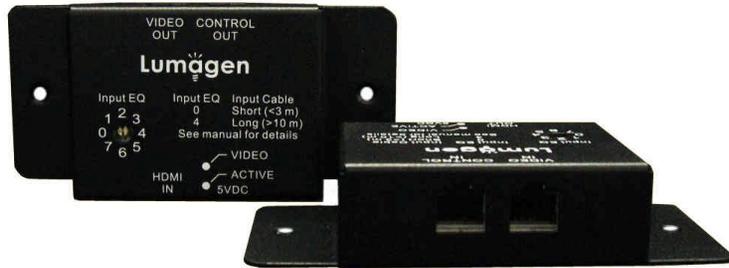


HDMI-CAT6 Cable Extender Manual

Lumagen® Inc.



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This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC rules, Canadian ICES-003, and CISPR 22. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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Introduction:

The Lumagen HDMI 1.4 CAT-cable extender is designed to allow more reliable real-world performance with longer cable lengths than competing products. Some key features are:

- Maximum pixel clock rate up to 300 MHz (3 Gbps per channel)
- Active signal buffering for video and control (DDC) signals, at both the transmitter and receiver, maximizes video, EDID, and HDCP-encryption-key, signal integrity.
- Programmable cable equalization at both transmitter and receiver provides lower cable jitter, and therefore longer cable lengths, than dynamic-cable-equalization solutions.
- Power supplies at both transmitter and receiver eliminate power-supply-current induced cable voltage-drop. This improves signal integrity.
- Using CAT6 FTP or STP, with 24 AWG HDMI, cables supports 1080p60 for a total distance of over 60 meters, with up to 30 meters of HDMI 1.3 22 AWG HDMI cable plus up to 30 meters of CAT6 STP cable, under nominal conditions.
- Supports all HDMI 1.4 3D formats and the HDMI 1.4 Audio-Return-Channel (ARC).

NOTICE:

Use of shielded CAT5e FTP or CAT6 FTP cable, or better, is required to conform to electromagnetic interference regulations.

The Lumagen HDMI-CAT6 cable extender uses a HDMI repeater chip in both the transmitter and receiver. Typically other products do not have a repeater chip in the “transmitter.” Solutions lacking an active video buffer in the transmitter cause discontinuities in the impedance of the transmission line, reducing maximum cable length.

Both transmitter and receiver support long input cables. For example, a system could have a 30-meter 22-AWG HDMI 1.3 cable driving the transmitter, a 30-meter CAT6 FTP cable-pair to the receiver, and a 3-meter HDMI cable from the receiver to the display/projector.

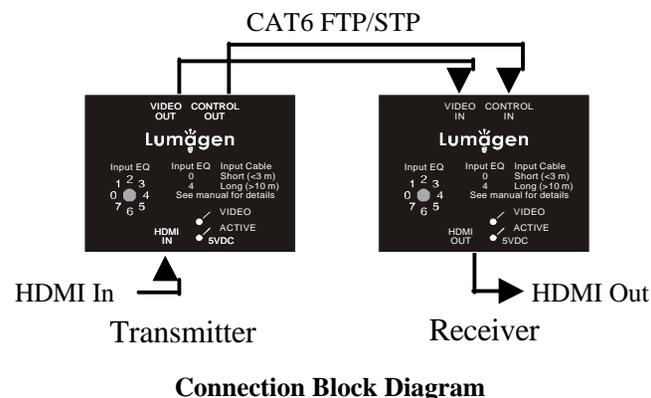
The transmitter and receiver have “static” input cable equalization (Input-EQ). The Input-EQ for each is selected manually using an 8-position rotary switch, based on its input cable length. Static cable-EQ has less signal jitter than dynamic-cable-EQ solutions. This translates into the ability to support longer cable lengths.

When long cables, or cable extenders, have issues in a given system, Lumagen has found that it is often due to problems with the DDC signals. Since the DDC signals are needed for HDCP and EDID communication, Lumagen uses active DDC buffers in both the transmitter and receiver. Unfortunately, many other HDMI extender manufacturers do not buffer these signals in their products. The three cables involved (input HDMI, CAT, output HDMI) all contribute cable capacitance losses. By having DDC buffers in both the transmitter and receiver, losses for each of the three cables can be isolated and corrected.

There is a separate power supply for the transmitter and the receiver. This eliminates voltage-drop caused by powering the repeater chip through the CAT cable. This is important for DDC signal integrity. Lumagen has measured significant voltage drop in other products that power their repeater chip through the CAT cable, which reduces their signal integrity. Separate power supplies eliminate this issue.

Installation Instructions:

Lumagen specifies the use of shielded CAT5e FTP/STP or CAT6 FTP/STP cable to meet EMI regulations. Non-shielded (UTP) cable will function, but will not meet EMI regulations. Another advantage of FTP/STP cable is that it is less susceptible to crosstalk from other cables in a cable-bundle environment. CAT6 FTP/STP cable supports longer reliable cable lengths compared to CAT5e FTP/STP cable because its electrical characteristics are better suited for video applications.



Connection order is important so ground signals in the CAT control cable are connected first to reduce the chance that ground loop current will damage equipment. Lumagen recommends connecting cables in the following order:

- Insert the supplied 5-VDC power-supply into the HDMI-CAT6 Receiver's 5-VDC jack, twisting it to make sure it seats all the way into the case. Plug the power supply into the wall outlet.
- Connect the control CAT cable and then the video CAT cable into the HDMI-CAT6 receiver.
- Connect the HDMI cable from the HDMI-CAT6 receiver to the projector/display.
- Insert the supplied 5-VDC power-supply into the HDMI-CAT6 Transmitter's 5-VDC jack, twisting it to make sure it seats all the way into the case. Plug the power supply into the wall outlet.
- Connect the CAT cable for control and then the CAT cable for video to their respective output on the HDMI-CAT6 Transmitter.
- Connect the HDMI cable from the source to the HDMI-CAT6 transmitter.
- Turn the system on.

Caution:

Be careful to not cross-wire the control and video cables as it may damage the HDMI-CAT6 extender.

Caution:

Ground loops are common even in well-designed systems -- even with power conditioners. Power conditioners do not prevent the most common ground loop issues, which are related to the ground prong on equipment with three prong power cords, and the difference in the case ground voltage potential between equipment. Given the longer distance involved, ground loops are generally worse for the source to display/projector connection. To help prevent damage, audio and video cables should be connected before power. This allows the ground wires of the audio/video cables to handle any ground loop current rather than the audio and video signals themselves.

Status Indicator Lights:

There are two light-emitting-diode (LED) indicator lights on the transmitter and on the receiver. These show the connection status as described below:

- **ACTIVE:** On if the external 5-VDC power is supplied, and HDMI "Standby Power" is active.
- **VIDEO:** On if the *ACTIVE* light is on, and the video input signals are actively driven.

All the indicators on both the transmitter and receiver must be illuminated for the HDMI-CAT6 extender to pass video/audio. However, having all the indicators illuminated does not guarantee that video/audio can be passed, or that the desired resolution can be achieved for the system as configured. The lights indicate that power is supplied, that the source's "standby power" is active, and that the video input signals are being driven, and not that video is being correctly received.

Input Equalization Selection:

The transmitter and receiver each have an input-equalization (Input-EQ) rotary switch with settings from 0 (no Input-EQ) to 7 (maximum Input-EQ) to select the cable equalization for their respective input cable. For short input cables, set input-EQ to 0. Input-EQ settings range from 0 – 2 for up to 5 meters, 1 – 4 for 5 to 10 meters, and 2 – 7 for = 10 meters.

NOTE:

The Transmitter's input equalization switch is set based on the length of its input HDMI cable. The Receiver's input equalization switch is set based on the length of its input CAT cable.

For best performance multiple switch settings should be tested and the average of the working settings should be used.

After the transmitter and receiver Input-EQ settings have been selected, power down the system and then power on normally to test that the video signal "locks" at power on. Acquiring signal "lock" is harder than maintaining "lock." A setting that works while changing Input-EQ settings may not "lock" during power-on. While unlikely, if this occurs, try other settings and test for power-on signal "lock."

Setup Tips and Trouble Shooting:

- When installing new CAT cable, always install CAT6 FTP cables (i.e. shielded), or better, for use with HDMI-CAT extenders.
- Avoid bundling the high-frequency video cables with LAN and other digital cables. Using CAT6 FTP cables reduces the potential for crosstalk between cables.
- Cable type, source-device clock-jitter, sink-device jitter-sensitivity, intra-cable crosstalk, inter-cable crosstalk, cable bundling, and ground loops, determine, and limit, maximum reliable cable length.
- The Transmitter's input equalization switch is set based on the length of its input HDMI cable. The Receiver's input equalization switch is set based on the length of its input CAT cable.
- If the system is properly connected with quality cables of an appropriate length, and equipment is turned on, if no video is seen, the likely cause is either the transmitter or receiver Input-EQ is not properly set for the given cable type and cable length.
- HDMI audio is more sensitive to cable jitter than video. So, the maximum cable length may be reduced if audio is being used.

Specifications:

- Maximum pixel clock rate: 300 MHz (3 GHz bit rate per channel), which support up to 1080p120, or 1080p60 with 16-bit 4:4:4
- Maximum video rate using CAT6 STP cable, or for the transmitter input using 24 AWG HDMI cable, for ideal conditions is:
 - For 1080p60 with 12-bit 4:2:2, or 8-bit 4:4:4: 30 meters
 - For 1080p75 with 12-bit 4:2:2, or 8-bit 4:4:4: 25 meters
 - For 1080p120 with 12-bit 4:2:2, or 8-bit 4:4:4: TBD
- Maximum total source to sink cable length (HDMI, CAT, HDMI) using for nominal conditions is 62 meters at 1080p60 12-bit 4:2:2, or 8-bit 4:4:4 video, using 30m of HDMI 1.3 and 30m of CAT6 FTP, under nominal conditions.
- Maximum distance may be reduced if audio is used since HDMI audio is more sensitive to cable induced jitter than video
- Supports all HDMI 1.4 3D formats and the HDMI 1.4 Audio-Return-Channel (ARC).
- Power: Transmitter = 2.5 Watts, Receiver = 2.5 Watts