Contents

CAUTION: THE BOSE® AM-25P AND AM-30P SERIES II BASS MODULES CONTAIN NO USER-SERVICEABLE PARTS. TO PREVENT WARRANTY INFRACTIONS, REFER SERVICE TO WARRANTY SERVICE STATIONS OR FACTORY SERVICE.

WARRANTY PERIOD

The Bose Lifestyle® 12, 25 and 30 Series II Speaker Systems are covered by a limited 1-year transferable warranty.

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, screw heads, 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.

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.

SPECIFICATIONS

Dimensions:	Module: Satellite: Jewel Cube®	23.3" W x 7.5" D x 14.0" H (59 x 19 x 35.5 cm) 3.1" W x 4.0" D x 6.02" H (7.8 x 10.2 x 15.7 cm) 2.2" W x 8.0" D x 2.6" H (39.4 x 20.3 x 6.6 cm)
Weight:	Module: Satellite: Jewel Cube:	33 lbs. (15 kg.) 2.4 lbs. (1.1 kg.) 1 lb (0.5 kg)
Module: **Satellites:** **Jewel Cube:**	2 2 2	5-1/4" Woofers (parallel) 2-1/4" Twiddlers™ (each satellite) 50 mm Twiddlers (each satellite)
Finish:	Module: Satellites:	Black or White, scratch-resistant, satin-finish Black or White, painted polymer finish
Amplifier Power:	Bass Channel: Left/ Center/Right Channels: Surround Channels: All Channels driven:	80W maximum into 4Ω resistive load, ≤0.2% THD, from 40 Hz-200 Hz 20W maximum into 8Ω resistive load, ≤0.2% THD, from 200 Hz-15 kHz 20W Maximum into 8Ω resistive load, ≤0.2% THD, from 200 Hz-15 kHz 50W (Bass), 25W(Left/Center/Right, and Left/Right Surround) ≤0.2% THD
Input Impedance:	System: Module: Satellites:	8.3kΩ 4Ω (8Ω Woofers wired in parallel) 8Ω (4Ω Twiddlers wired in series)
Output Noise:	<400 µVrms	A weighted for Satellite channels
Output Hum:	<2 mVrms	unweighted for bass channel
Channel Separation:	@210 Hz	>20 dB (Center and surround) >20 dB (Volume set at maximum)
Port Tuning Frequency:	Small Chamber: Large Chamber:	110 Hz 37 Hz
Input Sensitivity:	.310 Vrms input	@1 kHz produces maximum rated power in L/R channel outputs (at full volume)
Acoustic Output:	97 dB SPL in IEC standard room @50 watts	
Turn-On Delay: **(Auto)**	1.1 ± .2 seconds	(time to speaker unmute)
Turn-Off Delay:	0.1 ± .1 seconds	(time to speaker mute)
Main Voltage:	120 Vrms, 60 Hz 220-240 Vrms, 50 Hz 115/230 Vrms, 50/60 Hz 100 Vrms, 50/60 Hz	US version Euro version International version (with voltage select switch)
Power Consumption:	@ nominal voltage	350 Watts (max. power)
Standby Power Consumption:	@ nominal voltage	15 Watts

THEORY OF OPERATION

General Overview

The digital bassbox is essentially an AM-25P (or AM-30P) powered speaker system with the following new features:
- -SPDIF digital signal input.
- -the ability to decode Dolby Digital™ digital bitstreams.
- -all signal processing preformed with DSPs.

Compared with an earlier Series I, the digital bassbox delivers generally the same output power, consumes the same input power via the same line cord and dual voltage transformer, has the same input impedance (about 3 k in the audio bandwidth) at the audio input connector and the same input signal headroom (2Vrms max). The digital bassbox uses the same head-end units
(CD-5, CD-20) as the Series I and responds in a similar manner to the various SmartSpeaker commands issued from the head-end (volume up, mute, etc.).

The digital bassbox uses most of the same parts as the Series I bassbox and is (nearly) physically indistinguishable. New parts include:
- -a 13-pin input connector (replaces Series I 8-pin DIN).
- -a new set of head-end to bassbox cables.
- -a 4-layer DSP PCB (replacing Series I 2-layer Videostage®/eq PCB).
- -a 6-channel amplifier PCB (replacing Series I 5-channel amplifier).
- -an 18-conductor ribbon cable, connecting the DSP PCB to the Amplifier PCB.

Signal Processing

The signal processing will not be discussed in any great detail at this time. The digital bassbox uses the same user interface (i.e., the keypad on the head-end and on the remote control) as its predecessors, so very few new features have been added.

The most obvious new feature is the ability to receive a digital SPDIF bitstream, either PCM (digitized 2-channel audio) or the AC-3 output from a DVD player. AC-3, also known as Dolby Digital, is a perceptual coding and data compression technique that allows 5 wideband channels and one low frequency bass channel ("5.1") to be compressed into less bandwidth than would be required for 2-channel PCM.

The Videostage used on the Series I expanded a L, R input pair into L, C, R, S and bass. The Videostage 5 used in the digital bassbox does basically the same thing, but adds a few new features; stereo surround channels and a mono to 5 channel mode. The mono to 5 channel mode is a way of processing a mono soundtrack such that all 5 speakers receive parts of the signal.

AC-3, while most typically used to encode 5.1 audio, can be used to encode any number of channels from 1 to 5.1. Thus the Videostage signal processing used on the Series I was expanded to be able to cope with this greater variety of inputs. The rest of the signal processing, (volume control, dynamic eq, speaker eq, tone controls, etc). is analogous to the signal processing performed on Series I, except that in the digital bassbox it's all done in the digital domain.

THEORY OF OPERATION

Power Supplies

There are several sets of internal power supply voltage rails. The AM-25/30P Series II uses the same two transformers as the variants of Series I, (either the dual-voltage 120V/240V or the 100V Japanese). Voltage is applied to the transformer primary via triac D302. The triac is controlled from the head-end via the usual 10V "turn-on" logic signal. Note that this signal is the ONLY way to turn on the bassbox.

As with the Series I, the power amplifiers are supplied with both +17 and +34VDC unregulated rails, as determined by the Class G circuitry. These rails are developed from the transformer secondaries by the usual diode bridge and capacitor bank (B700, B701, C730, C731,etc.)

The digital circuitry on the DSP PCB requires two different regulated voltages, +5V and +3.3V. The +5V regulator is a standard 3 terminal linear regulator in a surface mount package and is located on the DSP PCB. It's powered from the +17V rail via a fusing resistor R704 on the amp PCB, and supplies about 120mA to the DSP PCB, most of which is consumed by the microcontroller and codec. The +3.3V regulator is a switch-mode regulator and must be located under the shield to avoid EMI problems (harmonics of the 100 kHz switching frequency will stray into the AM broadcast band if left unshielded). This regulator is also powered from the +17V rail and supplies about 350mA to the DSPs.

Operation of the 5V linear regulator is very simple. Current is supplied to the regulator via surface-mount power resistors R10 and R11, which drop the voltage supplied to the regulator to avoid excessive power dissipation. The regulator needs a minimum of about 7V at its input terminal to stay in regulation and it should be able to do this even as the +17V rail sags to +10V or so.

Operation of the +3.3V switch-mode regulator is more complicated. In its simplest terms, the unregulated input is "chopped" at about 100 kHz, and the resulting pulse train is low-pass filtered to extract the DC. This DC output is compared to a +3.3V reference, and the duty cycle of the switching waveform is adjusted accordingly. The high-side switch (the switch that connects +17V to the output filter) is integrated into the controller, while the low-side switch (the switch that connects ground to the output filter) is an external diode D500. When the controller is running, you should be able to observe the switching waveform at L500.

Microcontroller

A microcontroller on the DSP PCB is used for the following housekeeping and control functions:

- -to interpret SmartSpeaker commands from the head-end.
- -to interpret special test mode commands from the functional tester.
- -to store and retrieve data from nonvolatile memory (U201).
- -to boot and reprogram the codec (U100) as required by the operating mode of the system.
- -to monitor for
    - -bass and treble pot position.
    - -DC offset on the Twiddler™ outputs.
    - -PCB over-temperature.
    - -presence/absence of a digital SPDIF signal.

THEORY OF OPERATION

Microcontroller (continued)

-to sequence the amplifier and codec mute lines as required.
-to boot and monitor the performance of the DSPs.
-and relay information to/from DSPs.

In detail:

1. SmartSpeaker commands are interpreted by watching for digital activity on the serial data input line (J5, pin12). This serial input can be either the "standard" SmartSpeaker protocol, compatible with the outputs of CD-5, CD-20, etc., or it can be 4800 baud RS232 with 5V logic levels. The microcontroller decides which protocol to use based on the voltage level present on the serial data input at boot time. If the line is low, it assumes RS232; if the line is high, it assumes SmartSpeaker. It checks only once, at boot time, so switching from one protocol to the other requires a power cycle to reboot the system.

2. Test mode commands are special commands to facilitate testing, or to retrieve stored information from the nonvolatile memory. Test mode commands are RS232 only, e.g., the revision of the firmware can be queried by sending the command "tv", the answer "2200/2000" might come back on the serial data output line. This would indicate version 22.00 for the microcontroller and version 20.00 for the DSPs.

3. The nonvolatile memory is used to store the following information:
   - -choice of eq.
   - -system, center, and surround volume settings at power-down.
   - -US or Euro bass tone control preference.
   - -system usage statistics.
     - -number of times system was powered off.
     - -minutes spent powered on.

4. The codec (U100) has a fair number of internal registers, all of which must be set up properly for correct operation, e.g., to switch between the ADC inputs and the SPDIF input (both functions are integrated into the codec), the codec must be reprogrammed. In addition, there are a number of error status bits which are periodically sampled by the microcontroller, the codec can be rebooted if problems are discovered.

5. The tone control potentiometers no longer have analog signals passing through them (since all signal processing is now done by the DSPs). The microcontroller has several ADC inputs, two of which are used to detect the position of each pot. Everytime this position changes, the new position is reported to the DSPs, which adjust their tone control filter coefficients accordingly. One somewhat odd side effect of this is a delay from the time the pot is turned until the time the audible difference is heard. This delay is typically several hundred milliseconds, but is not noticeable to the casual listener unless the pot is turned through a large angle quickly.

6. Other ADC ports are used for the following functions:
   - -to monitor the gross DC offset on the five satellite speaker channels. Excessive DC. offset is assumed to be an indication of a serious problem and the microcontroller. will respond to this by shutting off the power to the bassbox.

Microcontroller (continued)

-to detect the presence or absence of a digital SPDIF signal. The codec cannot be set up for an analog input and a digital SPDIF input simultaneously and it cannot be reprogrammed from analog to digital (or vice versa) without interrupting the audio signal. There are times when it is helpful to be able to check for the presence/absence of a digital signal. e.g.,

-sequence the mute line. As with the Series I, there are three so-called "speaker modes", 2-channel (bass, left, right); 3-channel (bass, left, right and center) and 5-channel (bass, plus all 5 satellites). Unused output channels are muted, not only at the DSP but also at the power amplifier. The mute inputs to the power amplifiers are 5V logic-level outputs from the microcontroller.

-the microcontroller is in charge of booting the DSPs at power-up in the following sequence:

  -boots the codec and establishes the correct output signals from the codec (bit_clock, frame_clock, and data);

  - enables the 3.3V power supply, and verifies the correct voltage from it;

  -releases the DSP reset line and waits for the DSPs to boot and acknowledge.

The microcontroller is always engaged in dialogue with both DSPs. If the DSPs should fail to respond within a certain time-out, it is assumed that the DSPs have "crashed" and the DSPs are rebooted. The microcontroller must pass some of the nonvolatile information in the EEPROM over to the DSPs at boot time, e.g.: speaker eq, system volume (all volume control in is done in the DSPs), center and surround volume and bass and treble pot position. The microcontroller itself can be reset in two ways, by a hardware reset signal, which is generated by U200 when the 5V supply drops below 4.75V and by the microcontoller itself, once it has already booted successfully (it can pull its own reset line if the 8 MHz clock is running).

Codec

The codec (U100) is a highly integrated device which includes the following functions:

-a I^2C interface for control and status information.

-three channels of 20-bit ACD; only two are used, one for the Left analog input and one for the Right. The ADCs will input signal levels in excess of 1 Vrms.

-six channels of output DAC; all six are used. Maximum output signal level is 1 Vrms.

-a crystal oscillator which establishes the ADC/DAC sampling rate, in this case, it is 11.2896 MHz / 256 = 44.1 kHz.

-a SPDIF receiver. "SPDIF" stands for Sony/Philips Digital Interface Format. Essentially, for every pair of 20-bit audio samples, another 24 bits of status, parity-checking and general housekeeping bits are sent along for the ride. The data is encoded in such a way that

a.) there is no net DC content to the bit steam, allowing transformer or AC coupling and

b.) the bit clock can be recovered from the bit steam.

The codec generates three output signals, either from the 11.2896 MHz crystal, or from the input SPDIF bitstream;

-a serial bit stream containing the 20-bit audio data.

-a bit_clock, which indicates when to sample the serial bit stream.

-and a frame_clock, which indicates the start of an audio sample.

THEORY OF OPERATION

Codec (continued)

In addition, there is a serial data input (6 20-bit audio samples) to the codec, with timing that corresponds exactly to the timing of the serial data output. These four signals (data out, data in, bit_clock, and frame_clock) are used by the serial ports on the DSPs. The timing of the data flow into and out of the DSP subsystem is driven entirely by the codec; the serial ports on the DSP run asynchronously to the 40 MHz clock which drives the DSPs.

DSPs

The DSPs are Analog Devices 21061L general purpose floating point digital signal processors, each capable of about 40 MIPs of performance. Two are required to provide enough MIPs for:
- -AC-3 decoding.
- -Videostage®.
- -bass management (i.e., creating a single bass output from 2 to 6 channels of wideband input).
- -six channels of speaker eq.
- -tone controls.

The DSPs have no internal ROM; at boot time they load themselves from the external PROM U401. This boot process is more or less automatic; i.e., no intervention from the microcontroller is required (although the microcontroller has control of the DSP reset line). The 21061L processors are designed to be bussed together, which accounts for the relatively large number of pins found on each DSP (240).

For instance, the signals required to connect the DSPs to each other and to the boot PROM include:
- -an external data address buss (32 bits, of which 24 are used).
- -an external data buss (48 bits, of which 16 are used).
- -buss control signals (buss priority, address and r/w strobes, etc).

Also, there are 30 power and 30 ground pins on each DSP, and a 40 MHz clock oscillator (U400, crystal CR400, and associated components) which drives both processors.

Signal Path

The signal path through the system takes the following route(s):

For analog signals, the L/R stereo pair is introduced from the head-end via the control cable and the 13-pin DIN connector J5. Each signal is received (pseudo) differentially by op-amp U105 and associated components and -6 dB of gain is applied to match the maximum signal level of the bassbox (2Vrms, to be compatible with AM-25P) into line with the maximum in/out signal level of the codec (1Vrms).

THEORY OF OPERATION

Signal Path (continued)

For digital SPDIF input signals (which come directly from a SPDIF signal source such as a DVD player and not from the CD-20 head-end), the signal is routed directly to the codec U100 via a network of components (D1 and surrounding) designed to clamp and filter ESD transients.

The codec takes in either the pair of analog inputs, or the single SPDIF digital input and outputs three digital signals (data, bit_clock, and frame_clock, as described earlier). Since the codec runs on 5V and the DSPs run on 3.3V, any signals passing between them must be level-shifted via the buffers U101 and U102.

Without going into a lot of detail, DSP1 handles (mostly) AC-3 decoding and videostage processing and DSP2 handles (mostly) equalization. With the signal processing complete, DSP2 formats the six output channels into a single serial bitstream and sends this back to the output side of the codec U100. The analog buffers following the codec (U103, U104 and associated components) do three things:

- remove the 2.3VDC reference voltage from the codec's outputs. The codec is a single supply (+5V) device and references any of its internal analog signals to a reference voltage at approximately 2.3V, about one-half the +5V supply voltage.
- reference the signal to the amplifier ground, not the local ground. The power amps are single ended and are referenced to their own local ground on the amp PCB, which is not the same as the local ground at the codec on the DSP PCB. Amplifying the differences between the two grounds will produce audible hum in the output speakers.
- provide enough gain to increase the output signal to levels compatible with the AM-25P output levels. The signals leave the codec itself at about 1Vrms full-scale, this is amplified up to about 6Vrms full-scale by the output buffers.

Power-Up Sequence

The 10V turn-on signal is applied to J5 pin 7, which energizes the opto-coupler U300, which turns on the triac D302, which applies 120VAC to the primary side of the transformer, which charges up the ±34V and ±17V power supply rails. These rails become (more or less) fully charged after 100msec. The reset IC U200 holds the microcontroller U202 reset line low until the regulated +5V supply stabilizes, by which point the microcontroller's 8 MHz oscillator is already oscillating.

At power-up, all of the microcontroller ports are in a high impedance state, which means that:

- the amplifier mute lines are held low, muting the power amps.
- the 3.3V regulated supply is disabled, reducing the demand on the +17V supply until things have stabilized.
- the DSP reset line is held low, holding the DSPs in reset.

THEORY OF OPERATION

Power-Up Sequence (continued)

The microcontroller proceeds to:
- -set up its I/O ports.
- -print out a "reset" message on the TTY output.
- -program the codec and verify that it responds.
- -retrieve system variables from nonvolatile memory and print out the "power_cycle" and "eq" variables.
- -boot the DSPs, and wait for them to respond.
- -pass over system variables to the DSPs.
- -print out any appropriate error messages.
- -unmutes the power amplifiers, then unmutes the DSPs.

At this point, normal signal processing commences. It should take no more than 1.5 seconds from the time power is applied until the time audio appears at the speaker outputs.

Power-Down Sequence

Upon receiving the "off" command from the head-end, the microcontroller;
- -mutes the DSPs.
- -mutes the power amplifiers.
- -powers down the codec and the DSPs.
- -stores system variables in EEPROM.

and then monitors the voltage level at the turn-on input. When it sees a low to high transition, it resets itself as if the power had just come on.

Detailed Theory of Operation (see schematic diagram SD251571)

Sheet 1 of 5

Sheet 1 of 5 shows the analog input buffers, codec's power supply, analog output buffers and some "glue logic" around the codec. The analog input buffers consist of op-amp U105 and associated components. The ratio of R102 (and R107) to 100 sets the gain; -6 dB from J5 to the input of the codec. The dual-diodes D100, D102, and D104 are there to clamp ESD discharges into J5. The filter capacitors C100, C105, etc., are present to filter off RF picked up by the input cable.

The output signal from the buffer is ground referenced, but the codec's analog inputs are biased at about 2.3V. C104 is required to AC-couple the signal from the buffer into the codec. R103 and D103 are present to prevent transients from the op-amp (±12V rails) from overdriving and perhaps damaging the codec (5V rail). R104 and C102 are an EMI filter to prevent any RF leaking from the codec from getting outside the metal EMI shield. The codec is located under the shield, while the input buffer is not.

The SPDIF input to the codec consists of C151, R1, R2, D1, C3, C7 and R5. C151 AC couples the digital SPDIF signal, and R1 terminates the coax with 75 Ohms. R2 and D1 clamp the input (a typical SPDIF input is about 500 mVpp into a 75 Ohm load). C1 AC couples the signal at D1 (which is ground referenced) to the codec input (which will be biased at about 2.3V when the SPDIF receiver is working). R5 and C7 are an EMI filter designed to prevent RF from leaking outside the shield.

THEORY OF OPERATION

Sheet 1 of 5 (continued)

The codec's power supply consists of U1 and associated components. R10 and R11 are power resistors designed to drop the voltage at the voltage regulator's input, for reducing the power dissipation of the voltage regulator itself.

D2, D3, and R4 are used to draw a little current from the +12V regulated supply when the power supplies start to sag severely, as they will at low AC line and heavy amplifier load. The +12V regulator is fed from the +34V unregulated supply and has considerably more headroom than the +5V regulator fed from the +17V supply. Also fed from the +17V supply is the 3.3V switching regulator, which tends to draw more current as its input voltage drops (it delivers a fixed amount of power, at a fixed conversion efficiency). So, as the +17V supply starts to sag, the current load on it actually starts to increase, which tends to make it sag more.

The +5 volts supplied by the regulator is sent to two different components; the codec and the microcontroller and associated components. Since the regulator is located outside the EMI shield and the +5V supply line might be carrying EMI (Electro Magnetic Interference), ferrite beads L2 and L200 were placed in series with each of the supply lines.

L1 and R2 serve to isolate the two different power supply pins on the codec (the "analog" +5VA from the "digital" +5VB). C5 and C6 are bypass capacitors placed directly under the codec.

Codec glue logic

U101 is a 74LCX244, a 3.3V IC that can tolerate 5 volts on its inputs. It's used to convert 5V to 3.3V logic signals.

U102 is a 74ACT244, a 5v part that understands the logic levels used by the 3.3V IC. It's used to convert the 3.3V logic signals to 5V logic signals.

U106 is a flip-flop, used to convert a falling edge (from the codec) to a narrow pulse (to the DSP). This removes a potential timing ambiguity.

R192 (and others) is a 75 Ohm series resistor used to series-terminate some of the high speed logic signals, to preserve edge fidelity at the receiving end.

R6 and R7 comprise a low performance 5V to 3.3V shifter. Using such large series resistances in the presence of even moderate amounts of stray and input gate capacitance slows down the signal's edge, but this particular signal is very low bandwidth.

Analog output buffers consists of U103, U104, and associated components. Gain is set by the ratio of R132 to R131; about 6x. Note that the ratio of R189 to R188 must match. Gain of the output buffers = (codec_out - codec_reference) - amp_ground_sense).

THEORY OF OPERATION

Detailed Theory of Operation (see schematic diagram SD251571)

Sheet 2 of 5 (microcontroller and associated components)

Potentiometers R201 and R204 are unchanged from theSeries I, (to preserve the look and feel). The pots are not in the audio signal path, however. They are driven with +5 volts and the center wipers are connected to a pair of microcontroller ADC inputs. All of the connections between the pots (outside the shield) and the microcontroller (inside the shield) are EMI filtered.

R207 is a thermistor, a temperature sensitive resistor. R207 is mounted on the topside of the DSP PCB. When the DSP PCB temperature rises to about 70 degrees C, the microcontroller starts turning down the output volume by i.e.,programming the codec effectively controlling the maximum temperature inside the bassbox and preventing damage.

R211 connects the signal "CMOUT" to one of the microcontroller's ADC ports. CMOUT is the codec's 2.3V reference voltage. This voltage is monitored as one of the codec's "vital signs", if out-of-bounds, the microcontroller reboots the codec.

R208 connects the 3.3V power supply to one of the microcontroller's ADC ports. The microcontroller has the ability to turn the 3.3V regulator on and off, thus having the ability to check that the 3.3V supply is within limits. The microcontroller needs to be able to turn the 3.3V off at power down to avoid draining the +17V supply faster than the -17V supply. If the upper rails sag faster than the lower rails, the bass amp will unmute causing a "thump" to be heard (about 5 seconds after power down).

R220 through R226 sum together all the satellite outputs and feed them to one of the microcontroller's ADC ports. The microcontroller watches for grossly excessive DC offset at any of the speaker outputs. If DC is detected the microcontroller will shut down the AC power.

U201 is the non-volatile memory. Read/write access is via the 2-wire serial I-squared-C buss.

U200 generates a 250msec reset pulse for the microcontroller whenever the +5V supply drops below 4.75V.

Q202 and Q203 form a simple window comparator. Whenever the signal PROTECT strays more than one diode drop away from ground, one or the other transistor will turn on, which ultimately will turn the AC power off.

D200 forms a simple level translator. The CLIP signal is generated on the amp PCB whenever one of the satellite power amplifiers starts to clip. It's an open-collector output that pulls down to -12V. D200 level shifts this signal from -12V through +12V, to 0V through 5V. This level-shifted signal goes to both the microcontroller and DSP2 (via a 5V to 3.3V buffer). As it turns out, the microcontroller ignores this signal, but DSP2 turns down the system volume until the CLIP signal disappears, then lets the volume drift back up to the original setpoint.

Q204 and Q201 form a simple SPDIF detector. Q204 sets the bias for Q201 such that it is just barely off. An SPDIF signal arriving at Q201 will cause C216 to be discharged, causing the voltage at C216 to drop from 5V to something closer to ground. This voltage is connected to one of the microcontroller's ADC ports and is sampled periodically by the microcontroller.

THEORY OF OPERATION

Detailed Theory of Operation (see schematic diagram SD251571)

Sheet 2 of 5 (microcontroller and associated components continued)

Q200 allows the microcontroller to pull down on the DSP's reset line. When the microcontroller first boots, all of its output ports are set to a high impedance state. Q200 remains turned on by R252, which holds the DSPs in reset, until the microcontroller is ready to boot the DSPs.

R246, R248, etc. connect several of the microcontroller output ports to the MUTE inputs on the power amplifiers. The mute signals are organized into three groups; (bass, left, right), (center) and (left_surround, right_surround), corresponding to the three speaker modes the product supports. Each line is EMI filtered. Pulldown resistors R813, 814 and 815 guarantee that the signals will assume a LOW state i.e., muted) at power-up.

Sheet 3 of 5 (AC power control and associated components)

This circuit is nearly identical to the original Series I. Q300 and Q301 buffer the turn-on signal and drive current through the LED side of the opto-coupler U300. Zener D300 forces the turn-on signal to reach some minimum threshold before U300 is energized.

Q302 and Q303 form a latching circuit that will "crowbar" the LED side of U300. Once this circuit latches up and steals all of U300's LED current (thus shutting off the power), it stays latched until the source of the current (the turn-on signal generated by the head-end) is removed.

R308 connects a microcontroller ADC port to a voltage that indicates the state of the "turn-on" signal. It's possible to power the bassbox off, then back up again quickly, without the +5V supply ever going out of regulation. The microcontroller needs to know, one way or the other, that it's just been powered on. The usual way it knows this is that the reset IC U200, issues a reset pulse. The other way it knows that the power is "off" is to watch the state of the turn-on input. If the microcontroller sees the turn-on signal drop low, then go high again, it knows that the power has come back "on" again. It responds to this by issuing its own reset pulse.

Sheet 4 of 5 (DSPs)

There are only two DSPs, but since they each have 240 pins, they've been broken into several different schematic symbols so as not to clutter the page:

- -address and data busses.
- -buss control, and miscellaneous.
- -link ports (sheet 5).
- -power and ground (sheet 5).

Without going into any detail, the DSPs are connected to each other and to the boot PROM U401, as follows:

- -address buss connected to address buss.

THEORY OF OPERATION

Detailed Theory of Operation (see schematic diagram SD251571)

Sheet 4 of 5 (DSPs continued)

-data buss connected to data buss.
-buss control signals connected to buss control signals.
-power pins connected to 3.3V power plane.
-ground pins connected to ground plane.

The large number of interconnects and the fact that each signal has extremely fast rise times (2 nsec), required the use of a four layer PCB. One of the inner layers is a (more or less) solid ground plane; the other is used for a power plane, plus additional signal interconnect where required.

U400 and associated components form a third-overtone 40 MHz oscillator. There are two buffered outputs; one drives both DSPs and one is connected to the test connector J401, which was used to help debug the prototype PCBs but is no longer loaded.

Sheet 5 of 5

U500 and associated components form a 3.3V regulated supply. C500 and L500 are the regulator's output filter. R500 and C501 set the regulator's switching frequency (about 100 kHz).
C503 is the "bootstrap" capacitor required for establishing an internal bias voltage higher than the supply voltage (for turning on the internal N-channel MOSFET switch). C515, L501, and C505 prevent switching harmonics from leaking back out onto the raw DC input voltage. R501, C507, C508, etc., are feedback and compensation components. C506 is the "soft-start" capacitor, which forces the regulator to start up slowly when power is first applied, thus limiting the inrush current. R510 and Q500 allow the "soft-start" pin to be pulled low, shutting off the regulator. The 3.3V supply is turned off as part of the normal power down sequence.

Detailed Theory of Operation (see schematic diagram SD197228)

Sheet 1 of 2

Bass Power Amplifier

The bass power amplifier is a discrete high efficiency Class-G design. Maximum power is 80W into 4Ω at less than 0.1% THD. In Class-G operation the amplifier is powered by two different power supplies depending on the amplitude of the signal input. When the audio amplitude is low, the amplifier runs off of the lower supply rails, but during musical peaks it switches to the higher supply rails. Efficiency is typically increased from 20% to 40% and power dissipation is reduced by a factor of 2.5. Detailed operation is as follows:

Referring to sheet 1 of the schematic diagram (197222), audio input is applied to the amplifier PCB at pin8 of connector J700 and is AC coupled through C727. The amplifier is controlled by negative feedback to op-amp U707, which is configured as an inverting amplifier with a voltage gain of 12 (21.6 dB). With no signal applied to the input, all output power devices are biased off. For a negative input signal, pin 1 goes high and conducts driver transistor Q713. Collector current is pulled through R707 and R774 until the voltage drop across R774 reaches about 1 Volt, at which time the high gain darlington transistor Q718 begins to conduct emitter current through power diode D711, which connects to the +17VDC supply.

THEORY OF OPERATION

Detailed Theory of Operation (see schematic diagram SD197228)

Sheet 1 of 2

Bass Power Amplifier (continued)

Collector current from Q718 flows through the speaker load and the voltage at this node is regulated by feedback to the op-amp via resistor R789.

When the audio output voltage approaches the 17VDC power supply rail, output transistor Q718 begins to saturate and conducts much more base current than the normal maximum of 5mA. At approximately 8mA the voltage drop across 75 Ohm resistor R707 exceeds 0.6V and small signal transistor Q714 begins to conduct. This in turn conducts Class-G Darlington transistor Q715, which turns on the 34VDC power supply and reverse biases power diode D711, effectively turning off the 17VDC supply. During this period, the wave form at the collector of Q715 resembles the audio output signal plus the saturation drop of Q718 and Q715 is operated in the active region (not as a switch), thus sharing the power dissipation.

Crossover distortion and switching transients are not an issue due to the relatively low bandwidth of the amplifier (less than 250 Hz) and the ability of the Acoustimass® bass module to roll off high frequency distortion products. Crossover distortion is less than 0.5% at 200 Hz, 1 Watt.

Satellite Power Amplifiers

Each of the five satellite amplifiers are operated in Class-G configuration and consist of a 50W, Class AB monolithic integrated circuit (in a multiwatt-15 package, TDA7294). The amplifier is short circuit and thermally protected. External to this IC is a pair of TO-220 Darlington transistors (the same as used in the discrete bass amplifier) to perform the Class-G power supply switching. The following detailed operation is described for the left surround channel, however the other four channels would be the same.

The surround signal is applied to capacitor C717 and couples to the non-inverting input of the TDA7294 amplifier IC. It is configured as a non-inverting amplifier with a voltage gain of 4 (12 dB). The output stage consists of a pair of MOSFET transistors and the positive FET must develop gate drive well above the supply voltage and hence there is a bootstrap cap between pin 6 and 14.

With low amplitude signal, the amplifier runs off of the 17VDC rails through power diodes D704 and D710. The power supply voltage at pin 13 is subtracted by 5.6V zener diode D703 and divided down by the ratio of 1 + R731/R732. This bias voltage sets the threshold at which transistor Q703 turns on. When the audio or the input to the amplifier exceeds the voltage at the emitter of Q703 by two diode drops, D716 and Q703 conduct. In turn this conducts small signal transistor Q704 which in turn conducts output transistor Q705. A negative feedback loop is established that prevents Q705 from turning completely on and the voltage at the collector of Q705 resembles the audio output wave form plus several volts of saturation headroom. Q705 operating in the active region (instead of as an on/off switch), results in shared power dissipation between the transistor and the power amplifier IC. The phase lag created by the input network R753 and C745 allows the power circuit to switch on slightly ahead of the power amplifier at high frequencies (above 8 kHz) to minimize turn-on glitch.

THEORY OF OPERATION

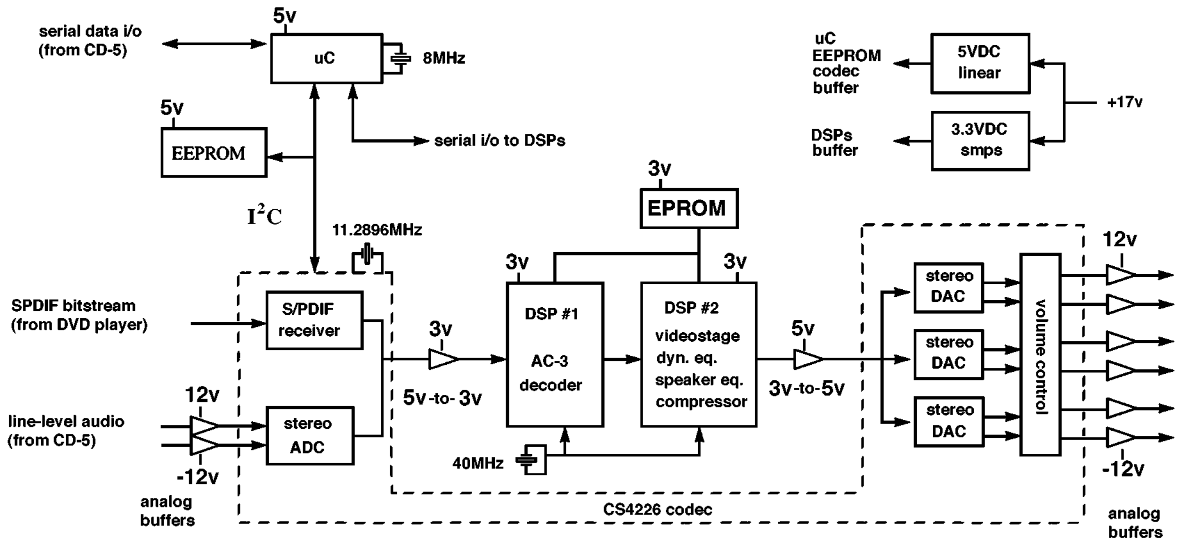


Figure 1. DSP PCB Block Diagram

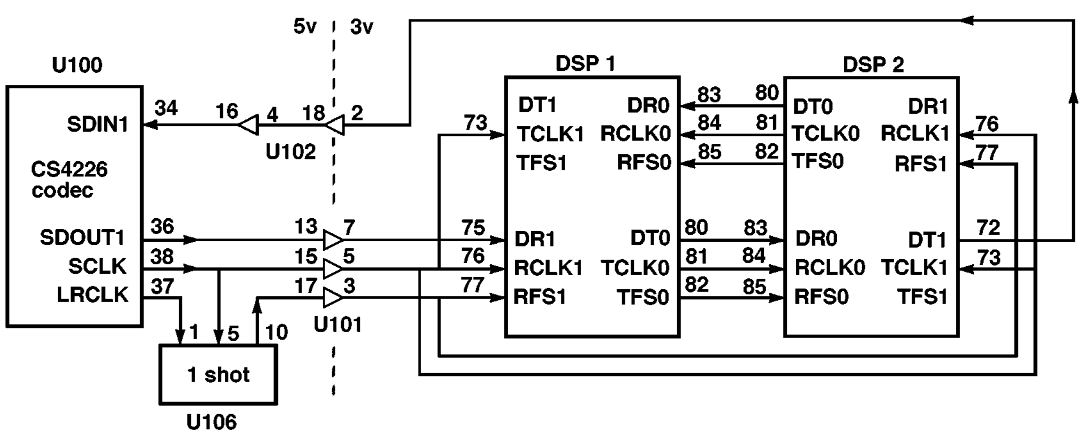


Figure 2. DSP Signal Flow

DISASSEMBLY/ASSEMBLY PROCEDURES

Bass Module

Note: Numbers in parentheses correspond to the callouts in the Figure 9.

1. Cover Removal

1.1 Remove the two screws indicated in Figure 3.

1.2 Stand the base module up so the open port of the enclosure is facing down. Position the module so you are facing the back of the cover. See Figure 4.

1.3 Remove the two control knobs from the side of the cover.

1.4 Engage one of the cogs of the cover latch with a scribe or small flat-head screwdriver. See Figure 4.

1.5 Rotate the cover latch counterclockwise until the pointed section of the latch is outside the cover and enclosure. See Figures 4, 5, and 6.

1.6 Put your right-hand thumb into the cover's bass control knob hole. Grasp the front of the enclosure with your right-hand fingers.

1.7 Press the module's right base-plate tab down with a scribe or small flat-head screwdriver. See Figure 6 for the tab's location.

1.8 While the tab is pressed down, move the cover forward (away from you) with your thumb. This will disengage the right side of the cover from the right base-plate tab.

1.9 Release the left side of the cover by the same method. Press down the left base-plate tab with a scribe or small flat-head screwdriver. Move the cover forward with your thumb inside the bass control knob hole.

1.10 Once the cover is released from both tabs it can be removed from the enclosure.

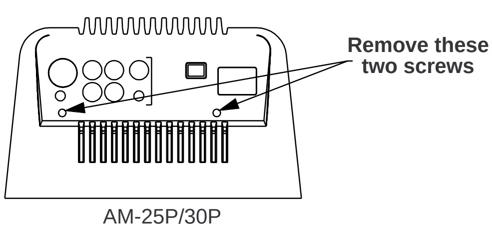


Figure 3. Top Cover Screw Location

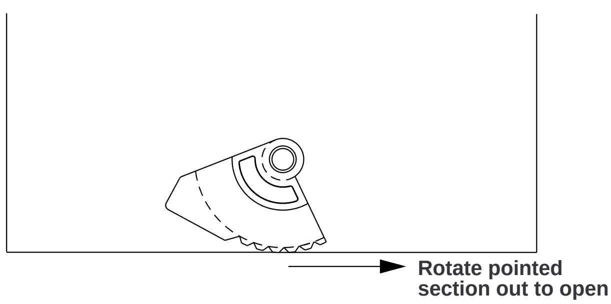


Figure 5. Cover Latch Rotated In

Figure 4. Cover Latch Rotated Out

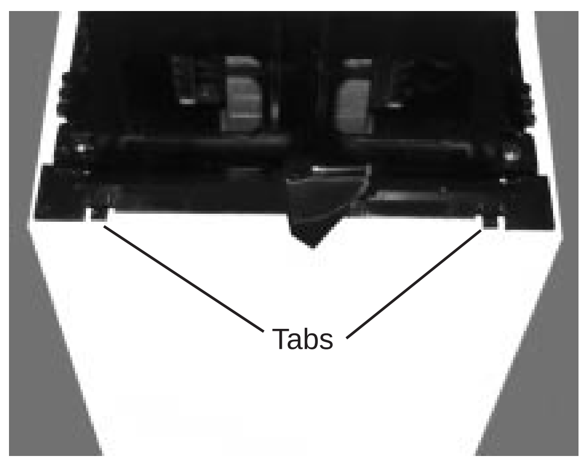


Figure 6. Base Plate Tabs

DISASSEMBLY/ASSEMBLY PROCEDURES

Note: Numbers in parentheses correspond to the callouts in Figure 9.

2. Cover Replacement

2.1 Place the cover (2) over the module assembly. Align the cover so that the main PCB input and output connectors are inserted into the holes of the cover.

2.2 Rotate the tab of the cover latch out from the enclosure.

2.3 Slide the cover over the base-plate (4) until the back of the cover snaps over the base-plate tabs.

2.4 Use a flat-head screwdriver or scribe to rotate (to the left) the cover latch (17) back into the enclosure.

2.5 Attach the two tone control knobs (1) by pushing them in towards the module. They are keyed and will only fit one way.

3. Main PCB Assembly Removal

3.1 Perform procedure 1.

3.2 Remove the two screws securing the main PCB (11) to the adapter bracket (13).

3.3 Disconnect the transformer's 5-pin connector from J7, the 8-pin cable from the amplifier, and the flat ribbon cable (20) from connector J8 on the main PCB.

3.4 Release the main PCB (11) from the four snaps of the adapter bracket (13).

4. Main PCB Assembly Replacement

4.1 Place the main PCB (11) onto the adapter bracket (13) component side down. The J5, J9, and J11 input and output connectors should be facing the label side of the module.

4.2 Press the main PCB into the adapter bracket's (13) four snaps.

4.3 Secure the main PCB to the adapter bracket.

4.4 Connect the transformer's 5-pin cable to J7, connect the 8-pin cable from the amplifier's PCB to J10, and the flat-ribbon cable (20) to J8 on the main PCB.

4.5 Perform procedure 2.

5. Amplifier PCB Removal

5.1 Perform procedure 3.

5.2 Remove four silver screws and eight black screws (3) securing the adapter bracket (13) to the base plate (4). Lift the bracket away from the enclosure.

5.3 Disconnect the transformer's 5-pin cable from the amplifier PCB's J1 connector. Disconnect the woofer harness connector (8) from the amplifier PCB's J3 connector. Disconnect the flat ribbon cable (20) from the amplifier PCB's J2 connector.

5.4 Lift out the heatsink amplifier PCB subassembly from the base plate (4).

5.5 Place the subassembly on the workbench with the heatsink (23) face down.

5.6 Place the tip of a flat-head screwdriver into the metal plate's (26) small rectangular slot. Quickly pry the heatsink wall back just enough to release the metal plate from the heatsink. Refer to Figure 7.

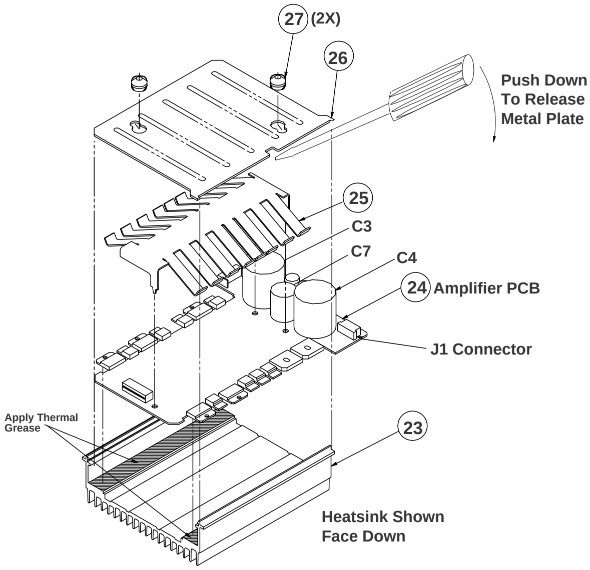


Figure 7. Amplifier Assembly

Note: Do not put a permanent bend in the heatsink wall. A large bend in the heatsink wall will not allow reassembly of the heatsink amplifier PCB subassembly.

5.7 Lift out the spring plate (25) that rests on the power devices.

5.8 Remove the amplifier PCB from the heatsink.

6. Amplifier PCB Replacement

6.1 Place the amplifier PCB (24) into the heatsink (23). The PCB should be component side up with the transistors and ICs resting on the inner sides of the heatsink.

Note: Thermal grease should be applied to the heatsink before seating the PCB.

6.2 Position the spring plate (25) into the holes of the PCB. The spring plate can only be inserted one way.

6.3 Position the metal plate (26) so that the rectangular slot is on the same side as the amplifier PCB's J1 connector. The side marked" Outside" Should be facing out. Insert this side of the metal plate into the slot of the heatsink.

6.4 Press down on the metal plate quickly with both palms of your hand. The plate should snap into the slot of the heatsink.

6.5 Place the heatsink amplifier PCB subassembly, metal plate side down, into the module's base plate (4). The large capacitors fit into the recess of the base plate. Make sure that the rubber grommets engage onto the plastic posts.

6.6 Connect the transformer's 5-pin cable to the amplifier PCB's J1 connector. Connect the woofer harness cable (8) back into the PCB's J3 connector and the flat ribbon cable (20) to the amplifier PCB's J2 connector.

6.7 Place the adapter bracket over the heatsink amplifier PCB subassembly and transformer.

Note: Before securing the adaptor bracket and main PCB over the heatsink amplifier subassembly, route the flat ribbon cable underneath the adaptor bracket and around the heatsink.

6.8 Secure the adapter bracket (13) to the base plate (4).

6.9 Redress any wire harness to the adaptor bracket as needed.

6.10 Perform procedure 2.

7. Transformer Removal

7.1 Perform procedure 5 through 5.2.

7.2 Disconnect the transformer's 5-pin cable from the amplifier PCB's J1 connector.

7.3 Lift the transformer from the module's base plate (4).

Note: Numbers in parentheses correspond to the callouts in the Figures referred to in the following procedures. Refer to Figure 9.

8. Transformer Replacement

8.1 Place the transformer (15) into the recess of the base plate (4). Make sure the transformer is positioned so that the primary wires (red, white, brown, orange, black) that connect to the J7 connector are facing the PCB.

8.2 Connect the transformer's 5-pin cable to the amplifier PCB's J1 connector. Connect the woofer harness cable (8) back into the amplifier PCB's J3 connector.

8.3 Secure the adapter bracket to the base plate and redress any wire harness as needed.

8.4 Perform procedure 2.

9. Woofer Removal

9.1 Perform procedure 1.

9.2 Disconnect the woofer harness cable (8) from the amplifier PCB's J3 connector.

9.3 Remove eight black screws (3) that secure the module assembly to the enclosure. Lift the module assembly away from the enclosure.

9.4 Remove four screws (5) from the woofer (6) under repair.

9.5 Lift the woofer up far enough to expose the wires connected to the woofer's terminals.

9.6 Cut the wires as close to the terminals as possible. Refer to Figure 8.

9.7 Remove the woofer from the enclosure.

10. Woofer Replacement

10.1 Strip the ends of the module's wiring harness. Connect the yellow wire to the replacement woofer's (6) + positive terminal and the green wire to the - negative terminal. Refer to Figure 8.

10.2 Line up the woofer's gasket (7) over the woofer's baffle panel hole.

10.3 Place the woofer over the gasket. Make sure it is seated evenly over the gasket and baffle hole.

10.4 Secure the woofer to the baffle.

10.5 Secure the module assembly to the enclosure.

10.6 Perform procedure 2.

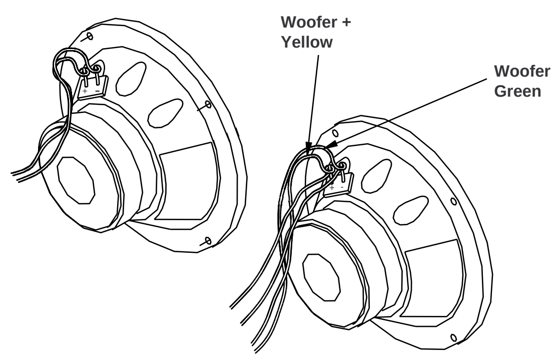


Figure 8. Woofer Harness Hookup

DISASSEMBLY/ASSEMBLY PROCEDURES

11. Satellite Grille Removal

Note: Refer to Figure 10 for the following procedures.

11.1 Place a plastic flat blade tool between the edge of the grille and the edge of the satellite enclosure. With a twisting action, gently release the grille from the catches on the satellite enclosure. Use care not to cosmetically damage the satellite enclosure.

12. Satellite Grille Replacement

12.1 Line up the grille with the catches on the satellite enclosure. Press the grille onto the enclosure so that it snaps into place. The grille with the logo is used on the lower satellite.

Note: The logo is attached to the grille by pressing it's tabs through the holes in the grille frame and secured by bending the tabs over.

Note: The grille is the only replaceable part on the satellite. The Twiddlers™ can not be replaced.

Jewel Cube® Satellite Disassembly/Assembly

Note: Refer to Figure 11 for the following procedures.

13. Grille Assembly Removal

13.1 Swivel the cube array so that the grille assemblies (1 and 2) are not aligned. Pull the grille away from the enclosure by prying off one side of the grille with a small scribe.

Note: Do not lose the small grommets (6) that cover the screws located behind the grille.

14. Grille Assembly Replacement

Note: Be sure the grommets (6) are in place before replacing the grille assembly.

14.1 Align the grille assemblies (1 and 2) with the cube array. The curved edges of the grille must be oriented vertically. Snap the grille into place.

Note: The grille assembly with the name-plate (3) should be on the bottom satellite cube.

15 Twiddler Removal

15.1 Perform procedure 1.

15.2 Remove the four grommets (6) covering the screws that hold the twiddler (4) in place.

15.3 Remove the four screws (5) holding the Twiddler (4) in place. Lift theTwiddle out of the enclosure and cut the wires as close to the terminals as possible.

16. Twiddler Replacement

16.1 Strip the wires and connect them to the replacement Twiddler's terminals as follows:

16.1.1 If replacing the top Twiddler, connect the black wire to the positive (+) terminal and the yellow wire to the negative (-) terminal.

16.1.2 If replacing the bottom Twiddler, connect the yellow wire to the positive (+) terminal and the white wire to the negative (-) terminal.

16.2 Place theTwiddler into the enclosure and secure it in place.

16.3 Perform procedure 2.

TEST SET-UP PARAMETERS AND EQUIPMENT

Before performing the tests described in these procedures, use the following test set-up parameters.

Speaker output loading

Left Front Output	8Ω, 1%, 50W
Right Front Output	8Ω, 1%, 50W
Center Output	8Ω, 1%, 50W
Left Surround Output	8Ω, 1%, 50W
Right Surround Output	8Ω, 1%, 50W
Bass Channel Output	4Ω, 1%, 100W

Equipment Requirements

1. Test Cable part number 199527
2. RS232 to TTL converter box (B+B Electronics) link to a PC
3. 25 to 9 pin serial data cable (you might have to make this, see diagram below)
4. A terminal emulator or in windows "95" use "Hyperterm"
5. An SPDIF digital signal source, or a DVD player
6. The standard equipment needed for testing audio products, i.e., audio signal generator, oscilloscope, dB meter, etc.

Test Set-up Procedure

Using the test cable, part number 199527, plug the 13-pin din connector into the bassbox.
Connect the RS232 (B+B TTL232 converter) to the 25-pin D connector on the test cable.
Connect the RS232 box to its power supply.
Connect the 25-pin to 9-pin cable to your PC's serial port.
Open "Hyperterm" (used with "windows 95") or the terminal emulator on your P.C.
Set up the serial port for 4800 baud, 8 data, 1 stop, no parity.
Connect an audio signal generator to the RCA input jacks on the test cable 199527.
Connect the SPDIF output from an SPDIF converter, or from a DVD player, to the female RCA on the test cable 199527.
Connect a 10VDC supply to the 3.5mm jack on the test cable 199527. A 9V battery works fine for this purpose.

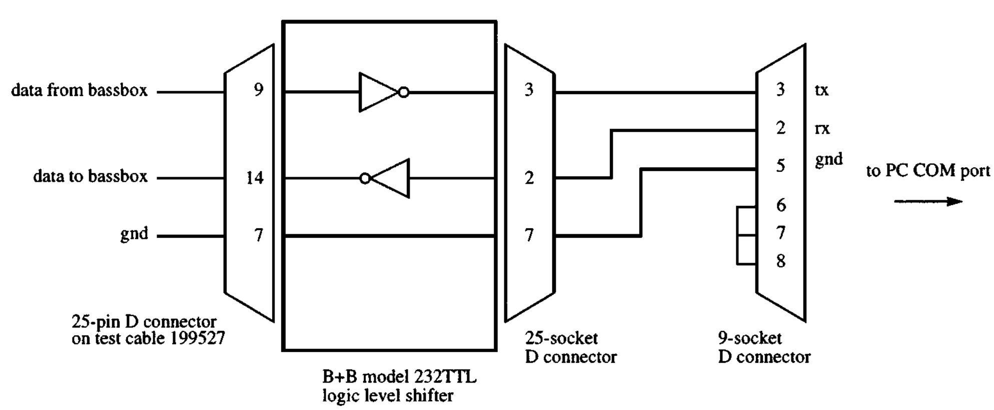


Diagram of the Test Set-Up

TEST PROCEDURES

1. Turn-On Test Procedure

1.1 With no signal applied connect the bassbox to a PC using the Test Set-up Procedures on the previous page.

1.2 Connect the 10V supply (9V battery) to the 3.5mm jack and monitor the computer screen.

1.3 You should see a prompt that looks like #0001%01. This boot prompt consists of a number of text strings. Each string is interpreted as follows:
** Is the normal response to being powered on.
> Normal system prompt
#0001 The four digit hex number, following the hash mark "#" indicates the number of times the system has been powered off (AC mains disconnected). The two digit number following the "%" percent sign (%01) indicates the currently programmed equalization curve. The current codes are as follows:

01	LS-12 II and LS-25 II systems
02	LS-30 II system
11	LS-12 II and 25 II 240V systems
12	LS-30 II 240V system

1.4 At this time you should not see any error codes such as --12++ which would indicate a problem with DSP1.

2. Gain Test

2.1 Enter the following command just as it is typed, **tn 6,0,0,0,0,0,0,0,0** (bypass mode, this will bypass any signal processing).

2.2 Apply a 100 mV, 200 Hz signal to the left and right inputs.

2.3 Reference a dB meter to the input signal, and measure the gain of the output signal according to the table.

Gain Response Table

Output	Measurement
Bass Channel	+31.0 dB ± 2.0 dB
Left Channel	+21.0 dB ± 2.0 dB
Right Channel	+21.0 dB ± 2.0 dB
Center Channel	+21.0 dB ± 2.0 dB
Left Surround	+21.0 dB ± 2.0 dB
Right Surround	+21.0 dB ± 2.0 dB

3. Bass Module Sweep Test

3.1 Put the module in a well defined state by issuing the following commands:
sk 61,af,ff (select analog source)
sk 31,d0,3f (select 5-channel mode)
sk 31,0f,ff (select maximum volume)
sk 31,3f,ff (un-mute)

3.2 Apply an 80 mVrms ±5 mVrms signal to the left and right inputs.

3.3 Sweep a frequency range of 40 Hz to 300 Hz for a 5 second duration.

3.4 Listen for any unusual buzz, rub, or extraneous noises. Redress any wires that might have buzzed, and repair or replace any defective woofers.

4. Bass Module Air Leak Test

4.1 Apply an 80 mVrms ±5 mVrms 45 Hz signal to the left and right inputs for a 5 second duration.

4.2 Listen for any air leaks from where the amplifier module meets the cabinet. Repair any air leaks that are found.

5. Bass Control Test

5.1 Apply a 40 mVrms ±5 mVrms 100 Hz signal to the inputs.

5.2 Rotate the bass control fully clockwise and counter clockwise.

5.3 Verify that the bass output increases and decreases as the control is rotated. Expect a slight delay in the response of the signal.

6. Treble Control Test

6.1 Connect a satellite cube to the left and right outputs.

6.2 Apply a 100 mVrms ±5 mVrms 8 kHz signal to the left and right inputs.

6.3 Rotate the treble control fully clockwise and counter clockwise.

6.4 Verify that the output increases and decreases as the control is rotated. Expect a slight delay in the response of the signal.

7. Turn-Off Test

7.1 Type an **rs** command to place the unit back to its initial state, and disconnect the 10V turn-on supply (9 volt battery).

7.2 Listen for any popping sounds.

8. Miscellaneous System Tests

8.1 Connect the system according to procedure 1.

8.2 Type a **tv** command and look for a response similar to 2200/2000. The first number is the microcontroller revision and the second number is the DSP revision.

8.3 Type a **vr** command and look for a response similar to:
CBLT xxxx (c) 1998 Bose® Corp. S/N xxxxxx Chksum: 0017BAD2.

8.4 Type an **ef ff** to return the module to the factory defaults. Then type an **rs** command to reset the unit. You might see an error code response similar to --16++. This is normal. Retype an **rs** command.

9. SPDIF Digital Signal Test

9.1 Apply a SPDIF signal to the SPDIF input using either a DVD player or a analog to SPDIF converter.

9.2 Type the following commands:
tn 0,0,0,0,0,0,0,0,0
sk 51,af,ff
tn 6,0,0,0,0,0,0,0,0.

9.3 Play a DVD disc or apply an 80 mVrms 200 Hz signal to the left and right inputs. If using a DVD player, connect the audio source to the left and right input.

9.4 Observe the output. If using a DVD player you may see what resembles bursts of white noise at the output instead of an analog signal. In the **tn 6** mode, the AC-3 (Dolby Digital) data is not decoded, its simply passed through to the outputs.

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 Parts Lists.

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 not interchangeable with the earlier versions of the AM-9P or AM-25P modules.

5. These parts are packaged in quantities of five per system.

MAIN PARTS LIST

(See Figure 9)

Item Number	Description	Part Number	Qty.	Note
1	KNOB, TONE CONTROL, BLACK KNOB, TONE CONTROL, WHITE	172289-2 172289-1	2	
2	COVER, BLACK COVER, WHITE	172278-12 172278-11	1	
3	SCREW, HILO, 6 x .38, PAN, XREC	147516-06	8	
4	MODULE ASSY, 120V MODULE ASSY, 220V MODULE ASSY, 100V MODULE ASSY, DUAL	253859-001 253859-002 253859-003 253859-004	1	1, 2
5	SCREW TAPP, 8-11 x 1.25, PAN, XRS/C	172672-20	8	
6	WOOFER ASSY, 5.25	172276	2	
7	GASKET WOOFER, 6.5"	104794-08	2	
8	HARNESS, WOOFER	188207	1	
9	SHIELD, TOP, COVER	196674	1	
10	FOOT, RUBBER	197288	1	
11	PCB, ASSY, DSP	253858-001	1	1, 2, 4
12	SHIELD, BOTTOM, COVER, PCB	196675	1	
13	BRACKET ASSY, ADAPTOR	172287	1	
14	CUSHION, TRANSFORMER	176169	2	
15	TRANSFORMER, 115/230V TRANSFORMER, 100V	172286 181912	1	3 ⚠
16	TAPE, FOAM, 8", TRANSFORMER HARNESS	194936-080	1	
17	LATCH, COVER	172294	1	
18	BASE PLATE ASSY	172288	1	
19	CABLE, FLEX, 1.25 PITCH, 18	191124-18	1	
20	TAPE, FOAM, 2", CABLE	193936-020	1	
21	ANCHOR, SCREW, #6, PLASTIC	186207	2	
22	VINYL CAP	183863	1	
23	HEATSINK, AMP PCB	172283	1	
24	PCB, ASSY, AMP	197279	1	1, 2, 4
25	PLATE, SPRING	196680	1	
26	PLATE, HEATSINK, METAL	172291	1	
27	GROMMET, BASE PLATE	172295	2	
---	GASKET, CONN/COVER	186845	1	
---	SCREEN, COVER, PORT TUBE	145325	1	
---	PORT, BOTTOM, BLACK PORT, BOTTOM, WHITE	173312-1 173312-2	1	
---	GASKET, TAPE, FOAM, PCB	174676	1	
---	GASKET, TAPE FOAM	175548	1	
---	SHIELD, FENCE	196673	1	

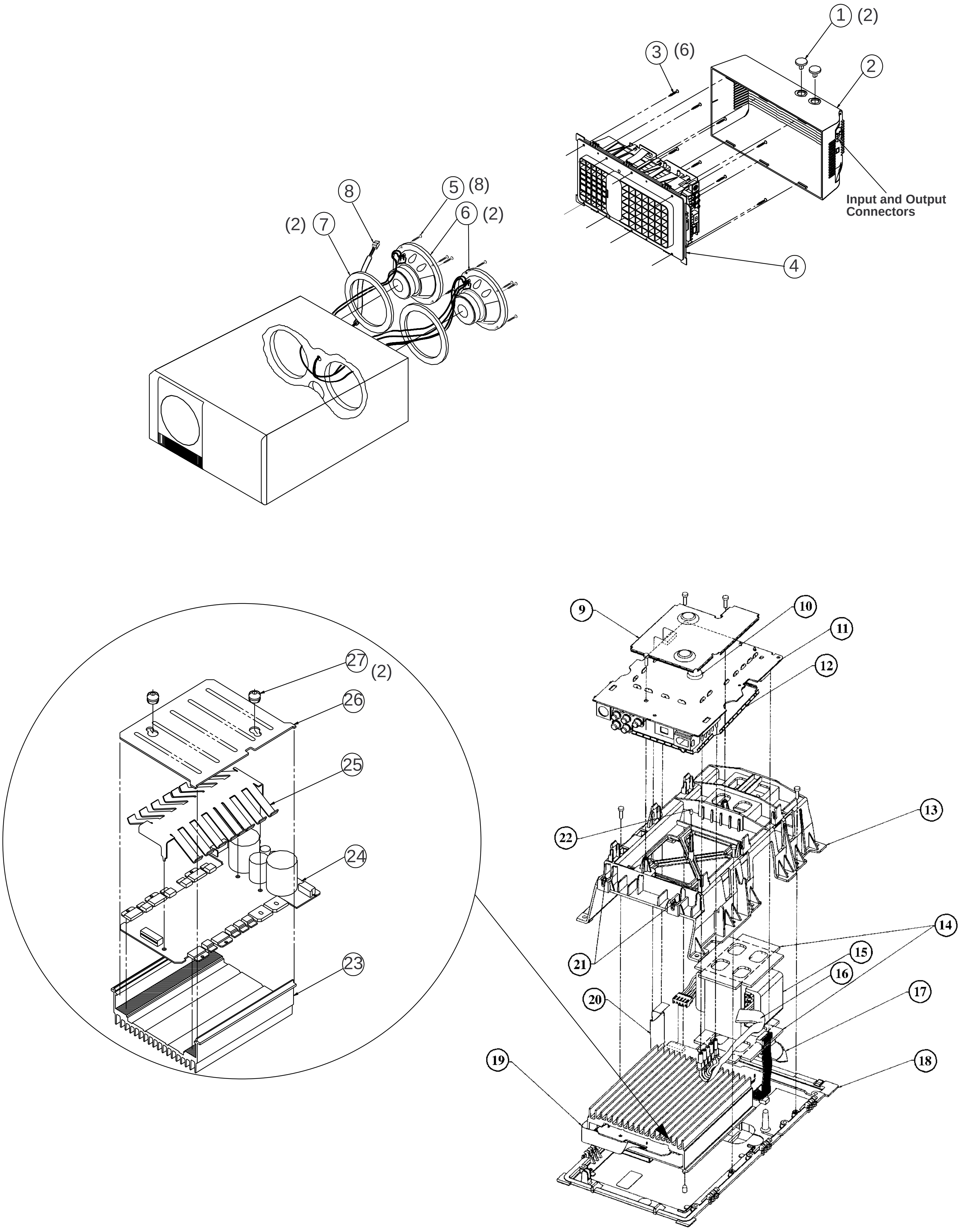


Figure 9. Bass Box and Module Exploded Views

ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	75Ω, 0805, 1/10W, 5%	133626-7505	
R2	100Ω, 0805, 1/10W, 5%	133626-1015	
R3	2Ω, 0805, 1/10W, 5%	133626-2R05	
R4	30Ω, 1206, 1/8W, 5%	124895-3005	
R5	100Ω, 0805, 1/10W, 5%	133626-1015	
R6	3.48K, 0805, 1/10W, 1%	133625-3481	
R7	6.19K, 0805, 1/10W, 1%	133625-6191	
R10	16Ω, 2512, 1W, 5%	181895-16R0	
R11	16Ω, 2512, 1W, 5%	181895-16R0	
R12	2.00K, 0805, 1/10W, 5%	133626-2025	
R100	1.0K, RES, ARRAY, SMT, 4 POS, 5%	186433-1024	
R101	1.0K, RES, ARRAY, SMT, 4 POS, 5%	186433-1024	
R102	1.00K, 0805, 1/10W, 1%	133625-1001	
R103	100Ω, 0805, 1/10W, 1%	133625-1000	
R104	300Ω, 0805, 1/10W, 5%	133626-3015	
R107	1.00K, 0805, 1/10W, 1%	133625-1001	
R108	3.0K, 0805, 1/10W, 5%	133626-3025	
R111	1.00K, 0805, 1/10W, 1%	133625-1001	
R112	100Ω, 0805, 1/10W, 1%	133625-1000	
R113	300Ω, 0805, 1/10W, 5%	133626-3015	
R116	1.00K, 0805, 1/10W, 1%	133625-1001	
R125	3.0K, 0805, 1/10W, 5%	133626-3025	
R131	10.0K, 0805, 1/10W, 1%	133625-1002	
R132	60.4K, 0805, 1/10W, 1%	133625-6042	
R135	200Ω. 0805, 1/10W, 5%	133626-2015	
R136	10.0K, 0805, 1/10W, 1%	133625-1002	
R137	60.4K, 0805, 1/10W, 1%	133625-6042	
R140	200Ω. 0805, 1/10W, 5%	133626-2015	
R141	10.0K, 0805, 1/10W, 1%	133625-1002	
R142	60.4K, 0805, 1/10W, 1%	133625-6042	
R145	200Ω. 0805, 1/10W, 5%	133626-2015	
R146	10.0K, 0805, 1/10W, 1%	133625-1002	
R147	60.4K, 0805, 1/10W, 1%	133625-6042	
R150	200Ω. 0805, 1/10W, 5%	133626-2015	
R151	10.0K, 0805, 1/10W, 1%	133625-1002	
R152	60.4K, 0805, 1/10W, 1%	133625-6042	
R155	200Ω. 0805, 1/10W, 5%	133626-2015	
R156	10.0K, 0805, 1/10W, 1%	133625-1002	
R157	60.4K, 0805, 1/10W, 1%	133625-6042	
R160	200Ω, 0805, 1/10W, 1%	133625-2000	
R161	75Ω, 0805, 1/10W, 5%	133626-7505	
R164	200Ω. 0805, 1/10W, 5%	133626-2015	
R165	100K, 0805, 1/10W, 5%	133626-1045	
R166	100K, 0805, 1/10W, 5%	133626-1045	
R167	100K, 0805, 1/10W, 5%	133626-1045	
R168	100K, 0805, 1/10W, 5%	133626-1045	
R169	100K, 0805, 1/10W, 5%	133626-1045	
R170	100K, 0805, 1/10W, 5%	133626-1045	
R171	100K, 0805, 1/10W, 5%	133626-1045	
R175	1.0M, 0805, 1/10W, 1%	133625-1004	
R176	2Ω, 0805, 1/10W, 5%	133626-2R05	

ELECTRICAL PART LIST

Resistors (continued)

Reference Designator	Description	Part Number	Note
R185	75Ω, 0805, 1/10W, 5%	133626-7505	
R186	75Ω, 0805, 1/10W, 5%	133626-7505	
R187	75Ω, 0805, 1/10W, 5%	133626-7505	
R188	1.00K, 0805, 1/10W, 1%	133625-1001	
R189	6.04K, 0805, 1/10W, 1%	133625-6041	
R190	1.00K, 0805, 1/10W, 1%	133625-1001	
R191	6.04K, 0805, 1/10W, 1%	133625-6041	
R192	75Ω, 0805, 1/10W, 5%	133626-7505	
R193	300Ω, 0805, 1/10W, 5%	133626-3015	
R194	300Ω, 0805, 1/10W, 5%	133626-3015	
R195	300Ω, 0805, 1/10W, 5%	133626-3015	
R196	300Ω, 0805, 1/10W, 5%	133626-3015	
R197	300Ω, 0805, 1/10W, 5%	133626-3015	
R198	300Ω, 0805, 1/10W, 5%	133626-3015	
R202	10.0K, 0805, 1/10W, 5%	133626-1035	
R205	10.0K, 0805, 1/10W, 5%	133626-1035	
R206	2.80K, 0805, 1/10W, 1%	133625-2801	
R207	THERMISTOR, 10K, 5%	197229	
R208	10.0K, 0805, 1/10W, 5%	133626-1035	
R211	300K, 0805, 1/10W, 5%	133626-3045	
R216	20K, 0805, 1/10W, 5%	133626-2035	
R217	100K, 0805, 1/10W, 5%	133626-1045	
R218	20K, 0805, 1/10W, 5%	133626-2035	
R220	200K, 0805, 1/10W, 5%	133626-2045	
R221	200K, 0805, 1/10W, 5%	133626-2045	
R223	200K, 0805, 1/10W, 5%	133626-2045	
R224	200K, 0805, 1/10W, 5%	133626-2045	
R225	200K, 0805, 1/10W, 5%	133626-2045	
R226	40.2K, 0805, 1/10W, 1%	133625-4022	
R230	20K, 0805, 1/10W, 5%	133626-2035	
R232	200K, 0805, 1/10W, 5%	133626-2045	
R233	200K, 0805, 1/10W, 5%	133626-2045	
R234	300Ω, 0805, 1/10W, 5%	133626-3015	
R236	3.65K, 0805, 1/10W, 5%	133626-3625	
R244	10.0K, 0805, 1/10W, 5%	133626-1035	
R245	10.0K, 0805, 1/10W, 5%	133626-1035	
R246	1.00K, 0805, 1/10W, 5%	133626-1025	
R248	1.00K, 0805, 1/10W, 5%	133626-1025	
R250	1.00K, 0805, 1/10W, 5%	133626-1025	
R252	10.0K, 0805, 1/10W, 5%	133626-1035	
R253	2.00K, 0805, 1/10W, 5%	133626-2025	
R254	10.0K, 0805, 1/10W, 5%	133626-1035	
R255	2.00K, 0805, 1/10W, 5%	133626-2025	
R256	2.00K, 0805, 1/10W, 5%	133626-2025	
R257	300Ω, 0805, 1/10W, 5%	133626-3015	
R260	1.00K, 0805, 1/10W, 5%	133626-1025	
R261	10.0K, 0805, 1/10W, 5%	133626-1035	
R262	1.00K, 0805, 1/10W, 5%	133626-1025	
R263	30K, 0805, 1/10W, 5%	133626-3035	
R264	100Ω, 0805, 1/10W, 5%	133626-1015	
R265	2.00K, 0805, 1/10W, 5%	133626-2025	
R266	1.00K, 0805, 1/10W, 5%	133626-1025	

ELECTRICAL PART LIST

Resistors (continued)

Reference Designator	Description	Part Number	Note
R267	100Ω, 0805, 1/10W, 5%	133626-1015	
R268	2.00K, 0805, 1/10W, 5%	133626-2025	
R270	2.00K, 0805, 1/10W, 5%	133626-2025	
R275	30K, 0805, 1/10W, 5%	133626-3035	
R280	10.0K, 0805, 1/10W, 5%	133626-1035	
R281	20K, 0805, 1/10W, 5%	133626-2035	
R282	20K, 0805, 1/10W, 5%	133626-2035	
R300	10Ω, CHIP, 0805, 5%	133626-1005	
R301	10Ω, CHIP, 0805, 5%	133626-1005	
R302	10Ω, CHIP, 0805, 5%	133626-1005	
R303	10Ω, CHIP, 0805, 5%	133626-1005	
R304	10Ω, CHIP, 0805, 5%	133626-1005	
R305	5.10K, 0805, 1/10W, 5%	133626-5125	
R306	100K, 0805, 1/10W, 5%	133626-1045	
R307	10.0K, 0805, 1/10W, 5%	133626-1035	
R308	1.00K, 0805, 1/10W, 5%	133626-1025	
R309	10.0K, 0805, 1/10W, 5%	133626-1035	
R310	360Ω, 0805, 5%	133626-3625	
R311	360Ω, 0805, 5%	133626-3625	
R313	100Ω, 0805, 1/10W, 5%	133626-1015	
R314	330Ω, 0805, 1/10W, 5%	133626-3315	
R315	39Ω, 1206, 1/8W, 5%	124895-3905	
R402	3.9K, RES, ARRAY, SMT, 4 POS, 5%	186433-3924	
R404	3.9K, RES, ARRAY, SMT, 4 POS, 5%	186433-3924	
R405	3.90K, 0805, 1/10W, 5%	133626-3925	
R406	75Ω, 0805, 1/10W, 5%	133626-7505	
R407	75Ω, 0805, 1/10W, 5%	133626-7505	
R408	75Ω, 0805, 1/10W, 5%	133626-7505	
R409	510Ω, 0805, 1/10W, 5%	133626-5115	
R410	3.90K, 0805, 1/10W, 5%	133626-3925	
R411	3.0K, 0805, 1/10W, 5%	133626-3025	
R412	510Ω, 0805, 1/10W, 5%	133626-5115	
R415	3.90K, 0805, 1/10W, 5%	133626-3925	
R416	3.90K, 0805, 1/10W, 5%	133626-3925	
R417	3.90K, 0805, 1/10W, 5%	133626-3925	
R418	3.90K, 0805, 1/10W, 5%	133626-3925	
R419	3.90K, 0805, 1/10W, 5%	133626-3925	
R420	3.90K, 0805, 1/10W, 5%	133626-3925	
R421	3.9K, RES, ARRAY, SMT, 4 POS, 5%	186433-3924	
R435	3.90K, 0805, 1/10W, 5%	133626-3925	
R500	48.7K, 0805, 1/10W, 1%	133625-4872	
R501	301K, 0805, 1/10W, 1%	133625-3013	
R502	49.9K, 0805, 1/10W, 1%	133625-4992	
R503	4.99K, 0805, 1/10W, 1%	133625-4991	
R510	100Ω, 0805, 1/10W, 5%	133626-1015	
R700	274K, 1206, 1/8W, 1%	124894-2743	
R701	274K, 1206, 1/8W, 1%	124894-2743	
R702	1.50K, 1206, 1/8W, 5%	124895-1525	
R703	1.50K, 1206, 1/8W, 5%	124895-1525	
R704	5.1Ω, FUSING, 2W, 5%	170174-5R1	3 ⚠

ELECTRICAL PART LIST

Resistors (continued)

Reference Designator	Description	Part Number	Note
R705	1.50K, 1206, 1/8W, 5%	124895-1525	
R706	1.50K, 1206, 1/8W, 5%	124895-1525	
R707	75Ω, 1206, 1/8W, 5%	124895-7505	
R708	22.1K, 0805, 1/10W, 1%	133625-2212	
R709	10.0K, 0805, 1/10W, 1%	133625-1002	
R710	5.1Ω, 1206, 1/8W, 5%	124895-5R15	
R711	220Ω, 1206, 1/8W, 5%	124895-2215	
R712	75Ω, 1206, 1/8W, 5%	124895-7505	
R713	20Ω, FUSING, .25W	130102-200	3
R714	20Ω, FUSING, .25W	130102-200	3
R715	274K, 1206, 1/8W, 1%	124894-2743	
R716	274K, 1206, 1/8W, 1%	124894-2743	
R717	274K, 1206, 1/8W, 1%	124894-2743	
R718	274K, 1206, 1/8W, 1%	124894-2743	
R719	2.49K, 1206, 1/8W, 1%	124894-2491	
R720	49.9K, 1206, 1/8W, 1%	124894-4992	
R721	49.9K, 1206, 1/8W, 1%	124894-4992	
R722	2.49K, 1206, 1/8W, 1%	124894-2491	
R723	16.5K, 1206, 1/8W, 1%	124894-1652	
R724	1.00K, 1206, 1/8W, 5%	124895-1025	
R725	100K, 1206, 1/8W, 5%	124895-1045	
R726	1.00K, 1206, 1/8W, 5%	124895-1025	
R727	100K, 1206, 1/8W, 5%	124895-1045	
R728	100K, 1206, 1/8W, 5%	124895-1045	
R729	2.49K, 1206, 1/8W, 1%	124894-2491	
R730	1.00K, 1206, 1/8W, 5%	124895-1025	
R731	3.65K, 1206, 1/8W, 1%	124894-3651	
R732	1.00K, 1206, 1/8W, 5%	124895-1025	
R733	100K, 1206, 1/8W, 5%	124895-1045	
R734	3.65K, 1206, 1/8W, 1%	124894-3651	
R735	1.00K, 1206, 1/8W, 5%	124895-1025	
R736	49.9K, 1206, 1/8W, 1%	124894-4992	
R737	16.5K, 1206, 1/8W, 1%	124894-1652	
R738	49.9K, 1206, 1/8W, 1%	124894-4992	
R739	2.49K, 1206, 1/8W, 1%	124894-2491	
R740	10.0K, 1206, 1/8W, 5%	124895-1035	
R741	1.00K, 1206, 1/8W, 5%	124895-1025	
R742	100K, 1206, 1/8W, 5%	124895-1045	
R743	100K, 1206, 1/8W, 5%	124895-1045	
R744	100K, 1206, 1/8W, 5%	124895-1045	
R745	1.00K, 1206, 1/8W, 5%	124895-1025	
R746	10.0K, 1206, 1/8W, 5%	124895-1035	
R747	1.00K, 1206, 1/8W, 5%	124895-1025	
R748	2.49K, 1206, 1/8W, 1%	124894-2491	
R749	49.9K, 1206, 1/8W, 1%	124894-4992	
R750	16.5K, 1206, 1/8W, 1%	124894-1652	
R751	24.9K, 0805, 1/10W, 1%	133625-2492	
R752	49.9K, 1206, 1/8W, 1%	124894-4992	
R753	2.49K, 1206, 1/8W, 1%	124894-2491	

ELECTRICAL PART LIST

Resistors (continued)

Reference Designator	Description	Part Number	Note
R754	24.9K, 0805, 1/10W, 1%	133625-2492	
R755	2.49K, 1206, 1/8W, 1%	124894-2491	
R756	49.9K, 1206, 1/8W, 1%	124894-4992	
R757	16.5K, 1206, 1/8W, 1%	124894-1652	
R758	49.9K, 1206, 1/8W, 1%	124894-4992	
R759	2.49K, 1206, 1/8W, 1%	124894-2491	
R760	3.65K, 1206, 1/8W, 1%	124894-3651	
R761	1.00K, 1206, 1/8W, 5%	124895-1025	
R762	3.65K, 1206, 1/8W, 1%	124894-3651	
R763	1.00K, 1206, 1/8W, 5%	124895-1025	
R764	1.00K, 1206, 1/8W, 5%	124895-1025	
R765	10.0K, 1206, 1/8W, 5%	124895-1035	
R766	1.00K, 1206, 1/8W, 5%	124895-1025	
R767	100K, 1206, 1/8W, 5%	124895-1045	
R768	100K, 1206, 1/8W, 5%	124895-1045	
R769	1.00K, 1206, 1/8W, 5%	124895-1025	
R770	10.0K, 1206, 1/8W, 5%	124895-1035	
R771	1.00K, 1206, 1/8W, 5%	124895-1025	
R772	100K, 1206, 1/8W, 5%	124895-1045	
R773	1.00K, 1206, 1/8W, 5%	124895-1025	
R774	1.00K, 1206, 1/8W, 5%	124895-1025	
R775	2.49K, 1206, 1/8W, 1%	124894-2491	
R776	2.49K, 1206, 1/8W, 1%	124894-2491	
R777	49.9K, 1206, 1/8W, 1%	124894-4992	
R778	100K, 1206, 1/8W, 5%	124895-1045	
R779	100K, 1206, 1/8W, 5%	124895-1045	
R780	16.5K, 1206, 1/8W, 1%	124894-1652	
R781	49.9K, 1206, 1/8W, 1%	124894-4992	
R782	2.49K, 1206, 1/8W, 1%	124894-2491	
R783	10 MEG, 1206, 1/8W, 5%	124895-1065	
R784	33.2K, 1206, 1/8W, 1%	124894-3322	
R785	10.0K, 1206, 1/8W, 5%	124895-1035	
R786	200Ω, 1206, 1/8W, 5%	124895-2015	
R787	49.9K, 1206, 1/8W, 1%	124894-4992	
R788	1Ω 1206, 1/8W, 5%	124895-1R05	
R789	200K, 1206, 1/8W, 1%	124894-2003	
R790	16.5K, 1206, 1/8W, 1%	124894-1652	
R791	1 MEG, 1206, 1/8W, 5%	124895-1055	
R792	1.00K, 1206, 1/8W, 5%	124895-1025	
R793	4.22K, 1206, 1/8W, 1%	124894-4221	
R794	301Ω, 1206, 1/8W, 1%	124894-3010	
R795	1.00K, 1206, 1/8W, 5%	124895-1025	
R796	100K, 1206, 1/8W, 5%	124895-1045	
R797	2.49K, 1206, 1/8W, 1%	124894-2491	
R798	3.65K, 1206, 1/8W, 1%	124894-3651	
R799	432Ω, 0805, 1/10W, 1%	133625-4320	
R800	432Ω, 0805, 1/10W, 1%	133625-4320	
R801	3.65K, 1206, 1/8W, 1%	124894-3651	
R802	6.80K, 0805, 1/10W, 5%	133626-6825	
R803	1K, 2512, 1W, 5%	181895-1001	
R804	6.80K, 0805, 1/10W, 5%	133626-6825	
R805	6.80K, 0805, 1/10W, 5%	133626-6825	

ELECTRICAL PART LIST

Resistors (continued)

Reference Designator	Description	Part Number	Note
R806	6.80K, 0805, 1/10W, 5%	133626-6825	
R807	6.80K, 0805, 1/10W, 5%	133626-6825	
R808	10.0K, 1206, 1/8W, 5%	124895-1035	
R809	49.9K, 0805, 1/10W, 1%	133625-4992	
R810	49.9K, 0805, 1/10W, 1%	133625-4992	
R811	1.00K, 0805, 1/10W, 1%	133625-1001	
R812	100K, 1206, 1/8W, 5%	124895-1045	
R813	30K, 0805, 1/10W, 5%	133626-3035	
R814	30K, 0805, 1/10W, 5%	133626-3035	
R815	30K, 0805, 1/10W, 5%	133626-3035	
R816	1 MEG, 0805, 1/10W, 5%	133626-1055	
R817	1 MEG, 0805, 1/10W, 5%	133626-1055	
R818	1 MEG, 0805, 1/10W, 5%	133626-1055	
R819	1 MEG, 0805, 1/10W, 5%	133626-1055	
R820	1 MEG, 0805, 1/10W, 5%	133626-1055	

Capacitors

Reference Designator	Description	Part Number	Note
C1	.01uF, 0805, X7R, 50V, 10%	133623-103	
C2	10uF, EL, 85°C, 25V, 20%	149947-100E	
C3	.01uF, 0805, X7R, 50V, 10%	133623-103	
C4	330pF, 0805, COG, 50V, 5%	133622-331	
C5	2.2uF, MONO, 1206, Y5V, 16V, 80%	178212-225	
C6	2.2uF, MONO, 1206, Y5V, 16V, 80%	178212-225	
C7	47pF, 0805, COG, 50V, 5%	133622-470	
C8	2.2uF, MONO, 1206, Y5V, 16V, 80%	178212-225	
C100	3300pF, 0805, X7R, 50V, 10%	133623-332	
C102	330pF, 0805, COG, 50V, 5%	133622-331	
C103	100pF, 0805, COG, 50V, 5%	133622-101	
C104	10uF, EL, 85°C, 25V, 20%	149947-100E	
C105	3300pF, 0805, X7R, 50V, 10%	133623-332	
C106	.01uF, 0805, X7R, 50V, 10%	133623-103	
C107	.01uF, 0805, X7R, 50V, 10%	133623-103	
C108	.01uF, 0805, X7R, 50V, 10%	133623-103	
C109	3300pF, 0805, X7R, 50V, 10%	133623-332	
C110	330pF, 0805, COG, 50V, 5%	133622-331	
C111	100pF, 0805, COG, 50V, 5%	133622-101	
C112	10uF, EL, 85°C, 25V, 20%	149947-100E	
C113	3300pF, 0805, X7R, 50V, 10%	133623-332	
C114	.22uF, TANT, 35V, 20%	262073-V224A	
C115	.022uF, 0805, X7R, 50V, 10%	133623-223	
C116	2.2uF, TANT, 10V, 20%	196981-A225A2	
C117	.01uF, 0805, X7R, 50V, 10%	133623-103	
C118	.01uF, 0805, X7R, 50V, 10%	133623-103	
C121	1000pF, 0805, COG, 50V, 5%	133622-102	
C124	1000pF, 0805, COG, 50V, 5%	133622-102	
C127	1000pF, 0805, COG, 50V, 5%	133622-102	
C130	1000pF, 0805, COG, 50V, 5%	133622-102	
C131	.01uF, 0805, X7R, 50V, 10%	133623-103	
C132	.01uF, 0805, X7R, 50V, 10%	133623-103	
C135	1000pF, 0805, COG, 50V, 5%	133622-102	
C138	1000pF, 0805, COG, 50V, 5%	133622-102	
C139	39pF, 0805, COG, 50V, 5%	133622-390	
C140	39pF, 0805, COG, 50V, 5%	133622-390	

ELECTRICAL PART LIST

Capacitors (continued)

Reference Designator	Description	Part Number	Note
C144	.01uF, 0805, X7R, 50V, 10%	133623-103	
C145	.01uF, 0805, X7R, 50V, 10%	133623-103	
C146	.01uF, 0805, X7R, 50V, 10%	133623-103	
C150	47pF, 0805, COG, 50V, 5%	133622-470	
C151	.01uF, 0805, X7R, 50V, 10%	133623-103	
C155	100pF, 0805, COG, 50V, 5%	133622-101	
C156	100pF, 0805, COG, 50V, 5%	133622-101	
C157	100pF, 0805, COG, 50V, 5%	133622-101	
C158	100pF, 0805, COG, 50V, 5%	133622-101	
C159	100pF, 0805, COG, 50V, 5%	133622-101	
C160	1000pF, 0805, COG, 50V, 5%	133622-102	
C200	.01uF, 0805, X7R, 50V, 10%	133623-103	
C201	.01uF, 0805, X7R, 50V, 10%	133623-103	
C203	.01uF, 0805, X7R, 50V, 10%	133623-103	
C204	10uF, EL, 85°C, 25V, 20%	149947-100E	
C205	33pF, 0805, COG, 50V, 5%	133622-330	
C206	33pF, 0805, COG, 50V, 5%	133622-330	
C207	2.2uF, MONO, 1206, Y5V, 16V, 80%	178212-225	
C208	2.2uF, MONO, 1206, Y5V, 16V, 80%	178212-225	
C209	1000pF, 0805, COG, 50V, 5%	133622-102	
C210	1000pF, 0805, COG, 50V, 5%	133622-102	
C211	330pF, 0805, COG, 50V, 5%	133622-331	
C212	330pF, 0805, COG, 50V, 5%	133622-331	
C213	330pF, 0805, COG, 50V, 5%	133622-331	
C214	1000pF, 0805, COG, 50V, 5%	133623-102	
C215	330pF, 0805, COG, 50V, 5%	133622-331	
C216	330pF, 0805, X7R, 10%	133623-331	
C217	1000pF, 0805, COG, 50V, 5%	133622-102	
C218	.01uF, 0805, X7R, 50V, 10%	133623-103	
C302	.033uF, 0805, X7R, 50V, 10%	133623-333	
C303	.033uF, 0805, X7R, 50V, 10%	133623-333	
C304	.033uF, 0805, X7R, 50V, 10%	133623-333	
C305	.033uF, 0805, X7R, 50V, 10%	133623-333	
C306	.033uF, 0805, X7R, 50V, 10%	133623-333	
C307	.01uF, 0805, X7R, 50V, 10%	133623-103	
C308	2.2uF, MONO, 1206, Y5V, 16V, 80%	178212-225	
C310	.01uF, 0805, X7R, 50V, 10%	133623-103	
C312	.0047uF, DISC, 60, AC, 100%	149016	
C313	1000pF, 0805, X7R, 50V, 10%	133623-102	
C314	1000pF, 0805, X7R, 50V, 10%	133623-102	
C315	.01uF, 0805, X7R, 50V, 10%	133623-103	
C400	.033uF, 0805, X7R, 50V, 10%	133623-333	
C402	33pF, 0805, COG, 50V, 5%	133622-330	
C403	33pF, 0805, COG, 50V, 5%	133622-330	
C404	.033uF, 0805, X7R, 50V, 10%	133623-333	
C410	33pF, 0805, COG, 50V, 5%	133622-330	
C411	33pF, 0805, COG, 50V, 5%	133622-330	
C414	.033uF, 0805, X7R, 50V, 10%	133623-333	
C415	.033uF, 0805, X7R, 50V, 10%	133623-333	
C416	.033uF, 0805, X7R, 50V, 10%	133623-333	
C417	.033uF, 0805, X7R, 50V, 10%	133623-333	
C418	.033uF, 0805, X7R, 50V, 10%	133623-333	

ELECTRICAL PART LIST

Capacitors (continued)

Reference Designator	Description	Part Number	Note
C419	.033uF, 0805, X7R, 50V, 10%	133623-333	
C420	.033uF, 0805, X7R, 50V, 10%	133623-333	
C421	.033uF, 0805, X7R, 50V, 10%	133623-333	
C422	.033uF, 0805, X7R, 50V, 10%	133623-333	
C423	.033uF, 0805, X7R, 50V, 10%	133623-333	
C424	.033uF, 0805, X7R, 50V, 10%	133623-333	
C425	.033uF, 0805, X7R, 50V, 10%	133623-333	
C426	.033uF, 0805, X7R, 50V, 10%	133623-333	
C427	.033uF, 0805, X7R, 50V, 10%	133623-333	
C428	.033uF, 0805, X7R, 50V, 10%	133623-333	
C429	.033uF, 0805, X7R, 50V, 10%	133623-333	
C501	1200uF, 0805, X7R, 50V, 10%	133623-122	
C503	.22uF, BOX, 85°C, 50V, 5%	137127-224	
C504	.033uF, 0805, X7R, 50V, 10%	133623-333	
C505	470uF, EL, 85°C, 25V, 20%	149948-471E	
C506	47uF, 1206, Y5V, 16V, 80%	178212-474	
C507	3300pF, 0805, X7R, 50V, 10%	133623-332	
C508	33pF, 0805, COG, 50V, 5%	133622-330	
C509	1200pF, 0805, X7R, 50V, 10%	133623-122	
C515	10uF, EL, 85°C, 25V, 20%	149947-100E	
C700	.01uF, 0805, X7R, 50V, 10%	133623-103	
C701	.01uF, 0805, X7R, 50V, 10%	133623-103	
C702	1.0uF, EL, 105°C, 50V, 20%	137126-1R0	
C703	.01uF, 0805, X7R, 50V, 10%	133623-103	
C704	1.0uF, EL, 105°C, 50V, 20%	137126-1R0	
C705	10uF, EL, 85°C, 25V, 20%	149947-100E	
C706	10uF, EL, 105°C, 16V, 20%	137126-100	
C707	.47uF, EL, 105°C, 50V, 20%	137126-R47	
C708	10uF, EL, 105°C, 16V, 20%	137126-100	
C709	.47uF, EL, 105°C, 50V, 20%	137126-R47	
C710	10uF, EL, 105°C, 16V, 20%	137126-100	
C711	10uF, EL, 85°C, 25V, 20%	149947-100E	
C712	10uF, EL, 85°C, 25V, 20%	149947-100E	
C713	1.0uF, EL, 105°C, 50V, 20%	137126-1R0	
C714	.47uF, EL, 105°C, 50V, 20%	137126-R47	
C715	10uF, EL, 105°C, 16V, 20%	137126-100	
C716	10uF, EL, 85°C, 25V, 20%	149947-100E	
C717	1.0uF, EL, 105°C, 50V, 20%	137126-1R0	
C718	10uF, EL, 105°C, 16V, 20%	137126-100	
C719	.47uF, EL, 105°C, 50V, 20%	137126-R47	
C720	1.0uF, EL, 105°C, 50V, 20%	137126-1R0	
C721	10uF, EL, 85°C, 25V, 20%	149947-100E	
C722	10uF, EL, 105°C, 16V, 20%	137126-100	
C723	.47uF, EL, 105°C, 50V, 20%	137126-R47	
C724	47uF, EL, BP, 85°C, 16V, 20%	147522-470	
C725	100uF, EL, 85°C, 16V, 20%	149947-101C	
C726	.1uF, CAP, BOX, 85°C, 50V, 5%	137127-104	
C727	1.0uF, EL, 105°C, 50V, 20%	137126-1R0	
C729	4700uF, EL, BP, 105°C, 50V, 20%	187394	
C730	4700uF, EL, BP, 105°C, 50V, 20%	187394	
C731	2200uF, EL, 85°C, 25V, 20%	198458-222E	
C732	2200uF, EL, 85°C, 25V, 20%	198458-222E	
C733	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C734	1000pF, 1206, COG, 50V, 10%	124956-1022	

ELECTRICAL PART LIST

Capacitors (continued)

Reference Designator	Description	Part Number	Note
C735	1000pF, 1206, COG, 50V, 10%	124956-1022	
C736	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C737	1000pF, 1206, COG, 50V, 10%	124956-1022	
C738	1000pF, 1206, COG, 50V, 10%	124956-1022	
C739	1000pF, 1206, COG, 50V, 10%	124956-1022	
C740	1000pF, 1206, COG, 50V, 10%	124956-1022	
C741	.01uF, 1206, X7R, 25V, 5%	131754-103	
C742	.01uF, 1206, X7R, 25V, 5%	131754-103	
C743	1000pF, 1206, COG, 50V, 10%	124956-1022	
C744	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C745	1000pF, 1206, COG, 50V, 10%	124956-1022	
C746	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C747	1000pF, 1206, COG, 50V, 10%	124956-1022	
C748	1000pF, 1206, COG, 50V, 10%	124956-1022	
C749	1000pF, 1206, COG, 50V, 10%	124956-1022	
C750	1000pF, 1206, COG, 50V, 10%	124956-1022	
C751	.01uF, 1206, X7R, 25V, 5%	131754-103	
C752	.01uF, 1206, X7R, 25V, 5%	131754-103	
C753	3300pF, 1206, X7R, 50V, 10%	124957-332	
C754	1000pF, 1206, COG, 50V, 10%	124956-1022	
C755	1000pF, 1206, COG, 50V, 10%	124956-1022	
C756	1000pF, 1206, COG, 50V, 10%	124956-1022	
C757	1000pF, 1206, COG, 50V, 10%	124956-1022	
C758	.01uF, 1206, X7R, 25V, 5%	131754-103	
C759	270pF, 1206, COG, 50V, 10%	124956-2712	
C760	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C761	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C762	1uF, 1206, Y5V, 16V, 80%	173383-105	
C763	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C764	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C765	1uF, 1206, Y5V, 16V, 80%	173383-105	
C766	3300pF, 1206, X7R, 50V, 10%	124957-332	
C767	.10uF, 0805, Y5V, 25V, 80%	133624	
C768	.10uF, 0805, Y5V, 25V, 80%	133624	
C769	1000pF, 0805, X7R, 50V, 10%	133623-102	
C770	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C771	1000pF, 0805, X7R, 50V, 10%	133623-102	
C772	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C773	1000pF, 0805, X7R, 50V, 10%	133623-102	
C774	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C775	1000pF, 0805, X7R, 50V, 10%	133623-102	
C776	1000pF, 0805, X7R, 50V, 10%	133623-102	
C777	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C778	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C779	.1uF, 1206, Y5V, 50V, 80%	138551-104	
C780	2200uF, EL, 85°C, 25V, 20%	198458-222E	
C781	2200uF, EL, 85°C, 25V, 20%	198458-222E	
C790	2.2uF, MONO, 1206, Y5V, 16V, 80%	178212-225	

ELECTRICAL PART LIST

Diodes

Reference Designator	Description	Part Number	Note
B700	RECTIFIER, BRIDGE, KBJ601G	187611-001	3 ⚠
B701	RECTIFIER, BRIDGE, KBJ601G	187611-001	3 ⚠
D1	BAV99, DUAL, SOT-23	147239	
D2	BAV99, DUAL, SOT-23	147239	
D3	BAV99, DUAL, SOT-23	147239	
D100		147239	
D101	BAV99, DUAL, SOT-23	147239	
D102	BAV99, DUAL, SOT-23	147239	
D103	BAV99, DUAL, SOT-23	147239	
D104	BAV99, DUAL, SOT-23	147239	
D105	BAV99, DUAL, SOT-23	147239	
D200	BAV70, DUAL, SOT-23	147249	
D202	BAV99, DUAL, SOT-23	147239	
D300	ZENER, 3.3V	135247-5226	
D301	BAV99, DUAL, SOT-23	147239	
D302	TRIAC, 8A,	197226	3 ⚠
D500	SCHOTTY, 30V, 3A	193847-001	
D700	BAV99, DUAL, SOT-23	147239	
D701	1N5232, ZENER, 5.6V, 225MW	135247-5232	
D702	BAV99, DUAL, SOT-23	147239	
D703	1N5232, ZENER, 5.6V, 225MW	135247-5232	
D704	1N5402, DIODE	170219	
D705	BAV99, DUAL, SOT-23	147239	
D706	1N5402, DIODE	170219	
D707	1N5402, DIODE	170219	
D708	1N5232, ZENER, 5.6V, 225MW	135247-5232	
D709	1N5232, ZENER, 5.6V, 225MW	135247-5232	
D710	1N5402, DIODE	170219	
D711	1N5402, DIODE	170219	
D712	1N5402, DIODE	170219	
D713	BAV99, DUAL, SOT-23	147239	
D714	BAV99, DUAL, SOT-23	147239	
D715	BAV99, DUAL, SOT-23	147239	
D716	BAV99, DUAL, SOT-23	147239	
D717	1N5252, ZENER, 24V, 225MW	135247-5252	
D718	BAV99, DUAL, SOT-23	147239	
D719	BAV99, DUAL, SOT-23	147239	
D720	BAV99, DUAL, SOT-23	147239	
D721	BAV99, DUAL, SOT-23	147239	
D722	BAV99, DUAL, SOT-23	147239	
D723	BAV99, DUAL, SOT-23	147239	
D724	BAV99, DUAL, SOT-23	147239	
D725	BAV99, DUAL, SOT-23	147239	
ZR200	1N5232, ZENER, 5.6V, 225MW	135247-5232	
ZR201	1N5232, ZENER, 5.6V, 225MW	135247-5232	

ELECTRICAL PART LIST

Transistors

Reference Designator	Description	Part Number	Note
Q200	BPLR, N, 50V, 100mA, SOT23	146817	
Q201	MMBT3904, NPN, SOT	146819	
Q202	MMBT3904, NPN, SOT	146819	
Q203	MMBT3904, NPN, SOT	146819	
Q204	MMBT3904, NPN, SOT	146819	
Q300	MMBT3904, NPN, SOT	146819	
Q301	MMBT3904, NPN, SOT	146819	
Q302	MMBT3904, NPN, SOT	146819	
Q303	BPLR, P, 40V, 200mA, SOT23	148596	
Q500	BPLR, N, 50V, 100mA, SOT23	146817	
Q700	DARL, P, 80V, 15A, TIP146T	172285	
Q701	BPLR, P, 60V, 200mA, TO-92	119168	
Q702	BPLR, N, 60V, 200mA, TO-92	117921	
Q703	BPLR, N, 60V, 200mA, TO-92	117921	
Q704	BPLR, P, 60V, 200mA, TO-92	119168	
Q705	DARL, P, 80V, 15A, TIP146T	172285	
Q706	DARL, N, 80V, 15A, TIP141T	172284	
Q707	BPLR, P, 60V, 200mA, TO-92	119168	
Q708	BPLR, N, 60V, 200mA, TO-92	117921	
Q709	DARL, N, 80V, 15A, TIP141T	172284	
Q710	BPLR, N, 60V, 200mA, TO-92	117921	
Q711	BPLR, P, 60V, 200mA, TO-92	119168	
Q712	BPLR, N, 60V, 200mA, TO-92	117921	
Q713	BPLR, N, 60V, 200mA, TO-92	117921	
Q714	BPLR, N, 60V, 200mA, TO-92	117921	
Q715	DARL, P, 80V, 15A, TIP146T	172285	
Q716	2SB560F, PNP	140349	
Q717	BPLR, P, 60V, 200mA, TO-92	119168	
Q718	DARL, P, 80V, 15A, TIP146T	172285	
Q719	DARL, N, 80V, 15A, TIP141T	172284	
Q720	DARL, N, 80V, 15A, TIP141T	172284	
Q721	BPLR, P, 60V, 200mA, TO-92	119168	
Q722	BPLR, N, 60V, 200mA, TO-92	117921	
Q723	BPLR, P, 60V, 200mA, TO-92	119168	
Q724	MMBF4392, JFET, SOT	134738	
Q725	BPLR, P, 55V, 150mA, SOT23	134743	

ELECTRICAL PART LIST

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	VOLT REG, 5V, DPAK, L78M05	197227-001	
U100	CODEC, CS4226-KQ	197221	
U101	74LCX244, IC, OCTAL, 3V	193841-001	
U102	74ACT244, IC, OCTAL, 3V	193842-001	
U103	TLO74D, QUAD OP AMP	186112	
U104	TLO74D, QUAD OP AMP	186112	
U105	NJM2082M, OP AMP	146820	
U106	JK FLOP, 74HC73, SO-14	196670-001	
U200	SOT23, MAX809, 4.65V	191158-01	
U201	EPROM, DIP-8/SO-8, 24CO2A	177982-2	
U202	uC, QFP44, TMP87PH47U, OTP, PRG	254101 or 253903-32	
U300	OPTO-TRIAC, PDIP-6, MOC3023T	253843	3 ⚠
U400	QUAD NAND, 3V, 74LCX00, S014	193858-001	
U500	VOLT REG, 3V, 3,5A SMPS, L4973D3.3	193846-001	
U700	POWER AMP, TDA7294	170156	
U701	POWER AMP, TDA7294	170156	
U702	LM339, VOLTAGE COMPARITOR	187618-001	
U703	POWER AMP, TDA7294	170156	
U704	POWER AMP, TDA7294	170156	
U705	POWER AMP, TDA7294	170156	
U706	LM393, DUAL COMPARITOR, SO-8	148584	
U707	NJM2082M, OP AMP, DUAL, SO-8	146820	
U708	VOLT REG, 37V, NEG	137928	
U709	VOLT REG, 37V, POS	137927	
DSP1	DSP, QFP240, ADSP21061L	193834	
DSP2	DSP, QFP240, ADSP21061L	193834	
U401	OTP, EPROM, M27W210, PLCC32	254102 or 253904-32	

ELECTRICAL PART LIST

Miscellaneous

Reference Designator	Description	Part Number	Note
L1	CHIP, 0805, 400 OHMS	188587-401	
L2	CHIP, 0805, 400 OHMS	188587-401	
L200	CHIP, 0805, 400 OHMS	188587-401	
L501	22uH, SMD, 20%	173273-220	
X600	CER, +/-5%, 8.00 MHz	180997	
CR400	CRYSTAL, 40.000 MHz, HC49S,SMD	254053	
CR100	CRYSTAL, 11.2896 MHz, HC49S,SMD	197225	
J4	CONN, HEADER, RTANG, 2.5mm, 8 POS	145402-08	
J5	CONN, DIN, 13-PIN, RTANG	193845	
J6	CONN, HOUSING, AC, 2 POS, FEMALE	146563	3
J6	CONN, HOUSING, AC, 230V	145306	3
J7	CONN, HEADER, 5 POS.	178742-5	3
J8	CONN, HEADER, 90DEG, 18 PIN, FCC	191169-18	
J9	CONN, PHONO JACK	180567	
J700	CONN, HEADER, 90DEG, 18 PIN, FCC	191169-18	
J701	CABLE, FLAT, BOARD-IN, 8P, 24 AWG	190701-001	
J702	CONN, HEADER, RTANG, 5 POS	134290-05	
J703	CONN, HEADER, RTANG, JST S2P-VH	190552-02	
F300	FUSE, 5X20mm, SLO-BLO, 3A	181561-3000	3
F300	FUSE, 5X20MM, SLO-BLO, 1.6A	181561-1600	3
F300A	FUSECLIP, 5MM	178548	
F300B	FUSECLIP, 5MM	178548	
Y300	JUMPER, 22AWG, INSUL, 7mm	135091-070	
Y301	JUMPER, 22AWG, INSUL, 7mm	135091-070	

SATELLITE PART LIST

(See Figure 10)

Item Number	Description	Part Number	Qty.	Note
1	GRILLE ASSY, SATELLITE, BLACK, LS12/25 GRILLE ASSY, SATELLITE, WHITE, LS12/25	192410-019 192410-029	2	
2	NAMEPLATE, 1" DIAMOND CUT, BLACK NAMEPLATE, 1" DIAMOND CUT, WHITE	193250-11 193250-12	1	

(See Figure 11)

Item Number	Description	Part Number	Qty.	Note
1	H-RING, SEAL, BLK	178710-01	1	
2	HARNESS, ASSY.	196136-01	1	
3	FOAM, ACOUSTIC	178714	2	
4	TWIDDLER®, ASSY., 50mm	171360	2	
5	SCREW, HILO, 4-16 x .375, PAN, XREC	181621-06	8	
6	GRILLE, CUBE, BLK, W/SLOT, LS30 GRILLE, CUBE, WHT, W/SLOT, LS30	192935-02 192935-04		
7	NAMEPLATE, BOSE, BLK/ PWTR, LS30 NAMEPLATE, BOSE, WHT/PWTR, LS30	178725-01 178725-02	1	
8	GRILLE, CUBE, BLK, W/O SLOT, LS30 GRILLE, CUBE, WHT, W/O SLOT, LS30	192935-01 192935-03	2	
9	DAMPER, ANTI-BUZZ	185951	8	
10	SNAP RING	178709	1	

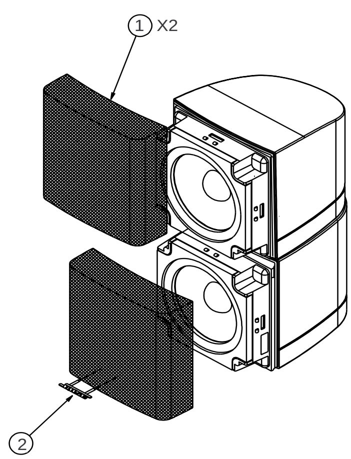


Figure 10. LS12/25 Satellite Assembly

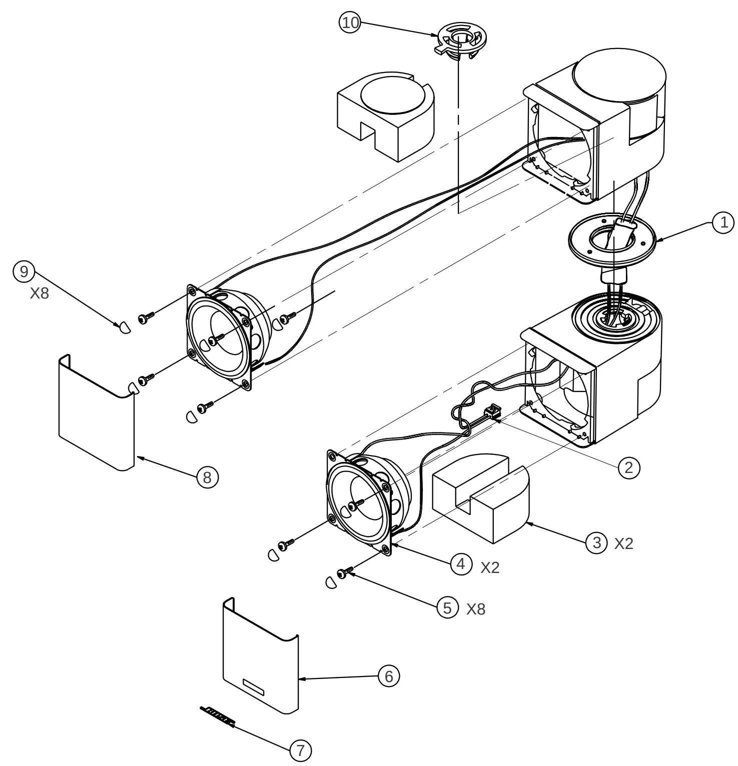


Figure 11. LS30 Jewel Cube® Assembly

LS12 II PACKAGING PART LIST

Item Number	Description	Part Number	Qty.	Note
1	PACKING, INSERT, EPS	172279	2	
2	PACKING, CORNER, POST, BASS MOD	148044	2	
3	D/C CARTON, SYSTEM LS12-II	177613-08	1	
4	CARTON, SATELLITE, ACCY KIT	172282	1	
---	CARTON, CHIPBOARD, SATELLITE	197330-002	5	inside carton number 4
5	CARTON, ACCY KIT, CD5V2	177798	1	
6	CARTON, CD5V2	177797	1	
7	PACKING, INSERT, D/C, GLUE, LS12-II	177800	1	

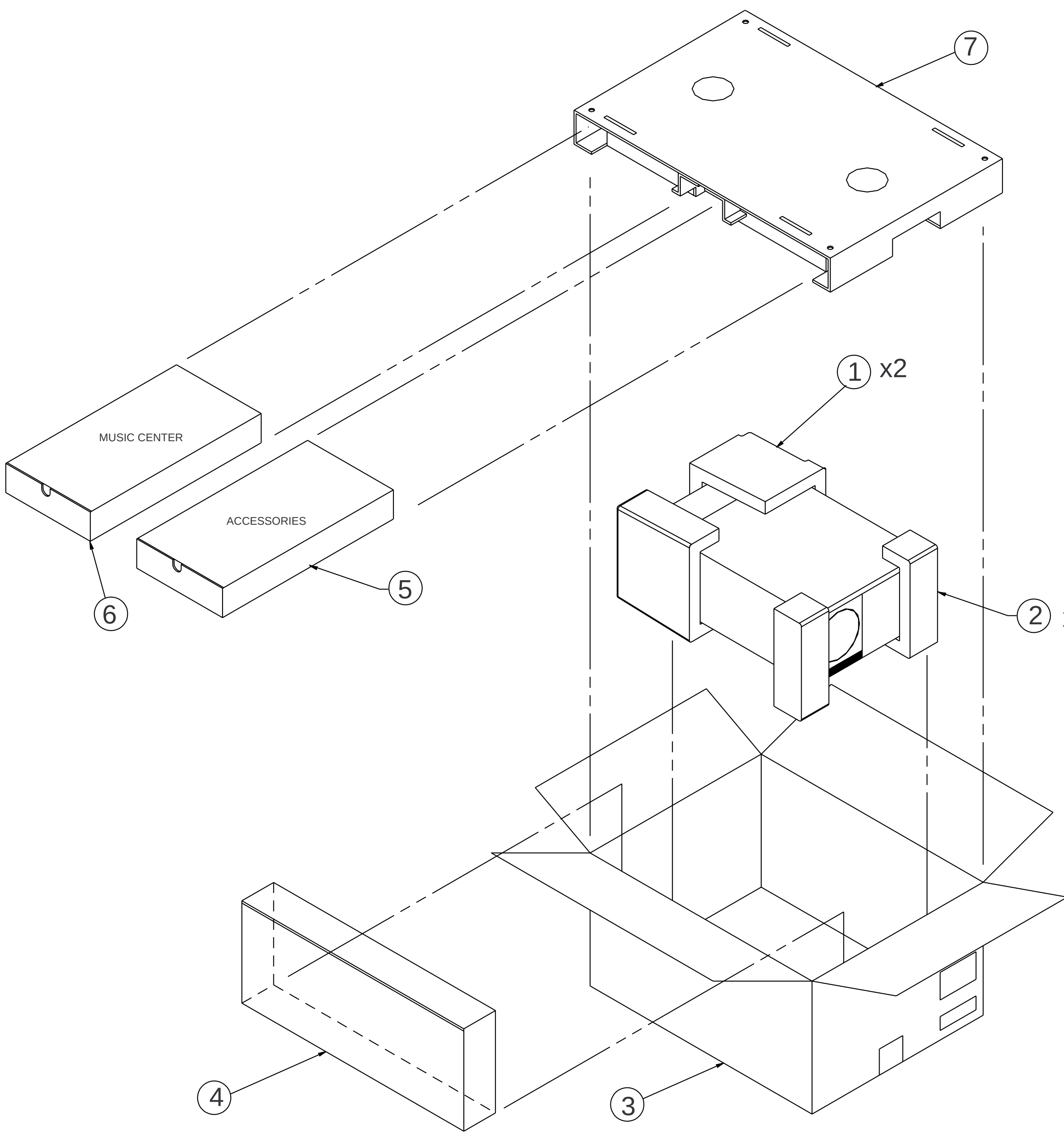


Figure 12. LS12 II Packaging View

LS25 II PACKAGING PART LIST

Item Number	Description	Part Number	Qty.	Note
1	PACKING, INSERT, EPS	172279	2	
2	PACKING, CORNER, POST, BASS MOD	148044	2	
3	D/C CARTON, SYSTEM LS25-II	187719-004	1	
4	CARTON, SATELLITE, ACCY KIT	172282	1	
---	CARTON, CHIPBOARD, SATELLITE	197330-001	5	inside carton number 4
5	CARTON, D/C, ACCY.	1190208-001	1	
---	PACKING, TRAY	190209-004	1	inside carton number 5
6	CD20 CARTON	188020-001	1	
---	FILLER, TOP, CD20	186424-001	1	inside carton number 6
---	FILLER, BOTTOM, CD20	186425-001	1	inside carton number 6

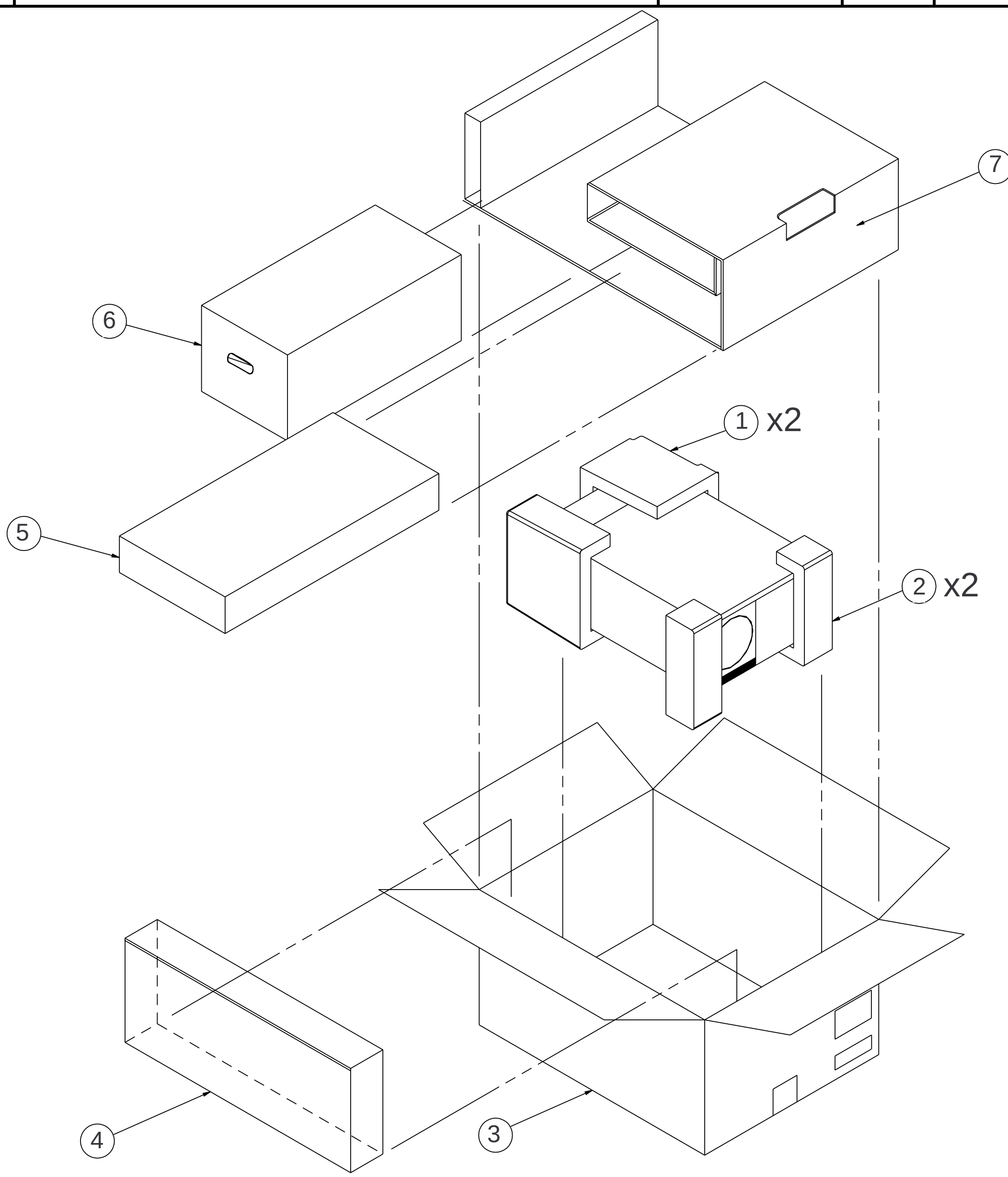


Figure 13. LS25 II Packaging View

LS30 II PACKAGING PART LIST

Item Number	Description	Part Number	Qty.	Note
1	PACKING, INSERT, EPS	172279	2	
2	PACKING, CORNER, POST, BASS MOD	148044	2	
3	D/C CARTON, SYSTEM LS30-II	188005-007	1	
4	PACKING, INSERT, LS30-II	196212	1	
5	CARTON, D/C, ACCY.	190208-001	1	
---	PACKING, TRAY	190209-004	1	inside carton number 5
6	CD20 CARTON	188020-001	1	
---	FILLER, TOP, CD20	186424-001	1	inside carton number 6
---	FILLER, BOTTOM, CD20	186425-001	1	inside carton number 6
7	PACKING, D/C, CABLE PACK	190216	1	
8	CARTON, D/C, SAT	190207-002		
---	SATELLITE TRAY	190211-001	1	inside carton number 8

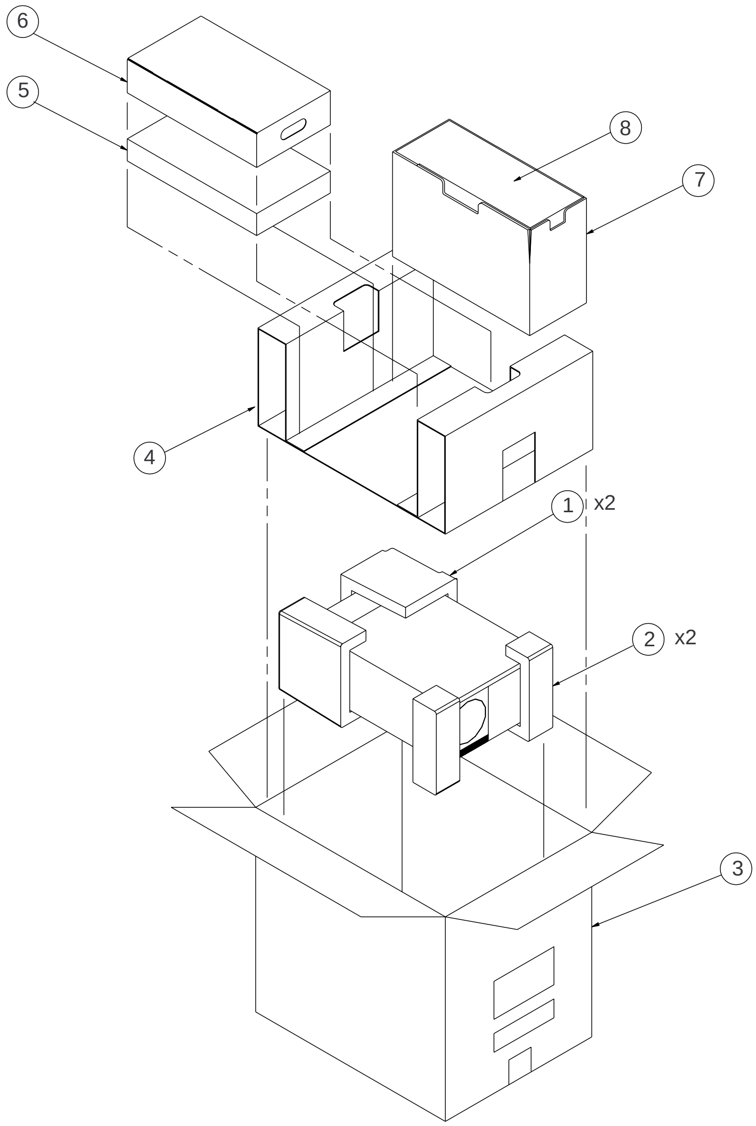


Figure 14. LS30 II Packaging View

ACCESSORY PART LIST

1	SATELLITE ASSY, SGL, BK, LS12/25 II SATELLITE ASSY, SGL, WH, LS12/25 II	192420-019 192420-029	1	5
2	SATELLITE ASSY, SFL, BK, LS30 SATELLITE ASSY, SGL, WH, LS30	194420-019 194420-029	1	5
3	CABLE, DIN-13 TO RCA, 3.5MM, SPDI, CD5V2	253347	1	
4	CABLE, DIN-13 TO DIN-8, SPDI, CD20	253346	1	
5	CABLE SET, 3PK, L/C/R, BLK, LS30 CABLE SET, 3PK, L/C/R, WHT, LS30	193145-04 193145-14	1	
6	CABLE SET, 2PK, LS/RS, BLK, LS30 CABLE SET, 2PK, LS/RS, WHT, LS30	193146-03 193146-13	1	
7	CABLE, SPEAKER, REAR, BLACK, LS12/25 CABLE, SPEAKER, REAR, WHITE, LS12/25	180644 176202	2	
8	CABLES, SPEAKER, L, R, C, BLACK, LS12/25 CABLES, SPEAKER, L, R, C, WHITE, LS12/25	180643-4 176201-4	1	
9	CABLE, AUDIO, DUAL RCA	185931-01	1	
10	ANTENNA, FM DIPOLE, 75 OHM, F CONN.	148589	1	
11	MAGAZINE, 6 DISK, LS25/30	187575	1	
12	POWER SUPPLY, 120VAC POWER SUPPLY, 100VAC, JAPAN POWER PACK, 230V, UK POWER PACK, 230, EURO POWER PACK, 240V, AUST	178371 178372 178374 178375 178373	1	3 ⚠
13	BATTERY, CARBON, AA SIZE	147538	2	
14	ANTENNA, ASSY, AM, CD20	199824-002	1	
15	ANTENNA, AM LOOP, CD5V2	190813	1	
16	LINE CORD, 120V, POL, DETACHABLE, BLK LINE CORD, 100V, DETACHABLE, 96" LINE CORD, 230V, UK, DETACHABLE, 72" LINE CORD, EUR, DETACHABLE, 96" LINE CORD, 230V, AUS, DETACHABLE	198603-001 145316 134725 148203 134726	1	3 ⚠
17	REMOTE CONTROL ASSY, RC-9, LS12 REMOTE CONTROL ASSY, RC-9, JAPAN REMOTE CONTROL ASSY, LS25 HT, LS25/30	176334 182423 187700	1	
18	BUMPER, RECESSED, FOOT, .88"	142839	4	
19	FOOT, CLEAR,. 312 x 0.85, LS12/25 FOOT, 2.03 x .06, LS30	178321-04 183621	5	5
20	MANUAL, OWNERS, LS12-II, 3 LANG. MANUAL, OWNERS, LS12-II, 5 LANG. MANUAL, OWNERS, LS25-II, 3 LANG. MANUAL, OWNERS, LS25-II, 5 LANG. MANUAL, OWNERS, LS30-II, 3 LANG. MANUAL, OWNERS, LS30-II, 5 LANG.	196573 196574 196575 196576 199736 199737	1	
21	CD, LIFESTYLE® MUSIC SYS, US CD, LIFESTYLE MUSIC SYS, EURO	183768 183769	1	
22	CD,TEST, 9 LANG, DIGITAL, HT	199740	1	
23	BROCHURE, ALL PRODUCTS	188898	1	
24	INFORMATION CARD, WARRANTY U.S.	181357	1	

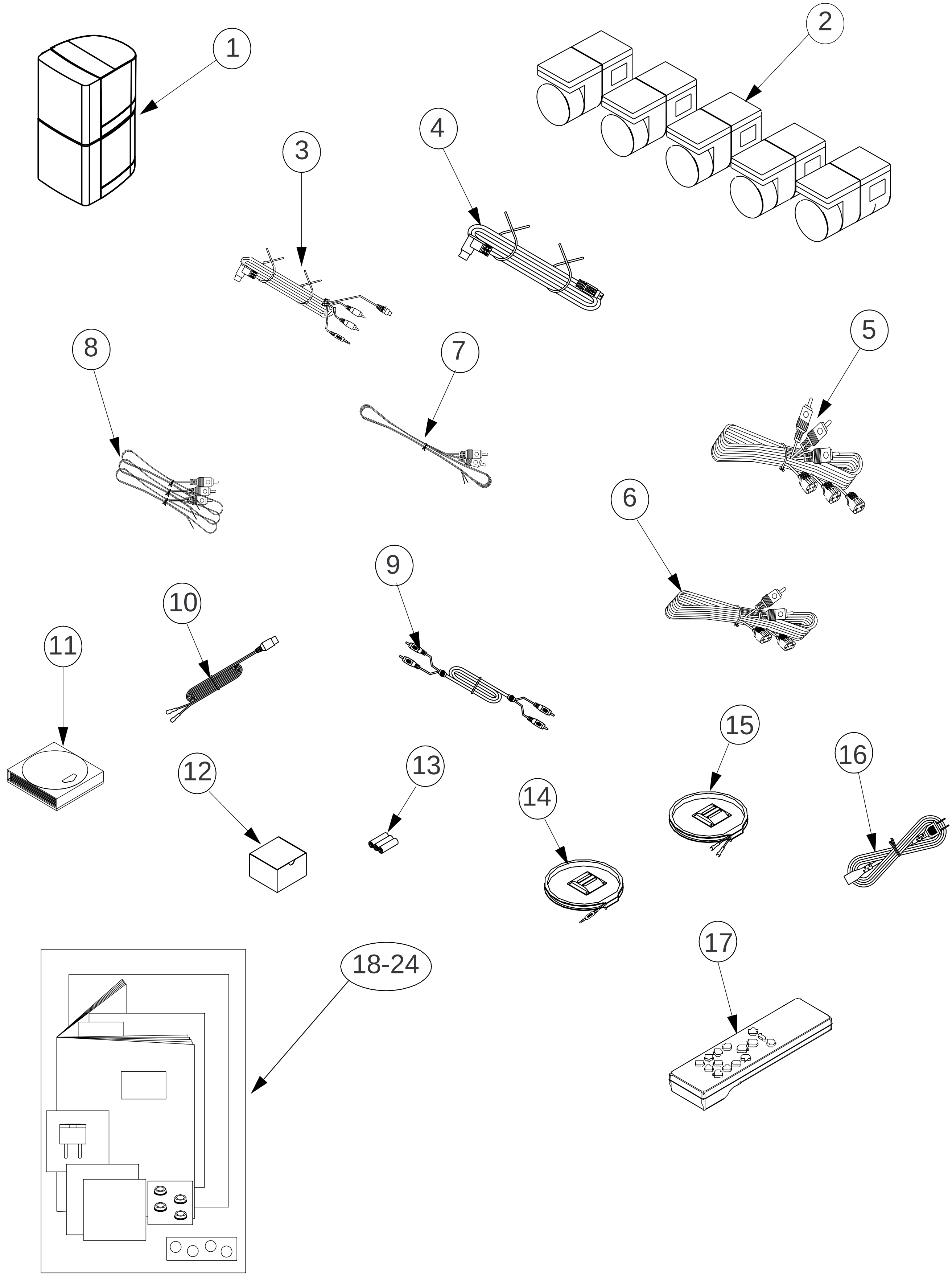
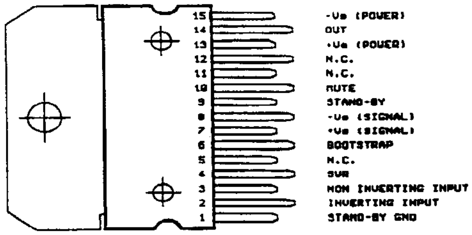
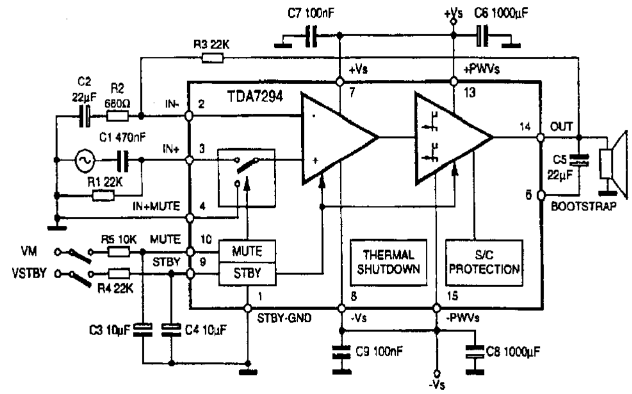


Figure 15. Accessory Kit View

INTEGRATED CIRCUITS

Pin Connection



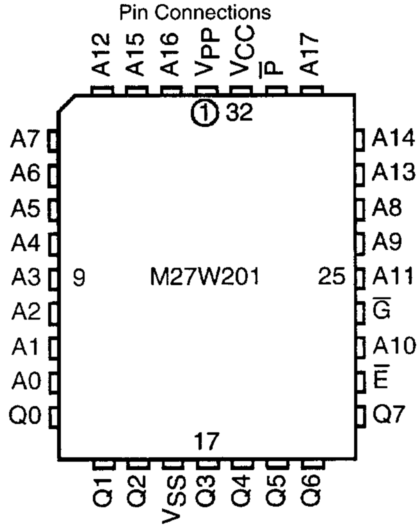


Audio Power Amplifier (TDA7294) Bose® part number 170156

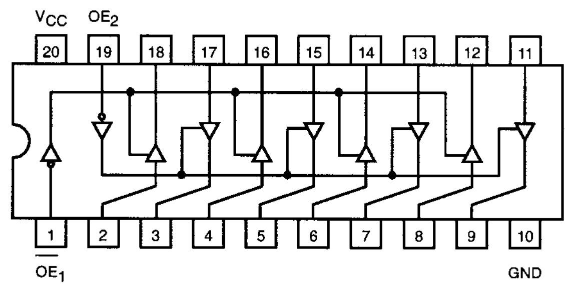
Pin Function

SIGNAL NAMES	
A0-A17	Address Inputs
Q0-Q7	Data Outputs
$\overline{E}$	Chip Enable
$\overline{G}$	Output Enable
$\overline{P}$	Program
Vpp	Program supply
Vcc	Supply Voltage
Vss	Ground

Pin Connections

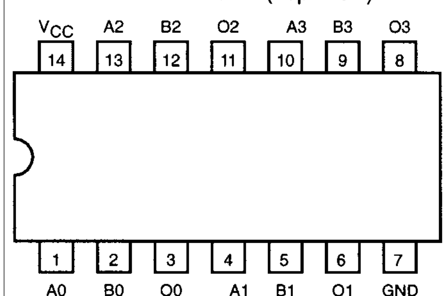


EPROM (M27W210) Bose part number 251708

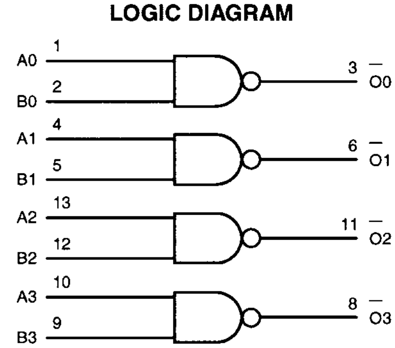


U101, 102 Octal Buffer (MC74ACT244 and MC74ACX244) Bose part number 193841-001, 193842-001

Pinout: 14-Lead (Top View)

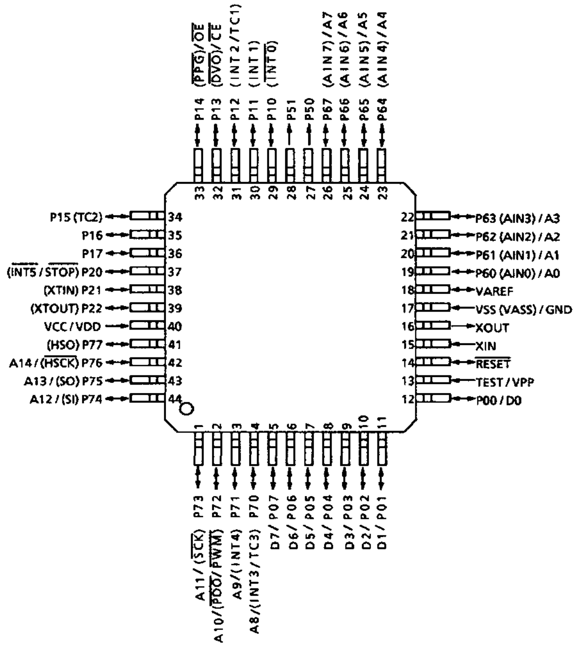


LOGIC DIAGRAM



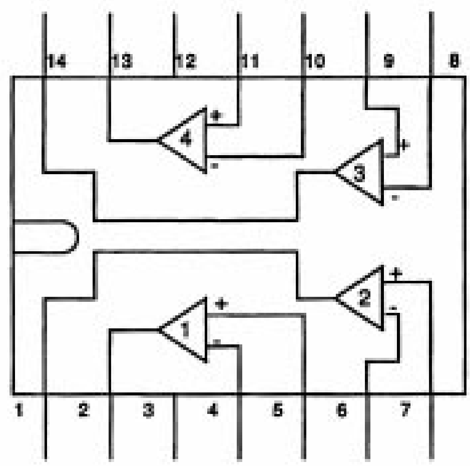
U400, Quad Nand, 3V (MC74LCX00) Bose part number 193858-001

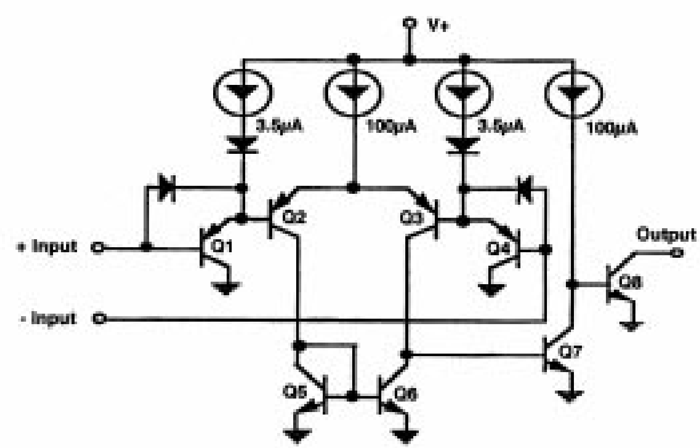
INTEGRATED CIRCUITS



U202, (TMP87PH47U)
Bose® part number 251561

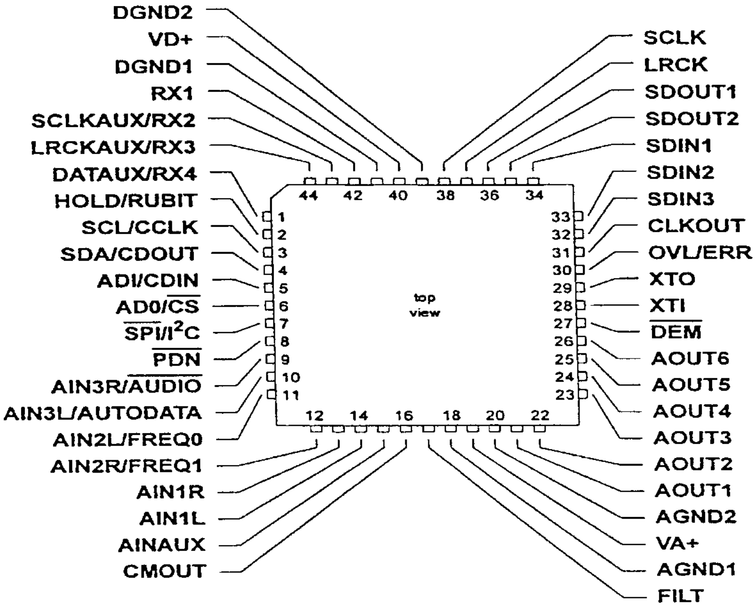
Pin	Connection
1	Output 2
2	Output 1
3	V+
4	Input 1-
5	Input 1+
6	Input 2-
7	Input 2+
8	Input 3-
9	Input 3+
10	Input 4-
11	Input 4+
12	GND
13	Output 4
14	Output 3



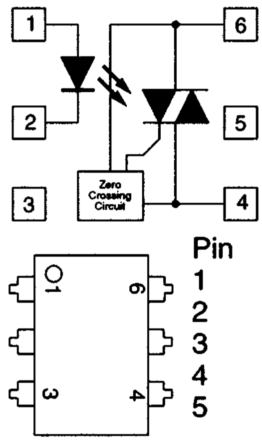


U702, Voltage Comparitor (LM339)
Bose part number 187618-001

INTEGRATED CIRCUITS



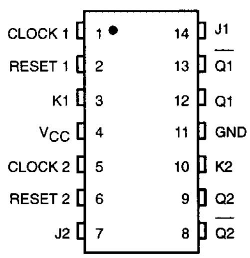
U100, Codec (CS4226-KQ)
Bose® part number 197221



Pin	Function
1	Anode
2	Cathode
3	NC
4	Main Terminal
5	Substrate Do Not Connect
6	Main Terminal

U300, Opto-Triac (MOC3023T)
Bose part number 190334-001

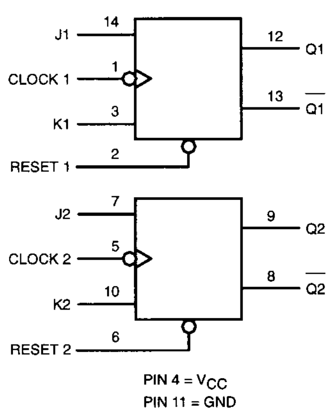
PIN ASSIGNMENT



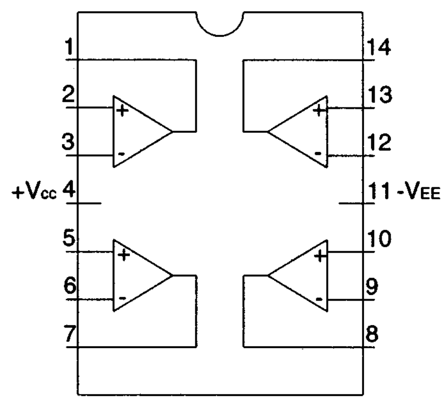
FUNCTION TABLE

Inputs				Outputs	
Reset	Clock	J	K	Q	$\overline{Q}$
L	X	X	X	L	H
H	↓	L	L	No Change	
H	↓	L	H	L	H
H	↓	H	L	H	L
H	↓	H	H	Toggle	
H	L	X	X	No Change	
H	H	X	X	No Change	
H	↑	X	X	No Change	

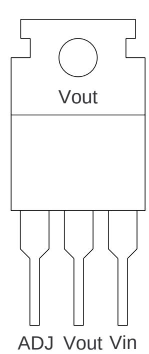
LOGIC DIAGRAM



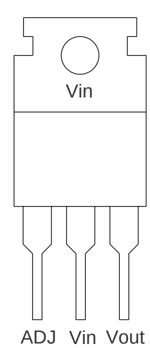
U106, JK Flip-Flop (MC74HC73)
Bose part number 196670-001



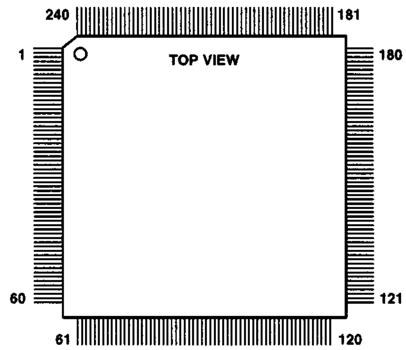
U103 and 104, Quad Op-Amp (TLO74D)
Bose part number 186112



Voltage Regulator 37V positive Bose part number 137927



Voltage Regulator 37V negative Bose part number 137928



DSP 1 and 2, (ADSP21061LKS-160) Bose part number 193834

Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name
1	TDI	41	ADDR20	81	TCLK0	121	DATA41	161	DATA14	201	NC
2	TRST	42	ADDR21	82	TFS0	122	DATA40	162	DATA13	202	NC
3	VDD	43	GND	83	DR0	123	DATA39	163	DATA12	203	NC
4	TDO	44	ADDR22	84	RCLK0	124	VDD	164	GND	204	NC
5	TIMEXP	45	ADDR23	85	RFS0	125	DATA38	165	DATA11	205	VDD
6	EMU	46	ADDR24	86	VDD	126	DATA37	166	DATA10	206	NC
7	ICSA	47	VDD	87	VDD	127	DATA36	167	DATA9	207	NC
8	FLAG3	48	GND	88	GND	128	GND	168	VDD	208	NC
9	FLAG2	49	VDD	89	ADRCLK	129	NC	169	DATA8	209	NC
10	FLAG1	50	ADDR25	90	REDY	130	DATA35	170	DATA7	210	NC
11	FLAG0	51	ADDR26	91	HBG	131	DATA34	171	DATA6	211	NC
12	GND	52	ADDR27	92	CS	132	DATA33	172	GND	212	GND
13	ADDR0	53	GND	93	RD	133	VDD	173	DATA5	213	NC
14	ADDR1	54	MS3	94	WR	134	VDD	174	DATA4	214	NC
15	VDD	55	MS2	95	GND	135	GND	175	DATA3	215	NC
16	ADDR2	56	MS1	96	VDD	136	DATA32	176	VDD	216	NC
17	ADDR3	57	MS0	97	GND	137	DATA31	177	DATA2	217	NC
18	ADDR4	58	SW	98	CLKIN	138	DATA30	178	DATA1	218	NC
19	GND	59	BMS	99	ACK	139	GND	179	DATA0	219	VDD
20	ADDR5	60	ADDR28	100	DMAG2	140	DATA29	180	GND	220	GND
21	ADDR6	61	GND	101	DMAG1	141	DATA28	181	GND	221	VDD
22	ADDR7	62	VDD	102	PAGE	142	DATA27	182	NC	222	NC
23	VDD	63	VDD	103	VDD	143	VDD	183	NC	223	NC
24	ADDR8	64	ADDR29	104	BR6	144	VDD	184	NC	224	NC
25	ADDR9	65	ADDR30	105	BR5	145	DATA26	185	NC	225	NC
26	ADDR10	66	ADDR31	106	BR4	146	DATA25	186	NC	226	NC
27	GND	67	GND	107	BR3	147	DATA24	187	NC	227	NC
28	ADDR11	68	SBTS	108	BR2	148	GND	188	VDD	228	GND
29	ADDR12	69	DMAR2	109	BR1	149	DATA23	189	NC	229	ID2
30	ADDR13	70	DMAR1	110	GND	150	DATA22	190	NC	230	ID1
31	VDD	71	HBR	111	VDD	151	DATA21	191	NC	231	ID0
32	ADDR14	72	DT1	112	GND	152	VDD	192	NC	232	LBOOT
33	ADDR15	73	TCLK1	113	DATA47	153	DATA20	193	NC	233	RPBA
34	GND	74	TFS1	114	DATA46	154	DATA19	194	NC	234	RESET
35	ADDR16	75	DR1	115	DATA45	155	DATA18	195	GND	235	EBOOT
36	ADDR17	76	RCLK1	116	VDD	156	GND	196	GND	236	IRQ2
37	ADDR18	77	RFS1	117	DATA44	157	DATA17	197	VDD	237	IRQ1
38	VDD	78	GND	118	DATA43	158	DATA16	198	NC	238	IRQ0
39	VDD	79	CPA	119	DATA42	159	DATA15	199	NC	239	TCK
40	ADDR19	80	DT0	120	GND	160	VDD	200	NC	240	TMS

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AM-25P II/AM-30P II Digital Bass Module

This manual is for the Lifestyle® Series II 12, 25 and 30 Systems

Service Manual

Part Number 199401 REV 00

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