ControlSpace® SP-24 Sound Processor

(US and non-US units)

Service Manual

Reference Number 352427-SM Rev. 00

CONTENTS

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) UL6500 / UL60065 / IEC 60065 paragraph 9.1.1. With the unit AC switch first in the ON position and then in OFF position, measure from a known earth ground (metal waterpipe, 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 testing 3 wire products, the resistance measured to the product enclosure should be between 2 and infinite MOhms. Also, the resistance measured to exposed input/output connectors should be between 4 and infinite MOhms. When testing 2 wire products, the resistance measured to exposed input/output connectors should be between 4 and infinite MOhms. 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.

CAUTION: The Bose® ControlSpace® SP-24 sound processor contains no user-serviceable parts. To prevent warranty infractions, refer servicing to warranty service stations or factory service.

WARRANTY

The Bose ControlSpace SP-24 sound processor is covered by a limited 5-year transferable limited warranty.

Product Description

The ControlSpace® SP-24 sound processor is a flexible and easy-to-use digital signal processor for loudspeaker control with portable PA systems or small-scale fixed-installations. It offers two methods of configuration with front-panel setup for situations where Bose® loudspeakers are being used, and the SP-24 Editor software for full-featured control of your sound with any loudspeaker.

Key Features

- Simplified front-panel user interface for selection of user-created Scenes or stand-alone use with Bose® loudspeakers.
- Built-in Bose loudspeaker EQ library supports Panaray, LT, MA12, MB4/12/24, and FreeSpace loudspeakers.
- End-fire bass array Presets for MB4, MB12, and MB24 modular bass loudspeakers.
- Balanced XLR inputs (2) and XLR outputs.
- Front-panel LCD display and controls allow access to important parameters such as input/output gains, input sensitivity, and delay.
- Input channel signal and clip LED indicators.
- User Lockout feature helps prevent unauthorized tampering of front panel interface.

ControlSpace SP-24 Editor software

The ControlSpace SP-24 Editor software enables full-featured control and monitoring of the SP-24 sound processor, allowing users to save, recall, and share customizable Scenes.

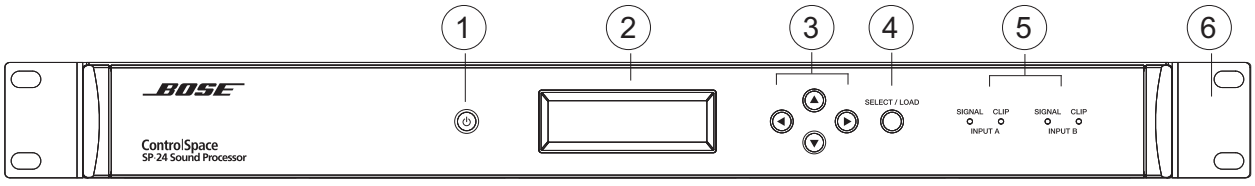
Additional Documentation

The following additional documents can help guide you through the setup and use of this product:

ControlSpace SP-24 sound processor Installation and Operating Guide
This document outlines safety warnings, precautions, basic setup, and configuration. A printed version of this guide is supplied with the unit and the most current version can be downloaded from pro.Bose.com.

ControlSpace SP-24 Editor User's Guide (PDF)
This document provides detailed instructions on how to use ControlSpace SP-24 Editor software to fully configure and update the unit. The most current version of this guide can be downloaded from pro.Bose.com and is included in the software help file.

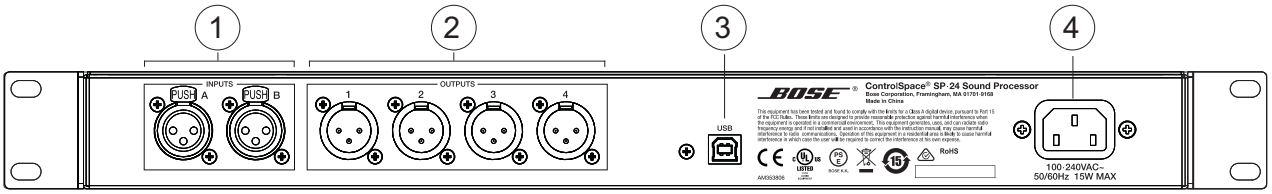
Front Panel Controls and Indicators



1. Power button: On/Off
2. Display: The 2 x 16 backlit LCD displays Preset names and parameter values.
3. Navigation controls: Press to navigate through the user interface.
4. SELECT/LOAD: Loads Presets and Custom Scenes.
5. SIGNAL/CLIP LEDs: Illuminates to show signal and clipping indication for each input channel.
6. Removable rack ears: For use when installing unit into rack-mount enclosures.

Product Description

Rear Panel Connections



1. Inputs A/B: Balanced XLR Inputs.
2. Outputs 1-4: Balanced XLR Outputs.
3. USB port: B-type USB port for optional connection to PC running SP-24 Editor software.
4. IEC power: IEC power cord input.

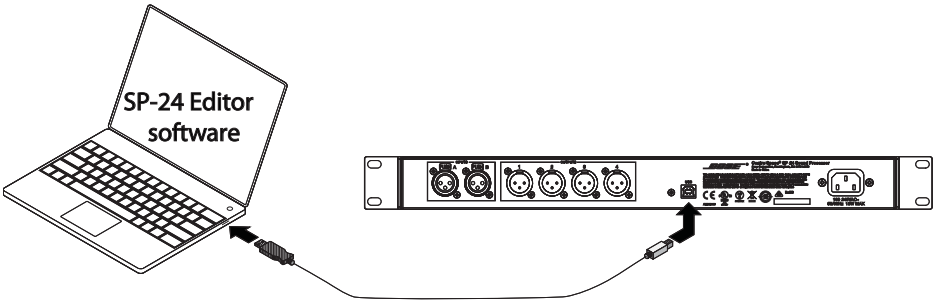
Balanced and Unbalanced Connections

The ControlSpace® SP-24 sound processor features balanced XLR connections which can be modified at the cable for use with unbalanced equipment. Although balanced connections are preferred, an unbalanced connection can be made by tying together pins 1 and 3.

USB Connection

When using the SP-24 Editor software, connect the supplied USB cable from the SP-24 sound processor to a PC. The USB cable should be used directly between the SP-24 sound processor and the computer.

Note: Use of docking stations or USB hubs is not recommended.



Note: The SP-24 Editor software and User's Guide are available for download from pro.Bose.com.

System Requirements

The following are the minimum system requirements for the SP-24 Editor software:

- Microsoft® Windows® XP Professional, Service Pack 2 (or later)
- Microsoft Windows 7 (Professional or Ultimate)
- Intel® Pentium® 4 850 Mhz processor (or better)
- Minimum screen resolution of 1280 x 768
- 512 MB RAM
- 100 MB disk space available
- USB connection

Product Description

Front Panel Setup and Configuration

The ControlSpace® SP-24 sound processor has two methods of configuration. The unit may be configured using pre-defined opera-tional modes and loudspeaker Presets from the front panel, or advanced Scenes and configurations may be created using the SP-24 Editor software. This section addresses the set up and configuration of the unit using the front panel.

For additional information related to the set up and configuration via the SP-24 Editor software, see the SP-24 Editor software User's Guide available at pro.Bose.com.

Note: The SP-24 Editor software requires the use of a PC running Windows XP or Windows 7 and an available USB port.

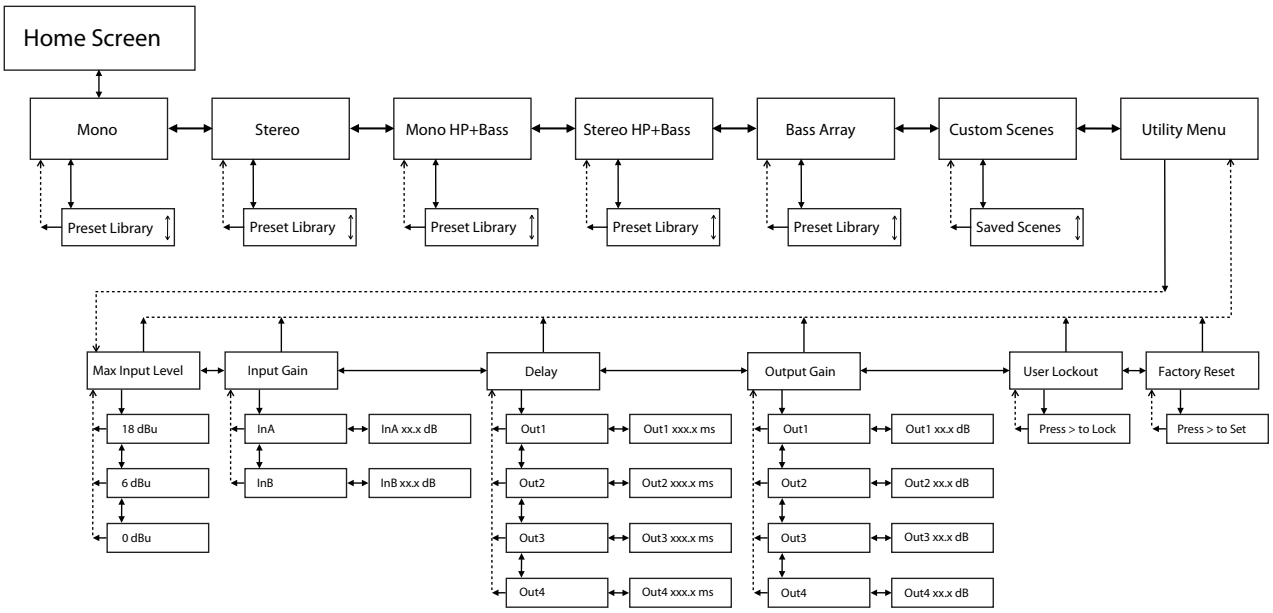
The table below outlines the features that can be accessed via the front panel of the sound processor and the ControlSpace SP-24 Editor software.

Function	Using Front Panel	Using SP-24 Editor Software
Load pre-configured mode w/ Bose ® loudspeaker Preset	x	
Load Custom Scene	x	
Set maximum input level (sensitivity)	x	x
Set input gain per channel	x	x
Mute input channels		x
Set input EQ per channel		x
Select custom channel routing		x
Set custom bandpass filter per channel		x
Select per-channel Bose loudspeaker EQs		x
Set 9-band zone EQ per output channel		x
Set delay per output channel in feet or meters	x	x
Set delay per output channel in millseconds	x	x
Set peak limiter per output channel		x
Set output gain	x	x
Mute output channels		x
Change phase 180 degrees per output channel		x
Enable User Lockout	x	
Perform a Factory Reset	x	
Open a Scene file stored on a PC		x
Save a Scene file to a PC		x
Send a Scene file to the SP-24 sound processor		x
Recall a Scene file from the SP-24 sound processor to the PC		x
Update SP-24 sound processor firmware		x
Input signal and clip indication	x	x
Detailed input and output metering		x
Output signal indication		x
Assign Bose loudspeakers EQs to individual output channels		x
Load discontinued Bose loudspeaker EQ		x

Product Description

Front Panel User Interface

Front Panel Menu Structure Control Map



Preset Modes

The ControlSpace® SP-24 sound processor comes pre-loaded with loudspeaker Presets for Bose® Professional loudspeakers. Updated loudspeaker Presets may be available and can be downloaded from pro.Bose.com. See “Updating Firmware and Loudspeaker EQ Presets” for instructions.

Factory Fixed Routing Table

The loudspeaker Presets are linked to pre-defined modes for common configurations of current Bose loudspeakers. Discontinued Bose loudspeaker EQs can be loaded and applied via the SP-24 Editor software. The following table indicates how each Preset mode affects input channel routing and filtering at each of the four output channels.

Output	Preset Category				
	Mono	Mono HP+Bass	Stereo	Stereo HP + Bass	Bass Array
1	A+B (Full Range)	A+B (HP Filter)	A (Full Range)	A (HP Filter)	A+B (LP Filter)
2	A+B (Full Range)	A+B (HP Filter)	B (Full Range)	B (HP Filter)	A+B (LP Filter)
3	A+B (Full Range)	A+B (LP Filter)	A (Full Range)	A+B (LP Filter)	A+B (LP Filter)
4	A+B (Full Range)	A+B (LP Filter)	B (Full Range)	A+B (LP Filter)	A+B (LP Filter)

Note: HP = High Pass (only high frequencies are passed)
LP = Low Pass (only low frequencies are passed)
Full Range = (all frequencies are passed)

Note: Other output configurations such as four discrete output channels, can be designed using the SP-24 Editor software.

Product Description

Loading Presets

1. From the home screen, press the left arrow button < located on the front panel to edit.
2. Use the left and right arrow buttons < > to navigate to the desired Preset category.
3. Use the down arrow button V to locate the desired Preset.
4. Press the SELECT/LOAD button to load the Preset.

Note: On LCD display, an asterisk (*) indicates the currently loaded Preset.

Custom Scenes

The ControlSpace® SP-24 sound processor supports the creation of four unique Custom Scenes which may be recalled from either the front panel or the SP-24 Editor software. Each Scene represents a unique configuration of comprehensive signal processing parameters which are immediately implemented when the scene is recalled. For detailed information on creating Custom Scenes, download the ControlSpace SP-24 Editor User's Guide from pro.Bose.com.

To recall a saved Custom Scene using the front panel controls on the sound processor:

1. From the Home Screen, press the down arrow V to edit.
2. Use the left and right arrows < > to navigate to Custom Scenes.
3. Use the down arrow V to locate desired Custom Scene.
4. Press the SELECT/LOAD button to load the selected Custom Scene.

Note: Any parameters set previously in the Utility Menu will be overwritten with data stored in the Custom Scene.

Utility Menu

The Utility Menu allows you to make limited adjustments to the SP-24 sound processor from the front panel. More advanced configura-tions can be created using the SP-24 Editor software.

Saving Settings

In the Utility Menu, changes to a parameter setting can be stored immediately by pressing SELECT/LOAD or will automatically store after sixty seconds of inactivity. To exit the parameter screen, press the left arrow button <.

Note: When entering a parameter screen, the initial value displayed is the current active parameter setting.

Note: When exiting a parameter screen, the last value displayed will automatically save after sixty seconds of inactivity. To avoid the unit saving an undesired setting, make sure to use the left arrow button < to exit the parameter screen from the desired parameter setting.

Updating Firmware and Loudspeaker EQ Presets

Both the device firmware and Bose® loudspeaker Presets contained within the ControlSpace SP-24 sound processer can be updated using the ControlSpace SP-24 Editor software. To obtain the newest versions of firmware and EQ files, go to pro.Bose.com. For more information about updating the firmware and loudspeaker EQ Presets, please refer to the ControlSpace SP-24 Editor User's Guide.

Product Description

SP-24 Editor PC Application

Features and Capabilities

The ControlSpace® SP-24 Editor software is used for the set up, configuration and control of the Bose® ControlSpace SP-24 sound processor. The SP-24 Editor provides access to all functions within the processor, and from within the application you may create Custom Scenes and store them within the processor. Up to four Custom Scenes may be stored to the SP-24 processor.

Additional information on the design and configuration of systems using the ControlSpace SP-24 sound processor can be found at pro.Bose.com.

The ControlSpace SP-24 sound processor employs a fixed signal processing architecture which includes the following signal processing functions accessed using the SP-24 Editor software:

- **Input and Output Level Controls**
  - Input sensitivity (Max. Input Level) and gain controls regulate signals entering the SP-24 processor while output gain controls set the output level of the product (up to 18dBu).

- **Multiple 9-Band EQ Stages**
  - Each input and output signal processing chain includes a 9-band Dual EQ, which can be operated as a 9-band graphic or param-eteic equalizer.

- **Routing**
  - Allows you to set the source for each output channel: A, B, A+B, or none.

- **Band Pass Crossover**
  - The Band Pass Crossover function provides a single mono crossover for the output signal processing chain. The Band Pass Crossover supports general purpose operation with user defined settings, or provides the loudspeaker specific band pass when a Bose loudspeaker Preset is activated from the front panel (model+bass Presets).

- **Bose Loudspeaker EQ**
  - Each output signal processing chain includes a dedicated Bose Loudspeaker EQ stage.

- **Signal Delay**
  - Up to 170 milliseconds of signal delay may be applied to each for the four output channels.

- **Signal Limiter**
  - Each output signal processing stage includes a peak value signal limiter with a fixed attack value of 1 millisecond and a fixed release value of 1 second.

Software Download and User's Guide

The ControlSpace SP-24 Editor software and User's Guide can be downloaded from pro.Bose.com.

SPECIFICATIONS

Audio Performance Specifications	
Frequency Response	20 Hz - 20 kHz (+0/-1 dB)
THD+N	0.003% (typical)
Channel Separation (Crosstalk)	100 dB (typical)
Dynamic Range	103 dB (typical)
Integrated DSP	
Audio Latency	1.52 ms
A/D and D/A Converters	24-bit
Sample Rate	48 kHz
Audio Inputs	
Inputs	2 analog, balanced, differential
Connectors, Input	XLR
Input Impedance	Differential 2.2 kohms @ 1 kHz
Maximum Input Level	+18 dBu
Sensitivity	Selectable: 0/+6/+18 dBu
Audio Outputs	
Output	4 analog, balanced, differential
Connectors, Output	XLR
Output Impedance	Differential 200 ohms
Maximum Output Level	+18 dBu
Indicators and Controls	
Audio Indicators	Input signal present (Green LED) Input signal clip (Red LED)
Electrical Specifications	
Mains Voltage	100 VAC - 240 VAC (+/- 10%, 50/60 Hz)
AC Power Consumption	15 W
AC Mains Connector	Standard IEC (C14)
Peak Inrush Current	0.7 Amps (230 V / 50 Hz), 1.0 Amps (120 V / 60 Hz)
Power Dissipation	52 BTU (13.1 kcal)
Power Consumption	< 15W
Physical	
Rack Space Units	1 RU
Dimensions	1.8" H x 19.0" W x 8.6" D (45 mm x 483 mm x 218 mm)
Net Weight	5.9 lb (2.7 kg)
Shipping Weight	7.8 lb (3.5 kg)
Operating Temperature	32 °F - 104 °F (0 °C - 45 °C)
Storage Temperature	-4 °F - 122 °F (-40 °C - 70 °C)
Humidity	95% relative humidity, maximum
General	
Communication Port	USB

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.

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 PCBs 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. This part is referenced for informational purposes only. It is not stocked as a repair part. Refer to the next higher assembly for a replacement part.

PACKAGING PART LIST

ControlSpace® SP-24 Sound Processor (see Figure 1)

Item Number	Description	Bose® Part Number	Vendor Part Number	Qty.	Note
1	POLY BAG, CHASSIS, 550*350*0.04MM	-	1497-4602+0	1	
2	OWNER'S MANUAL, ENGLISH	354951-0010	4301-7373+0	1	
3	AC LINE CORD, 120V, US/CAN AC LINE CORD, 230V, EURO AC LINE CORD, 100V, JAPAN AC LINE CORD, 240V, UK/SING AC LINE CORD, 240V, AUS	350745-001S 350747-001S 350749-001S 350748-001S 350746-001S	- - - - -	1	3 ⚠
4	POLY BAG , OWNER'S MANUAL, 10'*14' W/ES GREEN	-	1497-4122+0	1	
5	CARTON	354534-0010	1480-9502+1	1	
6	PACKING, POLYFOAM	298163	1490-4621+1	2	
7	POLYBAG	-	-	1	
-	USB A TO B, CORD, UL2725, 2 M	354117-0010	7013-2490+0	1	
-	POLY BAG, USB CORD, 10'*14' W/ES	-	1497-4122+0	1	

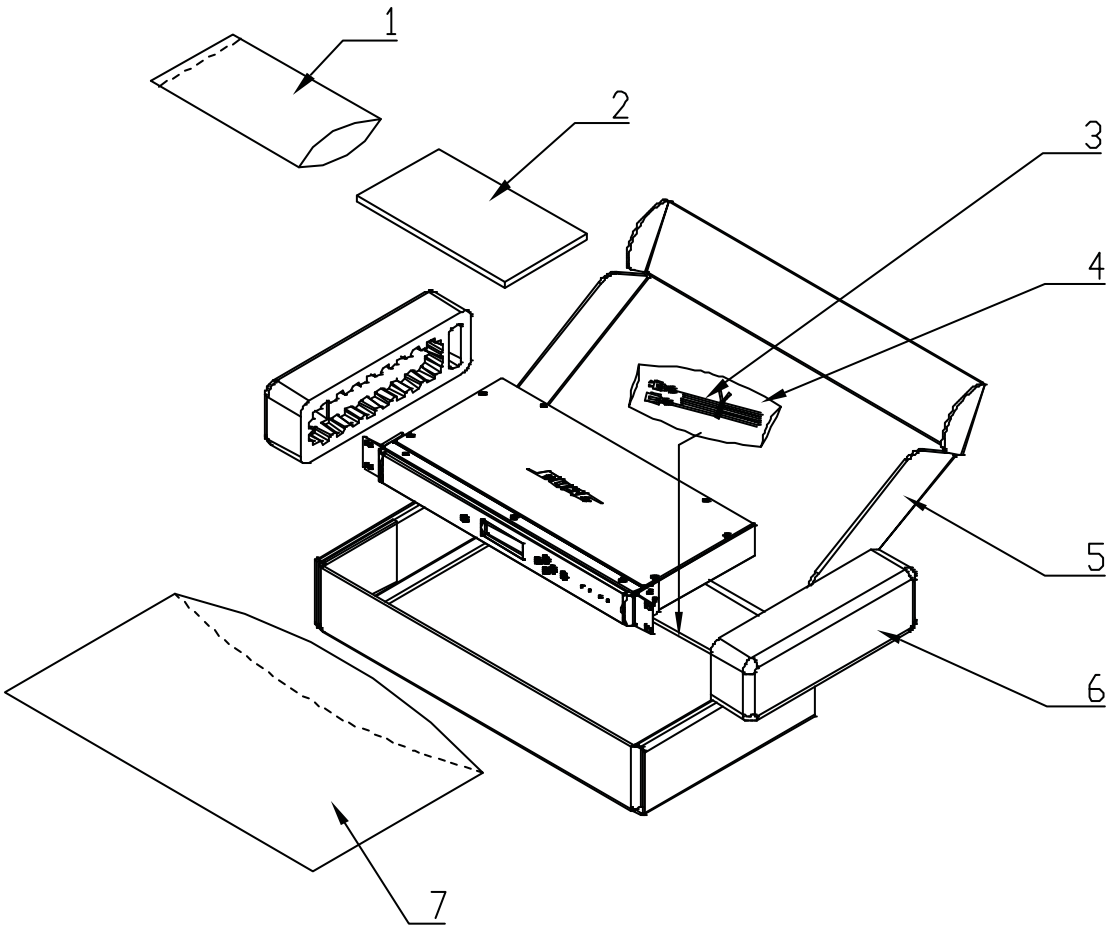


Figure 1. ControlSpace SP-24 Sound Processor Packaging View

MAIN PART LIST

ControlSpace® SP-24 Sound Processor (see Figure 2)

Item Number	Description	Bose® Part Number	Vendor Part Number	Qty.	Note
1	SCREW, MACHINE, CS, M3X6	-	2901-3005+3000	9	4
2	COVER, TOP	298519	1405-9901+0	1	4
-	FRONT PANEL ASSEMBLY, CONSISTS OF ITEMS 3 – 10	354125-001S	SVC-BASIC14+FPSP	1	
3	KNOB, POWER	-	2447-3502+0	1	4
4	COVER, FRONT, ALUMINUM	353809-0010	1405-9901+0	1	
5	PANEL, FRONT	-	1467-6801+0	1	4
6	SCREW, B-TITE, M3X8, BZ	-	2954-3008+3000	5	4
7	LIGHT PIPE	353810-001S	4155-1861+0	4	
8	ARROW AND LOAD BUTTONS	298518	2447-3201+0	1	
9	LENS, LCD, 72X26X1	-	3717-3016+0	1	4
10	SPONGE, LCD, 71.6X25.6X2.0	-	4149-0991+0	1	4
11	LCD DISPLAY, 3.3V, WHT SEG/BLUE BKGND, LMB162A	298159	8902-0005+0	1	
12	POWER SWITCH PCB ASSY	298158	SVC-BASICX4+SW	1	2, 3 ⚠
13	SCREW, B-TITE, PAN, M2.3X8	-	2950-2308+3000	13	4
14	CHASSIS	-	1405-9601+0	1	4
15	SCREW, MACHINE, M3X8, BZ	-	2B04-3008+3000	8	4
16	SWITCH-MODE P/S, AC100-240V, O/P, 15W	298155 or 360472-001S	8902-0009+0	1	2, 3 ⚠
17	RACK EARS	298161	1405-9701+0	2	
18	NUT, M4, BLK	-	2640-4030+0703	1	4
19	WASHER, SPRING, M4X1X7	-	2607-4010+0703	1	4
20	WASHER, METAL, M4X0.8X10	-	2600-4008+1003	1	4
21	CHOKE, EARTH, TOROIDAL, 200uH, #18 WIRE, GREEN / YELLOW	-	1806-3917+0	1	3, 4 ⚠
22	NUT, M3, NI	-	2640-3022+0540	2	4
23	SCREW, M3X8, C'SINK, BLK	-	2B04-3008+3000	2	4
24	INLET, AC, UL/CSA/VDE, 250V, 10A (Rong Feng Industrial Co., SS-7B, 250V, 10A VDE,15A UL/CSA)	298153	2113-1144+0	1	3 ⚠
25	SCREW, M3X6, BINDING, BLK	-	2954-3008+3000	2	4
26	WASHER, SPRING, M3X0.9X5.5, BZ	-	2607-3009+0553	10	4
27	INPUT/OUTPUT PCB ASSY	353803-001S	SVC-BASICX4+I/O	1	2
28	SCREW, 3X8, TAPPING	-	2950-3008+3000	12	4
29	DSP PCB ASSY	353804-001S	SVC-BASICX4+DSP	1	2
30	SCREW, MACHINE, CS, M3X6	-	2941-3006+3000	6	4
31	BUTTON AND LED PCB ASSY	298160	SVC-BASIC14+KEY	1	2
	CHOKE, EARTH, TOROIDAL, 100uH, P7.92, #18, WIRE, BU/BN	-	1806-3949+0	1	3, 4 ⚠
-	SHUNT, 2P, P=2.54 (JP601)	-	2101-0661+0	1	4
-	SHUNT, 2P, P=2.54 (JP602)	-	2101-0661+0	1	4
-	EMI FILTER, K5B, RC, 16X28X9, M2	-	2705-0050+0	2	3, 4 ⚠

MAIN PART LIST

ControlSpace® SP-24 Digital Controller (see Figure 2) (continued)

Item Number	Description	Bose® Part Number	Vendor Part Number	Qty.	Note
-	EMI FILTER, A5, FP63.5X12.7X28.5	-	2705-0060+0	1	3, 4 ⚠
-	CABLE, CLAMP, SELF-ADHESIVE, 21.5X21.5	-	6360-9750+0	2	4
-	CABLE, IDC, 24P, L=110, 3501 SERIES	-	7012-7520+0	1	4
-	CABLE, IDC, 30P, L=100, 3501 SERIES	-	7012-7531+0	1	4
-	WIRE, CONN, 16P, P2.0, #28, UL2651, L=200, FEMALE	-	7012-7641+0	1	4

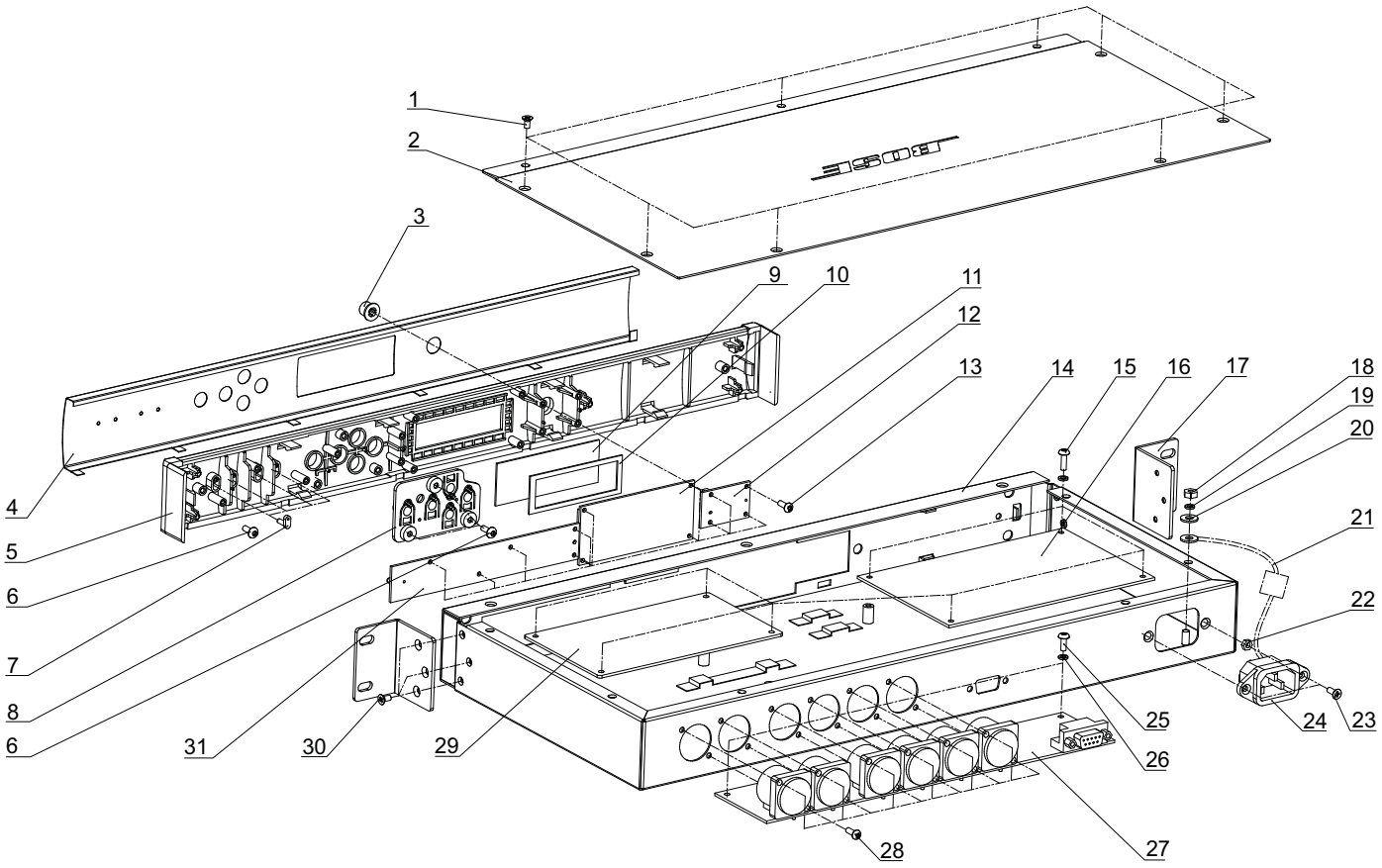


Figure 2. ControlSpace SP-24 Sound Processor Exploded View

MAIN PART LIST

Front Panel Sub-assembly (see Figure 3)

Item Number	Description	Bose® Part Number	Vendor Part Number	Qty.	Note
-	FRONT PANEL SUBASSEMBLY CONSISTS OF:	354125-001S	SVC-BASIC14+FPSP	1	
1	COVER, FRONT, ALUMINUM	353809-0010	1405-9901+0	1	4
2	PANEL, FRONT	-	1467-6801+0	1	4
3	LED LIGHT PIPE	353810-0010	4155-1861+0	4	4
4	ARROW AND LOAD BUTTONS	298518	2447-3201+0	1	4
5	SPONGE FRAME, LCD	-	4149-0991+0	1	4
6	LENS, LCD	-	3717-3006+0	1	4
7	BUTTON, POWER	-	2447-3502+0	1	4

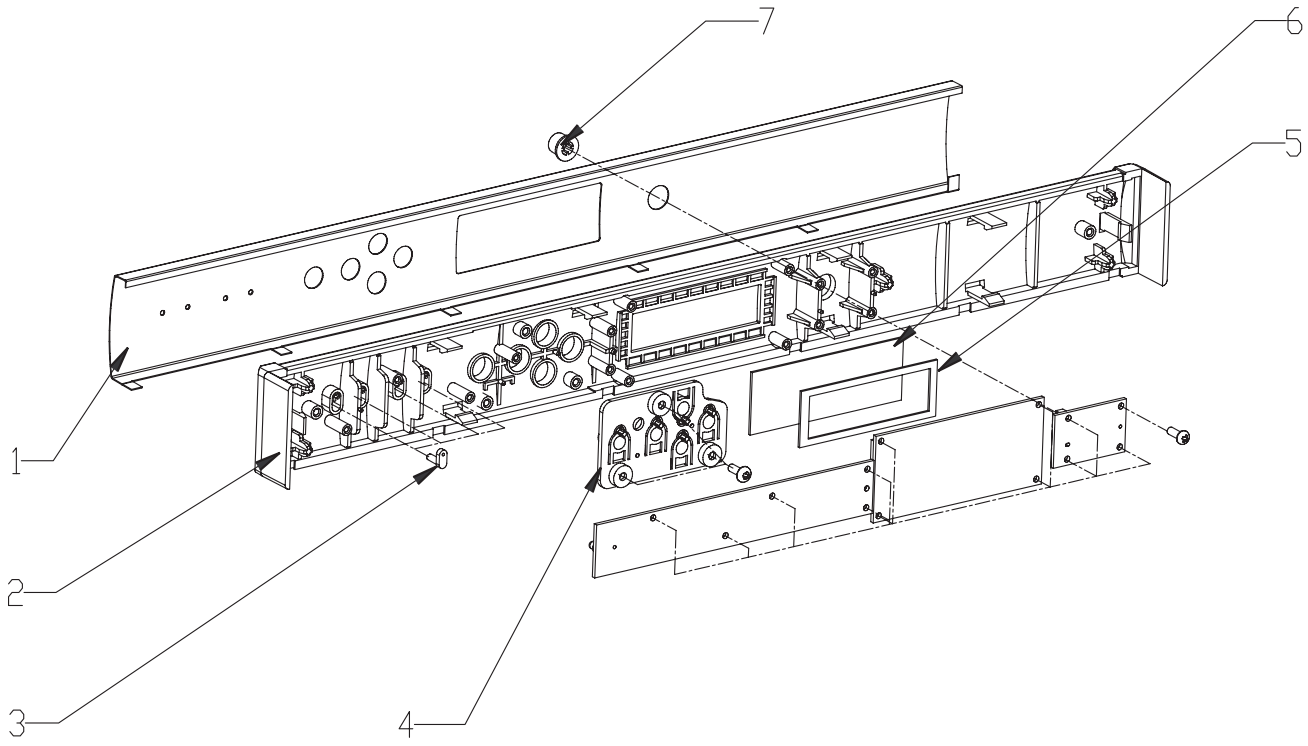


Figure 3. Front Panel Sub-assembly Exploded View

ELECTRICAL PART LIST

Digital Signal Processor (DSP) PCB Assembly

Resistors

Reference Designator	Description	Vendor Part Number	Note
R101	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R102	RCFA, 220RX4, 1/16W, 5%, 0603	4703-221J+P-04	4
R103	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R104	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R105	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R106	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R107	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R108	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R109	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R110	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R111	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R112	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R113	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R114	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R115	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R116	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R117	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R118	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R119	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R120	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R121	RCFA, 1KX4, 1/16W, 5%, 0603	4703-103J+P-04	4
R124	RCFA, 1KX4, 1/16W, 5%, 0603	4703-103J+P-04	4
R125A	10K, RMG, 1/16W, 5%, 0603/1608	4723-103J+P	4
R125B	10K, RMG, 1/16W, 5%, 0603/1608	4723-103J+P	4
R125C	10K, RMG, 1/16W, 5%, 0603/1608	4723-103J+P	4
R125D	10K, RMG, 1/16W, 5%, 0603/1608	4723-103J+P	4
R126	RCFA, 1KX4, 1/16W, 5%, 0603	4703-102J+P-04	4
R127	RCFA, 220RX4, 1/16W, 5%, 0603	4703-221J+P-04	4
R128	RCFA, 1KX4, 1/16W, 5%, 0603	4703-103J+P-04	4
R129	RCFA, 33RX4, 1/16W, 5%, 0603	4703-330J+P-04	4
R500	220R, RMG, 1/16W, 1%, 0603/1608	4723-221A+P	4
R501	220R, RMG, 1/16W, 1%, 0603/1608	4723-221A+P	4
R502	33R, RMG, 1/16W, 1%, 0603,	4723-330A+P	4
R503	33R, RMG, 1/16W, 1%, 0603,	4723-330A+P	4
R504	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R505	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R506	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R507	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R508	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R509	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R510	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R511	200R, RMG, 1/16W, 1%, 0603	4723-201A+P	4
R512	100R, RMG, 1/16W, 1%, 0603	4723-101A+P	4
R513	10R, RMG, 1/16W, 1%, 0603	4723-100A+P-R	4
R514	2.2K, RMG, 1/16W, 1%, 0603/1608	4723-222A+P	4
R515	1.1K, RMG, 1/16W, 1%, 0603,	4723-112A+P	4
R516	1.1K, RMG, 1/16W, 1%, 0603,	4723-112A+P	4
R517	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R518	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R519	2.2K, RMG, 1/16W, 1%, 0603/1608	4723-222A+P	4
R520	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R521	2.2K, RMG, 1/16W, 1%, 0603/1608	4723-222A+P	4

ELECTRICAL PART LIST

Digital Signal Processor (DSP) PCB Assembly

Resistors (continued)

Reference Designator	Description	Vendor Part Number	Note
R522	1.1K, RMG, 1/16W, 1%, 0603,	4723-112A+P	4
R523	1.1K, RMG, 1/16W, 1%, 0603,	4723-112A+P	4
R524	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R525	2.2K, RMG, 1/16W, 1%, 0603/1608	4723-222A+P	4
R526	330R, RMG, 1/16W, 1%, 0603	4723-331A+P	4
R527	2.2K, RMG, 1/16W, 1%, 0603/1608	4723-222A+P	4
R528	330R, RMG, 1/16W, 1%, 0603	4723-331A+P	4
R529	2.2K, RMG, 1/16W, 1%, 0603/1608	4723-222A+P	4
R530	330R, RMG, 1/16W, 1%, 0603	4723-331A+P	4
R531	2.2K, RMG, 1/16W, 1%, 0603/1608	4723-222A+P	4
R532	330R, RMG, 1/16W, 1%, 0603	4723-331A+P	4
R533	2.2K, RMG, 1/16W, 1%, 0603/1608	4723-222A+P	4
R534	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R535	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R536	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R537	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R538	40.2R, RMG, 1/16W, 1%, 0603	4723-40R2+P	4
R539	40.2R, RMG, 1/16W, 1%, 0603	4723-40R2+P	4
R540	40.2R, RMG, 1/16W, 1%, 0603	4723-40R2+P	4
R541	40.2R, RMG, 1/16W, 1%, 0603	4723-40R2+P	4
R542	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R543	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R544	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R545	270R, RMG, 1/16W, 1%, 0603/1608	4723-271A+P	4
R546	2K, RMG, 1/16W, 1%, 0603/1608	4723-202A+P	4
R547	2K, RMG, 1/16W, 1%, 0603/1608	4723-202A+P	4
R548	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R549	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R550	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R551	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R552	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R553	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R554	33K, RMG, 1/16W, 5%, 0603/1608	4723-333J+P	4
R555	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R556	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R557	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R558	4.7K, RMG, 1/16W, 5%, 0603/1608	4723-472J+P	4
R559	10K, RMG, 1/16W, 5%, 0603/1608	4723-103J+P	4
R560	10K, RMG, 1/16W, 5%, 0603/1608	4723-103J+P	4
R561	10K, RMG, 1/16W, 5%, 0603/1608	4723-103J+P	4
R562	10K, RMG, 1/16W, 5%, 0603/1608	4723-103J+P	4
R710	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R810	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R902	33R, RMG, 1/16W, 1%, 0603,	4723-330A+P	4
R903	220R, RMG, 1/16W, 1%, 0603/1608	4723-221A+P	4
R904	220R, RMG, 1/16W, 1%, 0603/1608	4723-221A+P	4
R905	220R, RMG, 1/16W, 1%, 0603/1608	4723-221A+P	4
R906	220R, RMG, 1/16W, 1%, 0603/1608	4723-221A+P	4
R907	150R, RMG, 1/16W, 1%, 0603	4723-151A+P	4

ELECTRICAL PART LIST

Digital Signal Processor (DSP) PCB Assembly

Capacitors

Reference Designator	Description	Vendor Part Number	Note
C500	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C501	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C502	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C503	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C504	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C505	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C506	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C507	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C508	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C509	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C510	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C511	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C512	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C513	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C514	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C515	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C516	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C518	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C520	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C521	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C522	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C523	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C524	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C525	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C526	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C527	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C528	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C529	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C530	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C531	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C532	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C533	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C534	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C535	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C536	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C537	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C538	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C539	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C540	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C541	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C542	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C543	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C544	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C545	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C546	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C547	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C548	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C549	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C550	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C551	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C552	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C553	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4

ELECTRICAL PART LIST

Digital Signal Processor (DSP) PCB Assembly

Capacitors (continued)

Reference Designator	Description	Vendor Part Number	Note
C554	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C555	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C556	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C557	1UF, CC, 50V, +80/-20%, 0805	150F-105Z+J-BD	4
C558	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C559	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C560	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C561	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C562	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C563	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C564	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C565	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C566	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C567	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C568	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C569	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C570	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C571	0.22UF, CC, 50V, +80/-20%, 0603, 332172240R1	150F-224Z+P-AC	4
C572	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C573	1000PF, CC, 50V, 10%, 0603/1608, 1X2	150F-102K+P-AC	4
C574	1000PF, CC, 50V, 10%, 0603/1608, 1X2	150F-102K+P-AC	4
C575	1000PF, CC, 50V, 10%, 0603/1608, 1X2	150F-102K+P-AC	4
C576	1000PF, CC, 50V, 10%, 0603/1608, 1X2	150F-102K+P-AC	4
C577	1000PF, CC, 50V, 10%, 0603/1608, 1X2	150F-102K+P-AC	4
C578	1000PF, CC, 50V, 10%, 0603/1608, 1X2	150F-102K+P-AC	4
C579	1000PF, CC, 50V, 10%, 0603/1608, 1X2	150F-102K+P-AC	4
C580	1000PF, CC, 50V, 10%, 0603/1608, 1X2	150F-102K+P-AC	4
C583	2700PF, CC, 50V, 10%, 0603/1608	150F-272K+P-AC	4
C584	2700PF, CC, 50V, 10%, 0603/1608	150F-272K+P-AC	4
C748	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C749	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C750	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C751	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C752	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
CT500	1UF, CT, 16V, 20%, SM, 1.6X3.2	157D-106M+3-GJ	4
CT501	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT502	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT503	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT504	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT505	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT506	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT507	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT508	1UF, CT, 16V, 20%, SM, 1.6X3.2	157D-106M+3-GJ	4
CT509	1UF, CT, 16V, 20%, SM, 1.6X3.2	157D-106M+3-GJ	4
CT510	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT511	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT512	1UF, CT, 16V, 20%, SM, 1.6X3.2	154E-106M+3-FK	4
CT513	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT514	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT515	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT516	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT517	1UF, CT, 16V, 20%, SM, 1.6X3.2	154E-106M+3-FK	4

ELECTRICAL PART LIST

Digital Signal Processor (DSP) PCB Assembly

Capacitors (continued)

Reference Designator	Description	Vendor Part Number	Note
CT518	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT519	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT521	1UF, CT, 16V, 20%, SM, 1.6X3.2	154E-106M+3-FK	4
CT522	1UF, CT, 16V, 20%, SM, 1.6X3.2	154E-106M+3-FK	4
CT531	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT532	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4
CT533	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-105M+3-CF	4
CT534	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-105M+3-CF	4
CT535	1UF, CT, 16V, 20%, SM, 1.6X3.2	157D-106M+3-GJ	4
CT720	1UF, CT, 16V, 20%, SM, 1.6X3.2	154D-106M+3-CF	4

Inductors and Ferrite Beads

Reference Designator	Description	Vendor Part Number	Note
FB500	FERRITE, BEAD, CHIP, SEBW201209U121MT, 0805	1808-0872+0	4
FB501	FERRITE, BEAD, 4.5X1.6X1.6, BLM41PG102SN1L, MURATA	1808-0871+0	4
FB505	FERRITE, BEAD, 4.5X1.6X1.6, BLM41PG102SN1L, MURATA	1808-0871+0	4
L500	EMI, FILTER, FERRITE, CHIP, EXCCET103U, SMD, PANASONIC	2705-0020+0	4
L501	INDUCTOR, CHIP, 10UH, LEMF3225T100K	1803-0055+0	4
L502	INDUCTOR, CHIP, 10UH, LEMF3225T100K	1803-0055+0	4

Diodes

Reference Designator	Description	Vendor Part Number	Note
D500	BAV99, SOT23, PHILIPS	4840-8970+3	4
D501	BAV99, SOT23, PHILIPS	4840-8970+3	4
D502	BAV99, SOT23, PHILIPS	4840-8970+3	4
D503	BAV99, SOT23, PHILIPS	4840-8970+3	4

Transistors

Reference Designator	Description	Vendor Part Number	Note
Q500	NPN, RN1402, SMD, TOSHIBA, 2214470R2	4852-4020+3	4
Q501	NPN, RN1402, SMD, TOSHIBA, 2214470R2	4852-4020+3	4
Q502	NPN, RN1402, SMD, TOSHIBA, 2214470R2	4851-4020+3	4
Q503	NPN, RN1402, SMD, TOSHIBA, 2214470R2	4851-4020+3	4
Q504	NPN, RN1402, SMD, TOSHIBA, 2214470R2	4851-4020+3	4
Q505	NPN, RN1402, SMD, TOSHIBA, 2214470R2	4851-4020+3	4

ELECTRICAL PART LIST

Digital Signal Processor (DSP) PCB Assembly

Integrated Circuits

Reference Designator	Description	Vendor Part Number	Note
U500	FLASH, MX29LV400CBTI-70G, TSOP48	3132-8111+0	4
U501	DSP, TMS320D708RFP, PQFP144	3132-8231+0	4
U502	PLD, EPM3064A-10, TQPF44, ALTERA	3132-3331+0	4
U503	SUPPLY, VOL, SUPERVISOR, TL7705BCD, SOP-8, TI	3132-3401+0	4
U504	LOW-DROP, LINEAR, REGU, TPS726126DCQ, SOT223-5, TI	3132-3391+0	4
U505	SN74LV245ADWR, OCTAL, B, TRANSCEIVER, SOT163-1/SO	3132-0680+0	4
U507	OCTAL, SN74LVC541ADWR, TI, BUFFER, SMD	3132-3341+0	4
U508	24BIT, DAC, W/VOL, CTRL, CS4392-KZZ, TSSOP, 20P, BOS	3132-0730+0	4
U509	24BIT, DAC, W/VOL, CTRL, CS4392-KZZ, TSSOP, 20P, BOS	3132-0730+0	4
U511	NJM5532M-#ZZZB, DUAL, OP, AMP	3131-4850+0	4
U512	STEREO, A/D, CONVERTER, PCM1804DB, 24BIT, SSOP28	3132-3311+0	4
U513	LC2MOS, 5 OHM, RON, SPST, SW, ADG452BRZ, SOIC16, ADI	3132-3361+0	4
U514	LC2MOS, 5 OHM, RON, SPST, SW, ADG452BRZ, SOIC16, ADI	3132-3361+0	4
U515	AUDIO, OP, AMP, OPA1632D, SO-8, TI	3132-3321+0	4
U516	AUDIO, OP, AMP, OPA1632D, SO-8, TI	3132-3321+0	4

Miscellaneous

Reference Designator	Description	Vendor Part Number	Note
CN500	HEADER, IDC, 24P, 2XP2.54, 3510, SERIES	2101-3123+0	4
CN501	WIRE-CONN, 8P, P2.5, #26, UL1007, L=260, F/M	7012-7651+0	4
CN502	HEADER, IDC, 30P, 2XP2.54, 3510, SERIES	2101-3122+0	4
J500	HEADER, 2X5P, P2.54, ST, MALE	2101-3121+0	4
J502	WIRE-CONN, 8P, P2.5, #26, UL1007, L=260, F/M	7012-7651+0	4
Y500	CRYSTAL, 24.576MHZ, +/-25PPM, 7.0X5.0X1.5, SM	2300-3323+0	4

ELECTRICAL PART LIST

Input/Output PCB Assembly

Resistors

Reference Designator	Description	Vendor Part Number	Note
R318	10R, RMG, 1/16W, 5%, 0603/1608	4723-100J+P	4
R506	22R, RMG, 1/16W, 5%, 0603/1608	4723-220J+P	4
R507	22R, RMG, 1/16W, 5%, 0603/1608	4723-220J+P	4
R514	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R700	1K, RCF, 1/2W, 5%, AT	4707-102J+2	4
R701	3.3K, RMG, 1/16W, 1%, 0603/1608	4723-332A+P	4
R702	3.3K, RMG, 1/16W, 1%, 0603/1608	4723-332A+P	4
R703	1.3K, RMG, 1/10W, 1%, 0603	4720-132A+P	4
R704	1.3K, RMG, 1/10W, 1%, 0603	4720-132A+P	4
R705	15K, RMG, 1/16W, 1%, 0603/1608	4723-153A+P	4
R706	15K, RMG, 1/16W, 1%, 0603/1608	4723-153A+P	4
R707	75R, RMG, 1/16W, 1%, 0603	4723-750A+P	4
R708	75R, RMG, 1/16W, 1%, 0603	4723-750A+P	4
R709	3.3K, RMG, 1/16W, 1%, 0603/1608	4723-332A+P	4
R710	3.3K, RMG, 1/16W, 1%, 0603/1608	4723-332A+P	4
R711	1.3K, RMG, 1/10W, 1%, 0603	4720-132A+P	4
R712	1.3K, RMG, 1/10W, 1%, 0603	4720-132A+P	4
R713	15K, RMG, 1/16W, 1%, 0603/1608	4723-153A+P	4
R714	15K, RMG, 1/16W, 1%, 0603/1608	4723-153A+P	4
R715	75R, RMG, 1/16W, 1%, 0603	4723-750A+P	4
R716	75R, RMG, 1/16W, 1%, 0603	4723-750A+P	4
R717	3.3K, RMG, 1/16W, 1%, 0603/1608	4723-332A+P	4
R718	3.3K, RMG, 1/16W, 1%, 0603/1608	4723-332A+P	4
R719	1.3K, RMG, 1/10W, 1%, 0603	4720-132A+P	4
R720	1.3K, RMG, 1/10W, 1%, 0603	4720-132A+P	4
R721	15K, RMG, 1/16W, 1%, 0603/1608	4723-153A+P	4
R722	15K, RMG, 1/16W, 1%, 0603/1608	4723-153A+P	4
R723	75R, RMG, 1/16W, 1%, 0603	4723-750A+P	4
R724	75R, RMG, 1/16W, 1%, 0603	4723-750A+P	4
R725	3.3K, RMG, 1/16W, 1%, 0603/1608	4723-332A+P	4
R726	3.3K, RMG, 1/16W, 1%, 0603/1608	4723-332A+P	4
R727	1.3K, RMG, 1/10W, 1%, 0603	4720-132A+P	4
R728	1.3K, RMG, 1/10W, 1%, 0603	4720-132A+P	4
R729	15K, RMG, 1/16W, 1%, 0603/1608	4723-153A+P	4
R730	15K, RMG, 1/16W, 1%, 0603/1608	4723-153A+P	4
R731	75R, RMG, 1/16W, 1%, 0603	4723-750A+P	4
R732	75R, RMG, 1/16W, 1%, 0603	4723-750A+P	4
R733	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R734	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R735	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R736	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R737	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R738	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R739	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R740	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R741	100K, RMG, 1/16W, 5%, 0603/1608	4723-104J+P	4
R751N	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R753N	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R758N	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R780	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R782	2K, RMG, 1/16W, 1%, 0603/1608	4723-202A+P	4
R783	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4

ELECTRICAL PART LIST

Input/Output PCB Assembly

Resistors (continued)

Reference Designator	Description	Vendor Part Number	Note
R784	2K, RMG, 1/16W, 1%, 0603/1608	4723-202A+P	4
R785	2.7K, RMG, 1/16W, 5%, 0603/1608	4723-272J+P	4
R786	2.7K, RMG, 1/16W, 5%, 0603/1608	4723-272J+P	4
R789	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R790	2.7K, RMG, 1/16W, 5%, 0603/1608	4723-272J+P	4
R800	10R, RMG, 1/16W, 5%, 0603/1608	4723-100J+P	4
R801	10R, RMG, 1/16W, 5%, 0603/1608	4723-100J+P	4
R802	10R, RMG, 1/16W, 5%, 0603/1608	4723-100J+P	4
R803	10R, RMG, 1/16W, 5%, 0603/1608	4723-100J+P	4
R812	51R, RMG, 1/16W, 1%, 0603	4723-510A+P	4
R813	51R, RMG, 1/16W, 1%, 0603	4723-510A+P	4
R814	51R, RMG, 1/16W, 1%, 0603	4723-510A+P	4
R815	51R, RMG, 1/16W, 1%, 0603	4723-510A+P	4
R816	51R, RMG, 1/16W, 1%, 0603	4723-510A+P	4
R817	51R, RMG, 1/16W, 1%, 0603	4723-510A+P	4
R818	51R, RMG, 1/16W, 1%, 0603	4723-510A+P	4
R819	51R, RMG, 1/16W, 1%, 0603	4723-510A+P	4
R820	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R821	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R822	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R823	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R824	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R825	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R826	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R827	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4

Capacitors

Reference Designator	Description	Vendor Part Number	Note
C509	0.1uF, CC, 50V, 5%, 0603	150F-104J+P-AC	4
C510	4.7uF, CC, 16V, +80/-20%, 1206, SMD, Y5V	150D-475Z+6-CF	4
C511	0.1uF, CC, 50V, 5%, 0603	150F-104J+P-AC	4
C512	1uF, CC, 16V, 10%, 0603, 0.8X1.6	150D-105K+P-AC	4
C513	0.1uF, CC, 50V, 5%, 0603	150F-104J+P-AC	4
C702	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C703	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C704	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C705	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C706	0.068uF, CC, 50V, 10%, 0603, 1x2	150F-683K+P-AC	4
C707	0.068uF, CC, 50V, 10%, 0603, 1x2	150F-683K+P-AC	4
C709	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C710	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C711	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C712	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C713	0.068uF, CC, 50V, 10%, 0603, 1x2	150F-683K+P-AC	4
C714	0.068uF, CC, 50V, 10%, 0603, 1x2	150F-683K+P-AC	4
C716	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C717	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C718	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C719	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C720	0.068uF, CC, 50V, 10%, 0603, 1x2	150F-683K+P-AC	4
C721	0.068uF, CC, 50V, 10%, 0603, 1x2	150F-683K+P-AC	4

ELECTRICAL PART LIST

Input/Output PCB Assembly

Capacitors (continued)

Reference Designator	Description	Vendor Part Number	Note
C723	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C724	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C725	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C726	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C727	0.068uF, CC, 50V, 10%, 0603, 1x2	150F-683K+P-AC	4
C728	0.068uF, CC, 50V, 10%, 0603, 1x2	150F-683K+P-AC	4
C729	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C730	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C731	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C732	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C733	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C734	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C735	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C736	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C737	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C738	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C739	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C740	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C741	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C742	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C743	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C744	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C745	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
C746	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C747	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C748	0.01uF, CC, 50V, 10%, 0603, 1x2	150F-103K+P-AC	4
C749	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C750	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C751	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
C752	220pF, CC, 50V, 5%, 0603	150F-221J+P-AC	4
CT501	10uF, CE, 16V, 20%, RLT, 4X7, ELNA	157D-106M+K-GME	4
CT502	10uF, CE, 16V, 20%, RLT, 4X7, ELNA	157D-106M+K-GME	4
CT503	10uF, CE, 16V, 20%, RLT, 4X7, ELNA	157D-106M+K-GME	4
CT504	10uF, CE, 16V, 20%, RLT, 4X7, ELNA	157D-106M+K-GME	4
CT505	10uF, CE, 16V, 20%, RLT, 4X7, ELNA	157D-106M+K-GME	4
CT506	10uF, CE, 16V, 20%, RLT, 4X7, ELNA	157D-106M+K-GME	4
CT507	10uF, CE, 16V, 20%, RLT, 4X7, ELNA	157D-106M+K-GME	4
CT508	10uF, CE, 16V, 20%, RLT, 4X7, ELNA	157D-106M+K-GME	4
CT509	15pF, CC, 50V, 5%, 0603, 1.6X0.8	150F-150J+P-AC	4
CT510	15pF, CC, 50V, 5%, 0603, 1.6X0.8	150F-150J+P-AC	4
CT601	100uF, CE, 16V, 20%, RL, 8X7, BP, SP	157D-107M+5-OMNC	4
CT602	100uF, CE, 16V, 20%, RL, 8X7, BP, SP	157D-107M+5-OMNC	4
CT603	100uF, CE, 16V, 20%, RL, 8X7, BP, SP	157D-107M+5-OMNC	4
CT604	100uF, CE, 16V, 20%, RL, 8X7, BP, SP	157D-107M+5-OMNC	4
CT701	10uF, CE, 25V, 20%, RLT, 5X11	157E-106M+K-IU	4
CT702	10uF, CE, 25V, 20%, RLT, 5X11	157E-106M+K-IU	4
CT703	10uF, CE, 25V, 20%, RLT, 5X11	157E-106M+K-IU	4
CT704	10uF, CE, 25V, 20%, RLT, 5X11	157E-106M+K-IU	4
CT705	10uF, CE, 25V, 20%, RLT, 5X11	157E-106M+K-IU	4
CT706	10uF, CE, 25V, 20%, RLT, 5X11	157E-106M+K-IU	4
CT707	10uF, CE, 25V, 20%, RLT, 5X11	157E-106M+K-IU	4

ELECTRICAL PART LIST

Input/Output PCB Assembly

Capacitors (continued)

Reference Designator	Description	Vendor Part Number	Note
CT708	10uF, CE, 25V, 20%, RLT, 5X11	157E-106M+K-IU	4
CT717	100uF, CE, 25V, 20%, GS, RLT, 6.3X11	157E-107M+K-LUG	4
CT718	100uF, CE, 25V, 20%, GS, RLT, 6.3X11	157E-107M+K-LUG	4
CT719	100uF, CE, 25V, 20%, GS, RLT, 6.3X11	157E-107M+K-LUG	4

Inductors and Ferrite Beads

Reference Designator	Description	Vendor Part Number	Note
L701	FERRITE, BEAD, INDUCTOR, BL01RN1A1F1J	1808-0680+0	4
L702	FERRITE, BEAD, INDUCTOR, BL01RN1A1F1J	1808-0680+0	4
L703	FERRITE, BEAD, INDUCTOR, BL01RN1A1F1J	1808-0680+0	4

Diodes

Reference Designator	Description	Vendor Part Number	Note
D601	BAV99, SOT23, PHILIPS	4840-8970+3	4
D602	BAV99, SOT23, PHILIPS	4840-8970+3	4
D603	BAV99, SOT23, PHILIPS	4840-8970+3	4
D604	BAV99, SOT23, PHILIPS	4840-8970+3	4
D701	BAV99, SOT23, PHILIPS	4840-8970+3	4
D702	BAV99, SOT23, PHILIPS	4840-8970+3	4
D703	BAV99, SOT23, PHILIPS	4840-8970+3	4
D704	BAV99, SOT23, PHILIPS	4840-8970+3	4
D705	BAV99, SOT23, PHILIPS	4840-8970+3	4
D706	BAV99, SOT23, PHILIPS	4840-8970+3	4
D707	BAV99, SOT23, PHILIPS	4840-8970+3	4
D708	BAV99, SOT23, PHILIPS	4840-8970+3	4
D800	LL4148, SM	4804-1480+3	4
D801	LL4148, SM	4804-1480+3	4
D802	LL4148, SM	4804-1480+3	4
D803	LL4148, SM	4804-1480+3	4

Transistors

Reference Designator	Description	Vendor Part Number	Note
Q701N	MOSFET, N-CH, 60V, 115MA, 2N7002, SOT-23, SM	4907-0020+3	4
Q702N	MOSFET, N-CH, 60V, 115MA, 2N7002, SOT-23, SM	4907-0020+3	4
Q704	MPSA06, VCE, 80V, NS, RLT	4860-8890+K	4
Q705	MPS, A56, VCE, 80V, NS, RLT	4860-8910+K	4
Q706	MPSA06, VCE, 80V, NS, RLT	4860-8890+K	4
Q707	MPS, A56, VCE, 80V, NS, RLT	4860-8910+K	4
Q708	MPSA06, VCE, 80V, NS, RLT	4860-8890+K	4
Q709N	MOSFET, N-CH, 60V, 115MA, 2N7002, SOT-23, SM	4907-0020+3	4
Q800	MOSFET, N-CH, 60V, 115MA, 2N7002, SOT-23, SM	4907-0020+3	4
Q801	MOSFET, N-CH, 60V, 115MA, 2N7002, SOT-23, SM	4907-0020+3	4

ELECTRICAL PART LIST

Input/Output PCB Assembly

Transistors (continued)

Reference Designator	Description	Vendor Part Number	Note
Q802	MOSFET, N-CH, 60V, 115MA, 2N7002, SOT-23, SM	4907-0020+3	4
Q803	MOSFET, N-CH, 60V, 115MA, 2N7002, SOT-23, SM	4907-0020+3	4
Q804	MPSA06, VCE, 80V, NS, RLT	4860-8890+K	4
Q805	MPS, A56, VCE, 80V, NS, RLT	4860-8910+K	4

Integrated Circuits

Reference Designator	Description	Vendor Part Number	Note
U202	MCU, AT90USB162-16AU, TQFP32	3132-8221+0	4
U701	NJM2068M-#ZZZB, DUAL OP AMP	3130-6890+0	4
U702	NJM2068M-#ZZZB, DUAL OP AMP	3130-6890+0	4
U703	NJM2068M-#ZZZB, DUAL OP AMP	3130-6890+0	4
U704	NJM2068M-#ZZZB, DUAL OP AMP	3130-6890+0	4

Miscellaneous

Reference Designator	Description	Vendor Part Number	Note
CR1	SURGE, PROTECTOR, 500V, 603	2706-0004+0	4
CR2	SURGE, PROTECTOR, 500V, 603	2706-0004+0	4
J201	JACK, USB, 4P, 90DEG	2113-3212+0	4
J202	WAFER, 8P, P2.5, ST.	2102-081S+004	4
J203	HEADER, 2X3P, P2.54, ST, MALE	2101-3124+0	4
J601	SOCKET, XLR, 3P, 50V, 6A, NC3FAH2, NEUTRIK	2113-3331+0	4
J602	SOCKET, XLR, 3P, 50V, 6A, NC3FAH2, NEUTRIK	2113-3331+0	4
J701	SOCKET, XLR, 3P, MALE, AC3MAH2-AU, AMPHENOL	2113-3159+0	4
J702	SOCKET, XLR, 3P, MALE, AC3MAH2-AU, AMPHENOL	2113-3159+0	4
J703	SOCKET, XLR, 3P, MALE, AC3MAH2-AU, AMPHENOL	2113-3159+0	4
J704	SOCKET, XLR, 3P, MALE, AC3MAH2-AU, AMPHENOL	2113-3159+0	4
J705	HEADER, IDC, 30P, 2XP2.54, 3510 SERIES	2101-3122+0	4
J706	WIRE-CON, 3P, P7.5/5.0, #26, UL1007, L150, RD/WH, F/M	7012-7550+1	4
J707	2P, ST.WAFER, P=2.5, COULOMB	2102-021S+004	4
JP601	SHUNT, 2P, P=2.54	2101-0661+0	4
JP601	WAFER, 2PIN, P=2.54, ST, 6MM	2101-1494+0	4
JP602	SHUNT, 2P, P=2.54	2101-0661+0	4
JP602	WAFER, 2PIN, P=2.54, ST, 6MM	2101-1494+0	4
K1	RELAY, 2P2T, 12V, 140MM, A-12W-K, TAKAMISAWA	4500-0490+0	4
K2	RELAY, 2P2T, 12V, 140MM, A-12W-K, TAKAMISAWA	4500-0490+0	4
K3	RELAY, 2P2T, 12V, 140MM, A-12W-K, TAKAMISAWA	4500-0490+0	4
K4	RELAY, 2P2T, 12V, 140MM, A-12W-K, TAKAMISAWA	4500-0490+0	4
T1	BRACKET-GROUNDING, PCB, SPCC, BSMPEXPO+05CS11	4132-6221+1	4
Y200	CRYSTAL, 8MHZ, HC-49/U-S	2300-2990+0	4

ELECTRICAL PART LIST

Button and LED PCB Assembly

Resistors

Reference Designator	Description	Vendor Part Number	Note
R0	100R, RCF, 1W, 5%, AL	4708-101J+1	4
R101	470R, RMG, 1/16W, 1%	4723-471A+P	4
R102	910R, RMG, 1/16W, 1%, 0603	4723-911A+P-R	4
R103	270R, RMG, 1/16W, 1%	4723-271A+P	4
R104	910R, RMG, 1/16W, 1%, 0603	4723-911A+P-R	4
R105	10K, RMG, 1/16W, 1%, 0603/1608	4723-103A+P	4
R106	10K, RMG, 1/16W, 1%	4723-103A+P	4
R107	10K, RMG, 1/16W, 1%	4723-103A+P	4
R108	10K, RMG, 1/16W, 1%	4723-103A+P	4
R109	10K, RMG, 1/16W, 1%	4723-103A+P	4
R112	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R113	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4
R115	0R, RMG, 1/16W, 5%, 0603	4723-000J+P	4

Capacitors

Reference Designator	Description	Vendor Part Number	Note
C102	100uF, CE, 16V, 20%, RLT, 5X11, RE3, ELNA	157D-107M+K-IUE	4
C105	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4

Diodes

Reference Designator	Description	Vendor Part Number	Note
D101	SIL, 3144D, GREEN, LED, 3MM	3700-9509+0	4
D102	LED, SIL-3143D, 3MM, RED	3700-9516+0	4
D103	SIL, 3144D, GREEN, LED, 3MM	3700-9509+0	4
D104	LED, SIL-3143D, 3MM, RED	3700-9516+0	4

Transistors

Reference Designator	Description	Vendor Part Number	Note
Q101	NPN, RN1402(T5L/F/T)	4851-4020+3	4
Q102	RN2402(T5L/F/T), SMD	4852-4020+3	4

Miscellaneous

Reference Designator	Description	Vendor Part Number	Note
J301	WIRE-CONN, 2P, P2.5, #26, UL1007, L=150, RD/BK, F/M	7012-7542+0	4
J302	HEADER, IDC, 24P, 2XP2.54, 3510, SERIES	2101-3123+0	4
J303	16P, ST, WAFER, P=2.0	2102-160S+003	4
SW101	SW, TACT, SPST, SKQNAED010, H=5, ALPS	5200-4847+0-01	4
SW102	SW, TACT, SPST, SKQNAED010, H=5, ALPS	5200-4847+0-01	4
SW103	SW, TACT, SPST, SKQNAED010, H=5, ALPS	5200-4847+0-01	4
SW104	SW, TACT, SPST, SKQNAED010, H=5, ALPS	5200-4847+0-01	4
SW105	SW, TACT, SPST, SKQNAED010, H=5, ALPS	5200-4847+0-01	4

ELECTRICAL PART LIST

Switch PCB Assembly

Resistors

Reference Designator	Description	Vendor Part Number	Note
R912	10R, RMG, 1/16W, 1%, 0603	4723-100A+P-R	4
R911	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R913	1K, RMG, 1/16W, 1%, 0603/1608	4723-102A+P	4
R910	30K, RMG, 1/16W, 1%, 0603/1608	4723-303A+P	4

Capacitors

Reference Designator	Description	Vendor Part Number	Note
C572	0.1uF, CC, 50V, 10%, 0603/1608, 1x2	150F-104K+P-AC	4
CT102	10UF, CT, 16V, 20%, SMD, 1.6X3.2	154D-106M+3-CF	4

Transistors

Reference Designator	Description	Vendor Part Number	Note
Q503	TR, NPN, RN1402(T5L/F/T), SMD, TOSHIBA, 2214470R2	4851-4020+3	4
Q702N	MOSFET, N-CH, 60V, 115MA, 2N7002, SOT-23, SM	4907-0020+3	4

Miscellaneous

Reference Designator	Description	Vendor Part Number	Note
J104	WIRE-CONN, 2P, P2.5, #26, UL1007, L=100, RD/BK, F/M	7012-7540+0	4
J105	WIRE-SHIELD, 2P, P2.5, #26, UL1533, L=180, WH/BK, F/M	7012-8820+0	4
SW106	SWITCH, PUSH, 2P2T, 20V, 0.2A, 8.5X8.5X20.1	5200-5002+0	4

ELECTRICAL PART LIST

Switch Mode Power Supply (SMPS) PCB Assembly

Resistors

Reference Designator	Description	Vendor Part Number	Note
RJ1	0 OHM, 0805, SMD, +/-5%	15B-000J81	4
R1	1M, 1206, SMD, +/-5%	15S-105J41	3, 4
R2	1M, 1206, SMD, +/-5%	15S-105J41	3, 4
R3	2M, 1206, SMD, +/-5%	15S-205J41	4
R4	2M, 1206, SMD, +/-5%	15S-205J41	4
R5	51 OHM, 1206, SMD, +/-5%	15S-510J41	4
R6	100 OHM, 0805, SMD, +/-5%	15B-101J81	4
R7	15K, 0805, SMD, +/-5%	15B-153J81	4
R8	2.2K, 1206, SMD, +/-5%	15S-222J41	4
R9	0.51 OHM, 1W, +/-5%	15N-518J01	4
R10	100K, 1W, +/-5%	15N-104J0S	4
R12	4.7K, 1206, SMD, +/-5%	15S-472J41	4
R14	1.2K, 0805, SMD, +/-5%	15B-122J81	4
R15	1K, 0805, SMD, +/-5%	15B-102J81	4
R16	2.2K, 0805, SMD, +/-5%	15M-220181	4
R17	2.74K, 0805, SMD, +/-5%	15M-274181	4
R18	100 OHM, 0805, SMD, +/-5%	15B-101J81	4
R18	22K, 1206, SMD, +/-5%	15S-223J41	4
R19	10K, 1206, SMD, +/-5%	15B-103J41	4
R20	75 OHM, 1206, SMD, +/-5%	15S-750J41	4
R21	75 OHM, 1206, SMD, +/-5%	15S-750J41	4
R22	2.2 OHM, 2W, +/-5%	15N-518J01	4
R23	0 OHM, 0805, SMD, +/-5%	15B-000J81	4
R25	2.2 OHM, 2W, +/-5%	15N-518J01	4
R26	270 OHM, 2W, +/-5%	-	4

Capacitors

Reference Designator	Description	Vendor Part Number	Note
CX1	0.47uF, 275VAC (Liow Gu type GS-L or Shenzen type MEX-X2 or Tenta type MEX or Various Rated 250, 275 or280V)	17T-474KEU	3, 4
CY1	152pF, 400VAC (Pan Overseas type AH or Guangdong South Hongming type F or Various)	17N-152KHT	3, 4
CY2	152pF, 400VAC (Pan Overseas type AH or Guangdong South Hongming type F or Various)	17N-152KHT	3, 4
CY4	102pF, 400VAC (Pan Overseas type AH or Guangdong South Hongming type F or Various)	17N-102MHT	3, 4
C1	47uF, 400V, 18x25, +/-20%	17A-680MH1	4
C2	103M, 1KV, PIN=5	17C-103KLA	4

ELECTRICAL PART LIST

Switch Mode Power Supply (SMPS) PCB Assembly

Capacitors (continued)

Reference Designator	Description	Vendor Part Number	Note
C3	222M, 1KV, PIN=5	17C-222KLA	4
C4	22uF, 50V, 5x11, +/-20%	17A-220M7B	4
C5	100nF, 50V, 1206, X7R	17S-104M72	4
C6	68pF, 50V, 0805, X7R	17B-680J71	4
C7	1nF, 0805, SMD, 50V, X7R	17B-102K71	4
C8	1nF, 1206, SMD, 250V, X7R	17S-102KD1	4
C9	680uF, 25V, 10x16, +/-20%, Low ESR	17A-681M4B	4
C10	220uF, 25V, 8x12, +/-20%, Low ESR	17A-221M4B	4
C11	220uF, 25V, 8x12, +/-20%, Low ESR	17A-221M4B	4
C12	1000pF, 1206, SMD, 630V, X7R	17S-101KK1	4
C13	100nF, 0805, SMD, X7R	17B-104K71	4
C14	1nF, 1206, SMD, 250V, X7R	17S-102KD1	4
C15	220uF, 25V, 8x12, +/-20%, Low ESR	17A-221M4B	4
C16	220uF, 25V, 8x12, +/-20%, Low ESR	17A-221M4B	4
C17	680uF, 25V, 10x16, +/-20%, Low ESR	17A-681M4B	4
C18	680uF, 25V, 10x16, +/-20%, Low ESR	17A-681M4B	4
C19	220uF, 25V, 8x12, +/-20%, Low ESR	17A-221M4B	4
C20	220uF, 25V, 8x12, +/-20%, Low ESR	17A-221M4B	4
C21	1000uF, 16V, 10x16, +/-20%, Low ESR	17A-102M3B	4
C22	1000uF, 16V, 10x16, +/-20%, Low ESR	17A-102M3B	4
C23	680uF, 25V, 10x16, +/-20%, Low ESR	17A-681M4B	4
C24	47uF, 50V, 6x12, +/-20%	17A-470M7B	4
C25	1nF, 0805, SMD, 50V, X7R	17B-102K71	4
C26	100nF, 0805, SMD, X7R	17B-104K71	4
C27	1000pF, 1206, X7R, SMD, 630V	17S-101KK1	4
C28	100nF, 0805, X7R, SMD	17B-104K71	4
C29	100nF, 0805, X7R, SMD	17B-104K71	4
C30	100nF, 0805, X7R, SMD	17B-104K71	4
C31	100nF, 0805, X7R, SMD	17B-104K71	4
C32	100nF, 0805, X7R, SMD	17B-104K71	4
C33	100nF, 0805, X7R, SMD	17B-104K71	4
C34	47nF, 0805, X7R, SMD, 50V	17B-473M4B	4
C35	100nF, 0805, X7R, SMD	17B-104K71	4
C36	100nF, 0805, X7R, SMD	17B-104K71	4
C37	100nF, 0805, X7R, SMD	17B-104K71	4
C38	1nF, 1206, X7R, SMD, 250V	17S-102KD1	4
C39	100nF, 0805, X7R, SMD	17B-104K71	4
C40	100nF, 0805, X7R, SMD	17B-104K71	4
C41	220uF, 25V, 8x12, +/-20%, Low ESR	17A-221M4B	4
C42	220uF, 25V, 8x12, +/-20%, Low ESR	17A-221M4B	4
C43	220uF, 25V, 8x12, +/-20%, Low ESR	17A-221M4B	4

ELECTRICAL PART LIST

Switch Mode Power Supply (SMPS) PCB Assembly

Inductors

Reference Designator	Description	Vendor Part Number	Note
LF1	25mH (Vdson (HZ) Electronics Co. model VD0880)	UD0880	3, 4 ⚠
L1	22Uh	GL0603-220J	4
L2	4.7uH, 3A	DR0710-4R7M-D180	4
L3	4.7uH, 3A	DR0710-4R7M-D180	4
L5	10uH, 1A	DR0608-100M-D182	4
L6	3.3uH, 3A	ISO-359K01-L01	4

Diodes

Reference Designator	Description	Vendor Part Number	Note
ZD1	SMD, 15V, 1/2W, SOD-8	12S-15V02E	4
ZV1	7N471K	15V-07N471	3, 4 ⚠
D1	UF108, 1A, 800V, D0-41	12H-UF108E	4
D2	UF108, 1A, 800V, D0-41	12H-UF108E	4
D3	UF108, 1A, 800V, D0-41	12H-UF108E	4
D4	UF108, 1A, 800V, D0-41	12H-UF108E	4
D5	FR104, 1A, 400V, D0-41	12H-FR104E	4
D6	UF108, 1A, 800V, D0-41	12H-UF108E	4
D7	FR104, 1A, 400V, D0-41	12H-FR104E	4
D8	SMD, 1N4148, SOD-8	12S-41480E	4
D9	UF204, 2A, 400V, D0-201AD	12H-UF204E	4
D10	UF204, 2A, 400V, D0-201AD	12H-UF204E	4
D11	FR104, 1A, 400V, D0-41	12H-FR104E	4
D12	SR1660CT, 16A, 60V, T0-220AB	12B-R1660P	4
D12	23.2x16x25mm	53E-000601	4
D12	3mm	62S-000100	4
D12	3x8mm	60M-B0308N	4
D13	1N4148, D0-35	12T-41480E	4
D14	FR104, 1A, 400V, D0-41	12H-FR104E	4

Transistors

Reference Designator	Description	Vendor Part Number	Note
Q1	MOSFET, SSS4N60, 4A, 600V, T0-220F, FAIRCHILD	13M-S4N60C	4
Q2	2N5551, T0-92	13T-2N555D	4

ELECTRICAL PART LIST

Switch Mode Power Supply (SMPS) PCB Assembly

Integrated Circuits

Reference Designator	Description	Vendor Part Number	Note
U1	NCP1200DR2, f=60KH, SOP-8	11S-P1200G	4
U2	KIA431B, 2.5V +/-1%, T0-220, KEC	11W-A431BA	4
U3	LM7812, 12V, T0-220, FAIRCHILD	11W-M7812B	4
U4	KA7912, 12V, T0-220, FAIRCHILD	11W-A7912B	4
U5	LDO, LM1084, 5V, T0-220, FAIRCHILD	11W-N1084B	4
U6	LDO, LM1084, 5V, T0-220, FAIRCHILD	11W-N1084B	4

Miscellaneous

Reference Designator	Description	Vendor Part Number	Note
MCR1	MCR100-6, T0-92	13K-R1006E	4
NTC1	5D-9 (5 Ohms)	15H-5D900M	3, 4 ⚠
PC1	EL817, DIP-4 (Sharp type PC817, Everlight type EL817or Lite-on type LTV-817)	11B-EL817Y	3, 4 ⚠
T1	ER28H (Vdson (HZ) Electronics Co., VD0935, ER28. Model VP330A (North America only)	22P-VD0935-L1	3, 4 ⚠
F1	T1.6A, 250V, WICKMANN (Wickman type 372 or Ever Island type 2000)	31T-130JTA	3, 4 ⚠
J1	0.6x15	32L-006150	4
J2	0.6x10	32L-006100	4
J3	0.6x7.5	32L-006075	4
J4	0.6x7.5	32L-006075	4
J5	0.6x18	32L-006180	4
J6	0.6x18	32L-006180	4
J7	0.6x10	32L-006100	4
J8	0.6x10	32L-006100	4
XS1	2 PIN, 7.92mm, VH (EI Dupont 101F or Kolon Industries KN3321V0)	33U-027921	3, 4 ⚠
XS2	2 PIN, 2.54mm, PH	33U-022540	4
XS3	2 PIN, 2.54mm, PH	33U-022540	4
XS4	8 PIN, 2.54mm, PH	33U-082540	4
XS5	6 PIN, 2.54mm, PH	33U-062540	4

DISASSEMBLY PROCEDURES

Note: Refer to the photos at right for the following procedures.

CAUTION: Be sure AC mains power is removed before disassembling the unit.

1. Top Cover Removal

1.1 Remove the nine screws as shown at right. Lift up the back edge of the top cover and slide it off the chassis.

2. DSP PCB Removal

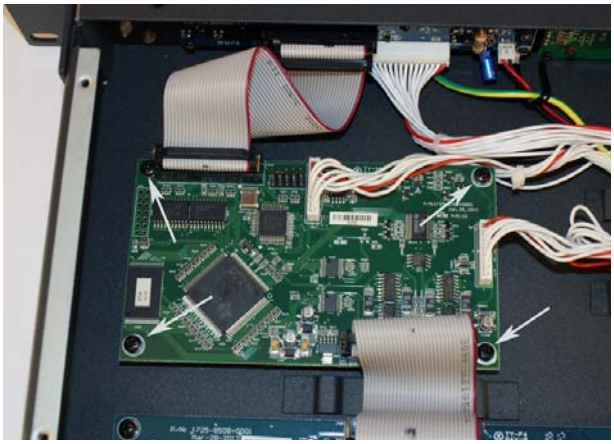
2.1 Perform procedure 1.

2.2 Unplug the wire harnesses at connectors CN500, CN502 and CON500.

2.3 Locate the wire harness that connects to CN501. Unplug the wire harness from the switch-mode power supply PCB (13) at XS4.

2.4 Remove the four screws that secure the DSP PCB to the chassis.

2.5 Lift out the DSP PCB.

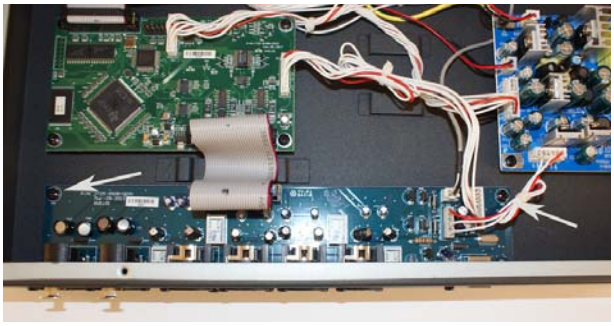


3. Input / Output PCB Removal

3.1 Perform procedure 1.

3.2 Unplug the ribbon cable at J705. Unplug the wire harness at J202. Unplug the wire harness at J707.

3.3 Locate the wire harness at J706. Follow the wire harness to the switch-mode power supply PCB and unplug it from the connector at XS5.

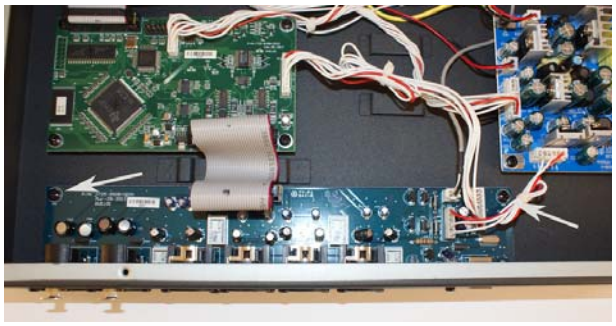


DISASSEMBLY PROCEDURES

3.4 Remove the twelve screws that secure the XLR jacks to the back of the chassis. Remove the one screw that secures the USB connector to the chassis.

3.5 Remove the two screws (4) that secure the Input / Output PCB (2) to the chassis.

3.6 Slide the I/O PCB toward the front of the chassis and lift it out.



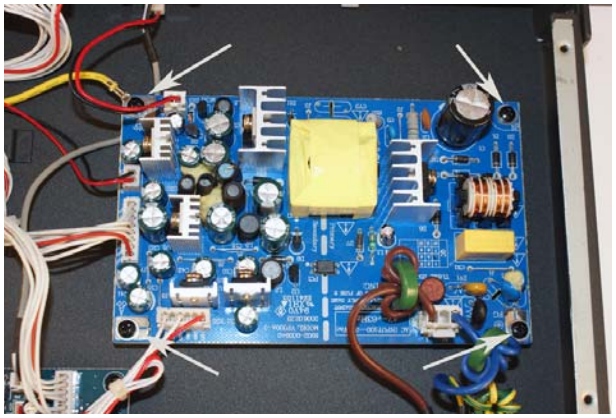
4. Switch-Mode Power Supply PCB Removal

4.1 Perform procedure 1.

4.2 Unplug the cable harnesses from the AC line input at XS1, from the DSP PCB at XS4 and the Input/Output PCB at XS5.

4.3 Unplug the wire harness that runs from the Button/LED PCB at XS3 and the AC Power Switch PCB at XS2.

4.4 Remove the four screws that secure the switch-mode power supply PCB to the chassis. Lift out the PCB assembly.



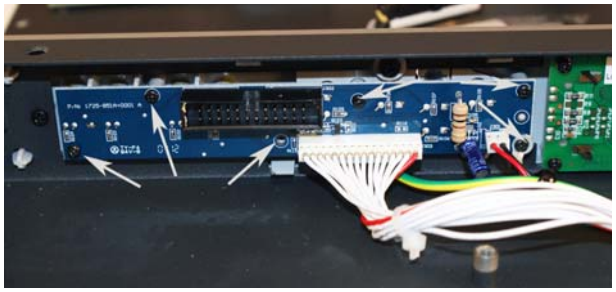
5. Button/LED PCB Removal

5.1 Perform procedure 1.

5.2 Unplug the ribbon cable from J302. Unplug the ribbon cable from J303. Unplug the wire harness from the switch-mode power supply at XS3.

5.3 Using a right-angle Phillips-head screw-driver, remove the six screws that secure the PCB to the front panel.

5.4 Slide the PCB toward the rear of the chassis and lift it out.



DISASSEMBLY PROCEDURES

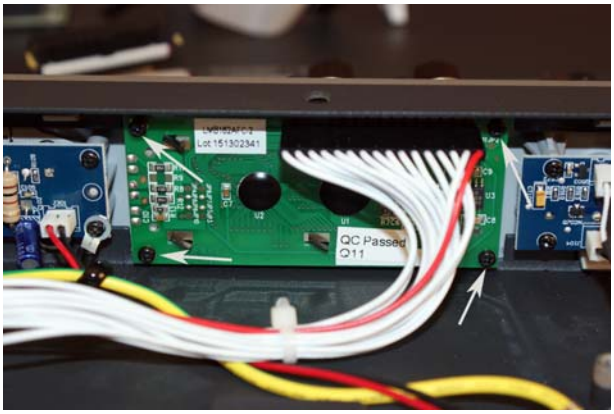
6. Display PCB Removal

6.1 Perform procedure 1.

6.2 Unplug the Display PCB's ribbon cable from the Button/LED PCB at J303.

6.3 Using a right-angle Phillips-head screwdriver, remove the four screws that secure the Display PCB to the plastic front panel.

6.4 Lift out the Display PCB.
Re-assembly Note: Be sure to properly align the Display PCB with the front panel when re-installing it. The ribbon cable should be located near the top of the front panel.



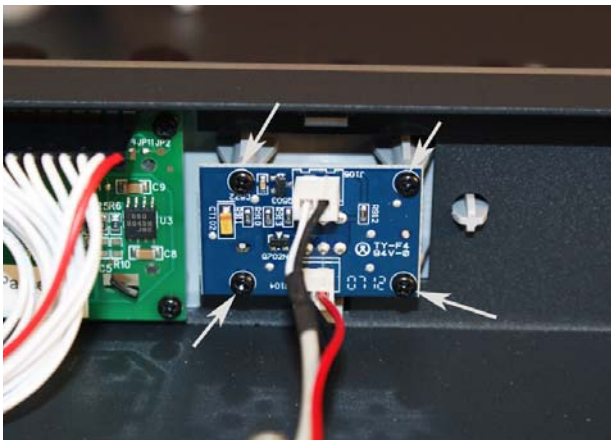
7. Power Switch PCB Removal

7.1 Perform procedure 1.

7.2 Unplug the Power Switch PCB (17) wire harness from the switch-mode power supply PCB at XS2.

7.3 Remove the four screws that secure the PCB to the plastic front panel. Lift out the PCB.

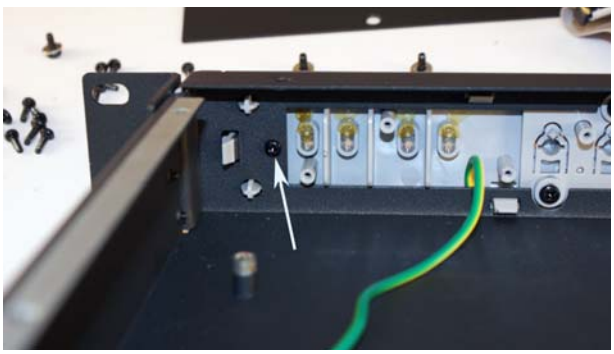
7.4 Pull the ON/OFF power button off of the power switch SW106. You will need to re-use this button with the new switch.
Re-assembly Note: Attach the power ON/OFF button to the new switch using a small amount of general purpose adhesive approved for use on plastic. Be sure that the vertical line on the power button faces toward the top of the front panel.



8. Front Panel Removal

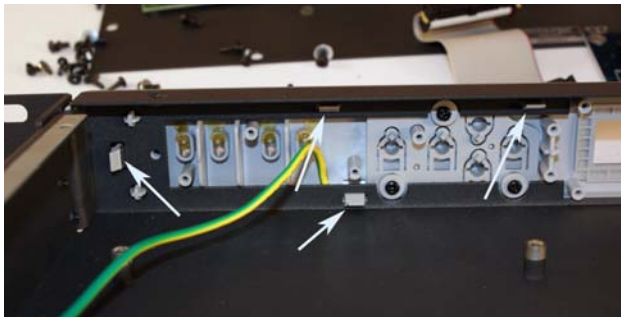
8.1 Perform procedures 5, 6 and 7 to remove the Button/LED PCB, Display PCB and the Power Switch PCB.

8.2 Remove the two screws that secure the plastic front panel to the metal chassis. There is one screw at each end of the chassis. The photo at right shows one of these two.

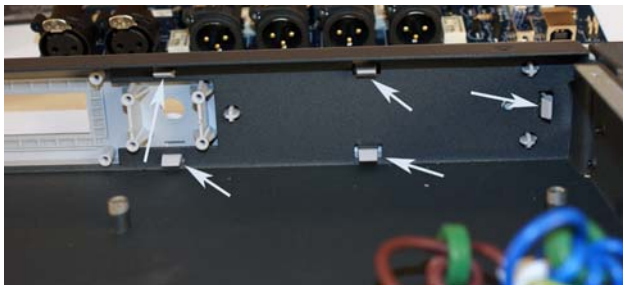


DISASSEMBLY PROCEDURES

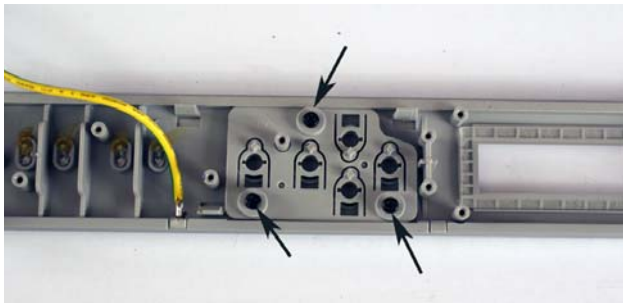
8.3 Disconnect the green/yellow ground wire that is secured at the corner of the power supply. That wire connects to the bottom edge of the front panel metal wrap.



8.4 Using a small flat-tip screwdriver, release the nine plastic tabs that secure the front panel to the chassis. It is easiest to start at one end of the chassis and work your way across, gently pulling the front panel away from the chassis as you go. Refer to the photos at right.



9. Arrow and Select/Load Button Removal

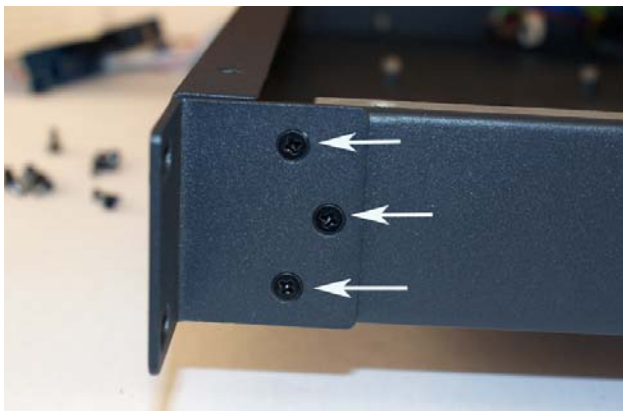


9.1 Perform procedure 1.

9.2 Remove the Button/LED PCB using procedure 5.

9.3 Using a Phillips-head screwdriver, remove the three screws that secure the plastic arrow and select/load button assembly to the front panel.

10. Rack Ear Removal



10.1 Remove the three screws that secure the rack ear you wish to remove. Refer to the photo at right.

TEST PROCEDURES

Test Conditions

Required Equipment

- Audio signal generator with balanced outputs
- DB meter with balanced inputs
- PC with MS Windows® XP or 7 installed
- USB A to B cable
- SP-24 ControlSpace® Editor software (can be downloaded from http://pro.bose.com)

General Test Configuration

- Set Mode to STEREO FLAT
- Level Match to 0 dB
- Input Gain A and B to 0 dB
- Output Gain 1 - 4 to 0 dB
- All other settings are default
- Input sine wave 0 dBu @ 1 kHz
- Generator output impedance 40 ohms
- Outputs are termintated with 10 kohms or greater
- 20 - 22 kHz band pass filter should be used for all audio measurements

1. Communication Data I/O Test

This test is to verify the proper operation of the USB type B connector on the back of the unit.

USB Pin #	Description
Pin 1	USB Power (VBus)
Pin 2	Data (-)
Pin 3	Data (+)
Pin 4	USB GND

1.1 Measure the DC voltage from pins 1 to 4 on the USB connector. There should be no voltage across those 2 pins.

1.2 Connect the UUT to the PC / laptop using the USB cable. The controller should remain in the fully off state when connected to the PC until the power button on the front panel is pressed.

1.3 With the SP-24 Editor PC application running and the UUT connected with the USB cable, the display on the UUT's front panel should read:

Under USB
Host Control

2. Idle Current Test

Apply AC mains voltage to the unit and verify the idle current as follows:

VAC	Max Current
120VAC/60Hz	120 mA
240VAC/50Hz	100 mA
100VAC/60Hz	150 mA

3. Power switch and On-Pop Test

3.1 Turn the unit on by pressing the power switch on the front panel and verify the correct firmware revision (i.e., x.x.x).

3.2 When the units powers on, verify that there is no loud audible on-pop when connected to an amplifier with 36 dBG set to maximum volume, and a loudspeaker located at a distance of 3 feet from the listener.

If there is an audible sound, it must be a muffled thud or thump and not a pop, click or static.

4. Front panel LED Test

Verify that the SIGNAL and CLIP LEDs operate as follows.
Note: The mode should be STEREO NEUTRAL with the system Max Input Level set to +18 dBu.

4.1 Apply a 1kHz, -12 dBu signal to Inputs A and B. Apply a 1kHz, +3dBu signal to Input 2. Verify that the Signal 1 and Clip 1 LED's, and the Signal 2 and Clip 2 LED's are OFF.

4.2 Apply a 1kHz, -10 dBu signal to Inputs A and B. Verify that the Signal 1 and Signal 2 LED's are GREEN and that the Clip 1 and Clip 2 LED's are OFF.

TEST PROCEDURES

4.3 Increase the input level to +18 dBu. Verify that the Signal 1 and Signal 2 LED's remain GREEN and that the Clip 1 and Clip 2 LED's remain OFF.

4.4 Apply a 1kHz, +20 dBu signal to Inputs A and B. Verify that the Signal 1 and Signal 2 LED's are GREEN and that the Clip 1 and Clip 2 LED's are RED.

5. Front Panel PCB Test

5.1 Verify that the front panel LCD and buttons are operational. This can be done visually by looking at the display and pressing the five up/down/left/right and select/load buttons.

5.2 Verify that you can navigate through the various EQ selection menus and the unit's utility menus.

6. Output Level Test

6.1 Apply a 0 dBu, 1 kHz sine wave into inputs A and B.

6.2 Measure the output levels at Outputs 1 - 4. Verify that the output level from each connector is +18.0 +/- 0.5 dBu.

7. THD+N Test

7.1 Terminate all inputs with 600 Ohms, each leg to ground and undriven. Terminate all outputs with 400 Ohms, each leg to ground.

7.2 Set the unit's input gain to 0 dB and the output gain to 0 dB. Set the mode to STEREO and the EQ to NONE.

7.3 Apply a 1kHz, 0dBu signal to Inputs A and B.

7.4 Measure the distortion at the output XLR connectors, outputs 1, 2, 3 and 4.
The output THD+N level should be < 0.08% (20Hz - 22kHz).

8. Signal To Noise Test

8.1 Terminate all inputs with 600 Ohms, each leg to ground and undriven. Terminate all outputs with 400 Ohms, each leg to ground.

8.2 Set the unit's input gain to 0 dB and the output gain to 0 dB. Set the mode to STEREO FLAT and the EQ to 20 - 22k Band Pass Filter.

8.3 Measure the output noise levels at the output 1 - 4 XLR connectors. The noise level should be < -95.0 dB (20Hz - 22kHz).

9. Frequency Response Test

9.1 Terminate all inputs with 600 Ohms, each leg to ground and undriven. Terminate all outputs with 400 Ohms, each leg to ground.

9.2 Set the unit's input gain to 0 dBu and the output gain to 0 dBu. Set the mode to STEREO and the EQ to NONE.

9.3 Apply a 1kHz, 0 dBu signal to Inputs A and B. Reference a dB meter to this output level.

9.4 Measure the output levels at the output XLR connectors, outputs 1, 2, 3 and 4 for the frequencies listed in the below table. Verify that the output levels are in accordance with those listed below.

Frequency	Output Level
20 Hz	0.0 ± 0.5 dB
500 Hz	0.0 ± 0.2 dB
1KHz	0.0 dB
7 KHz	0.0 ± 0.2 dB
20 KHz	0.0 ± 0.5 dB

TEST PROCEDURES

10. Crosstalk Test

10.1 Apply a 1 kHz, 0 dBu sine wave into input A or B only. Using a 1 kHz band reject filter, measure the signal level in dB at the outputs specified below.

Input Channel	Measurement Channel	Output Level
A	2	< -90 dB
B	1	< -90 dB
A	4	< -90 dB
B	3	< -90 dB

11. Output Noise Test

11.1 Configure as follows:
All inputs terminated 600 ohms each leg to GND and undriven. All outputs terminated 600 ohms, each leg to ground.

11.2 Measure the output noise level at each of the output 1 - 4 XLR connectors. Ensure that the noise levels are in accordance with the below table.

Output	Connector	Noise(20Hz – 22KHz), Un-Wtd
1	XLR 1,	< 20 µV
2	XLR 2,	< 20 µV
3	XLR 3,	< 20 µV
4	XLR 4,	< 20 µV

12. Maximum Input Signal Test

12.1 Configure as follows:
Input sensitivity at +18 dBu.

12.2 Apply a 1 kHz, +19 dBu sine wave to Inputs A and B. Measure the output 1 - 4 THD+N levels and ensure that they are in accordance with the below table.

Output	Level	THD + N
1	+19.6 dBu +/- 0.5 dB	< 0.1%
2	+19.6 dBu +/- 0.5 dB	< 0.1%
3	+19.6 dBu +/- 0.5 dB	< 0.1%
4	+19.6 dBu +/- 0.5 dB	< 0.1%

13. Turn-off Pop Test

13.1 Turn the unit OFF by pressing the power switch on the front panel. Verify that there is no audible off-pop when connected to an amplifier with 36dBG and a loud-speaker.

14. Hi-Pot Test

WARNING

This test is **REQUIRED** on all units that have been repaired after they have been fully reassembled.

This is a safety test designed to ensure that the product is safe to return to the customer after a repair. It tests leakage current to the chassis and exposed metal parts by applying a high voltage level across both pins of the AC line cord at the same time and measuring the leakage current.

This test captures reassembly errors (pinched wires) as well as testing the wiring insulation and the primary side of the power supply.

14.1 The power switch on the front panel must be in the ON position for this test. Press the switch to the ON position.

14.2 Test is to be performed from the AC input to the exposed earth (GND) parts of the chassis.

14.3 With the top cover ONLY removed, connect a test lead with an alligator clip to the bare metal edge of the top of the chassis. This lead would connect to the return connection on the Hi-Pot tester. The AC line cord would connect to the back of the UUT and to the AC adapter test box for the Hi-Pot tester.

TEST PROCEDURES

Hi-Pot tester settings:

IMPORTANT:
The SP-24 Sound Processor needs to be tested using two different settings as shown below. Two different connection points are used for these tests. Be sure to use the correct voltage setttings for each connection point.

14.4 Perform the Hi-Pot test at the chassis connection point. Be sure that the unit is fully re-assembled with the exception of the top cover.

- When connected to the chassis, use the following settings.

    2.120 KVDC / High .5 ma / Low 0 ma / Ramp 1 Sec. / Dwell 1 Sec. / Continuity OFF

14.5 Once the UUT has passed the Hi-Pot test at this settings level, replace the top cover, ensuring that there are no pinched wires between the cover and the unit.

14.6 Connect an XLR test cable to one of the channel 1 - 4 output jacks. This test cable should have only the ground (pin x) connection at the XLR end and an RCA connector at the other end. This adapter cable would connect to the RCA test cables supplied with the tester.

14.7 Be sure that the unit is fully re-assembled for this test, including the top cover.

- Perform the Hi-Pot test at an XLR output connector using the below settings.

    3.540 KVDC / High .5 ma / Low 0 ma / Ramp 1 Sec. / Dwell 1 Sec. / Continuity OFF

14.8 If the unit passes testing at both voltage levels, it can be returned to the customer.

If the unit fails this test, it must be returned to the repair tech for troubleshooting and repair and then be retested.

If the ground connection from the AC inlet to the chassis needed to be disconnected as part of the repair, then the unit would also need the Ground Bond test below.

15. Ground Bond Test

IMPORTANT:
This test MUST be performed if the ground connection from the AC inlet to the chassis has been disturbed as part of a repair. This test ensures that the ground connection can take the full current of the AC line if needed due to a product failure.

It does this by measuring the current handling capability of the ground connection by putting a high current through the ground blade of the AC line cord and measuring the leakage current on the exposed metal part of the chassis.

15.1 Plug the AC line cord into the AC adapter box supplied with the Hi-Pot tester. Connect the return line from the Hi-Pot tester to an exposed metal section of the chassis. Ensure a good electrical connection.

15.2 Perform the ground bond test in accordance with the parameters below.

- 10Amps, $\leq$ 12VAC open circuit,
$\leq$ 0.1 Ohms.

15.3 If the unit passes this test and the Hi-Pot tests, it can be returned to the customer. If the unit fails this test, it must be returned to the repair tech for troubleshooting and repair and then be retested.

Upgrading the ControlSpace® SP-24 Firmware

The ControlSpace SP-24 firmware and EQ presets can be updated by using the SP-24 Editor software, and connecting the SP-24 unit to the PC using a USB A to B cable.

Download the application update installer to your PC and install it. The SP-24 Editor software application can be downloaded from the http://pro.bose.com web site.

Firmware updates for the SP-24 sound processor are performed using the SP-24 Editor software. The current firmware version on the unit can be determined by selecting Help> About Bose SP-24 Editor from the pulldown menu when you are in the Editor's main window. You will get the dialog box below, showing the firmware revision.

Note: The SP-24 must be connected with the USB cable and you must be on-line with the unit to get this information to display.

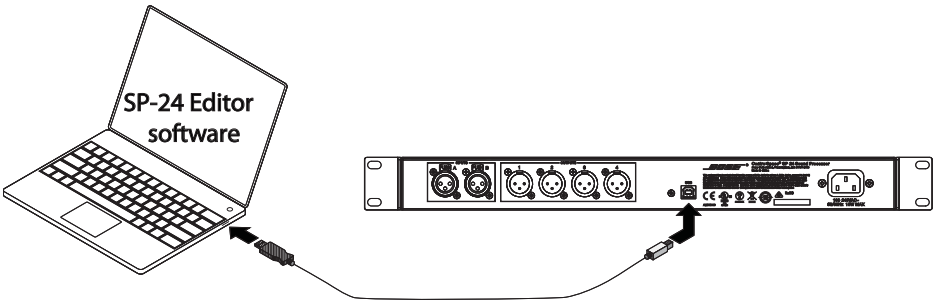


Fig. 6.1- About SP-24 Editor Dialog, firmware version is shown in lower section

All loudspeaker database and firmware updates are provided using an application update installer. To install the necessary files run the update installer.

Update Procedure

1. Download the application update installer to your PC and run the SP-24 Firmware Update application. The SP-24 Editor software application can be downloaded from the http://pro.bose.com web site.

Upgrading the ControlSpace® SP-24 Firmware

2. Launch the SP-24 Firmware update application and follow the on-screen steps to install the updated SP-24 firmware and/or loudspeaker database update.

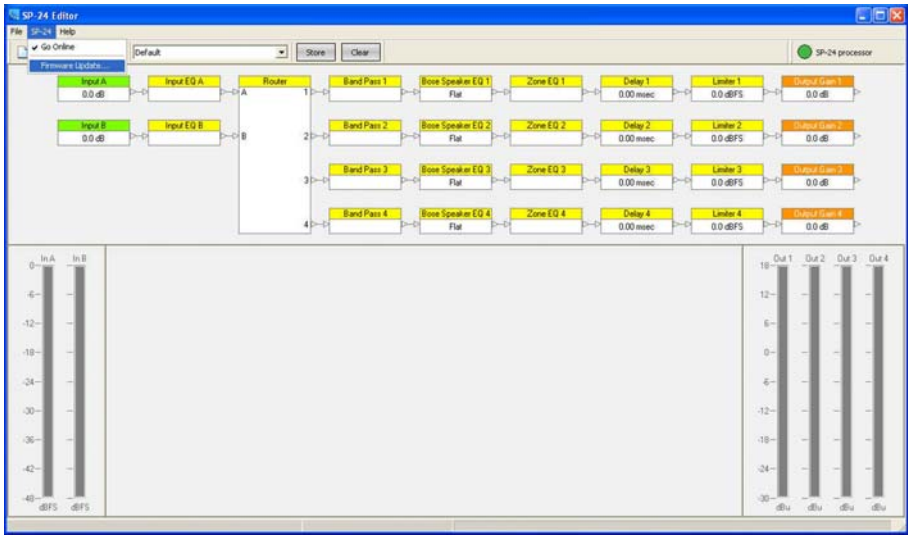
3. Once the installation is complete, click ‘Finish’ to close the installer.

You are now ready to upgrade the firmware within the SP-24 sound processor. Use the following procedure to install the new firmware:

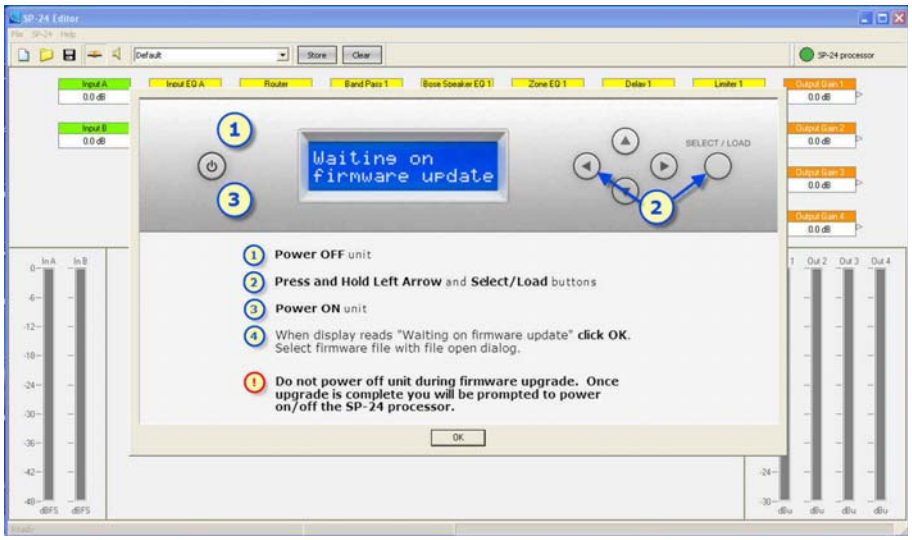
1. Make sure the SP-24 sound processor is connected to the PC and powered on.

2. Launch the SP-24 Editor software, and establish a connection between the PC and the hardware.

3. From the SP-24 pulldown menu, select ‘Firmware Updates’.

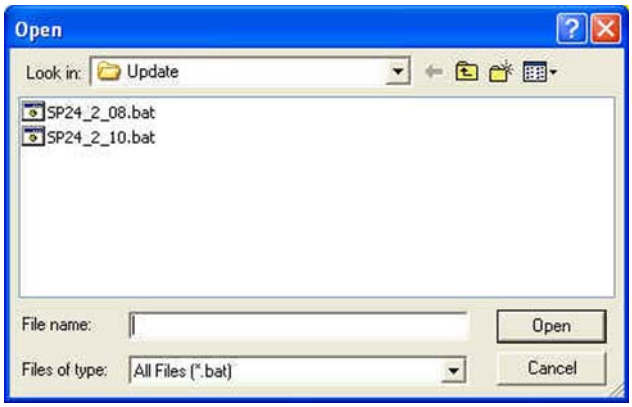


4. The Firmware update dialog contains the necessary instructions for placing the SP-24 sound processor into firmware update mode. Follow the instructions, and press OK.



Upgrading the ControlSpace® SP-24 Firmware

5. Pressing 'OK' causes the File Open dialog to appear. Select the new firmware file that will be uploaded to the processor.



6. You will be prompted to Erase all settings from the processor.

7. Selecting Yes will remove the current configuration, and all Custom Scenes from the processor, selecting No will leave the current configuration and Custom Scenes untouched.

8. Once the firmware update process has begun the firmware update progress dialog appears.

During the firmware update procedure do not disconnect the unit from the PC, or power cycle the SP-24 sound processor, until you are prompted to do so.

9. You will be prompted to power cycle the SP-24 sound processor. Once the SP-24 sound processor has rebooted, click ‘OK’ to restore the connection between the SP-24 Editor software and the hardware.

Upgrading the Bose® Loudspeaker EQ Database

As new loudspeaker products become available from Bose professional systems we will issue a loudspeaker database only firmware update. The most recent loudspeaker EQ database update for the SP-24 sound processor is always available at http://pro.Bose.com. All loudspeaker database and firmware updates are provided using an application update installer. To install the necessary files run the update installer.

1. Download the application update installer to your PC and run SP-24 Firmware Update application.

2. Launch the SP-24 Firmware update application and follow the on-screen steps to install the updated SP-24 firmware and/or loudspeaker database update.

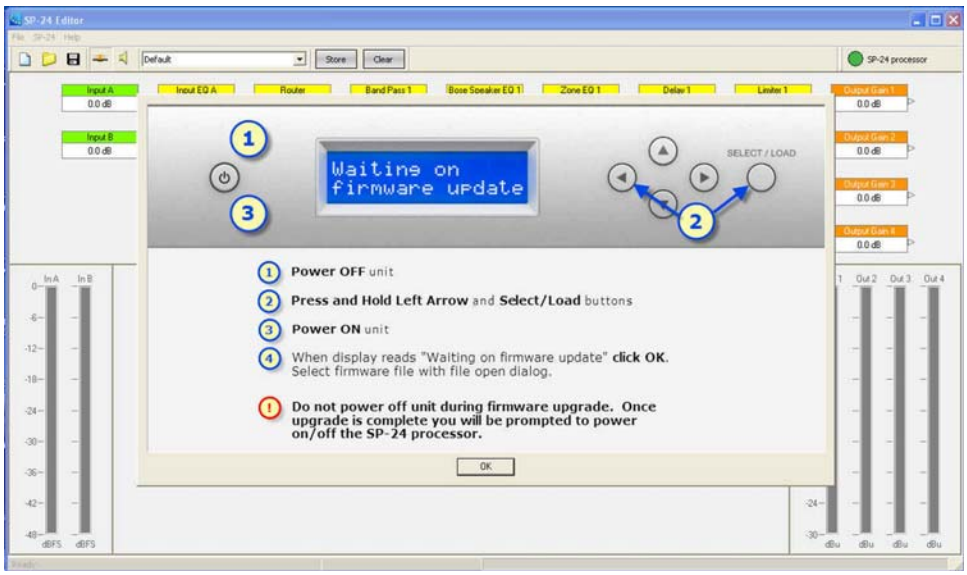
3. Once the installation is complete, click Finish to close the installer.

You are now ready to update the loudspeaker EQ database within the SP-24 sound processor. Use the following process to update the SP-24 loudspeaker EQ database.

1. Make sure the SP-24 sound processor is connected to the PC and powered on.

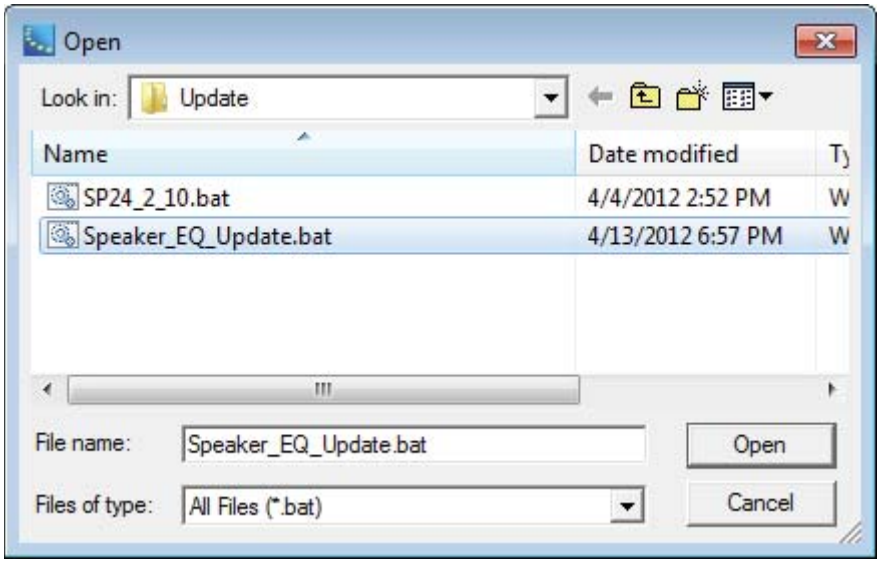
2. Launch the SP-24 Editor software, and establish a connection between the PC and the hardware.

3. The Firmware update dialog contains the necessary instructions for placing the SP-24 sound processor into firmware update mode. Follow the instructions, and press ‘OK’.

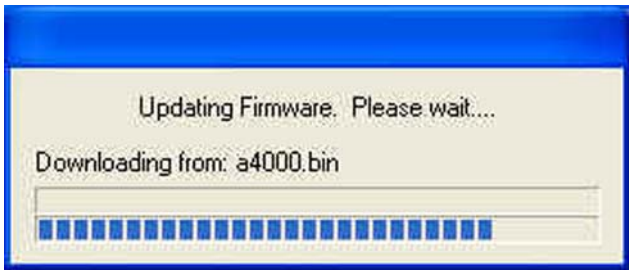


Upgrading the Bose® Loudspeaker EQ Database

4. Clicking ‘OK’ causes the File Open dialog to appear. Select the new loudspeaker EQ database file that will be uploaded to the processor.



5. Once the firmware update process has begun the firmware update progress dialog appears.



⚠ During the firmware update procedure do not disconnect the unit from the PC, or power cycle the SP-24 sound processor, until you are prompted to do so.

6. You will be prompted to power cycle the SP-24 sound processor. Once the SP-24 sound processor has rebooted click ‘OK’ to restore the connection between the SP-24 Editor software and the hardware.

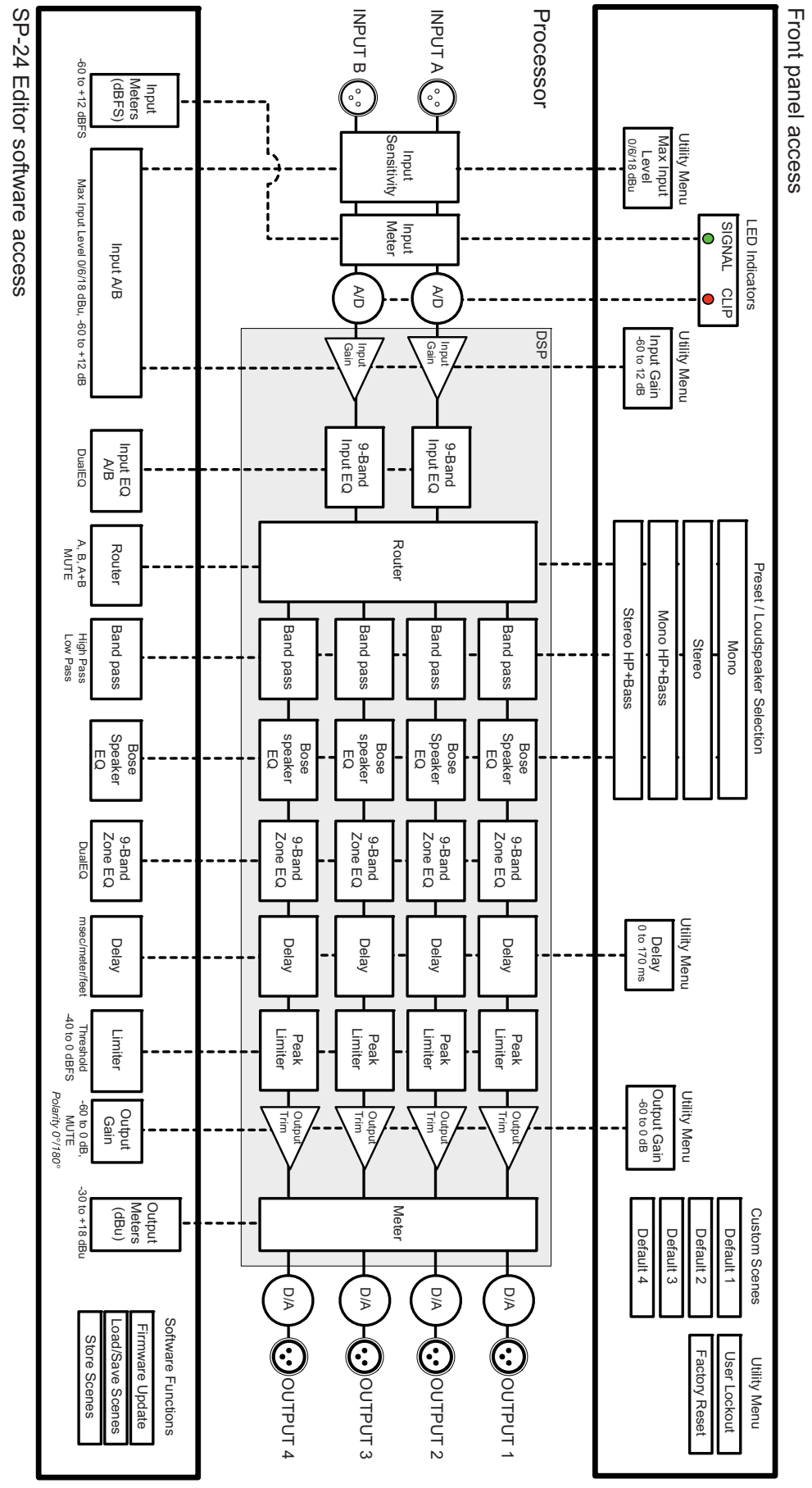
Upgrading an Existing PSDC I or II Based System to the SP-24 Sound Processor

In some situations you may need to upgrade an existing customer's system from a Panaray® System Digital Controller Series I or Series II to the SP-24 sound processor. In this situation it is recommend that the SP-24 Editor be used to configure the processor for similar operation.

Within the Bose Speaker EQ processing block you may select the required active equalization curve for a variety of discontinued Bose loudspeaker products. The following legacy equalization curves are available:

BOSE Professional Legacy Equalization Curves		
FreeSpace® Products	Panaray® Products	LT Products
FS1B 100 Hz LP	Acoustic Wave® Cannon (AWCS)	LT3202-I
FS1B Surface	402-I	LT4402-I
FS1B Flush	802-II	LT9702-I
FS360 Hard	802-II ST	LT3202-I Cluster
FS360 Soft	AWCS	LT4402-I Cluster
FS360 Deck	502 BEX	LT9702-I Cluster
Model 8		
Model 32		

ControlSpace® SP-24 Block Diagram



Service Manual Revision History

Date	Revision Level	Description of Change	Change Driven By	Pages Affected
7/12	00	Document released at revision 00.	Service manual release	All

SPECIFICATIONS AND FEATURES SUBJECT TO CHANGE WITHOUT NOTICE

BOSE®

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Bose Corporation
The Mountain
Framingham Massachusetts USA 01701

P/N: 352427-SM Rev. 00 7/2012 (P)
http://serviceops.bose.com