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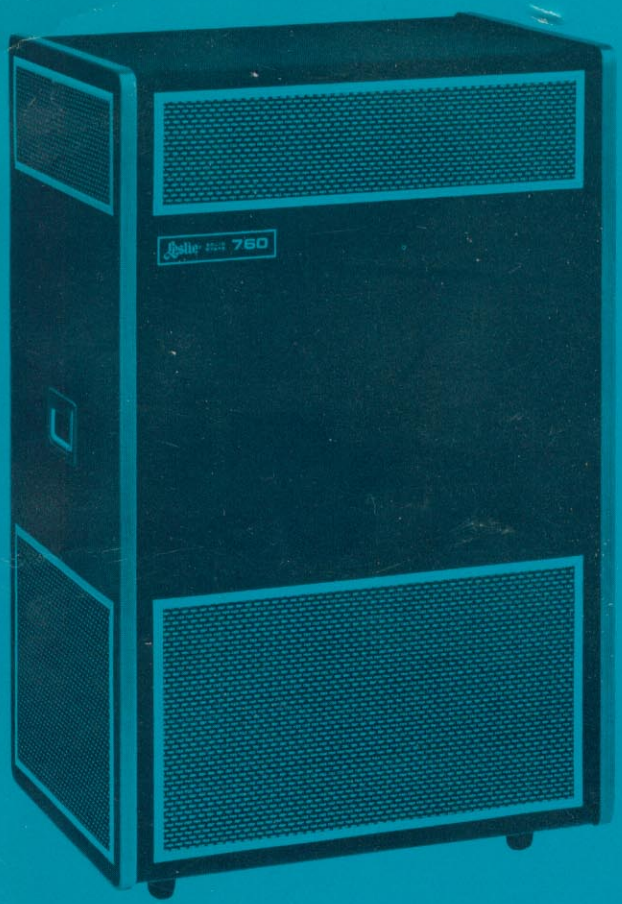
ELECTRO MUSIC / CBS MUSICAL INSTRUMENTS
a division of Columbia Broadcasting System, Inc.
Bin 30, Arroyo Annex, Pasadena, Calif. 91109

113980

Leslie
SPEAKERS

SPEAKER MODELS 760/770



SERVICE MANUAL

Electro Music/CBS Musical Instruments, A Division of Columbia Broadcasting System, Inc.
56 W. DEL MAR BOULEVARD, BIN 30, ARROYO ANNEX, PASADENA, CALIF. 91109 / PHONES: 793-9131 & 681-6654 (AREA CODE 213)

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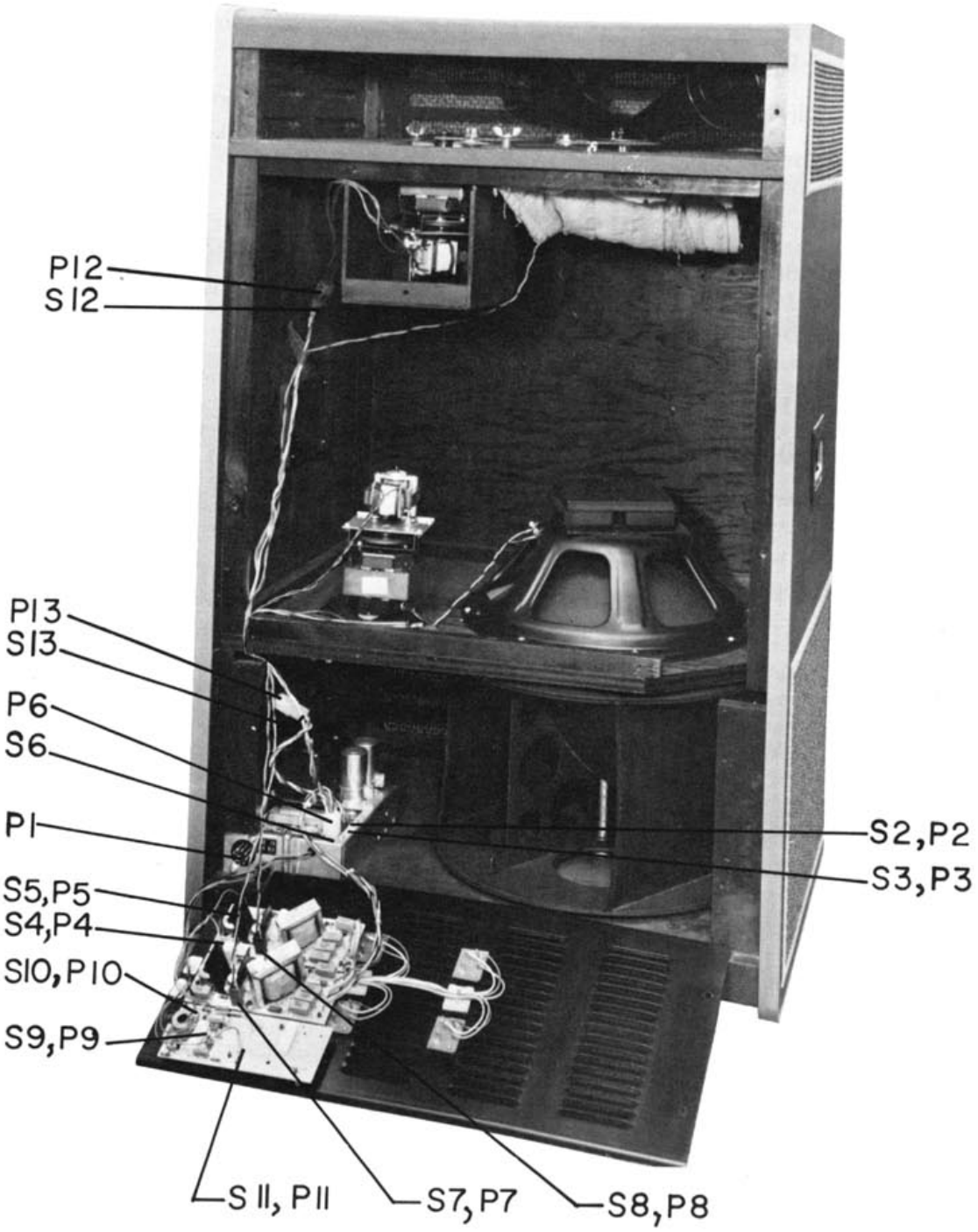


Figure 5. Connector Identification

The long leads also permit the printed circuit boards to be removed from the heat sink and turned over without being disconnected from the circuit. If a circuit board is defective, it may be easily replaced as a complete unit.

Voltage Checks

If desired, voltages may be checked without the circuits being disconnected. Voltage values at key points are shown on the circuit board drawings and on the schematic. Measurements should be made with a 20,000 - ohms - per - volt meter. Values may vary ±10% from those listed, under normal no-signal operating conditions.

All voltage measurements except base and emitter voltages of Q13, Q14, Q17, and Q18 should be made between test point and ground. The bases of output transistors Q13, Q14, Q17, and Q18 should be +.5 volt higher than their emitters. This can be measured by touching the voltmeter probes to the base and emitter of the output transistor being tested.

Transistor Replacement

See Parts Assembly for detailed instructions on transistor installation.

Crossover Network

The crossover network is mounted on the amplifier assembly. To check it, remove the metal panel at the lower part of the cabinet. See "Amplifier Circuit Boards."

TROUBLESHOOTING

The model 760 and 770 circuits have been engineered for durability and trouble-free operation. Trouble may occasionally develop after the equipment has been moved, or after long use. Always check the connections to be sure that they are properly located and that solid contact is made between plug and socket. Voltage checks will usually isolate the trouble to a specific component or section of the circuitry.

If replacement of individual parts is required, consult the appropriate photographs and parts lists for numbers and values. Rewiring after disassembly may require reference to the wiring diagrams.

LUBRICATION AND ADJUSTMENT

Treble Rotor Lubrication

It is not necessary to dismantle the treble speaker assembly to oil the spindle. Simply apply a few drops of light machine oil to the OIL HOLE in the treble horn.

Motor Lubrication and Cleaning

1. Remove the motor assembly from the cabinet. (See REMOVAL of MAJOR COMPONENTS.

CAUTION

Do not lose the bushings which are in the motor mount brackets.

2. Detach the large motor from the small motor by removing its four mounting bracket screws.

3. Remove the rim drive wheel assembly from the large motor with a 3/32 Allen wrench.

4. Saturate the bearing felts at either end of the large motor. (See OIL FELT PAD, figure 6.) Use oiler supplied or any good grade of lightweight machine oil. Do not overlubricate.

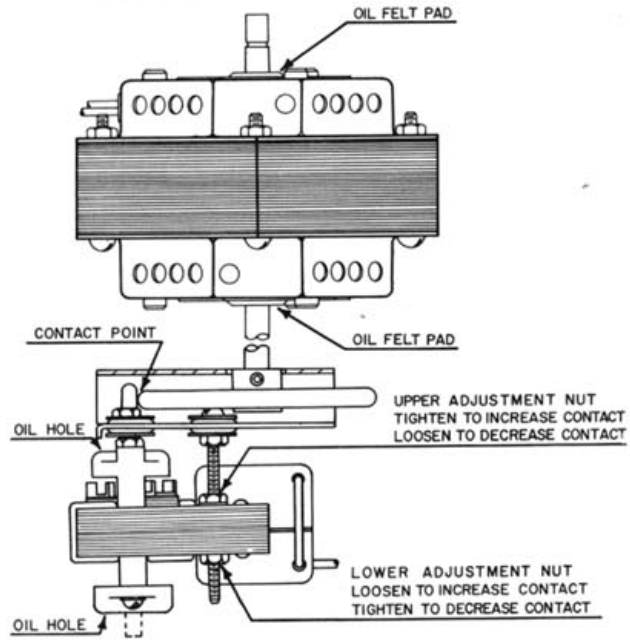


Figure 6. Motor Oiling and Adjustment Diagram

5. Remove the shaft adjustment nut from th free end of the small motor's shaft adjustment screw.
6. Remove the two nuts fastening the small motor to its mounting bracket. Detach the small motor.
7. Use compressed air or a vacuum hose to remove any dust lodged in the end bells of the large motor. If necessary, clean the small motor in the same manner.
8. Clean all accessible parts with solvent. Allow motors to dry.
9. Saturate bearing felts at either end of the small motor through the oil holes.

Small Motor Shaft Operation and Adjustment

The small motor drives the shaft of the large motor at slow speed by making contact with the rim drive wheel assembly. (See figure 6.) The small motor armature is spring loaded to withdraw from the rim drive wheel assembly when the small motor is not operating.

Switching the tremolo control to CHORALE activates the small motor. The magnetic field set up in the small motor laminations pulls the small motor shaft into contact with the rim drive wheel assembly; thus slowing the rotor to the chorale (slow) speed. Contact between the small motor shaft and the rim drive wheel assembly can be adjusted as follows:

1. With speaker power on, switch the tremolo control to CHORALE.
2. Loosen the contact adjustment nuts on the small motor until small motor shaft no longer touches the rim drive wheel assembly.
3. Grasp the treble horn or rotor to prevent its turning.
4. Slowly tighten the upper adjustment nut until the small motor shaft forces the drive pulley to turn the drive belt.
5. Tighten the lower adjustment nut against the small motor laminations.
6. Switch the tremolo control between TREMOLO and CHORALE positions to check for proper shaft adjustment.

NOTE

Make certain that the outer edge of the O-ring on the rim drive wheel is smooth. If there is unevenness, twist the O-ring until it makes even contact with the small motor shaft when the shaft is engaged.

Motor Noises

Excessive motor noises may indicate misaligned large motor bearings. Lightly tap the large motor laminations with a hammer to reseat the bearings.

Treble Drive Belt

This belt turns the treble horn which is mounted on the upper shelf, above the treble speaker. Should the belt become so loose that it cannot be adjusted to the required tension, replace it.

ADJUSTMENT

Increase the speed of the treble horn by shifting the belt to the smaller-diameter groove of the pulley. Decrease the speed by shifting the belt to the larger-diameter groove. The idler assembly exerts some pull on the belt, and it should be checked when adjustment seems to be required.

REPLACEMENT

1. Slip the old belt off the three-step pulley and idler pulley.
2. Lift the old belt over one treble horn, and then the other.
3. Install the new belt, reversing removal procedure.

Bass Drive Belt

Proper bass drive belt tension is important. An overly tight or loose belt usually will not drive the bass rotor to full tremolo speed. An over-tightened belt may even cause excessive wear on the motor bearings. The belt will slip slightly on the drive pulley during acceleration. Such slippage is actually necessary for attaining full rotor speed. The belt acts like a torque converter. As it slips, the drive pulley gathers momentum and torque. When the belt catches, the torque increase is transferred to the bass rotor, causing it to rotate faster.

TENSION CHECK

Switch the tremolo control from CHORALE to TREMOLO, noting the time required for the rotor to reach full speed. With a properly adjusted belt the rotor should reach full speed in 7 to 10 seconds.

Also, listen for excessive motor noise, which indicates an over-tightened belt.

ADJUSTMENT

1. Remove the lower back panel.
2. Loosen the wing nut that holds the motor in position; move the motor toward the rotor to decrease the tension, or away from the rotor to increase the tension.
3. Tighten the wing nut.
4. Check tension, as previously described.
5. Replace the panel.

REPLACEMENT

1. Remove both the lower and middle back panels.
2. Remove the screws that hold the bass speaker in place and move the speaker aside or remove it from the cabinet.

CAUTION

Handle the speaker carefully so that the cone is not punctured.

3. Remove the rotor support assembly.
4. Loosen the wing nut that holds the motor in position, to release the belt tension.
5. Slip the belt up off the shaft and pulley assembly and down off the motor pulley.
6. Pre-stretch the new belt.
7. Fit the new belt over the shaft and pulley assembly, through the channel on the under side of the speaker shelf, and onto the motor pulley.
8. Replace the rotor support assembly.
9. Adjust the tension, as described above.
10. Replace the speaker and the panels. If the speaker leads were disconnected, connect the orange wire to the dotted terminal and the black wire to the other terminal. (Position the speaker so that the terminals are toward the back of the cabinet.)

REMOVAL OF MAJOR COMPONENTS

If troubleshooting has indicated that replacement of parts is necessary, the major components may be removed to facilitate repair.

WARNING

Disconnect the power cable before removing any component.

Power Supply

The power supply is located behind the lower back panel (heat sink). Remove this panel and place it to the side.

The power supply is held in place by two screws, one toward the back of the cabinet and one toward the front.

Lower (Bass) Rotor

1. Remove the middle and lower back panels.
2. Remove the screws that hold the bass speaker in place and move the speaker aside or remove it from the cabinet.

CAUTION

Handle the speaker carefully so that the cone is not punctured.

3. Remove the rotor support assembly.
4. Slip the belt up, off of the pulley. If necessary, loosen the wing nuts that hold the motor in place and move the motor toward the rotor, to release tension from the belt.
5. Remove the remaining parts by following the disassembly order of the parts listing.

Lower Motor

1. Remove the middle and lower back panels.
2. Loosen the wing nuts that hold the motor.
3. Slip the belt off the pulley from below.
4. Remove the screws and wing nuts. Lift the motor up and out.

Upper Motor

1. Remove the upper and center back panels.
2. Loosen the wing nuts that hold the motor in position.
3. Slip the belt upward, off the pulley.
4. Remove the screws and wing nuts that hold the motor support.

   Model 760: It is not necessary to disturb the motor stabilizing bracket. The motor lifts upward and out.
5. Lift the motor up, tilting it slightly to clear the shelf.

Treble Horn and Speaker

1. Remove the upper and center back panels.
2. Disengage the idler pulley from the belt.
3. Slip the belt from the pulley, at the motor.
4. Lift the belt over the horns, one at a time.
5. Loosen the acoustic pad that covers the speaker, and remove the screws that hold the speaker to the shelf. (Support the speaker while loosening the screws alternately.)

DISASSEMBLY DETAILS

When no special instructions are given, remove the parts in the order listed.

Power Supply Transformer

1. Remove the power supply. Turn it upside down.
2. Unsolder the wires attached to the circuit board foil pattern.
3. Remove the four screws and washers that hold the two electrolytic capacitors to the circuit board.
4. Remove the four circuit board mounting nuts. Lift the circuit board off its mounting studs to expose the four transformer mounting nuts on the underside of the power supply chassis.
5. Remove the transformer mounting nuts and lift the transformer off the power supply chassis.

Treble Horn Spindle

1. Remove the entire treble speaker assembly from the cabinet.
2. Detach the three Phillips head screws attaching the spindle to the trbele speaker mounting plate.

Treble Horn Reflector

1. Clip the three stand-off pins where they attach to the body of the horn.
2. Remove the pins.

ASSEMBLY DETAILS

Areas which need special care or could cause difficulties when assembly is attempted are noted below. Most parts are readily removed or replaced by normal shop procedures.

Avoid excessive heat and the use of excess solder where printed circuits are located close together, or circuits may be incorrectly cross-connected by solder flow.

Circuit Boards

When replacing circuit boards be careful not to pinch the wires against nuts, bushings, or any sharp projection. A cut in the insulation could cause grounding or impaired performance.

Resistors

Resistors R82, R83, R85, R87, R88, and R91 on the bass amplifier circuit board must be spaced a minimum of ¼-inch above the circuit board.

Electrolytic Capacitors

Electrolytic capacitors should be properly positioned with regard to positive and negative terminals. These are indicated on the parts layouts. If capacitors are replaced use glue between the body of the capacitor and the circuit board, to help hold the capacitor in its position.

Relays

On the power supply circuit board relays Rel1 and Rel2 must be secured in place with glue, part no. 018622 (Scotch Grip Industrial Adhesive #847).

Transistors

Transistors mounted on the amplifier panel must fit snugly against their mountings to insure proper heat dissipation. Use a thin, smooth layer of silicone compound (part no. 047639) on both surfaces of the mica washer which separates the transistor from the heat sink. Make certain there are no air bubbles. If the heat is not dissipated the transistors will quickly deteriorate.

CAUTION:

A clip-on heat sink must be used between the body of the transistor and a lead being soldered. The heat necessary to melt the solder may damage the transistor.

When replacing other transistors be sure that the base, emitter, and collector leads are properly positioned, as shown in the parts layout.

Use heat sink compound, part no. 023796 (Dow Corning #340) between transistor Q12 and the heat sink on the bass amplifier circuit board and between Q16 and the heat sink on the treble amplifier circuit board.

Treble Horn Assembly

REFLECTOR

NOTE:

It may be necessary to drill out the holes before the pins will slip into place.

1. Position the reflector so that the cut edge will be upward when the horn is in operating position.
2. Apply 3-M Weatherstrip cement to the stand-off pins before inserting the reflector into the horn.
3. Use a soldering iron to melt the ends of the stand-off pins to the outer horn surface, to create a sturdy mechanical bond.

HORN AND HUB

Mounting and oil holes on the hub and horn must be aligned.

SPINDLE

Apply Scotch Grip Industrial Adhesive #847 to the washer on the side which contacts the spindle and plate assembly.

Upper Motor Support (Model 760)

If the upper motor support is removed when reinstalling it place the screws (37) and one washer (43) each in the support with the screws pointing downward. Place the support in the motor box and fasten it on the lower side of the box with the washers (40) and nuts (47). (Normally it is not necessary to remove this support when working with the motor assembly.)

Lower Rotor Bearing Assembly

Apply Scotch Grip Industrial Adhesive #847 to the side of washer (20) which touches grommet (25); press the washer and grommet together.

Lower Rotor Assembly

1. Position the rotor so that the EMI number is on the top.
2. Lubricate the lower bearing end of the rotor shaft with oil or Vaseline before inserting it through the rotor grommets. The neoprene grommets are not damaged by these lubricants.
3. Support the rotor and carefully slide it into the cabinet, being sure to clear the bearing assembly already positioned in the cabinet base.
4. Center the rotor over the bearing assembly by sighting through the shaft hole.
5. Place the shaft and pulley assembly so that the two drive pins in the rotor pulley straddle the wooden division between the cutouts in the top of the bass rotor where the scoop touches the top of the rotor.

6. Place the rotor support over the shaft and pulley assembly and let it rest on the shelf, with the indented portion UPWARD.

7. If the upper bearing seems loose, bend retainer (23) slightly to obtain a snug fit.

Large Motor

1. Examine the O-ring in the rim drive wheel assembly. If there are occasional rough spots, turn the ring so that the outer surface is smooth.

2. If the ring is badly worn, replace it.

3. When installing the rim drive wheel assembly on the large motor shaft, push it on as far as it will go; then back it off 1/16th of an inch.

4. Align the set screw of the rim drive wheel with the FLAT side of the motor shaft; then tighten the set screw.

5. Slip the drive belt onto the drive pulley.
6. Adjust the belt tension as previously described.

Small Motor

1. Follow instructions given for large motor, except for the last step.

2. Adjust the small motor shaft as described under the heading "Small Motor Shaft Operation and Adjustment."

3. Adjust belt tension as previously described.

INSTALLATION OF MAJOR COMPONENTS

In general, major components may be installed by reversing the removal procedure. Observe the following instructions as well.

Treble Horn and Speaker

1. Position the speaker so that the terminals point toward the motor box. Place the spacer ring on the speaker and spindle assembly.

2. Connect the red wire to the red dotted terminal.

3. Replace the acoustic pad after fastening the speaker to the shelf.

4. Place the belt on the center groove of the pulley. Hook the idler assembly to the belt, with the idler wire passing over the belt.

5. Adjust belt tension to meet the requirements in this manual.

Upper Motor

Be sure to place the wires in the notch at the upper left of the motor box, so that when the back panel is installed the wires will not be pinched.

Lower Rotor

Adjust the belt tension by loosening the wing nuts beneath the shelf and moving the motor assembly toward or away from the pulley, as required.

Bass Speaker

Position the speaker so that the terminals are toward the motor. (See figure 4.)

Connect the orange wire to the red dotted terminal.

Wires

Reconnect all plugs and sockets. (See diagrams, schematic, and figure 5.)

If they were unfastened, refasten the felt pieces that hold the wires into position at the lower shelf and the left side of the cabinet.

Wires are to pass through the slot at the left of the shelf. Be sure that the wires are inside the slot so that they are not pinched when the back panels are put in place.

Fasten extra lengths of wire neatly with tape or twist them so that they do not touch the moving parts.

PARTS IDENTIFICATION

Figures 7 through 22 indicate the locations of the individual parts in each major assembly, and the accompanying lists identify each part by number and give its description.

Commonly-used replacement parts may be obtained from the factory. Bulk items and those readily obtainable through local stores are not listed. Where possible the parts are listed in disassembly order.

Basic parts lists reflect the 117-V, 60-Hz model of 770; parts which are found in other models are indicated by footnote symbols.

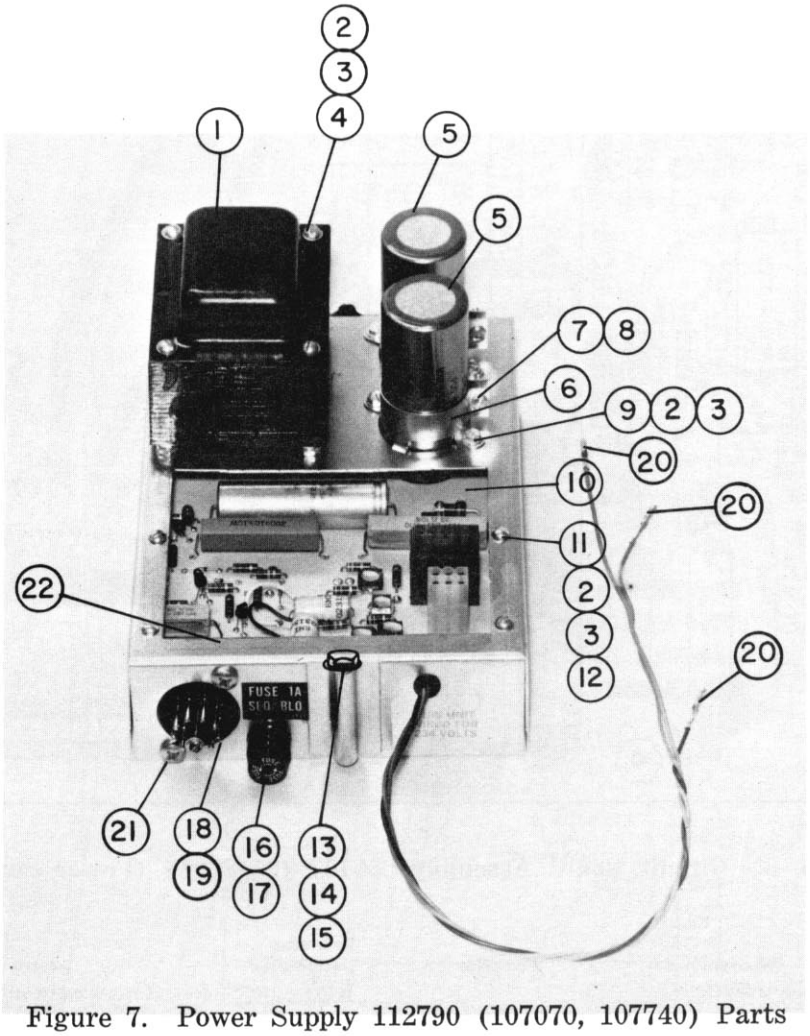


Figure 7. Power Supply 112790 (107070, 107740) Parts

Item	Description	Part No.
1	Transformer, power (T1)	045096 045476*
2	Nut, hex, 8-32 x 11/32 x 1/8	026773
3	Washer, lock, 8 x 5/16 x .020	026765
4	Bushing, .193 x .312 x .125	013656
5	Capacitor, electrolytic, 3000 mfd, 50V (C1, C2)	044826
6	Clamp, capacitor mounting	061499
7	Screw, machine, 6-32 x 5/8	028001
8	Nut, square, 6-32 x 5/16 x 3/32	045484
9	Screw, sheet metal, 6 x 1/4, hex washer head	026666
10	Circuit Board Assembly, 117-volt Circuit Board Assembly, 220-volt	055707 055830*
11	Screw, machine, 6-32 x 3/8, hex washer head	113780
12	Stand-off, 6-32 x .875	013770
	— attaching parts —	
13	Screw, machine, 10-24 x 2-3/4, hex washer head	110150
14	Washer, lock, 10 x 3/8 x .022	028019
15	Washer, flat, 10 x 1/2 x 1/16	026690
	* * *	
16	Fuse Holder	055178
17	Fuse, 2-amp, Slo-Blo (FZ1) Fuse, lamp, Slo-Blo (FZ1)	028787 038158*
18	Cable and Plug Assembly	113260 107050*
19	Plug Assembly, 9-pin (P1)	021170
20	Insert, contact, female (S9 on red wire)	039511
21	Screw, sheet metal, 12 x 3/8, Phillips head	029314
22	Fuse, 3-amp, Slo-Blo, pigtail (FZ2)	104050**
	Insert, contact, female (S10, S11) (not illustrated)	

*220/240V
**117V

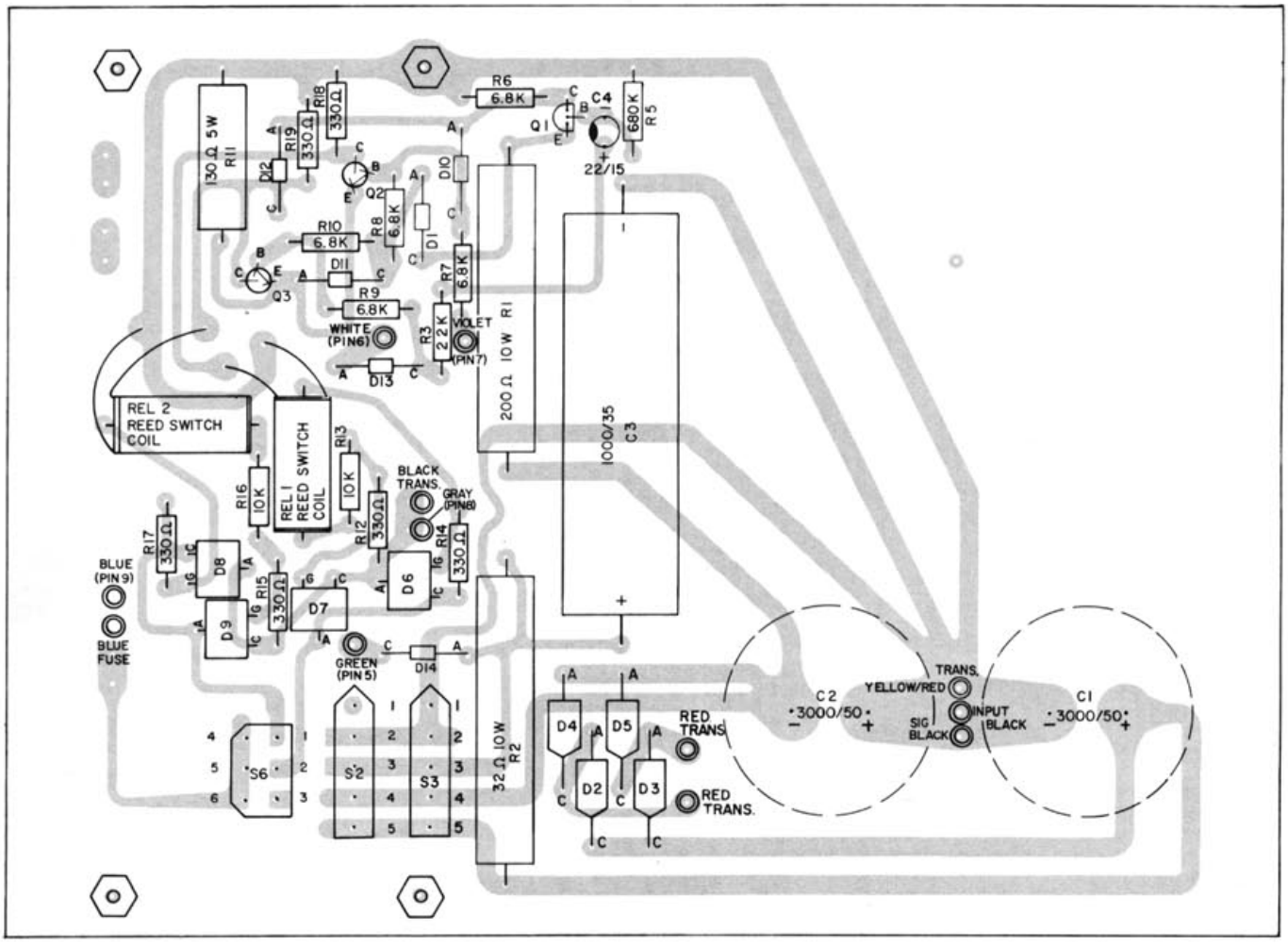


Figure 8. Circuit Board Assembly 055707 (055830*) (Power Supply)

Reference Designation	Description	Part No.
C3	Capacitor, electrolytic, 1000 mfd, 35VDC	023507
C4	Capacitor, tantalum, 22 mfd, 15V	062638
D1	Rectifier, silicone, 30 PIV, 500MW	041616
D2, D3, D4, D5	Rectifier, silicone, 200 PIV, 3-amp	031450
D6, D7,	Rectifier, SCR, 200 PIV, 4-amp	030387
D8, D9	Rectifier, SCR, 400 PIV, 4-amp	031997
D10, D11, D12, D13,	Rectifier, silicone, 30 PIV, 500MW	041616
D14	Rectifier, silicone, 100 PIV, 1-amp	021154
Q1	Transistor, MSPS 4382 GE	026237
Q2, Q3	Transistor, 2N3414	030254
R1	Resistor, wire-wound, 200-ohm, 10W, 10%	049767
R2	Resistor, wire-wound, 32-ohm, 10W, 10%	029769
R3	Resistor, 22K, 1/2W, 10%	028530
R5	Resistor, 680K, 1/2W, 10%	062646
R6, R7, R8, R9, R10	Resistor, 6.8K, 1/2W, 10%	016501

*220/240V

Reference Designation	Description	Part No.
R11	Resistor, wire-wound, 130-ohm, 5W, 10%	023739
R12	Resistor, 330-ohm, 1/2W, 10%	016493
R13	Resistor, 10K, 1/2W, 10%	028548
R14, R15	Resistor, 330-ohm, 1/2W, 10%	016493
R16	Resistor, 10K, 1/2W, 10%	028548
R17, R18	Resistor, 330-ohm, 1/2W, 10%	016493
R19		
Rel 1, Rel 2	Coil, reed switch	023150
	Switch, reed	023747
		067017*
	Housing, socket, 5-circuit, molex (orange) (S2)	109250
	Housing, socket, 5-circuit, molex (red) (S3)	109260
	Insert, contact, PCBD, female (in S2 and S3)	108660
	Housing, socket, 6-circuit, molex, natural (white) (S6)	023267
	Insert, contact, female (in S6)	023291
	Etched circuit board	044503

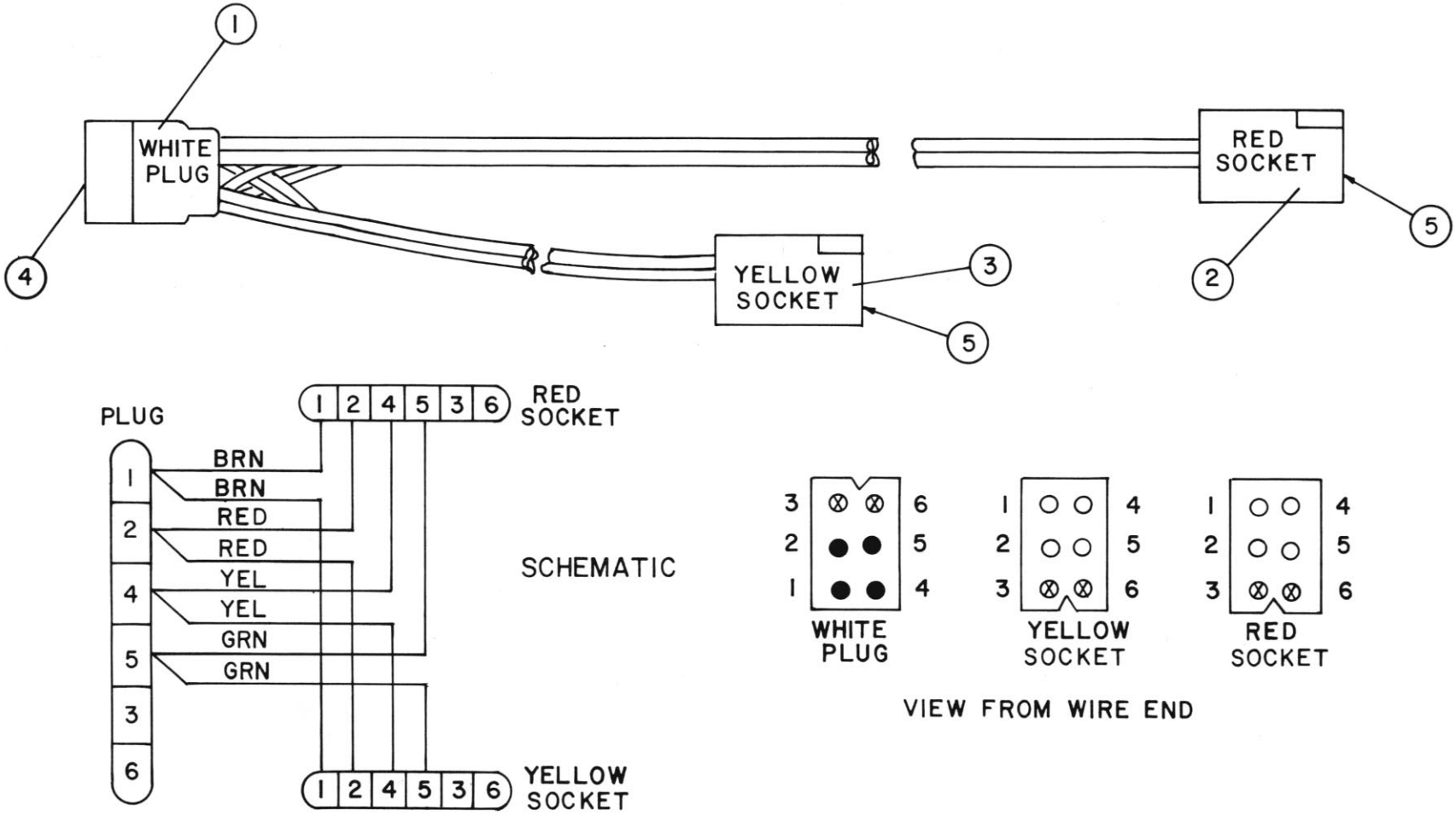


Figure 9. Cable Assembly 062778

Item	Description	Part No.
1	Housing, plug, 6-circuit, natural (white) (P6)	023259
2	Housing, socket, 6-circuit, red (S12)	033951
3	Housing, socket, 6-circuit, yellow (S13)	033969
4	Insert, contact, male	023309
5	Insert, contact, female	023556

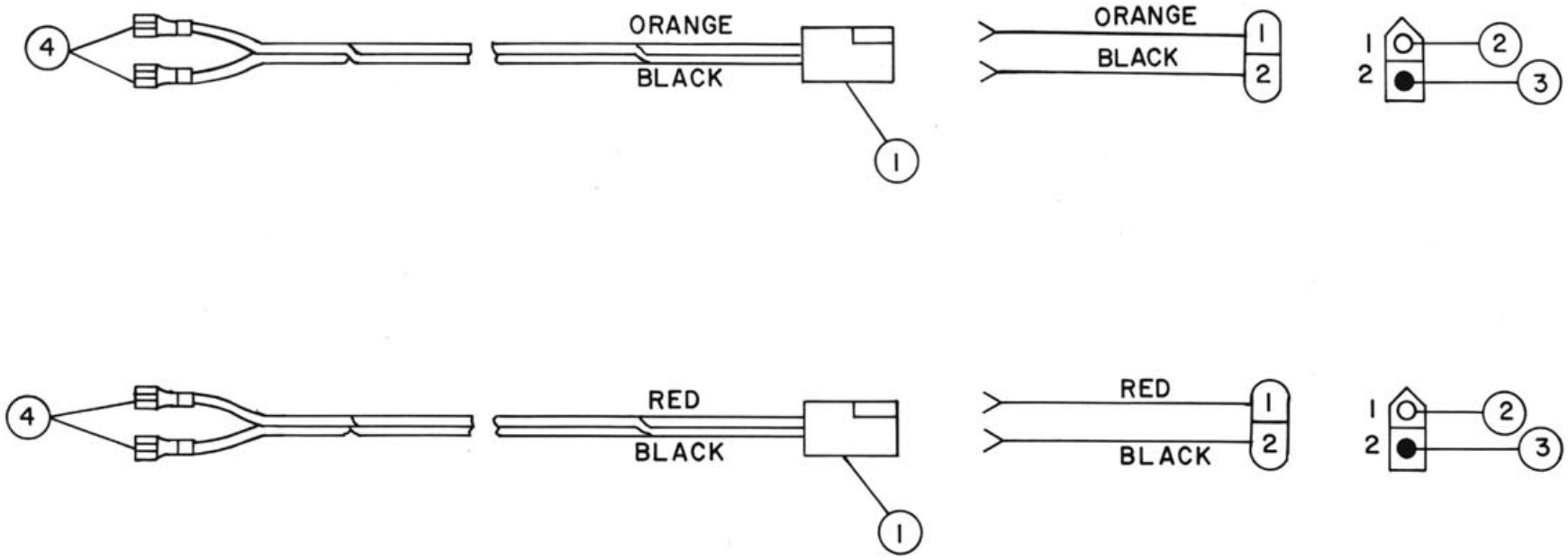


Figure 10. Cable Assemblies 063016 (Top) and 062786 (Bottom)

(top)

Item	Description	Part No.
1	Housing, socket, molex, orange (S7)	037135
2	Insert, connector, female	023556
3	Insert, connector, male	023309
4	Connector, tab, female	029389

(bottom)

Item	Description	Part No.
1	Housing, socket, molex, red (S8)	037127
2	Insert, connector, female	023556
3	Insert, connector, male	023309
4	Connector, tab, female	029389

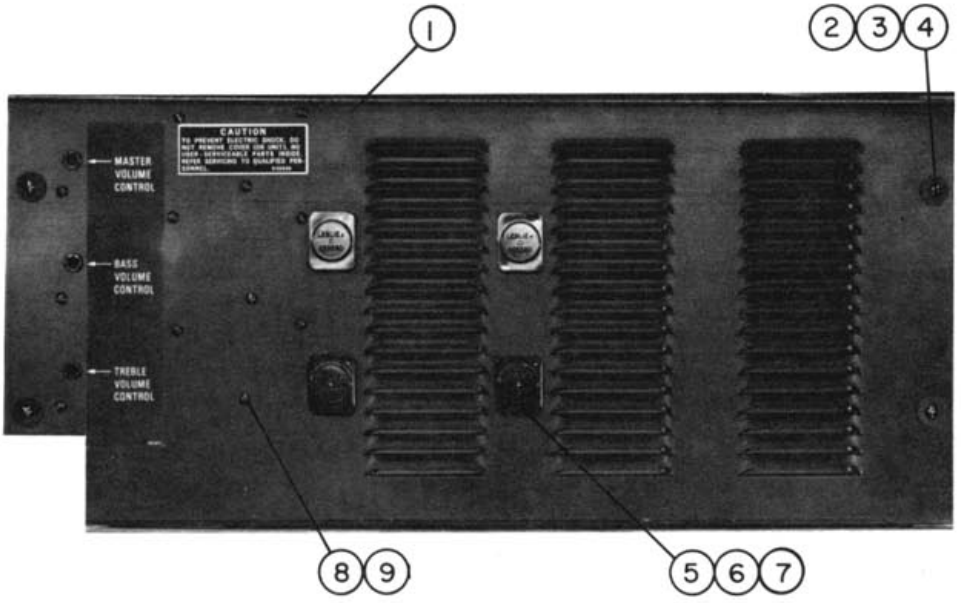


Figure 11. Amplifier Parts (Outside View)

Item	Description	Part No.
1	Heat Sink, power amplifier	062919
2	Screw, machine, 10-24 x 7/8	030155
3	Washer, fiber, flat, .194 x 3/4 x 1/16	031716
4	Bushing, snap	056861
5	Cover, transistor	023580
6	Transistor, 2N3055 (Q13, Q14, Q17, Q18)	023762
7	Washer, insulating, mica	023176
8	Screw, machine, 6-32 x 3/8	113780
9	Stand-off, 6-32 x .375	113760

Item	Description	Part No.
1	Circuit Board Assembly (red)	107600*
2	Screw, thread cutting, 3-28 x 1/2 Phillips head	023812
3	Eyelet, 1/8 x 1/32 SE47	030429
4	Cable and Plug Assembly, red (includes P3)	056788*
5	Screw, machine, 6-32 x 3/8	027979
6	Washer, lock, #6 x 9/32 x .018	028993
7	Cable Assembly, Driver Amplifier, orange (includes P2)	056796†
8	Socket, transistor	023168
9	Circuit Board Assembly (orange)	056770†
10	Circuit Board Assembly (green)	062877††

*When together, identified as circuit assembly 107590
†When together, identified as circuit assembly 056754
††With wires attached, identified as circuit assembly 062851

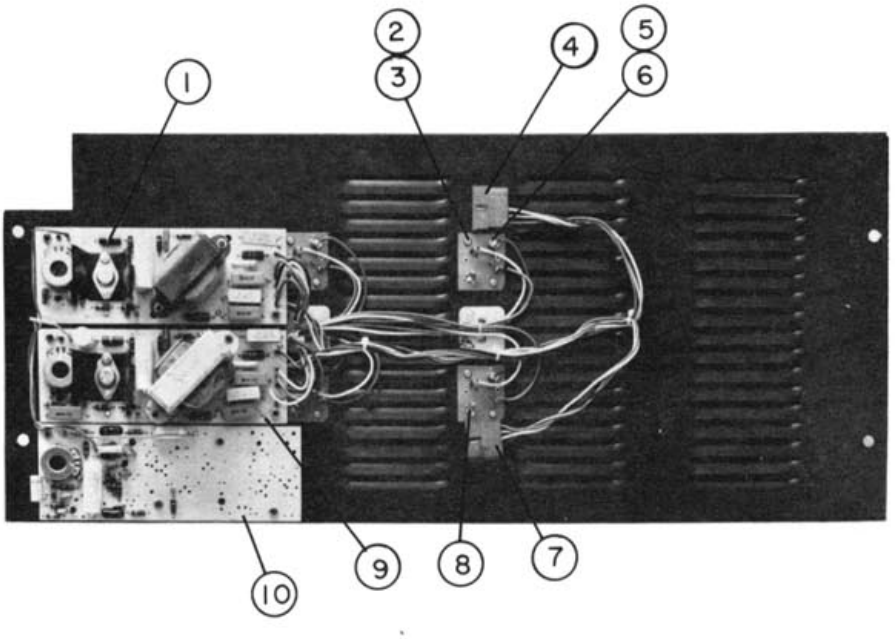


Figure 12. Amplifier Parts (Inside View)

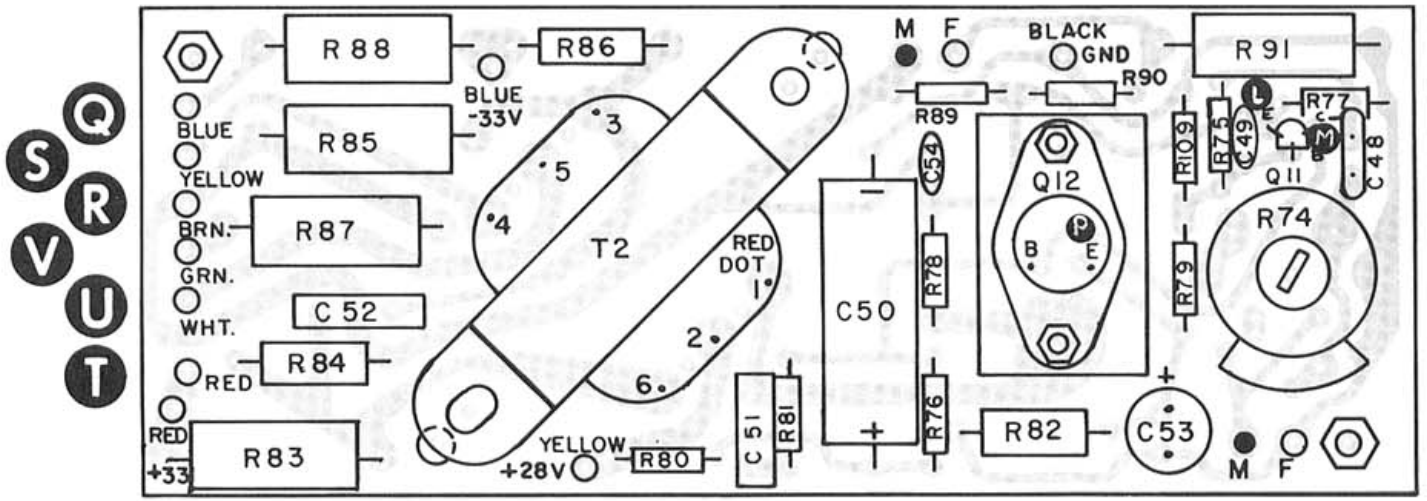


Figure 13. Circuit Board Assembly 056770 (Bass Amplifier)

Reference Designation	Description	Part No.
C48	Capacitor, tantalum, 22 mfd, 15V (white dot is +)	062638
C49, C54	Capacitor, disc, 4700pF, 100VDC	028431
C50	Capacitor, electrolytic, 150 mfd, 25VDC	031294
C51	Capacitor, mylar, .033 mfd, 100VDC	028654
C52	Capacitor, polyester, 0.1 mfd, 200VDC	022251
C53	Capacitor, electrolytic, 500 mfd, 6VDC	055483
Q11	Transistor, SPS 4382	026237
Q12	Transistor, 2N3054	023754
	Heat sink	045674
	Screw, machine, 6-32 x 3/8 RH	032052
	Nut, hex, 6-32 x 1/4 x 3/32	039701
	Washer, lock, 6 x 9/32 x .018	028993
R74	Potentiometer, 20K	037648
R75, R80, R81	Resistor, 1.2K, 1/2W, 10%	018036
R76	Resistor, 470-ohm, 1/W, 10%	028068
R77, R90	Resistor, 47-ohm, 1/2W, 10%	016311
R78	Resistor, 6.8K, 1/2W, 10%	016501
R79	Resistor, 27K, 1/2W, 10%	020834
R82	Resistor, 15-ohm, 1W, 10%	031823
R83, R85	Resistor, wire-wound, 430-ohm, 5 W, 5%	023648
R84, R86	Resistor, 6.8-ohm, 1W, 5%	055475
R87, R88, R91	Resistor, wire-wound, 0.3-ohm, 5W, 5%	023218
R89	Resistor, 820-ohm, 1/2W, 10%	028373
R109	Resistor, 47K, 1/2W, 10%	028506
T2	Transformer, driver	023770
	Etched Circuit Board	022848

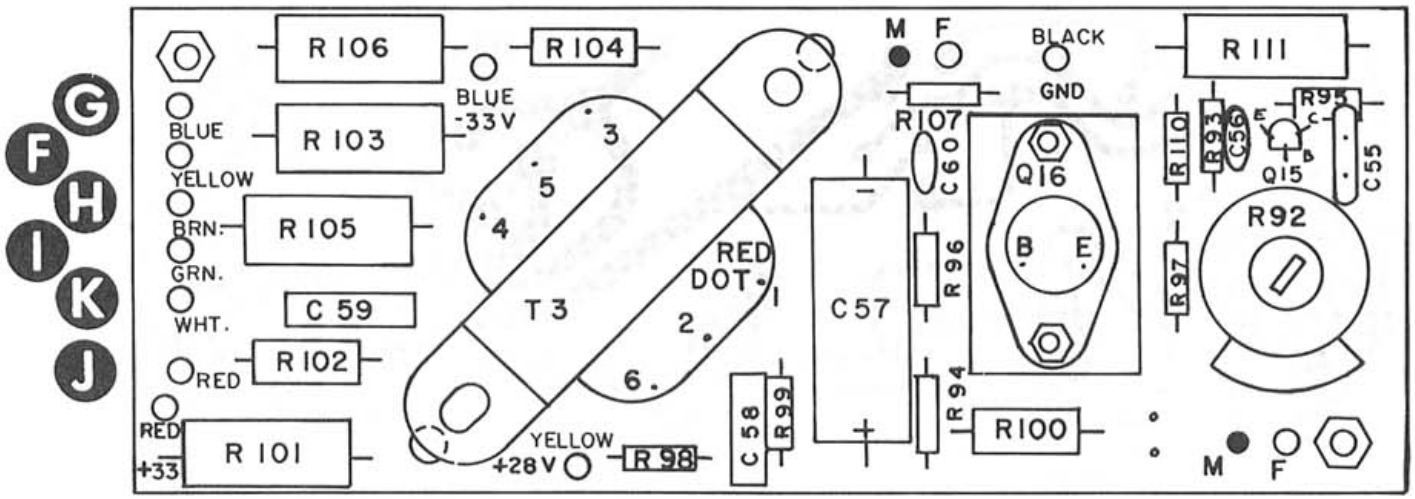


Figure 14. Circuit Board Assembly 107600 (Treble Amplifier)

Reference Designation	Description	Part No.
C55	Capacitor, .02 mfd	028423
C56, C60	Capacitor, .0047 mfd	028431
C57	Capacitor, electrolytic, 150 mfd, 25VDC	031294
C58	Capacitor, .033 mfd	028654
C59	Capacitor, 0.1 mfd	022251
Q15	Transistor, SPS4382	026237
Q16	Transistor, 2N3054	023754
	Heat Sink	045674
	Screw, machine, 6-32 x 3/8	032052
	Nut, hex, 6-32 x 1/4 x 3/32	039701
	Washer, lock, 6 x 9/32 x .018	028993
R92	Potentiometer, 20K	037648
R93, R98, R99	Resistor, 1.2K, 1/2W, 10%	018036

Reference Designation	Description	Part No.
R94	Resistor, 470-ohm, 1/2W, 10%	028068
R95	Resistor, 27-ohm, 1/2W, 10%	021253
R96	Resishtor, 2.2K, 1/W, 10%	028571
R97	Resistor, 27K, 1/2W, 10%	020835
R100	Resistor, 18-ohm, 1W, 10%	031146
R101, R103	Resistor, wire-wound, 430-ohm, 5W, 5%	023648
R102, R104	Resistor, 6.8-ohm, 1W, 5%	055475
R105, R106	Resistor, wire-wound, 0.5-ohm, 5W, 5%	023200
R107	Resistor, 820-ohm, 1/2W, 10%	028373
R110	Resistor, 47K, 1/2W, 10%	028506
T3	Transformer, driver	023788
	Etched Circuit Board	022848

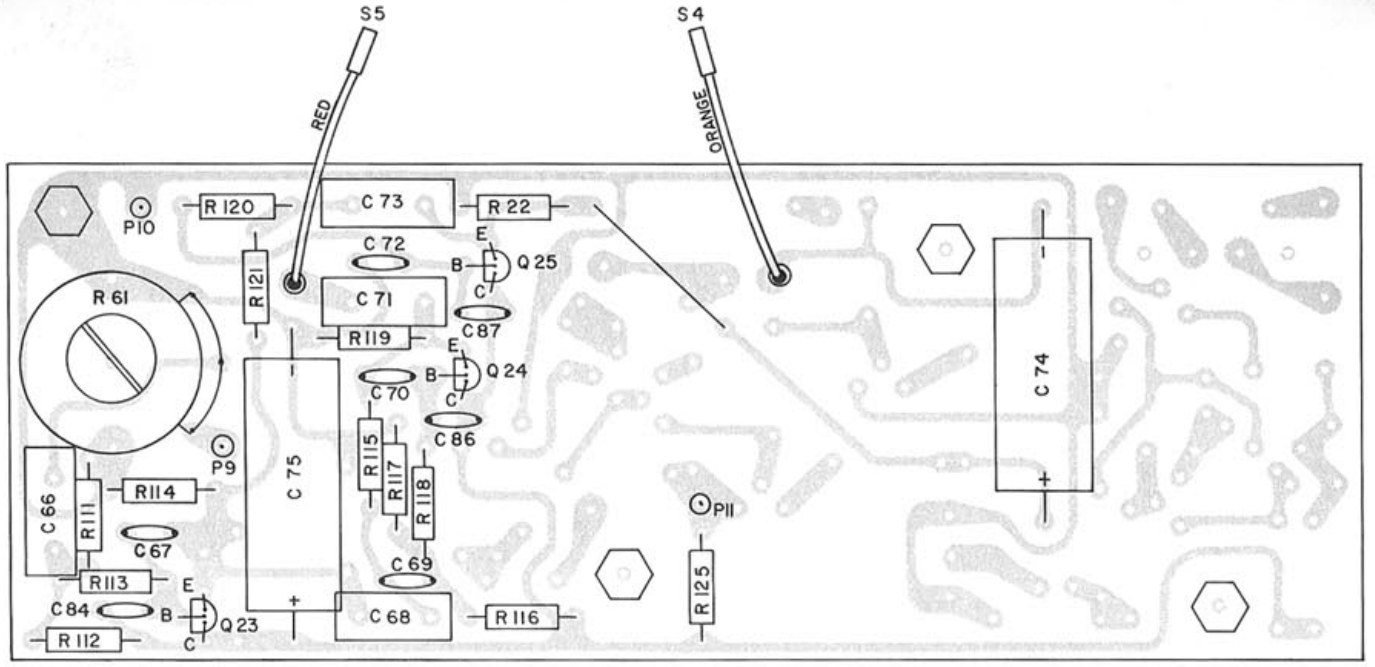


Figure 15. Circuit Board Assembly 062877 (Crossover Network)

Reference Designation	Description	Part No.
C66, C71	Capacitor, poly, 0.1 mfd, 200VDC	022251
C67, C69, C70, C72	Capacitor, disc, .0047 mfd, 100VDC	028431
C68, C73	Capacitor, mylar, .033 mfd, 100 VDC	028654
C74	Capacitor, electrolytic, 50 mfd, 50VDC	025262
C75	Capacitor, electrolytic, 250 mfd, 35VDC	065086
C84, C86, C87	Capacitor, disc, .00047 mfd, 1000VDC	028662
Q23, Q24, Q25	Transistor, MSPS4382	026237
R61	Potentiometer, 20K	037648
R111, R112	Resistor, 220K, 1/2W, 10%	013615
R113, R118	Resistor, 1.2K, 1/2W, 10%	018036
R114, R119, R122	Resistor, 3.3K, 1/2W, 10%	024141
R115, R121	Resistor, 4.7K, 1/2W, 10%	028555
R116	Resistor, 82K, 1/2W, 10%	027102
R117	Resistor, 120K, 1/2W, 10%	027078
R120	Resistor, 47K, 1/2W, 10%	028506
R125	Resistor, 820-ohm, 1/2W, 10%	028373
	Etched circuit board	035824

(key to figure 16 ➡)

Item	Description	Part No.
1	Cable Assembly, speaker, orange/black, 34-in.	063016
2	Speaker, 15-in., 4-ohm	031070
3	Screw, machine, 10-24 x 1-1/4	012849
	Ball Bearing Assembly	051003
4	Support, upper rotor	051078
5	Screw, machine, 8-32 x 13/16	026138
6	Nut, hex, 8-32 x 11/32 x 1/8	026773
7	Washer, lock, 8 x 5/16 x .020	026765
8	Washer, flat, 10 x 3/4 x 3/64	026518
9	Bushing, .196 x .312 x .325	051060
10	Grommet, 1 x 3/4 x 5/16	050641
11	Retainer, lower rotor bearing	051052
12	Bearing, rotor ball	051045
13	Grommet, 9/16 x 3/8 x 5/16	051037
14	Retainer, upper rotor bearing	051029
15	Belt, drive, 870 mm x 5 mm	011700
16	Shaft and pulley assembly	051706
17	Bushing, rubber, 1/8 x 3/8 x 3/4	051730
18	Rotor, wood, 17 x 9	032292*
19	Grommet, 1-1/16 x 3/16 x 1/2	051326
20	Washer, flat, 3/8 x 7/8 x 5/64	051342
	Ball Bearing Assembly, Rotor	051102
21	Nut, hex, 8-32 x 11/32 x 1/8	026773
22	Washer, lock, 8 x 5/16 x .020	026765
23	Retainer, upper bearing	051029
24	Bearing	051045
25	Grommet, 9/16 x 3/8 x 5/16	051037
26	Retainer, lower bearing	051052
27	**Screw, machine, 10-24 x 3/8	025460
28	Bearing plate	051128
29	Grommet, 1 x 3/4 x 5/16	050641
30	Bushing, .196 x .312 x .325	051060
31	Washer, flat, 10 x 3/4 x 3/64	026518
32	Washer, lock, 8 x 5/16 x .020	026765
33	Screw, machine, 8-32 x 13/16	026138

*Assembly 040060, which includes grommets, may be ordered.

**Not part of 051102 assembly.

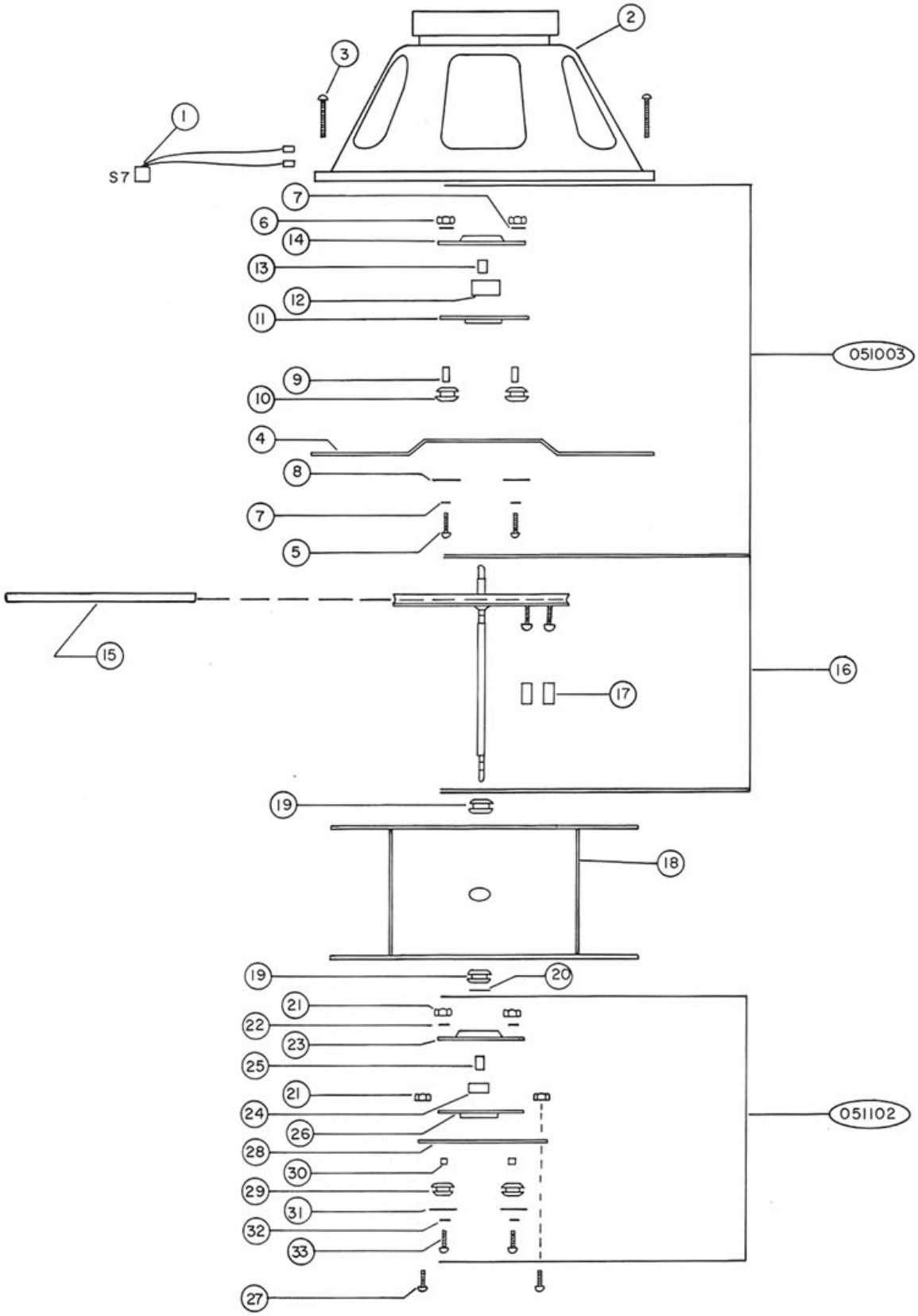


Figure 16. Bass Speaker, Lower Rotor, and Associated Parts

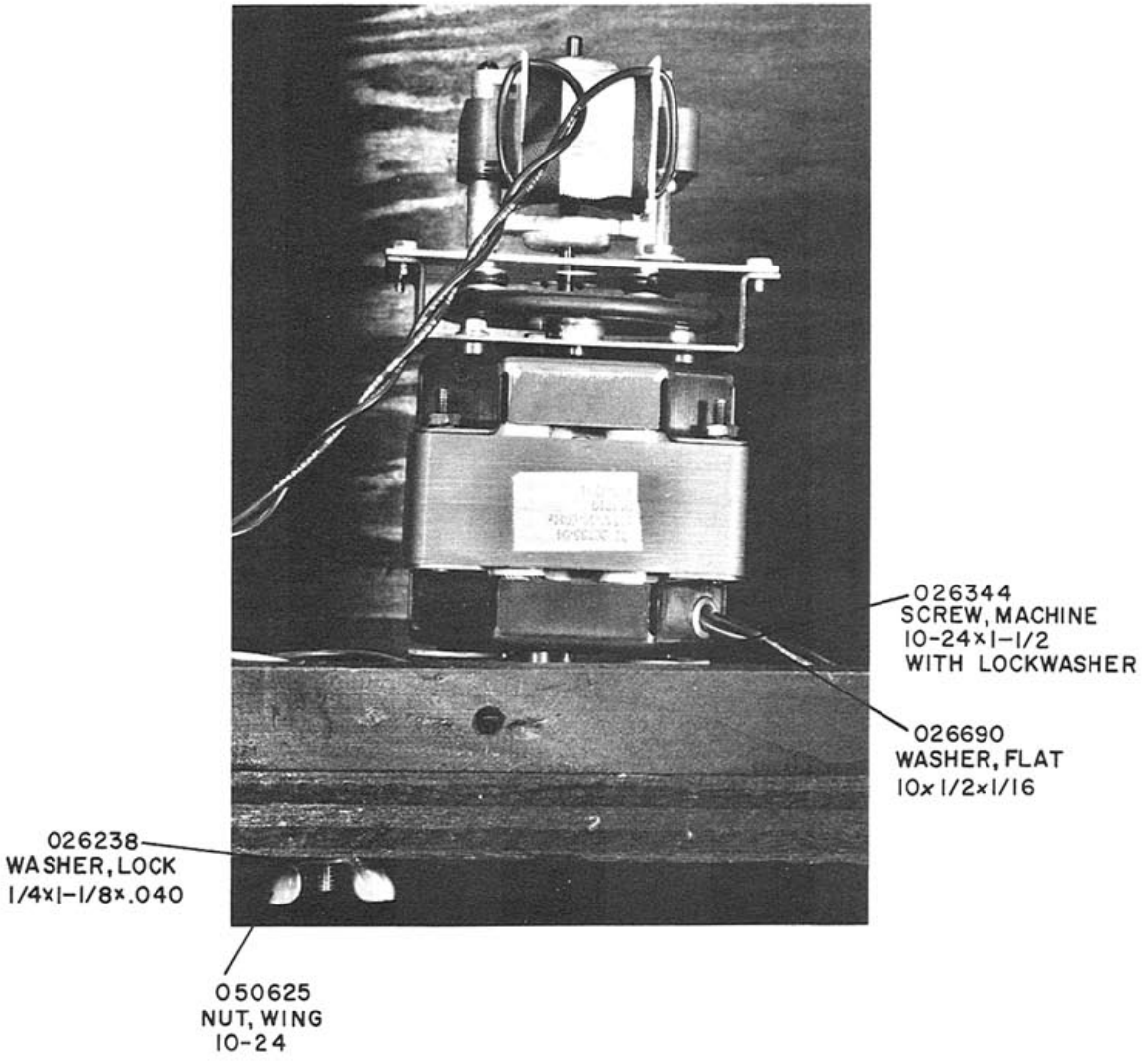


Figure 17. Lower (Bass) Motor, Assembled

Item	Description	Part No.
	Motor Assembly, 2-speed, V down, 117V 60Hz	112770
	Motor Assembly, 2-speed, V down, 117V 50Hz	112780
	Motor Assembly, 2-speed, V down, 220/240V 50Hz	062745
1	Housing, plug, 6-circuit, yellow	033944
2	Insert, contact, male	023309
3	Motor Assembly, slow, 117V 60Hz	054031
	Motor Assembly, slow, 220/240V 50Hz	062752
4	Screw, sheet metal, 6 x 1/4	022666
5	Wheel Assembly, rim drive	014027
6	Screw, set, hex socket head, 10-32 x 3/16	025973
7	Ring, O, 2.475 ID	014159
8	Wheel and Hub Assembly	055921
9	Bracket, U	014266
10	Screw, machine, 8-32 x 1/4, hex washer head	107670
11	Pulley, 60Hz	018309
	Pulley, 50Hz	014928
12	Screw, machine 8-32 x 1/4, hex washer head	108510
13	Washer, lock, 8 x 9/16 x .025	039131
14	Bracket Assembly, motor mounting	048207
15	Screw, machine, 8/32 x 5/8, with lock washer	025452
16	Washer, flat, 8 x 31/32 x 1/16	026641
17	Grommet, 1 x 3/4 x 5/16	050641
18	Bushing, shoulder, #10	048991
19	Bushing, .196 x .312 x .325	051060
20	Bumper, rubber	010751
21	Screw, machine, 10-24 x 1-3/4, with lock washer	026708
22	Nut, hex, 10-24 x 3/8 x 1/8	026542
23	Washer, lock, 10 x 3/8 x .022	028019
24	Washer, flat, 10 x 1-3/16 x 3/64	026625
25	Lever, locking	010744
26	Bracket, motor mounting	010728
27	Ring, C	050666
28	Motor, D10, 117V 50/60Hz	014019
	Motor, D10, 220/240V 50Hz	020438

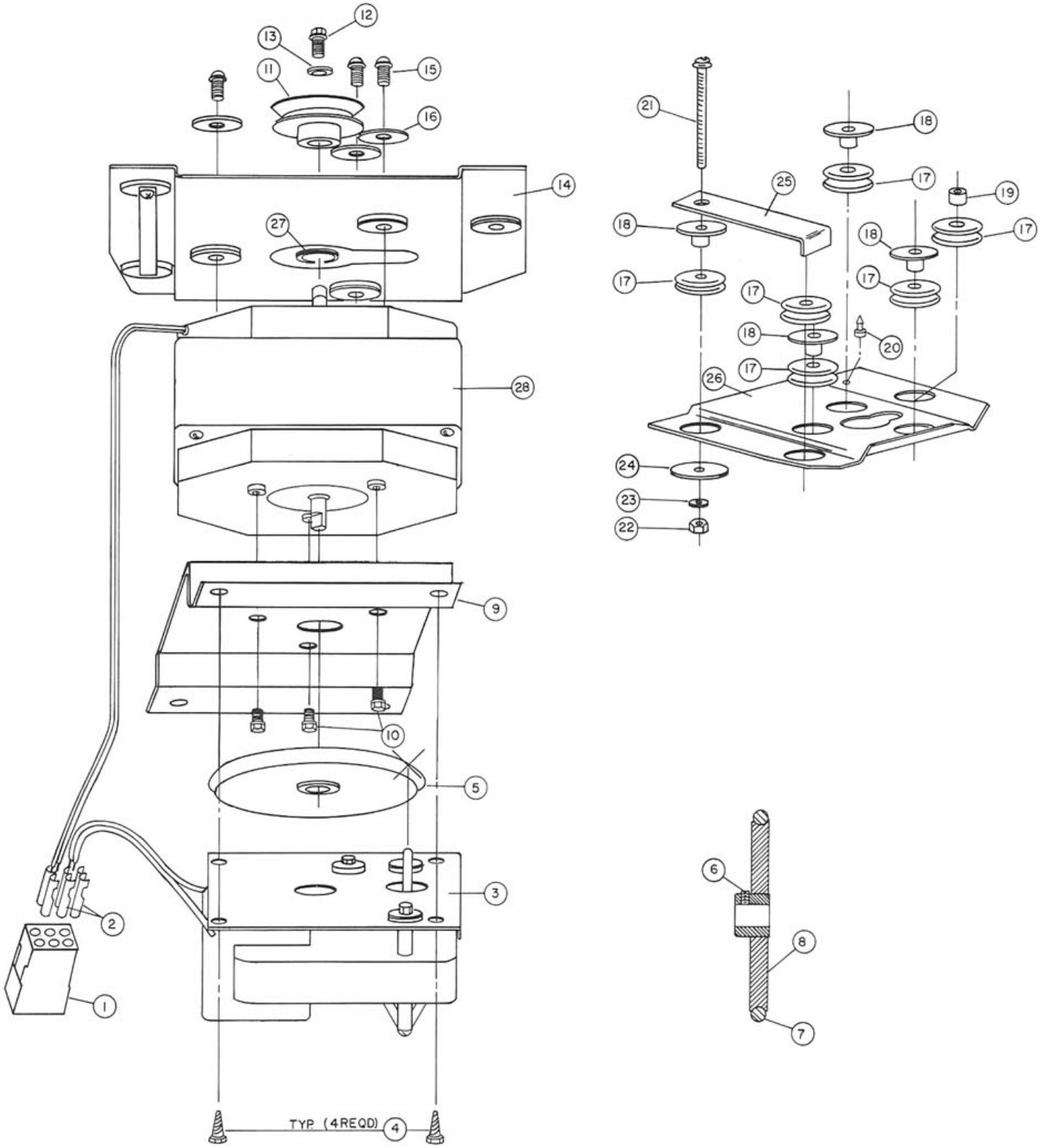


Figure 18. Lower (Bass) Motor and Associated Parts

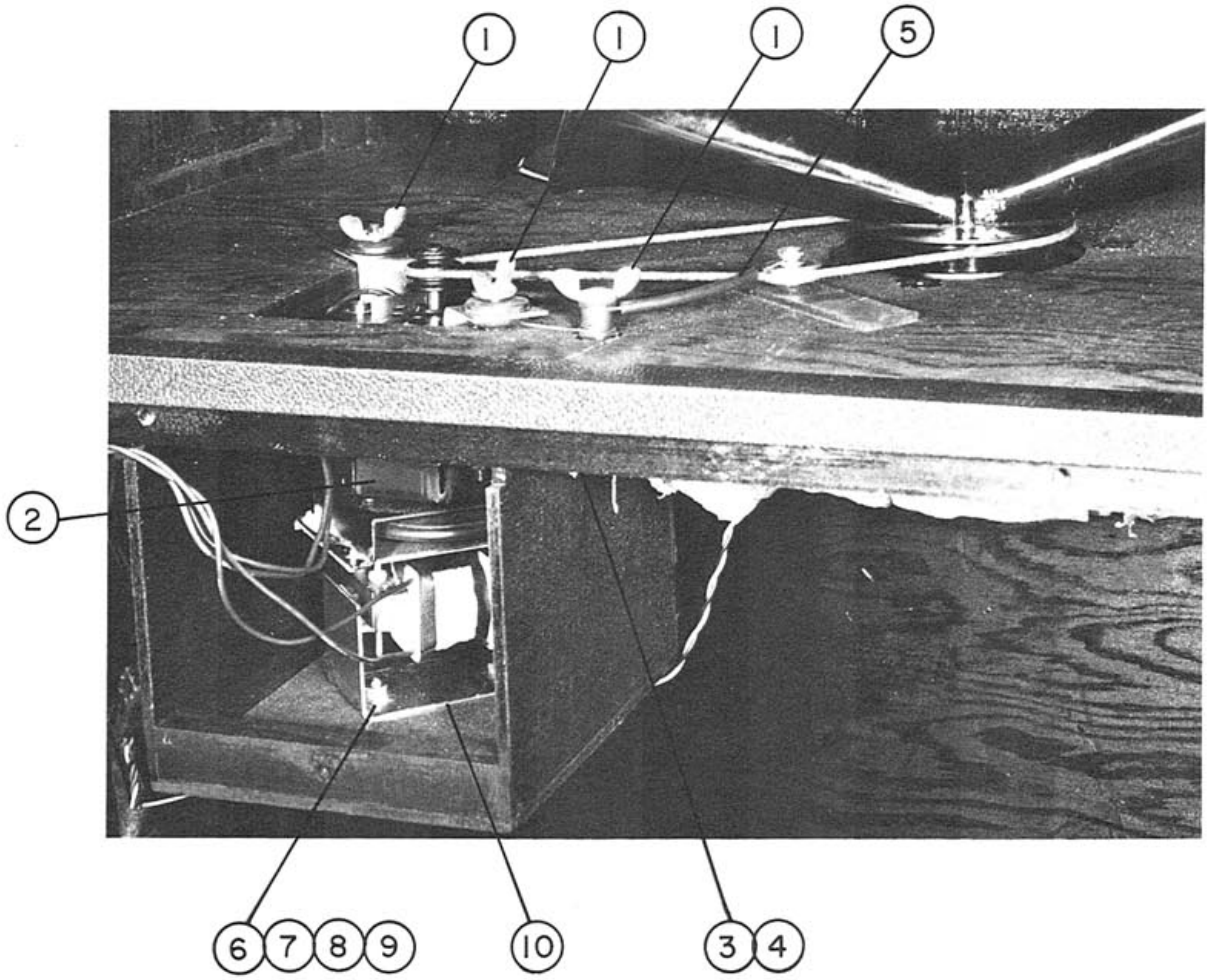


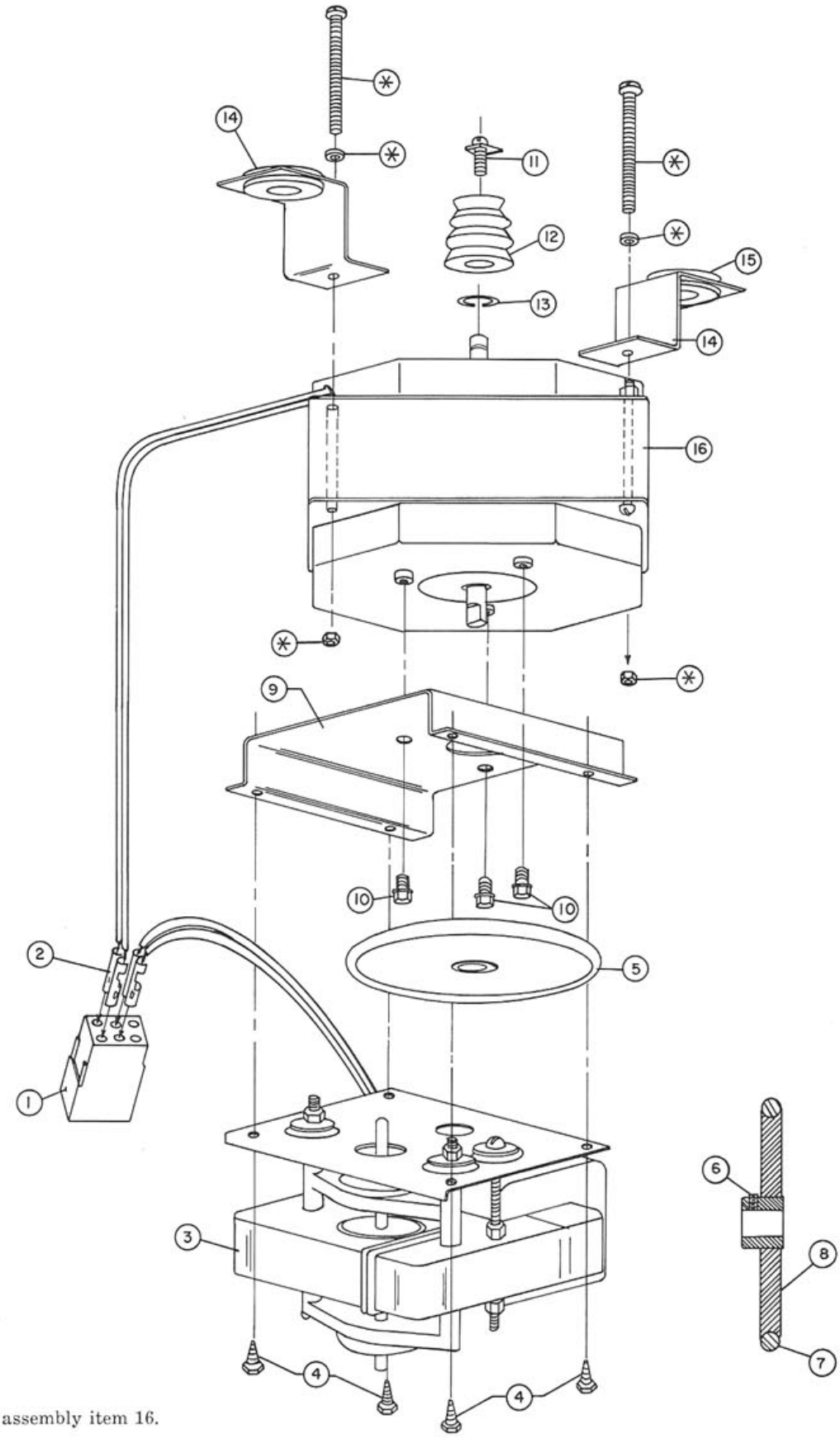
Figure 19. Upper (Treble) Motor, In Position, With Associated Parts

Item	Description	Part No.
1	Nut, wing, 10-24	050625
2	Motor Assembly, 2-speed, 117V 60Hz	063578
	Motor Assembly, 2-speed, V-up, 117V 50Hz	063586
	Motor Assembly, 2-speed, 220V 50Hz	062729
3	Screw, machine, 10-24 x 1-3/4, with lock washer	013524
4	Washer, flat, 10 x 1/2 x 1/16	026690
5	Idler Assembly	050708
	Pulley and Bearing Assembly	050716
	Spring Assembly	050732
	Screw, machine, 10-32 x 1/2	025544
	Washer, flat, 10 x 1/2 x 1/16	026690
	Washer, lock, 10 x 3/8 x .022	028019
	Nut, hex, 10-32 x 3/8 x 1/8	027953
6	Screw, machine, 10-24 x 5/8, with lock washer	025445
7	Washer, flat, 10 x 3/4 x 3/64	026518
8	Nut, hex, 10-24 x 3/8 x 1/8	026542
9	Washer, lock, 10 x 3/8 x .022	028019
10	Bracket, stabilizing	040386

(key to figure 20 ➡)

Item	Description	Part No.
	Motor Assembly, 2-speed, V-up, 117V 60Hz	063578
	Motor Assembly, 2-speed, V-up, 117V 50Hz	063586
	Motor Assembly, 2-speed, 220V 50Hz	062729*
1	Housing, plug, 6-circuit, red (P)	033936
2	Insert, contact, male	023309
3	Motor Assembly, slow speed, 117V 60Hz	012534**
	Motor Assembly, slow speed, 220V 50Hz	019349*
4	Screw, sheet metal, 6 x 1/4, hex washer head	026666
5	Wheel Assembly, rim drive	014027
6	Screw, set, hex socket head, 10-32 x 3/16	025973
7	Ring, O, 2.475ID	014159
8	Wheel and Hub Assembly	055921
9	Bracket, U	017012
10	Screw, machine, 8-32 x 1/4, hex washer head	107670
11	Screw, machine, 8-32 x 3/8, with lock washer	026740
12	Pulley, 3-step, 60Hz	050500
	Pulley, 3-step, 50Hz	050559
13	Ring, C	050666
14	Bracket, Z	050658
15	Grommet, 1 x 3/4 x 5/16	050641
16	Motor, D10, 117V 50/60Hz	014019
	Motor, D10, 220V 50/60Hz	020438

*Also for 240V
**Also for 117V 50Hz



*Part of motor assembly item 16.

Figure 20. Upper (Treble) Motor and Associated Parts

INTRODUCTION

LESLIE Speaker Model 760 or 770 operates in conjunction with a wide variety of single-channel output organs. Through auxiliary connections the speakers are usable with organs which have their own amplifiers or those which do not. The two models are functionally identical; only the cabinets are different.

Separate treble and bass amplifiers serve the speakers' two channels, giving powerful, undistorted 90 watt (RMS) total output.

The organ signal is divided at the crossover network into higher (over 800 Hz) and lower frequencies. Each group of frequencies is then separately amplified and fed to the appropriate speaker with conjunct rotor (figure 1). The motors which actuate the rotors can operate at either of two speeds, at the player's option: tremolo (fast) or chorale (slow). A brake circuit in the power supply provides positive stopping of the rotors at the turn of a switch.

SECTION I. USER'S INFORMATION

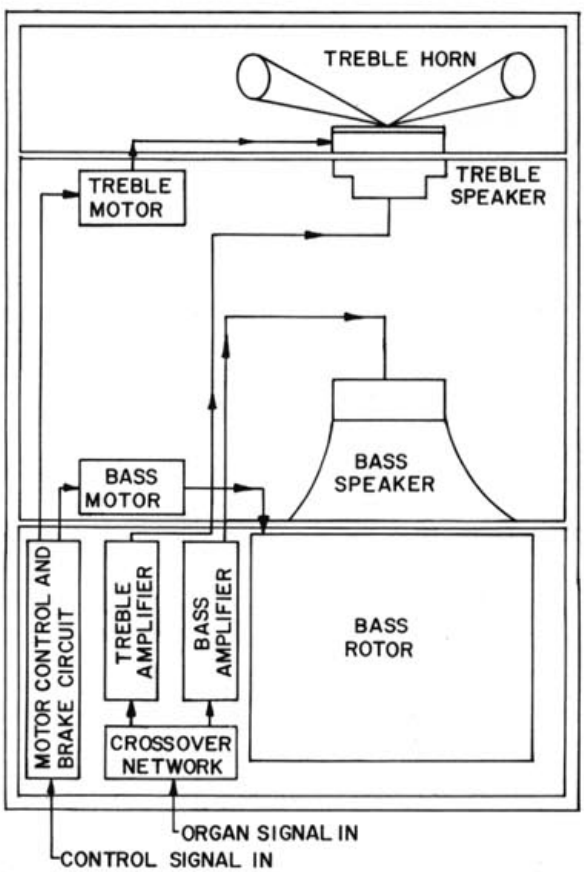


Figure 1. Functional Block Diagram

LOCATING THE SPEAKER

In the Home

One of your first considerations will be where to place the speaker for best effect. While some organists prefer having the LESLIE speaker close to the organ, most prefer a more remote location. The antiphonal effect of remote sound contrasted with console sound creates an exciting stereo effect not obtained by situating the LESLIE speaker close to the organ.

Placing the speaker in an adjoining room can be nice, providing the sound is not obstructed by walls and corners. Remember, direct sound will not travel around corners — only reflected sound will.

Never place your speaker in a closet! Sound from the LESLIE speaker radiates a full 360 degrees, and if you block off all but the face side you are preventing it from giving you the fine sound it was intended to.

Frequently the speaker is situated in an entrance hallway, thus avoiding the problem of seating listeners too close to it. Sitting too close to the LESLIE speaker is no better than hearing the console alone from the player's position.

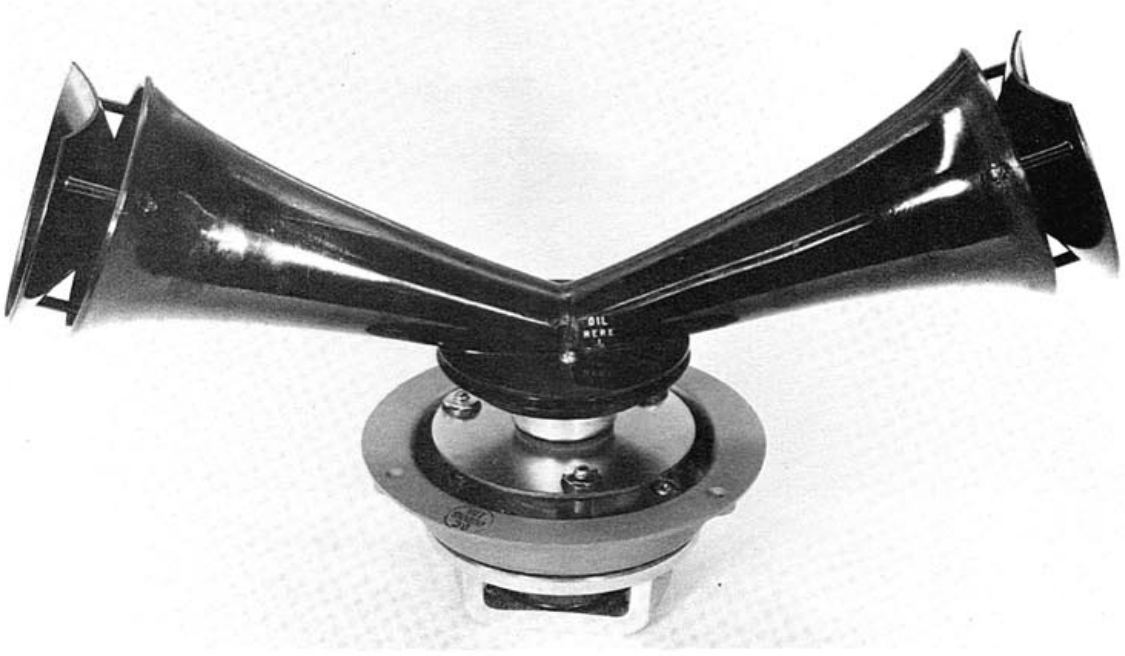


Figure 21. Treble Horn and Speaker, Assembled (Without Spacer Ring)

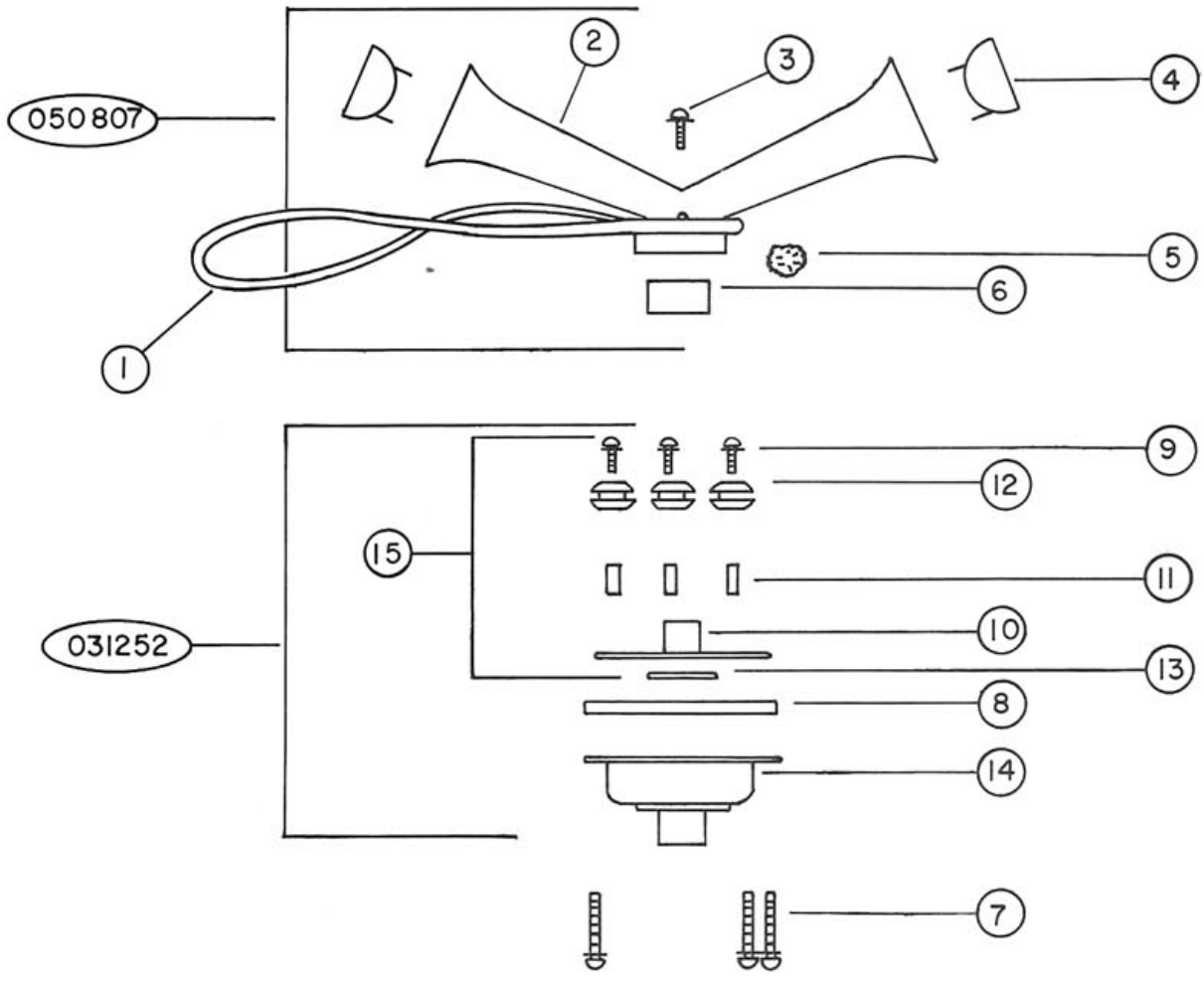


Figure 22. Treble Speaker, Horn, and Associated Parts

Item	Description	Part No.
1	Belt, drive, 680 mm x 3 mm	021048
	Horn Assembly, treble	050807
2	Horn, treble (without reflectors)	050815
3	Screw, machine, 6-32 x 5/8, with lock washer	019224
4	Reflector, treble horn	050823
5	Filter, acoustic	050161
6	Hub, treble horn assembly	016816
7	Screw, machine, 10-24 x 1-1/2, with lock washer	026344
8	Spacer Ring, treble driver	020313
	Speaker and Spindle Assembly, treble	031252
9	Screw, machine, 6-32 x 1-1/8, with lock washer	016832
10	Spindle and Plate Assembly	050229
11	Bushing, .144 x .281 x .812	050294
12	Grommet	050211
13	Washer, flat, 5/8 x 1-1/2 x 1/8	050286
14	Treble Driver	031260
15	Spindle Assembly (with hardware, for replacement use)	050906

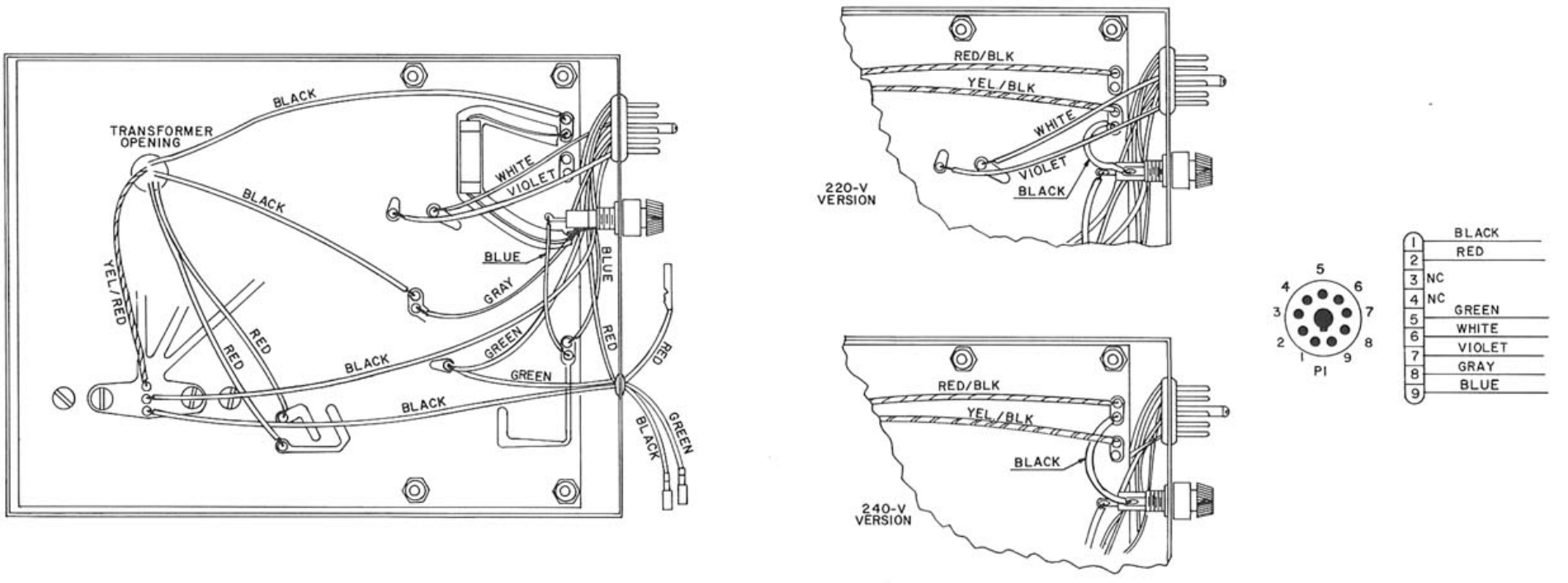


Figure 23. Power Supply Wiring

WIRING

To facilitate the proper reassembly of model 760/770 after part replacement the wiring of major assemblies is illustrated and described in figures 23 and 24. Reference may also be made to the complete electrical schematic located in the back of this manual.

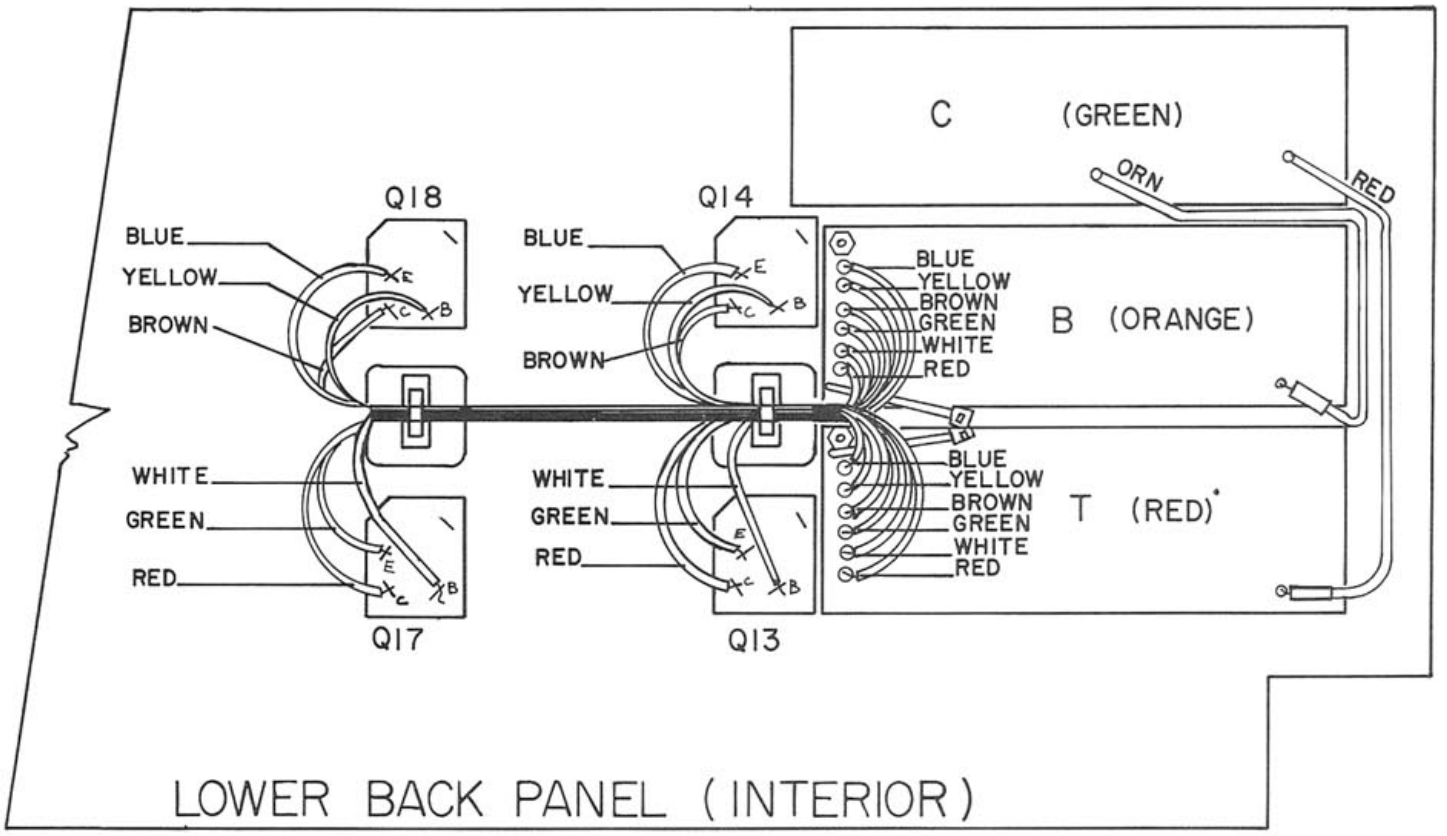


Figure 24. Amplifier Wiring

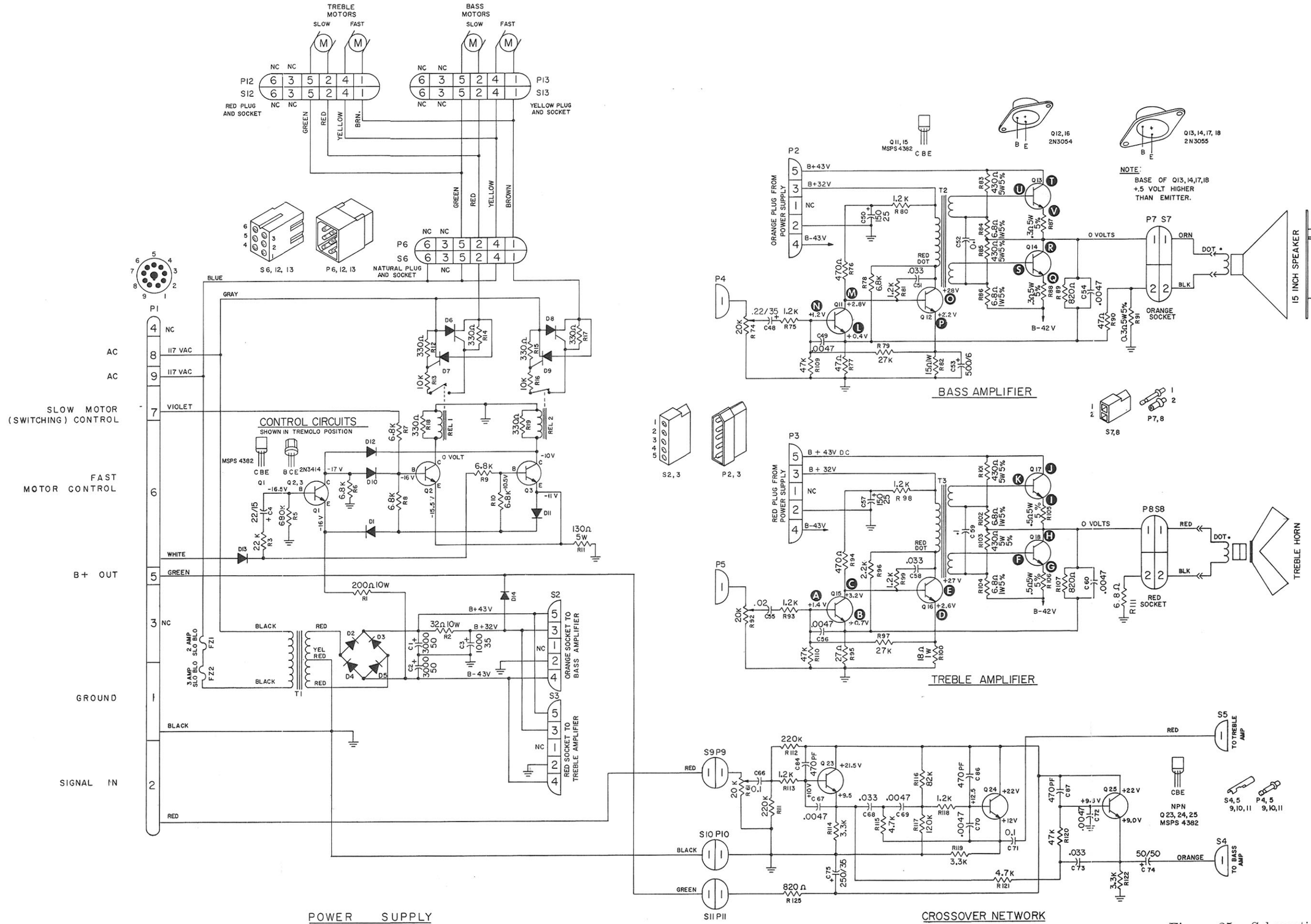


Figure 25. Schematic, LESLIE Speaker Model 760/770

Sound reflection is desirable; yet in most homes much sound is absorbed by furniture, rugs, and drapes rather than being reflected. Due to sound absorption, the "big hall" effect was difficult to achieve in home installations prior to the advent of reverberation units. The addition of the LESLIE speaker to your organ system helps to overcome some of this absorption problem, as well as providing a movable sound source.

Placing the speaker diagonally in a corner is good practice. Sound will be reflected off the two adjacent walls, enhancing the beauty, power, and dispersion of the music.

Another problem common to home installations is that of standing waves; certain notes sound softer or louder than others from certain parts of the room. This usually occurs in the lower frequencies. Even a slight change in speaker placement can change the relative volume of a note. Moving the speaker slightly while monitoring the result from the listening area may alleviate a standing wave problem.

In Professional Use

Place the LESLIE speaker approximately the same distance from the audience as is the organ. Avoid placing the LESLIE speaker too close to the listeners; not only is the output very strong, but the stereo effect will be lost if the positions of the organ and LESLIE speaker are greatly unbalanced.

Remember that the LESLIE speaker radiates sound through the full 360-degree area around it. Restriction of the sound dispersion by placing the speaker too close to a wall or solid partition will reduce the quality of the sound experienced by the audience.

PREPARING THE SPEAKER FOR USE

Customarily, your LESLIE speaker dealer will deliver and set up your speaker, ready to play. However, if for some reason this service is not available, perform the following steps to prepare the speaker for use:

1. Remove the carton and shipping skid.
2. 760: Remove the upper back panel. Remove any rubber bands or other restraints which hold the treble horn in place. Replace the panel. Go on to step 4.

   770: Remove the upper back panel. Remove any rubber bands or other restraints which hold the treble horn in place. Remove the shipping blocks. Replace the panel. Go on to step 3.

3. (770 only) Locate a hole in the center back panel, on the left. A tag should be hanging from the hole, or be just inside it. Pull firmly on the tape to which the tag is attached, until the shipping block comes away from the motor. Remove the block.

4. Connect a Combo Pre-amp II or other recommended console connector to the organ, following the instructions supplied with the connector.

   Extreme caution must be exercised when performing any operation inside the cabinet. Heed all warnings and cautions given in the kit instructions.

5. Connect the LESLIE speaker to the Combo Pre-amp II or console connector with the cable which comes with the connector kit. (If the applicable kit does not contain the cable, order the cable specified in the following paragraph.)

6. When a console connector is used, adjust the speaker volume according to the VOLUME ADJUSTMENT section of this manual.

   When a Combo Pre-amp II is used follow the volume control adjustment instructions given in the installation instructions accompanying the Combo Pre-amp II.

Connecting Cable

The 9-conductor connecting cable (LESLIE part number 021600) is supplied in a standard 30-foot length, complete with plug and socket. If the distance between the console and speaker exceeds 30 feet, two or more of these standard cables may be connected in series.

Figure 2. Cable Diagram
(Plug and socket viewed from wire end)

If a specific length of cable is required other than 30 feet or a multiple of 30 feet, bulk cable, plugs, and sockets should be obtained through your LESLIE speaker dealer.

In attaching the plug and socket to the cable, the color coding should be followed exactly, with special care being given to the handling of connections involving AC. The cable diagram, figure 2, shows the color coding and design.

Line Voltage

This model is manufactured in two versions: one for use with 117-volt, 50- or 60-Hz electric current and the other for use with 220- or 240-volt, 50-Hz current.

Prolonged fluctuations in line voltage are to be avoided because low voltages can adversely affect volume level and performance quality, while sharp increases in voltage could cause overheating, and damage to the components.

A voltage-regulating device should be used if the line voltage varies beyond these limits: lower than 100 volts (180, for the 220-volt model; 200, for the 240-volt model) higher than 130 volts (250, for the 220-volt model; 270, for the 240-volt model).

220- to 240-volt Conversion

Normally the speaker is shipped from the factory wired for the type of electricity which the customer uses. Versions built for 220/240-volt service can be adapted to either electrical supply. However, if a change is to be made the power supply must be removed so that the wiring can be altered. See the wiring diagram for the power supply, in the Service portion of this manual.

SOUND CONTROL AND BALANCE

Controls

There are two controls included in console connector kits designed for use with these speakers: an echo control and a tremolo control. The echo control switches the organ output to the LESLIE speaker, the internal organ speaker, or to both. The tremolo control varies the speed of the bass and treble rotors for tremolo (fast) or chorale (slow) effects.

Volume Adjustment

LESLIE speakers are set at the factory to a balanced volume output. However, because of variations in speaker-organ combinations and in musical taste some people may wish to adjust the volume levels. The following procedure may be used:

1. Back off the master volume control about half-way.
2. Have someone hold a chord encompassing the organ's entire frequency range, with the expression pedal on full.
3. Set the volume controls of the bass and treble amplifiers according to your musical preference. Controls are located at the left of the lower back panel.
4. Turn up the master volume control gain until distortion is evident; then, decrease the gain until distortion just disappears.

MULTIPLE SPEAKER INSTALLATION

When requirements of volume and sound distribution exceed what can be obtained from one LESLIE speaker, additional speakers should be added to achieve the proper acoustical balance. Each added speaker is connected by means of a 117-V (part number 021709) or 220/240-V (part number 047738) power relay available through your franchised LESLIE speaker dealership. For each added speaker, the power relay provides a

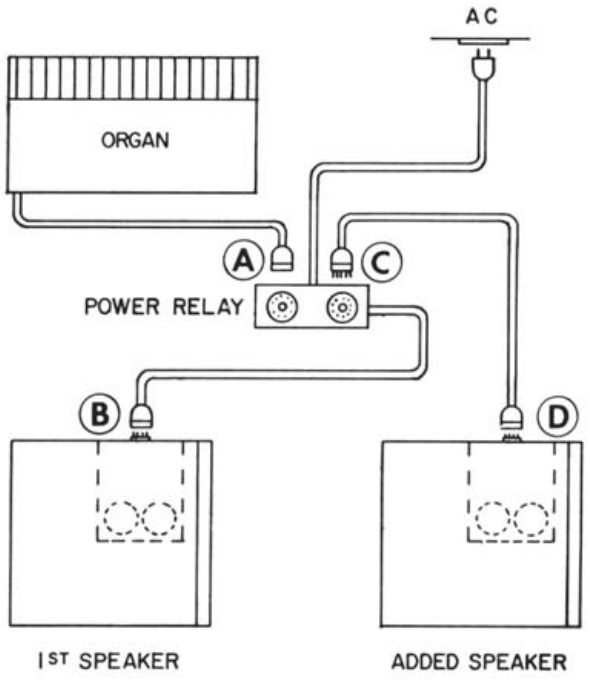


Figure 3. Multiple Speaker Installation

source of AC power independent of the organ. The added speaker is switched on and off by the organ's power switch. The console connector controls will control the added speaker(s) simultaneously with the first speaker.

Procedure For Adding A Second Speaker

1. Turn off the organ.
2. Disconnect the interconnecting cable from the original speaker.
3. Attach this end of the interconnecting cable to the power relay (A, figure 3). Other end is in the organ.
4. Attach the socket end of the relay cable to the original speaker. (B)
5. Plug the connecting cable (part number 021600 or kit 7600) for the added speaker into the power relay socket. (C)
6. Attach the other end of this connecting cable to the added speaker. (D)
7. Insert the AC plug of the power relay into an AC outlet.

Adding More Speakers

Use an additional power relay for each speaker added. Connect the cable from the first power relay into the second relay. Connect the cable from the second relay to the original speaker. Plug each added speaker into its individual power relay. Each relay must be connected to an AC source.

SPECIAL USES

Broadcasting And Recording

Here are a few general recommendations for recording and broadcasting:

1. Select a fairly "live" studio.
2. Play the organ at medium to full volume level.
3. Place microphone ten to fifteen feet from the speaker and about level with the upper shelf.

Non-Organ Use

This speaker will function satisfactorily only in its intended use as a musical instrument. No other applications are recommended.

LESLIE ACCESSORIES

The accessories listed below are available through your franchised LESLIE speaker dealer.

POWER RELAY — Used in multiple speaker installations. Specify part no. 021709 for 117-V speakers; part no. 047738 for 220/240-V speakers.

SPEAKER CABLE — A 30′ length of 9-conductor cable with plug and receptacle, designed to attach the model 760 or 770 to the console connector. Specify kit no. 7600.

SPEAKER COVER — Made of heavy-duty vinyl with white trim. Specify part no. 113420. (Made for model 760.)

COMBO PRE-AMP II or CONSOLE CONNECTOR — Used to connect the organ to the speaker and to provide controls. See your dealer's list for the correct combination for your organ.

SPECIFICATIONS

Cabinet Finish	760: Covered with Black Levant Leatherette with silver and black grill cloth over the speaker ports. Edge trim is silver-gray molding. 770: Hardwood veneer with quality lacquer finish in colors to harmonize with organ consoles.
Cabinet Dimensions	760: Height: 43-3/16 inches Depth: 20-3/16 inches Width: 28 inches 770: Height: 41-1/8 inches Width: 29 inches Depth: 20-1/2 inches
Weight	760: 170 lb — ready to ship 148 lb — ready to play, without skid 770: 155 lb — ready to ship 133 lb — ready to play, without skid
Loudspeakers	A 16-ohm, compression-type high-frequency driver for signals of 800 Hz and over. A 4-ohm, 15-inch heavy-duty bass speaker for signals below 800 Hz.
Power Requirement	250W
Amplifiers	Bass and treble amplifiers are solid-state units mounted on separate circuit boards. Total power output 90 watts RMS.
Fuses*	2-amp slo-blo (part number 062265) for 117-V, 50/60 Hz cabinets. 1-amp slo-blo (part number 043711) for 220-V, 50-Hz or 240-V, 50-Hz cabinets.

*A blown fuse should be replaced only after the overload which caused it to blow has been eliminated. **Never use a replacement fuse with a higher rating than the original.**

SHIPPING

If it is necessary to ship the LESLIE speaker, care should be exercised to keep the cabinet in an upright position. Placing the cabinet on a skid will facilitate safe moving, and padding should be used to protect the finish.

MAINTENANCE

The LESLIE speaker is carefully engineered for durability and maximum service. Except for lubrication and periodic checking of the belts it requires little attention.

CAUTION

To avoid electrical shock, or injury due to movement of mechanical parts, do not perform service inside the cabinet. If belt adjustment or replacement, motor lubrication, or other maintenance work is required, it should be done by a service man authorized by the dealer or factory to perform such work.

Drive Belts

Two drive belts propel the speaker rotors. If either belt becomes worn, noisy speaker operation may result. A worn drive belt should be replaced.

TREBLE DRIVE BELT:

This belt drives the treble horn on the upper shelf. Should the treble drive belt become loose, have it replaced. The speed of the treble horn may be increased or decreased by shifting the treble drive belt to the larger or smaller diameter grooves in the three-step pulley.

BASS DRIVE BELT:

Proper drive belt tension is important. An overly tight or loose belt won't usually drive the rotor to full tremolo speed and can cause noise. An over-tightened belt may even cause excessive wear on the motor bearings. With a properly adjusted drive belt, the rotor should reach full tremolo speed in 7 to 10 seconds, with the belt slipping slightly on the drive pulley during acceleration. Such slippage is actually necessary for attaining full rotor speed. The belt acts like a torque converter. As it slips, the drive pulley gathers momentum and torque. When the belt catches, the torque increase is transferred to the rotor, causing it to rotate faster.

TO CHECK BELT TENSION:

Switch the tremolo control from CHORALE to TREMOLO, observing time required for the rotor to reach full speed. Also, listen for any excessive motor noise. This may indicate an over-tightened drive belt.

TO ADJUST BELT TENSION:

Adjustments should be made only by a qualified service man.

Motor Lubrication and Cleaning

Use, climate, and dust conditions determine motor lubrication requirements. In normal service, yearly oiling is usually sufficient. However, if the speaker is used several hours a day, more frequent lubrication may be necessary. If the motor fails to start immediately the bearings may be dry or dirty.

Replacement Parts

Commonly-used replacement parts are available through your dealer or service man. A complete listing of part numbers is included in the service manual. For best results refer maintenance problems to authorized service personnel.

Cleaning the Cabinet

760: You can use saddle soap, a mild detergent, or hot water to clean the outside surface. Use a sponge or soft cloth. Wipe off excess moisture and let the cabinet air dry.

Do not use strong chemicals such as acetone or ammonia. They will permanently mar the luster of the covering material.

770: Treat the cabinet just as you would any other piece of fine wood furniture. Dusting is all the care normally needed; if desired it may be treated with a furniture polish or wax.

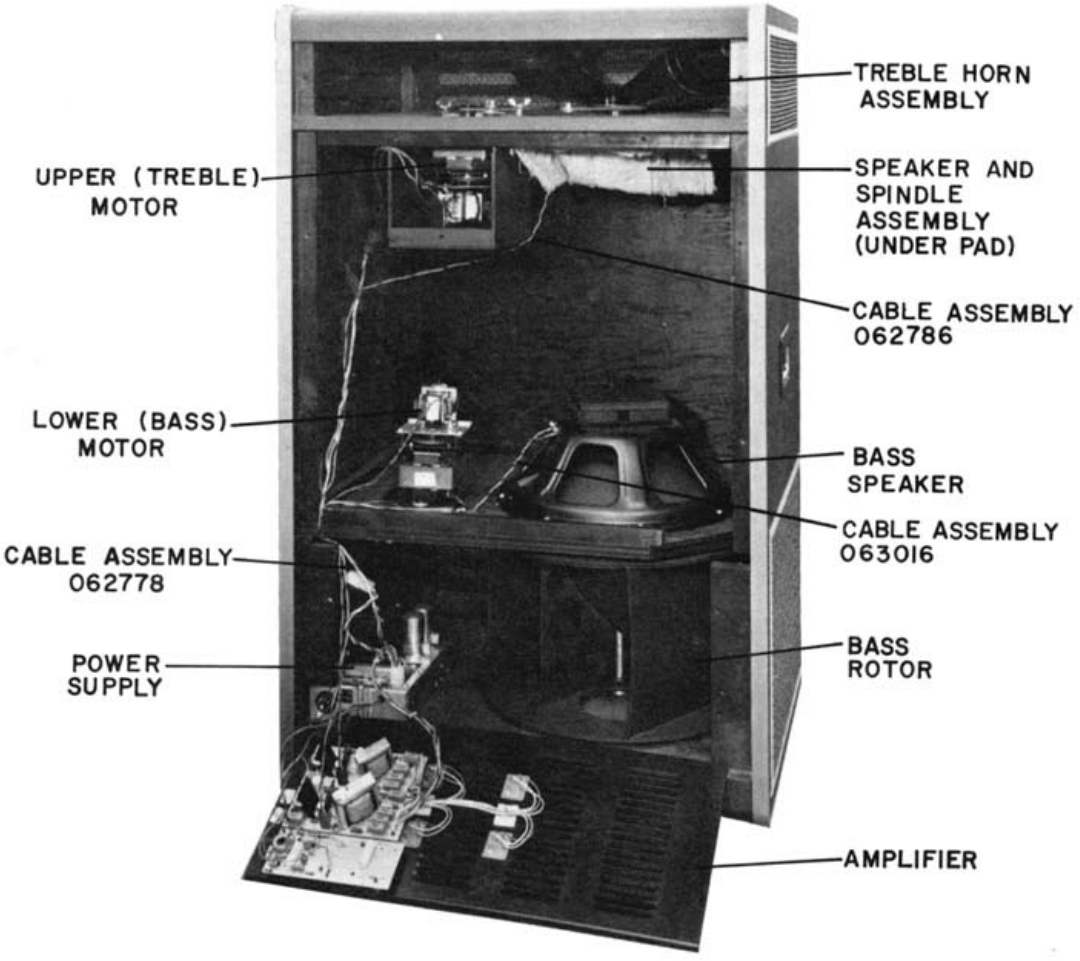


Figure 4. Major Components

SECTION II. SERVICE INFORMATION

MODEL DIFFERENCES

LESLIE Speaker Models 760 and 770 are manufactured in versions operable with 117-volt 60-Hz, 117-volt 50-Hz, 220-volt 50-Hz, and 240-volt 50-Hz electrical sources. Most assemblies and parts are alike in all versions; where there are differences the differences are noted. The basic discussion and parts listing is for the 117-volt 60-Hz model. Major differences occur in the power supplies and motor assemblies.

MAJOR COMPONENTS

The major components of the speaker are identified in figure 4. Each component is a readily-identifiable unit with a specific function. Parts lists and servicing information is given for each. Components and associated parts are sometimes grouped in the text for convenience, because of proximity or similarity of service procedures.

When disassembly and reassembly are begun the proper connection of plugs and sockets is often a source of confusion. Reference may be made to the complete schematic in the back of this manual for identification of electrical continuities, or to figure 5 for the physical location of the various connectors.

CAUTION

Due to the presence of electrical potential and the danger of moving mechanical parts, installation procedures or adjustments requiring work inside the LESLIE speaker cabinet or the organ console should be performed only by a service man authorized by the dealer or factory to perform such work.

GENERAL

Information is given in this section on testing, removal and replacement procedures, parts identification, wiring, details of disassembly and assembly, and other facts and instructions of use to those servicing the speakers. Unless otherwise noted, instructions and descriptions apply to both models.

MAJOR COMPONENT PART NUMBERS
(both models)

Power Supply	117V 60 Hz	112790
	117V 50 Hz	112790
	220V 50 Hz	107070
	240V 50 Hz	107740
Amplifier (all voltages)		062844
Lower (bass) Motor	117V 60 Hz	112770
	117V 50 Hz	112780
	220V 50 Hz	062745
	240V 50 Hz	062745
Cable Assembly (between power supply and both motors).		062778
Upper (treble) Motor	117V 60 Hz	063578
	117V 50 Hz	063586
	220V 50 Hz	062729
	240V 50 Hz	062729
Speaker (bass), 15-in., 4-ohm		031070
Rotor (bass), wood, 17 x 9		032292
Cable Assembly (between amplifier and bass speaker)		063016
Speaker (treble) **and Spindle Assembly**		031252
Horn Assembly (treble)		050807
Cable Assembly (between amplifier and treble speaker)		062786

Amplifier Circuit Boards

The bass and treble amplifier circuits are each mounted on a circuit board on the amplifier assembly. The metal panel of the assembly serves as a heat sink for the circuit transistors.

The amplifier leads are long enough to allow the heat sink to be laid flat for servicing. It may be necessary to untie the tape which holds these leads, to release the additional length of wire needed to move the panel out for servicing.

model 760/770

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