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Previous Page

Next Page

## How HDMI Works

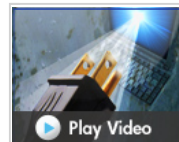
by Tracy V. Wilson

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### Inside this Article

1. Introduction to How HDMI Works
2. HDMI Signals
3. HDMI Connections
4. HDMI Standards and Revisions
5. Lots More Information
6. See all HDTV articles

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### HDMI Connections

There are lots of methods you can use to connect [home-theater](#) components. For example:

- **Component video** carries analog video signals separated into two channels for color and a third for luminance. Component video cables use RCA connectors.
- **S-video** transmits analog signals using one cable and a four-pin connector.
- **DVI**, or digital visual interface, is a 29-pin connection commonly used with computer monitors. Unlike composite video and s-video, it carries digital signals.

Many HDTV early adopters rely on DVI, since it hit the market before HDMI did. Since DVI and HDMI both use the TMDS protocol, they're compatible. All you need to connect an HDMI cable to a DVI port is a passive adapter.

The DVI and HDMI connectors have some other similarities. Both use a grid of pins to transmit signals from the cable to the device. While DVI has a 29-pin connector, HDMI's **type A** connector has 19 pins. A DVI connector also uses a pair of built-in screws to anchor it to the device. HDMI plugs don't have this extra support, and some users have expressed concern that this puts unnecessary strain on the device's circuitry. There's also a miniature version of the HDMI connector for use on smaller devices like [digital camcorders](#) as well as a 29-pin **type B** connector, although most consumer devices use type A.



Photo courtesy [HowStuffWorks Shopper](#)  
**With a simple adapter, you can plug an HDMI cable into a DVI slot.**

From the HDMI connector's pins, signals travel through **twisted pairs** of copper cable. Three audio and video channels travel through two pins each, for a total of six pins. The TMDS clock, which allows devices to synchronize the incoming data, travels through one pair of pins. Each of these four total pairs has a **shield** -- another wire that protects it from interference from its neighbors. The TMDS channels, the clock and the shields make up the bulk of the cable pairs inside the HDMI cable.

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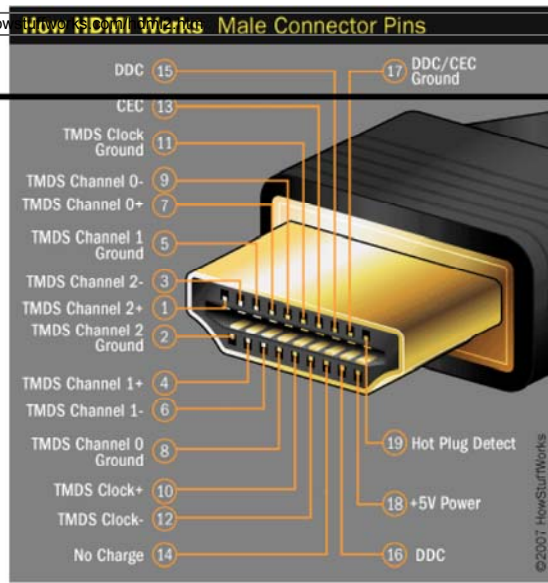
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The other signals that travel through the HDMI cable need only one pin. One such channel is the **consumer electronics channel (CEC)**. If your devices support it, this channel allows them to send instructions to one another. For example, an [HD-DVD](#) player could automatically turn on a home-theater receiver and an [HDTV](#) when it started playing a disk. The **hot plug detect** channel, which uses one pin, senses when you plug in or unplug a device, re-initializing the HDMI link if necessary. The one-pin **display data channel (DDC)** carries device information and the HDCP encryption information discussed in the previous section. Other channels carry encryption data and electricity to power communication between devices.

The cables themselves come in two categories. Category 1 has a speed of 74.25 MHz. Category 2 has a speed of 340 MHz. Most consumer cables are the faster category 2 variety.

In addition to the connector and cable, the HDMI standard applies to how [TV](#) sets can synchronize sound with video and display color. These capabilities have changed significantly over several revisions to the standard, which we'll compare in the next section.

#### HDMI Certification

In order to carry the HDMI logo, devices and cables have to pass compliance testing. Manufacturers, known as HDMI adopters, must submit a sample of their product for tests before starting mass production.

[Previous Page](#)

[Next Page](#)

#### Inside this Article

- 1. [Introduction to How HDMI Works](#)
- 2. [HDMI Signals](#)
- 3. [HDMI Connections](#)
- 4. [HDMI Standards and Revisions](#)
- 5. [Lots More Information](#)
- 6. [See all HDTV articles](#)

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