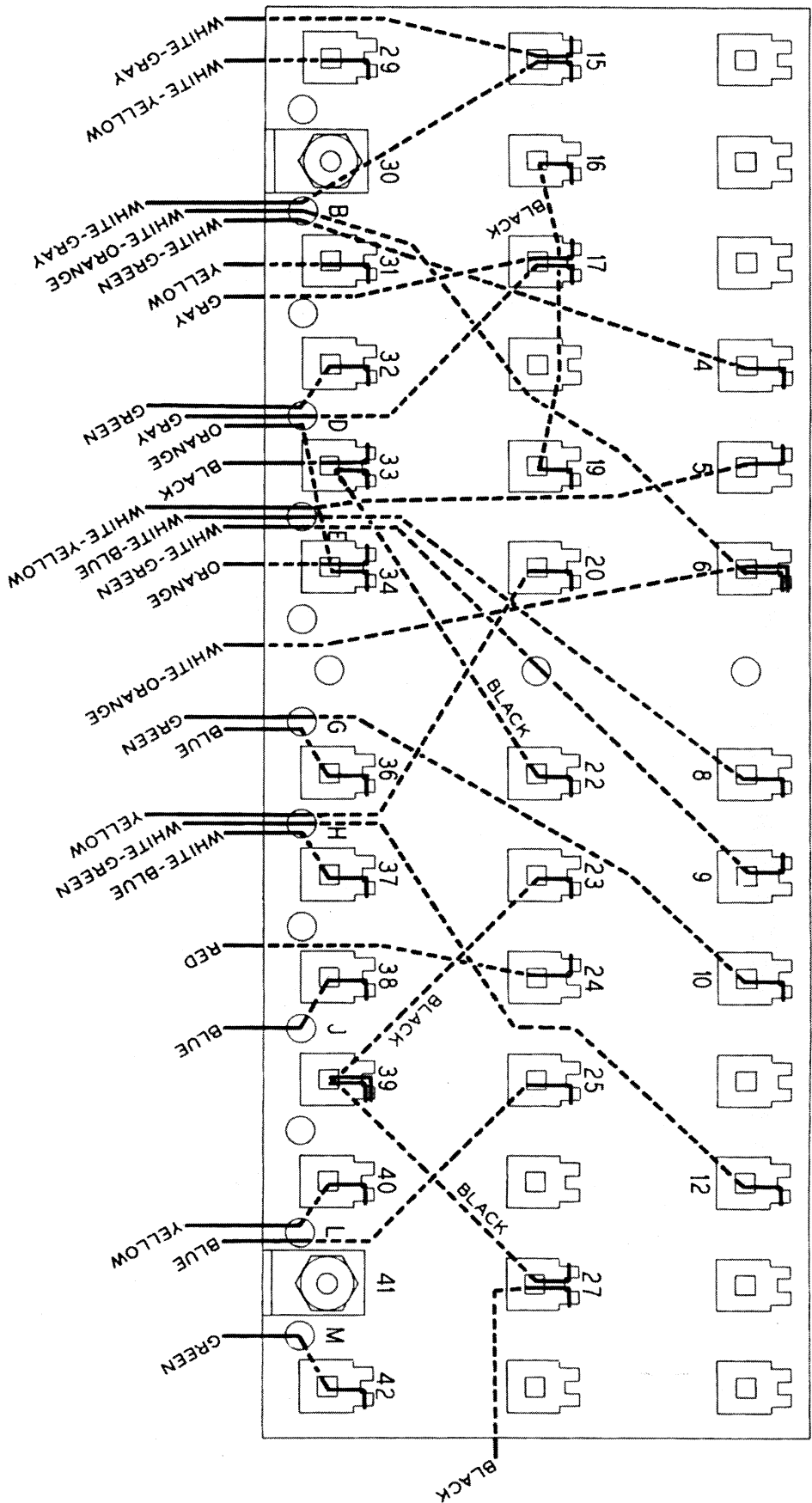


FIG. 1. FULL-SIZE DIAGRAM OF THE PARTS BOARD WIRING. DOTTED LINES INDICATE WIRES BEHIND THE BOARD

STAGE 1: PARTS BOARD WIRING