GEM-EX-S/R

Dual 4K HDMI, USB, AUDIO, & RS-232 over a single CAT 6 Extender with Daisy-Chainable Receivers

Instructions for Use

Rev. 1.0 — October 16, 2026





IMPORTANT SAFETY INSTRUCTIONS

1. Do not expose this apparatus to rain, moisture, dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus.
2. Do not install or place this unit in a bookcase, built-in cabinet or in another confined space. Ensure the unit is well ventilated.
3. To prevent risk of electric shock or fire hazard due to overheating, do not obstruct the unit's ventilation openings with newspapers, tablecloths, curtains, and similar items.
4. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
5. Do not place sources of naked flames, such as lighted candles, on the unit.
6. Clean this apparatus only with dry cloth.
7. Unplug this apparatus during lightning storms or when unused for long periods of time.
8. Protect the power cord from being walked on or pinched particularly at plugs.
9. Only use attachments / accessories specified by the manufacturer.
10. Refer all servicing to qualified service personnel.

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INTRODUCTION

Overview

The GEM-EX is comprised of the GEM-EX-S sender and the GEM-EX-R receiver. The system is used to extend USB 2.0, Audio, dual RS-232, and dual display HDMI video supporting various resolutions including 1080p @ 60 Hz and 4K UHD @ 30 Hz. These signals are extended to one or more receivers up to a distance of 100 m (328 ft.) over a single CAT6 cable.

The sender features two HDMI inputs, one USB input, one analog audio input, and a dual-port capable RS-232 port for connection to a dual-head PC. The audio input is embedded into HDMI A. It provides two local HDMI outputs (corresponding to the two HDMI inputs) and features an internal USB hub with two local USB outputs. Additionally, there are two separate RJ45 output ports to extend these signals to multiple remote locations.

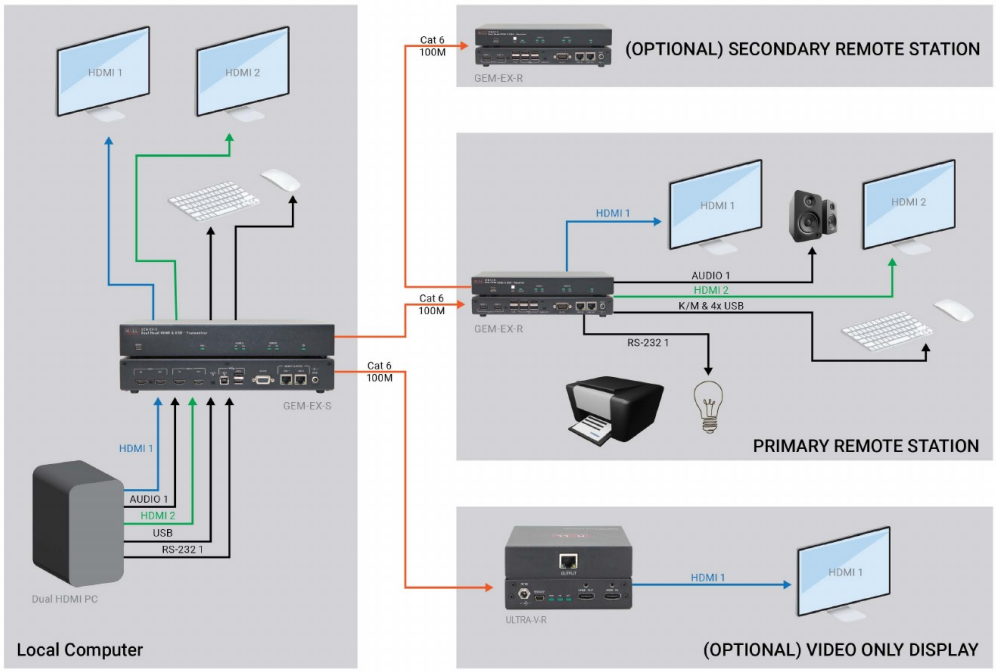
The receiver provides two HDMI outputs, 6 USB ports, an analog audio output, and a dual-port capable RS-232 port. Two of the USB ports are labeled for use with keyboard and mouse; however, they can also be connected to other USB devices such as KVM switches or touchscreen displays if desired. The audio output is de-embedded from HDMI A.

For connection of other USB devices such as printers or scanners, four additional general-purpose USB 2.0 ports are available. For security purposes, USB memory devices are not supported by default. If you want to enable USB memory support, please contact Hall Research.

In a setup with one Sender going to only one Receiver, the USB ports automatically pair with the Sender. However, when there is more than one GEM-EX Receiver connected to the same Sender, only one Receiver can be paired at a given time. Pairing is accomplished using a push button on the front panel of the Receiver. A corresponding LED next to the button indicates USB pairing status with the Sender.

Each Receiver features an RJ45 “LINK OUT” port that can be daisy-chained to down-stream Receivers. All signals are re-buffered, so the LINK OUT port can drive cables to 100 meters long.

It is important to note that the RJ45 output ports (on the Sender or the Receiver), can also be connected to ULTRA-V Receivers. ULTRA-V Receivers provide only one video output and no USB. The ULTRA-V Receivers show Video A by default; however, they can be configured to display Video B if desired. Please refer to the ULTRA-V User’s Manual for further details.



Typical Connection Diagram

Features

- Supports high resolution HDMI video including FHD. (1920x1080), WQHD (2560x1440), and 4K UHD (3840x2160)
- Two video streams, one USB port, one audio signal, and two RS-232 ports extended over a single CAT6 cable up to 100m/328ft.
- Full plug-and-play support with USB keyboard, mouse, and connected peripherals.
- Computer OS independent – No driver or software required.
- Local HDMI and USB output on the Sender
- Two Sender extension outputs and one Receiver daisy-chain output to distribute video to multiple locations.
- No video calibration required, no video quality reduction due to cable length or resolution.
- Locking power supply connector to prevent inadvertent disconnection.
- Sender includes mounting ears for standard 19” rack; Receiver includes mounting brackets for surface mounting.

PACKAGE CONTENTS

GEM-EX-S

- 1x GEM-EX-S
- 2x Rack mount ears and screws
- 1x power supply (Hall P/N 511-IEC5V4AP5L)
- 1x user manual card

GEM-EX-R

- 1x GEM-EX-R
- 2x Surface-mount brackets
- 1x power supply (Hall P/N 511-IEC5V4AP5L)
- 1x user manual card

SETUP

Installation

- Connect the PC HDMI outputs to the GEM-EX-S ports marked “HDMI A IN” and “HDMI B IN” using quality HDMI cables.
- Connect the PC USB to the GEM-EX-S port marked “USB IN” using a USB cable.
- Optionally, connect PC analog audio to the GEM-EX-S port marked “AUDIO IN” using a 3.5 mm audio cable, to embed an external audio signal into HDMI A
- Optionally, connect an RS-232 device (or two, using Hall Technologies CA10223 and CA10224 cables) Use PC GUI to set baud rate(s).
- Optionally, connect HDMI displays to HDMI A/B OUT ports, and USB peripherals to the USB LOCAL ports.
- Using a CAT6 cable, connect the GEM-EX-S “link out” port to the GEM-EX-R “link in” port.
- Connect remote HDMI displays to the GEM-EX-R HDMI A and HDMI B output ports.
- Connect keyboard, mouse, KVM Switch, or touchscreens to the GEM-EX-R ports marked as KBRD/MOUSE
- Optionally, connect other USB devices to any of the USB 2.0 ports.
- Optionally, connect external speakers to “audio out” to use audio from “HDMI A” or “AUDIO INPUT” of GEM-EX-S.

DisplayPort Adapters

While HDMI is the most widely adopted video standard, there are a number of computer and display manufacturers that rely on DisplayPort for higher resolutions such as 2560 or 4K. Hall Research offers 4K compatible adapters to convert between these two video standards.

> **NOTE:** These adapters are unidirectional. For example, the DisplayPort to HDMI adapter cannot convert a HDMI signal to DisplayPort.

To connect to a source (PC) with DisplayPort output, use GC-DP-HD.



Model GC-DP-HD: DisplayPort source to HDMI output

Virtually all monitor and TV’s have HDMI (or DVI) inputs. But if your display only has a display port input, the following adapter converts HDMI to DP.



Model GC-DP-HD: DisplayPort source to HDMI output

Single Video Display Receiver

In cases where only a single video display is required, an ULTRA-V-R Receiver can be connected to either the GEM-EX Sender or Receiver. The Receiver will display the video coming from HDMI A by default, or it can be configured to display video from HDMI B if desired. Please refer to the ULTRA-V User's Manual for more information.



RS-232 Baud Rate Programming and Dual-Port Support

The RS232 ports on the GEM-EX-S and GEM-EX-R have different baud rates by default. RS-232 Port A defaults to 9600 baud. RS-232 Port B defaults to 115200 baud.

These can change to any standard rate between 2400 and 115200 using free PC GUI software. Both sender and receiver are programmed separately.

> **NOTE:** Baud Rate Conversion: When the GEM-EX-S and GEM-EX-R are set to different baud rates; they will automatically convert between the two.

The GEM-EX has a dual-port RS-232 output, supporting a second RS-232 extension.
This requires the use of adapter cables CA10233 and CA10224, sold separately.



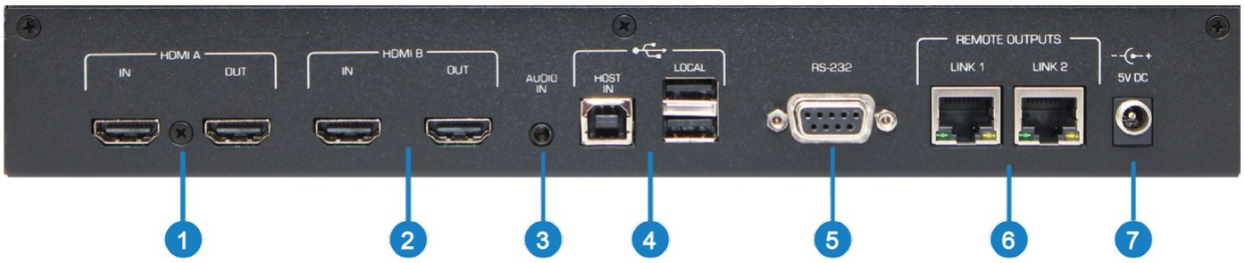
CONNECTORS & INDICATORS

GEM-EX-S (front)



No.	Name	Description
1	SERVICE	• USB-Mini connection, used for upgrading firmware or configuring parameters such as EDID and RS-232 baud rates via free PC GUI.
2	USB HUB	• LED indicates that the hub is active (note that PC/Host has the ability to put the hub in “selective suspend” mode in which case the Hub LED will turn off. Hosts usually do this if no downstream devices are connected to the hub.
3	VID/LINK	• Status indicators of HDMI A/B - VID: When this LED is solidly on, it indicates the system has detected at least one receiver and is actively transmitting video and data. Blinks if the system has never seen a compatible receiver or it is not transmitting video.
4	POWER	• Power LED lights when power is supplied.

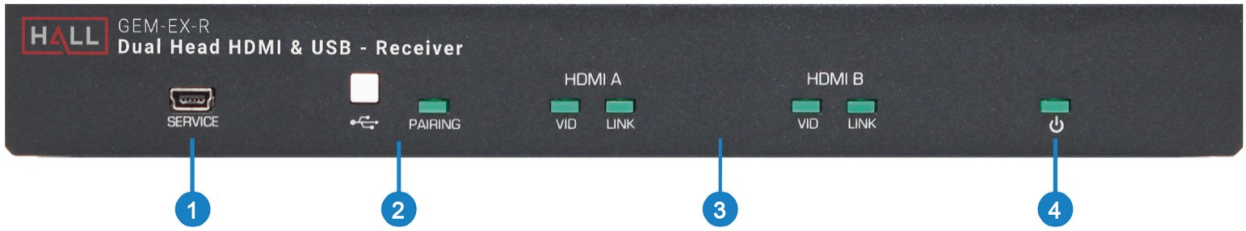
GEM-EX-S (back)



No.	Name	Description
1	HDMI A IN/OUT	HDMI A input port and local output. HDMI A IN is extended to GEM-EX-R HDMI A OUTPUT.
2	HDMI B IN/OUT	HDMI B input port and local output. HDMI B IN is extended to GEM-EX-R HDMI B OUTPUT.
3	AUDIO IN	Analog audio input. When connected, it embeds and replaces the audio in HDMI A. Audio is extended to GEM-EX-R HDMI A and AUDIO OUT ports.

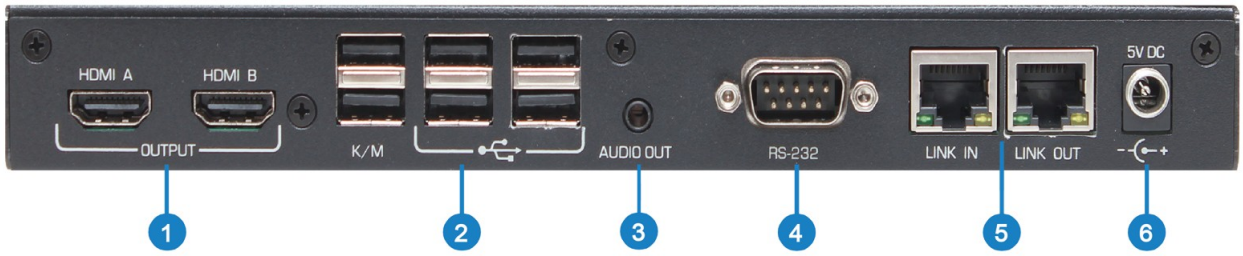
No.	Name	Description
4	USB HOST IN/LOCAL	USB input port, and local outputs. HOST IN is extended to GEM-EX-R USB ports.
5	RS-232	RS-232 communication port, extended to GEM-EX-R. Port A defaults to 9600 baud. Port B defaults to 115200 baud.
6	REMOTE OUTPUTS	Two separate outputs for connection to remote GEM-EX-R receivers. Use CAT6 cable to extend up to 100 m/328 ft. - GREEN LED on left side of ports indicates an active link to GEM-EX-R or ULTRA-V-R
7	5V DC	Power input. Connect supplied 5V DC locking power supply to power sender.

GEM-EX-R (front)



No.	Name	Description
1	SERVICE	• USB-Mini connection, used for upgrading firmware or configuring parameters such as USB mass storage class device filtering or RS-232 baud rates via free PC GUI.
2	USB 2.0 PAIRING	• When only one receiver is connected to a sender, the receiver will automatically pair by default and then the PAIRING LED will be on. If multiple receivers are connected, the user needs to decide which receivers USB ports is to be paired with the sender. To change pairing to a different receiver, press the button and the PAIRING LED will light. If the pairing LED is solidly lit, the receiver has successfully paired with the sender, but if it is blinking, the pairing was unsuccessful, and you should press the pairing button again until the LED is solidly lit.
3	HDMI A/B VID/LINK	• Status indicators of HDMI A/B - VID: This LED is lit when HDMI video is being output. - VID: When this LED is solidly on, it indicates the system has detected at least one receiver and is actively transmitting video and data. Blinks if the system has never seen a compatible receiver or it is not transmitting video.
4	POWER	• Power LED lights when power is supplied.

GEM-EX-R (back)



No.	Name	Description
1	HDMI A IN/OUT	Outputs HDMI from GEM-EX-S HDMI A/HDMI B Input ports respectively.
2	USB K/M and 2.0	Connect keyboard/mouse/KVM switchers or other HID input devices including touchscreens to K/M ports. The rest are general purpose ports for other USB devices such as printers or scanners. By default, USB memory devices are not allowed, and these USB ports do not support USB webcams.
3	AUDIO OUT	Analog audio input. When connected, it embeds and replaces the audio in HDMI A.
4	RS-232	RS-232 communication port, extended to GEM-EX-S. Port A defaults to 9600 baud. Port B defaults to 115200 baud.
5	LINK IN/LINK OUT	LINK IN receives video/USB from GEM-EX-S; LINK OUT is used to daisy-chain to another GEM-EX-R or ULTRA-V-R.
6	5V DC	Power input. Connect supplied 5V DC locking power supply to power receiver.

TROUBLESHOOTING

If you are experiencing problems getting the GEM-EX to work properly, please use the following troubleshooting suggestions.

- Ensure that all connections are secure. Check all status LEDs to ensure proper operation.
- Try resetting the system by unplugging the power supply, waiting 5 seconds, and plugging it back.
- Try restoring factory defaults using the PC GUI.

SPECIFICATIONS

Specification	GEM-EX-S/R
Video	
Standards	DVI (single link)
Resolutions	**PC** VGA to WQXGA (2560x1600) **HDTV** 480p to 4K UHD including QHD (2560x1440)
Refresh Rates	60 Hz for resolutions up to and including HD (1920x1080) and WUXGA (1920x1200) 30 Hz for resolutions above and including QHD (2560x1440)
Other Signals	
USB	GEM-EX-S: USB 2.0 (2) from built-in hub GEM-EX-R: USB 1.0 (2) and USB 2.0 (4)
AUDIO	GEM-EX-S: Analog line level input. Embeds into HDMI A. GEM-EX-R: Analog line level output. Extracted from HDMI A.
RS-232	DB9 with (2) serial ports. Supports baud rates from 2,400 to 115,200.
Connectors	
GEM-EX-S	2x HDMI inputs, 2x HDMI Outputs (local) 1x USB-B host port, 2x USB-A device ports 1x 3.5 mm analog stereo audio input 1x DB9-F RS-232 port (dual-port capable) 2x RJ45 Link outputs 1x 2.1 mm locking DC power input
GEM-EX-R	2x HDMI outputs 2x USB-A 1.1 Device ports 4x USB-A 2.0 device ports 1x 3.5 mm analog stereo audio output 1x RJ45 link input, 1x RJ45 link output 1x 2.1 mm locking DC power input
General	
Power Supply	100 VAC to 240 VAC, 47-63 Hz, External; 5 VDC
Temp/humidity	Storage: -40 to +158 degrees F (-40 to +70 degrees C)/ 10% to 90%, non-condensing Operating: +32 to +122 degrees F (0 to +50 degrees C) / 10% to 90%, non-condensing
Typical DC	5 VDC, 4.0 A power supply

Specification	GEM-EX-S/R
Current Draw	GEM-EX-S: 2.5 A DC depending on # and type of connected USB devices. GEM-EX-R: 1.5 A DC depending on # and type of connected USB devices.
Cooling	Convection
Enclosure Type	Metal (Steel)
Dimensions	GEM-EX-S: 6.09” L x 11.23” W x 1.66” H GEM-EX-R: 5.04” L x 9.00” W x 1.12” H
Product Weight	Model only GEM-EX-S: 2.8 lbs (1.3 Kg) GEM-EX-R: 1.3 lbs (0.6 Kg) Shipping GEM-EX-S: 4.4 lbs (2.0 Kg) GEM-EX-R: 3.1 lbs (1.4 Kg)
MTBF	90,000 hours (estimate)
Warranty	3 years parts and labor
Certifications	
Safety	CE
EMI/EMC	CE, FCC, Class A
Certifications	CE, FCC, RoHS

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Sales, Marketing & Customer Support

Main Office (US)	Hall Research, 1234 Lakeshore Dr Suite #150, Coppell, TX 75019
Website	https://www.hallresearch.com
Support Phone (U.S. and Canada)	+1 (408) 962-0515
Support Phone (Europe and Middle East)	Switzerland: +41 43 508 43 21 Germany: +49 6196 7715944 UK: +44 20 3929 8275
Support Email	support@atlona.com
Support Hours	Monday – Friday, 8:00 a.m. – 6:00 p.m. (CST)