

A person is standing in a dark room, wearing a VR headset and holding a VR controller. The image is framed by a thick black border.

# MONITORS

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# WHAT IS A MONITOR?

- A MONITOR IS A PIECE OF COMPUTER HARDWARE THAT DISPLAYS THE VIDEO AND GRAPHICS INFORMATION GENERATED BY A CONNECTED COMPUTER THROUGH THE COMPUTER'S **VIDEO CARD**.
- MONITORS ARE SIMILAR TO TVs, BUT USUALLY DISPLAY INFORMATION AT A MUCH HIGHER RESOLUTION. ALSO, UNLIKE TELEVISIONS, MONITORS TYPICALLY SIT ATOP A DESK RATHER THAN BEING MOUNTED ON A WALL. A MONITOR IS SOMETIMES REFERRED TO AS A SCREEN, DISPLAY, VIDEO DISPLAY, VIDEO DISPLAY TERMINAL, VIDEO DISPLAY UNIT, OR VIDEO SCREEN.

# HOW DO COMPUTER MONITORS WORK?

- DO YOU EVER WONDER WHY YOUR PC MONITOR IS ABLE TO DISPLAY THE IMAGES AND VIDEOS THAT YOU SEE ON A DAILY BASIS?
- COMPUTER MONITORS USE COMPLICATED TECHNOLOGY TO DISPLAY CONTENT FROM YOUR COMPUTER. ONE COMES WITH A SCREEN, A POWER SUPPLY, AND A CASING THAT HOLDS THESE PARTS, BUT THESE ARE NOT THE MAIN FEATURES. THEY RELY UPON OTHER COMPONENTS, E.G. THE ELECTRONICS BOARD AND LCD PANEL, TO FUNCTION FULLY.

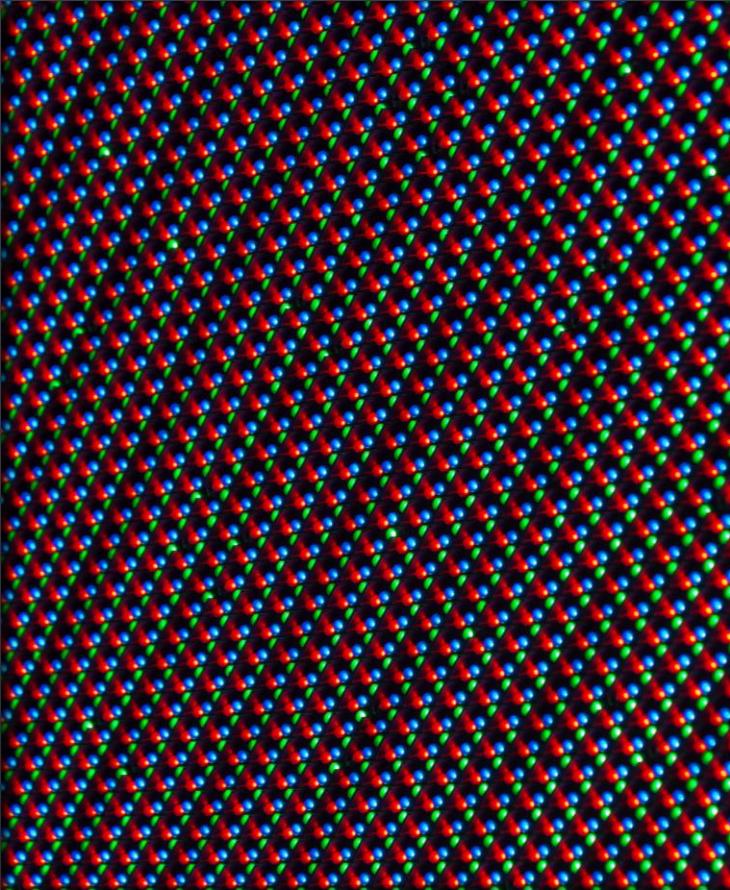
# PROS AND CONS OF LCD MONITORS

## Cons:

- The visual deflection angle is small; it is easy to cause an image tailing phenomenon (such as the rapid shaking of the mouse pointer).
- LCD "dead pixels" problem; life is limited; when the resolution is lower than the default resolution of the monitor, the picture will be blurred; when the resolution is greater than the default resolution of the monitor (mandatory setting by the software is required), the color of the details Will be lost.

## Pros:

- thin body and space saving. Compared with the more bulky CRT display, the liquid crystal display only needs one third of the space of the former.
- it saves electricity and does not produce high temperature. It is a low power consumption product, which can be achieved compared to CRT displays. No heat at all
- no radiation, which is good for health, and the liquid crystal display is completely free of radiation.



## WHAT IS LED MONITORS?

- LED DISPLAY IS A FLAT PANEL DISPLAY THAT USES AN ARRAY OF LIGHT-EMITTING DIODES AS PIXELS FOR A VIDEO DISPLAY.
- THE DIODES WORK TOGETHER TO CREATE AN IMAGE ON DISPLAY BY ADJUSTING THEIR BRIGHTNESS. THE CONCEPTS OF ADDITIVE COLOR MIXING, IN WHICH NEW COLORS ARE FORMED BY COMBINING LIGHT IN DIFFERENT COLORS, ARE UTILIZED TO CREATE BRILLIANT COLOR IMAGES.

# PROS AND CONS OF LED MONITORS

## Cons:

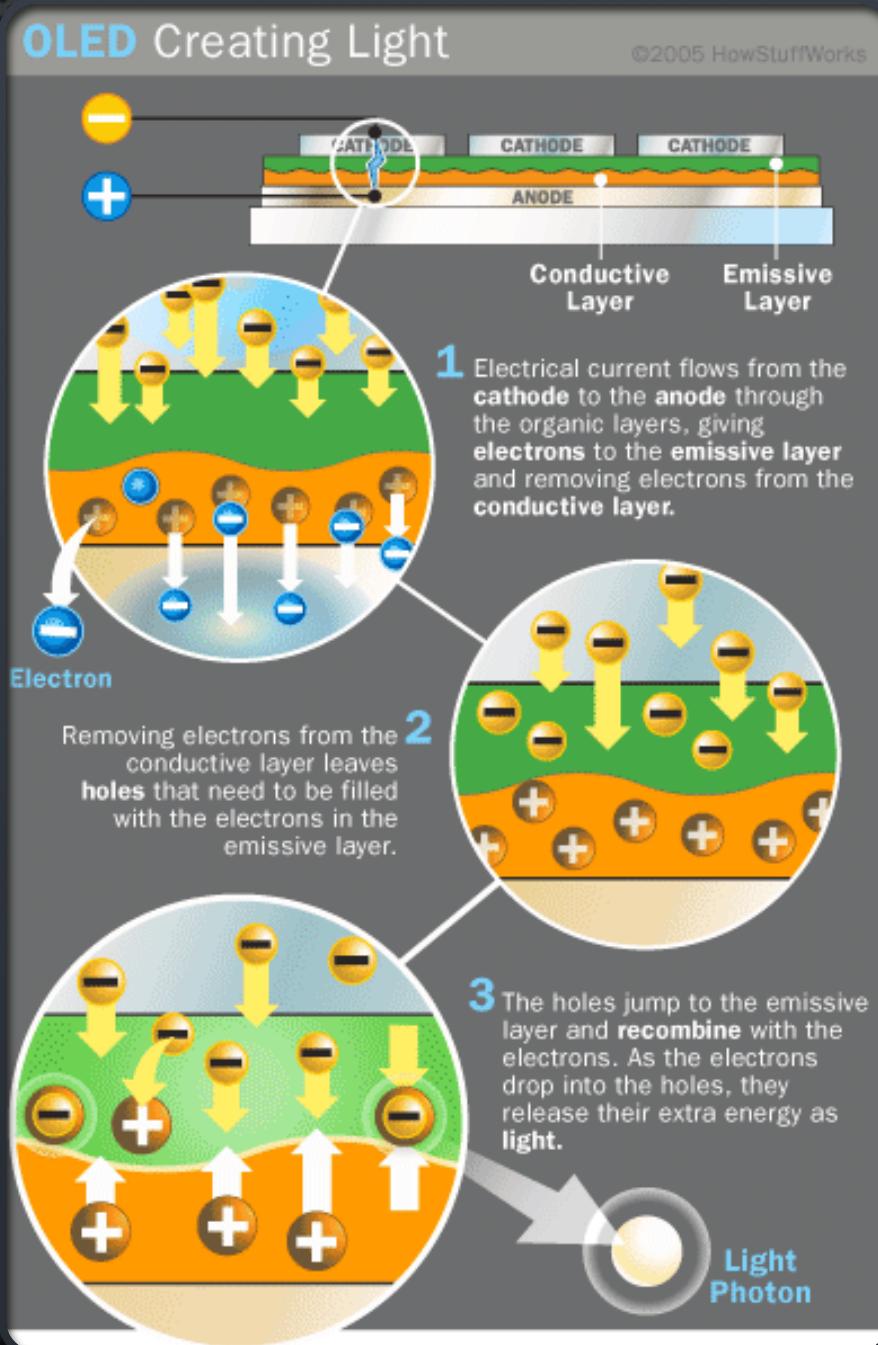
- LEDs are more expensive than conventional lighting technologies.
- LEDs can shift color due to age and temperature.
- LED is a lot thinner than the LCD or Plasma.
- Contrast ratios not consistent.
- Higher price.

## Pros:

- Brighter and sharper Images
- Better colors.
- Flicker-Free Images.
- True black picture.
- Wider viewing angle(typically 175 degree)

## OLED Creating Light

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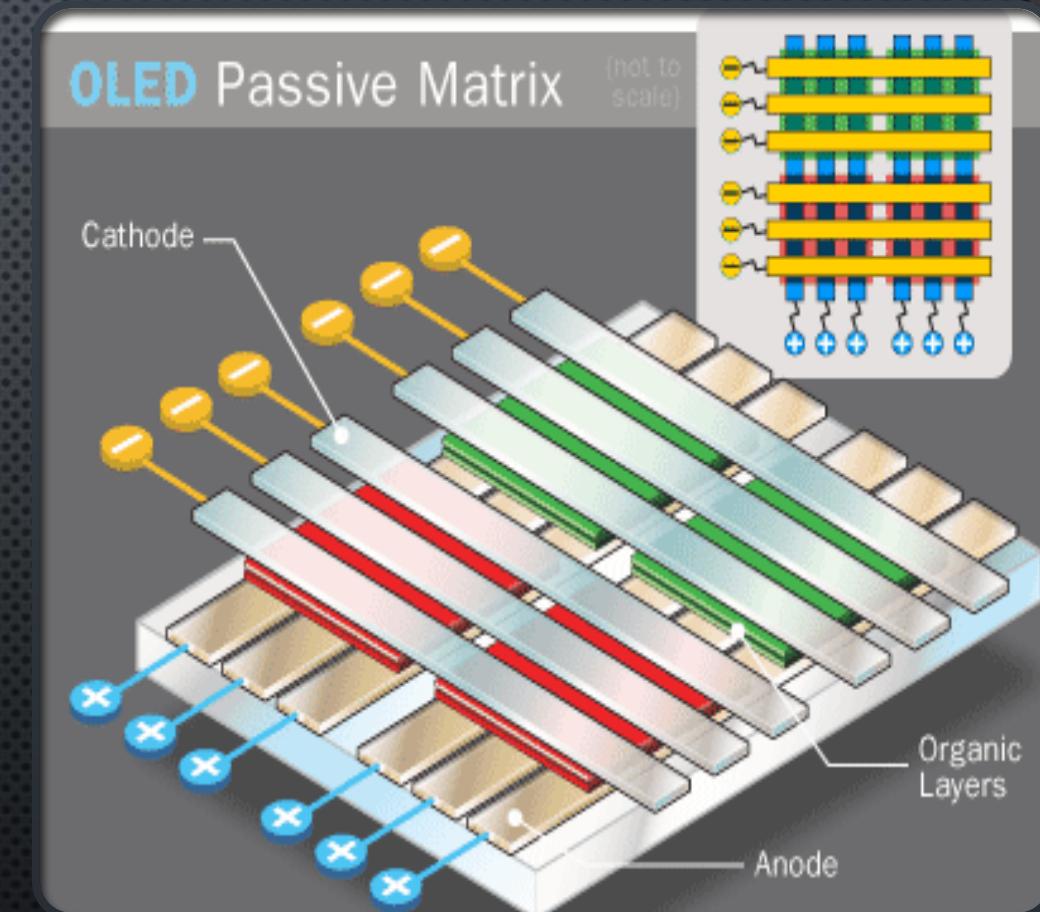


# WHAT IS OLED MONITOR?

- OLED MONITORS ARE FLAT COMPUTER DISPLAYS WHICH CONSIST OF PIXELS MADE FROM OLEDs (ORGANIC LIGHT EMITTING DIODES) RATHER THAN LIQUID CRYSTAL FILLED UNITS. UNLIKE LCD (LIQUID CRYSTAL DISPLAY) TECHNOLOGY, OLED DOES NOT REQUIRE BACKLIGHTING TO FUNCTION. THE PRINCIPLE OF THIS TECHNOLOGY IS THAT WHEN CURRENT FLOWS BETWEEN A CATHODE AND AN ANODE, AN EMISSIVE LAYER OF ORGANIC MOLECULES (E.G. POLYANILINE, GREEN IN DIAGRAM) SANDWICHED BETWEEN THESE ELECTRODES CAN BECOME ILLUMINATED (ELECTROLUMINESCENCE). FOR THIS TO HAPPEN EFFICIENTLY, A LAYER KNOWN AS THE CONDUCTIVE LAYER (ORANGE IN DIAGRAM), MADE UP OF ORGANIC PLASTIC MOLECULES SUCH AS POLYFLUORENE, LIES BETWEEN THE EMISSIVE LAYER AND THE ANODE. THE ANODE IS POSITIVELY CHARGED AND THEREFORE DRAWS ELECTRONS FROM THE CONDUCTIVE LAYER, LEAVING THE CONDUCTIVE LAYER WITH A POSITIVE CHARGE THAT DRAWS ELECTRONS FROM THE EMISSIVE LAYER. LIGHT IS EMITTED AS A BY-PRODUCT, IN A PROCESS KNOWN AS ELECTROPHOSPHORESCENCE. THE OLED PROCESS IS EXPLAINED IN THE DIAGRAM BELOW.

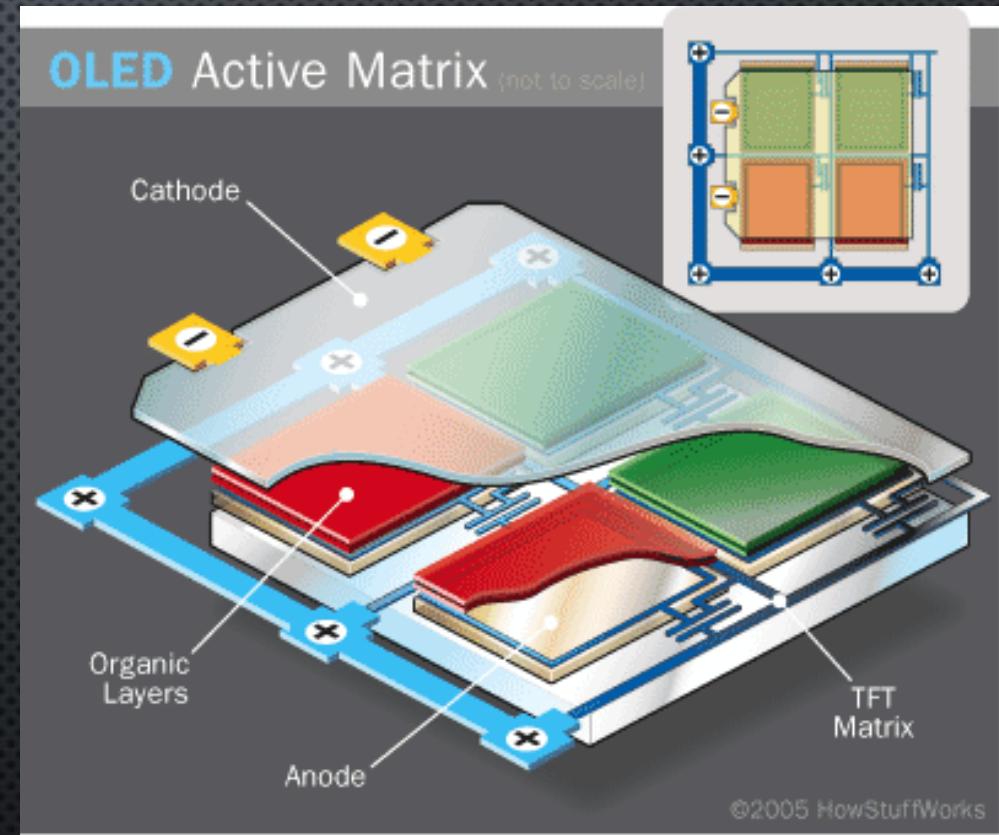
# TYPES OF OLED SCREEN:

- **PASSIVE-MATRIX:**
- PASSIVE-MATRIX OLED (PMOLED) SCREENS CONSIST OF CELLS WITH OPAQUE CATHODES AND TRANSPARENT ANODES LAID PERPENDICULAR TO ONE ANOTHER IN STRIPS. BETWEEN THESE STRIPS ARE THE ORGANIC LAYERS OF ALTERNATE COLOURED LIGHT-EMITTING DIODES AND CONDUCTIVE MOLECULES. ONCE POWER IS SWITCHED ON TO EXTERNAL CIRCUITRY (VOLTAGE IS APPLIED), CURRENT FLOWS THROUGH PARTICULAR CATHODE AND ANODE STRIPS, SO THAT LIGHT OF SELECTED COLOURS AND BRIGHTNESS ARE EMITTED THROUGH THE ELECTRODE INTERSECTIONS ACCORDING TO THE MOLECULES ILLUMINATED AND CURRENT APPLIED (RESPECTIVELY). THE PMOLED PROCESS IS SHOWN DIAGRAMMATICALLY BELOW, WITH ONLY TWO PIXEL COLOURS SHOWN FOR SIMPLICITY:



- **ACTIVE-MATRIX** OLED (AMOLED) SCREENS ARE CURRENTLY RECEIVING MASSIVE RESEARCH AND DEVELOPMENT FUNDS FROM THE LIKES OF SAMSUNG, LG AND SONY FOR INCORPORATION INTO HDTVs AND PC MONITORS. AMOLED CELLS CONTAIN ORGANIC MOLECULE LAYERS AND ANODES ARRANGED IN SMALL SHEETS (PIXELS), SANDWICHED BETWEEN A LARGER CATHODE SHEET AND INTEGRATED INTO A TFT (THIN FILM TRANSISTOR) MATRIX. THE TFT MATRIX NOT ONLY ACTS AS THE SUPPORTING SUBSTRATE; IT ALSO CONTROLS WHICH PIXELS BECOME ACTIVATED BY SWITCHING ON OR OFF CURRENT FLOW TO THE APPROPRIATE PIXELS AND HENCE DRIVES THEM IN A SIMILAR MANNER TO TFT LCD MONITORS. THE TYPICAL LAYOUT OF SUCH A CELL IS SHOWN BELOW, AGAIN WITH ONLY TWO PIXEL COLOURS FOR DIAGRAMMATIC PURPOSES. NOTE THAT THE CELL FEATURED IN THE DIAGRAM IS BOTTOM-EMITTING (I.E. HAS A TRANSPARENT TFT BACKPLANE THAT LIGHT PASSES THROUGH). AMOLED CELLS MAY ALSO BE TOP-EMITTING, MEANING THAT LIGHT PASSES THROUGH A TRANSPARENT CATHODE RATHER THAN THE SUBSTRATE (TFT BACKPLANE), WHICH IS REFLECTIVE OR TRANSPARENT.

## ACTIVE-MATRIX:



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# PROS AND CONS OF OLED MONITORS

## Pros:

- Superior viewing angle.
- High brightness and contrast
- Fast response time
- Small size form factors
- Well suited for battery driven applications

## Cons:

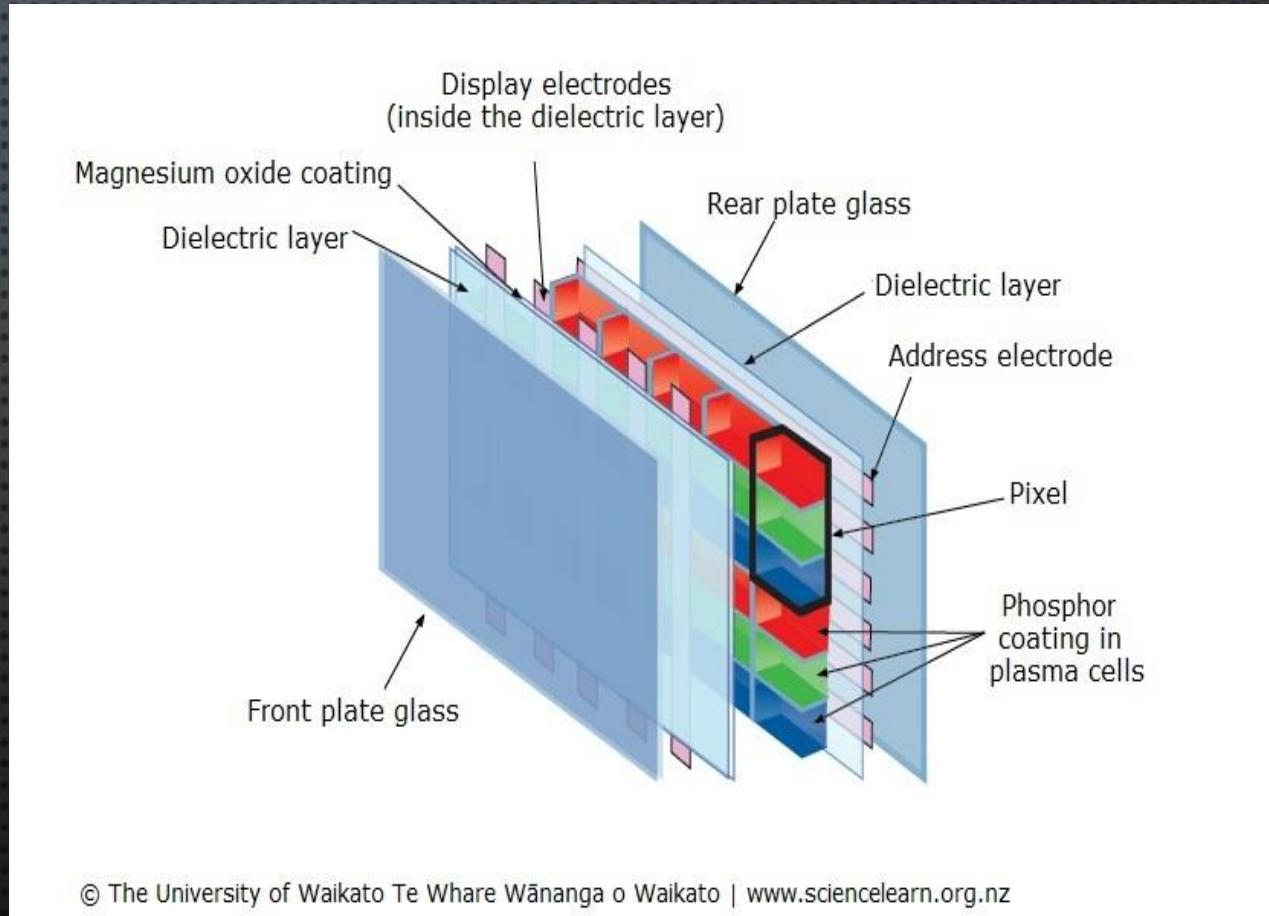
- Shorter lifetime than some other display technologies. This shorter lifetime is mainly due to the blue organic material but lifetime gets better all the time but is also due to moisture migration.
- Poor sunlight readability.
- The current production processes make it difficult and costly to produce large displays so most are limited to handheld devices, but like the lifetime issue this eventually will be improved.

## WHAT IS PLASMA MONITOR?

- A PLASMA DISPLAY IS A TYPE OF FLAT PANEL DISPLAY THAT USES PLASMA, AN ELECTRICALLY CHARGED IONIZED GAS, TO ILLUMINATE EACH PIXEL IN ORDER TO PRODUCE A DISPLAY OUTPUT. IT IS COMMONLY USED IN LARGE TV DISPLAYS OF 30 INCHES AND HIGHER. PLASMA DISPLAYS ARE OFTEN BRIGHTER THAN LCD DISPLAYS AND ALSO HAVE A WIDER COLOR GAMUT, WITH BLACK LEVELS ALMOST EQUALING “DARK ROOM” LEVELS.

## ALSO:

- A PLASMA DISPLAY PANEL CONSISTS OF MILLIONS OF TINY COMPARTMENTS SANDWICHED BETWEEN TWO PANELS OF GLASS. EACH COMPARTMENT OR CELL IS ARRANGED IN GROUPS OF THREE, WHICH ARE COATED IN PHOSPHORS COLORED RED, GREEN AND BLUE. ELECTRODES CRISS-CROSS ALONG THE CELLS' FRONT AND BACK, AND WHEN A CELL NEEDS TO BE ACTIVATED, THE ELECTRODES ARE CHARGED; THE VOLTAGE DIFFERENCE BETWEEN THE FRONT AND THE BACK IONIZES THE GAS IN THE CELL, RESULTING IN A LOSS OF ELECTRONS AND CREATING AN ELECTRICALLY CONDUCTING PLASMA OF ATOMS, IONS AND FREE ELECTRONS.



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# PROS AND CONS OF PLASMA DISPLAY

## Pros:

- Less bulky than rear projection television.
- Virtually less motion blur, so better motion tracking like high refresh rates and faster response time.
- Superior contrast ratio so that capable of producing deeper blacks.
- Excellent brightness.
- High resolution.

## Cons:

- Commonly do not come in smaller sizes than 40 inches.
- A picture is not so clear under bright conditions.
- Glass screen damage can be permanent and far more difficult to repair.
- Use more electricity so energy consumption is higher.
- Suffer from luminosity degradation that results in a gradual decline in their absolute brightness level.

# SHORT HISTORY OF COMPUTER MONITORS

- COMPUTER MONITORS HAVE COME A LONG WAY SINCE THEIR INVENTION IN THE MID-20TH CENTURY. THE FIRST COMPUTER MONITORS WERE LARGE, BULKY DEVICES THAT USED CATHODE RAY TUBES (CRTs) TO DISPLAY INFORMATION. THESE EARLY MONITORS WERE MONOCHROME, MEANING THEY COULD ONLY DISPLAY ONE COLOR AT A TIME. THEY WERE ALSO VERY EXPENSIVE AND OFTEN REQUIRED SIGNIFICANT DESK SPACE.
- IN THE 1980S, COLOR CRT MONITORS BECAME MORE COMMON, ALLOWING FOR MORE VISUALLY APPEALING DISPLAYS. THE FIRST FLAT-SCREEN MONITORS WERE ALSO INTRODUCED IN THIS DECADE, BUT THEY WERE VERY EXPENSIVE AND NOT YET WIDELY AVAILABLE. AS COMPUTER TECHNOLOGY ADVANCED, SO DID MONITOR TECHNOLOGY. IN THE 1990S, FLAT-PANEL LCD MONITORS BEGAN TO REPLACE CRT MONITORS IN SOME APPLICATIONS.

## WHAT ABOUT TODAY?

- TODAY, COMPUTER MONITORS ARE SLEEK, LIGHTWEIGHT, AND CAPABLE OF DISPLAYING HIGH-DEFINITION IMAGES AND VIDEO. THEY COME IN A VARIETY OF SIZES AND RESOLUTIONS, WITH MANY FEATURING ADVANCED FEATURES LIKE TOUCHSCREENS AND CURVED DISPLAYS.
- OVER THE PAST FEW DECADES, ADVANCEMENTS IN MONITOR TECHNOLOGY HAVE REVOLUTIONIZED THE WAY WE USE COMPUTERS. ONE OF THE MOST SIGNIFICANT ADVANCEMENTS HAS BEEN THE DEVELOPMENT OF FLAT-PANEL DISPLAYS. LCD AND LED DISPLAYS ARE NOW THE MOST COMMON TYPES OF COMPUTER MONITORS, OFFERING HIGH RESOLUTION, LOW POWER CONSUMPTION, AND A SLIM FORM FACTOR.

# LIST OF REFERENCES

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**THANKS FOR YOUR ATTENTION!**