



HAL System Description

Meet HAL, an expert in room combining, paging and distributed audio systems. This groundbreaking architecture is dimensions beyond any other solution. 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 required to distribute pages and background music to multiple zones.

Seamlessly interface HAL to your application with a broad variety of peripheral devices including smart Digital Remotes, Remote Audio Devices (RADs), portable and in-rack automixers, audio I/O and control 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.

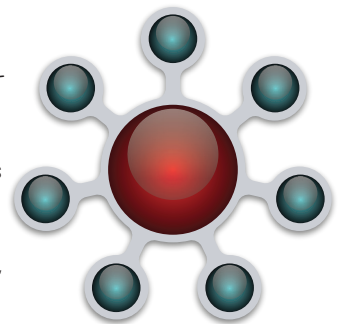
HAL is more than just another DSP drag-and-drop system. It has revolutionized system design and installation.

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 an additional 512 in x 512 out by adding EXP1x, EXP3x or EXP5x Expanders. Up to 32 Expanders can be daisy-chained to a single HAL1x. Add more mic inputs with AM Automixers. Add AEC with the new EXP7x (Oct. 2013).
- HAL2 supports 18 in x 18 out audio, of which 2 x 2 come from AES3 on XLR connections.
- HAL3 supports 4 in x 8 out audio, of which 2 “Line-Plus” Inputs accept balanced line, or mono left/right unbalanced lines.
- HAL4 supports 2 in x 2 out audio, of which 2 “Mic/Line-Plus” Inputs accept balanced mic, line, or mono left/right unbalanced lines. (Oct. 2013).

See the “HAL Comparison” on page 2.

Halogen software includes Ethernet control support for third-party control systems. Standard TCP/IP set and get ASCII text messages control levels, selectors, presets and toggle actions within Halogen. 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 to test your control systems software code and buy the hardware only when the install date arrives. See the HAL System Data Sheet for screenshots and processing block descriptions.



HALOGEN

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

Well-documented example programs for AMX, Crestron and Stardraw Control ease programming headaches. These Support Packages are installed with Halogen software, or available as separate downloads.



HAL3

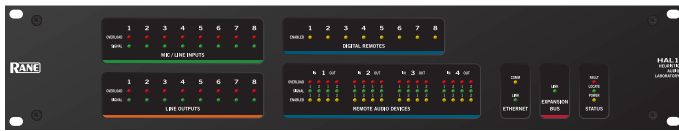
Multiprocessor



HAL 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



EXP3x Zone Output Expander for HAL1x



EXP5x Input Expander for HAL1x

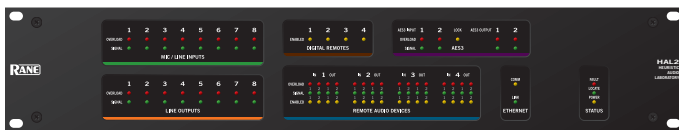


EXP7x AEC Expander for HAL1x (available October 2013)



HAL2 Multiprocessor

- 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.

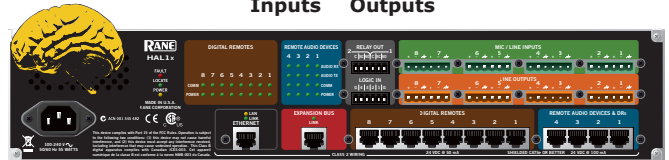


HAL3 Multiprocessor

- 4 line in x 8 line out - 2x6 analog & 2x2 digital (RAD port).
- Line-Plus Inputs can wire "balanced" or "unbalanced L/R monoed."
- Up to four Digital Remotes.
- Four logic inputs (closure).



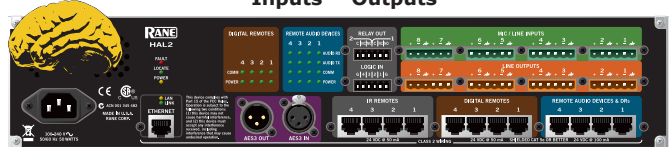
Analog Mic / Line Inputs 8	8 Analog Line Outputs
Digital RAD Port Inputs 8	8 Digital RAD Port Outputs
Digital Expansion into HAL1x 512	512 Digital Expansion from HAL1x
Total in the HAL1x DSP Brain 528	528
Inputs	Outputs



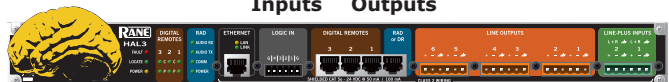
Daisy-chain up to 32 Expanders

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

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
Inputs	Outputs



Analog Line-Plus Inputs 2	6 Analog Line Outputs
Digital RAD Port Inputs 2	2 Digital RAD Port Outputs
Total in the HAL3 DSP Brain 4	8
Inputs	Outputs



HAL Comparison

HAL4 Multiprocessor

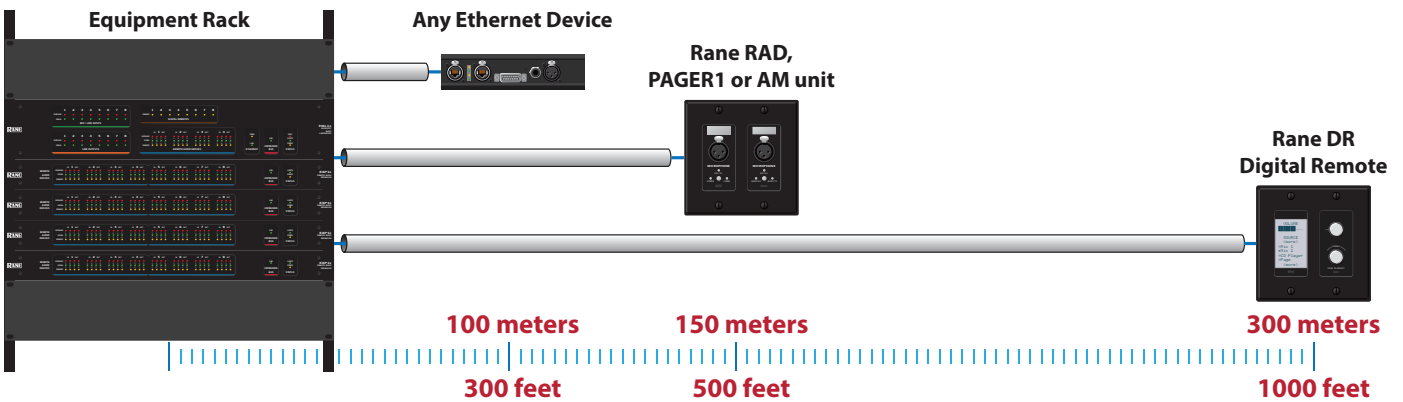
- 2 Mic/Line/Line-Plus Inputs can wire “mic balanced,” “line balanced,” or “unbalanced L/R monoed.”
- 2 balanced line outputs.
- One Digital Remote Port.

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

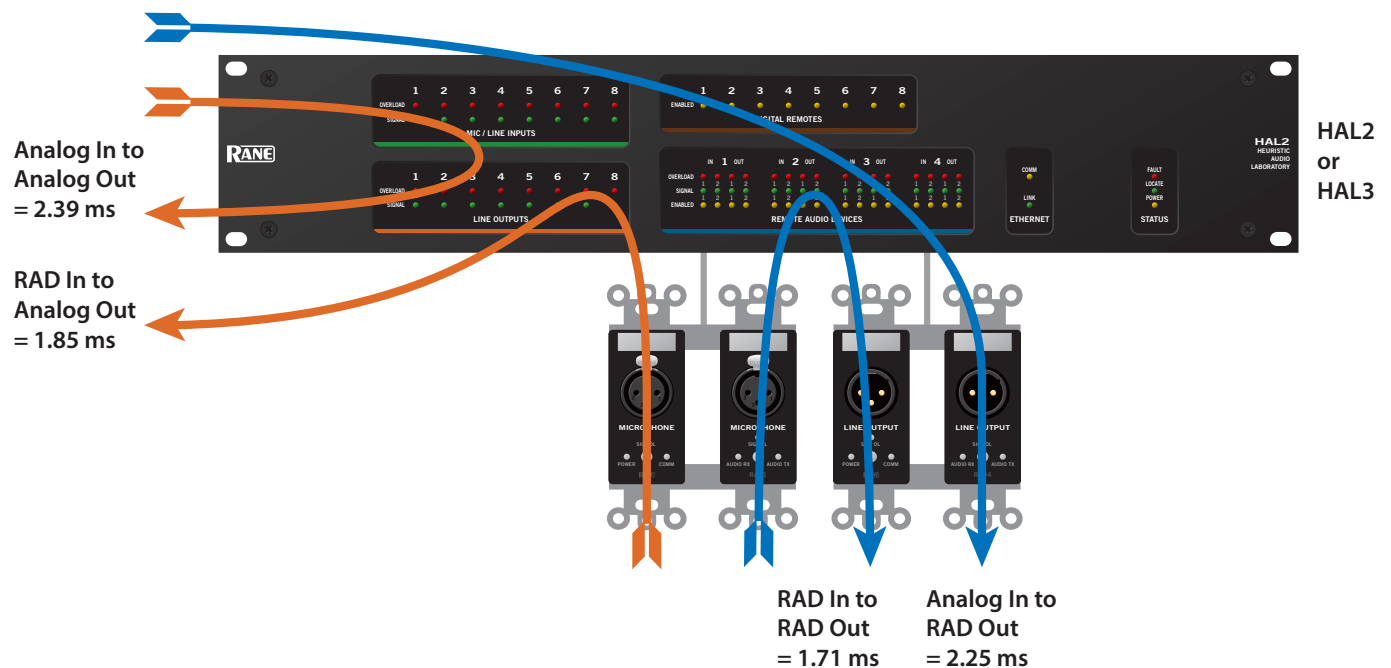
The HAL4 Multiprocessor and EXP7x AEC Expander will ship October 2013.

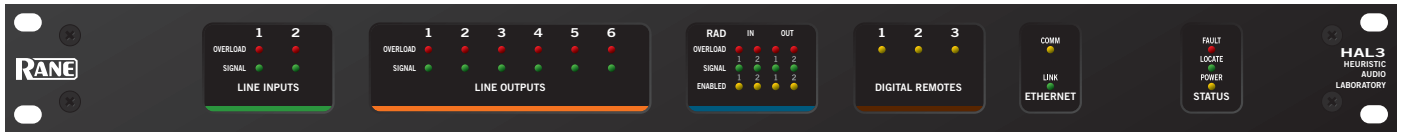
These devices have not been authorized as required by the rules of the Federal Communications Commission. These devices are not, and may not be, offered for sale or lease, or sold or leased, until authorization is obtained.

RAD and DR Cable Lengths



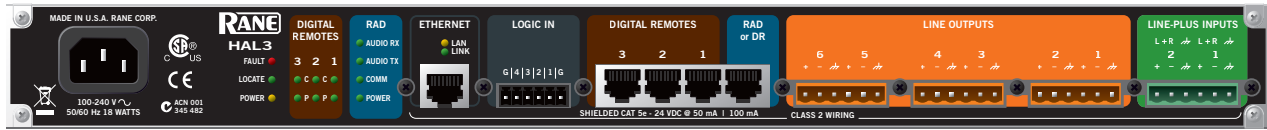
Latency





HAL3 Specifications

Parameter	Specification	Limit	Conditions/Comments
Analog I/O	2 x 6		
...Input Connectors	Euroblock		4 x 6-pin, 5 mm pitch, Green
...Output Connectors	Euroblock		4 x 6-pin, 5 mm pitch, Orange
...CODEC	24-bit, 48 kHz		
Line Input: Balanced Mono	Active Balanced Mono		
...Input Impedance	10.0 k Ω	1%	1 kHz, each leg to ground
...THD+N	< 0.01 %	typ	20-20k Hz, +4 dBu, unity gain, 20 kHz BW
...Maximum Balanced Input	20.6 dBu (8.3 Vrms)	typ	Input gain at 0 dB, 1 kHz, <1% THD+N
...Frequency Response	20-20k Hz, +0, -3 dB		+4 dBu, unity gain
...Dynamic Range	95 dB	max	re +20 dBu, 20 kHz BW, A weighted, Rs = 150 Ω
...Interchannel Isolation	100 dB	max	20-20k Hz, +20 dBu, unity gain, channel-to-channel
Line Input: Unbalanced Stereo	Active Balanced Mono		
...Input Impedance	10.0 k Ω	1%	1 kHz, each channel to ground
...THD+N	< 0.01 %	typ	20-20k, L/R combined, +4 dBu, unity gain, 20 kHz BW
...Maximum Unbalanced Input	20.6 dBu (8.3 Vrms)	typ	L/R combined, 1 kHz, <1% THD+N
...Frequency Response	20-20k Hz, +0, -3 dB		L/R combined, +4 dBu, unity gain
...Dynamic Range	95 dB	max	re +20 dBu, 20 kHz BW, A weighted, Rs = 150 Ω
Outputs	Active Balanced		
...Impedance	200 Ω	1%	Each leg
...Maximum Output	+20.9 / +16.4 dBu	typ	1 kHz, 100 k Ω / 600 Ω load
...Frequency Response	20-20k Hz, +0.1 / -0.3 dB		+4 dBu, unity gain, 100 k Ω load
...Dynamic Range	104 dB	max	re +20 dBu, 20 kHz BW, A-weighted, 100 k Ω load
...Interchannel Isolation	104 dB	typ	20-20k Hz, +20 dBu, channel-to-channel, 100 k Ω 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 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 DSPs @ 300 MHz each 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



Parameter	Specification	Limit	Conditions/Comments
RAD Port	1		RJ-45 connector
...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, 18 W max
Ambient Room Temp.	40 °C	max	Maximum external loading
Conformity: Safety			
...NRTL (USA)	UL 60065		cCSAus (CSA file no. 247105)
...CSA (Canada)	CAN/CSA 60065		cCSAus (CSA file no. 247105)
...EU Directive 2006/95/EC	EN 60065		CB Certificate (Nemko)
Conformity: EMC			
...FCC	Part 15B		Class B Device
...EU Directive 2004/108/EC	EN 55103-1, EN 55103-2		Environment E2
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	4.75 lb		(2.2 kg)
Shipping: Size	6.5" x 20.3" x 13.75"		(16.5 cm x 52 cm x 35 cm)
...Weight	8 lb		(3.7 kg)

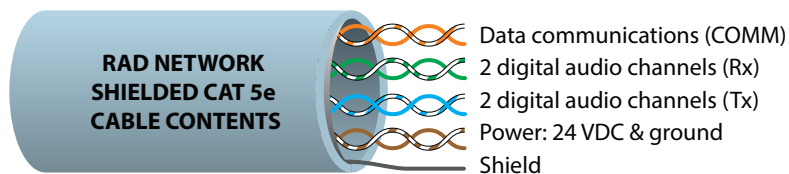
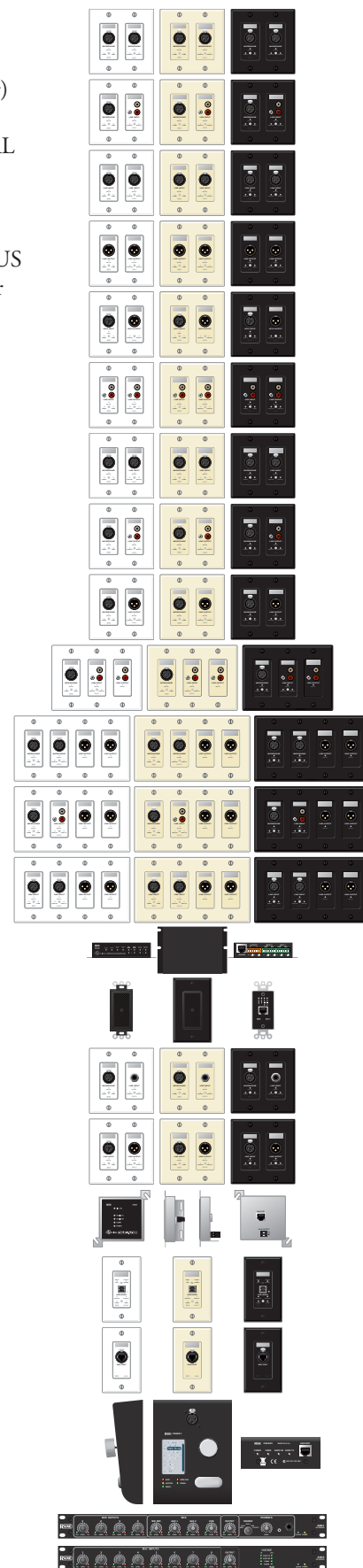
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RADs

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 150 meter (500 feet) 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. Except for the RAD16, RAD17, RAD24, AM1, AM2, and PAGER1, all other RADs are available in white, ivory, or black, with a matched Decora® plate cover included.

- 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
- RAD18** XLR Mic Input / 1/4" Balanced Line Input
- RAD23** XLR Line Input / XLR Line Output
- RAD24** One-Watt, Plenum-Rated Amplifier
- RAD27** USB Audio Sound Card
- RADX** RAD Port Extension (CAT 5 wall jack for portable RADs)
- AM1** Four-Channel Gain-Sharing Automixer with added Line Inputs
- AM2** Eight-Channel Gain-Sharing Cascadable Automixer
- PAGER1** Mic Preamp with Push-to-Talk and Page Zone Selection



DR Remotes

- Simplify end-user control in HAL systems.
- Home run CAT 5e connection to any HAL up to 300 meters.
- Fit in standard electrical boxes.
- Customizable backlit LCD screens for intuitive labeling.
- Available in white, ivory or black (Decora® plate included).

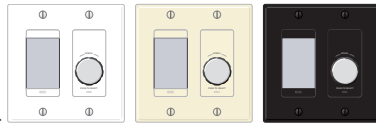
DR1

- Supports Level Control.



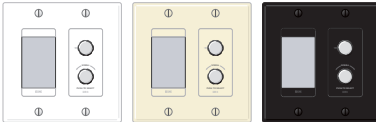
DR2

- Single Selector.
- List of Toggles/Commands.



DR3

- Single Level plus Selector.
- Single Level & List of Toggles/Commands.
- List of Levels for either multizone volume control or input mix.



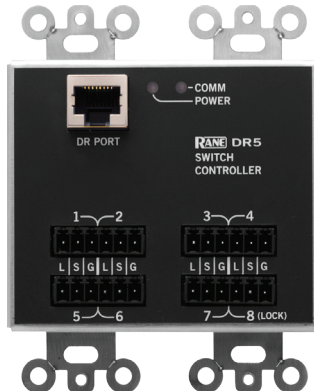
DR4 Logic I/O Remote

The DR4 Digital Remote adds additional logic input and output ports to any HAL, enabling simple analog level and logic I/O controls. The DR4 offers eight logic ins and outs, six IR2 ports (future use) and eight analog control 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.



DR5 Switch Controller

The DR5 Digital Remote offers additional logic input and output ports, enabling the use of simple analog level 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 a DR5. It is designed to fit in a standard US dual-gang electrical box.

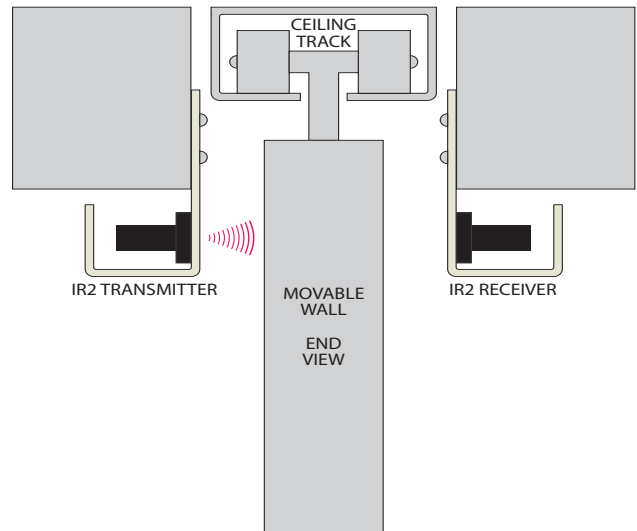


IR2 Infrared Wall Sensors

The Rane IR2 provides an automatic way to sense the position of a movable wall or door. Mounting brackets and screws are included. A single CAT 5e cable for each door connects the IR2 pair to a dedicated IR Remote port on the rear of a HAL2 or a DR4.



The IR2 works with Halogen's Room Combine Processor to support custom wall layouts and auto-activation of independent room processors for each possible physical room as walls open and close. Control links to Digital Remotes also combine and separate automatically as wall states change. No presets required.

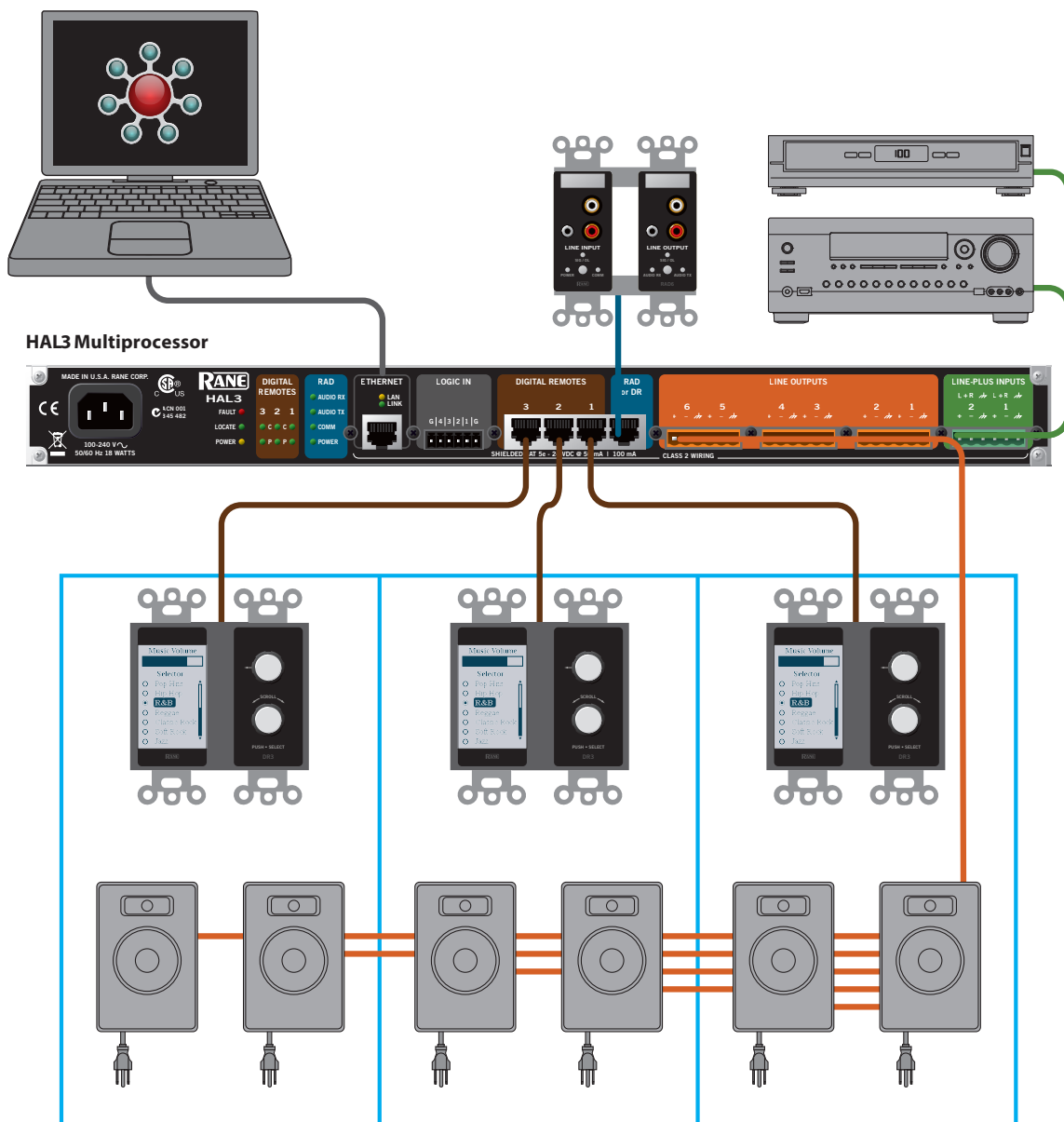


PAGER1 Paging Station

This RAD has a mic preamp, paging zone(s) [Scenario] selector and an integrated push-to-talk switch. It sits on or can fasten to a tabletop, and accepts any gooseneck microphone (not included).



Example HAL3 Background Music System



Applications

- 3-zone stereo music system
- 6-zone mono music system
- 3-zone mono 2-way (biamped) music system

Inputs

- The 2 Line-Plus Inputs may be wired as “+4 dBu balanced” or “-10 dBV unbalanced Left/Right Monoed.”
- A RAD can add 2 more mic or line inputs, and 2 more line outputs.
- An AM1 into the RAD port would add 4 gain-shared mic inputs, 2 line inputs and a USB audio input (all mono'ed).
- An AM2 into the RAD port would add 8 gain-shared mic inputs (mono mix).