HALL RESEARCH

USER'S MANUAL

HDBT™

UHBX-R-XT

Daisy-Chainable HDBaseT Receiver with IR and RS232 Control

Extends uncompressed HDMI to 150m

UMA1230 Rev 1.0

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The Award-Winning UHBX-R-XT

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FCC RADIO FREQUENCY INTERFERENCE STATEMENT

This device complies with part 15 Class A of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RoHS Compliant

1.0 Introduction

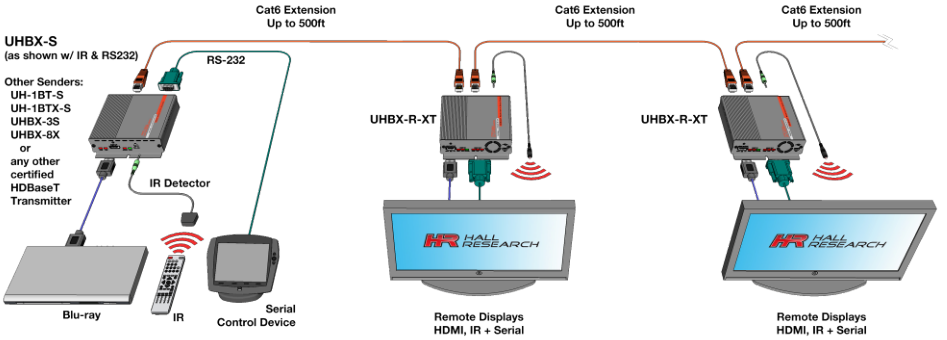
The award winning UHBX-R-XT is an HDBaseT Receiver with integrated HDBaseT transmitter for connection to downstream HDBaseT receiver(s) in a daisy-chain fashion. It provides a local HDMI output, an RS-232 port for controlling displays, and it also extends IR signals (IR signal detected at source is broadcast to all receivers - IR cables sold separately).

The RS-232 port can be used to send commands (such as power on/off) to compatible displays and projectors. This can be done either automatically (autonomously by detecting video), or directed by an external Serial Control Device using Hall Research's simple command set.

When RS-232 operation is under external control, each receiver in the daisy chain can be individually addressed for sending specific commands at that particular node. In order to communicate with a given receiver, each receiver in the daisy-chain is assigned a unique address.

The UHBX-R-XT provides a Mini-USB port that is used to assign the box address, configure operation mode, upload internal commands (required for automatic on/off control), and more. A free Windows® GUI software is available on the product's webpage for users who want to take advantage of the product's control capabilities.

The distance between receivers (in a daisy chain), is 100 meters (328 ft) maximum, however, if the video is limited to 1080p (24 bit color or 8bits/color), then users can utilize the “Long Reach” function of the receiver that allows UTP cables of up to 150 meters (500 ft) between consecutive receivers in the daisy-chain (Long-Reach mode does not support 4K or deep color).



1.1 Block Diagram

Block Diagram for Daisy Chain connection

1.1 HDBaseT Daisy Chain

The video source needs to be connected to a compatible transmitter. Please refer to section 3.1 below for a table listing of compatible senders.

Up to 8 UHBX-R-XT Receivers can be connected in a daisy chain. The last unit in the daisy chain can be a lower cost receiver with no daisy-chain output such as: UH-1BT-R, UH1-BTX-R, or UHBX-R. However, the serial port function will not be compatible. Therefore, if you are using the addressable serial port feature (see section 4.5), then the last unit in the daisy chain will also have to be a UHBX-R-XT.

2.0 Features

- Extends uncompressed HDMI video, RS232, and IR, up to 500 feet on a single CAT6
- Supports multiple units in daisy-chain to allow extending video and data to very long distances
- At Full-HD (1080p), up to 8 receives can be daisy chained
- Individually addressable RS-232 ports on each receiver for controlling connected displays
- Can be directed to send out RS-232 commands on the fly, or to send any of the commands programmed in its internal memory
- Can detect video and use RS-232 to turn displays on and off automatically (from commands uploaded to its internal memory)
- Multiple units in the daisy chain can be individually addressed
- IR extension (from source to all receivers)
- Supports HDCP, 3D and Deep color
- Sturdy metal enclosures with L brackets for mounting
- Complies fully with HDBaseT standard
- Compact, Rugged, Reliable, and Economical
- Made in USA

2.1 Package Contents

Qty (1) UHBX-R-XT
Qty (1) 5V DC Universal Power Adapter
Qty (1) 1m/3ft USB to Mini-USB Cable
Qty (1) User's Manual

3.0 Setup

3.1 Installation

- The UHBX-R-XT is primarily an HDBaseT™ RECEIVER, meaning that a compatible transmitter (sender) must already exist in the system. Hall Research provides various compatible transmitters, from economical video only, to video, plus RS-232 for control, and IR extension. The Table below lists recommended senders and their characteristics.

Sender P/N	Description	Video	RS-232	IR
UH-1BT-S 	HDBaseT Sender (to 70m or 220 ft)	✓		
UH-1BTX-S 	HDBaseT Sender (to 150m or 500 ft)	✓		
UHBX-S-WP 	HDBaseT Wall-Plate Sender (requires 511-POH-17W Power Supply)	✓		
UHBX-S 	HDBaseT Sender with Bidirectional IR, and RS232 (for UTP length to 150m or 500 ft)	✓	✓	✓
UHBX-SC-WP 	HDBaseT Wall-Plate Sender with Bidirectional IR, and (requires 511-POH-17W Power Supply)	✓	✓	✓
UHBX-3S 	HDMI on HDBaseT™ 1x3 Splitter (3 HDBaseT outputs, and one HDMI local output)	✓	✓	
UHBX-8X 	8 channel HDMI to HDBaseT™ converter (with 8 HDMI inputs and 8 corresponding HDBaseT outputs)	✓	✓	✓
UHBX-SW3-S 	VGA, HDMI, MHL Auto-Switching Transmitter with HDBaseT™ (requires 511-POH-17W Power Supply)	✓	✓	✓

- Using Cat6 cable, connect the UHBX-R-XT connector labeled HDBT IN to the HDBaseT signal.from compatible sender.

CAT6 Input and Output Connections

- If RS-232 output is to be used, connect this port using appropriate cable to device being controlled. The Pinout of the RS-232 port on the UHBX-R-XT is as follows:

DB9-M Pin	Term	Direction
2	RX	Input
3	TX	Output
5	GND	

Connect a good quality HDMI cable to the HDMI output of the unit to a display device. The HDMI output connector on the box has a locking nut above it. Hall Research offers compatible locking HDMI cables.

C-HDMI-L locking HDMI cable

- If IR Extension is required (from sender to all receivers in daisy chain), connect an I.R. Emitter cable to the 3.5 mm I.R. EMIT connector. Recommended IR cable: p/n CIR-EMT

- Install a second CAT6 cable into the RJ45 connector on the UHBX-R-XT and connect the other end of the CAT6 cable to the next UHBX-R-XT in the chain.

3.2 End Panels

Figure 4 - Connections (UHBX-R-XT shown above)

4.0 Configuration

As shipped, no user configuration is needed for extending HDMI video. By default the length of CAT6 cable plugged to the input can be as long as 100 meters (328 ft). The length of CAT6 cable plugged to the output depends on the downstream receiver, but by default it too is good for at least 100 meters.

To achieve even longer distances, the receiver has a "Long Reach" mode setting. If the HDBaseT “Source Device” connected to the input of the receiver also supports "Long Reach" operation, 1080p video (with 8-bit color) can be extended to 150m (500 ft). So if in your setup there is no choice and you have to go beyond 100m, you have this option (limits your color depth to 8 bit, and resolution to 1080p).

If RS-232 control output is going to be used (for example to control on/off function of compatible TV or projector connected to the HDMI output, please refer to section 4.5 below.

4.1 Distance Mode Switch

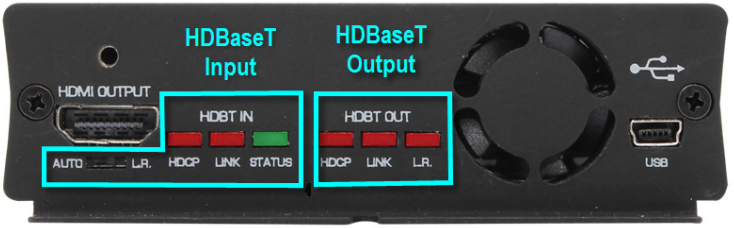
This switch affects the operation at the HDBaseT input. It is recommended to leave it in AUTO. In LR mode, UTP cable lengths of up to150 meters can be accommodated.

The slide switch is located under the HDMI OUTPUT connector. To enable Long Reach mode place the switch in L.R. position (use the tip of a pencil or a paper clip).

Mode	UTP Length	Notes
Auto	0 to 100 m (330ft)	Default setting
L.R.	0 to 150 m (450ft)	Long Reach setting Supports maximum of 1080p@60 Hz, 8-bit. 1080p deep-color and 4Kx2K are not supported

4.2 LED Indicators

The front panel contains LEDs that show the state of operation at the input and daisy-chain output.



LED Indicators

HDBT IN

HDCP	Video Status. Off = No Video detected at the input, Blink = Video detected with no HDCP, Solid ON = Video detected with HDCP
LINK	Solid on means Sender & Receiver are communicating, Blink = Link has been established but is in low power mode
STATUS	Used as power indicator

HDBT OUT

HDCP	Video Status. Off = No Video being transmitted, Blink = Video being sent out with no HDCP, Solid ON = Video output with HDCP
LINK	Solid on means the HDBaseT output of the device is connected to and communicating with a down-stream Receiver. Blinking means Link has been established but is in low power mode
L.R.	Used as Long Reach indicator. Means the HDBASET output is operating in Long Reach mode.

4.3 IR Connections

The extender can extend Infra-red Remote Control signals from the sender to all the receiver. IR emitter cable is not provided and must be purchased separately.

IR Emitter (Blaster) Cables

Currently two IR emitter cables are available: CIR-EMT and CIR-EMT2. CIR-EMT, shown below, is recommended for most applications

IR Emitter Cable CIR-EMT
(Emitter has adhesive backing)
Pin out: Tip=Anode, Ring=Cathode, Sleeve=Not Connected

An alternative Emitter cable is CIR-KIT-EMT2. This cable is better suited for situations where there is a need to isolate the IR signal to just one TV. It comes with an adhesive rubber cover can be used to confine the IR beam to just one target device directly over its IR sensor..

Alternate IR Emitter Cable CIR-EMT2

The CIR-EMT2 has a mono-type plug.
Pin out: Tip=Anode, Sleeve=Cathode

4.4 Power Connection

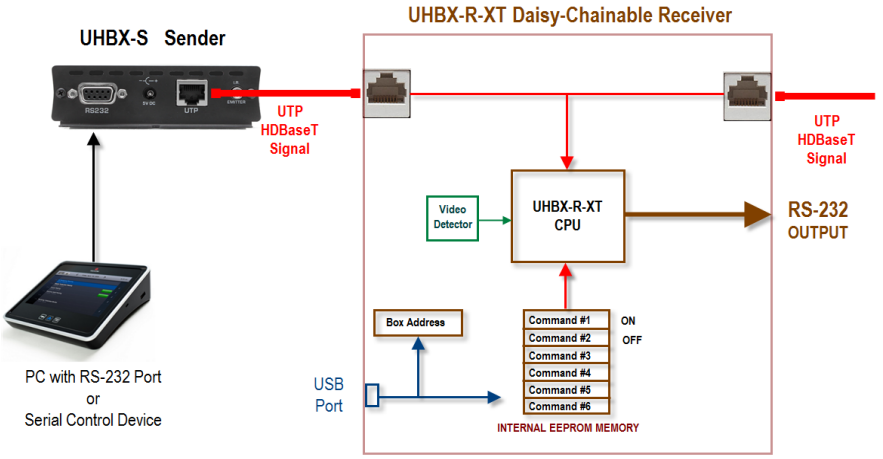
The extender requires 5vDC regulated operating voltage. A universal input (110~240 VAC) external power supply is provided. The UHBX-R-XT features power input supervisory circuit that protects the device if wrong power supply is plugged in. But please do not substitute power supplies!

4.5 Using the Serial Port

Each UHBX-R-XT device provides an RS-232 port which is primarily there for controlling a display (such as on and off functions). The pinout of the RS-232 connector is as follows?

DB9-M Pin	Term	Direction
2	RX	Input
3	TX	Output
5	GND	

To best understand how this RS-232 port operates, refer to the image below.



RS-232 Functional Block Diagram

As shown in the block diagram above, each box has internal EEPROM for programming and holding upto 6 individual commands. Also each box is shipped with the same address (default address = 1), but the box address can be changed.

If you will be using the internally stored commands or if you want to give each box a unique address, a mini-USB port is provided (USB cable is also included). Please download the Windows® GUI software from the product's webpage and install it on your PC. Instructions for the GUI is on the website.

There are 3 ways RS-232 Commands can be sent out on the UHBX-R-XT.

Using HDBaseT to construct and send a command

This method **does not** rely on the internally stored commands. The user can address a particular box and connect to it. Then it can specify the baud rate for the RS-232 port on the receiver, define the command, and send it out. When only one box is being addressed, any RS-232 response received from the TV

or projector connected, is also kept in a buffer and is readable through the HDBaseT by the controller connected to the HDBaseT transmitter.

Using HDBaseT to send an internally stored command

To use this method, the user must have uploaded commands in the internal memory of the UHBX-R-XT. Using the serial port on the HDBaseT sender, the user can address a particular box and ask it to send out one of its 6 internal commands.

Sending commands automatically by detecting video

The UHBX-R-XT can be set to send out the first two internal commands automatically based on detecting video in the HDBaseT. Only the first two of the internal commands are used, the first one is sent out when video is detected (typically used to turn on a display), and after video is absent for a given amount of time (the time is specifiable using the USB GUI), the UHBX-R-XT will issue the off command.

5.0 Serial Commands

The UHBX-R-XT will be communicating with a host through its HDBaseT input at a fixed baud rate of 9600 and no parity.

Command	Response	Function
XCn <cr>	XCn <cr>	Connect the host controller to a specific unit addressed by n. n = 01 - 99 or * (for all) If n is not specified, the unit reports an address of the unit connected to the host controller
XT <cr>	XT <cr>	Transmit serial command from RS-232 port. This command should be followed by a string of serial bytes to be sent out, and it is terminated by two single bytes ***hex 17*** and ***hex 0D*** If you want to include Hex bytes in your string (mixed with ASCII), define hex bytes with &h before the two digit number **Example:** XT <cr> *(tells the receiver to get ready to receive command bytes)* HELLO WORLD&h0d *(this is the string that will be sent out)* Hex 17 Hex 0D *(send the command above. Of course you need to find out how to send hex 17 and hex 0D through the HDBaseT sender. If a PC's serial port is used, you can press Ctrl+w for hex 17 and Enter for hex 0D)*
XR <cr>	x Bytes	Read the response received at the RS-232 port. There is a 64 byte receive FIFO on the RS232 port. Reading will also clear FIFO
XBn <cr>	XBn <cr>	Set baud rate for the local RS232 port. n = 1, 2, 3, 4, 5, 6, 7, 8 correspond respectively to baud = 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
XPn <cr>	XPn <cr>	Set parity for the RS232 port. n = 0,1,2 (None, Odd, and Even)
XSn <cr>	XSn <cr>	Send stored serial command out the RS232 port (n=1 - 6).
AMn <cr>	AMn <cr>	Set auto mode n = 0 – 1 = Manual – Auto
ODn <cr>	ODn <cr>	Set auto off delay n = 0 – 240 (in minutes)
FD <cr>	FD <cr>	Perform a factory default.
FW <cr>	FWx.x <cr>	Read firmware version.

NOTE: If n is not specified in any of the commands above, the command becomes a query command instead of a set command. In response to a query command, the system reports the current status of that command.

6.0 Troubleshooting

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

- Make sure that all of the connections on both the sender and the receiver are solid. Loose connections are the number one cause of issues.
- Try resetting the system by unplugging the power supply connected to the sender side, waiting 5 seconds and plugging it back.
- Check the state of the LED's on the front of both the sender and the receiver. Refer to the table in section 4.2 to interpret the status being indicated. Alternatively, hookup the USB port to a PC and run the Windows® GUI and check the status indicators in the GUI.
- If the cable length is longer than 100 meters (330 ft) set the Mode Switch on the receiver to L.R. (Long Reach) position (see section 4.1). Note that in L.R. mode the unit does not support deep-color video.
- Make sure the display is compatible with the video source by connecting them directly.
- Make sure that the UTP or STP cable meets the requirements. Never use low-skew cable for digital video extension. We recommend using CAT6 or CAT6a. In noisy environments use Shielded Cat6 (23 gauge).
- The extender requires that the source DDC signals of its HDMI output operate at100 KHz or less and support clock-stretching. The vast majority of sources meet these requirements. But if you determine that a particular source does not (by substituting a video pattern generator, or a different source), an HDMI transceiver may be needed. Hall Research offers the model HD-AUD that has a compatible output, can handle virtually any HDMI input, and can resolve source incompatibility issues.

If you still are not able to get the system working properly, contact Hall Research support (preferably via email or the form on support page of www.hallresearch .com) with a detailed description of the issue and the troubleshooting steps you have taken.

Do not open or try to repair the unit yourself as this will void your warranty. To return the extender for repair, you must contact HR Support at 714-641-6607 or via email or web. To ship the unit back for repair, make sure to obtain a Return Material Authorization (RMA) number.

7.0 Specifications

Video

Standards	DVI (single link) and HDMI (compliant with HDMI 1.4 video specifications including 12 bit color depth, 3D video)
Signal type	TMDS
Connectors	Locking HDMI
Resolutions	DVI signal VGA (640x480) thru WUXGA (1920x1200) HDTV signal 480i through 1080p, 4K/30* * At 4K/30 fewer than 8 can be daisy chained (may be as few as 3), and performance depends on UTP cable quality (augmented Cat6 or Cat6A is recommended for best performance at 4K)

Audio

Formats	All HDMI Embedded Audio including: LPCM 7.1CH, Dolby TrueHD and DTS-HD Master Audio (32-192kHz sample rate)

Other Signals

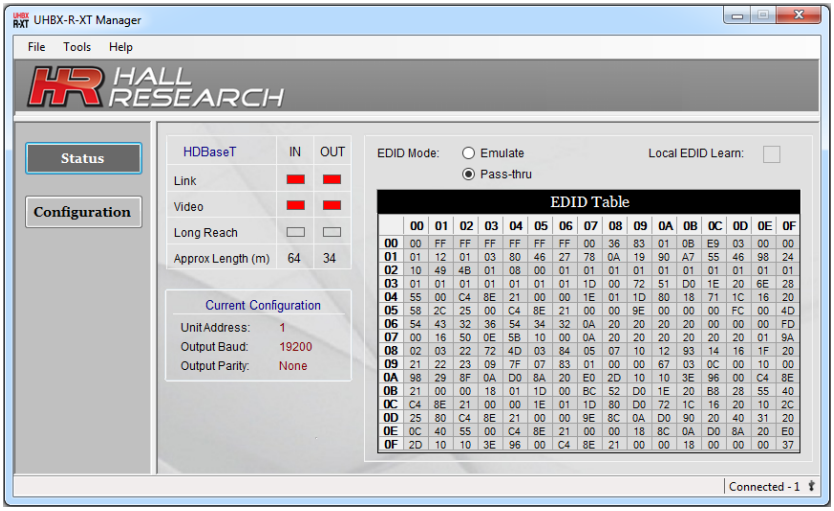
DDC	Pass-Thru DDC for reading EDID directly from remotely connected LCD and HDCP handshake
CEC	Pass-Thru
RS232	Fixed input (from HDBaseT input) baud rate of 9600 bps Local RS232 port can be programmed to baud rate of 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
IR	IR Emitter. Carrier modulation range from 30 KHz to 60 KHz

General

Power Supply	100 VAC to 240 VAC, 50-60 Hz, external; 5 VDC, 3.2 A, regulated Actual DC current 2.1A max
Power	Receiver 10.5 watts (36 BTU) maximum
Temp/humidity	Storage: -40 to +158 °F (-40 to +70 °C) / 10% to 90%, non-condensing Operating: +32 to +122 °F (0 to +50 °C) / 10% to 90%, non-condensing
Cooling	Convection plus temperature controlled variable speed forced air (Fan)
Mounting	End plates have L bracket with hole for surface mounting
Enclosure type	Metal (Aluminum ends, Aluminum Extrusion)
Dimensions	1.18" H x 4.56" W x 4.17" D (30mm H x 116mm W x 106mm D) Depth excludes connectors
Product weight	Receiver 10 oz (0.63 lb or 284 g) Kit (shipping) 37 oz (2.3 lb or 1050 g) includes: receiver, power supply, power cord, HDMI cable, manual, and packaging
Vibration	ISTA 1A in carton (International Safe Transit Association)
Safety	CE
EMI/EMC	CE, FCC Class A
MTBF	90,000 hours (Calculated Estimate)
Warranty	3 years parts and labor

Specifications are subject to change without notice

8.0 Windows® Manager Software GUI



	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00	00	FF	FF	FF	FF	FF	FF	00	36	83	01	0B	E9	03	00	00
01	01	12	01	03	80	46	27	78	0A	19	90	A7	55	46	98	24
02	10	49	4B	01	08	00	01	01	01	01	01	01	01	01	01	01
03	01	01	01	01	01	01	01	1D	00	72	51	D0	1E	20	6E	28
04	55	00	C4	8E	21	00	00	1E	01	1D	80	18	71	1C	16	20
05	58	2C	25	00	C4	8E	21	00	00	9E	00	00	00	FC	00	4D
06	54	43	32	36	54	34	32	0A	20	20	20	20	00	00	00	FD
07	00	16	50	0E	5B	10	00	0A	20	20	20	20	20	20	01	9A
08	02	03	22	72	4D	03	84	05	07	10	12	93	14	16	1F	20
09	21	22	23	09	7F	07	83	01	00	00	67	03	0C	00	10	00
0A	98	29	8F	0A	D0	8A	20	E0	2D	10	10	3E	96	00	C4	8E
0B	21	00	00	18	01	1D	00	BC	52	D0	1E	20	B8	28	55	40
0C	C4	8E	21	00	00	1E	01	1D	80	D0	72	1C	16	20	10	2C
0D	25	80	C4	8E	21	00	00	9E	8C	0A	D0	90	20	40	31	20
0E	0C	40	55	00	C4	8E	21	00	00	18	8C	0A	D0	8A	20	E0
0F	2D	10	10	3E	96	00	C4	8E	21	00	00	18	00	00	00	37

The UHBX-R-XT graphical user interface (GUI) is a Windows® software used to configure advanced settings of the UHBX-R-XT. Use of the software requires USB connection of the PC to the device. For convenience, a USB cable is provided with the receiver.

After configuring the receiver, the user can save the desired configuration as a file on their PC. Configuration files can also be uploaded to receiver.

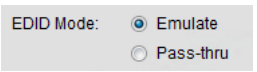
The USB port can also be used to upgrade the firmware in the UHBX-R-XT.

There is a full manual for the GUI on the website. Below are basic features.

8.1 Status page

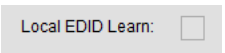
There are two main pages in the GUI. The status page is shown above. It gives you visual indication of how the HDBaseT input and output are working (mode, cable length, video detection), as well as how you have configured the box (its Address, and serial port settings). This page also allows you to manage the EDID.

EDID



EDID mode can be set to either emulate or pass-thru.

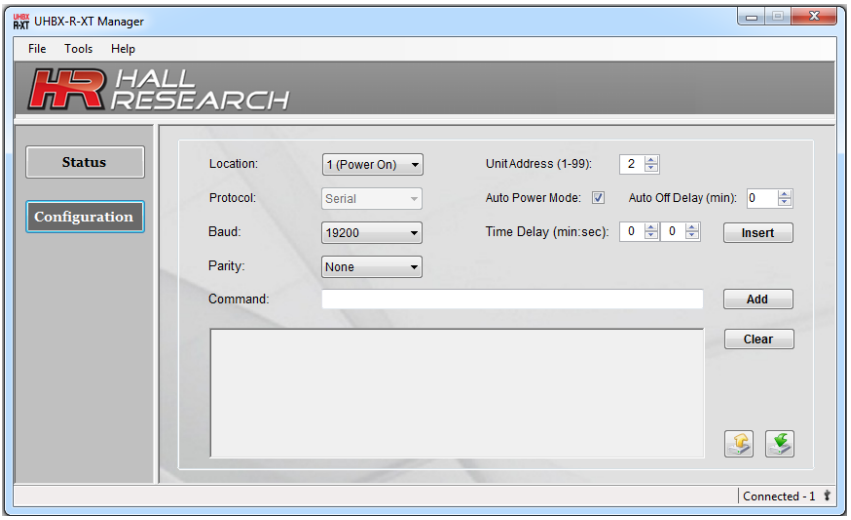
- Emulate – In this mode, the internal default EDID is passed to the source.
- Pass-thru (Default) – This is a default mode. When set to this mode, the EDID passed to the source comes from a sink TV, LCD monitor, or projector connected to the receiver.



EDID can be learned from a local HDMI monitor. The saved EDID will automatically replace the emulated EDID.

In a daisy chain, only the operation of the first receiver in the chain matters. It is recommended that if you have any issues, make sure the TV is connected to the HDMI output port of the receiver, Turn on the TV, then using the GUI "LEARN" the EDID of the TV and then put the system in Emulate EDID mode. From then on regardless of TVs being connected and powered, the source will get proper EDID.

8.2 Configuration page



Use this page to define and upload upto 6 internal commands.

You can also enable the "Auto Power Mode" where the UHBX-R-XT sends power on and off commands based on detecting video on the HDBaseT signal.

CUSTOMER SUPPORT INFORMATION

Order toll-free in the U.S. 800-959-6439
FREE technical support, Call **714-641-6607** or fax **714-641-6698**
Mail order: **Hall Research**, 1163 Warner Ave. Tustin, CA 92780
Web site: www.hallresearch.com E-mail: info@hallresearch.com