HAL System Description

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, a 7-inch programmable touchscreen, expansion devices for logic and wall sensors. Control HAL functions from a web browser in any smartphone, computer or tablet – including iPads, iPhones, Androids, Samsung, etc. The Event Manager can trigger events using time-of-day.

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. Does your DSP troubleshoot the cable install for you and offer a "Get on the Plane" indicator showing you that the installers have finished their job? It should.

Halogen software includes Ethernet control support for third-party control systems such as AMX®, Crestron® and Stardraw Control™, including well-documented examples. Standard TCP/IP set and get ASCII text messages control levels, selectors, presets and toggle software actions. 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 and completely skip needing it early solely for control system programming verification.

Analog audio has always offered "plug it in, it works." With HAL's modern DSP system, finally digital audio offers "plug it in, it works." Without IP anything, without DHCP servers, without unblocking ports, without firmware mismatches, without hours (or days?) of bad cable termination or swapped cable-pull troubleshooting, and other troubles caused by Ethernet and other supposedly modern digital audio and control transports.

HALOGEN

Includes Customizable Web Controls

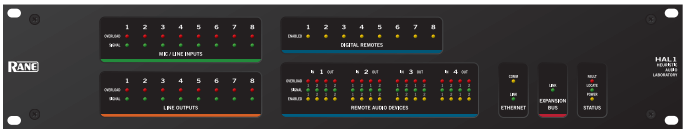
Download Halogen and design a system now!
rane.com/hal
Applications, installations, and solutions are at blog.rane.com

AMX CRESTRON STARDRAW CONTROL

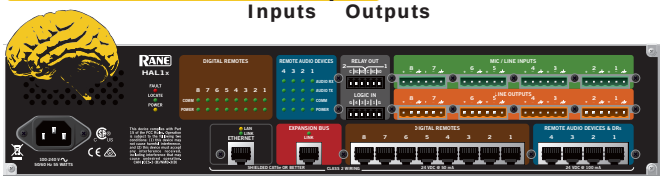
HAL Comparison

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).



Inputs	Outputs
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**



Daisy-chain up to 32 EXPanders

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.

EXP2x Dante Expander for HAL1x (Fall 2014)

- Enables HAL1x to send / receive 32 channels to Dante devices.
- 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

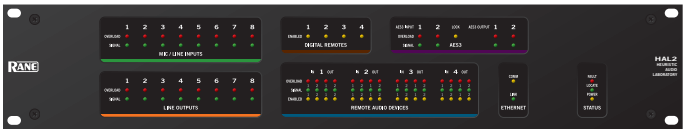
- Adds 12 analog mic / line/ line-plus* inputs to a HAL1x.
- Adds 4 Digital Remote ports to a HAL1x.
- Chain up to 32 EXP5x units to a HAL1x for 384 analog outputs.

EXP7x AEC Expander for HAL1x

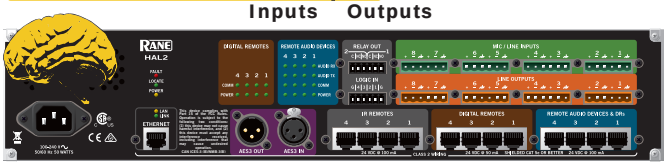
- Adds 8 channels of Acoustic Echo Cancelling DSP to a HAL1x.
- Chain up to 32 EXP7x units to a HAL1x for 256 AEC channels.

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.



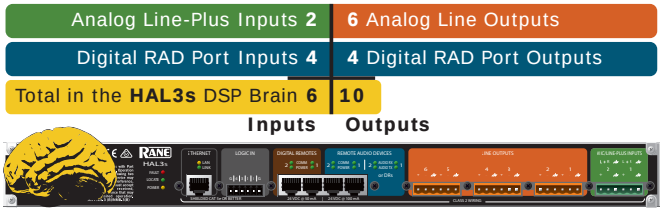
Inputs	Outputs
Analog Mic / Line Inputs **8**	**8** Analog Line Outputs
Digital RAD Port Inputs **8**	**8** Digital RAD Port Outputs
(AES3) Input Channels **2**	**2** (AES3) Output Channels
Total in the **HAL2** DSP Brain **18**	**18**



HAL Comparison

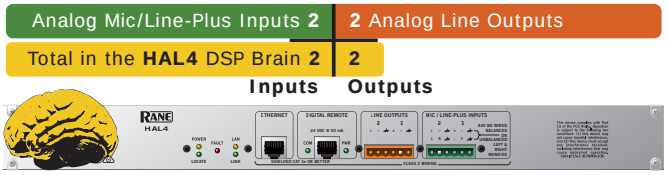
HAL3s Multiprocessor

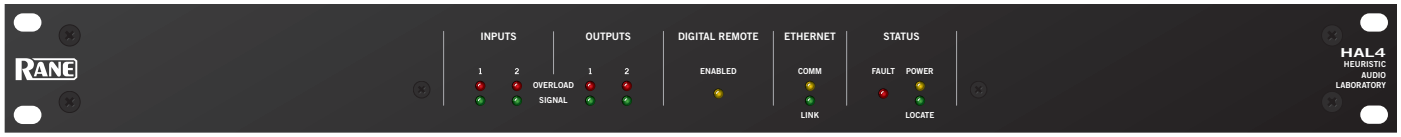
- 6 line in x 10 line out - 2x6 analog & 4x4 digital (RAD port).
- 2 Mic/Line/ Line-Plus Inputs.*
- Up to four Digital Remotes.
- Four logic inputs (closure).



HAL4 Multiprocessor

*- 2 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.
- 2 balanced line outputs.
- One Digital Remote Port.





The HAL4 is a stand-alone 2x2 Halogen replacement for the popular DragNet RPM2 with four-times the processing power, improved digital remote and Web Control options, simplified linking and improved preset recall capability. It solves just about every signal processing problem encountered in one and two room spaces. Some typical applications include:

- House of Worship
- Education / Gymnasium
- Theatre / Auditorium
- Health Clubs
- Basic PA / Small Meeting Room, and combining two rooms.

The HAL4 is a 2-Input, 2-Output drag-and-drop DSP device for Halogen software. Inputs are Line / Line-Plus / Mic with switchable +48V phantom. In addition to balanced Line and Mic inputs, this configuration allows connecting a stereo pair for conversion to a single L+R mono signal input. This versatile, universal audio input configuration accommodates a wide variety of applications. Standard balanced outputs are provided.

A single DR port provides support for preset recall, level control and selection functions using a DR1, DR2 or DR3. Support is also available for 3rd-party and Web Controls using any device with a web browser such as a tablet, smart phone or iPad. These flexible control options present many possible control solutions.

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!

Dynamics
Ambient Noise Compensator (ANC)
Automatic Gain Control (AGC)
Compressor
Ducker
Expander
Gate
Limiter

Misc. blocks
Level
Delay: simple
Delay: distance
Delay: video
Signal Meter
Pink Noise: Simple
Pink Noise: Ramped
Pink Noise: Swept
Sine Wave generator
Voice Detect

Filters
Feedback Suppressor
Cut Filter
Shelf Filter: single
Shelf Filter: multichannel
Parametric EQ: single
Parametric EQ: multichannel
Graphic EQ
FIR Filter
Crossover: 2-way mono
Crossover: 3-way mono
Crossover: 4-way mono
Crossover: 2-way stereo
Crossover: 3-way stereo
Crossover: 4-way stereo
Crossover: all-pass
Crossover: CD horn

Mixers
Mixer: 2 to 80 inputs
Matrix Mixer
Gain-sharing Auto Mixer
Gain-sharing Auto Matrix Mixer

Selectors
Selector: 2 to 80 inputs
Priority Selector
Router: 2 to 80 outputs

Paging and Room Combine
Distributed Program Bus
Paging Station with 2-band PEQ, Compressor, Level
Paging Zone
Emergency Page Zone
Zone Processor with Priority Selector, Level,Paging Zone

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

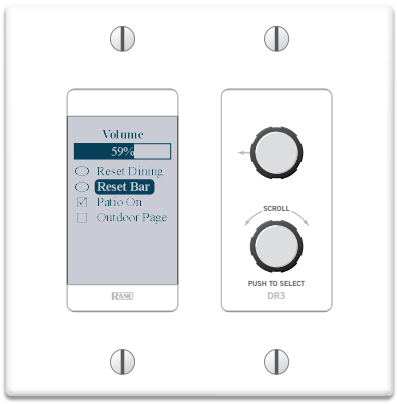
Level Control

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

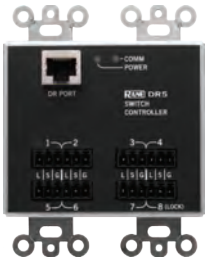
Single Level & Selector

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 rackmount DR4 offers eight logic ins and outs for switches and relays, six IR2 ports for door sensors and eight analog control input ports for pot-on-a-wall level control.

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 fits in a standard US dual-gang electrical box.



DR6 Touchscreen Remote

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. 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. An optional desk stand accessory (shown) allows the DR6 to mount on a horizontal surface.

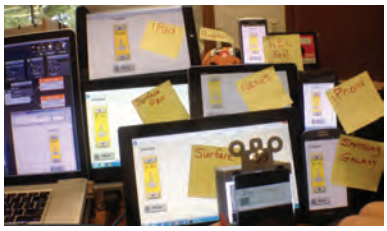
Details of HAL Accessories are found in the HAL System Data Sheet

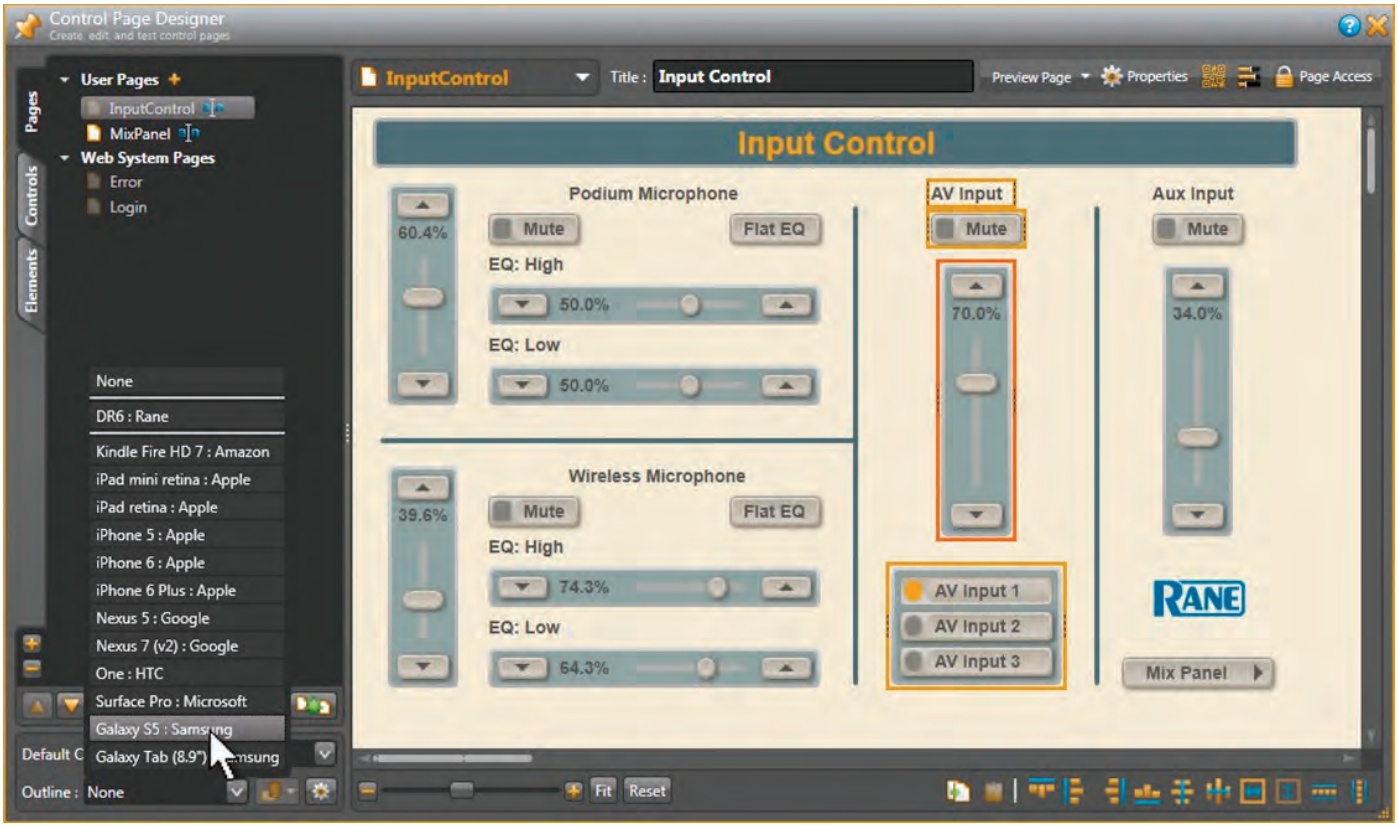
Halogen Web Controls

Control the Levels, Selectors, Toggles and Commands in any HAL System from **any device with a web browser**. Halogen'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 & DR6) and wireless devices and they'll automatically track each other.

Customers 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 ink on this page not listing all the possible devices that support web browsers and wireless Ethernet. Besides, the list will change before the ink dries.





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%	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	4.25" x 20.3" x 13.75"		(11 cm x 52 cm x 35 cm)
...Weight	8.02 lb		(3.64 kg)

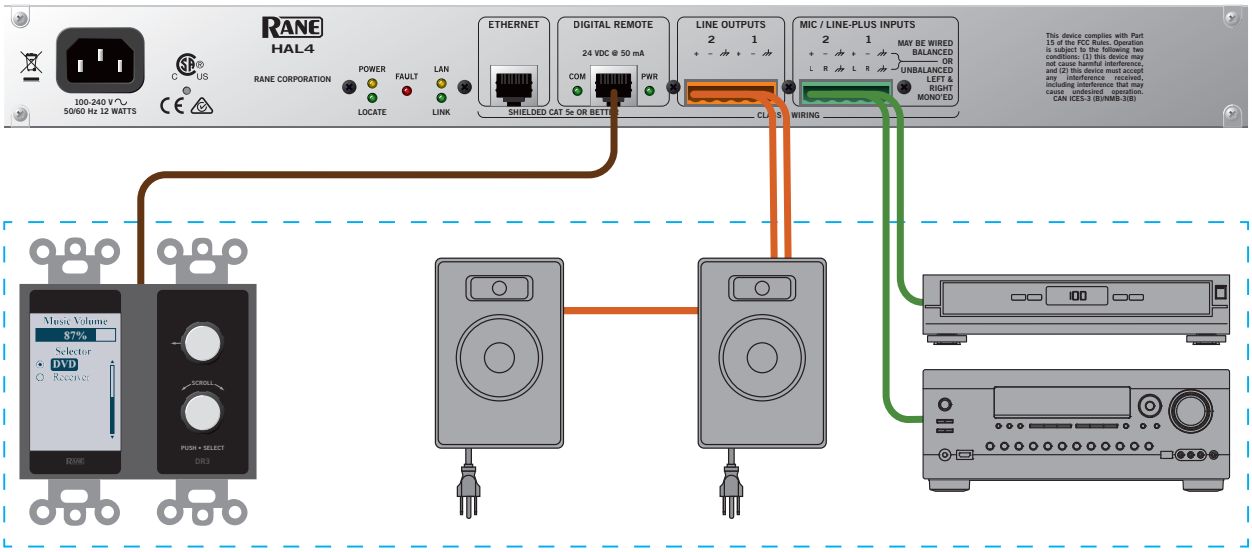
HAL4 Multiprocessor Architects & Engineers Specification

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, and capable of creating controls for use in a web browser. 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).

Example HAL4 Background Music System

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



Applications

Simply put, the HAL4 has a ton of DSP horsepower. Combine this with the flexibility of drag and drop system design and the HAL4 fits a variety of applications, simple or complex. Such as:

- A 2-channel Graphic Equalizer using Rane's Perfect-Q technology. Store and recall different EQ curves using presets.
- Add several bands of parametric filters for precise EQ.
- Add a limiter on each output for speaker protection.
- Add compression or AGC for dynamics control.
- Give one of the inputs Priority for automatic source selection.

It's easy to make a small restaurant or office system with two zones with presets for source selection.

Replace one of the line sources with a paging mic and now you have a simple two-zone music/paging system. Halogen makes it easy to set up emergency paging, adjust the ducking, eliminate feedback, and configure a backlit DR remote so anyone can easily control volume, the source, or both.