BOSE®
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802C System Controller
Original and SMD Version



Units with serial numbers beginning with 100000 are the **original** 802C's.
Units with serial numbers beginning with 200000 are the **new SMD** 802C's.

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Service Manual
Part Number 129292 REV 03

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SAFETY INFORMATION

1. Parts that have special safety characteristics are identified by the  symbol on schematics or by special notes on the parts list. Use only replacement parts that have critical characteristics recommended by the manufacturer.

2. Make leakage current or resistance measurements to determine that exposed parts are acceptably insulated from the supply circuit before returning the unit to the customer. Use the following checks to perform these measurements:

   A. **Leakage Current Hot Check**-With the unit completely reassembled, plug the AC line cord directly into a 120V AC outlet. (Do not use an isolation transformer during this test.) Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI) C101.1 “Leakage Current for Appliances” and Underwriters Laboratories (UL) 1492 (71). With the unit AC switch first in the ON position, then in the OFF position, measure from a known earth ground (metal water pipe, conduit, etc.) to all exposed metal parts of the unit (antennas, handle bracket, metal cabinet, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. Any current measured must not exceed 0.5 milliamp. Reverse the unit power cord plug in the outlet and repeat test. ANY MEASUREMENTS NOT WITHIN THE LIMITS SPECIFIED HEREIN INDICATE A POTENTIAL SHOCK HAZARD THAT MUST BE ELIMINATED BEFORE RETURNING THE UNIT TO THE CUSTOMER.

   B. **Insulation Resistance Test Cold Check**-(1) Unplug the power supply and connect a jumper wire between the two prongs of the plug. (2) Turn on the power switch of the unit. (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each exposed metallic cabinet part on the unit. When the exposed metallic part has a return path to the chassis, the reading should be between 1 and 5.2 Megohms. When there is no return path to the chassis, the reading must be “infinite”. If it is not within the limits specified, there is the possibility of a shock hazard, and the unit must be repaired and rechecked before it is returned to the customer.

PROPRIETARY INFORMATION

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ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICE HANDLING

This unit contains ESDS devices. We recommend the following precautions when repairing, replacing or transporting ESDS devices:

• Perform work at an electrically grounded work station.

• Wear wrist straps that connect to the station or heel straps that connect to conductive floor mats.

• Avoid touching the leads or contacts of ESDS devices or PC boards even if properly grounded. Handle boards by the edges only.

• Transport or store ESDS devices in ESD protective bags, bins, or totes. Do not insert unprotected devices into materials such as plastic, polystyrene foam, clear plastic bags, bubble wrap or plastic trays.

CAUTION: THE 802®C SYSTEM CONTROLLER CONTAINS NO USER-SERVICEABLE PARTS. TO PREVENT WARRANTY INFRACTIONS, REFER SERVICING TO WARRANTY SERVICE STATIONS OR FACTORY SERVICE.

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SPECIFICATIONS

Input Connections: (per channel)	One (1) balanced female XLR connector One (1) unbalanced 1/4" phone jack
Output Connections: (per channel)	Two (2) 1/4" phone jacks per channel (outputs used depend upon mode selected)
Input Impedance:	Balanced input, 4kΩ Unbalanced input, 42kΩ
Electronic Crossover Frequency:	180Hz (bi-amplified mode only)
Maximum Output Level:	4 Volts (+12dB into 600Ω, 50Hz-16kHz)
Total Harmonic Distortion:	Less than .02% at 1 Volt (0dB) Less than .2% at 8 Volts (18dB)
Output Noise:	Less than 20uV (-9dBV) A-weighted
Power Requirements:	120 Vac, 50-60Hz, 3.5 Watts 220 Vac, 50-60Hz, (European) 100 Vac, 50-60Hz, (Japan)
Dimensions:	1 3/4"H x 10" W x 5" D (4.4 x 25.4 x 12.7 cm)
Weight:	1.97 lbs (.895 kg)

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TECHNICAL DESCRIPTION

The 802®C System Controller is a sophisticated signal processing device which combines the functions of three equalizers, an automatic switching circuit, and an electronic crossover. The 802C system controller automatically selects the proper crossover function and equalization curve for a given system application through use of a switching network operating in conjunction with the unit's output jacks. In addition to signal routing based on equalization requirements, the switching network indicates mode of operation on its front panel. The front panel also includes high-cut and low-cut switches which decrease line output by 4dB at 55Hz and by 10dB at 16kHz. Sharp subsonic and ultrasonic band-limiting filters reduce power waste, stage noise, high-frequency instability, and interference. The 802C system controller retains the compact dimensions of its predecessor, the Bose® 802E active equalizer, and fits into one space of a standard 19" equipment rack with the optional RMK-8 Rack Mount Kit.

In an on-going process of manufacturing updates, as technology permits, Bose Corporation has begun using SMD (surface mount devices) components on its 802C controller. The new SMD components are such a space saving feature that this new version permits us to eliminate the "piggy-back" PCB and place all electronics on one single printed circuit board. This manual will identify the different procedures, PCB layouts, and components where necessary.

There is no difference in the operation or function between the original 802C and the 802C SMD units.

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DISASSEMBLY/ASSEMBLY PROCEDURES

Note: Refer to the Figures (2 and 3) for the following procedures.

1. Top Cover Removal

1.1 Remove the four screws (two located at the rear of the unit and one located on each side of the unit) that secure the top cover to the chassis.

1.2 Lift the rear of the top cover slightly and slide it forward until the front of the top cover is clear of the switches.

2. Top Cover Replacement

2.1 Align the front of the top cover with the switches and LED's and slide the cover into place.

2.2 Secure the top cover into place.

3. 302EQ ("piggy-back") PCB Removal

Note: The original 802C has two PCB's. The following procedure will discuss the removal of the "piggy-back" PCB.

Note: The "piggy-back" PCB does not need to be removed when removing the main PCB.

3.1 Perform procedure 1.

3.2 Locate the four plastic stand-offs (three are located in the corners of the PCB and one is located between C125 and C225).

3.3 With small needle-nose pliers, squeeze the retaining tab of each stand-off while gently lifting up on the PCB to release the lock. Grasp the PCB at the middle of each side and lift the PCB off of the connectors.

4. 302EQ ("piggy-back") PCB Replacement

4.1 Replace the "piggy-back" PCB (on the original 802C controller) by placing the board over the connectors and pushing the board down onto the stand-offs.

4.2 Perform procedure 2.

5. Main PCB Removal

5.1 Perform procedure 1.

5.2 Remove the 6 knurled nuts securing the input and output jacks to the chassis.

5.3 Remove the 5 screws that secure the main PCB to the chassis.

5.4 On the rear of the unit, at the XLR jacks there is a small hole with a locking screw inside (see Figure 1). Insert a small flathead screwdriver into the hole and rotate the locking screw 1/8 turn counter-clockwise to release the locking tab.

5.5 Lift the front of the PCB up slightly. Gently pull the PCB out while pushing on the center of the XLR jacks.

6. Main PCB Replacement

6.1 Carefully slide the PCB into the chassis while aligning the XLR jacks into their housing.

6.2 Lock the XLR jacks into place by inserting a small screwdriver into the small hole in the XLR jack and rotate the screw clockwise 1/8 turn.

6.3 Replace the 5 screws that hold the PCB into place in the chassis.

6.4 Perform procedure 2.



Figure 1. Locking Tab Screw Location

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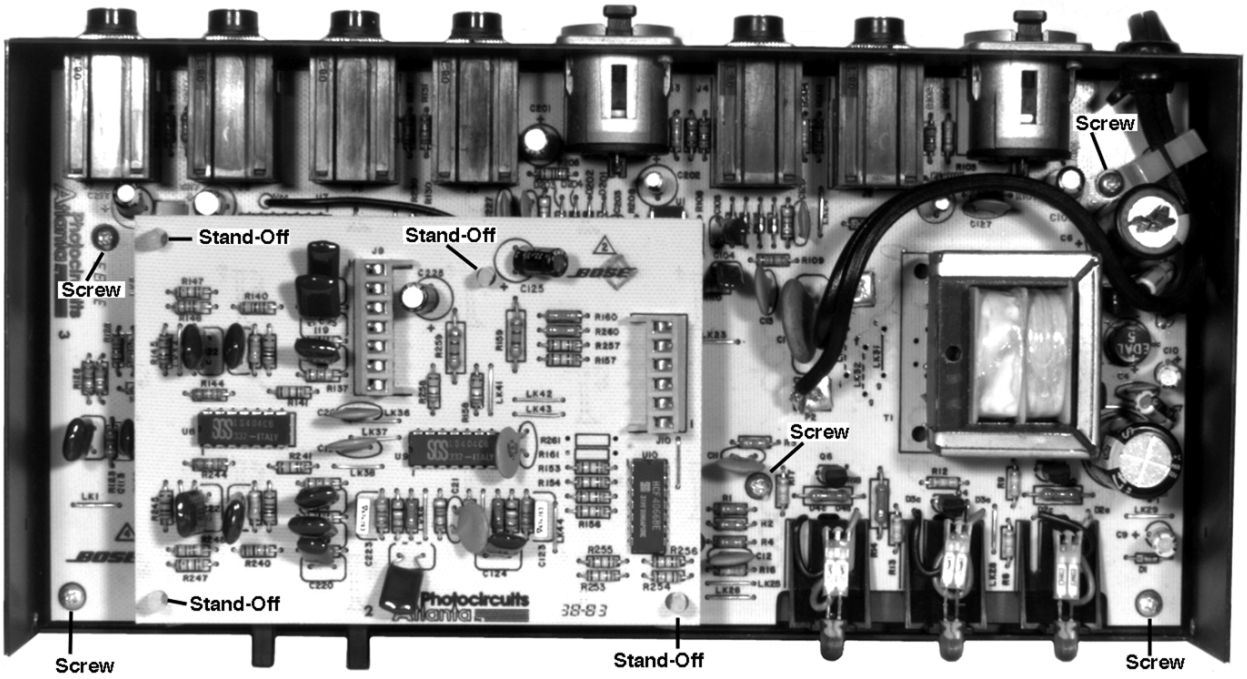


Figure 2. Original 802C PCB Exploded View

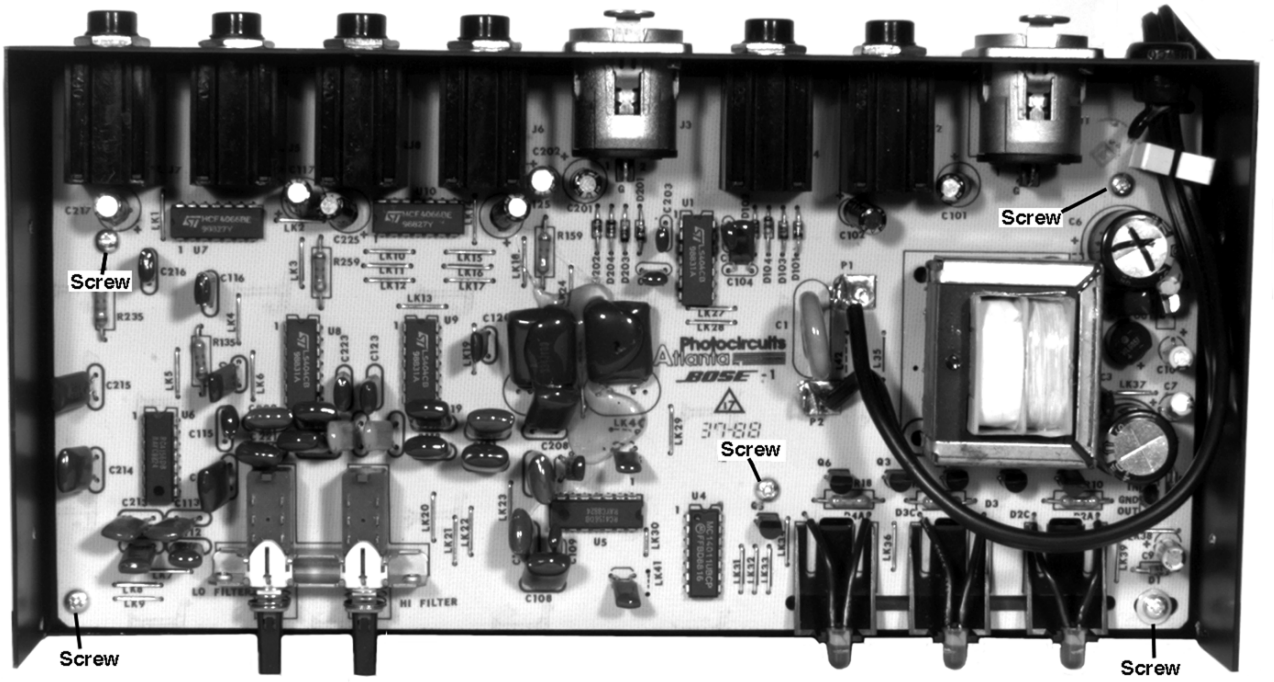


Figure 3. SMD 802C PCB Exploded View

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TEST PROCEDURES

1. Mode Indicator Test

1.1 Depending on the output jack configuration (see top cover diagram on page 17), equalization curves and output vary. You must test all modes of the 802C to assure proper operation.

1.2 Perform the test below to verify that the mode select operation is working properly.

Note: You can insert one or both of the output jacks into the unit for this test.

LED Indicator Status

Output Jacks Inserted	802 Full Range	Passive 2-Way	Bi-AMP
No Jacks Inserted	On	Off	Off
Inserted into 802 AMP	On	Off	Off
Inserted into 302 AMP	Off	On	Off
Inserted into 802 and 302 AMP	Off	Off	On

2. 802 Full Range Frequency Response

2.1 Apply a 750Hz, 500mVrms signal to the input of the 802C.

2.2 Reference a dB meter to the 802 AMP output jacks.

2.3 Refer to the frequency response table below and verify the response of the unit.

Full Range Frequence Response Table

Frequency	Output	Tolerance
55Hz	+14.0dB	± 1.5dB
30Hz	0dB	± 2.5dB
250Hz	+2.7dB	± 1.2dB
750Hz	0dB (reference)	-
3kHz	+2.3dB	± 1.5dB
7.5kHz	+12.0dB	± 1.5dB
15kHz	+16.9dB	± 1.8dB

Note: Set both the Lo and Hi cut switches IN for the following response table.

Lo and Hi Cut Switch Response Table

Frequency	Output	Tolerance
55Hz	+9.3dB	± 1.8dB
750Hz	0dB (reference)	-
15kHz	+6.9dB	± 2.0dB

3. 302 Passive Frequency Response

3.1 Apply a 750Hz, 500mVrms signal to the input of the 802C.

3.2 Reference a dB meter to the 302 AMP output jacks.

3.3 Refer to the frequency response table below and verify the response of the unit.

Passive Frequency Response Table

Frequency	Output	Tolerance
30Hz	-8.8dB	± 2.5dB
55Hz	+6.2dB	± 1.5dB
150Hz	-3.2dB	± 1.5dB
250Hz	+3.2dB	± 1.8dB
750Hz	0 dB (reference)	-
3kHz	0.9dB	± 1.5dB
15kHz	+15.3dB	± 1.8dB

4. Bi-Amp Frequency Response

Note: This test is performed with both the 802 AMP and the 302 AMP output jacks used at the same time.

4.1 Apply a 750Hz, 500mVrms signal to the input of the 802C.

4.2 Reference a dB meter to the 802 AMP output jacks (while in the Bi-Amp mode).

4.3 Refer to the frequency response table below and verify the response of the unit.

802 Bi-Amp Frequency Response Table

Frequency	Output	Tolerance
55Hz	-20.1dB	± 2.5dB
230Hz	+2.6dB	± 1.8dB
750Hz	0 dB (reference)	-
15kHz	+17.0dB	± 1.8dB

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TEST PROCEDURES

4.4 Apply a 100Hz, 500mVrms signal to the input of the 802C.

4.5 Reference a dB meter to the 302 AMP output jacks (while in the Bi-Amp mode).

4.6 Refer to the frequency response table below and verify the response of the unit.

302 Bi-Amp Frequency Response Table

Frequency	Output	Tolerance
55Hz	+3.7dB	± 1.5dB
100Hz	0dB (reference)	-
230Hz	-8.3dB	± 1.5dB
750Hz	-25.8dB	± 2.5dB

5. Distortion Test

Note: Total harmonic distortion must be measured in all modes to assure proper operation.

5.1 Apply a 750Hz, 5Vrms signal to the input of the 802C.

5.2 Refer to the table below for the distortion specification for the corresponding mode being tested.

Note: For the Bi-Amp 302 reading the input signal should be a 100Hz, 5Vrms signal.

Distortion Table

Output	Frequency.	Distortion
802 Full Range	750Hz	<0.1%
302 Passive	750Hz	<0.1%
802 Bi-Amp	750Hz	<0.1%
302 Bi-Amp	100Hz	<0.1%

6. Noise Test

6.1 All noise measurements are ANSI A-weighted true rms, with the inputs shorted.

6.2 Refer to the table below for the proper noise levels.

Noise Table

Output	Noise
802 Full Range	<20uV
302 Passive	<20uV
802 Bi-Amp	<20uV
302 Bi-Amp	<10uV

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PART LIST NOTES

1. This part is not normally available from Customer Service. Approval from the Field Service Manager is required before ordering.

2. The individual parts located on the PCB are listed in the Electrical Part List.

3.  This part is critical for safety purposes. Failure to use a substitute replacement with the same safety characteristics as the recommended replacement part might create shock, fire and or other hazards.

4. RC-4156 is to be used **ONLY** as a replacement for U5 and U6. This replaces the selected LS-404 IC previously used in these locations. Due to the higher current needs of the RC-4156, **DAMAGE** could occur to the power supply if this IC is used in other locations on the PCB.

5. This part is used on the 220V variation only.

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MAIN PART LIST

(See Figure 4)

Item Number	Description	Part Number	Note
1	COVER	135040	
2	CHASSIS	133230	1
3	FEET	103593	
4	SCREW, SHEET METAL, 4-40 x .25L	103118-04	
5	CONNECTOR, XLR	121810	
6	NUT, KNURLED	121890	
7	STRAIN RELIEF BUSHING	106346	
8	LINE CORD, 100/120V LINE CORD, 220V	111672 113608	3
9	LED	123487	
10	BRACKET, LED	120975	
11	SMD PCB ASSEMBLY	-	1
12	SWITCH, KNOB	120989	
13	SWITCH, DUAL	107461	
14	SCREW, MACHINE, 4-40 x .187L	103140-03	
15	STANDOFF	123199	1
16	PCB ASSEMBLY (TOP)	122068	
17	PCB ASSEMBLY (MAIN)	-	1
-	CARTON	121860	
-	FILLER	122640	
-	POLY BAG	100688	
-	ACCESSORY KIT	121783	
-	MTG KIT (802 COVER)	123037	
-	SWITCH, SLEEVE	120996	
-	INSULATOR	122855	
-	SCREW, MACHINE, NYLON, 6-32 x .75L, 220V	124843-12	5
-	SCREW, MACHINE, NYLON, 6-32 x .25L, 220V	128843-04	5
-	STANDOFF, HEX, 6 x .375L	121828-06	5

Reference Designator	Description	Part Number	Note
J1, 3	CONNECTOR, XLR, INSERT	121823	
J2, 4-8	JACK, PHONE	121570	
J9	WAFER, 7PIN, (2461)	123237-07	
J9	CONNECTOR, 7PIN (21458)	121970-07	
J10	WAFER, 6PIN (2461)	123237-06	
J10	CONNECTOR, 6PIN (21458)	121970-06	
P1, 2	TEMINAL, FASTON	111262	3
T1	TRANSFORMER, 110/220V TRANSFORMER, 120V TRANSFORMER, 100V	120993 121659-1 121824	3

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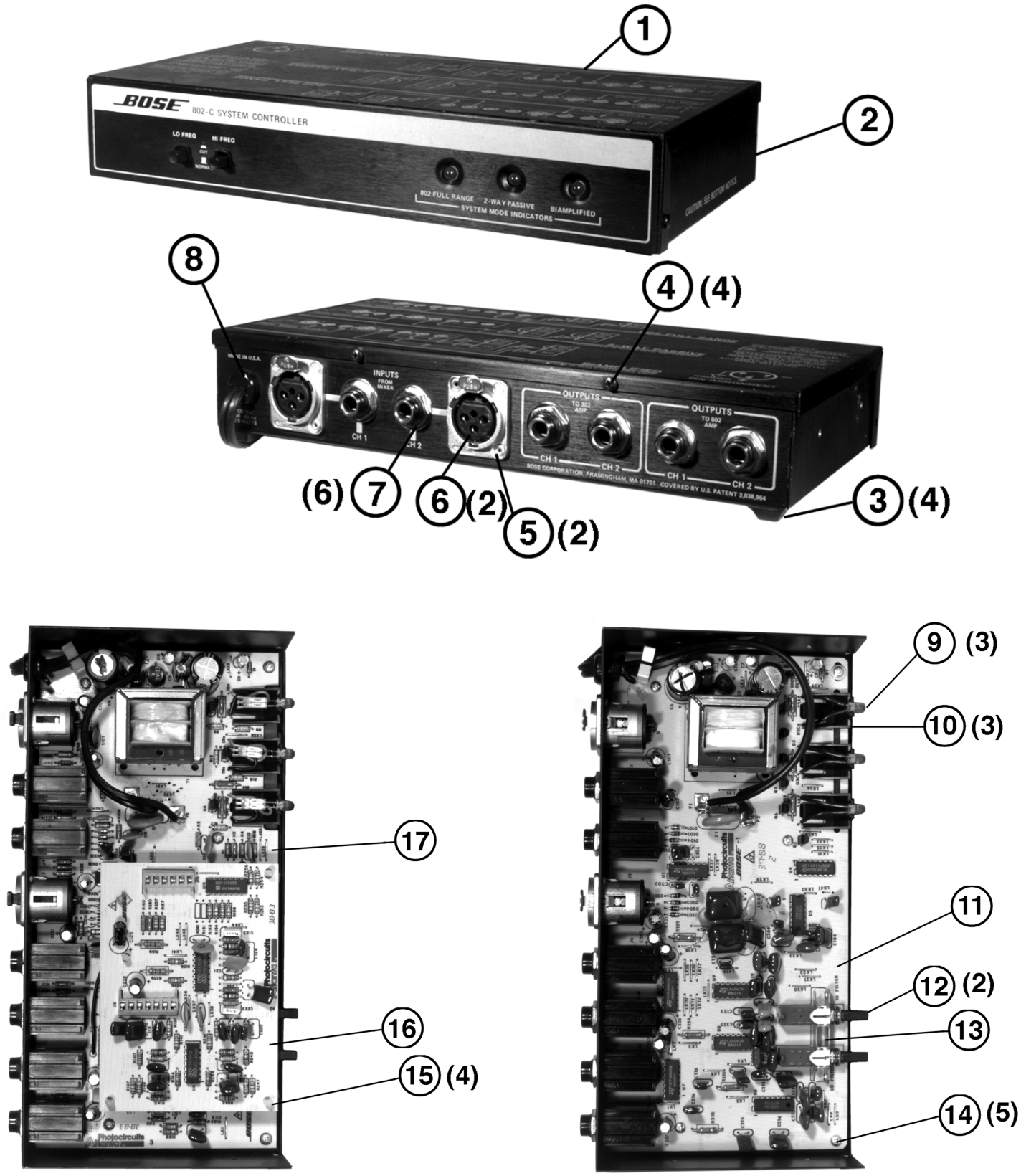


Figure 4. Main Parts Exploded View

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ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1, 2	2.7kΩ, 1/4 Watt, 5%	117704-1212725	
R3, 4	3.3kΩ, 1/4 Watt, 5%	117704-1213325	
R5-7, 11, 15, 118, 218	160kΩ, 1/4 Watt, 5%	117704-1211645	
R8, 9, 12, 13, 16, 17, 101, 210, 104, 204	330kΩ, 1/4 Watt, 5%	117704-1213345	
R10, 14, 18	8.2kΩ, 1/2 Watt, 5%	122071-8225	
R102, 103, 105, 122, 124, 202, 203, 205, 222, 224	2.00kΩ, 1/4 Watt, 1%	119976-2212001	
R106, 206	1.9kΩ, 1/4 Watt, 1%	119976-2211911	
R107, 207	48.7kΩ, 1/4 Watt, 1%	119976-2214872	
R108, 208	20kΩ, 1/4 Watt, 5%	117704-1212035	
R109, 126, 130, 131, 209, 226, 230, 231	23.7kΩ, 1/4 Watt, 1%	119976-2212372	
R110, 210	2.74kΩ, 1/4 Watt, 1%	119976-2212741	
R111, 113, 211, 213	1kΩ, 1/4 Watt, 5%	117704-1211025	
R112, 146, 152, 212, 246, 252	4.75kΩ, 1/4 Watt, 1%	119976-2214751	
R114, 214	13kΩ, 1/4 Watt, 2%	117704-1211332	
R115, 215	10kΩ, 1/4 Watt, 5%	117704-1211035	
R116, 125, 216, 225	8.2kΩ, 1/4 Watt, 2%	117704-1218222	
R117, 128, 129, 133, 134, 217, 228, 229, 233, 234	6.81kΩ, 1/4 Watt, 1%	119976-2216811	
R119, 120, 219, 220	18kΩ, 1/4 Watt, 5%	117704-1211835	
R121, 136, 221, 236	22kΩ, 1/4 Watt, 5%	117704-1212235	
R123, 223	470Ω, 1/4 Watt, 5%	117704-1214715	
R127, 227	130kΩ, 1/4 Watt, 5%	117704-1211345	
R132, 141, 145, 153-158, 232, 241, 245, 253-258	6.04kΩ, 1/2 Watt, 1%	119976-2216041	
R135, 159, 235, 259	510Ω, 1/4 Watt, 5%	122071-5115	
R137, 237	47.5kΩ, 1/4 Watt, 1%	119976-1214752	
R138, 140, 238, 240	15.0kΩ, 1/4 Watt, 1%	119976-2211502	
R142, 242	3.0kΩ, 1/4 Watt, 1%	119976-2213011	
R143, 243	33kΩ, 1/4 Watt, 5%	117704-1213335	

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ELECTRICAL PART LIST

Resistors (continued)

Reference Designator	Description	Part Number	Note
R144, 244	56kΩ, 1/4 Watt, 2%	117704-1215632	
R148, 248	4.12kΩ, 1/4 Watt, 1%	119976-2214121	
R149, 249	23.7kΩ, 1/4 Watt, 1%	119976-2212372	
R150, 250	30.9kΩ, 1/4 Watt, 1%	119976-2213092	
R160, 260	22kΩ, 1/4 Watt, 5%	117704-1212235	

SMD Resistors

Reference Designator	Description	Part Number	Note
R1, 2	2.7kΩ, CHIP, 5%	124895-2725	
R3, 4	3.3kΩ, CHIP, 5%	124895-3325	
R5, 6, 7, 11, 15, 118, 218	160kΩ, CHIP, 5%	124895-1645	
R8, 9, 12, 13, 16, 101, 104	330kΩ, CHIP, 5%	124895-3345	
R102, 103, 105, 111, 122, 124, 202, 203, 205, 211, 222, 224	2.00kΩ, CHIP, 1%	124894-2001	
R106, 206	1,91kΩ, CHIP, 1%	124894-1911	
R107, 207	48.7kΩ, CHIP, 1%	124894-4872	
R108, 208	20kΩ, CHIP, 5%	124895-2035	
R109, 126, 130, 131, 209, 226, 230, 231	23.7kΩ, CHIP, 1%	124894-2372	
R110, 210	2.74kΩ, CHIP, 1%	124894-2741	
R112, 114, 212, 214	13.3kΩ, CHIP, 1%	124894-1332	
R113, 213	1kΩ, CHIP, 5%	124895-1025	
R115, 215	10kΩ, CHIP, 5%	124895-1035	
R116, 125, 139, 152, 216, 225, 239, 252	8.25kΩ, CHIP, 1%	124894-8251	
R117, 128, 129, 133, 134, 217, 228, 229, 233, 234	6.81kΩ, CHIP, 1%	124894-6811	
R119, 120, 219, 220	18kΩ, CHIP, 5%	124895-1835	
R121, 136, 160, 221, 236, 260	22kΩ, CHIP, 5%	124895-2235	
R123, 223	470Ω, CHIP, 5%	124895-4715	
R127, 227	130kΩ, CHIP, 5%	124895-1345	
R132, 141, 145, 147, 151, 153-158, 232, 241, 245, 247, 251, 253-258	6.04kΩ, CHIP, 1%	124894-6041	
R137, 237	47.5kΩ, CHIP, 1%	124894-4752	
R142, 242	3.01kΩ, CHIP, 1%	124894-3011	
R143, 149, 150, 234, 249, 250	33kΩ, CHIP, 5%	124895-3335	
R144, 244	56.2kΩ, CHIP, 1%	124894-5622	
R146, 246	4.75kΩ, CHIP, 1%	124894-4751	
R164, 264	26.7kΩ, CHIP, 1%	124894-2672	

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ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C1	.0047uF, 220V .0047uF, 1.4KV, 100/120V	120993 103447	3 
C2, 3	.015uF, FILM	118091-153	
C4	.01uF, CERAMIC DISC	119696-103	
C5, 6	470uF, ELECTROLYTIC	110704	
C7-10	1uF, ELECTROLYTIC	119942-1R0	
C11-19, 22	.1uF, CERAMIC DISC	117502	
C101, 117, 125, 201, 217, 225	22uF, ELECTROLYTIC	119944-220	
C102, 202	2.2uF, ELECTROLYTIC	119943-2R2	
C103-105, 203-205	.0068uF, FILM	118091-682	
C106, 206	.33uF, FILM	123785-334	
C107, 108, 121, 122, 207, 208, 221, 222	.1uF, FILM	118091-104	
C109, 209	.0012uF, FILM	118091-122	
C110, 126, 127, 210, 226, 227	470pF, CERAMIC DISC	119617-471	
C111, 211	270pF, CERAMIC DISC	119617-271	
C112, 113, 124, 212, 213, 224	.033uF, FILM	118091-333	
C114, 214	.068uF, FILM	118091-683	
C115, 116, 123, 215, 216, 223	.047uF, FILM	118091-473	
C118, 119, 218, 219	.082uF, FILM	118091-823	
C120, 220	.022uF, FILM	118091-223	

SMD Capacitors

Reference Designator	Description	Part Number	Note
C4	.01uF, CERAMIC, CHIP	124959-103	
C11-22	.1uF, CERAMIC, CHIP	124959-104	
C110, 126, 127, 210, 226, 227	470pF, CERAMIC, CHIP, 10%	124956-4712	
C111, 211	270pF, CERAMIC, CHIP, 10%	124956-2742	

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ELECTRICAL PART LIST

Diodes

Reference Designator	Description	Part Number	Note
D1-5	ZENER, 18V, 1W, IN4746A	116995-4746A	
D1, 101, 104, 201-204	1N4148, DIODE	121501	
Z1	BRIDGE RECTIFIER	112027	3 

Transistors

Reference Designator	Description	Part Number	Note
Q1, 4, 5	TRANSISTOR NPN	117921	
Q2, 3, 6	TRANSISTOR PNP	119168	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1, 8, 9	QUAD OP AMP, LS-404	120535/192166	4
U2	VOLT REG, 78L15	121116-1	
U3	VOLT REG, 79L15	121117-1	
U4	QUAD NAND CD-4011	121854	
U5, 6	QUAD OP AMP, RC4156	192166	4
U7, 10	QUAD AW. SW. CD4066	119837	

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VOLTAGE CONVERSION INSTRUCTIONS

Voltage Conversions are to be performed on Military units. However it is possible to convert a 110 Volt unit **(by replacing the transformer)** and a 220 Volt European unit.

1. 220 Volt to 110 Volt Conversion

Note: Conversions must be performed with the line cord disconnected from any power source. Refer to Figure 3 below for the following procedures. The jumpers listed in parentheses refer to the **SMD** units.

1.1 Perform disassembly procedure 3, PCB removal.

1.2 Locate jumper LK-31, (LK-35) in front of the power transformer (near the line cord), and remove it.

1.3 Add jumpers LK-32 (LK-42) and LK-33 (LK-43).

For European 220 Volt units.

1.4 Remove the 220 Volt line cord and replace it with a 110 Volt line cord. Make certain the line cord is properly installed in the strain relief.

1.5 Perform assembly procedure 4, PCB replacement.

1.6 Test the unit to confirm the voltage conversion was perform correctly.

1.7 Remove the 220 Volt label on the rear of the unit.

2. 110 Volt to 220 Volt Conversion

2.1 Perform disassembly procedure 3, PCB removal.

2.2 Remove the two jumpers LK-32 (LK-42) and LK-33 (LK-43).

For units with a 110 Volt transformer.

2.2 Remove the 110 Volt transformer and C1 capacitor, and install 220 Volt components (see the part list).

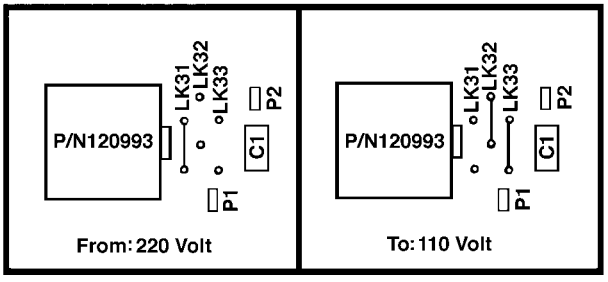
2.3 Add jumper LK-31 (LK-35). Line cord replacement is optional.

2.4 Perform assembly procedure 4, PCB replacement.

2.5 Test the unit to confirm the voltage conversion was perform correctly.

2.6 Add a 220 Volt label on the rear of the unit just below the line cord.

220 Volt to 110 Volt Conversion



110 Volt to 220 Volt Conversion

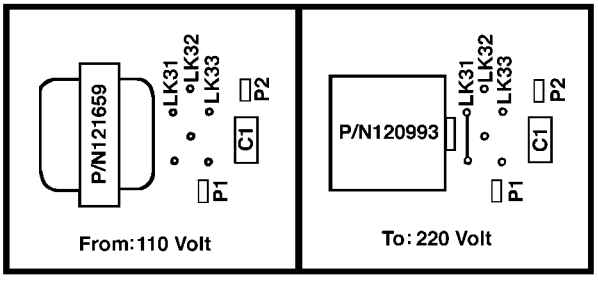


Figure 5. Voltage Conversion Diagram

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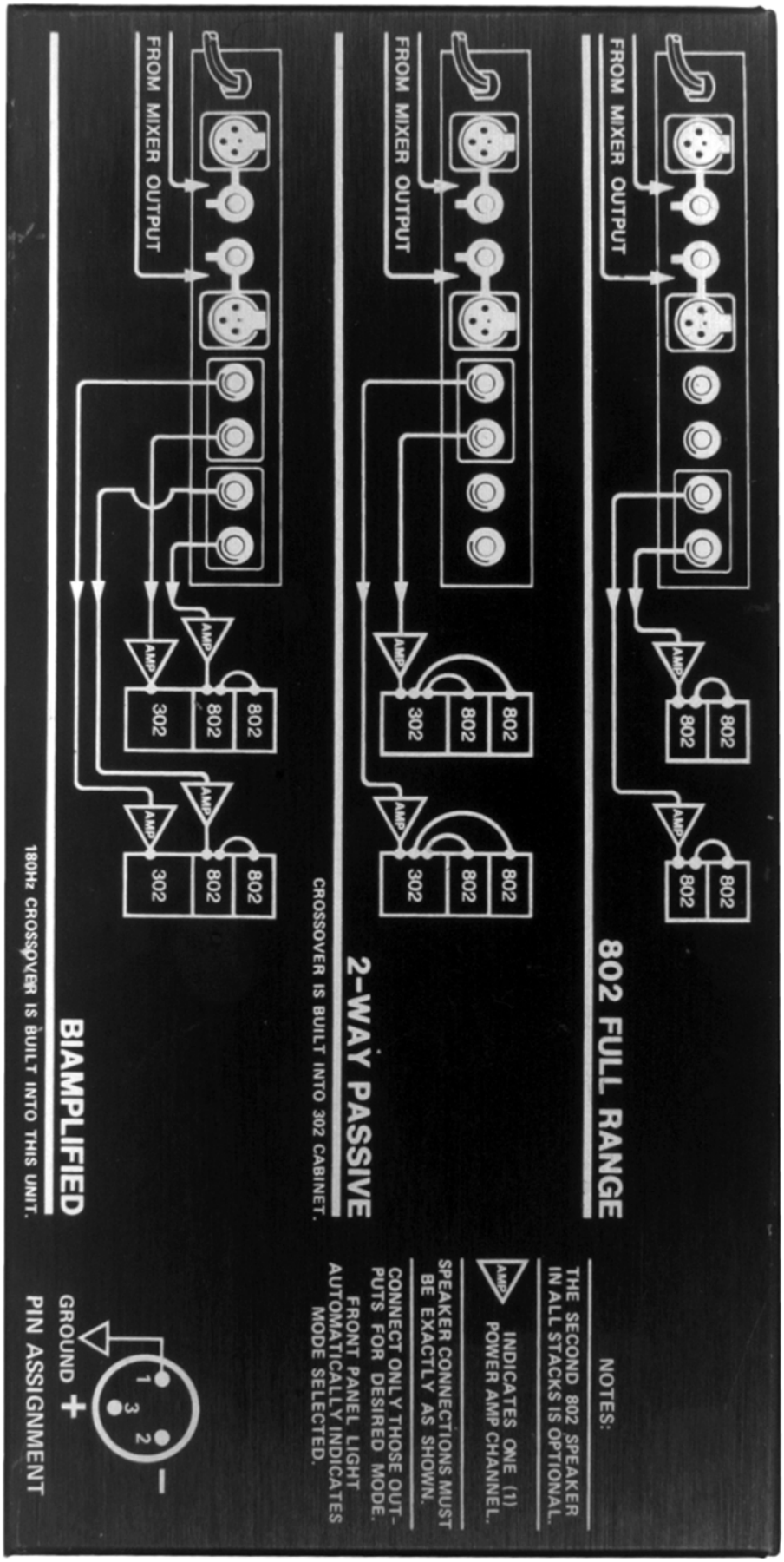


Figure 6. Top Cover Connection Diagram

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