HALL RESEARCH

USER'S MANUAL

URA

URA-SKU

URA-XT

URA, URA-SKU, & URA-XT

PC Video & Audio on Twisted-Pair Receivers with Cable Length Compensation Skew Correction and Daisy-Chain Output

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**
Address: **Hall Research**, 1163 Warner Ave. Tustin, CA 92780
Web site: www.hallresearch.com E-mail: info@hallresearch.com

UMA1168 Rev. NC

TRADEMARKS USED IN THIS MANUAL

Hall Research and its logo are trademarks of Hall Research.

Any other trademarks mentioned in this manual are acknowledged as the property of the trademark owners.

FEDERAL COMMUNICATIONS COMMISSION

RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in strict accordance with the manufacturer's instructions, may cause interference to radio communication. This equipment is designed to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are intended to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at their own expense will be required to take whatever measures may be necessary to correct the interference.
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Contents

1. Introduction

1.1 General

This User's Manual applies to Hall Research Models URA, URA-SKU, and URA-XT.

These models are video and audio over Category 5/5e/6 receivers. In a typical application, they are located at a distance from the video source and are connected to a compatible sender unit that converts the audio and video source signal for transmission on twisted pair cable.

Below is a list of capabilities & features of each receiver model:

	Equalization to 1000 ft	RGB Skew Correction	Chain Output	Cable Requirements
URA	●			Low-Skew UTP Cable
URA-SKU	●	●		Any UTP or STP Cable
URA-XT	●	●	●	Any UTP or STP Cable

Table 1 – Model Number Differences

Low-skew UTP cables (such as Hall Research's Zero-skew™ Cat5 cables) are recommended with the Model URA particularly if cable lengths are 200 feet or longer. The Models URA-SKU and URA-XT do not have any special cable requirements since they are capable of correcting the RGB color skew that is induced in typical Cat6 cables.

The Model URA-XT allows downstream receiver units to daisy chain connections using UTP cables. This eliminates the need for running separate cables from every receiver back to the sender (in star or home-run fashion) – a very useful feature when several receivers are located in a line going away from the sender.

Depending on the application, the URA-XT's downstream RJ45 port can be connected to another receiver (URA-XT, URA-SKU, or URA). The constructed daisy chain may have:

- Up to 3750 feet maximum cable from source to last URA
- A maximum of 5 URA devices in any chain
- 750 feet maximum distance between units in a chain

1.2 Features

- Receives audio and video on a single CATx cable
- Adjustable cable length compensation to 1000 ft
- The URA–SKU and URA–XT units have RGB skew correction
- Digitally controlled adjustment eliminates tweaking pots
- Supports resolutions up to 1920x1200 at any refresh rate
- Compact & rugged metal enclosure with mounting holes
- Easily expandable by daisy-chaining receivers (URA-XT)
- No software required for setup and use

2. Installation

2.1 Package Contents

Your package should contain the URA receiver unit, a Universal power supply (5 VDC @ 2A), an IEC320 Power Cord, and a User's Manual.

Figure 1 – Package Contents

2.2 Connection to Compatible Senders

The URA, URA-SKU and URA-XT units accept a UTP cable connection from any of Hall Research's compatible UVA Sender product line. Some compatible senders are listed below:

PART NUMBER	
UVA-WP VGA+Audio sender on a single-gang Wallplate. Sends audio & VGA on standard RJ45 connector on UTP cable. Includes a power supply. May be powered from the VGA input connector per VESA power specifications. EDID/DDC compliant	
UVA-2 VGA+Audio 2-channel video splitter UTP sender with local AV outputs. EDID/DDC compliant	
UVA-4 VGA+Audio 4-channel video splitter UTP sender with local AV outputs. EDID/DDC compliant	
UVA-8 VGA+Audio 8-channel video splitter UTP sender with local AV outputs. EDID/DDC compliant	
UVA-24 VGA+Audio 24-channel video splitter UTP sender with local AV outputs. EDID/DDC compliant	
UVA-16X 16 independent VGA or component video & Audio over UTP sender in a single 2 RU enclosure.	
Genesis 8x8 and 16x16 Matrix with -JA output option Up to 16 RJ45 outputs with video and audio that can be switched to any of up to 16 AV inputs. Housed a single 2 RU enclosure	

Table 2 – Compatible Senders
(Always check the website for other models)

- Connect the UTP cable from any of the compatible UVA senders to the “UTP IN” connector.
- Connect the HD15 - “PC/HDTV OUT” connector to the display device. For YPbPr video sources, use a 3-RCA to HD15 cable (Hall Research P/N CHD15-RGB).
- Connect the 3.5mm - “AUDIO OUT” connector to the speakers or other sound equipment.
- Connect the included power supply to the 2.1mm – center positive +5 VDC power input connector on the unit. Never use any other supply as this may damage the device.

2.3 Cable Requirements

All units can be used with Cat5/5e/6 or Zero-Skew™ UTP or STP (unshielded or shielded twisted pair) cables.

All units provide high-frequency compensation (to account for the losses in the CATx cable). The URA-SKU and URA-XT units also provide RGB skew correction.

Low-skew UTP cables (such as Hall Research’s Zero-skew™ Cat5 cables available in both PVC and Plenum) are recommended with the Model URA particularly if cable lengths are 200 feet or longer. The Models URA-SKU and URA-XT, do not have any special cable requirements since they are capable of correcting the RGB color skew that is induced in typical CATx cables.

2.4 Daisy-Chain Limitations

The Model URA-XT allows downstream receiver units to be daisy chained using UTP cables. This eliminates the need for running separate cables from every receiver back to the sender.

Depending on the application, the URA-XT’s downstream RJ45 port can be connected to a URA-XT, URA-SKU, or URA. The constructed daisy chain may have:

- Up to 3750 feet maximum cable from source to last URA
- A maximum of 5 URA devices in any chain
- 750 feet maximum distance between units in a chain

2.5 Connection Block Diagram for URA & URA-SKU

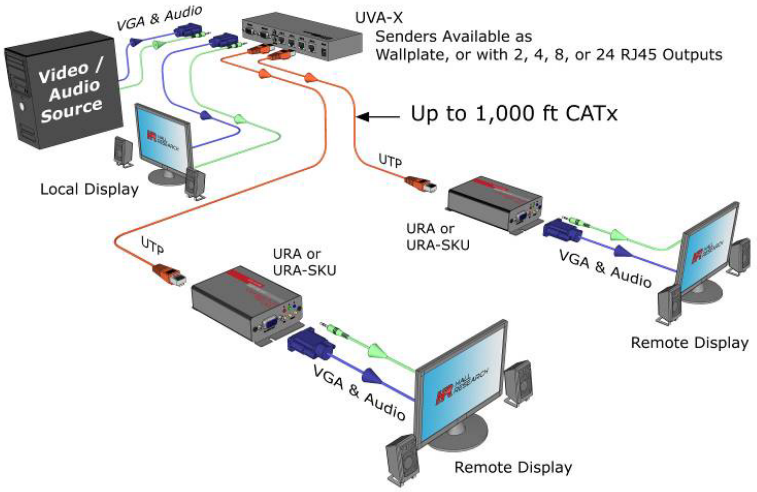

Figure 2 – URA & URA-SKU Application Diagram

2.6 Connection Block Diagram for URA-XT

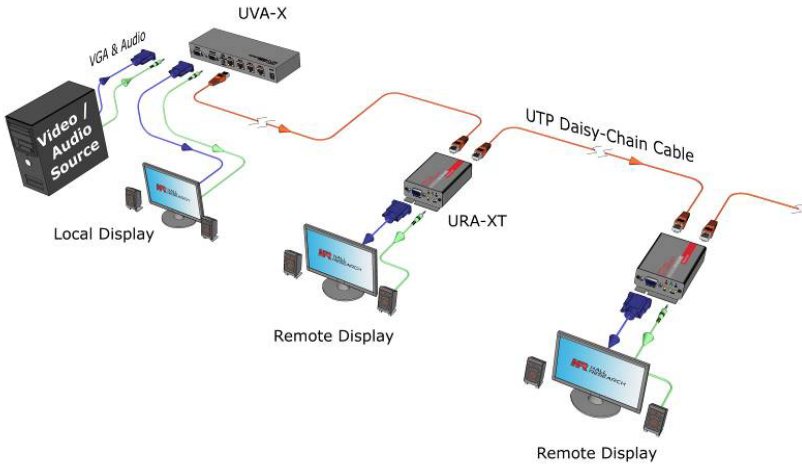

Figure 3 – URA-XT Application Diagram

3. Configuration & Operation

3.1 Why Cable Compensation?

All cables attenuate (reduce) the high-frequency components of the video signal that is being transmitted. The longer the cable, the more signal loss. If not compensated for, this signal loss will result in blurry and smeared images being displayed.

The image quality depends on the resolution and level of detail in the image. The Hall Research URA series of receivers have one of the most precise and complex equalization techniques in the industry and allow full recovery of the original signal's bandwidth.

It is best to make this adjustment using a test pattern that is designed to depict and exaggerate this effect.

Some Hall Research senders may have a built-in test pattern generator. If your sender unit is equipped with this feature, simply activate it on the sender. Otherwise, you can connect a PC to the source and display a test pattern. You can point your browser to http://www.hallresearch.com/skew.htm for an image that allows one to adjust the compensation and to evaluate the amount of color skew in your setup.

The table below lists the recommended maximum distances from sender to the receiver depending on the resolution used.

		Refresh Rate	
		60 Hz	75 Hz
Resolution	800x600	1000 ft	1000 ft
	1024x768	1000 ft	850 ft
	1280x1024	850 ft	750 ft
	1920x1200	750 ft	700 ft

Table 3 - Recommended maximum CATx cable length from sender to the receiver

3.2 Compensation Adjustment Procedure

- Press the **SEL** button once to enter the adjustment-mode (i.e. without first hitting SEL button the up and down arrows are inactive).

- In adjustment-mode, all 3 LEDs on the unit will be turned on.
- The UP or DOWN buttons can now be used to adjust the high frequency (HF) compensation up or down until the video no longer looks smeared (see figure below).
- Pressing both the UP & DOWN buttons together resets the current adjustment back to zero. This is a quick way if you want to start over.
- To exit the adjustment mode at any time, press the **SEL** button (the unit also has a built-in timeout to exit this mode).

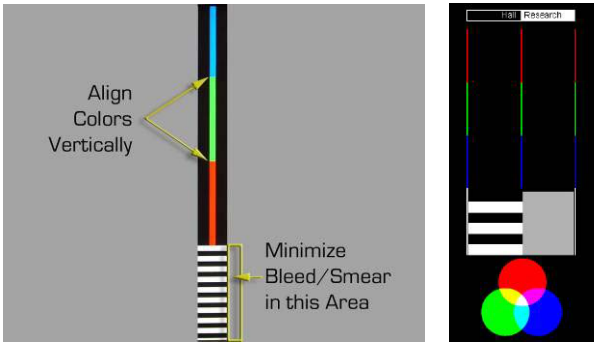

Figure 4 - Typical test patterns used for adjusting compensation

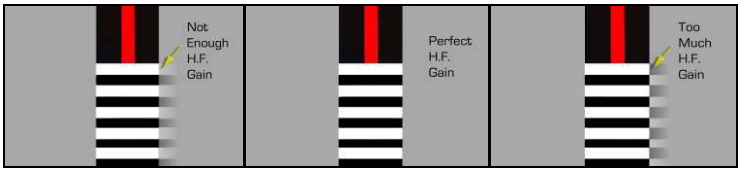

Figure 5 - Effect of adjustment on the smearing

3.3 Advanced Adjustment (CATx AWG)

The URA automatically equalizes the brightness of the video as the smearing is reduced. This automatic adjustment is based on the assumption that typical 24 AWG CATx cable is being used. When using 23 AWG CATx cable, then when the smearing is minimized, your image may be brighter than normal. In many installations, this is not critical and requires no adjustment;

however, for the daisy chain Model (URA-XT), it is important to set the cable type (23 vs. 24 AWG) that you are using because of the cumulative nature of the daisy chain.

- In the adjustment-mode, press and hold the **SEL** button for at least 3 seconds to enable the WIRE SIZE selection mode between 23-gauge wire and 24-gauge wire.
- The **UP** button is used to select 24-gauge wire. The **DOWN** button is used to select 23-gauge wire.
- To exit the adjustment mode at any time, press the **SEL** button (the unit also has a built-in timeout to exit this mode).

3.4 Why Skew Adjustment?

UTP cables have 4 twisted pairs inside. The Hall Research UVA/URA video transmission on UTP uses 3 individual pairs for each color (Red, Green, & Blue).

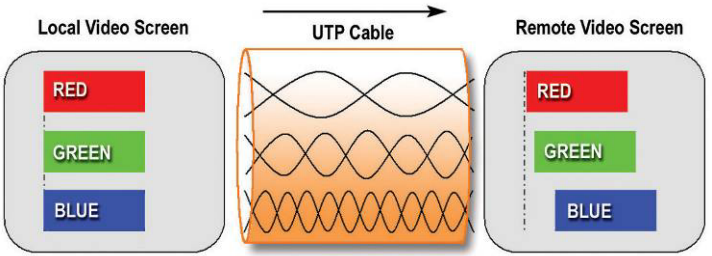

Figure 6 - skew mechanism, explained

As shown in the figure above, a characteristic of Category-5/5e/6 cable is that the pairs of wires are twisted at different rates. Therefore, for a given length of Cat-6 cable the total length of any particular pair could be longer than other pairs in the same cable. Since the signals travel along the length of each pair at a fixed speed, the arrival times of signals will be skewed in a long cable (those that have to travel farther arrive later and the corresponding color shifts to the right).

This is seen on the monitor as separation, or lack of convergence in colors. For example, a vertical white line on the screen may look to have a red tinge on the left edge and blue tinge on the right edge.

This effect gets worse at high resolutions, high refresh rates, long cables (in excess of 200 feet), and depends on the cable construction itself.

If you are using special UTP cables that are specifically designed for video transmission (such as Hall Research Zero-Skew™), then there should be no shift in color alignment regardless of the cable length. However, in many applications standard and common Cat6 cables may be utilized, this will necessitate a receiver that can also move each color component to the left and right in order to realign them. Models URA-SKU and URA-XT both are capable of doing this. It is noteworthy that Hall Research also offers a stand-alone skew corrector unit (Model SKU-RGB).

300 ft of CAT6 (1280x1024 source)
* actual zoomed photo of screen *

After skew adjustment

Figure 7 – Example of Skew manifested

3.5 Skew Adjustment Procedure

This procedure applies to URA-SKU and URA-XT models only.

- Press the SEL button once to enter the adjustment. Press the SEL button again to light only one of the 3 RGB LEDs. As you press SEL the Red, Green, and Blue LEDs will light up one at a time.
- The **UP** and **DOWN** buttons are used to move the selected color component to the left and right. Pressing both buttons at the same time resets all skew adjustments.

3.6 Signal Adjustment for the Daisy Chain

There are no specific procedures for adjusting the URA-XT's other than the order the adjustment is made.

The URA-XT's RJ45 (Cat5) output is the video signal AFTER IT HAS BEEN ADJUSTED.

This means that the unit closest to the sender has to be adjusted first. Set the high frequency compensation first and then adjust the skew. Since the effects in the daisy chain are cumulative, we recommend that you set the gauge of CATx cable used as well (see section 3.3 above).

Remember, if the calibration is off on a URA-XT in the middle of a daisy chain and you adjust the device settings you must then check the rest of the downstream devices and if necessary; make additional adjustments on those devices as well.

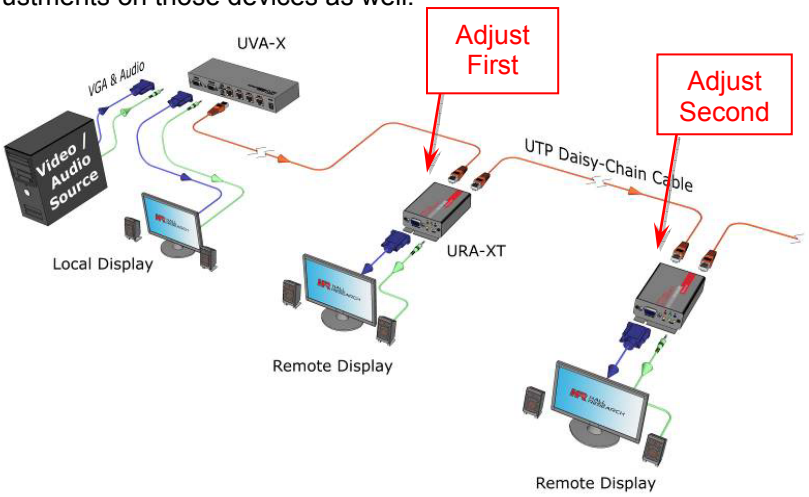

Figure 8 – Daisy-Chain adjustment sequence

4. Troubleshooting

There are no field serviceable parts or circuits in the device. Opening the unit will void the warranty. If you think the device is malfunctioning (or you have no picture output), please try to use the methods described in Section 4.3 below to obtain a picture first.

4.1 Contacting Hall Research

If you determine that the URA, URA-SKU or URA-XT is malfunctioning, do not attempt to repair the unit instead, contact Hall Research Technical Support at 714-641-6607.

> Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description.

4.2 Shipping and Packaging

If you need to transport or ship your unit:

- Package it carefully. We recommend that you use the original container.
- Before you ship the units back to Hall Research for repair or return, contact us to get a Return Authorization (RMA) number.

4.3 Problem Solving FAQ

1. **Fuzzy, blurry, or ghosting image at remote location**
   If you have a stable image but it looks somewhat blurry (edges are not sharp), make sure that you have adjusted the receiver unit's HF compensation correctly. In addition, check the recommended table of max distance vs. resolution to see that you have not exceeded the maximum recommended cable lengths. If you still have a fuzzy image, try reducing the refresh rate and/or resolution of the video source.

2. **Image exhibits steady or rolling horizontal color "hum" bars**
   This is usually an indication of improper grounding at the sending end, the receiving end, or both. Verify that the AC line is properly wired and that a protective ground (green) wire is established with NO potential difference between both the sender and receiver locations. The UTP splitter can handle up to 5 volts peak-to-peak of ground noise between the two locations, but ground potential differences more than this can show up on video.

3. **Shaking image or periodically blanking monitor**
   Inherently, balanced signal transmission over twisted pair offers good immunity to EMI coupled noise from other external sources. However, a strong electromagnetic noise field can cause instability in the signal.
   Usual sources are high power AC lines or data and/or control cables that run adjacent to and parallel with a substantial length of the CAT5 cable. To eliminate this, either place a distance between the CAT5 cables from the splitter and the interfering source, or use shielded twisted pair (STP) CAT5 cables.

4. **Poor audio quality at the receiving end**
   Only use powered speakers with the splitter and receivers. It is also good practice to set the audio level (volume) output of the PC about 1/2 to 2/3 from the maximum and use the volume knob of the speakers to adjust the volume to the desired level. A low volume signal output from the PC reduces the signal-to-noise (S/N) ratio, whereas too high output amplitude can cause saturation and clipping to occur.

5. Specifications

Video

Gain	Unity
Number/signal type	1 proprietary analog signal input. Standard VGA output RGBHV, RGBS, RGsB, RsGsBs, component video (bi-/tri-level sync)
Connectors	1 female RJ-45 input, 1 HD15 output
Nominal amplitude	1 V p-p for Y of component video 0.7 V p-p for RGB and for Pr and Pb of component video 4.0 V to 5.0 V p-p, for TTL Sync signals of RGBHV, RGBS
Impedance	75 ohms
Skew compensation	62 ns
Maximum resolution	Up to 1920x1200 and 1080p at 750 ft; 1280x1024 at 850 ft
Polarity	Positive or negative

Audio

Gain	Unbalanced output: 0 dB
Frequency response	20 Hz to 20 kHz, ±1 dB
Connector	(1) 3.5 mm connector
Type	Monaural, Simulated Stereo
THD + Noise	0.2% @ 1 kHz, 0.3% @ 20 kHz at nominal level

General

Recommended cable	CAT 5/5e/6 (shielded or unshielded) for URA-XT and URA-SKU
Power Supply	100 VAC to 240 VAC, 50-60 Hz, external; 5 VDC, 2 A, regulated; 2.1mm
Temperature/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, vents on each end
Mounting	Brackets at each end with screw hole provided for Wall or Rack mounting
Enclosure type	Metal
Dimensions	1.18" H x 2.75" W x 3.85" D - Depth excludes connectors (30 mm H x 70 mm W x 98 mm D)
Product weight	0.75 lb (0.35 kg)
Shipping weight	1.5 lbs (0.70 kg)
Vibration	ISTA 1A in carton (International Safe Transit Association)
Safety	CE
EMI/EMC	CE, FCC Class A
MTBF	90,000 hours
Warranty	2 years parts and labor

Specifications are subject to change without notice

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