ControlSpace® ESP-880
engineered sound processor

TECHNICAL DATA SHEET



Product Overview

The Bose® ControlSpace® ESP-880 engineered sound processor is an open-architecture DSP with 8x8 fixed analog audio, built-in 8-channel ESPLink output and a rear-panel digital expansion slot offering IP-based network audio and control card options.

This model meets today's strict requirements for high-quality signal processing and control in a cost-effective package. The ESP-880 is designed for a wide variety of applications ranging from small self-contained projects to larger networked applications.

Product Information

The ESP-880 accommodates a total of 56 audio channels through analog audio connections (8 input, 8 output), ESPLink (8 output), and when an optional Dante™ audio network card is used, an additional 32 channels (16 input, 16 output) are available for signal processing, routing and switching. Alternatively, a Network Control card is available for clean rear-panel control network connections. For standalone applications or convenient service access, a front panel Ethernet connector allows for local configuration and monitoring. Onboard connectivity includes Serial over Ethernet, RS-232, 5 control inputs and 5 control outputs.

Any of the elegant Bose wall-mounted user interfaces—Including the programmable CC-64 and CC-16 controllers and three simplified zone volume interfaces— can be used to control all Bose networkable devices.

Open architecture configuration and control is enabled using Bose ControlSpace Designer™ software where an ever-expanding list of algorithms and improvements offers a high level of functionality for audio installations. Bose single-rack-space ESPs are designed for a wide variety of applications ranging from small self-contained projects to larger networked applications.

Applications

Designed for a wide range of applications, including:

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

Key Features

- **High-quality analog circuitry** offers both mic and line-level I/O, operates with ultra-low noise and 115 dB dynamic range
- **Advanced digital signal processing** supports audio at 48 kHz sample rate/24-bit, uses a floating-point open architecture DSP and operates at low latencies for sound system precision
- **Expansion card slot** supports the use of accessory networking cards, allowing digital audio to be sent and/or received from other compatible products
- **Optional Dante™** network cards allow ESP processors to closely integrate with other product supporting Audinate®'s Dante audio networking solution
- **Bose® ControlSpace® Designer™ software** enables a large set of signal processing modules, such as automatic mic mixing, multiband graphic and parametric EQs, Bose loudspeaker libraries, signal generators, routers, mixers, AGCs, duckers, gates, compressors, source selectors and delays
- **Front panel RJ-45 Ethernet** connection enables localized configuration and monitoring, while enabling network passthrough when using a rear-panel network option card
- **Built-in Bose ESPLink output** sends up to 8 channels of uncompressed digital audio to ESPLink-equipped Bose PowerMatch® amplifiers
- **A variety of control options** – ControlSpace ESP products are compatible with the programmable Bose CC-64 and CC-16 controllers and three simplified zone volume interfaces, as well as potentiometers and switches built by other manufacturers
- **Integration with industry-standard control systems** using a comprehensive serial protocol through onboard RS-232 and Ethernet ports

Technical Specifications

Integrated DSP	
Signal Processor	32-bit fixed/floating-point DSP + ARM, 456 MHz
Maximum Calculation	3.6 GIPS / 2.7 GFLOPS
Delay	43 s
Audio Latency	860 µs (analog in to analog out)
A/D and D/A Converters	24-bit
Sample Rate	48 kHz
Audio Performance Specifications	
Frequency Response	20 Hz - 20 kHz (+0.3 dB/-0.1 dB)
THD+N	0.002 % at +4 dBu (A-weighted/20 Hz – 20 kHz)
Channel Separation (Crosstalk)	< -105 dB at +4 dBu input and output level, 1 kHz
Dynamic Range	> 115 dB A-weighted 20 Hz – 20 kHz, analog through
Audio Inputs	
Input Channels	8 analog (balanced, mic/line level), 16 digital (via option card)
Connectors	3.81 mm Phoenix Contact®, 6-pin
Input Impedance	12 kΩ @ 1 kHz (with or without phantom power active)
Maximum Input Level	+24 dBu
Equivalent Input Noise	<-119 dBu (22 - 20 kHz, 150 Ω input, 64 dB gain)
Phantom Power	+48 VDC, 10 mA, selectable per input
Gain settings	0/14/24/32/44/54/64 dB
Audio Outputs	
Output Channels	8 analog (balanced, line level), 8 ESPLink, 16 digital (via optional card))
Connectors, Output	3.81 mm Phoenix Contact®, 6-pin (analog), EIAJ optical (ESPLink)
Output Impedance	66 Ω
Maximum Output Level	+24 dBu
Control Inputs	
Inputs (Control)	5 analog or digital inputs, 2 kΩ internal pull-up resistor to 5 V, 3.81 mm Phoenix Contact®, 6-pin
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)	5 digital outputs, 3.81 mm Phoenix Contact®, 6-pin
Output Voltage	High: 8 V (open circuit), 2.5 V @ 10 mA, Low: < 1 V @ 100 mA, push-pull
Output Current	10 mA source, 100 mA sink (24 VDC max external supply voltage)
Indicators and Controls	
LED Status Indicators	Power/Status, Signal, Ethernet, Serial (RS-232 + CC-16)
Audio Signal Indication	Green (-60 to -20 dBFS), Yellow (-20 to -2 dBFS), Red (-2 to 0 dBFS)
Electrical Specifications	
Mains Voltage	85 VAC-264 VAC 50/60 Hz
AC Power Consumption	< 37 VA typical, over all mains voltages
Mains Connector	IEC 60320-C14 (Inlet)
Power Dissipation	22 W (75 BTU/Hr, 19 kcal/hr)
Physical	
Dimensions	1.7" H x 19" W x 8.5" D (44 mm x 483 mm x 215 mm)
Net Weight	5.8 lb (2.6 kg)
Operating Temperature	32 °F - 104 °F (0 °C - 40 °C)
Cooling System	Active, side venting
General	
PC Configuration Software	ControlSpace® Designer™ software
Network Control	Ethernet (RJ-45), 100Mb
Communications Ports	RS-232 (DB9M, DTE), Bose CC-16 (3.81 mm Phoenix Contact®, 3-pin)
Expansion Slots	1 control/audio network
Audio Channel Capacity	56 (8x8 analog, 8 ESPLink out, 16x16 digital with expansion card)

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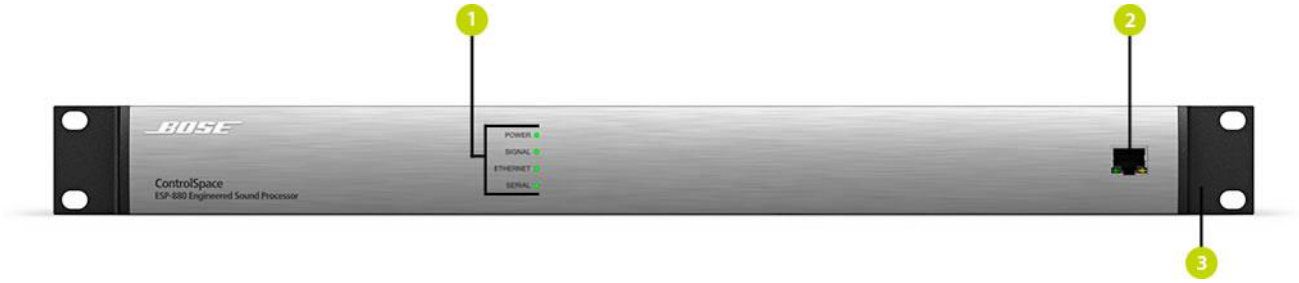
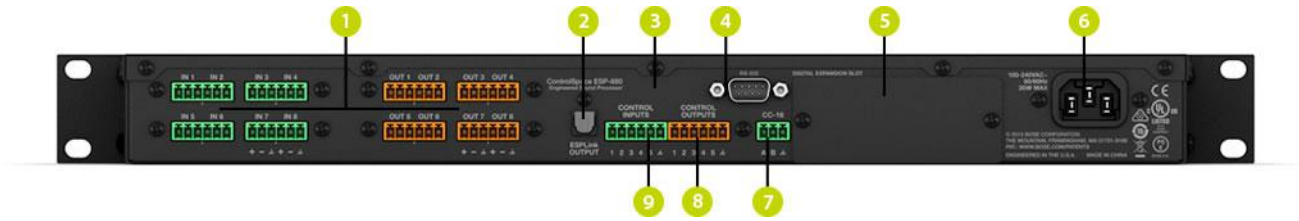
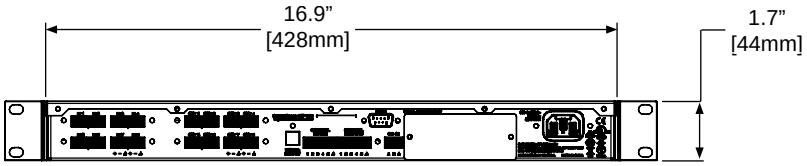


1. **LED indicators** - Power, Signal, Ethernet and Serial indication
2. **Ethernet connector** - RJ-45 jack for front panel network connectivity
3. **Front rack-mount ears** - For use when securing into rack enclosures

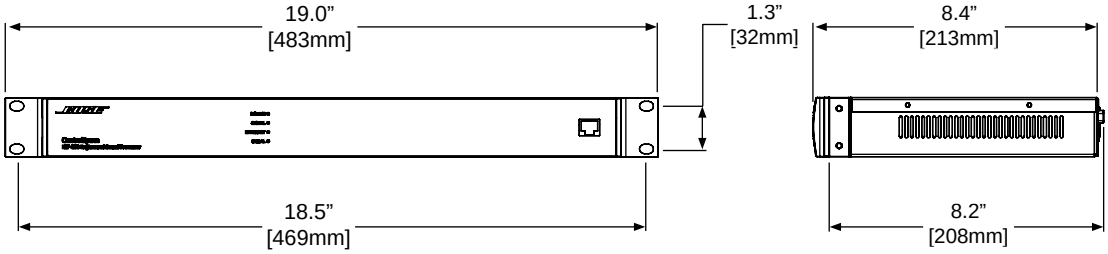


1. **Analog audio connectors** – Mic/line-level balanced input and line-level output connectors
2. **ESPLink output connector** – For use with ESPLink card-equipped PowerMatch® amplifiers
3. **Chassis serial number** – Location for unit serial number
4. **RS-232** – 5-wire, RS-232-C (DTE) serial data interface connection
5. **Digital expansion slot** – Supports optional digital expansion cards
6. **AC Mains receptacle** – Power cord connection (IEC 60320-C14 inlet)
7. **CC-16 connector** – Allows Bose® CC-16 zone controller connections
8. **Control Outputs connector** – Five general-purpose control outputs
9. **Control Inputs connector** – Five general-purpose control inputs

Mechanical Diagrams



Back View



Front View

Right View

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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.

Integrated Dante routing, configuration and monitoring streamlines setup and control of optional Dante networked audio components.

Minimum System Requirements
The following are the minimum system requirements for ControlSpace® Designer™ 4.1

Operating System:
Microsoft Windows® 7 and 8, x86 and x86-64 bit versions (Windows 8 requires installation of Microsoft .NET 3.5)

Processor:
1GHz processor (or better)

RAM:
512MB of RAM available (1GB recommended)

Disc Space:
512MB of disk space available (1GB recommended)

Ports Required:
1 USB, 1 network port (Wired LAN, Ethernet, 100 Mb minimum, or wireless LAN 802.11g/n)

USB & Interfaces:
1 available USB port
A scroll-wheel mouse (highly recommended)

Network Port:
1 available network port (wired LAN, Ethernet, 100 MB minimum, or wireless LAN 802.11g/n)

Important note: ControlSpace Designer software is not fully tested for operation running on a virtual Windows machine using Apple® Macintosh® computers. For critical set up and control operations a standard Windows PC is recommended for use.

Expansion Cards

ControlSpace® ESP-880/1240/4120 network control card
Adds a rear-panel network connection to fixed-I/O ControlSpace engineered sound processors.
Product Code: 359841-0010

ControlSpace® ESP-880/1240/4120 Dante™ network card
Provides 16 input and 16 output channels of low-latency digital audio using the Dante audio networking solution from Audinate®.
Product Code: 359842-0020

Architects' and Engineers' Specifications

The engineered sound processor shall be an open-architecture audio signal processor supporting 8 analog microphone/line inputs, 8 analog line outputs, 8-channel Bose ESPLink output, and optional 32-channel audio network connectivity through one expansion card slot.

The digital signal processing shall be performed by a Texas Instruments® brand OMAP-L137 DSP+ARM chip running at 456 MHz, supporting both fixed and floating-point calculations at 6.4 GIPS / 4.8 GFLOPS, and utilizing a total of 64MB of RAM (42 seconds of buffer) for delay operations. All processing shall be done at 32-bit resolution, and audio sampling shall be at 48 kHz/24-bit. System latency, from input to output, shall not exceed 860 microseconds.

The processor shall include a built-in ESPLink 8-channel optical output and a user-upgradeable expansion slot accommodating one optional rear-panel network card. Card offerings shall include a basic ControlSpace network card and Dante™ audio networking card. The rear panel network card shall support both streaming audio and control over the same network connection. The total channel capacity of the processor shall be 56 audio channels.

The front panel shall include LED indication for POWER, SIGNAL, ETHERNET, and SERIAL. The processor shall feature a front-panel Ethernet connection for standalone access or maintenance functions. The front panel connector shall have the capability to bridge to any rear panel network connection and be disabled in software.

Design, configuration and real-time control/monitoring shall be provided through any active network port and Bose® ControlSpace® Designer™ software. The PC-based ControlSpace Designer software shall enable the following minimum set of processing modules: Bose® Professional loudspeaker EQs, 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. The software shall allow full IP addressability of the processor with password protection of system files.

The engineered sound processor shall include external control capability through serial (RS-232 or Ethernet port), five general-purpose control outputs, and five general-purpose inputs. The engineered sound processor shall support up to 16 Ethernet-based control centers, up to 15 Bose CC-16 zone controllers, and multiple volume and switch-based selector controllers using the onboard GPI connections.

All signal-processing modules, parameter sets and groups shall be directly controllable by Bose user interfaces, generic switches

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and 10k potentiometers, and third-party control systems (using a published serial protocol). It shall also be possible to flag signal processing modules in the design file for which asynchronous serial communication feedback can be requested by external control system devices. The processor shall provide a real-time clock (RTC) by which automated events can be scheduled using the configuration software.

The processor shall be constructed of painted steel with a black durable chassis finish and brushed aluminum front panel. The processor shall allow for 19-inch (483 mm) EIA-310 standard rack mounting using the pre-installed rack ears. The processor dimensions shall be 1.7 inches in height (44 mm, 1RU) and 8.5 inches (215 mm) in depth. The processor shall weigh 5.8 pounds (2.6 kg).64

The processor shall have a universal auto switching power supply capable of accepting input voltages from 85 VAC to 264 VAC, 50 Hz to 60 Hz, and be able to operate in ambient temperatures up to 104ºF (40ºC). Power consumption shall be less than 25 W. Certifications shall include cUL, C-Tick, PSE and IEC/EN 60065, and have a CB report including all country deviations.The processor shall meet FCC Class A, Canadian ICES-003 Class A and EN55103-1 and EN55103-2 EMC requirements.

The engineered sound processor shall be the Bose ControlSpace® ESP-880 engineered sound processor.

Safety and Regulatory Compliance

The ControlSpace ESP-880 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 A, Canadian ICES-003 Class A and EN55103-1 and EN55103-2 EMC requirements.

Product Codes
ESP-880

ControlSpace ESP-880 120V – US	359868-1120
ControlSpace ESP-880 230V – EU	359868-2120
ControlSpace ESP-880 100V – JPN	359868-3120
ControlSpace ESP-880 230V – UK/Sing	359868-4120
ControlSpace ESP-880 240V – AU	359868-5120

Accessories

ControlSpace CC-64 control center	041760
ControlSpace CC-16 zone controller	041761
ControlSpace CC-4 room controller	042023
ControlSpace® CC-PS1 universal power supply	371407-0010
Volume control with A/B switch user interface	041967
Volume control user interface	041966

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