

## Basic Knowledge of Digital Visual Interface Technology (DVI) and High-Definition Multimedia Interface (HDMI)

### What are DVI/HDMI?

DVI (Digital Visual Interface) connections allow users to utilize a digital-to-digital connection between their display (LCD monitor) and source (Computer). These types of connectors are found in LCD monitors, computers, cable set-top boxes, satellite boxes, and some televisions which support HD (high definition) resolutions.

HDMI (High-Definition Multimedia Interface) is the first industry-supported, uncompressed, all-digital audio/video interface. HDMI provides an interface between consumer electronic audio/video sources (for example, cable set-top boxes and satellite boxes, DVD players, and A/V receivers), and audio and/or video monitors (for example, digital televisions (DTV)). HDMI supports standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable. It transmits all ATSC (Advanced Television Systems Committee) HDTV standards and supports 8-channel digital audio, with bandwidth to spare to accommodate future enhancements and requirements.

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Both DVI and HDMI connections transmit video data using TMDS (Transition Minimized Differential Signaling) protocol. The only difference is that HDMI carries both video and audio signal through a single cable.

### DVI Connector Types:

There are two main types: DVI-I and DVI-D. DVI-D supports only digital signals while DVI-I can support both digital and analog signals.

DVI-D contains 24 pins (3 rows of 8 pins) while DVI-I contains additional 5 pins for RGBHV (analog) connection.

**DVI-D Female Connector Picture 1**



**DVI-I Female Connector Picture 2**



**DVI-D Male Dual Link Connector Picture 3**



**DVI-I Male Single Link Connector Picture 4**



The DVI male connectors can be utilized as 12 or 24 pin connections:

Dual link DVI supports 2x165 MHz (2048x1536 at 60 Hz, 1920x1080 at 85 Hz) and utilizes all 24 pins (picture 3).

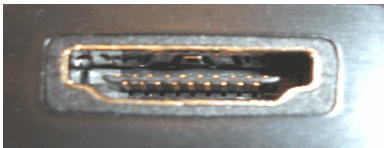
Single Link DVI supports 165 MHz (1920x1080 at 60 Hz, 1280x1024 at 85 Hz) and utilizes only 12 of the 24 available pins (picture 4)

### HDMI Connector Types:

Like DVI, there are 2 types of HDMI connectors: single link (type A, 19 pins) and dual link (type B, 29 pins). Type B is slightly larger than type A, which is necessary to support very high-resolution computer displays requiring dual link bandwidth.

Currently, there is no practical market for the type B connector.

HDMI Single Link-Type A-Male



HDMI Single Link-Type A-Female



### Digital versus Analog:

HD-15 Male Analog Connector

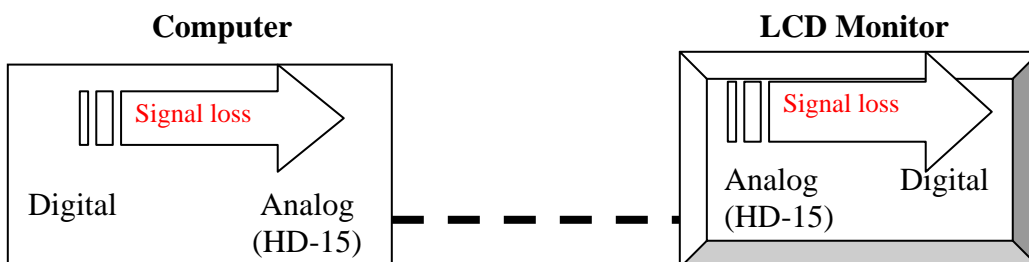


HD-15 Female Analog connector

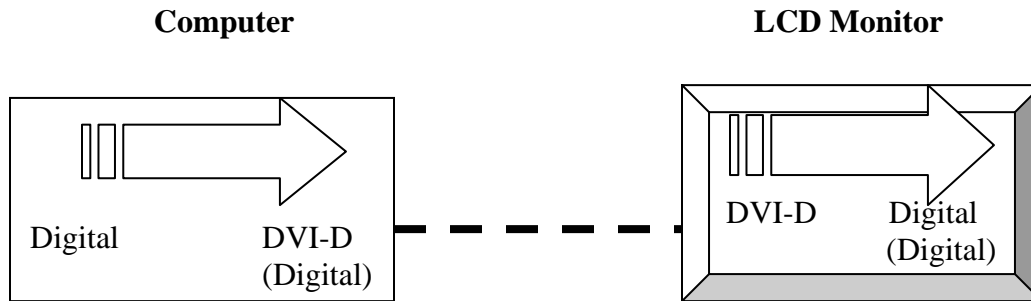


In order to display images on the monitor, data (graphic signals) is sent from the computer to the monitor. Since the graphic signals sent from the computer are digital, they need to be converted to analog in order to be received and interpreted properly by the analog monitor through the analog connectors. If the monitor is digital, the data needs to be converted again to digital in order to be displayed on the screen (e.g. LCD monitor).

Each conversion creates small amounts of signal loss. The multiple conversions will impact the overall quality of the picture. The DVI connections eliminate the need for these conversions in addition to other secondary benefits.



## Analog (HD-15) Connections



## Digital (DVI-D) Connections

### Notes

The computer industry is always in a state of change: moving away from analog connectors and traditional cathode ray tube (CRT). Today's computers and monitors are usually equipped with both analog and digital connections. Depending on the equipment and needs, one should connect only one type of connection in order to achieve the optimal computer performance and avoid unstable results.

A major problem when dealing with digital flat panels is that they have a fixed "native" resolution. There are a fixed number of pixels on the screen; therefore, attempting to display a higher resolution than the "native" one of the screen can create problems.

### Known Issues in DVI and HDMI

*Do Not Connect both VGA (HD-15) and DVI connectors from the same computer to the same display monitor.* This operation has been known to cause unexpected software application compatibility.

*Cable length limitation for DVI and HDMI cable.* With copper-wired cable, the maximum length for optimal performance is 15 meters compared to 50-60 meters for analog/component cable.

*Compatibility of HDMI on consumer electronic connection with DVI-D on computer connection.* Even though Video Signals on HDMI and DVI-D use the same TMDS technology, the implementation for timing (EDID) is not standardized. Therefore, there is no guarantee that connecting computer DVI-D to consumer HDMI (Plasma TV, LCD TV...) will work properly. Please refer to your TV user manual for a list of approved devices.

*Timing differences may degrade LCD's performance, resulting in blurred screen text.* This scenario is caused by incompatibility between the LCD monitor and computer's graphic card.

## References

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