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Digital Visual Interface (DVI) and Video Graphics Array (VGA)

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In this video from ITFreeTraining, I will look at the DVI and VGA connectors. These connectors are legacy connectors and generally not used any more, but you will find them on old computers and other devices like projectors.

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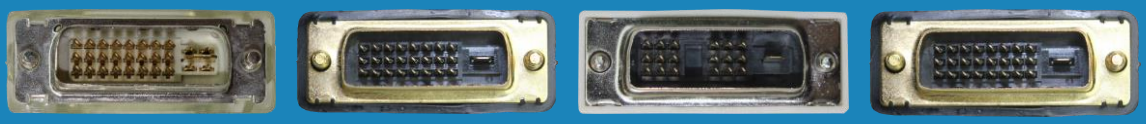
Digital Visual Interface (DVI)

- Released in 1999
- Comes in many different connector types
- Supports analog and digital
- Backwards compatible with VGA
- Comes in single link or dual link



0:15 The Digital Visual Interface or DVI interface was first released in 1999. It was designed to replace the VGA connector which I will cover later in the video. The DVI connector comes in many different connector types.

DVI supports both analog and digital signals. VGA was an analog signal and thus DVI supports analog to allow it to be backwards compatible with VGA. Lastly, DVI supports both single link and dual link.

Single link means there is only the one signal in the cable. Dual link means there are two signals. Having two signals essentially means that you can double the amount of data that is sent through the cable. This is essential when you start using DVI for higher resolutions.

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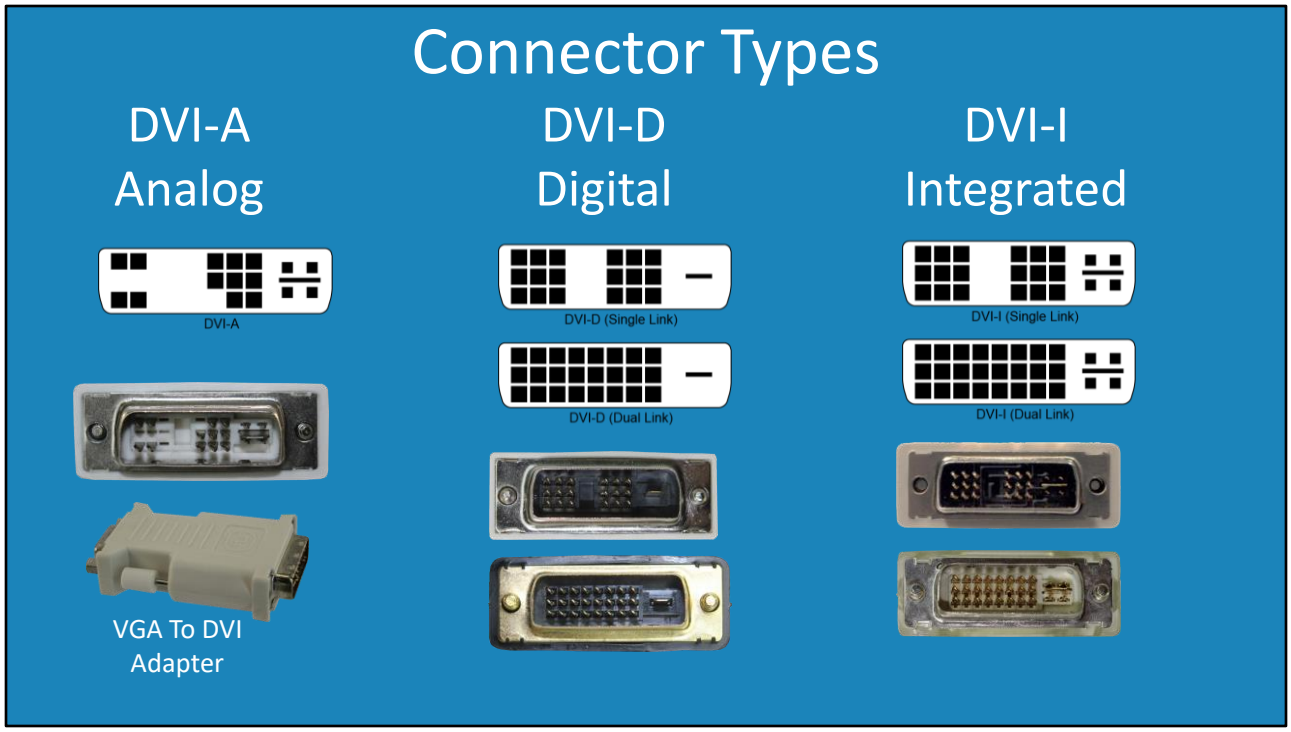

1:05 The DVI connectors can be divided into three different types. DVI is old technology so for the exam you will not be required to know too much about it. It is useful to be aware there are different types of connectors for troubleshooting purposes.

The first connector is DVI-A. The A stands for Analog. So essentially this DVI connector only supports an analog signal. The analog signal is there for VGA compatibility. You will generally see this connector on an adapter like the one shown. The adapter converts a VGA signal to a DVI signal. Since the input is VGA, only an analog signal needs to be outputted.

The next connector type is DVI-D. The D stands for digital. The digital connector comes in single link and dual link. You can see the dual link has additional pins to carry the second signal.

The last connector is the DVI-I connector. The I stands for integrated. The connector essentially supports both analog and digital signals. The connector also comes in single link and dual link. If you purchase a DVI cable it will most likely be a DVI-I connector. Also, if you were to purchase a device in the current market, considering DVI is a legacy connector, if the device has a DVI connector it is most likely to be a DVI-I connector.

A DVI-I cable will plug into a DVI-A or DVI-D connector. For this reason, you would always buy a DVI-I connector, but nowadays it would be difficult to find a cable that is not a DVI-I cable. However, not all DVI-I cables are created equal.

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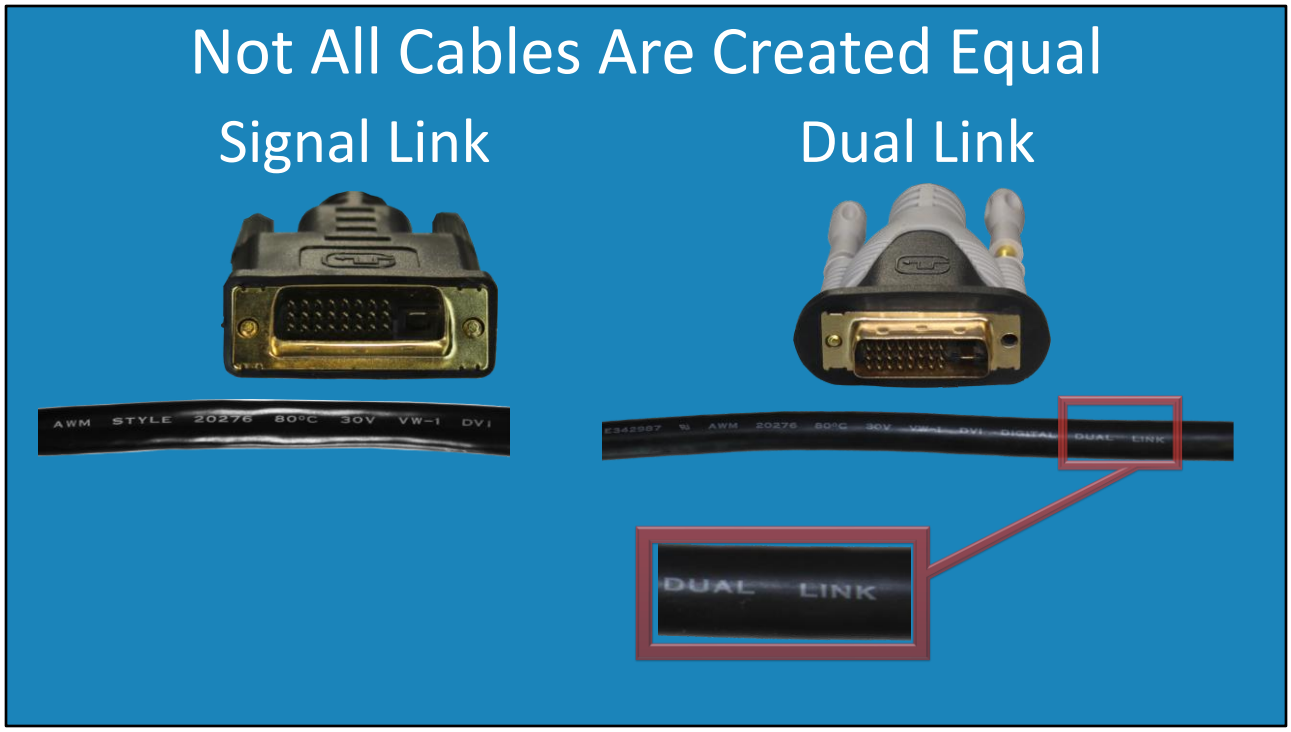

2:57 Shown here is a single link cable. If I compare this with a dual link cable that I purchased, you will notice that the same connector is used on both. If I were to take a guess, I would say that the manufacturer finds it cheaper to manufacturer the one type of plug rather than different plugs. This may make it cheaper to make but means you can't tell if the cable is single or dual link by looking at the plug. Some single link cables will have a single link plug while others will have the dual link plug.

When you purchase a DVI cable, have a look at the packaging and see if it says dual link. If it does not say dual link, don't assume it is, most likely it is not. A lot of cables will have writing on the cable to help identify what kind of cable it is and what it is capable of. In the case of dual link, notice that dual link is printed on the cable.

Different cables are also made of different quality. A poor quality DVI cable will have signal problems and may not be able to display higher resolutions. This becomes more problematic when the cable is longer in length. When purchasing a DVI cable, make sure you check what the specification of the cable is before you buy it, otherwise the cable may not be able to do what you want.

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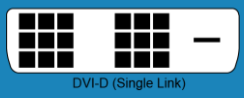
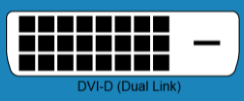
Max Specification (DVI)

- Single mode (Max resolution)
  - 2560x1600x30 Hz or 1920x1200x60 Hz
- Dual mode (Max resolution)
  - 3840x2400x30 Hz or 2560x1600x60 Hz





4:26 The DVI specification supports a lot of different resolutions and timings. What resolutions are supported will be determined by your video card and your monitor. The maximum resolution supported by DVI single-mode is 2560 by 1600 at 30 hertz or 1920 by 1200 at 60 hertz.

If you are using dual mode, this essentially doubles the amount of data that can be transmitted through the video cable. This increases the maximum resolution to 3840 by 2400 at 30 hertz and 2560 by 1600 at 60 hertz.

This essentially means that DVI supports 4k resolution, but you will only be able to get 30 hertz. For this reason, if you are using 4k resolution, you most likely will be using HDMI or DisplayPort rather than DVI.

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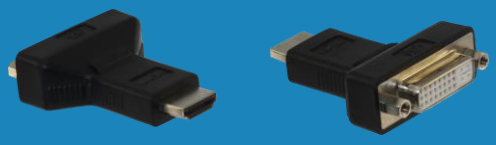
HDMI vs DVI



- DVI supports VGA
- DVI has limited color model
  - HDMI supports YCbCr 4:4:4 and YCbCr 4:2:2
- HDMI supports audio
- HDMI supports some native DVI-D signals
- DVI does not support HDCP
  - High-bandwidth Digital Content Protection

5:19 DVI and HDMI uses the same signaling but use different voltages and features. Since they are similar it is possible to convert between the two using an adapter or a cable with different connectors on each end.

HDMI is a new standard so has newer features. Thus, when you convert between the two, you will be losing some features. The only advantage DVI has over HDMI is that it supports VGA. So, you won't be able to get a HDMI to VGA adapter, however you will be able to get a HDMI to VGA converter. Although the size of the converter may differ, converters will have some additional electronics in order to convert the signal and thus they will be a larger and a bit bulky. Usually, the electronics is encased in a square or rectangle plastic housing. VGA is very old technology, so using adapters generally does not cause problems.

DVI (in comparison to HDMI) has a limited color model. HDMI supports more color spaces than DVI. When sending video data over a cable, the color can be encoded using differences in color and luma known as chroma subsampling. Essentially, more data is used for differences in the intensity in the brightness and less is used for the color. It is done this way because our eyes are more sensitive to changes in brightness than changes in color.

Support for 4 4 4 essentially means luma and color use the same amount of data to encode. Four is the maximum so in other words, no subsampling has occurred. So essentially, what you start with is what you get out the other side.

In contrast, lower values like 4 2 2 essentially mean that less data is used to encode. Luma is

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first followed by color so more data is used to encode luma or light intensity compared with color. It is a compromise, but our eyes are more sensitive to luma than color, so this gives us a better result than is you reduce luma sampling. If you want the best results, you will be better off using HDMI rather than DVI, when you have the choice.

The next difference is that HDMI supports audio. If your monitor has inbuilt speakers, an HDMI cable will be able to transmit audio to the monitor, while the DVI cable is not able to.

In order to promote interoperability between HDMI and DVI, HDMI supports some DVI digital signals directly. Essentially some of the lower resolutions of DVI and HDMI have the same signaling specification. So, an HDMI device will always display at least some of the lower DVI resolutions.

DVI does not support HDCP or High-bandwidth Digital Content Protection. This is a system developed by Intel to prevent copying. Essentially when a signal travels over a cable it can be copied. The easiest way would be to split the cable into two using a splitter. HDCP attempts to prevent this from happening by encrypting the data as it travels over the cable. If you are attempting to connect a device that requires HDCP in order to work, you won't be able to use a DVI cable.

There have been a lot of problems with HDCP, including loss of the master keys allowing it to be hacked; you most likely won't see too much of it unless you are using 4k resolution. This is because a lot of problems with HDCP were not fixed until 4k resolution came out. In a lot of cases, if HDCP is causing problems, the device will allow you to switch it off. For example, if you have a PlayStation 4 and you want to live stream your gameplay, you will need to switch it off. Switching off HDCP won't cause any problems unless you attempt to use a service like Netflix which uses HDCP for 4k videos.

Since HDCP mostly gets used with 4k and DVI only supports 4k at 30hetz, you are most likely to be using HDMI with 4k. For this reason, HDCP is unlikely to cause you too many issues if you convert from HDMI to DVI, since you won't be using the higher resolutions.

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Video Graphics Array (VGA)

- Released in 1987
- Uses analog signal
- Max resolution
  - 2048x1536x85 Hz
- No audio

9:47 To finish this video, I will have a look at the Video Graphics Array or VGA. VGA was released in 1987 and uses a 15-pin connector. For a long time, it was the standard for video on the PC.

VGA uses an analog signal rather than a digital signal found in newer devices. The advantage of an analog signal is that, as the distance gets longer, the signal gets weaker but you still get a signal. With digital, once you start losing the signal it becomes unusable. Digital gets around this by using quality materials and techniques like twisting to reduce interference. This increases the distance digital can be used for. However, digital can send a lot more data than analog and this is one of the main reasons that analog is no longer used. You can also increase the length of digital transmission using digital repeating devices.

VGA has a max resolution of 2048 by 1536 at 85 hertz. If you consider that the 4k standard did not get released until 2005 and took a while before it took off, this is a fairly decent maximum resolution. For this reason, even after the DVI standard was released, VGA was still used on devices like laptops. Most likely this was because the VGA plug was quite small compared with the DVI plug. If you required DVI, an adapter could be used to convert the plug from VGA to DVI.

Nowadays, you don't tend to see VGA plugs on laptops as they tend to use HDMI or DisplayPort to connect an external monitor. DVI is not used so much, which is most likely due to how old the technology is and how big the plug is.

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Lastly, VGA does not support audio. VGA was quite a good standard for computing for a long time, but nowadays it has really shown its age. You won't see it used on new computers, but you may still see it used on devices like projectors for backwards compatibility.

This concludes this video on DVI and VGA. I hope you found this video useful and informative. Until the next video from us, I would like to thank you for watching.

References

"Digital Visual Interface" https://en.wikipedia.org/wiki/Digital_Visual_Interface
"DVI compatibility for sticklers" http://www.playtool.com/pages/dvicompat/dvi.html
"VGA connector" https://en.wikipedia.org/wiki/VGA_connector

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