BOSE®
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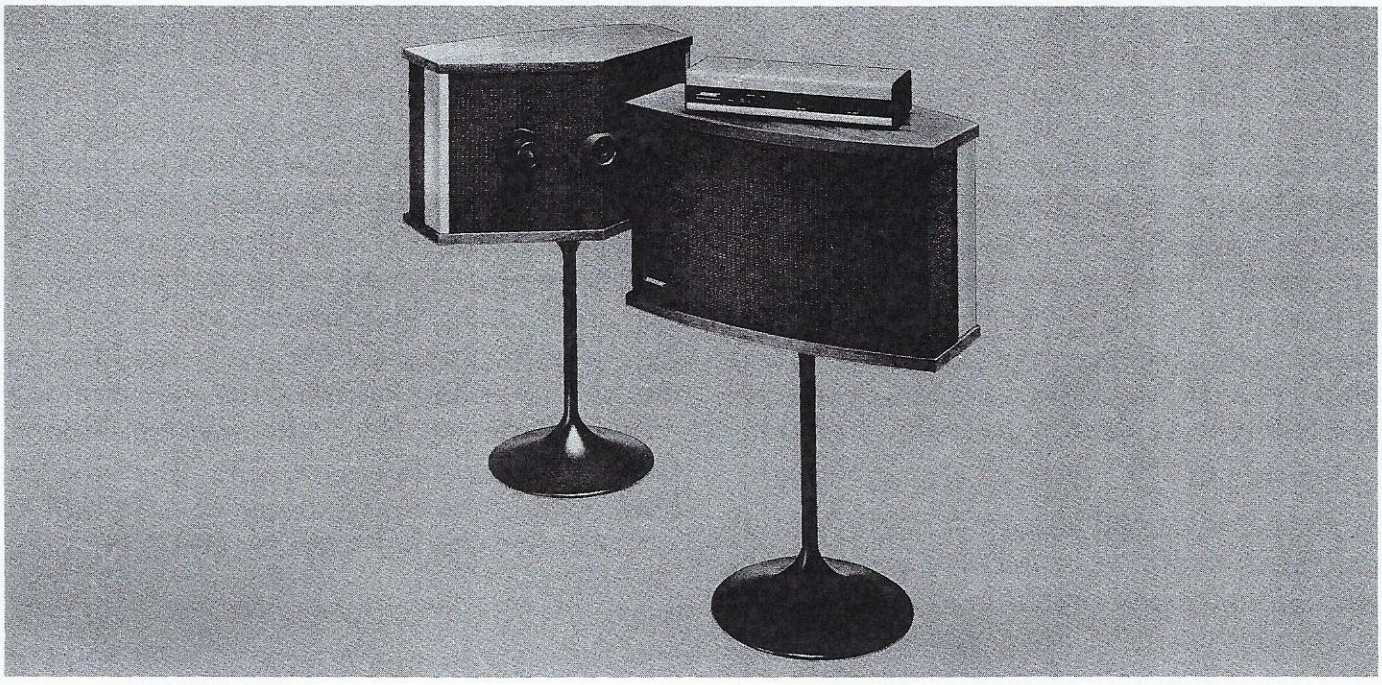
901® Series V Direct/Reflecting® Speaker, Series V Active Equalizer and Series IV B, Active Equalizer

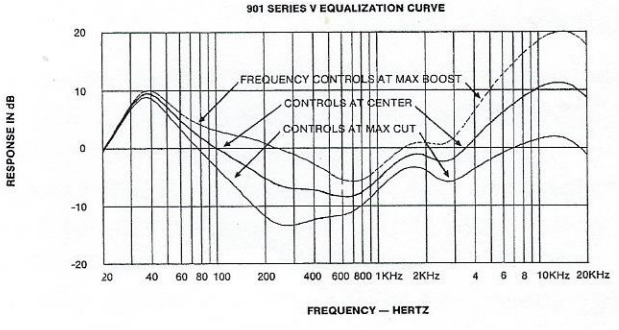


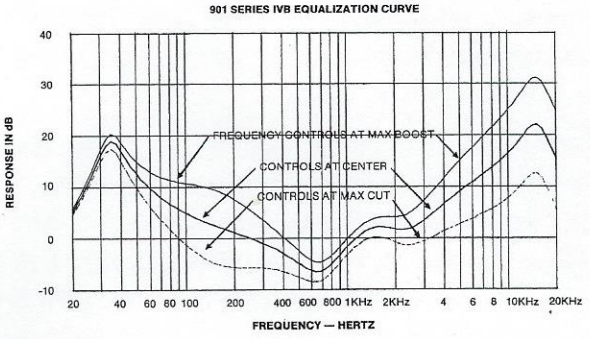
Specifications

901® Series V Direct/Reflecting® Loudspeakers
Transducer Complement: Nine (9) 4½" (144 mm) Helical Voice Coil drivers per enclosure
Energy Distribution: 89% by reflection, 11% by direct radiation
Enclosure: 14-element Acoustic Matrix™ with three Reactive Air Columns
Nominal Impedance: 8 ohms
Amplifier Power Requirements: 10 watts/channel minimum. Maximum power unlimited in non-commercial applications
Recommended Fusing: Series-connected 3A quick-acting fuse
Cabinet: Oil-rubbed walnut veneer with bronze anodized aluminum trim
Dimensions: 21" W x 12⅝" H x 13" D
(533 x 320 x 330 mm)
Weight: 35 lbs. (16 kg) per enclosure

901 Series V Active Equalizer
Input Impedance: 47k ohms
Output Impedance: 1k ohms
Usable Dynamic Range: 106 dB @ 35 Hz
Noise (A-Weighted): Greater than 90 dB below 1 volt
Distortion: Less than 0.09% THD at 1 kHz, 1 V input
Compensation Controls: Mid-Bass, ±6 dB @ 225 Hz; Mid-Treble, ±6 dB @ 3kHz
Bass Switch: —6 dB @ 35 Hz

Power Requirements: 120 Vac, 60 Hz, 2.5 watts (North America); 220 Vac, 50/60 Hz (not available in North America); 100 Vac, 50/60 Hz (Japan only)
Cabinet: Bronze anodized aluminum
Dimensions: 2¾" H x 13" W x 4 15/16 D
(70 x 330 x 125 mm)
Weight: 3.4 lbs (1.5 kg)





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Service Manual

Technical Description

Series V Speaker

The BOSE® 901® Series V Direct/Reflecting® Loudspeaker System has been redesigned to meet the demands and maximize the potential of the latest digital recording technology. Each enclosure houses nine 4½" full-range, Helical voice coil drivers. The advantages of multiple full-range drivers include elimination of crossover networks (increasing efficiency and power handling), more accurate power response (response averaging of all 9 drivers), reduction of unwanted resonance effects (through better distribution of radiated power), and more comprehensive control of dispersion pattern and stereo imaging properties (due to the multiplicity of drivers).

The Helical voice coil features a single layer of aluminum ribbon wire, coated with an extremely thin, high-temperature insulation material. Helical configuration increases driver efficiency by putting more conducting metal into the magnetic fields. Single layer winding allows reduction of magnetic gap width, resulting in higher effective flux level and greater power output, while the decreased coil mass improves transient response. The durable construction and advanced insulation provides increased power handling capability.

Driver frames are constructed of non-magnetic frame material that virtually eliminates field distortion and flux leakage.

A new one-piece, completely sealed Acoustic Matrix™ enclosure reduces the amount of cone motion necessary to reproduce deep bass frequencies, thus reducing distortion. Each enclosure contains three reactive air columns and two flow-controlling cores. The columns radiate bass energy while increasing positive pressure on the back of driver cones which limits distortion by decreasing cone motion. The flow-controlling cores smooth high-velocity air motion to eliminate audible turbulence.

Each driver is acoustically isolated from the rest of the system to ensure uniform cone motion. The outputs of the individual drivers are combined by the nine chambers, two couplers and three reactive air columns, which provides clean, powerful bass.

Series V Active Equalizer

The 901 Series V equalizer is an integral part of the Series V system. Extensive changes have been made on the unit to accommodate the extended dynamic range and increased signal-to-noise ratio available from digital recording technology. The equalizer is a fixed, active system designed to optimize the spectral characteristics of the 901 speaker, regardless of listening environment. The Series V equalizer represents a new generation in signal processing. Its design exceeds the demands of digital recording technology. In addition, the Series V equalizer incorporates increased tone control flexibility, which tailors system response to listening environment. The system offers improved performance in digital compatibility, equalization, spectral response, and tone control flexibility.

The extended dynamic range and increased signal-to-noise ratio made possible by digital recordings offer the most lifelike music reproduction currently available. The 901 Series V Active Equalizer is specifically designed to exceed the demands of digital audio and has the potential to achieve greater dynamic range than currently offered by any digital recording. This is evidenced by the increased dynamic range (106 dB), low noise (—90 dBV "A" Weighted), and low distortion (0.9%).

The increased dynamic range of the 901 Series V Active Equalizer allows the unit to be placed in the tape monitor loop of any pre-amp/receiver. The high signal levels in this configuration require all the dynamic range available in the Series V system. Because the signal levels are so high, it is possible to get the maximum signal-to-noise ratio.

Equalization is accomplished by a cascade of three, fourth-order, complex analog filter sections. These were designed using computer-aided circuit-simulation techniques and computerized measurement systems. The three-stage approach reduces component interaction, produces maximum dynamic range, and allows the use of lower impedance components to decrease noise output.

A project initiated by BOSE® Corporation to study the variance in speaker performance with changes in surroundings, provided useful data on the spectrum of a 901® loudspeaker as affected by listening environments. Since it is impossible to produce a loudspeaker which offers uniform performance in every listening environment, the tone controls on the Series V equalizer have been changed to compensate for the acoustics of any given room.

The MID-BASS slide control is positioned so that it can compensate for the area of **widest** spectral variation. The MID-TREBLE control serves a dual function, source compensation and spectral balance. The psychoacoustic perception of "clean" bass is not focused in the bass region, but at much higher frequencies. The MID-TREBLE control restores "clean" bass to recordings that lack it. It also increases the "presence" of upper register instruments and compensates for source quality in recordings of female vocals.

The 901 Series V System faithfully reproduces all source material, including state-of-the-art digital recordings. The extended dynamic range, increased signal-to-noise ratio, and improved tone control flexibility of the Series V system ensure spacious, lifelike music reproduction regardless of listening environment.

901 SERIES IV B EQUALIZER

The 901 Series IV B equalizer has all the electronic advantages of the Series V equalizer including extended dynamic range and signal-to-noise ratio. The CURVE of the IV B equalizer is IDENTICAL TO THE ORIGINAL SERIES IV EQUALIZER. (See response graph on cover).

Speaker Test Procedure

1. Sweep Test: Connect a sine wave oscillator to a power amplifier. Adjust the frequency of the oscillator to approximately 10 Hz. Adjust the amplifier output to 25-volts rms and connect to the 901 Series V speaker inputs. No extraneous noises such as rubbing, ticking, or scraping should be heard. Sweep the oscillator from 10 Hz to 75 Hz, using the 25-volt signal.

Reduce the output of the amplifier to 10-volts rms and continue sweeping from 75 Hz to 15 kHz. There should be no loud extraneous noises, aside from the normal noises that will not be heard when playing music. If there are any loud extraneous noises, check the wire dress of the speaker or replace the noisy driver.

NOTE: If the speaker is inoperative, check the Troubleshooting Aid for assistance in determining which driver or wiring location is defective.

2. Intermittent output: If the customer complaint is that the speaker intermittently drops in volume output, the problem is probably a bad connection between an individual driver's terminal and its voice coil, adding resistance to the circuit.

To duplicate the symptom, remove the rear grille, exposing 8 of the 9 drivers. Apply a signal of 25-volts rms, 40 Hz to the 901 speaker input terminals. Let the speaker play until the volume drops (usually not more than 5 minutes). Once the speaker output cuts down, check the temperature of the BLACK insulating material (see fig. 2) on the front of the speaker cones. The **HOT** connection is intermittent and that driver should be replaced.

NOTE: Sometimes the resistance becomes so

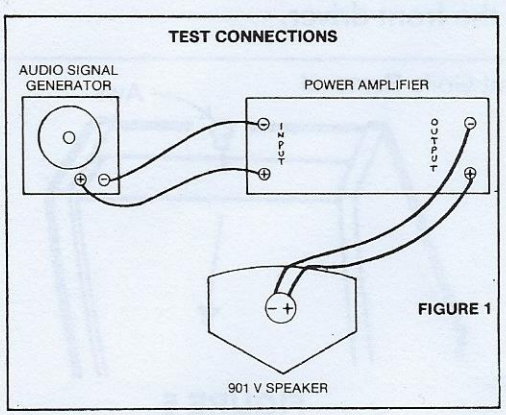


FIGURE 1

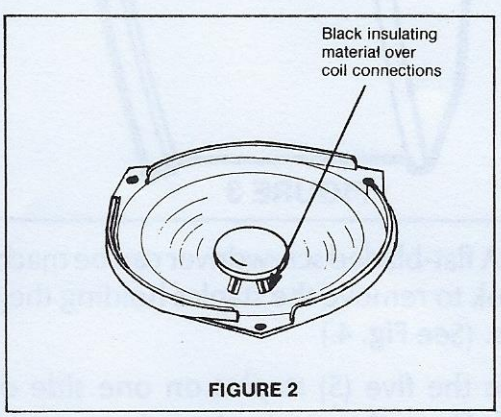


FIGURE 2

great that the resulting heat could cause the black insulation material to emit a small puff of smoke. This is a good visual means to detect the intermittent driver. Visually check each driver's insulation material to see if a section has been heated.

3. Phasing Test: Using a 6 to 12 volt dc supply, check that all drivers are in phase by placing the positive portion of the supply to the positive (+) speaker input terminal and the negative portion of the supply to the negative (—) input terminal. All drivers should move outward. If one or more of the drivers move in the opposite direction, they are wired out of phase and must be corrected. (See Schematic Diagram; Fig. 8).

Disassembly Procedure

Grille Removal Procedure

1. Back Grille: The back grille is secured by tacky hot metal composition that makes the grille readily removable. It is best to use a thin, flat tool, such as a putty knife for easy removal. Insert the knife between the grille and cabinet at the top (or bottom) of the cabinet, near the side edge of the speaker. Gently pry the grille up and out of the slotted groove in the burnished metal side trim. Lift the grille up and out of the cabinet enclosure.

2. Front Grille: The front grille is secured by ten (10) staples. It is only necessary to remove five (5) staples on one side of the cabinet to access the front driver. (See staple location diagram Fig. 3).

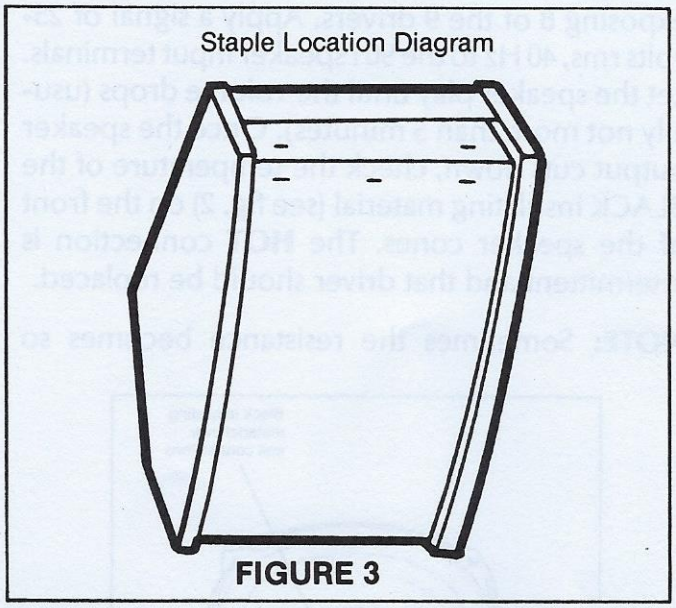
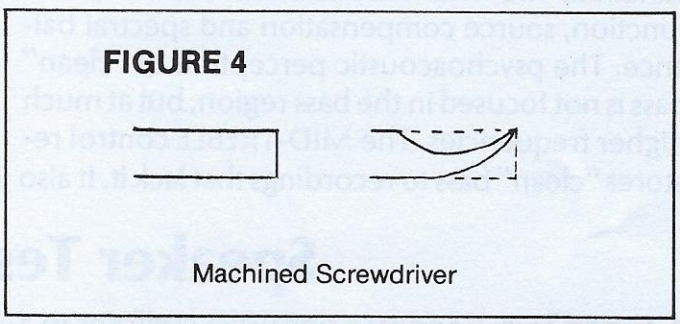


FIGURE 3

NOTE: A flat-bladed screwdriver can be machined to a hook to remove the staples holding the grille in place. (See Fig. 4.)

Remove the five (5) staples on one side of the cabinet. Once the staples have been removed,



the grille will still be firmly held in place by the slotted groove in the burnished metal side trim.

NOTE: If the grille will not pull out of the slotted groove, please follow the next procedure CAREFULLY.

If the grille will not pull out of the slot once the staples have been removed, set the speaker up on its side, with the removed staple side up. Take an awl and puncture through the side of the grille. The awl will go through the grille and baffle board, to rest on the matrix. This will not hurt the grille, or be seen by the customer. With the awl standing straight up, use the awl as a handle and pull the grille out of the slot. (See Figure 5). Remove the awl and smooth out the grille cloth, if there is any space where it was punctured. Unwrap the grille from the side and front of the cabinet to access the front driver.

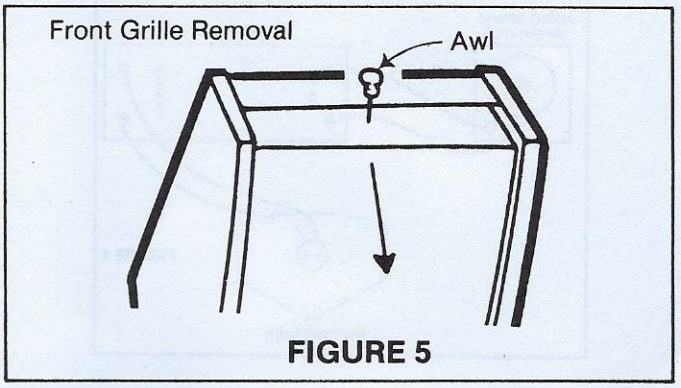


FIGURE 5

Troubleshooting Aid

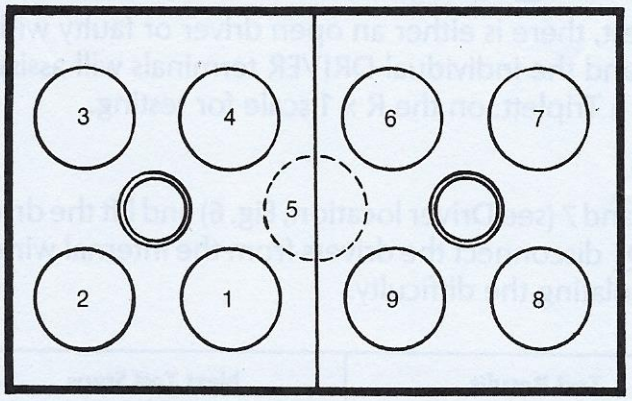
If the 901-V speaker has no output during the Sweep Test, there is either an open driver or faulty wiring within the cabinet. Using the speaker INPUT terminals and the individual DRIVER terminals will assist in isolating the failure location. Use an ohmmeter, such as a Triplett, on the R x 1 scale for testing.

Remove the rear grille. (See grille removal instructions.)

Remove the three (3) ¼" hex-head screws from Drivers 4 and 7 (see Driver location, Fig. 6) and lift the driver out of the cabinet to expose the driver terminals. Do NOT disconnect the drivers from the internal wiring. Using the ohmmeter, follow the table below to aid in isolating the difficulty.

Meter Between:	Reading	Test Results	Next Test Steps
1. Positive input terminal and (—) terminal of Driver 4	Continuity	Positive input through Driver 4 and connections test good.	1. Go to Test 2
	Open	Problem between input terminal and Driver 4.	1. OHM test on Driver 4. If good, lift up Driver 2 and ohm test. 2. Test between Drivers 2 (—) and 4 (+). 3. Test between Driver 2 (+) and Positive input terminal.
2. (—) terminal on Driver 4 and (—) terminal of Driver 7.	Continuity	Drivers 4 through 7 and connections test good.	1. Go to Test 3.
	Open	Problem between Drivers 4 and 7.	1. OHM test on Driver 7. If good, lift Driver 6 and perform ohm test. 2. Test between Drivers 6 (+) and 7 (+). 3. Test between Drivers 6 (+) and 4 (—).
3. (—) terminal of Driver 7 and negative input terminal.	Continuity	Drivers 8 and 9, all connections test good.	1. Perform sweep test.
	Open	Problem between Driver 7 and negative input terminal.	1. Lift Driver 9 and perform ohm test. 2. Test between Drivers 7 (—) and 9 (+). 3. Test between Driver 9 (—) and negative input terminal.

FIGURE 6 Driver Location Diagram



Replacing a Driver

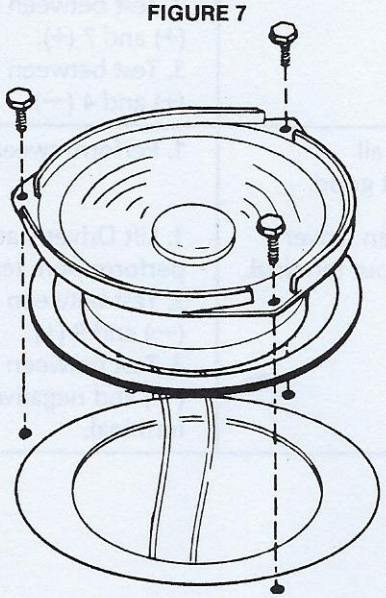
Using a ¼" hex-head bit, remove the three (3) screws holding the driver in place. Carefully lift the driver out of the matrix and cut the wires connected to the driver as close to the driver terminals as possible. Strip the wires and reconnect to the replacement driver. Make certain the wires are reconnected to the correct terminals (see Schematic Diagram Fig. 8). Align the driver and gasket to the matrix. Make certain the gasket is correctly positioned behind the driver to provide an air-tight seal. Secure with the three (3) screws. (see Fig. 7). Perform the Sweep and Phasing tests. Seal any air leaks (a whoosing noise) by repositioning the gasket.

Remounting the Grille

1. Back Grille: It is best to place one side of the grille over the port tube first. Then, take the side and fit the edge of the grille into the groove in the burnished metal side trim. Once the grille is in place, repeat the above for the other side of the grille. Once the complete grille has been positioned, gently press on the grille so that the tack hot-melt will again adhere.

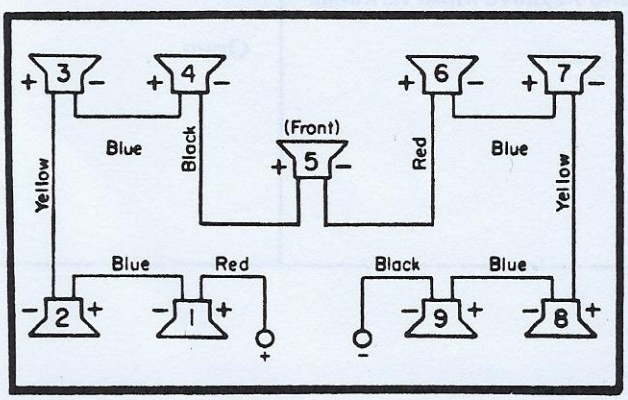
2. Front Grille: Fit the grille into the groove of the metal side trim. Once the grille has been aligned, gently tap the grille all the way in place. Using a hammer and dark staples or small nails, carefully reattach grille back in place. (See Staple Location Diagram, Fig. 3).

FIGURE 7



Driver Replacement

FIGURE 8



Schematic Diagram

901® V Speaker Parts List

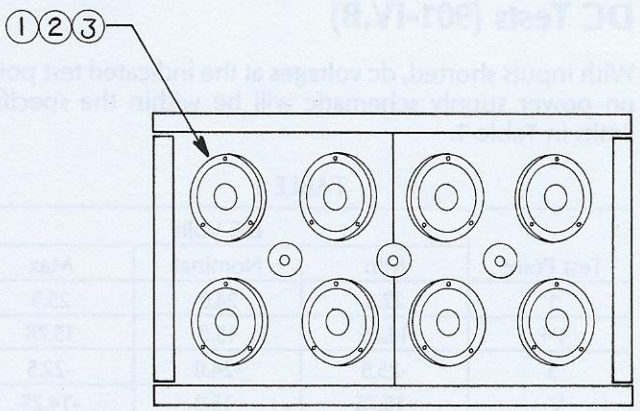


FIGURE 9

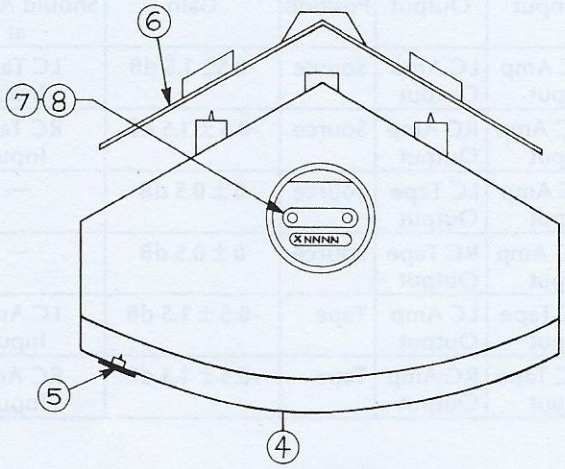


FIGURE 10

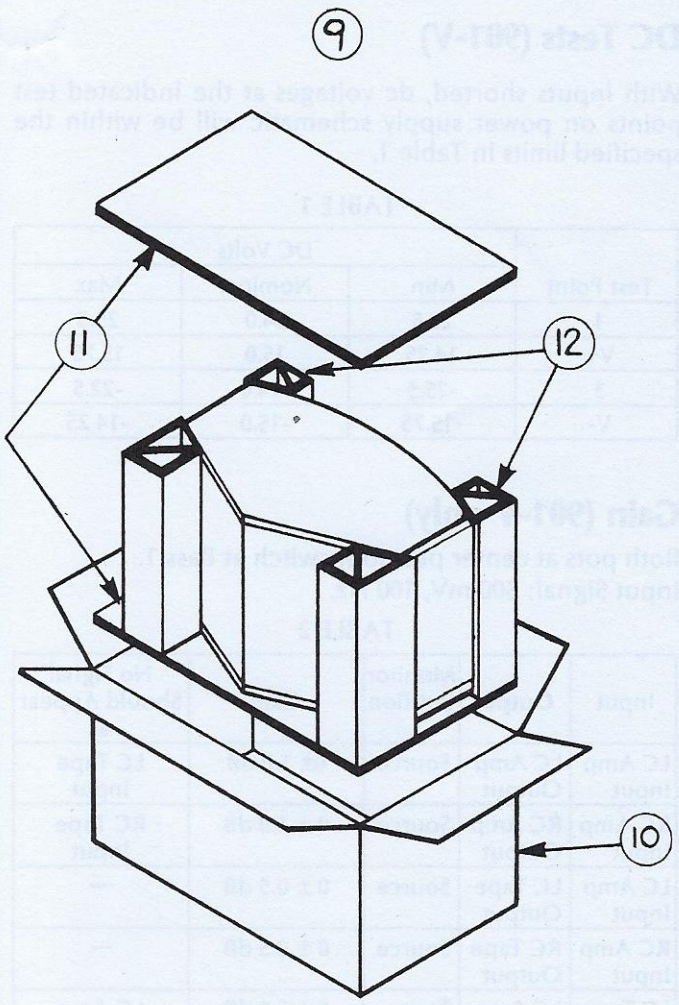


FIGURE 11

1	4.5" Driver	124276-5	7	Knurled Nut	100424-1
2	Gasket	104794-02	8	Flat Washer	121646
3	Screw Hex Washer #8-15 x .62L	108877	9	Carton Kit (Complete)	121019
			10	Carton	121081
4	Front Grille Assembly	121005-1	11	Pad	121614
5	Name Plate	121350-5	12	Side Filler	121613
6	Rear Grille Assembly	121006-1			

901 Series V and Series IV B Equalization Test Procedures

DC Tests (901-V)

With inputs shorted, dc voltages at the indicated test points on power supply schematic will be within the specified limits in Table 1.

TABLE 1

Test Point	DC Volts		
	Min	Nominal	Max
1	22.5	24.0	25.5
V+	14.25	15.0	15.75
3	-25.5	-24.0	-22.5
V-	-15.75	-15.0	-14.25

Gain (901-V only)

Both pots at center position; switch at Bass 1.
Input Signal: 500 mV, 100 Hz.

TABLE 2

Input	Output	Monitor Position	Gain	No Signal Should Appear at
LC Amp Input	LC Amp Output	Source	0± 1.0 dB	LC Tape Input
RC Amp Input	RC Amp Output	Source	0 ± 1.0 dB	RC Tape Input
LC Amp Input	LC Tape Output	Source	0 ± 0.5 dB	—
RC Amp Input	RC Tape Output	Source	0 ± 0.5 dB	—
LC Tape Input	LC Amp Output	Tape	0 ± 1.0 dB	LC Amp Input
RC Tape Input	RC Amp Output	Tape	0 ± 1.0 dB	RC Amp Input

Frequency Response

All response measurements will be normalized to the reference gain measured in Table 2, Gain Meaurement. Input amplitude shall be 500 mV.

TABLE 3 Reponse in dB

Table applies to all 901-V units manufactured 11/83 or later.

Freq. (Hz)	Bass 1	Bass 2	Both Pots at Max. Cut	Both Pots at Max. Boost
35	9.3 ± 1.5	2.3 ± 2.0		
225	-6.0 ± 1.0		-12.7 ± 2.0	+0.3 ± 2.0
650	-8.5 ± 1.0		11.3 ± 2.0	-5.9 ± 2.0
1850	-1.2 ± 1.5			
3000	1.7 ± 1.5		-5.7 ± 2.0	2.0 ± 2.0
13,000	10.9 ± 1.5		1.5 ± 2.0	19.5 ± 2.0

DC Tests (901-IV.B)

With inputs shorted, dc voltages at the indicated test points on power supply schematic will be within the specified limits in Table 1.

TABLE 1

Test Point	DC Volts		
	Min	Nominal	Max
1	22.5	24.0	25.5
V+	14.25	15.0	15.75
3	-25.5	-24.0	-22.5
V-	-15.75	-15.0	-14.25

Gain (901-IV.B only)

Both pots at center position; Low filter switch out.
Input Signal: 100mV, 250 Hz.

TABLE 2

Input	Output	Monitor Position	Gain	No Signal Should Appear at
LC Amp Input	LC Amp Output	Source	-0.5± 1.5 dB	LC Tape Input
RC Amp Input	RC Amp Output	Source	-0.5 ± 1.5 dB	RC Tape Input
LC Amp Input	LC Tape Output	Source	0 ± 0.5 dB	—
RC Amp Input	RC Tape Output	Source	0 ± 0.5 dB	—
LC Tape Input	LC Amp Output	Tape	-0.5 ± 1.5 dB	LC Amp Input
RC Tape Input	RC Amp Output	Tape	-0.5 ± 1.5 dB	RC Amp Input

Frequency Response

All response measurements will be normalized to the response measured in GAIN section. Input Signal shall be 100 mV.

TABLE 3 Reponse in dB

Freq. (Hz)	Normal	Low Filter 'IN'	Both Slide Pots at Max. cut.	Both Slide Pots at Max. Boost
35	18.7 ± 3.0	11.7 ± 3.0		
50	12.4 ± 1.5			
150	2.4 ± 1.0		-4.4 ± 2.0	9.3 ± 2.0
700	-6.5 ± 1.0		-8.2 ± 1.5	-4.8 ± 1.5
1,800	1.9 ± 1.25			
2,500	1.6 ± 1.25		-1.3 ± 2.0	4.8 ± 1.5
14,000	21.7 ± 3.2		12.6 ± 3.5	30.6 ± 3.5

Distortion (901-V only)

Total harmonic distortion shall be measured under the following conditions:
Both slide pots at max. **cut** position.
At 35 Hz at an input level of 2.0 volt; THD 0.5%
At 1 kHz at an input level of 1.0 volt; THD .09%

Separation (901-V)

TABLE 4

	Input Test Condition		Output (Maximum)	
f (Hz)	LC Amp Input	RC Amp Input	LC Amp Output	RC Amp Output
13000	Shorted	600 mV	18 mV	—
13000	600 mV	Shorted	—	18 mV

Distortion (901-IV.B only)

Total harmonic distortion shall be measured under the following conditions:
Both slide pots at max **cut** position.
At 1 kHz at an input level of .8 volt; THD .5%.

Separation (901-IV.B)

TABLE 4

	Input Test Condition		Output (Maximum)	
f (Hz)	LC Amp Input	RC Amp Input	LC Amp Output	RC Amp Output
13000	Shorted	600 mV	18 mV	—
13000	600 mV	Shorted	—	18 mV

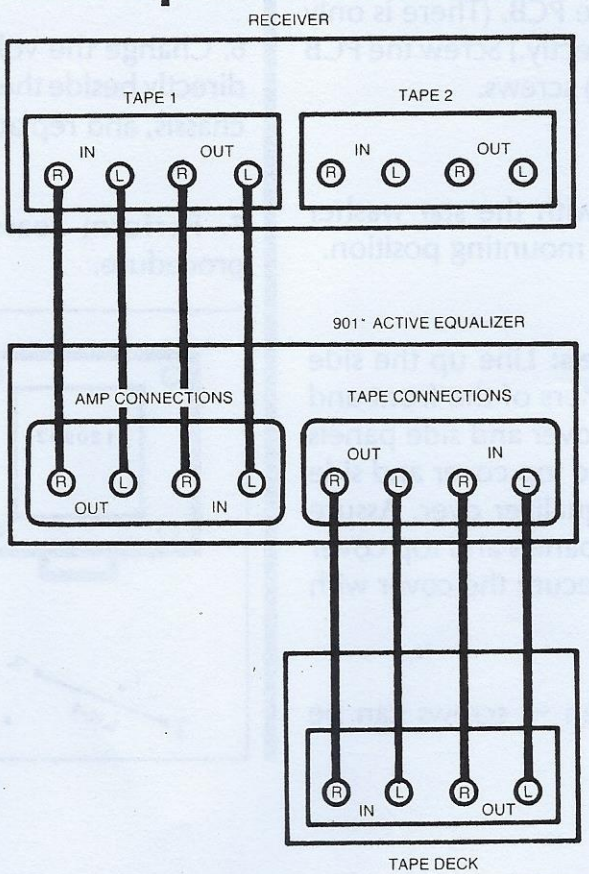
Noise Test (901-V)

The total output hum and noise, with AMP inputs shorted and MONITOR switch in NORMAL position, shall be less than 30 mV when measured through a cascade of two ANSI "A" weighting networks in series (measured with average responding RMS meter and both slide pots in maximum **cut** position).

Noise Test (901-IV.B)

The total output hum and noise, with AMP inputs shorted and MONITOR switch in NORMAL position, shall be less than 30 mV when measured through a cascade of two ANSI "A" weighting networks in series (measured with average responding RMS meter and both slide pots in maximum **cut** position).

Basic Equalizer Connection



Equalizer Disassembly Procedures

1. Top Cover and Side Panels: Using a Phillips head screwdriver, locate the four (4) black screws on the bottom of the equalizer case and remove. Turn the equalizer over, while holding the top cover in place. (The side panels are removed with the top cover.) Lift the top cover and side panels off.

NOTE: The front and rear panels have notches at the corners for side panel alignment when reinstalling.

2. PCB, Front And Back Panels: Locate the six (6) screws holding the PCB in place and remove. When lifting out the board, you will notice the front and rear panels will come out also.

Equalizer Reassembly Procedures

1. PCB, Front and Rear Panels: Note the grooves in the front and back of the equalizer chassis. Align the front and back panels in the grooves as you lower the PCB into the chassis. Align the screw mounting holes of the PCB. (There is only one way the PCB will fit correctly.) Screw the PCB to the chassis with the six (6) screws.

NOTE: The longest screw with the star washer should be in the LEFT REAR mounting position.

2. Top Cover and Side Panels: Line up the side panel grooves with the corners of the front and back panels. Slide the top cover and side panels into place. While holding the top cover and side panels in place, turn the equalizer over. Assure that the corners of the side panels and top cover are fully lowered in place. Secure the cover with the four (4) screws.

NOTE: DO NOT overtighten — screws can be easily stripped.

Voltage
220-to-110-Volt Only

CAUTION: Before proceeding with conversion, disconnect the equalizer from the AC power line.

CAUTION: This procedure is for 220-to-110-volt conversion **ONLY.** 110-to-220-volt conversion requires a transformer and capacitor change.

1. Perform disassembly procedure to lift PCB and panels.

2. Locate jumper LK-1, directly in front of the power transformer, and remove.

3. Add a jumper to solder pads 1 and 2.

4. Add a jumper to solder pads 3 and 4.

5. Change AC line cord, if necessary.

6. Change the voltage information label located directly beside the AC line cord on the back of the chassis, and replace with 110-volt information.

7. Perform reassembly procedure and test procedure.

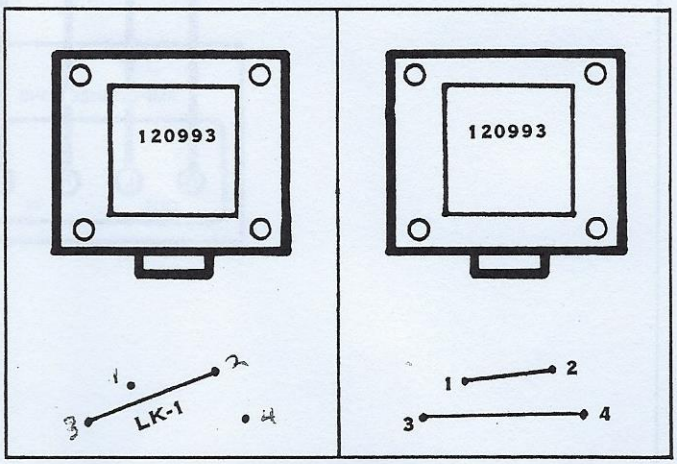


FIGURE 12

Conversion Instructions

110-to-220-Volt Only

CAUTION: Before proceeding with conversion, disconnect the equalizer from the AC power line.

NOTICE: This procedure requires a transformer and capacitor change **unless** the equalizer is a military unit purchased overseas.

1. Perform disassembly procedures to lift PLB and panels.

2. Remove transformer (Part Number 120992 or 120991).

3. Replace transformer with Part Number 120993 and secure with four (4) screws and two (2) stand-offs.

NOTE: The two (2) short screws (Part Number 124843-04) are to be mounted from **under** the PCB to the stand-offs (Part Number 121828-06) and the two (2) long screws (Part Number 124843-12) are from the top of the transformer to the stand-offs.

4. Solder transformer to PCB.

5. Remove C-1 line capacitor located between Pin 1 and Pin 2 in front of transformer.

6. Replace C-1 capacitor with 250V, 4700 uF, Part Number 11715.

7. Insert jumper LK-1 in front of the power transformer.

NOTE: If transformer is Part Number 120993 and has two jumpers in front of transformer, remove the jumpers and insert LK-1 (Military units).

8. Change AC line cord, if necessary.

9. Change the voltage information label located directly beside the AC line cord on the back of the chassis, and replace with 220 Volt information.

10. Perform reassembly procedures and test procedures.

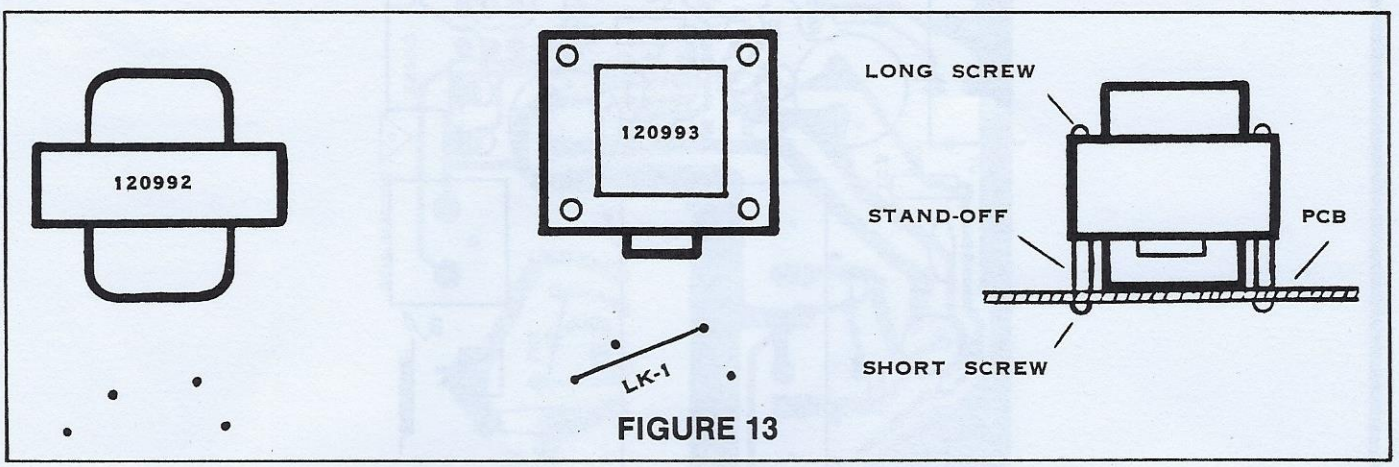
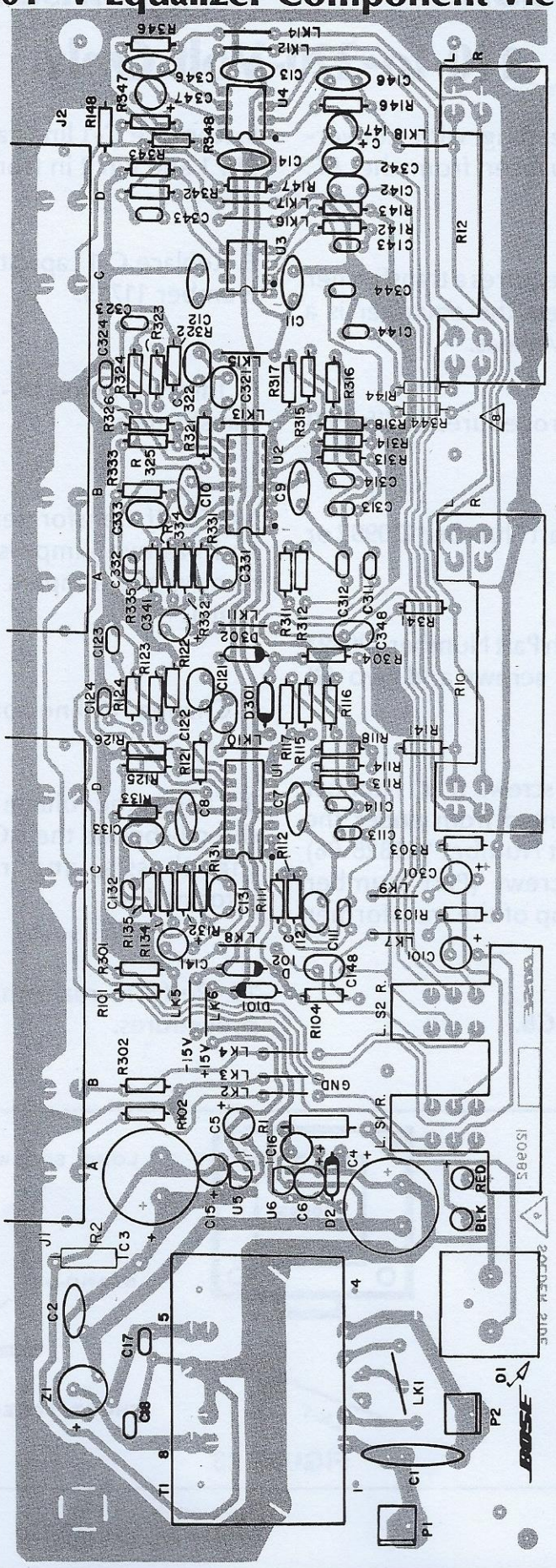
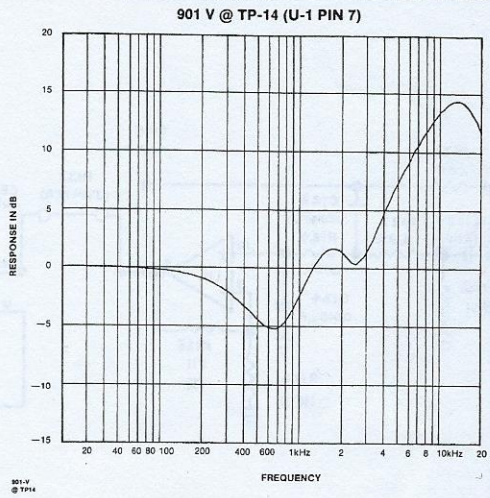


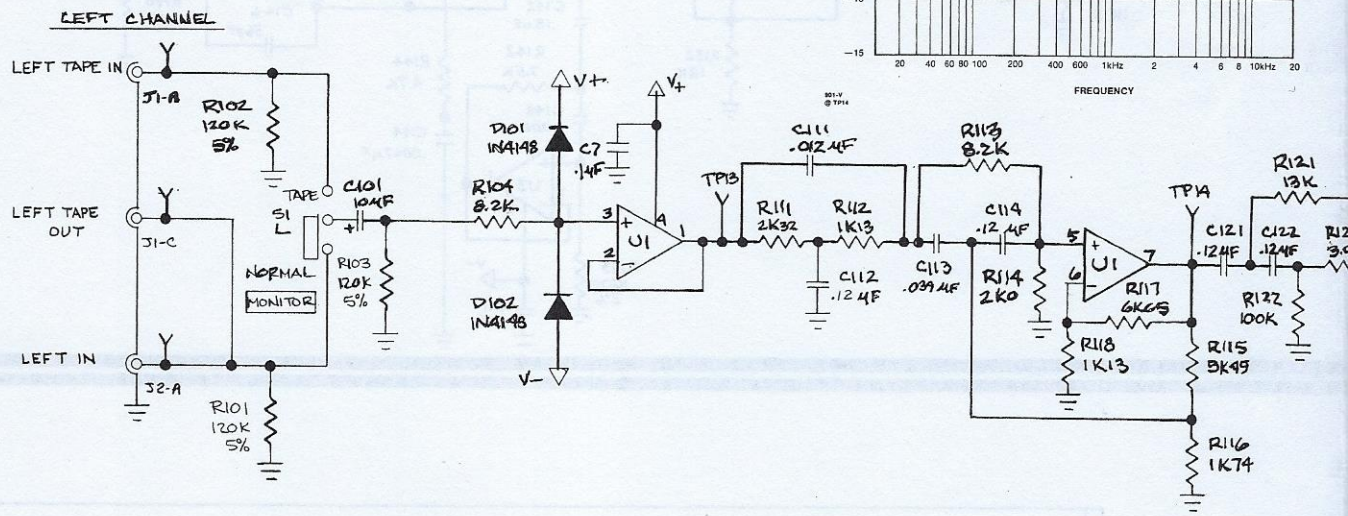
FIGURE 13

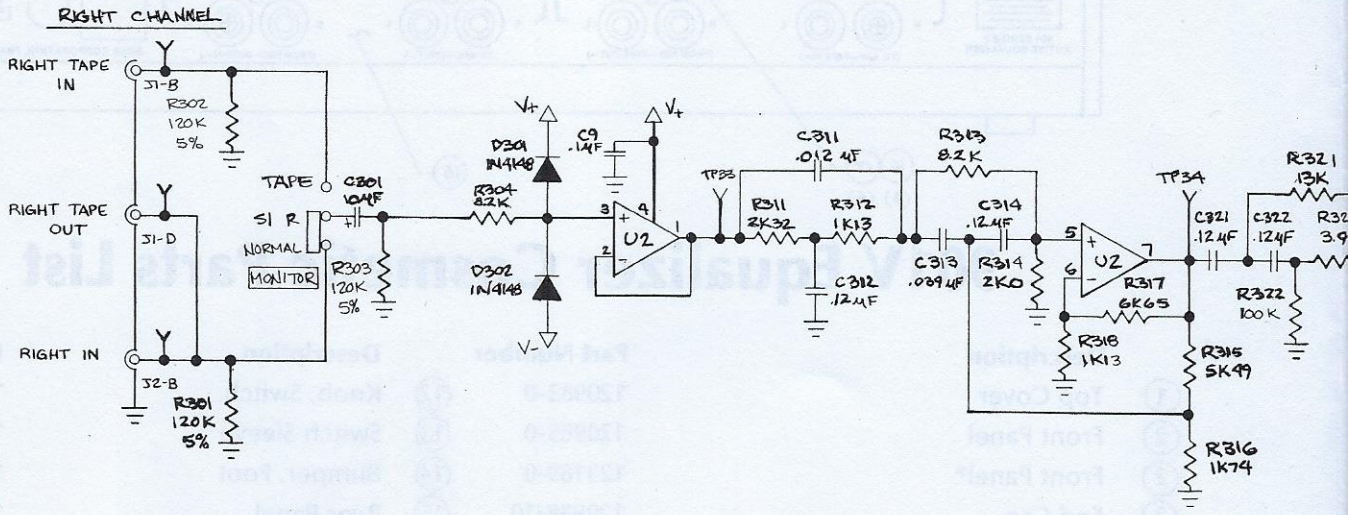
901® V Equalizer Component View

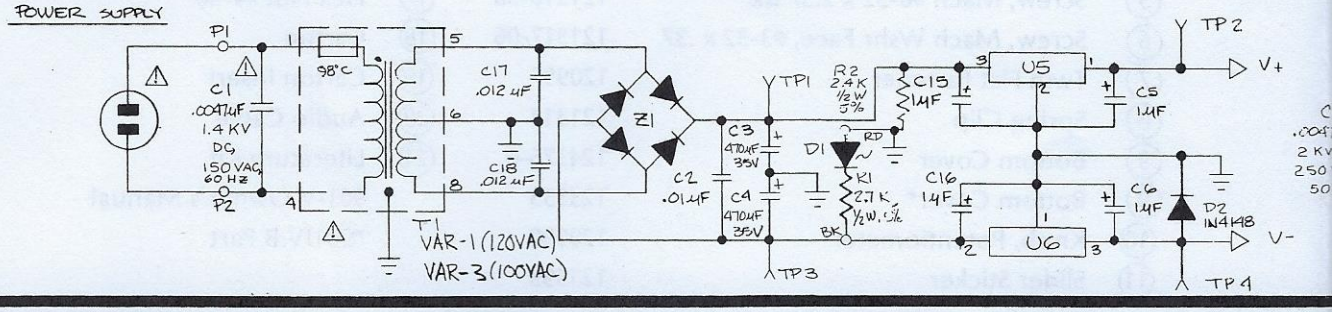


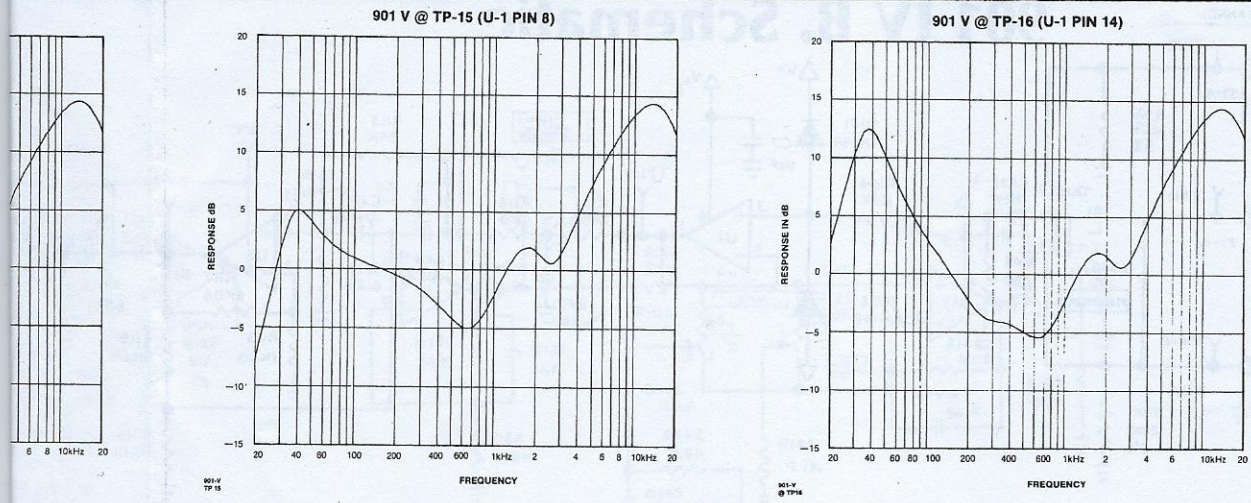
901V Equalizer Schematic

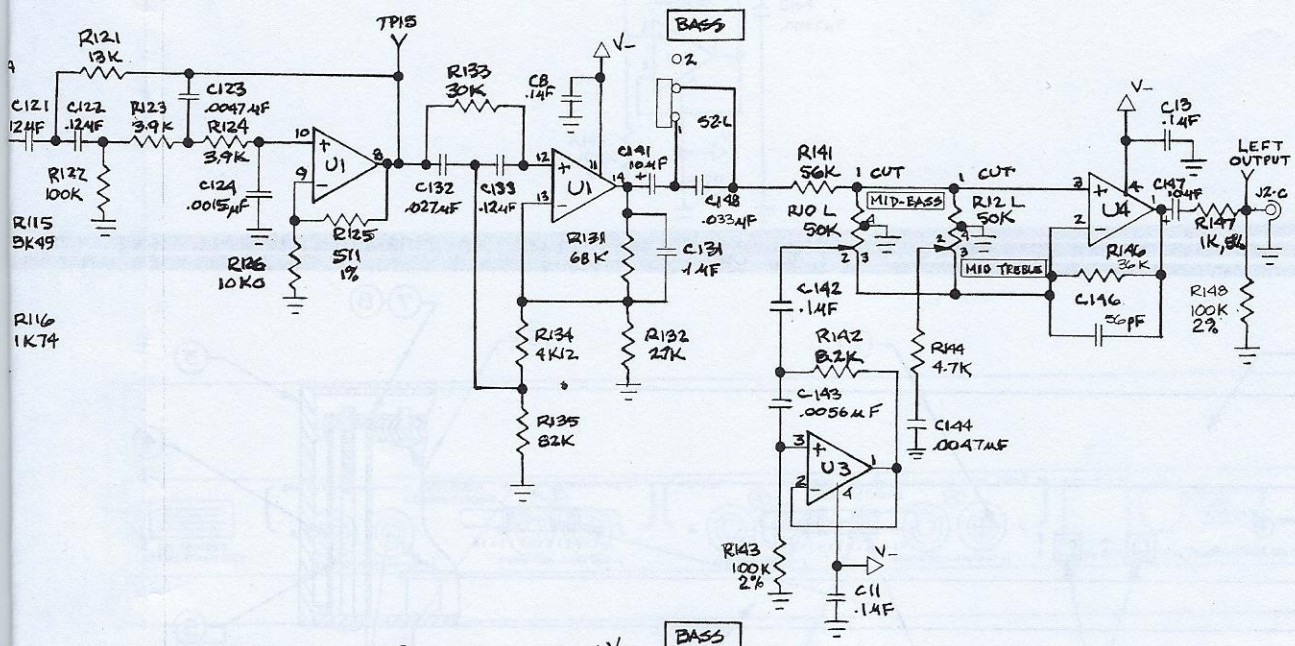


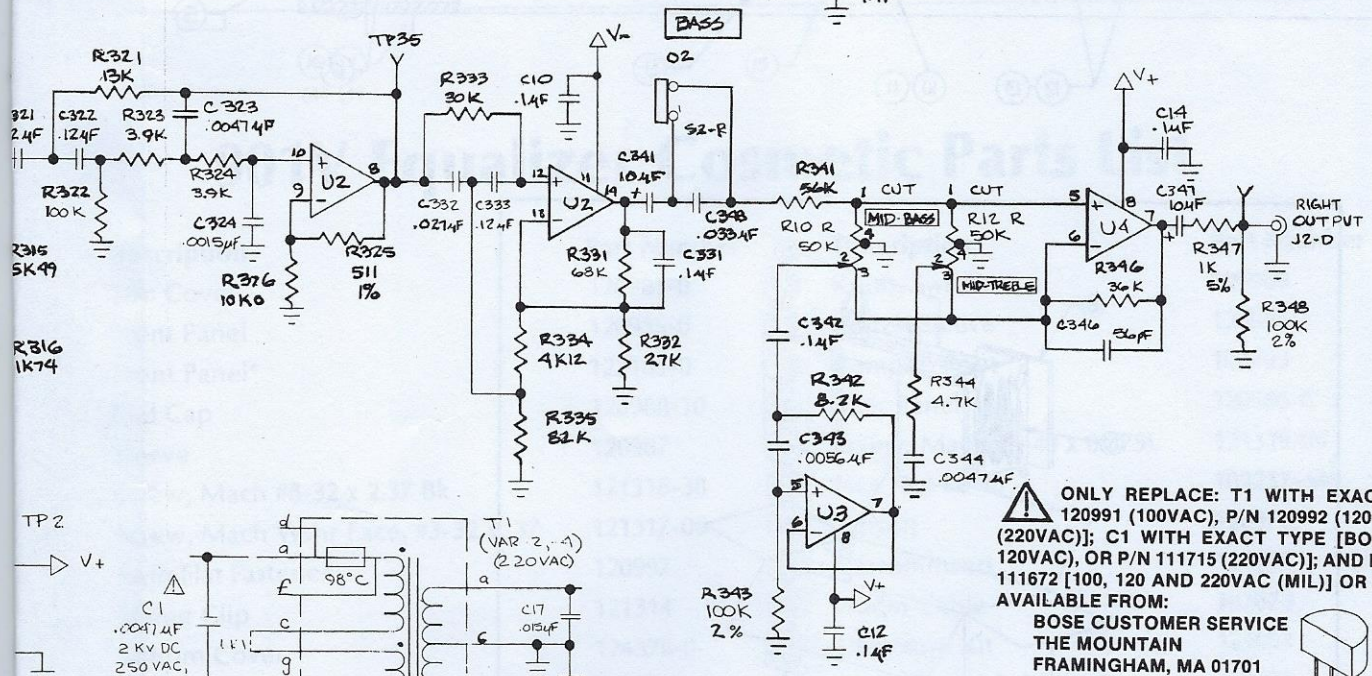


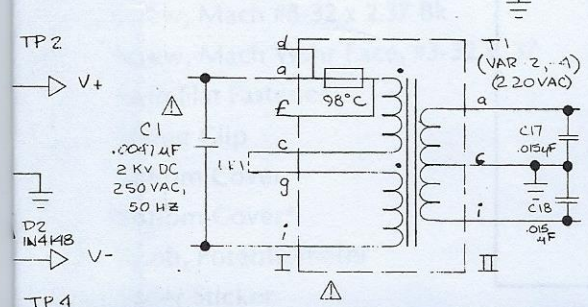






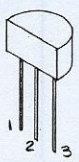






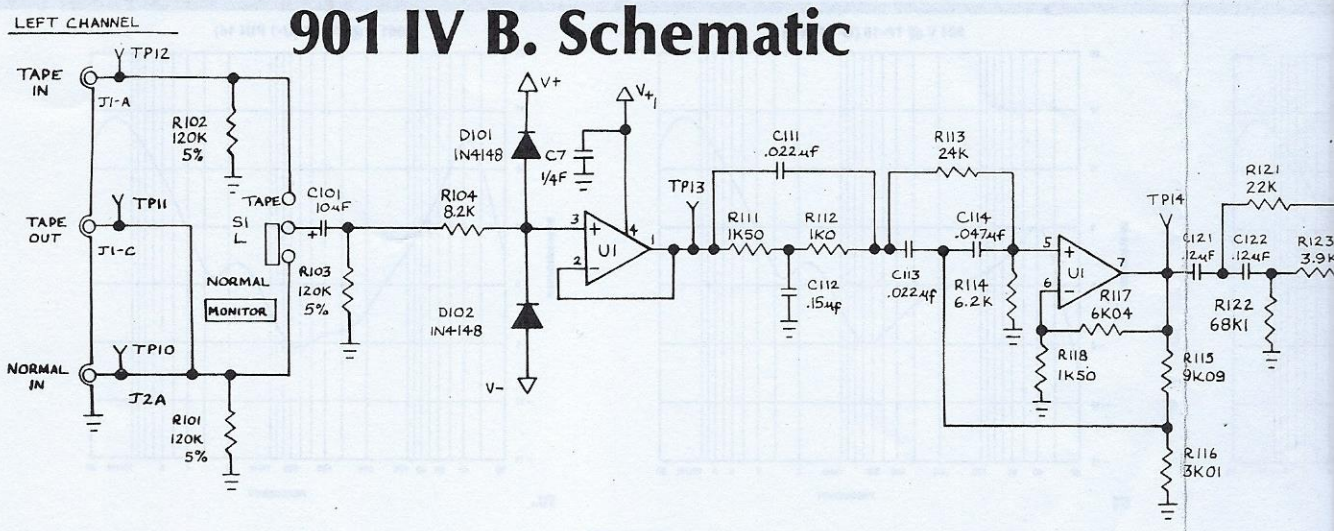
ONLY REPLACE: T1 WITH EXACT TYPE [BOSE P/N 120991 (100VAC), P/N 120992 (120VAC), OR P/N 120993 (220VAC)]; C1 WITH EXACT TYPE [BOSE P/N 103447 (100, 120VAC), OR P/N 111715 (220VAC)]; AND LINE CORD WITH P/N 111672 [100, 120 AND 220VAC (MIL)] OR P/N 113608 (220VAC) AVAILABLE FROM:

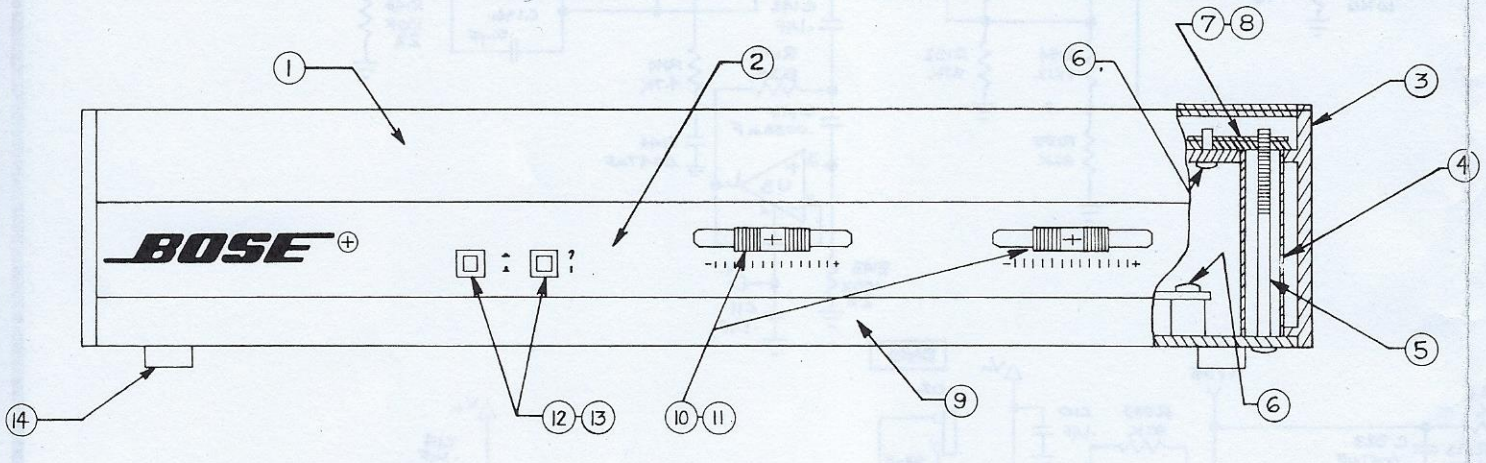
BOSE CUSTOMER SERVICE
THE MOUNTAIN
FRAMINGHAM, MA 01701

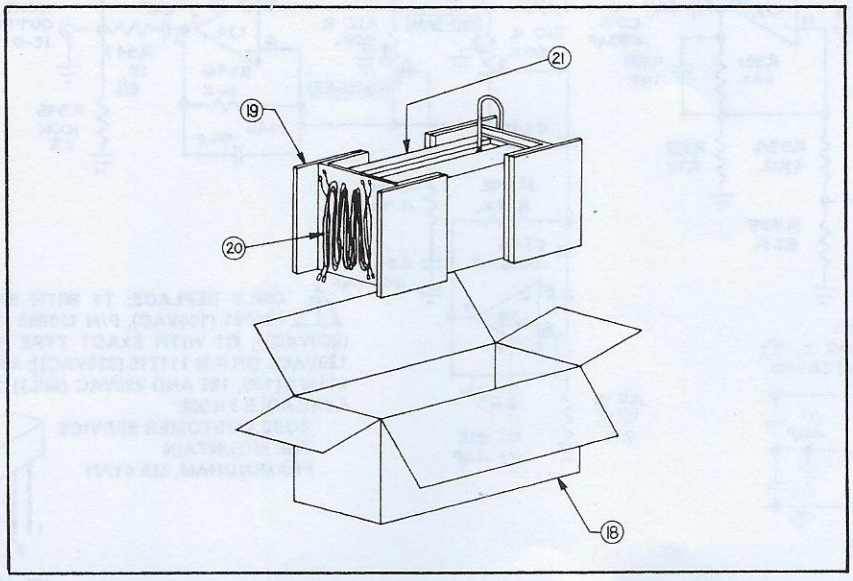


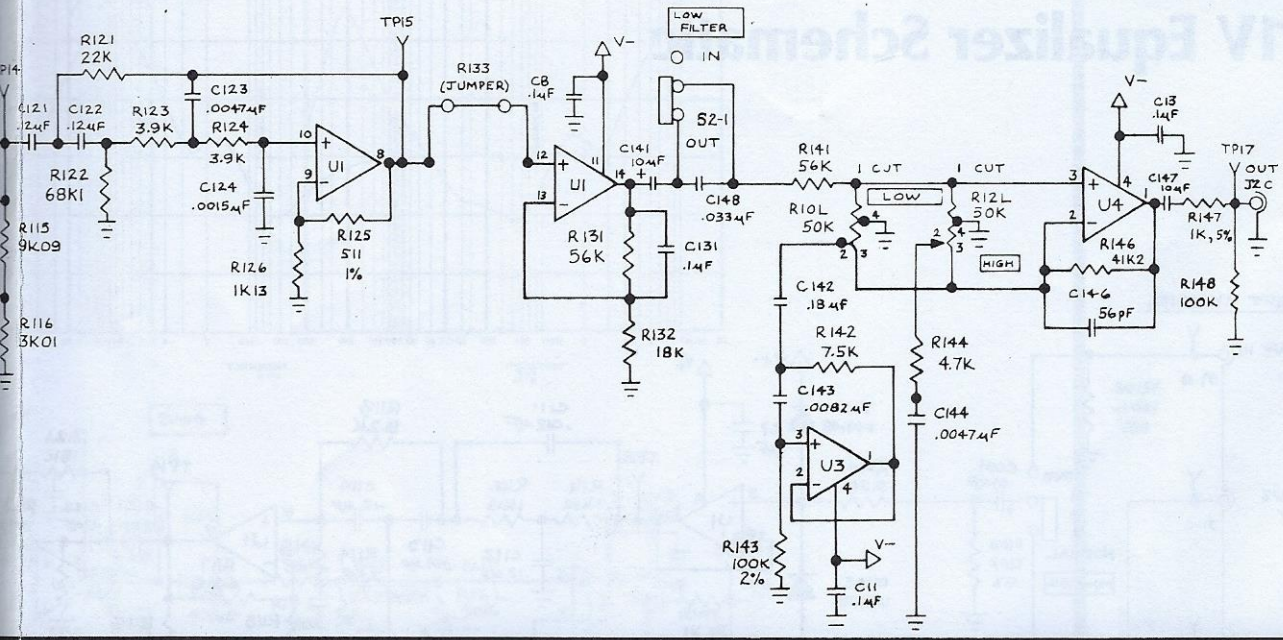
U5, U6

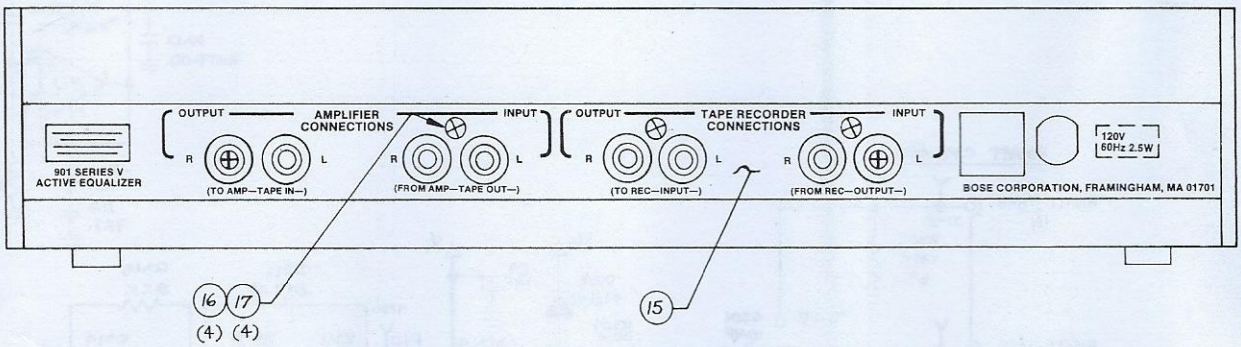
901 IV B. Schematic











901V Equalizer Cosmetic Parts List

	Description	Part Number
1	Top Cover	120983-0
2	Front Panel	120985-0
2	Front Panel*	123169-0
3	End Cap	120988-10
4	Sleeve	120987
5	Screw, Mach #8-32 x 2.37 Bk	121316-38
6	Screw, Mach Wshr Face, #3-32 x .37	121317-06
7	Twin Flat Fastener	120997
8	Spring Clip	121314
9	Bottom Cover	124376-0
9	Bottom Cover*	123553
10	Knob, Potentiometer	120990
11	Slider Sticker	121599

	Description	Part Number
12	Knob, Switch	120989
13	Switch Sleeve	120996
14	Bumper, Foot	103593
15	Rear Panel	120986-0
16	Screw, Mach #4-40 x 0.375L	121319-06
17	Hex Nut #4-40	103237-440
18	Carton	120978
19	Carton Insert	121327
20	Audio Cable	103876
21	Literature Kit	121004
	901-V Owner's Manual	124375
	*901IV.B Part	

Equalizer Parts List

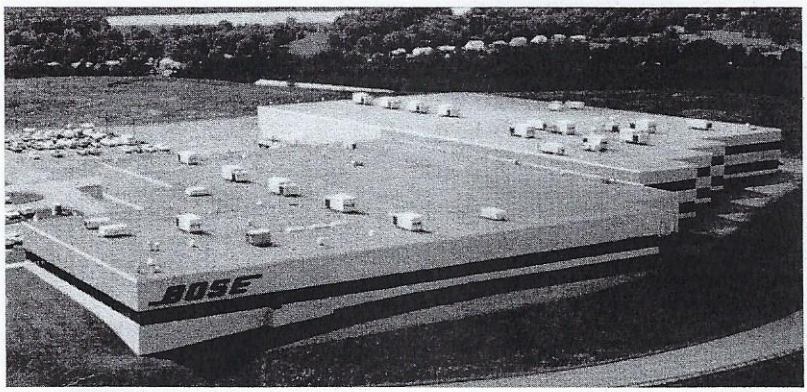
Symbol	Description	Part Number
U1, 2	OP Amp-Quad	120535
U3, 4	Op Amp-Dual	108568
U5	Voltage Regulator	121116-1
U6	Voltage Regulator	121117-1
D2, 101, 102, 301, 302	Diode, 1N4148	121501
Z1	Bridge Rectifier	112027
C2	Cer Disc .01 uF	119626-103
C3, 4	Elec 470 uF 35V	110704
C5, 6, 15, 16	Elec 1 uF 50V	119942-1RO
C7-14	Cer Disc .1 uF	117502
C17, 18, 111, 311	Film .012 uF 5%	11809-123
C101, 141, 147 301, 341, 347	Elec 1 uF 35V	119944-100
C112, 114, 121, 122, 133, 312, 314, 321, 322, 333	Film .12 uF 5%	118091-124
C113, 313	Film .039 uF 5%	118091-393
C123, 144, 323, 344	Film .001 uF 5%	118091-472
C124, 324	Film .001 uF 5%	118091-152
C131, 142, 331, 342	Film .1 uf 5%	118091-104
C132, 332	Film .027 uF 5%	118091-273
C143, 343	Film .0056 uF 5%	118091-562
C146, C346	Cer Disc 56 pF ± 5% 50V	119372-560
C148, 348	Film .033 uF 5%	118091-333
R1	.5W 2.7K Ohms 5%	122071-2725
R2	.5W 2.4K Ohms 5%	122071-2425
R101-103, 301-303	120K Ohms 5%	117704-1211245
R104, 113, 142, 304, 313, 342	8.2K Ohms 2%	117704-1218222
R111, 311	2.32K Ohms 1%	119976-2212321
R112, 118, 312, 318	1.13K Ohms 1%	119976-2211131
R114, 314	2.00K Ohms 1%	119976-2212001
R115, 315	5.49K Ohms 1%	119976-2215491
R116, 316	1.74K Ohms 1%	119976-2211741
R117, 317	6.65K Ohms 1%	119976-2216651
R121, 321	13K Ohms 2%	117704-1211332
R122, 143, 148, 322, 343, 348	100K Ohms 2%	117704-1211042
R123, 134, 323, 324	3.9K Ohms 2%	117704-1213922
R125, 325	511 Ohms 1%	119976-2215110
R126, 326	10.0K Ohms 1%	119976-2211002
R131, 331	68K Ohms 2%	117704-1216832
R132, 332	27K Ohms 2%	117704-1212732
R133, 333	30K Ohms 2%	117704-1213032
R134, 334	4.12K Ohms 1%	119976-2214121
R135, 335	82K Ohms 2%	117704-1218232
R141, 341	56K Ohms 2%	117704-1215632
R144, 344	4.7K Ohms 2%	117704-1214722
R146, 346	36K Ohms 2%	117704-1213632
R147, 347	1K Ohms 5%	117704-1211025
S1, 2	Switch, Push Button	107461
J1, 2	Phono Jack, Quad	120646
R10, 12	Potentiometer, Dual Slide	120977-503
P1, 2	Terminal Faston	111262
	Eyelet	120431
	Sleeving, PVC Black	107679-20
	LED, Red	123487
	LED Bracket	120975
	Sleeving, .186 I.D.	107678-5

Series IV. B. Component Variances

Symbol	Description	Part Number
C17, 18	.015uF, 5%	118091-153
C111, 311, 113, 313	.022uF 5%	118091-223
C112, 312	.15uF, 5%	118091-154
C114, 314	.047uF, 5%	118091-473
C142, 342	.18uF, 5%	120388-184
C143, 343	.0082uF, 5%	118091-822
R111, 311, 118, 318	1K50 Ohms 1%	119976-2211501
R112, 312	1K00 Ohms 1%	119976-2211001
R113, 313	24K Ohms 2%	117704-1212432
R114, 314	6.2K Ohms 2%	117704-1216222
R115, 315	9K09 Ohms 1%	119976-2219091
R116, 316	3K01 Ohms 1%	119976-2213011
R117, 317	6K04 Ohms 1%	119976-2216041
R121, 321	22K Ohms 2%	117704-1212232
R122, 322	68K1 Ohms 1%	119976-2216812
R126, 326	1K13 Ohms 1%	119976-2211131
R132, 332	18K Ohms 2%	117704-2211832
R141, 131, 341, 331	56K Ohms 2%	117704-1215632
R142, 342	7.5 Ohms 2%	117704-1217522
R146, 346	41K2 Ohms 1%	119976-2214122
LK2-18, R113, 333	Jumper 22AWG 10MM L	120100

Voltage Variances

Symbol	Description	Part Number
T-1	Transformer (110V)	120992
T-1	Transformer (220, 220 Military)	120993
T-1	Transformer (100V)	120991
C-1	Cap .0047uf 1KV (100, 110V)	103447
C-1	Cap .0047uf SW/lie (220V)	111715
	Sleeving, .186 I.D. (110, 100V)	107678-5
	Line Cord (100, 110, 220 Military)	111672
	Line Cord (220V)	113608
	Strain Relief	106346
	Screw, Mach 6-32 x .25L (220V)	124843-04
	Screw, Mach 6-32 x .75L (220V)	124843-12
	Standoff, Hex 6 x .375L (220V)	121828-06



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