Ch 17 - Display Technologies

Monitor Technologies

- A monitor is composed of individual picture elements (pixels);
the total pixels across and down is the resolution
- Liquid Crystal Display (LCD) monitors use liquid crystals
to allow light to pass or not pass for each color in a pixel
- LCD backlights are fluorescent or LED lights
and shine through the liquid crystals
- Organic LED (OLED) doesn't use a backlight, as the pixels make their own light
- Digital Light Processing (DLP) uses a grid of tiny mirrors
that shine through a color wheel to create an image

Image is created by 100,000's, possibly Millions, of tiny elements called Pixels

Pixel (Picture Element) - consists of 3 pieces that emit RGB (Red, Green & Blue) light

Each of the 3 elements is a LCD (Liquid Crystal Display)
The color is just film put on top of them

If we put Electricity on 1 of the elements, it goes clear,
and light can Pass Through it.
If we Take Electricity Away, it becomes completely opaque,
and light Can't Pass Through it.

We can also dim & brighten the light

LCD doesn't glow. It can only either let light pass through, or block the light.
They need some sort of back lighting to them.
CCFL (Cold Cathode Fluorescent Lamp) - 1st Generation LCD's
LED's (Light-Emitting Diodes) - used today in vast majority
Separate the Imaging (LCD) from the back light (CCFL or LED)

To generate the color Green, there will be No Charge on the Blue & Red (block light),
and put a big Charge on the Green allowing Light to Pass Through (show color).

Different Types of LCD Technologies
TN (Twisted Nematic) Panel - Very Inexpensive; Good Speed
IPS (In-Plane Switching) Panel - Wide Range of View

Resolution -
1280 x 1024 - 1280 Pixels Wide x 1024 Pixels Down
1920 x 1080 - 1920 Pixels Wide x 1080 Pixels Down

Brightness -
nt (Nit) - measure of light
Panels generally run from 200-500 nits

Response Time -
With motion on your screen, the panel has to be able to reset itself,
so we have that persistence of vision which allows us to detect motion.
How long it takes one pixel to go from all black, to all white, to all black.
Panel Response Times run from 1ms - 4ms

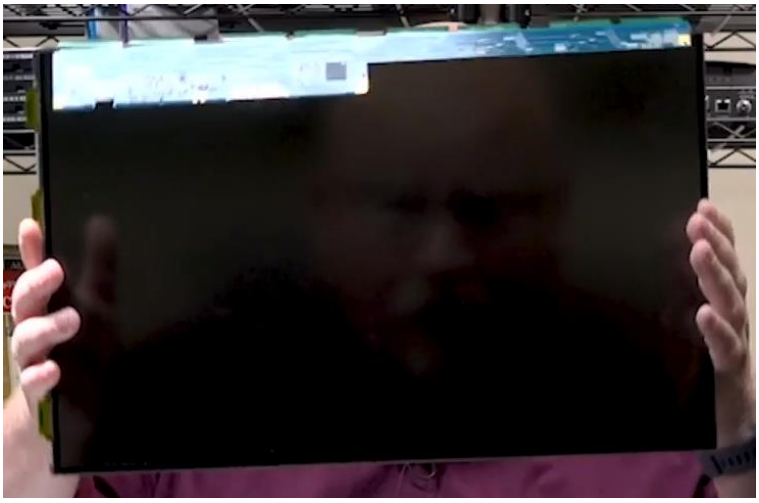
People will say they're selling an LED Monitor ← Not True
They're selling a LCD Monitor with LED backlight

OLED (Organic LED) - RGB has a Red, Green, and Blue Light Bulb
Can make really thin monitors (Smart Devices use this)

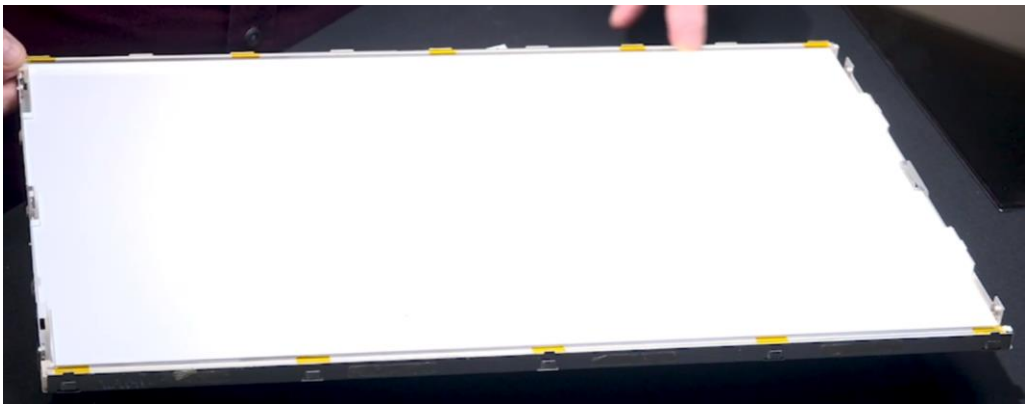
DLP (Digital Light Processing) - instead of having individual Pixels,
this is a grid of extremely tiny mirrors.
A light source is going through a color wheel that spins RGB colors.
The light turns on/off very quickly.
The light reflects out for your image. Very common for Projectors.

LCD Breakdown

- An LCD panel has a preset resolution
- The back panel (backlight unit) distributes the light emanating from the CCFL or LED backlights
- Inverters convert DC power back into AC power for fluorescent lights; LEDS don't need inverters

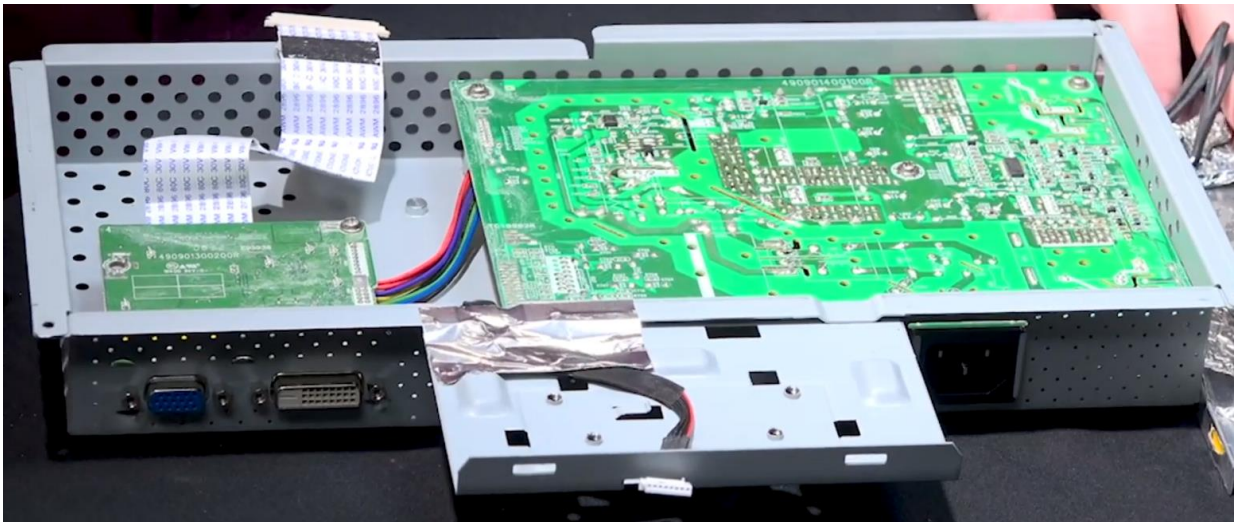


This is a LCD Panel, which was removed from the Monitor.
You shouldn't be able to see through the LCD when there's no power, but no LCD is perfect. This is the working part of any monitor.



In the "trenches" of the top and bottom
are these big, long fluorescent tubes, CCFL Tubes.

The White is a reflector.
We want the light to be as even as possible across the monitor, so we don't have dark & bright spots



AD-to-DC Power Supply - gives us the DC Power we need for our Monitor to run

Problem - CCFL's are fluorescent lights which need AC Power!
DC Power needs to be converted back to AC Power through Inverters
Only will need Inverters IF we have CCFL's

Inputs from Video Card with Logic Circuitry, & Primary Connection to the LCD Panel

LCD's -
Panel
Backlight Unit - if you have CCFL's, you'll have inverters
Connectors
Input from Data
Power Connection

Graphics Cards and Connections

- Nvidia, AMD (ATI), and Intel make the majority of GPUs
- All graphics cards have RAM to help resolve the screen
- Many CPUs come with built-in GPUs
- VGA uses an analog signal; DVI uses a digital signal

Graphics Card -

GPU (Graphics Processing Unit) - Smart Processor
which have their own memory (4 DDR2 RAM chips)
storing what's on the Monitor.
Sends a new image up a minimum of 60 times per sec

Frame Buffering (old) - to make an image appear on the screen,
you needed RAM that kept track of what's in every single pixel electronically,
then push it out onto the Monitor

We'll have a certain Type of GPU & Type of RAM

Nvidia -

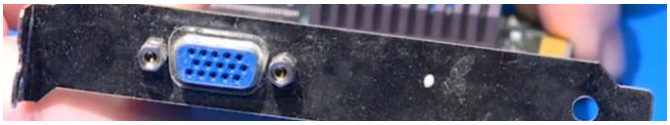
ATI/AMD -

Intel - sells a lot of GPU's which are designed to work on the Mobo

Integrated (Built-In) GPU - A lot of CPU's have built in GPU's,
so you'll see HDMI Connectors on the Mobo

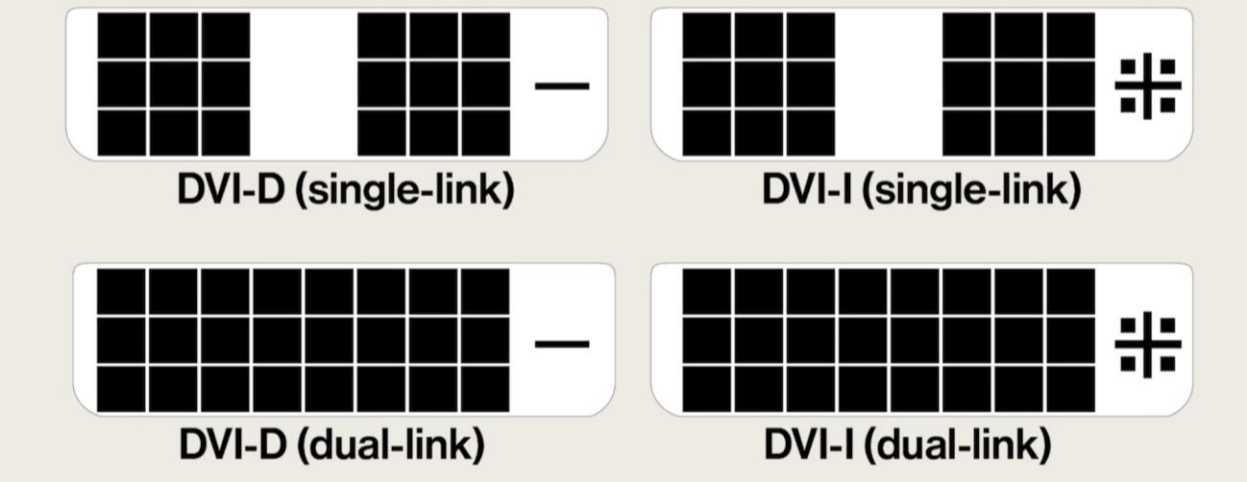
AMD - CPU with a built in GPU is called a APU
CPU + GPU = APU

Not uncommon to see 8GB of RAM on the board,
which resolves the screen, and the next screen getting it ready to go!



VGA (Video Graphics Array) - 15 Pins on 3 Rows (Blue)
Analog Signal
If you have a VGA LCD, which needs a Digital Signal,
it would come through VGA into the Monitor,
which then converts that signal into Digital
and update all the individual pixels.

DVI (Digital Visual Interface) - has 2 DVI connectors
That cross with 4 Pins is for Analog for VGA Monitors!
You would just need a DVI-to-VGA adapter
This is true for DVI-I (digital & analog) has the cross
DVI-D (digital only) - has NO cross, just a Minus Sign



DVI-D - Minus Sign DVI-I - Cross with 4 Pins

Single-Link DVI - have a distinct Space

Dual-Link DVI - 1 DVI Connector from the card can run 2 Monitors,
but now they handle High Resolution Monitors

DRM (Digital Rights Management) - People wanting to Protect their Movies/Music/etc

Regular HDMI Mini-HDMI (Tablets)

HDMI (High-Definition Multimedia Interface) - Video, Sound, and DRM
Can play sound from speakers that are attached to your Monitor!
Very popular for Home Theaters

DisplayPort - 3 shown above (1 HDMI 1 DVI-D (dual-link))
Competitor to HDMI

Regular DisplayPort
Mini-Display Port

The reason for all of these Video Connections on this Graphics Card is for,
Multi-Monitors, and flexibility for the type of Monitor you buy!

Resolutions & Aspect Ratios

- All monitors have a resolution and an aspect ratio
- Take time to memorize all the resolutions defined in this episode
- It helps to memorize the resolutions by organizing them by aspect ratios

1st Generations of Graphics Monitors used 4 x 3 Aspect Ratio
Basically mimics Television

VGA 640 x 480 - 1st exposure to Graphics Monitors
SVGA 800 x 600 - If there are issues with a Video Card,
Windows will downgrade you to this resolution so it can run
SXGA 1280 x 1024 - 5 x 4 Aspect Ratio
UXGA 1600 x 1200 - Highest 4 x 3 Aspect Resolution ever

16 x 10 Aspect Ratio - Very Popular for a while, because it tied into the Golden Ratio
which has an aesthetic that a lot of people like

WSXGA 1440 x 900 - lot of laptops used this
WUXGA 1920 x 1200 - very popular until HD-TV

HD-TV Resolutions -

720p - Progressive Scan

1280 x 720

2560 x 1440 - called QHD or WQHD (popular for Gamers)

1080p -

1920 x 1080 - most common Monitor Resolution today

4K Resolutions -

3840 x 2160 - That’s 4 HD-TV Resolutions on 1 Screen!

5K Resolutions -

5120 x 2880

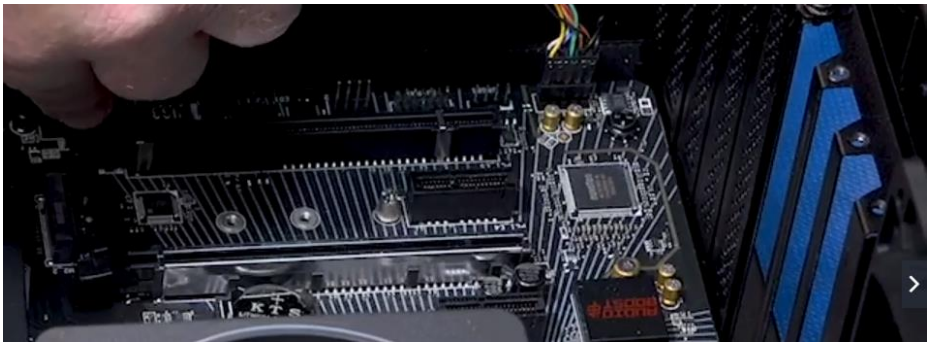
Installing a Graphics Card

- Almost all graphics cards use 16-lane PCIe slots and one or two PCIe power connectors

- With multiple graphics cards, define the primary card in system setup

- Some systems provide riser cards for extra graphics cards

- Always run the system at your monitor's native resolution



3 PCIe Connectors

Remove the Spacer

Drop in the Card

Screw down with 2 Screws! (not just 1)

Dual-8 Pin PCIePower

IGFX (Internal Graphics) -

More than 1 Graphics Card - More than 1 Monitor
or for Mining Bitcoin

Riser Card - Used to add Additional Graphics Cards
Plugs into Main Expansion Bus to give you another Slot

Device Manager - See if there are any errors. If none, you're set!

Make sure your Graphics Card matches your Native Resolution of your Monitor
All Monitors have a Fixed Resolution (such as a 4K Monitor)
Make sure your Graphics Card can push it that hard.

Settings → System → Display → Resolution
Use recommended - Native Resolution
Change Text Size (personal preference)

Update your Drivers - Windows Update does a pretty good job updating Video Drivers!
Or, just go to Manufacturer's website & download the latest Driver

Multiple Monitors

- Windows multi-monitor support is not dependent on a single graphics card or even the same resolution
- Make sure you recognize your primary (number 1) monitor, since it's your main display by default
- Second monitors can duplicate or extend the desktop

Projectors

- Projectors have resolutions and aspect ratios just like monitors
- Projectors usually have either DLP or LCD technology
- Lumens define the brightness of the projector
- Make sure you understand throw, pincushion, keystone, and skew

Projectors - basically just monitors
Graphics Connectors (HDMI; VGA), Plug them into Graphics Cards, and they Projecto on our screens

2 Main Technologies - DLP & LCD

Light Source - Big Light Bulb, or now seeing with LED's
Sold at certain amount of Brightness known a Lumens

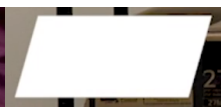
Pretty Dark Place - 1000-1200 Lumens
Lot of Light - 2500 or more Lumens

Throw - all projectors will have a min & max recommended Throw Distance
The farther out you project, the bigger the screen gets.
The closer you project, the smaller the screen gets.
Distance & Screen Size are directly proportional.

Geometric Shapes - Adjustment Menus will help resolve these issues


Pincushion


Keystone


Skew

Get a Projector that will have a Bulb that will last a Long Time
Mike says LED is the way to go

Keep in mind the Concept of Throw when buying the Projector

Troubleshooting Monitors

- The CompTIA exams cover many monitor troubleshooting situations
- This episode covers all the situations described on the exam
- Take time to memorize these situations and Mike's diagnoses

1) Video Card Overheat Shutdown -
High-End Video Cards require proper cooling
Video Cards come with cooling built in, and they monitor themselves

Might have Bad Fans on the Video Card
Video Card may be packed in too tight & not getting enough ventilation

2) Dead Pixels -
This just happens on LCD Monitors
Manufacturer's have a quality control leniency
where they allow a certain amount of dead pixels.

Dead Pixels towards the center of the screen (black or very bright),
go back to the manufacturers and return the monitor.
There's no fixing this issue.

3) Artifacts -
This is where pieces of stuff shows up on the screen
that look like they may have belonged there earlier
but they don't belong there anymore. (like, lag time)
Look at the Video RAM - this does go bad
There's no way to Test Video RAM
There's also no way to replace Video RAM (soldered on the board)

Get yourself a Replacement Video Card

4) Incorrect Color Patterns -

Everything is there looking normal, except for the colors are looking weird.

Check your Cable, especially if it's an old VGA Cable
Video RAM is bad

5) DIM Image

Common with CCFL's.

These Parts are Replaceable, but it does take work
Look at Brightness settings/menus

6) Flickering Image -

Typically a Cable issue

HDMI Cables aren't designed to be plugged in & out a lot

7) Distorted Image -

Could mean a couple of things

Make sure you're running at the Native Resolution of your Monitor

Happens with Projectors all the time

Adjust your Geometry

8) Burn In -

Barely happens anymore
Old Plasma Monitors might get Burn In

If you have a Fixed Image on a Screen for a while, you might get Burn In

With LCD's you can get a Burn In, but it's called Image Persistence

Get rid of this by putting different screens on there,
and it will go away on its own pretty quickly.

9) Oversized Images & Icons -

Usually the issue is an Undersize, not typically an Oversize

Resize your Text & Icons in Settings

Settings → System → Display → Change Text Size

Troubleshooting Display Technologies

- Projectors need regular cleaning and bulb replacements
- You may need to swap from incorrect data source to the correct one to get an output
- Always double check cabling when troubleshooting displays

Projectors….

Intermittent Projector Shutdown - due to overheating
Pop off the plastic case, and give it a good cleaning

Burned-out Bulb - replaceable bulbs
They have a certain amount of life-hours & can be expensive

Monitors….

Incorrect Data Source - can cause no image to appear on the display

Use the Display Settings by right clicking on the desktop
to modify any monitor settings such as….
- orientations (landscape or portrait)
- brightness & color (including Night light to reduce Blue Light)

Blue Tint could be caused by a Bent Pin in your VGA cable

Image/Display Burn-in - old monitor issue (CRT - Cathode Ray Tube Monitors)
Not an issue for LED, LCD, and OLED Monitors

Dead Pixel - physical defect, and the monitor needs to be returned or repaired

Incorrect Color Display or Dim Image - adjust in your display settings

Flashing Screen – due to Cable Misconfigurations, or Incompatibilities
such as using a Low-Speed HDMI cable
in a High-Speed HDMI environment