RANE

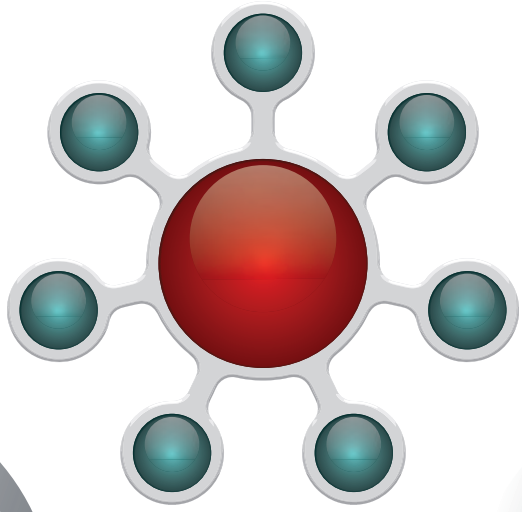
HAL SYSTEM

WEB BROWSER CONTROL

CONFERENCE ROOM COMBINING

ACOUSTIC ECHO CANCELLING

AUDITORIA



HALOGEN SOFTWARE

AUTOMIXERS

PAGING STATIONS

ALL SPECIFICATIONS

HAL IS EVOLVING

HAL is more than just another DSP drag-and-drop system. It has revolutionized system design and installation.

HAL is an expert in room combining, paging and distributed audio systems. This groundbreaking architecture is dimensions beyond any solution in any industry. HAL easily guides even novice users through what used to be complex tasks in just minutes. No intricate matrix mixing or presets are required for room combining and paging. No virtual wiring is required to distribute pages and background music to multiple, even hundreds of zones.

Seamlessly interface HAL to your application with web controls and/or a broad variety of peripheral devices including smart Digital Remotes, Remote Audio Devices (RADs), portable or rack automixers, audio I/O and logic expansion devices, wall sensors, ambient sensing mics, small remote amplifiers, and an advanced Paging Station.

In addition, the HAL Multiprocessor and Halogen™ software check the status, location, CAT 5 wiring integrity, and that audio is flowing in all peripheral devices, so you know your system is properly connected and ready to go.

Four HAL multiprocessors provide various audio I/O and control options for both large and small installations.

- HAL1x supports 16 in x 16 out audio, which may be increased up to 528 in x 528 out by adding up to 32 daisy-chained Expanders to a single HAL1x. Add a few to hundreds of more mic inputs with AM Automixers.
- HAL2 supports 18 in x 18 out audio, of which 2 x 2 are via AES3 on XLR connections.
- HAL3s supports 6 in x 10 out audio. The 2 "Mic/Line-Plus" Inputs accept balanced, or unbalanced left/right monoed.
- HAL4 supports 2 in x 2 out audio. The 2 "Mic/Line-Plus" Inputs accept balanced, or unbalanced left/right monoed.

See the "HAL Comparison" on pages 2-4.

Since the same Halogen software code runs on both Windows® and within HAL hardware, third-party control developers can test all their code using only the Halogen Windows software. Use only software for complete system design and validation. Buy the hardware only when the install date arrives. Standard TCP/IP set and get ASCII text messages control levels, selectors, presets and toggle software actions.

Halogen software includes Ethernet control support for third-party control systems. AMX, Crestron and Stardraw Control Support Packages are installed with Halogen software, or available as separate downloads.

Halogen includes support for custom Web Controls using any device with a web browser such as a tablet, smartphone or laptop.

Download Halogen and design a system now!
rane.com/hal

Applications, installations, and solutions are at
blog.rane.com

HAL Hardware

Halogen Software

Control HAL

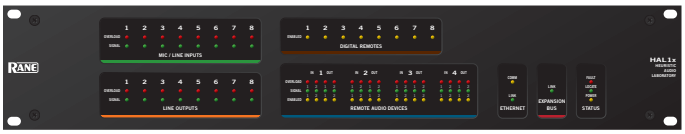
HAL Applications

HAL Specifications

HAL1x and Expanders Comparison

HAL1x Multiprocessor

- 16 in x 16 out - 8x8 analog & 8x8 digital (RAD ports).
- Up to 4 RADs (without EXP1x), up to 260 RADs (with 32 EXP1s).
- Up to 12 Digital Remotes (without EXPs), up to 268 (with EXPs).
- Four logic inputs, Two relay outputs (more with DR4 or DR5).



EXP1x Remote Audio Expander for HAL1x

- Adds 16 in x 16 out digital (8 more RAD ports) to HAL1x.
- Up to 8 Digital Remotes or RADs in any combination.
- Chain up to 32 EXP1x units to a HAL1x for 512 in x 512 out.

NEW! EXP2x Dante Expander for HAL1x

- Lets HAL1x send and receive 32 channels to a Dante network.
- Supports 44.1, 48, 88.2 or 96 kHz Dante network sample rates.
- Chain up to 16 EXP2x units to a HAL1x for 512 in x 512 out.

EXP3x Zone Output Expander for HAL1x

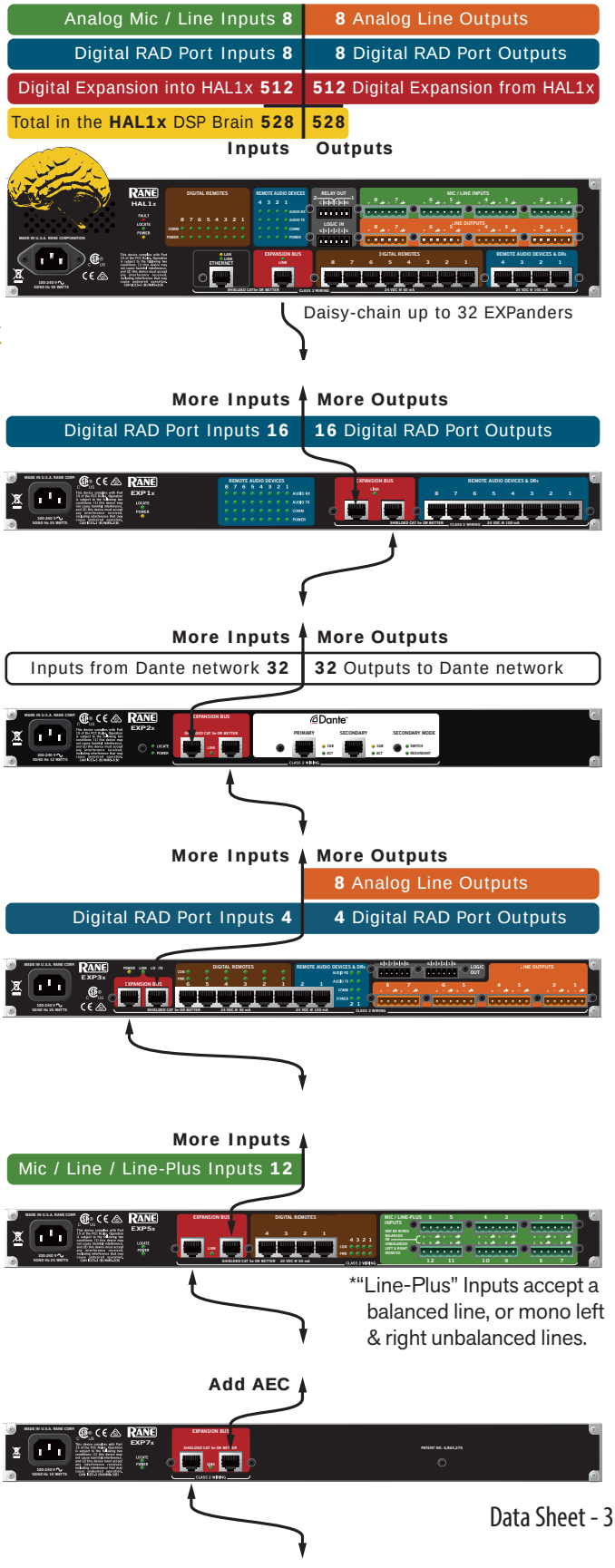
- Adds 8 analog line outputs and 8 logic outputs to a HAL1x.
- Adds 6 Digital Remote ports & 2 RAD ports to a HAL1x.
- Chain up to 32 EXP3x units to a HAL1x for 256 outputs.

EXP5x Input Expander for HAL1x

- Adds 12 analog mic / line / line-plus* inputs to a HAL1x.
- Adds 4 Digital Remote ports to a HAL1x.
- Chain up to 32 EXP5x units to a HAL1x for 384 analog inputs.

EXP7x AEC Expander for HAL1x

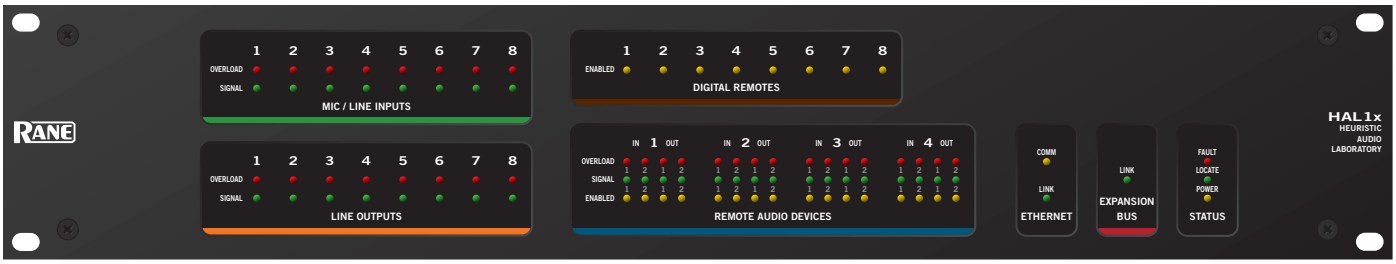
- Adds 8 channels of Acoustic Echo Cancelling DSP to a HAL1x.
- Chain up to 32 EXP7x units to a HAL1x for 256 AEC channels.



*"Line-Plus" Inputs accept a balanced line, or mono left & right unbalanced lines.

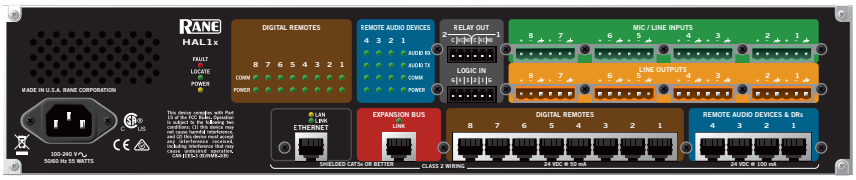
HAL1x Multiprocessor

HAL1x features a 16 x 16 analog/digital I/O, plus an assortment of control ports for Rane's elegant Digital Remotes. The HAL1x provides access to an array of Expanders (previous page) for additional inputs, outputs, DSP and AEC for medium to large venues. Up to 32 Expanders can daisy-chain to a single HAL1x. See the HAL1x Specifications on page 36..



Features

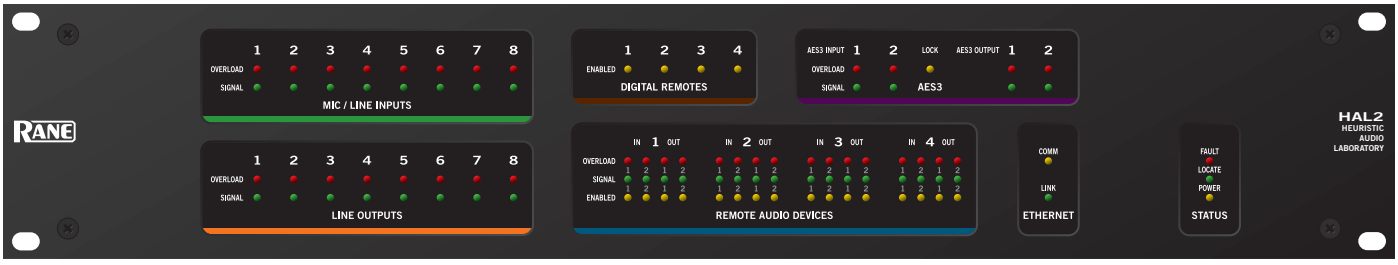
- 16 in x 16 out:
  - 8x8 analog & 8x8 digital (RAD ports).
  - 528 x 528 potential by adding Expanders.
- Up to 12 Digital Remotes.
- Four logic inputs (closure)
- Two relay outputs.



See the HAL1x Expander list on the previous page, and the HAL1x Expansion Bus description on page 6.

HAL2 Multiprocessor

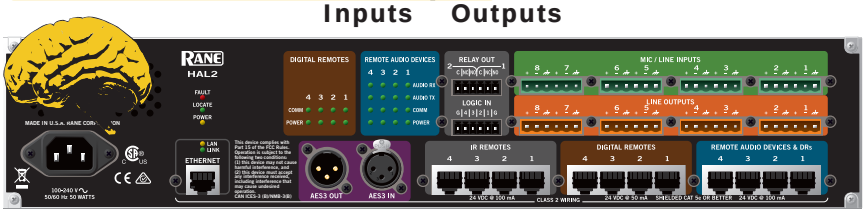
HAL2 features an 18 x 18 combination analog-digital I/O, plus an assortment of control ports for Rane's Digital Remotes. The HAL2 applies the versatile Halogen software interface to venues that don't need extensive expansion. It includes the same abilities to quickly design room combinations, paging systems, distributed music, and automixers with Rane's "no virtual wiring needed" approach, but in a smaller I/O configuration to meet smaller budgets. See the HAL2 Specifications on page 42.



Features

- 18 in x 18 out:
  - 8x8 analog & 8x8 digital (RAD ports).
  - AES3 I/O.
- Up to 8 Digital Remotes.
- Four logic inputs (closure)
- Two relay outputs.
- Four IR Ports for IR2 Wall Sensors.

Inputs	Outputs
Analog Mic / Line Inputs **8**	**8** Analog Line Outputs
Digital RAD Port Inputs **8**	**8** Digital RAD Port Outputs
(AES3) Input Channels **2**	**2** (AES3) Output Channels
Total in the **HAL2** DSP Brain **18**	**18**



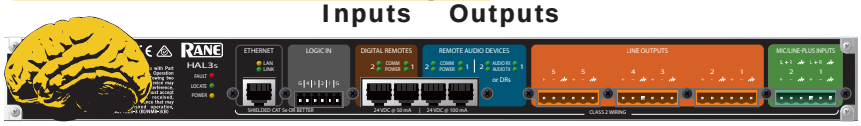
NEW! HAL3s Multiprocessor

The improved HAL3s upgrades the HAL3 with an additional RAD port, mic-capable inputs and 10 dB more dynamic range. It fits more installations with an impressive 6 inputs by 10 outputs at a price that fits the budget with the benefits of open-architecture processing. Add two from Rane's growing army of RADs (Remote Audio Devices) to get two sets of analog inputs and/or outputs up to 150 meters (500 feet) away. See the HAL3s Specifications on page 44.

Features

- 6 line in x 10 line out:
  - 2x6 analog
  - 4x4 digital (RAD ports).
- Mic / Line / Line-Plus Inputs are configurable:
  - +4 dBu balanced, mic or line level.
  - +48V phantom available in mic mode.
  - -10 dBV unbalanced Left/Right Monoed.
- Up to four Digital Remotes.
- Four logic inputs (closure).

Analog Line-Plus Inputs **2**	**6** Analog Line Outputs
Digital RAD Port Inputs **4**	**4** Digital RAD Port Outputs
Total in the **HAL3s** DSP Brain **6**	**10**
Inputs	**Outputs**



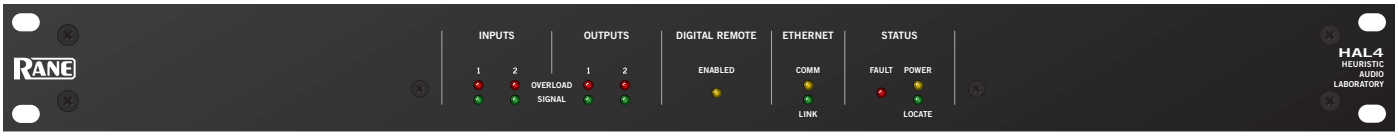
HAL4 Multiprocessor

The HAL4 is a 2-Input, 2-Output drag-and-drop DSP device for Halogen software. It is a stand-alone Halogen replacement for the popular DragNet RPM2 with four-times the processing power, improved digital remote and Web Control support, simplified linking and improved preset recall capability. It solves just about every signal processing problem found in one or two rooms.

Each of the 2 inputs independently supports a dynamic mic, 48V phantom mic, +4 dBu line-level, or Rane's Line-Plus input. Line-Plus accepts -10 dBV unbalanced Left/Right Monoed together on the "+" and "–" ports, respectively. For stereo unbalanced sources, Line-Plus allows connecting the stereo RCA left tip to the "+" terminal, the RCA right tip to the "–" terminal, and both RCA shields to the Euroblock ground. Select Line-Plus in Halogen and you get a properly monoed audio channel.

A single DR port provides support for preset recall, level control and select functions using a DR1, DR2, DR3 or DR6. A DR4 or DR5 may be added for other logic I/O.

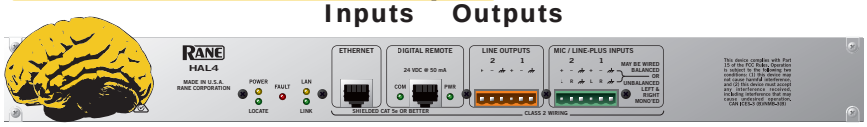
As with other Halogen host products, the HAL4 connects to a computer via a Gigabit Ethernet Port with Halogen software used for initial system setup. The full suite of processing blocks available with other Halogen host devices is available for the HAL4. No other 2-channel DSP gives this much bang for the buck! See HAL4 Specifications on page 46.



Features

- 2 mic/line/line-plus inputs x 2 line outputs.
- Mic / Line / Line-Plus Inputs are configurable:
  - +4 dBu balanced, mic or line level.
  - +48V phantom available in mic mode.
  - -10 dBV unbalanced Left/Right Monoed.
- One Digital Remote port.

Analog Mic/Line-Plus Inputs **2**	**2** Analog Line Outputs
Total in the **HAL4** DSP Brain **2**	**2**
Inputs	**Outputs**



HAL1x Expansion Bus

The HAL1x Expansion Bus supports up to 32 daisy-chained Expanders in any combination. The Expansion Bus requires shielded CAT 5e (or better) cable with RJ-45 connectors.

The bus supports 512 channels in and 512 out, although designers need not worry about wiring channels along the bus — this is automatically done within Halogen software. The Resources window in Halogen displays the number of channels in use and updates as you draw the audio wiring. Latency hops on the bus are 750 nanoseconds per hop. Thus, daisy-chaining 32 Expanders provides a maximum latency of 22.4 microseconds. See the Latency graphic below to add up the latency of any given path through the HAL1x, EXPs, RADs, the DSPs and converters.

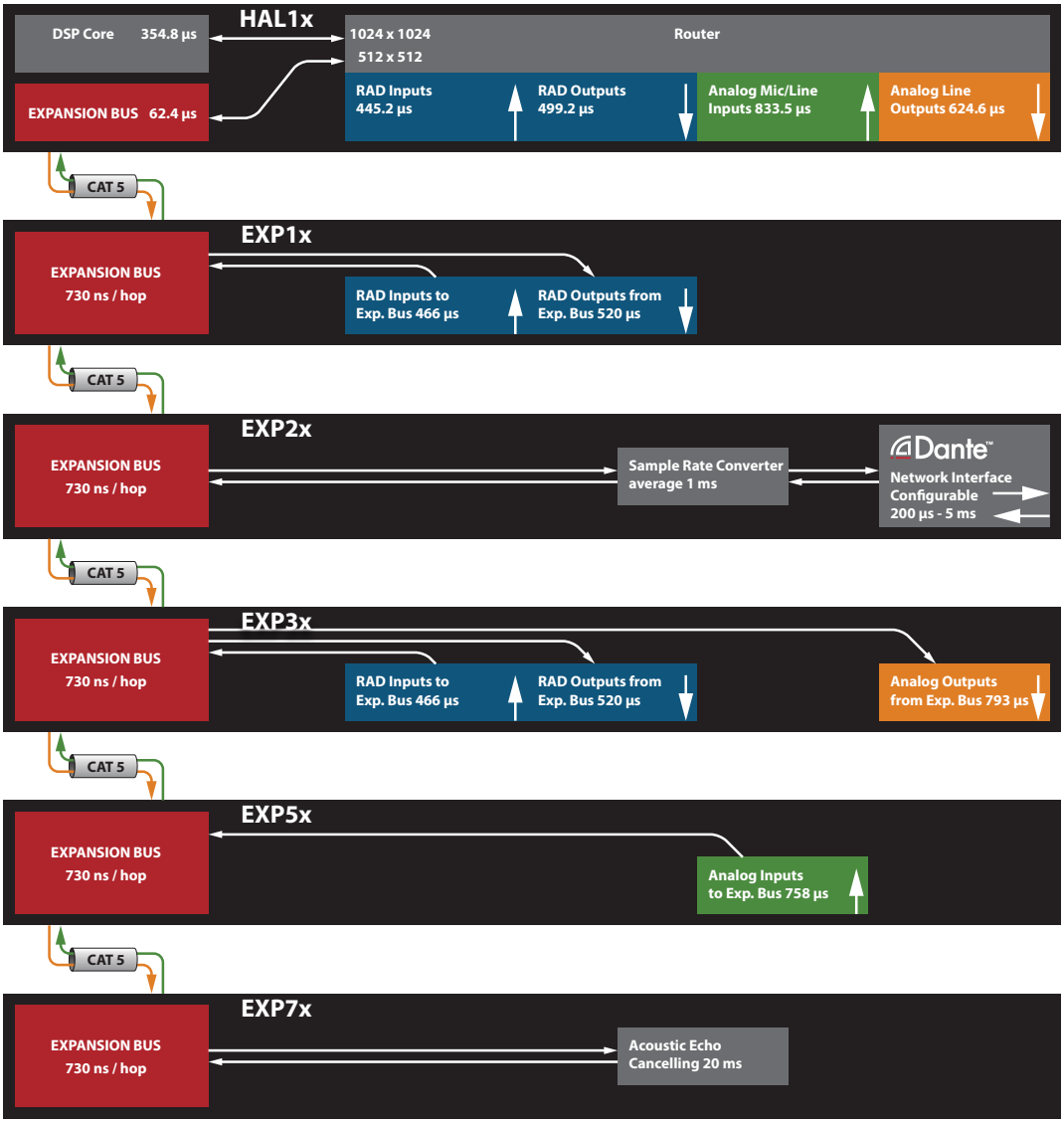
Thirty-two Expanders maximum in any order can be daisy-chained. For example, 16 EXP3x and 16 EXP5x Expanders daisy-chained, provides 128 outputs (8 out times 16), plus 192 mic/line/line-plus inputs (12 in times 16).

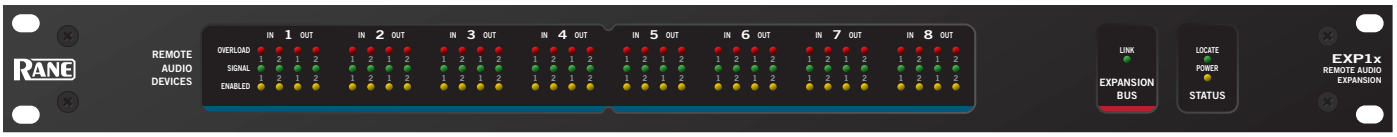
Some examples max out the Expansion Bus:

- If you need 256 RADs, daisy-chain 32 EXP1x Expanders. This is 8 RAD ports times 32 Expanders, 8 x 32 = 256 RADs. This still leaves 4 RAD ports available on the HAL1x.
- For 256 output zones, daisy-chain 32 EXP3x Expanders.
- For 384 mic/line inputs, daisy-chain 32 EXP5x Expanders.

Each Expansion Bus cable can be 100 meters long (300 feet). This permits spreading Expanders across different locations or equipment rooms. Yet only a single HAL1x is required at the head-end of the daisy-chain. Star topologies are not supported — don't use Ethernet switches, they won't work. And since the EXP3x & EXP5x contain their own DSP, no DSP resources in the HAL1x device are used; thus adding these devices adds DSP resources to the HAL1x System.

Gigabit Ethernet Media Converts *are* supported. Thus, using multimode fiber, one can separate Expanders up to 2 kilometers (1.2 miles). Singlemode fiber distance goes up to 12 km (7.5 miles). The Expansion Bus is Ethernet Layer 1 only — there are no MAC and no IP addresses involved, therefore dedicated unmanaged media converters must be used.





EXP1x RAD Expander

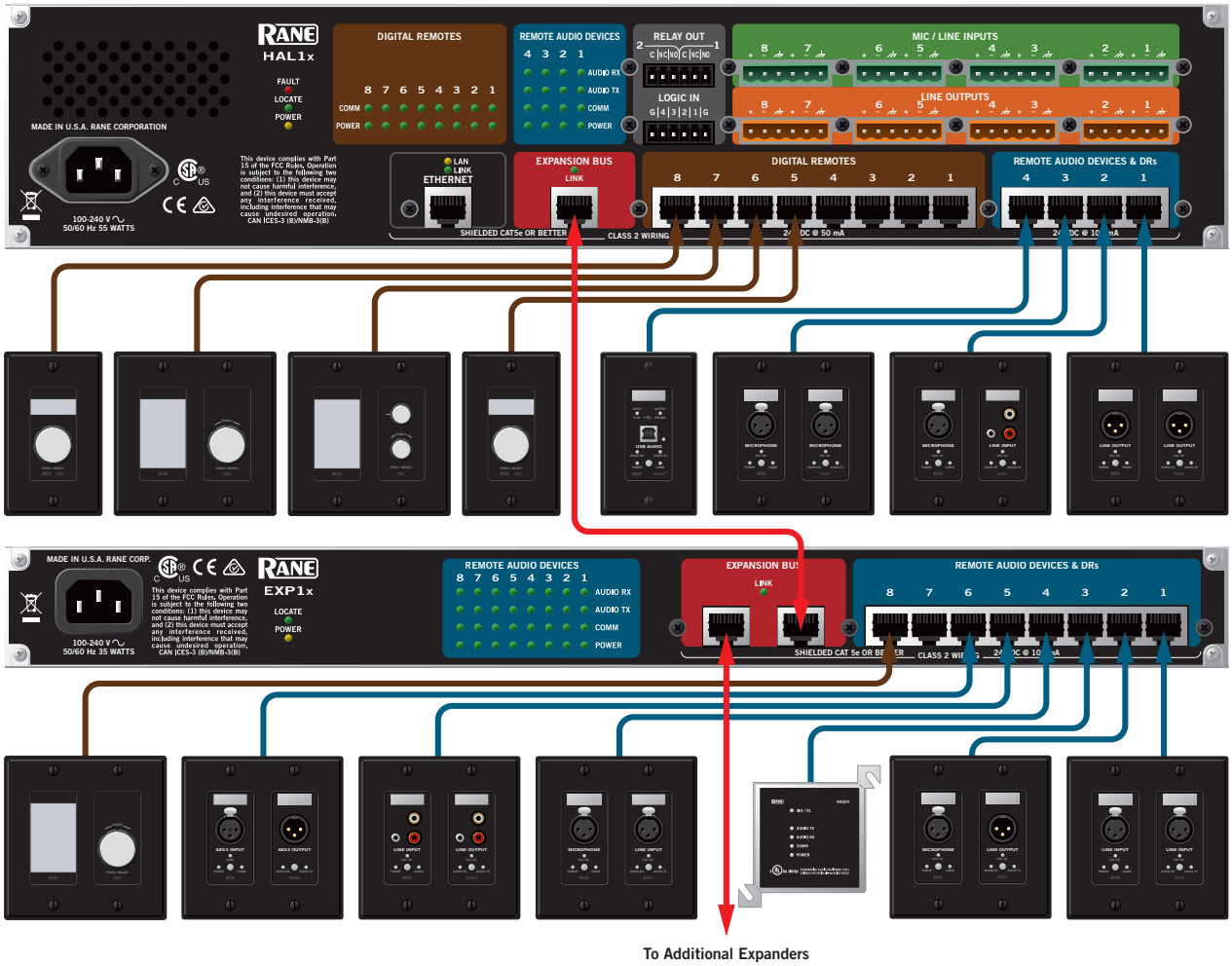
The EXP1x adds eight RAD ports to a HAL1x via the Expansion Bus. The EXP1x requires a HAL1x to operate.

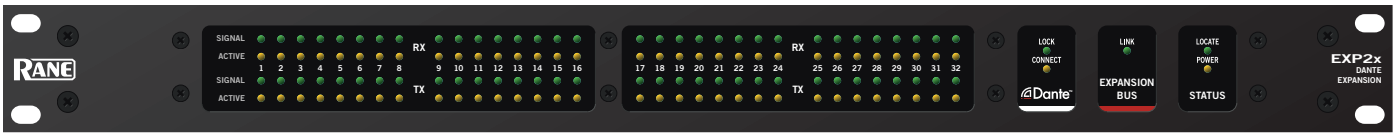
RADs can be the most valuable asset in a HAL system. Shielded CAT 5e (or better) cable and termination transport four digital audio channels – two channels each direction – as well as power, ground and a communications channel, with status indicators at each RAD, HAL1x and EXP1x up to 150 meters (500 feet) away. See all the RADs on page 14. See the EXP1x Specifications on page 38.

Note that DR remotes can also be plugged into any RAD port, so the EXP1x makes room for additional DR remotes when needed.

Up to 32 Expanders, in any combination, may be daisy-chained to a single HAL1x, adding 512 inputs and 512 outputs if all 32 are EXP1x units.

The original HAL1 and EXP1 have been replaced with the HAL1x and EXP1x using the improved CAT 5 expansion bus.





NEW! EXP2x Dante Expander

The EXP2x is an input/output expander that enables the HAL1x to transmit 32 and receive 32 audio channels from a Dante™ network. Applications abound in houses of worship, installed sound, performing arts venues, education and corporate environments – anywhere a Dante network is used. The EXP2x also allows connecting a Dante network between multiple independent HAL1x systems.

Built-in sample rate converters convert the 44.1, 48, 88.2 or 96 kHz sample rate on the Dante network to the HAL's 48 kHz clock domain.

Daisy-chain up to 16 EXP2x Expanders to a single HAL1x to max-out at 512 x 512 channels on both a single cable on the Dante network and the HAL1x's Expansion Bus. The HAL1x is capable of 32 Expanders on its bus, so the EXP2x can be combined with other Expanders. For example, use 16 EXP2x Expanders with 512 input and 512 output channels, and then put on another 16 EXP3x Expanders for more outputs.

The EXP2x is equipped with a Secondary Dante port for either Redundant Mode or Switch Mode. Use Dante Controller software for all network audio and EXP2x settings via its Brooklyn II card.

Front panel and Halogen software indicators for Dante connection, network status, flow active, and audio signal present aid troubleshooting. Dante Controller provides all network setup, monitoring, control, diagnostics and troubleshooting beyond compare; while Halogen reads, but does not edit the Dante setup, simplifying which software to use and eliminating conflict.

Dante provides a no-hassle, self-configuring network with ultra-low latency, while providing a true plug-and-play digital audio network using standard Internet Protocols on existing infrastructure — without requiring a dedicated network. The technology is built on global networking standards, making signal distribution more flexible, cost-effective and user-friendly and has been used at some of the largest live events and sophisticated installations worldwide.

See the EXP2x Specifications on page 38.

Read Rane's Dante Setup Philosophy under the EXP2x tab at rane.com/hal/hal1x.html.

Features

- Supports 44.1, 48, 88.2 or 96 kHz Dante network sample rates.
- Up to 32 transmit channels and up to 32 receive channels (at any supported sample rate - that's right, even at 96 kHz).
- 32 bi-directional channels of high-quality sample rate conversion.
- Switch Mode and Redundant Mode for the Secondary Dante network port.
- Clear signal presence and fault status indication in Halogen Software and on the EXP2x front panel.
- Discoverable and configurable using Dante Controller software.

What Ethernet switch can I use for my Dante network?

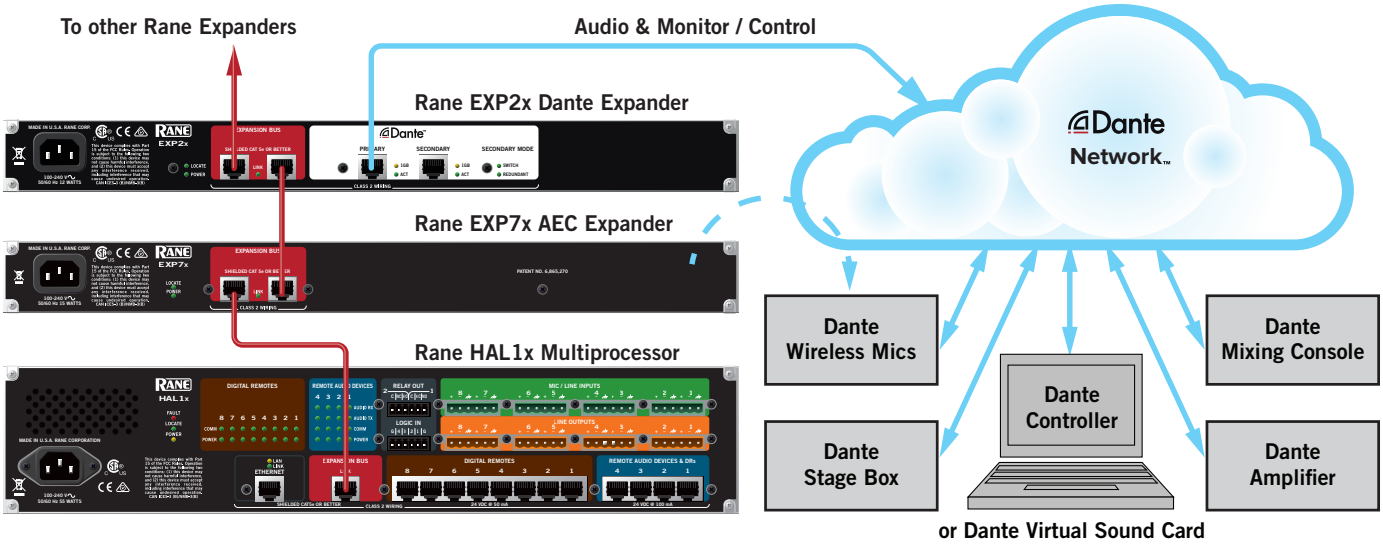
Answers to this and many other Dante questions are found at audinate.com/resources/networks-switches. The Cisco 300 Series Ethernet switches are available in many varieties, such as the 10-port, SG300-10. They are very affordable, managed, and some offer PoE versions if needed. If you use an Ethernet switch with "Green" Energy-Efficient Ethernet (IEEE 802.3az) turn off this feature. This green technology can delay packets hundreds of milliseconds which will stop all Dante audio from working.

Dante™
SPOKEN HERE

About Audinate

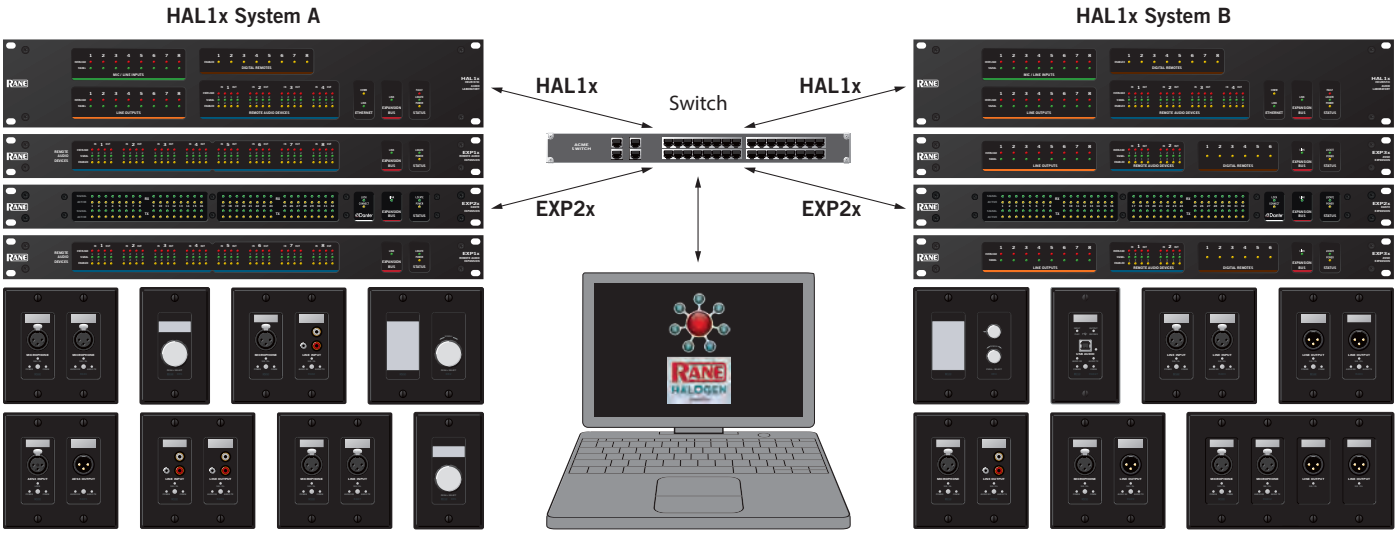
Audinate revolutionizes AV systems to enable its customers to thrive in a networked world. Audinate's patented Dante media networking technology has been adopted by the leading manufacturers in the professional audio/visual industry. Dante is used extensively for live performance events, commercial installation, broadcast, recording and production, and communications systems. Audinate offices are located in US, United Kingdom and Australia. Visit audinate.com for the latest news and information on the company. Dante is Digital Media Networking Perfected.

Example using a Dante network with the EXP2x, console, microphones and amplifiers.

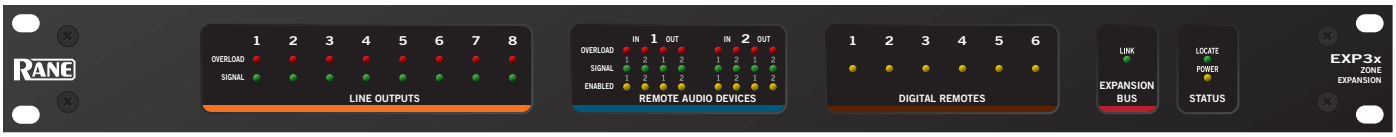


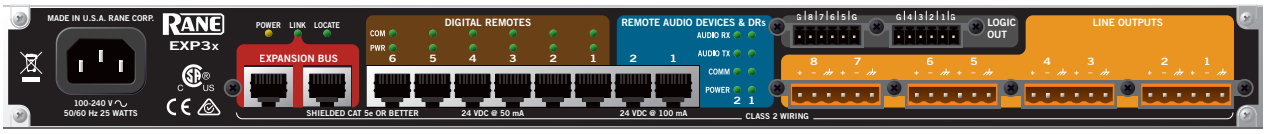
A Rane HAL system supplies DSP for distribution and sound reinforcement, while adding AEC to Dante wireless mics. This is an excellent way to add AEC to Shure's Dante products.

Example connecting 2 HAL systems through the EXP2x



EXP2x Expanders allow two independent HAL systems to share audio channels through an Ethernet switch.





EXP3x Zone Output Expander

The EXP3x is an 8-channel analog output & DSP expander for the HAL1x, which is required for operation. It has 8 logic outputs, 6 DR remote ports and 2 RAD ports making a 4-input, 12-output audio device, depending on which 2 RADs are connected. Thus, 32 daisy-chained EXP3x Expanders provide 256 discrete zone outputs maximum, including output compression, parametric EQ, two levels of paging and background music. These 32 EXP3x Expanders would also provide 64 RAD ports, 192 DR ports and 256 logic outputs.

The dedicated DSP for each of the 8 analog outputs offers two signal processing choices independently selectable per output. When you need background music, paging and emergency paging on an output, select the Zone Output processing set. This provides a Zone Processor block, an Emergency Zone in addition to a Compressor and a 5-band parametric EQ with high- and low-cut filters. When Line Output is selected, the compressor and parametric EQ are available without the zone processing and emergency paging blocks.

EXP3x Application Example

Each EXP3x provides full support for an 8-zone cluster without consuming the HAL1x DSP resources. All of the DSP required for paging, distributed background music selection, PEQ, dynamics and Level control is handled by the EXP3x. DR and RAD resources also scale with 6 DR ports and 2 RAD ports.

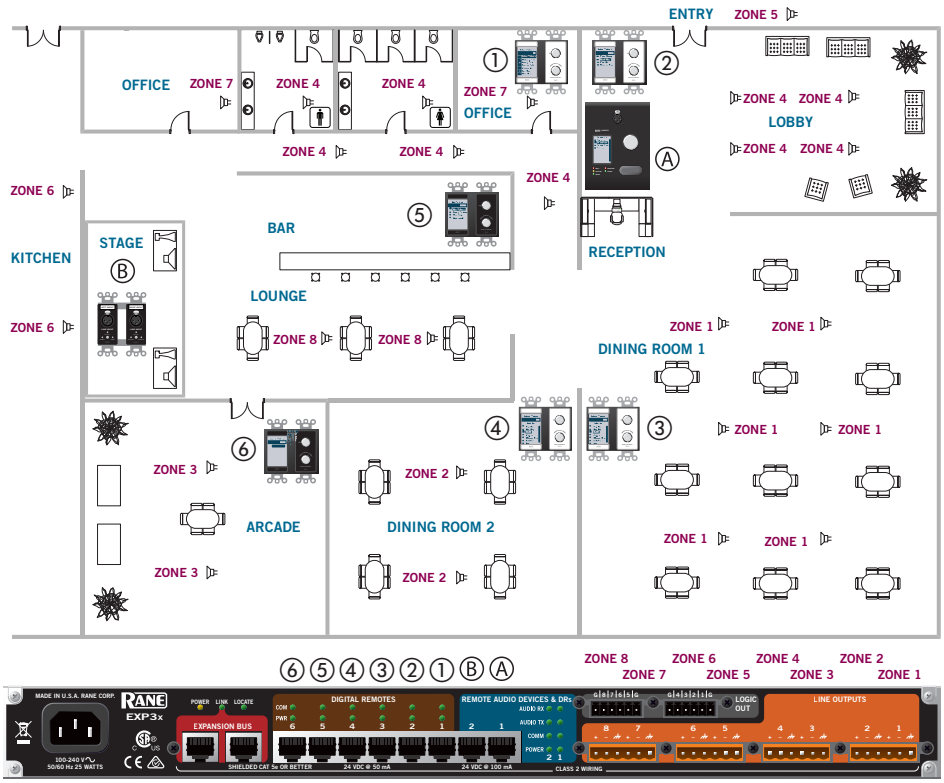
The logic outputs on the EXP3x are suited for legacy paging systems where relays within each zone's 70/100 volt volume controls must be tripped during a page. Simply link the Logic Out to a Page Active in the Halogen Paging Manager, and use a Logic Out to drive a relay. This turns up the remote's volume during pages. With 8 logic outputs, 8 zones of old-school constant-voltage paging are supported.

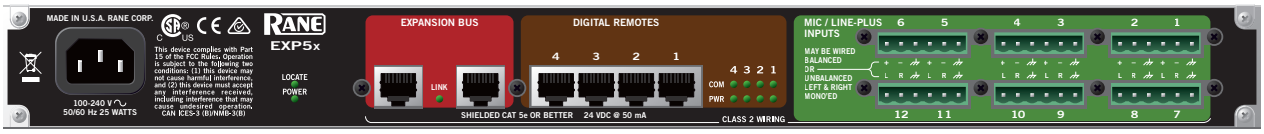
Pushing the EXP3x Zone Output Expander

If your application requires 8 floors of combined retail and office space, where each floor contains 8 zones, the EXP3x is a clear winner with a HAL1x. This would support 64 zones, a handful of building-wide global background music channels connected to the HAL1x directly, paging via PAGER1s within individual or even across a few floors, plus a couple of local-only audio sources per floor. Add up to 58 DR remotes, one or two RADs per floor, and you're done. You can even spread the EXP3x Expanders across different equipment rooms using dedicated shielded CAT 5e cable runs, as long as they don't exceed 100 meters each (300 feet). Use standard unmanaged Ethernet Gigabit Media Converters within the daisy-chained Expansion Bus to achieve distances up to 12 kilometers, or 7.5 miles.

In existing room combine facilities, the EXP3x slots ahead of the amplifiers to upgrade existing systems.

See theEXP3x Specifications on page 39.





EXP5x Input Expander

The EXP5x is a 12 Mic/Line/Line-Plus input & DSP expander for the HAL1x. It also supplies four DR ports, useful for adding source selection and/or volume control remotes such as the DR3. Each of the 12 inputs independently supports either dynamic mic, 48V phantom mic, +4 dBu line-level, or Rane's Line-Plus input. Line-Plus accepts -10 dBV unbalanced Left/Right Monoed together on the "+" and "–" ports, respectively. For stereo unbalanced sources, Line-Plus allows connecting the stereo RCA left tip conductor to the "+" terminal, the RCA right tip to the "–" terminal, and both RCA shields to the EXP5x Euroblock ground. Select Line-Plus in Halogen and you get a properly monoed audio channel.

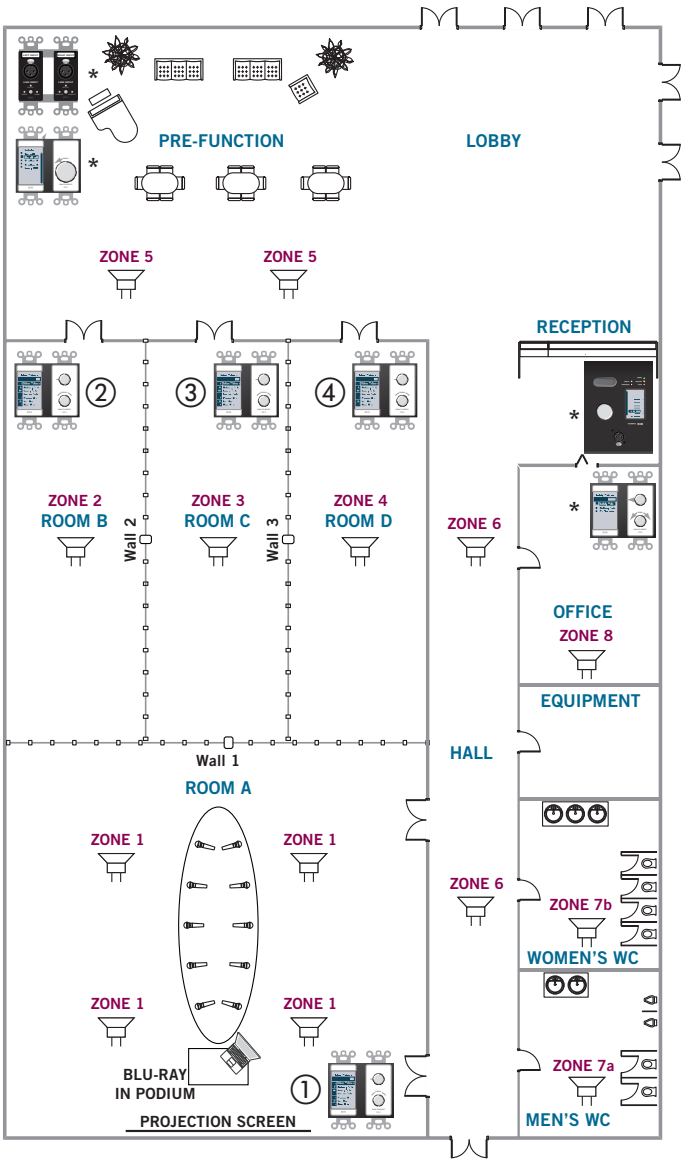
EXP5x Application Example

The EXP5x is perfectly suited to expand a HAL1x's analog audio inputs. Control is also expanded given its 4 DR ports. Each of the 12 inputs can independently accept mic, line, or Line-Plus audio — the ultimate in flexible input topologies. Also worth noting is the performance enhancement achieved since the mic input topologies automatically compensate for the sensitivity difference between condenser and dynamic mics.

In a meeting room with ten microphones (see graphic), one audio source (e.g., blu-ray) and a laptop on the podium, all these channels can connect directly to one EXP5x. A single DR3 in the room can select the audio source (blu-ray or laptop) and adjust the room volume. Or, the DR3 can be programmed as a mixer allowing independent level adjustment of all 12 sources in the room: 10 mics, blu-ray and laptop. If the podium location moves from the north to the east wall, duplicate remotes can provide multiple control locations. Use a preset recalled from a switch closure, DR2 remote or 3rd-party Ethernet control system to "spin" the room or disable any DR remote in a room.

There are equipment placement options. If the HAL1x lives in the equipment room, the EXP5x can live in the podium along with the blu-ray, and a single shielded CAT 5 returns to the HAL1x. However, if you are upgrading an existing facility, the EXP5x connects at the end of the existing analog conduit feeds in one or more equipment rooms.

If you had 12 such meeting rooms, use 12 daisy-chained EXP5x Expanders and a single HAL1x. The accompanying illustration shows only four such rooms. There would be plenty of spare DR ports available for adding control locations. The four RAD ports on the HAL1x support the addition of page sources (e.g., PAGER1) or portable 8-channel AM2 Automixers. AM mixers can be added to larger rooms - even during a meeting - to add 8 more gain-shared mixed mics to the 10 in any given room. Review the Cascade In feature of the Gain-sharing Auto Mixer or the Room Combine Processing blocks within Halogen for details. See theEXP5x Specifications on page 40.



EXP7x AEC Expander

The Rane EXP7x Expander for the HAL1x provides 8 channels of full-featured, drag and drop Acoustic Echo Cancellation (AEC) (U.S. Patent No. 6,865,270). Each channel of AEC can be added to any HAL1x system input and route to any Halogen DSP block, including the gain-sharing automixer, manual mixer, regular Room Combine and Conference Room Combine blocks.

The Rane EXP7x in combination with HAL1x and Halogen software provides a conferencing solution including far more than high-performance AEC. Because EXP7x AEC channels are not associated with a particular hardware input, preset recall can re-assign an AEC resource across inputs / rooms as required. Drag and drop AEC supports the typical one-AEC-per-microphone configuration. With optimum acoustics, mic and loudspeaker placement, or with rarely used mics (such as audience mics) it allows mixing more than one mic into a single AEC channel, significantly reducing cost.

Processing blocks to enhance the AEC system solution:

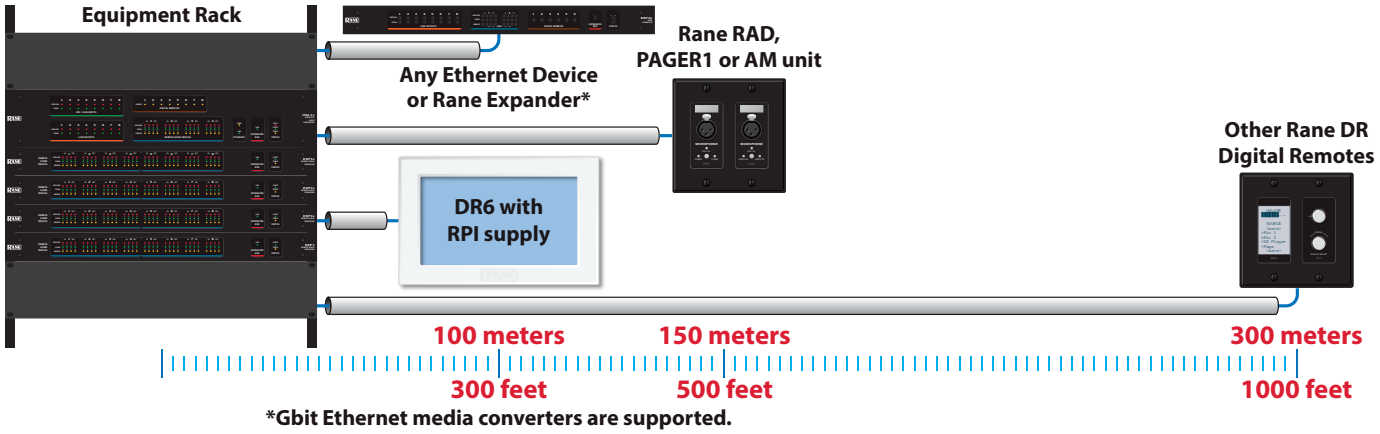
- Revolutionary Conference Room Combine block with intrinsic support for conferencing.
  - Independent Far End mixers and AEC Reference output per room.
  - Far End gain-sharing mixer inputs and AEC reference feeds automatically change with each room combination.
- Conference Switchboard DSP Router
  - Multichannel and Tracking processing blocks mirror local room processing in the AEC Reference signal path.
  - Included are the Multichannel Shelving Filter, Multichannel PEQ, Tracking Ambient Noise Compensation and Tracking Side-chain Compressor.
- Flexible drag-and-drop AEC placement.
  - Use it where you need it, on any HAL System input.
  - Re-route AEC resources with presets: re-use AEC across rooms.
- Multi-channel processing blocks mirror the room processing in the reference signal path.

Each AEC channel includes:

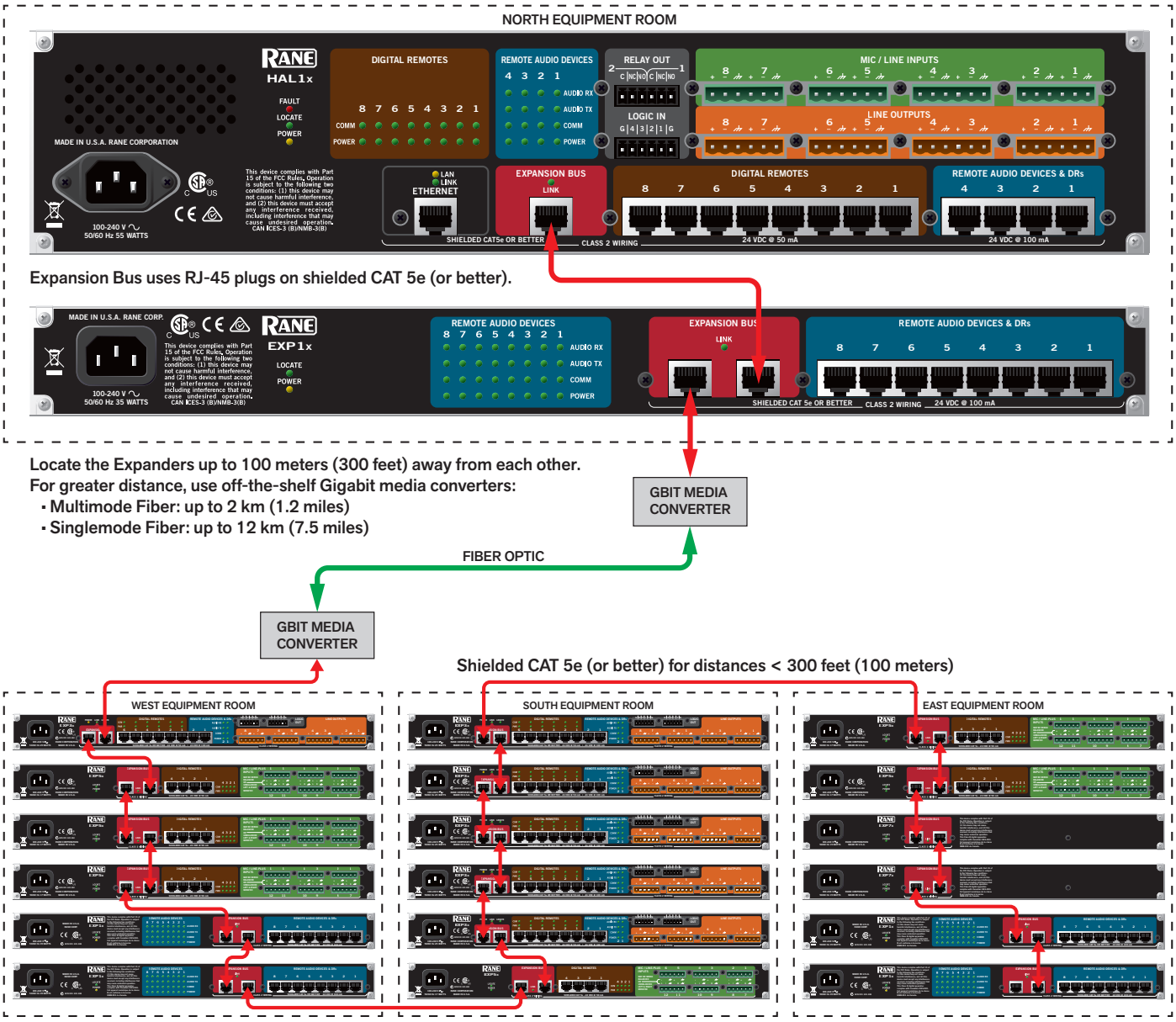
- Mic and Reference Inputs with Level control & metering.
- AEC on/off, plus adjustable AEC Threshold.
- Soft / loud talker AGC & 5-band parametric EQ, plus high- and low-cut filters.
- Full bandwidth AEC with adjustable non-linear processing.
- Ambient Noise Reduction (dynamic & steady-state) & howling prevention.
- Complete metering: Input, Reference, Echo Return Loss (ERL), Echo Return Loss Enhancement (ERLE) & Total Echo Return Loss (TER).
- 20 to 20 kHz Bandwidth, 300 ms tail length.
- <17 ms propagation delay, 100 dB/sec convergence rate.

See the EXP7x Specifications on page 41.

Ethernet, RAD and DR Cable Lengths



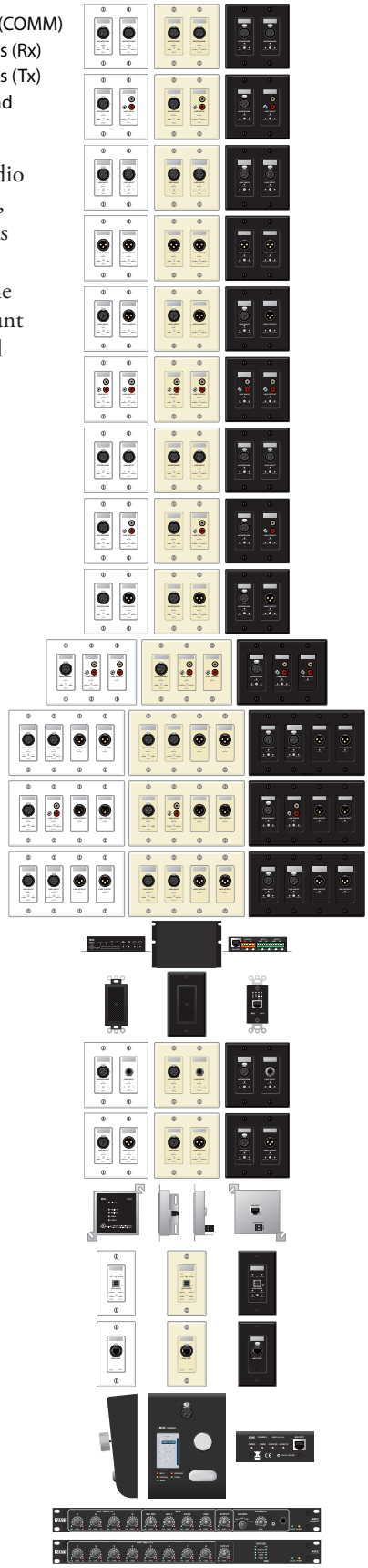
*Gbit Ethernet media converters are supported.



RADs

Data communications (COMM)
2 digital audio channels (Rx)
2 digital audio channels (Tx)
Power: 24 VDC & ground
Shield

The entire family of RAD models interface with HAL, for digital conversion at the wall. Each converts analog audio to and/or from 24-bit, 48 kHz digital audio. Shielded CAT 5e (or better) cable and termination transport four digital audio channels – two channels each direction – as well as power, ground and a communications channel, with status indicators at each RAD, HAL or EXP unit, and in Halogen software. HAL auto-checks the CAT 5 crimp and verifies audio. All RADs (and DRs) are both "location-aware" and hot-swappable with 500-foot homerun connections (66% farther than Ethernet). Light sensors dim the RAD indicators in dark rooms. Except for the RAD16, AM1, AM2, and PAGER1, all RADs mount in standard US electrical boxes. These RADs are available in white, ivory, or black, with a matched Decora® plate cover included. See the RAD Specifications (all models) on page 48.



RAD1 Dual XLR Mic Inputs

RAD2 XLR Mic Input / Mini & RCA Mono'ed Line Input

RAD3 Dual XLR Line Inputs

RAD4 Dual XLR Line Outputs

RAD5 AES3 Input / AES3 Output

RAD6 Mini & RCA Stereo Line Input / Stereo Line Output

RAD7 XLR Mic Input / XLR Line Input

RAD8 XLR Mic Input / Mini & RCA Stereo Line Output

RAD9 XLR Mic Input / XLR Line Output

RAD11 XLR Mic In / Mini & RCA Mono'ed Line In / Mini & RCA Stereo Line Out

RAD12 Dual XLR Mic Inputs / Dual XLR Line Outputs

RAD14 XLR Mic In / Mini & RCA Mono'ed Line In / Dual XLR Line Out

RAD15 Dual XLR Line Inputs / Dual XLR Line Outputs

RAD16 Dual Mic-Line Input / Dual Line Output Euroblocks in a Box

RAD17 Omnidirectional Boundary Layer Mic (see page 18)

RAD18 XLR Mic Input / 1/4" Balanced Line Input

RAD23 XLR Line Input / XLR Line Output

RAD24 One-Watt, Plenum-Rated Amplifier (see page 18)

RAD27 USB Audio Sound Card

RADX RAD Port Extension (CAT 5 wall jack for portable RADs)

PAGER1 Mic Preamp with Push-to-Talk and Page Zone Selection

AM1 Four-Channel Gain-Sharing Automixer with extra Line & USB Inputs

AM2 Eight-Channel Gain-Sharing Cascadable Automixer

All wallplate RADs are available in white, ivory or black

RAD1 Dual XLR Mic Inputs

RAD1W = white RAD1I = ivory RAD1B = black

RAD4 Dual XLR Line Outputs

RAD4W = white RAD4I = ivory RAD4B = black

RAD2 XLR Mic Input / Mini & RCA Mono'ed Line Input

RAD2W = white RAD2I = ivory RAD2B = black

RAD5 AES3 Input / AES3 Output

RAD5W = white RAD5I = ivory RAD5B = black

The AES3 input accepts sample rates from 32 kHz to 192 kHz. These are converted to the 48 kHz within HAL.

RAD3 Dual XLR Line Inputs

RAD3W = white RAD3I = ivory RAD3B = black

RAD6 Mini & RCA Stereo Line Input / Mini & RCA Stereo Line Output

RAD6W = white RAD6I = ivory RAD6B = black

All wallplate RADs are available in white, ivory or black

RAD7 XLR Mic Input / XLR Line Input

RAD7W = white RAD7I = ivory RAD7B = black

RAD11 XLR Mic Input / Mini & RCA Mono'ed Line Input / Mini & RCA Stereo Line Output

RAD11W = white RAD11I = ivory RAD11B = black

RAD8 XLR Mic Input / Mini & RCA Stereo Line Output

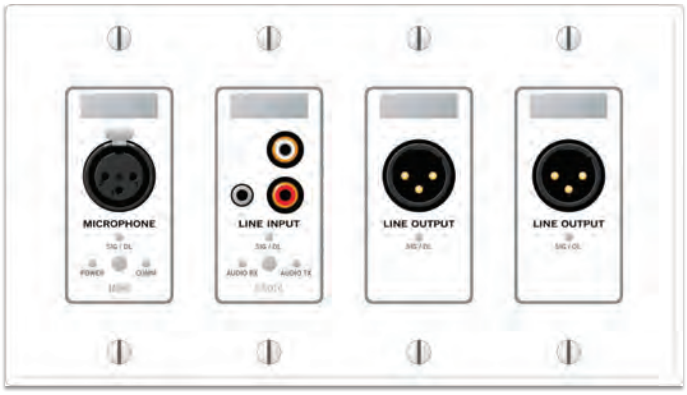
RAD8W = white RAD8I = ivory RAD8B = black

RAD12 Dual XLR Mic Inputs / Dual XLR Line Outputs

RAD12W = white RAD12I = ivory RAD12B = black

RAD9 XLR Mic Input / XLR Line Output

RAD9W = white RAD9I = ivory RAD9B = black



RAD14 XLR Mic Input / Mini & RCA Mono'ed Line Input / Dual XLR Line Outputs

RAD14W = white RAD14I = ivory RAD14B = black

All wallplate RADs are available in white, ivory or black

RAD15 Dual XLR Line Inputs / Dual XLR Line Outputs

RAD15W = white RAD15I = ivory RAD15B = black

RAD23 XLR Line Input / XLR Line Output

RAD23W = white RAD23I = ivory RAD23B = black

RAD18 XLR Mic Input / ¼" Balanced Line Input

RAD18W = white RAD18I = ivory RAD18B = black

RAD27 USB Audio Input & Output Card

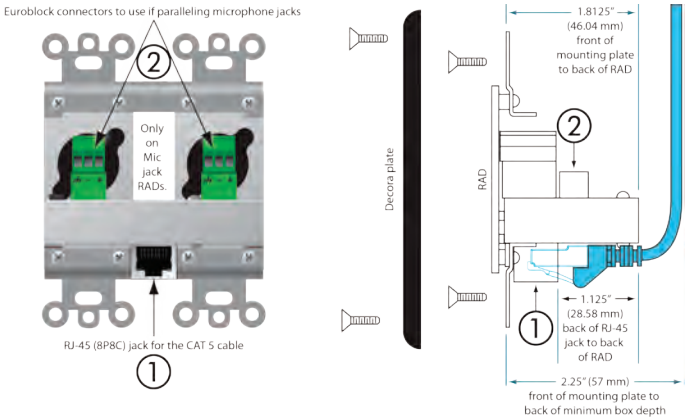
RAD27W = white RAD27I = ivory RAD27B = black

RADX RAD Port Extension

RADXW = white RADXI = ivory RADXB = black

Distinguish Ethernet RJ-45 from Audio RJ-45 jacks.

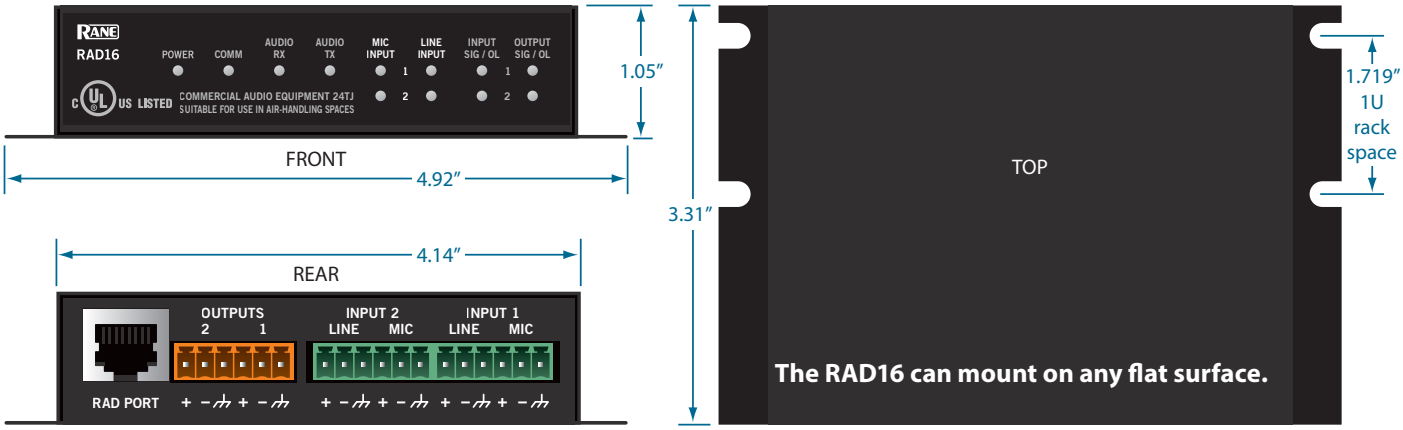
RAD Back and Side View



RAD16 Dual Mic-Line Input / Dual Line Output

A RAD16 provides an alternative to standard switchboxes for areas in which a switchbox is impractical. Its form factor is a rugged metal box with flexible mounting options. It contains two balanced mic / line inputs on Euroblock connectors, and two balanced line outputs on Euroblock connectors. The inputs are individually software switchable to mic or line, and 24 V phantom power or none. LEDs indicate Mic or Line level for each input. The Euro connections accept wire between 30 AWG minimum and 14 AWG maximum.

The RAD16 is only available in black. Mountable to any flat surface, it measures 4.92" x 3.31" x 1.05" (12.5 x 8.4 x 2.7 cm). The RAD16 is plenum rated UL 2043.

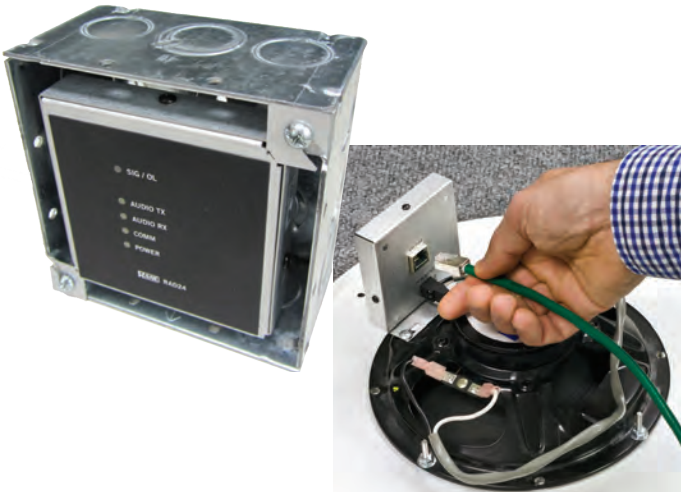


RAD17 Microphone

This omnidirectional boundary layer microphone / PZM pressure zone electret microphone handles extreme temperatures and humidity for indoor or outdoor applications. It may be used for ambient noise sensing, serveillance, security, train stations, etc. Sold only in black, but the grill may be painted any color, and finished with any Decora plate.

RAD24 Amplifier

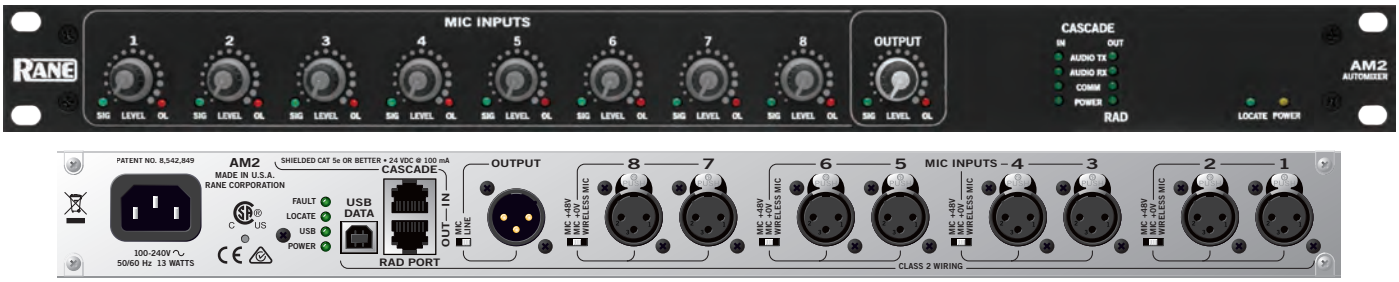
A RAD24 provides one audio output channel that is a one-watt plenum-rated class-D amplifier which directly drives an 8Ω loudspeaker. It installs in a U.S. 4-square gang box, or the flanges can be removed and the RAD can be mounted to a ceiling loudspeaker's 70/100 mounting holes (replacing the transformer) or to another flat surface.



AM1 and AM2 Automixers as RADs

AM1 Automixer with 4 Mic/Line Ins, 2 Line Ins, USB Audio I/O, Headphone Amp, and RAD Port.

AM2 Automixer with 8 Mic/Line Inputs and Cascadable RAD Port.



The AM1 and AM2 offer a integrated solution providing superior gain before feedback while eliminating operator error with simple controls. The microphone gain-sharing algorithm automatically and appropriately attenuates mics not in use, while maintaining the 3 dB per doubling of mics for different talkers (noncoherent signals), and 6 dB per doubling for the same talker who is directly between two mics (coherent signals). Think of the person wearing a live lavalier or headset, while approaching a live podium mic... no problem!

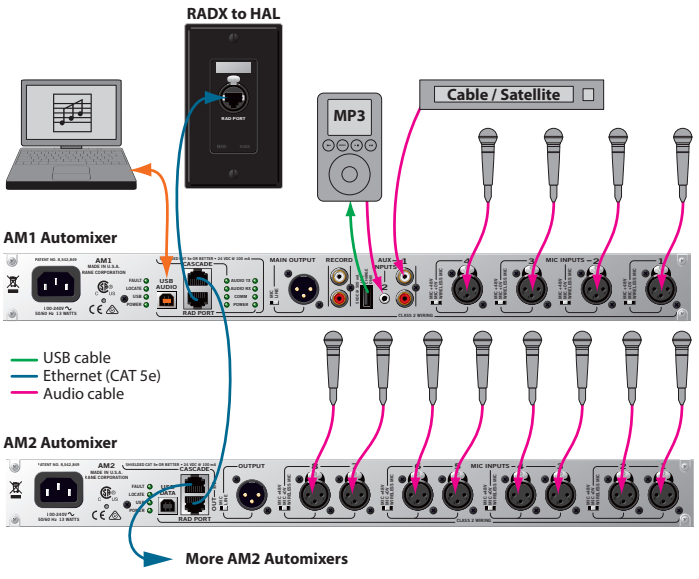
The AM2 makes it easy to set up and manage multiple wired or wireless microphones for up to eight participants. More mics are easily handled by daisy-chaining up to seven more AM2 Automixers, supporting up to 64 gain-shared mics.

The AM1 Automixer enables an operator to quickly set up and manage audio for a multimedia presentation involving up to four participants with microphones (wired or wireless) and several program audio sources (e.g., DVD, Laptop and MP3 player). The USB Audio port can simultaneously play back audio and record the AM1's output, so the same laptop can be both a source and a recording device to document meetings, presentations, trainings, and karaoke nights.

The AM1 or AM2 can be a RAD, sending its digital mono output mix to HAL. Once the AM Output mix is in the HAL DSP, additional signal processing such as EQ and compression can be added. Control of the mix's level using Rane's DR1 or DR3 Digital Remotes is a breeze.

AM Automixers may be installed in a mobile case, and connected when needed via an installed RADX on a wall or podium. This allows occasional panel discussions to use as many mics as necessary, while keeping the number of wall plates minimal.

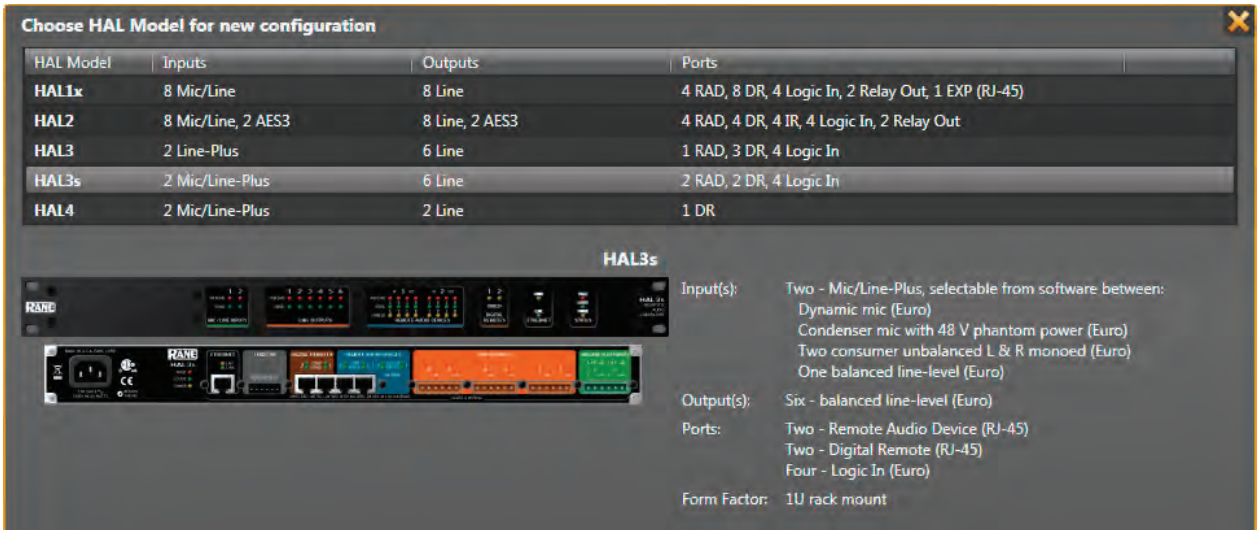
For more details, see the AM1 and AM2 Data Sheets.



Halogen Software

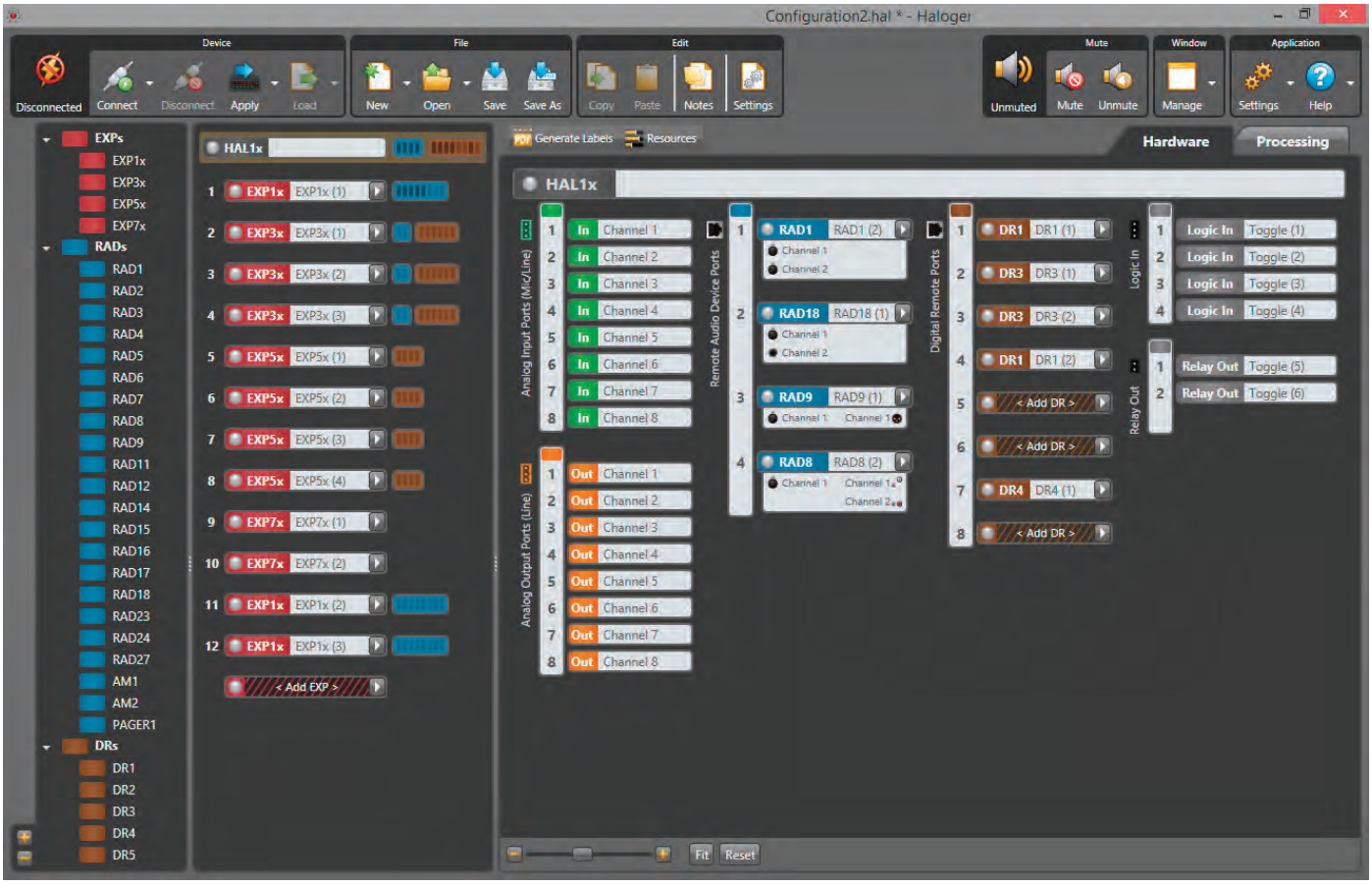
The Halogen software application is your home for designing, configuring, and controlling your HAL audio system. Halogen's easy-to-use graphic user interface simplifies the design and configuration process so much that your only concern will be deciding how to use the extra time you have!

The Halogen software manages global tasks such as discovering, connecting to, and applying configurations to HAL devices. The interface is divided into two main sections: the Hardware Workspace and the Processing Workspace. Halogen helps you choose the best HAL Model to start a new configuation.



Hardware Workspace

Specify, configure, and troubleshoot the physical hardware components of your audio system.



Processing Workspace

Wire together the audio processing components of your system, adding and configuring standard processing blocks such as equalizers, matrix mixers, compressors, limiters, and so on. Manage and configure control links and presets here. Halogen also provides innovative processing blocks that simplify complex multizone background music, paging and room combine scenarios.

Notice that Halogen separates the hardware view from the processing view of your audio system. A key benefit of this separation is the flexibility it provides when configuring the system's various inputs and outputs. For example, suppose you have a RAD2 in your audio system. You drag the RAD2 device into the Hardware Workspace but then go to the Processing Workspace to configure the RAD2's line input and mic input. This separation of hardware from processing allows you to work with each input and output individually instead of having to work with the hardware device as a single entity. It also allows you to focus on hardware in one place and audio flow and processing in another place—simplifying your job as a result. Brilliant!

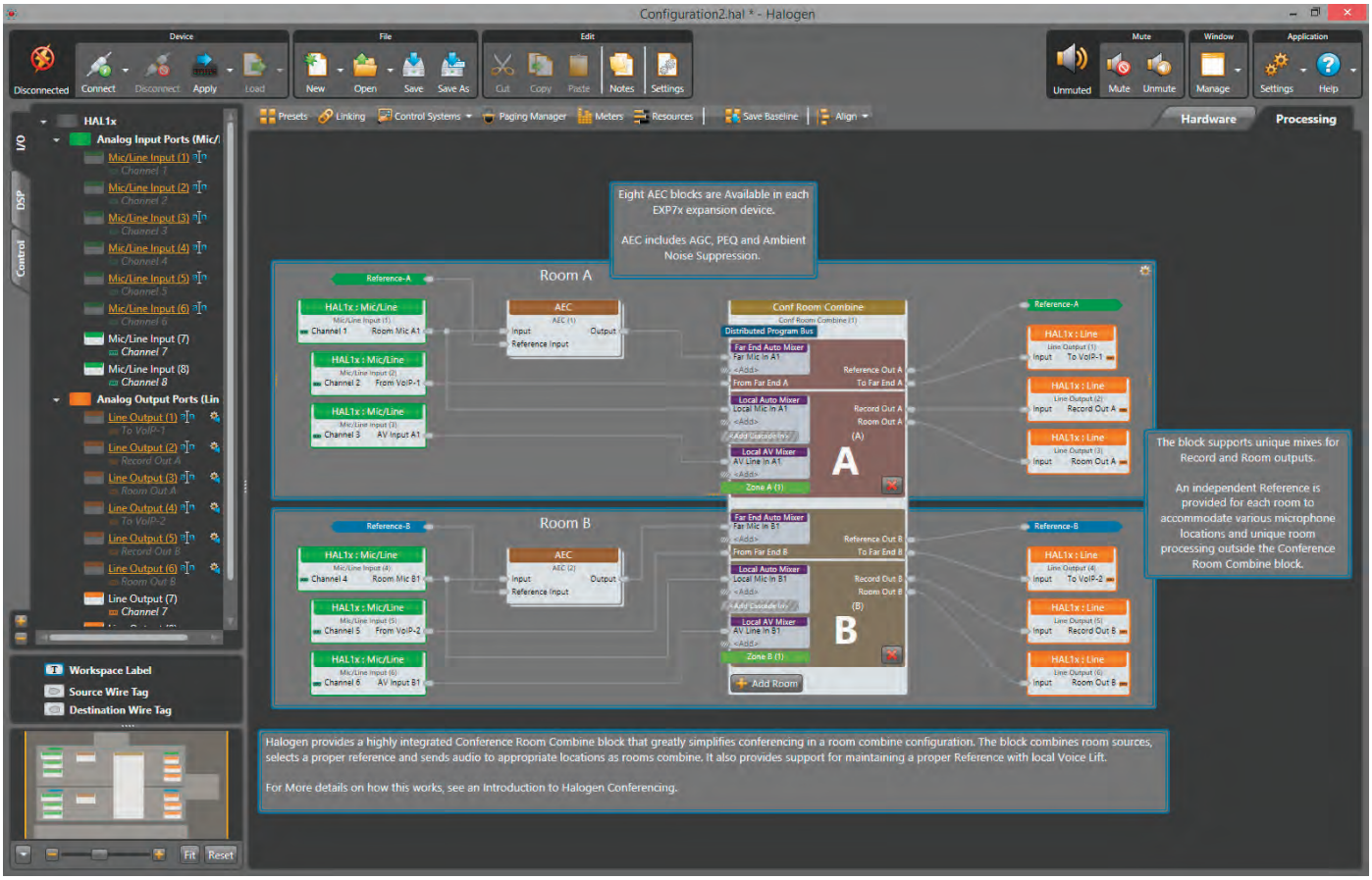
Workspace Layout

As you may have noticed, the Hardware Workspace and the Processing Workspace have similar layouts. On the right is the actual workspace itself in which you create your system. Associated with each workspace is a palette of objects on the left, and at the top a toolbar specific to the workspace. To add an entity to your audio system, you drag one or more objects from the palette to the workspace.

A simple way to think of the Halogen workspaces is that you use the Hardware Workspace to create, connect and troubleshoot all of your physical hardware, while you use the Processing Workspace to select, configure, and connect the processing blocks and controls.

Wire Management

- Distributed Program Bus
- Paging Manager
- Orthogonal Wires
- Wire Tags
- Highlight Wires



Digital Remotes

Three Digital Remotes simplify end user control and eliminate installer brain fatigue. Use Digital Remotes for volume control, preset recall, source selection, or resetting or toggling system states. All offer customizable backlit LCD screens for intuitive end user labeling. Home run shielded CAT 5e (or better) connections to a HAL or EXP eliminate addressing, external power, and the need to test the cables.

The **DR1** supports Level Control.

The **DR2** offers Single Selector or List of Toggles/ Commands behavior.

The **DR3** has three behaviors: Single Level & List of Toggles/Commands, List of Levels for either multizone volume control and/or input source mixing, and Single Level plus Selector.

DR1 Digital Volume Remote

Level Control

DR2 Digital Selection Remote

Single Selector

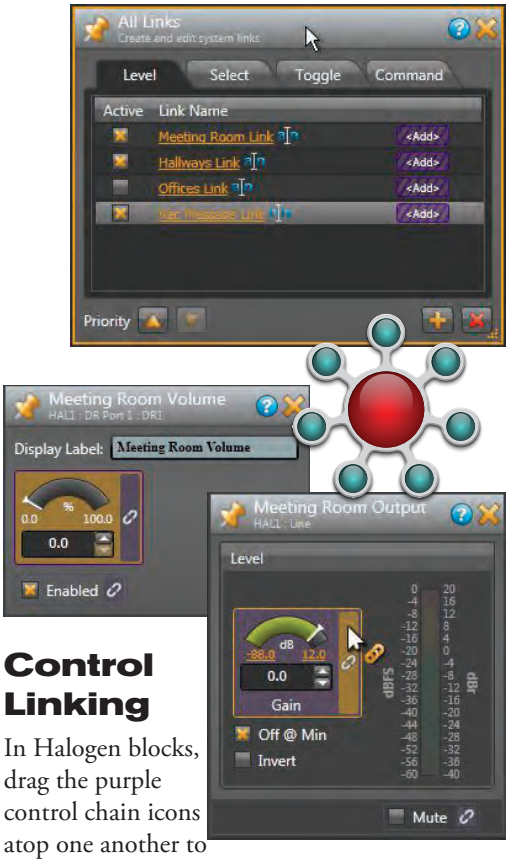
List of Toggles / Commands

DR3 Digital Volume and Selection Remote

Single Level & List of Toggles / Commands

List of Levels

Single Level & Selector

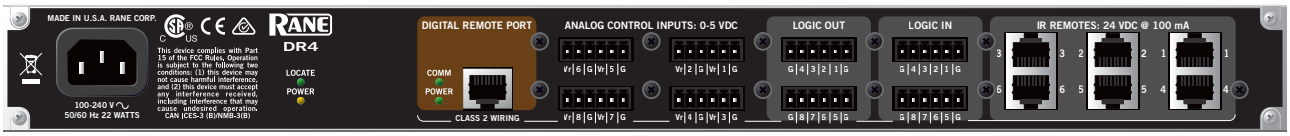


Control Linking

In Halogen blocks, drag the purple control chain icons atop one another to create links between Levels, Toggles, Selectors, Commands, Digital Remotes, Web Controls and/or 3rd-party controls. The above screen shows linking a DR1 volume onto the Meeting Room Output Level control. Four Control Link types and behaviors are supported: Level, Select, Toggle or Command. Activation and Priorities work together for incredible flexibility. Link simple analog remote level controls, contact closures and IR remote wall sensors by adding a DR4 Logic I/O Expander.

DR4 Logic I/O Expander

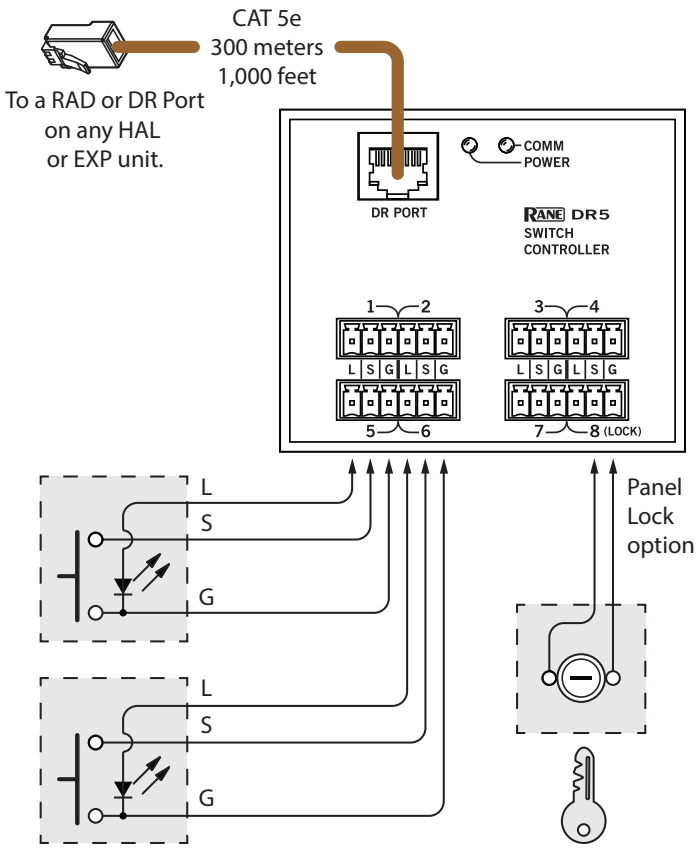
The DR4 Digital Remote adds additional logic input and output ports to any HAL, enabling simple analog level and logic I/O controls plus IR2 remotes for wall sensing. The DR4 offers eight logic ins and outs, six IR ports and eight analog input ports for pot-on-a-wall level control. Multiple DR4's can connect to Digital Remote Ports on any HAL, up to 300 meters (1000 feet) away. See the Logic Inputs, Control Inputs and Logic Outputs on page 26. See the IR2 Infrared Wall Sensors on page 27.



See the DR4 Logic I/O Expander Specifications on page 53.

DR5 Switch Controller

The DR5 Digital Remote offers additional logic input and output ports, enabling the use of simple analog switch controls in any HAL system. Lighted switch panels for room combine applications are easily integrated into a HAL system using the eight switch inputs and eight LEDs outputs on the DR5. Unlike the HAL and DR4 Logic I/O, the DR5 Logic Out is intended to drive the LED indicator on a room combine panel, and is a writable parameter. The DR5 is designed to fit in a standard US dual-gang electrical box or mount directly near a room combine panel.



See the DR5 Switch Controller Specifications on page 52.

NEW! DR6 Touchscreen Remote Control

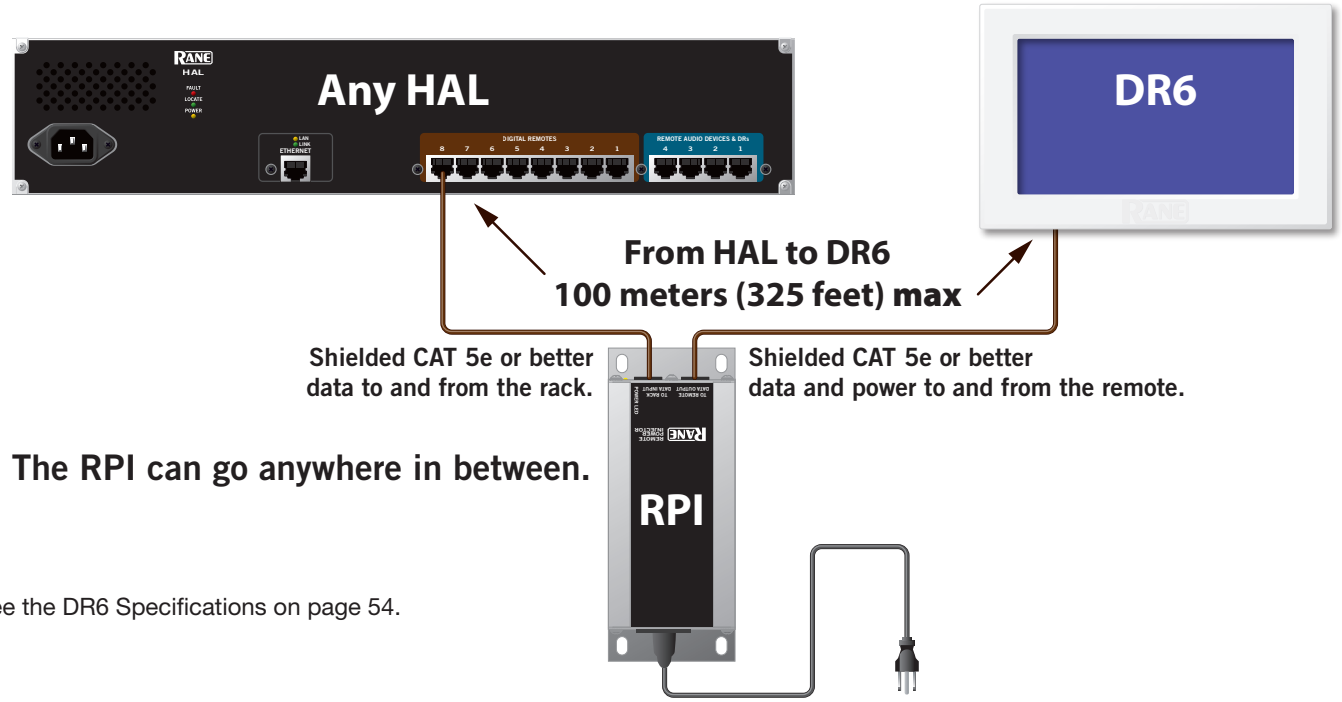
The new DR6 is a fully customizable touchscreen remote for the HAL family. It supports multiple pages or tabs and any set of levels, toggles, selectors and/or commands. Drag, drop and resize controls any way that's desired. Use custom background images and logos in full-color on the 7-inch LCD display.

Screw the included wall-mount bracket over U.S. or international electrical boxes, or flush mount the ¾" thick DR6 with a 2-inch hole in the wall to accommodate the cable. The optional DS1 desk stand accessory (shown) allows the DR6 to mount on a horizontal surface. The optional RB1 rack bracket installs the DR6 in a 19" equipment rack.

The included midspan power injector connects CAT5e (or better) cables between any HAL and the DR6 to deliver communications and the extra power needed for the display.

Optional, on-screen User Access logins secure management pages from public or staff use, and a programmable ambient light sensor automatically dims the backlight.

The Control Page Designer in Halogen 5.0 allows you to create one set of pages and use them in a web control design, DR6 display or both.

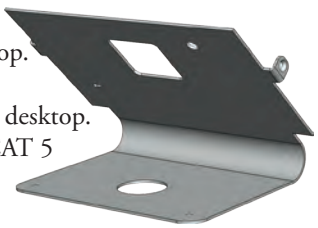


The RPI can go anywhere in between.

See the DR6 Specifications on page 54.

DS1 Desk Stand Accessory

- All steel, painted white.
- Rubber bottom protects the desktop.
- Kensington security hole.
- Holes in the bottom to fasten to a desktop.
- Larger hole in bottom to thread CAT 5 cable through the desktop.



RB1 Rack Bracket Accessory

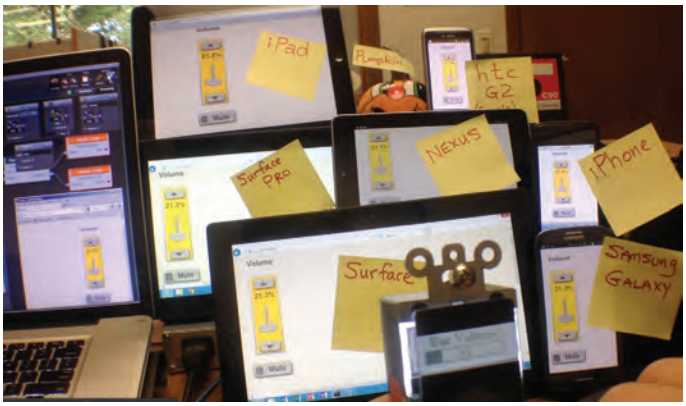
- All steel, painted black, 3U rack height.

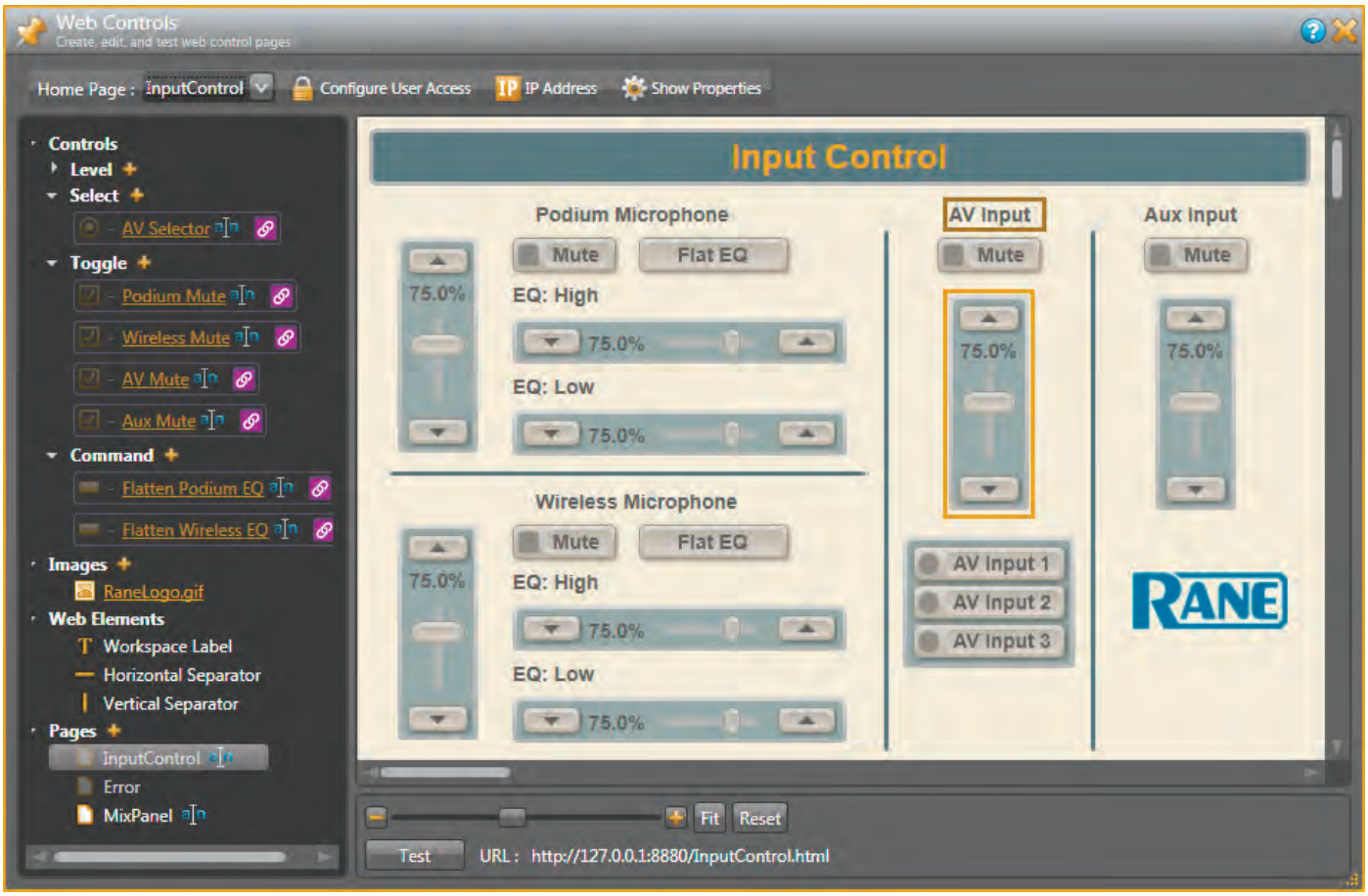
Halogen Web Controls

Control the Levels, Selectors, Toggles and Commands in any HAL System from any device with a web browser. Halogen 4.0's Web Controls feature allows creation of custom HTML GUI control screens. Define the quantity of control pages, and the layout, labeling and size of each control, and completely test them using your default web browser from within Halogen.

Access any control page from any browser-enabled device on the network with a HAL device. Just open a browser and type in the customizable IP/webpage address for the HTML page – and bookmark it for easy access. Type in an optional User Access code, and voilà, the trick, she is done! Control your HAL system wirelessly from one or more tablets, smart phones, laptops or desktop computers. The HAL web server is multi-client, allowing control across many devices and many rooms. You can link Rane's wired DR remote controls (DR1, DR2 & DR3) and wireless devices and they'll automatically track each other.

Customers from almost every audio application are asking for "iPad control" and Halogen's Web Controls is the solution. It is not Apple®-centric — no iTunes® store or app installs required. We'll save a lot of space and ink on this page by not listing all the possible devices that support web browsers and wireless Ethernet. Besides, the list will change before the ink dries.



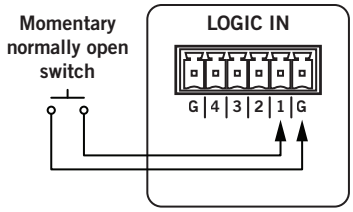


Logic Inputs

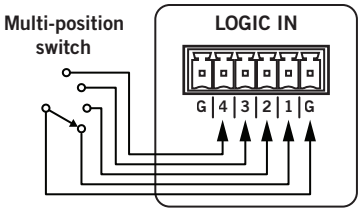
These inputs are found on the HAL1x, HAL2 and HAL3s. More can be added with the DR4 or DR5 connectable to any HAL. You can configure each of the Logic Input ports in one of three ways: toggle, command, or selector.

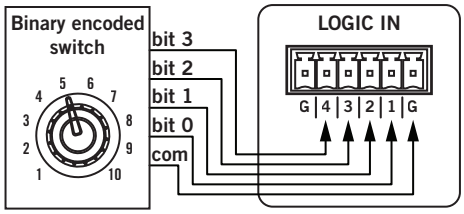
The **Toggle** configuration allows a Toggle command with an on/off switch. You can configure each port type to be either *Momentary* or *Latching*.

The **Command** configuration allows triggering a Command control from an on/off switch, which can link to one or more Command controls such as a Command preset or a linkable button in a processing block property dialog.



The **Selector** configuration uses either a multi-position switch or a binary switch. You can connect a physical device to any or all of the Logic In ports and configure the ports in Halogen so they make the desired selection according to the state of the physical device. Wiring details are in the Halogen Software Help. The Selector configuration is not supported by the DR5.

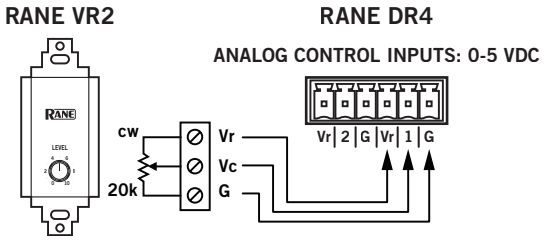




Analog Control Inputs

These inputs are found on the DR4 that can connect to any HAL. Each port allows an analog voltage source to control the value of a Level control in the Halogen Control palette. The input range for the port is from 0 V to 5 V, where 0 V corresponds to 0% on the associated Level control and 5 V corresponds to 100%.

Connect a physical linear-taper potentiometer, like the Rane VR2 Volume Remote. The Vc wiper provides the control voltage to the DR4. As you adjust the pot the voltage changes, which in turn changes any linked Level control in Halogen.



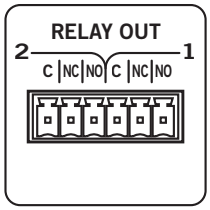
Logic Outputs

These outputs are found on the EXP3x Output Expander for the HAL1x, or on a DR4 that can connect to any HAL. You can configure each of the 8 output ports in one of 2 ways:

- **Toggle**: When a toggle control in the Halogen Control palette is unchecked, HAL sets the corresponding DR4 Logic Out port to logic high (5 V), and when the toggle is checked, it sets the port to logic low (0 V).
- **Selector**: When a selector control in the Halogen Control palette is set to the first selection, HAL sets the corresponding DR4 Logic Out port to logic high (5 V). Conversely, when the selector control is in the second position, HAL sets the port to logic low (0 V).

Relay Outputs

These reed relay ports are found on the HAL1x and HAL2 to signal other devices. A common implementation is to link a relay port to a Toggle control so an end user can change its value. Halogen software contains a checkbox for each relay port. Its value can be included in a preset or link to another control, making it possible to use a preset or control to turn the relay port on or off.



AMX, Crestron and Stardraw Support Packages

These Control System Guides include an introduction to external control systems with HAL. Each appendix includes reference information on the HAL external control message protocol and how to use a telnet client to monitor and troubleshoot control system operation. Each package has an example HAL1x configuration and how to set up a controller for each touch panel to communicate with a Halogen/HAL Control Server.

The Support Packages are installed with the Halogen software and can be accessed from the Windows Start Menu under Rane Corporation > Halogen > Guides > AMX, Crestron or Stardraw.

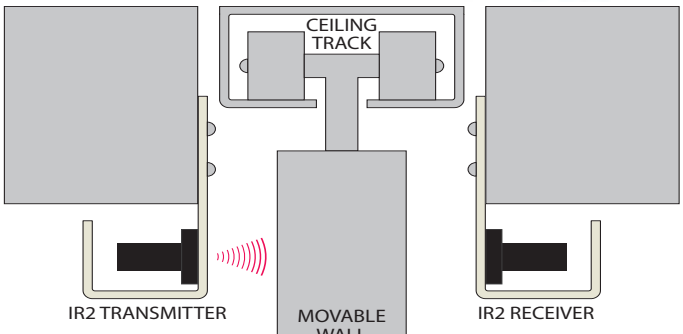
IR2 Infrared Wall Sensors

The Rane IR2R and IR2S are collectively known as an IR2, working in pairs to provide an automatic way to sense the position of a movable wall or door. The IR2S sends infrared, the IR2R receives it. Mounting brackets and screws are included.

A single CAT 5e cable for each door connects the IR2 to a dedicated IR Remotes port on the rear of a HAL2 or a DR4.

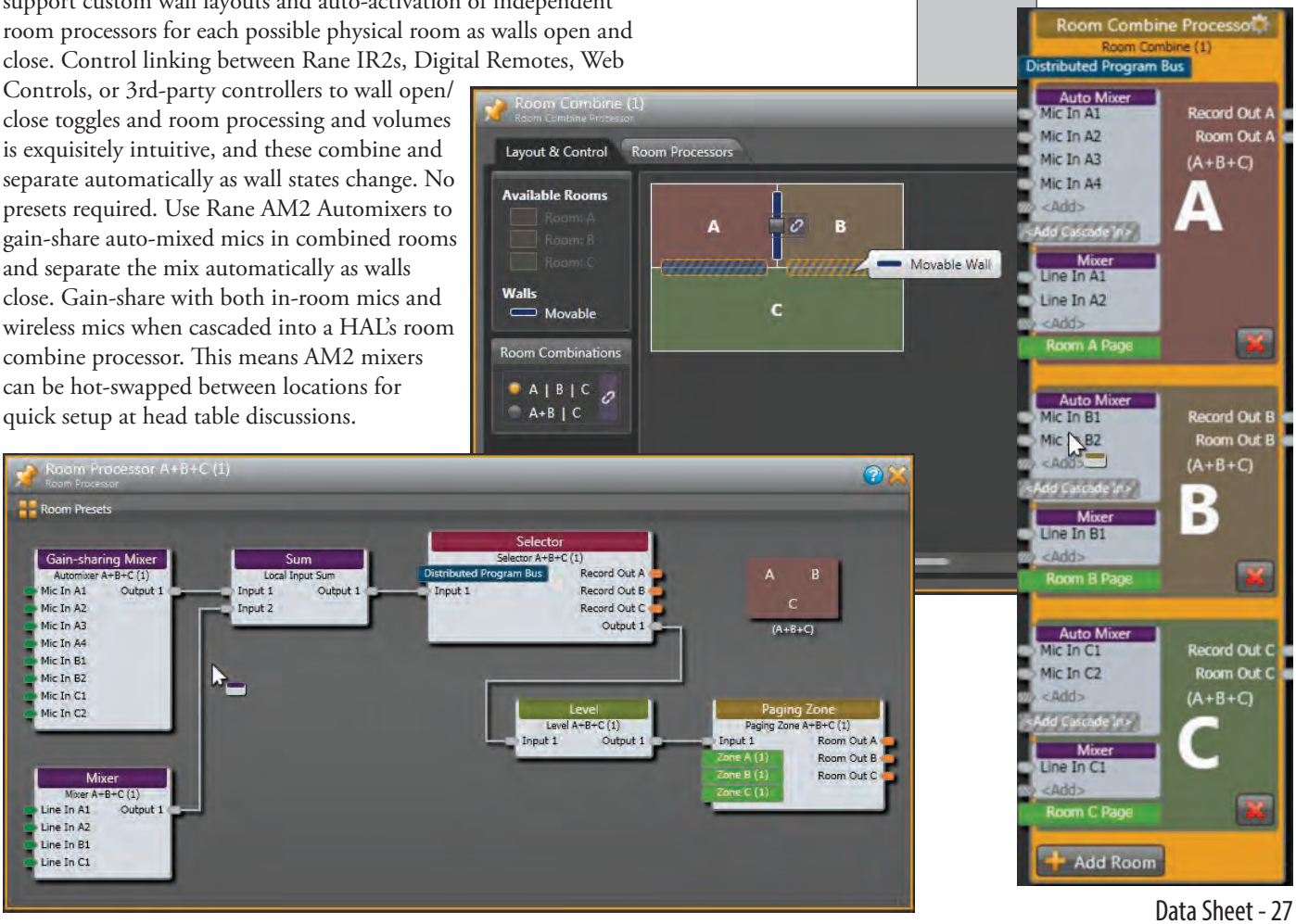
When mounted on opposite sides of the wall, green indicators on the IR2R and IR2S are always lit. Only when the door is open and the IR2R is receiving infrared from the sender does the IR2R's amber indicator light. Depending on the IR2 mounting height and your eyeglass prescription, these indicators can usually be viewed from the floor.

For an IR2 remote to control audio, the IR2 requires a connection to a HAL2, or to a DR4 connected to any HAL loaded with a suitable configuration. When doors or movable partitions are opened or closed the IR2 automatically detects this, and the audio system reconfigures itself appropriately and automatically. The IR2 will operate up to 1.5 meters (5 feet) apart. See the IR2 Specifications on page 56.



Room Combining with the IR2

Both Room Combine Processors (regular and conferencing) support custom wall layouts and auto-activation of independent room processors for each possible physical room as walls open and close. Control linking between Rane IR2s, Digital Remotes, Web Controls, or 3rd-party controllers to wall open/close toggles and room processing and volumes is exquisitely intuitive, and these combine and separate automatically as wall states change. No presets required. Use Rane AM2 Automixers to gain-share auto-mixed mics in combined rooms and separate the mix automatically as walls close. Gain-share with both in-room mics and wireless mics when cascaded into a HAL's room combine processor. This means AM2 mixers can be hot-swapped between locations for quick setup at head table discussions.



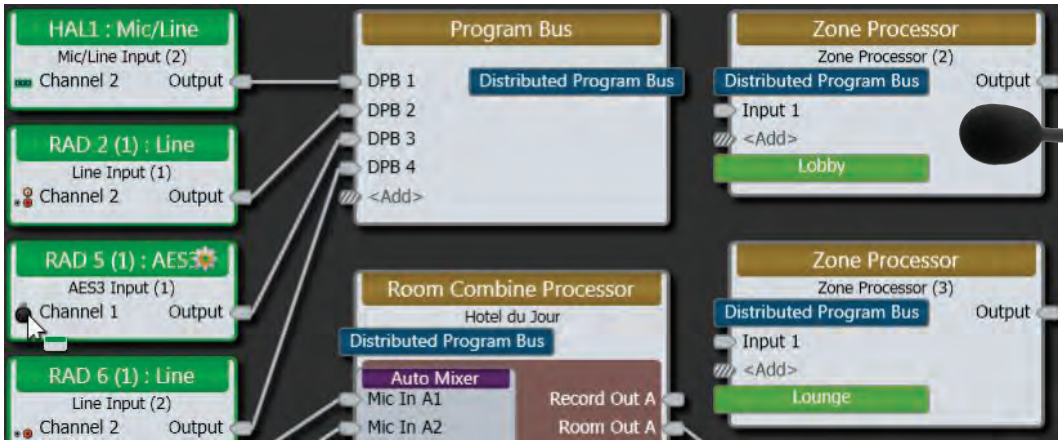
PAGER1 Paging Station

This RAD is a mic preamp with a paging zone(s) [Scenario] selector with integrated push-to-talk switch. Busy, Caution and Ready indicators inform end users when priorities clash. It accepts any standard gooseneck mic (not included) and has built-in selectable 24 V Phantom Power and a 13 dB pad. It normally sits on a desk or table, and has lockdown features for device and microphone security. See the PAGER1 Station Specifications on page 51.

Multizone Paging with the PAGER1

DISTRIBUTED PROGRAM BUS

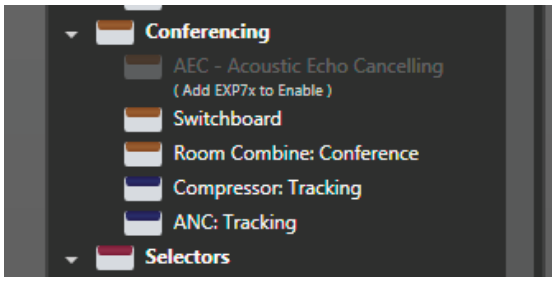
Wiring system-wide background music sources into the single Distributed Program Bus automatically wires all music sources to every output zone — even if there are hundreds of zones and dozens of background music sources. The blue Distributed Program Bus label in the Halogen processing map represents bus output and input to blocks.



PAGING STATION AND ZONES

Paging Station and PAGER1 input DSP blocks automatically connect input page sources (lime green labels) to zones requiring paging. Thus, wiring from all page sources through the Paging Manager to all page zones – including rooms that combine – is automatic. The Paging Manager easily maps all page sources to any combination of zones when using the Paging Zone, Emergency Page, Zone Processor and Room Combine Processor blocks.

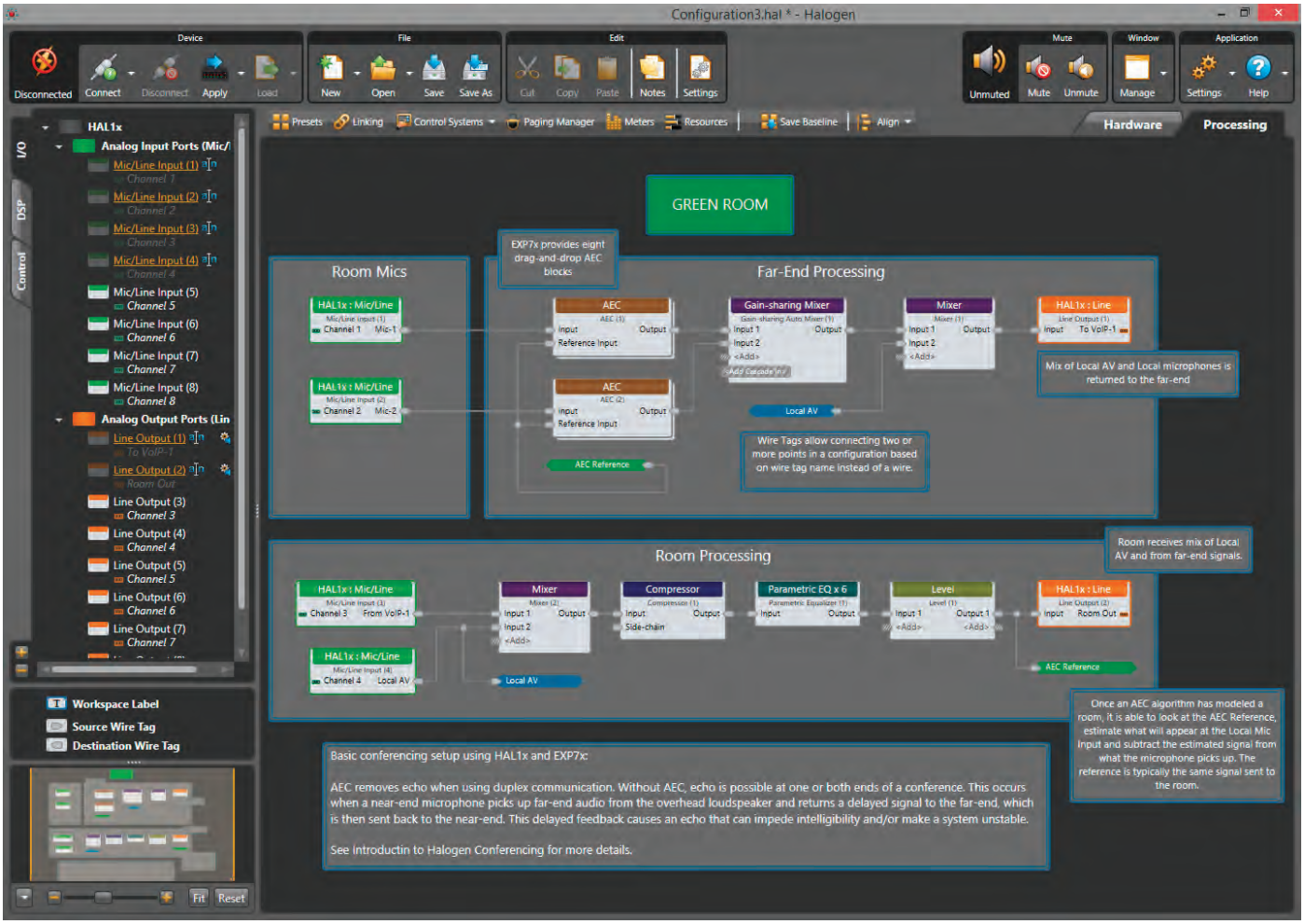
Acoustic Echo Canceling (AEC) with the EXP7x



After adding an EXP7x to a HAL1x, new Conferencing blocks are made available in the DSP Processing Tab (above). Now, eight AEC blocks can be placed. When these are all utilized, the AEC Block is grayed out with a hover-tool-tip indicating a need to add another EXP7x to acquire eight more AEC blocks.

AEC Block and Controls (right)

Conferencing Processing Example (below)



Conference Switchboard

The Conference Switchboard block supports dynamic routing of Far End Audio sources. This block is useful when more than one room must share a single VoIP or Video Conference resource. It's also useful when a room needs to access one or more remote rooms on a campus in order to include them in a conference. In some cases a combination of these scenarios is required.

The function of the Conference Switchboard could be accomplished using a standard matrix mixer, but that would require a user to avoid disallowed routing (like 1:1 or 2:2 etc.), and ensure that To and From Far End pairs are correctly wired. This Conference Switchboard simplifies the process.

Multi-Channel Processing Blocks

In order to get the best performance from an AEC application, the same signal processing parameters used to feed a room loudspeaker must be applied to the AEC reference signal as well. To simplify this process, special blocks that mirror the processing for room and reference channels include:

- Tracking Compressor
- Tracking ANC
- Multi-Channel PEQ
- Multi-Channel Shelf

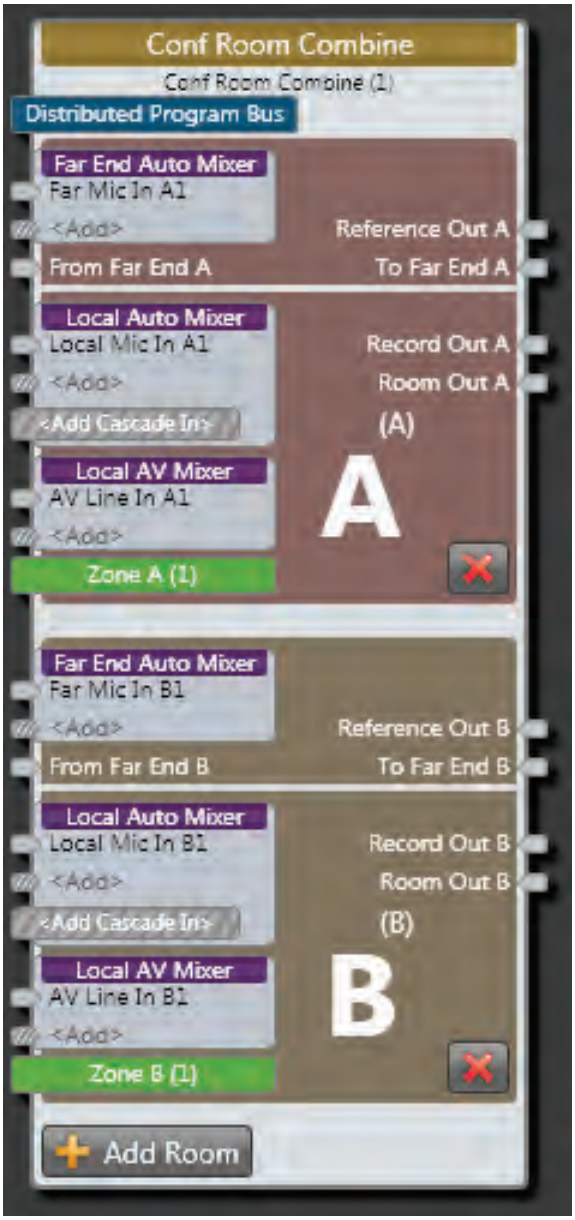
Conference Room Combine Block

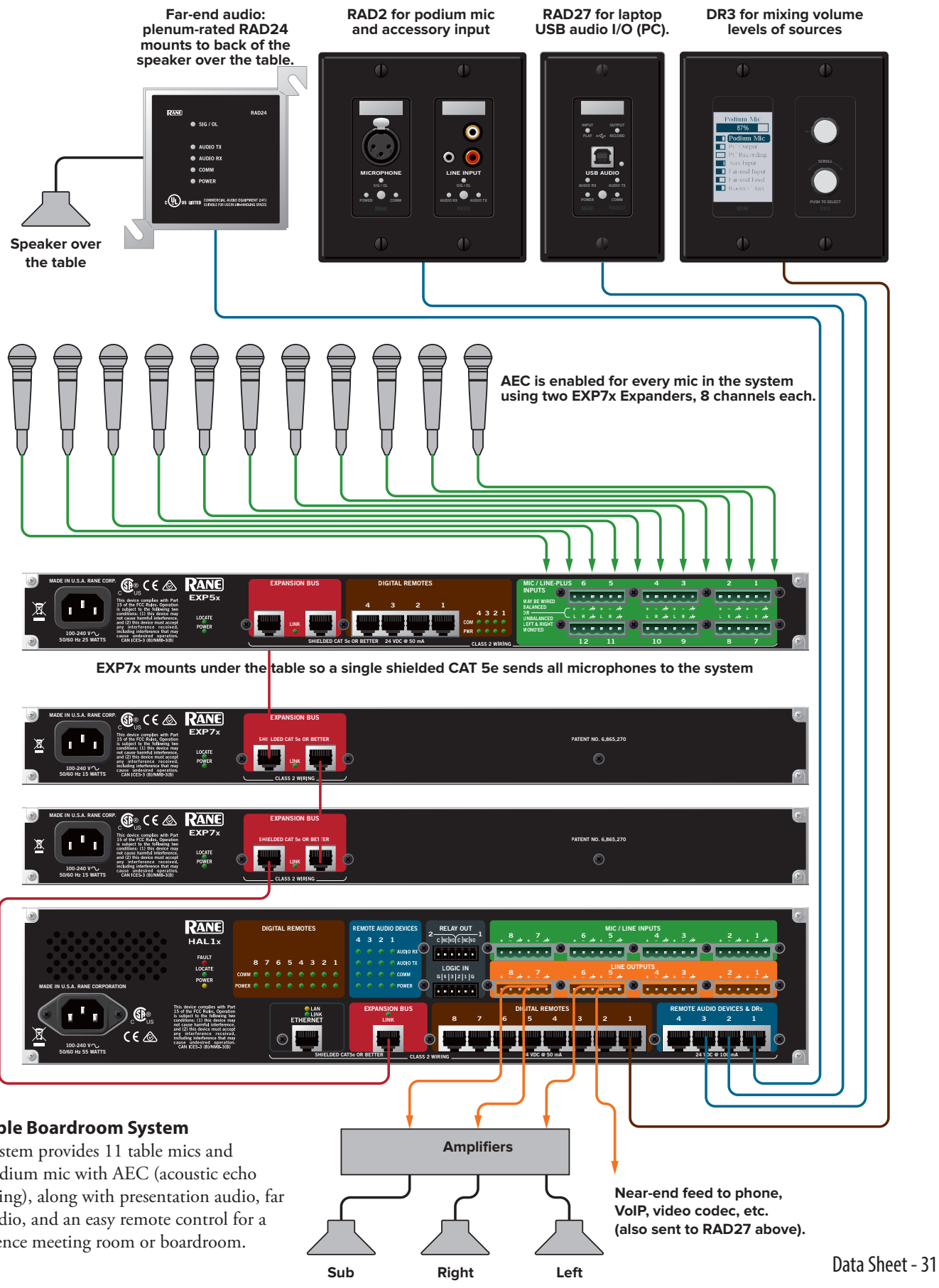
Conferencing in a room combine environment is a complex task without a specialized Room Combine Processor designed to handle room mix, far-end mix and AEC reference routing. Halogen's unique ability to do conferencing within a room combine scenario without complex wiring and routing makes it easy.

Halogen provides a highly integrated Conference Room Combine block that greatly simplifies conferencing in a room combine configuration. The block combines room sources, selects a proper reference, and sends audio to appropriate locations as rooms combine. It also provides support for maintaining a proper AEC Reference with local Voice Lift.

This block supports unique mixes from Record and Room outputs. An independent AEC Reference Output is provided for each room to accommodate various microphone locations and unique room processing outside the Conference Room Combine block.

Also inherently provided in this block are support for background music selection and paging per room.

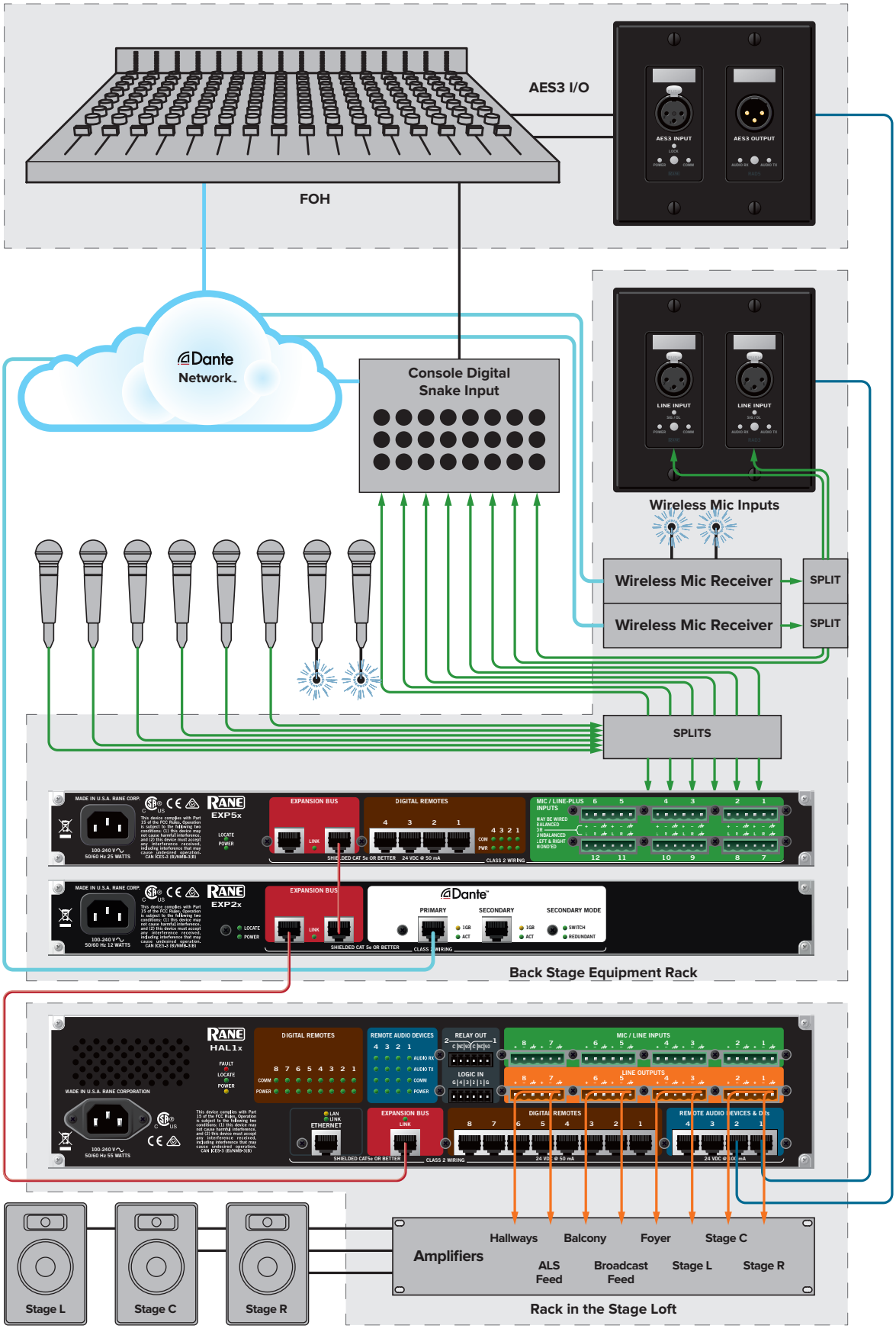




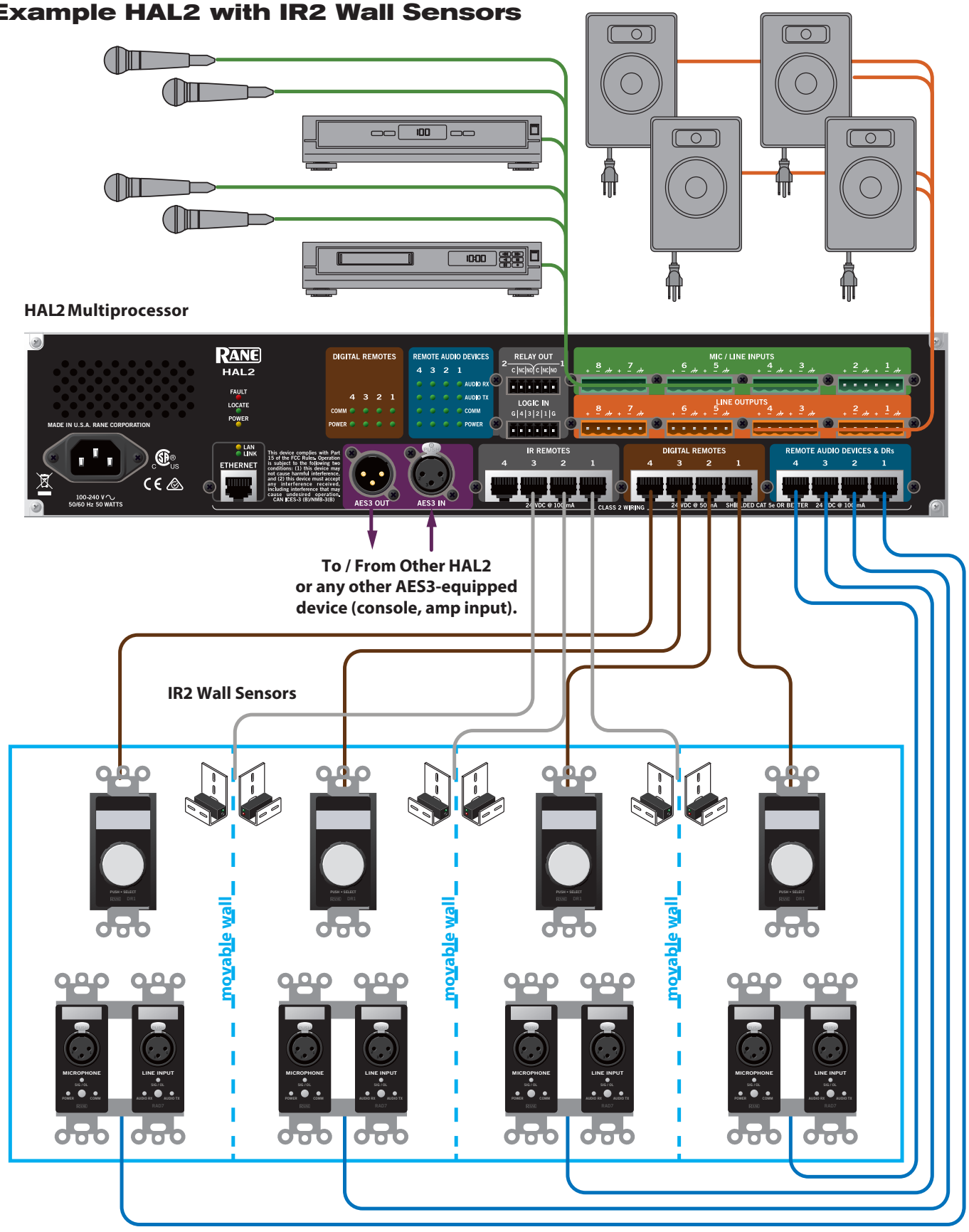
Example Boardroom System

This system provides 11 table mics and one podium mic with AEC (acoustic echo cancelling), along with presentation audio, far end audio, and an easy remote control for a conference meeting room or boardroom.

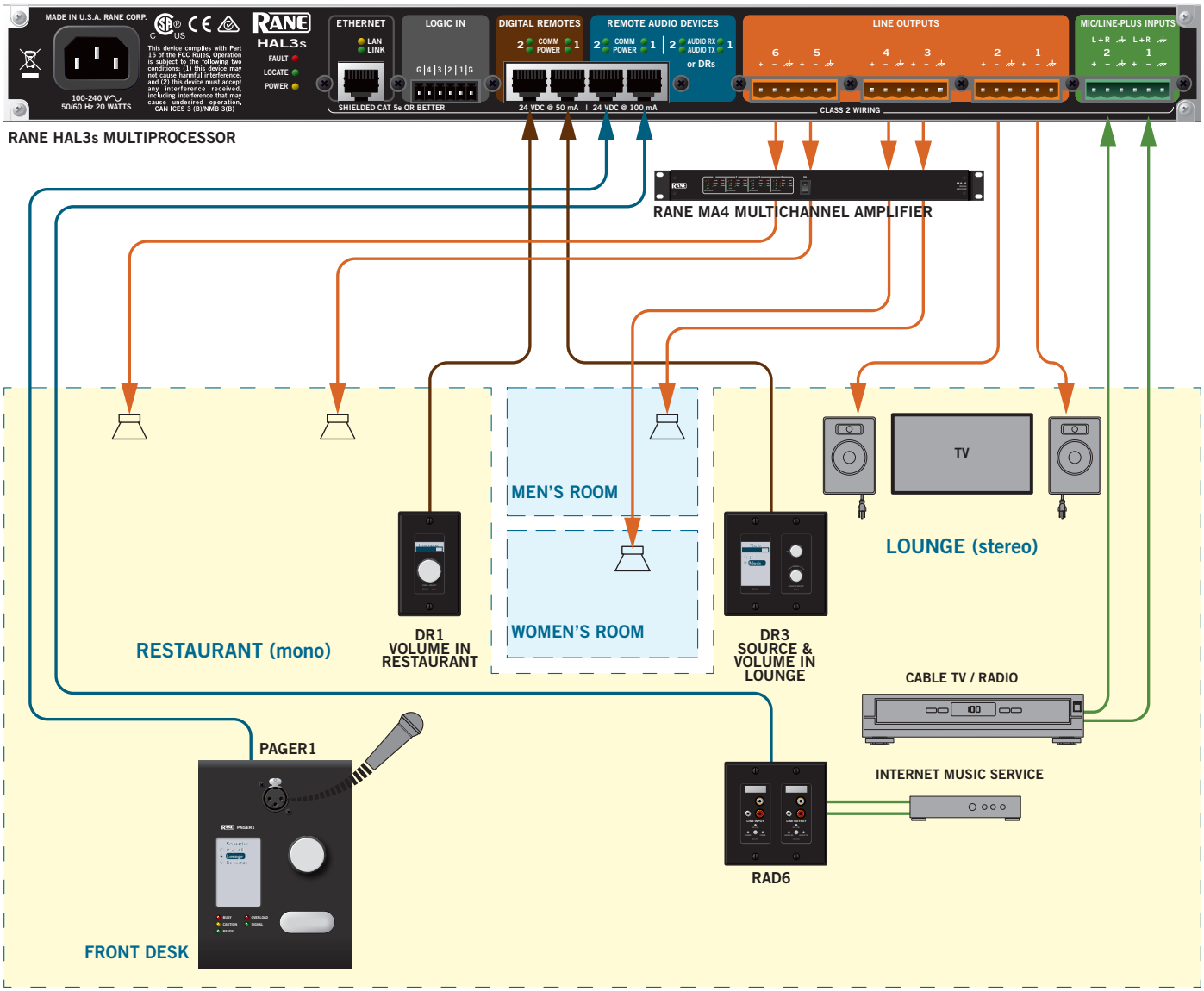
Example HAL1x Theater Application with Dante



Example HAL2 with IR2 Wall Sensors



Example HAL3s Restaurant Music and Paging System

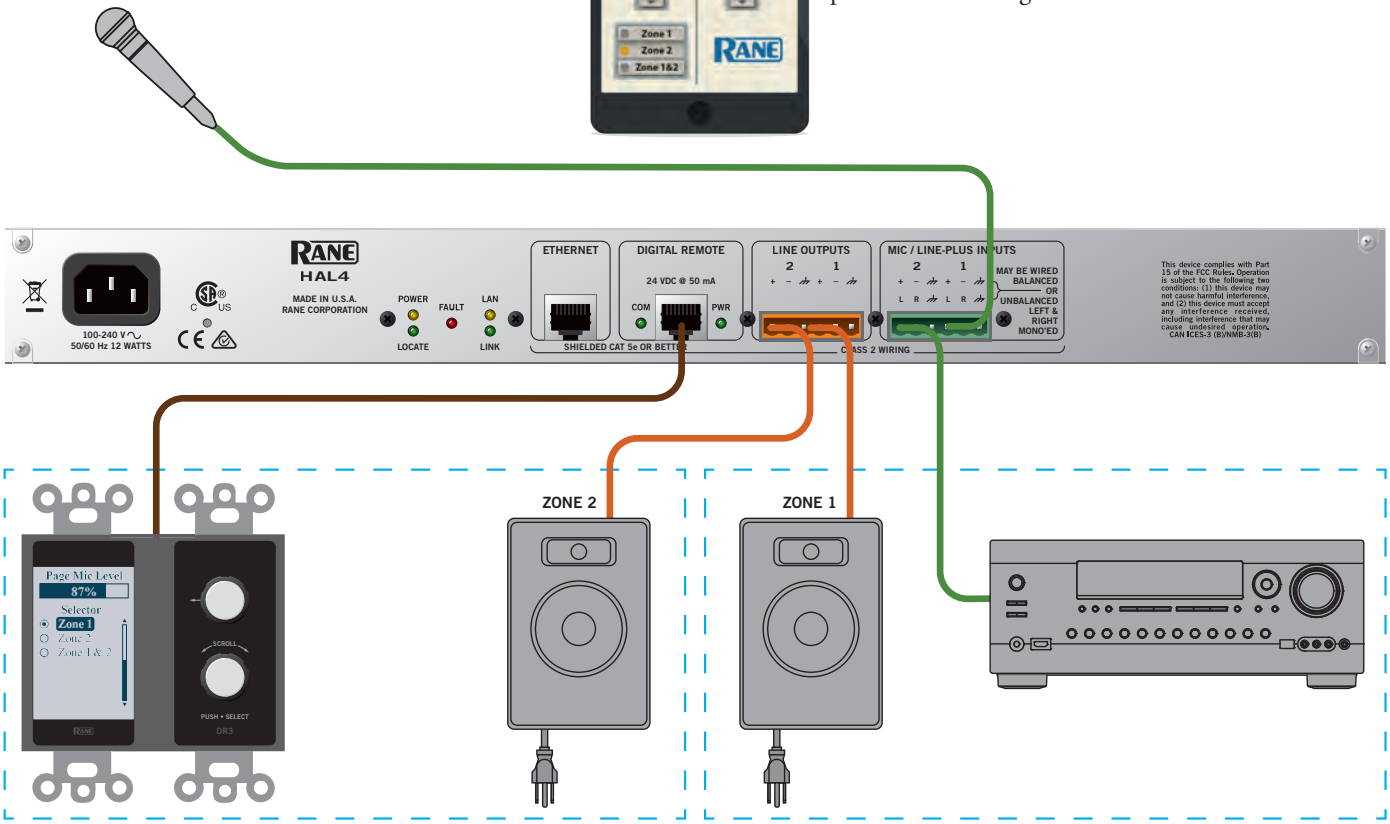


- The 2 Mic / Line-Plus Inputs (green) may be wired as "+4 dBu balanced" or "-10 dBV unbalanced Left/Right Monoed."
- A RAD14 located in the bar adds 1 optional mic, an easy place to plug in a phone to play MP3s, and provides two balanced outputs for remote powered speakers that can be unplugged and put away when not in use.
- The PAGER1 is located near the entrance with scenarios to:
  - Page the bar when a table is ready in the restaurant,
  - Page the restaurant when someone is needed at the bar.
  - Page the entire restaurant.
- DR3 Source and Level Remotes are located in each area, with easy source selection and volume.
- A simple analog switch is provided in the kitchen to turn music on or off. An SPDT switch could select which source is played.
- The MA4 Multichannel Amplifier provides four channels @ 100W, and the MT4 provides transformers for distributed speakers.

Example HAL4 Music and Paging System

- 2-zone background music and paging
- 1-source stereo or 2-source mono system

Web Controls use the browser in any smartphone, tablet or laptop to control volume, source or any parameter in Halogen.



Application Notes

Background Music Input: Line-plus mode sums together a left/right stereo pair of inputs into one mono channel.

A **Compressor** block is added with a -30 dB threshold and a ratio of 2:1 for background music comfort, fully adjustable.

Page Mic Input: In Condenser Mode, +48 V phantom power is enabled. The "Active/Inactive" toggle from the Voice Detect Block is linked to the Paging Station block "Talk" input. When the input on the Voice Detect block crosses the input threshold, the page will start.

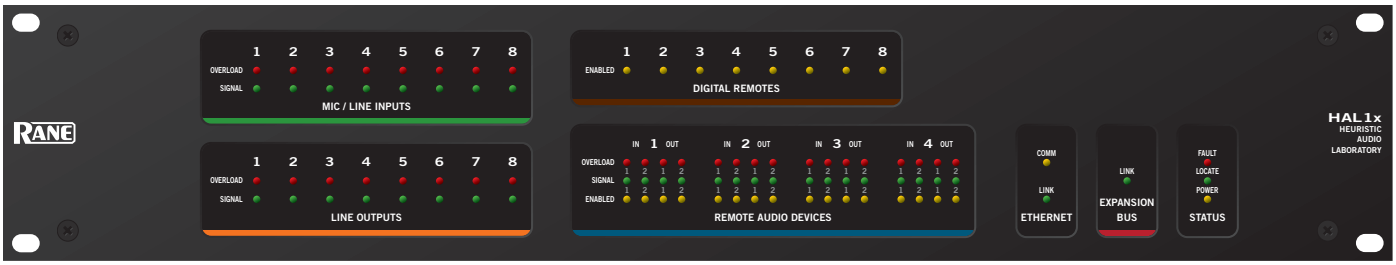
Paging: Use the "Paging Manager" to connect Paging Stations to Paging Zones. Page Mic 1 can currently page into Zone 1, Zone 2 or both simultaneously.

Linking: A DR3 remote selector is linked to the Paging Station selector so a user may choose which zones are receiving a page. A DR3 remote level is linked to the Page Level so a user may adjust the volume of the page (in all zones). See the "Linking" panel for a list of all control links.

An **Output Limiter** block is added with a -6 dB threshold for speaker protection, fully adjustable.

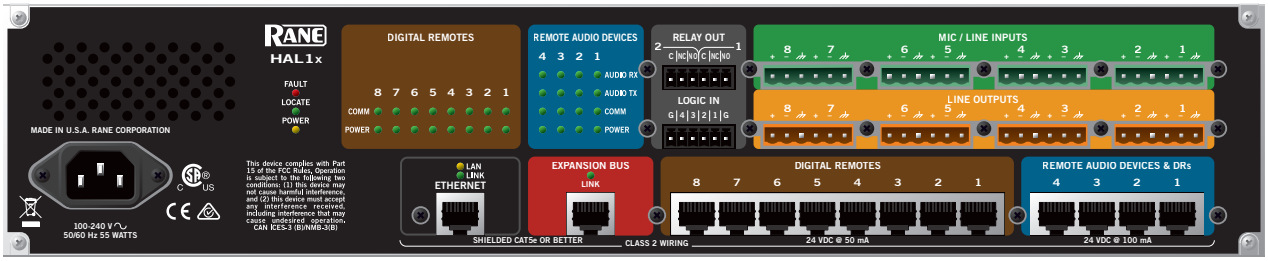
This configuration is included with Halogen for you to customize. Select File > New > Choose Starter Configuration > VoiceDetect Paging.

Specifications



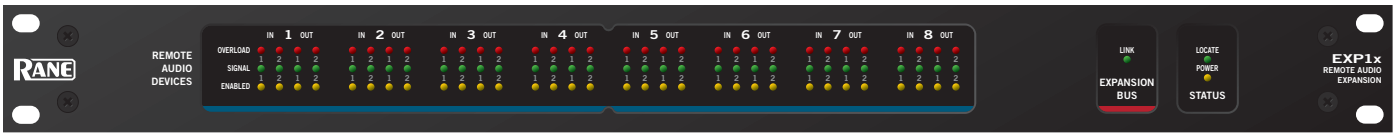
HAL1x Specifications

Parameter	Specification	Limit	Conditions/Comments
Analog I/O	8 x 8		
...Connectors	Euroblock		4 x 6-pin, 5 mm pitch, Green = Inputs, Orange = outputs
...CODEC	24-bit, 48 kHz		
Mic Inputs	Active Balanced		
...Gain Settings	+10 to +60 dB		1 dB steps
...Input Impedance	2.6 kΩ	1%	1 kHz, each leg to ground
...Phantom Power	+48 VDC		10 mA max per input
...Equivalent Input Noise	-127 dBu	max	20-20k Hz, 150 Ω source, 60 dB gain, A-weighted
...THD+N	< 0.008 %	typ	20-20k Hz, +4 dBu, +10 dB gain, 20 kHz BW
...Maximum Input	3 dBV (1.4 Vrms)	typ	Input gain at +10 dB, 1 kHz, < 1% THD+N
...CMRR	55 dB	min	1 kHz
Line Inputs	Active Balanced		
...Gain Settings	Unity & +10 to +20 dB		1 dB steps from +10 to +20
...Input Impedance	5.1 kΩ	1%	1 kHz, each leg to ground
...THD+N	< 0.008 %	typ	20-20k Hz, +4 dBu, unity gain, 20 kHz BW
...Maximum Input	20.8 dBu	typ	Input gain at 0 dB, 1 kHz, <1% THD+N
...CMRR	45 dB	min	1 kHz
...Frequency Response	20-20k Hz, +0, -.05 dB		+4 dBu, unity gain
...Dynamic Range	109 dB	max	re +20 dBu, 20 kHz BW, A weighted, Rs = 150 Ω
...Interchannel Isolation	104 dB	max	20-20k Hz, +20 dBu, unity gain, channel-to-channel
Outputs	Active Balanced		
...Impedance	200 Ω	1%	Each leg
...Maximum Output	+20.9 / +16.4 dBu	typ	1 kHz, 100 kΩ / 600 Ω load
...Frequency Response	20-20k Hz, +0.1 / -0.3 dB		+4 dBu, unity gain, 100 kΩ load
...Dynamic Range	109 dB	max	re +20 dBu, 20 kHz BW, A-weighted, 100 kΩ load
...Interchannel Isolation	110 dB	typ	20-20k Hz, +20 dBu, channel-to-channel, 100 kΩ load
Indicators			
...Signal	-50 dBFS	typ	Green LED, peak-reading
...Overload	-0.5 dBFS	typ	Red LED, peak-reading
Propagation Delays			See the graphic on page 6.
...RAD In to RAD Out	1.71 ms	typ	Tested with RAD23
...RAD In to Analog Out	1.85 ms	typ	
...Analog In to RAD Out	2.25 ms	typ	
...Analog In to Analog Out	2.39 ms	typ	
DSP			
...HAL1x Processing Power	9600 MIPS	max	4 DSPs @ 300 MHz each with up to 8 instructions / cycle
...Word Length	32 / 64-bit Floating Point		
...HAL1x Delay Memory	80 seconds	max	



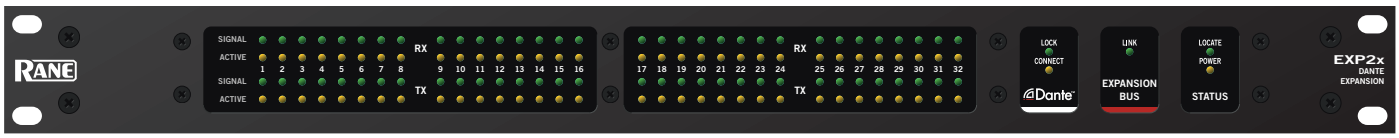
Parameter	Specification	Limit	Conditions/Comments
Computer Interface: Type	Ethernet 1000 base-T		Zeroconf service discovery protocol for easy set up
...Cable	Shielded CAT 5e or better		RJ-45 connector
...Length	100 meters / 300 feet	max	Standard Ethernet cable length limit
HAL1x Expansion Bus	Not on other HAL models		Shielded CAT 5e cable with RJ-45 connectors
...Audio Channels	512 in x 512 out of HAL1x	max	Plus control channel
...Maximum EXP Units	32	max	Daisy-chain
...Maximum Cable Length	100 meters / 300 feet	max	Per "hop." See HAL1x Expansion Bus on page 6.
...Propagation Delay “hop”	730 ns	typ	In and Out of Expansion Unit – 22.4 µs across 32 EXPs.
RAD Ports	4		RJ-45 connectors
...Audio Channels	8 in x 8 out		Each port 2 in x 2 out, plus control channel, 24-bit, 48 kHz
...Power	24 VDC @ 100 mA	max	Each port
...Length	150 meters / 500 feet	max	Shielded CAT 5e cable or better
HAL1x DR Ports	8		RJ-45 connectors
...Power	24 VDC @ 50 mA	max	Each port
...Length	300 meters / 1000 feet	max	Shielded CAT 5e cable or better
Relay Outputs	2		
...Connector	Mini Euroblock		6-pin, 3.81 mm pitch, Black
...Type	COM, NC & NO		
...Limit	2 A, 48 V	max	60 W max switching power
Logic Inputs	4		
...Connector	Mini Euroblock		6-pin, 3.81 mm pitch, Black
...Type	Internal passive pull-up		Protected to +24 V
...Vin High	> 2.2 V	min	Normal state
...Vin Low	< 1.0 V	max	External circuit sinks > 22 µA to assert
Wiring	Class 2		All rear panel terminals
Power Requirement	100 to 240 VAC		50/60 Hz, 50W max
Ambient Room Temp.	40 °C	max	Maximum external loading
Unit: Conformity	CE, FCC, cCSAus		
Unit: Size	2U, 3.5"H x 19"W x 8.25"D		(8.9 cm x 48.3 cm x 20.9 cm)
...Weight	7 lb		(3.2 kg)
Shipping: Size	6.5" x 20.3" x 13.75"		(11.5 cm x 52 cm x 35 cm)
...Weight	10 lb		(4.5 kg)

Specifications



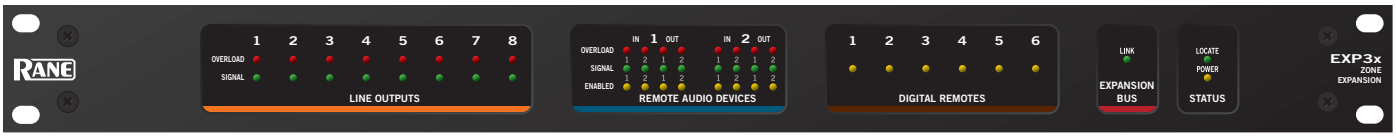
EXP1x Specifications

Parameter	Specification	Limit	Conditions/Comments
Expansion Bus	HAL1x is required		Shielded CAT 5e cable with RJ-45 connectors
...Audio Channels	512 in x 512 out of HAL1x	max	Plus control channel
...Maximum EXP1x Units	32	max	Daisy-chain with shielded CAT 5e or better
...Maximum Cable Length	100 meters / 300 feet	max	
RAD / DR Ports	8		RJ-45 connectors
...RAD Audio Channels	16 in x 16 out		Each port 2 in x 2 out, plus control channel, 24-bit, 48 kHz
...RAD Cable Length	150 meters / 500 feet	max	Shielded CAT 5e cable or better
...DR Cable Length	300 meters / 1000 feet	max	Shielded CAT 5e cable or better
...Power	24 VDC @ 100 mA	max	Each port
Wiring	Class 2		All rear panel terminals
Power Requirement	100 to 240 VAC		50/60 Hz, 35 W max
Unit: Conformity	CE, FCC, cCSAus		
Unit: Size	1U, 1.75" x 19" x 8.25"		(4.4 x 48.3 x 20.9 cm)
...Weight	4 lb 6 oz		(2.0 kg)
Shipping Size	6.5" x 20.3" x 13.75"		(11.5 x 52 x 35 cm)
...Weight	8 lb		(4.5 kg)



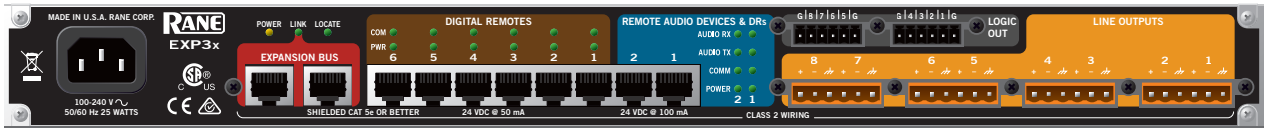
EXP2x Specifications

Parameter	Specification	Limit	Conditions/Comments
Expansion Bus	HAL1x is required		Shielded CAT 5e cable with RJ-45 connectors
...Audio Channels	512 in x 512 out of HAL1x	max	Plus control channel
...Maximum EXP2x Units	16 (all channels used)	max	Daisy-chain with shielded CAT 5e or better
...Maximum Cable Length	100 meters / 300 feet	max	
Dante Network			May use **un**shielded CAT 5e cable
...Sample Rates	44.1, 48, 88.2 or 96 kHz		Adjustable using Dante Controller
...TX Channels	32		At any supported sample rate, yes, even 96 kHz
...RX Channels	32		At any supported sample rate, yes, even 96 kHz
...Secondary Dante Port Modes	Switch or Redundant		
...Latency Support	250 µS, 500 µS, 1 mS, 2 mS, or 5 mS		Set in Dante controller
Wiring	Class 2		All rear panel terminals
Power Requirement	100 to 240 VAC		50/60 Hz, 12 W max
Unit: Conformity	CE, FCC, cCSAus		
Unit: Size	1U, 1.75" x 19" x 8.25"		(4.4 x 48.3 x 20.9 cm)
...Weight	4 lb 6 oz		(2.0 kg)
Shipping Size	6.5" x 20.3" x 13.75"		(11.5 x 52 x 35 cm)
...Weight	8 lb		(4.5 kg)



EXP3x Specifications

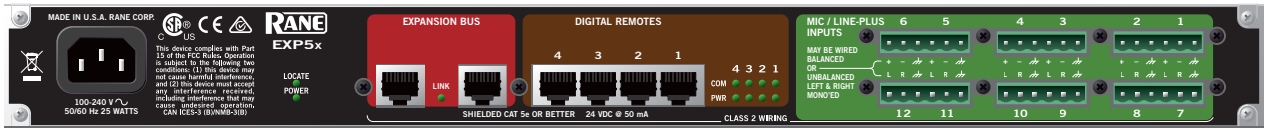
Parameter	Specification	Limit	Conditions/Comments
Expansion Bus	HAL1x is required		Shielded CAT 5e cable with RJ-45 connectors
...Audio Channels	512 in x 512 out of HAL1x	max	Plus control channel
...Maximum EXP3x Units	32	max	Daisy-chain with shielded CAT 5e or better
...Maximum Cable Length	100 meters / 300 feet	max	
Line Outputs	8 Balanced Outputs		Euroblock, 4 x 6-pin, 5 mm pitch, orange
...DAC	24-bit, 48 kHz		
...Maximum Output	+20 dBu / +16 dBu		10 kΩ / 600 Ω, 1 kHz
...Dynamic Range	107 dB	typ.	A-weighted
...Frequency Response	20 Hz to 20 kHz, +0.1 / -0.3 dB		+4 dBu, unity gain, 10 kΩ load
...Impedance	200 Ω / leg	typ.	@ 1 kHz
...Inter-channel Isolation	>100 dB	typ.	@ 1 kHz
...Signal Indicators	-50 dBFS	typ.	Green LED
...Overload Indicators	-0.5 dBFS	typ.	Red LED
Propagation Delays			
...Exp. Bus to Line Out	793 µs		
...RAD In to Exp Bus	466 µs		
...Exp. Bus to RAD Out	520 µs		
RAD / DR Ports	2 RAD / 6 DR		RJ-45 connectors
...RAD Audio Channels	4 in x 4 out		
...RAD Cable Length	150 meters / 500 feet		Shielded CAT 5e or better
...RAD Power	24 VDC @ 100 mA	max	Each Port
...DR Cable Length	300 meters / 1000 feet		Shielded CAT 5e or better
...DR Power	24 VDC @ 50 mA		
Logic Output Port			Mini Euroblock x 2, 6-pin, 3.81 mm pitch, black
...Internal Pull-up	1.0 kΩ, 5.0 V		Protected to +30 V, reverse polarity protected
...Sink Current	200 mA	max	Output FET on
...LED Drive Current	LED Drive Current 2 mA		Output FET off, Vf = 2.0 V
...Logic High Output Voltage	4.7 V	min	Output FET off, Output Current 0.0 mA
...Logic Low Output Voltage	0.1 V	max	Output FET on, Sink Current < 200 mA
Power Requirement	100 to 240 VAC		50/60 Hz, 25 W max
Unit: Conformity	CE, FCC, cCSAus		
Unit: Size	1U, 1.75" x 19" x 8.25"		(4.4 x 48.3 x 20.9 cm)
...Weight	4 lb 10 oz		(2.1 kg)
Shipping Size	6.5" x 20.3" x 13.75"		(11.5 x 52 x 35 cm)
...Weight	8 lb		(4.5 kg)



Specifications

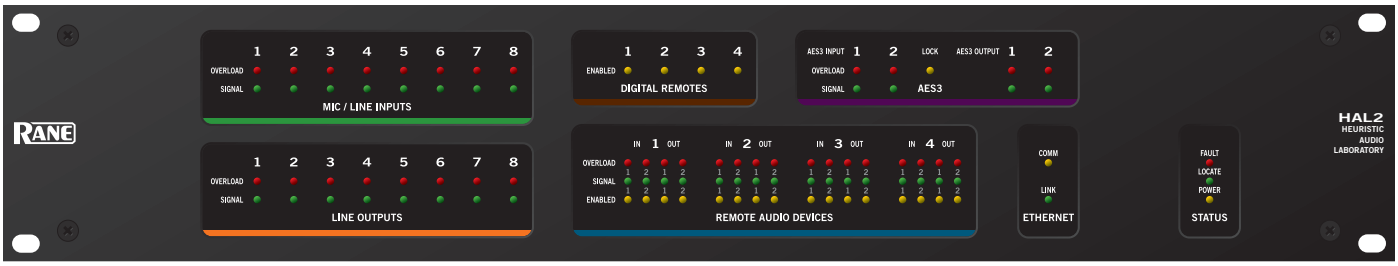
EXP5x Specifications

Parameter	Specification	Limit	Conditions/Comments
Expansion Bus	HAL1x is required		Shielded CAT 5e cable with RJ-45 connectors
...Audio Channels	512 in x 512 out of HAL1x	max	Plus control channel
...Maximum EXP5x Units	32	max	Daisy-chain with shielded CAT 5e or better
...Maximum Cable Length	100 meters / 300 feet	max	
Mic / Line / Line+ Inputs	12 Balanced Inputs		Euroblock, 4 x 6-pin, 5 mm pitch, green
...ADC	24-bit, 48 kHz		
...Line Input	4 Vrms / 12 dBV	min	1 kHz
...Line-Plus Input (L+R Mono)	4 Vrms / 12 dBV	min	1 kHz, Sum of Left and Right
...Condenser Mic Input	500 mVrms / -6 dBV	min	1 kHz, 48 V phantom power
...Dynamic Mic Input	127 mVrms / -18 dBV	min	1 kHz
...Dynamic Range	101 dB	typ.	A-weighted
...Frequency Response	20 Hz to 20 kHz, +0.1 / -0.3 dB		+4 dBu, unity gain, 10 kΩ load
...Input Impedance	5.766 kΩ / 2.9 kΩ	typ.	Balance / Each leg, @ 1 kHz
...Inter-channel Isolation	>100 dB	typ.	@ 1 kHz
...CMRR	55 dB	min	1 kHz
...Signal Indicators	-50 dBFS	typ.	Green LED
...Overload Indicators	-0.5 dBFS	typ.	Red LED
Propagation Delay	758 µs		Analog In to Exp Bus
DR Ports	2		RJ-45 connectors
...DR Cable Length	300 meters / 1000 feet		Shielded CAT 5e or better
...DR Power	24 VDC @ 50 mA		
Wiring	Class 2		
Ambient Room Temperature	45°C	max	
Power Requirement	100 to 240 VAC		50/60 Hz, 25 W max
Unit: Conformity	CE, FCC, cCSAus		
Unit: Size	1U, 1.75" x 19" x 8.25"		(4.4 x 48.3 x 20.9 cm)
...Weight	4 lb 10 oz.		(2.1 kg)
Shipping Size	6.5" x 20.3" x 13.75"		(11.5 x 52 x 35 cm)
...Weight	8 lb		(4.5 kg)



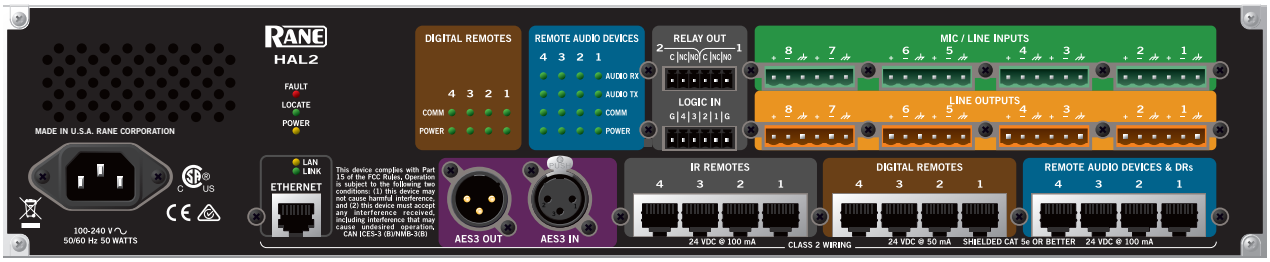
EXP7x Specifications

Parameter	Specification	Limit	Conditions/Comments
Expansion Bus	HAL1x is required		Shielded CAT 5e cable with RJ-45 connectors
...Audio Channels	512 in x 512 out of HAL1x	max	Plus control channel
...Maximum EXP7x Units	32	max	Daisy-chain with shielded CAT 5e or better
...Maximum Cable Length	100 meters / 300 feet	max	
AEC Processing	8 blocks		Add more EXP7x Expanders for up to 256 blocks
...Frequency Response	20 Hz to 20 kHz		
...Tail Length	300 ms		
...Propagation Delay	17 ms	max	
...Convergence Rate	100 dB per second		
Additional Processing			Included in each AEC block
...AGC			1 per AEC block
...Parametric Equalizer	5-band, + low- and high-cut		1 per AEC block
Wiring	Class 2		All rear panel terminals
Power Requirement	100 to 240 VAC		50/60 Hz, 15 W max
Unit: Conformity	CE, FCC, cCSAus		
Unit: Size	1U, 1.75" x 19" x 8.25"		(4.4 x 48.3 x 20.9 cm)
...Weight	4 lb 6 oz		(2.0 kg)
Shipping Size	6.5" x 20.3" x 13.75"		(11.5 x 52 x 35 cm)
...Weight	8 lb		(4.5 kg)



HAL2 Specifications

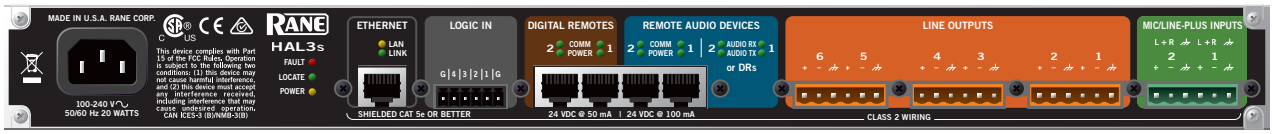
Parameter	Specification	Limit	Conditions/Comments
Analog I/O	8 x 8		
...Connectors	Euroblock		4 x 6-pin, 5 mm pitch, Green = Inputs, Orange = outputs
...CODEC	24-bit, 48 kHz		
Mic Inputs	Active Balanced		
...Gain Settings	+10 to +60 dB		1 dB steps
...Input Impedance	2.6 kΩ	1%	1 kHz, each leg to ground
...Phantom Power	+48 VDC		10 mA max per input
...Equivalent Input Noise	-127 dBu	max	20-20k Hz, 150 Ω source, 60 dB gain, A-weighted
...THD+N	< 0.008 %	typ	20-20k Hz, +4 dBu, +10 dB gain, 20 kHz BW
...Maximum Input	3 dBV (1.4 Vrms)	typ	Input gain at +10 dB, 1 kHz, < 1% THD+N
...CMRR	55 dB	min	1 kHz
Line Inputs	Active Balanced		
...Gain Settings	Unity & +10 to +20 dB		1 dB steps from +10 to +20
...Input Impedance	5.1 kΩ	1%	1 kHz, each leg to ground
...THD+N	< 0.008 %	typ	20-20k Hz, +4 dBu, unity gain, 20 kHz BW
...Maximum Input	20.8 dBu	typ	Input gain at 0 dB, 1 kHz, <1% THD+N
...CMRR	45 dB	min	1 kHz
...Frequency Response	20-20k Hz, +0, -.05 dB		+4 dBu, unity gain
...Dynamic Range	109 dB	max	re +20 dBu, 20 kHz BW, A weighted, Rs = 150 Ω
...Interchannel Isolation	104 dB	max	20-20k Hz, +20 dBu, unity gain, channel-to-channel
Outputs	Active Balanced		
...Impedance	200 Ω	1%	Each leg
...Maximum Output	+20.9 / +16.4 dBu	typ	1 kHz, 100 kΩ / 600 Ω load
...Frequency Response	20-20k Hz, +0.1 / -0.3 dB		+4 dBu, unity gain, 100 kΩ load
...Dynamic Range	109 dB	max	re +20 dBu, 20 kHz BW, A-weighted, 100 kΩ load
...Interchannel Isolation	110 dB	typ	20-20k Hz, +20 dBu, channel-to-channel, 100 kΩ load
Indicators			
...Signal	-50 dBFS	typ	Green LED, peak-reading
...Overload	-0.5 dBFS	typ	Red LED, peak-reading
Propagation Delays			See the Latency graphic.
...RAD In to RAD Out	1.71 ms	typ	Tested with RAD23
...RAD In to Analog Out	1.85 ms	typ	
...Analog In to RAD Out	2.25 ms	typ	
...Analog In to Analog Out	2.39 ms	typ	
...HAL2 AES3 In to AES3 Out	2.50 ms	typ	AES3 input accepts sample rates from 32 kHz to 192 kHz. These are converted to the 48 kHz within HAL.



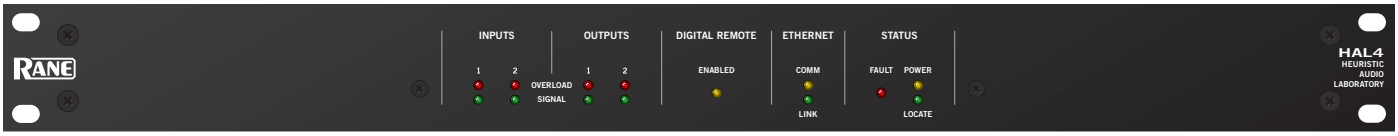
Parameter	Specification	Limit	Conditions/Comments
DSP			
...HAL2 Processing Power	4800 MIPS	max	2 DSPs @ 300 MHz each with up to 8 instructions / cycle
...Word Length	32 / 64-bit Floating Point		
...HAL2 Delay Memory	40 seconds	max	
Computer Interface: Type	Ethernet 1000 base-T		Zeroconf service discovery protocol for easy set up
...Cable	Shielded CAT 5e or better		RJ-45 connector
...Length	100 meters / 300 feet	max	Standard Ethernet cable length limit
RAD Ports	4		RJ-45 connectors
...Audio Channels	8 in x 8 out		Each port 2 in x 2 out, plus control channel, 24-bit, 48 kHz
...Power	24 VDC @ 100 mA	max	Each port
...Length	150 meters / 500 feet	max	Shielded CAT 5e cable or better
HAL2 DR Ports	4		RJ-45 connectors
...Power	24 VDC @ 50 mA	max	Each port
...Length	300 meters / 1000 feet	max	Shielded CAT 5e cable or better
HAL2 IR Remote Ports	4		RJ-45 connectors
...Type	Compatible with IR2 remote		Protected to +24 V, reverse polarity protected
...Power	24 VDC @ 100 mA	max	Normal state
...Length	300 meters / 1000 feet	max	Shielded CAT 5e cable or better
Relay Outputs	2		
...Connector	Mini Euroblock		6-pin, 3.81 mm pitch, Black
...Type	COM, NC & NO		
...Limit	2 A, 48 V	max	60 W max switching power
Logic Inputs	4		
...Connector	Mini Euroblock		6-pin, 3.81 mm pitch, Black
...Type	Internal passive pull-up		Protected to +24 V
...Vin High	> 2.2 V	min	Normal state
...Vin Low	< 1.0 V	max	External circuit sinks > 22 µA to assert
Wiring	Class 2		All rear panel terminals
Power Requirement	100 to 240 VAC		50/60 Hz, 50W max
Ambient Room Temp.	40 °C	max	Maximum external loading
Unit: Conformity	CE, FCC, cCSAus		
Unit: Size	2U, 3.5"H x 19"W x 8.25"D		(8.9 cm x 48.3 cm x 20.9 cm)
...Weight	7 lb		(3.2 kg)
Shipping: Size	6.5" x 20.3" x 13.75"		(11.5 cm x 52 cm x 35 cm)
...Weight	10 lb		(4.5 kg)

HAL3s Specifications

Parameter	Specification	Limit	Conditions/Comments
Analog I/O	2 x 6		2 Mic / Line / Line-plus Inputs, 6 Line Outputs
...Connectors	Euroblock		4 x 6-pin, 5 mm pitch, Green = Inputs, Orange = outputs
...CODEC	24-bit, 48 kHz		
All Inputs			Common specifications
...Input Impedance	2.9 kΩ	1%	Each leg to ground
...Inter-channel isolation	>100 dB	typ	20-20k Hz, unity gain, channel-to-channel
...CMRR	55 dB	min	1 kHz
Inputs: Dynamic Mic Mode	Active Balanced		Microphone input mode without phantom power
...Gain	+30 dB to +50 dB	typ	+30 dB (analog gain), 1 dB steps to +50 dB (digital gain)
...THD+N	< 0.005 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Equivalent Input Noise	-120 dBu	typ	20-20k Hz, 150 Ω source, 30 dB gain
...Maximum Input	-18 dBV (125 mVrms)	typ	1 kHz, < 0.01% THD+N
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k Ω load, Mic Input to Output
Inputs: Condenser Mic Mode	Active Balanced		Microphone input mode with 48V phantom power
...Gain	+18 dB to +38 dB	typ	+18 dB (analog gain), 1 dB steps to +38 dB (digital gain)
...Phantom Power	+48 VDC		10 mA max per input
...THD+N	< 0.005 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Equivalent Input Noise	-110 dBu	typ	20-20k Hz, 150 Ω source, 18 dB gain
...Maximum Input	-6 dBV (500 mVrms)	typ	1 kHz, < 0.01% THD+N
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k Ω load, Mic Input to Output
Inputs: Line+ Mode	Active Summer		Left ("+") and Right ("-") signals summed to mono
...Gain	0 dB to +20 dB	typ	0 dB (analog gain), 1 dB steps to +20 dB (digital gain)
...THD+N	< 0.007 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Maximum Input	+14 dBu	typ	1 kHz, < 0.01% THD+N, each leg
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k Ω load, Line-plus Input to Output
...Dynamic Range (in to out)	108 dB	max	re +20 dBu, 20 kHz BW, A weighted, Rs = 50 Ω
Inputs: Line Mode	Active Balanced		Balanced line level input
...Gain	0 dB	typ	0 dB (analog gain), 1 dB steps to +20 dB (digital gain)
...THD+N	< 0.005 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Maximum Input	+14 dBu	typ	1 kHz, < 0.01% THD+N
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k Ω load, Line Input to Output
...Dynamic Range (in to out)	108 dB	max	re +20 dBu, 20 kHz BW, A weighted, Rs = 50 Ω
Outputs	Active Balanced		
...Impedance	200 Ω	1%	Each leg
...Maximum Output	+20.0 / +15.5 dBu	typ	1 kHz, 100 kΩ / 600 Ω load

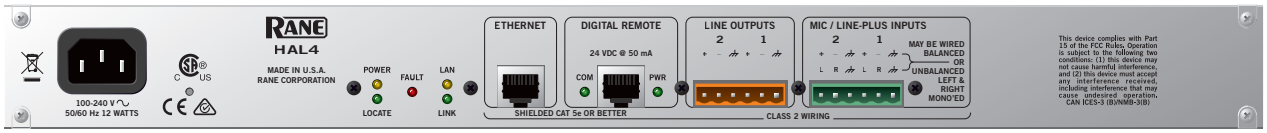


Parameter	Specification	Limit	Conditions/Comments
Indicators			
...Signal	-50 dBFS	typ	Green LED, peak-reading
...Overload	-0.5 dBFS	typ	Red LED, peak-reading
Propagation Delays			See the Latency graphic on page page 3.
...RAD In to RAD Out	1.71 ms	typ	Tested with RAD23
...RAD In to Analog Out	1.85 ms	typ	
...Analog In to RAD Out	2.25 ms	typ	
...Analog In to Analog Out	2.39 ms	typ	
DSP			
...Processing Power	2400 MIPS	max	1 DSP @ 300 MHz with up to 8 instructions / cycle
...Word Length	32 / 64-bit Floating Point		
...Delay Memory	20 seconds	max	
Computer Interface			
...Type	Ethernet 1000 base-T		Zeroconf service discovery protocol for easy set up
...Cable	Shielded CAT 5e or better		RJ-45 connector
...Length	100 meters / 300 feet	max	Standard Ethernet cable length limit
RAD Port	2		RJ-45 connectors
...Audio Channels	2 in x 2 out		Each port 2 in x 2 out, control channel, 24-bit, 48 kHz
...Power	24 VDC @ 100 mA	max	Each port
...Length	152 meters / 500 feet	max	Shielded CAT 5e cable or better
DR Ports	4		RJ-45 connectors
...Power	24 VDC @ 50 mA	max	Each port
...Length	300 meters / 1000 feet	max	Shielded CAT 5e cable or better
Logic Inputs	4		
...Connector	Mini Euroblock		6-pin, 3.81 mm pitch, Black
...Internal Pull-up	51.1 kΩ, 5.0 V		Protected to +24 V, reverse polarity protected
...Vin High	> 2.2 V	min	Normal state
...Vin Low	< 0.7 V	max	External circuit sinks > 22 µA to assert
Wiring	Class 2		All rear panel terminals
Power Requirement	100 to 240 VAC		50/60 Hz, 20 W max
Ambient Room Temp.	40 °C	max	Maximum external loading
Unit: Conformity	CE, FCC, cCSAus		
Unit: Size	1.73"H x 19"W x 8.25"D		(4.4 cm x 48.3 cm x 20.9 cm)
...Weight	4.75 lb		(2.2 kg)
Shipping: Size	6.5" x 20.3" x 13.75"		(16.5 cm x 52 cm x 35 cm)
...Weight	9 lb		(3.8 kg)



HAL4 Specifications

Parameter	Specification	Limit	Conditions/Comments
Analog I/O	2 x 2		2 Mic / Line / Line-plus Inputs, 2 Line Outputs
...Connectors	Euroblock		4 x 6-pin, 5 mm pitch, Green = Inputs, Orange = outputs
...CODEC	24-bit, 48 kHz		
All Inputs			Common specifications
...Input Impedance	2.9 kΩ	1%	1 kHz, each leg to ground
...Inter-channel isolation	>100 dB	typ	20-20k Hz, unity gain, channel-to-channel
...CMRR	55 dB	min	1 kHz
Inputs: Dynamic Mic Mode	Active Balanced		Microphone input mode without phantom power
...Gain	+30 dB to +50 dB	typ	+30 dB (analog gain), 1 dB steps to +50 dB (digital gain)
...THD+N	< 0.005 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Equivalent Input Noise	-120 dBu	typ	20-20k Hz, 150 Ω source, 30 dB gain
...Maximum Input	-18 dBV (125 mVrms)	typ	1 kHz, < 0.01% THD+N
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k Ω load, Mic Input to Output
Inputs: Condenser Mic Mode	Active Balanced		Microphone input mode with 48V phantom power
...Gain	+18 dB to +38 dB	typ	+18 dB (analog gain), 1 dB steps to +38 dB (digital gain)
...Phantom Power	+48 VDC		10 mA max per input
...THD+N	< 0.005 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Equivalent Input Noise	-110 dBu	typ	20-20k Hz, 150 Ω source, 18 dB gain
...Maximum Input	-6 dBV (500 mVrms)	typ	1 kHz, < 0.01% THD+N
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k Ω load, Mic Input to Output
Inputs: Line+ Mode	Active Summer		Left ("+") and Right ("-") signals summed to mono
...Gain	0 dB to +20 dB	typ	0 dB (analog gain), 1 dB steps to +20 dB (digital gain)
...THD+N	< 0.007 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Maximum Input	+14 dBu	typ	1 kHz, < 0.01% THD+N, each leg
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k Ω load, Line-plus Input to Output
...Dynamic Range (in to out)	108 dB	max	re +20 dBu, 20 kHz BW, A weighted, Rs = 50 Ω
Inputs: Line Mode	Active Balanced		Balanced line level input
...Gain	0 dB	typ	0 dB (analog gain), 1 dB steps to +20 dB (digital gain)
...THD+N	< 0.005 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Maximum Input	+14 dBu	typ	1 kHz, < 0.01% THD+N
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k Ω load, Line Input to Output
...Dynamic Range (in to out)	108 dB	max	re +20 dBu, 20 kHz BW, A weighted, Rs = 50 Ω
Outputs	Active Balanced		
...Impedance	200 Ω	1%	Each leg
...Maximum Output	+20.0 / +15.5 dBu	typ	1 kHz, 100 kΩ / 600 Ω load



Parameter	Specification	Limit	Conditions/Comments
Front Panel Indicators			
...Signal	-50 dBFS	typ	Green LED, peak-reading, 250 ms hold time
...Overload	-0.5 dBFS	typ	Red LED, peak-reading, 250 ms hold time
Propagation Delay	2.2 ms	typ	Analog in to analog out
DSP			
...HAL4 Processing Power	2100 MIPS	max	1 DSP @ 266 MHz with up to 8 instructions / cycle
...Word Length	32 / 64-bit Floating Point		
...HAL4 Delay Memory	20 seconds	max	
Computer Interface: Type	Ethernet 1000 base-T		Zeroconf service discovery protocol for easy set up
...Cable	Shielded CAT 5e or better		RJ-45 connector
...Length	100 meters / 300 feet	max	Standard Ethernet cable length limit
DR Port	1		RJ-45 connector
...Power	24 VDC @ 50 mA	max	
...Cable Length	300 meters / 1000 feet	max	Shielded CAT 5e cable or better
Wiring	Class 2		All rear panel terminals
Power Requirement	100 to 240 VAC		50/60 Hz, 12W max
Ambient Room Temp.	45 °C	max	Maximum external loading
Unit: Conformity	CE, FCC, cCSAus		
Unit: Size	1U, 1.73"H x 19"W x 8.25"D		(4.4 cm x 48.3 cm x 20.9 cm)
...Weight	4.8 lb		(2.2 kg)
Shipping: Size	6.5" x 20.3" x 13.75"		(16.5 cm x 52 cm x 35 cm)
...Weight	8.8 lb		(4.5 kg)

RAD Specifications (all models)

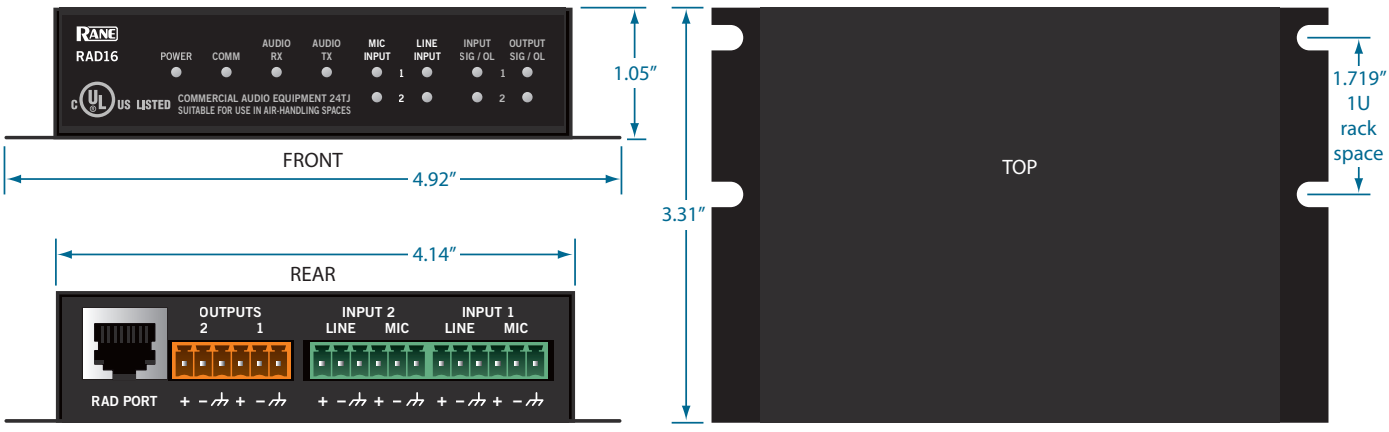
Parameter	Specification	Limit	Units	Conditions/Comments
Cable Length	150 meters / 500 feet			Shielded CAT 5e or better.
Signal Indicator	-50	typ.	dBFS	Unbalanced / balanced output, green LED, peak-reading
Overload Indicators	-0.5	typ.	dBFS	Unbalanced / balanced output, red LED, peak-reading
Unit: Conformity	CE, FCC			The RAD16 and RAD24 also conform to cULus

RAD1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 14, 15, 18, 23 Specifications

Parameter	Specification	Limit	Units	Conditions/Comments
Microphone Input Specs (Both XLR & Euro RADs)				
Input Impedance	2.16 k	1%	Ω	Balanced, 1.08 k + 1.08 k
Max. Input Level	-17	min.	dBu	Balanced, Gain = 26 dB, <1% THD
Equivalent Input Noise	-121	typ.	dBu	20 kHz BW, Rs = 150 Ω, Gain = 26 dB
Dynamic Range	98	typ.	dB	re: 0 dBFS, 20 kHz BW, A-weighted, Gain = 26 dB
CMRR	-70	typ.	dB	Rs = 150 Ω, 1 kHz, Gain = 26 dB
Frequency Response	30 to 20k	typ.	Hz	+0, -3dB, At All Gain Settings
THD+Noise	0.010% typ.	@ 1 kHz, 20 kHz BW, Rs = 150 Ω, Output = -6 dBFS, Gain = 26 dB		
Gain Range	26 to 60	typ.	dB	In 1 dB Steps
Phantom Power	+24	4%	V	15 mA Max.
Impedance	1.21 k	1%	Ω	Each Leg
Balanced Line-Level Output Specs (Active Balanced)				
Output Impedance	600	1%	Ω	Each Leg
Max. Output Level	18	min.	dBu	<1% THD, Load = 10 kΩ
Dynamic Range	103	typ.	dB	re: 0 dBFS, 20 kHz BW, A-weighted
Frequency Response	10 to 22k	typ.	Hz	+0, -3dB
THD+Noise	0.017	typ.	%	@ 1 kHz, 20 kHz BW, Output = -6 dBFS
Balanced Line-Level Input Specs				
Input Impedance	22.18 k	1%	Ω	1.09 kΩ + 11.09 kΩ
Max. Input Level	23	min.	dBu	<1% THD
Dynamic Range	102	typ.	dB	re: 0 dBFS, 20 kHz BW, A-weighted
CMRR	-56	typ.	dB	Rs = 150 Ω, 1 kHz
Frequency Response	10 to 22k	typ.	Hz	+0, -3dB
THD+Noise	0.004	typ.	%	@ 1 kHz, 20 kHz BW, Rs = 150 Ω, Output = -6 dBFS
Unbalanced Line-Level Input Specs				
Input Impedance, Mono	20 k	1%	Ω	(**RAD2**, **RAD11** & **RAD14**)
Max. Input Level, Mono	6	min.	Vrms	<1% THD (**RAD2**, **RAD11** & **RAD14**)
Input Impedance, Stereo	20 k	1%	Ω	(**RAD6**)
Max. Input Level, Stereo	3	min.	Vrms	<1% THD (**RAD6**)
Dynamic Range	96	typ.	dB	re: 0 dBFS, 20 kHz BW, A-weighted
Frequency Response	10 to 22k	typ.	Hz	+0, -3dB
THD+Noise	0.005	typ.	%	@ 1 kHz, 20 kHz BW, Rs = 150 Ω, Output = -6 dBFS
Unbalanced Line-Level Output Specs				
Output Impedance, Stereo	600	1%	Ω	(**RAD6**, **RAD8**, **RAD11**)
Max. Output Level, Stereo	3.3	min.	Vrms	<1% THD, Load = 10 kΩ (**RAD6**, **RAD8**, **RAD11**)
Dynamic Range	98	typ.	dB	Re: 0 dBFS, 20 kHz BW, A-weighted
Frequency Response	10 to 22k	typ.	Hz	+0, -3dB
THD+Noise	0.028	typ.	%	@ 1 kHz, 20 kHz BW, Output = -6 dBFS

RAD16 Specifications

Parameter	Specification	Limit	Units	Conditions/Comments
Input Impedance	2.16 k	1%	Ω	Balanced 1.08 k + 1.08 k
Max. Input Level	-16	min.	dBu	Balanced, Gain = 26 dB, <1% THD
Equivalent Input Noise	-121	typ.	dBu	20 kHz BW, Rs = 150 Ω, Gain = 26 dB
Dynamic Range	96	typ.	dB	re: 0 dBFS, 20 kHz BW, A-weighted, Gain = 26
CMRR	-62	typ.	dB	Rs = 150 Ω, 1 kHz, Gain = 26 dB
Frequency Response	41 to 20k	typ.	Hz	+0, -3dB, At All Gain Settings
THD+Noise	0.008	typ.	%	@ 1 kHz, 20 kHz BW, Rs = 150 Ω, Output = -6 dBFS, Gain = 26 dB
Gain Range	26 to 60	typ.	dB	In 1 dB Steps
Phantom Power	+24	4%	V	15 mA Max.
Impedance	1.21 k	1%	Ω	Each Leg
Balanced Line-Level Input Specs				
Input Impedance	22.60 k	1%	Ω	Balanced 11.3 kΩ + 11.3 kΩ
Max. Input Level	23	min.	dBu	Balanced, <1% THD
Dynamic Range	99	typ.	dB	re: 0 dBFS, 20 kHz BW, A-weighted
CMRR	-52	typ.	dB	Rs = 150 Ω, 1 kHz
Frequency Response	22 to 22k	typ.	Hz	+0, -3 dB
THD+Noise	0.008	typ.	%	@ 1 kHz, 20 kHz BW, Rs = 150 Ω, Output = -6 dBFS
Balanced Line-Level Output Specs (Active Balanced)				
Outut Impedance	600	1%	Ω	Each Leg
Max. Output Level	18	min.	dBu	Balanced, <1% THD, Load = 10 kΩ
Dynamic Range	103	typ.	dB	20 kHz BW, A-weighted
Frequency Response	10 to 22k	typ.	Hz	+0, -3 dB
THD+Noise	0.07	typ.	%	@ 1 kHz, 20 kHz BW, Output = -6 dBFS
Unit: Conformity	CE, FCC, cULus			
Unit: Size	4.92" x 3.31" x 1.05"			(12.5 x 8.4 x 2.7 cm)
...Weight	12 oz			(340 g)
Shipping Size	7.25" x 5.25" x 3.375"			(18.5 x 13.4 x 8.6 cm)
...Weight	1 lb			(436 g)



The RAD16 may be mounted on any flat surface.

RAD17 Microphone Specifications

Parameter	Specification	Limit	Conditions/Comments
Built-in Microphone	Condenser / Electrostatic		Small capsule
...Capsule Sensitivity	6.3 mV/Pa (-44 dBu @ 1 Pa)	max	1 kHz, 1 Pa = 94 dB SPL
...Maximum Ambient SPL	114 dB SPL	max	120 dB SPL max at the microphone, Gain = 26 dB
...Gain Range	26 to 60 dB	typ	In 1 dB steps
...Frequency Response	100 Hz to 10 kHz	typ	±3 dB
Ambient Operating Temperature	-4 to +122 °F		-20 to +50 °C
Unit: Size	4.1″H x 1.6″W x 0.9″D		10.4 x 4.0 x 2.3 cm (fits in 1-gang US electrical box)

RAD24 Amplifier Specifications

Parameter	Specification	Limit	Conditions/Comments
Amplifier Output	1 Channel		Class D, full bridge, current limited
...Connector	Euroblock		2-pin, 5 mm pitch, black
...Maximum Output Power	1 W (0 dBW)	max	1 kHz, 0 dBFS, 8Ω, cable = 150 meters, THD < 1%
...Maximum Output Level	11.2 dBu / 2.83 Vrms		1 kHz, 0 dBFS, 8Ω, cable = 150 meters, THD < 1%
...Frequency Response	20 Hz - 20 kHz, +0 / -1 dB		0 dBFS, 8Ω
...THD+N	0.1%	max	1 kHz, 0 dBFS, 8Ω
...Dynamic Range	80 dB	typ	20 kHz BW, re: 11.2 dBu, 8Ω
...Power Taps	5 selections		1, 1/2, 1/4, 1/8, 1/16 W into 8Ω
Ambient Room Temperature	104 °F / 40 °C	max	Maximum external loading
Unit: Conformity	CE, FCC, cULus		
Unit: Size with mounting tabs	4.0″H x 4.0″W x 1.3″D		10.2 x 10.2 x 3.3 cm (fits in 4″ US electrical box)
...Size without mounting tabs	3.1″H x 3.1″W x 1.3″D		7.9 x 7.9 x 3.3 cm (mount on loudspeaker or flat area)

RAD27 USB Card Specifications

Parameter	Specification	Limit	Units	Conditions/Comments
Cable Length	150 meters / 500 feet			Shielded CAT 5e or better.
Signal Indicator	-50	typ.	dBFS	Unbalanced / balanced output, green LED, peak-reading
Overload Indicators	-0.5	typ.	dBFS	Unbalanced / balanced output, red LED, peak-reading
USB Digital Audio				
Type	USB 2.0			Full speed device (12 Mb/s)
Sample Rate	48 kHz			
Sample Format	16-bit PCM			
Channels	2 in, 2 out			Simultaneous stereo in and out
Dynamic Range	90		dB	
Unit				
Conformity	CE, FCC			
Size	4.1″H x 1.3″W x 1.9″D			10.4 x 3.3 x 4.8 cm
...Unit Weight	2.8 oz			80 g
...Shipping Weight	13 oz			3.6 kg

PAGER1 Station Specifications

Parameter	Specification	Limit	Conditions/Comments
RAD Port	Rear panel with indicators		RJ-45 connector
Mic Input	Accepts any gooseneck mic		
...Connector	3-pin female XLR		Locking tab may be removed
...Phantom Power	24 VDC @ 100 mA		On/off in Halogen software
...Mic Pad	13 dB	max	Set in Halogen software
...Signal & OL Indicators	See RAD Specifications		
Page Indicators	Busy (red), Caution (yellow), Ready (green)		
Unit	All Steel		Lockdown holes in chassis allow securing to a table
...Size	4.5"H x 6"W x 2"D		(11.5 cm x 15.3 cm x 5.1 cm)
...Weight	20 ounces		(567 grams)
Shipping Size	6.25" x 8.5" x 5.5"		(16 cm x 22 cm x 14 cm)
...Weight	1.64 lb		(745 grams)

Specifications

DR1 Specifications

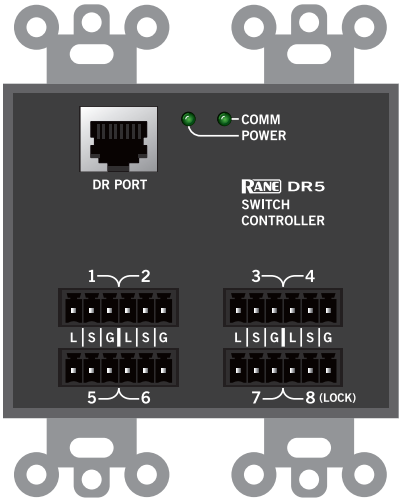
Parameter	Specification
CAT 5e Cable Length Max.	300 meters / 1000 feet
Power Requirement:	+24VDC / 50mA
Baud Rate:	115200
Unit: Conformity	CE, FCC
Unit: Size	
...cm 10.4H x 4W x 5.5D	6.6D including knob
...in 4.1″H x 1.6″W x 2.2″D	2.6″D including knob
Unit: Weight	113 g / 4.0 oz
Unit: Shipping	261 g / 9.2 oz

DR3 Specifications

Parameter	Specification
CAT 5e Cable Length Max.	300 meters / 1000 feet
Power Requirement:	+24VDC / 50mA
Baud Rate:	115200
Unit: Conformity	CE, FCC
Unit: Size	
...cm 10.4H x 8.6W x 4.8D	6D including knob
...in 4.1″H x 3.4″W x 2.1″D	2.4″D including knob
Unit: Weight	6.4 oz / 181g
Unit: Shipping	12.4 oz / 352g

DR2 Specifications

Parameter	Specification
CAT 5e Cable Length Max.	300 meters / 1000 feet
Power Requirement:	+24VDC / 50mA
Baud Rate:	115200
Unit: Conformity	CE, FCC
Unit: Size	
...cm 10.4H x 8.6W x 4.8D	5.7D including knob
...in 4.1″H x 3.4″W x 2.1″D	2.3″D including knob
Unit: Weight	166 g / 5.9 oz
Unit: Shipping	326 g / 11.5 oz

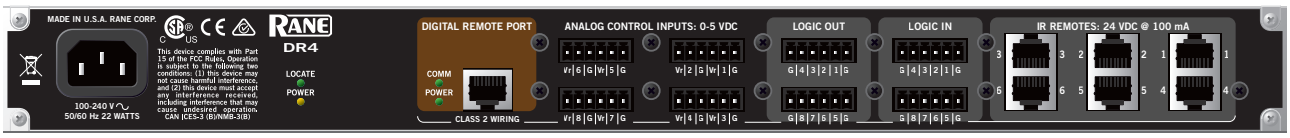


DR5 Switch Controller Specifications

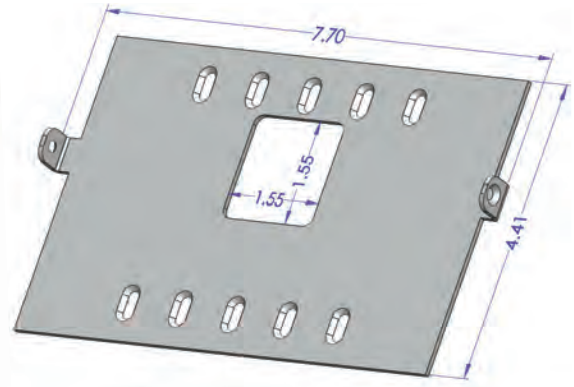
Parameter	Specification	Limit	Conditions/Comments
Switch Inputs	8		Small capsule
...Connector	Mini Euroblock		6-pin, 3.81 mm pitch, black
...Internal Pull-up	51.1 kΩ, 5.0 V		Protected to +24V, reverse polarity protected
...Vin High	> 2.0 V	min	Normal state
...Vin Low	< 0.9 V	max	External circuit must sink > 80 µA to assert
LED Outputs	8		
...Connector	Mini Euroblock		6-pin, 3.81 mm pitch, black
...LED Drive Current	5 mA	typ	Driving an LED with Vf = 2.0 V
...Output High Voltage	5 V	typ	Output On, Current out = 0 mA
DR Port	To RAD or DR host unit		RJ-45 connectors
...Power	24 VDC @ 100 mA	max	Normal state
...Length	300 meters / 1000 feet	max	Shielded CAT 5e cable or better
Ambient Room Temperature	104 °F / 40 °C		Maximum external loading
Unit: Conformity	CE, FCC		
Unit: Size	4.0″H x 3.3″W x 0.9″D		10.2 x 8.4 x 2.3 cm (fits in 2-gang US electrical box)
...Weight	5.6 oz		159 g
...Shipping	11.4 oz		322 g

DR4 Logic I/O Expander Specifications

Parameter	Specification	Limit	Conditions/Comments
IR Remote Ports	6		RJ-45 connectors
...Type	Compatible with IR2 remote		Protected to +24 V, reverse polarity protected
...Power	24 VDC @ 100 mA	max	Normal state
...Length	300 meters / 1000 feet	max	Shielded CAT 5e cable or better
Logic Inputs	8		
...Connector	Mini Euroblock		6-pin, 3.81 mm pitch, black
...Internal Pull-up	51.1 kΩ, 5.0 V		Protected to +24 V
...Logic High Input Level	> 2.0 V	min	Normal state
...Logic Low Input Level	< 0.9 V	max	External circuit must sink > 80 µA to assert
Logic Outputs	8 Relay drive, LED or logic level output		
...Connector	Mini Euroblock		6-pin, 3.81 mm pitch, Black
...Internal Pull-up	1.0 kΩ, 5.0 V		Protected to +30 V, reverse polarity protected
...Sink Current	200 mA	max	Output FET on
...LED Drive Current	2 mA		Output FET off, Driving an LED with Vf = 2.0 V
...Logic High Output Level	4.7 V	min	Output FET off, Output Current = 0 mA
...Logic Low Output Level	0.1 V	max	Output FET on, Sink Current < 200 mA
Analog Control Input	8 ADC inputs for potentiometer control		
...Connector	Mini Euroblock		6-pin, 3.81 mm pitch, black
...Control Voltage Range	0-5 V / Normal = 5 V	typ	Protected to +24V, reverse polarity protected
...Internal Pull-up	51.1 kΩ		10-20 kΩ, linear taper poteniometer recommended
...A/D Converter	8-bit, 2 kHz sample rate		
Wiring	Class 2		All rear panel terminals
Power Requirement	100 to 240 VAC		50/60 Hz, 18 W max
Ambient Room Temperature	104 °F / 40 °C	max	Maximum external loading
Unit: Conformity	CE, FCC, cCSAus		
Unit: Size	1.73"H x 19"W x 8.25"D		(4.4 cm x 48.3 cm x 20.9 cm)
...Weight	4.5 lb		(2 kg)
Shipping: Size	6.5" x 20.3" x 13.75"		(9.5 cm x 52 cm x 35 cm)
...Weight	7.5 lb		(3.5 kg)



Specifications



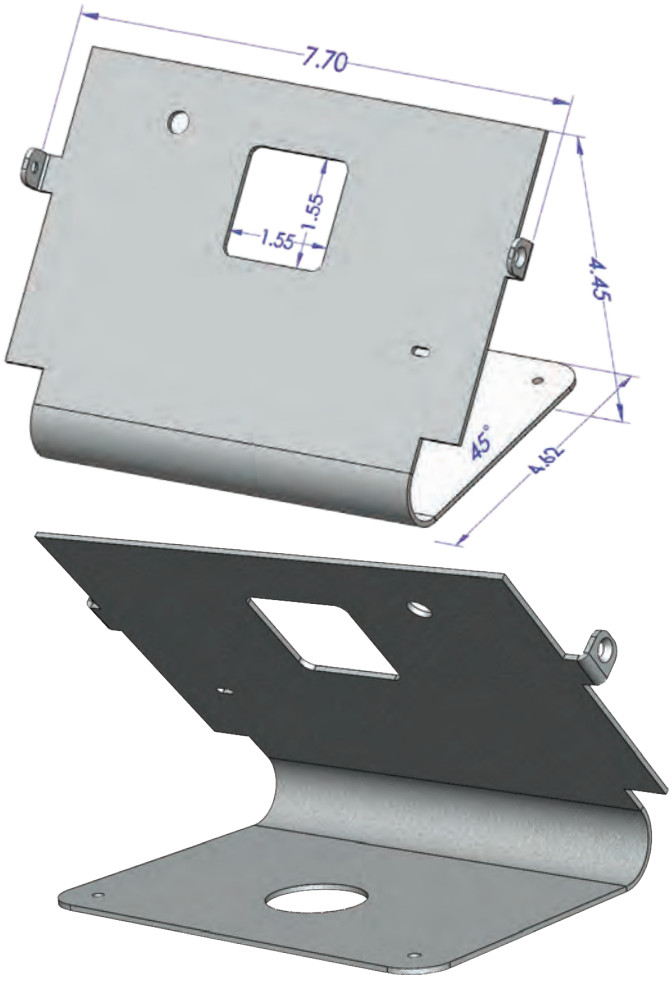
This wall plate is included with the DR6, which can mount over a 1.55" square hole in drywall, or mount to a U.S. electrical box.

DR6 Specifications

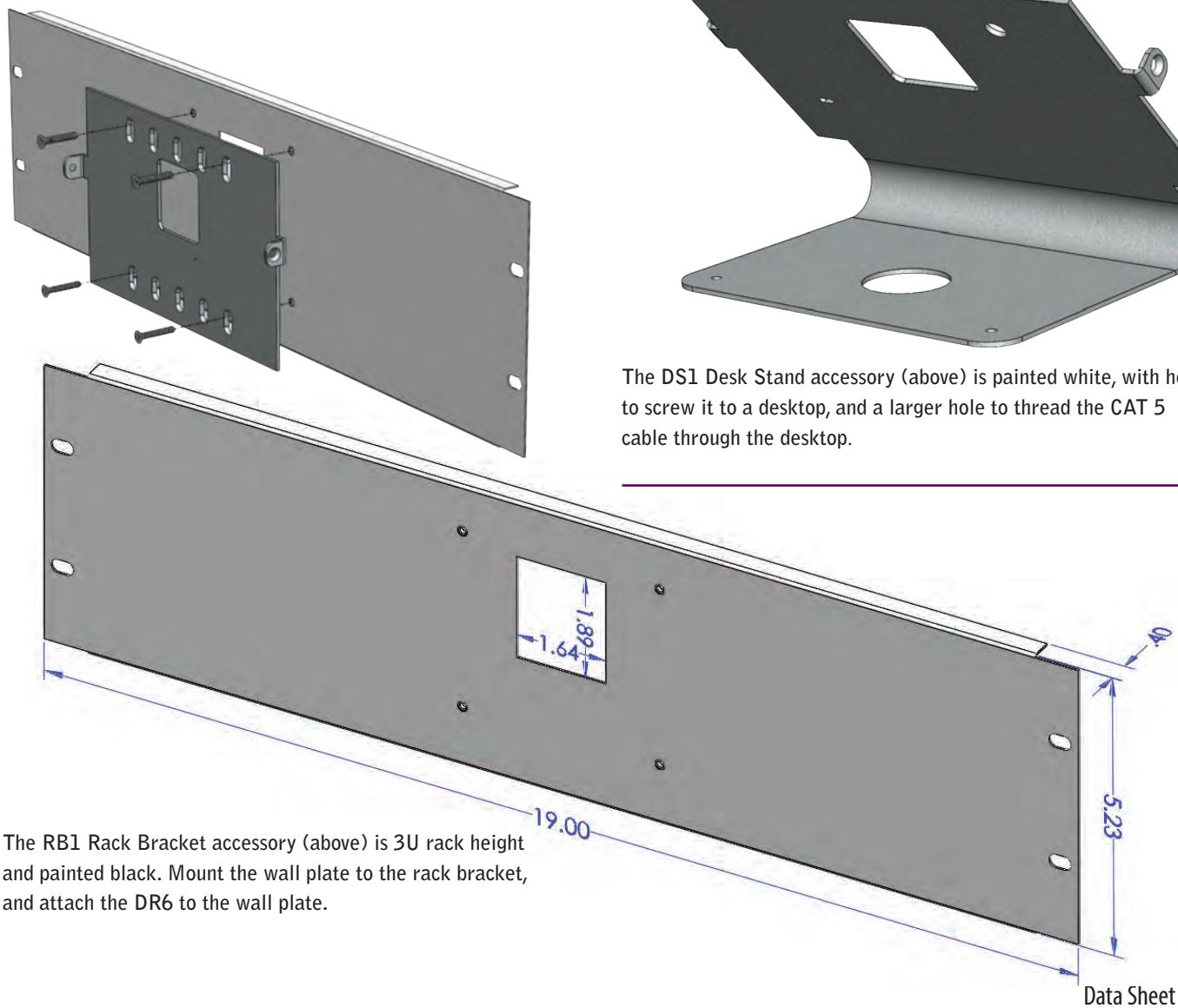
Parameter	Specification	Limit	Conditions/Comments
Display			
...Size	3.38" x 6.06"		8.6 x 15.4 cm
...Resolution	480 x 800 pixels		
...Color Depth	16-bit		131,071 colors
...Ambient Light Sensitivity	Software configurable		Adjust the sensitivity to ambient light changes.
Touch Screen			
...Size	3.42" x 6.10"		8.7 x 15.5 cm
...Type	Resistive		
Mounting Hardware			
...Included Mounting Screws	#6-32x1/4" Torx T10 (qty 2)		Secures DR6 to wall plate or DS1 desk stand
...Included Wall Screws	#6-20x1-1/4" (qty 4)		Drywall / cement anchors included
...Included Electrical Box Screws	#6-32x7/8" (qty 4)		Used to mount Wall Plate to an electrical box or RB1
RPI Data Input Port	To a DR Port on a HAL		RJ-45 connector
RPI Data Output Port	To the DR6		RJ-45 connector
...Power	24 VDC @ 550 mA	max	
...HAL to RPI to DR6 Distance	100 meters / 325 feet total	max	Shielded CAT 5e cable or better (see diagram)
RPI Power Requirement	100 to 240 VAC		50/60 Hz, 18 W max
Wiring	Class 2		All RJ-45 connectors
Ambient Room Temperature	104 °F / 40 °C		Maximum external loading
Unit: Conformity	CE, FCC, cCSAus		
DR6 Unit: Size	5.0″H x 7.7″W x 0.76″D		12.7 x 19.6 x 2 cm
...DR6 Weight	1 lb		455 g
...Included Wall Plate Size	4.41"H x 7.7"W		11.2 x 19.6 cm
...Included RPI Power Supply Size	1.78″H x 6.9″W x 2.79″D		4.6 x 17.6 x 7 cm
...RPI Power Supply Weight	14.1 oz		400 g
...Shipping (DR6 with RPI)	3 lb 3 oz		1.47 g
DS1 Desk Stand Accessory: Size	4.5″H x 7.6″W x 4.6″D		11.4 x 19.3 x 11.7 cm
...Weight	1 lb 1 oz		480 g
...Shipping (DS1)	1 lb 5 oz		600 g
RB1 Rack Bracket Accessory: Size	5.2″H x 19″W x .4″D		13.2 x 48.3 x 1 cm
...Weight	1 lb 1 oz		480 g
...Shipping (RB1)	1 lb 14 oz		850 g

The RPI Remote Power Injector is included with the DR6 and includes an IEC power cable (connects at the far end).

DR6 Accessories



The DS1 Desk Stand accessory (above) is painted white, with holes to screw it to a desktop, and a larger hole to thread the CAT 5 cable through the desktop.

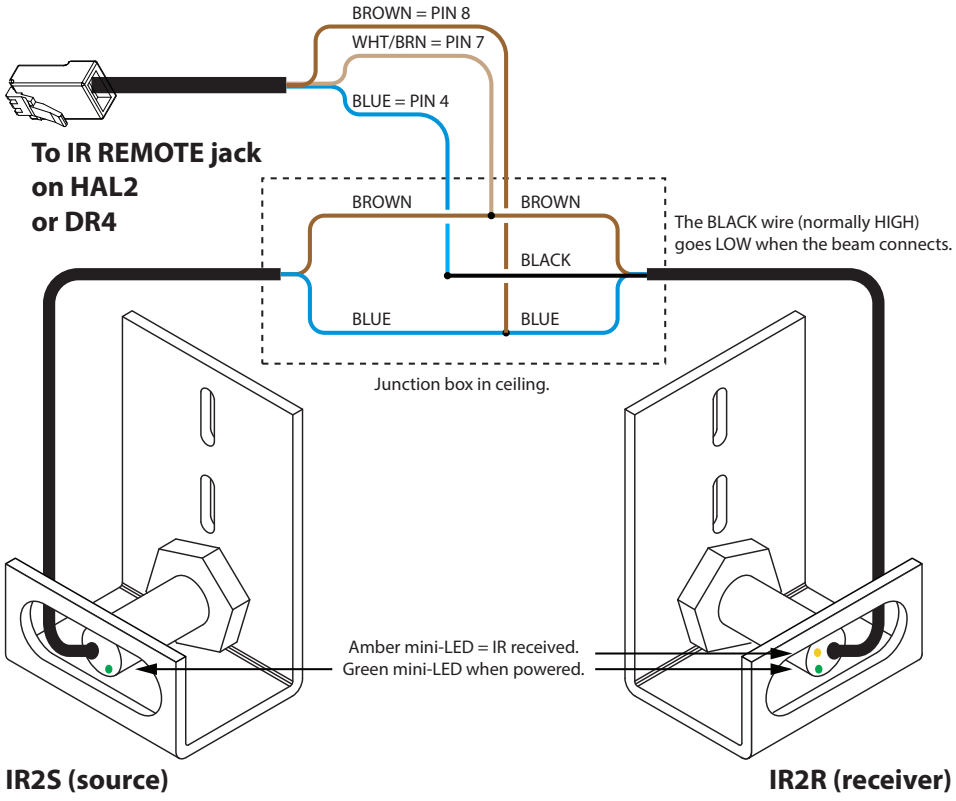


The RB1 Rack Bracket accessory (above) is 3U rack height and painted black. Mount the wall plate to the rack bracket, and attach the DR6 to the wall plate.

IR2 Specifications

Parameter	Specification	Limit	Units	Conditions/Comments
Infrared Range	1.5 meters / 5 feet	max		
Power Supply Requirement				
.....Supply Voltage	10	min	VDC	Protected against reverse polarity.
	30	max	VDC	
.....Supply Current	30	max	mA	IR2 combined.
IR2R Load Current	100	max	mA	Protected against short-circuit.
Ambient Temperature	70	typ	°C	
Cable Length: Unit to Junction	2.0 meters / 6.5 feet	typ		Cables attached (see wiring diagram).
Cable Length: Junction to IR Port	305 meters / 1,000 feet	max	CAT 5e or similar cable with RJ45 (8P8C) at IR Port (3 wires of 26 AWG or better).	
Environmental	IP66			
Unit: Conformity	CE, FCC			
.....Construction	Steel bracket and ABS housing			
.....Size	2.65"H x 1.75"W x 1.5"D			(6.8 cm x 4.5 cm x 3.8 cm)
.....Weight	3 oz			(.09 kg)

IR2 Wiring



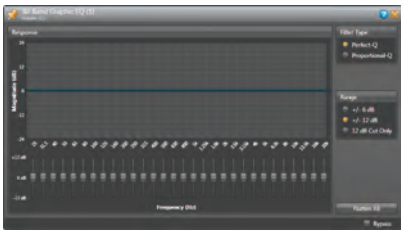
Warning **Not To Be Used For Personnel Protection**

Never use these products as sensing devices for personal protection. Doing so could lead to serious injury or death. These sensors do *not* include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energised or de-energised sensor output condition.

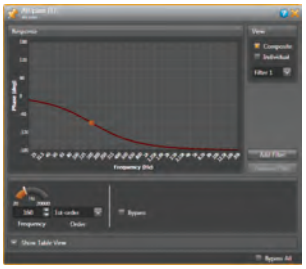
Halogen DSP Parameters

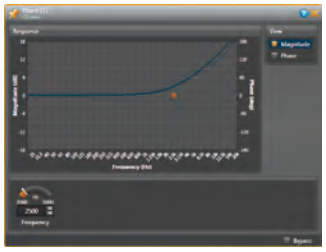
Block	Parameter	Unit	Min	Max	Default
Dynamics					
Ambient Noise Compensator (ANC)	Threshold	dBFS	-60	0	-40
	Gain	dB	-30	30	10
	Ratio	n:1	0.5	2	1
	Response Time	s	1	600	10
	Distance	ft	0	500	0
	Force Gain				Off
Automatic Gain Control (AGC)	Target	dBFS	-50	-10	-20
	Ratio	n:1	1	10	2
	Max Gain	dB	0	30	15
	Increase Rate	dB/s	1	200	10
	Decrease Rate	dB/s	1	200	100
	Hold Time	s	0	31	3
	Gain	dB	-12	12	0
Compressor	Threshold	dBFS	-60	0	-20
	Ratio	n:1	1	10	2
	Knee	dB	0	20	0
	Attack	ms	10	250	10
	Release	ms	1	5000	100
	Auto Mode				On
	Gain	dB	-12	12	0
Ducker	Threshold	dBFS	-80	0	-68
	Depth	dB	0	80	10
	Attack	ms	0.02	100	0.02
	Release	ms	1	5000	100
	Hold Time	s	0	3	3
	Low-cut	Hz	20	5000	20
	High-cut	Hz	200	20000	20000
	Force duck				Off
	Side-chain Talkover				Off
Expander	Threshold	dBFS	-80	-20	-80
	Ratio	n:1	1	8	2
	Attack	ms	10	250	10
	Release	ms	1	5000	100
	Low-cut	Hz	20	5000	20
	High-cut	Hz	200	20000	20000
Gate	Threshold	dBFS	-80	0	-80
	Depth	dB	0	80	10
	Attack	ms	0.02	100	0.02
	Release	ms	1	5000	100
	Hold Time	s	0	3	3
	Low-cut	Hz	20	5000	20
	High-cut	Hz	200	20000	20000
Limiter	Threshold	dBFS	-60	0	-6
	Attack	ms	0.02	100	0.02
	Release	ms	1	5000	100
	Auto Mode				On

Specifications



Block	Parameter	Unit	Min	Max	Default
Filters					
Feedback Suppressor	Filter Frequency	Hz	20	20000	ISO centers > 160
	Filter Gain	dB	-6	0	0
	Filter Bandwidth	Oct	0.015	4	0.5
	Dominant Frequency	Hz	20	20000	
	Current Gain	dB	0	12	0
	Gain Margin	dB	0	12	
	Composite				On
	Individual				Off
Cut	Low-cut Frequency	Hz	20	20000	40
	High-cut Frequency	Hz	20	20000	16000
	Magnitude				On
	Phase				Off
	Composite				On
	Individual				Off
...Type and Slope	1st-order: 6 dB/oct. (1st-order)				Bw 12 dB/octave
	Linkwitz-Riley: 12 dB/octave (2nd-order)				
	Linkwitz-Riley: 24 dB/octave (4th-order)				
	Linkwitz-Riley: 36 dB/octave (6th-order)				
	Linkwitz-Riley: 48 dB/octave (8th-order)				
	Butterworth: 12 dB/octave (2nd-order)				
	Butterworth: 18 dB/octave (3rd-order)				
	Butterworth: 24 dB/octave (4th-order)				
	Butterworth: 30 dB/octave (5th-order)				
	Butterworth: 36 dB/octave (6th-order)				
	Butterworth: 42 dB/octave (7th-order)				
	Butterworth: 48 dB/octave (8th-order)				
	Bessel: 12 dB/oct. (2nd-order)				
	Bessel: 18 dB/oct. (3rd-order)				
	Bessel: 24 dB/oct. (4th-order)				
Shelf (single & multi)	Low Shelf Frequency	Hz	20	20000	100
	Low Shelf Gain	dB	-15	12	0
	High Shelf Frequency	Hz	20	20000	10000
	High Shelf Gain	dB	-15	12	0
	Magnitude				On
	Phase				Off
	Composite				On
	Individual				Off
Parametric EQ	Low-cut Frequency	Hz	20	20000	40
	High-cut Frequency	Hz	20	20000	16000
	Parametric Frequency	Hz	20	20000	ISO centers >160
	Parametric Gain	dB	-15	12	0
	Parametric Bandwidth	Oct	0.015	4	0.5
	Magnitude				On
	Phase				Off
	Composite				On
	Individual				Off
Graphic EQ	Filter Type	Perfect-Q or Proportional-Q			Perfect-Q
	Range	±6, ±12, 12 dB cut-only			±12
	Gain	dB	12	-12	0





Block	Parameter	Unit	Min	Max	Default
FIR Filter	Import FIR Taps	txt or csv file			
	Export FIR Taps	txt file			
	Response View	Magnitude, Group Delay, or Impulse			
Crossovers (mono & stereo)					
	Low : High-cut	Hz	20	20000	500
	High : Low-cut	Hz	20	20000	500
	Gain	dB	-24	12	0
	Delay	ms	0	10	0
	Invert				Off
	Mute				Off
...Type and Slope	1st-order: 6 dB/oct. (1st-order)				LR 24 dB/octave
	Linkwitz-Riley: 12 dB/octave (2nd-order)				
	Linkwitz-Riley: 24 dB/octave (4th-order)				
	Linkwitz-Riley: 48 dB/octave (8th-order)				
	Butterworth: 12 dB/octave (2nd-order)				
	Butterworth: 18 dB/octave (3rd-order)				
	Butterworth: 24 dB/octave (4th-order)				
	Bessel: 12 dB/oct. (2nd-order)				
	Bessel: 18 dB/oct. (3rd-order)				
	Bessel: 24 dB/oct. (4th-order)				
...2-Way Crossovers	Low : High-cut	Hz	20	20000	500
	High : Low-cut	Hz	20	20000	500
...3-Way Crossovers	Low : High-cut	Hz	20	20000	500
	Mid : Low-cut	Hz	20	20000	500
	Mid : High-cut	Hz	20	20000	2900
	High : Low-cut	Hz	20	20000	2900
...4-Way Crossovers	Low : High-cut	Hz	20	20000	100
	Mid : Low-cut	Hz	20	20000	100
	Mid : High-cut	Hz	20	20000	500
	High-Mid : Low-cut	Hz	20	20000	500
	High-Mid : High-cut	Hz	20	20000	4000
	High : Low-cut	Hz	20	20000	4000
All-pass	Frequency	Hz	20	20000	160
	Order	1st-order or 2nd-order			1st-order
	Add Filters		1	6	1
	Composite				On
	Individual				Off
CD Horn	Frequency	Hz	2000	5000	5000
	Magnitude				On
	Phase				Off

Specifications

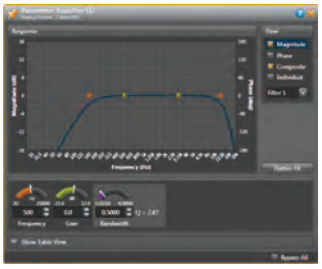
Block	Parameter	Unit	Min	Max	Default
Misc: Level, Delay, Meter, Signal Generator					
Level	User Min	dB	-88	User max	-88
	User Max	dB	User min	12	12
	Gain	dB	-88	12	0
	Off @ Min				On
	Mute				Off
Delay: Simple	Delay	ms	0	Max	0
	Max Delay	s	0.250005	20	0.250005
Delay: Distance	Standard: Distance	ft	0	1000	0
	Standard: Temp.	F	-22	140	72
	Metric: Distance	m	0	300	0
	Metric: Temp.	C	-30	60	22
	Max Delay	ms	250.005	999.999	999.999
	Metric Units				Off
Delay: Video	Frame Rate				23.976 fps
	...23.976 fps NTSC	fps	0	12	
	...24 fps NTSC	fps	0	12	
	...25 fps PAL	fps	0	12.5	
	...29.97 fps NTSC	fps	0	15	
	...50 fps PAL	fps	0	25	
	...59.94 fps NTSC	fps	0	25	
	...60 fps NTSC	fps	0	25	
	Max Delay	ms	250.005	500.01	500.01
Meter	no controls	dBFS	-60	0	
		dBr	-40	20	
Pink Noise: Simple	Amplitude (rms)	dBr	-100	0	-20
	Mute				On
Pink Noise: Ramped	Min Amplitude	dBr	-100	Max -1	-100
	Max Amplitude	dBr	Min +1	0	0
	Ramp Time	min	0.1	180	
	Mute				On
Pink Noise: Swept	Manual Frequency	Hz	20	20000	1000
	Start Frequency	Hz	20	Stop -1	20
	Stop Frequency	Hz	Start +1	20000	20000
	Steps		1	255	100
	Dwell Time	ms	10	2000	20
	Repeat				Off
	Amplitude (rms)	dBr	-100	0	-20
	Mute				On
Sine Wave	Frequency	Hz	20	2000	1000
	Amplitude (rms)	dBr	-100	0	-30
	Mute				On
Voice Detect	Low-cut	Hz	40	400	100
	High-cut	Hz	400	4000	3000
	Threshold	dBFS	-85	0	-30
	Hold Time	5	1	60	3
	Delay	ms	0	250	20
	Force Trigger				Off

Block	Parameter	Unit	Min	Max	Default
Mixers					
Mixer	Crosspoint Level	dB	-120	0	0
	Output Level	dB	-120	0	0
	Output User Max	dB	User min	0	0
	Output User Min	dB	-120	User max	-120
	Output Off @ Min				On
	Inputs		2	80	2
	Mute				Off
Matrix Mixer	Crosspoint Level	dB	-120	0	0
	Crosspoint Enable				Off
	Output Level	dB	-120	0	0
	Output User Max	dB	User min	0	0
	Output User Min	dB	-120	User max	-120
	Output Off @ Min				On
	Crosspoints		2	1024	2 in x 2 out
	Mute				Off
Gain-sharing Auto Mixer	Crosspoint Priority				Off
	Output Level	dB	-120	0	0
	Output User Max	dB	User min	0	0
	Output User Min	dB	-120	User max	-120
	Output Off @ Min				On
	Mute				Off
	Priority Level	dB	0	60	6
Gain-sharing Auto Matrix Mixer (Gainsharing)	Crosspoint Priority				Off
	Crosspoint Enable				Off
	Output Level	dB	-120	0	0
	Output User Max	dB	User Min	0	0
	Output User Min	dB	-120	User max	-120
	Output Off @ Min				On
	Mute				Off
	Priority Level	dB	0	60	6
Selectors					
Selector	Input #		2	80	Input 1
Priority Selector	Priority Input #		0	80	None
	Input #		2	80	Input 1
	Detector Threshold	dBFS	-85	0	-60
	Detector Low-cut	Hz	40	400	40
	Detector High-cut	Hz	400	4000	4000
	Detector Hold Time	s	1	60	3
	Detector Ramp Rack	s	0.0	30.0	3.0
Router	Output #		2	80	Output 1

The **Room Combine Block** contains these processors in this order:

- Gain-sharing Auto Mixer for a Mic Input
- Mixer for a Line input
- Sum for the Mic and Line Inputs
- Selector from the Distributed Program Bus
- Level control
- Paging Zone

Specifications



Block	Parameter	Unit	Min	Max	Default
Paging Station (PS)	**Scenarios / Talk**				Talk Off
PS: 2-band PEQ	Low-cut Frequency	Hz	20	20000	160
	High-cut Frequency	Hz	20	20000	12000
	Filter 1 Frequency	Hz	20	20000	500
	Filter 2 Frequency	Hz	20	20000	3000
	Filter Gain	dB	-15	12	0
	Filter Bandwidth	Oct	0.015	4	0.5
	Magnitude				On
	Phase				Off
	Composite				On
	Individual				Off
PS: Compressor	Threshold	dBFS	-60	0	-20
	Ratio	n:1	1	10	2
	Gain	dB	-12	12	0
PS: Level	User Min	dB	-88	User max	-88
	User Max	dB	User min	12	12
	Gain	dB	-88	12	0
	Off @ Min				On
	Mute				Off
Paging Zone	Ducker Depth	dB	0	85	12
	Ramp Back	s	0	10	3
	Page Gain User Min	dB	-88	User max	-88
	Page Gain User Max	dB	User min	12	12
	Page Gain	dB	-88	12	0
Emergency Page Zone	Page Gain User Min	dB	-88	User max	-88
	Page Gain User Max	dB	User min	12	12
	Page Gain	dB	-88	12	0
Zone Processor (ZP)					
ZP: Priority Selector	Priority Input				None
	Input				Input 1
	Threshold	dBFS	-85	0	-60
	Low-cut	Hz	40	400	40
	High-cut	Hz	400	4000	4000
	Hold Time	s	1	60	3
	Ramp Back	s	0	10	3
ZP: Level	User Min	dB	-88	User max	-88
	User Max	dB	User min	12	12
	Gain	dB	-88	12	0
	Off @ Min				On
	Mute				Off
ZP: Paging Zone	Ducker Depth	dB	0	85	12
	Ramp Back	s	0	10	3
	Page Gain User Min	dB	-88	User max	-88
	Page Gain User Max	dB	User min	12	12
	Page Gain	dB	-88	12	0

Block	Parameter	Unit	Min	Max	Default
Acoustic Echo Canceling					
AEC	Input Gain	dB	-30	0.0	0.0
	Reference Gain	dB	-30	0,0	0.0
	AEC Enabled				On
	NLP	%	0	100	20
	Min Threshold	dBFS	-88	-60	70
	ANR Enabled				On
Automatic Gain Control (AGC)	Target	dBFS	-50	-10	-20
	Ratio	n:1	1	10	2.5
	Max Gain	dB	0	30	3
	Increase Rate	dB/s	1	200	2
	Decrease Rate	dB/s	1	200	100
	Hold Time	s	0	31	2
Parametric EQ	Low-cut Frequency	Hz	20	20000	150
	High-cut Frequency	Hz	20	20000	8000
	All other default settings are the same as the regular PEQ block.				
Conf Switchboard	Participants				Off
AEC Conference Room Combine					
Room Matrix Mixer	Crosspoint Level	dB	-120	0	0
	Crosspoint Enable				On
	Record Output Level	dB	-120	0	0
	Room Output Level	dB	-120	0	0
	Output User Max	dB	User min	0	0
	Output User Min	dB	-120	User max	-120
	Output Off @ Min				On
	Crosspoints		2	1024	2 in x 2 out
	Mute Record Output, Mute Room Output.				Off each
	Mute Local Auto Mixer, Mute Local AV Mixer.				Off each
	Mute DPB Selection, Mute from Far End Mixer.				Off each
Room Processor					
Far End Auto Mixer	Mic In Priority				Off
	Mic In Mute				Off
	Output Level	dB	-120	0	0
	Output Off @ Min				On
	Output Mute				Off
	Priority Level	dB	0	60	6
Local Auto Mixer	Same defaults as Far End Auto Mixer				
Local AV Mixer	Line In Level	dB	-120	0	0
	Line Off @ Min				On
	Mute				Off
	Output Level, Output Off @ Min, Output Mute same as Auto Mixer				
From Far End Mixer	Same defaults as Local AV Mixer				
To Far End Mixer	Inputs: Far EndAuto Mixer, Local AV Mixer, DPB Selection				
	Each Input Level	dB	-120	0	0
	Each Input Off @ Min				On
	Each Input Mute				Off
	To Far End Level	dB	-120	0	0
	To Far End Off @ Min				On
	To Far End Mute				Off

HAL1x Multiprocessor Architects & Engineers Specification

The digital multiprocessor shall be a 16 in x 16 out configuration having sixteen inputs: eight balanced analog on plug-in barrier strips that can be either mic- or line-level with switchable +48 V phantom power, and four digital remote audio device ports providing up to two digital inputs and two digital outputs per port, as well as eight balanced analog line-level outputs on plug-in barrier strips. Provisions shall be provided for eight digital remotes to control source or preset selection, toggle and/or level control, control logic expansion and wall sensors, located up to 300 meters (1,000 feet) away. The digital remote shall connect to and be powered by the rack room multiprocessor using a dedicated homerun over shielded CAT 5e (or better) cable. Low communication data rates shall permit use of punch-down blocks or RJ-45 patch bays for homerun cable routing flexibility as well as relaxed minimum bend radius. In addition there shall be four contact closure logic inputs on a plug-in barrier strip and two separate relay Form C contact outputs. The multiprocessor shall be expandable using a 512 x 512 channel serial expansion bus interface via RJ-45 connectors, which shall connect up to 32 optional, daisy-chained expander units. The remote audio devices shall provide A/D and/or D/A conversion based on AES3 transport to the wall up to 150 meters (500 feet) from the multiprocessor, as well as units for cascading automatic microphone mixing up to 64 channels, ambient sensing mics, small amplifiers, and advanced paging stations. All remote audio devices and digital remotes shall connect via shielded CAT 5e (or better) cable to the multiprocessor. Further, all remote audio devices and digital remote devices shall support portable use and hot-swapping so that devices may be replaced without shutting down the system, and do so without any audio interference, and that all settings for new devices are automatically downloaded from the multiprocessor along with the correct firmware. The unit shall connect to a computer using a standard Ethernet connector. All functions shall be designed, configured and controlled by a software program featuring a graphical user interface that allows managing the global tasks of discovering, connecting to, and applying configurations to the digital multiprocessor. The hardware-software combination shall automatically check and display the status, location, CAT 5e crimp and wiring integrity, and that audio is flowing to and/or from all peripheral devices. The hardware multiprocessor and the software shall each include Ethernet ASCII text over TCP/IP control support for third-party control systems such as AMX, Crestron and Stardraw Control. The processor shall have an internal 100-240 VAC, 50/60 Hz power supply.

The digital multiprocessor shall be a Rane HAL1x running Rane Halogen software, and using Rane Remote Audio Devices (RADs), Rane Digital Remotes (DRs) and Rane IR2 Wall Sensors.

EXP1x Expander Architects & Engineers Specification

The Expander shall add 16 digital audio inputs and 16 digital audio outputs to the digital multiprocessor via provisions for eight remote audio device ports. The remote audio devices shall provide A/D and/or D/A conversion based on AES3 transport to the wall up to 150 meters (500 feet) from the multiprocessor, as well as units for cascading automatic microphone mixing up to 64 channels, ambient sensing mics, small amplifiers, and advanced paging stations. The eight remote audio device ports shall also support digital remotes to control source or preset selection, toggle and/or level control, control logic expansion and wall sensors, located up to 300 meters (1,000 feet) away. All remote audio devices and digital remotes shall connect via shielded CAT 5e (or better) cable to the multiprocessor. Further, all remote audio devices and digital remote devices shall support portable use and hot swapping so that devices may be replaced without shutting down the system, and do so without any audio interference, and that all settings for new devices are automatically downloaded from the multiprocessor along with the correct firmware. The Expander shall connect to the multiprocessor via a standard RJ-45 connector and cable, with the capability to daisy chain a maximum of 32 expanders to the multiprocessor for a total of 512 inputs and 512 outputs. The processor shall have an internal 100-240 VAC, 50/60 Hz power supply.

The Expander shall be a Rane EXP1x with Rane Remote Audio Devices (RADs).

HAL2 Multiprocessor Architects & Engineers Specification

The digital multiprocessor shall be an 18 in x 18 out configuration having eighteen inputs: eight balanced analog on plug-in barrier strips that can be either mic- or line-level with switchable +48 V phantom power, and four digital remote audio device ports providing up to two digital inputs and two digital outputs per port, as well as eight balanced analog line-level outputs on plug-in barrier strips, plus AES3 input and output jacks providing two digital inputs and two digital outputs on XLR. Provisions shall be provided for four digital remotes to control source or preset selection, toggle and/or level control, and control logic expansion, located up to 300 meters (1,000 feet) away. In addition there shall be four contact closure logic inputs on a plug-in barrier strip and two separate relay Form C contact outputs, as well as provisions for four wall-sensing IR remotes. The remote audio devices shall provide A/D and/or D/A conversion based on AES3 transport to the wall up to 150 meters (500 feet) from the multiprocessor, as well as units for cascading automatic microphone mixing up to 64 channels, ambient sensing mics, small amplifiers, and advanced paging stations. All remote audio devices and digital remotes shall connect via shielded CAT 5e (or better) cable to the multiprocessor. Further, all remote audio devices and digital remote devices shall support portable use and hot swapping so that devices may be replaced without shutting down the system, and do so without audio interference, and that all settings for new devices are automatically downloaded from the multiprocessor along with the correct firmware. The unit shall connect to a computer using a standard Ethernet connector. All functions shall be designed, configured and controlled by a software program featuring a graphical user interface that allows managing the global tasks of discovering, connecting to, and applying configurations to the remote digital multiprocessor. The hardware-software combination shall automatically check and display the status, location, CAT 5e crimp and wiring integrity, and that audio is flowing to and/or from all peripheral devices. The hardware multiprocessor and the software shall each include Ethernet ASCII text over TCP/IP control support for third-party control systems such as AMX, Crestron and Stardraw Control. The processor shall have an internal 100-240 VAC, 50/60 Hz power supply.

The digital multiprocessor shall be a Rane HAL2 running Rane Halogen software, and using Rane Remote Audio Devices (RADs), Rane Digital Remotes (DRs) and Rane IR2 Wall Sensors.

HAL3s Multiprocessor Architects & Engineers Specification

The digital multiprocessor shall be a 6 in x 10 out configuration having six inputs: two mic or line-level analog on a plug-in barrier strip that can be either +4 dBu balanced or -10 dBV unbalanced with left (+) and right (-) automatically monoed; and two digital remote audio device ports providing up to four digital inputs and four digital outputs; as well as six balanced analog line-level outputs on plug-in barrier strips. Phantom power shall be available for a condenser microphone input. Provisions shall be provided for two digital remotes to control source or preset selection, toggle and/or level control located up to 300 meters (1,000 feet) away. In addition there shall be four contact closure logic inputs on a plug-in barrier strip. The remote audio devices shall provide A/D and/or D/A conversion based on AES3 transport to the wall up to 150 meters (500 feet) from the multiprocessor, as well as units for cascadable automatic microphone mixing up to 64 channels, control logic expansion and wall sensors, ambient sensing mics, small amplifiers, and advanced paging stations. All remote audio devices and digital remotes shall connect via shielded CAT 5e (or better) cable to the multiprocessor. Further, all remote audio devices and digital remote devices shall support portable use and hot swapping so that devices may be replaced without shutting down the system, and do so without any audio interference, and that all settings for new devices are automatically downloaded from the multiprocessor along with the correct firmware. The unit shall connect to a computer using standard Ethernet on an RJ-45 connector. All functions shall be designed, configured and controlled by a software program featuring a graphical user interface that allows managing the global tasks of discovering, connecting to, and applying configurations to the remote digital multiprocessor. The hardware-software combination shall automatically check and display the status, location, CAT 5 crimp and wiring integrity, and that audio is flowing to and/or from all peripheral devices. The hardware multiprocessor and the software shall each include Ethernet ASCII text over TCP/IP control support for third-party control systems such as AMX, Crestron and Stardraw Control, and shall be capable of creating controls accessible from any web browser.The processor shall have an internal 100-240 VAC, 50/60 Hz power supply.

The digital multiprocessor shall be a Rane HAL3s running Rane Halogen software, and using Rane Remote Audio Devices (RADs) and Digital Remotes (DRs).

HAL4 Multiprocessor Architects & Engineers Specification

The digital multiprocessor shall be a 2 in x 2 out configuration. The two analog inputs shall have microphone or line-level selection and include a +48V phantom power selection. These two inputs shall exist on a plug-in barrier strip that can be either +4 dBu balanced or -10 dBV unbalanced with left (+) and right (–) automatically monoed. The two analog outputs shall be balanced line-level on plug-in barrier strips. Provisions shall be provided for one digital remote to control source or preset selection, toggle and/or level control located up to 300 meters (1,000 feet) away. The digital remote shall connect via shielded CAT 5e (or better) cable to the multiprocessor. Further, the digital remote device shall support portable use and hot swapping so that devices may be replaced without shutting down the system, and do so without any audio interference, and that all settings for new devices are automatically downloaded from the multiprocessor along with the correct firmware. The unit shall connect to a computer using standard Ethernet on an RJ-45 connector. All functions shall be designed, configured and controlled by a software program featuring a graphical user interface that allows managing the global tasks of discovering, connecting to, and applying configurations to the remote digital multiprocessor. The hardware-software combination shall automatically check and display the status, location, CAT 5 crimp and wiring integrity. The hardware multiprocessor and the software shall each include Ethernet ASCII text over TCP/IP control support for third-party control systems such as AMX, Crestron and Stardraw Control. The processor shall have an internal 100-240 VAC, 50/60 Hz power supply.

The digital multiprocessor shall be a Rane HAL4 running Rane Halogen software, and using a Digital Remote (DR).

DR1 Architects & Engineers Specification

The digital remote shall control one or more simultaneous levels and be located up to 300 meters (1,000 feet) away from the rack room multiprocessor. The digital remote shall have a customizable backlit LCD screen for end user labeling with variable and automatic backlight dimming feature for superior visibility under varying light conditions. The digital remote shall connect to and be powered by the rack room multiprocessor using a dedicated homerun over shielded CAT 5e (or better) cable. Low communication data rates shall permit use of punch-down blocks or RJ-45 patch bays for homerun cable routing flexibility as well as relaxed minimum bend radius. The shielded CAT 5e interface shall transport power, ground and a communications channel. The digital remote shall support portable use and hot-swapping so that devices may be replaced without reprogramming or shutting down the system, and do so without audio interference. Within seconds, all settings for new or existing portable digital remotes shall automatically download from the multiprocessor along with the correct firmware permitting continuous hot-swapping – even between different vintage multiprocessors. The hardware-software combination shall automatically check and display the status, location, and CAT 5e crimp and wiring integrity. Hardware and software troubleshooting indications shall point out any and all errors. The digital remote shall fit into a 1-gang US standard electrical junction box. The digital remote shall be available in white, ivory or black, and come with a matching Decora® wallplate.

The Digital Remote shall be a Rane DR1 connected to a Rane HAL multiprocessor or EXP expander running Rane Halogen software.

DR2 Architects & Engineers Specification

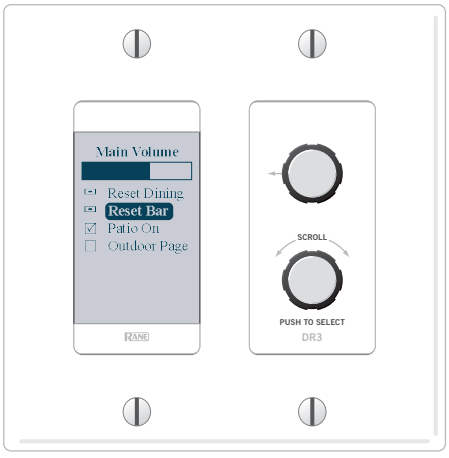
The digital remote shall control either source or preset selection (radio buttons), or a list of checkbox toggles and commands, and be located up to 300 meters (1,000 feet) away from the rack room multiprocessor. The digital remote shall have a customizable backlit LCD screen for end user labeling of up to 20 controls with variable and automatic dimming feature for superior visibility under varying light conditions. The digital remote shall connect to and be powered by the rack room multiprocessor using a dedicated homerun shielded CAT 5e (or better) cable. Low communication data rates shall permit use of punch-down blocks or RJ-45 patch bays for homerun cable routing flexibility as well as relaxed minimum bend radius. The shielded CAT 5e interface shall transport power, ground and a communications channel. The digital remote shall support portable use and hot-swapping so that devices may be replaced without reprogramming or shutting down the system, and do so without audio interference. Within seconds, all settings for new or existing portable digital remotes shall be automatically downloaded from the multiprocessor along with the correct firmware permitting repeated hot-swapping – even between different vintage multiprocessors. The hardware-software combination shall automatically check and display the status, location, and CAT 5e crimp and wiring integrity. Hardware and software troubleshooting indicators shall point out any and all errors. The digital remote shall fit into a 2-gang US standard electrical junction box. The digital remote shall be available in white, ivory or black, and come with a matching Decora® wallplate.

The Digital Remote shall be a Rane DR2 connected to a Rane HAL multiprocessor running Rane Halogen software.

DR3 Architects & Engineers Specification

The digital remote shall control source or preset selection (radio buttons), or a list of checkbox toggles and commands, plus level control and be located up to 300 meters (1,000 feet) away from the multiprocessor. The digital remote shall have a customizable backlit LCD screen for end user labeling of up to 20 controls with variable and automatic backlight dimming feature for superior visibility under varying light conditions. The digital remote shall connect to and be powered by the rack room multiprocessor using a dedicated homerun shielded CAT 5e (or better) cable. Low communication data rates shall permit use of punch-down blocks or RJ-45 patch bays for homerun cable routing flexibility as well as relaxed minimum bend radius. This shielded CAT 5e interface shall transport power, ground and a communications channel. The digital remote shall support portable use and hot-swapping so that devices may be replaced without reprogramming or shutting down the system, and do so without audio interference. Within seconds, all settings for new or existing portable digital remotes shall be automatically downloaded from the multiprocessor along with the correct firmware permitting repeated hot-swapping – even between different vintage multiprocessors. The hardware-software combination shall automatically check and display the status, location, and CAT 5e crimp and wiring integrity. The digital remote shall fit into a 2-gang US standard electrical junction box. The digital remote shall be available in white, ivory or black, and come with a matching Decora® wallplate.

The Digital Remote shall be a Rane DR3 connected to a Rane HAL multiprocessor running Rane Halogen software.



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