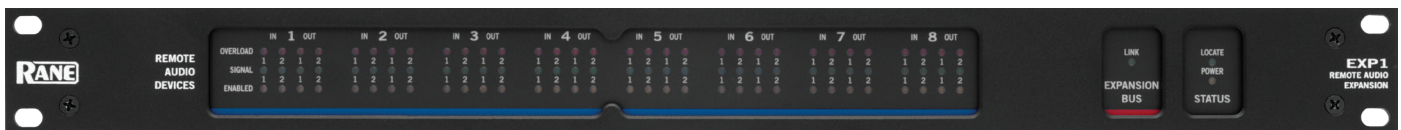




HAL1 Multiprocessor



EXP1 Expander for HAL1

General 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.

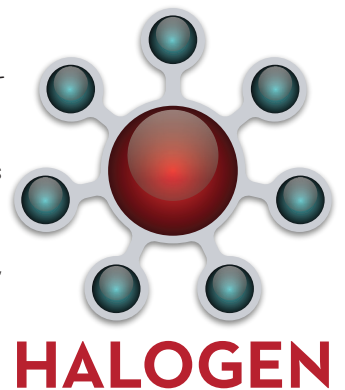
In addition, the HAL Multiprocessor and Halogen software check the status, location, CAT 5 wiring integrity, and that audio is flowing in all peripheral devices, so you know your system is properly connected and ready to go.

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

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

- HAL1 supports 16 in x 16 out audio, which may be increased up to 80 in x 48 out by adding EXP1 Expanders. More mic inputs can be added with AM1 and AM2 Automixers.
- 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 sum stereo unbalanced lines. 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.



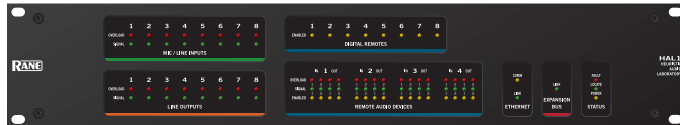
HAL1 Multiprocessor EXP1 Expander



HAL Comparison

HAL1 Multiprocessor

- 16 in x 16 out - 8x8 analog & 8x8 digital (RAD ports).
- Up to 4 RADs (without EXP1), up to 36 RADs (with EXP1s).
- Up to 12 Digital Remotes (without EXP1), up to 44 (with EXP1s).
- Four logic inputs (closure), Two relay outputs.

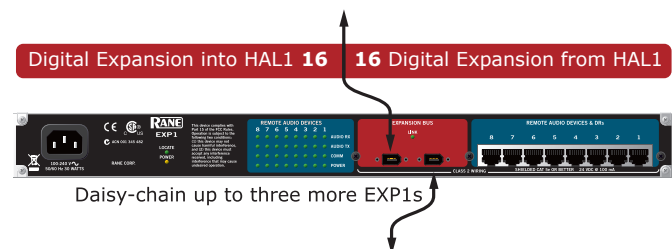
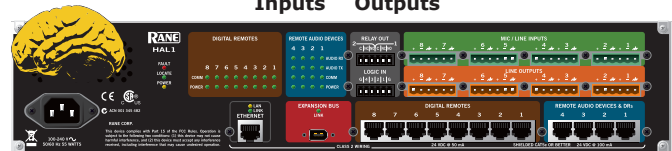


EXP1 Expander for HAL1

- Adds 16 in x 16 out digital (8 more RAD ports) to HAL1 (only).
- Up to 8 Digital Remotes or RADs in any combination.
- Chain up to four EXP1 Units to a HAL1 for 80 in x 48 out.



| | |
|--|---------------------------------------|
| Analog Mic / Line Inputs 8 | 8 Analog Line Outputs |
| Digital RAD Port Inputs 8 | 8 Digital RAD Port Outputs |
| Digital Expansion into HAL1 64 | 32 Digital Expansion from HAL1 |
| Total in the HAL1 DSP Brain 80 | 48 |
| Inputs | Outputs |

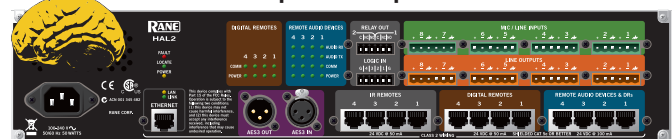


NEW! HAL2 Multiprocessor

- 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.



| | |
|--|-----------------------------------|
| 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 |

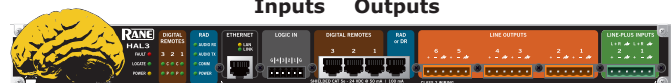


NEW! HAL3 Multiprocessor

- 4 line in x 8 line out - 2x6 analog & 2x2 digital (RAD port).
- Line-Plus Inputs are configured in Halogen Software:
" +4 dBu balanced" or "-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 2 | 2 Digital RAD Port Outputs |
| Total in the HAL3 DSP Brain 4 | 8 |
| Inputs | Outputs |

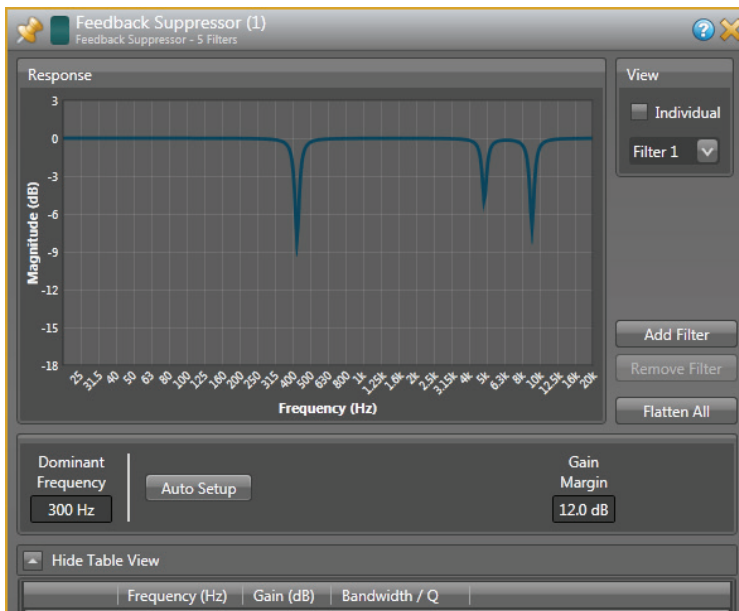


NEW! Halogen 2.0 Processing



Ambient Noise Compensator (ANC) Block

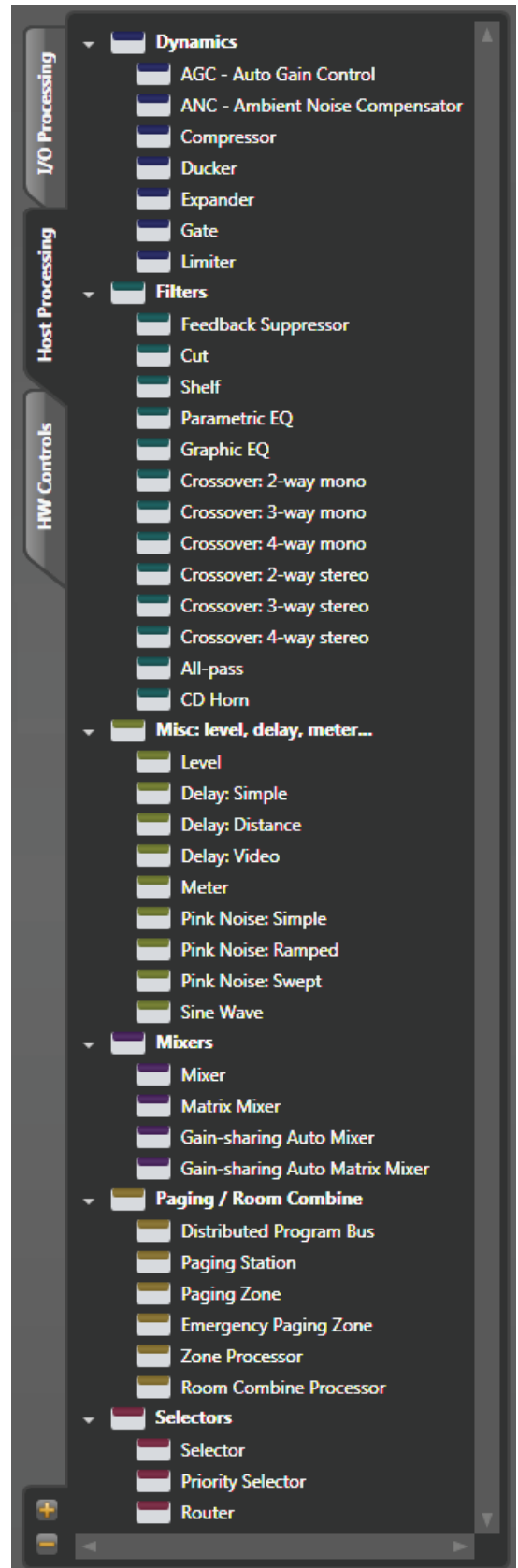
The new Ambient Noise Compensation (ANC) DSP block is perfect for retail, restaurants, hotels, busy lobbies, industrial areas, transportation stations and even the cry room in a house of worship. The ANC block automatically adjusts page and/or program music volumes as the room background noise changes. It constantly models the direct and reflected sound between sensing mics (such as Rane's new RAD17 on page 3) and the loudspeakers to distinguish noise from the loudspeaker content.

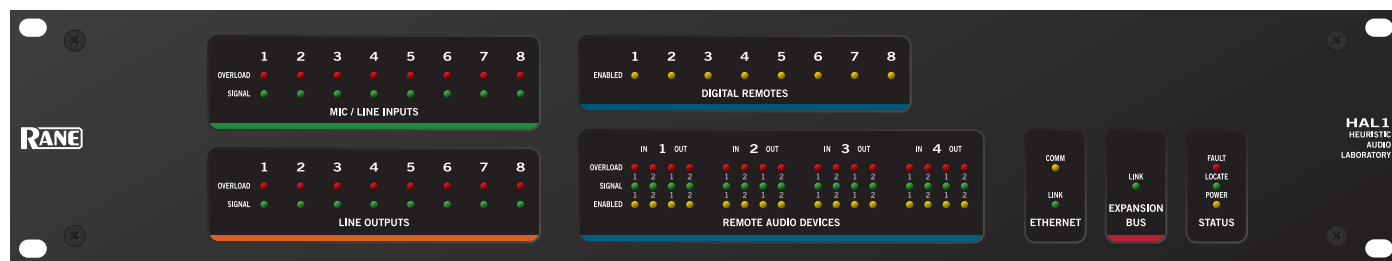


Feedback Suppressor Block

Rane's patented Feedback Suppressor DSP block provides the peace of mind needed when system acoustics and sound system uses encounter a PAG-NAG conflict. The Feedback Suppressor is constantly looking for feedback and automatically deploys notch filters as needed.

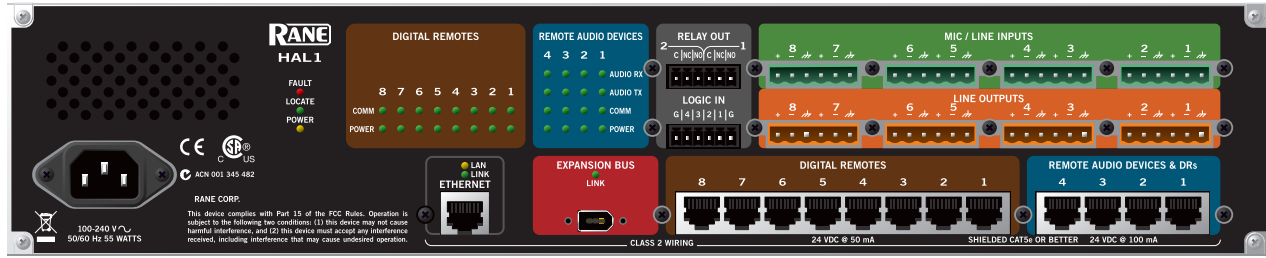
2.0 Processing Blocks



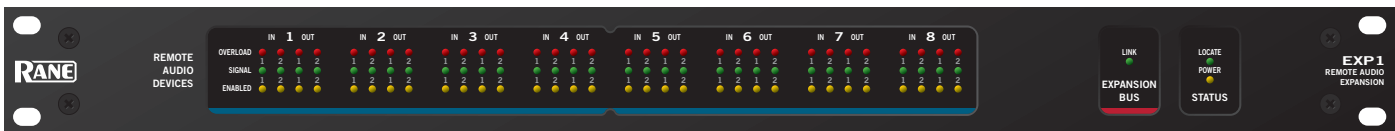


HAL1 Specifications

| 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 k Ω | 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 |
| Line Inputs | Active Balanced | | |
| ...Gain Settings | Unity & +10 to +20 dB | | 1 dB steps from +10 to +20 |
| ...Input Impedance | 5.1 k Ω | 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 |
| ...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 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 | 109 dB | max | re +20 dBu, 20 kHz BW, A-weighted, 100 k Ω load |
| ...Interchannel Isolation | 110 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 | | | |
| ...RAD In to RAD Out | 1.71 ms | typ | See the Latency graphic on page page 7. |
| ...RAD In to Analog Out | 1.85 ms | typ | Tested with RAD23 |
| ...Analog In to RAD Out | 2.25 ms | typ | |
| ...Analog In to Analog Out | 2.39 ms | typ | |
| DSP | | | |
| ...HAL1 Processing Power | 9600 MIPS | max | 4 DSPs @ 300 MHz each with up to 8 instructions / cycle |
| ...Word Length | 32 / 64-bit Floating Point | | |
| ...HAL1 Delay Memory | 80 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 | 328 feet / 100 meters | max | Standard Ethernet cable length limit |



| Parameter | Specification | Limit | Conditions/Comments |
|-----------------------------|---------------------------|-------|--|
| HAL1 Expansion Bus | Only on the HAL1 | | IEEE 1394a (FireWire) connectors |
| ...Audio Channels | 64 in x 32 out of HAL1 | max | Plus control channel |
| ...Maximum EXP1 Units | 4 | max | Daisy-chain with FireWire cable included in EXP box |
| ...Type/Connector/Cable | IEEE 1394a, 6-pin | | Optional screw locks on HAL and EXP units* (see page 10) |
| ...Maximum Cable Length | 15 feet / 4.5 meters | max | Standard IEEE 1394a cable length limit |
| ...Included Cable Length | 3 feet / 1 meter | | Included cable with EXP unit is not a locking type |
| ...Propagation Delay | 0.83 ms | typ | In or Out of Expansion Unit |
| 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 | 500 feet / 152.4 meters | max | Shielded CAT 5e cable or better |
| HAL1 DR Ports | 8 | | RJ-45 connectors |
| ...Power | 24 VDC @ 50 mA | max | Each port |
| ...Length | 1000 feet / 304.8 meters | 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 μ A 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 |
| 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 | 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) |



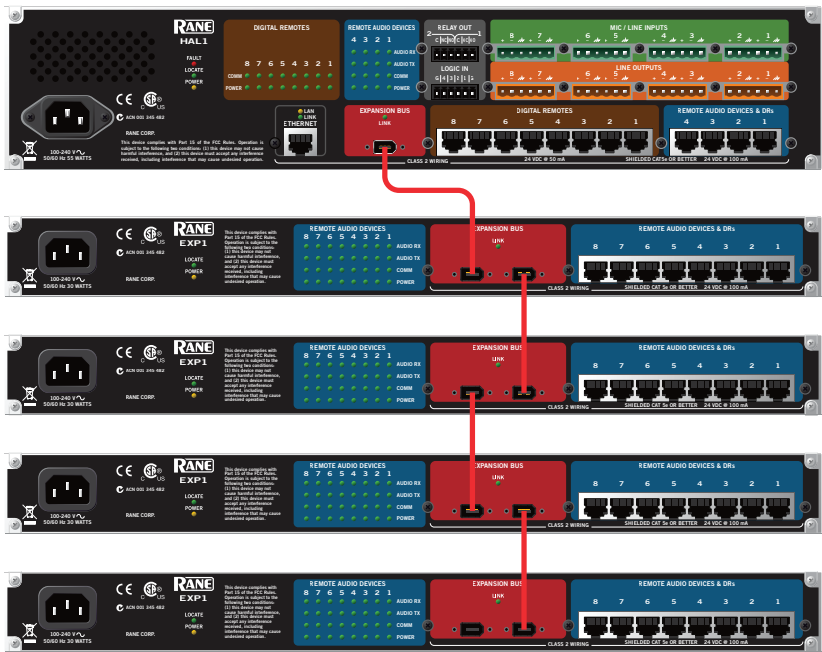
EXP1 Specifications

| Parameter | Specification | Limit | Conditions/Comments |
|-----------------------------|--------------------------|-------|--|
| Expansion Bus | HAL1 required | | IEEE 1394a (FireWire) connectors |
| ...Audio Channels | 64 in x 32 out of HAL1 | max | Plus control channel |
| ...Maximum EXP1 Units | 4 | max | Daisy-chain with FireWire cable included in EXP box |
| ...Type/Connector/Cable | IEEE 1394a, 6-pin | | Optional screw locks on HAL and EXP units* (see below) |
| ...Maximum Cable Length | 15 feet / 4.5 meters | max | Standard IEEE 1394a cable length limit |
| ...Included Cable Length | 3 feet / 1 meter | | Supplied cable is not a locking type* (see below) |
| 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 | 500 feet / 152.4 meters | max | Shielded CAT 5e cable or better |
| ...DR Cable Length | 1000 feet / 304.8 meters | 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, 30 W max |
| Conformity: Safety | | | |
| ...NRTL (USA) | UL 60065 | | cCSAus (CSA file #247105) |
| ...CSA (Canada) | CAN/CSA 60065 | | cCSAus (CSA file #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, 1.75" x 19" x 8.25" | | (4.4 x 48.3 x 20.9 cm) |
| ...Weight | 5 lb | | (2.3 kg) |
| Shipping Size | 6.5" x 20.3" x 13.75" | | (11.5 x 52 x 35 cm) |
| ...Weight | 8 lb | | (4.5 kg) |

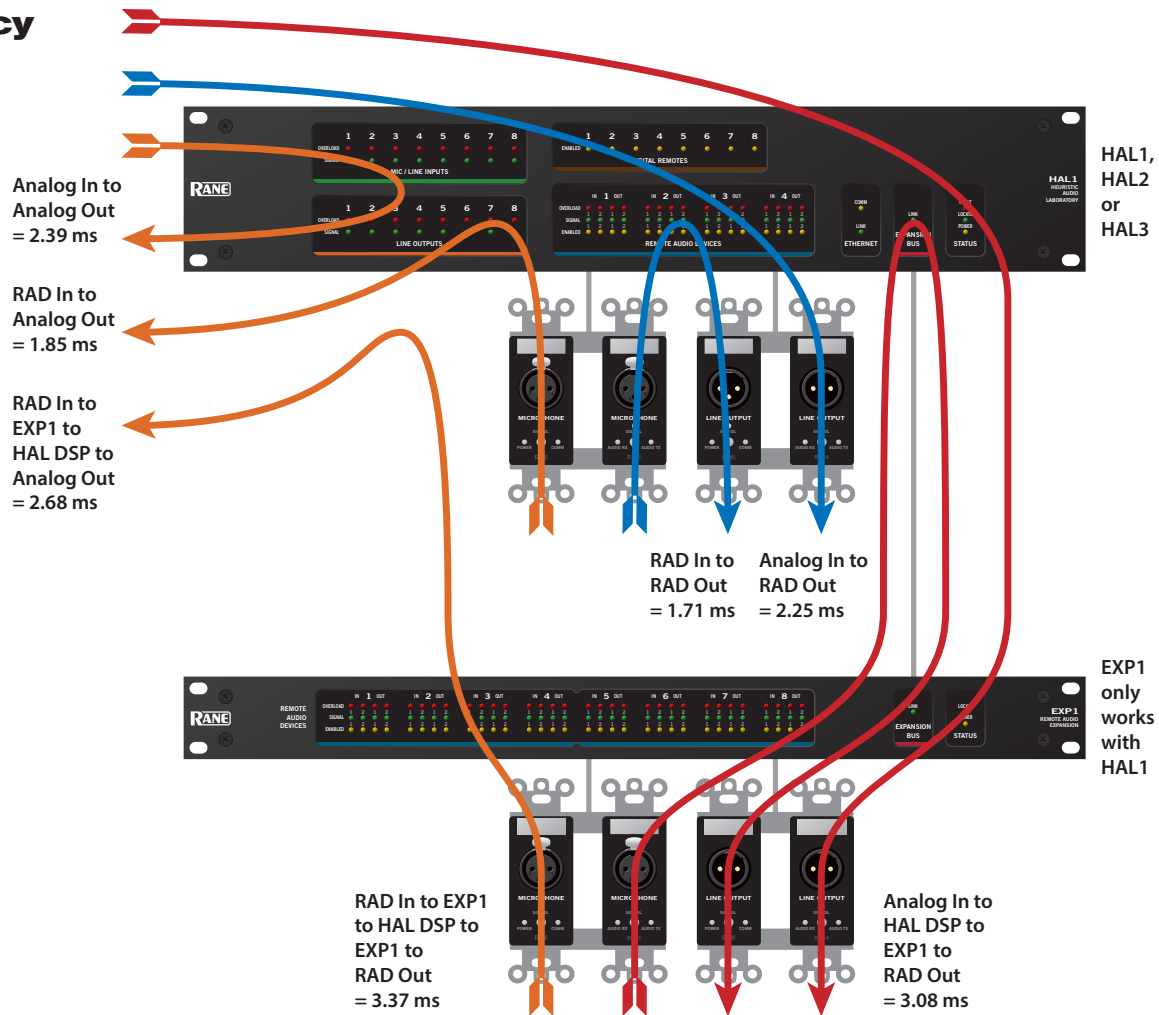
***FireWire Cable Sources**

Northwire NAFW1322-XX where XX is the length in meters. Features screw locks and industrial-grade cable.
northwire.com

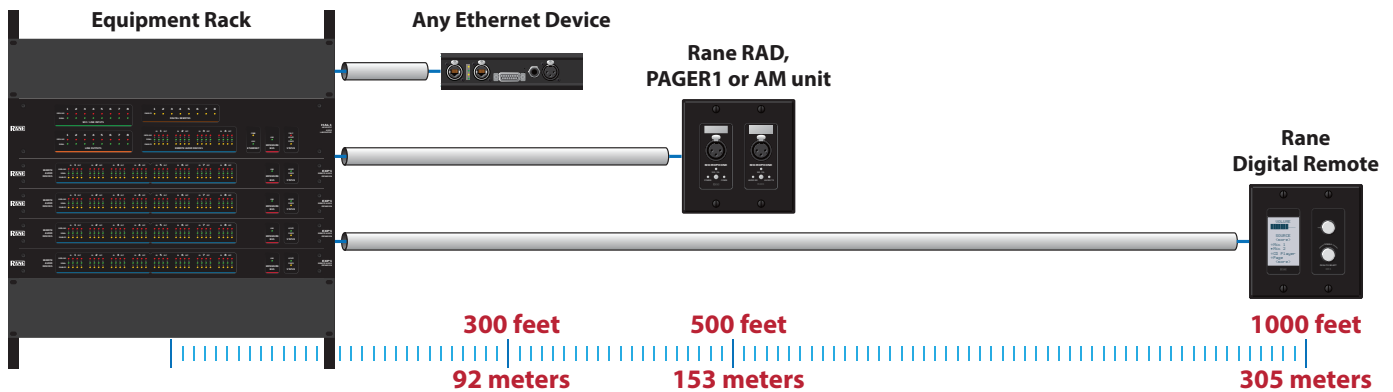
Newnex CFS-66XX-S where XX is the length in meters. Features thumb-screw locks.
newnex.com



Latency



RAD and DR Cable Lengths



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HAL1 Multiprocessor EXP1 Expander



Example HAL1 with EXP1 Expander

