# HDMI 2.1b Feature Descriptions Archive

HDMI Ethernet Channel

HDMI Ethernet Channel technology consolidates video, audio, and data streams into a single HDMI cable, combining the unmatched signal quality and convenience of HDMI connectivity with the power and flexibility of home entertainment networking. It incorporates a dedicated data channel into the HDMI link, enabling high-speed, bi-directional networking at up to 100 Mb/sec.
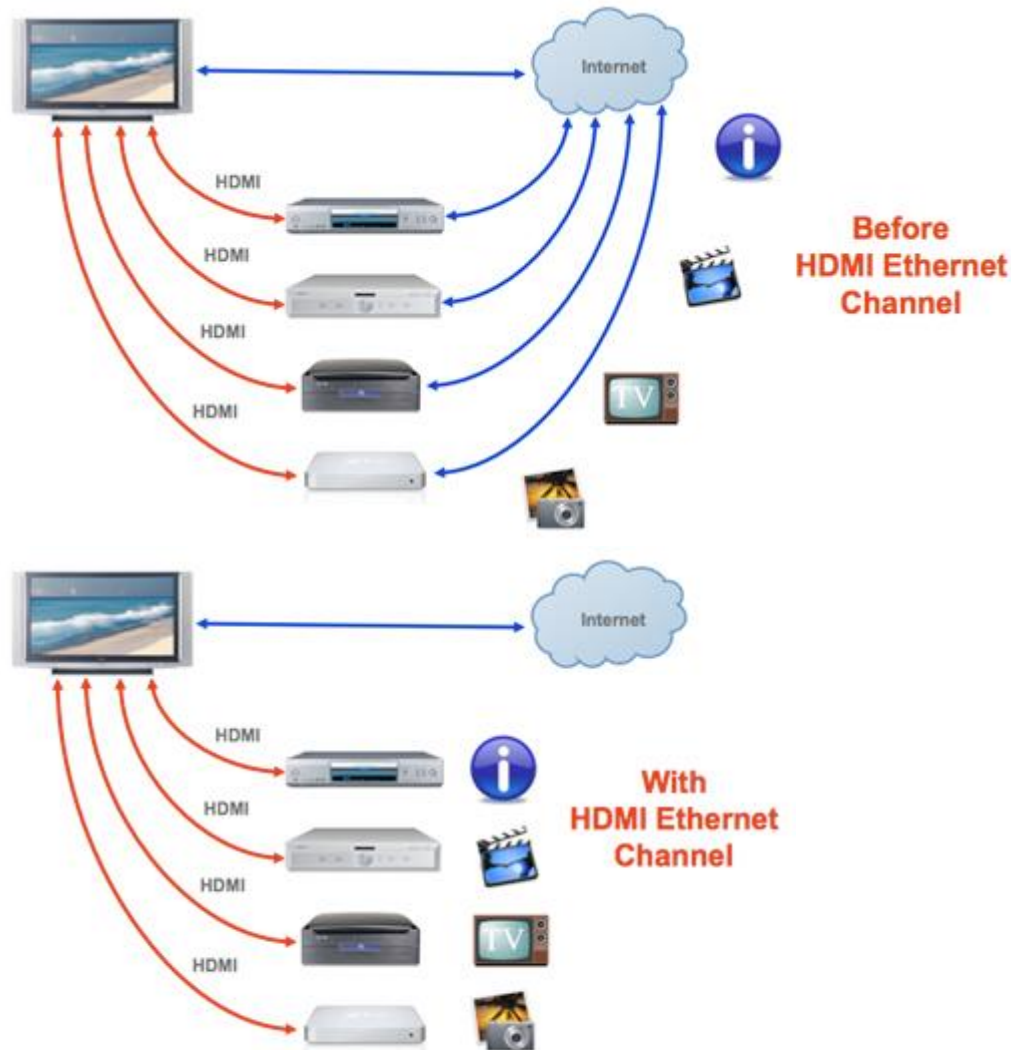
With networking capabilities now available in a wide range of IP-enabled home entertainment devices, from TVs and gaming consoles to DVRs and more, adding an Ethernet channel is a big step forward in the evolution of the HDMI standard. Consumers can enjoy all the benefits of Ethernet connectivity via HDMI, and further simplify their systems by eliminating the need for separate Ethernet cables.

- Accommodates current and future IP-based networking solutions for consumer electronics, including DLNA, IPTV, LiquidHD, and UPnP.
- Allows multiple connected devices to share an Internet connection.
- Enables native-format content distribution between connected devices, including recording and playback across a networked system.

- Provides a true one-cable solution for all your home entertainment needs, offering HDMI's world-class quality and reliability plus all the benefits of home entertainment networking in one powerful connection.

How to Ensure HDMI Ethernet Channel functionality in your Home Theater System

- Look for devices that include HDMI Ethernet Channel functionality.
- Be sure to connect devices with one of the new cables designed to support HDMI Ethernet Channel functionality, either the Standard HDMI Cable with Ethernet or the High Speed HDMI Cable with Ethernet. **(more)**
- Connect your devices through HDMI Ethernet Channel-enabled HDMI ports. HDMI Licensing has strongly recommended that Adopters label all HDMI Ethernet Channel-enabled HDMI ports with the letters "HEC" for easy identification, but does not require manufacturers to do so. Please check with your manufacturer to determine which HDMI ports (if any) will support HDMI Ethernet Channel functionality.
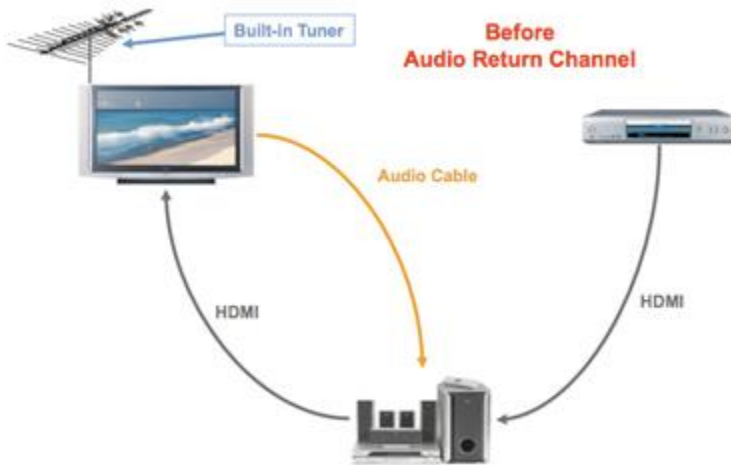
Key Benefits

- Consolidation of HD video, audio, and data in a single cable
- Enables high speed bi-directional communication
- Enables IP-based applications over HDMI
- Transfer speeds up to 100 Mb/sec

Audio Return Channel

The Audio Return Channel in HDMI 1.4 enables a TV, via a single HDMI cable, to send audio data "upstream" to an A/V receiver or surround audio controller, increasing user flexibility and eliminating the need for any separate S/PDIF audio connection.

TVs have always been able to receive multi-channel audio through an HDMI connection, and this is still a typical use-case, with the TV positioned "downstream" from content sources and any connected audio equipment. However, if a user had a TV with a built-in tuner or DVD player, and wanted to send content "upstream" from the TV back to the audio system, a separate connection had to be installed, typically an S/PDIF cable.

- An Audio Return Channel-enabled TV can either send or receive audio via HDMI, upstream or downstream, depending on system set-up and user preferences.
- LipSync functionality, introduced in HDMI 1.3, ensures that the audio stays matched to the video, automatically compensating for any processor delays whether the audio is traveling upstream or downstream.

Built-in Tuner

**Before
Audio Return Channel**

Audio Cable

HDMI

HDMI

Built-in Tuner

**With
Audio Return Channel**

Simplifies cabling by combining
the upstream audio capability
into a single HDMI cable

HDMI

HDMI

How to Ensure Audio Return Channel functionality in your Home Theater System

- Look for devices that feature Audio Return Channel functionality.
- All HDMI cables will support Audio Return Channel functionality when connected to Audio Return Channel-enabled devices. You can use your existing HDMI cables or choose a different cable type. **(more)**
- Connect your devices through Audio Return Channel-enabled HDMI ports. HDMI LA has strongly recommended that Adopters label all Audio Return Channel-compliant HDMI ports with the letters "ARC" for easy identification, but does not require manufacturers to do so. Please check with your manufacturer to determine which HDMI ports (if any) will support Audio Return Channel functionality.

3D

The latest version of the HDMI standard establishes critical infrastructure for implementing 3D video in the home, defining input/output protocols that will allow 3D displays and source devices to communicate through an HDMI link. It's a major milestone on the path to bringing true 3D gaming and 3D home theater to the mass market, supporting resolutions up to 1080p in 3D.

3D technology is evolving rapidly, with several competing approaches under development, so the HDMI 1.4 specification establishes protocols for a number of popular 3D display methods, including:

- Frame, line, or field alternative methods
- Side by side methods (full and half)
- 2D plus depth methods

A complete list of the supported 3D formats can be found in the HDMI 1.4 specification.

How to Ensure 3D in your Home Theater System

- Look for devices that include 3D functionality.
- All High Speed HDMI cables will support 3D when connected to 3D devices. You can use your existing High Speed HDMI cables or choose a different cable type. **(m**

4K Support

The HDMI 1.4 specification adds support for extremely high video resolutions that go far beyond today's 1080p systems. 4K is shorthand for 4,000 lines wide by 2,000 lines high, or roughly four times the resolution of a 1080p display. The term actually covers two formats, both supported in the HDMI 1.4 specification:

- 3840 pixels wide by 2160 pixels high
- 4096 pixels wide by 2160 pixels high

4K displays will put high-end home theater systems roughly on a par with the state-of-the-art Digital Cinema projectors used in many commercial movie theaters. Staying true to its commitment to future-readiness, the HDMI standard can now support these systems with the extremely high bandwidth connectivity they will require.

**How to Ensure 4K functionality in your Home Theater System**

- Look for devices that support 4K functionality.
- All High Speed HDMI cables will support 4K functionality when connected to 4K devices. You can use your existing High Speed HDMI cables or choose a different cable type. **(more)**

Content Type

The HDMI Specification Version 1.4 enables simple, automated picture setting selection with no user intervention. The Content Type feature enables a display to auto-select the correct viewing mode to match the content type it is currently receiving from a source device, and to switch modes when a new content source is selected. Content Type supports content profiles for gaming, movie, photograph, and text viewing modes.

Additional Color Spaces
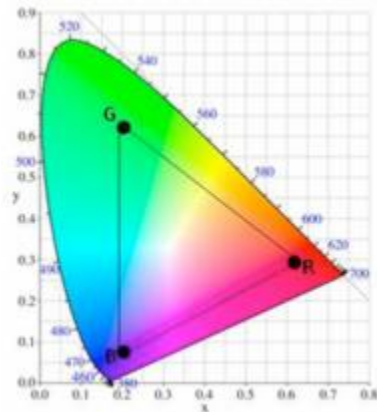
While RGB is still the dominant color space in most video applications, other color models are gaining popularity, particularly in digital still photography. Version 1.4 of the HDMI specification adds support for three additional color spaces (also known as color gamuts), enabling manufacturers to deliver better and more accurate color to users when they view their digital photos on an HDTV. In addition to RGB color and x.v.Color, the HDMI standard now offers native support for three additional color spaces:

- sYCC601 color
- Adobe RGB color
- Adobe YCC601 color

Like x.v.Color, each of these color spaces defines a palette of available colors that is larger than the traditional RGB color model, and closer to the full range of colors perceptible to the human eye.

**How to Ensure Extended Color Support in your Home Theater System**

- Look for devices that feature support for these additional color spaces.
- All HDMI cables will support this functionality when connected to compliant devices. You can use your existing HDMI cables or choose a different cable type. **(more)**

HDMI Micro Connector

In addition to the three connector types already defined in previous versions of the HDMI standard, the HDMI 1.4 specification introduces a new "Type D" connector designed for cell phones, pocket cameras, and other portable devices where space is at a premium. Roughly the size of a Micro USB connector, it packs all the power and functionality of an HDMI link into a tiny form factor. Featuring a full nineteen-pin array like other HDMI connectors, the HDMI Micro Connector can handle video signals up to 1080p, bringing state-of-the-art HD resolutions to the realm of handheld devices. This new connector is approximately 50% smaller than the size of the existing HDMI Mini Connector.

Automotive Connection System
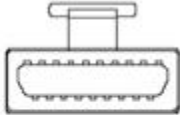
Automotive Connection System

Automotive video systems are increasingly popular, and car manufacturers have been asking for a way to incorporate HDMI connectivity into their vehicles. The HDMI 1.4 specification answers that need with a new, robust automotive connection system, specifically designed to meet the demanding requirements of the road while delivering true HD video to a seatback or dashboard display.

The new automotive connection system consists of two elements:

- A new type of Automotive HDMI cable, designed for connections within a vehicle and tested to perform under the unique stresses of the motoring environment such as vibration and temperature extremes.
- A new category of locking HDMI connector, known as the Type E connector, designed for securing internal connections within a vehicle.

Owners of HDMI-equipped vehicles will be able to easily enjoy HD video from their personal media players, HD camcorders, and other digital sources while on the go.

Overview of HDMI 1.4

What's new in the HDMI 1.4 specification?

- **HDMI Ethernet Channel**

  The HDMI 1.4 specification adds a data channel to the HDMI connection, enabling high-speed, bi-directional communication. Connected devices that include this feature can send and receive data via 100 Mb/sec Ethernet, making them instantly ready for any IP-based application. The HDMI Ethernet Channel allows internet-enabled HDMI devices to share an internet connection via the HDMI link, with no need for a separate Ethernet cable. It also provides the connection platform that will allow HDMI-enabled components to share content between devices.

- **Audio Return Channel**

  The new specification adds an audio channel that will reduce the number of cables required to deliver audio "upstream" from a TV to an A/V receiver for processing and playback. In cases where a TV features an internal content source, such as a built-in tuner or DVD player, the Audio Return Channel allows the TV to send audio data upstream to the A/V receiver via the HDMI cable, eliminating the need for an extra cable.

- **3D**

The 1.4 version of the specification defines common 3D formats and resolutions for HDMI-enabled devices, enabling 3D gaming and other 3D video applications. The specification standardizes the input/output portion of the home 3D system, facilitating 3D resolutions up to dual-stream 1080p.

- **4K Resolution Support**

  The new specification enables HDMI devices to support extremely high HD resolutions, effectively four times the resolution of a 1080p device. Support for 4K allows the HDMI interface to transmit digital content at the same resolution as the state-of-the-art Digital Cinema systems used in many movie theaters.

- **Expanded Support For Color Spaces**

  HDMI now supports color spaces designed specifically for digital still cameras, enabling more accurate color rendering when viewing digital photos. By supporting sYCC601, Adobe®RGB, and Adobe®YCC601, HDMI display devices are capable of displaying more accurate, life-like colors when connected to a digital camera.

- **HDMI Micro Connector (Type D)**

  The HDMI Micro Connector is a significantly smaller 19-pin HDMI connector supporting up to 1080p resolutions for portable devices such as cell phones, portable media players, and digital cameras. This new connector is approximately 50% smaller than the size of the existing HDMI Mini connector.

- **Automotive Connection System (Type E)**

  The Automotive Connection System is a cabling specification designed to be used for in-vehicle HD content distribution. The HDMI 1.4 specification provides a solution designed to meet the rigors and environmental issues commonly found in automobiles, such as heat, vibration and noise. Using the Automotive Connection System, car manufacturers now have a viable solution for HD distribution within a vehicle.

When should we expect to see products with some of these new features?

While the HDMI Licensing authority has no special insight into manufacturers' product plans, prior experience tells us that when a new version of the specification is released, products featuring the new capabilities typically start to reach the market within six to nine months. A number of products featuring HDMI 1.4 functionality are likely to be introduced at the 2010 Consumer Electronics Show in Las Vegas.

Are manufacturers required to implement all of the new HDMI 1.4 features?

No. HDMI technology is designed to enable a wide variety of manufacturers in different markets to implement the feature sets that work best for their customers.

How will I know which HDMI 1.4 features are implemented in a device?

Shop for the specific features that interest you, rather than shopping for an HDMI version number and assuming that a certain feature is supported. Since many of the capabilities detailed in the HDMI 1.4 specification are optional implementations, it's the responsibility of the manufacturer to tell you what features are supported in any given device.

Will any of the new HDMI 1.4 features require a new cable?

The HDMI Ethernet Channel feature will require a new cable that supports this functionality, either a Standard HDMI Cable with Ethernet or a High Speed HDMI Cable with Ethernet, depending on the maximum resolution to be supported. The Automotive Connection System will also employ a new class of cable, the Standard Automotive HDMI cable, which is designed specifically for automotive use. All of the other new HDMI 1.4 features will be compatible with the existing categories of cables.

Are HDMI 1.4 devices going to be backwards-compatible with older HDMI (v.1.0 - 1.3) devices?

Yes, devices built to the HDMI 1.4 specification will be fully backwards-compatible with existing HDMI devices and their features.

Can older HDMI (v.1.0 - 1.3) devices be firmware-upgraded to take advantage of the new features introduced in HDMI 1.4?

Probably not. Most of the new features introduced in HDMI 1.4 will require a new HDMI chip to enable, and cannot be upgraded via firmware.

HDMI Ethernet Channel

What will I be able to do with an HDMI Ethernet Channel -enabled device?

The HDMI Ethernet Channel enables a number of new possibilities via the HDMI link, including:

- **Sharing an internet connection** – The HDMI Ethernet Channel feature allows your internet-ready entertainment devices, from gaming consoles to Blu-ray Disc players and more, to share an internet connection without any need for a separate Ethernet cable.
- **Content distribution** – Devices connected by the HDMI Ethernet Channel will be able to exchange digital content in its native format, enabling recording, storage, and playback options across a connected system, with no need for a separate Ethernet cable.
- **Home entertainment networking** – The HDMI Ethernet Channel accommodates current and future IP-based networking solutions for consumer electronics, such as UPnP, LiquidHD, and DLNA. HDMI with Ethernet is the ideal one-cable solution for connecting devices in these advanced home-networking environments.

What network protocols are supported over the HDMI Ethernet Channel?

The HDMI Ethernet Channel feature supports any networking protocol that can run over an existing Ethernet connection, including TCP/IP, UPnP, DLNA, LiquidHD, and so forth.

What is the maximum available bandwidth of the HDMI Ethernet Channel?

Up to 100 Mb/sec of bi-directional (full-duplex) bandwidth is available over the HDMI Ethernet Channel.

Will devices connected via the HDMI Ethernet Channel be able to share an Internet connection?

Yes. Provided there is a routing device somewhere in the network – either a stand-alone router or a device with integral router functionality – the HDMI Ethernet Channel will enable linked devices to share an Internet connection.

Will content distribution and recording be possible in a system connected via the HDMI Ethernet Channel?

Yes. The HDMI Ethernet Channel allows connected devices to share digital content in its native format. For instance, if it is protected by HDCP encryption, it will stay in its encrypted format, and can only be accessed if all the devices in the system are HDCP-compliant. Unprotected content, such as digital HD broadcast programming or user-generated HD video, will of course be free of any content protection.

Will I need a new cable to support HDMI Ethernet Channel functionality?

Yes. The HDMI Ethernet Channel feature will require a new type of cable, either a Standard HDMI Cable with Ethernet or a High-Speed HDMI Cable with Ethernet, depending on the maximum resolution to be supported.

Audio Return Channel (ARC)

What will I be able to do with an Audio Return Channel -enabled device?

If your HDTV has a built-in tuner, DVD player, or other digital content source, the Audio Return Channel allows the TV to send audio data "upstream" to your A/V receiver, eliminating the need for a separate audio cable in this type of configuration. Audio Return Channel-enabled TVs can either send or receive audio via the HDMI link, giving you greater flexibility in how you set up your home theater equipment and making a separate upstream audio link unnecessary.

Which audio formats are supported over the Audio Return Channel?

The Audio Return Channel supports all the same audio formats that can be sent through a traditional S/PDIF audio connection, including Dolby Digital, DTS, and PCM audio.

Is the HDMI LipSync feature compatible with the Audio Return Channel?

Yes. Whether the TV is sending audio to the sound system or vice-versa, devices featuring LipSync functionality (introduced in HDMI 1.3) will be able to track and correct for any processor lags, and adjust the delivery of audio and video so that the two signals stay in sync.

Will I need a new cable to support Audio Return Channel functionality?

No. **Audio Return Channel** -enabled devices can be connected via all the existing categories of HDMI cables.

3D

Which 3D video formats are contained in HDMI 1.4?

The HDMI 1.4 specification includes information on a wide range of 3D display formats at up to 1080p resolution, including:

- field alternative
- frame alternative
- line alternative
- side-by-side half
- side-by-side full
- L + depth
- L + depth + graphics + graphics depth

What kind of cable will I need to use for 3D?

3D video requires substantial data throughput, so you'll want to use a High Speed HDMI cable (with or without Ethernet).

Are there any 3D displays available today? What about 3D content?

A number of displays on the market are already 3D capable, including many DLP models. Likewise, there are already some content sources, such as gaming consoles that are 3D-capable. The 3D support introduced in HDMI 1.4 fills an important role by providing an input/output connection that can handle 3D content, and this could help launch consumer 3D video into the mainstream.

Support for 4K format

What does 4K refer to?

4K is a term used to describe displays with resolutions that are essentially four times that of a 1080p device – or roughly 4,000 lines wide by 2,000 lines high. The HDMI 1.4 specification supports multiple 4K formats:

- 3840 pixels wide by 2160 pixels high @ 24Hz | 25Hz | 30Hz
- 4096 pixels wide by 2160 pixels high @ 24Hz

What kind of cable will I need to use for a 4K display?

A High Speed HDMI Cable (with or without Ethernet).

Are there any 4K displays available today? What about 4K content?

The first 4K displays were showcased at the 2009 Consumer Electronics Show. We expect them to be more widely available by the end of 2009, and we hope to see 4K source devices, such as up-scaling Blu-ray Disc players, introduced in roughly the same time frame.

Support for sYCC601, Adobe®RGB, and Adobe®YCC601

What do these color spaces refer to?

These are color formats used in many digital still cameras, providing an extended range of available colors that is wider than what's available in the traditional RGB color model. By providing native support for these color spaces, HDMI 1.4 enables HDTV manufacturers to deliver better and more accurate color to users when they view their digital photos.

What exactly is a color space?

A color space, also known as a color gamut or color model, defines the total palette of colors available to the display. The traditional RGB color space, developed in the days of analog broadcast TV, delivers a relatively limited subset of what the human eye can actually perceive. Extended color spaces like sYCC601, Adobe® RGB, and Adobe® YCC601 define a broader palette of colors that is closer to the full visible spectrum.

Does this require a new cable?

No. Support for these extended color spaces is compatible with the existing categories of HDMI cables.

HDMI Micro Connector

What kinds of products will use an HDMI Micro Connector?

Mobile phones, portable media players, digital cameras, or any portable device where space is at a premium and HDMI quality is desired.

When will products be available in the market with an HDMI Micro Connector?

Past experience tells us that when a new version of the HDMI specification is released, products featuring the new capabilities typically start to reach the market within six to nine months. And when new products appear, cable manufacturers are usually quick to support them with compliant cables and connectors.

Is the HDMI Micro Connector a 19-pin connector just like the Standard and Mini HDMI connectors?

Yes. The HDMI Micro Connector does everything a standard connector does – it's just smaller.

Will the HDMI Micro Connector support all the new HDMI 1.4 features?

Yes.

Automotive Connection System

What exactly is the Automotive Connection System?

It consists of two elements:

1. A specification designed for the cabling requirements for distribution of HD data over HDMI in embedded systems within an automobile. The specification covers cables, a latching connector as well as relays. These components will all be used internal to an automobile and are designed to meet the requirements of an environment that is subject to noise, vibration and heat unique to an automobile.
2. A new cable, called a Standard Automotive HDMI cable, designed to connect external devices (camcorders, digital still cameras, portable Blu Ray players, etc.) to an in-vehicle HDMI-enabled system.

If I want to connect an external device to my in-vehicle, HDMI-enabled system, which cable should I use?

To connect your camcorder, portable media player, or other content source device to an in-vehicle video system, you'll want to use an Automotive HDMI cable. We anticipate that these will feature various connector types - Standard, Mini, or Micro - depending on the intended application.

How is a Standard Automotive HDMI cable different from other Standard HDMI cables?

The Standard Automotive HDMI cable is a robust cable designed to handle the unique requirements of connecting to an embedded HDMI Automotive Connection System. Since an automotive video system may be wired with one or more internal relays that can effect signal strength, the Standard Automotive HDMI cable needs to send a strong and reliable signal, so it will be tested to higher performance standards than other cables.

Will the Automotive Connection System support all the new HDMI 1.4 features?

No. Video resolution via the Standard Automotive HDMI cable will be limited to 720p/1080i, and there are no plans at this point to support HDMI Ethernet Channel functionality.

Cables

What are the new cables that have been introduced as part of HDMI 1.4?

HDMI Ethernet Channel functionality adds a new data channel, so new cables are required to support Ethernet connectivity. These two new cable types are Standard HDMI with Ethernet and High Speed HDMI with Ethernet, with the former supporting resolutions up to 1080i/720p, and the latter built for resolutions of 1080p or higher. Both cable types support a full-duplex 100 Mb/sec Ethernet connection.

The other new cable type is the Standard Automotive HDMI cable, designed for use in automotive video systems. It is a robust cable designed to handle the unique stresses of the motoring environment, such as vibration and temperature extremes, and will be tested to higher performance standards than other cables.

What are the types of HDMI cables?

In the HDMI specification, cables are specified in two categories (Standard and High Speed) according to their supported speed. Each can be made either with or without the HDMI Ethernet Channel. The 4 resulting cable types are then:

- Standard HDMI Cable
- High Speed HDMI Cable
- Standard HDMI Cable with Ethernet
- High Speed HDMI Cable with Ethernet

There are also cable-types defined for automotive applications but these cables are not currently available to consumers.

What cable do I need?
- Use a standard cable if you have a lower-resolution display (approx. 720p or 1080i).
- Use a High Speed cable if you have higher-resolution display (e.g. 1080p). High Speed cables can deliver all video content currently defined for the HDMI standard (i.e. more than two 1080p/60 video streams, including 3D).
- Use an HDMI cable with Ethernet if your devices take advantage of the HDMI Ethernet Channel. HDMI cables with Ethernet are capable of sending 100/mbps over the HDMI Ethernet Channel.

Miscellaneous

Where can I find more information about HDMI 1.4?

For general questions about HDMI, please visit www.hdmi.org. For complete details on the HDMI 1.4 specification, please go to http://www.hdmi.org/manufacturer/hdmi_1_4/. Additionally, HDMI LA will be conducting webinars beginning in June 2009. Please go to http://www.hdmi.org/learningcenter/installer_training.aspx#1 to sign up for an upcoming webinar session.

Am I allowed to download the specification? If so, where can I download the specification?

The specification is available for download under certain terms of use at no charge. Please go to http://www.hdmi.org/manufacturer/specification.aspx to get a copy.

Is there an HDMI 1.4 Compliance Test Specification? If so, can I download it?

The Compliance Test Specification is still being developed. HDMI Adopters will be notified as soon as it is published.

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