

ControlSpace® ESP-88 / ESP-00 engineered sound processor

BOSE®

TECHNICAL DATA SHEET



Product Overview

ControlSpace engineered sound processors are powerful digital signal processors that provide control and audio signal processing in a single, expandable unit. When combined with ControlSpace control centers, the system provides simple, one touch operation for a variety of system applications. When a customized control system is required engineered sound processors easily integrate with popular control systems, and IT networks.

Product Information

The ControlSpace engineered sound processors include a complete set of audio-processing algorithms, a flexible signal path and an adaptable card architecture that make them an excellent solution for most engineered sound applications.

For larger applications, optional audio expansion cards can be added, and an optional DSP expansion card can increase processor power and delay memory by 4x. Multiple processors can be utilized.

The ControlSpace engineered sound processors support multiple choices of user control interfaces, including the ControlSpace CC-4 room controller, CC-16 zone controller and CC-64 control center.

The ControlSpace Designer™ software is used to configure the ControlSpace processors and the user interfaces. The Smart Simulation programming allows immediate testing of the functionality to verify all control programming. The software runs on a PC and communicates with the system over Ethernet.

Applications

Designed for a wide range of applications, including:

- Houses of worship
- Multi-purpose spaces
- Resorts and hospitality venues
- Retail stores
- Schools and universities
- Auditoriums

Key Features

- **Available in two configurations:**
 - ESP-88:** Pre-loaded 8x8 configuration with two 4x4 mic line cards, one DSP card, and one GPIO card
 - ESP-00:** Does not include audio cards, allowing the unit to be custom-configured to meet the needs of the application. Includes one DSP card and one GPIO card
- **Up to 32 analog** audio channels; configurable for 4x28 to 28x4 operation
- **Expandable and flexible** cardframe architecture allows up to 64 digital audio channels
- **DSP expansion** slot allows DSP processing power and delay times to increase fourfold
- **Eight general-purpose** control inputs and eight general-purpose control outputs (GPIO)
- **GPIO** expansion slot allows up to 16 control inputs and 16 control outputs
- **Automatic microphone** mixing providing gating, priority and NOM attenuation for sound reinforcement systems using multiple active microphone inputs
- **Large set** of signal processing modules, including: Bose® loudspeaker EQs, crossovers, automatic microphone mixer, graphic and parametric EQs, routers, delays, matrix mixer, signal generators, meters, compressors/limiter duckers, automatic gain controls, and gate and source selectors
- **Supports** several user control interfaces, including: ControlSpace CC-4 room controller, CC-16 zone controller and CC-64 control center
- **104 dB** dynamic range standard, 111 dB with EDR cards

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Technical Specifications

Audio Performance Specifications	
Frequency Response	20 Hz - 20 kHz (+0.5 dB/-2.0 dB) at +4 dBu nominal output level
Signal-to-Noise Ratio	80 dB at +4 dBu nominal output level (A-weighted/20 Hz – 20 kHz)
THD+N	0.01 % at +4 dBu nominal input and output level (A-weighted/20 Hz – 20 kHz)
Channel Separation (Crosstalk)	< -90 dB at +4 dBu nominal input and output level 1 kHz
Dynamic Range	104 dB (typical) at +4 dBu nominal input level (A-weighted/20 Hz – 20 kHz)
Integrated DSP	
Signal Processor	32-bit floating-point digital signal processor(s), 200 MHz
Maximum Calculation	1600 MIPS/1200 MFLOPS (6400 MIPS/4800 MFLOPS with optional DSP expansion card)
Delay Memory	16 MByte/72 s (64 MByte/288 s with optional DSP expansion card)
Audio Latency	610 µs (analog in to analog out); (860 µs with optional DSP expansion card)
A/D and D/A Converters	24-bit
Sample Rate	48 kHz
Audio Inputs	
Input Channels	8 channels
	ESP-88 Only
Inputs	8 analog, balanced, microphone/line-level (software selectable)
Connectors, Input	Phoenix/Euro block 2-piece, 3-pin connectors
Input Impedance	2.4 kΩ @ 1 kHz (with or without phantom power active)
Maximum Input Level	+24 dBu at +4 dBu nominal input level
Equivalent Input Noise	-115 dB at -60 dBu nominal input level (A-weighted/20 Hz – 20 kHz)
Phantom Power	+15V nominal selectable per input
Nominal Input Level	+4 dBu/-10 dBu/-20 dBu/-38 dBu/-44 dBu/-50 dBu/-60 dBu
Audio Outputs	
Output Channels	8 channels
	ESP-88 Only
Outputs	8 analog, balanced
Connectors, Output	Phoenix/Euro block 2-piece, 3-pin connectors
Output Impedance	200 Ω (600 Ω load expected)
Maximum Output Level	+24 dBu
Residual Output Noise	-110 dBu at output muted (A-weighted/20 Hz – 20 kHz)
Nominal Output Level	+4 dBu
Control Inputs	
Inputs (Control)	8 analog or digital inputs, 5.1 kΩ internal pull-up resistor to 5 V, Phoenix/Euro block 2-piece, 9-pin 3.81 mm pitch connectors
Analog Input Voltage Range	0 V to 3.3 V (maximum 5 V)
Digital Input Voltage Range	0 V to 3.3 V (threshold voltage = 1.6 V)
Control Outputs	
Outputs (Control)	8 digital outputs, 10 kΩ internal pull-up resistor to 5 V, Phoenix/Euro block 2-piece, 9-pin 3.81 mm pitch connectors
Output Voltage	0 V to 5 V open collector
Output Current	0.5 mA (source)/10 mA max (sink)
Indicators and Controls	
LED Status Indicators	Power/Status/Ethernet/Serial (RS-232C + RS-485)
Audio Indicators	Signal (present/normal/clip) for each audio input and output
Electrical Specifications	
Mains Voltage	85 VAC-264 VAC 50/60 Hz with PFC
AC Power Consumption	< 35 VA typical < 70 VA max at < 35°C ambient
Physical	
Dimensions	3.5" H x 19.0" W x 13.0" D (88 mm x 483 mm x 331 mm)
Net Weight	11.6 lb (5.3 kg)
General	
Communication Port	10Base-T (RJ-45), RS-232C (D-Sub 9-pin, male, DTE), RS-485 (Phoenix/Euro block 2-piece, 3-pin)
Expansion Slots	ESP-88: 8 audio (4 occupied), 2 control (1 occupied), 1 DSP ESP-00: 8 audio, 2 control, 1 DSP
Audio Channels	32 maximum analog or 64 maximum digital (AES-3)

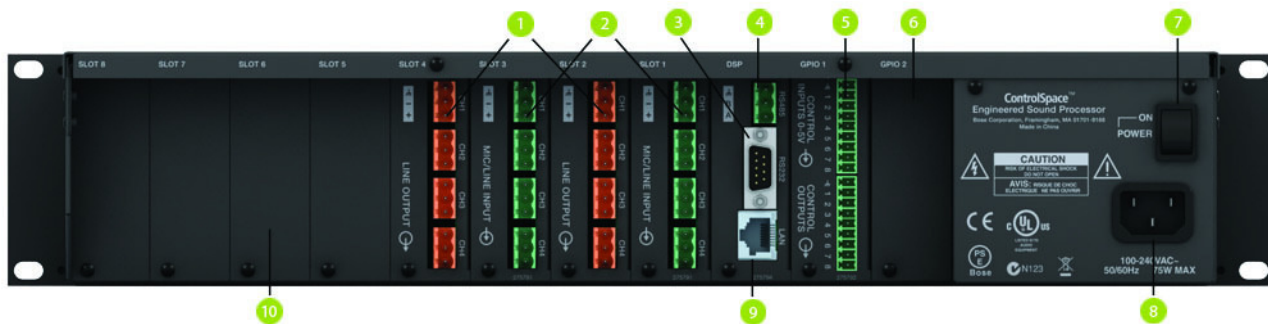
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1. **Status indicator:** LED indicates operating condition of unit
2. **Power indicator:** LED Indicates power on or fatal error
3. **Audio input indicators (4 per audio card slot):** LEDs indicate operating status of the input sources
4. **Audio output indicators (4 per audio card slot):** LEDs Indicate operating status of output channels
5. **Front door:** Shown closed, pull to open and reveal audio input and output label area
6. **Serial indicator-** LED indicates RS232 or RS485 serial command status (receive/transmit)
7. **Ethernet indicator:** LED indicates Ethernet command status (link/receive/transmit)



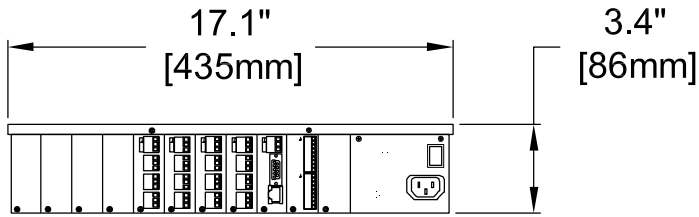
(ESP-88 shown ESP-00 does not include I/O cards and must be configured separately.)

1. **LINE OUTPUTS (ESP-88 only)** – Four balanced line outputs in slots 2 and 4.
2. **MIC/LINE INPUTS (ESP-88 only)** – Four balanced mic/line inputs in slots 1 and 3.
3. **RS-232C CONNECTOR** – DB-9 male (DTE).
4. **RS-485 CONNECTOR** – Connect ControlSpace CC-16 controllers.
5. **GPIO CARD** – Eight general-purpose control inputs, eight general-purpose control outputs.
6. **GPIO SLOT 2** – For optional second GPIO card.
7. **POWER SWITCH** – ON/OFF AC power.
8. **AC MAINS LINE CORD JACK** – AC line voltage input
9. **ETHERNET LAN CONNECTOR** – Connect to your PC with enclosed crossover cable. Or, connect directly to a hub or router with a straight through cable.
10. **AUDIO SLOTS 5 - 8** – For optional audio cards.

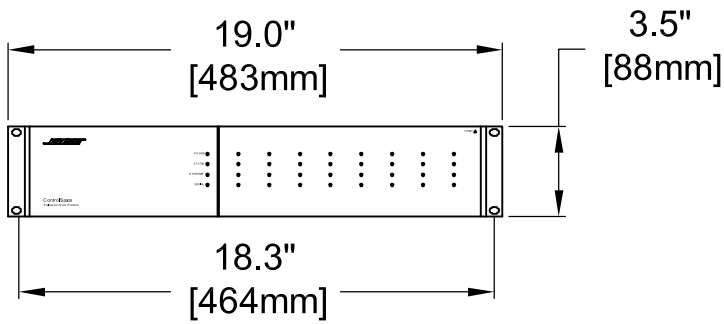
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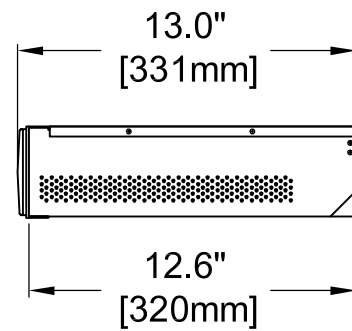
Mechanical Diagrams



Back View



Front View



Right View

ControlSpace® ESP-88 / ESP-00 engineered sound processor



Software Information

Bose® ControlSpace® Designer™ software is used for the design, configuration, real-time operation and monitoring of a system containing selected Bose system electronics and control centers. Using a standard drag and drop user interface, ControlSpace Designer software offers the flexibility to quickly and accurately configure signal processing functions within processors, and to develop complex control programming for system operation.

When actively connected to the system ControlSpace Designer software can be used to either control and operate the system in real time for system set-up and optimization, or may be used as a system monitor. When configured for monitor mode device parameters are protected and the system operator only has access to virtual control panels and amplifier monitor functions.

Parameter sets provide the ability to program and recall system settings ranging from an individual signal processing parameter to a complete system setup; while Group controls provide master volume control of multiple gains, or control of multiple instances of the same signal processing function type. Both Parameter set and Group programming functions are easily mapped to the physical controls of a Bose control center, or may be invoked remotely using a standard serial protocol or general purpose inputs.

Smart Simulation programming enables designers to test and modify system control programming while off-line, eliminating the need to connect to the actual system to configure and test system control programming. Virtual control centers are included to test system operation, and all parameter set, group and general purpose input and outputs may be tested using the Smart Simulation.

Minimum System Requirements

Operating System:

Microsoft Windows XP Professional, Service Pack 2 (or later)
Microsoft Windows 7 (Home, Professional* or Ultimate*)

Processor:

850 MHz Pentium® III (1.50 GHz Pentium M or Pentium 4 recommended)

RAM:

512MB of RAM available (1GB recommended)

Disc Space:

512MB of disk space available (1GB recommended)

CD-ROM:

CD-ROM drive

Network:

ControlSpace Designer supports both 10 and 100 Mbps network operation

USB & Interfaces:

A scroll-wheel mouse (highly recommended)

Additional System Requirements:

ControlSpace Designer v3.0 requires the installation of Microsoft .NET version 3.5.

Expansion Cards

Audio	Product Code
ControlSpace® ESP four-channel mic/line input card Occupies one audio slot and four microphone or line-level inputs (software-selectable).	PC 041917
ControlSpace® ESP four-channel SDR output card Occupies one audio slot, and provides four line-level outputs.	PC 041916
ControlSpace® ESP 4x4 mic/line input/output card series II Occupies two audio slots. Four microphone or line-level inputs (software-selectable), and four line-level outputs. Expands the number of available channels. ESP 88 and ESP 00 can support a total of 4 cards per ESP for a total of 16 mic/line inputs and 16 line outputs. The ESP-88 comes pre-loaded with two 4x4 mic/line cards, allowing two additional 4x4 cards to be added. The ESP-00 does not include these cards, so 8 audio input or output cards can be added.	PC 041915
ControlSpace® ESP AES-3 Input Card Occupies one audio slots. Provides eight channels of AES-3 digital audio input.	PC 041765
ControlSpace® ESP AES-3 Output Card Occupies one audio slots. Provides eight channels of AES-3 digital audio output.	PC 041766
ControlSpace® ESP EDR line level input card Occupies one audio slot. Provides four extended dynamic range line level inputs.	PC 041764
ControlSpace® ESP EDR line level output card Occupies one audio slot. Provides four extended dynamic range line level outputs.	PC 041763
ControlSpace® ESP surround sound decoder input card Occupies one audio slot. Provides surround sound decoding for Dolby 5.1, DTS 5.1, and DTS 6.1, eliminating the need for an external decoder and integrating all audio processing within the ESP-88 or ESP-00.	PC 302210
ControlSpace® CobraNet® I/O expansion card	311506

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Occupies one audio slot. Provides up to 32 channels of CobraNet digital audio.

ControlSpace® ESP ESPLink output card 350513-0010

Occupies one audio slot. Provides eight channels of digital audio of a single optical cable. For use with the PowerMatch PMESPLink input card.

DSP

ControlSpace® ESP DSP Expansion card PC 041769

Daughterboard expansion increases processing power by 300%. Audio Signal Delay Memory increases from 72 seconds to 288 seconds. Maximum ESP latency 800µS with DSP expansion card. One card can be added to an ESP-88 or ESP-00.

GPIO

ControlSpace® ESP GPIO Expansion card PC 041768

Installs in the available GPIO slot. Adds eight additional control inputs and eight additional control outputs.

Architects' and Engineers' Specifications

The engineered sound processor shall be a DSP-based signal processor. The processor shall include eight general-purpose control outputs and eight general-purpose inputs with expansion capabilities for up to a total of 16 general-purpose control outputs and 16 general-purpose inputs.

The processor shall include Ethernet, RS-232 and RS-485 ports. Certifications shall include cUL, C-Tick and IEC60065, and have a CB report including all country deviations. Processor and peripherals shall meet EN55103-1 and EN55103-2 EMC requirements.

The system shall include PC-based design and control and configuration software, and communicate with the DSP and other parts of the system via Ethernet with full IP addressability and password protection.

The processor and design software shall include the following minimum set of processing modules: Bose® loudspeaker EQs, Bose crossovers, crossovers, graphic and parametric EQs, routers, delays, matrix mixers, automatic microphone mixer, signal generators, meters, compressor/limiters, duckers, automatic gain controls, gate, room combiner and source selectors.

All signal-processing modules, parameter sets, presets and groups shall be directly controllable by third-party devices via the RS-232 port. It shall also be possible to designate signal processing modules in the design file for which asynchronous RS-232 feedback is requested.

The processor shall be capable of using a variety of audio cards, including a 4x4 mic/line input/output card, a four-channel enhanced dynamic range output card, a four-channel enhanced dynamic range input card, AES-3 eight-channel input and output

cards, a four channel mic/line input card and a four-channel output card. Unit also shall support addition of a GPIO expansion card to increase the system's general-purpose inputs and outputs to 16 each. Processor shall support a DSP expansion card, which includes three Texas Instruments™ TMS320C6713 DSPs running at 200 MHz and three 128Mbit RAMs for delay.

Processor shall also support a surround sound card, capable of decoding Dolby® Digital, DTS® and PCM audio formats. The processor shall support up to 15 RS-485-based zone controllers, eight Ethernet-based control centers and two GPI-based room controllers.

ESP-88 Only

Analog audio inputs and outputs shall be electronically balanced. The maximum input and output levels shall be +24 dBu. Analog inputs shall be software-switchable between microphone and line-level inputs. Phantom power of +15 volts shall be provided. A/D and D/A sections shall be 24-bit, 64x over-sampled.

The processor shall include eight analog audio inputs and eight analog audio outputs, but be expandable to a total of 64 audio channels in one 2U frame. The digital signal processing shall be performed by a Texas Instruments brand TMS320C6713 DSP chip running at 200 MHz and utilizing 128Mbit of RAM for delay. All processing shall be done with 32-bit resolution, and audio sampling shall be at 48 kHz.

The engineered sound processor shall be the Bose ControlSpace® ESP-88 engineered sound processor.

Safety and Regulatory Compliance

The ControlSpace engineered sound processor meets cUL (UL 60065 7th edition), C-Tick, PSE and IEC/EN 60065 7th edition, and has a CB report including all country deviations. It meets FCC Class B, Canadian ICES-003 Class B and EN55103-1 and EN55103-2 EMC requirements.

Product Codes

ESP-88

ControlSpace ESP-88 120V – US	313419-0010
ControlSpace ESP-88 230V – EU	313419-0020
ControlSpace ESP-88 100V – JPN	313419-0030
ControlSpace ESP-88 230V – UK/Sing	313419-0040
ControlSpace ESP-88 240V – AU	313419-0050

ESP-00

ControlSpace ESP-00 120V – US	315228-0010
ControlSpace ESP-00 230V – EU	315228-0020
ControlSpace ESP-00 100V – JPN	315228-0030
ControlSpace ESP-00 230V – UK/Sing	315228-0040
ControlSpace ESP-00 240V – AU	315228-0050

Accessories

ControlSpace CC-64 control center	PC 041760
ControlSpace CC-16 zone controller	PC 041761
ControlSpace CC-4 room controller	PC 042023
ControlSpace accessory power supply	PC 041762