PRICE $2.00

HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATHKIT®
ASSEMBLY MANUAL

SOLID-STATE GUITAR AMPLIFIER
MODEL TA-16

595-847-02

Dear Customer:

The Heathkit electronic product you have purchased is one of the best performing electronic products in the world.

Here's how we aim to keep it that way:

Your Heathkit Warranty

During your first 90 days of ownership, any parts which we find are defective, either in materials or workmanship, will be replaced or repaired free of charge. And we'll pay shipping charges to get those parts to you — anywhere in the world.

If we determine a defective part has caused your Heathkit electronic product to need other repair, through no fault of yours, we will service it free — at the factory, at any retail Heathkit Electronic Center, or through any of our authorized overseas distributors.

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We hope you'll never need our repair or replacement services, but it's nice to know you're protected anyway — and that cheerful help is nearby.

Sincerely,

HEATH COMPANY
Benton Harbor, Michigan 49022

Assembly
and
Operation
of the

HEATHKIT

SOLID-STATE GUITAR AMPLIFIER

Model TA-16

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HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

INTRODUCTION

The Heathkit Model TA-16 Guitar Amplifier is especially designed for use with Harmony-by-Heath and other high quality Electric Guitars to give you all the features most wanted by modern guitarists.

High-power, solid-state amplifier circuitry with a pair of custom 12" speakers in a sturdy cabinet provide you with the "big sound." Each of the two amplifier channels has two inputs plus Volume, Bass, and Treble controls. The special-effects channel also features reverb and tremolo. Reverb intensity, and both the depth and rate of the tremolo are adjustable. Foot switches provide hands-free control of reverb and tremolo. A line-reversing Off-On switch assures minimum hum.

Accordians and other musical instruments with electric pickups may also be played through the Guitar Amplifier. Lead instruments are normally used with the special-effects channel with reverb and tremolo; microphones and accompaniment instruments are used with the other channel.

For versatility and convenience, all controls and inputs are located on the control panel at the top-front of the Guitar Amplifier cabinet. The black, leather-textured cabinet and black-and-white patterned grille cloth are both durable and attractive.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

PARTS LIST

The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial (fold-out from Page 9).

To order replacement parts, refer to the Replacement Parts Price List and use the Parts Order Form furnished with this kit.

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS		
1/2 Watt		
(1) 1-54	1	15 Ω 5% (brown-green-black)
1-49	1	22 Ω (red-red-black)
1-1	4	47 Ω (yellow-violet-black)
1-3	1	100 Ω (brown-black-brown)
1-42	1	270 Ω (red-violet-brown)
1-119	1	560 Ω (green-blue-brown)
1-9	4	1000 Ω (brown-black-red)
1-57	2	2200 Ω 5% (red-red-red)
1-13	1	2700 Ω (red-violet-red)
1-14	1	3300 Ω (orange-orange-red)
1-16	3	4700 Ω (yellow-violet-red)
1-113	6	5600 Ω 5% (green-blue-red)
1-19	5	6800 Ω (blue-gray-red)
1-20	4	10 KΩ (brown-black-orange)
1-133	3	15 KΩ 5% (brown-green-orange)
1-22	5	22 KΩ (red-red-orange)
1-23	1	27 KΩ (red-violet-orange)
1-24	1	33 KΩ (orange-orange-orange)
1-25	2	47 KΩ (yellow-violet-orange)
1-26	3	100 KΩ (brown-black-yellow)
1-27	2	150 KΩ (brown-green-yellow)
1-142	1	560 KΩ (green-blue-yellow)

PART No.	PARTS Per Kit	DESCRIPTION
Other Resistors		
(2) 4-9	1	91 Ω 1/2 watt low-noise 5% (white-brown-black)
4-24	2	24 KΩ 1/2 watt low-noise 5% (red-yellow-orange)
4-26	2	33 KΩ 1/2 watt low-noise 5% (orange-orange-orange)
4-33	4	470 KΩ 1/2 watt low-noise 5% (yellow-violet-yellow)
(3) 1-18-1	2	150 Ω 1 watt (brown-green-brown)
1-54-1	1	270 Ω 1 watt (red-violet-brown)
1-21-1	1	680 Ω 1 watt (blue-gray-brown)
3-7-2*	2	1 Ω 2 watt (brown-black-gold)

*NOTE: These resistors are 2 watt wire-wound resistors, but are the same size as 1 watt composition resistors.

(4) 1-15-2	1	1000 Ω 2 watt (brown-black-red)
(5) 3-10-5	1	110 Ω 5 watt
(6) 9-18	1	LDR (light dependent resistor)

PART No.	PARTS Per Kit	DESCRIPTION
CAPACITORS		
Disc		
(7) 21-36	1	.002 μfd
21-16	1	.01 μfd
21-70	1	.01 μfd 1.4 KV
Electrolytic		
(8) 25-115	8	10 μfd 15 V vertical
25-117	2	100 μfd 15 V vertical
(9) 25-123	2	2 μfd 25 V tubular
25-146	3	100 μfd 30 V tubular
25-157	2	500 μfd 15 V tubular
25-154	1	2500 μfd 30 V tubular
(10) 25-156	1	4000 μfd 50 V can
Mylar*		
NOTE: These capacitors may be color coded, or the value may be printed on them. If necessary, refer to the capacitor color code chart and example on the Parts Pictorial to help identify these capacitors. Capacitors with the value stamped on them, may have a body that is any color.		
(11) 27-27	2	.022 μfd (wide red-orange)
27-44	2	.01 μfd (brown-black-orange)
27-60	6	.22 μfd (wide red-yellow)
27-61	3	.47 μfd (yellow-violet-yellow)
27-47	2	.1 μfd (brown-black-yellow)
CONTROLS-SWITCHES-CIRCUIT BREAKER		
(12) 10-7	1	5000 Ω (5 KΩ) control
10-110	2	10 KΩ control
10-11	4	50 KΩ control
10-40	2	100 KΩ control
(13) 61-12	1	Toggle switch
(14) 64-25	2	Pushbutton switch
(15) 65-11	2	Circuit breaker
DIODES-LAMP-TRANSISTORS		
(16) 56-32	1	Zener diode (56-32 marked on part)
57-65	4	Silicon diode
(17) 56-33	1	1N3754 diode
412-1	1	#47 pilot lamp
NOTE: When identifying each transistor, look for the part number or type number printed on the case. EXAMPLE: Transistor number 417-99 may be marked 417-99, 2N2148, or 417-99/2N2148 (or in this last case, where 417-99 is also on the transistor, another number may be used in place of 2N2148).		

* Du Pont Registered Trademark

PART No.	PARTS Per Kit	DESCRIPTION
Diodes-Lamp-Transistors (cont'd.)		
(18) 417-91	3	2N3391 transistor
417-94	1	2N3416 transistor
417-118	3	2N3393 transistor
(19) 417-108	1	2N3692 transistor
(20) 417-109	1	2N3566 transistor
417-110	1	S2090 transistor
(21) 417-100	1	2N3053 transistor
(22) 417-99	1	2N2148 transistor
417-101	1	TA2577A transistor
GROMMETS-INSULATORS-TERMINAL STRIPS		
(23) 73-4	1	5/16" rubber grommet
(24) 73-43	1	3/8" plastic grommet
73-45	2	1/2" plastic grommet
73-50	2	Foam tape
(25) 75-24	1	Small line cord strain relief
75-71	1	Large line cord strain relief
(26) 75-20	1	Double phono socket insulator
(27) 75-60	2	Mica insulator (packed between two pieces of cardboard)
(28) 431-26	2	1-lug terminal strip
431-10	1	3-lug terminal strip
431-11	1	5-lug terminal strip
CONNECTORS-SOCKETS-JACKS-PLUG		
(29) 432-66	2	Push-on connector
(30) 434-22	1	Pilot lamp socket assembly
(31) 434-82	1	Double phono socket
(32) 434-117	2	Transistor socket
(33) 434-147	1	AC socket
(34) 436-20	4	2-terminal phone jack
(35) 436-27	1	3-terminal phone jack
(36) 438-27	1	3-terminal phone plug
WIRE-SHIELDED CABLE-SLEEVING		
89-13	1	Line cord
134-146	2	Shielded cable with phono plugs on each end
343-7	1	Single conductor shielded cable
344-15	1	Large black wire
344-16	1	Large red wire
344-50	1	Black hookup wire
344-51	1	Brown hookup wire
344-52	1	Red hookup wire
344-53	1	Orange hookup wire
344-54	1	Yellow hookup wire
344-59	1	White hookup wire
347-35	1	2-conductor shielded cable
346-1	1	Sleeving

PART No.	PARTS Per Kit	DESCRIPTION
HARDWARE		
#2 Hardware		
(37) 250-212	5	2-56 x 3/16" self-tapping screw
(38) 250-182	1	2-56 x 1/4" screw
(39) 252-51	1	2-56 nut
#3 Hardware		
(40) 254-7	1	#3 lockwasher
#4 Hardware		
(41) 250-163	9	4-40 x 5/16" self-tapping screw
(42) 252-89	6	4-40 push-on nut
#6 Hardware		
(43) 250-89	17 19	6-32 x 3/8" screw
(44) 250-252	4	#6 x 5/8" sheet metal screw
(45) 252-3	17 19	6-32 nut
(46) 254-1	21 24	#6 lockwasher
#8 Hardware		
(47) 250-137	4	8-32 x 3/8" screw
(48) 250-97	4	8-32 x 1" screw
(49) 252-4	12 14	8-32 nut
(50) 252-92	4	#8 self-retaining nut
(51) 253-45	8	#8 flat washer
(52) 254-2	12 14	#8 lockwasher
(53) 259-24	2	#8 wire clamp
Control Hardware		
(54) 252-7	14	Control nut
(55) 253-10	5	Control flat washer
(56) 254-4	14	Control lockwasher

1 KNOB
1 HEAT SINK

PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous Hardware		
(57) 207-5	2	Cable clamp
(58) 253-30	1	1/2" flat washer
GENERAL		
54-269	1	Power transformer
73-49	1	Foot switch rubber pad
85-162-4	1	Circuit board
91-151	1	Cabinet
150-10	1	Reverberation assembly
203-466	1	Control panel
(59) 260-24	1	Diode mounting clip
(60) 352-13	1	Silicone grease
401-117	2	12" speaker
(61) 462-244	9	Knob
(62) 100-587	1	Transistor heat sink
(63) 100-589	1	Capacitor mounting strap
200-481-1	1	Chassis
(64) 205-347	1	Transistor mounting plate
(65) 214-46-1	1	Foot switch housing
(66) 205-536-1	1	Foot switch bottom plate
205-553-1	1	Reverberation mounting plate
(67) 206-286	1	Transformer shield
390-183	1	REV-TREM label
490-5	1	Nut starter
391-34	1	Blue and white label
597-308	1	Kit Builders Guide
597-260	1	Parts Order Form
	1	Manual (See front cover for part number.)

STEP-BY-STEP ASSEMBLY

Before starting to assemble this kit, read the Kit Builders Guide for complete information on wiring, soldering, and step-by-step assembly procedures.

NOTE: Use 1/2 watt resistors unless the step directs otherwise. Resistors will be called out by only their resistance value (in Ω, KΩ, or megohms) and color code. Capacitors will be called by only the capacitance value and type.

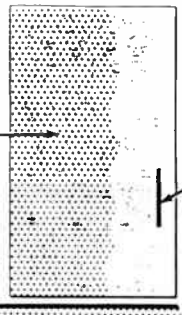
CIRCUIT BOARD ASSEMBLY

Components will be installed on the circuit board by following the steps on Pictorials 1 through 5. Only the left-hand or the right-hand section of the circuit board is shown in Pictorials 1 through 4 for easier assembly.

( ) Position the circuit board with the lettered side up. Then complete the circuit board assembly steps, beginning with Pictorial 1.

START

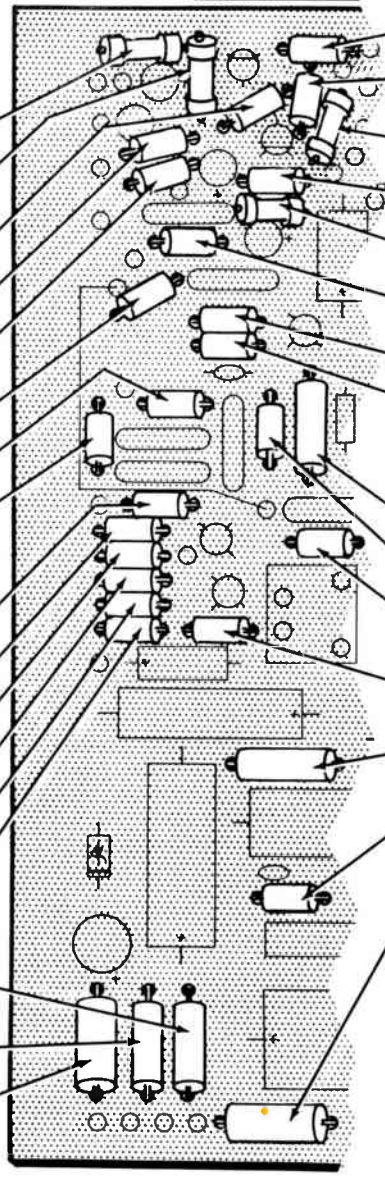
The steps performed in Pictorial 1 are in this area of the circuit board.



Part number location.

NOTE: Some of the low-noise resistors will be installed with their leads bent slightly inward. Bend these resistor leads inward before installing the resistor. It is not necessary to force these low-noise resistors down so they are flat against the circuit board.

- ( ) 24 KΩ (red-yellow-orange) low-noise.
- ( ) 470 KΩ (yellow-violet-yellow) low-noise.
- ( ) 6800 Ω (blue-gray-red).
- ( ) 10 KΩ (brown-black-orange).
- ( ) 5600 Ω (green-blue-red).
- ( ) 1000 Ω (brown-black-red).
- ( ) 10 KΩ (brown-black-orange).
- ( ) 47 KΩ (yellow-violet-orange).
- ( ) Solder all connections and cut off excess lead lengths.
- ( ) 27 KΩ (red-violet-orange).
- ( ) 6800 Ω (blue-gray-red).
- ( ) 560 KΩ (green-blue-yellow).
- ( ) 47 KΩ (yellow-violet-orange).
- ( ) 22 Ω (red-red-black).
- ( ) 15 KΩ (brown-green-orange).
- ( ) 150 Ω 1 watt (brown-green-brown).
- ( ) 150 Ω 1 watt (brown-green-brown).
- ( ) 1000 Ω 2 watt (brown-black-red).
- ( ) Solder all connections and cut off excess lead lengths.

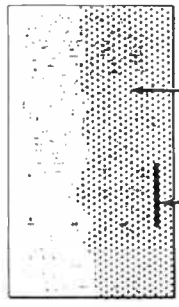


CONTINUE

- ( ) 47 Ω (yellow-violet-black).
- ( ) 47 Ω (yellow-violet-black).
- ( ) 33 KΩ (orange-orange-orange) low-noise.
- ( ) 6800 Ω (blue-gray-red).
- ( ) 470 KΩ (yellow-violet-yellow) low-noise.
- ( ) 5600 Ω (green-blue-red).
- ( ) 15 Ω (brown-green-black).
- ( ) 10 KΩ (brown-black-orange).
- ( ) Solder all connections and cut off excess lead lengths.
- ( ) 680 Ω 1 watt (blue-gray-brown).
- ( ) 150 KΩ (brown-green-yellow).
- ( ) 270 Ω (red-violet-brown).
- ( ) 100 KΩ (brown-black-yellow).
- ( ) 270 Ω 1 watt (red-violet-brown).
- ( ) 2200 Ω (red-red-red).
- ( ) 1 Ω 2 watt (brown-black-gold).
- ( ) Solder all connections and cut off excess lead lengths.

PROCEED TO PICTORIAL 2.

PICTORIAL 1



The steps performed in Pictorial 2 are in this area of the circuit board.

Part number location.

START

( ) 24 KΩ (red-yellow-orange) low-noise.

( ) 470 KΩ (yellow-violet-yellow) low-noise.

( ) 6800 Ω (blue-gray-red).

( ) 10 KΩ (brown-black-orange).

( ) 5600 Ω (green-blue-red).

( ) 5600 Ω (green-blue-red).

( ) 1000 Ω (brown-black-red).

( ) 4700 Ω (yellow-violet-red).

( ) Solder all connections and cut off excess lead lengths.

( ) 15 KΩ (brown-green-orange).

( ) 2700 Ω (red-violet-red).

( ) 22 KΩ (red-red-orange).

( ) 2200 Ω (red-red-red).

( ) 33 KΩ (orange-orange-orange).

( ) 1000 Ω (brown-black-red).

( ) 91 Ω (white-brown-black) low-noise resistor.

( ) 1 Ω 2 watt (brown-black-gold).

( ) Solder all connections and cut off excess lead lengths.

CONTINUE

( ) 47 Ω (yellow-violet-black).

( ) 47 Ω (yellow-violet-black).

( ) 33 KΩ (orange-orange-orange) low-noise.

( ) 6800 Ω (blue-gray-red).

( ) 470 KΩ (yellow-violet-yellow) low-noise.

( ) 15 KΩ (brown-green-orange).

( ) 4700 Ω (yellow-violet-red).

( ) 150 KΩ (brown-green-yellow).

( ) Solder all connections and cut off excess lead lengths.

( ) 3300 Ω (orange-orange-red).

( ) 4700 Ω (yellow-violet-red).

( ) 100 KΩ (brown-black-yellow).

( ) 100 KΩ (brown-black-yellow).

( ) 100 Ω (brown-black-brown).

( ) 560 Ω (green-blue-brown).

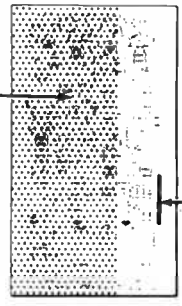
( ) 1000 Ω (brown-black-red).

( ) Solder all connections and cut off excess lead lengths.

PROCEED TO PICTORIAL 3.

PICTORIAL 2

The steps performed in Pictorial 3 are in this area of the circuit board.



Part number location.

START

NOTE: When installing electrolytic capacitors, position the positive (+) lead in the (+) marked hole in the circuit board.

( ) 10 µfd vertical electrolytic. Note position of (+) lead.

( ) 10 µfd vertical electrolytic. Note position of (+) lead.

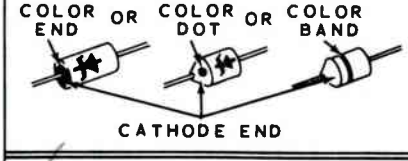
( ) 10 µfd vertical electrolytic. Note position of (+) lead.

( ) 10 µfd vertical electrolytic. Note position of (+) lead.

NOTE: When hookup wire is called for, use wire of the color specified and remove 1/4" of insulation from each end. Do not use the large wire until it is called for later.

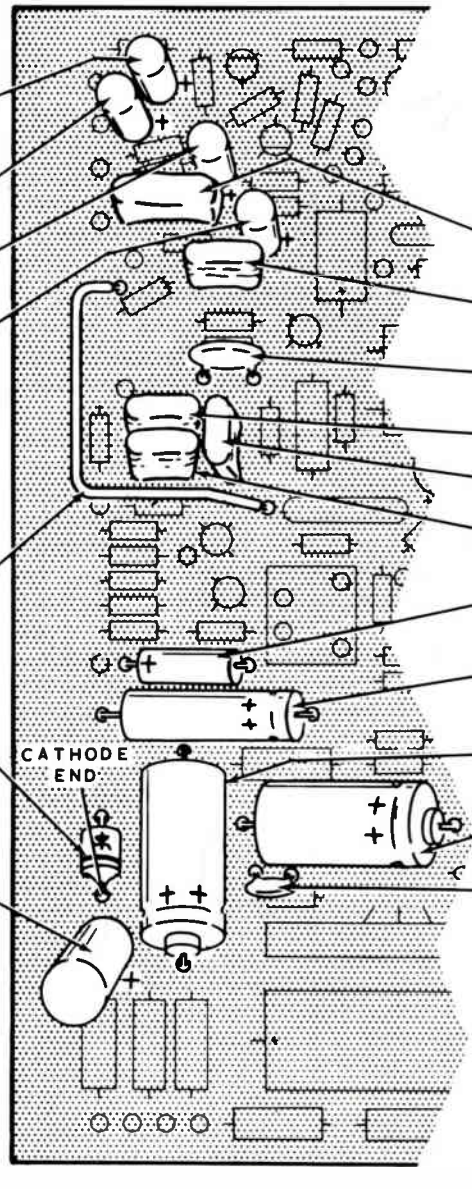
( ) 3-3/4" black wire. Shape the wire along the line marked WIRE.

( ) Zener diode (#56-32). Position the cathode end as shown.



( ) 100 µfd vertical electrolytic. Note position of (+) lead.

( ) Solder all connections and cut off excess lead lengths.



CONTINUE

NOTE: Mylar capacitors may be marked with a value or with a color code. The Mylar and disc capacitors may be installed with their leads in either direction.

( ) .022 µfd Mylar.

( ) .22 µfd Mylar (wide red-yellow).

( ) .01 µfd disc. Do not use the 1.4 KV (1400 V) disc capacitor.

( ) .22 µfd Mylar (wide red-yellow).

( ) .22 µfd Mylar (wide red-yellow).

( ) .22 µfd Mylar (wide red-yellow).

( ) 2 µfd tubular electrolytic. Note position of (+) lead.

( ) 100 µfd tubular electrolytic. Note position of (+) lead.

( ) 500 µfd tubular electrolytic. Note position of (+) lead.

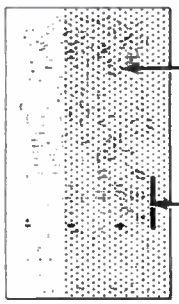
( ) 500 µfd tubular electrolytic. Note position of (+) lead.

( ) .002 µfd disc.

( ) Solder all connections and cut off excess lead lengths.

PROCEED TO PICTORIAL 4.

PICTORIAL 3



START

(√) 10 µfd vertical electrolytic. Note position of (+) lead.

(√) 10 µfd vertical electrolytic. Note position of (+) lead.

(√) 10 µfd vertical electrolytic. Note position of (+) lead.

(√) .47 µfd Mylar (yellow-violet-yellow). Position capacitor body 1/4" from circuit board.

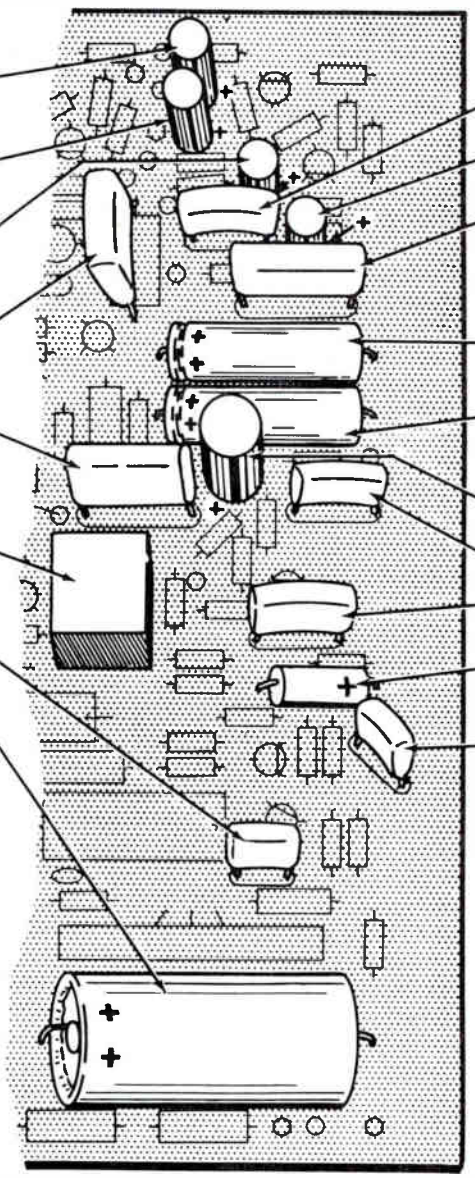
(√) .47 µfd Mylar (yellow-violet-yellow). Position capacitor body 1/4" from the circuit board.

(√) LDR (#9-18). Insert the narrow-spaced and wide-spaced leads through the correspondingly spaced holes in the circuit board.

(√) .1 µfd Mylar (brown-black-yellow).

(√) 2500 µfd tubular electrolytic. Note position of (+) lead.

(√) Solder all connections and cut off excess lead lengths.



CONTINUE

(√) .022 µfd Mylar.

(√) 10 µfd vertical electrolytic. Note position of (+) lead.

(√) .47 µfd Mylar (yellow-violet-yellow). Position capacitor body 1/4" from circuit board.

(√) 100 µfd tubular electrolytic. Note position of (+) lead.

(√) 100 µfd tubular electrolytic. Note position of (+) lead.

(√) 100 µfd vertical electrolytic. Note position of (+) lead.

(√) .22 µfd Mylar (wide red-yellow).

(√) .22 µfd Mylar (wide red-yellow).

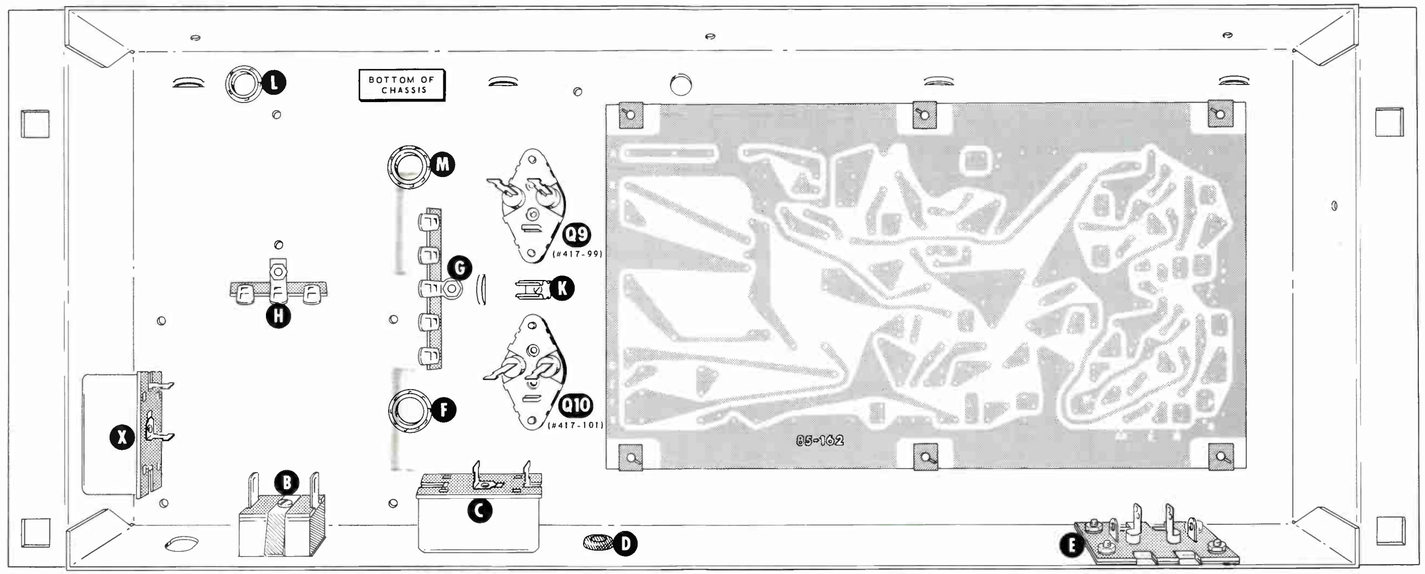
(√) 2 µfd tubular electrolytic. Note position of (+) lead.

(√) .1 µfd Mylar (brown-black-yellow).

(√) Solder all connections and cut off excess lead lengths.

PROCEED TO PICTORIAL 5.

PICTORIAL 4



PICTORIAL 6

CHASSIS PARTS MOUNTING

As you mount a part on the chassis or front panel, use the hardware specified in the step and position the part as shown in the Pictorial. The step will call out only the size and type of hardware to use. For example "Use 6-32 x 3/8" hardware" means to use a 6-32 x 3/8" screw, one or more #6 lockwashers, and a 6-32 nut. Lockwashers will be used under all nuts when you are mounting parts. Refer to the Details for the proper number of lockwashers and positioning of hardware. Read each step completely before you perform the operation directed in the step.

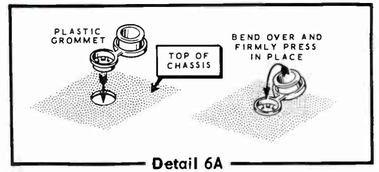
The plastic nut starter (#490-5) will help you pick up a nut and start it on the threads of a screw. Be sure to tighten the hardware with a screwdriver after you mount a part.

Refer to Pictorial 6 for the following steps.

( ) Position the chassis as shown in the Pictorial.

( ) Install a 5/16" rubber grommet at D.

( ) Refer to Detail 6A, and install 1/2" plastic grommets at F and M. Install the grommets from the top side of the chassis.

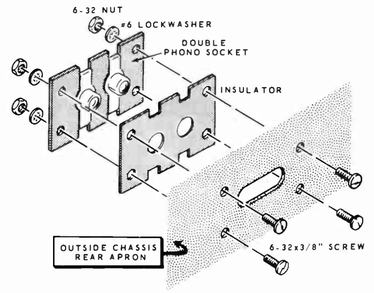


Detail 6A

( ) Install a 3/8" plastic grommet from the top of the chassis at L.

( ) Refer to Detail 6B, and install the double phono socket and double phono socket insulator at E. Use 6-32 x 3/8" hardware.

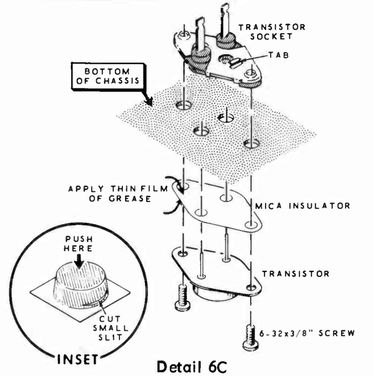
NOTE: The purpose of the silicone grease that is used on the mica insulators in the following two steps is to help conduct the heat of the transistor to the chassis. This grease should be applied in a thin even coating which completely covers both sides of the insulator.



Detail 6B

CAUTION: Be very careful to install the transistors at the proper locations in the next two steps. If the locations are reversed, the transistors will be damaged when the Amplifier is turned on.

( ) Mount the 2N2148/417-99 transistor, a mica insulator, and transistor socket at Q9, as shown in Detail 6C. Apply a thin film of silicone grease to both sides of the mica insulator, and place the insulator between the transistor and the chassis. NOTE: Use two 6-32 x 3/8" screws to mount the transistor and socket. Be sure the shoulders of the transistor socket are seated in the mounting holes in the chassis.

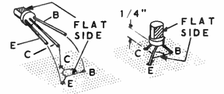


Detail 6C

START

NOTE: Transistors are marked with either a type number or a part number. Both numbers are given in these steps to help you identify the transistors. Solder the leads after each transistor is installed and cut off the excess lead lengths.

( ) 2N3391/417-91 at Q1.



( ) 2N3391/417-91 at Q2.

( ) 2N3393/417-118 at Q3.

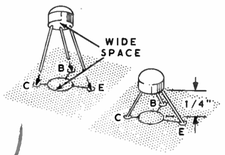
( ) 2N3393/417-118 at Q4.

( ) 2N3391/417-91 at Q5.

( ) 2N3393/417-118 at Q6.

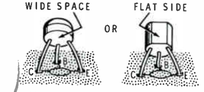
( ) 2N3416/417-94 at Q7.

( ) 2N3566/417-109 at Q11.

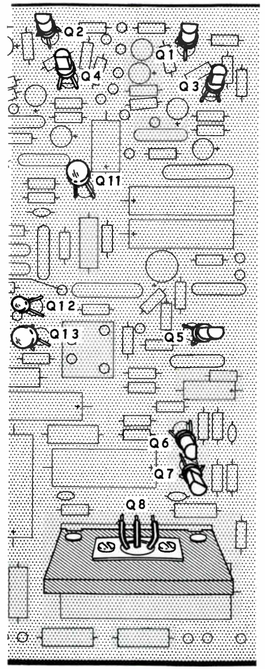


( ) S2090/417-110 at Q13.

NOTE: The transistor installed in the step below may be in either of the two shapes shown. Determine which type you have received so you can correctly identify the C, B, and E leads.



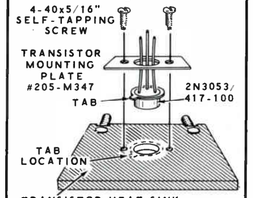
( ) 2N3692/417-108 at Q12.



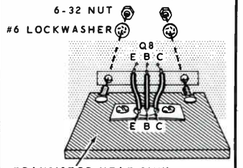
PICTORIAL 5

CONTINUE

( ) Place the 2N3053/417-100 transistor on the unpainted side of the transistor heat sink. Note position of transistor tab. Use the transistor mounting plate and 4-40 x 5/16" self-tapping screws. It is normal for the mounting plate to bend when the screws are tightened.



( ) Place 1" of sleeving on each transistor lead. Insert transistor leads E, B, and C through holes E, B, and C at Q8 on the circuit board. Then secure the heat sink to the circuit board with #6 lockwashers and 6-32 nuts.



( ) Solder and cut off the excess transistor leads on the foil side of the circuit board.

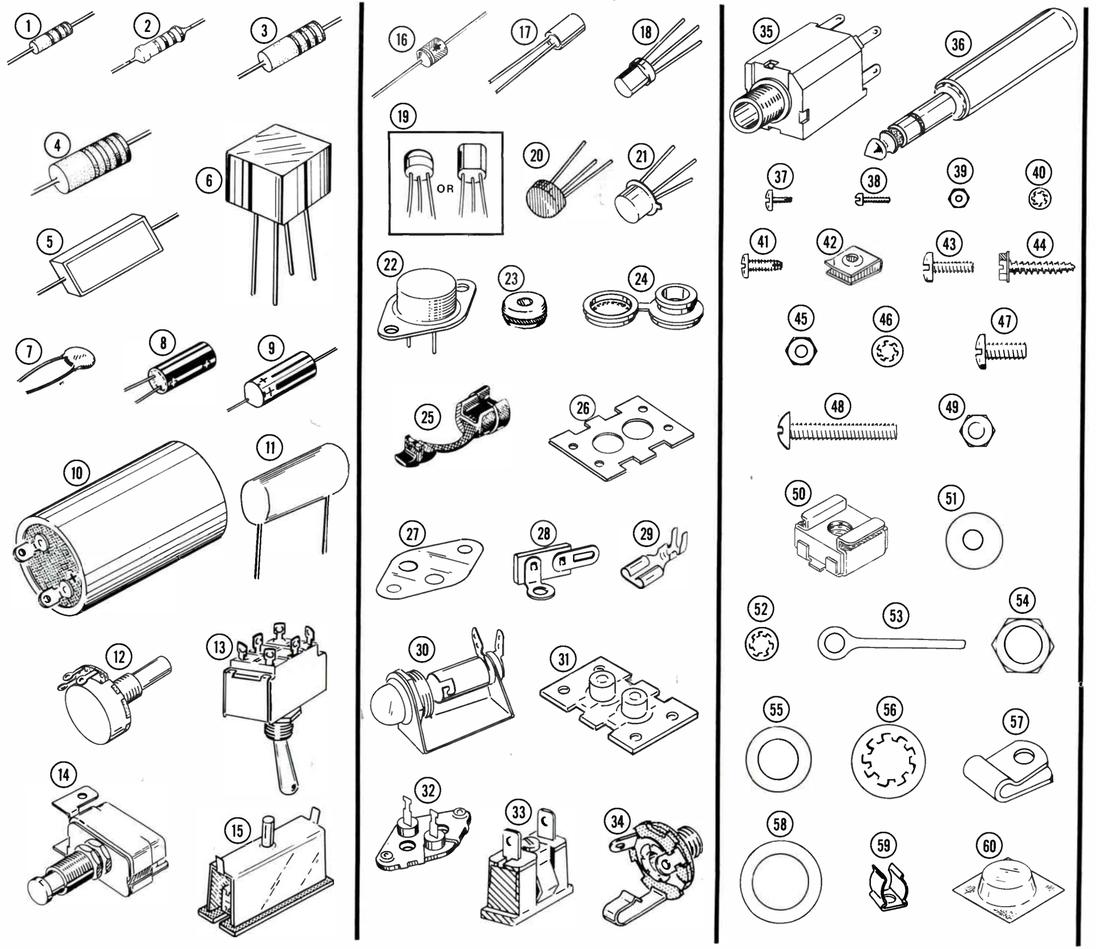
( ) Check to see that all leads are soldered and that no solder bridges exist between foils.

Set the circuit board aside until it is called for.

FINISH

PROCEED TO PAGE 00.

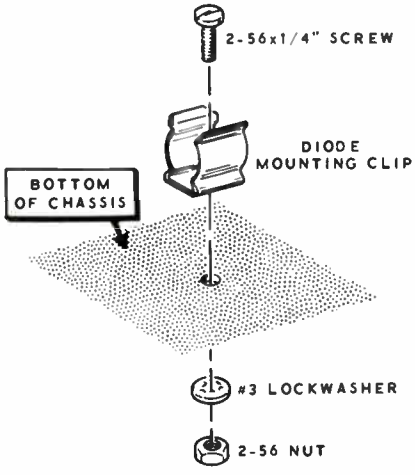
PARTS PICTORIAL



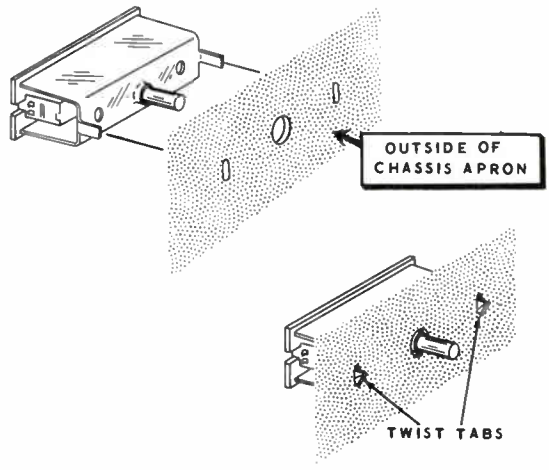
MYLAR CAPACITOR COLOR CODE CHART

EXAMPLE
BROWN - 1
BLACK - 0
ORANGE - 1,000
10 x 1,000 = 10,000 pf
or
10,000 pf = .01 - fd

COLOR	1ST DIGIT	2ND DIGIT	MULTIPLIER
BLACK	0	0	1
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
VIOLET	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	1,000,000,000



Detail 6D



Detail 6E

( ) Similarly, mount the TA2577A/417-101 transistor, mica insulator and transistor socket at Q10.

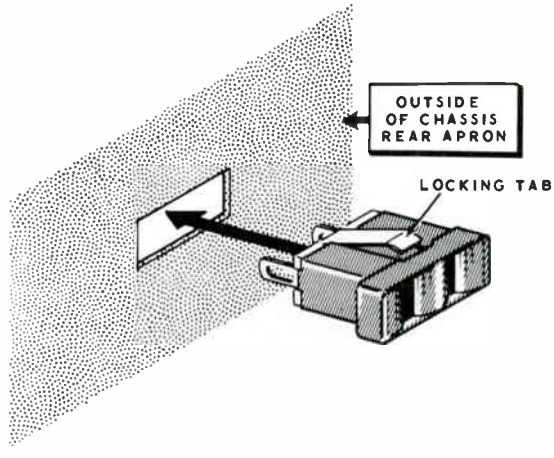
( ) Refer to Detail 6D, and mount the diode mounting clip at K. Use a 2-56 x 1/4" screw, a #3 lockwasher, and a 2-56 nut.

( ) Install circuit breakers at C and X as shown in Detail 6E. Twist the mounting tabs to hold the circuit breakers in place.

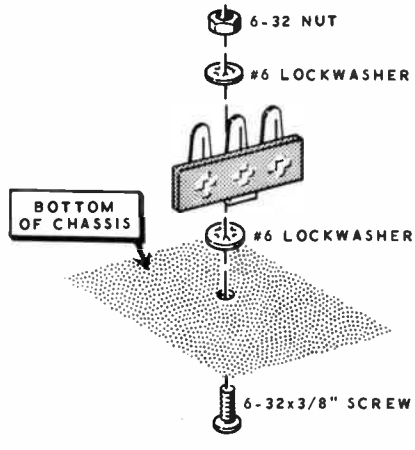
( ) Refer to Detail 6F, and mount the AC socket at B. Push the socket in until the locking tabs spread out and hold the socket in place.

( ) Refer to Detail 6G, and install a 3-lug terminal strip at H. Use 6-32 x 3/8" hardware, with one #6 lockwasher under and one above the mounting foot. Position the terminal strip as shown in the Pictorial.

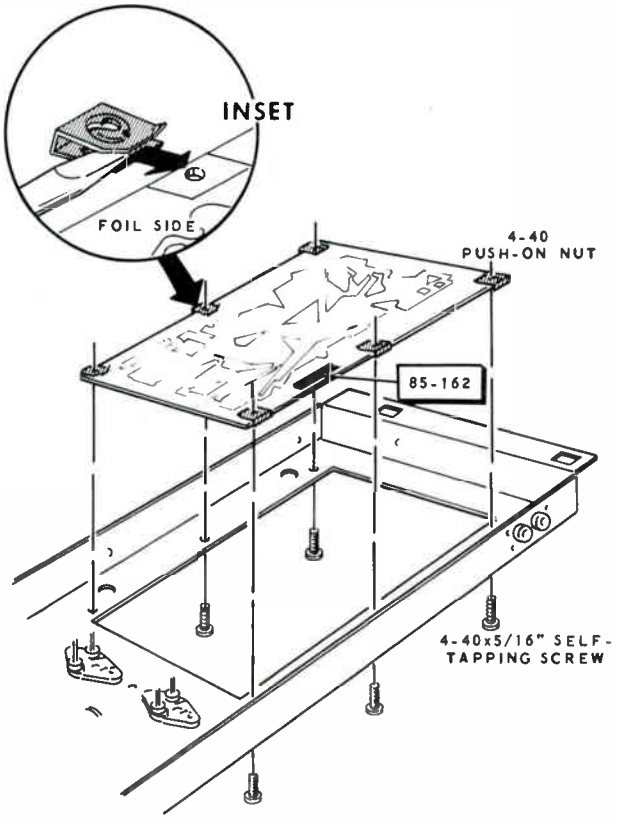
( ) Similarly, install a 5-lug terminal strip at G.



Detail 6F



Detail 6G



Detail 6H

( ) Refer to the inset drawing on Detail 6H, and install the six 4-40 push-on nuts on the circuit board. Be sure the flat sides of the nuts are on the component side of the board.

( ) Install the circuit board from the bottom of the chassis as shown in Detail 6H. Use 4-40 x 5/16" self-tapping screws. Position the part number on the circuit board as shown in Pictorial 6. Be careful not to overtighten the 4-40 screws or you will strip the threads.

( ) Set the chassis aside temporarily.

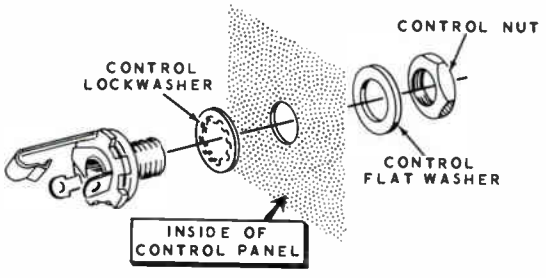
CONTROL PANEL PARTS MOUNTING

Refer to Pictorial 7 (fold-out from Page 15) for the following steps.

( ) Locate the control panel and place it on a soft cloth on your work area. This will prevent the front panel from being scratched in the following steps. Be careful of the sharp edges on the control panel.

( ) Mount a 1-lug terminal strip at AA. Use 6-32 x 3/8" hardware with two lockwashers. See the inset drawing on Pictorial 7.

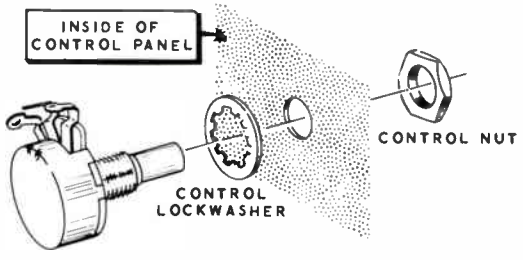
( ) Refer to Detail 7A, and mount a 2-terminal phone jack at AB. Use a control lockwasher, a control flat washer, and a control nut. Position the lugs as shown in Pictorial 7.



Detail 7A

( ) Mount a 2-terminal phone jack at AC. Use a control lockwasher, a control flat washer, and a control nut. Position the lugs as shown.

( ) Refer to Detail 7B, and mount a 10 KΩ control (#10-110) at AD. Use a control lockwasher and a control nut. Position the lugs as shown.

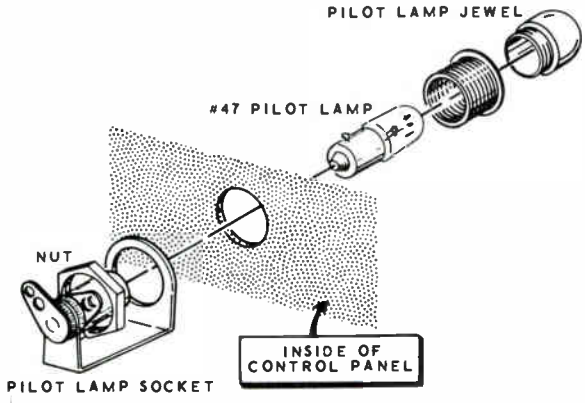


Detail 7B

( ) Mount a 50 KΩ control (#10-11) at AE. Use a control lockwasher and a control nut.

( ) Mount a 50 KΩ control (#10-11) at AF. Use a control lockwasher, and a control nut.

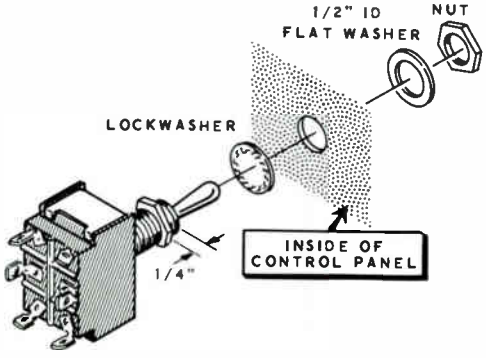
( ) Refer to Detail 7C, and mount the pilot lamp socket at AG. Use the hardware supplied with the socket.



Detail 7C

( ) Remove the plastic jewel from the pilot lamp socket and install a #47 pilot lamp in the socket. Replace the jewel.

( ) Refer to Detail 7D, and remove a nut and lockwasher from the toggle switch bushing. Turn the other nut on the switch bushing until the top of the nut is 1/4" away from the end of the bushing.



Detail 7D

( ) Again refer to Detail 7D and mount the switch at AH. Use the switch lockwasher, a 1/2" flat washer, and the switch nut.

( ) Mount the 3-terminal phone jack at AJ. Use a control lockwasher, a control flat washer, and a control nut. Place the lockwasher between the phone jack and the inside of the control panel. The flat washer goes on the outside of the control panel. Be sure to position the slanted corner of the phone jack as shown in Pictorial 7.

( ) Mount a 5000 Ω (5 KΩ) control (#10-7) at AK. Use a control lockwasher and a control nut.

( ) Mount a 100 KΩ control (#10-40) at AL. Use a control lockwasher and a control nut.

( ) Mount a 100 KΩ control (#10-40) at AM. Use a control lockwasher and a control nut.

( ) Mount a 50 KΩ control (#10-11) at AN. Use a control lockwasher and a control nut.

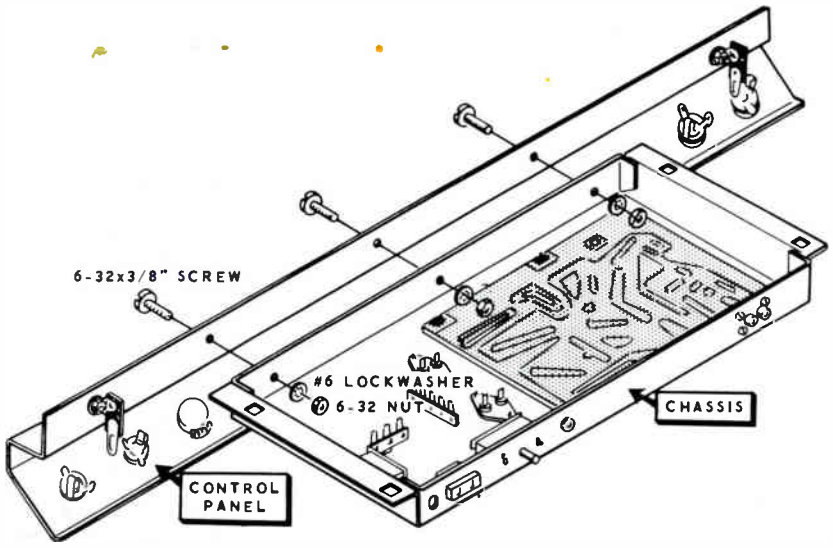
( ) Mount a 50 KΩ control (#10-11) at AP. Use a control lockwasher and a control nut.

( ) Mount a 10 KΩ control (#10-110) at AR. Use a control lockwasher and a control nut.

( ) Mount a 2-terminal phone jack at AS. Use a control lockwasher, a control flat washer, and a control nut. Position the lugs as shown.

( ) Mount a 2-terminal phone jack at AT. Use a control lockwasher, a control flat washer, and a control nut. Position the lugs as shown.

( ) Mount a 1-lug terminal strip at AU. Use 6-32 x 3/8" hardware with two lockwashers.



Detail 8A

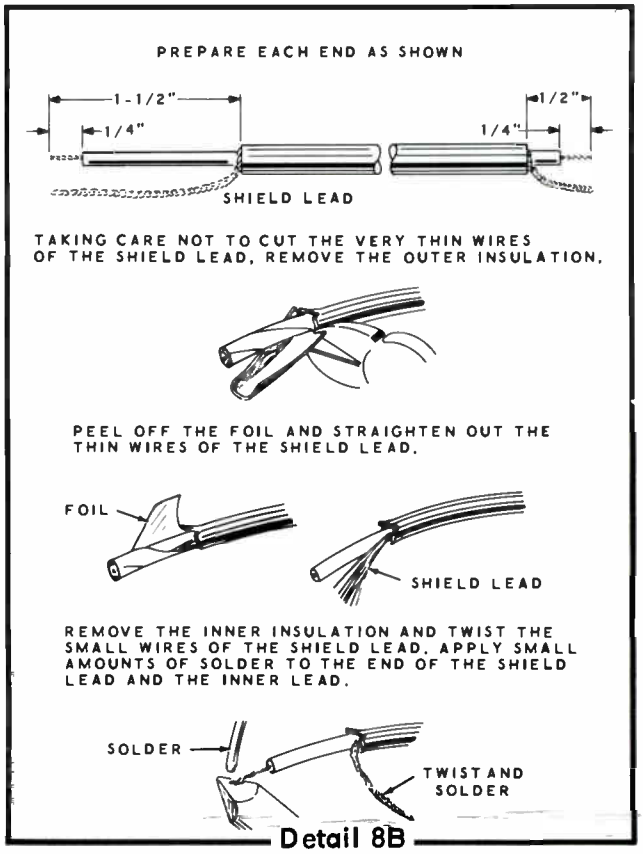
CONTROL PANEL MOUNTING AND WIRING

For best operation of the Amplifier, all wire should be positioned neatly. Refer to the Chassis Photos (fold-out from Page 38) which show how a completed kit should look.

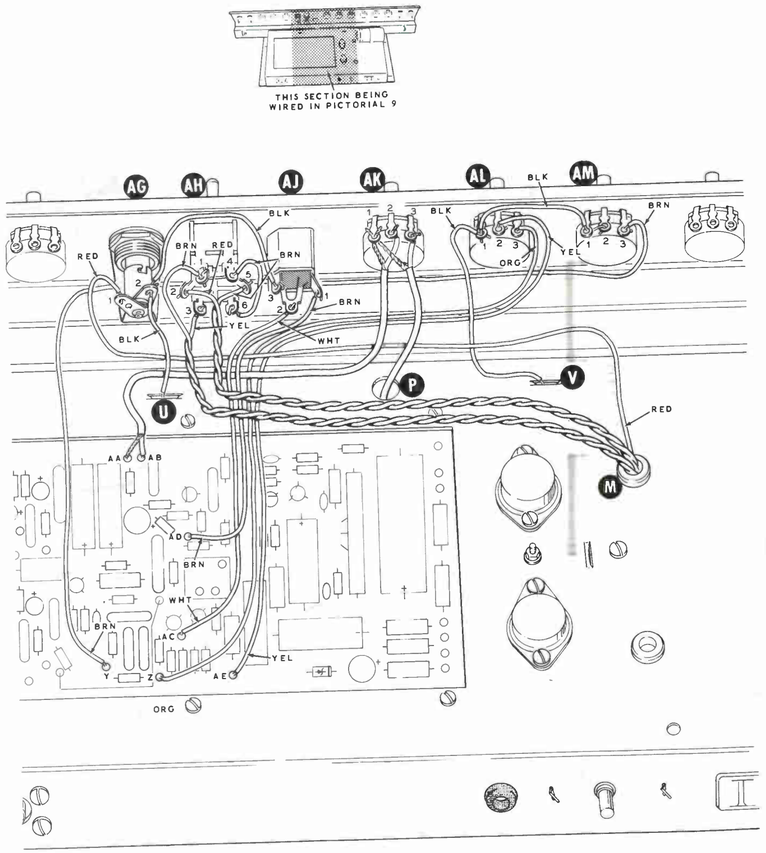
( ) Position the chassis and control panel as shown in Detail 8A. Secure the control panel to the chassis with 6-32 x 3/8" hardware.

NOTE: The large black hookup wire is quite similar to the shielded cable. Remove 1/4" of insulation from one end of each of these wires; then be sure you choose the shielded cable (with the foil inner wrap) for the next step. Also, do not confuse the 2-conductor (two inner leads and a shield) shielded cable with the single conductor (one inner lead and a shield) shielded cable. The 2-conductor shielded cable should only be used for the wiring of the foot switch.

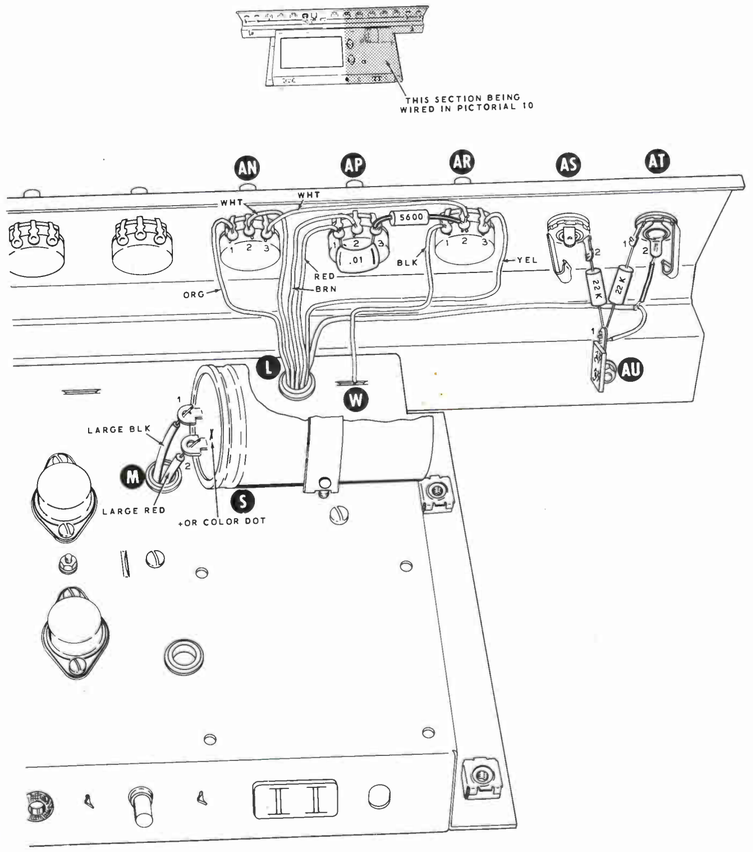
( ) Refer to Detail 8B, and prepare the ends of a 10" length of single conductor shielded cable.



Detail 8B



PICTORIAL 9



PICTORIAL 10

Refer to Pictorial 9 for the following steps.

( ) Prepare the following lengths of colored hookup wire:

18-1/2" brown	2-1/4" black
14" yellow	4" black
15-1/4" orange	6-1/2" white
2-3/4" black	5-3/4" brown
5-1/4" black	2-1/4" brown
13" red	

( ) Connect an 18-1/2" brown wire from lug 3 of control AM (S-1) to hole Y in the circuit board (S-1).

( ) Connect a 14" yellow wire from lug 2 of control AL (S-1) to hole AE in the circuit board (S-1).

( ) Connect a 15-1/4" orange wire from lug 3 of control AL (S-1) to hole Z in the circuit board (S-1).

NOTE: Where a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the solder instructions (S-2), one entering and one leaving the connection.

( ) Remove a total of 1/2" of insulation from one end of a 2-3/4" black wire. Place the 1/2" prepared end through lug 1 (S-2) to lug 2 (S-1) of control AM. Connect the other end of this wire to lug 1 of control AL (NS).

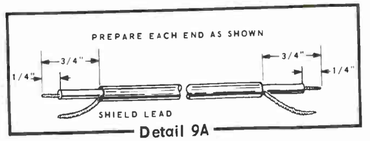
( ) Connect a 5-1/4" black wire from lug 1 of control AL (S-2) to solder tab V (S-1).

( ) Connect one end of a 13" red wire to lug 1 of pilot lamp socket AG (S-1). Place the free end of this wire through grommet M. It will be connected later.

( ) Refer to Detail 9A, and prepare the ends of a 9-1/2" length of shielded cable.

( ) At either end of this cable, connect the inner lead to lug 2 (S-1) and the shield lead to lug 1 (NS) of control AK.

( ) At the other end of this cable, connect the inner lead to hole AB (S-1) and the shield lead to hole AA (S-1) in the circuit board.



Detail 9A

( ) Refer to Detail 9A, and prepare the ends of a 20" length of shielded cable.

( ) At either end of this prepared cable, connect the inner lead to lug 3 (S-1) and the shield lead to lug 1 (S-2) of control AK. Place the free end of this cable through hole P in the chassis. It will be connected later.

( ) Connect a 2-1/4" black wire from lug 2 of pilot lamp socket AG (NS) to solder tab U (S-1).

( ) Connect a 4" black wire from lug 2 of pilot lamp socket AG (S-2) to lug 3 of phone jack AJ (S-1).

( ) Connect a 6-1/2" white wire from lug 2 of phone jack AJ (S-1) to hole AC in the circuit board (S-1).

( ) Connect a 5-3/4" brown wire from lug 1 of phone jack AJ (S-1) to hole AD in the circuit board (S-1).

( ) Remove a total of 5/8" of insulation from one end of a 2-1/4" brown wire.

( ) Place the 5/8" prepared end of this wire through lug 4 (S-2) to lug 1 (NS) of switch AH. Connect the other end of this wire to lug 6 of AH (S-1).

( ) Prepare the following lengths of colored hookup wire:

14-1/2" yellow	14" red
14-1/2" brown	14-1/4" brown

Refer to Pictorial 8 (fold-out from Page 15) for the following steps.

( ) Position the chassis as shown.

NOTE: When a wire end is connected to a hole in the circuit board, place the wire through the hole in the circuit board, solder the wire to the foil, and cut off the excess length close to the foil.

In the following steps, route all cables and wires as shown in the Pictorial.

( ) At the 1/2" prepared end of the 10" shielded cable, connect the inner lead to hole S (S-1) and the shield lead to hole R (S-1) in the circuit board.

( ) At the other end of this cable, place a 1" length of sleeving over the shield lead. Connect the shield lead to lug 2 of phone jack AC (S-1) and the inner lead to lug 1 of terminal strip AA (NS).

( ) Connect a 22 KΩ (red-red-orange) resistor from lug 2 of phone jack AB (S-1) to lug 1 of terminal strip AA (NS).

( ) Connect a 22 KΩ (red-red-orange) resistor from lug 1 of phone jack AC (S-1) to lug 1 of terminal strip AA (S-3).

NOTE: Use wire of the proper color when wire is called for in a step. Do not use the large red wire or the large black wire unless it is specified. Position each wire as shown in the Pictorial.

( ) Prepare the following lengths of colored hookup wire. Cut each wire to the correct length and remove 1/4" of insulation from both ends. These wires are listed in the order in which they will be used:

6-3/4" black	10" brown
9-1/4" yellow	4-3/4" white
8-3/4" red	7-1/2" white
	7-3/4" orange

NOTE: Connections should be made to solder tabs in the following manner: Place the wire end through the slot in the chassis. Then turn the chassis over, wrap the lead around the tab, and solder the connection as instructed in the step. Refer to the inset drawing on Pictorial 8.

( ) Connect a 6-3/4" black wire from lug 1 of control AD (S-1) to solder tab Y (S-1).

( ) Connect a 9-1/4" yellow wire from lug 3 of control AD (S-1) to hole T in the circuit board (S-1).

( ) Connect an 8-3/4" red wire from lug 1 of control AE (NS) to hole V in the circuit board (S-1).

( ) Connect a 10" brown wire from lug 2 of control AE (S-1) to hole X in the circuit board (S-1).

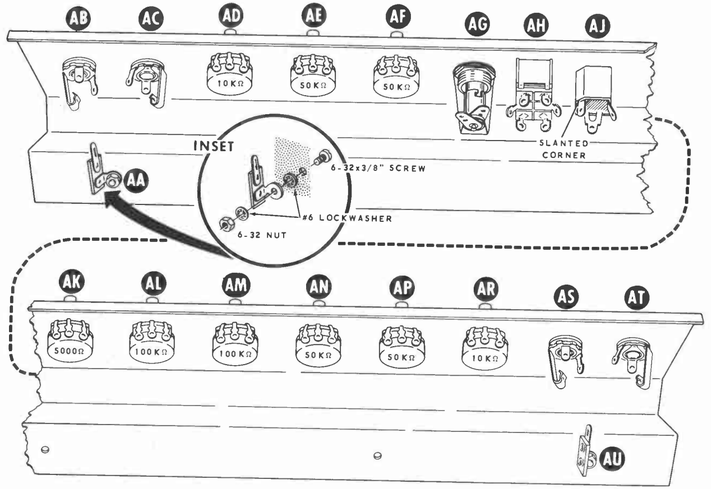
( ) Connect a .01 µfd Mylar capacitor between lugs 1 (S-2) and 3 (NS) of control AE. Position the banded end as shown.

( ) Connect a 4-3/4" white wire from lug 2 of control AD (NS) to lug 3 of control AF (S-1).

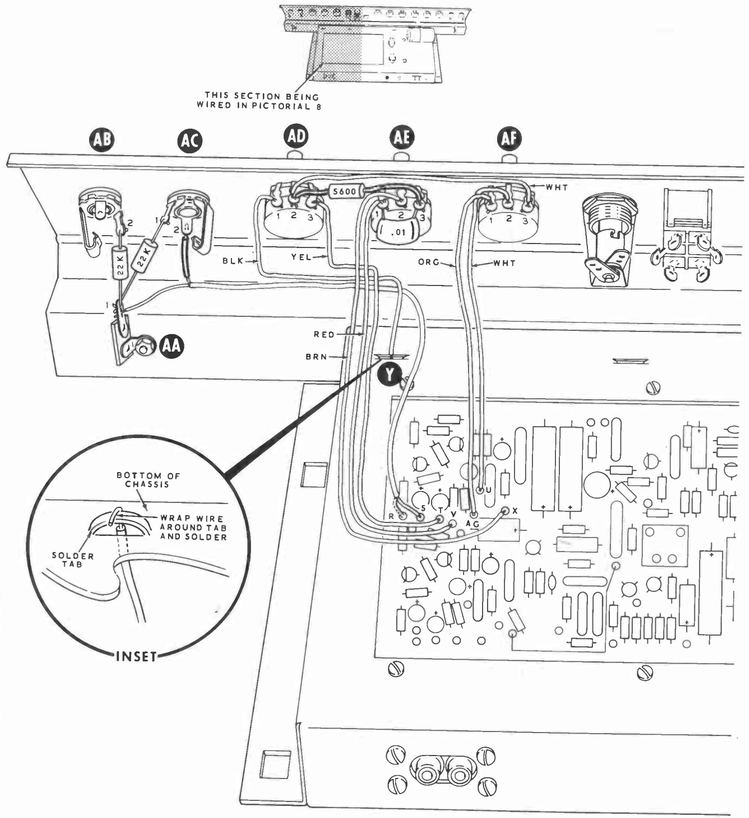
( ) Place a 3/4" length of sleeving over each lead of a 5600 Ω (green-blue-red) resistor. Connect this resistor from lug 2 of control AD (S-2) to lug 3 of control AE (S-2).

( ) Connect a 7-1/2" white wire from lug 2 of control AF (S-1) to hole U in the circuit board (S-1).

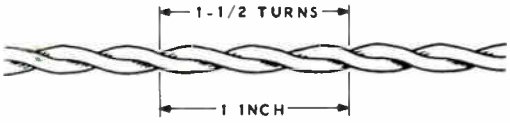
( ) Connect a 7-3/4" orange wire from lug 1 of control AF (S-1) to hole AG in the circuit board (S-1).



PICTORIAL 7



PICTORIAL 8



Detail 9B

( ) Refer to Detail 9B, and twist a 14-1/2" yellow wire and a 14-1/2" brown wire together to form a twisted pair that has approximately one and a half turns per inch.

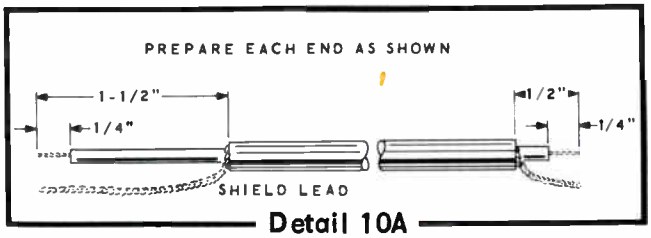
( ) At either end of this twisted pair, connect the yellow wire to lug 3 (S-1) and the brown wire to lug 1 (S-2) of switch AH. Place the free end of this twisted pair through grommet M to be connected later.

( ) Starting with one end even, twist a 14" red wire and 14-1/4" brown wire together to form a twisted pair, having approximately one and a half turns per inch.

( ) At the even end of this twisted pair, connect the red wire to lug 2 (S-1) and the brown wire to lug 5 (S-1) of switch AH. Place the free end of this twisted pair through grommet M to be connected later.

Refer to Pictorial 10 (fold-out from Page 16) for the following steps.

( ) Refer to Detail 10A, and prepare the ends of a 28-3/4" length of shielded cable.



Detail 10A

( ) At the 1-1/2" prepared end of this cable, place a 1" length of sleeving over the shield lead and connect the shield lead to lug 2 of phone jack AT (S-1). Connect the inner lead at this end of the cable to lug 1 of terminal strip AU (NS). Place the free end of this cable through grommet L to be connected later.

( ) Connect a 22 KΩ (red-red-orange) resistor from lug 2 of phono socket AS (S-1) to lug 1 of terminal strip AU (NS).

( ) Connect a 22 KΩ (red-red-orange) resistor from lug 1 of phone jack AT (S-1) to lug 1 of terminal strip AU (S-3).

( ) Prepare the following lengths of colored hookup wire:

28-1/2" yellow	4-1/4" white
26-1/4" brown	6" black
25-3/4" red	
25-1/2" white	
26-1/2" orange	

NOTE: In the following steps, one end of each wire is connected to a control on the control panel. The other end of each wire should be placed through grommet L to be connected later. Position each wire as shown in Pictorial 10.

( ) One end of a 28-1/2" yellow wire to lug 3 of control AR (S-1).

( ) One end of a 26-1/4" brown wire to lug 2 of control AP (S-1).

( ) One end of a 25-3/4" red wire to lug 1 of control AP (NS).

( ) One end of a 25-1/2" white wire to lug 2 of control AN (S-1).

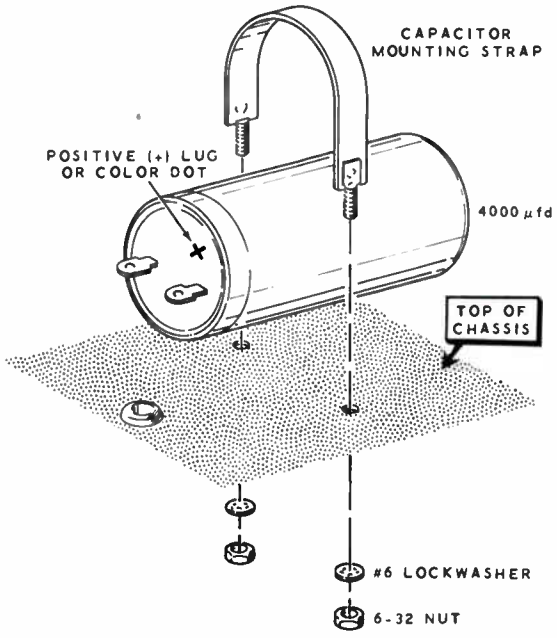
( ) One end of a 26-1/2" orange wire to lug 1 of control AN (S-1).

( ) Connect a 4-1/4" white wire from lug 3 of control AN (S-1) to lug 2 of control AR (NS).

( ) Connect a 6" black wire from lug 1 of control AR (S-1) to solder tab W (S-1).

( ) Connect a .01 μfd Mylar capacitor between lugs 1 (S-2) and 3 (NS) of control AP. Position the banded end as shown.

( ) Place a 1/2" length of sleeving over each lead of a 5600 Ω (green-blue-red) resistor. Connect this resistor from lug 3 of control AP (S-2) to lug 2 of control AR (S-2).



Detail 10B

( ) Bend the capacitor mounting strap to the shape shown in Detail 10B.

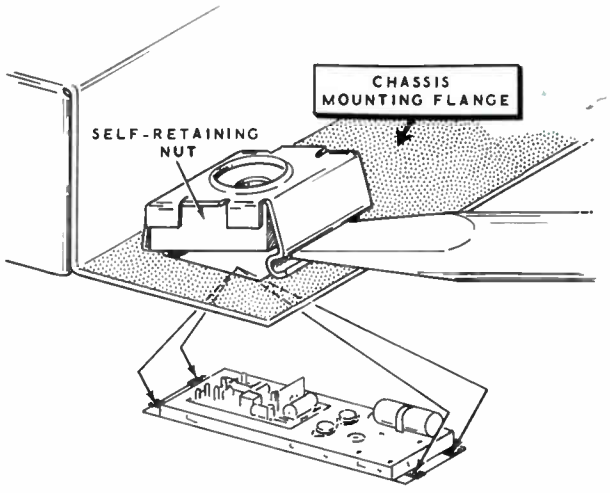
( ) Refer to Detail 10B, and mount the 4000 µfd electrolytic capacitor on the top of the chassis at S. Use the capacitor mounting strap, #6 lockwashers, and 6-32 nuts. Position the positive (+ or color dot) lug of the capacitor as shown.

NOTE: When you use a length of stranded wire, such as the large black or large red wire, twist together the ends of the fine wires and apply a thin film of solder to hold the strands together.

( ) Prepare and connect one end of a 4" large black wire to lug 1 of electrolytic capacitor S (S-1). Place the free end of this wire through grommet M to be connected later.

( ) Prepare and connect one end of a 3-1/2" large red wire to lug 2 of electrolytic capacitor S (S-1). Place the free end of this wire through grommet M to be connected later.

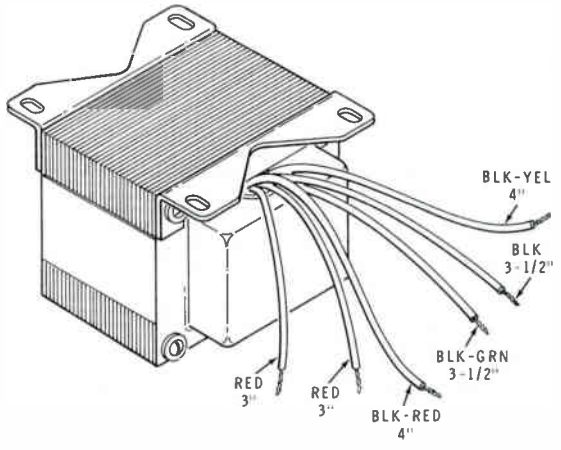
( ) Refer to Detail 10C, and install a self-retaining nut in each corner of the two chassis mounting flanges.



Detail 10C

POWER TRANSFORMER MOUNTING AND WIRING

( ) Cut the leads of the power transformer to the dimensions shown in Detail 11A. Measure each lead from the point it leaves the transformer body. Remove 1/4" of insulation from the end of each transformer lead. Then melt a small amount of solder on the bared lead end to hold the wire strands together.



Detail 11A

( ) Insert the transformer leads through grommet F and mount the power transformer and transformer shield to the top of the chassis as shown in Detail 11B (fold-out from this Page). Use 8-32 x 3/8" hardware. Slide the transformer shield on the transformer before installing the hardware.

NOTE: The power transformer can be wired for either 105-125 volt or 210-250 volt AC operation. Refer to only one of the following two sections; use the one that applies to the line voltage in your area:

120 Volts

Refer to Detail 11C for the following steps.

Connect the power transformer leads extending from grommet F as follows:

LEAD COLOR	CONNECT TO
( ) Black	lug 2 of socket B (NS).
( ) Black-green	lug 2 of socket B (NS).
( ) Black-yellow	lug 2 of circuit breaker X (NS).
( ) Black-red	lug 2 of circuit breaker X (S-2).
( ) Either red	lug 1 of circuit breaker C (S-1).
( ) Other red	lug 4 of terminal strip G (NS).

This completes the 120 volt wiring.

240 Volts

Refer to Detail 11D for the following steps.

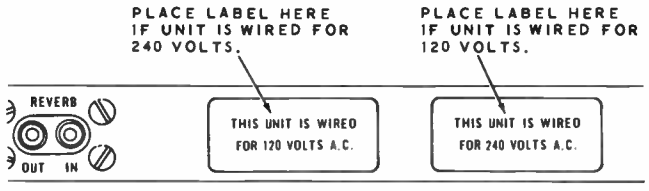
Connect the power transformer wires extending from grommet F as follows:

LEAD COLOR	CONNECT TO
( ) Black	lug 2 of socket B (NS).
( ) Black-red	lug 2 of circuit breaker X (S-1).
( ) Black-yellow	lug 3 of terminal strip H (NS).
( ) Black-green	lug 3 of terminal strip H (S-2).
( ) Either red	lug 1 of circuit breaker C (S-1).
( ) Other red	lug 4 of terminal strip G (NS).

This completes the 240 volt wiring.

NOTE: In the next step, the blue and white identification label will be installed on the rear of the chassis. If the Amplifier is wired for 120 volts, place the label over the 240 volt lettering. If it is wired for 240 volts, place the label over the 120 volt lettering.

( ) Carefully peel away the backing paper from the blue and white identification label. Then press the label in place over the proper lettering on the rear of the chassis as shown in Detail 11E. Be sure to refer to the numbers on this label in any communications you have with the Heath Company about this kit.



Detail 11E

CHASSIS BOTTOM WIRING

Refer to Pictorial 11 for the following steps.

NOTE: When wiring to the foil side of the circuit board, do not push the insulation of the wire down tightly against the foil. Always leave about 1/8" of the bare wire end exposed to insure a good solder connection to the foil and wire.

( ) Prepare the following lengths of colored hookup wire.

2" brown
7" yellow
19" large black

( ) Connect a 2" brown wire between lugs 1 (S-1) and 4 (NS) of double phono socket E.

( ) Connect a 7" yellow wire from lug 2 of phono socket E (S-1) to hole H in the circuit board (S-1).

( ) At the free end of the coaxial cable extending from hole P, connect the inner lead to lug 3 (S-1) and the shield lead to lug 4 (S-2) of double phono socket E.

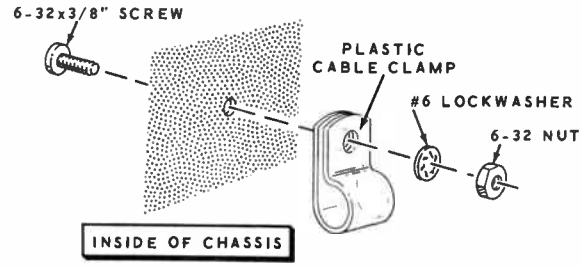
( ) Route the wires that extend from grommet L around the chassis edge as shown.

( ) At the free end of the coaxial cable extending from grommet L, connect the inner lead to hole P (S-1) and the shield lead to hole N (S-1) in the circuit board.

Connect the free ends of each of the remaining wires extending from grommet L to the circuit board as follows:

WIRE COLOR	CONNECT TO HOLE
( ) White	L (S-1).
( ) Yellow	M (S-1).
( ) Red	K (S-1).
( ) Orange	AH (S-1).
( ) Brown	W (S-1).

( ) Connect a 19" large black wire from hole J in the circuit board (S-1) to solder tab J (NS).



Detail 11F

( ) Slide a plastic cable clamp over all of the wires at N. Secure the cable clamp to the chassis with 6-32 x 3/8" hardware as shown in Detail 11F.

( ) Similarly, place a plastic cable clamp over all of the wires at R. Secure the cable clamp to the chassis with 6-32 x 3/8" hardware.

Connect the free ends of each of the wires extending from grommet M as follows:

WIRE COLOR	CONNECT TO
( ) Red	lug 1 of terminal strip G (NS).
( ) Large red	lug 2 of terminal strip G (NS).
( ) Large black	lug 3 of terminal strip G (NS).

( ) Brown-yellow twisted pair:

Brown	lug 1 of AC socket B (NS).
Yellow	lug 2 of AC socket B (NS).

( ) Brown-red twisted pair:

Brown	lug 1 of circuit breaker X (S-1).
Red	lug 1 of terminal strip H (NS).

( ) Prepare the following lengths of colored hookup wire:

2-1/2" brown	2" yellow
2-1/2" brown	2" red
1-1/2" black	6" red
2" yellow	3" red
1-1/2" black	

( ) Connect a 2-1/2" brown wire from lug B of transistor socket Q10 (NS) to hole E in the circuit board (S-1).

( ) Connect a 2-1/2" brown wire from lug B of transistor socket Q9 (NS) to hole B in the circuit board (S-1).

( ) Connect a 1-1/2" black wire from lug C of transistor socket Q9 (S-1) to solder tab J (NS).

( ) Connect a 2" yellow wire from lug E of transistor socket Q9 (S-1) to hole C in the circuit board (S-1).

( ) Connect a 1-1/2" black wire from lug 3 of terminal strip G (NS) to solder tab J (NS).

( ) Connect a 2" yellow wire from lug E of transistor socket Q10 (S-1) to hole D in the circuit board (S-1).

( ) Connect a 2" red wire from lug C of transistor socket Q10 (S-1) to hole F in the circuit board (S-1).

( ) Connect a 6" red wire from hole G in the circuit board (S-1) to lug 2 of terminal strip G (NS).

( ) Install the 1N3754 diode (#56-33) in diode mounting clip K with the color dot toward transistor socket Q9, as shown.

( ) Place 1" of sleeving on the diode lead nearest the color dot; then connect this lead to lug B of transistor socket Q9 (S-2).

( ) Place 1" of sleeving on the other diode lead; then connect this lead to lug B of transistor socket Q10 (S-2).

( ) Connect a .01 µfd 1.4 KV disc capacitor between lugs 1 (S-2) and 2 (S-1) of terminal strip H.

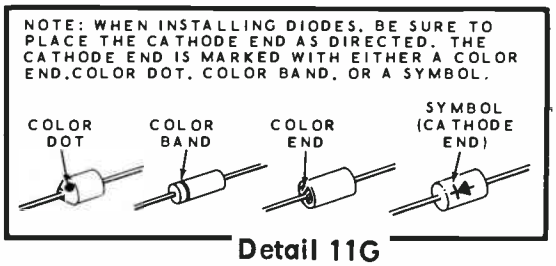
( ) Place a 1" length of sleeving on one lead of a 110 Ω 5 watt resistor; then connect this lead to lug 5 of terminal strip G (NS).

( ) Connect the other lead of this resistor to lug 1 of terminal strip G (S-2). Position the body of the resistor down against the chassis.

( ) Connect a 3" red wire from lug 5 of terminal strip G (NS) to lug 2 of circuit breaker C (S-1).

Refer to the inset drawing on Pictorial 11 for the following steps.

( ) Refer to Detail 11G, and identify the cathode lead of a silicon diode. Then connect the cathode lead to lug 5 (NS) and the other lead to lug 3 (NS) of terminal strip G.



Detail 11G

( ) Connect the cathode lead of a silicon diode to lug 4 (NS) and the other lead to lug 3 (S-4) of terminal strip G.

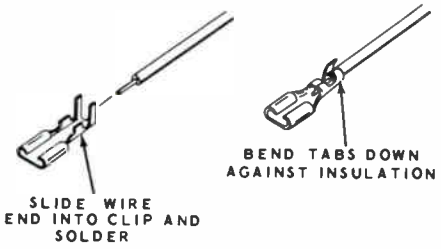
( ) Connect the cathode lead of a silicon diode to lug 2 (NS) and the other lead to lug 5 (S-4) of terminal strip G.

( ) Connect the cathode lead of a silicon diode to lug 2 (S-4) and the other lead to lug 4 (S-3) of terminal strip G.

( ) Hold a 23" large red wire and a 22" large black wire even at one end. Then tie a knot in the two wires 15-1/2" from the even end.

( ) At the uneven end of this pair of wires, connect the large black wire to solder tab J (S-4). Route the large red wire under the wires connected between the circuit board and transistor sockets, and connect the large red wire to hole A in the circuit board (S-1).

( ) Pass the free end of this pair of wires through grommet D.



Detail 11H

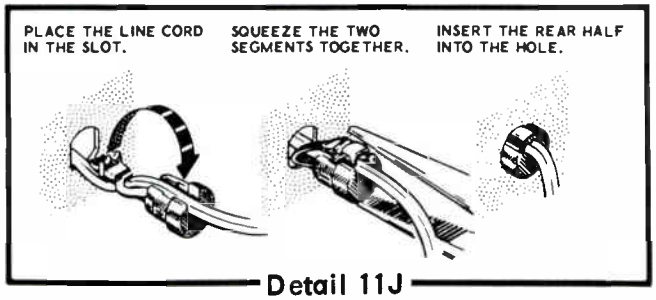
CAUTION: Do not use too much solder when preparing the push-on connectors in the next step. If too much solder is used, it will flow into the rolled end of the connector and make it impossible to install on the speaker lugs later.

( ) Refer to Detail 11H, and install push-on connectors on the free ends of the large red and large black wires extending from grommet D.

( ) Twist the wire strands together on each lead of the line cord. Then melt a small amount of solder on each of the twisted wires to hold the strands together.

( ) Place this end of the line cord through hole A in the chassis. Connect either line cord lead to lug 1 (S-2) and the other lead to lug 2 of AC socket B. Lug 2 will be an (S-4) for 120 V wiring or an (S-3) for 240 V wiring.

( ) Refer to Detail 11J, and install the small line cord strain relief in hole A.



Detail 11J

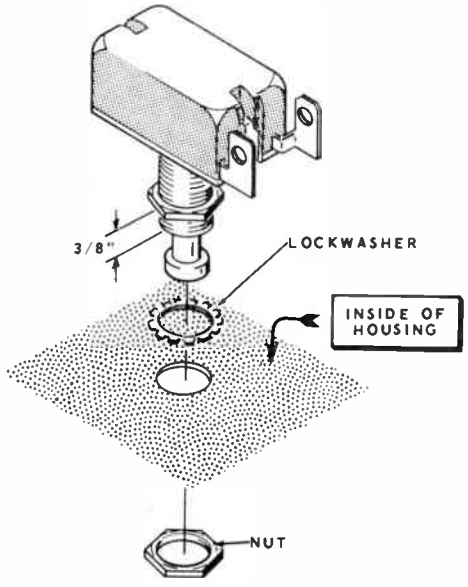
( ) Turn all control shafts fully counterclockwise. Install a knob on each control shaft. Position each knob pointer to the 0 mark, and then tighten the knob setscrew against the control shaft.

This completes the wiring of the chassis assembly. Check all wiring and solder connections carefully. Be sure there are no solder bridges between the foils of the circuit board. Set the chassis assembly aside until it is called for later.

FOOT SWITCH WIRING

Refer to Pictorial 12 for the following steps.

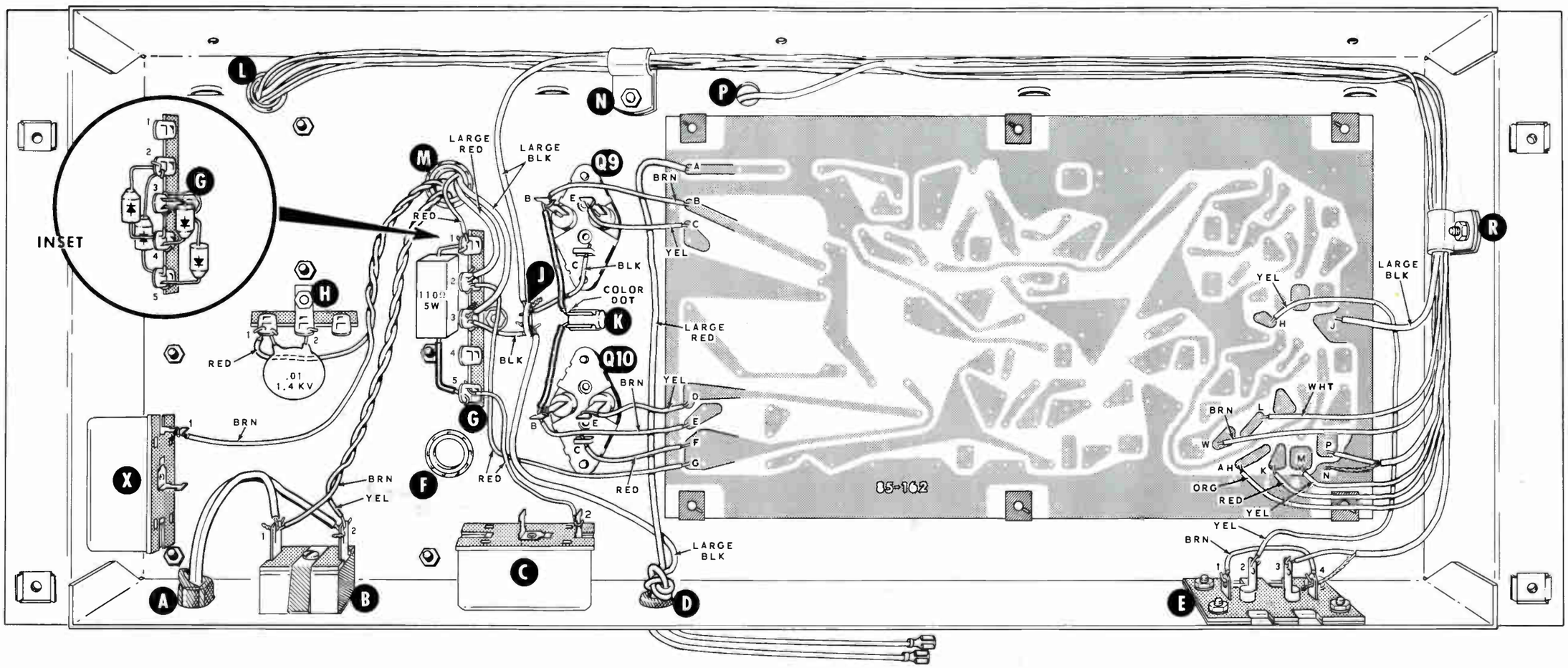
( ) Refer to Detail 12A and remove one nut and the lockwasher from each of the two pushbutton switches.



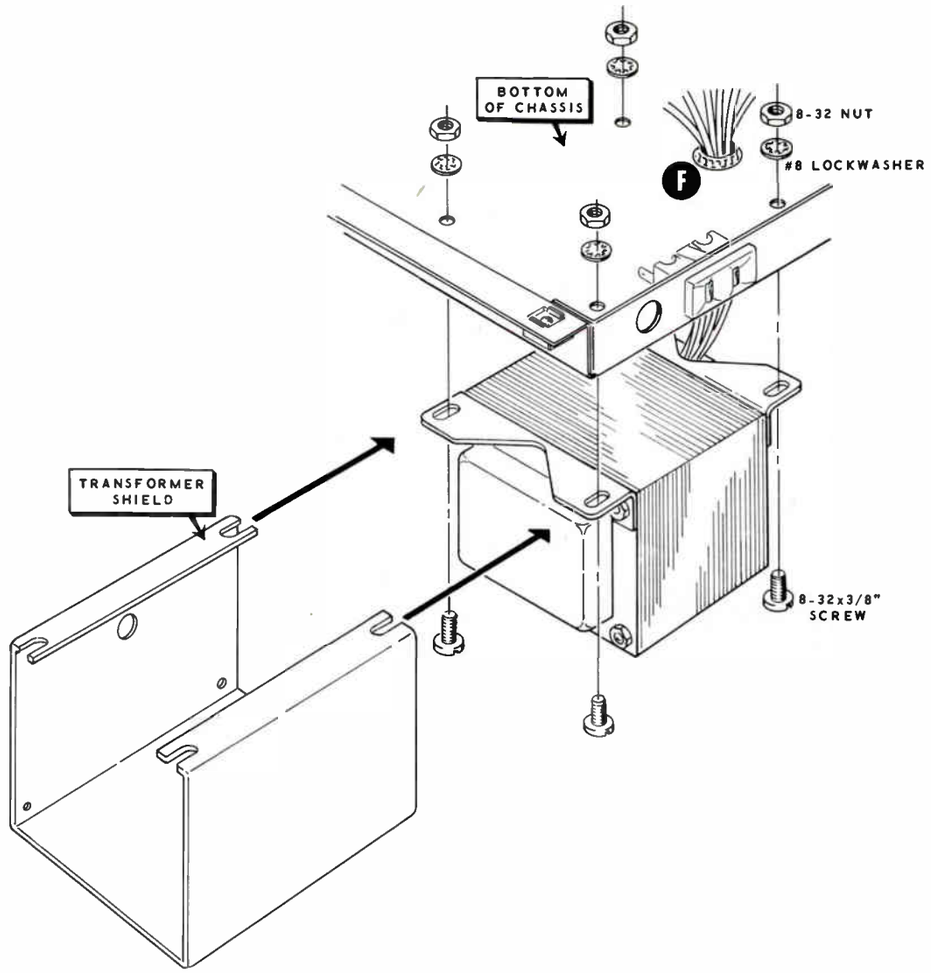
Detail 12A

( ) Adjust the second nut of each switch so it is 3/8" from the end of the switch bushing as shown in Detail 12A.

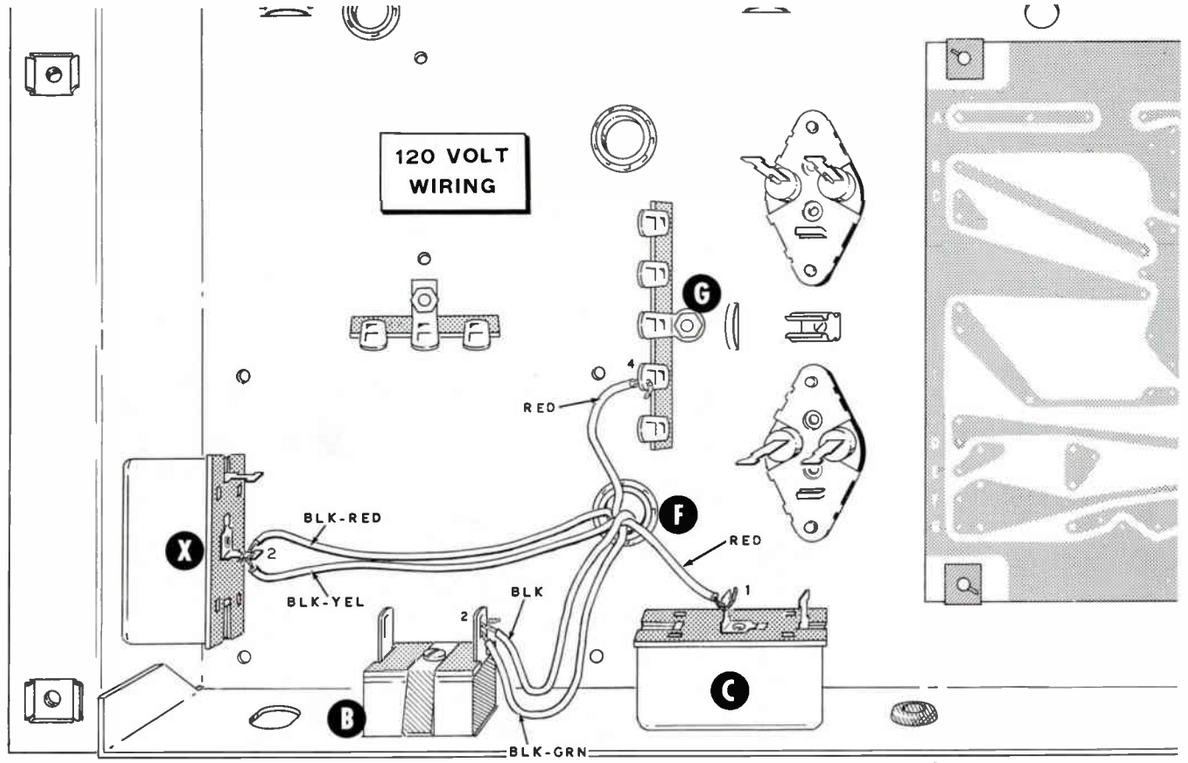
( ) Mount the pushbutton switches at BA and BB. Use the nut and lockwasher removed previously.



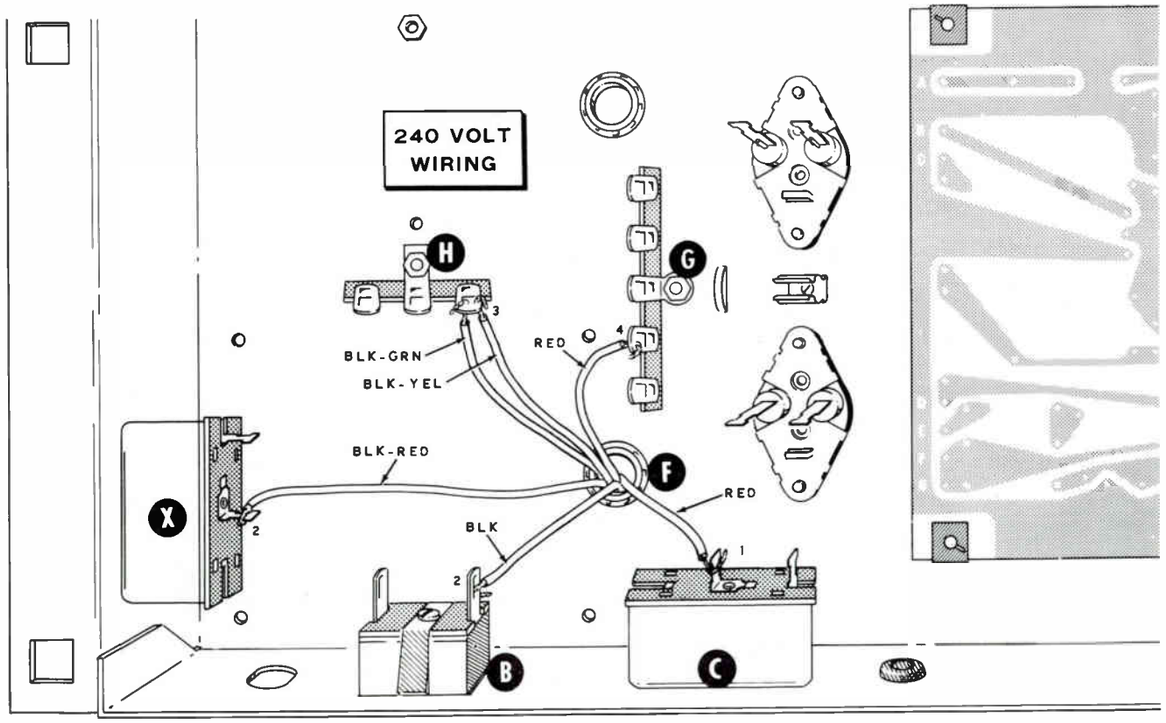
PICTORIAL 11



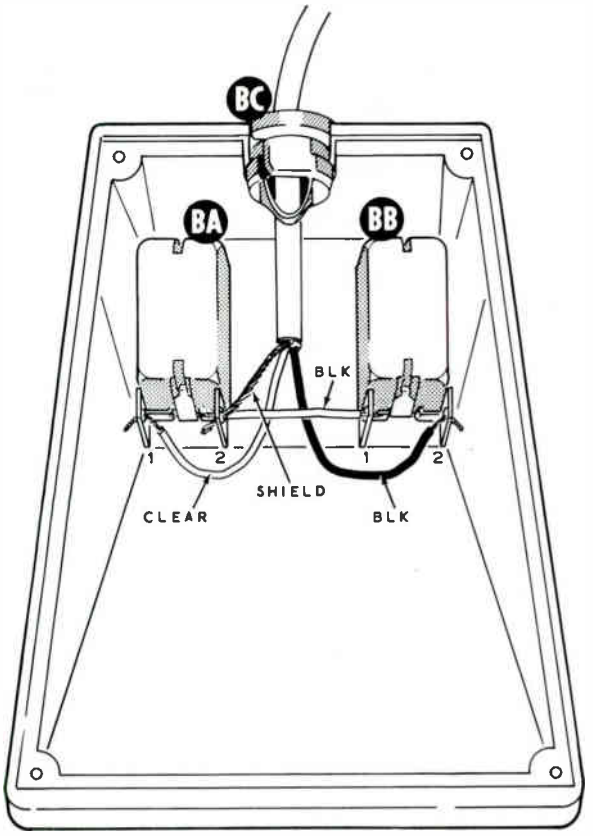
Detail 11B



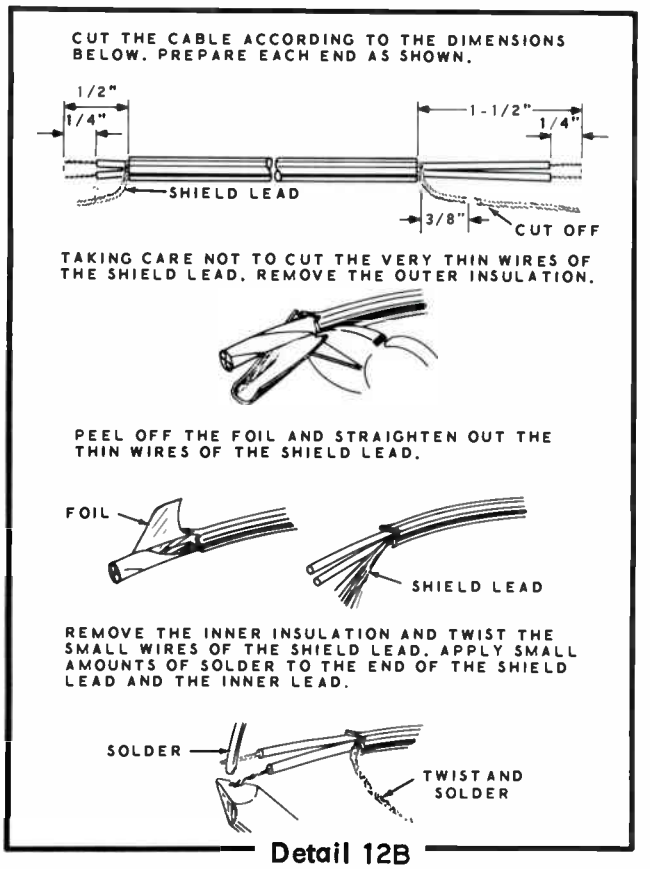
Detail 11C



Detail 11D



PICTORIAL 12



Detail 12B

( ) Refer to Detail 12B and prepare the full length of 2-wire shielded cable.

Connect the long prepared end of this cable as follows:

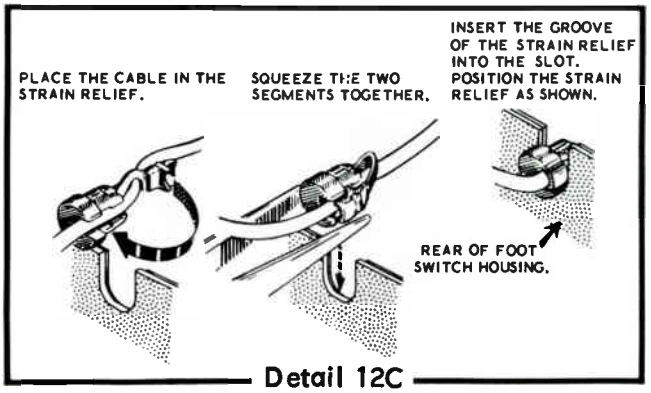
( ) Connect the black lead to lug 2 of switch BB (S-1).

( ) Connect the clear lead to lug 1 of switch BA (S-1).

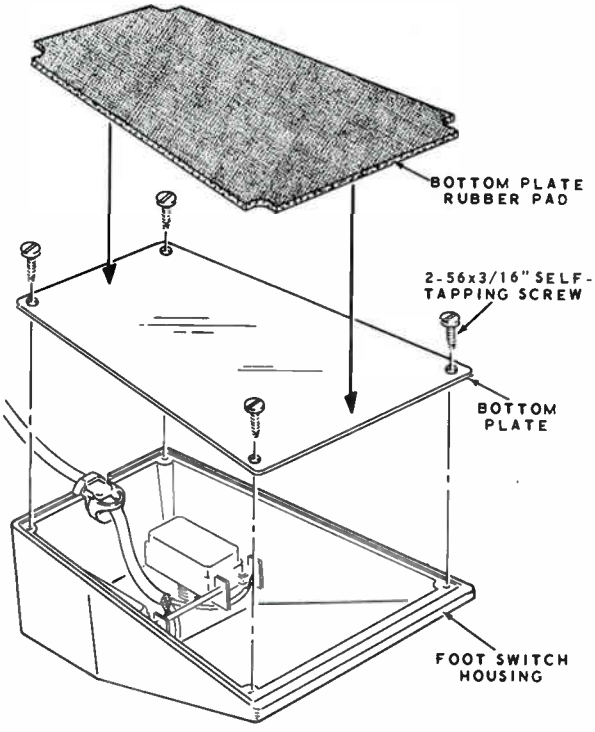
( ) Connect the shield lead to lug 2 of switch BA (NS).

( ) Connect a 1-3/8" black wire from lug 2 of switch BA (S-2) to lug 1 of switch BB (S-1).

( ) Refer to Detail 12C, and install the large strain relief in slot BC. Position the strain relief as shown.



Detail 12C

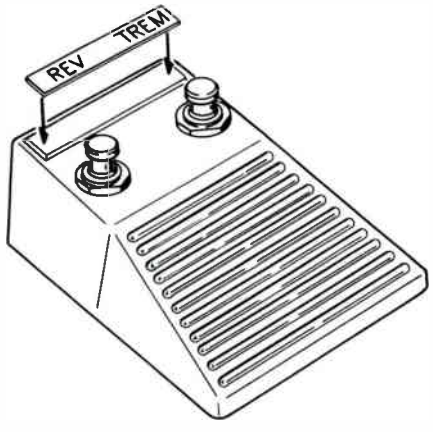


Detail 12D

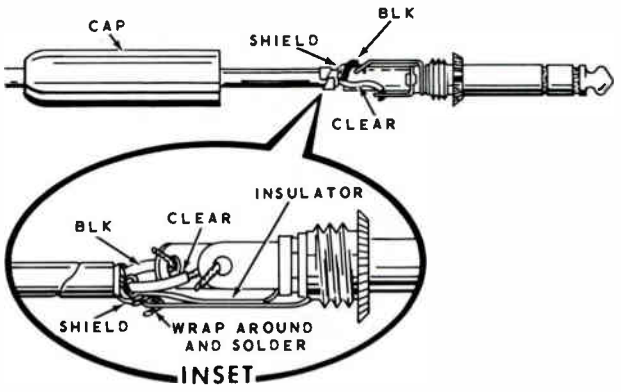
( ) Refer to Detail 12D, and install the bottom plate on the foot switch housing. Use four 2-56 x 3/16" self-tapping screws.

( ) Again refer to Detail 12D, and remove the backing paper from the bottom plate rubber pad. Stick the rubber pad to the bottom plate.

( ) Remove the backing paper from the foot switch label and stick it to the top of the housing as shown in Detail 12E.



Detail 12E



Detail 12F

( ) Refer to Detail 12F, and install a phone plug on the free end of the 2-wire shielded cable. Be sure to place the phone plug cap on the cable before installing the plug.

This completes the assembly of the foot switch. Set it aside until it is called for later.

CABINET PARTS MOUNTING

Refer to Detail 13A (fold-out from Page 27) for the following steps.

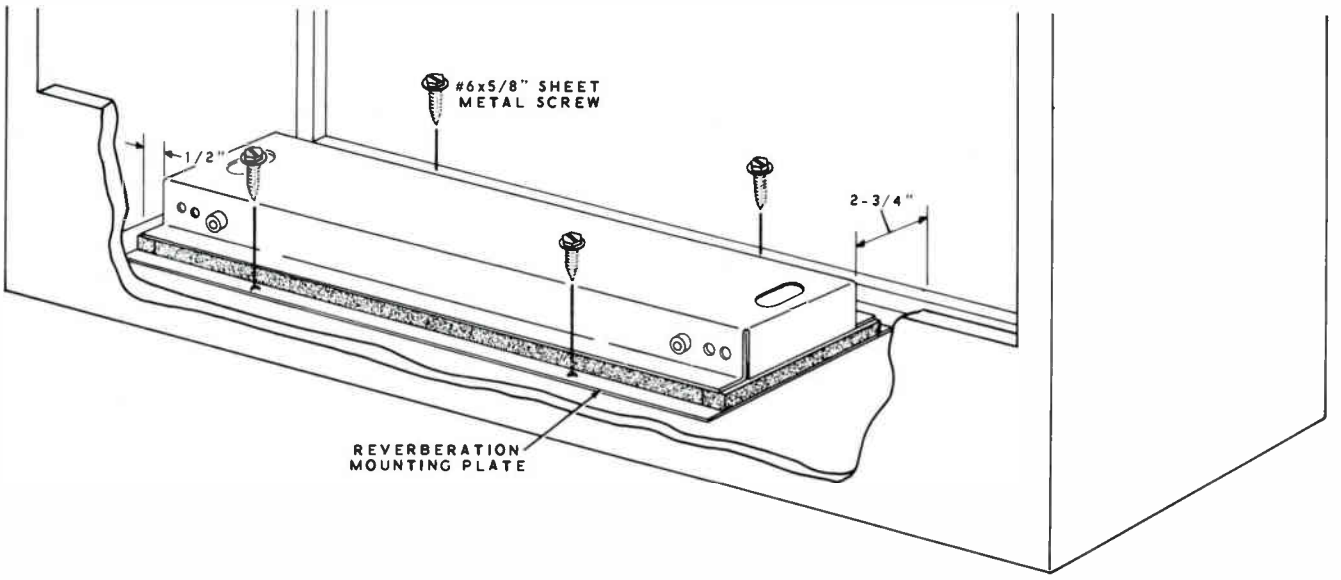
CAUTION: When handling the reverberation unit, be very careful not to bend or stretch the springs.

( ) Position the reverberation unit upside down as shown. Carefully remove the pieces of cardboard that were used to support the springs during shipment.

( ) Wipe off the bottom flange of the reverberation unit. This will insure a clean surface for the foam tape which will be installed in the following steps.

( ) Cut a 4-3/8" piece from only one end of each of the two long lengths of foam tape.

( ) Carefully peel away the backing paper from only one side of one of the 4-3/8" lengths of foam tape.



PICTORIAL 13

( ) Press the sticky side of this foam tape across one end of the reverberation unit as shown. The tape should be flush with the end of the unit.

( ) In a like manner, place the other 4-3/8" length of foam tape across the other end of the reverberation unit.

( ) Cut one of the remaining lengths of foam tape to 15-3/4". Remove the backing paper from one side only and press the tape in place along one of the flanges of the reverberation unit.

( ) In a like manner, prepare and install the other length of foam tape on the other flange of the reverberation unit.

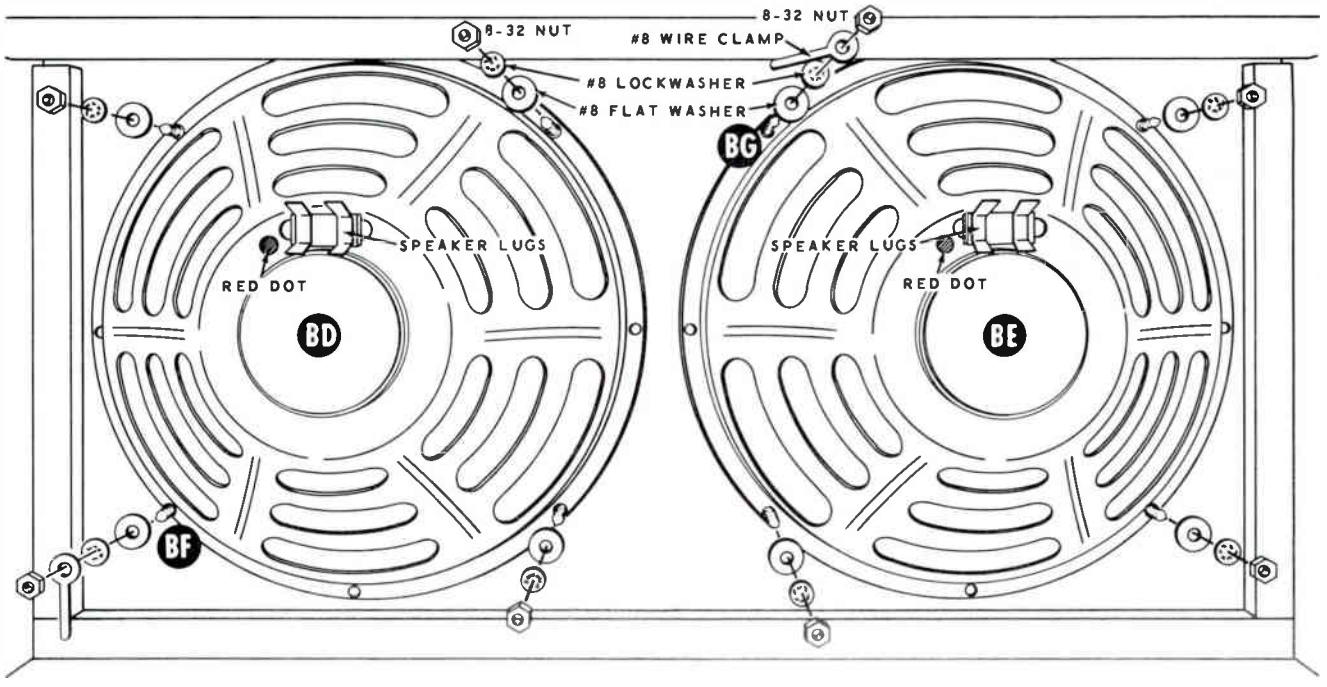
( ) Carefully peel away the backing paper from the other side of all four lengths of the foam tape.

( ) Wipe the surfaces of the reverberation mounting plate clean.

( ) Position the reverberation mounting plate on the reverberation unit so the ends of the mounting plate are flush with the ends of the reverberation unit. Carefully center the mounting plate so its side edges are equally distant from the sides of the reverberation unit. Press the mounting plate firmly in place on the foam tape.

Refer to Pictorial 13 for the following steps.

( ) Mount the reverberation unit in the bottom of the cabinet using the dimensions given. Secure the reverberation mounting plate to the bottom of the cabinet with four #6 x 5/8" sheet metal screws. Use an ice pick or nail to punch shallow starting holes for the screws.



Detail 14A

Refer to Detail 14A for the following steps.

NOTE: When you handle the speakers in the following steps, be very careful not to puncture the paper cones. Be especially careful of the speaker mounting lugs. Also, keep your wrist watch away from the speaker magnets to avoid magnetizing the watch movement.

( ) Unpack the two 12" speakers.

( ) Mount a speaker in the cabinet at BD with a #8 wire clamp on one mounting screw at BF. Use four #8 flat washers, four #8 lockwashers, and four 8-32 nuts. Position the speaker lugs as shown.

( ) Mount the remaining speaker at BE with a #8 wire clamp at BG on one mounting screw. Use four #8 flat washers, four #8 lockwashers, and four 8-32 nuts. Position the lugs as shown.

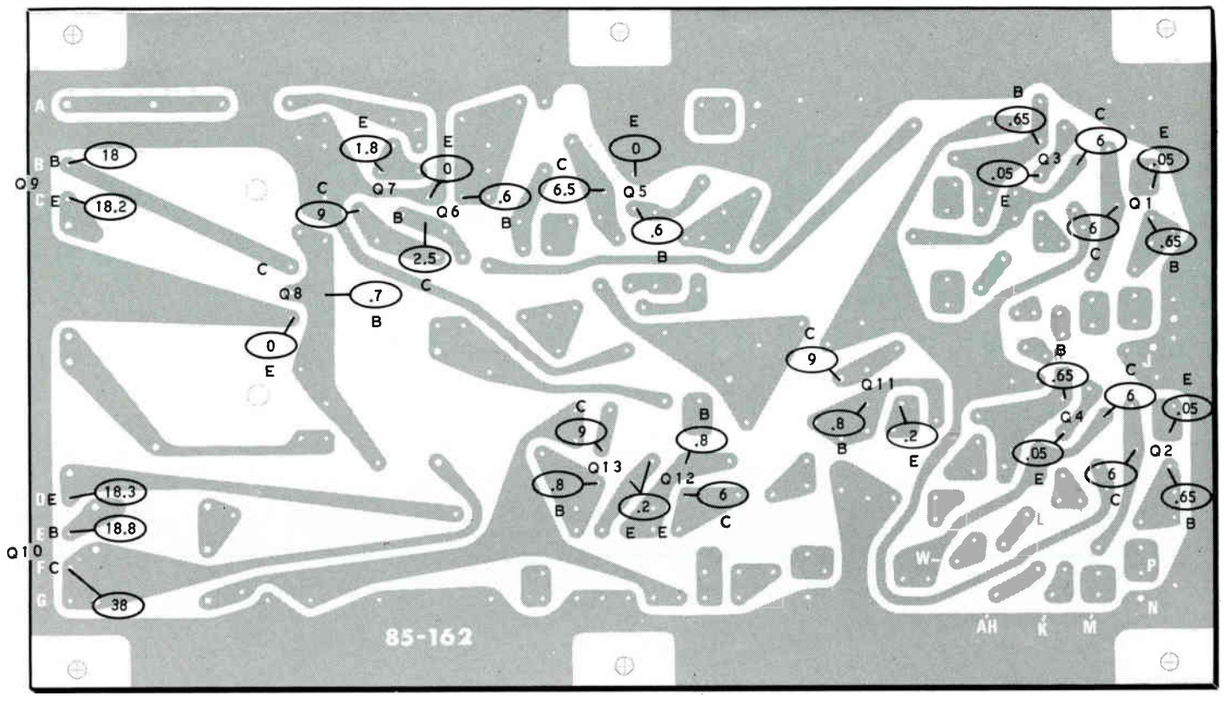
Refer to Pictorial 14 for the following steps.

( ) Prepare and connect a 19" large red wire from the color dot lug of speaker BD (S-1) to the color dot lug of speaker BE (S-1).

( ) Prepare a 19" large black wire and then wrap it about four turns around the large red wire just connected between the two speakers.

( ) Connect this wire from the unmarked lug of speaker BE (S-1) to the unmarked lug of speaker BD (S-1).

This completes the assembly of your Guitar Amplifier kit. The amplifier chassis assembly will be installed in the cabinet later. Proceed to the Initial Test section.



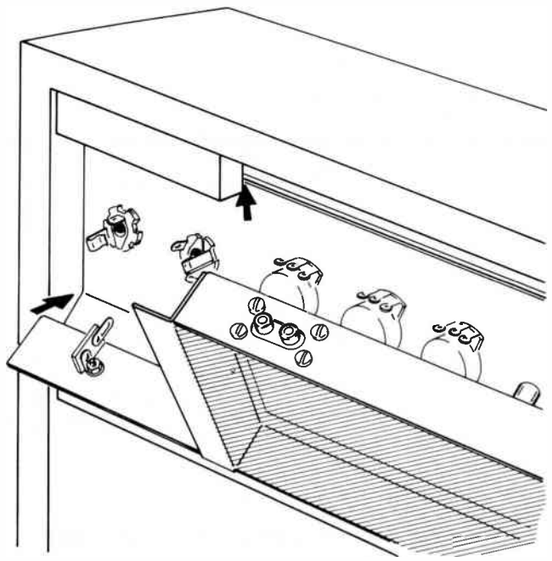
VOLTAGE CHART

FINAL ASSEMBLY

Refer to Pictorial 15 for the following steps.

( ) Remove the four screws from the back of the cabinet, and set the rear panel and screws aside temporarily.

( ) Tip the amplifier chassis up and slide it into place on the shelf from the rear of the cabinet, as shown in Detail 15A.



Detail 15A

( ) Center the control panel between the inside surfaces of the sides of the cabinet. Secure the amplifier assembly to the shelf with four 8-32 x 1" screws.

( ) Twist together the red and black speaker wires extending from the rear of the Amplifier assembly as shown. Slide the push-on connectors onto the speaker lugs. The red wire should be connected to the speaker lug with the red dot.

( ) Locate the two shielded cables that have phono plugs on each end.

NOTE: In the next two steps, considerable pressure will be needed to push the plugs into the sockets. This is normal due to the newness of the plugs.

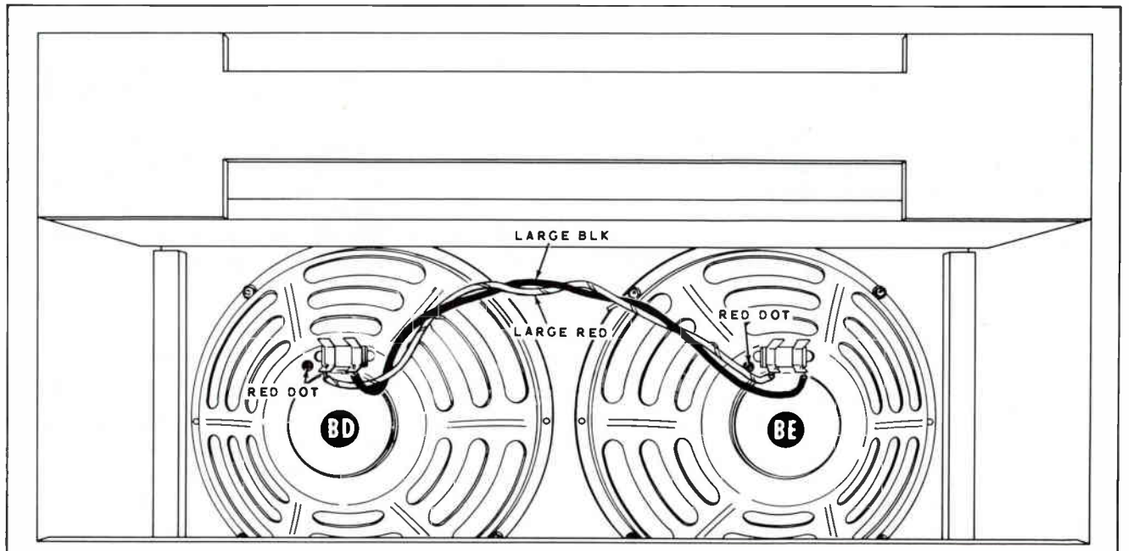
( ) Plug one of these shielded cables from the input socket on the reverberation unit to the input socket of the Amplifier. Position this cable through the slot at the front of the shelf.

( ) Plug one end of the other shielded cable into the output socket of the reverberation unit. Wrap it four loose turns around the other shielded cable. Then position it in the notch at the rear of the shelf, and plug it into the output socket of the Amplifier.

( ) Position the speaker wires and the reverberation shielded cables in their respective wire clamps as shown. Bend the clamps around the wires and cables to hold them in place.

( ) Replace the back panel of the cabinet. Secure it with the four screws removed previously. Be sure the output cable from the reverberation unit is in the corner notch.

This completes the final assembly of the Guitar Amplifier.



PICTORIAL 14

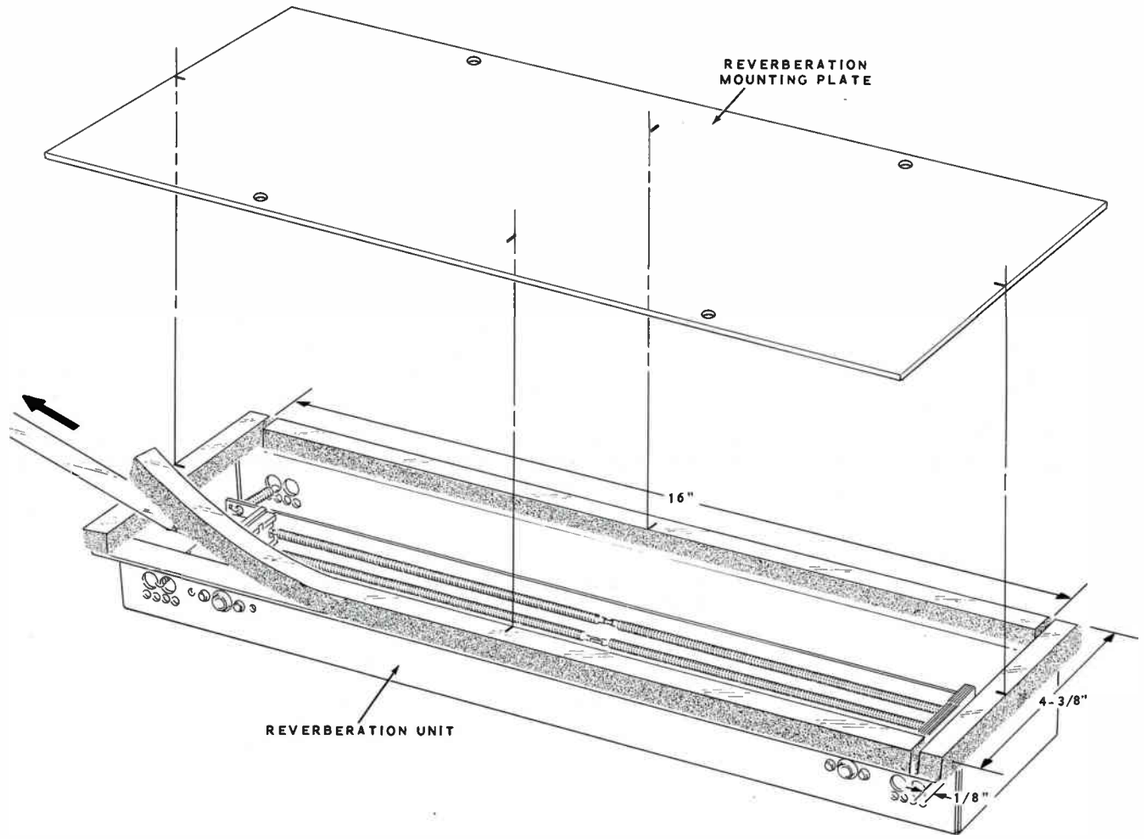
INITIAL TEST

Visually inspect the Guitar Amplifier wiring. In particular, make sure all connections are soldered and that bare wires and component leads are touching only the points they connect to.

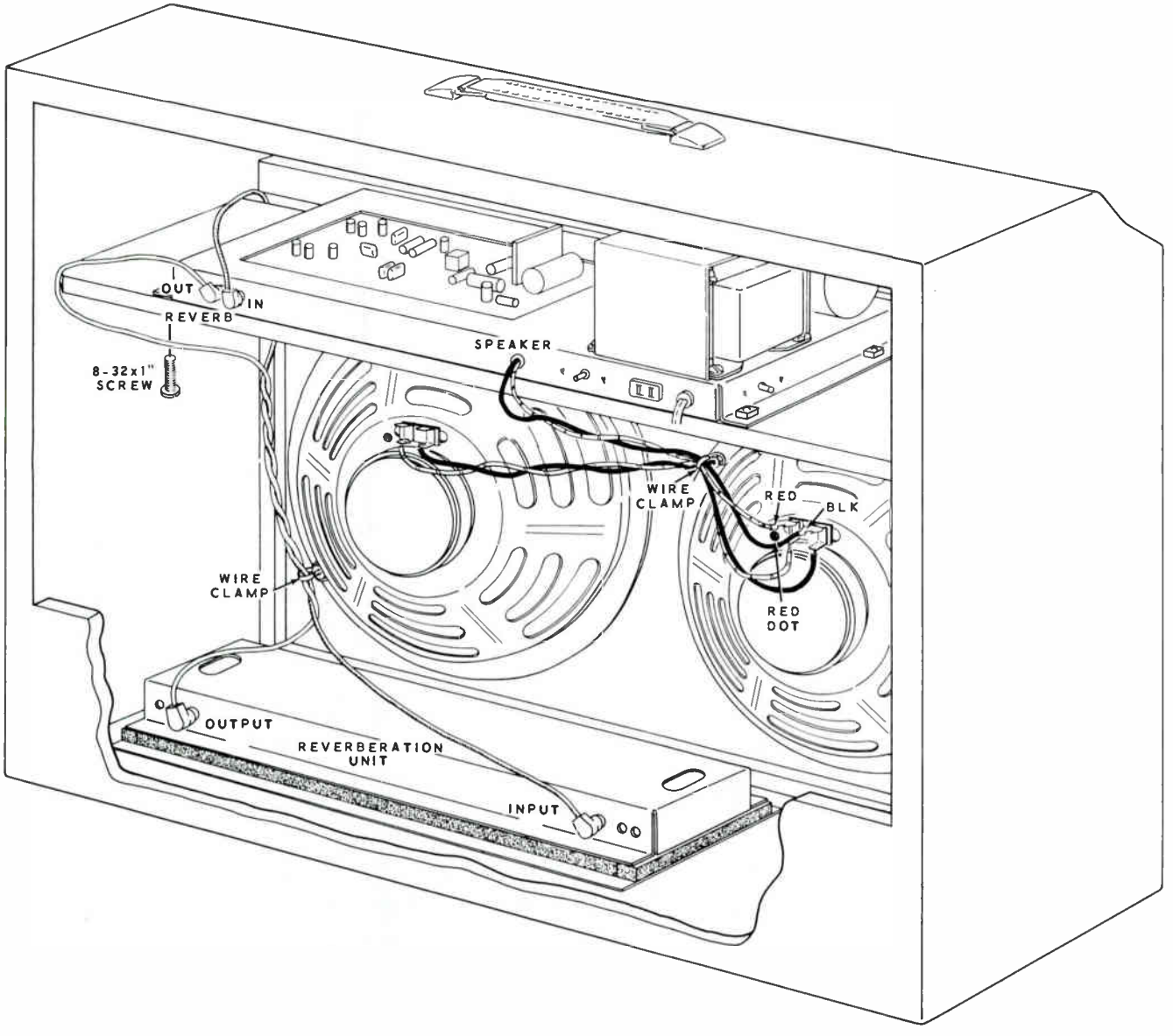
Check the circuit board to make sure there are no solder bridges between adjacent foils. If you find a solder bridge, refer to the Kit Builders Guide for information on correcting it.

If an ohmmeter is available, we suggest that you make the following resistance check to make sure that the power supply circuit is wired correctly. If the ohmmeter reading is any lower than 1200 ohms, there is a problem in the wiring that must be corrected before you operate the Guitar Amplifier. NOTE: The internal wiring of some ohmmeters is such that it will be necessary to reverse the test leads to get the proper resistance reading. Try the test leads in both directions and use the higher reading.

( ) Set the ohmmeter range switch at RX100, connect the common test lead to the chassis, and connect the positive test lead to TP-G (see the X-Ray View, fold-out from Page 38). Wait until the meter indication stops increasing, and then read the resistance. Reverse the test leads and repeat the measurement. If the highest reading you obtained was more than 1200 ohms, proceed to Final Assembly; if your highest reading was less than 1200 ohms, use the information in the In Case Of Difficulty section to locate and correct the difficulty before you proceed to Final Assembly.



Detail 13A



PICTORIAL 15

OPERATION

Refer to Figure 1 for a description of the various control functions.

CAUTION The loudspeakers used in this Guitar Amplifier have been selected to handle adequately all the power that the amplifier circuit can produce. However, prolonged usage under conditions of maximum power, full bass boost, and overload distortion, may result in torn or ruptured cones.

OPERATING PROCEDURE

1. Turn all the controls to their "0" position and turn the LINE REVERSE switch to OFF.

2. Plug the line cord of the Amplifier into an AC outlet.

3. Plug the instrument into the desired input of the Amplifier.

4. Place the LINE REVERSE switch in the ON position that gives the least amount of hum.

5. Now increase the VOLUME control (of the channel being used) in small amounts while alternately playing the instrument, until the desired volume level is obtained.

6. Next, set the BASS and TREBLE controls of this channel to obtain the tone desired.

7. If the Reverb channel is being used, you should set the REVERB, TREMOLO RATE and DEPTH controls as desired. NOTE: The delayed reverb and tremolo circuits are always in operation unless the foot switch is plugged into the Amplifier and the switches turned off, or the REVERB and TREMOLO controls are set at zero.

ACOUSTIC FEEDBACK

Acoustic feedback occurs when vibrations (sound waves) from the speakers are picked up by the Guitar or microphone, or by the delay springs in the reverberation unit. These vibrations are converted into electrical signals and reamplified; the result is a loud, continuous squeal or hum.

Acoustic feedback is more likely to occur when using the Guitar Amplifier in rooms that are small, with a low ceiling, and hard walls. Another condition that causes acoustic feedback is placing the guitar or microphone directly in front of or behind the speakers in the Guitar Amplifier.

Usually, acoustic feedback can be corrected by using lower Volume and/or Reverb settings. At high Reverb settings you may also encounter mechanical feedback directly from the speakers, through the cabinet, to the springs in the reverberation unit. If this occurs, use a lower setting of the Reverb control.

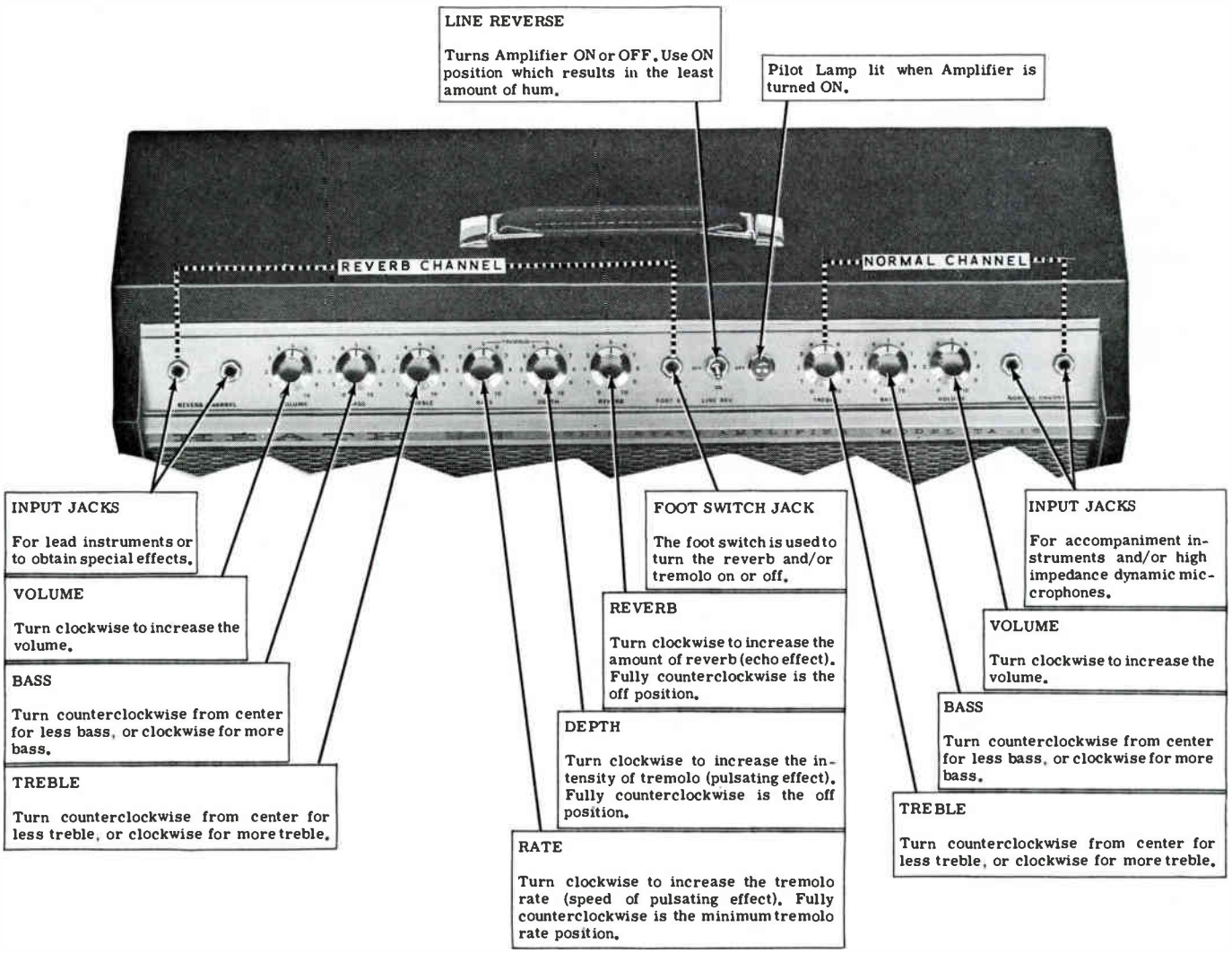
There are two possible hookups that can be used when two Heathkit Guitar Amplifiers are available. See Page 41. One hookup will produce greater output power, and the other is for special reverberation effects.

IN CASE OF DIFFICULTY

NOTE: Refer to the Kit Builders Guide for Service and Warranty information. Refer to the X-Ray View and the Chassis Photographs (fold-out from Page 38) for the physical location of parts.

This section of the Manual is divided into the following six sections: General Checks, Testing Precautions, The Circuit Breakers, Troubleshooting Chart, Point-To-Point Hum Test, and Signal Tracing. The General Checks describe what you could do about the type of difficulty that may occur right after the amplifier is assembled. The next section describes some precautions to observe when making tests, and the Circuit Breaker section tell you what to do if a circuit breaker opens.

The Troubleshooting Chart lists some actual difficulties that could occur, and tells what could cause these difficulties. The Point-To-Point Hum


LINE REVERSE
Turns Amplifier ON or OFF. Use ON position which results in the least amount of hum.
Pilot Lamp lit when Amplifier is turned ON.
REVERB CHANNEL
NORMAL CHANNEL
INPUT JACKS
For lead instruments or to obtain special effects.
VOLUME
Turn clockwise to increase the volume.
BASS
Turn counterclockwise from center for less bass, or clockwise for more bass.
TREBLE
Turn counterclockwise from center for less treble, or clockwise for more treble.
FOOT SWITCH JACK
The foot switch is used to turn the reverb and/or tremolo on or off.
REVERB
Turn clockwise to increase the amount of reverb (echo effect). Fully counterclockwise is the off position.
DEPTH
Turn clockwise to increase the intensity of tremolo (pulsating effect). Fully counterclockwise is the off position.
RATE
Turn clockwise to increase the tremolo rate (speed of pulsating effect). Fully counterclockwise is the minimum tremolo rate position.
INPUT JACKS
For accompaniment instruments and/or high impedance dynamic microphones.
VOLUME
Turn clockwise to increase the volume.
BASS
Turn counterclockwise from center for less bass, or clockwise for more bass.
TREBLE
Turn counterclockwise from center for less treble, or clockwise for more treble.

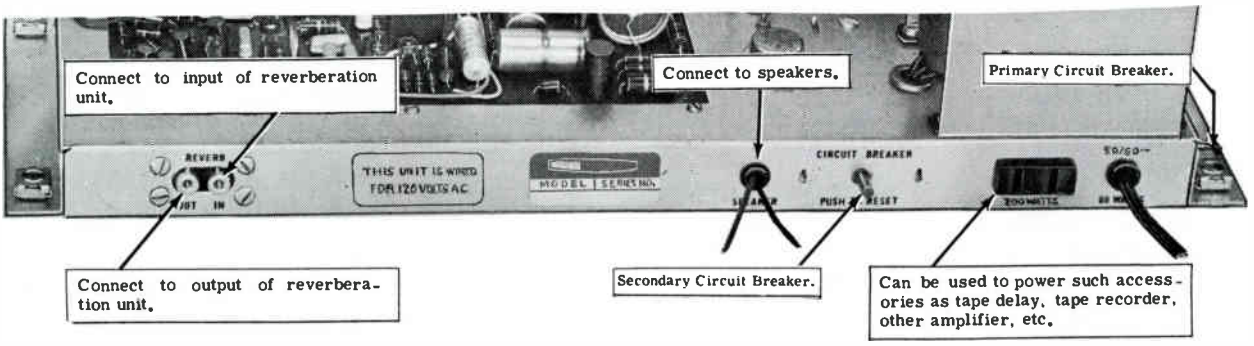

Connect to input of reverberation unit.
Connect to speakers.
Primary Circuit Breaker.
REVERB
OUT IN
THIS UNIT IS WIRED FOR 120 VOLTS AC
MODEL
SERIES NO.
CIRCUIT BREAKER
PUSH TO RESET
200 WATTS
50/60~
Connect to output of reverberation unit.
Secondary Circuit Breaker.
Can be used to power such accessories as tape delay, tape recorder, other amplifier, etc.

Figure 1

Tests and the Signal Tracing sections tell how to search through the amplifier to find a difficulty. The Hum Tests use a method that does not require electronic test equipment. The Signal Tracing section requires the use of a signal tracer or an oscilloscope.

Before you try to locate the cause of a difficulty, be sure you are operating the controls correctly. See the Operation section on Page 30.

CAUTION: The power transformer, AC socket, primary circuit breaker, and the On-Off-On switch all have AC line voltage applied to them. Use caution when testing to avoid electrical shock.

GENERAL CHECKS

The following general checks should be made if the amplifier does not operate properly after the kit is assembled.

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorials as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the builder.

2. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Soldering section of the Kit Builders Guide.

3. Check to be sure that all transistors are in their proper locations. Make sure the pilot lamp lights up.

4. Check the values of the parts. Be sure that the proper part has been wired into the circuit, as shown in the Pictorial diagrams and called out in the wiring instructions. It is sometimes easy to misread the third color band on a resistor. For example, if a 3300 Ω (orange-orange-red) resistor were installed instead of a 33 KΩ (orange-orange-orange) resistor, the circuit would not operate properly.

5. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring and for solder that may be bridged across the circuit board foils.

6. If, after visual checks, the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Voltage Chart (fold-out from Page 28) and the Schematic Diagram (fold-out from Page 41). NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages may vary as much as ±20%.

7. A review of the Circuit Description will prove helpful in indicating where to look for trouble.

TESTING PRECAUTIONS

When testing the amplifier, make certain the speaker leads are not short circuited, as this could damage the output transistors or other circuit components in the amplifier. When making voltage measurements, be careful that you do not short across adjacent foils on the circuit board, or between two terminals, or from a terminal to ground. For instance, if the voltmeter test probe should slip and short out a bias or supply point in the power output stage, it is almost certain to damage one or more transistors or diodes.

Never remove or install transistors while the amplifier is turned on or you may damage some of the other transistors. Although transistors have almost unlimited life when they are used properly, they are much more vulnerable to damage than vacuum tubes. A vacuum tube, for instance, may be operated under shorted, zero-bias, excessive voltage, or high-current conditions for at least short periods of time without materially damaging the tube; but any one of these same conditions can completely destroy a transistor instantaneously.

THE CIRCUIT BREAKERS

The circuit of your Guitar Amplifier is protected by two circuit breakers, one in the primary winding and the other in the secondary winding of the power transformer. If your amplifier should ever go completely dead and the pilot lamp goes out, there may be a short circuit somewhere that has caused a circuit breaker to open up. Use the following procedure if you suspect that one of the circuit breakers has opened.

1. Push in on the red button of the secondary circuit breaker and release it (the secondary circuit breaker is on the rear of the chassis). If the amplifier comes back on and remains in operation, the overload was only of a temporary nature and you need not look any further.

2. If the amplifier comes back on and then goes off again, there is a short circuit somewhere that must be located before the unit will operate. Look for signs of overheated parts, bare wires touching each other or the chassis, or items 1, 3, 4, and 5 of the General Checks. After the trouble is corrected, press in on the red button of the secondary circuit breaker and the amplifier should remain in operation.

3. If the amplifier does not go back on when the secondary circuit breaker is pressed in, press the red button on the primary circuit breaker (the primary circuit breaker is located on the side of the chassis). If the amplifier comes back on and goes off again, there is a short circuit or a wrong connection at power transformer T1. After the short circuit is repaired, this red button can be pressed again and the amplifier should remain in operation.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the Service and Warranty sections of the "Kit Builders Guide" and to the "Factory Repair Service" information on Page 40 of this Manual.

Troubleshooting Chart

DIFFICULTY	POSSIBLE CAUSE
No sound. Pilot lamp does not light.	1. Circuit Breaker tripped. See the Circuit Breakers. 2. On-Off-On switch incorrectly wired. 3. Defective or incorrectly installed diode D102, D103, D104, or D105. 4. Defective line cord. 5. Defective power transformer.
Circuit breakers keep tripping.	1. Defective or incorrectly installed diode D102, D103, D104, or D105. 2. Shorted capacitor C104 or C35. 3. Transformer wires improperly connected. 4. Faulty transistor Q8, Q9, or Q10. 5. Speaker wires shorted.
No sound. Pilot lamp lights up.	1. Defective or incorrectly installed diode D102, D103, D104, or D105. 2. Faulty resistor R68, R69, or R70. 3. Speakers wired incorrectly. 4. Defective input cable between musical instrument and amplifier. 5. Transistor installed incorrectly. 6. Faulty component or wiring error in stages Q6, Q7, Q8, Q9, or Q10. Make point-to-point hum test. See Page 35.
Normal channel dead, Reverb channel OK.	1. Defective component or wiring error in stages Q1 or Q3. Make point-to-point hum test. See Page 35.
Reverb channel dead, Normal channel OK.	1. Defective component or wiring error in stages Q2 or Q4. Make point-to-point hum test. See Page 35.

DIFFICULTY	POSSIBLE CAUSE
No tremolo with foot switch not plugged in.	1. Resistor R67 open. 2. Faulty zener diode D1. 3. Defective component or wiring error in stages Q12 or Q13. 4. Defective LDR. 5. Incorrect wiring of foot switch jack.
No reverb with foot switch not plugged in.	1. Defective reverb cable. 2. Incorrect wiring of foot switch jack. 3. Defective component or wiring error in stages Q11 or Q5. Make point-to-point hum test. See Page 35. 4. Defective reverb unit. NOTE: If stage Q5 was OK in the point-to-point hum test, the reverb unit can be checked by tapping on its metal chassis with the Reverb Volume control rotated fully clockwise. This should result in a loud banging noise from the speaker. 5. Cardboard still in reverb unit.
Distorted sound.	1. Controls set too high. 2. Incorrect bias on transistors. Check collector voltages. 3. Shorted coupling capacitor. 4. Defective speaker.
Excessive hum with musical instrument connected.	1. Place On-Off-On switch in the other ON position. 2. Check for faulty ground connections. 3. If excessive hum stops (some hum will be normal) when musical instrument is disconnected, check instrument wiring, connecting cable, and pickup heads. 4. Move the instrument further away from the Amplifier, or change the angle between it and the Amplifier.
High hum with no musical instrument connected.	1. Place On-Off-On switch in the other ON position. 2. Check for wiring errors or faulty ground connections. 3. Faulty filter capacitors; C34 through C37, or C104. 4. Connecting cable between reverb unit and amplifier open or shorted. 5. Shield lead to lug 4 of double phono socket E is touching the chassis or a mounting nut. 6. The outside of the connector on one of the reverb unit cables is touching the rear of the chassis. 7. Reverse line plug in AC outlet.
One or both foot switches inoperative.	1. Wiring error in the foot switch or plug, or in amplifier foot switch jack. 2. Faulty cable on foot switch. 3. Defective switch.
Very little bass with distorted output.	1. Speakers connected out-of-phase with each other.
Amplifier howls continuously with reverberation turned on.	1. Reverb control set too high.

POINT-TO-POINT HUM TEST

The following tests are performed by introducing hum signals into the amplifier circuit. These (hum) signals are induced into the circuit with the blade of a small screwdriver which is held between your fingers; the tip of the blade is then touched to the base leads of the transistors in a carefully planned sequence.

Hum should be heard from the speakers when you touch the base lead of each properly operating transistor. The hum level should increase as you progress toward the input of the Amplifier. If no hum is heard, it indicates that there is a faulty or improperly installed component in this area; either the transistor being touched, or one of the parts in its circuit, or a component or bad solder connection between this transistor and the last transistor checked. Reheat all solder connections in the suspected area.

If a voltmeter is available, it may help to check the voltages at the transistors in question. Refer to the Voltage Chart (fold-out from Page 28) And Schematic (fold-out from Page 41) for the proper voltages.

Refer to Figure 2 (fold-out from Page 37) when making the following checks.

( ) Remove the amplifier from the cabinet.

( ) Be sure the speaker leads from the amplifier are connected to the terminals on the speaker. Also be sure the shielded cables from the reverb unit are connected to the amplifier. Do not connect the foot switch.

( ) Turn all controls fully counterclockwise.

( ) Plug the amplifier line cord into an AC outlet, and place the On-Off-On switch in one of its ON positions. Use the ON position that gives the loudest hum in the speakers.

NOTE: The circled numbers preceding the following paragraphs correspond to the circled test point numbers in Figures 2A and 2B (fold-out from Page 37). The test procedure in paragraph ① should be performed at test point ① in Figure 2, etc. All the following tests should be made on the top side of the chassis.

CAUTION: There is line voltage present on the rear of the LINE REVERSE switch. Therefore, it is suggested the following tests be made carefully. Never touch the Amplifier or reverb chassis with one hand while making tests using the other hand. It is a good habit to keep your "free hand" in your pocket or behind you when making tests, thus avoiding the possibility of getting a shock.

Power Amplifier Section

(1.) Touch the tip of the screwdriver to test point 1 (the base of transistor Q7). A faint hum or buzzing noise should be heard from the speakers. If no hum is heard, the difficulty is between stage Q6 and the speakers. Check transistors Q7, Q8, Q9, and Q10 for poor solder connections, wiring errors, or overheated parts.

(2.) Touch test point 2 (the base of transistor Q6); a louder hum than before should be heard.

Normal Channel Preamplifier Section

(3.) Touch test point 3 (the base of transistor Q3); again the hum level should increase.

(4.) Touch test point 4 (the base of transistor Q1) and turn up the Normal Channel Volume control; the hum should increase to an extremely high level as the Normal Channel Volume control is rotated clockwise.

Reverb Channel Preamplifier Section

Refer to Figure 2B for the following tests.

(5.) Touch test point 5 (the base of transistor Q4); the hum level should be about the same as that obtained from transistor Q3.

(6.) Touch test point 6 (the base of transistor Q2) and turn up the Reverb Channel Volume control; the hum should increase to an extremely high level as the Reverb Channel Volume control is rotated clockwise.

Reverb Section

(7.) Touch test point 7 (the base of transistor Q5); an extremely loud hum should be heard from the speakers.

(8.) Turn the Reverb control fully clockwise and tap the metal chassis of the reverb unit; a loud banging sound should be heard from the speakers.

(9.) Return the Reverb control to its fully counterclockwise position. Touch test point 9 (the base of transistor Q11); the hum should increase as the Reverb control is rotated clockwise.

This completes the Point-to-Point Hum check.

SIGNAL TRACING

A signal tracing procedure can also be used to locate a point of signal loss. First apply a suitable audio signal to the input; then, using either a signal tracer or an oscilloscope, check along the signal path to determine at which point the signal is missing. After obtaining this information, carefully check the associated wiring and parts in this area. Figure 2 shows the signal path for each channel.

SPECIFICATIONS

Peak Power Output	60 watts.
Music Power Output	25 watts*.
Continuous Power Output	20 watts*.
Damping Factor	50 or better.
Hum And Noise (inputs open)	Normal Channel: -55 db below 25 watts. Reverb Channel: -60 db below 25 watts.
Input Sensitivity (25 watts output)	Normal Channel: 25 millivolts. Reverb Channel: 35 millivolts.
Input Impedance	Normal Channel: 25 K ohms (each input). Reverb Channel: 25 K ohms (each input).
Reverb Level	Variable.
Reverb Delay	Long Spring: .037 seconds (nominal). Short Spring: .029 seconds (nominal).
Tremolo Speed	Variable from 4 to 14 hertz.
Tremolo Depth	Variable from 0 to approximately 75% amplitude modulation.
Speakers	Two; 12" special design with ceramic magnet.

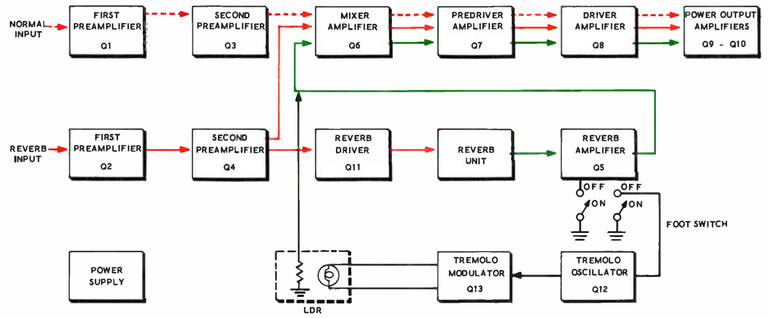
*Rated EIA (Electronics Industries Association) standards.

Transistor Complement	3 - 2N3391; first normal preamplifier, first reverb preamplifier, reverb amplifier. 3 - 2N3393; second normal preamplifier, second reverb preamplifier, and mixer amplifier. 1 - 2N3566; reverb driver. 1 - 2N3692; tremolo oscillator. 1 - S2090; tremolo modulator. 1 - 2N3416; predriver. 1 - 2N3053; driver. 1 - 2N2148; output amplifier. 1 - TA2577A; output amplifier.
Diode Complement	1 - 1N3754; reference diode. 4 - Bridge rectifiers. 1 - 13 volt zener diode.
Circuit Breakers	One primary and one secondary; each 2.11 amperes.
AC Power Socket	120 VAC, 200 watts.
Inputs	Normal Channel: 2 inputs. Reverb Channel: 2 inputs.

CONTROLS

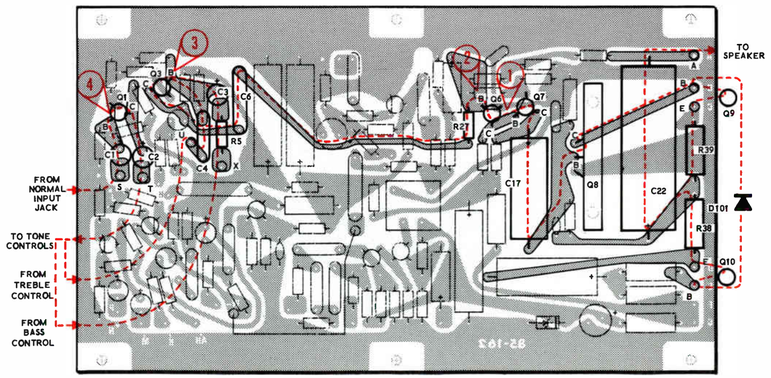
Normal Channel	Volume. Bass. Treble.
Reverb Channel	Volume. Bass. Treble. Tremolo Rate. Tremolo Depth. Reverb Level.
Line Reverse	On-Off-On switch.
Power Requirements	105-125 volts or 210-250 volts, 50-60 hertz, 15 watts idling and 60 watts at full output.
Cabinet	3/4" wood with black Lavant covering. 28" wide x 9" deep x 19-3/4" high (including carrying handle).
Net Weight	41 pounds.
Accessory (Included With Amplifier)	Foot switch: Reverb On-Off; Tremolo On-Off.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.



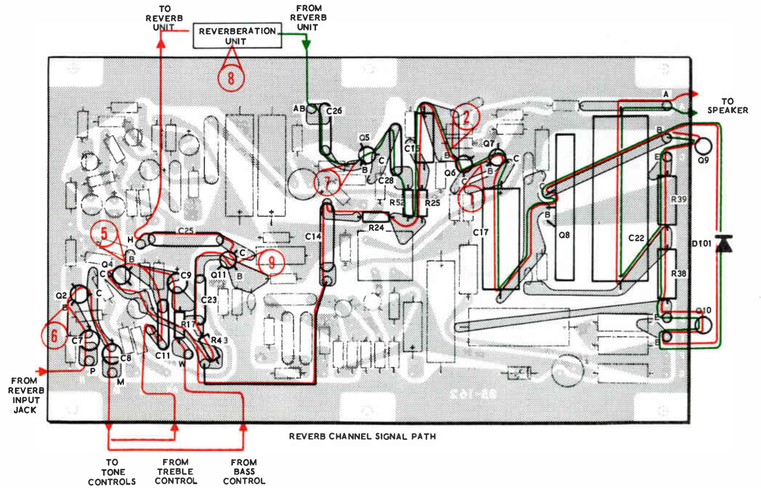
BLOCK DIAGRAM

NORMAL CHANNEL SIGNAL
REVERB CHANNEL (NONDELAYED) SIGNAL
REVERB CHANNEL DELAYED SIGNAL
TREMOLO MODULATION



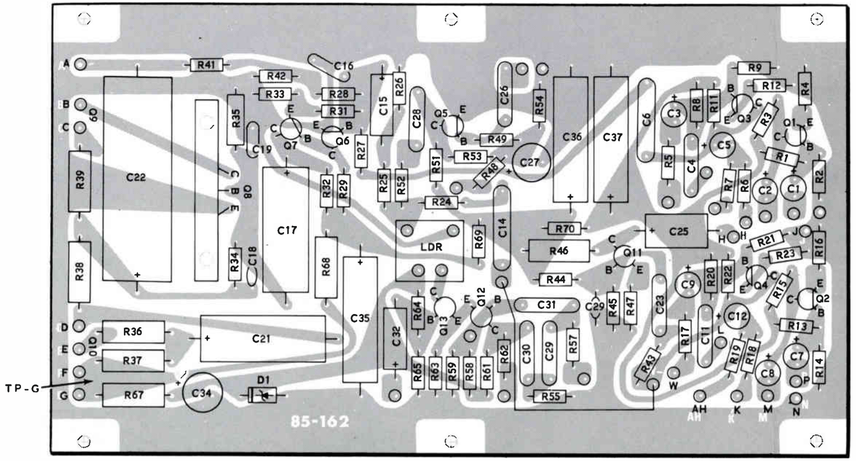
NORMAL CHANNEL SIGNAL PATH

FIGURE 2A



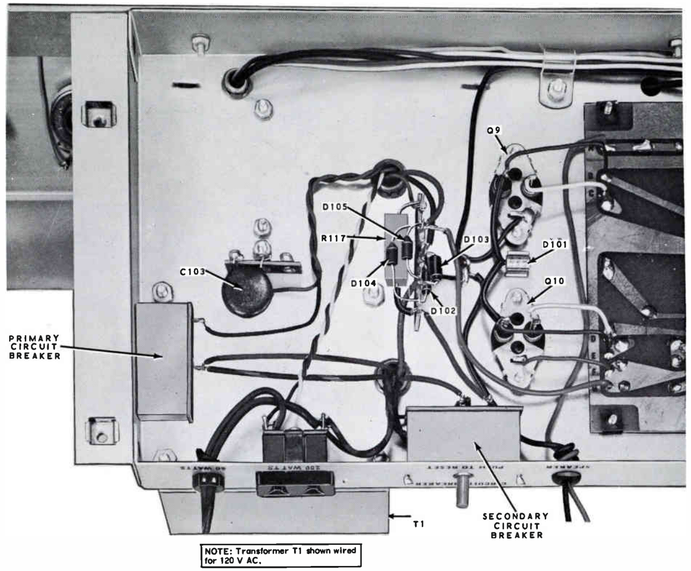
REVERB CHANNEL SIGNAL PATH

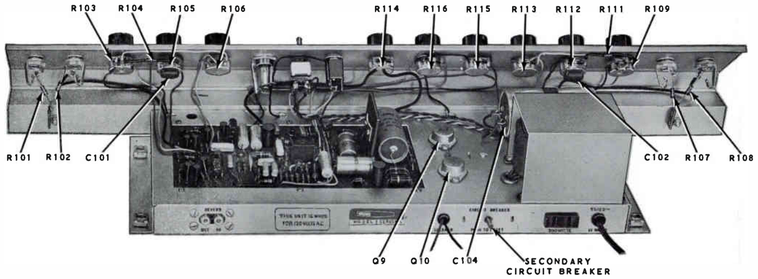
FIGURE 2B



CIRCUIT BOARD X-RAY VIEW

(VIEWED FROM FOIL SIDE)





CHASSIS PHOTOGRAPHS

CIRCUIT DESCRIPTION

The Guitar Amplifier circuit consists of two preamplifier channels, a power amplifier, and a power supply. Each preamplifier channel has two inputs plus Volume, Bass, and Treble controls. The normal preamplifier channel is generally used for the accompaniment guitar, or some other instrument, and a microphone; the reverb channel, which features variable reverb and tremolo, is generally used for the lead guitars.

Each section of the Guitar Amplifier circuit will be described separately. As you read the description, refer to the Block Diagram (fold-out from Page 37) for signal flow, and refer to the Schematic (fold-out from Page 41) for circuit details.

NORMAL CHANNEL PREAMPLIFIER

Signals from the Normal input jacks are coupled through isolation resistors R101 and R102. These signals are mixed at the junction of R101 and R102; the resulting signal is coupled through capacitor C1 to the base of first preamplifier transistor Q1, a special low-noise transistor. The amplified signal from the collector of Q1 is coupled through capacitor C2 to the Volume control. From the arm of the Volume control, the signal is coupled through resistor R104, the Bass control, and capacitor C3, and through the Treble control and capacitor C4 to the base of second preamplifier transistor Q3.

The signal is amplified and inverted in Q3, therefore, the signal at the collector is out of phase with the signal that was applied to the base. This out-of-phase signal is applied back to the Bass control through capacitor C5 and resistor R6, and back to the Treble control through resistor R7.

With the input signal at one end of the Bass control and an out-of-phase signal at the other end, there will be a point near the center of the control where bass response will be essentially the same as that of the input signal. As the arm of the control is moved counterclockwise, more of the out-of-phase signal is applied to the base of Q3 and a cut in bass response results; as the arm of the control is moved clockwise, more of the input signal is applied to the base of Q3 and a boost in bass response results.

Capacitor C101, across the Bass control, bypasses higher frequencies, limiting the effect of the control to the lower frequencies. Capacitor C3, between the arm of the control and the base of Q3, has a high value to pass the low frequencies with very little attenuation.

The Treble control works the same way as the Bass control. The main difference between the bass and treble circuits is that the treble coupling capacitor, C4, has a low value to block low frequencies while passing high frequencies with very little attenuation.

The tone compensated signals present at the collector of Q3 are coupled through capacitor C6 and resistor R27 to the base of mixer amplifier transistor Q6.

REVERB CHANNEL PREAMPLIFIER

The circuits of transistors Q2 and Q4 and the reverb channel tone control network are identical to the circuits in the normal channel, and operate in the same way. The output signal from the collector of second preamplifier transistor Q4 follows two paths: One path is through capacitor C14, resistors R24 and R25, and capacitor C15 to the base of mixer transistor Q6; the other path is through resistor R43 and capacitor C23 to reverb driver transistor Q11.

THE REVERB DELAY CIRCUITS

This reverb channel signal is amplified by transistor Q11 and then is coupled through capacitor C25 to the reverberation unit, which consists of two transducers and two delay springs. The input transducer changes the electrical signal into physical motion, which is delayed slightly as it travels down the springs to the output transducer. The output transducer changes the physical motion back into an electrical signal, which is coupled to the Reverb control. The signal at this point is essentially the same as the input signal, except that it is delayed slightly.

The setting of the Reverb control determines how much of this delayed signal is coupled through capacitor C26 to the base of reverb amplifier transistor Q5. After the delayed signal is amplified by transistor Q5, it is coupled through capacitor C28, resistors R52 and R25, and capacitor C15 to the base of mixer transistor Q6.

The base of reverb amplifier transistor Q5 is connected through resistors R49 and R48, to a foot switch. When the foot switch is On or unplugged, transistor Q5 amplifies normally. When the foot switch is Off, the base bias of transistor Q5 is shorted to ground, cutting off the transistor and, thus, stopping the signal.

TREMOLO CIRCUIT

Both of the signals from the reverb channel (one delayed and the other not delayed) are applied across the resistance element of the LDR (Light Dependant Resistor). The LDR is in effect the output element of the tremolo circuit, which operates as follows:

Tremolo oscillator transistor Q12 is connected in a subsonic, phase-shift oscillator circuit. This circuit develops a signal that can be varied from approximately 4 to 14 Hz by the Rate control in the phase-shift network. The amplitude of the oscillator signal from the collector of Q12 is varied by the Depth control. The signal is then coupled through capacitor C32 to the base of tremolo modulator transistor Q13. Transistors Q12 and Q13 are connected to a common emitter resistor to provide positive feedback to sustain oscillation.

The LDR unit consists of a low-current lamp and a light-dependent resistance element. The value of the resistance element depends upon the brightness of the lamp: As the lamp glows brighter, the resistance decreases; as the lamp glows dimmer, the resistance increases.

Transistor Q13 draws collector current through the lamp element in the LDR unit, causing the lamp to glow. Since transistor Q13 is amplifying the tremolo oscillator signal, the collector current will follow this signal, causing the lamp in the LDR unit to glow correspondingly brighter and dimmer.

Because the brightness of the lamp varies in accordance with rate and depth of the tremolo signal, the resistance of the LDR will also vary in the same manner, from a very low resistance (practically a short circuit) to a very high resistance (practically an open circuit). Since the LDR is connected between the reverb channel signal path and ground, its resistance variations will modulate the reverb channel signal with the low-frequency tremolo signal.

The tremolo circuit can be turned on and off with the foot switch, which, in the Off position, shorts the base of oscillator transistor Q12 to ground. The tremolo circuit is on when the foot switch is unplugged.

THE AMPLIFIER CIRCUITS

Both the normal channel signal and the reverb channel signal (with or without reverberation and tremolo) are present at the base of mixer amplifier transistor Q6. These signals are combined and then amplified in transistor Q6, and then further amplified by predriver transistor Q7 and driver transistor Q8.

The amplified signal from the collector of driver transistor Q8 is coupled directly to the base of output transistor Q9 and through diode D101 to the base of output transistor Q10. Diode D101 is part of the collector load for Q8 and also determines the relative base bias for the output transistors to establish the correct class of operation. It is also used to provide temperature stability. Output transistors Q9 and Q10 are connected in a complementary symmetry output circuit. In this circuit, PNP transistor Q9 and NPN transistor Q10 are connected in a class B emitter-follower configuration. A positive-going signal at the base of the output transistors will cause Q10 to conduct, charging capacitor C22 through the voice coils of the speakers. When the signal goes negative, Q10 will be cut off and Q9 will conduct, discharging capacitor C22 back through the voice coils of the speakers. The charge and discharge of capacitor C22 causes the speaker cones to move in and out and convert the electrical signal back to sound.

POWER SUPPLY

The AC input from the power line is connected through the line-reversing On-Off switch and through the primary circuit breaker to power transformer T1. In addition to turning the Guitar Amplifier on and off, the line-reversing switch permits connecting either side of the power line to the chassis through capacitor C103; this is useful in reducing stray hum pickup from the musical instrument. The circuit breakers protects the Guitar Amplifier circuitry under overload conditions.

The power transformer has two primary windings. These two windings may be connected in parallel for a 120 volt line input, or they may be connected in series for a 240 volt line input.

The secondary winding of the power transformer is connected through the secondary circuit breaker to a full-wave bridge circuit, containing diodes D102, D103, D104, and D105. Capacitors C104, C35, C36, and C37 with resistors R68, R69, and R70 filter the rectified voltage from the bridge circuit and establish the different supply voltages. Zener diode D1, with resistor R67, regulates the supply voltage for the tremolo circuit to provide stable tremolo operation. Capacitor C34 provides additional filtering for this regulated voltage.

FACTORY REPAIR SERVICE

You can return your completed kit to the Heath Company Service Department to have it repaired for a minimum service fee. (Kits that have been modified will not be accepted for repair.) If you wish, you can deliver your kit to a nearby Heath Authorized Service Center. These centers are listed in your Heathkit catalog.

To be eligible for replacement parts under the terms of the warranty, equipment returned for factory repair service, or delivered to a Heath Authorized Service Center, must be accompanied by the invoice or the sales slip, or a copy of either. If you send the original invoice or sales slip, it will be returned to you.

If it is not convenient to deliver your kit to a Heath Authorized Service Center, please ship it to the factory at Benton Harbor, Michigan and follow the following shipping instructions:

Prepare a letter in duplicate, containing the following information:

- Your name and return address.
- Date of purchase.
- A brief description of the difficulty.
- The invoice or sales slip, or a copy of either.
- Your authorization to ship the repaired unit back to you C.O.D. for the service and shipping charges, plus the cost of parts not covered by the warranty.

Attach the envelope containing one copy of this letter directly to the unit before packaging, so that we do not overlook this important information. Send the second copy of the letter by separate mail to Heath Company, Attention: Service Department, Benton Harbor, Michigan.

Check the equipment to see that all parts and screws are in place. (Do not include wooden cabinets when shipping receivers, tuners, amplifiers, or TV sets, as these are easily damaged in shipment.) Then, wrap the equipment in heavy paper. Place the equipment in a strong carton, and put at least THREE INCHES of resilient packing material (shredded paper, excelsior, etc.) on all sides, between the equipment and the carton. Seal the carton with gummed paper tape, and tie it with a strong cord. Ship it by prepaid express, United Parcel Service, or insured parcel post to:

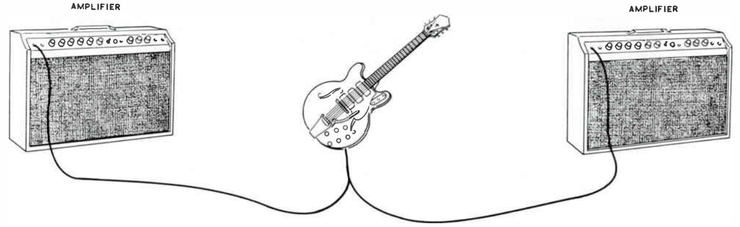
Heath Company
Service Department
Benton Harbor, Michigan 49022

SPECIAL CONNECTIONS USING TWO MODEL TA-16 AMPLIFIERS

NOTE: The following setups should only be made with two TA-16 Amplifiers (or one TA-16 Amplifier and one TA-27 Amplifier). Making these connections between one TA-16 Amplifier and an amplifier of another manufacturer may cause damage to one or both amplifiers.

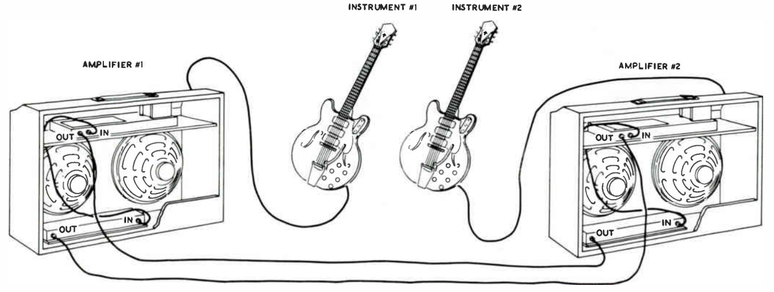
TWO AMPLIFIERS CONNECTED IN PARALLEL

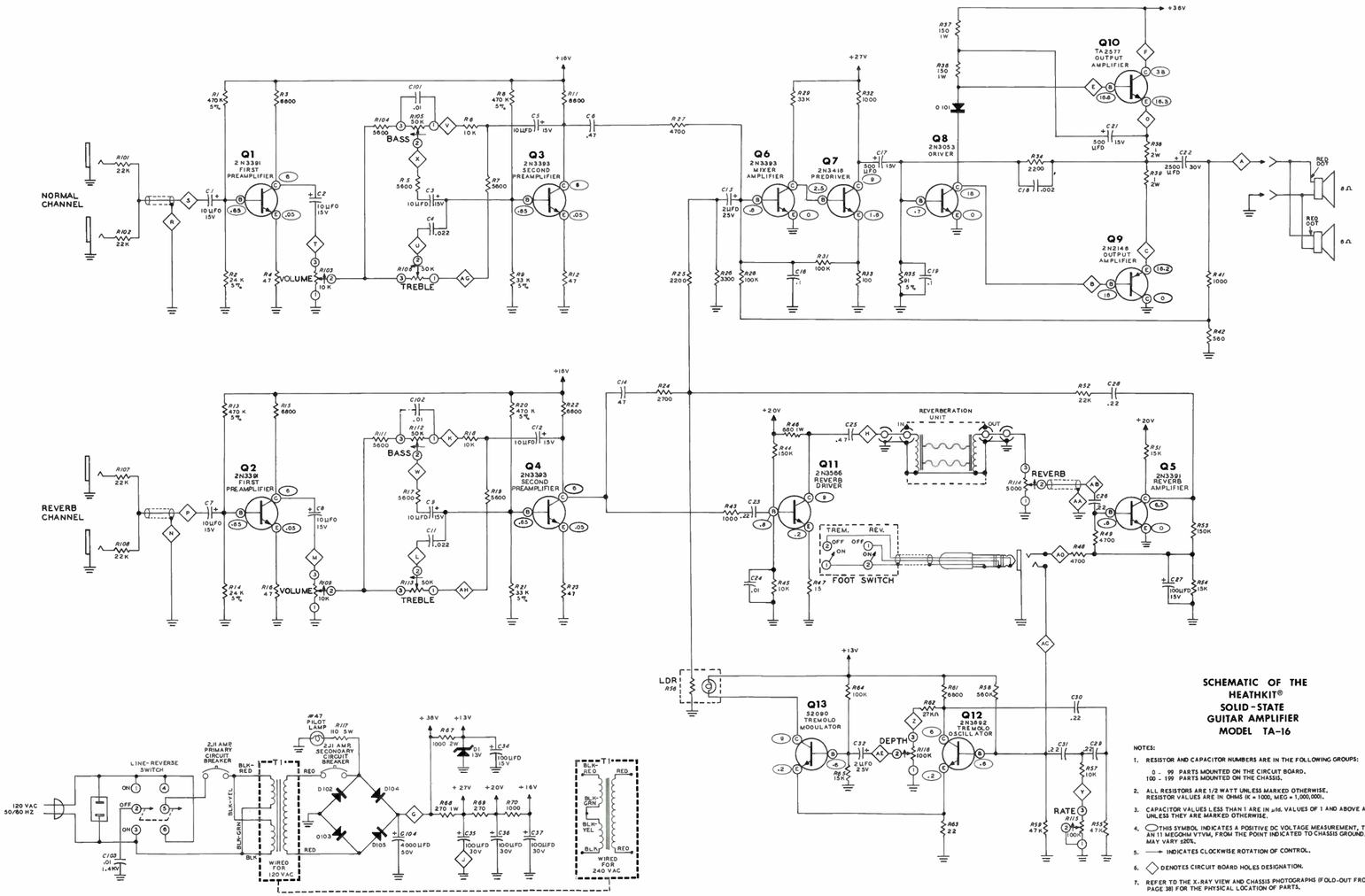
By connecting an instrument to two TA-16 Amplifiers in parallel, as shown, you will obtain an increased power output. This larger output power will give you greater coverage of extra large areas.



CROSS CONNECTION OF TWO REVERBERATION UNITS

For greater versatility of special effects from two instruments, the reverberation units of amplifiers #1 and #2 can be cross connected as shown below. Only the connections of the output cables between the amplifiers and reverberation units are changed. The reverberation input cable connections remain unchanged. When instrument #1 is played (into amplifier #1), the undelayed reverb signal will come out of the speakers of amplifier #1 and the delayed signal will come out of the speakers of amplifier #2. When instrument #2 is played (into amplifier #2), the undelayed reverb signal will come out of the speakers of amplifier #2 and the delayed reverb signal will come out of the speakers of amplifier #1.





SCHEMATIC OF THE HEATHKIT® SOLID-STATE GUITAR AMPLIFIER MODEL TA-16

NOTES:

1. RESISTOR AND CAPACITOR NUMBERS ARE IN THE FOLLOWING GROUPS:
   0 - 99 PARTS MOUNTED ON THE CIRCUIT BOARD.
   100 - 199 PARTS MOUNTED ON THE CHASSIS.
2. ALL RESISTORS ARE 1/2 WATT UNLESS MARKED OTHERWISE. RESISTOR VALUES ARE IN OHMS (K = 1000, MEG = 1,000,000).
3. CAPACITOR VALUES LESS THAN 1 ARE IN μfd. VALUES OF 1 AND ABOVE ARE IN pf, UNLESS THEY ARE MARKED OTHERWISE.
4. (+) THIS SYMBOL INDICATES A POSITIVE DC VOLTAGE MEASUREMENT, TAKEN WITH AN 11 MEGOHM VTVM, FROM THE POINT INDICATED TO CHASSIS GROUND. VOLTAGES MAY VARY ±20%.
5. → INDICATES CLOCKWISE ROTATION OF CONTROL.
6. ◇ DENOTES CIRCUIT BOARD HOLES DESIGNATION.
7. REFER TO THE X-RAY VIEW AND CHASSIS PHOTOGRAPHS (FOLD-OUT FROM PAGE 38) FOR THE PHYSICAL LOCATION OF PARTS.

REPLACEMENT PARTS PRICE LIST

To order parts, use the Parts Order Form furnished with this kit. If Parts Order Form is not available, refer to Replacement Parts in the Kit Builders Guide.

PART No.	PRICE Each	DESCRIPTION
RESISTORS		
1/2 Watt		
1-54	.10	15 Ω 5%
1-49	.10	22 Ω
1-1	.10	47 Ω
1-3	.10	100 Ω
1-42	.10	270 Ω
1-119	.10	560 Ω
1-9	.10	1000 Ω
1-57	.10	2200 Ω 5%
1-13	.10	2700 Ω
1-14	.10	3300 Ω
1-16	.10	4700 Ω
1-113	.10	5600 Ω 5%
1-19	.10	6800 Ω
1-20	.10	10 KΩ
1-133	.10	15 KΩ 5%
1-22	.10	22 KΩ
1-23	.10	27 KΩ
1-24	.10	33 KΩ
1-25	.10	47 KΩ
1-26	.10	100 KΩ
1-27	.10	150 KΩ
1-142	.10	560 KΩ
Other Resistors		
4-9	.10	91 Ω 1/2 watt low-noise 5%
4-24	.10	24 KΩ 1/2 watt low-noise 5%
4-26	.10	33 KΩ 1/2 watt low-noise 5%
4-33	.10	470 KΩ 1/2 watt low-noise 5%
1-18-1	.10	150 Ω 1 watt
1-54-1	.20	270 Ω 1 watt
1-21-1	.10	680 Ω 1 watt
3-7-2	.15	1 Ω 2 watt
1-15-2	.20	1000 Ω 2 watt
3-10-5	.15	110 Ω 5 watt
9-18	4.25	LDR (light dependent resistor)
CAPACITORS		
Disc		
21-36	.10	.002 μfd
21-16	.10	.01 μfd
21-70	.20	.01 μfd 1.4 KV
Electrolytic		
25-115	.45	10 μfd 15 V vertical
25-117	.60	100 μfd 15 V vertical
25-123	.40	2 μfd 25 V tubular
25-146	.50	100 μfd 30 V tubular
25-157	.80	500 μfd 15 V tubular
25-154	1.65	2500 μfd 30 V tubular
25-156	4.15	4000 μfd 50 V can
Mylar		
27-27	.15	.022 μfd
27-44	.15	.01 μfd
27-60	.25	.22 μfd
27-61	.45	.47 μfd
27-47	.20	.1 μfd
CONTROLS-SWITCHES-CIRCUIT BREAKER		
10-7	.50	5000 Ω (5 KΩ) control
10-110	.55	10 KΩ control
10-11	.50	50 KΩ control
10-40	.50	100 KΩ control
61-12	1.55	Toggle switch
64-25	1.30	Pushbutton switch
65-11	.60	Circuit breaker
DIODES-LAMP-TRANSISTORS		
56-32	1.50	Zener diode (56-32 marked on part)
57-65	.20	Silicon diode
56-33	.55	1N3754 diode
412-1	.15	#47 pilot lamp
417-91	1.10	2N3391 transistor
417-94	1.00	2N3416 transistor
417-118	.55	2N3393 transistor
417-108	.55	2N3692 transistor
417-109	.55	2N3566 transistor
417-110	.55	S2090 transistor
417-100	1.50	2N3053 transistor
417-99	2.25	2N2148 transistor
417-101	4.50	TA2577A transistor

PART No.	PRICE Each	DESCRIPTION

GROMMETS-INSULATORS-TERMINAL STRIPS

73-4	.10	5/16" rubber grommet
73-43	.10	3/8" plastic grommet
73-45	.10	1/2" plastic grommet
73-50	.20	Foam tape
75-24	.10	Small line cord strain relief
75-71	.10	Large line cord strain relief
75-20	.10	Double phono socket insulator
75-60	.10	Mica insulator (packed between two pieces of cardboard)
431-26	.10	1-lug terminal strip
431-10	.10	3-lug terminal strip
431-11	.10	5-lug terminal strip

CONNECTORS-SOCKETS-JACKS-PLUG

432-66	.10	Push-on connector
434-22	.40	Pilot lamp socket assembly
434-82	.10	Double phono socket
434-117	.25	Transistor socket
434-147	.20	AC socket
436-20	.45	2-terminal phone jack
436-27	.50	3-terminal phone jack
438-27	1.10	3-terminal phone plug

WIRE-SHIELDED CABLE-SLEEVING

89-13	.40	Line cord
134-146	.95	Shielded cable with phono plugs on each end
343-7	.05/ft	Single conductor shielded cable
344-15	.05/ft	Large black wire
344-16	.05/ft	Large red wire
344-50	.05/ft	Black hookup wire
344-51	.05/ft	Brown hookup wire
344-52	.05/ft	Red hookup wire
344-53	.05/ft	Orange hookup wire
344-54	.05/ft	Yellow hookup wire
344-59	.05/ft	White hookup wire
347-35	.10/ft	2-conductor shielded cable
346-1	.05/ft	Sleeving

PART No.	PRICE Each	DESCRIPTION

HARDWARE

#2 Hardware

250-212	.05	2-56 x 3/16" self-tapping screw
250-182	.05	2-56 x 1/4" screw
252-51	.05	2-56 nut

#3 Hardware

254-7	.05	#3 lockwasher

#4 Hardware

250-163	.05	4-40 x 5/16" self-tapping screw
252-89	.05	4-40 push-on nut

#6 Hardware

250-89	.05	6-32 x 3/8" screw
250-252	.05	#6 x 5/8" sheet metal screw
252-3	.05	6-32 nut
254-1	.05	#6 lockwasher

#8 Hardware

250-137	.05	8-32 x 3/8" screw
250-97	.05	8-32 x 1" screw
252-4	.05	8-32 nut
252-92	.10	#8 self-retaining nut
253-45	.05	#8 flat washer
254-2	.05	#8 lockwasher
259-24	.05	#8 wire clamp

Control Hardware

252-7	.05	Control nut
253-10	.05	Control flat washer
254-4	.05	Control lockwasher

Miscellaneous-Hardware

207-5	.10	Cable clamp
253-30	.05	1/2" flat washer

GENERAL

PART No.	PRICE Each	DESCRIPTION
54-269	6.40	Power transformer
73-49	.15	Foot switch rubber pad
85-162-4	2.15	Circuit board
91-151	21.80	Cabinet
150-10	11.00	Reverberation assembly
203-466	5.00	Control panel
260-24	.30	Diode mounting clip
352-13	.15	Silicone grease
401-117	7.50	12" speaker
462-244	.65	Knob
100-587	.15	Transistor heat sink
100-589	.10	Capacitor mounting strap
200-481-1	2.80	Chassis
205-347	.10	Transistor mounting plate
214-46-1	1.10	Foot switch housing
205-536-1	.20	Foot switch bottom plate

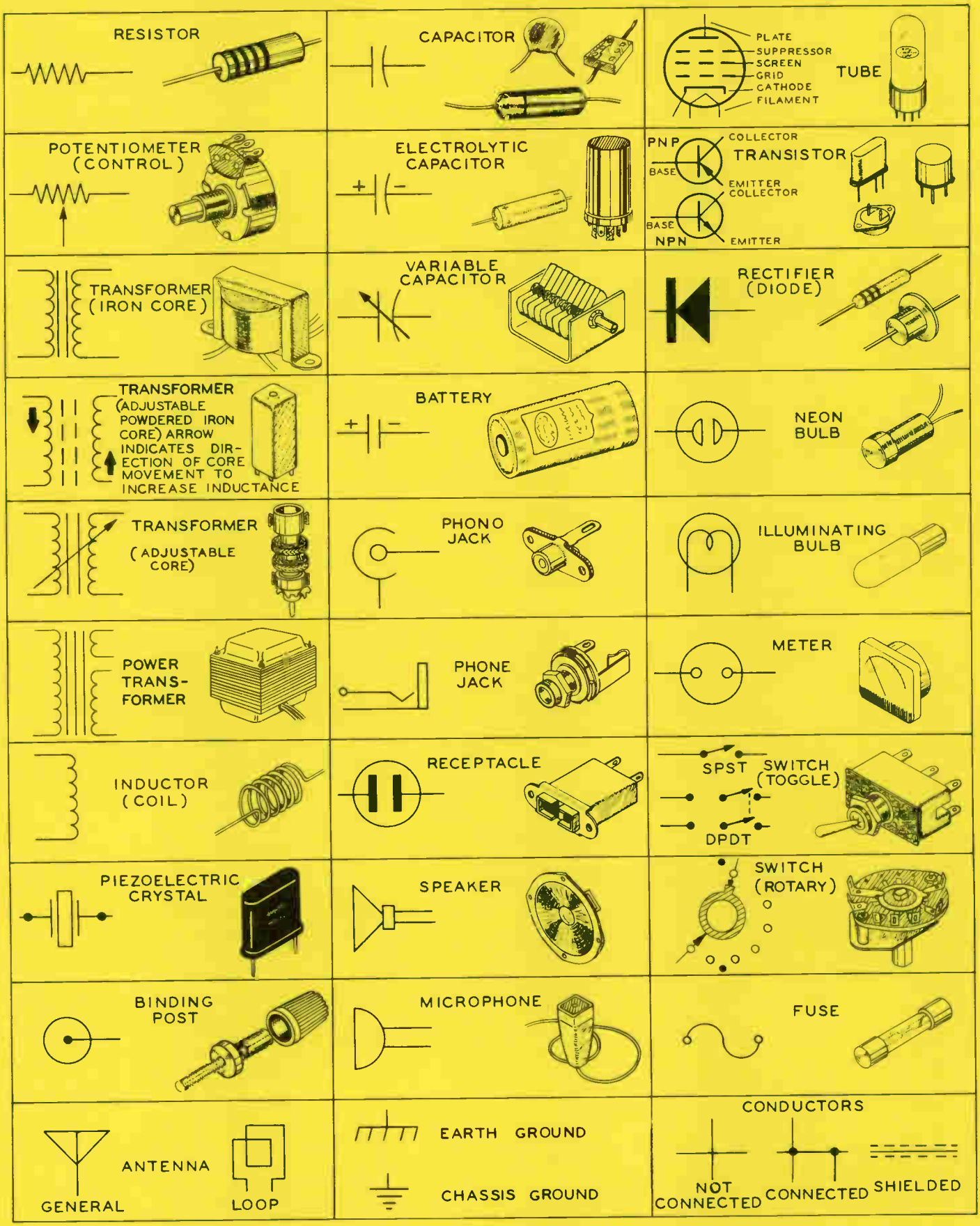
General (cont'd.)

PART No.	PRICE Each	DESCRIPTION
205-553-1	.90	Reverberation mounting plate
206-286	.45	Transformer shield
390-183	.10	REV-TREM label
490-5	.10	Nut starter
331-6	.15	Solder
	2.00	Manual (See front cover for part number.)

The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from an authorized Service Center or Heathkit Electronic Center to cover local sales tax, postage and handling. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties and rates of exchange.

TYPICAL COMPONENT TYPES

This chart is a guide to commonly used types of electronic components. The symbols and related illustrations should prove helpful in identifying most parts and reading the schematic diagrams.



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