



RQF LEVEL 4



CSALS401

**COMPUTER SYSTEM
AND ARCHITECTURE**

**LED and LCD
Screen Setup**

TRAINEE'S MANUAL

October, 2024



LED AND LCD SCREEN SETUP



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ACRONYMS

AC: Alternating Current
CAT6: Category 6 Cable
CMS: Content Management System
CPU: Central Processing Unit
DC: Direct Current
EEPROM: Electrically Erasable Programmable Read-Only Memory
HDMI: High-Definition Multimedia Interface
HDR: High Dynamic Range
I²C: Inter-Integrated Circuit
IoT: Internet of Things
KOICA: Korean International Corporation Agency
LCD: Liquid Crystal Display
LCD: Liquid Crystal Display.
LED: Light Emitting Diode
LED: Light Emitting Diode
LVDS: Low Voltage Differential Signaling
NFC: Near Field Communication
NFC: Near Field Communication
OLED: Organic Light Emitting Diode
PC: Personal Computer
PoE: Power over Ethernet
QLED: Quantum Dot Light Emitting Diode
RAM: Random Access Memory
RGB: Red-Green-Blue
RJ45: Registered Jack 45
RTB: Rwanda TVET Board
SPI: Serial Peripheral Interface
T-Con: Timing Controller
TQUM Project: TVET Quality Management Project
UPS: Uninterruptible Power Supply
USB: Universal Serial Bus
VGA: Video Graphics Array
Wi-Fi: Wireless Fidelity

INTRODUCTION

This trainee's manual includes all the knowledge and skills required in Computer System and Architecture specifically for the module of "**LED and LCD Screen Set Up**". Trainees enrolled in this module will engage in practical activities designed to develop and enhance their competencies. The development of this training manual followed the Competency-Based Training and Assessment (CBT/A) approach, offering ample practical opportunities that mirror real-life situations.

The trainee's manual is organized into Learning Outcomes, which is broken down into indicative content that includes both theoretical and practical activities. It provides detailed information on the key competencies required for each learning outcome, along with the objectives to be achieved.

As a trainee, you will start by addressing questions related to the activities, which are designed to foster critical thinking and guide you towards practical applications in the labor market. The manual also provides essential information, including learning hours, required materials, and key tasks to complete throughout the learning process.

All activities included in this training manual are designed to facilitate both individual and group work. After completing the activities, you will conduct a formative assessment, referred to as the end learning outcome assessment. Ensure that you thoroughly review the key readings and the 'Points to Remember' section.

MODULE CODE AND TITLE: CSALS401 LED AND LCD SCREEN SETUP

Learning Outcome 1: Assembling the LED/LCD Panels.

Learning Outcome 2: Configuring LED/LCD Display Settings.

Learning Outcome 3: Troubleshooting LED/LCD Screen Setup.

Learning Outcome 1: Assembling the LED/LCD panels.



Indicative contents

1.1 Identification of LED And LCD Screen Components

1.2 Handling Screen Components

1.3 Assembling of LED/LCD Screen

Key Competencies for Learning Outcome 1: Assembling the LED/LCD Panels.

Knowledge	Skills	Attitudes
<ul style="list-style-type: none"> ● Description of LED and LCD Screen. ● Description of Display technologies ● Description of LED/LCD Screens Components. ● Description of mounting techniques. ● Description of assembling techniques and Interfacing technologies 	<ul style="list-style-type: none"> ● Preparing the installation sites. ● Mounting LED/LCD Screen ● Assembling a LED/LCD screen. ● Tagging and Testing Connectivity. 	<ul style="list-style-type: none"> ● Having Precision ● Being Attentive ● Having self-confident ● Having accountability ● Respecting time ● Being patient ● Having self-motivation ● Being organized



Duration: 25 hrs

Learning outcome 1 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Describe correctly LED and LCD Screen according to manufacturer's guide.
2. Describe clearly Display technologies based on manufacturer's guide.
3. Describe clearly LED/LCD Screens Components based on their functionalities.
4. Prepare effectively the installation sites based on visual parameters.
5. Describe correctly mounting techniques according to visual parameters.
6. Mount appropriately LED/LCD Screen according to visual parameters.

7. Describe correctly assembling LED/LCD based on manufacture's guide.
8. Assemble properly LED/LCD screen according to manufacturer's guide.
9. Tag and Test perfectly connectivity according to the intended uses.



Resources

Equipment	Tools	Materials
<ul style="list-style-type: none"> ● LED panel ● LCD panel ● LCD Controller ● UPS ● Laptop Computer ● Surge Protector ● Drilling machine 	<ul style="list-style-type: none"> ● Tape Measure ● Crimping Tool ● Wire Stripper ● Hammer ● Pliers ● Screwdrivers ● Ladder ● Scaffold ● ESD Tools 	<ul style="list-style-type: none"> ● Power Cables ● CAT6 ● Cable Ties ● Insulator ● RJ45 ● Mounting Brackets ● Drill Bits ● Data cables ● Screws



Indicative content 1.1: Identification of LED and LCD Screen Components.



Duration: 5 hrs



Theoretical Activity 1.1.1: Description of LED and LCD Screen.



Tasks:

- 1: You are required to answer the following questions:
 - i. What do you understand by the following terms?
 - a) LED.
 - b) LCD
 - ii. What are the benefits of LED and LCD?
 - iii. Differentiate LED and LCD.
 - iv. What are the applications of LED and LCD?
 - v. Identify the features of LED and LCD.
- 2: Write findings/answers on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 1.1.1.
- 5: In addition, ask questions where necessary.



Key readings 1.1.1: Description of LED and LCD Screen.

1. Definition of LED and LCD

Light Emitting Diode (LED) is a type of LCD that actually accompanies the advancement of technology

Liquid Crystal Display (LCD) is a passive device, which means that it does not deliver any light to display characters, animations, videos, etc.

LCD uses fluorescent tubes to lighten the picture, but can't provide a clearer picture as LED delivers.



2. Benefits of LED and LCD

+ Benefits of LED

- ✓ **Energy Efficiency:**
 - LED displays consume less power compared to traditional LCDs, especially in large screens. This leads to lower electricity bills and reduced environmental impact.
- ✓ **Brightness and Color Accuracy:**
 - LEDs produce bright images and vibrant colors. They have a higher contrast ratio than traditional LCDs, enhancing the overall picture quality.
- ✓ **Longevity:**
 - LED lights typically have a longer lifespan than other lighting technologies, meaning they can last tens of thousands of hours before needing replacement.
- ✓ **Thin and Lightweight:**
 - LED displays can be made very thin and lightweight, allowing for sleeker designs in modern televisions and monitors.
- ✓ **Fast Response Time:**
 - LEDs have a faster response time, which can improve motion clarity in fast-paced scenes, making them ideal for gaming and sports viewing.
- ✓ **Less Heat Generation:**
 - LED technology produces less heat than traditional bulbs, reducing the need for additional cooling and making devices safer to use.

+ Benefits of LCD

- ✓ **Cost-Effectiveness:**
 - LCD technology is generally cheaper to produce than LED, making LCD screens more affordable for consumers.

- ✓ **Wide Availability:**
 - LCDs have been around longer than LEDs, so they are widely available in various sizes and resolutions, catering to a broad range of consumer needs.
- ✓ **Good Color Reproduction:**
 - While not as vibrant as LEDs, LCDs still offer decent color reproduction, making them suitable for most general uses.
- ✓ **No Burn-In Issues:**
 - LCD screens do not suffer from burn-in problems like some OLED displays, making them ideal for displaying static images for extended periods.
- ✓ **Versatility:**
 - LCD technology can be used in various applications, including monitors, televisions, tablets, and smartphones, making it a versatile choice for manufacturers.
- ✓ **Less Power in Certain Applications:**
 - In specific uses, especially when displaying less bright content, LCDs can consume less power compared to LED backlighting.

3. Differences between LED and LCD.

LED and LCD screens are both popular display technologies, but they differ in several key ways. Here's a breakdown of their differences:

➤ Backlighting Technology

- **LCD (Liquid Crystal Display):**

- LCD screens use cold cathode fluorescent lamps (CCFLs) for backlighting. These lamps illuminate the liquid crystals in the display to produce images.

- **LED (Light Emitting Diode):**

- LED screens are a type of LCD display that uses light-emitting diodes (LEDs) as the backlight source instead of CCFLs. So, technically, LED displays are an improved version of LCDs that use more energy-efficient and brighter LED backlights.

➤ Brightness

- **LCD:** Typically less bright than LED screens because of the CCFL backlighting, which provides more uniform but less intense illumination.
- **LED:** Brighter than traditional LCDs, making them better suited for environments with strong ambient light or for outdoor use. LED backlighting can be adjusted for more intense brightness and contrast.

➤ **Energy Efficiency**

- **LCD:** Consumes more energy compared to LED screens because CCFLs are less efficient.
- **LED:** More energy-efficient due to the use of LEDs, which consume less power and generate less heat compared to CCFLs.

➤ **Thickness**

- **LCD:** Tends to be thicker because CCFL backlighting requires more space behind the screen.
- **LED:** Generally thinner and lighter, as LED backlighting is more compact and flexible, allowing for sleeker designs.

➤ **Color Accuracy and Contrast**

- **LCD:** Offers good color accuracy, but the contrast is lower since CCFLs provide less precise control over black levels. This can make the blacks appear more like dark grays.
- **LED:** LED screens provide better color accuracy and higher contrast ratios, especially with technologies like "local dimming," where specific areas of the screen can be dimmed for deeper blacks and better contrast.

➤ **Lifespan**

- **LCD:** CCFLs used in traditional LCDs have a shorter lifespan compared to LEDs, and they may degrade faster over time.
- **LED:** LED backlighting has a longer lifespan and maintains brightness levels better over time.

➤ **Price**

- **LCD:** Generally less expensive than LED displays, though the price difference has reduced as LED technology becomes more common.
- **LED:** Typically more expensive than traditional LCD screens, especially for higher-end models that offer features like local dimming or edge-lighting.

➤ **Environmental Impact**

- **LCD:** CCFLs contain mercury, which is harmful to the environment and makes disposal more challenging.
- **LED:** LEDs are mercury-free, making them more environmentally friendly and easier to recycle.

➤ **Picture Quality**

- **LCD:** While LCD screens offer good picture quality, they may suffer from issues like lower contrast ratios, especially in dim lighting.
- **LED:** LED screens generally provide better picture quality, with sharper images, better brightness,

and more vivid colors due to the improved backlighting technology.

4. Application of LED and LCD

LCDs have a wide range of applications.

They are commonly used in :

- televisions,
- computer monitors
- laptops
- tablets
- smartphones
- digital cameras
- portable gaming devices
- car displays

while LED screens are widely used in various settings including:

- retail stores
- stadiums
- airports
- corporate events.

5. Features of LED and LCD

Features LCDs are:

- thinner
- lighter,
- more energy efficient
- Long Lifespan and flexible in Size
- Shapes

while LED monitors consists of

- Red, green and blue colors

they have to be mounted in a fixed pattern and have a high dynamic contrast ratio and produce clear images with exceptional color quality.



Theoretical Activity 1.1.2: Description of display technologies



Tasks:

- 1: You are requested to answer the following questions
 - i. What do you understand by display technologies?
 - ii. Explain key display technologies

- 2: Write findings/answers on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 1.1.2.
- 5: In addition, ask questions where necessary.



Key readings 1.1.2: Description of display technologies

Definition of Display technologies

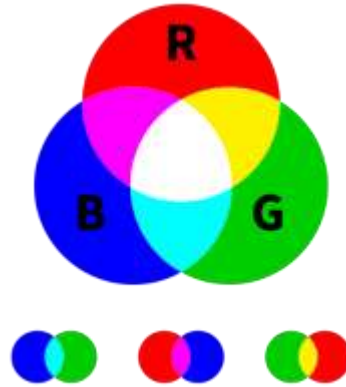
Display technologies are an integral part of our modern world, playing a pivotal role in presenting visual information across various devices. These technologies encompass a wide range of screens, monitors, and digital display systems that enable us to interact with and consume digital content seamlessly. Let's delve into the world of display technologies and explore their key features and characteristics. There are several display technologies for both LED and LCD which are the following:

1. LED display technologies:

- **Edge-Lit LED (ELED):** Lights placed at the periphery of the display pointing towards the center of the display, means that the light from the LED strips at the edges of the device shines into a light guide, this light guide then directs the light into a diffuser, the diffuser finally spreads the light evenly and uniformly across the screen to produce a desired image with no bright spots.
- **Direct-Lit LED:** is an upgrade of the ELED technology and the LED lighting located directly in back of the LCD panel to illuminate the screen.
- **Full-Array:** It is like direct-lit however, the difference for this is that more LEDs are used compared to the direct-lit technology, and these LEDs cover the entire back of the display, providing better brightness and color contrast.
- **RGB:** Stands for Red-Green-Blue, and this type of LED is often used to produce aesthetic and colorful illuminations. If you are into gaming or decorations, you have probably seen an RGB LED.
- **Organic LED (OLED):** This take a different path from the previous technologies such that with OLEDs, the display itself produces its light when current passes through; therefore, there is no requirement for backlighting. Due to the absence of a backlight, OLEDs tend to be thinner than the first three types displayed and highlighted in this section. Not only that, but OLEDs have an infinite contrast ratio and this is because the brightness of each pixel can be controlled independently. Besides that OLEDs are known to be more color accurate, and

have a faster response time with an unlimited viewing angle than their predecessors.

- **Quantum Dot LED (QLED):** Quantum dots enhance the display by emitting more color. In this the backlight shines through the regular pixel layer, and then a layer of quantum dots, which emits more color than a regular LED set.



- **Mini-LED:** The idea of a mini-LED is built off that of a QLED. Essentially, it features the same technology as a QLED, with the only difference being that the LEDs on the backlight are much smaller and numerous; hence the name. Due to the numerous LEDs, it can be further sectioned into more zones providing more control of the black levels and more contrast compared to a QLED.
- **Micro-LED:** Is an upgrade of the OLED. Unlike OLED which uses organic materials to produce its light, micro-LEDs use inorganic materials such as Gallium Nitride to produce its light. Due to the use of inorganic materials, this type of display tends to produce brighter images.

2. LCD display technologies:

- **TN (Twisted Nematic) LCD:** It contains two polarized filters, and nematic liquid crystal elements that are inside two glass substrates. When nature's light goes through the front polarizer to meet with the nematic liquid crystal cells, it twists 90-degree, and passes through the rear glass to arrive at the rear polarizer. In this way, it controls the TN LCD panel on and off, and lets us see the light. As one of the oldest LCD display technologies, it has lower cost, and faster response time, but suffers from limited viewing angle, so it is mostly used in the low-end market, such as LCD panel terminals.
- **STN (Super Twisted Nematic) LCD:** is characterized by the use of passive-matrix monochrome pixels. It differs from TN LCDs only in the twisted composition as it uses a 180-to-190-degree twisted composition for its pixel. STN LCDs produce

sharper contrast, and require less power, but they are more expensive and have slower response speed than TN LCDs. They are typically used in inexpensive mobile phones and digital information display screens.

- **TFT (Thin Film Transistor) LCD:** is one of active matrix LCD that uses thin-film transistor technology to create images and improve image quality. The liquid crystal molecules are filled between two parallel glasses. Two polarizer filters, color filters (RGB, red/green/blue), and two alignment layers decide the amount of light that is allowed to pass and which colors are created. TFT LCDs have excellent performance with minimal energy consumption, faster and more accurate response time, and sharp visibility. Thanks to TFT technology, it makes more display devices possible like televisions, laptop monitors, CDs, DVDs, etc., and also makes the world more colorful.
- **IPS (super fine TFT) LCD:** is a variant of TFT LCDs that have liquid crystals to switch in and out of a plane, which leads it to reign supreme in regards to the great color performance and ultra-wide viewing angles. Whereby, IPS LCD panels become the preferred choice of those who value image quality and super-wide viewing angles, such as professional applications dealing with graphics, monitors for gaming, high-level business use, etc.

The two most popular display technologies are LED (Light Emitting Diode) and OLED (Organic Light Emitting Diode). LED displays are widely used in various devices due to their energy efficiency, while OLED displays offer superior colour reproduction and contrast, making them popular in high-end consumer electronics.



Theoretical Activity 1.1.3: Description of LED/LCD Screens Components.



Tasks:

- 1: You are requested to answer the following questions
 - i. Explain the following LED/LCD screen components.
 - a. Display Panel
 - b. Video Input Interfaces
 - c. Data Cables
 - d. Power Cables
 - e. Backlighting System
 - f. Power supply
 - g. Filters
 - h. Controller and Driver Circuits

- 2: Write findings/answers on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 1.1.3.
- 5: In addition, ask questions where necessary.



Key readings 1.1.3: Description LED/LCD Screens Components.

Commonly components of LED and LCD screens:

a. Display Panel:

LED Screens: LED screens have an array of individual light-emitting diodes (LEDs) that make up the display panel. Each LED acts as a pixel, and they are arranged in a grid.

LCD Screens: LCD screens have liquid crystal panels that control the passage of light. The liquid crystals are sandwiched between two layers of glass or plastic and are divided into pixels.

b. Video Input Interfaces

Both LED and LCD screens typically have various video input interfaces to connect to external devices. Common interfaces include HDMI, DisplayPort, VGA, DVI, and more, depending on the screen's purpose and compatibility.

c. Data Cables

Cables are inside and outside the cabinets. Data cables connect modules and receiving card. RJ45 Internet cables connect control card and receiving cards. Data cables, there are others such as HDMI cables or DisplayPort cables, which are used to transmit video signals from the source device (e.g., computer, Blu-ray player) to the screen. These cables carry the digital or analog video data.

d. Power Cables:

Power cables connect modules and power suppliers.

Each cabinets has data and power connectors for input and output, they connect the screen to a power source, allowing it to operate.

e. Backlighting System

LED screens: Often include a backlighting system, which provides the necessary illumination for the display to function. LEDs are commonly used as the light source for this purpose.

LCD screens: Also require backlighting, which can be in the form of a Cold Cathode Fluorescent Lamp (CCFL) or LEDs, depending on the type of LCD.

f. Power supply

Transfer AC to DC and supply stable output power and is supplied to the countries based on AC voltage in that country.

g. Filters

Filters, such as polarizing filters, color filters, and anti-glare coatings, are used to enhance the display's quality by controlling the passage of light, improving color accuracy, and reducing reflections and glare.

h. Controller and Driver Circuits

These circuits are responsible for processing the video input signals, controlling the display panel (for example, addressing individual LEDs or liquid crystal pixels), and ensuring that the image is displayed correctly on the screen.

In LED screens: Driver circuits control the brightness and color of each LED.

In LCD screens: The controller circuits manage the voltage applied to the liquid crystals, controlling their orientation to produce the desired image.



Points to Remember

Description of LED and LCD

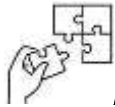
- **Definition:** Light Emitting Diode (LED) is a type of LCD that actually accompanies the advancement of technology while Liquid Crystal Display (LCD) is a passive device, which means that it does not deliver any light to display characters, animations, videos, etc.
- ✚ **Benefits:** In most cases, an LED monitor holds the advantage due to its longer lifespan, better picture quality, thinner design, fast response time and more environmentally friendly construction. These qualities offset the higher initial price point that might have you considering an LCD option.
- ✚ **Application:**
LCDs have a wide range of applications. They are commonly used in: televisions, computer monitors, laptops, tablets, smartphones, digital cameras, portable gaming devices, displays
While LED screens are widely used in: various settings, including retail stores, stadiums, airports, Corporate events.
- ✚ **Features:**
 - ✓ **LCDs are:** Thinner, lighter, more energy efficient, Long Lifespan, flexible in Sizes and Shapes,
 - ✓ **While LED** monitors consists of Red, green blue colors they have to be mounted in a fixed pattern and have a high dynamic contrast ratio and produce clear images with exceptional color quality.

The common components of LED and LCD screens are the followings:

Display Panel, Video Input Interfaces, Data Cables, Power Cables, Backlighting System
Power supply, Filters, Controller and Driver Circuits.

There are several display technologies for both LED and LCD which are the following:

- ✚ **Display technologies** are an integral part of our modern world, playing a pivotal role in presenting visual information across various devices.
- ✚ **LED display technologies:** Edge-Lit LED (ELED), Direct-Lit LED, Full-Array, RGB, Organic LED (OLED), Quantum Dot LED (QLED), Mini-LED, Micro-LED:
- ✚ **LCD display technologies:** TN (Twisted Nematic) LCD, STN (Super Twisted Nematic) LCD, TFT (Thin Film Transistor) LCD, IPS (super fine TFT) LCD.



Application of learning 1.1

XYZ TSS hired you and the school manager wants to buy screen for the student's stadium. The school does not have more information about the benefits, features, display technologies and components of LED and LCD screens. As IT technician, you are required to advise and help the school manager to get information needed about the above-identified points.



Indicative content 1.2: Handling Screen Components.



Duration: 10 hrs



Practical Activity 1.2.1: Preparing installation site.



Task:

- 1: As technician, you are required to go to workplace to prepare installation site.
- 2: Read the key readings 1.2.1
- 3: Ask clarifications and supports where necessary.
- 4: Present your work to the trainer and whole class



Key readings 1.2.1: Preparing installation site.

Preparing an installation site for electronic equipment, such as LED or LCD screens, involves several important considerations to ensure safety, functionality, and longevity. Here's a step-by-step guide covering safety precautions, location selection, weather protection, cable management, and electrical requirements:

Step 1. Consider Safety Precautions:

Before talking on safety precaution we can't start without talking on Personal Protective Equipment (PPE) which is specialized on clothing or equipment worn by an employee for protection against infectious materials.



Step 2. Select Location.

Visibility and Viewing Angle: Choose a location that provides an unobstructed and comfortable viewing angle for the intended audience. Consider the arrangement of seating or standing positions.

Distance from Viewers: Calculate and optimize the distance between the screens and viewers based on screen size, resolution, and content type.

Lighting Conditions: Minimize glare by avoiding direct sunlight or bright artificial light sources that could affect screen visibility. Use anti-glare coatings or window coverings if necessary.

Step 3. Weather consideration

Indoor vs. Outdoor: If installing screens outdoors, use weatherproof enclosures or cabinets designed to protect against rain, humidity, and extreme temperatures. For indoor installations, consider environmental factors like humidity and temperature to ensure optimal performance.

Step 4. Cable management

Cable Routing: Plan cable pathways from signal sources (e.g., computers, media players) to the screens, ensuring neat and organized cable runs. Use cable conduits, raceways, or cable trays for effective cable management.

Service Loops: Leave service loops in the cable runs to allow for future maintenance or equipment replacements without the need to re-run cables.

Labelling: Label cables at both ends to identify their purpose and connections, making troubleshooting and maintenance more efficient.

Step 5. Identify Electrical requirements

Power Outlets: Ensure that there are enough nearby power outlets to accommodate the screens and any additional equipment (e.g., media players, amplifiers). Consider using surge protectors to safeguard against power surges.

Voltage and Current: Verify that the electrical supply voltage and current match the specifications of the screens and associated equipment. Avoid overloading circuits by distributing the load appropriately.

Dedicated Circuits: Depending on the size and power requirements of the installation, consider dedicated electrical circuits to prevent power fluctuations or interference from other devices.

Backup Power: For critical installations, consider backup power solutions such as uninterruptible power supplies (UPS) or generators to ensure uninterrupted operation during power outages.



Theoretical Activity 1.2.2: Description of mounting Techniques.

Tasks:

- 1: You are requested to answer the following questions
 - i. Describe the following mounting techniques:
 - a. Wall
 - b. Ceiling
 - c. Curved
 - d. Ground Stacking
- 2: Write findings/answers on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 1.2.2
- 5: In addition, ask questions where necessary.



Key readings 1.2.2: Description of mounting Techniques.

a. Wall Mounting

Description:

Wall mounting involves attaching objects or structures directly to a vertical wall surface. This technique is often used for artworks, televisions, shelves, and various types of equipment.

Advantages:

Space-saving: Frees up floor space, making areas look less cluttered.

Visibility: Can enhance visibility and accessibility for displays or screens.

Security: Can deter theft and damage, especially for valuable items.

Considerations:

Weight Limitations: The wall must be able to support the weight of the mounted item.

Installation Requirements: May require specific hardware and tools for secure attachment.

b. Ceiling Mounting

Description:

Ceiling mounting involves suspending objects from the ceiling. This technique is commonly used for lighting fixtures, speakers, and projectors.

Advantages:

Floor Space: Maximizes floor space and minimizes clutter.

Lighting and Sound Distribution: Allows for even distribution of light or sound throughout a room.

Decorative Impact: Can create a unique aesthetic appeal, particularly with artistic installations.

Considerations:

Installation Complexity: Requires careful installation to ensure stability and safety.

Height and Accessibility: Items may be difficult to access for maintenance or adjustment.

c. Curved Mounting

Description:

Curved mounting refers to the installation of objects along a curved surface or track, often used for displays, screens, or specialized equipment that follows a non-linear path.

Advantages:

Dynamic Aesthetics: Provides a modern and visually appealing look, especially in exhibitions or presentations.

Functional Design: Can enhance functionality in specific environments, such as auditoriums or immersive installations.

Considerations:

Custom Design: Often requires custom fixtures or tracks to accommodate the curvature.

Complexity in Installation: Installation may be more complicated and require professional assistance.

d. Ground Stacking

Description:

Ground stacking involves placing items directly on the ground or floor in a stable manner. This technique is commonly used for equipment, displays, and storage solutions.

Advantages:

Simplicity: Easy to set up and change layouts without complicated installations.

Stability: Ground-mounted items can often provide a more stable base compared to elevated mounting.

Considerations:

Space Utilization: Can take up significant floor space, potentially leading to a cluttered appearance.

Accessibility: Items on the ground may be more difficult to access or view, depending on height.

Each of these mounting techniques has its unique applications, advantages, and considerations, making them suitable for different environments and purposes.



Practical Activity 1.2.3: Mounting LED/LCD Screen



Task:

- 1: As technician, you are required to go to the workplace and mount LED/LCD Screen
- 2: Read the key readings 1.2.3 and ask clarifications where necessary.
- 3: Demonstrate all steps required to mount LED/LCD Screen
- 4: Present the findings/answers to the whole class.
- 5: Ask clarifications and supports where necessary.



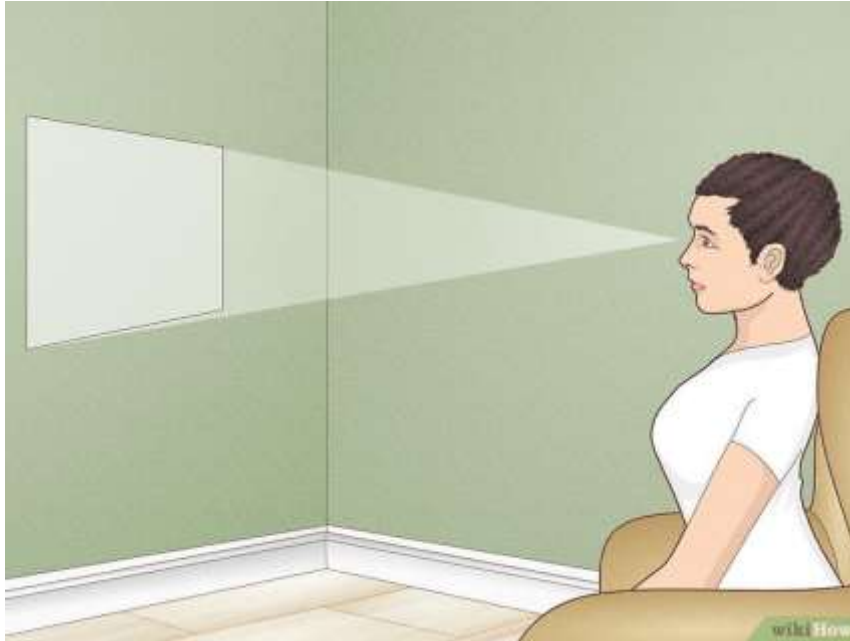
Key readings 1.2.3: Mounting LED/LCD Screen

The above practical activity of mounting screen is based LED/LCD Screen

Step1: Choose the Right Spot for Your LED/LCD Screen

Decide where you want to hang your LED/LCD Screen before you go shopping for a mount, because that will affect the type of hardware you choose. You can try a few different positions using painter's tape to mark off the LED/LCD Screen dimensions on the wall. It's easiest to install a mount on a conventional wall of 2x4s and drywall. Mounting on brick or other surfaces can be trickier.

Make sure the location gives you easy access to an electrical outlet for power, and that you'll have adequate storage for any components you'll be connecting to the LED/LCD Screen, such as a cable box, streaming player, or game console.



Choose a spot on your wall that's eye-level when you're sitting.

Step2: Get the Right LED/LCD Screen Mount

First, you need to decide what style of TV mount to shop for. (We tried several mounts in various styles, and found them all easy to install and use.) A basic fixed model will simply hold the LED/LCD Screen against the wall. Models that tilt can compensate if you're sitting lower than the TV. Some tilting mounts can also swivel. Full-motion, or articulated, mounts can move in any direction, including forward toward the viewer. This is important if you're hanging the LED/LCD Screen at an angle from your seating area.



Get the Right LED/LCD Screen Mount

Once you get the mount home, install the brackets on your LED/LCD Screen just to double-check that they fit. Almost all LED/LCD Screen have four mounting holes on the back, arranged in a standard VESA pattern. The name stands for the Video Electronics Standards Association. That means that any LED/LCD Screen mount you buy should work, as long as it's rated for your television's size.

Once the brackets are attached, we suggest measuring from the bottom of your LED/LCD Screen to the bottom of the wall plate. Knowing this distance will help you install the mount so that the LED/LCD Screen is at the proper height once it's on the wall.

Step 3: Locate the Wall Studs

We're going to assume you're mounting the hardware on a wall with studs and drywall. The first step in the installation is to gather a few tools. These include a stud finder, a level, a drill and appropriately sized drill bits, along with some painter's tape, and a socket set. A ruler or tape measure can also come in handy.



Locate the Wall Studs

You'll want to screw the LED/LCD Screen mount into wall studs for the most secure installation. To locate the studs it's easiest to use a stud finder.

If you don't have a stud finder, it could be worth buying one they're handy devices.

Move your stud finder across the wall at the height where you'll be installing the LED/LCD Screen mount until it indicates it has found the edge of a stud. Mark that spot with a pencil or some painter's tape. Then move the stud finder horizontally to locate the other edge of the first stud. (It will be 1.5 inches farther along.)

Some LED/LCD Screen wall mounts get attached to just one stud, but more typically you'll have a model that requires two studs. (That's our preference.) If your mount uses two studs, continue sliding the stud finder along the wall, and mark the start and end of the next stud, too. For the most secure attachment, the bolt should be firmly centered in the studs.

Step 4: Mark and Drill Pilot Holes

Once you've found the studs, it's time to mark the locations to drill small pilot holes for your mounting screws or lag bolts. The pilot holes will make it easier to drive the bolts into the studs without splintering the wood.



Mark and Drill Pilot Holes

Many mounts come with a template you can use to ensure the proper position for the mounting holes. If you're using the mount itself as a guide, you'll probably want a partner to hold it up to the wall. Either way, you should use a level to make sure it's straight. (Some mounts have a built-in level to help with the task.) Then make marks with a pencil where you'll be drilling. Again, make sure you're drilling into the center of each stud.

Make sure the wood or masonry bits you use for the pilot holes have a smaller diameter than the bolts you'll use to attach the mount, so there's still enough wood to let the bolts get a strong, secure bite.

Step5: Attach the TV Mount

Holding the mount against the wall, lining up the mount with the pilot holes you've drilled. To drive the lag bolts, use a ratcheting socket wrench. The mounts we tested recently all came with either two or four lag bolts, plus washers and anchors in case the lag bolts were going to be used in masonry walls.

Don't fully tighten the bolts until you make sure that everything will be level once it's firmly mounted. Then finish driving the bolts all the way in, and once again check to make sure the mount is level.



Step 6: Mount the LED/LCD Screen

As tempting as it may be to go it alone, placing the LED/LCD Screen onto the wall should be a two-person job: Large LED/LCD Screen can be awkward to hold and tricky to align and secure without help.

Before you attach the LED/LCD Screen to the mount, check whether you'll have access to its ports and inputs. Most new LED/LCD Screen have inputs on the side of the cabinet, but some models only have them at the rear of the LED/LCD Screen. Also, some slim mounts will leave little room between the LED/LCD Screen and the wall, so it could be hard to get to HDMI inputs or USB ports once the set is installed. If it's going to be hard to get to the ports once the LED/LCD Screen is on the wall, attach all the cables first.



Step 7: Organize and Hide LED/LCD Screen Cables

A mess of wires or cables can ruin an otherwise clean-looking installation, so you'll likely want to conceal or camouflage the wires running to the LED/LCD Screen. If you're going to hide HDMI and Ethernet cable wires inside the walls, you may want to consider professional installation (see below) unless you're knowledgeable about wiring. Audio-video and Ethernet cables that run through walls require a specific rating for fire resistance.

Power cables shouldn't be routed in a wall, so you might consider having an electrician install a recessed outlet behind where the LED/LCD Screen will be installed.

If you don't want to go to that trouble and expense, most retailers sell cable concealment kits, also called raceways, that let you hide and organize cables without cutting into the wall. These typically have an adhesive backing, so they can stick to the wall without damaging it, with covers that snap shut once the cables are inserted. Many can be painted to match your wall color.



Points to Remember

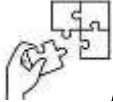
To prepare the installation site we have follow the following steps:

- ✓ Safety Precautions
- ✓ Location Selection
- ✓ Weather protection
- ✓ Cable management
- ✓ Electrical requirements

LED and LCD mounting techniques include: Wall, Ceiling, Curved and Ground Stacking.

To mount LED/LCD Screen, you need to pass through the following steps.

- ✓ Select the Right Spot for LED/LCD Screen.
- ✓ Select the Right LED/LCD Screen mount.
- ✓ Locate the Wall Studs.
- ✓ Mark and Drill Pilot Holes.
- ✓ Attach the LED/LCD Screen mount.
- ✓ Mount the LED/LCD Screen.
- ✓ Organize and Hide LED/LCD Screen Cables.



Application of learning 1.2.

XYS Company have just purchased a new LED/LCD Screen, and want to mount it to save space and create a sleek look in its position. The company hired you as technician to mount it. Following all steps prepare installation site and mount the given LED/LCD Screen.



Indicative content 1.3: Assembling of LED/LCD Screen



Duration: 10 hrs



Theoretical Activity 1.3.1: Description of assembling techniques and interfacing technologies



Tasks:

1: Answer the following questions:

- i. Explain the following assembling techniques:
 - a. Daisy Chain
 - b. Clockwise
 - c. Anti-Clockwise
 - d. Zigzag
- ii. What do you understand on the following Interfacing technologies:
 - a. HDMI/DisplayPort
 - b. Wireless
 - c. Ethernet/IP Based

2: Provide the answers for the asked questions and write them on flipchart/papers.

3: Present the findings/answers to the whole class.

4: For more clarification, read the key readings 1.3.1.

5: In addition, ask questions where necessary.



Key readings 1.3.1: Description of assembling techniques and Interfacing technologies

Software and hardware technologies that provide a link between two different systems, where users interact with a digital system using technologies.

1. Interfacing technologies

The terms "interfacing technologies" refer to the techniques and instruments used to link various hardware, software, and system components so they can successfully interact and cooperate. These technologies are essential to enabling

seamless data, command, and function sharing across different systems. The following are typical classifications and illustrations of Interfacing technologies:
HDMI/DisplayPort: HDMI (High-Definition Multimedia Interface) and DisplayPort are two different types of interface technologies used to connect and transfer audio and video signals between devices. Here's a breakdown of each:



HDMI and DisplayPort image

HDMI (High-Definition Multimedia Interface): HDMI's intended use is to send high definition audio and video signals from a source device such as a game console, computer, or Blu-ray player to a display like a TV, projector, or monitor.

Features: Integrated Audio: HDMI simplifies connectivity by allowing a single cable to transmit both visual and audio signals.

Analog connections may not always offer the same quality as digital connections, such as the one used by HDMI.

Versions: HDMI comes in multiple versions (e.g., HDMI 1.4, HDMI 2.0, and HDMI 2.1), each of which supports a unique set of capabilities like increased refresh rates, greater resolutions, and more audio formats.

Consumer Electronics: Home theatre systems, gaming consoles, and TVs are just a few examples of the consumer goods that frequently employ HDMI.

DisplayPort

Purpose: DisplayPort is mainly intended for computer monitors and is a means of connecting a computer to a display. It can also be utilized to establish connections with other kinds of screens and gadgets.

Features:

Versatile: DisplayPort is perfect for high-performance computing and gaming since it can support a broad range of resolutions and refresh rates, including very high resolutions and high refresh rates.

Audio Support: Just like HDMI, DisplayPort supports audio in addition to visual.

Digital Signal: High-quality video and audio are also provided via DisplayPort using a digital transmission.

Versions: DisplayPort is available in numerous versions, such as DisplayPort 1.2, DisplayPort 1.4, and DisplayPort 2.0, each of which has unique capabilities in terms of resolutions, frame rates, and extra features like daisy chaining multiple monitors.

Professional Use: Owing to its capabilities for high resolutions and refresh rates, DisplayPort is frequently utilized in professional and upscale gaming contexts.

Key Differences

Compatibility: DisplayPort is typically used in professional and computer environments, whereas HDMI is more frequently seen in consumer devices and home entertainment systems.

Features: For high-performance situations, DisplayPort typically provides more sophisticated features like daisy chaining multiple monitors and support for higher refresh rates and resolutions.

Connector Types: HDMI connectors come in various types (Standard, Mini, Micro), while DisplayPort has its own types, including standard DisplayPort and Mini DisplayPort.

Both technologies serve to connect devices and deliver high-quality audio and video signals, but their specific applications and features cater to slightly different needs.

Wireless: Wireless interfacing technology is all about connecting devices and systems without the need for physical cables. This can encompass a range of technologies and standards, each suited to different applications. Here are some key types:

Wi-Fi: Commonly used for internet access and local area networks (LANs). It operates on the 2.4 GHz and 5 GHz bands, with newer versions also using the 6 GHz band.

Bluetooth: Ideal for short-range communication, typically within a range of about 10 meters. It's used in devices like headphones, keyboards, and smartphones.

Zigbee: Designed for low-power, low-data-rate applications, often used in home automation systems and IoT devices. It operates in the 2.4 GHz band.

NFC (Near Field Communication): Used for very short-range communication, typically a few centimeters. It's common in contactless payment systems and smart cards.

LoRa (Long Range): Suited for long-range communication with low power consumption, often used in IoT applications requiring extended range and minimal energy use.

Cellular Networks: Includes technologies like 4G LTE and 5G, used for wide-area communication. 5G offers significantly higher speeds and lower latency compared to 4G.

Infrared (IR): Uses light waves to transmit data. It's often used in remote controls and some communication devices, though it's limited by line-of-sight requirements.

RFID (Radio-Frequency Identification): Uses radio waves to identify and track objects. Common in inventory management and access control systems.

Each of these technologies has its own strengths and weaknesses, making them suitable for different applications and environments. For instance, Wi-Fi provides high-speed internet access but consumes more power, while Zigbee is more energy-efficient but offers lower data rates.

Ethernet/IP Based: Ethernet/IP (Ethernet Industrial Protocol) is a widely used technology in industrial automation and control systems. It combines the standard Ethernet protocol with the Common Industrial Protocol (CIP), which provides a comprehensive set of services for managing industrial devices and data. Here's a breakdown of what makes

Ethernet/IP significant and how it works:

Key Features

Standard Ethernet: Ethernet/IP uses standard Ethernet hardware and infrastructure, which means it leverages the widespread availability and cost-effectiveness of Ethernet technology. It operates over the same physical layers as standard Ethernet, including twisted pair cables (Cat 5e, Cat 6) and fiber optics.

Common Industrial Protocol (CIP): CIP is the protocol layer that provides the application-level services. It supports a wide range of industrial automation applications by providing a consistent communication framework. CIP encompasses several protocols, including:

Device Net: For communication between devices in a network.

Control Net: For real-time control and high-speed data exchange.

CIP Safety: For safety-related communications.

Real-Time and Deterministic Communication: Ethernet/IP supports real-time and deterministic communication through mechanisms like Explicit Messaging (for configuration and diagnostic data) and I/O Messaging (for real-time control and data exchange).

Scalability and Flexibility: Ethernet/IP networks can be scaled from small systems with a few devices to large networks with thousands of nodes. It supports a wide

range of devices, from sensors and actuators to complex controllers and computers.

Integration with IT Systems: Because Ethernet/IP uses standard Ethernet, it can easily integrate with IT systems, including enterprise resource planning (ERP) and manufacturing execution systems (MES). This enables seamless data exchange between industrial and business systems.

Network Management: Ethernet/IP supports network management and diagnostics, helping to monitor network performance, detect faults, and optimize network operation.

Applications

Manufacturing Automation: Used extensively in factories for controlling machinery, conveyor systems, robotics, and other equipment.

Process Control: Applied in industries such as chemicals, oil and gas, and water treatment for managing and monitoring processes.

Building Automation: Facilitates control of HVAC systems, lighting, and security systems in commercial and industrial buildings.

Transportation: Employed in systems for managing and controlling railways, traffic signals, and other transportation infrastructure.

Benefits

Cost-Effectiveness: By utilizing standard Ethernet, Ethernet/IP reduces the cost of hardware and infrastructure compared to proprietary industrial networks.

Interoperability: Ethernet/IP's use of standardized protocols and components ensures interoperability between devices from different manufacturers.

Ease of Use: Leveraging existing Ethernet expertise and infrastructure makes it easier to implement and maintain Ethernet/IP networks.

High Performance: Offers high data rates and the ability to handle large volumes of data, making it suitable for demanding industrial applications.

Overall, Ethernet/IP is a robust and versatile choice for industrial networking, offering the advantages of standard Ethernet technology while meeting the specific needs of industrial automation and control systems.

2. Assembling techniques

Assembling LED/LCD screens involves arranging and connecting them in various configurations depending on the desired visual effect, installation layout, and content

presentation.



Below there are four common assembling techniques:

1. Daisy Chain:

Description: In a daisy chain setup, LED/LCD screens are connected in a linear fashion, one after the other, like a chain. The output of one screen serves as the input for the next screen, creating a chain of screens.

multimonitorcomputer.com

HOW TO DAISY-CHAIN DISPLAYPORT 1.2 MONITORS



Benefits:

Simplified Wiring: Daisy chaining reduces the number of cables needed because each screen connects to the previous one.

Easy Scalability: Additional screens can be added to the chain as needed, making it suitable for creating larger video walls.

Applications: Commonly used in video walls and digital signage installations where screens are arranged in a linear or grid-like pattern.

2.Clockwise assembly (or Rightward Assembly):

Description: In a clockwise assembly, screens are arranged in a clockwise direction when viewed from above or in front of the screens. Each screen is placed to the right of the previous one.

Benefits: Provides a systematic and organized appearance to the multi-screen setup can create a sense of continuity or flow in content across screens.

Applications: Suitable for applications where a specific order or sequence of screens is desired, such as storytelling displays or artistic installations.

3.Anti-Clockwise assembly (or Counter-Clockwise Assembly):

Description: In an anti-clockwise assembly, screens are arranged in an anti-clockwise (counter-clockwise) direction when viewed from above or in front of the screens. Each screen is placed to the left of the previous one.

Benefits: Offers an alternative arrangement to clockwise assembly for artistic or creative purposes allows for variation in content presentation across screens.

Applications: Useful for installations that aim to create visual interest through screen arrangement variations.

4.Zigzag: (or Snake) Assembly:

Description: In a zigzag assembly, screens are arranged in a zigzag or snake-like pattern. This arrangement typically involves alternating the orientation of screens, creating a dynamic visual effect.

Benefits: Creates a dynamic and visually engaging display, particularly when content flows across screens. Provides flexibility for designing non-linear or artistic layouts. Applications:

Ideal for artistic installations, unconventional video walls, or displays with irregular shapes. Remark: The choice of assembling technique depends on the specific goals and aesthetics of the installation. Each technique offers a unique visual effect and can be selected based on the content being displayed and the desired impact on the audience. When implementing these techniques, it's important to consider factors like content synchronization, bezel compensation (to minimize visual gaps between screens), and the capabilities of the display hardware and software being used to control the screens. Proper planning and calibration are essential to ensure a cohesive and visually appealing multi-screen display.



Practical Activity 1.3.2: Assembling LED/LCD screen.



Task:

- 1: As technician, you are required to go to workshop and assemble LED/LCD screen.
- 2: Read the key readings 1.3.2.
- 3: Present the findings/answers to the whole class.
- 4: Ask clarifications and supports where necessary.



Key readings 1.3.2: Assembling LED/LCD screen.

While assembling LED/LCD screen you need to follow the following steps.

Step 1. Check for accessories.

Carefully Unbox the Screen: Remove the screen from the packaging, ensuring you don't damage the display or drop any small components like screws, stands, or cables.

Check for Accessories: Ensure that all accessories (e.g., power cable, remote control, stand, wall mount, HDMI/VGA cables, user manual) are included in the box.

Step 2. Assembling the Screen (Stand or Wall Mount):

Attach the Stand (if applicable), Stand Assembly: If the screen comes with a stand, align the base with the bottom of the screen. Use the provided screws or clips to attach the stand securely. Tighten the screws with a screwdriver, making sure the screen is stable.

Position the Screen Upright: Carefully lift the screen and position it upright on a flat surface, ensuring it is balanced and secure.

Wall Mount (if applicable), Bracket Installation: If mounting the screen to a wall, attach the wall-mount bracket to the back of the screen. Use the screws provided and follow the manufacturer's instructions.

Mounting to Wall: Mark and drill holes in the wall where the screen will be installed. Secure the wall bracket to the wall using anchors and screws, then carefully hang the screen on the mounted bracket.

Step 3. Connecting Power and Input Cables:

Power Connection: Plug the power cable into the back of the screen and then into a power outlet. Ensure the outlet is functional and provides the necessary voltage for the screen.

Connecting Input Devices:

HDMI Cable: If you are connecting the screen to a computer, gaming console, or Blu-ray player, use an HDMI cable. Plug one end into the screen's HDMI port and the other into the device.

VGA/DisplayPort: For older computers or additional display options, you may use a VGA or DisplayPort cable instead of HDMI.

USB Devices (if applicable): If your screen has USB ports, you can connect external devices like flash drives, keyboards, or webcams.

Step 4. Initial Power-On and Configuration:

Power On the Screen: Turn on the screen using the power button or remote control. Check if the screen powers up and displays an image.

Set Input Source: Using the remote control or the buttons on the screen, select the correct input source (HDMI, VGA, or other). Ensure the connected device (e.g., a computer or TV box) is turned on and transmitting a signal.

If the screen doesn't display an image, double-check the input connections and make sure the right input source is selected.

Step 5. Screen Calibration and Settings Configuration:

Adjust Display Settings: Use the remote or on-screen menu buttons to access the settings menu. Adjust the brightness, contrast, color, and sharpness to your preference.

Many screens have preset modes (e.g., Movie, Game, Standard) that you can choose based on how you plan to use the screen.

Resolution and Display Settings (for computers): If connected to a computer, ensure the display settings (resolution, refresh rate) are optimized for the screen size. For example, a 1080p screen should be set to 1920x1080 resolution.

Access your computer's display settings to adjust screen scaling, resolution, and orientation.

Step 6. Audio Setup (if applicable):

Built-in Speakers: If your screen has built-in speakers, check the sound settings. You may need to select the screen as the audio output device in your system settings.

External Speakers or Sound bar: If you are using external speakers or a soundbar, connect them to the screen's audio output port (usually via HDMI ARC, optical cable, or 3.5mm jack).

Test the sound by playing media and adjusting the volume.

Step 7. Testing and Final Adjustments:

Test Video Quality: Play a video or connect to a source to test the screen's display. Look for any dead pixels, uneven lighting, or color inaccuracies.

Adjust the settings as needed for optimal viewing.

Check for Connectivity: Ensure that all connected devices (computers, game consoles, TV boxes) are transmitting properly. If there are connectivity issues, double-check the cables and input selections.

Positioning the Screen: Place the screen in its final location. If it's on a stand, ensure it's positioned on a flat, stable surface.

For a wall-mounted screen, ensure the mount is secure, and the screen is level and at the correct height for comfortable viewing.

Cable Management: Organize and secure any excess cables using clips or ties to keep the area neat and free from clutter.

Once the screen is assembled, connected, and configured, it is ready for use. You can now enjoy the display for your chosen purpose, whether it's for work, gaming, or entertainment.



Practical Activity 1.3.3: Tagging and testing LED/LCD screen connectivity.



Task:

1: As technician, you are required to go to workshop to tag and test LED/LCD screen connectivity.

- 2: Read the key readings 1.3.3.
- 3: Present the findings/answers to the whole class.
- 4: Ask clarifications and supports where necessary.



Key readings 1.3.3: Tagging and testing LED/LCD screen connectivity.

Step 1. Preparation

Gather Tools: Ensure you have the necessary tools, including labels, multimeter, HDMI/VGA cables, power tester, and cleaning tools. **Power off:** Before any testing, make sure the screen and devices are powered off.

Step 2. Tagging Process

Identify the Screen: Record the model, serial number, manufacturer, and type (LED/LCD) for each screen.

Label the Screen: Attach a unique identification tag (could be a sticker) with the screen's details (e.g., "Screen 001").

Label the Cables: Tag each cable (HDMI, VGA, Power, etc.) with corresponding labels. For example: "HDMI - Screen 001," "Power - Screen 001."

Connectivity Testing

Step 3. Power Supply Test

Check the Power Cord: Ensure the power cable is securely connected to both the screen and the power source.

Multimeter Test: If the screen doesn't power on, use a multimeter to verify that the power cable is delivering the correct voltage. **Power on:** Turn on the screen. Check if the power indicator light illuminates.

Step 4. Input Source Testing

Connect the Screen: Attach the correct input cable (HDMI, VGA, or DVI) from a working source device (like a laptop, desktop, or media player).

Select Input: Use the screen's menu to select the input source. Ensure the screen detects the input (e.g., HDMI 1, VGA).

Signal Verification: Check for a stable and clear display. Ensure no flickering, distorted colors, or abnormal lines appear on the screen.

Resolution Check: Ensure the screen is displaying in its native resolution (e.g., 1920x1080 for Full HD screens). Adjust the resolution from the source device if needed.

Step 5. Testing Audio (if applicable)

Audio Output: If the screen has built-in speakers, connect an audio source and play audio to check sound quality.

Volume Control: Test volume control on the screen or via the connected device to ensure functionality.

Step 6. Connectivity for External Devices

Test Multiple Inputs: If the screen has multiple input options (e.g., HDMI 1, HDMI 2, VGA), test each port with different cables and devices.

Test USB Ports (if available): For screens with USB ports (used for media or power), connect a USB device to ensure the port works properly.

Step 7. Recording Test Results

Log Results: After testing, record all test results, including:

Whether the screen powered on successfully.

Any display or audio issues.

Verification of all input ports tested.

Mark as Passed/Failed: Based on the test, tag the screen as “Passed” or “Failed” for future reference.



Points to Remember

- **Interfacing technologies**

The terms "interfacing technologies" refer to the techniques and instruments used to link various hardware, software, and system components so they can successfully interact and cooperate.

- **The following are typical classifications and illustrations of interfacing technologies:**

- ✓ HDMI/Display Port
- ✓ Display Port
- ✓ Audio Support

- **Connector Types:**

- ✓ Wireless
- ✓ Wi-Fi
- ✓ Bluetooth
- ✓ Cellular Networks
- ✓ Ethernet/IP Based

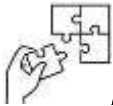
- **LED/LCD Assembling techniques:**

- ✓ Daisy Chain
- ✓ Clockwise
- ✓ Anti-Clockwise
- ✓ Zigzag

- **To assemble LED/LCD screen the following steps are needed:**

- ✓ Check for accessories.

- ✓ Assemble the stand or screen mount.
 - ✓ Connect the power and input cables.
 - ✓ Power on and configure the display settings.
 - ✓ Calibrate the screen and adjust settings.
 - ✓ Set up audio (if applicable).
 - ✓ Test the screen's video and connectivity.
 - ✓ Finalize the screen's placement and organize cables.
- **To tag and test LED/LCD screen you have to pass through the following steps:**
 - ✓ Preparation
 - ✓ Tagging Process
 - ✓ Power Supply Test
 - ✓ Input Source Testing
 - ✓ Testing Audio (if applicable)
 - ✓ Connectivity for External Devices
 - ✓ Recording Test Results



Application of learning 1.3.

The XYZ Company is a mid-sized electronics manufacturer, specializing in producing LED and LCD screens for various purposes. The company operates on an assembly line where each screen goes through a series of processes, from assembling components to final quality checks before being shipped to customers. The company hired you as IT technician, and asked you to ensure every screen is properly assembled, tagged, and tested for quality and connectivity to the appropriate interfacing technology.



Learning outcome 1 end assessment

Written assessment

- I. Circle the letter corresponding to the correct answer.
- Which of the following is a key difference between LED and LCD screens?
 - LCDs are typically thinner than LEDs
 - LEDs have a faster response time than LCDs
 - LCDs provide higher brightness than LEDs
 - LEDs consume more power than LCDs
 - Which of the following components is responsible for controlling the brightness and color of an LED screen?
 - Display panel
 - Power supply
 - Driver circuits
 - Data cables
 - Which of the following components is crucial for connecting external devices such as computers to an LED/LCD screen?
 - Power cables
 - Video input interfaces
 - Backlighting system
 - Polarizing filters
 - In an industrial environment, what is one key advantage of Ethernet/IP-based interfacing technologies?
 - They are the most energy-efficient options
 - They support wireless connections
 - They integrate easily with IT systems
 - They provide superior sound quality
- II. Answer by TRUE to the correct statement and FALSE to the wrong statement.
- Ethernet/IP interfacing technology is primarily used for wireless connections.
 - HDMI and DisplayPort both transmit high-definition video and audio signals.
 - Curved mounting is one of the simplest and cheapest mounting techniques for LED/LCD screens.
 - Driver circuits in LED screens are responsible for controlling the brightness and color of each LED.

5. OLED displays require a backlight to function.

III. Match the statements of column A to their corresponding description in column B, and write the letter in blank space of answers.

Answers	Column A	Column B
.....	1. Wall Mounting	a. Connects to external devices, such as computers
.....	2. Ceiling Mounting	b. Attaching objects to a vertical wall surface
.....	3. Curved Mounting	c. Placing objects directly on the floor or ground
.....	4. Ground Stacking	d. Suspending objects from the ceiling
		e. Attaching objects to a curved surface

Practical assessment

XYZ INVESTMENT Ltd bought LED/LCD screen online from China and delivered to Rwanda. After opening the boxes, they saw that the screen is not assembled and they need to use it in good working condition. They do not know where they can place it and how to fix it to the location. As IT technician, they hired you and asked you to install the site, assemble LED/LCD screen, mount it, and test it for connectivity on the appropriate interfacing technology.



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Learning Outcome 2: Configuring LED/LCD Display Settings



Indicative Contents

2.1 Develop Led Matrix Display.

2.2 Identification of Configuration Software.

2.3 Configuration of Visual Parameters.

2.4 Perform Content Loading.

2.5 Functionality Testing.

Key Competencies for Learning Outcome 2: Configuring LED/LCD Display Settings.

Knowledge	Skills	Attitudes
<ul style="list-style-type: none">● Identification of LED Matrix display Components● Identification of configuration software.● Identification of content loading	<ul style="list-style-type: none">● Interconnecting display modules.● Mounting display modules on circuit board.● Programming and testing microcontroller.● Installing drivers.● Applying calibration.● Applying Light, color, and size.● Performing Content loading.● Testing electrical functionality.	<ul style="list-style-type: none">● Having Precision● Being Attentive● Having self-confident● Having accountability● Respecting time● Being patient● Having self-motivation● Being organized

	<ul style="list-style-type: none">• Testing data and display parameters.	
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Duration: 25 hrs

Learning outcome 2 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Identify clearly LED Matrix Display Components based on manufacture’s guide.
2. Identify correctly configuration software based on manufacture’s guide.
3. Interconnect properly display modules according to manufacturer’s guide.
4. Mount perfectly display modules on circuit board.
5. Program and test properly microcontroller based on user needs.
6. Install effectively drivers based on manufacturer’s guide.
7. Apply perfectly calibration according to intended use.
8. Apply properly light, color, and size to intended use.
9. Identify clearly content loading according to user needs.
10. Perform effectively Content loading according to user needs.
11. Test properly electrical functionality based on intended use.
12. Test properly data and display parameters based on intended use.



Resources

Equipment	Tools	Materials
<ul style="list-style-type: none"> ● LED panel ● LCD panel ● LCD Controller ● UPS ● Laptop ● Computer ● Surge Protector ● Drilling machine 	<ul style="list-style-type: none"> ● Tape measure ● Crimping tool ● Wire stripper ● Hammer ● Pliers ● Screwdrivers ● Ladder ● Scaffold ● ESD Tools 	<ul style="list-style-type: none"> ● Power cables ● CAT6 ● Cable ties ● Insulator ● RJ45 ● Mounting Brackets ● Drill Bits ● Data cables ● Screws



Indicative content 2.1: Develop LED Matrix Display.



Duration: 3 hrs



Theoretical Activity 2.1.1: Identification of LED Matrix Display

Tasks:

1: Answer the following questions:

- i. What do you understand by the following terms?
 - a) LED matrix
 - b) Microcontroller
- ii. Identify the key features of LED Matrix display
- iii. Explain the types of controller board
- iv. Identify the types of Power Supplies

2: Provide the answers for the asked questions and write them on flipchart/papers.

3: Present the findings/answers to the whole class.

4: For more clarification, read the key readings 2.1.1.

5: In addition, ask questions where necessary.



Key readings 2.1.1: Identification of LED Matrix display Components.

1. **Microcontroller** : It is a single integrated circuit (IC) that functions as a miniature computer and is intended to carry out particular tasks. It is capable of managing a range of electronic parts and operations. Utilizing an LED screen means that the microcontroller serves as the "brain" or controller of the display.
2. **LED dot matrix modules** : A LED Matrix consists of an array of LED' s which are interconnected such that the positive terminal (anode) of each LED in the same column are connected together and the negative terminal (cathode) of each LED in the same row are connected together.

Advantages of using LED dot matrix modules are:

- Flexibility in displaying dynamic content
- High visibility due to bright LEDs

- Easy integration with microcontrollers
- Scalability for larger displays

Key Features:

- ✓ **Grid Layout:** They typically have a grid layout, such as 8x8 or 16x16, where each LED in the matrix can be turned on or off to create patterns.
- ✓ **Control:** They can be controlled using various methods, including microcontrollers like Arduino or Raspberry Pi. Common control interfaces include Inter-Integrated Circuit (I2C), Serial Peripheral Interface (SPI), or serial communication.
- ✓ **Brightness:** Many modules come with adjustable brightness settings, either through hardware or software control.
- ✓ **Driver ICs:** Modules often include driver ICs (like the MAX7219 or HT16K33) to simplify control and reduce the number of microcontroller pins needed.

3. **Connecting Wires :** Reliability of communication between components in Computer System and architecture depends on correctly connecting cables. The following provides basic advice as well as instructions for connecting wires for popular communication protocols like SPI and I2C.

General Tips for Connecting Wires: Check Voltage Levels: Ensure all connected devices operate at compatible voltage levels to avoid damage.

Keep Connections Short: Minimize the length of wires to reduce signal degradation and interference.

Use Color-Coded Wires: This helps to easily identify different lines and prevent connection mistakes.

Secure Connections: Use connectors, headers, or soldering to ensure stable and reliable connections.

Double-Check Pinouts: Verify the pin configurations and wiring diagrams in the datasheets for each component.

4. **Controller board :** is a type of electronic circuit board used in devices and systems to monitor and regulate different functions. It is utilized in many different applications, ranging from straightforward hobby projects to intricate industrial systems, and usually comprises a microcontroller, microprocessor, or specialized processor.

Types of controller board

Arduino: Popular for hobbyists and prototyping. Models like Arduino Uno and Mega are widely used.

Raspberry Pi: A single-board computer that runs a full operating system and is used for more complex tasks.

ESP32/ESP8266: Microcontroller boards with integrated Wi-Fi and Bluetooth, ideal for IoT projects.

BeagleBone: A single-board computer aimed at industrial applications, offering real-time processing capabilities.

STM32 Nucleo: Development boards for STM32 microcontrollers, used in both hobby and industrial applications.

Applications:

Embedded Systems: Used in appliances, automotive systems, medical devices, and other embedded applications.

Prototyping and Development: Common in DIY projects and product development, providing a flexible platform for experimentation and development.

Robotics: Controls robots, including their sensors, actuators, and communication systems.

Consumer Electronics: Found in devices like remote controls, smart home devices, and gaming consoles.

Industrial Automation: Manages machinery, sensors, and process control systems in industrial settings.

5. **Power Supply :** is an electrical device that supplies electric power to an electrical load. It is also a crucial part of electronic projects and systems because it provides the electricity required to run circuits and devices.

Types of Power Supplies:

▪ **Linear Power Supplies:**

Description: Use linear regulation to provide a stable output voltage. They are simple and reliable but can be less efficient and generate more heat.

Applications: Used in audio equipment, laboratory power supplies, and applications requiring precise voltage regulation.

▪ **Switching Power Supplies:**

Description: Use high-frequency switching and inductors or transformers to convert power more efficiently. They are compact and generate less heat compared to linear supplies.

Applications: Common in computers, power adapters for electronic devices, and power supplies for LED lighting.

▪ **AC-DC Power Adapters:**

Description: Convert alternating current (AC) from the wall outlet to direct current (DC) suitable for electronic devices.

Applications: Used to power devices like laptops, routers, and other electronics.

- **Batteries:**

Description: Provide portable power with varying voltages and capacities. Rechargeable batteries can be reused multiple times.

Applications: Used in portable electronics, remote controls, and backup power systems.

- **Uninterruptible Power Supplies (UPS):**

Description: Provide backup power to critical devices during power outages. Often include a battery to keep devices running temporarily.

Applications: Used for computers, servers, and other sensitive electronics requiring continuous power.

6. **Power connector:** are critical for providing electrical power to various electronic devices and systems. They come in many types and configurations, each suited to different applications and requirements.

Common Types of Power Connectors

- **Barrel Jack Connectors:** Cylindrical connectors with a central pin (positive) and an outer sleeve (ground). They are commonly used for power adapters.

Sizes: Common sizes include 5.5mm outer diameter and 2.1mm or 2.5mm inner diameter.

Applications: Used in power adapters for devices like routers, CCTV cameras, and other electronics.

- **USB Connectors:**

USB Type A: Standard rectangular connector used in many devices for both data and power.

USB Type B: Square-shaped connector often used for peripherals like printers.

Micro USB: Smaller connector used in mobile devices.

USB-C: Reversible connector supporting high-speed data transfer and high power delivery (up to 100W).

Applications: Powering and data transfer for computers, smartphones, tablets, and peripherals.

- **DC Power Connectors:**

2-Pin Screw Terminal: Allows for wire connections via screw terminals, suitable for DC power input.

2-Pin JST: Compact, reliable connectors often used in small electronic devices and battery connections.

Applications: Used in various DIY electronics, robotics, and embedded systems.

- **Molex Connectors:** Often used in computer power supplies and other electronics. They provide power to internal components.

Types: Includes 4-pin connectors for HDDs, optical drives, and other peripherals.

Applications: Internal connections in PCs for hard drives, optical drives, and other components.

- **Anderson Powerpole Connectors:** Modular connectors known for high current capacity and durability. They are stackable and easy to assemble.

Applications: High-power applications such as battery packs, automotive systems, and emergency equipment.

- **Terminal Blocks:** Connectors with screw terminals where wires are clamped down. They can handle various wire sizes and are often used in industrial applications.

Applications: Used for power connections in industrial controls, automation, and other high-current applications.

- **Power Over Ethernet (PoE):** Combines power and data transmission over a single Ethernet cable.

Applications: Used for network devices like IP cameras, VoIP phones, and wireless access points.

- **XLR Connectors:** Typically used for audio but also available in power configurations. They are known for their robustness and locking mechanism.

Applications: Professional audio equipment and some power applications requiring durability and secure connections.

- **Barrel Power Connectors:** Typically used for DC power connections with a cylindrical shape. They are common in many low-voltage applications.



Practical Activity 2.1.2: Interconnecting Display Modules and Mounting on Circuit Board.



Task:

- 1: You are required to go to workshop and interconnect LED/LCD screen display modules and mounting on circuit board.
- 2: Read the key readings 2.1.2 and ask clarifications where necessary.

3: Present your work to trainer or whole class.

4: Ask clarifications and supports where necessary.



Key readings 2.1.2: Interconnecting display modules and mounting on circuit board.

Steps to Interconnect Display Modules.

Step 1: Choose the Right Components

- **Select the Display Module:**

- Determine the size and type of the display (e.g., 8x8, 16x32 LED matrix).

- **Select the Microcontroller:**

- Choose a microcontroller that is compatible with the display module and has sufficient GPIO pins (e.g., Arduino, Raspberry Pi).

- **Driver ICs:**

- If required, select driver ICs (like MAX7219, HT16K33) that simplify the control of multiple displays.

Step 2: Understand the Wiring Configuration

- **Identify Pin Layout:**

- Review the datasheet or user manual for the LED matrix display to understand the pin configuration (common anode/cathode, row/column layout).

- **Identify Driver Connections:**

- If using a driver IC, check its pinout to connect it correctly to the microcontroller and display.

Step 3: Gather Required Components

- **Wires and Connectors:**

- Use jumper wires or ribbon cables to connect the components.

- **Resistors:**

- Determine and use current-limiting resistors for the LEDs, if necessary.

- **Power Supply:**

- Ensure you have an appropriate power supply that matches the voltage and current requirements of the display module.

Step 4: Wiring the Components

- **Connect the Display to the Driver IC:**

- Connect the rows and columns of the display to the corresponding pins on the driver IC.
- Follow the wiring diagram provided in the datasheet of the display and driver.

- **Connect the Driver IC to the Microcontroller:**

- Connect the input pins of the driver IC to the GPIO pins on the microcontroller.
- Use appropriate communication protocol pins (e.g., SPI, I2C) based on the driver used.
- **Power Connections:**
 - Connect the VCC pin of the display and driver IC to the positive terminal of the power supply.
 - Connect the GND pins of the display, driver, and microcontroller to the ground of the power supply.

Step 5: Install Required Libraries

- **Download Libraries:**
 - For easy control of the display, download and install relevant libraries compatible with your microcontroller.
 - Libraries like Adafruit_GFX or Adafruit_NeoMatrix for Arduino can simplify programming.
- **Include Libraries in Your Code:**
 - Add the required library headers in your sketch/code.

Step 6: Write and Upload the Code

- **Initialize the Display:**
 - Write code to initialize the display and set up the communication protocol.
- **Display Test Patterns:**
 - Create test patterns or scrolling text to ensure that the connections are correct and functioning as expected.
- **Upload the Code:**
 - Use the appropriate IDE (like Arduino IDE) to compile and upload your code to the microcontroller.

Step 7: Test the Interconnection

- **Power On the System:**
 - Turn on the power supply and observe if the display lights up as expected.
- **Verify Functionality:**
 - Check if the display is showing the correct patterns or images as programmed.

Step 8: Troubleshooting (if needed)

- **Check Connections:**
 - Ensure all wiring is correct and secure.
- **Inspect Code:**
 - Review the code for any logical errors or incorrect pin configurations.
- **Measure Voltage and Current:**

- Use a multimeter to check if the display is receiving the appropriate voltage and current.

✚ **Steps for Mounting a Display Module on a Circuit Board**

Step 1: Gather Necessary Tools and Materials

- **Display Module:** (e.g., LED matrix, LCD, OLED)
- **Circuit Board:** PCB designed for your project.
- **Tools:**
 - ✓ Soldering iron and solder (for through-hole components).
 - ✓ Hot air rework station or soldering paste (for surface mount components).
 - ✓ Tweezers (for precise placement).
 - ✓ Wire cutters/strippers.
 - ✓ Multimeter (for testing connections).
- **Safety Equipment:** Safety goggles and a well-ventilated workspace.

Step 2: Prepare the Circuit Board

- **Inspect the PCB:**
 - Ensure it is clean and free of dust or moisture.
 - Check for any visible damage.
- **Identify Component Placement:**
 - Refer to your schematic or PCB layout to determine where the display module will be mounted.

Step 3: Insert the Display Module

- **For Through-Hole Display Modules:**
 - Align the pins of the display with the corresponding holes on the PCB.
 - Ensure the correct orientation (check for markings on the module).
 - Push the display module gently into the holes until it sits flush against the board.
- **For Surface Mount Display Modules:**
 - ✓ Carefully place the display module onto the designated pads on the PCB.
 - ✓ Use tweezers to ensure accurate placement and alignment.

Step 4: Secure the Display Module

- **For Through-Hole Modules:**
 - ✓ Bend the leads slightly on the underside of the PCB to hold the display in place temporarily.
- **For Surface Mount Modules:**
 - ✓ If using solder paste, apply it to the pads before placing the module.
 - ✓ Ensure the module is aligned correctly with the pads.

Step 5: Solder the Connections

➤ **For Through-Hole Modules:**

- ✓ Heat the pad and lead with the soldering iron.
- ✓ Feed solder into the joint until it flows around the lead.
- ✓ Remove the solder and iron, allowing the solder to cool and solidify.

➤ **For Surface Mount Modules:**

- ✓ Use a soldering iron or hot air rework station to heat the solder paste, allowing the solder to flow and secure the module.
- ✓ Inspect each connection to ensure a solid solder joint.

Step 6: Trim Excess Leads

➤ **For Through-Hole Modules:**

- ✓ Use wire cutters to trim any excess leads protruding from the PCB.

➤ **For Surface Mount Modules:**

- ✓ Ensure no excess solder or debris could cause shorts.

Step 7: Inspect and Test Connections

➤ **Visual Inspection:**

- ✓ Check all solder joints for proper connections and ensure no solder bridges are present.

➤ **Continuity Testing:**

- ✓ Use a multimeter to test for continuity between the display connections and ensure no shorts.

Step 8: Final Assembly

➤ **Connect Additional Components:**

- ✓ If the display requires additional components (like resistors or drivers), insert and solder those accordingly.

➤ **Mounting the PCB:**

- ✓ If applicable, secure the PCB within an enclosure using standoffs or screws for added stability.

Step 9: Power Up and Test the Display

➤ **Connect Power:**

- ✓ Connect the circuit to a power supply, ensuring it matches the display's voltage and current specifications.



Practical Activity 2.1.3: Programming and testing microcontroller.



Task:

- 1: As technician, you are required to go to workshop to write a program which display VISIT RWANDA message and test a microcontroller.
- 2: Read the key readings 2.1.3 and ask clarifications where necessary.
- 3: Present your work to trainer or whole class.
- 4: Ask clarifications and supports where necessary.



Key readings 2.1.3: Programming and test microcontroller

Programming a microcontroller involves writing code in a language like C or Assembly. This code is compiled and uploaded to the microcontroller's flash memory. The microcontroller then executes this code to perform its tasks.

Microcontrollers are widely used in various applications including automotive systems, consumer electronics, medical devices, and more. Their versatility and ability to be programmed for specific tasks make them fundamental components in modern technology.

Step 1: Understanding Microcontrollers

Components of microcontroller: Key components include the CPU (central processing unit), RAM (random access memory), ROM (read-only memory), and various I/O ports (input/output).

Step 2: Choosing a Microcontroller

Type: Select a microcontroller based on your project requirements, such as processing power, memory size, and peripheral features.

Popular Families: Examples include the Arduino (based on Atmel AVR), PIC (by Microchip), and STM32 (by STMicroelectronics).

Step 3: Development Environment

IDE (Integrated Development Environment): Use an IDE that supports your microcontroller. For instance, Arduino IDE for Arduino boards or MPLAB X IDE for PIC microcontrollers.

Compilers: These translate your code into machine language that the microcontroller can execute.

Step 4: Writing Code

Language: Microcontrollers are often programmed in C or C++, though some use Assembly or specialized languages.

Example Code 1: This example is for an Arduino microcontroller that blinks an LED.

```
// Pin number where the LED is connected
const int ledPin = 13;

void setup() {
  // Initialize the digital pin as an output
  pinMode(ledPin, OUTPUT);
}

void loop() {
  // Turn the LED on
  digitalWrite(ledPin, HIGH);
  // Wait for a second
  delay(1000);
  // Turn the LED off
  digitalWrite(ledPin, LOW);
  // Wait for a second
  delay(1000);
}
```

Example Code 2: This example is for an Arduino microcontroller that print “Hello, World”.

```
// This is the setup function, which runs once when the program starts
void setup() {
  // Start the serial communication with a baud rate of 9600
  Serial.begin(9600);
}

// This is the loop function, which runs repeatedly
void loop() {
  // Print "Hello, World!" to the Serial Monitor
  Serial.println("Hello, World!");
  // Wait for 1 second
  delay(1000);
}
```

Step 5: Uploading Code

Programming Tools: Use a programmer or bootloader to upload your code to the microcontroller. For Arduino, this is done via USB using the Arduino IDE.

Verify and Test: After uploading, test the microcontroller's functionality to ensure the code runs as expected.

Step 6: Debugging

Testing: Check for any issues with hardware connections or code logic.

Debugging Tools: Utilize debugging tools like serial monitors, oscilloscopes, or in-circuit debuggers.

Step 7: Optimizing and Finalizing

Efficiency: Optimize your code for performance and memory usage.

Deployment: Once your code is stable, you can deploy the microcontroller into your final product or system.

By following these steps, you can successfully program a microcontroller to perform a wide range of tasks, from simple LED blinking to complex sensor data processing.

Test

Testing is a crucial step in microcontroller programming to ensure that your code works as expected and to identify and fix any issues. Here is a guide on how to approach testing in microcontroller projects:

1. Unit Testing

Focus: Test individual components or functions in isolation to ensure they work correctly.

Approach: Use test scripts or mock inputs to verify that each function behaves as expected. For instance, if you have a function that reads a sensor value, you might test it with known inputs to see if it returns the correct values.

2. Integration Testing

Focus: Test how different components or modules of your system work together.

Approach: Verify that the integration of various functions or hardware components (like sensors, actuators, or communication modules) performs as intended. For example, if your system reads sensor data and then processes it to control an actuator, ensure that the entire sequence works correctly.

3. Hardware Testing

Focus: Ensure that the microcontroller interacts correctly with the physical components.

Approach:

Check Connections: Verify that all hardware connections are correct and secure.

Use Test Equipment: Employ tools like oscilloscopes, multimeters, and logic analyzers to check signal integrity and troubleshoot issues.

Monitor Power Supply: Ensure that the microcontroller and all components are receiving proper power.

4. Functional Testing

Focus: Validate that the system performs its intended functions.

Approach: Test the entire application in real-world scenarios. For instance, if your project involves controlling a motor, run it through different operational scenarios to make sure it performs correctly under various conditions.

5. Stress Testing

Focus: Determine how the microcontroller handles extreme conditions or high loads.

Approach: Test the system under maximum operating conditions, such as high data rates or maximum input ranges, to ensure reliability and robustness.

6. Error Handling and Edge Cases

Focus: Verify how the system responds to unexpected inputs or conditions.

Approach: Simulate edge cases and error conditions, such as sensor failures or power interruptions, to ensure that your code handles them gracefully and maintains stability.

7. Debugging

Tools: Utilize debugging tools provided by your IDE or external hardware debuggers.

Serial Monitor: Print debug messages to a serial monitor to track variable values and program flow.

Breakpoints: Set breakpoints to pause execution and inspect the state of your microcontroller at specific points in the code.

In-Circuit Debuggers: Use debuggers to step through code and examine memory and registers.

8. Validation against Specifications

Focus: Ensure that the microcontroller and the entire system meet the required specifications and performance criteria.

Approach: Compare the tested functionality against your design requirements and specifications to confirm that all requirements are met.

9. User Testing

Focus: Ensure that the end-user experience is as expected.

Approach: Have real users test the system to provide feedback on usability and functionality. This is particularly important for consumer-facing applications.

10. Documentation and Reporting

Focus: Document your testing process and results.

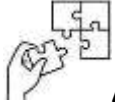
Approach: Create detailed reports on test cases, results, and any issues encountered. This documentation can be useful for troubleshooting, future development, and compliance purposes.

By thoroughly testing your microcontroller project across these various aspects, you can ensure a robust, reliable, and functional end product.



Points to Remember

- **LED Matrix Display Components**
 - ✚ **Microcontroller:** is a single integrated circuit (IC) that functions as a miniature computer and is intended to carry out particular tasks.
 - ✚ **LED dot matrix modules:** are displays that can be utilized in a wide range of computer system and architecture gadgets and projects.
 - ✚ **Key features:** Grid Layout, Control, Brightness and Driver ICs
 - ✚ **Types of controller board are:** Arduino, Raspberry Pi, ESP32/ESP8266, Beagle Bone and STM32 Nucleon
 - ✚ **Types of Power Supplies:** Linear Power Supplies, Switching Power Supplies, AC-DC Power Adapters, DC-DC Converters and Uninterruptible Power Supplies (UPS)
- **Interconnecting Display modules and Mounting on circuit board:**
 - ✚ **Steps to Interconnect Display Modules:** Choose the Right Components, Understand the Wiring Configuration, Gather Required Components, Wiring the Components, Install Required Libraries, Write and Upload the Code, Test the Interconnection, Troubleshooting (if needed)
 - ✚ **Steps for Mounting a Display Module on a Circuit Board:** Gather Necessary Tools and Materials, Prepare the Circuit Board, Insert the Display Module, Solder the Connections, Trim Excess Leads, Inspect and Test Connections, Final Assembly and Power Up and Test the Display
 - ✚ **The below steps are followed when programming a microcontroller:** Understanding Microcontrollers, Choosing a Microcontroller, Development Environment, Writing Code, Uploading Code, Debugging and then finally and Testing



Application of learning 2.1.

A MBIS Ltd Company want to display VIST RWANDA message on a new stadium; As Computer System and architecture technician you are required to write a VISIT RWANDA message that will be displayed on a new stadium for advertisement purpose. Suppose that you are hired to this job. Use Arduino IDE display a static message “VISIT RWANDA “on this 16x2 LCD using an ATmega328 microcontroller.



Indicative content 2.2: Identification of Configuration Software.



Duration: 2 hrs



Theoretical Activity 2.2.1 Description of display control software.

Tasks:

- 1: Answer the following questions:
 - i. What do you understand by the term:
 - a) Display control software
 - b) Screen orientation
 - c) Screen resolution
 - ii. Identify Common Screen Resolutions.
- 2: Write answers on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 2.2.1.
- 5: In addition, ask questions where necessary.



Key readings 2.2.1: Description of display control software.

1. Definitions

a. Display control software

It is used to manage and optimize the way content is displayed on screens, whether they are computer monitors, televisions, digital signage, or other types of displays. Here are some common features and types of display control software:

b. Screen Resolution and Orientation

Allows users to adjust screen resolution, orientation, and multiple display setups (e.g., extending or mirroring displays).

c. Screen Resolution

Screen resolution: is the number of distinct pixels displayed on a screen, affecting clarity and detail. This applies to both LED and LCD screens, as the technology primarily influences how the pixels are illuminated or arranged, not their count.

LED Screens: These are essentially LCD screens with LED backlighting. They use LEDs to illuminate the pixels, which allows for better color accuracy, contrast, and energy efficiency compared to traditional LCDs with CCFL (cold cathode fluorescent lamp) backlighting.

LCD Screens: These screens use liquid crystal displays with backlighting (either CCFL or LED). The resolution remains the same in terms of pixel count but can vary in terms of color and brightness performance due to the type of backlighting used.

1. Common screen resolutions:

- ✓ HD (720p): 1280 × 720 pixels
- ✓ Full HD (1080p): 1920 × 1080 pixels
- ✓ Quad HD (1440p): 2560 × 1440 pixels
- ✓ 4K (UHD): 3840 × 2160 pixels
- ✓ 8K: 7680 × 4320 pixels

Screen Orientation

Screen orientation determines how content displayed on the screen, and while the basic orientations are the same for LED and LCD screens, their application can vary depending on usage.

Landscape: The screen is wider than it is tall. This is the default and most common orientation for both types of screens.

Portrait: The screen is taller than it is wide. This is less common for general use but is useful for tasks like reading documents or coding.

Considerations

Aspect Ratio: Ensure that the resolution you choose maintains the correct aspect ratio for your screen to avoid distortion. Common aspect ratios include 16:9 for widescreens and 4:3 for older or more specialized displays.

Scaling: On high-resolution displays, especially with modern 4K or 8K screens, you may need to adjust scaling settings to ensure text and icons are readable and not too small.

Monitor Settings: Some monitors come with their own settings menus (often accessed via physical buttons on the monitor) that allow you to adjust resolution and orientation. This is particularly useful for external monitors or when using multiple displays.

Understanding and adjusting resolution and orientation helps ensure that content displayed clearly and efficiently, enhancing both productivity and visual comfort.

2. Color Calibration: Tools for adjusting and calibrating color settings to ensure accurate color representation on the screen.

In other words, the Color calibration is essential for ensuring that the colors displayed on your LED or LCD screen are accurate and consistent with the intended colors. This is crucial for tasks that require precise color reproduction, such as graphic design, photo editing, video production, and even general media consumption.

Why Color Calibration is important:

Accuracy: Ensures that the colors you see on the screen match the colors in the original source material.

Consistency: Provides uniform color reproduction across different devices and media.

Professional Standards: Meets industry standards for color accuracy in professional fields.

Here is how we can manually adjust settings to improve color accuracy

Brightness and Contrast: Adjust brightness to a comfortable level where white areas are bright but not washed out. Contrast should be set so that you can distinguish between different shades of gray.

Color Temperature: Set the color temperature to 6500K (D65) for most tasks, as this is close to daylight and offers balanced color.

Gamma: Set gamma to 2.2, which is the standard for most displays. This setting affects the brightness of mid-tones.

Common Calibration Standards:

sRGB: The standard color space for most web and general use.

Adobe RGB: A wider color gamut used for professional photo and print work.

DCI-P3: Used in digital cinema and increasingly in consumer displays.

❖ **Calibration Maintenance**

- **Recalibrate Regularly:** Displays can change over time, so recalibrate every few months or as needed.
- **Environment:** Ensure that the ambient lighting in your workspace is consistent and does not affect your display's color.

3. Display Management: Software that helps manage multiple displays, such as setting up different virtual desktops or arranging screens in a specific configuration.

4. Content Scheduling: For digital signage, this feature schedules when and what content displayed, managing playlists, and updating content remotely.

5. **Remote Control and Monitoring:** Tools that allow users to control and monitor displays remotely, which is useful for managing digital signage networks or troubleshooting issues.
6. **Custom Layouts and Zones:** For advanced setups, this feature lets users define custom display zones or layouts for content shown in specific areas of the screen.
7. **Performance Monitoring:** Monitors the performance of displays and connected hardware, providing diagnostic information and alerts.
8. **Driver and Firmware Updates:** Keeps display drivers and firmware up-to-date to ensure compatibility and performance.
9. **Popular examples of display control software include:**
 - **DisplayFusion:** Provides advanced multi-monitor management features and customization options.
 - **ScreenSplit:** Software that helps in managing window layouts on a single display.
 - **XSplit:** Often used for streaming and content creation, offering features for display and video management.
 - **CompuLink:** Used for managing digital signage and content distribution across multiple screens.
 - **LG SuperSign:** Software for managing and controlling LG digital signage displays. The specific software you might need depends on your use case, whether it's for personal use with multiple monitors or for managing a network of digital signage displays.



Theoretical Activity 2.2.2: Identification of Video processing and Media



Tasks:

- 1: Answer the following questions:
 - i. What do you understand the following team:
 - a. Video Processing Software
 - b. Media player software
 - ii. Explain the types of Video Processing Software
- 2: Provide the answers for the asked questions and write them on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 2.2.2.
- 5: In addition, ask questions where necessary.



Key readings 2.2.2: Identification of Video processing and Media Player

1. Video processing software

Video processing software used to edit, enhance, and manipulate video content. Whether you are a professional video editor, a content creator, or just looking to improve your home videos, the right software can make a significant difference in the quality and efficiency of your video projects.

Here is a comprehensive overview of video processing software, including popular options, key features, and usage scenarios:

2. Types of Video Processing Software

Video processing software comes in various types, each tailored for specific tasks and needs. Here's a breakdown of the main categories:

Video Editing Software

- **Non-Linear Editors (NLEs):** Tools like Adobe Premiere Pro, Final Cut Pro, and DaVinci Resolve that allow users to edit video footage in a non-destructive manner.
- **Basic Editors:** Simple applications like iMovie and Windows Movie Maker for quick edits and straightforward projects.

Video Conversion Software

- **Transcoding Tools:** Software such as HandBrake and FFmpeg that convert videos from one format to another, adjusting codecs, resolutions, and bitrates.
- **Batch Converters:** Programs that can process multiple files simultaneously, like Any Video Converter.

Video Compression Software

- Tools like WinZip or specific video compressors designed to reduce file sizes while maintaining quality, often used for online sharing.

Video Effects and Animation Software

- **Visual Effects Software:** Programs like Adobe After Effects and Blender for creating complex visual effects and motion graphics.
- **Animation Software:** Tools like Toon Boom and Adobe Animate for creating 2D animations.

Screen Recording Software

- Applications like OBS Studio, Camtasia, and ScreenFlow that capture video directly from your screen, useful for tutorials and gameplay recordings.

Video Surveillance Software

- Specialized software for managing and analyzing video feeds from security cameras, like Milestone XProtect and Blue Iris.
- ✚ Streaming Software
 - Platforms like OBS Studio and Streamlabs that allow users to broadcast live video content to platforms like Twitch and YouTube.
- ✚ Video Enhancement Software
 - Tools focused on improving video quality, like Topaz Video Enhance AI, which uses AI to upscale and enhance footage.
- ✚ Collaboration and Review Software
 - Platforms like Frame.io and Wipster that facilitate collaboration among teams by allowing for video reviews and feedback.
- ✚ Specialized Software
 - Tools for specific purposes like subtitle editing (Aegisub), color grading (DaVinci Resolve), or 360-degree video editing (Kolor Autopano Video).

Key Features

- Editing Tools:** Cutting, trimming, merging, and rearranging clips, as well as adding transitions, text, and effects.
- Audio Management:** Tools for audio editing, mixing, and syncing, including noise reduction and equalization.
- Color Correction and Grading:** Adjusting color balance, brightness, contrast, and applying color effects.
- Export Options:** Various file formats, resolutions, and codecs to ensure compatibility with different devices and platforms.
- Performance and Rendering Speed:** Efficient processing and rendering capabilities to handle high-resolution videos and complex projects.
- User Interface:** An intuitive and customizable interface that matches your workflow and preferences.

✚ Media player software

Media player software: is essential for playing various types of media files, including video, audio, and streaming content. It helps in managing and enjoying multimedia content on your computer or other devices. Here's a comprehensive guide to media player software, including popular options, key features, and usage scenarios:

Types of Media player software

✚ General Media Players3

Purpose: Play a wide range of audio and video formats, often with support for playlists and library management.

Examples:

- **VLC Media Player:** Free and open-source with support for nearly every media format, including DVDs, CDs, and streaming protocols. Known for its versatility and broad format support.
- **Windows Media Player:** Built into Windows with basic media playback features and integration with Windows libraries.
- **QuickTime Player:** Apple's media player for macOS, known for its support of high-quality video formats and integration with macOS.

Advanced Media Players

Purpose: Offer advanced features such as video editing, playback controls, and enhanced audio/video effects.

Examples:

- **PotPlayer:** A feature-rich media player with extensive format support, customizable controls, and advanced playback options.
- **KMPlayer:** Supports a wide variety of formats and provides advanced playback controls and customization options.
- **GOM Player:** Includes built-in codec support, video playback features, and options for customizing the user interface.

iii. Audio-Only Players

Purpose: Focus solely on audio playback with advanced features for managing and organizing music libraries.

Examples:

- **Foobar2000:** A highly customizable audio player with support for various audio formats and features like tagging and playlist management.
- **Winamp:** Known for its skinning options and music library management, though less commonly used now.

iv. Streaming Media Players

Purpose: Play streaming media content from online services and platforms.

Examples:

- **Plex:** Organizes and streams your media library, including videos, music, and photos, and can be accessed from various devices.
- **Kodi:** An open-source media center that can stream content from various online sources and manage local media libraries.

Choosing the Right Media Player

- **For Basic Use:** VLC Media Player is a great choice for its broad format support and user-friendly interface. It's suitable for general media playback needs. Windows Media Player and QuickTime Player are good for users who prefer integrated or built-in solutions.
- **For Advanced Features:** PotPlayer and KMPlayer offer more advanced playback controls and customization options. GOM Player is useful if you need built-in codec support and additional playback features.
- **For Audio Focus:** Foobar2000 is ideal for audiophiles who need advanced features for managing and playing music.
- **For Streaming and Media Center:** Plex and Kodi are excellent choices for users who want to manage and stream their media libraries across different devices.



Theoretical Activity 2.2.3: Description of Mapping and Calibration software.



Tasks:

- 1: Answer the following questions:
 - i. Define the following team:
 - a. Mapping software
 - b. Geographic Information Systems (GIS)
 - c. Calibration Software
 - ii. Explain three considerations when choosing mapping software
- 2: Provide the answers for the asked questions and write them on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 2.2.3
- 5: In addition, ask questions where necessary.



Key readings 2.2.3: Description of Mapping and Calibration software.

Mapping software: is a broad category that includes various tools for creating, analysing, and visualizing geographic or spatial data. Depending on your needs whether you are working with geographic information systems (GIS), creating custom maps, or analysing spatial data there are different software options available. Here is an overview of some popular mapping software:

1. Geographic Information Systems (GIS): GIS software is used for creating, managing, and analysing spatial data.

- **ArcGIS:** Developed by Esri, it is one of the most comprehensive GIS platforms. It offers tools for mapping, spatial analysis, and data management. ArcGIS Online provides cloud-based mapping solutions.
 - **QGIS:** An open-source GIS tool that supports various data formats and offers extensive plugins for additional functionality. It is widely used due to its flexibility and cost-effectiveness.
 - **MapInfo Professional:** A desktop GIS application known for its mapping and spatial analysis capabilities. It is particularly popular in business and government sectors.
 - **GRASS GIS:** Another open-source GIS software with powerful tools for spatial modelling, data analysis, and geostatistics.
- 2. Online Mapping Services:** These are web-based tools that offer mapping capabilities, often with APIs for integration into other applications.
- **Google Maps API:** Provides interactive maps and location-based services. It is widely used for embedding maps into websites and applications.
 - **Mapbox:** Offers customizable maps and location data APIs. It is known for its high quality, customizable map visualizations and robust developer tools.
 - **OpenStreetMap (OSM):** A collaborative project that provides free editable maps. You can use OSM data with various tools and services.
 - **Bing Maps:** Microsoft's mapping service offering APIs for integrating maps into applications and websites.
- 3. Desktop Mapping Software:** These applications are installed on your computer and offer extensive mapping and analysis features.
- **AutoCAD Map 3D:** Combines CAD and GIS features for mapping and spatial data management. It is widely used in engineering and architecture.
 - **Global Mapper:** A GIS application known for its user-friendly interface and support for a wide range of spatial data formats.
 - **ERDAS IMAGINE:** Focuses on remote sensing and geospatial data analysis, often used in environmental and resource management applications.
- 4. Specialized Mapping Tools:** These tools cater to specific needs within the mapping domain.
- **Surfer:** Used for 3D surface mapping and analysis, often employed in scientific research and engineering.
 - **MapInfo Professional:** Known for its strong business analysis capabilities, including spatial data analysis and map creation.

- **Kepler.gl:** An open-source geospatial analysis tool for visualizing large-scale data sets. It's often used for big data visualization.

5. Open-Source Tools: Many open-source tools provide robust mapping capabilities without the cost of commercial software.

- **Leaflet:** A lightweight open-source JavaScript library for interactive maps. It's popular for web-based mapping applications.
- **D3.js:** A JavaScript library for producing dynamic, interactive data visualizations, including maps.
- **JOSM (Java OpenStreetMap Editor):** An open-source editor for creating and editing OpenStreetMap data.

6. Mobile Mapping Applications: For mobile or field use, these apps provide mapping capabilities directly on your smartphone or tablet.

- ✓ **Locus Map:** A versatile map app for Android with offline capabilities and various map types.
- ✓ **GIS Cloud Mobile Data Collection:** Allows field data collection and mapping using mobile devices.

Considerations When Choosing Mapping Software

Purpose: Determine whether you need GIS functionality, online mapping, or specific analysis tools.

Budget: Open-source options are available if cost is a concern, while commercial software often provides advanced features and support.

Ease of Use: Consider the learning curve and user interface, especially if you're new to mapping software.

Integration: Ensure the software integrates well with other tools or systems you use.

Calibration software: is used to adjust the color, brightness, contrast, and other settings to ensure the display shows accurate and consistent images across different devices or environments. Here's an overview of how it works and popular tools available for calibration:

1. Key Features of Calibration Software

Color Accuracy: Adjusts RGB values to ensure true-to-life color reproduction, essential for photography, design, and video editing.

Gamma Correction: Optimizes the tonal range of the display, ensuring that the brightness levels are accurately represented.

Brightness and Contrast: Balances these settings so that both light and dark areas are displayed clearly without distortion.

White Balance: Adjusts the color temperature, affecting the display's warmth (yellowish) or coolness (bluish).

Gray Balance: Ensures that grayscale content is properly displayed, without unwanted color tinting.

Uniformity: Some tools can correct uneven brightness or color across the display, particularly in larger screens.

Hardware Calibration:

Calibration often requires hardware, such as a colorimeter or spectrophotometer, to measure the output of the display accurately. These devices work with calibration software to create a profile that adjusts the display's output to a standard.

Popular Calibration Software for LED/LCD Displays:

X-Rite i1Profiler:

Works with X-Rite's i1Display Pro or i1Studio devices.

Offers detailed control over color settings.

Supports advanced calibration for photographers and designers.

Datacolor SpyderX:

Paired with Datacolor's SpyderX calibration device.

Easy-to-use software for beginners but with advanced options for professionals.

Fast calibration process and includes features like ambient light monitoring.

DisplayCAL (open-source):

Free and open-source software that works with many calibration tools, including X-Rite and Datacolor devices.

Extensive customization for expert users.

Highly accurate, supporting ICC profiles and 3D LUTs (Look-Up Tables) for video editing.

CalMAN:

Used widely in professional TV calibration.

Supports both SDR and HDR calibration.

Can be used with various calibration tools like the X-Rite i1Display Pro.

ArgyllCMS:

Command-line based calibration tool with extensive control over calibration processes.

Supports colorimeters and spectrometers, and is often used by DisplayCAL.

BenQ Palette Master Element:

Specific to BenQ monitors with hardware calibration support.

Works with X-Rite and Datacolor devices.

Optimized for photographers and color-sensitive work.

Calibration Process:

Setup: Connect the calibration hardware to the display.

Software Configuration: Open the calibration software, select your display type, and configure settings based on the usage needs (e.g., photo editing, gaming, movie watching).

Measurement: The calibration device reads the screen's output for color, brightness, and contrast. The software guides you through the adjustments.

Profile Creation: After calibration, the software generates a color profile (ICC profile) that ensures the display operates according to the calibration.

Regular Maintenance: Calibration should be done regularly (every few weeks or months) to ensure consistency, as displays can drift over time.

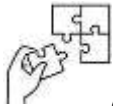
Using calibration software ensures your LED/LCD display shows accurate and consistent visuals, which is critical for professionals in color-sensitive fields like photography, video editing, and graphic design.



Points to Remember

- ✦ **Display control software** is used to manage and optimize the way content is displayed on screens, whether they are computer monitors, televisions, digital signage, or other types of displays.
 - ✦ **Screen Resolution and Orientation:** Allows users to adjust screen resolution, orientation, and multiple display setups
 - ✦ **Screen resolution:** is the number of distinct pixels displayed on a screen, affecting clarity and detail.
 - ✦ **LED Screens:** These are essentially LCD screens with LED backlighting.
 - ✦ **LCD Screens:** These screens use liquid crystal displays with backlighting (either CCFL or LED).
 - ✦ **Common Resolutions:** HD (720p): 1280 × 720 pixels, Full HD (1080p): 1920 × 1080 pixels, Quad HD (1440p): 2560 × 1440 pixels, 4K (UHD): 3840 × 2160 pixels, 8K: 7680 × 4320 pixels
 - ✦ **Popular examples of display control software include:** Display Fusion, Screen Split, XSplit and CompuLink.
- ❖ **Video processing software** used to edit, enhance, and manipulate video content.

- ❖ **Types of Video Processing Software:** Video Editing Software, Video Conversion Software, Video Compression Software, Video Effects and Animation Software, Screen Recording Software, Video Surveillance Software, Streaming Software, Video Enhancement Software
- ❖ **Media player software:** is essential for playing various types of media files, including video, audio, and streaming content.
- ❖ **Types of Media Player Software:** General Media Players3, VLC Media Player, Windows Media Player, QuickTime Player
- ❖ **Mapping software:** is a broad category that includes various tools for creating, analysing, and visualizing geographic or spatial data. There are popular mapping software such as GIS, Google Maps API, AutoCAD Map 3D, Surfer, Leaflet and Locus Map
- ❖ **Calibration software** is used to adjust the color, brightness, contrast, and other settings to ensure the display shows accurate and consistent images across different devices or environments
- ❖ **Calibration Process:** Setup, Software Configuration, Measurement, Profile Creation, and Regular Maintenance.
- ❖ **To ensure consistent color across multiple displays:** We use the following software; CalMAN, DisplayCAL, or X-Rite i1Profiler.



Application of learning 2.2.

EM Company wants to configuring LED/LCD screen but they haven't more information about configuration software. Let say you are a Computer System and Architecture technician and you are tasked to tell them more information about configuration software which is used to configuring LED/LCD screen.



Indicative content 2.3: Configuration of Visual Parameters.



Duration: 5 hrs



Practical Activity 2.3.1: Installing Drivers and calibrating LED/LCD Screen.



Task:

- 1: As technician, you are required to go to install drivers and calibrate LED/LCD Screen.
- 2: Read the key readings 2.3.1 and ask clarifications where necessary.
- 3: Present your work to trainer or whole class.
- 4: Ask clarifications and supports where necessary.



Key readings 2.3.1: Installation drivers and calibrating LED/LCD Screen.

By following these steps, you can ensure that your LED/LCD screen is running with the correct drivers and is calibrated for the best possible image quality.

Step 1: Installing Drivers

1. Identify Your Display

- ✓ **Check the Model:** Look for the model number on the back or bottom of the monitor.
- ✓ **Manufacturer Information:** Write down the brand and model number for reference.

2. Download Drivers

- ✓ **Visit the Manufacturer's Website:**
 - Go to the official support page for your monitor brand (e.g., Dell, HP, LG).
- ✓ **Search for Drivers:**
 - Enter your monitor's model number in the search bar.
 - Navigate to the driver downloads section.
- ✓ **Choose the Right Driver:**
 - Look for display drivers or monitor drivers (often listed as INF files).
- ✓ **Download the Driver:**
 - Click on the appropriate download link and save the file to your computer.

3. Install the Drivers

- ✓ **Windows:**
 1. Locate the downloaded driver file.

2. Double-click on the file to start the installation.
3. Follow the on-screen prompts to complete the installation.

✓ **Mac:**

1. Open the downloaded file.
2. If it's a package file, follow the installation instructions.
3. Restart your Mac if necessary.

4. Verify Installation

✓ **Windows:**

1. Right-click on the desktop and select **Display Settings**.
2. Ensure your monitor is detected and the resolution is set correctly.

✓ **Mac:**

1. Go to **System Preferences > Displays**.
2. Confirm that your monitor is recognized and set to the correct resolution.

Step 2: Calibrating the Screen

1. Access Calibration Tools

✓ **Windows:**

1. Go to **Control Panel**.
2. Click on **Display**.
3. Select **Calibrate Color**.

✓ **Mac:**

1. Open **System Preferences**.
2. Click on **Displays**.
3. Go to the **Color** tab and click **Calibrate**.

2. Start the Calibration Wizard

- ✓ Follow the prompts provided by the calibration tool.

✓ **Windows:**

- The wizard will guide you through adjusting brightness, contrast, gamma, and color balance.

✓ **Mac:**

- The wizard will also guide you through similar settings.

3. Adjust Brightness and Contrast

✓ **Brightness:**

- Increase until whites are bright but not blinding.

✓ **Contrast:**

- Adjust to see clear differences between dark and light shades.

4. Adjust Gamma

- ✓ Follow the on-screen instructions to adjust gamma settings for balanced midtones.

5. Adjust Color Balance

- ✓ Modify the levels of red, green, and blue to achieve natural skin tones and colors.
- ✓ Use test images if available to assist with adjustments.

6. Use Test Patterns (Optional)

- ✓ Find online test patterns for contrast and color accuracy.
- ✓ Use these patterns to help evaluate your settings visually.

7. Fine-Tune Settings

- ✓ After completing the wizard, you may want to go into your monitor's on-screen display (OSD) menu for further adjustments.

8. Save Calibration Profile

✓ **Windows:**

1. After calibration, you may be prompted to save the profile.
2. Name it appropriately (e.g., "Calibrated Monitor").

✓ **Mac:**

- The new profile is saved automatically; you can select it in the Color tab.

Step 3: Regular Maintenance

- ✓ **Recalibrate Periodically:** It's good practice to recalibrate your monitor every few months, especially if used for color-sensitive work.
- ✓ **Adjust Based on Environment:** Recalibrate if the lighting conditions in your workspace change significantly.



Practical Activity 2.3.2: Applying light, color, and size.



Task:

- 1: As technician, you are required to go to Apply Light, color, and size.
- 2: Read the key readings 2.3.2 and ask clarifications where necessary.
- 3: Present your work to trainer or whole class.
- 4: Ask clarifications and supports where necessary.



Key readings 2.3.2: Applying light, color, and size.

Applying light, color, and size in LED and LCD screens involves several steps, each critical to the display's functionality and quality. Here's a breakdown:

1. Understanding the Basics

- ✓ **LED (Light Emitting Diode):** Uses LEDs as a light source. Can be full-array or edge-lit.
- ✓ **LCD (Liquid Crystal Display):** Requires a backlight (often LED) to illuminate the liquid crystals.

2. Choosing the Right Backlight

- ✓ For **LCDs**, select an appropriate LED backlight type (full-array for better uniformity or edge-lit for thinner designs).
- ✓ Consider brightness levels needed for the intended use (e.g., gaming, outdoor, etc.).

3. Color Management

- ✓ **Color Filters:** For LCDs, apply RGB filters to liquid crystals to produce colors. Ensure the right combination of red, green, and blue for accurate color reproduction.
- ✓ **Color Calibration:** Use software and hardware tools to calibrate the screen to ensure colors are true to life.

4. Adjusting Brightness and Contrast

- ✓ **Brightness Levels:** Adjust the intensity of the backlight. For LEDs, this can be done through PWM (Pulse Width Modulation).
- ✓ **Contrast Ratio:** Optimize the liquid crystal alignment for better contrast. Higher contrast enhances color depth and clarity.

5. Sizing the Display

- ✓ **Screen Size:** Determine the physical dimensions based on the application (e.g., mobile, desktop, signage).
- ✓ **Pixel Density:** Calculate the pixel density (PPI) for clarity. Higher pixel density means sharper images.

6. Testing and Optimization

- ✓ **Visual Testing:** Check for uniformity in brightness and color across the screen.
- ✓ **Software Tools:** Use calibration tools to adjust settings for optimal performance.

7. Final Adjustments

- ✓ **User Settings:** Allow for user-defined settings (e.g., color temperature adjustments, preset modes for gaming or media).

- ✓ **Environmental Adaptation:** Implement sensors for adaptive brightness based on ambient light conditions.

8. Quality Control

- ✓ Conduct rigorous quality control tests to ensure that the display meets the desired specifications in terms of light output, color accuracy, and size.



Points to Remember

- By following these steps, you can ensure that your LED/LCD screen is running with the correct drivers and is calibrated for the best possible image quality.
 - ✓ **Installing Drivers:** Identify Your Display, Download Drivers, Select and Download, Install the Drivers, Verify Installation.
 - ✓ **Calibrating the Screen:** Access Calibration Tools, Start the Calibration Wizard, Adjust Brightness and Contrast, Adjust Gamma, Adjust Color Balance, Use Test Patterns, Fine-Tune Settings, Save Calibration Profile.
 - ✓ Regular Maintenance
- Applying light, color, and size in LED and LCD screens involves several steps, each critical to the display's functionality and quality. Here's a breakdown:
 - ✓ Understanding the Basics
 - ✓ Choosing the Right Backlight
 - ✓ Color Management
 - ✓ Adjusting Brightness and Contrast
 - ✓ Sizing the Display
 - ✓ Testing and Optimization
 - ✓ Final Adjustments
 - ✓ Quality Control



Application of learning 2.3.

One of your company supervisors have a Computer which was working properly two weeks ago and now is displaying a black screen and not calibrated and light, color and size are not applied but one week ago this computer was not accessing wi-fi network; from that it was not displaying the available wireless names. As computer System and architecture technician, you are requested to troubleshoot these issues.



Indicative content 2.4: Perform Content Loading.



Duration: 7 hrs



Theoretical Activity 2.4.1: Description of digital content management.



Tasks:

- 1: Answer the following questions:
 - i. What do you understand by Content loading
 - ii. What are the benefits of Ethernet in Professional Displays?
 - iii. Differentiate HDMI over DisplayPort (DP)?
 - iv. Describe the benefits of Wi-Fi in Smart TVs
- 2: Provide the answers for the asked questions and write them on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 2.4.1.
- 5: In addition, ask questions where necessary.



Key readings 2.4.1: Description of Digital content Management.

1. Definition of Content loading

Content loading: refers to the process of transferring, updating, or displaying digital content (such as text, images, or videos) on an LED or LCD screen. This is essential for applications such as advertising displays, digital signage, and user interfaces. The process of content loading typically involves several key components:

✚ Content Creation & Formatting

Digital Content: First, the content (images, videos, or other media) needs to be created or formatted to suit the display's specifications. For LED/LCD screens, this often involves ensuring that the content fits the screen's resolution (e.g., 1920x1080 for Full HD or other custom dimensions).

Aspect Ratio: Maintaining the correct aspect ratio is crucial to avoid distortion. Common aspect ratios include 16:9, 4:3, and custom ratios for LED walls.

✚ Content Management System (CMS)

A CMS is often used to manage the scheduling and distribution of content. This software allows users to upload, organize, and set schedules for when the content will be displayed on the LED/LCD.


The CMS can be cloud-based or installed locally, depending on the needs of the user. Modern CMS platforms can even allow remote access to upload and manage content.

Content Transfer

Content needs to be transferred from a source (such as a computer, USB drive, or cloud storage) to the display unit. Common methods include:

Ethernet: Ethernet in LED/LCD displays refers to the integration of networking capabilities directly into the display, allowing the device to connect to a Local Area Network (LAN) via an Ethernet port. This feature is primarily found in smart TVs, digital signage, and professional displays. Here is how it works and the benefits it provides:

Many modern smart TVs come equipped with Ethernet ports alongside built-in Wi-Fi. The Ethernet connection offers a more stable and faster connection than Wi-Fi for streaming content and other network-related tasks.

-  **Benefits:** Stable Connectivity: Ethernet provides a more reliable and faster connection for streaming high-definition (HD) or 4K content from services like Netflix, YouTube, or Amazon Prime.
- ✓ **Low Latency:** A wired Ethernet connection reduces lag and buffering, providing smoother media playback, especially in areas where Wi-Fi might be unreliable.
- ✓ **Software Updates:** TVs can download software or firmware updates faster and more reliably via Ethernet.
- ✓ **Smart Features:** Built-in Ethernet allows access to online services, apps, and other smart features like browsing, gaming, or accessing cloud content.

Ethernet in Professional Displays (Digital Signage)

In digital signage and commercial displays, Ethernet is widely used for centralized content management and remote control.

Benefits:

- ✓ **Centralized Content Delivery:** Using Ethernet, content like advertisements, announcements, or informational slides can be updated remotely and delivered to multiple screens simultaneously via a network.
- ✓ **Remote Monitoring:** Administrators can monitor and manage the displays from a central location. They can check for issues, control settings, or perform updates without physical access.
- ✓ **Real-Time Updates:** Ethernet allows for real-time content updates and scheduling changes, critical for applications like news feeds, stock prices, weather updates, or event information.

✓ **Power over Ethernet (PoE):** Some commercial displays support PoE, meaning they can receive power and data over the same Ethernet cable. This reduces the need for additional power wiring, simplifying installations.

✓ Power over Ethernet (PoE) in LED Displays

✓ In LED displays, particularly for commercial or signage purposes, Power over Ethernet (PoE) may be supported. PoE allows both power and data to be transmitted over a single Ethernet cable.

✚ **Advantages of PoE in LED Displays:**

✓ **Simplified Setup:** Only one cable is needed for both power and data, making the installation neater and easier, especially in hard-to-reach places.

✓ **Cost-Effective:** Reduces the need for electrical wiring and power outlets, especially in large display setups.

✓ **Remote Power Management:** Allows the administrator to control the power supply remotely.

✓ **Home Use (Smart TVs):** For streaming, gaming, and accessing smart features.

✓ **Commercial Use (Digital Signage):** For displaying advertisements, real-time updates in public places like malls, airports, hospitals, and more.

✓ **Business and Conference Rooms:** For easy sharing of presentations, videos, and other media from a centralized server or device.

PoE: Power over Ethernet can further simplify setups, providing both power and data via a single cable.

✚ **HDMI/DP/DVI**

HDMI (High-Definition Multimedia Interface), DisplayPort (DP), and DVI (Digital Visual Interface): are common interfaces used for content loading and transfer to LED and LCD displays. Each of these connections has its specific characteristics and uses when connecting media sources to displays. Let's break down how each of these interfaces works in the context of content loading for LED/LCD displays:

a. **HDMI (High-Definition Multimedia Interface)**

HDMI is one of the most popular connections for transmitting high-quality audio and video between devices, and it supports many modern LED/LCD screens.

✓ **Video Quality:** HDMI can support resolutions ranging from 480p to 8K (7680x4320), depending on the HDMI version (1.4, 2.0, or 2.1).

✓ **Audio and Video Together:** HDMI can transmit both audio and video, making it a convenient choice for most displays, particularly when the display has built-in speakers or is connected to an external sound system.

✓ **Content Loading:** When content is loaded via an HDMI source (e.g., a laptop, media player, or streaming device),

- ✓ it is directly mirrored or extended onto the display. This is especially common for presentations, digital signage, or TV screens.
- ✓ **HDCP (High-bandwidth Digital Content Protection):** HDMI connections often support HDCP to protect against unauthorized copying of high-definition content. If you're streaming protected content (e.g., from a Blu-ray player or streaming service), HDCP ensures that the media is transmitted securely.
HDMI is widely used in consumer-grade LCDs, digital signage systems, and home setups where ease of connection and audio/video in a single cable are required.
- b. DisplayPort (DP):** DisplayPort is often used in more professional environments or for high-performance displays, particularly for high-resolution content and multiple screen setups.
 - ✓ **Video Quality:** DisplayPort supports higher resolutions and refresh rates than HDMI, including 4K at 144Hz and 8K at 60Hz, making it ideal for high-end LCDs and LED video walls.
 - ✓ **Multiple Monitors:** One of the key advantages of DisplayPort is Multi-Stream Transport (MST), which allows daisy-chaining multiple monitors from a single DP connection. This is particularly useful for large video wall setups or multi-display configurations.
 - ✓ **Audio and Video:** Like HDMI, DisplayPort can transmit both audio and video, but it's more commonly used for high-resolution video, especially in professional settings (e.g., gaming, video production, and high-end commercial displays).
 - ✓ **DisplayPort Versions:** The latest versions (like DisplayPort 2.0) support up to 16K resolution, making it suitable for future-proof setups.
DisplayPort is often found in professional monitors, high-resolution LED/LCD displays, or systems where multiple screens need to be driven by a single source, such as control rooms or professional signage.
- c. DVI (Digital Visual Interface):** DVI is an older standard but still widely used in some cases. It primarily transmits video and does not carry audio like HDMI or DisplayPort.
 - ✓ **Video Quality:** DVI can support up to 1920x1200 resolution (Single Link DVI) and 2560x1600 resolution (Dual Link DVI). It's commonly used in older LCD displays or for basic digital signage setups where high resolutions aren't necessary.
 - ✓ **No Audio:** Since DVI transmits only video, an additional connection (such as a 3.5mm audio cable or separate sound system) is required if audio is needed.
 - ✓ **Compatibility with HDMI:** DVI and HDMI are somewhat compatible, meaning that you can use adapters to connect an HDMI device to a DVI display or vice versa. However, since DVI does not carry audio, you would lose the audio functionality when using an HDMI-to-DVI adapter.

✓ **DVI Variants:** There are several types of DVI connectors:

- **DVI Variants:** There are several types of DVI connectors:
- **DVI-D (Digital):** For digital video signals.
- **DVI-A (Analog):** For analog signals.
- **DVI-I (Integrated):** Supports both digital and analog signals.

DVI is often found in older displays, low-end digital signage, or situations where audio isn't a concern. It is also used with older projectors and monitors in business or industrial setups.

Feature	HDMI	DisplayPort (DP)	DVI
Max Resolution	Up to 10K (HDMI 2.1)	Up to 16K (DP 2.0)	1920x1200 (Single Link) / 2560x1600 (Dual Link)
Audio Support	Yes (audio + video)	Yes (audio + video)	No (video only)
Cable Length	Up to 15m (for 1080p)	Up to 3m for 8K, longer for lower resolutions	Up to 5m
Multi-Monitor Support	No (requires multiple ports)	Yes (with MST for daisy-chaining)	No
Use Case	Consumer displays, home theater, signage	Professional setups, high-res displays, multi-monitor	Older monitors, basic displays
Compatibility	Common in most consumer electronics	Common in high-end monitors, video walls	Used in older setups

USB (Universal Serial Bus): serve multiple purposes depending on the model and brand.

The most common uses of USB ports in such TVs:

1. Media Playback: Photo, Music, and Video Playback: Many LED/LCD TVs with USB ports allow you to connect a USB drive (flash drive, external hard drive) and directly play media files such as photos, music, and videos. Supported file formats typically include MP3 (audio), JPEG (photos), MP4, MKV, AVI (video), etc.

PVR (Personal Video Recorder): Some TVs offer the ability to record live TV to an external storage device, like a USB drive. This is especially useful for time-shifting TV programs.

2. Software Updates: Firmware Upgrades: Manufacturers release updates for TV software to improve performance or add features. You can download the update to a USB drive from the manufacturer's website and then plug the drive into the TV to install the update.

3. Power Supply: Powering Devices: The USB port can sometimes be used to power devices like a streaming stick (Amazon Fire Stick, Roku, Chromecast), a small USB-powered light, or charge devices like smartphones.

4. Connecting External Devices: USB Keyboard/Mouse: Some smart TVs support connecting a USB keyboard or mouse for easier navigation of the TV's interface or for web browsing.

Webcams/Accessories: If the TV has video conferencing features, the USB port may allow you to connect a webcam or other compatible accessories.

5. Service Port: Diagnostics/Service: In some cases, the USB port is primarily for service technicians, allowing them to diagnose or fix issues with the TV.

Wi-Fi in LED/LCD displays: especially in smart TVs and digital signage, enables these devices to connect wirelessly to the internet or a local network, providing a range of smart features without the need for a physical Ethernet connection. Here is an overview of how Wi-Fi is integrated into LED/LCD displays and its key benefits:

1. Wi-Fi in Smart TVs (LED/LCD)

Modern smart TVs are equipped with Wi-Fi capabilities that allow them to connect to the internet without needing a wired Ethernet connection.

This integration enables smart features such as:

Key Features:

Streaming Services: Access to platforms like Netflix, YouTube, Hulu, and Amazon Prime Video directly from the TV without needing an external device (e.g., Chromecast, Firestick).

App Store: Many smart TVs have app ecosystems (e.g., Android TV, Roku, LG WebOS, Samsung Tizen) where users can download various apps and games.

Web Browsing: Some TVs come with built-in web browsers, allowing users to surf the web from the TV screen.

Media Sharing: With Wi-Fi, users can wirelessly share content like videos, photos, and music from their smartphones, tablets, or computers to the TV via services like DLNA or Miracast.

Voice Assistants: Many modern smart TVs are integrated with voice assistants like Google Assistant or Alexa, which can operate over Wi-Fi.

Benefits of Wi-Fi in Smart TVs:

Wireless Convenience: No need to run physical Ethernet cables, which can be cumbersome, especially if the TV is mounted on a wall or placed in a room far from the router.

Easy Setup: Connecting to Wi-Fi is often as simple as selecting the network and entering the password, which makes setup much quicker.

Portability: If the TV is moved to another room, it can quickly reconnect to the Wi-Fi network without the need for rewiring.

Wi-Fi allows smart TVs to receive over-the-air (OTA) updates, keeping the software up to date with the latest features and security improvements.

2. Wi-Fi in Digital Signage (Commercial Displays)

In digital signage (commercial-grade LED/LCD displays used in advertising, information displays, etc.), Wi-Fi plays a crucial role in remotely managing and updating content.

Benefits for Digital Signage.

Remote Content Management: Using Wi-Fi, administrators can push updates, videos, images, and announcements to the screens remotely without the need for a physical connection. This is especially useful in large installations, such as malls, airports, and corporate offices.

Easy Installation: Wi-Fi eliminates the need to run Ethernet cables to every display, reducing installation costs and simplifying the process.

Real-Time Updates: Content like news feeds, weather updates, advertisements, and stock prices can be updated in real time via the internet.

Interactive Displays: Wi-Fi enables certain digital signage to interact with users via mobile apps, QR codes, or NFC, allowing for enhanced engagement.

3. Wi-Fi Direct and Screen Mirroring

Some LED/LCD displays support Wi-Fi Direct, which allows the TV or display to connect directly to other devices (like smartphones, tablets, or laptops) without needing a wireless router. This is commonly used for:

Screen Mirroring: With technologies like Miracast, users can mirror their phone or laptop screen to the TV wirelessly, which is useful for presentations, media sharing, and gaming.

Casting: Features like Google Cast allow users to cast content (e.g., YouTube videos, music) from their phones to the TV over Wi-Fi.

4. Wi-Fi vs. Ethernet in LED/LCD Displays

While both Wi-Fi and Ethernet can connect LED/LCD displays to the internet, each has its pros and cons:

Ethernet over Wi-Fi: Ethernet offers better speed and reliability for high-quality streaming and professional use.

Networked Control: Especially in digital signage, Ethernet enables remote content management and system control.

Feature	Wi-Fi	Ethernet
Convenience	Easy to set up, no cables needed	Requires physical wiring
Speed	Can vary based on signal strength	More stable and consistent, ideal for 4K/8K streaming
Interference	Prone to interference from walls/devices	No interference, more reliable connection
Mobility	Wireless, so easy to move the device	Tied to the location of the Ethernet port



Theoretical Activity 2.4.2: Identification of Video Switcher, Live Feed and Broadcasting.

Tasks:

1: Answer the following questions:

- i. What do you understand the following team:

- a. Video Switcher in LED/LCD screen
 - b. Real-Time Effects
 - ii. What is the difference between live feed and broadcasting?
 - iii. State at least four places where live feed can be used?
- 2: Write answers on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 2.4.2
- 5: In addition, ask questions where necessary.



Key readings 2.4.2: Identification of Video Switcher, Live Feed and Broadcasting

1. Definitions.

✚ **A video switcher (also known as a vision mixer)** is a device used in video production to select between several different video sources.

✚ **The use of Video switchers:**

- ✓ composite video sources together,
- ✓ apply effects
- ✓ control live output to a display or stream.
- ✓ live television
- ✓ web streaming
- ✓ events and
- ✓ video productions where multiple cameras or video feeds are involved.

✚ **The main functions of a video switcher:**

- **Source Selection:** Allows the operator to choose which video feed (from multiple cameras, pre-recorded videos, or computer inputs) should be displayed or broadcast.
- **Transitions:** Provides smooth transitions between video sources, such as cuts, dissolves, wipes, and other special effects.
- **Compositing:** Combines multiple video feeds using techniques like picture-in-picture, keying (green screen), and layering graphics over video.
- **Real-Time Effects:** Some switchers allow for applying real-time visual effects like filters, color correction, or digital enhancements.
- **Preview and Program Outputs:** Many switchers feature a preview output (showing the next source) and a program output (what is currently live).
- **Live feed and broadcasting** refer to the process of transmitting real-time audio and video signals to an audience, typically through television, online platforms, or large

display screens. This is common in news broadcasting, sports events, concerts, conferences, and other live events.

✚ **Key Components of Live Feed and Broadcasting:**

❖ **Cameras and Capture Equipment:**

Cameras: Capture the live video feed. Multiple cameras are often used to get different angles.

Microphones: Capture audio in real time, whether it's dialogue, music, or ambient sound.

Video Switchers: Allow for switching between different camera feeds, graphics, and pre-recorded videos during the live broadcast.

❖ **Transmission and Streaming:**

Wired Transmission: Often used for closed networks like in-studio broadcasting or localized events.

Wireless Transmission: Uses wireless technologies (like 4G, 5G, or satellite) for events where cables are impractical.

Streaming Platforms: Livestreams can be transmitted over the internet using platforms like YouTube Live, Twitch, Facebook Live, or dedicated event streaming services.

Broadcast TV: Uses satellites, antennas, or cables to deliver live content to TV screens in real-time.

LED and LCD Screens: Used in venues to display the live feed to large audiences. As mentioned earlier, LED is preferred for large outdoor screens, while LCD is more common for smaller indoor displays.

Projection Systems: For large-scale indoor events, projectors can be used to display the live feed on large surfaces like walls or stages.

❖ **Real-Time Graphics and Overlays:**

On-Screen Graphics: Often used for adding information like scores, speaker names, logos, or subtitles in real-time.

Augmented Reality (AR): In advanced setups, AR can be used to add interactive or enhanced content to the broadcast.

❖ **Encoding and Compression:**

Encoding: Converts raw video and audio into a format that can be streamed or broadcast. Common formats include H.264 for video and AAC for audio.

Compression: Compresses data so it can be transmitted efficiently without losing quality.

❖ **Latency and Synchronization:**

Low Latency: Critical for live feeds to ensure that the broadcast is as close to real-time as possible. For example, in live sports, the delay needs to be minimal to avoid spoiling key moments.

Synchronization: Ensures that audio and video are perfectly in sync.

❖ **Types of Live Feed and Broadcasting Setups:**

• **Broadcast Studios:**

Commonly used by TV stations for news, sports, and entertainment shows. These studios have professional-grade cameras, lighting, green screens, and soundproofing for high-quality production.

• **Event Broadcasting:**

Live events like concerts, conferences, or sports events use specialized equipment to capture and broadcast the event in real-time. This often involves mobile production trucks or remote setups.

• **Online Streaming:**

Increasingly popular with platforms like YouTube, Twitch, and Vimeo. Individuals, organizations, and event producers stream live content directly to a global audience via the internet.

• **Hybrid Broadcasting:**

Many modern setups combine traditional TV broadcasting with online streaming, allowing for wider audience reach.

❖ **Application**

• **Live Sports:** Real-time broadcasting of games or matches to TVs, mobile devices, and venue screens.

• **Concerts & Festivals:** Large LED screens display performances to audiences, while live feeds are broadcast online or on TV.

• **News Broadcasting:** Live coverage of events as they unfold, with multiple camera feeds, interviews, and on-screen graphics.

• **Conferences & Webinars:** Live streaming keynote speakers, panel discussions, and presentations to a remote audience.

• **Church Services:** In large venues, live feeds are often used to broadcast sermons or worship services to satellite locations or online audiences.



Theoretical Activity 2.4.3: Description of Media Players.



Tasks:

1: Answer the following questions:

- i. What do you understand by a media player?
- ii. Give the different between Software Media Players and Hardware Media Players
- iii. Identify media player that is built-in software in windows Operating System?
- iv. Identify software that is widely recommended for its wide format support?

2: Provide the answers for the asked questions and write them on flipchart/papers.

3: Present the findings/answers to the whole class.

4: For more clarification, read the key readings 2.4.3.

5: In addition, ask questions where necessary.



Key readings 2.4.3: Description of Media Players.

1. Definitions

- ✓ **A media player** is a device or software used to play multimedia content such as video, audio, or images. Media players can be either hardware-based or software-based, depending on their purpose.
- ✓ **Software Media Players:** are applications installed on a device (like a computer, smartphone, or tablet) that play digital multimedia files.

2. Popular Software Media Players:

- ✓ VLC Media Player:
 - ✓ Open-source, cross-platform media player that supports nearly every audio and video format.
 - ✓ Features: Media streaming, playback of DVDs, Blu-rays, and network streams, subtitle support.
- ✓ Windows Media Player:
 - ✓ Built-in with Microsoft Windows, this player supports various audio and video formats.
 - ✓ QuickTime Player:
 - Developed by Apple, it supports formats like MOV and MP4, with additional editing features.
- **Kodi:**
 - Open-source software that turns devices into home entertainment hubs. Supports video, music, podcasts, and streaming from the internet.
- **Plex:**
 - Media server software that streams content from a central library to various devices.

3. Hardware Media Players:

These are dedicated devices that connect to displays (TVs or monitors) and are used to play multimedia files or streams.

4. Types of Hardware Media Players:

- ✓ Set-Top Boxes:
 - ✓ Devices like Apple TV, Roku, Amazon Fire Stick, and Google Chromecast allow users to stream content from services like Netflix, Hulu, and YouTube to their TV.
 - ✓ Blu-ray/DVD Players:
 - ✓ Traditional media players that play physical discs (DVD, Blu-ray) and often come with USB ports to play media files from external drives.
 - ✓ Digital Signage Players:
 - ✓ Specialized hardware designed for businesses or venues to display multimedia content on LED/LCD screens in real-time. Used for ads, live feeds, or other dynamic displays.
 - ✓ Portable Media Players (PMPs):
 - ✓ Devices like iPods or older MP3/MP4 players used for playing audio and video on the go.
 - ✓ Streaming Media Players:
 - ✓ These devices or software tools access online media services to stream live or on-demand content.
- ### 5. Key Streaming Media Players:
- ✓ **Netflix, YouTube, Hulu (Streaming Apps):** Available across devices, these platforms provide on-demand video content.
 - ✓ **Twitch, YouTube Live:** For live streaming, particularly for gaming, events, and entertainment.

🚩 Features of Media Players:

- ✓ **Codec Support:** Media players need to support various codecs (compression formats) like MP4, AVI, MKV, FLAC, MP3, etc.
- ✓ **Streaming Capability:** Many media players can stream content from the internet or a local network.
- ✓ **Subtitle Support:** Modern media players offer support for adding subtitles to videos, either manually or through built-in services.
- ✓ **Customizable Playlists:** Allows users to create custom playlists for music or video playback.

- ✓ **Media Library Organization:** Some software and hardware media players come with built-in features to organize and catalog your media files.
- ✓ **Remote Access:** Many modern players allow you to control or stream media remotely via mobile apps.
- ✓ **Choosing the Right Media Player:**
- ✓ **For Home Use:** Devices like Apple TV, Amazon Fire Stick, or Roku are popular for streaming content on televisions.
- ✓ **For PC/Mac:** VLC Media Player is widely recommended for its wide format support.
- ✓ **For Business or Digital Signage:** Digital signage players like BrightSign or Raspberry Pi are designed for large displays with scheduling and media management features.



Practical Activity 2.4.4: Performing content loading.



Task:

- 1: You are required to perform content loading.
- 2: Read the key readings 2.4.4 and ask clarifications where necessary.
- 3: Present your work to trainer or whole class.
- 4: Ask clarifications and supports where necessary.



Key readings 2.4.4: Performing content loading.

The following are steps involved in loading content onto an LED/LCD screen:

1. Prepare Content
 - ✓ **Format Selection:** Choose appropriate formats (e.g., JPEG for images, MP4 for videos).
 - ✓ **Resolution:** Ensure content matches the screen resolution for optimal display.
 - ✓ **Design:** Use graphic design software if creating custom graphics or layouts.
2. Connect Device
 - ✓ **Physical Connection:** Connect the screen to a power source and media player (HDMI, USB, etc.).
 - ✓ **Network Setup:** If using a networked display, connect it to Wi-Fi or Ethernet.
3. Use Software
 - ✓ **Choose Software:** Select content management software (e.g., Xibo, ScreenCloud).

- ✓ **Installation:** If not already installed, download and install the software on your media player.
- 4. Upload Content**
- ✓ **Import Files:** Use the software's interface to upload images, videos, and text.
- ✓ **File Organization:** Organize content into folders or categories for easier access.
- 5. Schedule/Arrange**
- ✓ **Create Playlists:** Combine different pieces of content into a single playlist.
- ✓ **Set Timing:** Determine how long each item will display.
- ✓ **Schedule:** Set specific times for content to appear (daily, weekly, etc.).
- 6. Preview**
- ✓ **Check Formatting:** Ensure text is legible and images are clear.
- ✓ **Adjust Layout:** Make any necessary changes to the arrangement or timing of content.
- 7. Launch Display**
- ✓ **Start Playback:** Activate the playlist and monitor the display.
- ✓ **Test Performance:** Observe for any glitches or issues during the initial playback.
- 8. Monitor and Update**
- ✓ **Regular Checks:** Monitor the content to ensure it's displaying correctly.
- ✓ **Update Content:** Refresh content periodically to keep it relevant and engaging.
- 9. Maintenance**
- ✓ **Software Updates:** Regularly update your content management software.
- ✓ **Hardware Checks:** Inspect the LED/LCD screen for any physical issues.
- 10. User Feedback**
- ✓ **Gather Feedback:** Ask viewers for input on the content to improve future displays.
- ✓ **Analyze Engagement:** Use analytics tools (if available) to measure viewer engagement.



Points to Remember

- **Content loading:** refers to the process of transferring, updating, or displaying digital content (such as text, images, or videos) on an LED or LCD screen.
- **Ethernet:** Ethernet in LED/LCD displays refers to the integration of networking capabilities directly into the display, allowing the device to connect to a Local Area Network (LAN) via an Ethernet port.

- **The benefits of Ethernet in Professional Displays** include Centralized Content Delivery, Remote Monitoring, Real-Time Updates, Power over Ethernet, Power over Ethernet in LED Displays.
- **HDMI (High-Definition Multimedia Interface), DisplayPort (DP), and DVI (Digital Visual Interface):** are common interfaces used for content loading and transfer to LED and LCD displays. Each of these connections has its specific characteristics and uses when connecting media sources to displays.
- **DisplayPort Versions:** The latest versions (like DisplayPort 2.0) support up to 16K resolution, making it suitable for future-proof setups.
- The benefits of Wi-Fi in Smart TVs include Wireless Convenience, Easy Setup, and Portability.
- **A video switcher** (also known as a vision mixer) is a device used in video production to select between several different video sources.
- **Types of Live Feed and Broadcasting Setups:** Broadcast Studios, Event Broadcasting, Online Streaming, Hybrid Broadcasting
- **Key Components of Live Feed and Broadcasting:**Cameras and Capture Equipment, Transmission and Streaming,Real-Time Graphics and Overlays,Encoding and CompressionLatency and Synchronization
- **Definition of media player:** A media player is a device or software used to play multimedia content such as video, audio, or images. Media players can be either hardware-based or software-based, depending on their purpose.
- **Popular Software Media Players:** VLC Media Player, Windows Media Player, QuickTime Player, Kodi, Plex.
- **Components of Live Feed and Broadcasting:** Cameras, Microphones, Video Switchers, both wired and wireless Transmission and Broadcast TV.
- Content needs to be transferred from a source (such as a computer, USB drive, or cloud storage) to the display unit. Common methods include Ethernet, HDMI/DP/DVI, USB (Universal Serial Bus), Wi-Fi.
- Step involved in loading content onto an LED/LCD screen:
 - Prepare Content, Connect Device, Use Software, Upload Content, Schedule/Arrange, Preview, Launch Display, Monitor and Update, Maintenance and User Feedback.



Application of learning 2.4.

You are an IT technician tasked with setting up a digital signage system in a hotel lobby. The system consists of a content management software (CMS) that will push promotional videos, text, and images to a large LED screen mounted on the wall. Your task is to perform properly content loading onto the screen



Indicative content 2.5: Functionality Testing.



Duration: 8 hrs



Practical Activity 2.5.1: Testing Electrical Functionality.



Task:

- 1: You are required to go to workshop and test electrical functionality.
- 2: Read the key readings 2.5.1 and ask clarifications where necessary.
- 3: Present your work to trainer or whole class.
- 4: Ask clarifications and supports where necessary.



Key readings 2.5.1: Testing Electrical Functionality.

Functionality testing: involves a series of procedures to ensure that the display is working as intended and meets quality standards.

Here are some key aspects and methods involved in functionality testing for the LED/LCD screens:

1. Visual Inspection

Physical Condition: Check for cracks, scratches, or any physical damage.

Screen Mounting: Ensure the screen is securely mounted.

2. Power Testing

Verify that the screen powers on and off correctly.

Check for abnormal noises or flickering during power-up.

3. Display Quality Tests

Color Accuracy: Use color calibration tools to assess whether the screen displays colors accurately across the spectrum.

Brightness and Contrast: Measure brightness levels and check contrast ratios to ensure they meet specifications.

Uniformity: Inspect for uniform brightness across the screen; look for any bright or dark spots.

4. Functional Tests

Input Response: Test various input ports (HDMI, VGA, etc.) to ensure they accept signals properly.

Resolution and Refresh Rate: Verify that the screen displays the intended resolution and refresh rate without artifacts.

Touch Functionality (if applicable): For touch screens, ensure that touch responses are accurate and timely.

5. Dead Pixel Testing

Use software or a test pattern to identify any dead or stuck pixels. A dead pixel appears as a black dot, while a stuck pixel can appear as a single color.

6. Viewing Angle Testing

Check the visibility and color accuracy from various angles. The screen should maintain its quality when viewed from the sides or above/below.

7. Temperature and Environmental Testing

Test the screen in different temperature conditions to ensure it operates effectively under various environmental factors.

8. Audio Testing (if applicable)

If the screen has built-in speakers, test audio output for clarity and volume.

9. Software Functionality Testing

If the screen is part of a smart device, ensure that the operating system and installed applications function correctly.

10. Safety Testing

Verify that the screen meets safety standards, including electrical safety and potential hazardous material checks.

Testing Tools and Techniques

- **Colorimeter:** For measuring color accuracy and brightness.
- **Multimeter:** For electrical tests.
- **Software:** Specific applications for dead pixel detection and color testing.

Electrical Testing

When performing electrical testing specifically for LED and LCD screens, the focus is on ensuring that all electrical components, circuits, and connections are functioning correctly and safely.

Electrical Testing Procedures:

1. Power Supply Testing

Input Voltage Check: Measure the input voltage at the power supply connector using a multimeter. Verify that it matches the specifications (e.g., 110V AC or 220V AC).

Output Voltage Measurement: Measure the DC output voltage from the power supply to the screen's components, ensuring it meets specifications for the LED backlight and LCD panel (typically around 12V or 24V for LEDs).

2. Current Consumption

Operating Current Measurement: During normal operation, use an ammeter to measure the current drawn by the screen to ensure it is within the specified range.

Standby Current: Check the current draw when the screen is in standby mode to ensure it is low as expected.

3. Continuity Testing

Circuit Continuity: Using a multimeter, check for continuity in key power supply and signal circuits to ensure there are no breaks or shorts.

Connector Testing: Verify the integrity of connectors and cables leading to the screen using continuity tests.

4. Component Resistance Testing

LED Strips Resistance: Measure the resistance of LED strips (if accessible) to check for shorts or open circuits. Resistance values should typically be low for functional LEDs.

Power Supply Resistance: Measure the resistance across power supply components to ensure they are not faulty.

5. Grounding Verification

Ground Resistance Check: Use a multimeter to measure the resistance between the chassis and ground to confirm a good grounding connection (should be close to 0 ohms).

Grounding Compliance: Ensure the screen meets safety standards for grounding to prevent electrical shocks.

6. Backlight Testing

LED Voltage Check: Measure the voltage at the LED backlight terminals to ensure proper operation. Check against specified voltage ratings (often 3V to 12V per LED).

Backlight Intensity: Visually or using a light meter, assess the uniformity and brightness of the backlight.

7. Signal Integrity Testing

Input Signal Testing: Use an oscilloscope to analyze signals coming from input sources (HDMI, VGA, etc.) for distortion or noise.

Signal Timing Verification: Check timing diagrams for digital signals to ensure correct synchronization with the display.

8. Thermal and Temperature Testing

Temperature Monitoring: Measure the temperature of key components (like the power supply and backlight drivers) during operation to ensure they do not exceed safe limits.

Heat Dissipation Check: Ensure that cooling mechanisms (if present) are functioning correctly to dissipate heat.

9. Functional Tests

Turn-On/Off Cycle: Test the power cycling of the screen to ensure it operates correctly without failures during startup or shutdown.

Stress Testing: Run the screen at maximum brightness and varied inputs for extended periods to ensure reliability.

10. Leakage Current Testing

Insulation Resistance Testing: Use a megohmmeter to check for insulation integrity, ensuring no leakage current occurs, which could pose safety risks.

Tools Commonly Used

Multimeter: For measuring voltage, current, resistance, and continuity.

Oscilloscope: For analyzing signal waveforms and integrity.

Ammeter: For current measurement during operation.

Thermal Camera or Thermocouple: For monitoring component temperatures.

Cable Tester: To check the integrity of cables and connectors.

Power On/Off



Practical Activity 2.5.2: Testing data and display parameters.



Task:

- 1: You are required to go to workshop and Test data and display parameters.
- 2: Read the key readings 2.5.2 and ask clarifications where necessary.
- 3: Present your work to trainer or whole class.
- 4: Ask clarifications and supports where necessary.



Key readings 2.5.2: Testing data and display parameters.

Setting display parameters.

Step-by-Step Guide to Apply Data and Display Parameters

Step 1: Gather Required Tools

- ✓ **Calibration Software:** Ensure you have appropriate calibration software installed.
- ✓ **Measurement Device:** Use a colorimeter or spectrophotometer.
- ✓ **Display Device:** Ensure the LED/LCD display is properly set up and powered on.

Step 2: Connect Calibration Device

- ✓ Connect the colorimeter or measurement device to the computer.
- ✓ Ensure it is recognized by the calibration software.

Step 3: Set Up Calibration Software

- ✓ Open the calibration software.
- ✓ Select the connected display from the list of available devices.

Step 4: Choose Calibration Type

- ✓ **Select Calibration Mode:** Depending on the software, choose between options such as 'Full Calibration' or 'Basic Calibration.'

Step 5: Adjust Display Settings

- ✓ **Brightness:** Set the initial brightness to a standard level (usually around 120 cd/m²).
- ✓ **Contrast:** Set the contrast to the default value.
- ✓ **Color Temperature:** Set to the desired temperature (typically 6500K for standard calibration).

Step 6: Begin Calibration Process

- ✓ **Start Calibration:** Initiate the calibration process in the software. The software will usually guide you through various patterns and settings.
- ✓ **Measurement:** The calibration device will take measurements from the display, assessing colors and brightness.

Step 7: Apply Data Parameters

- ✓ **Adjust Values:** The software will suggest adjustments based on the measurements. Apply the suggested display parameters (brightness, contrast, color balance).
- ✓ **Fine-Tuning:** If the software allows, manually adjust settings for optimal performance based on your preferences or specific requirements.

Step 8: Save Calibration Profile

- ✓ **Create Profile:** After applying the necessary adjustments, save the calibration profile for future use.
- ✓ **Label the Profile:** Give the profile a descriptive name for easy identification.

Step 9: Verify Calibration

- ✓ **Test Display:** Use test patterns provided in the calibration software to verify the accuracy of the display.
- ✓ **Make Final Adjustments:** If discrepancies are noted, return to the calibration settings to make any necessary fine-tuning adjustments.

Step 10: Document the Calibration

- ✓ Record the calibration parameters and settings used, along with any notes about the display performance.
- ✓ Save this documentation for reference in future calibrations.

Step 11: Clean Up

- ✓ Disconnect the calibration device from the computer.
- ✓ Store all equipment and tools used during the process.



Points to Remember

- **Functionality testing:** involves a series of procedures to ensure that the display is working as intended and meets quality standards.
- **Here are some methods involved in functionality testing for the LED/LCD screen :** Visual Inspection, Power Testing, Display Quality Tests, Functional Tests, Dead Pixel Testing, Viewing Angle Testing, Temperature and Environmental Testing, Audio Testing (if applicable) and Software Functionality Testing.
- **Step-by-Step Guide to Apply Data and Display Parameters:** Gather Required Tools, Connect Calibration Device, Set Up Calibration Software, Choose Calibration Type, Adjust Display Setting, Begin Calibration Process, Apply Data Parameters, Save Calibration Profile, Verify Calibration, Document the Calibration and Clean Up



Application of learning 2.5.

H.S COMPANY has the LCD screen which is not being ON long time; when you turn it ON, it turns OFF in few a moment; As computer system and architecture technician you are required to test the problem before solving it



Learning outcome 2 end assessment

Written assessment

I Use True or False for the following statements:

1. A media player is a device or software used to play multimedia content such as video, audio, or images
2. A video switcher is a device used in video production to select between several different video sources.
3. Multiple Displays is Connecting multiple parallel-interface LCDs typically requires additional circuitry

II Match the features with their corresponding Ethernet descriptions, and write a letter in empty places of answers:

	Feature	Ethernet
1.....	1. Convenience	A.Tied to the location of the Ethernet port
2.....	2. Speed	B.More stable and consistent, ideal for 4K/8K streaming
3.....	3.Interference	C. Good quality
4.....	4.Mobility	D.Requires physical wiring
		E.No interference, more reliable connection

I. Choose the correct word and fill it in blank space provided.

1. is a single integrated circuit that functions as miniature computer and is intended to carry out particular tasks.

(Chip, Microcontroller, LED/LCD)

- 2..... is a device used in video production to select between several different video sources.

(Video switcher, Media player, Microcontroller)

- 3.....: is a broad category that includes various tools for creating, analysing, and visualizing geographic or spatial data.

(Calibration software, VLC software, Mapping software)

Practical assessment

You've set up a new home entertainment system with a high-resolution LED TV connected to your gaming console or laptop. However, every time you connect your device, the display is not calibrated, the brightness isn't right for the room, and the resolution doesn't match the TV's native settings. You want to create a simple program to automatically configure the display settings for the best visual experience whenever you connect your device. As a technician solve correctly this problem described above.



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Learning Outcome 3: Troubleshooting LED/LCD Screen Display.



Indicative contents

3.1 Analysis of a LED/LCD Screen Display.

3.2 Perform Preventive Maintenance.

3.3 Perform Corrective Maintenance.

Key Competencies for Learning Outcome 3: Troubleshooting LED/LCD Screen Display.

Knowledge	Skills	Attitudes
<ul style="list-style-type: none">● Description of dead pixels.● Description of Common LED/LCD screen Issues.● Identification of diagnostic tools.	<ul style="list-style-type: none">● Inspecting dead pixels.● Checking LED/LCD screen display accuracy.● Configuring backup.● Cleaning LED/LCD Screen.● Performing electrical protection.● Inspecting LED/LCD screen.● Updating LED/LCD screen firmware and drivers.● Preventing LED/LCD screen burn-in.● Applying configuration and restore of LED/LCD screen software.	<ul style="list-style-type: none">● Having Precision● Being Attentive● Having self-confident● Having accountability● Respecting time● Being patient● Having self-motivation● Being organized

	<ul style="list-style-type: none">● Applying calibration and color Uniformity.● Applying repair and replacement.● Applying testing, validation and documentation.	
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Duration: 20 hrs

Learning outcome 2 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Describe clearly common LED/LCD screen Issues according to user requirements.
2. Identify correctly diagnostic tools according to the problem identified.
3. Inspect perfectly dead pixels according to user requirements.
4. Check perfectly LED/LCD screen display according to user requirements.
5. Configure appropriately backup according to the problem identified.
6. Clean effectively, LED/LCD Screen based on standards procedures.
7. Perform effectively electrical protection according to the problem identified.
8. Inspect appropriately LED/LCD screen based on standards procedures.
9. Update properly firmware and drivers based on standards procedures.
10. Prevent appropriately LED/LCD screen burn-in according to the problem identified.
11. Apply perfectly configuration and restore of LED/LCD screen software according to user requirements.
12. Apply properly calibration and color Uniformity according to user requirements.
13. Apply perfectly repair and replacement according to user requirements.
14. Apply properly testing, validation and documentation according to the problem identified.



Resources

Equipment	Tools	Materials
<ul style="list-style-type: none"> ● Computer ● Power Supply ● Switcher ● Storage devices ● Scanning Control Board 	<ul style="list-style-type: none"> ● Crimping tool ● Wire stripper ● Drilling machine ● Hammer ● Ladder ● Pliers ● Screw drivers ● Controller software ● Calibration software 	<ul style="list-style-type: none"> ● Internet bundles ● Connectors ● Cable ties ● Trunks ● Pipes ● Screws ● Wall Mounts ● Power extension ● Labelling tags ● Power supply box ● LED panels



Indicative content 3.1: Analysis of a LED/LCD Screen Display.



Duration: 5 hrs



Theoretical Activity 3.1.1: Description of dead pixels.



Tasks:

- 1: Answer the following questions:
 - i. What do you understand by Vertical and Horizontal lines?
 - ii. What do you understand by Stuck pixels?
 - iii. Identify some characteristics of stuck pixels?
- 2: Provide the answers for the asked questions and write them on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 3.1.1.
- 5: In addition, ask questions where necessary.



Key readings 3.1.1: Description of dead pixels.

1. Definition: Dead pixel inspection in LED or LCD screens involves checking for malfunctioning pixels that either don't display any color (a "dead" pixel) or display the wrong color (a "stuck" pixel). Here's a step-by-step guide to inspecting for dead or stuck pixels on your screen:

2. Vertical or Horizontal lines

While dead pixels can't usually be fixed, stuck pixels might be recoverable using software that rapidly cycles colors (called a "pixel massage") in an attempt to bring the pixel back to normal. Tools like JScreenFix (web-based) can be used for this purpose.

In dead pixel inspection, both vertical and horizontal lines are used to help identify dead or stuck pixels on a screen. Here's how they are typically applied:

i. Horizontal lines: These lines run from left to right (or vice versa) across the screen. By moving horizontal lines across the display, it becomes easier to detect pixels that aren't changing color as expected or remain stuck in a certain state (bright, dark, or a specific color).

ii. Vertical lines: These lines run from top to bottom (or vice versa) on the screen. Similar to horizontal lines, they allow you to observe whether pixels along these lines are properly functioning or if any pixels are dead or stuck.

3. Causes of Vertical or Horizontal lines in LED/LCD screen:

i. Dead pixels: These pixels usually appear black and do not respond to color changes.

ii. Stuck pixels: These may be red, green, or blue, and appear fixed on the screen without changing.

Using vertical and horizontal lines helps to reveal these malfunctioning pixels because the lines contrast with the stuck or dead pixels, making them more noticeable across the screen.

Stuck pixels

Stuck pixels in dead pixel inspection are individual pixels on a screen that remain fixed in one of the subpixel colors (red, green, or blue) and do not display the correct colors as expected. Unlike dead pixels, which are completely non-functional and typically appear black, stuck pixels are still active but malfunction in their ability to change colors.

4. Characteristics of Stuck Pixels:

i. Color: Stuck pixels usually appear as a bright spot in red, green, or blue. Sometimes they can appear as other colors if multiple subpixels are stuck.

ii. Visibility: They are most noticeable when the screen displays a dark or solid background, such as black or white.

iii. Activity: While they do not change with the rest of the screen, they are technically still receiving power.

5. How to Identify Stuck Pixels:

During dead pixel inspection, special software or test patterns are often used to cycle through various solid colors (black, white, red, green, blue, etc.). Stuck pixels will stand out as small colored dots on the screen that do not change as the display shifts between colors.

6. Potential Fixes:

i. Pixel-stimulating software: Some software tools can attempt to "unstick" a pixel by rapidly cycling colors over the area of the stuck pixel, which may stimulate it back into functioning.

ii. Pressure method: Applying gentle pressure on the stuck pixel while turning the screen on and off can sometimes free up the pixel.

iii. Manual approaches: Tools like massaging the pixel or using a special heat source can also help, although these methods should be used cautiously to avoid further damage.

However, there is no guarantee that a stuck pixel can be fixed, and if persistent, it may remain a permanent defect on the display.



Practical Activity 3.1.2: Inspecting dead pixels.



Task:

- 1: As technician, you are required to go to workshop to inspect LED/LCD screen dead pixels.
- 2: Read the key readings 3.1.2
- 3: Ask clarifications and supports where necessary.
- 4: Present your work to the trainer and whole class



Key readings 3.1.2: Inspecting dead pixels.

Case 1. Visual Inspection Using a Test Image:

Step 1: Clean your screen to ensure there are no dust particles that might look like dead pixels.

Step 2: Open a full-screen image or use a software tool that displays solid colors across the entire screen. Common test colors include:

Black (for detecting white or bright stuck pixels)

White (for detecting black or dead pixels)

Red, Green, and Blue (for detecting stuck pixels in specific color channels)

Case 2. Online Tools or Software:

There are several online tools and downloadable software specifically designed to help inspect for dead pixels. These tools cycle through solid color backgrounds, making dead or stuck pixels easy to identify.

Step 1: Download App from manufacturer website

Step 2. Use the downloaded App

Popular options include:

- ✓ Dead Pixel Buddy (web-based)
- ✓ InjuredPixels (for Windows)
- ✓ LCD DeadPixel Test (web-based)

Case 3. Mobile App Inspection:

Step 1: If you are using a smartphone or tablet, you can download apps that assist in dead pixel detection, such as:

Step 2: Use the downloaded App.

- ✓ Dead Pixel Test and Fix
- ✓ Dead Pixel Detector

Case 4. Manual Inspection:

Step 1: Look closely at the screen while it displays each solid color.

Step 2: A dead pixel will appear as a black dot on any color, while a stuck pixel will appear as a single color (red, green, or blue) that doesn't change with the background.

Step 3. Fixing Stuck Pixels



Practical Activity 3.1.3: Checking LED/LCD screen display accuracy.



Task:

- 1: As technician, you are required to go to workshop and check the LED/LCD screen accuracy.
- 2: Read the key readings 3.1.3 and ask clarifications where necessary.
- 3: Check LED/LCD Screen accuracy.
- 4: Ask clarifications and supports where necessary.



Key readings 3.1.3:

Checking LED/LCD screen display accuracy.

When checking accuracy, we have to follow the following steps:

Step 1. Check Pixel Issues (Dead or Stuck Pixels)

Method: Display a solid color (e.g., white, red, green, blue, and black) on the screen. Stuck pixels will appear as a single color, while dead pixels may appear black.

Tools: Use online dead pixel tests, such as Dead Pixel Buddy or monitor test apps.

Step 2. Color Accuracy

Method: Use color calibration tools or software to test the color accuracy.

Tools:

Hardware: Colorimeters or spectrophotometers like X-Rite or Datacolor.

Software: Built-in calibration tools in Windows or macOS, or third-party software like DisplayCAL.

Step 3. Uniformity

Method: Check if the screen brightness and color uniformity remain consistent across the entire display.

Tools: Display a neutral grey or white image and inspect for inconsistencies in brightness.

Step 4. Brightness and Contrast

Method: Test the screen's ability to produce deep blacks and bright whites, and measure contrast ratio.

Tools: Online contrast testing tools or use a brightness meter.

Step 5. Sharpness and Resolution

Method: Ensure that the screen displays text and images clearly without any blurriness or distortion.

Tools: Use test images with fine details and text for clarity.

Step 6. Response Time

Method: For gaming or video editing, test how quickly the screen responds to changes.

Tools: Use test patterns or fast-moving images to check for ghosting or blurring.

Step 7. Viewing Angles

Method: Check how the display looks from different angles to detect any color shift or brightness loss.



Theoretical Activity 3.1.4: Description of common LCD/LED Screen issues



Tasks:

1: Answer the following questions:

- I What do you understand by the following terms?
 - a. Backlight bleeding
 - b. Screen flickering
 - c. Image retention
- II Differentiate Power issues and Overheating.

2: Provide the answers for the asked questions and write them on flipchart/papers.

3: Present the findings/answers to the whole class.

4: For more clarification, read the key readings 3.1.4.

5: In addition, ask questions where necessary.



Key readings 3.1.4: Description of common LCD/LED Screen issues

The following are common issues faced with LED/LCD screens and their potential causes

1. Backlight Bleeding

Description: Visible light leakage around the edges of the screen, especially noticeable when the screen is displaying dark images or during black scenes.

Causes: Imperfect sealing between the screen and the frame or uneven backlight distribution.

2. Screen Flickering

Description: The screen intermittently flashes or flickers, creating a noticeable distraction.

Causes: Faulty display cable, incompatible refresh rate, backlight issues, or power supply instability.

4. Image Retention/Burn-In

Description: Faint traces of a previously displayed image remain on the screen, even after switching to a different image.

Causes: Prolonged display of static images (common with OLED screens but can occur in LED/LCDs as well, though temporary).

5. Power Issues:

Symptoms: Screen not turning on, flickering, dim screen, or screen shutting off suddenly.

Causes: Faulty power supply or power adapter, Loose or damaged power cables, Issues with the internal power circuits (capacitors, regulators), Dead battery (for portable screens).

Effects: The screen may not function at all or could show erratic power behavior, such as turning on and off or failing to start.

6. Overheating:

Symptoms: Screen flickering, random shutdowns, display artifacts (strange lines, colors), or the back of the screen feeling excessively hot.

Causes: Poor ventilation or blocked air vents, Continuous use for extended periods without proper cooling, Malfunctioning internal cooling components (fans, heat sinks), Defective components generating excess heat.

Effects: Prolonged overheating can damage internal components (like the display backlight or circuits) and reduce the lifespan of the screen.

Power Issues and Overheating are different the following is their difference:

Power issues are more about inconsistent or failed electrical power supply to the screen while Overheating is related to the thermal management of the device, where excessive heat buildup affects performance or causes damage. Both can lead to similar outcomes (like the screen shutting down), but their root causes are quite different.



Points to Remember

- ✓ Vertical or Horizontal lines

While dead pixels can't usually be fixed, stuck pixels might be recoverable using software that rapidly cycles colors (called a "pixel massage") in an attempt to bring the pixel back to normal.

- ✓ **Horizontal lines:** These lines run from left to right (or vice versa) across the screen.
- ✓ Characteristics of Stuck Pixels: Color, Visibility, Activity.

While inspecting LED/LCD screen you need to use the following ways and steps.

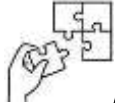
- ✓ Inspect using visual inspection using a test image.
- ✓ Inspect using online tools or software.
- ✓ Inspect using mobile app inspection.
- ✓ Inspect using manual inspection, then after you will fix the stuck pixels.

When checking accuracy, we have to follow the following steps:

Check Pixel Issues (Dead or Stuck Pixels), Color Accuracy, Uniformity, Brightness and Contrast, Sharpness and Resolution, Response Time and Viewing.

Common LED/LCD screen Issues

- ✓ **Backlight Bleeding:** is visible light leakage around the edges of the screen, especially noticeable when the screen is displaying dark images or during black scenes.
- ✓ **Screen Flickering:** is when a screen intermittently flashes or flickers, creating a noticeable distraction.
- ✓ **Image Retention/Burn-In:** is when faint traces of a previously displayed image remain on the screen, even after switching to a different image.
- ✓ **Difference between power issues and overheating:** Power issues are more about inconsistent or failed electrical power supply to the screen while Overheating is related to the thermal management of the device, where excessive heat buildup affects performance or causes damage.



Application of learning 3.1.

ABC University have the following problems which are inaccurate color display, discrepancies between monitor colors and those on professional printing devices, and pixel issues such as small black and bright spots. As the new Computer System and Architecture technician, referring to your responsibility you are requested to inspect LED/LCD screen and check its display accuracy.



Indicative content 3.2: Perform Preventive Maintenance.



Duration: 8 hrs



Practical Activity 3.2.1: Configuring Backup.



Task:

- 1: As technician, you are required to go to workshop to configure LED/LCD screen backup.
- 2: Read the key readings 3.2.1
- 3: Ask clarifications and supports where necessary.
- 4: Present your work to the trainer and whole class



Key readings 3.2.1: Configuring backup.

Performing a configuration of backup for an LED/LCD screen, particularly for modern smart TVs or monitors with advanced settings, helps restore display preferences, network settings, and other custom configurations in case of a reset or hardware failure. Here's how to handle configuration backups for such devices:

Steps to configure backup are identified below:

Step 1. Check if the Device Supports Backup

Not all LED/LCD screens have a built-in backup feature. Smart TVs, projectors, or monitors with advanced settings might have this feature, but basic screens usually don't.

Refer to the user manual or the manufacturer's website to check if the device supports configuration backup.

Step 2. Backup via Cloud (Monitors)

Account Synchronization: Some smart TVs or monitors allow you to link an account (e.g., Samsung, LG, or Google account). Once linked, settings can be backed up to the cloud.

Navigate to settings → Account Settings → Backup or Sync option (varies by manufacturer).

Ensure that you have enabled auto-backup to the cloud.

Factory Reset Protection: Many devices provide factory reset protection, which also allows restoring settings after a reset through cloud backup.

Step 3. Manual Backup on Smart Devices

Export Settings: Some advanced displays (like professional monitors or projectors) allow you to export settings to an external USB drive.

Go to settings → General Settings → Export Configuration (or similar option).

Insert a USB drive, and save the configuration file on the drive.

Note Configuration Settings: In case the device doesn't support backup export, manually take note of key settings such as display calibration, network settings, and input configurations. Save this information in a document for future reference.

Step 4. Backup the Remote Control Configuration (if applicable)

If you use a universal remote control or smart app to control the LED/LCD screen, ensure to back up the settings within the remote or app.

Many smart remote control apps (like Google Home, Logitech Harmony) store configurations in the cloud or allow you to export them.

Step 5. Firmware and Software Backup

Check for Firmware Updates: Some manufacturers allow you to download the current firmware from their website before upgrading to a new version, effectively serving as a backup. Keep the firmware file safe in case a rollback is needed.

Backup Current Version: If your device supports it, backup the current software configuration via settings before performing firmware upgrades.

Restoring Configuration from Backup

Cloud Restore: If you've linked your smart TV/monitor to an account, restoring from a cloud backup is as simple as logging in to the same account on the device after a reset or during the setup.

USB Restore: If you've saved the configuration file on a USB drive, insert it into the device and navigate to the restore option within the settings.



Practical Activity 3.2.2: Screen Cleaning.



Task:

- 1: As technician, you are required to go to workshop and apply screen cleaning.
- 2: Thoroughly read Key Reading 3.2.2 for detailed guidance.
- 3: Ask clarifications and supports where necessary.
- 4: Seek assistance if needed and verify your implementation with key reading 3.2.2 to ensure completeness and accuracy.



Key readings 3.2.2: Screen Cleaning

Screen Cleaning

The following are steps that are followed to clean screen.

Step 1. Identify the Issue

Symptom: The screen is dirty with visible fingerprints, dust, and smudges, causing poor display quality.

Possible Risks:

Using improper cleaning materials may scratch the screen or leave streaks.

Using too much liquid can seep into the screen's internal components, causing damage.

Step 2. Gather Proper Cleaning Materials

Action: Ensure that you are using the correct cleaning materials to avoid damaging the screen.

Materials Needed:

Microfiber cloth (soft, lint-free)

Distilled water (avoid tap water as it may contain minerals that leave residue)

Screen cleaning solution (if available, specifically designed for LCD/LED screens)

Spray bottle

Cotton swabs (for cleaning edges)

Materials to Avoid:

Paper towels (can scratch the screen)

Harsh chemicals like ammonia or alcohol-based cleaners

Abrasive sponges or cloths

Expected Outcome: You should have a cleaning kit that is safe for use on sensitive screens.

Step 3. Power Down and Unplug the Screen

Action: For safety and to avoid streaking, turn off the screen and unplug it before cleaning.

Reasoning: A powered-down screen reduces the risk of electric shock and makes it easier to see smudges. Also, the screen should be cool during cleaning.

Expected Outcome: The screen is powered off and safe to clean.

Step 4. Dust Off the Screen

Action: Use a dry microfiber cloth to gently wipe the screen to remove loose dust and particles.

Do not apply pressure; lightly sweep the cloth across the surface in straight motions to lift dust.

Expected Outcome: The majority of the dust is removed without scratching the screen.

Step 5. Prepare a Cleaning Solution (If Needed)

Action: If the screen has stubborn fingerprints or smudges, lightly dampen a microfiber cloth with distilled water or a screen cleaning solution.

Never spray liquid directly onto the screen.

Lightly spray distilled water or a cleaning solution onto the cloth, ensuring the cloth is slightly damp but not wet.

Expected Outcome: You have a cloth ready with a safe, minimal amount of moisture for cleaning.

Step 6. Clean the Screen

Action: Use the damp microfiber cloth to gently wipe the screen, focusing on smudges and fingerprints.

Use circular motions or gentle strokes from top to bottom.

Apply only light pressure to avoid damaging the delicate display.

If necessary, use a cotton swab to clean the edges of the screen where dust may accumulate.

Expected Outcome: Smudges, fingerprints, and dirt are removed, leaving the screen clear without streaks.

Step 7. Dry the Screen

Action: After cleaning, use a dry portion of the microfiber cloth to go over the screen again, ensuring that no moisture or streaks remain.

Let the screen air dry for a few minutes before plugging it back in or powering it on.

Expected Outcome: The screen should be completely dry, with no moisture or streaks.

Step 8. Inspect the Screen

Action: After the screen is dry and you power it back on, check for any remaining smudges or streaks.

If necessary, repeat the cleaning process using the same safe methods.

Expected Outcome: The screen is clean and clear, with no visible dirt, smudges, or streaks. Display quality should be fully restored.



Practical Activity 3.2.3: Performing electrical protection



Task:

- 1: As technician, you are required to go to workshop and perform electrical protection.
- 2: Read the key readings 3.2.3 and ask clarifications where necessary.
- 3: Ask clarifications and supports where necessary.
- 4: Follow the demonstrated steps to perform electrical protection.
- 5: Seek assistance if needed and verify your implementation with Key Reading 3.2.3 to ensure completeness and accuracy.



Key readings 3.2.3: Performing electrical protection.

Performing electrical protection on an LED/LCD screen ensures the screen is shielded from power surges, voltage spikes, and electrical faults. Here are the steps you can follow:

Step 1. Turn Off and Disconnect Power

Turn off the device: Power down the screen using its control buttons or remote.

Unplug the power source: Remove the screen from the electrical outlet to avoid any electrical accidents while working on it.

Step 2. Inspect and Use Surge Protectors

Check your power source: Ensure that the power source is stable and free from voltage fluctuations.

Use a surge protector: Plug the screen into a surge protector to prevent damage from voltage spikes or surges. Surge protectors can absorb extra voltage and protect the internal components.

Step 3. Install an Uninterruptible Power Supply (UPS)

Install a UPS: A UPS will provide backup power in case of outages and stabilize voltage levels. This is essential if you are in an area prone to power fluctuations.

Connect the screen: Plug the screen into the UPS instead of directly into the wall outlet. The UPS will regulate the incoming power and provide protection.

Step 4. Grounding the Electrical Circuit

Ensure proper grounding: Verify that the electrical circuit the screen is connected to is grounded. This prevents issues like static discharge or electrocution hazards.

Install ground fault interrupters (GFCI): GFCIs can cut off power if a ground fault occurs, offering an additional layer of protection.

Step 5. Check the Power Cord and Adapter

Inspect the power cord: Look for any visible damage or wear on the cord, which could lead to electrical shorts.

Test the adapter: If using an external power adapter, make sure it is in good condition and rated for the correct voltage and amperage for the screen.

Step 6. Install Voltage Stabilizers (Optional)

If your area has frequent power fluctuations or brownouts, installing a voltage stabilizer will help keep the voltage steady, preventing damage to the screen.

Step 7. Electrostatic Discharge (ESD) Protection

Use an ESD strap: If you're working on the screen's internal components, wear an ESD strap to avoid damaging sensitive circuits with static electricity.

Step 8. Check Ventilation and Heat Protection

Ensure proper ventilation: Ensure that the LED/LCD screen has adequate airflow to avoid overheating. Heat can increase electrical stress on components.

Avoid blocking vents: Keep the vents clear of dust and obstructions to allow heat dissipation.

Step 9. Test the Screen After Installation

Reconnect the power: After setting up protection, plug the screen back into the power supply through the surge protector or UPS.

Turn on the screen: Power on the screen and ensure it operates normally.

**Practical Activity 3.2.4: Inspecting LED/LCD screen.****Task:**

- 1: As technician, you are required to go to workshop and inspect LED/LCD Screen.
- 2: Read the key readings 3.2.4 and ask clarifications where necessary.
- 3: Inspect LED/LCD Screen.
- 4: Ask clarifications and supports where necessary.



Key readings 3.2.4: Performing regular inspections of LED/LCD

Performing regular inspections of LED/LCD screens is an important part of preventive maintenance. Here are the steps you can follow to apply a regular inspection effectively.

The above are steps that are followed to regular inspect LED/LCD screens.

Step 1. Power Off and Disconnect the Screen

Safety first: Before starting any inspection, turn off the screen and unplug it from the power source to avoid the risk of electrical shock or damaging components.

If it's connected to a computer or other devices, disconnect those cables as well.

Step 2. Inspect the Power Cord and Connections

Check for visible damage: Look for any signs of wear and tear on the power cord, such as fraying, cracks, or cuts. Replace any damaged cables immediately.

Test connection firmness: Ensure the power cord is securely plugged into both the screen and the wall outlet. Loose connections can lead to intermittent power loss or fluctuations.

Examine all connected cables: Check HDMI, VGA, DisplayPort, or any other cables for damage, ensuring the connectors are in good shape and the pins are not bent.

Step 3. Check for Dust and Debris

Clean the vents: Dust buildup in air vents can block airflow, leading to overheating. Use a soft brush or compressed air to clean the vents.

Clean the screen surface: Gently clean the screen using a microfiber cloth to remove fingerprints, dust, and smudges. If necessary, lightly dampen the cloth with a screen-safe cleaner, but never spray directly onto the screen.

Clean ports and connectors: Inspect ports (HDMI, USB, etc.) for dust or debris and clean them carefully to avoid connection issues.

Step 4. Examine the Screen for Physical Damage

Inspect the screen surface: Look for cracks, scratches, or any discolored spots on the display. Any signs of physical damage can indicate internal issues or potential risks that may worsen over time.

Check for dead or stuck pixels: Power on the screen and look closely for any non-responsive pixels (bright or dark spots). These can sometimes be fixed using pixel-fixing software, but if widespread, professional repair may be necessary.

Look for signs of image retention: If images seem to stay "ghosted" on the screen after changing, this could be a sign of burn-in (common with OLED but rare in LCD).

Step 5. Monitor Temperature and Ventilation

Check the screen's temperature: After using the screen for a while, lightly touch the

back or sides to see if it feels too hot. Overheating could indicate poor ventilation or internal problems.

Ensure proper airflow: Make sure the screen is placed in a well-ventilated area and that air can freely circulate around it. Avoid placing the screen near heat sources, such as radiators or direct sunlight.

Step 6. Inspect Power Source and Surge Protection

Test the surge protector: If the screen is plugged into a surge protector, make sure it is still functioning properly. Surge protectors can degrade over time and may need replacement after a few years.

Examine the power outlet: Ensure that the power outlet the screen is connected to is in good working condition and is not loose or overloaded with other devices.

Check backup power systems: If you use a UPS (Uninterruptible Power Supply), test it periodically to ensure it's still providing backup power in case of outages or fluctuations.

Step 7. Update Firmware and Software (if applicable)

Check for firmware updates: For smart TVs or monitors with built-in operating systems, look for firmware updates in the settings menu or on the manufacturer's website.

Update drivers: If your monitor is connected to a computer, ensure that the drivers for the monitor and any associated graphics card are up to date.

Step 8. Test the Display Settings

Check resolution and color accuracy: Ensure that the screen is displaying content at the correct resolution and color settings. Misconfigured settings can strain the display and reduce visual quality.

Adjust brightness and contrast: Set the brightness and contrast to an optimal level that suits the environment, as overly bright or dim settings can wear down the backlight.

Enable power-saving features: Enable auto-off or sleep mode features to conserve energy and reduce wear on the screen when it's not in use.

Step 9. Inspect Mounting and Physical Stability

Check the mounting hardware: If your screen is wall-mounted or on a stand, ensure that it is securely fastened and that there are no loose screws or instability.

Assess positioning: Make sure the screen is positioned properly to avoid strain, both on the display and on the cables. Ensure that there's no unnecessary pressure on the power cord or other connected cables.

Step 10. Schedule and Record the Inspection

Set a routine: Regularly inspect your LED/LCD screen every 3–6 months, depending on

the intensity of usage. For heavily used displays, more frequent inspections might be necessary.

Keep records: Record the inspection date, any issues found, and the actions taken. This can help you track the screen's condition over time and catch recurring problems early.

In fact, By performing regular inspections, you can prevent issues related to power, physical damage, overheating, and software bugs in your LED/LCD screen.

These checks ensure safety, maintain display quality, and extend the lifespan of your screen, helping you avoid costly repairs or replacements.



Practical Activity 3.2.5: Updating LED/LCD screen firmware and drivers.



Task:

- 1: As technician, you are required to go to workshop and update LED/LCD screen firmware and drivers.
- 2: Read the key readings 3.2.5.
- 3: Ask clarifications and supports where necessary.
- 3: Follow all demonstrated steps to update LED/LCD screen firmware and drivers.
- 4: Update LED/LCD screen firmware and drivers.
- 5: Seek assistance if needed and verify your implementation with Key Reading 3.2.2 to ensure completeness and accuracy.



Key readings 3.2.5: Updating firmware and drivers.

Updating the firmware and drivers for your LED/LCD screen can help improve its performance, fix bugs, and ensure compatibility with other devices. Here's how to do it step by step:

Step 1. Check the Current Firmware Version

Menu Access: Use the on-screen menu of your display (usually accessed via the remote or buttons on the monitor) to find the current firmware version. This is typically located in the "Settings" or "About" section.

Step 2. Visit the Manufacturer's Website

Go to the official website of the monitor or TV manufacturer (e.g., Samsung, LG, Sony). Navigate to the "Support" or "Downloads" section.

Step 3. Search for Your Model

Enter your device model number in the search bar or select it from a list to find specific information related to your device.

Step 4. Download Firmware Update

If an update is available, download the firmware file. Make sure to read the release notes or instructions provided by the manufacturer to understand what the update addresses.

Step 5. Prepare a USB Drive

Format a USB flash drive to FAT32 (most monitors accept this format).

Copy the downloaded firmware file onto the USB drive.

Step 6. Install the Firmware Update

Plug the USB drive into the appropriate USB port on your monitor/TV.

Access the settings menu using the remote or buttons.

Look for an option that says “Firmware Update,” “Software Update,” or similar.

Follow the on-screen instructions to initiate the update process.

Do not turn off the device during the update; this can cause the device to malfunction.

Step 7. Restart the Device

Once the update is complete, the device may automatically restart or prompt you to do so.

Updating Drivers (for PC Monitors)

Step 8. Identify the Monitor Model

Note the model number of your monitor (found on the back of the monitor or in the settings menu).

Step 9. Access Device Manager

On your computer, right-click on the Start Menu and select Device Manager.

Expand the Monitors category to see your connected display devices.

Step 10. Update Driver

Right-click on your monitor model and select Update Driver.

Choose Search automatically for updated driver software. Windows will search online for the latest driver and install it if found.

Step 11. Download from Manufacturer’s Website

Alternatively, visit the monitor manufacturer’s website, go to the support/downloads section, and look for the latest driver for your model. Download and install it manually if necessary.

Step 12. Restart the Computer

After updating the driver, restart your computer to ensure the changes take effect.

Additional Tips

Backup Settings: Before updating firmware, consider backing up your display settings

if the option is available.

Read Instructions Carefully: Follow all instructions provided by the manufacturer during the update process to avoid issues.

Check for Compatibility: Ensure that the firmware version and drivers are compatible with your device before proceeding.

By following these steps, you can effectively update the firmware and drivers of your LED/LCD screen, ensuring it operates efficiently and effectively.



Practical Activity 3.2.6: Preventing LED/LCD screen burn-in



Task:

- 1: As technician, you are required to go to workshop and apply LED/LCD screen burn-in prevention.
- 2: Read the key readings 3.2.6 and ask clarifications where necessary.
- 3: Follow all demonstrated steps to apply LED/LCD screen burn-in prevention.
- 4: Apply LED/LCD screen burn-in prevention.
- 5: Ask clarifications and supports where necessary.



Key readings 3.2.6: Preventing LED/LCD screen burn-in.

Here are some steps to help prevent burn-in on LED and LCD screens:

Step 1. Use Screensavers

Activate Screensavers: Set up a screensaver that activates after a few minutes of inactivity. Choose dynamic or moving images to reduce static content on the screen.

Digital Clock Screensavers: Use screensavers that show a moving digital clock or abstract designs.

Step 2. Adjust Brightness and Contrast

Lower Brightness: Reducing screen brightness can decrease the risk of burn-in. High brightness levels can lead to faster wear on the pixels.

Modify Contrast Settings: Lowering contrast can help reduce the intensity of static images.

Step 3. Implement Automatic Sleep Mode

Set Sleep Timer: Configure your device to enter sleep mode after a period of inactivity. This will turn off the display and prevent static images from being displayed for too long.

Step 4. Use Dynamic Content

Avoid Static Images: Limit the use of static content (like logos or news tickers) that remain on the screen for extended periods.

Change Wallpaper Regularly: If you use a static wallpaper, change it frequently to avoid prolonged exposure to the same image.

Step 5. Move Windows and Content Regularly

Shift UI Elements: Regularly move or resize windows, icons, or text on the screen to prevent the same areas from being consistently used.

Enable Taskbar Auto-Hide: This can help by hiding static elements when not in use.

Step 6. Use Image Retention Tools

Pixel Refresh Functions: Some TVs and monitors have built-in pixel refresh or screen cleaning modes that can help mitigate burn-in effects.

White Screen or Color Slides: Running a white or solid color screen for a short period can help even out pixel wear.

Step 7. Avoid High Contrast Images

Be Mindful of Content: When displaying content, be cautious of high contrast images (e.g., bright logos on dark backgrounds) for extended periods.

Step 8. Monitor Settings

Adjust Display Settings: Use settings such as “Logo Luminance Adjustment” or similar features, if available, to reduce brightness of static elements.

Enable Motion Smoothing Features: Many displays have settings that can help minimize static content effects.

Step 9. Regular Maintenance

Keep Software Updated: Ensure your device's firmware is up to date to benefit from the latest display technologies and fixes.

Periodic Rebooting: Restart your device occasionally to reset the display and minimize potential burn-in.

By following these preventive measures, you can significantly reduce the risk of burn-in on your LED or LCD screens. Regular maintenance and mindful usage will help ensure a longer lifespan and better performance of your display.



Points to Remember

- **These steps are followed when configure backup:**
 - ✓ Check if the Device Supports Backup,
 - ✓ Backup via Cloud (Monitors),
 - ✓ Manual Backup on Smart Devices,
 - ✓ Backup the Remote Control Configuration (if applicable),
 - ✓ Firmware and Software Backup.
- **To clean screen you have to follow the following steps:**
 - ✓ Identify the Issue,
 - ✓ Gather Proper Cleaning Materials,
 - ✓ Power Down and Unplug the Screen,
 - ✓ Dust off the Screen,
 - ✓ Prepare a Cleaning Solution (If Needed),
 - ✓ Clean the Screen,
 - ✓ Dry the Screen,
 - ✓ Inspect the Screen.
- The following are steps that are essential for performing electrical protection:
 - ✓ Turn Off and Disconnect Power,
 - ✓ Inspect and Use Surge Protectors,
 - ✓ Install an Uninterruptible Power Supply (UPS),
 - ✓ Grounding the Electrical Circuit,
 - ✓ Heck the Power Cord and Adapter,
 - ✓ Install Voltage Stabilizers (Optional),
 - ✓ Electrostatic Discharge (ESD) Protection,
 - ✓ Check Ventilation and Heat Protection,
 - ✓ Test the Screen after Installation.
- The following are steps that are essential for regular LED/LCD screen inspections:
 - ✓ Power Off and Disconnect the Screen,
 - ✓ Inspect the Power Cord and Connections,
 - ✓ Check for Dust and Debris,
 - ✓ Examine the Screen for Physical Damage,
 - ✓ Monitor Temperature and Ventilation,
 - ✓ Inspect Power Source and Surge Protection,
 - ✓ Update Firmware and Software (if applicable),
 - ✓ Test the Display Settings,

- ✓ Inspect Mounting and Physical Stability,
- ✓ Schedule and Record the Inspection.
- These are key steps that are followed to update firmware and drivers:
 - ✓ Check the Current Firmware Version,
 - ✓ Visit the Manufacturer's Website,
 - ✓ Search for Your Model,
 - ✓ Download Firmware Update,
 - ✓ Prepare a USB Drive,
 - ✓ Install the Firmware Update,
 - ✓ Restart the Device, Identify the Monitor Model, Access Device Manager,
 - ✓ Update Driver,
 - ✓ Download from Manufacturer's Website,
 - ✓ Restart the Computer.
- The following are steps of preventing LED/LCD screen burn-in:
 - ✓ Use Screensavers,
 - ✓ Adjust Brightness and Contrast,
 - ✓ Implement Automatic Sleep Mode,
 - ✓ Use Dynamic Content,
 - ✓ Move Windows and Content Regularly,
 - ✓ Use Image Retention Tools,
 - ✓ Avoid High Contrast Images,
 - ✓ Monitor Settings and Regular Maintenance.



Application of learning 3.2

As a screen maintenance technician, your primary task today involves ensuring the optimal performance, safety, and longevity of the XYZ Company LED/LCD screens. Recently, the institution has faced several issues with their LED/LCD screens, such as loss of configuration settings after power outages, dirty or smudged screens affecting display quality, screens damaged by electrical surges, image retention and burn-in, and outdated firmware causing compatibility problems. Your task is to address these problems through a comprehensive maintenance process, including configuration backups, cleaning, electrical protection, inspections, firmware updates, and burn-in prevention.



Indicative content 3.3: Perform Corrective Maintenance.



Duration: 7 hrs



Theoretical Activity 3.3.1 Identification of diagnostic tools



Tasks:

- 1: You are required to answer the following questions:
 - i. What do you understand by diagnostic tool?
 - ii. What are software diagnostic tools?
 - iii. What hardware diagnostic tools?
- 2: Write findings/answers on flipchart/papers.
- 3: Present the findings/answers to the whole class.
- 4: For more clarification, read the key readings 3.3.1.
- 5: In addition, ask questions where necessary.



Key readings 3.3.1: Identification of diagnostic tools

Definition: Diagnostic tools are essential for identifying, troubleshooting, and resolving issues in various systems, whether they're hardware, software, mechanical, or electrical

I. Software

There are several diagnostic tools and software available to help identify and troubleshoot issues with LED/LCD screens and other display components. Below are some commonly used tools:

1. Built-in Diagnostic Tools (Windows/Linux/macOS)

Windows Display Trouble shooter:

Windows has a built-in display troubleshooting tool. You can access it through the Control Panel > Troubleshooting > Hardware and Sound > Display.

It helps diagnose basic display issues such as incorrect resolution, external display detection, and driver problems.

Linux Diagnostic Tools: Linux has utilities like xrandr and dmesg to identify display and graphics card issues.

Use xrandr to check resolution settings and connected displays, and dmesg to view hardware logs for errors.

Apple Diagnostics (for macOS): Apple provides built-in diagnostic tools like Apple Diagnostics (formerly Apple Hardware Test) to check for display issues.

You can run the tool by pressing D while booting up your Mac to perform a hardware check.

2. Third-Party Diagnostic Software

a. Display Tester (for Mobile Devices): Available on Android, this app helps test LCD/LED screens for dead pixels, color uniformity, touch sensitivity, and more.

It can be downloaded from the Google Play Store.

b. Dead Pixel Buddy (Windows): This is a free, lightweight tool for checking dead or stuck pixels on a display. It shows different solid colors on the screen, making dead pixels more visible.

c. MonitorTest (Windows): Software that helps test the performance and quality of computer monitors. It can run tests on color accuracy, dead pixels, brightness, contrast, sharpness, etc.

d. JScreenFix (Web-based): A web-based tool that helps fix stuck pixels by rapidly cycling colors through a stuck pixel.

This tool can run in any browser and doesn't require any installation.

e. PixelHealer (Windows): This software attempts to fix stuck pixels on an LED/LCD screen by flashing colors across the screen. It's particularly useful for screens with small pixel issues.

3. Diagnostic Tools for Hardware Components

a. Multimeter: A multimeter is essential for testing electrical components in LED/LCD screens, like capacitors, power supply boards, and LED backlights.

b. Oscilloscope: Used for diagnosing signal and voltage issues in more complex circuits, particularly for testing video signal integrity in display units.

c. SpyderX (Color Calibration): The Datacolor SpyderX is a professional tool for color calibration, ensuring accurate colors on LED/LCD screens, which is especially useful for graphic designers and photographers.

d. T-Con Board Testers

These tools are used to diagnose and verify if the T-Con (Timing Controller) board is functioning correctly in LCD displays.

e. Infrared Thermometers

For diagnosing overheating issues, an infrared thermometer can detect temperature irregularities in display panels, power supplies, or other components.

4. Driver and Graphics Card Diagnostic Tools

a. GPU-Z: A utility that provides detailed information about your graphics card (GPU), which is crucial for diagnosing display issues related to the graphics card.

b. Display Driver Uninstaller (DDU): Software that helps cleanly uninstall display drivers, ensuring no driver conflicts that could cause display issues.

c. HWMonitor: This software monitors the health and temperature of your GPU and other hardware components, which can indirectly help diagnose display performance issues.

5. Firmware/Software Update Tools

Some displays, especially TVs and smart monitors, allow for firmware updates via tools provided by the manufacturer (e.g., Samsung Service Menu, LG Software Update Tool).

These tools and software can be used to effectively diagnose and repair issues with LED/LCD screens, whether the problem lies in hardware or software.

II. Hardware

When performing diagnostics and maintenance on LED/LCD screens, several hardware tools can assist in identifying and resolving issues. These tools can help diagnose electrical problems, check for damaged components, and ensure proper functionality. Below is a list of common diagnostic hardware tools:

1. Multimeter

Purpose: Measures electrical properties such as voltage, current, resistance, and continuity.

Use: Useful for checking power supply issues, verifying continuity in circuits, testing capacitors, and diagnosing open or short circuits.

Recommendation: Digital multimeters are often preferred due to their precision and ease of use. Brands like Fluke are highly recommended for reliability.

2. Oscilloscope

Purpose: Visualizes electronic signals, showing how they vary over time.

Use: Essential for diagnosing video signal integrity, measuring clock signals, and analyzing electrical noise or irregularities in complex circuits, especially in T-Con boards and power supplies.

Recommendation: A portable digital oscilloscope, like the Hantek or Rigol series, is commonly used in display diagnostics.

3. T-Con Board Tester

Purpose: Specialized tool for testing the Timing Controller (T-Con) board in LCD displays.

Use: The T-Con board controls the signal between the display panel and the graphics processor. A T-Con tester can determine if the board is functioning properly or causing screen defects such as no image or color distortion.

4. Capacitor Tester/ESR Meter

Purpose: Measures the capacitance and equivalent series resistance (ESR) of capacitors.

Use: Faulty capacitors are common in LED/LCD screens, particularly on power supply boards. An ESR meter helps diagnose whether a capacitor needs replacing, even if there are no visible signs like bulging or leakage.

Recommendation: A handheld ESR meter, such as the Peak Atlas ESR70, is widely used.

5. Backlight Tester

Purpose: Tests the functionality of LED backlights in LCD/LED panels.

Use: Determines whether the backlight LEDs or the inverter circuit is faulty by applying controlled voltage to the backlight strip. Useful for diagnosing flickering, dimming, or black screen issues caused by backlight failure.

Recommendation: Tools like the LED TV Backlight Tester are affordable and easy to use.

6. DC Power Supply

Purpose: Provides adjustable DC voltage for testing circuits and components.

Use: Useful for testing individual components like backlight strips, power boards, and T-Con boards under controlled conditions to isolate faults.

Recommendation: A variable DC power supply, such as those by KORAD or Rigol, allows for precise testing.

7. Infrared Thermometer

Purpose: Measures surface temperatures without direct contact.

Use: Useful for identifying overheating components such as power supply boards, transformers, or other internal parts that may cause screen failures or flickering.

Recommendation: An infrared thermometer by Fluke or Etekcity can quickly spot overheating issues.

8. BGA Rework Station

Purpose: Used for reflow or reballing of Ball Grid Array (BGA) chips.

Use: Reflow soldering can be necessary if the issue is related to poor or cracked solder joints on GPU chips, T-Con boards, or power supplies. These stations use heat to repair solder connections.

Recommendation: Quick 861DW is a popular model for rework stations used in electronics repair.

9. Signal Generator (Pattern Generator)

Purpose: Generates video test patterns.

Use: Used to test the performance of an LED/LCD display by sending various test patterns (e.g., color bars, grayscale, grid) to check for image clarity, uniformity, dead pixels, and color issues.

Recommendation: Tools like Video Signal Pattern Generators by Quantum Data are widely used in the industry.

10. Logic Analyzer

Purpose: Captures and analyzes digital signals from electronic circuits.

Use: Used for debugging and testing digital signals, especially in complex display circuits like T-Con boards, to ensure proper signal transmission.

Recommendation: Saleae logic analyzers are popular for troubleshooting digital logic circuits.

11. LVDS Cable Tester

Purpose: Tests the LVDS (Low-Voltage Differential Signaling) cables used in LED/LCD displays.

Use: LVDS cables transmit the image data between the T-Con board and the display panel. A cable tester can determine if the cable is damaged or if it is the source of display issues like flickering, lines, or no image.

12. SMD Rework Station (Hot Air Gun)

Purpose: Allows for safe removal and replacement of Surface Mount Devices (SMD) such as capacitors, resistors, and transistors.

Use: Essential for repairing tiny components on circuit boards in LED/LCD screens, especially in power supply boards and T-Con boards.

Recommendation: Hakko and Weller are leading brands for soldering and rework stations.

13. Dead Pixel Tester

Purpose: Checks for dead or stuck pixels on the display.

Use: A handheld dead pixel tester can quickly diagnose whether dead or stuck pixels are present and their location on the screen. Although software-based tools exist, hardware testers are more efficient in diagnosing certain issues.

14. EEPROM Programmer

Purpose: Reads and writes data to EEPROM chips.

Use: EEPROM chips store configuration settings and firmware for displays. An EEPROM programmer can help rewrite corrupted firmware, which could be the source of display issues.

Recommendation: The TL866II Plus is a popular EEPROM programmer used for repairing display boards.

15. Magnifying Glass or Microscope

Purpose: Allows for close-up inspection of small components.

Use: Useful for visually inspecting solder joints, cracks, or damage on circuit boards, such as T-Con and power boards.

Recommendation: A USB digital microscope or bench magnifier provides a detailed view of components during repair. These hardware diagnostic tools are essential for troubleshooting and repairing issues with LED/LCD screens, from power problems to display anomalies like dead pixels and color distortions.



Practical Activity 3.3.2: Applying configuration and restore of LED/LCD screen.



Task:

- 1: As technician, you are required to go to workshop for applying configuration and restore of LED/LCD screen.
- 2: Read the key readings 3.3.2 and ask clarifications where necessary.
- 3: Present your work to the entire class
- 4: Ask clarifications and supports where necessary.



Key readings 3.3.2 Applying configuration and restore of LED/LCD screen.

The following are key steps to follow when Apply LED/LCD Configuration and restore:

Step 1. Access the Menu

Use the remote control or the physical buttons on the monitor to access the On-Screen Display (OSD) menu.

Look for a button labeled Menu or Settings.

Step 2. Navigate to Settings

Use the navigation buttons (usually arrows) to scroll through the menu options. Look for sections labeled Setup, Settings, or Configuration.

Step 3. Find the Factory Reset Option

Within the settings menu, look for an option that says Reset, Factory Reset, or Restore Default Settings.

This option may be under a submenu like Advanced Settings or System Settings.

Step 4. Confirm the Reset

Select the Factory Reset option and confirm your choice when prompted.

This action may require you to press a button like OK, Yes, or Confirm.

Step 5. Wait for the Process to Complete

The screen may take a moment to restore its default settings.

After the process is complete, the screen may turn off and then back on, or you might return to the main menu.

Step 6. Reconfigure Settings

After the reset, you may need to reconfigure your display settings, such as brightness, contrast, and any other personal preferences.

Additional Tips

Consult the User Manual: Different brands and models may have unique methods for resetting configurations. Refer to the user manual for specific instructions related to your model.

Software Reset: If your screen is connected to a computer or other devices, you may also need to check the display settings on those devices and reset them as necessary.

Backup Configuration (if possible): If your screen has specific configurations you want to keep, look for options to export settings before performing a reset.

Troubleshooting After Reset

If issues persist after restoring factory settings, consider checking for firmware updates or consulting a professional technician for further assistance.



Practical Activity 3.3.3: Applying calibration and color uniformity.



Task:

1: As technician, you are required to go to workshop for applying calibration and color uniformity.

- 2: Read the key readings 3.3.3 and ask clarifications where necessary.
- 3: Present your work to the entire class
- 4: Ask clarifications and supports where necessary.



Key readings 3.3.3: Applying calibration and color uniformity.

The following are the steps to apply calibration and ensure color uniformity:

Step 1. Prepare Your Environment

Lighting: Set up your workspace with consistent ambient lighting. Avoid direct sunlight or strong artificial lighting that can affect color perception.

Screen Position: Ensure the screen is at eye level and in a comfortable viewing position to reduce glare and reflections.

Step 2. Use Calibration Tools

Hardware: Acquire a colorimeter (e.g., X-Rite i1Display, Datacolor Spyder) to measure color accuracy.

Software: Install calibration software that is compatible with your colorimeter (most come with their own software, but you can also use third-party options like DisplayCAL).

Step 3. Initial Screen Setup

Reset Settings: Reset your monitor to factory settings to start with a clean slate.

Select Color Mode: Choose a color mode that is closest to the intended use (e.g., sRGB for web design, Adobe RGB for photography).

Step 4. Basic Adjustments

Brightness: Adjust the brightness to a comfortable level, typically around 120-140 cd/m² for most environments.

Contrast: Set the contrast to a level where white is bright without losing detail in highlights.

Color Temperature: Adjust the color temperature to 6500K for most standard applications.

Step 5. Calibrate the Display

Run the Calibration Software: Follow the prompts in the calibration software. This typically involves:

Placing the colorimeter on the screen.

Running a series of tests where the software displays different colors and patterns. The colorimeter measures the screen's output and provides data to adjust the RGB values.

Adjust RGB Levels: Based on the measurements, adjust the red, green, and blue levels until the desired calibration is achieved.

Step 6. Fine-Tuning

Gamma Correction: Adjust gamma settings to a standard value (commonly 2.2). This ensures that mid-tones are rendered accurately.

Profile Creation: After adjustments, the software will create a color profile for your display. Save this profile to ensure your settings are applied whenever the display is in use.

Step 7. Test for Color Uniformity

Uniformity Check: Use the calibration software to run uniformity tests across the screen. This will show any inconsistencies in color and brightness.

Adjustment: If inconsistencies are detected, manually adjust settings where necessary or consider using features like uniformity compensation (if available) in your monitor settings.

Step 8. Regular Maintenance

Routine Calibration: Schedule regular calibrations (every few weeks or months) to maintain color accuracy and uniformity, especially if you work in color-critical fields.

Monitor Aging: Keep an eye on how colors change over time. If you notice significant drift, a recalibration might be necessary.

Additional Tips

Software Options: If you don't have a colorimeter, some software (like Windows Color Calibration) allows manual adjustments but is less precise.

Monitor Quality: Investing in a high-quality monitor with good reviews for color accuracy and uniformity can reduce the need for frequent calibrations.

Use Reference Images: During testing, use standard reference images to compare colors and ensure they appear as intended.

By following these steps, you can effectively calibrate your LED or LCD screen for optimal color accuracy and uniformity, ensuring a better viewing experience whether for professional work or entertainment.



Practical Activity 3.3.4: Applying repair and replacement.



Task:

- 1: As technician, you are required to go to workshop to apply repair and replacement LED/LCD Screen.
- 2: Read the key readings 3.3.4 and ask clarifications where necessary.
- 3: Present your work to the entire class

4: Ask clarifications and supports where necessary.



Key readings 3.3.4: Applying repair and replacement.

Step 1. Diagnose the Problem

Determine if the screen needs repair or replacement. Common issues include:

- ✓ Cracked screen
- ✓ Unresponsive touch
- ✓ Dead pixels or discoloration
- ✓ Backlight failure

Therefore the below are key steps to follow so that you can apply repair and replacement.

Step 2. Power Off and Disassemble the Device

Turn off the device and unplug it from any power source.

Remove any back covers or protective casing using appropriate tools.

Keep track of screws and parts during disassembly.

Step 3. Remove the Damaged Screen

Disconnect the battery if applicable.

Use a plastic spudger to gently pry off the old screen, being cautious not to damage internal components.

Detach the flex cable that connects the screen to the motherboard.

Step 4. Install the New Screen

Align the new screen with the connectors and carefully attach the flex cable to the motherboard.

Ensure the screen is properly seated and secure any adhesive or clips.

Step 5. Reassemble the Device

Reconnect the battery if you disconnected it.

Replace any back covers and screws, ensuring everything is secured properly.

Use a heat gun or hairdryer to gently warm adhesive strips (if used) for a better seal.

Step 6. Test the New Screen

Power on the device and check the new screen for functionality, including:

- ✓ Touch response
- ✓ Color accuracy
- ✓ Brightness

Step 7. Final Adjustments

If everything works correctly, you can finalize the reassembly. If there are issues, double-check the connections or consider consulting a professional technician.



Practical Activity 3.3.5: Applying testing, validation and documentation.



Task:

- 1: As technician, you are required to go to workshop.
- 2: Read the key readings 3.3.5 and ask clarifications where necessary.
- 3: Based on all demonstrated steps test, Validate and Document LED/LCD Screen.
- 4: Present your work to the entire class
- 5: Ask clarifications and supports where necessary.



Key readings 3.3.5: Applying testing, validation and documentation.

Applying testing and validation for LED/LCD screens involves systematic steps to ensure that each unit meets required specifications and quality standards. Below is a detailed approach to applying testing and validation processes:

Step-by-Step Application of Testing and Validation

Step 1. Define Testing Standards

Establish industry standards for testing (e.g., ISO, IEC) that the LED/LCD screens need to comply with. Specify acceptance criteria for each test, including pass/fail thresholds.

Step 2. Visual Inspection

Tools Needed: Magnifying glass, light source.

Process: Inspect each screen for physical defects (scratches, cracks, dead pixels). Ensure the screen surface is free from dust and smudges.

Step 3. Functional Testing

Tools Needed: Functionality testing software, test images.

Process: Power on the screen and verify that it turns on without issues. Display a series of test images and patterns to check responsiveness. For touch screens, validate touch accuracy and multi-touch features.

Step 4. Color Testing

Tools Needed: Colorimeter, spectrophotometer.

Process: Measure RGB values for a series of predefined colors to ensure accurate color representation.

Use color uniformity tests to check consistency across the screen.

Step 5. Brightness and Contrast Testing

Tools Needed: Luminance meter.

Process: Measure peak brightness in nits (cd/m^2) at various screen locations. Calculate contrast ratio using the maximum luminance of white and minimum of black.

Step 6. Response Time Testing

Tools Needed: Oscilloscope, high-speed camera.

Process: Measure the time taken for pixels to transition from one color to another. Test different color transitions to ensure response times meet specifications.

Step 7. Refresh Rate Testing

Tools Needed: Refresh rate testing software, oscilloscope.

Process: Validate that the screen operates at its specified refresh rate. Use a high-speed camera to capture and analyze refresh performance.

Step 8. Environmental Testing

Tools Needed: Environmental chamber, vibration/shock testing equipment.

Process: Subject screens to various temperature and humidity conditions. Perform vibration and shock tests to assess durability under mechanical stress.

Step 9. Power Consumption Testing

Tools Needed: Power meter.

Process: Measure power usage in different operating modes (idle, active). Ensure power consumption aligns with specifications.

Step 10. Lifetime Testing

Tools Needed: Automated testing rig for continuous operation.

Process: Perform burn-in tests by displaying static images for extended periods. Run endurance tests to simulate long-term usage scenarios.

Step 11. Compliance Testing

Tools Needed: Compliance testing equipment for certifications (e.g., EMC, safety).

Process: Conduct tests to ensure compliance with regulatory standards. Document results for certification purposes.

Step 12. User Experience Testing

Tools Needed: User feedback forms, ergonomic testing tools.

Process:

Assess usability in various environments (bright, dark).

Gather user feedback on comfort and ease of use.

Step 13. Documentation and Reporting

Document all test results, methodologies, and compliance checks.

Prepare reports for quality assurance teams and management for review.

In fact, applying testing and validation processes for LED/LCD screens involves thorough planning, execution, and documentation. By following these steps,

manufacturers can ensure that their products meet quality standards, perform reliably, and provide a positive user experience. Regular updates to testing methods based on new technology developments and user feedback are also essential to maintain high quality.



Points to Remember

The diagnostic tools are categorised into two main parts, which are software and hardware.

- Software: There are several diagnostic tools and software available to help identify and troubleshoot issues with LED/LCD screens and other display components.
- Hardware: When performing diagnostics and maintenance on LED/LCD screens, several hardware tools can assist in identifying and resolving issues.
- To configure and restore screen software you need to follow the following steps: Access the Menu, Navigate to Settings, Find the Factory Reset Option, Confirm the Reset, Wait for the Process to Complete, Reconfigure Settings.
- To apply calibration and ensure color uniformity we follow the below steps: Prepare Your Environment, Use Calibration Tools, Initial Screen Setup, Basic Adjustments, Calibrate the Display, Fine-Tuning, Test for Color Uniformity, Regular Maintenance.
- To apply Testing, Validation and Documentation you need to follow the following steps: Define Testing Standards, Visual Inspection, Functional Testing, Color Testing, Brightness and Contrast Testing, Response Time Testing, Refresh Rate Testing, Environmental Testing, Power Consumption Testing, Lifetime Testing, Compliance Testing, User Experience Testing, Documentation and Reporting.



Application of learning 3.3.

A technology company, TechVision, has developed a new model of LED/LCD screen intended for high-definition gaming and multimedia use. The screen boasts features like a high refresh rate, HDR support, and enhanced color accuracy. Before releasing the product to the market, TechVision needs to ensure that the screen meets quality standards and performs as advertised. As TechVision technician you are required to configure and restore LED/LCD screen by calibrating color uniformity, after repairing or replacement of that LED/LCD screen you have to conduct test and finally document the work done.



Learning outcome 3 end assessment

Written assessment

I. Circle the letter corresponding to the right answer of the following questions:

1. Which color do dead pixels typically appear as on a screen?
 - A. Red
 - B. Green
 - C. Black
 - D. Blue
2. Which software feature can help recover stuck pixels?
 - A. JScreenFix
 - B. Dead Pixel Buddy
 - C. PixelHealer
 - D. All of the above
3. Which tool is used to check the voltage and continuity in LED/LCD screens?
 - A. Oscilloscope
 - B. Backlight Tester
 - C. Multimeter
 - D. LVDS Cable
4. Which of the following is recommended to prevent damage from power surges?
 - A. Backlight Tester
 - B. Surge Protector
 - C. T-Con Board Tester
 - D. Pixel-stimulating software
5. Which of these tools is used to diagnose backlight issues in LED/LCD screens?
 - A. Multimeter
 - B. T-Con Board Tester
 - C. Backlight Tester
 - D. Infrared Thermometer

II. Answer by TRUE on the correct statement and FALSE on the wrong statement:

1. Dead pixels appear as black on the screen during all color tests.
2. Stuck pixels can sometimes be recovered using software that cycles colors.
3. It is unnecessary to use a surge protector to prevent damage to LED/LCD screens from voltage spikes.
4. A multimeter is used to check the continuity and voltage in LED/LCD screens.
5. Backlight testers do not help diagnose screen flickering issues in LED/LCD panels.

III Match the statements of column A of Terms to their corresponding column B of Description, and write the letter in blank space of answers.

Answers	A: Term	B: Description
1.....	1. Dead Pixel	A. Helps identify and resolve voltage issues in screens
2.....	2. Stuck Pixel	B. Reduces wear on the screen by lowering contrast levels
3.....	3. Multimeter	C. Displays as a black spot on any color test
4.....	4. Pixel-stimulating software	D. Remains fixed in a single color (red, green, or blue)
5.....	5. Surge Protector	E. Checks for continuity and voltage in circuits
		F. Dead cable of the screen

Practical assessment

As IT Technician of NEW CENTURY HOTEL, you are informed that the conference room LED/LCD screens have suddenly reverted to factory settings after a system update. This case has caused all custom display settings, network configurations, and calibration data to be lost, leading to poor display quality during the preparations for the meeting. You are tasked with restoring the screens to their proper settings by updating the firmware and drivers to ensure the display quality is restored in time for the meeting.

END



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