RTB | RWANDA TVET BOARD

RQF LEVEL 5

ELECTRONIC SERVICES

MODULE CODE: ELSCM501

TEACHER'S GUIDE

Table of Contents

Acronyms

CCD: Charged Coupled Device

CCU: Camera Control Unit

CMOS: Complementary Metal Oxide Semi-conductor

DMM: Digital Multimeter

ISO: international standard organisation

LCD: Liquid Crystal Display

RTB: Rwanda Tvet Board

Introduction

This module describes the skills, knowledge and attitudes required to maintain a camera. At the end of this module, participants will be able to diagnose and rectify camera faults, describe the camera parts, disassemble and assemble camera hardware, and finally install television camera.

The last century has seen truly amazing leaps forward in the field of technology. Starting with grainy images and travelling to Ultra HD in a century has been a helluva ride, so much so that the so called 'inventor of cinema' Marey's invention of a camera that looks like a shotgun (the term 'shooting a film' apparently came from this' now looks incredibly anachronistic, though at the time it was revolutionary. From the Lumière brothers to the Coen Brothers, fromMéliès A Trip to the Moon to James Cameron's Avatar, the history of video technology has been incredibly exciting.

BEGINNING OF PHOTOGRAPHY

The beginning of cinema was a quest to find the right technology to shoot continuous images, and the Lumière brothers hit on a solution in the early part of the 20th century, and then there was no going back. After this, cinema going became a very popular pastime, with 65% of people going to the cinema at least once a week in the 30s, and many movies from the so called 'golden age' of Hollywood still hold a special place in many of our hearts (Think the final scene from Casablanca, or Gone with the Wind).

STREAMING TAKES OVER

Now it is the era of Netflix and streaming. We 'binge watch' shows, unlike back in the day when we waited religiously for episodes of our favourite show, and we 'Netflix and Chill' with our dates rather than going to the cinema. Netflix and other streaming services are also encroaching on the areas formerly controlled by the traditional media, for example Netflix has begun to pick up awards at awards ceremonies formerly dominated by 6 traditional film studies, which has upset the balance in the film and TV industry, and it will be interesting to see how this develops in the next few years.

Module Code and Title: ELSCM501: CAMERA MAINTAINANCE

Learning Unit 1: Prepare the camera maintenance work
Learning Unit 2: Rectify camera faults
Learning Unit 3: Install studio camera
Learning Unit 4: Report the work done

Learning Unit 1: Prepare the camera maintenance work

Learning outcomes
1.1 Select materials, tools and equipment
1.2. Setup the working environment
1.3 Check the camera parts

Learning outcome 1.1 Select materials, tools and equipment

Duration: 2 hours

Learning outcome 1 objectives:

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

- Proper selection of tools, equipment and materials according to their uses.

Resources

Equipment	Tools	Materials
▪ Camera ▪ Camera accessories ▪ Camera stand ▪ Camera tester ▪ Lighting equipment ▪ DMM ▪ Drilling machine ▪ Screwdriver machine ▪ Soldering station ▪ Air blowing machine ▪ PPE	▪ Soldering irons ▪ Screwdrivers ▪ Pliers ▪ Brushes Sponge ▪ Soft cloth ▪ Tape measure ▪ Crimping tools ▪ Cable cutters ▪ Safety knife ▪ Hex keys ▪ Torch	▪ Screws ▪ Insulation tape ▪ SD cards ▪ Soldering tin ▪ Universal anchors ▪ Cables and wires ▪ camera Batteries ▪ Electronic components

Advance preparation

Availability of equipment, tools and materials

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

- ✓ Description of tools, material and equipment.
- ✓ Classification of tools and their uses
  - Repairing tools: Soldering irons Screwdrivers Pliers Cable cutters Crimping tools
  - Cleaning tools Brushes Sponge Soft cloth
  - Measuring tools Tape measure Camera stands
  -
- ✓ Classifications of materials and their use: Cables and wires Repairing materials Soldering tin Screws
- ✓ Equipment and their uses: Drilling machine and accessories, Screwdriver machine, Soldering station, Digital Multimeter, Air blowing machine ,PPE Camera tester Lighting equipment

Indicative content 1.1.1: Description of tools, material and equipment

1) **Tool:** a device or implement, especially one held in the hand, used to carry out a particular function.

A *tool* is any instrument or simple piece of equipment that you hold in your hands and use to do a particular kind of work.

Some **examples of tools** that are often used today are the hammer, the wrench (also called a spanner), saws, shovel, telephone, and the computer. Very basic things like knives, pens, and pencils are also **tools**.

2) **Materials** are the **matter or substance that objects are made from**.

A **material** is a chemical substance or mixture of substances that constitute an object.

We use a wide range of different materials daily; these might include:

- Metal, plastic, wood, glass, ceramics, synthetic fibres, composites (made from two or more materials combined together)

3) **Equipment** is defined as the necessary items for a particular purpose.

Equipment consists of the things which are used for a particular purpose.

Examples of equipment include devices, machines, tools, and vehicles.

Indicative content 1.1.2: Classification of tools and their uses

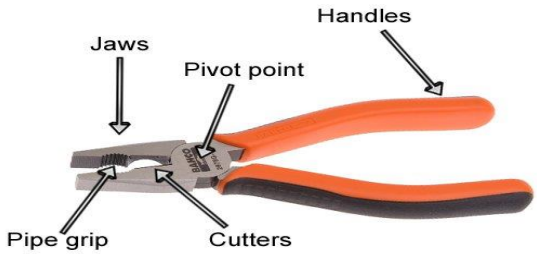
Repairing tools

1. **Soldering irons:** A soldering iron isan electrical tool used for melting solder and applying it to metals that are to be joined.

A *soldering iron* is a hand tool used in *soldering*. It supplies heat to melt *solder* so that it can flow into the joint between two workpieces.

2. **Screwdriver: Screwdriver** istool, usually hand-operated, for turning screws with slotted heads. For screws with one straight diametric slot cut across the **head**, standard screwdrivers with flat blade tips and in a variety of sizes are used.

3. **Pliers:** Pliers (plyers) are handheld, manually-powered hand tools, often employing serrated jaws, designed for holding, cutting, bending, or manipulation of tough or difficult materials such as wire, sheet metal, or fine machine components.



4. **Cable cutters:** The cable cutter is a tool used to cut copper or aluminum electric wire. They come in four varieties: palm grip, manual two-handled units, ratchet cutters and electric cutters.

4. Crimping tools: A crimping tool is a device used to conjoin twopieces of metal by deforming one or both of them in a way that causes them to hold each other. The result of the tool's work is called a crimp.

For instance, network cables and phone cables are created using a crimping tool (shown below) to join the RJ-45 and RJ-11 connectors to both ends of either phone or Cat 5 cable.

Cleaning tools

a) **Brushes:** an implement with a handle and a block of bristles, hair, or wire, used especially for cleaning, applying a liquid or powder to a surface, or arranging the hair.
b) **Sponge:** a piece of a soft, light, porous absorbent substance originally consisting of the fibrous skeleton of an aquatic invertebrate but now usually made of synthetic material, used for washing and cleaning.
c) **Soft cloth:***Soft cloth* is an excellent way to lift organic matter and inorganic matter off an anything's surface. A *soft cloth* cleans the hard-to-get places most effectively.

Measuring tools

a) **Tape measure:** A tape measure or measuring tape is a flexible ruler and used to measure distance. It consists of a ribbon of cloth, plastic, fibre glass, or metal strip with linear-measurement markings. It is a common measuring tool. ... Surveyors use tape measures in lengths of over 100 m.

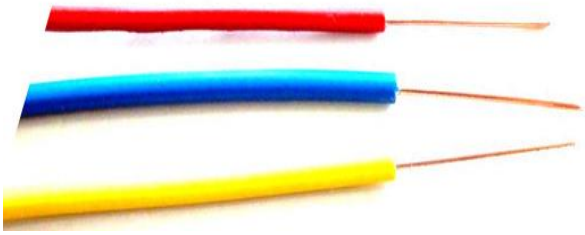
Camera stands: "Camera stand" is the generic term for any contraption that a camera sits on for stability. Camera stands covers the full range of tripods, studio stands and rostrums. The familiar **camera tripod** looks like this:

Indicative content 1.1.3: Classification of materials and their uses

1 **Cables and wires**

A *cable* is a thick *wire*, or a group of *wires* inside a rubber or plastic covering, which is used to carry electricity or electronic signals.

A **wire** is a single conductor (material most commonly being copper or aluminium) while **cable** is two or more insulated **wires** wrapped in one jacket. Multiple conductors that have no insulation around would be classified as a single conductor.



Wire is a single electrical conductor, whereas a **cable** is a group of **wires** swathed in sheathing. The term **cable** originally referred to a nautical line of multiple ropes used to anchor ships, and in an electrical context, **cables** (like **wires**) are used to carry electrical currents.

Repairing materials

1. **Soldering tin: Soldering tin is** a**metal** or metallic alloy used when melted to join metallic surfaces especially: an alloy of lead and **tin** so used.

Solder is a fusible metal alloy used to create a permanent bond between metalworkpieces.

soldering tin

2. **Screws:**A *screw* is a metal object similar to a nail, with a raised spiral line around it. You turn a *screw* using a screwdriver so that it goes through two things, for example two pieces of wood, and fastens them together.

screws

3. **Electronic components**

Electronic components: An **electronic component** is a basic electronic element. These components can be connected together to make circuits. Components can be single items (resistor, transistor) or in more or less complex groups as integrated circuits (logic gate, resistor array).

Electronic components are the basic building blocks of an electronic circuit or electronic system or electronic device.

Electronic components

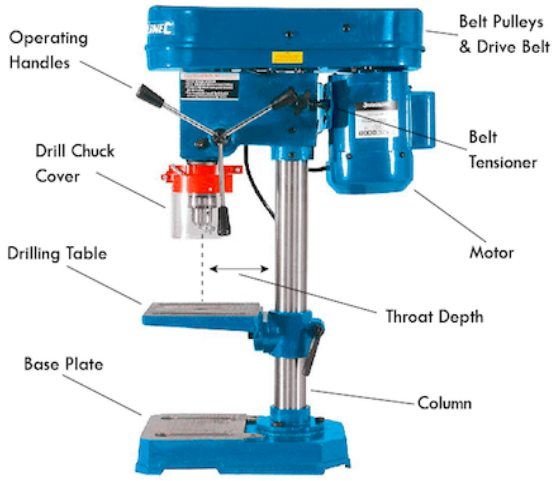
Indicative content 1.1.4: Classification of equipments and their uses

- **Camera**

Camera isa device that consists of a lightproof chamber with an aperture fitted with a lens and a shutter through which the image of an object is projected onto a surface for recording (as on a photosensitive film or an electronic sensor) or for translation into electrical impulses (as for television broadcast).

A **camera** is a piece of equipment that is used for taking photographs, making films, or producing television pictures. Many cameras are now included as part of other digital devices such as phones and tablets.

Drilling machine can be defined as a machine which makes a circular hole in the job by removing volume of the metal from it with the help of a cutting tool called **drill** bit.



Drilling machine

Screwdriver machine

Screwdriver machine is apowered equipment, for screwing (installing) and unscrewing (removing) screws.

screwdriver machine

Soldering station

A **soldering station** is an electronic tool for hand soldering of electronic components onto a PCB. It consists of a station or a unit to control temperature and a soldering iron that can be attached to the station unit.

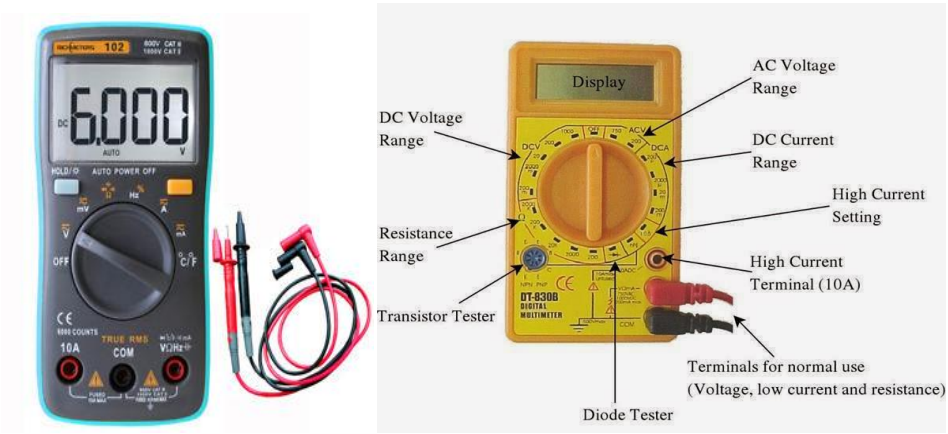
Soldering stations are widely used in electronics repair workshops, electronic laboratories, in industry. Sometimes simple soldering stations are used for household applications and for hobbies.

soldering station

Digital Multimeter

A digital multimeter (DMM) is a test tool used to measure two or more electrical values—principally voltage (volts), current (amps) and resistance (ohms). It is a standard diagnostic tool for technicians in the electrical/electronic industries.

Digital multimeters combine the testing capabilities of single-task meters—the voltmeter (for measuring volts), ammeter (amps) and ohmmeter (ohms). Often they include a number of additional specialized features or advanced options. Technicians with specific needs, therefore, can seek out a model targeted for particular tasks.



Digitalmultimeter

Air blowing machine

A centrifugal fan is a mechanical device for moving air or other gases. The terms "blower" and "squirrel cage fan", (because it looks like a hamster wheel), are frequently used as synonyms. These fans increase the speed and volume of an air stream with the rotating impellers.

air blowing machine

PPE

PPE is defined in the Personal Protective Equipment at Work Regulations as: 'All equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work which protects them against one or more risks to their health and safety'.

Types of PPE and their uses

Gloves is a covering for the hand worn for protection against cold or dirt and typically having separate parts for each finger and the thumb.

a piece of clothing that is worn on the hand and wrist for warmth or protection, with separate parts for each finger

Gloves

Helmet is a hat made of a strong material which you wear to protect your head.

Helmet

Safety shoes/a steel-toe boot (also known as a **safety** boot, steel-capped boot or **safety shoe**) is a durable boot or **shoe** that has a **protective** reinforcement in the toe which protects the foot from falling objects or compression, usually combined with a mid sole plate to protect against punctures from below.

Safety shoes

⎫ **Overall is** a piece of clothing that covers both the upper and lower parts of the body and is worn especially over other clothes to protect them


Overall

Overcoat is an **overcoat** is a type of long coat intended to be worn as the outermost garment, which usually extends below the knee.

Overcoat

Glasses isa special pieces of strong glass or plastic in a frame that fits tightly to a person's face to protect their eyes from dangerous chemicals or machines


Glasses/Goggles

o Nose mask is a flexible pad held over the nose and mouth by elastic or rubber straps to protect against dusts encountered during construction or cleaning activities, such as dusts from drywall, brick, wood, fiberglass, silica (from ceramic or glass production), or sweeping.

Nose mask

Earmuff is a pair of soft fabric coverings, connected by a band across the top of the head, that are worn over the ears to protect them from cold or noise.

Ear muff

- **Use of PPE**

PPE is equipment that will protect the user against health or safety risks at work. It can include items such as safety helmets, gloves, **eye** protection, high-visibility clothing, safety footwear and safety harnesses. It also includes respiratory protective equipment (RPE).

Camera tester

This means you won't be burning time experimenting with camera settings, filters, and mics on the actual shoot- just concentrating on getting the framing and performance you want. This will lead to a much more productive, less stressful shooting day and excellent looking and sounding footage that is ideal for your project.

You are also making sure your camera, mics and all other equipment is in perfect functioning condition.

And, if you pack up right afterwards, it will also ensure you don't forget any gear or accessories you'll need.

Theoretical learning Activity

In group of 3-4 members, discuss about the following

1. Discuss the use of PPE

2. Give 2 types of PPE

3. Give 3 tools, equipment, and tools used to repair a camera.

Practical learning Activity

Trainees are asked to Select tools for camera repair work

Checklist	score	
	yes	no
Indicator: Tools, materials, and equipment are well described		
✓ **Tools**		
✓ **Materials**		
✓ **Equipment**		
Indicator: Tools are well classified		
✓ **Repairing Tools**		
✓ **Cleaning tools**		
✓ **Measuring tools**		
Indicator: materials are well identified		
✓ **Cables**		
✓ **Wires**		
✓ **Soldering tin**		
✓ **Screws**		
✓ **Electronic components**		
Indicator: Equipment are well described		
✓ **Camera**		
✓ **Drilling machine**		
✓ **Screw driver machine**		
✓ **Soldering station**		
✓ **Air blowing machine**		
✓ **Digital multimeter**		
✓ **PPE**		
✓ **Camera tester**		

✓ **Lighting equipment**		

Points to Remember (Take home message)

1) **Tool:** a device or implement, especially one held in the hand, used to carry out a particular function.
2) **Materials** are the **matter or substance that objects are made from**.

A **material** is a chemical substance or mixture of substances that constitute an object.

3) **Equipment** is defined as the necessary items for a particular purpose.

Learning outcome 1 formative assessment

1. Classify clearly all tools with examples:

-Repairing tools **ex: Soldering iron**

-Cleaning tools **ex: Brush**

-Measuring tools **ex: Measuring tape**

2. Answer true or false

a) A material is any substance that can be used to make different tools **True**

b) Camera is the best equipment used for painting **False**

c) Digital multmeter is a helpful instrument in camera maintenance work **True**

Practical assessment

Suppose you are going to repair a camera canon 98X, prepare equipment you will use to repair that camera.

checklist	score	
	yes	no

Indicator: Equipment are well prepared		
✓ Camera is well selected		
✓ Drilling machine is properly prepared		
✓ Screw driver machine is well selected		
✓ Soldering station is well selected		
✓ Air blowing machine is well selected		
✓ Digital multimeter is well selected		
✓ PPE is properly prepared		
✓ Camera tester is properly prepared		
✓ Lighting equipment is properly prepared		

Learning outcome 1.2: setup the working environment

Duration: 2 hrs

Learning outcome 2 objectives:

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

- Proper setup of the working environment according to the work to be done

Resources

Equipment	Tools	Materials
▪ Air blowing machine ▪ PPE	▪ Brushes Sponge	▪ Screws

	▪ Soft clothes, Towels	▪ Insulation tape

Advance preparation

Availability of equipment, tools and materials

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

- ✓ Cleaning techniques
  - Brushing
  - Toweling
- ✓ Cleaning tools: Brushes Sponge Soft cloth
- ✓ Safety rules and guidelines
  - Individual safety precautions
  - Electrical safety precautions
- Operating safety precautions
- ✓ Techniques of arranging tools, materials and equipment
  - Arrangement by size
  - Arrangement by type
  - Arrangement by manufacturer instructions

Indicative content 1.2.1: Cleaning techniques

Blowing: cleaning using blower/blowing air on surface remove dirty,

Brushing: remove (dust or dirt) by sweeping or scrubbing

Towelling: wipe or dry with a towel.

Towel absorbent cloth or paper for wiping and drying something wet, as one for the hands, face, or body after washing or bathing

Steps of well setting up the working area

1. Clean the workplace

2. Comfy sitting place

3. Install enough lighting

4. Install cooling fans

5. Arrange well the tools, Equipment and materials

6. Follow Workplace Safety rules and guidelines

dicative content 1.2.2: Safety rules and guidelines

Safety rules and guidelines are the regulations or rules that are put in place to ensure a product, event, etc, is safe and not dangerous. These are classified in the following categories:

Individual safety precautions

One of the best ways to maximize your safety and minimize your risk is to follow some very simple security rules:

1. Walk with a friend whenever possible,
2. Always be aware of your surroundings and the people around you, no matter whether it is day or night,
3. Use well-lighted, well-travelled routes,
4. Walk with confidence,
5. Your safety is your personal responsibility. Always follow the correct procedures. Never take shortcuts. Clean and organize your workspace. Ensure a clear and easy route to emergency exits and equipment.

6. Be attentive at all times to your work surroundings. When in doubt, contact your supervisor or manager for instruction, guidance, or training. Never take risks when it comes to safety.
7. Obey safety signs, stickers (paper), and tags. (a small piece, cloth, material attached to something as a labor) Report serious injuries immediately to a supervisor and get emergency assistance. Keep things in perspective. Hazards may be limitless, so focus on the most likely risks first.

Operating safety precautions

1) Never make any adjustments while the machine is operating.
2) Do not support the workplaces by hand. Use a holding device to prevent the work piece from being tom from the operator's hand.
3) Never clean away chips with your hand. Use a brush.
4) Keep all loose clothing away from turning tools.
5) Make sure that the cutting tools are running straight before starting the operation.
6) Never place tools or equipment on the drilling tables.
7) Keep all guards in place while operating.
8) Ease up on the feed as the drill breaks through the work to avoid damaged tools or workplaces.
9) Remove all chuck keys and wrenches/blow before operating.
10) Always wear eye protection while operating any drilling machines.

Electrical safety precautions

It's vitally important to take safety precautions when working with electricity. Safety must not be compromised and some ground rules need to be followed first. The basic guidelines regarding the safe handling of electricity documented below will help you while working with electricity.

1. Avoid water at all times when working with electricity. Never touch or try repairing any electrical equipment or circuits with wet hands. It increases the conductivity of the electric current.

2. Never use equipment with frayed cords (loose threads), damaged insulation or broken plugs.

3. Always use insulated tools while working.

4. Always use appropriate insulated rubber gloves and goggles while working on any branch circuit or any other electrical circuit.

5. Never try repairing energized equipment. Always check that it is de-energized first by using a tester. When an electric tester touches a live or hot wire, the bulb inside the tester lights up showing that an electrical current is flowing through the respective wire. Check all the wires, the outer metallic covering of the service panel and any other hanging wires with an electrical tester before proceeding with your work.

6. Do not use the electrical equipment or circuit of others.

7. Try not to handle electrical appliances with wet hands, foot and on a wet floor.

8. Never use highly flammable liquids near electrical equipment.

9. Never underestimate the power of electricity you would not like to underestimate (make to low estimate) the power of electricity in any condition. So always work with electricity carefully and pretend as the electricity flow is always there.

10. Shut-off. Always make sure you have shut-off the power source before performing any work related to electricity. For example; Inspecting, Maintaining or repairing.

dicative content 1.2.3: Techniques of arranging tools, materials and equipment

Organization or arrangement of tools, materials and equipment is one of the keys to an effective workplace. It seems like such a simple thing, but the fact is that when we take the time to organize our workplace, we become more efficient. One reason for this increase in efficiency is the decrease in "search time" that results from an organized work area. Whether it's a file, work order, tool, part, blueprint or even something as simple as a pen,

we spend considerable time searching for these things, and this is time wasted. Planning and organization makes efficient use of your time by keeping you focused from beginning to completion of a project.

Arrangement is an act of arranging; state of being **arranged,** the manner or way in which things are **arranged**.

It is achieved by the following settings:

3.1 Arrangement by uses: the tools, materials and equipment of the same function are put on the same level.

3.2 Arrangement by size: the tools, materials and equipment of the same size, weight are put on the same level.

3.3 Arrangement by types: the tools, materials and equipment of the same type are put on the same level.

Theoretical learning Activity

In group of 3-4 members, discuss about the following

1. Techniques of arranging tools and materials

2. Individual safety precautions

Practical learning Activity

Arrange tools, materials and equipment for camera repair work

checklist	score	
	yes	no
Indicator: cleaning techniques are well identified		
✓ blowing		
✓ brushing		
✓ towelling		
Indicator: safety rules and guidelines are well identified		
✓ individual safety precautions		
✓ electrical safety precautions		

✓ operating safety precautions		
Indicator: tools, materials and equipment arrangement techniques are well identified		
✓ Arrangement by type		
✓ Arrangement by use		
✓ Arrangement by size		

Points to Remember (Take home message)

Steps of well setting up the working area

1. Clean the workplace

2. Comfy sitting place

3. Install enough lighting

4. Install cooling fans

5. Arrange well the tools, Equipment and materials

6. Follow Workplace Safety rules and guidelines

Learning outcome 2 formative assessment

1. Give five steps of preparing the working environment

Answers: Steps of well setting up the working area

1. Clean the workplace

2. Comfy sitting place
3. Install enough lighting
4. Install cooling fans
5. Arrange well the tools, Equipment and materials
6. Follow Workplace Safety rules and guidelines

2. Give three importance of cleaning the workplace

Answers:-Avoid different hazards

-Protect Environment

-Protect workers from different diseases

3. Choose the letter that matches the correct answer:

The work place should be cleaned:

a) Before the work

b) After working

c) Every three hours

d) All of above

e) a and b

ANSWER: IS e

Practical assessment

Before starting repairing a camera you are requested to arrange tools, materials and equipment.

checklist	score	
	yes	no
Indicator: arrangement techniques are well identified		
✓ Arrangement by type is well respected		
✓ Arrangement by use is properly identified		
✓ Arrangement by size is well respected		

Learning outcome 1.3: Check Camera parts

Duration: 1 hrs

Learning outcome 3 objectives:

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

- Correct checking of camera parts as per role.

Resources

Equipment	Tools	Materials
▪ Camera ▪ Camera accessories ▪ Camera stand ▪ Camera tester ▪ Lighting equipment ▪ DMM ▪ Air blowing machine ▪ PPE	▪ Soldering irons ▪ Screwdrivers ▪ Pliers ▪ Tape measure ▪ Cable cutters ▪ Safety knife	▪ Screws ▪ Insulation tape ▪ SD cards ▪ Soldering tin ▪ Cables and wires ▪ camera Batteries ▪ Electronic components

Advance preparation

Availability of equipment, tools and materials

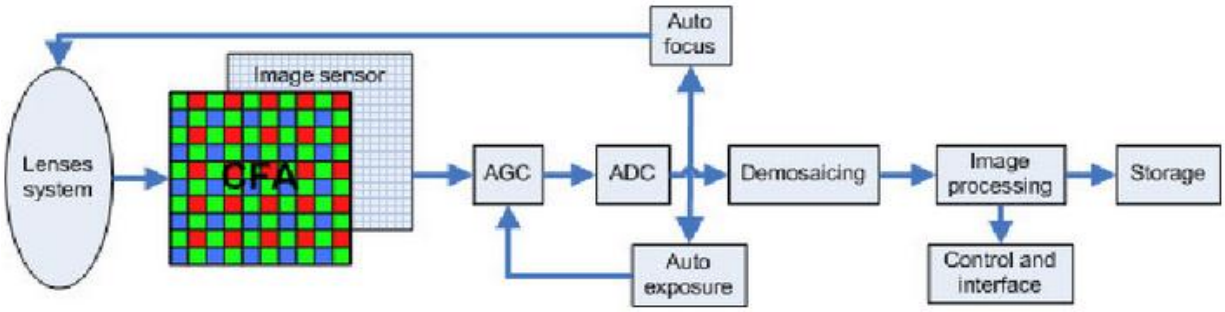
Indicative content: 1.3.1. Introduction to camera operation

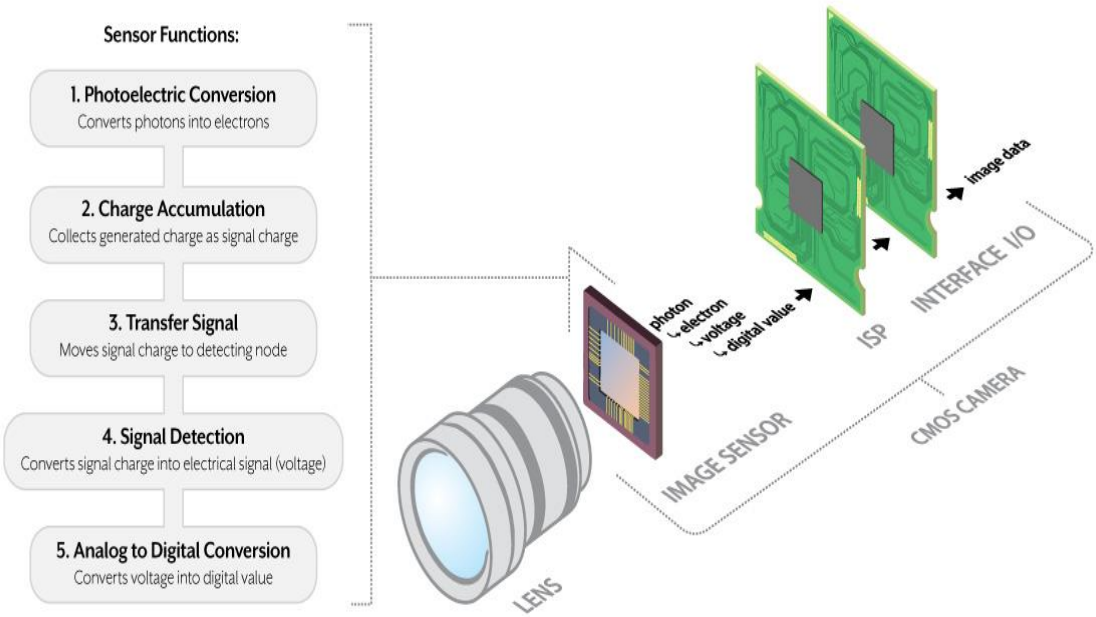
Introduction to camera

A camera is an optical instrument that records images that can be stored directly, transmitted to another location, or both. These images may be still photographs or moving images such as videos or movies.

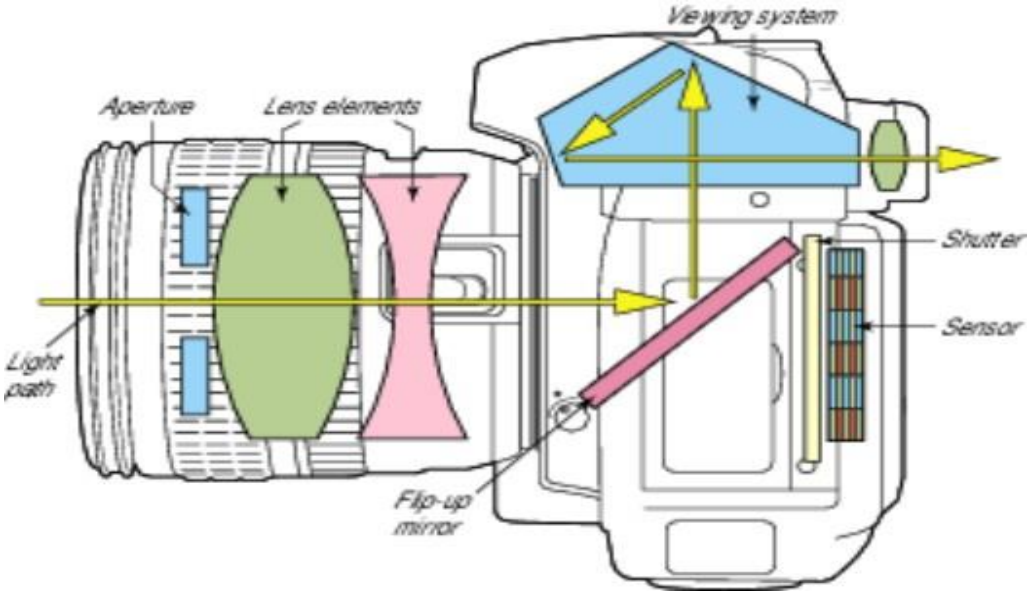
The term camera comes from the word camera obscura (Latin for "dark chamber"), an early mechanism for projecting images. The modern camera evolved from the camera obscura& functioning of the camera is very similar to the functioning of the human eye.

.2 **Block diagram of Camera**





1.3 How a camera works

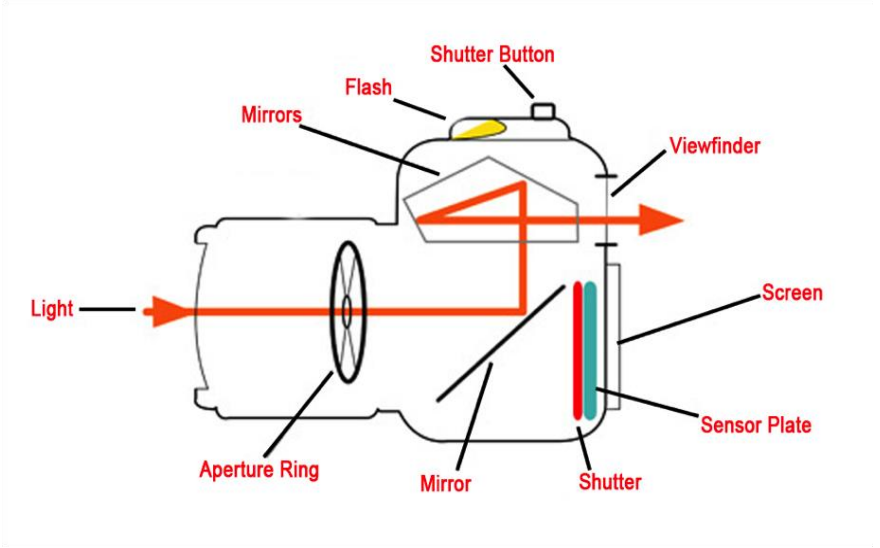


To put it in the most simplest way, light from the subject enter the camera through the lens and hits the film or sensor and a photograph is born. Every lens has an aperture inside it, it is basically the equivalent of an iris inside an eye. It is an opening which controls the amount of light that enters the camera. The aperture is measured in F stops, the bigger the f stop number (f/16), the more the aperture is closed which results in less light coming in and the smaller the f stop (f/1.8), the more the aperture is open which means there is more light

coming in, which makes it ideal for low light conditions. The price of a camera lens is usually based on how wide the aperture can open, lens with aperture f/1.2 are more expensive than lens with f/4.

The aperture can also affect the depth of field. The bigger the f stop the wider the depth of field and conversely, the smaller the f stop the shallower the depth of field. Depth of field is basically the area of the shot that is in focus or sharp. To achieve a very shallow DOF, you could to a number of things; adjust your aperture to the smallest f stop, use the largest focal length (300mm), move in as close to your subject as possible.
The focal length is measured mm, 35mm is the standard for films, for close ups a larger focal length would be ideal such as a 50mm or even a telephoto lens, for wider shots like landscapes, a small focal length is needed such as a 16mm lens.

Indicative content: 1.3.2: Description of functional parts



The basic components are all the same for both analog and digital cameras. But, the only difference is that the images received in an analog camera will be printed on a photographic paper. If you need to send these photos by mail, you will have to digitally convert them. So, the photo has to be digitally scanned. This difficulty is not seen in digital photos. The photos from a digital camera are already in the digital format which the computer can easily

recognize (0 and 1). The 0's and 1's in a digital camera are kept as strings of tiny dots called pixels.

The image sensors used in a digital can be either a Charge Coupled Device (CCD) or a Complementary Metal Oxide Semi-conductor (CMOS). The image sensor is basically a micro-chip with a width of about 10mm. The chip consists arrays of sensors, which can convert the light into electrical charges. Though both CMOS and CCD are very common, CMOS chips are known to be cheaper. But for higher pixel range and costly cameras mostly CCD technology is used.

A digital camera has lens/lenses which are used to focus the light that is to be projected and created. This light is made to focus on an image sensor which converts the light signals into electric signals. The light hits the image sensor as soon as the photographer hits the shutter button. As soon as the shutter opens the pixels are illuminated by the light in different intensities. Thus an electric signal is generated. This electric signal is then further broke down to digital data and stored in a computer.

Lens

The lens is what captures the light and focuses it on the film/sensor. The lens is positioned

at the correct focusing distance from the film/sensor by a focusing mechanism.
On some cameras, this length is fixed however on most cameras you have control over the focal length.

Shutter

Another important part of the camera, a shutter prevents the entered light reaching the film/sensor until you press the release button allowing you to decide exactly when to take the picture.

The beginner models usually do not let you change the shutter speed, and it is typically set at 1.125 second. The more expensive ones however allow you to select from a range of speed settings. This way you can either "freeze" / "blur" moving subjects, or compensate for dim / bright lighting conditions.

Lens Aperture

A lens aperture is an adjustable circular hole positioned within or just behind the lens. It is used to control the amount of light / brightness of an image.

Usually, the smaller the aperture, the more parts of the scene will appear in focus, and the greater is the “depth of field”.

As you can see, this along with the shutter, are the controls you have at your disposal to adjust the light that your image receives.

Viewfinder

A viewfinder allows you to preview the picture. There are two types of viewfinders, one that is found on non-reflex cameras (they have a direct viewfinder) and the other that is available on SLR cameras.
Single lens reflex (SLR) cameras allow you to view the actual image formed by the lens. Direct viewfinders are bright and clear, but less accurate than SLR for composing images, particularly close-ups.

The LCD is another important component that displays all the menu options and also lets you know how many pictures you have taken.

dicative content 1.3.3: Checking methods

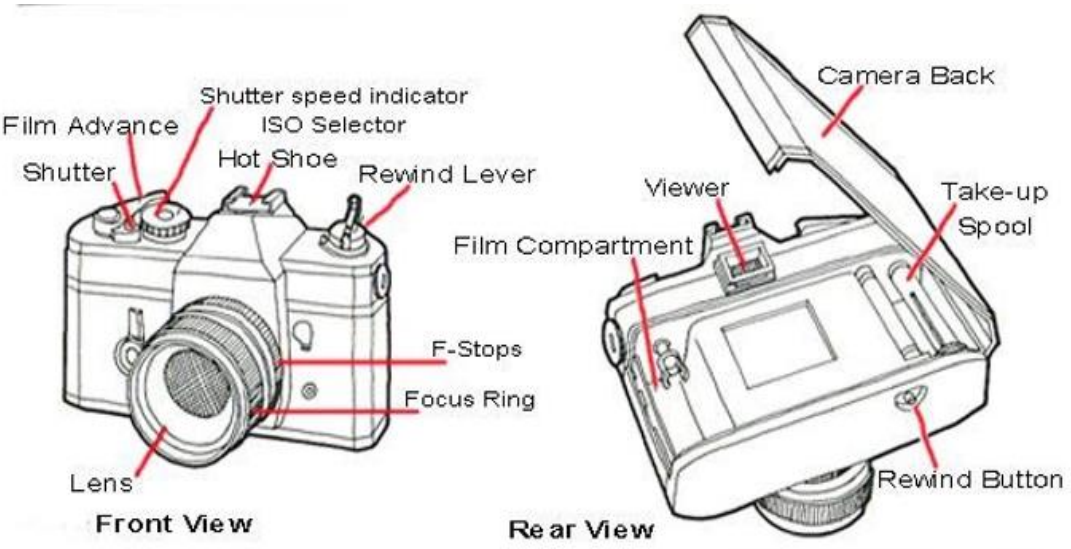
Visual checking

Visual Inspection, used in maintenance of facilities, mean inspection of equipment and structures using either or all of raw human senses such as vision, hearing, touch and smell and/or any non-specialized inspection equipment.

Measuring

The process of measurement of some electric, magnetic, or electromagnetic quantity or of the relationships between such quantities characterizing the operation
of electronic equipment.

Indicative content 1.3.4: Checking of camera parts and their functions



From the moment you look through the viewfinder and your finger presses the shutter button, you're engaging a camera's operation. It's all designed to capture a photograph using light. Once you understand how each part of a camera body works, you can have a better understanding of how to take great photographs and maintain it when defective.

Modern-day DSLRs or digital single reflex cameras are incredibly advanced with lots of features and controls that allow you to fine-tune every photo taken. But do you know what the different parts of a camera do?

3.1 Power supply

A **power supply** is a hardware component that supplies power to an electrical device such as camera. Most cameras use rechargeable battery as their power supply.

A rechargeable battery, storage battery, or secondary cell, (or archaically accumulator) is a type of electrical battery which can be charged, discharged into a load, and recharged many times, as opposed to a disposable or primary battery, which is supplied fully charged and discarded after use. It is composed of one or more electrochemical cells.

A common consumer battery charger for rechargeable AA and AAA batteries

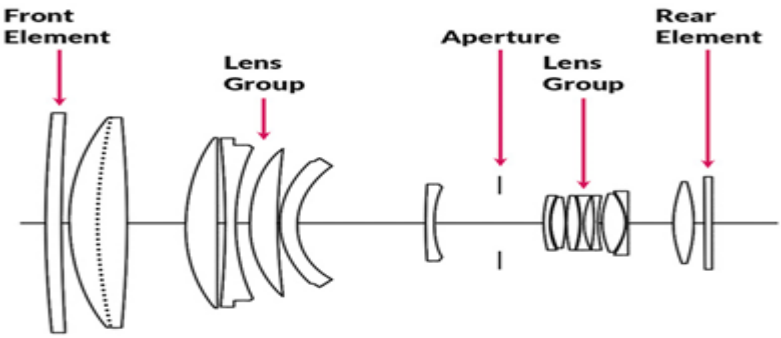
3.2 Lens

One of the most vital components of photography is the camera lens. Basic point and shoot cameras will come with a built-in lens that can not be changed. But even entry-level DSLRs will have an interchangeable lens to suit the shoot.
There are two main types of lenses. Zoom lenses allow you to zoom in and out between a set focal range (i.e. 24 – 70mm). Whereas prime lenses are fixed at one focal length (i.e. 50mm).

Lens of the camera

Parts of a Camera Lens

Here we have the anatomy of a lens. As you can see, there is a lot of glass that makes up a lens.



Parts of a Camera Lens

3.3 View finder

The viewfinder is a small window on the back of the camera that allows you to look through and compose your image.

The benefit of using a viewfinder instead of looking on a digital LCD screen is that external light is reduced. This allows you to see the subject and scene in the truest light and without distraction.

Some cameras, such as point and shoot cameras, don't have viewfinders. Instead, they have an LCD screen you can use to compose the image.

3.4 Body

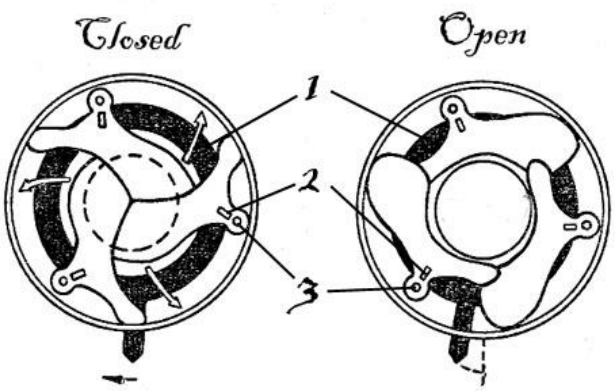
The camera body is the most basic part of a camera. It is the box that holds the film and the camera controls. The lens is either built-into the body or attaches to the body. The body also

houses a battery that powers the shutter, flash, light meter, and other controls. There are generally rings to connect a strap to the camera for easy carrying as well.

3.5 Shutter

The shutter is an opaque piece of metal or plastic inside your camera that prevents light from reaching the film or digital sensor. The shutter is opened, or released, by the shutter release button. The amount of time the shutter stays open is controlled by the shutter speed setting.

In digital cameras, you will not be able to see the actual shutter. However, if you open up the back of a film camera, the shutter—typically a curtain or blades—is visible.



Camera shutter

Shutter speed is the amount of time in which the shutter is open to allow the film/sensor to be exposed to light. This speed is generally measured in fractions of a second such as 1/250. The faster the shutter opens and closes, the less light strikes the film or digital sensor.

3.5 Shutter release

Depending on what camera you have, you will often find a whole host of buttons on the back and top of the camera. All these will have a function and use but the most important one is the “shutter release” button at the top.

Pressing this button half-way down often focuses on the subject that you are pointing at (unless you are using the “back focus” button). Pressing the button all the way down takes the picture.

The other buttons on the camera will allow you to control various elements. These are things such as ISO, point of focus, white balance, shutter speed, aperture and many more.

Depending on the type of camera, the shutter button has a number of other functions as well:

- In some single-lens reflex (SLR) cameras, this button also raises a mirror that allows the photographer to use the viewfinder to look through the lens itself.

- For autofocus cameras, including DSLRs, point and shoots, and some 35mm film SLRs, pressing the shutter button halfway focuses the lens.

- In automatic film cameras, the shutter release also causes the film to advance to the next exposure. In manual film cameras, there is a "film advance lever" that must be turned in order to advance the film and the exposure counter.

Many SLR cameras also allow you to remotely engage the shutter via a cable release or wireless remote.

3.7 Aperture

Every time you click to take a photo, a mechanical process occurs in the lens and camera. One element of this process is the opening and closing of the shutter that allows light into the camera.
The bigger (or wider) this opening is, the more light enters. If the opening is smaller, less light will pass through. The amount of opening is represented by an f/number.

Now, this is where it gets tricky. The higher the f/number, the smaller the opening and the smaller the f/number, the bigger the opening. So f/2.8 is a much wider aperture than f/22. The reason why this is so important is that aperture along with ISO and shutter speed form the exposure triangle.

These three settings ultimately determine how your image will be captured by the camera and lens.

3.8 Mirror

You might be surprised to know that inside DSLR cameras there is also a mirror. This mirror reflects the light from the scene or subject in front of you to the viewfinder. So when you look through it, you see a live view.
When you press the shutter button, this mirror flips up and back down again to expose the sensor to the light, hence capturing the image.
This is why when you take a photo on a DSLR camera, the viewfinder goes momentarily dark. The mirror is no longer reflecting the light.
There is also a wide range of cameras called “mirror less” cameras. These do not have this mirror and instead, the sensor is continuously exposed to the light.
When you look through the viewfinder on one of these cameras you see a digital preview of your image.

3.9 Image sensor

Every digital camera will have a sensor. This device is what captures and converts an optical image in the form of light to an electronic version (i.e. a digital image).
There are different types of sensors but the two most common are CCD and CMOS. To make things even more complicated there is also a variety of image sensor sizes as well.
The important thing to remember is that this is the heart of the camera and the most important element. So, make sure it doesn't get damaged otherwise you'll be looking at an expensive repair bill.

3.10 Memory card slot

It is a slot in which you insert the memory card for recording images. The type of card usable varies with the camera model.

3.11 Memory card

Memory card

A **memory card** is known to be a small storage medium which is generally used to store information. The most common type of data that's being stored on a **memory card** include videos, pictures, audio and other types of file formats. It's also used for smaller, portable as well as remote computer devices.

3.12 LCD screen

All modern cameras will have some sort of LCD screen that will allow a whole host of functions to be accessed. You will be able to see and compose your image before taking the picture using a “live mode”.
You can review images you have taken and also see information like the histogram on there. Often this is also the screen that will allow you to see and choose your settings.
Some LCD screens can be tilted to make it easier to see when photographing at awkward angles (such as low down).

3.13 Flash

Most cameras will come with a built-in or pop-up flash these days. For those that don’t come with one, like the higher end DSLR models, you can attach a flash to the hot shoe that sits above the viewfinder.
External flashes that attach to the hot shoe will give you more flexibility as you can place them in other places. You can then fire them off with a remote that sits on the hot shoe.
The downside of these is that there is an additional cost involved in actually purchasing one.

Camera Flash

3.14 User control

To master your camera, you have to know it like the back of your hand. You must know what each control does and know where each control is in order to master a specific picture-taking situation. The position of these controls varies from camera to camera. The following is a list of important camera controls and what they do:

- **Mode dial:** On most cameras this is a round dial on top of the camera. This is the shooting mode dial. On Canon cameras, the dial is on the left side when you hold the viewfinder to your eye and take pictures. On Nikon cameras, it's on the right side. You use the dial to choose the desired shooting mode.
- **Shutter button:** You press this button to pre-focus the camera and take a picture.
- **ISO setting:** The ISO determines how sensitive the sensor is to light. You use higher ISO settings to take pictures in low light conditions. On many cameras, a dial is used to change the ISO. Some cameras use a menu command to change the ISO setting.
- **Aperture setting:** The aperture determines how much light enters the camera. When you choose Aperture Priority as the shooting mode, you use a dial to change the aperture, and the camera automatically selects the shutter speed to properly expose the image.
- **Shutter speed setting:** The shutter speed setting comes into play when you shoot in Shutter Priority mode. After choosing Shutter Priority for the shooting mode, you use a dial to change the shutter speed, and the camera automatically selects the correct f/stop to properly expose the image.

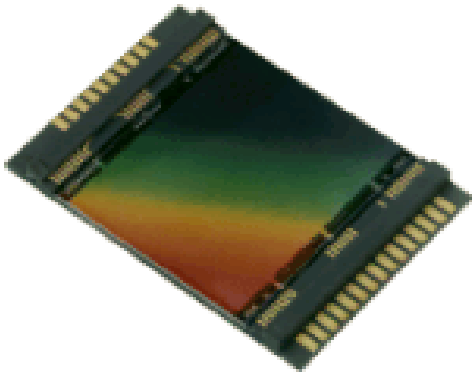
- **Exposure compensation setting:** This is used to increase or decrease the exposure. You increase or decrease the exposure when the camera gets it wrong.
- **Histogram display:** This option displays a graph that shows you the distribution of pixels from the lightest parts of the image to the darkest parts of the image. If you notice a spike on the right side of the histogram, your image is overexposed. If you see a spike on the left side of the histogram, part of the shadows are pure black, and no details are visible.
- **White balance:** You use this setting to set the white balance. The human eye can compensate for different lighting scenarios to see white as white. If the camera gets confused due to multiple light sources, the whites have a color cast to them and may have a green, orange, or blue tint.
- **Metering mode:** The metering mode determines which area of the viewfinder is used to meter the image. In most instances, your camera's default metering mode does an excellent job. However, in some picture-taking scenarios, you may need to change the metering mode.
- **Flash control:** If your camera has a built-in flash unit, you push this button to pop the flash unit up and enable it. You can use flash to light the scene or add additional light known as fill flash.
- **Hot shoe:** You slide a flash unit that's compatible with your camera into this slot. The contacts in the hot shoe communicate between the camera and flash unit.
- **LCD panel:** This panel shows you all the current settings. When you change a setting such as the shutter speed or ISO setting, the panel updates to show you the new settings. If your camera doesn't have an LCD panel, these settings are visible in most camera viewfinders.

3.15 CCD (Charge Coupled Device)

A Charge Coupled Device (CCD) is a highly sensitive photon detector. The CCD is divided up into a large number of light-sensitive small areas (known as pixels) which can be used to build up an image of the scene of interest. A photon of light which falls within the area defined by one of the pixels will be converted into one (or more) electrons and the number

of electrons collected will be directly proportional to the intensity of the scene at each pixel. When the CCD is clocked out, the number of electrons in each pixel are measured and the scene can be reconstructed.

The picture here shows a "typical" CCD. The CCD itself is primarily made of silicon and the structure has been altered so that some of the silicon atoms have been replaced with impurity atoms.



Charge Coupled Device

Theoretical learning Activity

In group of 3-4 members, discuss about the following

1. Main parts of a camera

2. Working principle of a camera

Practical learning Activity

Individually each trainee is asked to check camera parts functionality

checklist	Score	
	yes	No
Indicator: camera are well described		
✓ Power supply		
✓ Lens		
✓ view finder		
✓ body		
✓ shutter release		
✓ aperture		
✓ image sensor		
✓ memory card slot		
✓ memory card		
✓ flash		
✓ LCD screen		
✓ CCD Sensor		
Indicator: checking methods are well identified		
✓ Visual checking		
✓ Measuring		

Points to Remember (Take home message)

There are two major methods you may use for checking different parts of camera:

1. Visual checking: Here you use your eyes for inspection
And
2. Measuring method: Here you use different measurements to check the fault

Learning out come 1.3: formative assessment

1. Kass tech hired you as a technician. One day, a client brought a camera which is turning on but some of its parts are not functioning. Describe the best checking methods you will use in order to identify the faults parts.

Answer: There are two major methods you may use for checking different parts of camera:

-Visual checking: Here you use your eyes for inspection

And

-Measuring method: Here you use different measurements to check the fault

2. Discuss about the functional camera part named: **"shutter"**

Answer: Shutter is the part of camera where you press in order to capture an Image

Practical assessment

Before repairing a camera show the parts of that camera one another

checklist	Score	
	yes	No
Indicator: camera are described		
✓ Power supply is described		
✓ Lens is described		
✓ view finder is described		
✓ body is described		
✓ shutter release is described		
✓ aperture is described		
✓ image sensor is described		
✓ memory card slot is described		
✓ memory card is described		
✓ flash is described		
✓ LCD screen is described		
✓ CCD Sensor is described		

References:

1.https://www.google.com/searchtools+materials+and+equipment+in+electronic+repairs+and+maintenance

2. https://www.techspray.com/electronic-repair

3. TOMOSY, T. (1993). Camera maintenance and repair (book1 ed.). New York: Amherst ,NY:Amherst media.

LEARNING UNIT 2: RECTIFY CAMERA FAULTS

Learning outcome
2.1 Identify the fault
2.2 Fix the faulty component
2.3. Test the camera

Learning outcome 2.1: Identify the fault

Duration: 10hrs

Learning outcome 2 objectives:

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

- Accurate identification of faults according to the functionality

Resources

Equipment	Tools	Materials
▪ Camera ▪ Camera accessories ▪ Camera stand ▪ Camera tester ▪ Lighting equipment ▪ DMM ▪ Drilling machine ▪ Screwdriver machine ▪ Soldering station ▪ Air blowing machine ▪ PPE	▪ Soldering irons ▪ Screwdrivers ▪ Pliers ▪ Brushes Sponge ▪ Soft cloth ▪ Tape measure ▪ Crimping tools ▪ Cable cutters ▪ Safety knife ▪ Torch	▪ Screws ▪ Insulation tape ▪ SD cards ▪ Soldering tin ▪ Universal anchors ▪ Cables and wires ▪ camera Batteries ▪ Electronic components

Advance preparation

Availability of a camera (Canon)

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

- ✓ Identification of camera faults:
  - Settings faults
  - Hardware frequent faults: Lens problems, Power supply fault, LCD problems, Shutter problems, Image sensor fault, Memory card and slot faults.
- ✓ Disassembling process
  - Consult user manual Remove power supply
  - Remove Memory card
  - Unscrew screws
  - Remove the cover
  - Separate Optical and visor system
  - Disconnect camera internal parts

Indicative content 2.1.1: Identification of camera fault

1.1 Settings faults

The most basic characteristic that you can influence is how bright or dark the photograph will turn out. The more light can enter, the brighter the picture will be. That is a very easy to understand characteristic in photography.

Aperture: controls the area over which light can enter your *camera*.

Shutter speed: controls the duration of the disclosure/exposure/exposé.

ISO speed: controls the sensitivity of your *camera's* sensor to a given amount of light.

Aperture

The first basic camera setting is the aperture. The aperture describes how open the lens is and how much light the lens will pass through.

- **Common camera aperture problems**

The corners of your photos are dark

Vignetting is when your photos come out with a darker tinge in the corners. It usually happens when your lens is capturing its own ends in a shot and is especially common when you combine wide-angle lenses with large apertures.

Try to avoid using your lens's largest apertures (such as f/1.2 or f/1.4). To find out the largest possible aperture you can use without vignetting, just take a series of shots gradually stepping down one stop until the vignetting disappears.

Vignetting can help to create help direct the viewer's eye to the centre of the frame, so it might be a creative tool you want to hold in some shots.

My photos are white at larger apertures

Once again, your camera is unable to perform what you're asking of it. Your largest apertures let tones of light in. Sometimes your camera can't adjust to a shutter speed fast enough – or an ISO low enough – to balance.

Try a darker location or check your camera settings to see if you can stop your ISO down to an extremely low setting. Alternatively, just raise your settings to a smaller aperture, such as f/5.6.

You can't get the blurry/unclear background

If you can't get the blurry background, you might not have a large enough aperture to achieve the shallow/thin depth of field you want. Alternatively, there could be too much distance between yourself, the subject, and the background.

First, check that your focus is trained on the subject and not on the background. Sometimes, it works to change to manual focus.

If your focus is correct, try moving closer to your subject – as close as you can get while maintaining focus. Or you can bring the subject further away from the background.

You're getting overexposed photos and the wrong depth of field

Overexposed images and the wrong depth of field may occur if your aperture is failing to stop down during exposure.
This can happen if you have a faulty aperture ring. You can check the problem by switching to manual mode to set your camera at the smallest aperture with a slow shutter speed. Take photos while the camera faces you and you'll be able to see if the aperture ring is working or not.
You might also get a hot aperture ring after leaving your camera in an area with high temperatures for a long time (such as in your car on a hot day).

If you have sticky/hot blades/cutting ends, it's best to drop off your camera at a specialized repair store, since the lens will need to be disassembled.

Shutter Speed

The Shutter Speed determines how long the sensor or film will be exposed to the light. It is usually measured in fractions of a second and the sensor is only exposed for a very short amount of time.

The longer the shutter stays open, the longer the sensor will be exposed to light and the brighter the picture will be. While adjusting the shutter speed for your camera settings, keep in mind that movement also plays an important role.

Common Camera Shutter Problems

The Shutter Won't Open or Close

If the shutter refuses to close or open, it can create huge problems for photographers.

If your shutter won't move/shunt, it's likely blocked. You'll end up with overexposed photos (if the shutter stays open too long) or dark images if the shutter is stuck closed.

You may want to do a quick check:

- Set your camera to any mode than Auto.
- Turn off the flash.
- Point the camera towards you.
- Look down the lens and press the shutter release/free/discharge.

If you see a flash, your shutter is working fine. But if that flicker is absent, you've got a blocked shutter.

The Shutter Lags Too Long

Shutter lag time can be an issue for many photographers, though it is usually only common in compact digital cameras or phone cameras.

Your shutter lag time is the time taken between you pressing the shutter button and the camera actually taking the shot. In quality DSLRs and mirror less cameras, shutter lag isn't usually an issue. But even a lag of less than a second can spell disaster for a carefully timed shot.

- *What Causes Shutter Lag?*

Three possible things could cause shutter lag:

- Your camera takes too long to autofocus, especially if it's a fast-moving subject or low-light scene.
- Your camera has a slower shutter release lag.
- You haven't had enough time to focus the image before fully pressing the shutter release

➢ *How to Fix Shutter Lag?*

Shutter lag isn't necessarily a camera problem that can be fixed since a fast shutter is either built into the camera or it isn't.

The best way to avoid shutter lag is to buy a quality camera that has a built-in fast shutter speed. Failing that, here are a few other things you can do to reduce shutter lag:

- Shoot in good lighting where possible.
- Try to position yourself so any moving subject is coming towards you rather than across your shot.
- Try to pre-focus your shot.
- Shoot in manual control and manual focus modes.

Naturally, the best way to avoid these problems is to provide in a quality camera, protect it by storing it in an insulated camera bag, and performing regular maintenance.

1.2 Hardware frequent faults

1) Lens problems

The main causes due to which lens error occur is all because of dirt, dust or sands gets deposited inside the lens or if lens get out of their place.

Solution

- Try to clean the lens area and remove the dust or sands. You may use can of compressed air to clean the lens area. You may also use hair dryer to clean the area where there is no heat risk.
- If the cleaning the lens area does not work, then you have to check the lens visually. Check whether the lenses are not tilted to one side. Most of the time when camera

gets dropped then lens may get tilted and it will not work proper. **However, it is recommended that you must show professional camera repair center to fix damaged lenses because fixing this yourself may cause more damage to the camera. Try to fix the lens error by yourself only when you are out of budget.**

2) **Power supply fault**

Fixing Camera Battery Error

There are many users out there who reports battery problems. It is true that battery errors can also become trouble for digital camera users.

Solution

- First, make sure that battery is fully charged and always check the light on the charger in order to be sure that charger is working. Also make sure that battery contacts properly and they are clean. If it is not clean then with the help of dry cloth wipe it, you may also use can of compressed air to clean it.
- Second, different batteries have different level of handling temperature. If your camera does not get switch ON in high or low temperature level then try to switch ON camera after 30 minutes in normal temperature level. If your camera gets turned ON then it is confirmed that your camera battery could not handle extreme temperature level. So, try to keep your camera in normal temperature level.

If your camera does not get switched ON or your battery life is not what it used to be then replace your camera battery.

LCD problems

The LCD Will Not Display the Image

Some Canon Power Shot cameras have a DISP button, which may turn the LCD on and off. Press the **DISP** button to turn on the LCD. This is most common when the Canon Power Shot camera has an electronic viewfinder option for framing photos, along with the LCD screen for framing photos. The live screen may be active with the electronic viewfinder, so pressing the DISP button can switch the live screen back to the LCD screen.

The LCD Screen is Flickering/shining

If you find yourself holding the camera near a bright, the LCD screen image may flicker. Try moving the camera away from the light. The LCD also may appear to flicker if you're attempting to view a scene when shooting in very low light. But if the LCD screen seems to flicker in all types of shooting situations, you may need a repair.

White Dots Are Appearing in My Photos

Most likely, this is caused by the light from the flash reflecting off dust or other particles in the air. Try turning off the flash or wait until the air clears to shoot the photo. It's also possible that the lens could have some spots/bad skin on it, causing problems with image quality. Make sure that the lens is completely clean. Otherwise, you could be having a problem with your image sensor that's causing the white dots on the photos.

3) **Shutter problems**

Exposure Time is the length of time that the sensor is open for collecting light. Also known as shutter speed and integration time.

Fixing Camera Shutter Error

Solution

- Make sure that the lens surface is clean and nothing is coming in between the way. If there is any dirt then with the help of lens brush clean the glass and then with the help of can filled with compressed air clean the area around lens and shutter.
- You can use shutter priority or manual to adjust shutter speed to the slowest probable settings if your camera allow manual modes.

4) **Image sensor fault**

- **Blooming**

Blooming is known as the spread of charges to adjacent pixels due to over saturation of pixels. This makes some very bright spots/bad skin in the image.

- **Smearing**

Smear is similar to blooming. It’s caused by pixels becoming saturated, and light spilling over into the vertical shift register while clocking out.

5) **Memory card and slot faults**

Fixing SD Card Error

Sometimes you may get frustrated/disturbed in finding what the problem with your camera is. And later you will come to know that the problem was in SD card and not in the camera. If you are getting “write error” then your photos does not get written to the card. First check your card is not locked and then try to take photos.

If your card is damaged due to dust or dirt then you may get card error. In this case make sure that the metallic part is dust free and if there is any dust then clean it with micro-fiber cloth that comes with camera for cleaning lenses. You may also use can of compressed air to clean the camera SD card slot and card, so that they can make a good contact.

Different camera uses different format on the card. So formatting the SD card may also fix this problem. But before you format the card make sure that you take a backup of your photos from the card. You can find the “Format” Option in the menu of the camera itself.

SD cards are cheap and hence you can replace it to avoid this problem. If you notice that photos are taking time to get written then you can use advanced memory card that have higher transfer rate, will help speed things up. If the card still has only copies of Photos or if you have completely lost your photos and recorded videos then you can make use of **Digital Media Recovery Tool also popular as Photo Recovery Tool in order to recover lost deleted or missing media files from Camera SD card.**

Indicative content 2.1.1. Camera disassembling process

1) **Consult user manual:**

Otherwise referred to as a user guide, a user manual is a technical document with a quite specific purpose: to help technical and non-technical people identify and solve problems without expert assistance.

Since user guides translate what's not comprehensible to a plain language for everyone to understand, they are essential in technical sectors and most commonly associated with software and hardware, camera, and electronic goods.

2) **Remove power supply**

This is done after switching off the device and then open battery part and then remove the battery.

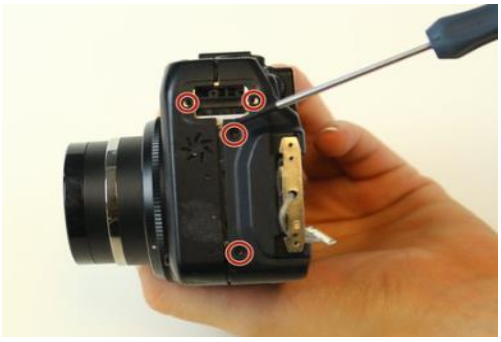
3) **Remove Memory card**

This is done by Opening the Memory card slot and remove it.

4) **Unscrew screws**

Locate the screws and unscrew them by the help of suitable screwdriver

Remove all of the screws on both the left and right side of the camera.



Looking at the front side of the camera, there is a port on left side of the camera labeled HDMI.

Remove the one screw on the side of the HDMI port.

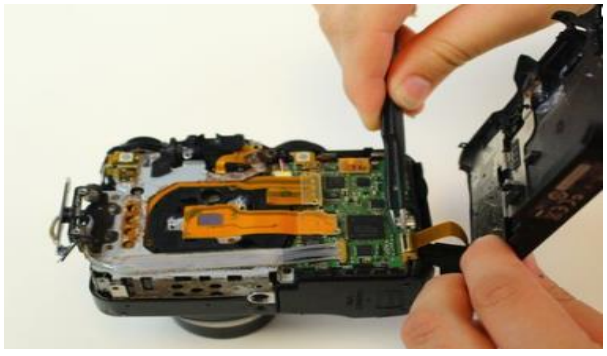
Remove the screw on the right side of the view finder on the back side of the camera.

5) **Remove the cover**

Using a spudger, carefully open the back side of the camera starting directly under the camera's serial label.

Make sure all sides of the back case are movable before trying to force it off of the camera. It should be removed with relatively little effort.

The back case is still attached to the camera with a yellow ribbon cable. The socket has a black flip-up cover that must be flipped up/turn over before the cable can be removed.



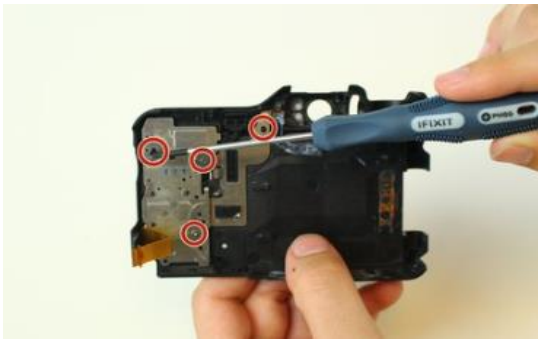
6) **Separate Optical and visor system**

An **optical** device consisting of a lens system set in a light-proof construction inside which a light-sensitive film or plate can be positioned.

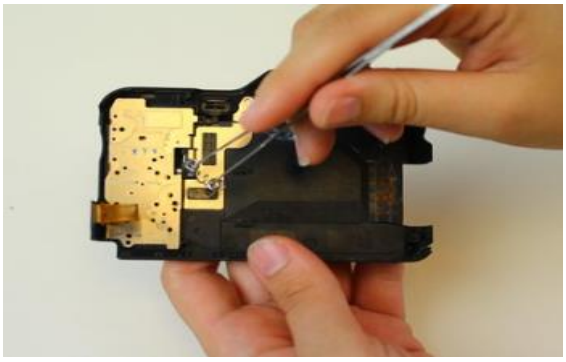
Vision sensors (VISOR) use images captured by a camera to determine presence, orientation, and accuracy of parts.

7) Disconnect camera internal parts

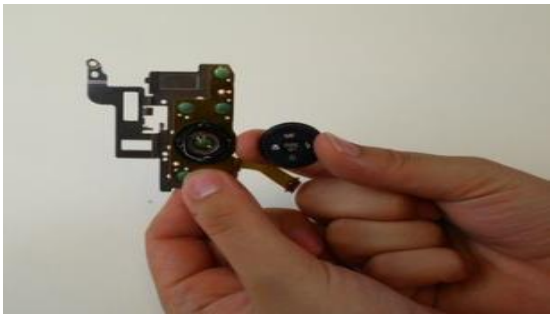
Remove the four screws from the metal plate using a Phillips-head 00 screwdriver.



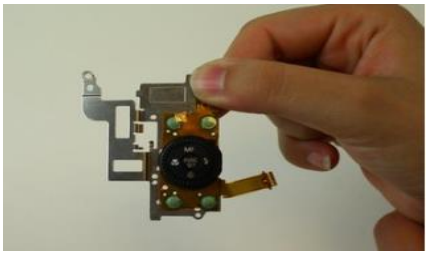
Remove the spring from its socket using precision tweezers (tool used to remove screws in hole) allowing the metal plate with the function dial to be removed.



Using precision tweezers.



Attach the new function dial simply by pressing it into the black, metal ring until you hear a click/become clear.



Theoretical learning Activity

In group of 3-4 members, discuss about the following

1. Hardware faults

2. Setting faults

3. Disassembling process of a certain camera.

Practical learning Activity

- ✓ In a group of 2 members, Rectify camera fault

checklist	score	
	yes	no
Indicator: camera faults are well identified		
✓ Setting faults		
✓ Hardware frequent faults		
Indicator: hardware frequent faults are well identified		
✓ Lens problems		
✓ Power supply fault		
✓ LCD problems		
✓ Shutter problems		
✓ Image sensor fault		
✓ Memory card slot fault		
Indicator: camera disassembling process is well applied		
✓ User manual is well consulted		
✓ Power supply is well removed		
✓ Memory card is well removed		
✓ Screws are well removed		
✓ Cover is well removed		

✓ Internal camera parts are well disconnected		

Points to Remember (Take home message

Camera disassembling process

1) **Consult user manual:**
2) **Remove power supply**
3) **Remove Memory card**
4) **Unscrew screws**

Learning out come 2.1: formative assessment

1. Give two camera shutter problems

Answer:-Shutter doesn't open

-Shutter lags too long

2. Suppose someone brings you a camera that is functioning but no display. What part of Camera do you think is defected?

Answer: Lcd

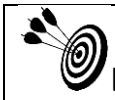
Practical assessment

A camera canon is faulty, you are going to repair it, individually show how you can disassemble the camera.

checklist	score	
	yes	no
Indicator: camera disassembling process is well applied		
✓ User manual is well consulted		
✓ Power supply is well removed		
✓ Memory card is well removed		
✓ Screws are well removed		
✓ Cover is well removed		

✓ Internal camera parts are well disconnected		

Learning Outcome 2.2 Fix faulty components



Learning outcome 2 objectives:

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

- Suitable fixing of faulty components according to their types

Resources

Equipment	Tools	Materials
▪ Camera ▪ Camera accessories ▪ Camera stand ▪ Camera tester ▪ Lighting equipment ▪ DMM ▪ Drilling machine ▪ Screwdriver machine ▪ Soldering station ▪ Air blowing machine ▪ PPE	▪ Soldering irons ▪ Screwdrivers ▪ Pliers ▪ Brushes Sponge ▪ Soft cloth ▪ Tape measure ▪ Crimping tools ▪ Cable cutters ▪ Safety knife ▪ Torch	▪ Screws ▪ Insulation tape ▪ SD cards ▪ Soldering tin ▪ Universal anchors ▪ Cables and wires ▪ camera Batteries ▪ Electronic components

Advance preparation

Availability of a camera (Canon)

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

✓ Camera faults fixing techniques: Adjusting settings Brightness Focus Sharpness contrast colors

- Fixing frequent Lens problems Retraction
- Difficulty focusing Blurry photo and videos
- Poor lighting
- Lens distortion
- Fixing frequent Power supply fault Battery level Battery ports
- Fixing Shutter problems
- Fixing of Image sensor faults
- Fixing of memory card and slot faults

✓ Camera assembling process

Indicative content 2.2.1: Camera faults fixing techniques

1. Adjusting settings

Image settings are functions that enable you to select your preferred finish for your images and to make adjustments to them. The image settings are set and changed in the shooting settings menu. However, the effects of image settings are not reflected in image files that were taken in the RAW format. Also, the image settings that can be chosen and the details of the adjustments they make vary depending on the camera you are using.

a. Brightness

Brightness is an attribute of visual perception in which a source appears to be radiating or reflecting light. In other words, brightness is the perception elicited by the luminance of a visual target. It is not necessarily proportional to luminance. This is a subjective attribute/property of an object being observed and one of the color appearance parameters of color appearance models. Brightness refers to an absolute term and should not be confused with Lightness.

Black Level (Brightness)adds an offset to pixel values.Adjusting the camera's black level will result in an offset to the pixel values output by the camera. Increasing the black level setting will result in a positive offset in the digital values output for the pixels. Decreasing the black level setting will result in a negative offset in the digital values output for the pixels. i.e. Black image emitting photons – adjust black level to capture or not Black Level Considerations:

- ✓ Proper use is to ensure camera accurately measures light when scene is darker.

- ✓ Side effect is that it can make the image brighter or darker, but not by much.

Exposure: the amount of light falling per unit area on a sensor: it is determined by the scene luminance, the *f*-ratio (more properly the *T*-ratio), and the shutter speed.

Exposure consists of two components: lens aperture (the hole through which light enters the camera) and shutter speed (how long the light is allowed into the camera).

A microprocessor in the camera takes the readings from each segment and biases them according to the difference in overall brightness (and often contrast) within each segment and between adjacent segments. It then calculates which aperture and shutter speed settings will deliver an optimum exposure. Some cameras also include distance information from the autofocus system and/or colour data.

b. Focus

Focusing is the moving of the lens elements until the sharpest possible image is achieved. Depending on the distance of the subject from the camera, the focusing elements have to be set a certain distance from the camera's sensor to form a clear image. A typical **autofocus** sensor uses a charge-coupled device (CCD).

In order for a camera to create a focused image, it takes light and runs it through a lens, concentrating the rays on the image sensor inside. The size of the hole the light travels through (the aperture) determines how focused those rays are once they hit the sensor. Smaller holes do a better job of focusing light than larger holes.

Focus is nothing more than the degree of sharpness at a certain point. You can focus on different things, or you can change the aperture to get a larger or smaller depth of field. Either present you with a number of creative options that will help you draw attention to the most important parts of your image. Keep the depth of field small for closeups of your friends and large when you’re doing big open landscapes.

Focusing is an integral part of any camera operation. Whether you are using a basic point-and-shoot model, or something that enables you to fine-tune your focusing, picking the right mode and getting the sharpness where you want it is the difference between a poor image and a stunning one. For many people, focusing is something that is regarded as a given, but, as with all photography techniques, it is not quite that straightforward.

Most consumer digital cameras often have more than one focusing mode, but the two main ones are **autofocus and manual focus.**

c. Sharpness

Sharpness can be defined as edge contrast, that is, the contrast along edges in a photo. When we increase sharpness, we increase the contrast only along/near edges in the photo while leaving smooth areas of the image alone.

This is the image's clarity. The higher the sharpness, the more distinct the subject's contours will be.

'Sharpness' refers to an image's overall clarity in terms of both focus and contrast. When the subject of an image is sharp the image appears clear and lifelike, with detail, contrast and texture rendered in high detail. Images which lack sharpness or are 'soft' can appear blurry and lacking in detail, although experienced photographers are able to manipulate sharpness to allow a feeling of warmth or movement within an image. Image sharpness is extremely reliant on achieving accurate focus on a desired subject, especially challenging when shooting scenes which require a narrow depth of field, or shooting in low light situations which require large apertures.

d. Contrast

Contrast is defined as the separation between the darkest and brightest areas of the image. Increase contrast and you increase the separation between dark and bright, making shadows darker and highlights brighter. Decrease contrast and you bring the shadows up and the highlights down to make them closer to one another. Adding contrast usually adds "pop" and makes an image look more vibrant while decreasing contrast can make an image look duller.

This is the difference in the bright and dark areas of the image. If the contrast is high, the image looks lively; conversely, if the contrast is low, the image looks flat and monotonous.

The highest contrast image possible would be one in which pixels in the image were either black or white, with no value in between. A low contrast image would see the values of the darkest and lightest parts close together. Of the two, high contrast images have greatest impact. Low contrast images can look flat and quite frankly a little bit dull.

There are two contrast ratio as **Static contrast ratio** is the luminosity ratio comparing the brightest and darkest colour the system is capable of producing simultaneously at any instant of time, while **dynamic contrast ratio** is the luminosity ratio comparing the brightest and darkest colour the system is capable of producing over time (while the picture is moving).

e. Colours

There are two colour related settings you need to know how to use. One is white balance (I'll tackle that in the next article in this series).The second setting has a different name depending on the camera you have.

Saturation defines a colour's intensity. The more saturated a colour, the more vivid it appears to be. The less saturated a colour is the closer to grey it is. Some image controls often increase saturation on certain colours but leave others alone.

2. Fixing frequent Lens problems

Lens errors are one of the most common problems with digital cameras, particularly in cameras with barrel style lenses. Typically, a lens error will occur if sand or dust gets trapped inside or if something bumps the lens slightly out of place.

If your camera gives you a lens error message, the first thing to try is to clean out the lens area. Use a can of compressed air (sold at electronics stores for this purpose) to clean out all the pieces, paying particular attention to where the lens retracts and any area where it would be easy for dirt to get stuck in. You can also use a hair dryer set to the no heat setting.

If a good cleaning doesn't work, visually inspect the camera lens. Is it tilted slightly to one side? If a camera gets dropped or bumped or the lens tries to extract with something in front of it, the lens may get tilted and no longer work properly. Fixing a titled lens yourself

can cause more damage to the camera—so only try fixing it yourself if the cost of a professional repair is out of the question. Try gently pushing on the extracted lens until it's no longer crooked.

a. Retraction

Lens extend and lens retract on a compact camera refer to the lens being in an operating state (extend) or in a storage state (retract). In some remote control software interfaces I believe it can be used as a variable read to determine the position of the lens or as a variable write to cause the lens to retract.

b. Difficulty focusing

Focus problems are thus diverse in nature and can be caused by simple user error or complicated issues related to advanced camera settings. The following are common problems which can cause the subject to be out of focus, they can be split into categories:

Camera focuses on the wrong subject

It may be easier to let your camera decide where to focus, but you could run into some problems. Usually your camera determines the subject to be whatever is closest to the lens and near the centre of the frame.

This may work out just fine in some situations, but if there are objects between your subject and the camera or if your subject is off-centre then your camera get confused and not focus where you want it to.

You can avoid this issue by setting the AF point manually. Look for an option on your camera called Single-point or Flexible-spot AF mode (refer to your manual to find out what the option is called on your camera).

Use the control button to activate the option once it’s set and then use the navigation controls to choose the AF point that overlies your subject.

Not enough light

Light deficiency is one of the biggest issues with standard autofocusing systems. The camera cannot focus the lens if the subject is not clearly visible. While your camera may have an AF assist light to help in low light situations its reach is likely quite restricted.

Using a torch or other light source to illuminate your subject is one way help your camera focus. Turn off the light once the subject is sharp and set the camera to manual focus mode to stop the camera from trying to refocus on the subject when you press the shutter release.

One reason why top-end cameras and lenses come with such high price tags is that they boast extremely sensitive AF systems and large maximum apertures such as f/2.8 and f/2.0.

More light can reach the camera's AF system through these large apertures which, when partnered with an extra-sensitive AF system, produces images that are sharp even in very low light.

Contrast too low

Even in ideal lighting the autofocus system has to perceive some sort of edging or contrast in order to focus on a subject. Try choosing an AF point that is over an area of contrast if you find your camera is having trouble locking on.

Phase detection AF systems use either linear or cross-type AF points. Linear AF points can only detect contrast in one direction while cross-type AF points can detect contrast in both vertical and horizontal dimensions, making them more sensitive.

Even lower tier DSLR cameras typically have a cross-type AF point in the centre of the image frame, so this point is frequently a good choice for the 'focus-and-recompose' technique.

Subject too close

Compact cameras and camera phones generally allow you to position yourself much closer to your subject when focusing than do compact system cameras and SLRs. You may need to move back a bit, then, if you're camera is unable to focus on a nearby subject.

The longer the focal length of the lens, the closer the focusing distance will be. This means that a wide-angle lens may provide better focus than the telephoto end of your zoom lens (however the images will look quite different from one another).

Inaccurate manual focusing

While many photographers exalt the optical viewfinder, it can sometimes still be hard to perceive enough detail required to get a subject sharp.

Fortunately, Live View mode has solved that problem. SLRs allow you to magnify the view of the image you've composed on the screen so you can see fine detail while you focus the lens. The camera can also apply gain in low-light situations to make the scene easier to see.

Camera fails to adjust focus when subject moves

When the camera is in Single-AF mode the lens will focus when the shutter release is half-pressed and it will make no further adjustments as long as the button remains held down.

This setting is perfect when using the 'focus-and-recompose' method and shooting still objects because it won't refocus unless the button is released and half-pressed again.

You'll then want to position that point over the subject and give the shutter release a half-press to focus lens.

c. Blurry photo and videos

There are three common reasons photos come out blurry: Either the subject in the picture moved, the camera moved, or the subject wasn't in focus, to begin with.

- **The shutter speed is too slow.**

The first problem to address in blurry photos is subject movement.It's the cause of blurred images, and it happens because your camera's shutter speed was set too slow to capture any movement crisply.Shutter speed is the amount of time your shutter is opened, and the camera sensor is exposed to light.

While you might think you can hold perfectly still, and you might have told your subject to keep still, your camera needs to be told the shutter speed or how long to keep the shutter open.If you choose too long of shutter speed, a moving subject will appear blurry in the photo.

- **The ISO is set incorrectly**

If you're shooting with proper shutter speed but still having issues, ISO may also be the culprit causing your images to blur.

ISO stands for International Organization of Standardization and is a setting on your camera that changes the light sensitivity of the camera sensor.

The higher the ISO, the more light-sensitive your camera becomes.

Higher ISO values also introduce more 'noise' or grain into the photo. This can reduce the image quality just as much as blur.

- **Camera moved**

If it's not related to shutter speed, another option is that **the camera moved** while the shutter was firing.

Also known as **camera shake**, moving the camera after the shutter is depressed is a sure-fire way to blur a camera.

Blur could be caused by large movements, like moving the camera closer or farther away from your eye while shooting.

It could be caused by the slightest movement of the finger while pressing the shutter.

It could also be caused by instability in the environment, like riding in a vehicle or wind.

Although it appears differently than subject movement or camera movement, **improper focus** can also cause an image to appear blurry.

Out of focus blur occurs when the photographer manually focused incorrectly or when the camera's autofocus settings did not focus on the correct item in the scene.

Suggestion solution:

1. **Shoot in RAW format.**

Before you even begin to shoot a single photo, you'll want to configure your camera to be shooting in RAW or RAW + JPEG mode.RAW files give you the maximum recorded detail and allow you more control in post-processing to edit your photos.Even though it's challenging to correct blurry images in post-processing, the best chance you'll have is by shooting in RAW format.

2. **Calculate the right minimum shutter speed to freeze movement.**

The most important setting to freeze the movement of the subject based on the lighting conditions is the shutter speed.Many beginning photographers are unaware that there's a simple formula that can help you determine where to start when configuring your shutter speed.

For a 50 mm lens, shoot at least 1/100th. For a 200 mm lens, shoot at least 1/400th or faster.

For full-frame cameras, just choose a shutter speed faster than the maximum focal length of your lens.

3. **Choose the lowest ISO possible given the lighting conditions.**

As mentioned above, as ISO values move higher, so does the probability of blur or loss of detail in your images. Higher ISO values introduce noise and can give images a soft, blurry appearance. The smaller the camera sensor, the more challenges you'll have shooting with higher ISO values. As always, be sure to choose the lowest possible ISO value given the lighting conditions to avoid noise-related blur.

4. **Set the autofocus modes correctly.**

If you've got your ISO and shutter speed configured, another option to ensure your camera is set correctly is to check the autofocus modes. Most DSLR cameras on the market will have two to three methods of autofocus. Some modes are better for portraits or landscapes where the subject is not likely to move. Others are better for when the subject is moving quickly across the frame, like in sports and wildlife photography. These settings are meant

to be dynamic and failing to change them based on your scene could result in blurry or out of focus items in your frame.

5. **Use image stabilization settings.**

One of the top features that camera manufacturers use to sell cameras is image stabilization technology. When turned on, it compensates for camera shake from your own hand movements. Image stabilization is either built-in or can be manual turned on and off. It's especially helpful when you're unable to use the best shutter speed or ISO because of unique lighting conditions (e.g., low light without a flash.) If you do use image stabilization, make sure that you turn it off anytime you use a tripod. Your camera will attempt to compensate for camera shake that doesn't exist when on a tripod. In some cases, it can actually add noise to your image.

6. **Shoot in burst mode.**

One final strategy to configure your camera to avoid camera blur is to shoot in burst mode. Burst mode takes multiple photos in succession each time the shutter is fired. The philosophy is that by taking numerous pictures of the same scene, at least one is more likely to be in focus. If the first image in the series is blurry from your hand movements while the shutter fired, it's possible that the last photo in the series will not have the same camera blur. The same applies to a subject in motion. By taking multiple images in rapid succession, it increases the likelihood that at least one will be a tack-sharp photo.

d. Poor lighting

Photographic lighting is the illumination of scenes to be photographed. A photograph simply records patterns of light, colour, and shade; lighting is all-important in controlling the image. In many cases even illumination is desired to give an accurate rendition of the scene. In other cases the direction, brightness, and colour of light are manipulated for effect. Lighting is particularly important for monochrome photography, where there is no colour information, only the interplay of highlights and shadows. Lighting and exposure are used to create effects such as low-key and high-key.

The main sources of light for photography are:

- Daylight, which varies with the weather and the time of day. Different techniques are necessary to take best advantage of, say, brilliant sunshine, and an overcast evening.
- Continuous artificial light, which may be normal lighting, or produced by special photoflood lights. The properties of different light sources vary; household incandescent lighting, fluorescent lighting, sodium discharge street lighting, etc., are very different and produce different results, and require different correction if a subjectively neutral rendition of colours is required.
- A bright and very brief photographic flash from a single position (usually very close to the camera) or, in a studio environment, from several.
- For special purposes lightning, electric sparks, fireworks, moonlight, or other light sources may be exploited.

Shooting low light photography can be incredibly challenging. Every one of your camera settings will change, even if you're photographing the same scene you covered in the daytime.

Types of Low Light

Visible: These are the dark areas, found in the daytime. Shadows created by large buildings or trees can be up to -2 stops of light than the well-lit areas.

Low Light: After sunset, areas may still be visible, yet too dark to capture. It maybe indoor photography also.

Dark: This is when only the brightest objects are visible at night-time.

Lighting is a key factor in creating a successful image. Lighting determines not only brightness and darkness, but also tone, mood and the atmosphere. Therefore it is necessary to control and manipulate light correctly in order to get the best texture, vibrancy of colour and luminosity on your subjects. By distributing shadow and highlights accurately, you can create stylized professional looking photographs.

e. Lens distortion

In photography, there are two types of distortions: **optical and perspective.** Both result in some kind of deformation of images – some lightly and others very noticeably. While optical distortion is caused by the optical design of lenses (and is therefore often called “lens distortion”), perspective distortion is caused by the position of the camera relative to the subject or by the position of the subject within the image frame.

Lens distortion is any deformation that occurs in the images produced by a camera lens.

- Distortion can generally be described as when straight lines appear bent or curvy in photographs.
- Sometimes this effect is intended, other times it occurs as a result of an error.
- There are two major categories of lens distortions: **optical distortion** and **perspective distortion**.
- There are a variety of causes that can produce a distortion effect and a number of remedies for distortion correction. In order to fix image distortion, it’s important to have a thorough understanding of the types of distortion and the best ways to correct distortion.

    - ✓ **Optical distortion**

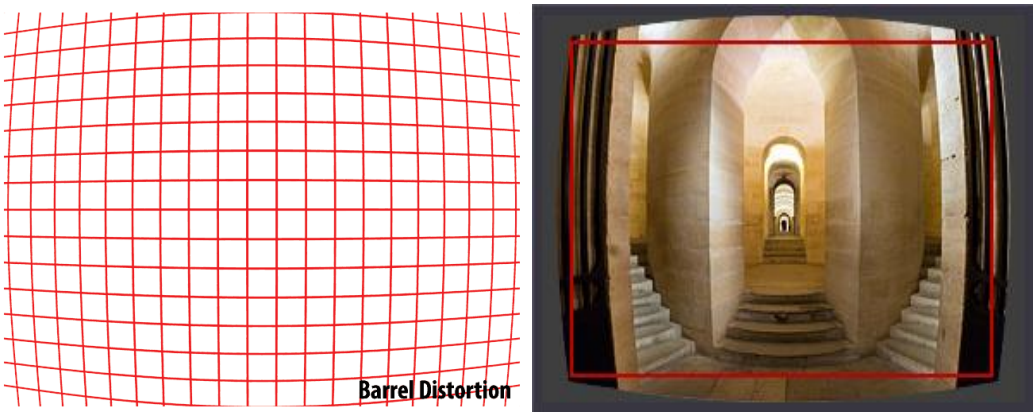
The first major category of lens distortion is optical distortion. Optical distortion can be attributed to the lens profile and the lens design. Sometimes optical distortion results from certain lens elements that are used to reduce other visual deformations such as spherical aberrations. There are three major types of optical distortion:

- Barrel distortion
- Pincushion distortion
- Mustache distortion

Almost every lens suffers from some degree of optical distortion. Different lenses will produce different types of distortion depending on a variety of factors including: the length of the lens, focal length, and subject distance, among others.

What Is Barrel Distortion?

Barrel distortion describes a type of distortion wherein lines that are straight in real life appear to curve inwards (like the walls of a barrel).

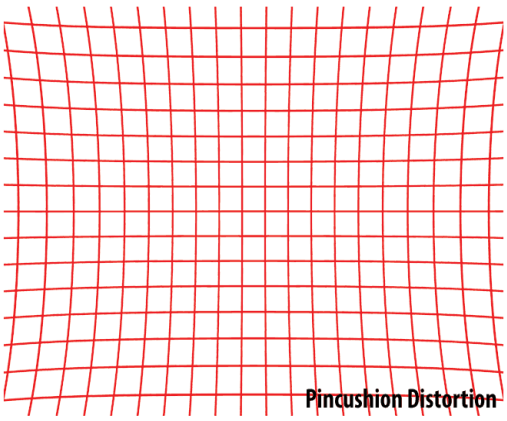


A good way to check for barrel distortion is to look for parallel lines in the area you are shooting and see if the lines appear parallel in your image. Barrel distortion often occurs when using wide-angle lenses. This is because the field of view of wide-angle lenses is wider than the image sensor on a digital camera and therefore the image looks like it has been squeezed and constricted to fit in the edges of the frame. In addition to wide-angle lenses, zoom lenses with short focal lengths tend to produce barrel distortion.

What Is Pincushion Distortion?

Pincushion distortion produces the opposite effect from barrel distortion.

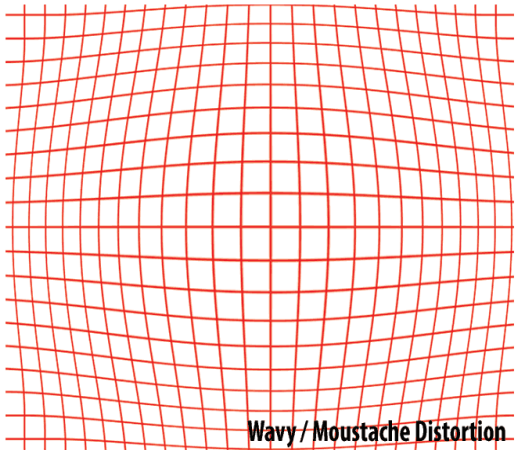
Instead of an image curving in, pincushion distortion causes straight lines to curve outwards from the center of the image. Telephoto lenses are the most common source of pincushion distortion because of the increased magnification on parts of the image closest to the edge of the frame. This is especially true when the lens is at a shorter focal length.



What Is Mustache Distortion?

Mustache distortion is a complex form of distortion that has elements of both barrel and pincushion distortion.

Mustache distortion makes straight vertical lines appear to curve inward towards the center of the frame and back outwards at the corner.



How Do You Fix Distortion?

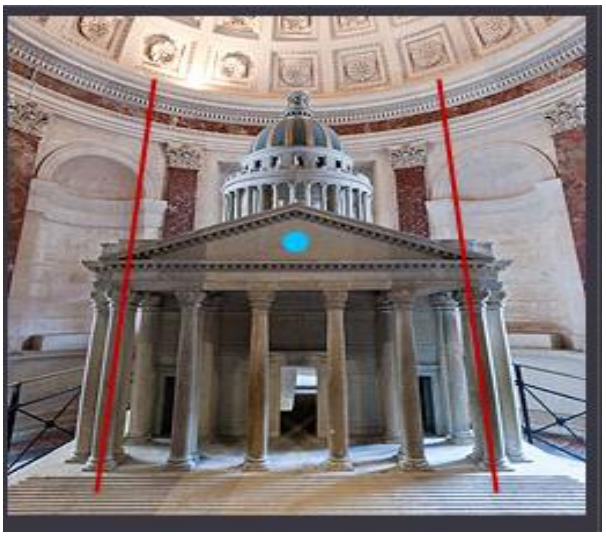
There are a number of things to keep in mind when trying to fix distortion in photographs, particularly related to the type of distortion.

- In order to fix **barrel and pincushion distortion**, use a photo editing, post-processing application like Light room or Adobe Photoshop.
- Any basic photo editing software will be able to fix **standard barrel distortion** as long as the lens you used has a profile stored in the software database.

- **Mustache distortion** is one of the most difficult types of distortion to fix. Standard photo editing software generally don’t have presets to address the distortion parameters you’d find in mustache distortion. Specialized proprietary software is usually the only way to fix the complex visual aberrations caused by mustache distortion.

Perspective Distortion

Perspective distortion is a separate category of visual distortion that has nothing to do with camera lenses. Perspective distortion generally has to do with the positioning of a subject in relation to the camera and your angle of view.



Appears when otherwise parallel lines converge. Caused by the camera not facing these parallel lines perpendicularly; with trees and architecture, this usually means that the camera isn't pointed at the horizon.

There are two types of perspective distortion:

- **Wide-angle distortion (or extension distortion)**. Objects generally appear larger as perceived by the human eye, the closer you get to them. This same principle applies in photography—when you position your subject close to your camera using a wide-angle lens, whatever is closest to the camera will appear disproportionately large in your final image. This phenomenon is known as wide-angle distortion.

- **Compression distortion**. Compression distortion occurs when using a telephoto zoom lens and is essentially the opposite of wide-angle distortion. Compression distortion causes objects that are far away to appear larger than normal.

So far we have been only talking about optical distortions. Another distortion type that is often seen in images is perspective distortion. Unlike optical distortion, it has nothing to do with lens optics and thus, it is not a lens error. When projecting three dimensional space into a two dimensional image, if the subject is too close to the camera, it can appear disproportionately large or distorted when compared to the objects in the background. This is a very normal occurrence and something you can easily see with your own eyes. If you take a smaller object like your mobile phone, then bring it very close to your eyes, it will appear large relative to say your big screen TV in the background (and the farther your phone is from your TV, the smaller the TV will appear relative to your phone). The same thing can happen when photographing any subject, including people.

3. Fixing frequent Power supply fault

The battery does not charge

If the battery is charged in a **separate charger** please follow the steps below:
1. Make sure you are using a compatible, genuine Sony battery
2. Make sure the contacts on the battery and the charger are clean and free from dust or dirt

3.Make sure the battery is inserted correctly
4. Make sure the power cable is inserted properly into the charger when connected to the

power mains
5. Wait a couple of seconds

a) Battery level

battery level indicator

A **battery indicator** (also known as a battery gauge) is a device which gives information about a battery. This will usually be a visual indication of the battery's state of charge.

b) Battery ports

A **battery charger**, or recharger, is a device used to put energy into a secondary cell or rechargeable battery by forcing an electric current through it.

4. Fixing frequent LCD problems

1) Image flicker

Suggestion solution:

a. Check your cables

It doesn't matter if you're using a VGA, HDMI, DVI, or displayport cable to connect your monitor to a Camera: If the cable isn't securely connected there are going to be issues.

Check the cable at both the computer and monitor ends. If tightening it down or reconnecting it doesn't fix the problem try replacing the cable with a new one. If that doesn't fix the issue it's time to investigate something else.

b. Check the monitor refresh rate

Monitor refresh rate is the number of times the screen image is refreshed in a second, as measured in Hertz. If the refresh rate isn't optimal, or is too low, flickering, lag, and other issues can occur.

c. Check the video card

A video card that isn't properly seated on the motherboard can cause a lot of problems, including a screen flicker. Turn the camera off and open the case. Find the video card and check to see if it's properly connected.

2) Black screen

The most common reason for a camera screen to go black is a simple hardware failure. This can be caused by the actual LCD going bad, by the cable that runs between the LCD and control board going bad, or even just from the cable's connectors coming loose.

Solution:

Make sure the camera is turned on. If the camera does not turn on, further troubleshooting is required. If applicable, make sure the lens cover has been removed before taking pictures. If the camera has a DISPLAY button, press the button several times to see if the LCD screen is working.

5. Fixing Shutter problems

A camera's shutter can sometimes start to stick, either in the open or closed position. A stuck shutter will result in either overexposed images if the shutter stays open too long or black images if it doesn't open at all.

The shutter is an important element of the exposure triangle. And mastering it is an important step in becoming a great photographer. But what do you do when your shutter starts misbehaving?

Shutter issues are a common camera problem for DSLR and mirrorless cameras. Below, we've outlined two of the most cited shutter problems by camera owners.

Common Camera Shutter Problems

1. The Shutter Won't Open or Close

The shutter in your camera is raised for a prescribed amount of time to dictate the amount of light that passes through the lens. If the shutter refuses to close or open, it can create huge problems for photographers.

If your shutter won't budge, it's likely jammed. You'll end up with overexposed photos (if the shutter stays open too long) or dark images if the shutter is stuck closed.

Of course, there can be other causes for over- and underexposed images. So to figure out if your shutter is at fault, you may want to do a quick check:

- ✓ Set your camera to any mode other than Auto.
- ✓ Turn off the flash.
- ✓ Point the camera towards you.
- ✓ Look down the lens and press the shutter release.

If you see a little flicker, your shutter is working fine. But if that flicker is absent, you've got a jammed shutter.

2. The Shutter Lags Too Long

If you've ever tried to take a fast-moving subject with a slow shutter? The result is usually that you've missed the shot entirely or you've caught nothing but a blurred subject.

Shutter lag time can be an issue for many photographers, though it is usually only common in compact digital cameras or phone cameras.

Your shutter lag time is the time taken between you pressing the shutter button and the camera actually taking the shot. In quality DSLRs and mirrorless cameras, shutter lag isn't usually an issue. But even a lag of less than a second can spell disaster for a carefully timed shot.

What Causes Shutter Lag?

Three possible things could cause shutter lag:

- Your camera takes too long to autofocus, especially if it's a fast-moving subject or low-light scene.
- Your camera has a slower shutter release lag.

- You haven’t had enough time to focus the image before fully pressing the shutter release

There is little you can do about autofocus since many inexpensive cameras just aren’t fitted with a quick-responding AF function. More high-end cameras have a red assist beam to help cameras register an object in the dark before you take your shot.

✓ *How to Fix Shutter Lag*

Shutter lag isn’t necessarily a camera problem that can be fixed since a fast shutter is either built into the camera or it isn’t.

The best way to avoid shutter lag is to buy a quality camera that has a built-in fast shutter speed. Failing that, here are a few other things you can do to reduce shutter lag:

- Shoot in good lighting where possible.
- Try to position yourself so any moving subject is coming towards you rather than across your shot.
- Try to pre-focus your shot. That is: Focus your camera on a certain spot and wait for the subject to move into the frame.
- Shoot in manual control and manual focus modes.

So there you have it, two of the most common shutter problems for cameras. Naturally, the best way to avoid these problems is to invest in a quality camera, protect it by storing it in an insulated camera bag, and performing regular maintenance.

With all this heavy usage and the wearing and tearing that goes along with it, it is only normal that camera parts jam and buttons don't always fire correctly. But with a little insight and some practice, those problems can be avoided and minimized.

3. Shutter Failing to Open, or Close, or Fully Close

As we all know, the shutter is a camera component that goes up for a specific period of time allowing light to pass through the lens, hitting a photographic film or a light-sensitive sensor to expose a scene and permanently register it. When the scene is registered, that shutter goes back down.

If the shutter jams along the way failing to go up or failing to go back down accurately, you're likely to get really bright, over-exposed photos due to the shutter not going down in a timely manner. And you'll also get underexposed images when the shutter is stuck closed.

To determine whether or not you have a jammed shutter, set your camera to any mode other than Auto, turn the flash off, turn your camera around so that the front is facing you, and then press the shutter release while looking through the lens.

You should see a tiny flicker at the center of your lens as the shutter goes up and down during the exposure. If you do not see a flicker, then your shutter is stuck. You can also remove your lens, set a slow shutter speed, and look into the camera's body cavity while taking a picture or two. If one or both of the shutter curtains is stuck, you'll be able to tell.

Some of the possible reasons for shutter jamming or failing to go up or back down:

- Faulty timer
- Shutter curtains might be slightly misaligned
- Camera hasn't been used in a while

Fixing your camera's shutter is a very complicated process, and you will most likely cause damage to your camera.

If fixing it would cost way too much than you're willing to pay (and sometimes it may well do), and the only other choice would be to retire it, then you can use one of these two fixes:

Sometimes a power interruption can jog the shutter open if its stuck, so what you will do is:

1. Set your camera to manual
2. Turn off any features that might drain the battery (image stabilization, flash, LCD view ...etc)
3. Set your shutter to the slowest speed possible (15-30 seconds)
4. Take a picture
5. Open the battery door during the exposure and then close it right up. The momentarily power interruption during exposure time might be able to jog your shutter open
6. Repeat until your shutter un-jams.

My other suggestion requires extra caution, and my advice is to not get into it unless it's your last resort. What you will do is tap your camera solidly against a wooden surface, and then fire the shutter release button a few times. This can sometimes jog the shutter open.

6. Fixing of Image sensor faults

7. Fixing of memory card and slot faults

Sometimes, the error isn't the camera, but within the SD card.

If the pictures won't record to the card or the camera displays a “write error” message, first check to make sure the card isn't locked. SD cards have a small switch on one side to prevent any changes to the content, including adding new photos (it's a useful tool for preventing photos from being accidentally deleted).

Different cameras require a different format on the card, so reformatting the card may also solve the issue. Make sure that all the pictures are off the card first. The “format card” option is usually listed in the menu, though different camera models vary.

Dirt, dust and grime can also cause memory card issues. Make sure the metallic parts on the card are clean my wiping it with a cloth; the microfiber cloths designed to clean camera lenses work best. You can also try using a can of air to blow out the camera's SD card slot to make sure there's nothing preventing a good contact with the card.

SD cards are inexpensive to replace, so try using a new one in the camera. If the photos seem to be recording slow, a more advanced SD card can help speed things up. If the card still contains the only copies of some images, look for a file recovery program online or take it in to a repair shop.

Theoretical learning Activity

In group of 3-4 members, discuss

1. Steps to fix lens problems
2. Camera assembling process

Practical learning Activity

checklist	score	
	yes	no
Indicator: Settings are well adjusted		
✓ Brightness is well set		
✓ Focus are well set		
✓ Sharpness is well set		
✓ Contrast is well set		
✓ Colours are well set		
Indicator: frequent lens problem are well fixed		
✓ Retraction		
✓ difficult focusing		
✓ blurry photo and video		
✓ poor lighting		
✓ lens distortion		
Indicator: frequent power supply faults are well fixed		
✓ battery level		
✓ battery ports		


Points to Remember (Take home message)

Brightness is an attribute of visual perception in which a source appears to be radiating or reflecting light

Sharpness: Sharpness can be defined as edge contrast, that is, the contrast along edges in a photo.

Contrast: Contrast is defined as the separation between the darkest and brightest areas of the image.

Learning out come 2.1: formative assessment

1. Choose the letter corresponding to the correct answer

The following are the steps of camera disassembling process except:

a) Consult user manual

b) Remove power supply

c) Solder new component

d)Remove Memory card

e)Unscrew screws

Answer: C

2. Give the Troubleshooting steps that should be used in fixing camera faults

Answer:-Identify the fault

-Analyse the probable cause of the fault

-Suggest possible solution to the fault

-Apply the proposed solution

-Fix the fault

Practical assessment

You are going to shoot a wedding activity, you have to adjust the camera setting to the suitable environment.

checklist	score	
	yes	no
Indicator: Settings are well adjusted		
✓ Brightness is well set		
✓ Focus are well set		
✓ Sharpness is well set		
✓ Contrast is well set		
✓ Colours are well set		

Learning Outcome 2.3: Test the camera

Learning outcome 3 objectives:

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

- Correct testing of camera according to diagnostic techniques

Resources

Equipment	Tools	Materials
▪ Camera ▪ Camera stand ▪ Camera tester ▪ DMM ▪ PPE	▪ Safety knife ▪ Camera stand	▪ Screws ▪ Insulation tape ▪ SD cards ▪ Electronic components

Advance preparation

Availability of measuring instrument

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

- ✓ Testing techniques
  - Continuity testing
  - Voltage measurement
  - Current measurement
  - Electronic components testing
  - Functionality of camera

Indicative content 2.3.1: Testing techniques.

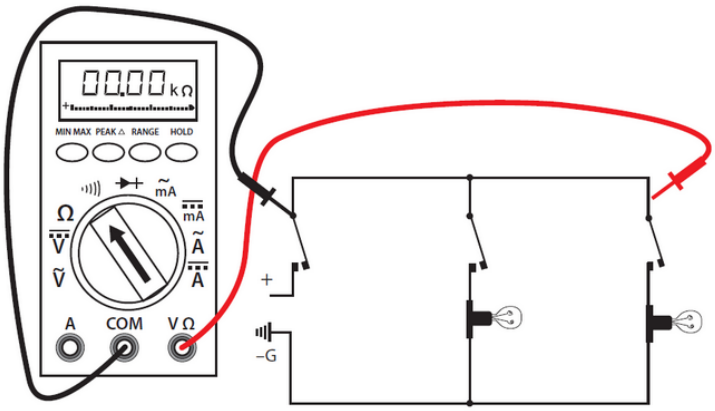
1.1 Continuity testing

In electronics, a continuity test is the checking of an electric circuit to see if current flows (that it is in fact a complete circuit). A continuity test is performed by placing a small voltage (wired in series with an LED or noise-producing component such as a piezoelectric speaker) across the chosen path. If electron flow is inhibited by broken conductors, damaged components, or excessive resistance, the circuit is "open".

Devices that can be used to perform continuity tests include multimeters which measure current and specialized continuity testers which are cheaper, more basic devices, generally with a simple light bulb that lights up when current flows.

- ✓ **How to test for continuity**

1. Turn the dial to Continuity Test mode. It will likely share a spot on the dial with one or more functions, usually resistance (Ω). With the test probes separated, the multimeter's display may show OL and Ω.
2. If required, press the continuity button.
3. First insert the black test lead into the COM jack.
4. Then insert the red lead into the VΩ jack. When finished, remove the leads in reverse order: red first, then black.
5. With the circuit de-energized, connect the test leads across the component being tested. The position of the test leads is arbitrary. Note that the component may need to be isolated from other components in the circuit.
6. The digital multimeter (DMM) beeps if a complete path (continuity) is detected. If the circuit is open (the switch is in the OFF position), the DMM will not beep.
7. When finished, turn the multimeter OFF to preserve battery life.



Continuity testing overview

- Continuity is the presence of a complete path for current flow. A circuit is complete when its switch is closed.
- A digital multimeter's Continuity Test mode can be used to test switches, fuses, electrical connections, conductors and other components. A good fuse, for example, should have continuity.
- A DMM emits an audible response (a beep) when it detects a complete path.
- The beep, an audible indicator, permits technicians to focus on testing procedures without looking at the multimeter display.

1.2 Voltage measurement

Voltage is the difference of electrical potential between two points of an electrical or electronic circuit, expressed in volts.It measures the potential energy of an electric field to cause an electric current in an electrical conductor.

Most measurement devices can measure voltage. Two common voltage measurements are direct current (DC) and alternating current (AC).
Although voltage measurements are the simplest of the different types of analog measurements, they present unique challenges due to noise considerations.

Voltage Measurement Fundamentals

To understand how to measure voltages, it is essential to understand the background of how you take the measurement. Essentially, voltage is the electrical potentialdifference

between two points of interest in an electrical circuit. However, a common point of confusion is how the measurement reference point is determined. The measurement reference point is the voltage level at which the measurement is referenced to.

There are essentially two methods to measure voltages: ground referenced and differential.

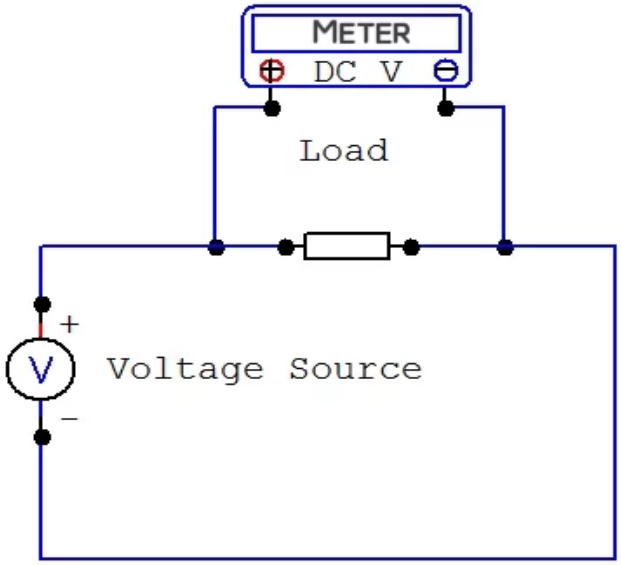
How to make a voltage measurement -with a digital multimeter, DMM

1. Power off the circuitry/wiring under test if there is a danger of shorting out closely spaced adjacent wires, terminals or other points which have differing voltages.
2. Plug the black ground probe lead into the COM socket on the meter (see photo below).
3. Plug the red positive probe lead into the socket marked V (usually also marked with the Greek letter "omega" Ω and possibly a diode symbol).
4. If the meter has a manual range selection dial, turn this to select AC or DC volts and pick a range to give the required accuracy. So for instance measuring 12 volts on the 20 volt range will give more decimal places than on the 200 volt range.
   If the meter is autoranging, turn the dial to the 'V' setting with the symbol for AC or DC.
5. A multimeter must be connected in parallel in a circuit in order to measure voltage. So this means the two test probes should be connected in parallel with the voltage source, load or any other two points across which voltage needs to be measured.
6. Touch the black probe against the first point of the circuitry/wiring.
7. Power up the equipment.
8. Touch the other red probe against the second point of test. Ensure you don't bridge the gap between the point being tested and adjacent wiring, terminals or tracks on a PCB.
9. Take the reading on the LCD display.
10. Either make the next reading or if finished remove the probes and turn the meter off.
11. It is always best to return the meter range switch to the highest voltage range available as this could save damage of the meter is used before the proper range is set.

Connecting Probe Leads to Measure Voltage

Test leads and 4mm sockets on a DMM, setup to measure voltage

Measuring Voltage - Meter in Parallel With Load



DMM connected in parallel with load to measure voltage across it

Safety First When Measuring Mains Voltages!

1. Before using a meter to measure mains voltages, ensure the test leads aren't damaged and that there are no exposed conductors which could be touched inadvertently.
2. Double check *that* the test leads are plugged into the common and voltage sockets of the DMM (see photo below) and not the current sockets. This is essential to avoid blowing up the meter.

3. Set the range dial on the meter to AC volts and the highest voltage range.
4. If you want to check the voltage at a socket outlet, switch off power using the switch on the socket. Then insert probes into the mains socket. If the socket outlet has no switch and you can't turn off power, insert a probe into the neutral pin first before inserting a probe into the hot (live) pin of the socket. If you insert the probe into the hot (live) pin first and the meter is faulty, current could flow through the meter to the neutral probe. If you then inadvertently touch the tip of the probe or the probe is left on a conductive metal surface, there is a possibility of shock.
5. Finally turn on the power switch and measure the voltage.

1.3 Current measurement

The rate at which electrons flow, i.e., current through a conductor is measured using an ammeter. To perform the measurement of current using ammeter, the circuit must be opened and then the meter is inserted in series or in-line with the circuit as shown in figure.

This implies that an ammeter must be connected in the path of the current flow where the current is being measured. These meters can be panel mountable or portable meters. In this article we are going to deal with portable ammeter which is a part of the multimeter.

How to Measure Current

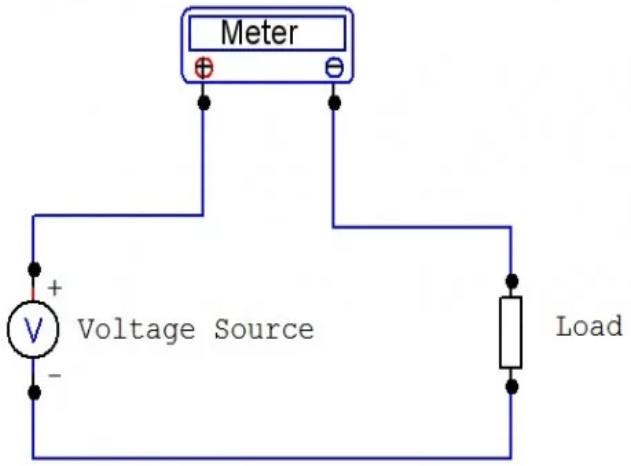
1. Turn off the power in the circuit being measured.
2. Connect the probe leads as shown in the photo below. Plug the black ground probe lead into the COM socket.
3. Plug the red positive probe lead either into the mA socket or the high current socket which is usually marked 10A (some meters have a 20 A socket instead of 10A). The mA socket is often marked with the maximum current and if you estimate that the current will be greater than this value, you must use the 10 A socket, otherwise you will end up blowing a fuse in the meter.
4. A multimeter must be inserted in series in a circuit in order to measure current. See the diagram below.

5. Turn the dial on the meter to the highest current range (or the 10A range if the probe is in the 10A socket). If the meter is autoranging, set it to the "A" or mA setting. (See the photo above for an explanation of symbols used).
6. Turn on the power.
7. If the range is too high, you can switch to a lower range to get a more accurate reading.
8. Remember to return the positive probe to the V socket when finished measuring current. The meter is practically a short circuit when the lead is in the mA or 10 A socket. If you forget and connect the meter to a voltage source when the lead is in this position, you may end up blowing a fuse at best or blowing up the meter at worst! (On some meters the 10A range is un-fused).

Connecting Probe Leads to Measure Current

Test leads and sockets on a DMM, setup to measure current | Source

Measuring Current - Meter in Series



DMM connected in series with load to measure current flowing through it

Before measuring the current using multimeter, one should consider the following:

1. Range selector knob for setting current knob
2. DC or AC form of current
3. Expected range of current
4. Position of red probe for DC and AC current measurements

Cautions:

Never leave the multimeter in ammeter position once the current measurement is taken. Don't test higher currents than that of highest current measured by the multimeter in their respective ranges, i.e., mA as well as A range.

1.4 Electronic components testing

Working electronic components are crucial to operating virtually any electronic device. Components such as resistors, capacitors and transistors create circuits that allow camera to work properly. Each component has a specific role in a circuit. Resistors limit current. Capacitors store charge. Transistors amplify an electrical signal.

Repairing an electronic device begins with testing these electronic components through a multimeter. Multimeters can measure resistance and voltage. They can test devices powered by either AC or DC voltages and work in or out of circuit.

Multimeters are simple to use because of their readable display and multitude of measuring functions. A handheld multimeter is low cost, easy to use and gives accurate readings. Using one to test your electronic components lets you determine if they need to be repaired or replaced.

When using a multimeter to check electrical components, following these steps to obtain an accurate reading:

1. Switch on the multimeter. Turn the knob to the resistance setting marked by the symbol for the Greek letter Omega. Your knob setting should match the resistor value. If the value is unknown, start with the lowest setting and increase in gradual increments as you test the resistor.

2. Place a multimeter probe on each resistor lead. Record the resistance. Switch probes and note the resistance again.

3. Place the multimeter probes on other components leads. This can include diodes, capacitors and photocells. Measure the resistance using the same method as with the resistor. Photocells should be tested twice – near a light source and far away from that same light source.

General Precautions

- Disconnect the power source before checking, servicing, repairing or installing electrical equipments and devices.
- Always, Select the higher value in Digital or analog Multimeter, and then, gradually reduce it to the proper valve.
- Never try to work on electricity without proper guidance and care
- Read all instruction and cautions and follow them strictly.
- The author will not be liable for any losses, injuries, or damages from the display or use of this information or try any circuit in the wrong format so please! Be careful because it’s all about electricity and electricity is too dangerous

1.5 Functionality of camera

Functional testing verifies that each function of the device operates in conformance with the requirement specification.

Ensuring that electrical and electronic products comply with the regulation requirements or with the specific requirements defined by the client.

 Theoretical learning Activity

Ask trainees to brainstorm about testing techniques after repair a camera.

 Practical learning Activity

In group of 3 Test the camera parts functionality

Checklist	score	
	yes	no
Indicator: testing techniques are well identified		
✓ Continuity testing		
✓ Voltage measurement		
✓ Current measurement		
✓ Electronic components testing		
✓ Functionality of camera		

 Points to Remember (Take home message)

Camera testing techniques

1. Continuity Testing
2. Voltage Measurement
3. Functionality testing

Learning out come 3 : formative assessment

1. Describe all measuring types that are used in Testing Camera

Answer: -Functionality testing

-Continuity testing

-Voltage measurement

2. Answer true or false

a) Continuity test refers to taking different measurement of potential difference at every part of a device. **False**

b) After using a meter to measure mains voltages, ensure the test leads aren't damaged and that there are no exposed conductors which could be touched inadvertently. **False**

c) It is necessary to do functionality test periodically in order to avoid future damage surprises

True

Practical assessment

After repairing a camera perform testing.

Checklist	score	
	yes	no
Indicator: testing techniques are well identified		
✓ Continuity testing is well performed		
✓ Voltage measurement is well performed		
✓ Current measurement is well performed		
✓ Electronic components testing is well performed		
✓ Functionality of camera is well performed		

References:

TOMOSY, T. (1993). Camera maintenance and repair (book1 ed.). New York: Amherst ,NY:Amherst media.

http://www.rescuedigitalmedia.com/7-common-digital-camera-errors-their-solutions

LEARNING UNITY 3: INSTALL STUDIO CAMERA

Learning outcomes

3.1 Conduct the site survey

3.2 Prepare for studio camera installation

3.3 Integration of studio camera

Learning Outcome 3.1: Conduct the site survey

Duration: 10hrs

Learning outcome 1 objectives:

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

- Proper conduction of site survey

Resources		
Equipment	**Tools**	**Materials**
▪ PPE ▪ Tape measure	▪ Tape measure ▪ Torch ▪ Pens ▪ Notebook	
Advance preparation Visiting a place where site survey will be conducted before		

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

- ✓ Introduction to site survey
- ✓ Studio camera installation factors:
  - Power supply
  - Visual angle
  - Location
  - Environmental operating conditions

Indicative content 3.1.1: Introduction to site survey

1.1 What is site survey?

Site surveys are inspections of an area where work is proposed, to gather information for a design or an estimate to complete the initial tasks required for an outdoor activity. It can determine a precise location, access, best orientation for the **site** and the location of obstacles.

1.2 What does a site survey include?

A site survey includes taking pictures, examining the materials and area where the sign will be installed, and verifying all measurements. Additionally, we reexamine all sign ordinances to make sure that your sign will fall within city code, and determine when a permit is needed, as well as securing these permits when necessary.

1.3 Why is a site survey so important?

From what material, to visibility, to accurate measurements, a site survey can help work out any kinks before they happen; after the sign is already manufactured, it's almost impossible to fix a majority of these problems that are easily preventable with a site survey.

A site survey allows us to make sure that the sign we're about to manufacture will actually fit in the space desired, and that it will actually be possible to install it with current conditions.

Finally, a site survey allows the sign company to give a much more accurate quote. Knowing what is really going to be involved in the process, as well as how easy or hard it will be to work around obstacles, will help your sign company give an accurate quote and prevent any surprises when the installation comes around.

Site survey can help an organization even technician save valuable time, money and resources. As a result of the intelligence gathered through a site survey, you can make better decisions; reducing cost errors are made in the execution phase of your project. The information we need to know on site survey are:

- Gathering information about the design of installation
- Gathering information about the cost of the work
- Determination of precise location of installations.

Camera placement

When planning camera placement during installation, many factors must be taken into account. As mentioned in Camera Selection, the objectives will determine what type of camera should be used, as well as how it should be positioned.

Getting a useful image involves much more than simply pointing the camera in the required direction. Lighting (and backlighting), angles, reflections, dead zones, and the zoom factor cameras are all matters to consider. Sometimes, it's actually easier to change the environment itself, for example by shading windows or moving objects to new locations.

a) Power supply

Most camera are powered by rechargeable battery and these battery may be charged in two ways:

1) Charged by external external charger when connected to the mains or wall supply,
2) Charged by specific adapter for each camera which is connected to the camera through a provided charger port.

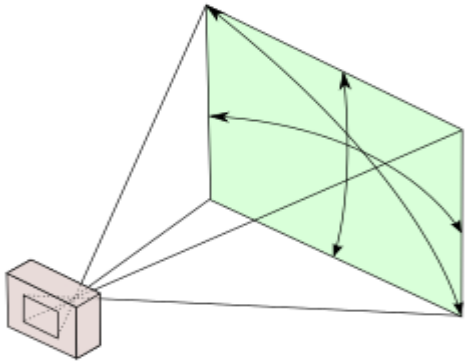
So, while using camera consider these source of camera power because it require to be powered while is in using.

b) Visual angle

In photography, **angle of view** (AOV) describes the angular extent of a given scene that is imaged by a camera. It is used interchangeably with the more general term field of view.

It is important to distinguish the angle of view from the angle of coverage, which describes the angle range that a lens can image. Typically the image circle produced by a lens is large enough to cover the film or sensor completely, possibly including some vignetting toward the edge. If the angle of coverage of the lens does not fill the sensor, the image circle will be visible, typically with strong vignetting toward the edge, and the effective angle of view will be limited to the angle of coverage

A camera's angle of view depends not only on the lens, but also on the sensor.



A camera's **angle of view** can be measured horizontally, vertically, or diagonally.

c) Location

Just as important as the shot you choose, and whether your camera is static or moving, is the position of the camera when the shot is taken. The camera position (also known as camera angle) impacts on the way we interpret a film sequence.

The **camera angle** marks the specific location at which the movie camera or video camera is placed to take a shot. A scene may be shot from several camera angles simultaneously. This will give a different experience and sometimes emotion. The different camera angles will have different effects on the viewer and how they perceive the scene that is shot. There are a few different routes that a camera operator could take to achieve this effect.

d) Environmental operating conditions

To confirm the operating temperatures for your camera, please refer to your camera user manual. In the majority of cases, these temperatures are between 0 to +40 degrees C (+32 to +104 degrees F).

Theoretical learning Activity

In group of 3 members discuss about site survey

Practical learning Activity

Perform site survey for camera

checklist	score	
	yes	no
Indicator: studio camera installation factors are well identified		
✓ Power supply		
✓ Visual angle		
✓ Location		
✓ environmental operating conditions		

Points to Remember (Take home message)

Information we need to know on site survey are:

- Gathering information about the design of installation
- Gathering information about the cost of the work
- Determination of precise location of installations.

Learning out come 1 : formative assessment

1. What do you understand by the term: “Site survey”?

Answer: Is a set of Inspections done on the place where work is proposed

2. Give three main functions of site survey

Answer: -Helps to know well where to place your equipment

-Helps to discover any kinks before they happen

-Helps to Estimate the Cost of the work

Practical assessment

Perform site survey and choose the best location where you will install your cameras and equipment's

	score	
	yes	no
Indicator: studio camera installation factors are well identified		
✓ Power supply is well located		
✓ Visual angle is well identified		
✓ Location is well presented		
✓ environmental operating conditions is well located		

Learning outcome 3.2: Prepare the studio camera installation

Duration: 10hrs

Learning outcome 2 objectives:

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

- Proper preparation of studio camera installation according to the studio requirements

Resources

Equipment	Tools	Materials
▪ Camera ▪ Camera accessories ▪ Camera stand ▪ Camera tester ▪ DMM ▪ Drilling machine ▪ Screwdriver machine ▪ Soldering station Digital ▪ Air blowing machine ▪ PPE	▪ Wire strippers ▪ Screwdrivers ▪ Pliers ▪ Cable cutters ▪ Digital Multimeter ▪ Safety knife, ▪ Hex keys ▪ Torch ▪ Soldering iron ▪ Headphone	▪ ▪ Measuring tape ▪ Soldering tin ▪ Insulation tape ▪ SDs ▪ Camera Batteries

▪ Cable conduits ▪ Cable trunks	▪ Camera stand tripod	

Advance preparation

Prepare studio equipment

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

- ✓ Description of camera stands
- ✓ Description of trunking and cable conduits
- ✓ Techniques for fixing and connecting cables conduits and trunking:
  - Planning the route of the cables conduits and trunking
  - Measurement of trunking and cables length
  - Cutting cable conduits and trunking
  - Joining cable conduits and trunking
  - Bending cable conduits and trunking
  - Drilling and fixing of cable conduits and trunking

Indicative content 3.2.1: Description of camera stands

"Camera stand" is the generic term for any contraption that a camera sits on for stability. Camera stands covers the full range of tripods, studio stands.

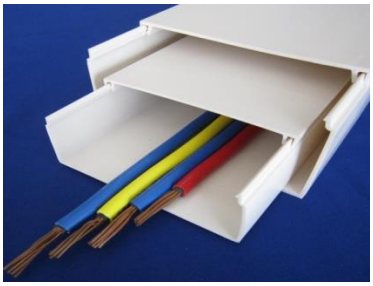
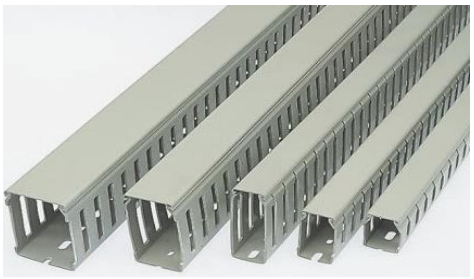
In photography, a **tripod** is used to stabilize and elevate a camera, a flash unit, or other photographic equipment. All photographic tripods have three legs and a mounting head to couple with a camera. The mounting head usually includes a thumbscrew that mates to a female threaded receptacle on the camera, as well as a mechanism to be able to rotate and tilt the camera when it is mounted on the tripod. Tripod legs are usually made to telescope,

in order to save space when not in use. Tripods are usually made from aluminum, carbon fiber, steel, wood or plastic.

Camera stand

Indicative content 3.2.2: Description of trunking and cable conduits

Cable trunking is an enclosure usually with a rectangular cross section, and with one removable or hinged side, that is used to protect cables and provide space for other electrical equipment. They make electrical ducting and cable trunking for concealing and securing cabling.

Cable trunking

An **electrical conduit** is a tube used to protect and route electrical wiring in a building or structure. Electrical conduit may be made of metal, plastic, fiber, or fired clay. Most conduit is rigid, but flexible conduit is used for some purposes.

Conduit is generally installed by electricians at the site of installation of electrical equipment. Its use, form, and installation details are often specified by wiring regulations, such as the US National Electrical Code (NEC) and other building codes.

cable conduits

Indicative content 3.2.3: Techniques for fixing and connecting cables conduits and trunking

Planning the route of the cables conduits and trunking

Route is the way between two places along which cable conduits and trunking travel.

Plan for a way for travel or movement, the path from point A to point B, where conduits and trunk should be fixed.

Measurement of trunking and cables length

A **measurement** is the action of measuring something, or some amount of stuff. So it is important to measure certain things like distance or length specified for trunking, conduits and cables.

Cutting cable conduits and trunking

Cutting is the action of *cut* off a piece from the main part of cable conduits and trunking which will fit to the length measured**.**

Joining cable conduits and trunking

The way of connecting two things order to produce something new. This is done to connect cable conduits and trunking to make them to have a good finishing and a good outlook.

Bending cable conduits and trunking

Bending is to force (an object, especially a long or thin one) from a straight form into a curved or angular one. This is done to facilitate the joining process of cable conduits and trunking.

Drilling is the process of cutting holes in a solid material using a rotating cutting tool whereas fixing is the action of fastening something in place. This is done to fix the cable conduit and trunking in the planned route.

Theoretical learning Activity

Ask trainees to brainstorm the description of cable trunking and cable conduit

Practical learning Activity

Fix cables conduits and trunking for studio camera

checklist	score	
	yes	no
Indicator: Techniques for fixing and connecting cables conduits and trunking are well identified		
Planning the route of the cables conduits and trunking		
✓ Measurement of trunking and cable length		
✓ Cutting cables conduits and trunking		
✓ Joining cables conduits and trunking		
✓ Bending cables conduits and trunking		
✓ Planning the route of the cables conduits and trunking		

Points to Remember (Take home message)

Techniques for fixing and connecting cables conduits and trunking:

Planning the route of the cables conduits and trunking

- Measurement of trunking and cables length
- Cutting cable conduits and trunking
- Joining cable conduits and trunking
- Bending cable conduits and trunking

Learning out come 2: formative assessment

1. Studio Camera differs from field camera by the following facts:

a) Both can be used in Studio

b) Field camera is used Outdoor and Studio camera is used indoor

c) Studio camera is used Outdoor and Field camera is used indoor

d) a and b are correct

e) None of above

Answer: b

2. What is the Purpose of Cable Conduit and Cable Trunking?

Answer:-The purpose of cable trunking and cable conduit is to route cables during different installations in order to avoid disorder and to limit some accidents that may be caused by trip over of cables.

Practical assessment

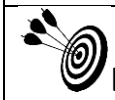
Fix cables conduits and trunking for studio camera

Checklist	score	
	yes	no
Indicator: Techniques for fixing and connecting cables conduits and trunking are well identified		
Planning the route of the cables conduits and trunking		
✓ Measurement of trunking and cable length is performed		

✓ Cutting cables conduits and trunking is done		
✓ Joining cables conduits and trunking is properly done		
✓ Bending cables conduits and trunking is properly done		
✓ Planning the route of the cables conduits and trunking		

Learning outcome 3.3: Interconnect studio camera parts

Duration: 10hrs



Learning outcome 1 objectives:

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

Proper Integration of Studio Camera

Resources

Equipment	Tools	Materials
▪ Camera ▪ Camera accessories ▪ Camera stand ▪ Camera tester ▪ Lighting equipment ▪ DMM ▪ Drilling machine ▪ Screwdriver machine ▪ Soldering station Digital ▪ Air blowing machine ▪ PPE	▪ Wire strippers ▪ Screwdrivers ▪ Pliers ▪ Cable cutters ▪ Spanners ▪ Digital Multimeter ▪ Safety knife, ▪ Hex keys ▪ Torch ▪ Soldering iron ▪ Camera stand tripod	▪ ▪ Measuring tape ▪ Soldering tin ▪ Insulation tape ▪ SDs ▪ Camera Batteries

Advance preparation

- Visiting a place where site survey will be conducted before

- Prepare all needed equipment

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

- ✓ Types of camera
  - Field camera
  - Studio camera: Studio broadcast camera, Portable Broadcast camera Lightweight camera, Electronic Cinematography camera, Combination camera .
- ✓ Fixing and mounting Camera
- ✓ Steps of fixing and mounting the camera:
  - Fixing the tripod Mounting the camera Positioning the camera to the desired angle

Indicative content 3.3.1: Types of camera

1.1 Field camera

A camera used or designed for use outside a studio; (Photography) a folding large-format film camera used on a tripod, and generally having a limited range of rear and front standard movements and interchangeable lenses linked to the camera by means of bellows.

1.2 Studio camera

Most television studio cameras stand on the floor, usually with pneumatic or hydraulic mechanisms called pedestals to adjust the height, and are usually on wheels. Any video camera when used along with other video cameras in a multiple-camera setup is controlled by a device known as CCU (camera control unit), to which they are connected via a triax, fibre optic or the almost obsolete multicore cable. The CCU along with genlock and other equipment is installed in the production control room (PCR) often known as the gallery of the television studio.

When used outside a formal television studio in outside broadcasting (OB), they are often on tripods that may or may not have wheels (depending on the model of the tripod). Initial models used analog technology, but are now obsolete, supplanted by digital models.

These cameras are classified into the following types:

a) Studio broadcast camera
b) Portable Broadcast camera
c) Lightweight camera
d) Electronic Cinematography camera
e) Combination camera

Indicative content 3.3.2: Fixing and mounting Camera on tripod

A tripod is a three-legged camera stand that stabilizes your shot. Using the tripod can help you take sharper photographs, even in poor lighting. There are many brands and models of tripod on the market, but most of them attach to the camera in the same way. Read on for a basic description of how to attach a camera to a tripod.

2.1 Steps of fixing and mounting the camera:

1. Fixing the tripod

- ✓ **How to set-up a tripod**

1. Extend the legs starting from the wider top sections
2. Position the tripod with one leg pointing in the direction of the lens
3. Adjust the length of the lower leg sections to level the tripod
4. Attach a base plate to the camera, and use a coin to tighten

Basic tripod set-up is straightforward, and once you've mastered the basics of setting up a tripod, you can then start to experiment with other features such as low-angle shooting and macro arrangements.

2. Mounting the camera. The camera might screw directly onto the tripod; you might need to clamp it into place; and you might need to tighten screws to hold the camera steady. Look for a threaded hole in the bottom of the camera. If your camera screws directly onto the tripod, then the camera plate (tripod mount) should have a matching screw. Twist the pieces together until they are snugly joined.

- Some tripods will have a small screw-head on the underside of the plate. In this case, tighten the screw-head from the bottom of the plate instead of twisting the plate itself onto the camera.
- The connection should be snug, but not over-tight. Too-tight screws can put stress on the mounting system, which could in turn damage your camera or tripod.

3. Positioning the camera to the desired angle. You should be able to swivel the camera on the tripod for pan shots, but you can always move the rig to a more convenient spot. Before you take any photos or shoot video, look through the viewfinder to check that the lens is angled exactly how you want it. Make sure that the tripod is level and stable when you shoot.


Theoretical learning Activity

Discuss about the steps of fix and mounting the camera in 3-4 groups.


Practical learning Activity

Individually mount and Fix studio camera


Points to Remember (Take home message)

Steps of fixing and mounting the camera:

1. Fixing the tripod
2. Mount the Camera
3. Position the camera at a desired angle

Learning out come 3.2 : formative assessment

1. The following are the steps of fixing and mounting the camera except:

a) Fixing the tripod

b) Mounting the camera

c) Positioning the camera to the desired angle

d) Fix the Tripod to the roof

e) None of above

Answer: d

2. Differentiate Visual Angle from Coverage Angle

Answer: In photography, angle of view (AOV) describes the angular extent of a given scene that is imaged by a camera. It is used interchangeably with the more general term field of view. And **The angle of coverage, describes the angle range that a lens can image.**

Practical assessment

- Assessment instruments/tools

  ✓ Task to be performed with performance checklist/quality product checklist

References:

http://www.largeformatphotography.info/forum/showthread.php?20176-View-Camera-vs-FieldCamera (Reteaved on 04 June 2020)

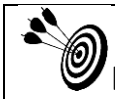
https://quizlet.com/125989975/parts-of-the-studio-camera-and-supporting-equipment-flashcards/ (Reteaved on 06 June 2020)

Learning Unit 4: REPORT THE WORK DONE

Learning outcomes
3.1 Review the previous work
3.2 Record the work process
3.3 Write Technical Recommendation

Learning outcomes 4.1 Review the previous work

Duration: 2hrs



Learning outcome 1 objectives:

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

- Accurate Review of the previous work document according to the work process

Resources

Equipment	Tools	Materials
hand-outs	Pens Documents	Papers

Advance preparation

Availability report documents templates.

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

- ✓ Description of work document elements
  - Repairing date
  - Addresses of technician
  - Status of camera parts
  - Name of the repaired parts
  - Work carried out
  - Recommendation
- ✓ Analysis of the previous work document
  - Previous faults
  - Previous used Technics
  - Previous status of the camera
  - Previous recommendation

Indicative content 4.1.1. Description of work document elements

The description of the work documents may include the following elements:

a) **Repairing date:** the date at which you service the device.
b) **Addresses of technician:** this includes the home or work phone number, the street number even the apartment where the technician do its services.
c) **Status of camera parts**: this indicates the conditions/status in which the technician receives the camera.
d) **Name of the repaired parts:** this element shows which parts causes the device (camera) to be defective and how it/they has or have been repaired
e) **Work carried out:** this part indicates or shows all necessary work done to service the defective device.
f) **Recommendation:** this part is where the technician indicates the suggestions required to be done by the owner of the device (camera) in orderto prevent that device**.**

Indicative content 4.1.2.Analysis of the previous work document.

It is the part in which the technician analyse the previous work document in order to maintain the camera, this may include the following elements:

a) **Previous faults:** this indicates the faults of the camera previously when it has been taken to the technician.
b) **Previous used Techniques:**this should indicate the techniques used while servicing the previous fault.
c) **Previous status of the camera:** this is the stage where the technician analyse the status of the camera before and after it has been taken to the technician previously.

d) **Previous recommendation:** in this stage the technician should analyse the suggestions taken by the previous technician while it has been taken to the technician4

Theoretical learning Activity

Discuss about the elements of work document in groups of 3 members

Practical learning Activity

Describe the work related document

checklist	score	
	yes	no
Indicator: work document elements are described		
✓ Repairing date		
✓ Address of technician		
✓ Status of camera parts		
✓ Name of the repaired part		
✓ Work carried out		
✓ Recommendation		
Indicator: previous work is well interpreted		
✓ Previous fault		
✓ Previous used technics		
✓ Previous status of the camera parts		
✓ Previous recommendation		

Points to Remember (Take home message

Work document Elements:

1. Repairing date
2. Address of Technician
3. Status of Camera parts
4. Name of Repaired parts
5. Work carried out
6. Recommendation

Learning out come 4.1 : formative assessment

1. Why do we need to do a Previous Review before starting to repair any device?

Answer: Because it helps to know the previous fault and previous fixing techniques

2. Answer by True or False:

a) It is not necessary to review the previous fixing techniques because every technician has his/her own techniques that he/she uses to solve problems.

False

b) Work document includes the following elements: Technician address and technician account number.

False

b) A technician can review the previous work by only referring to the name of previous repairer.

False

c) No one can review the previous work document except the owner.

False

e) It is not necessary to mention a repairing date in a work document.

False

Learning outcomes 4.2 Record the work process

Duration: 2hrs

Learning outcome 2 objectives:

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

- Effective recording of the work process according to the work done

Resources

Equipment	Tools	Materials
hand-outs	Papers Documents	Pens

Advance preparation

Availability report documents templates.

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

- ✓ Description of the work carried out
  - Faulty parts
  - Type of fault
  - Tools, materials and Equipment used
  - Steps and Technics used to fix the fault
  - Status of the camera after work

Indicative content 4.2.2: record the work process

This part the technician should indicates all about the work done during the maintenance of the device/camera which includes the following:

a) Faulty parts

b) Type of fault

c) Tools, Materials and Equipment used

d) Steps and Techniques used to fix the fault

e) Status of the camera after work

Theoretical learning Activity

Trainees should brainstorm on main parts a technician indicates in reporting the work done

Practical learning Activity

Record the work done process

checklist	score	
	yes	no
Indicator: work document elements are described		
✓ Repairing date		
✓ Address of technician		
✓ Status of camera parts		
✓ Name of the repaired part		
✓ Work carried out		
✓ Recommendation		
Indicator: the work carried out is well described		
✓ Fixed fault		
✓ Tools, materials and equipment used		
✓ Steps and techniques used		

Points to Remember (Take home message

The following are the points to be mentioned in recording the work done:

a) Faulty parts

b) Type of fault

c) Tools, Materials and Equipment used

d) Steps and Techniques used to fix the fault

e) Status of the camera after work

Learning out come 4.2 : formative assessment

1. Tell me if the statement below is true or false:

When you are recording the work done, it is necessary to mention the faults parts, the techniques used to fix the fault, materials, tools and equipment used to fix the fault, Possible solution to faced challenges, your suggestions about preventive strategies and your proposition about periodic check-up.

Answer: It's true

2. List down the points to be mentioned in recording the work done.

Answer:

f) Faulty parts
g) Type of fault
h) Tools, Materials and Equipment used
i) Steps and Techniques used to fix the fault
j) Status of the camera after work

Learning outcomes 4.3 write technical recommendation

Duration: 1hrs

Learning outcome 1 objectives:

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

- Methodical writing of the technical recommendation according to the work done

Resources

Equipment	Tools	Materials
	Pens Documents	Papers

Advance preparation

Availability report documents templates.

Summary for the trainer related to the indicative content (key notes using bullets such as ticks etc)

- ✓ Description of element of technical recommendation
  - Propose preventive strategies
  - Suggest solutions to faced challenges
  - Propose the periodic check up

Indicative content 4.3.1 Description of element of technical recommendation

This is the part where the technician indicates the suggestions to the owner of the camera which help him or her to prevent it not being defective again and include the following:

a) Propose preventive strategies

b) Suggest solutions to faced challenges

c) Propose the periodic check up

Theoretical learning Activity

Brainstorm on what you can recommend a client to prevent him from not being defective again if you have repaired his camera.

Practical learning Activity

Write a technical recommendation on repaired camera

Checklist	score	
	yes	no
Indicator: element of technical recommendation are well described		
✓ Propose preventive strategies		
✓ Suggest solutions faced challenges		
✓ Propose the periodic check up		

Points to Remember (Take home message)

Elements of Technical Recommendation

a) Propose preventive strategies

b) Suggest solutions to faced challenges

c) Propose the periodic check up

Learning out come 3: formative assessment

1. The following are the elements of technical recommendation except:

a) Propose preventive strategies

b) Provide Invoice to the client

c) Suggest solutions to faced challenges

d) Propose the periodic check up

e) None of above

Answer: b

3. One of your clients 'camera has been damaged and been repaired by you on 19/01/2023. The fault was that the lens were dirty. You cleaned the lens, then the camera is now functioning normally.so, write the sample of technical recommendation you provided to the client.

Answer:

Dear Client, here are some points I need to recommend you in order to protect/to keep well your device:

1. During this reparation, I have challenged by the fact that your Lens were very dirty, they were almost damaged totally. So, please, next time, don't wait until your camera is not able to function. You should clean your Lens before they are damaged due to dirtiness.

2. You should keep your camera in an appropriate bag in order to prevent your lens from dirtiness. You should also cover your camera lens by the appropriate cover when not in use.

3. It is better to do periodic checkup and cleaning when necessary, so please, don't hesitate to contact me 0n +250 785182067 every three months so that I can help you in checking your camera.

Practical assessment

Camera maintenance and services (CAMAS) Company, located in Southern Province, Huye district, has assigned different task to its technician. You, as video equipments technicians, are requested to repair a Canon Camera. According to the information given by the owner of this Camera; He was using it in the ceremony, then suddenly it shut down and it can't be switched on. From that moment, the camera is not working and when he inserts a full charged Battery, there is no indication that the camera receives power. The camera is needed in 4 hours

QUALITY OF PROCESS

checklist	score	
	yes	no
Indicator: Tools, Materials and equipments are well selected		
Soldering iron		
Screw driver		
Pliers		
Brushes		
Sponge		
Soft clothes		
Cable cutters		
Battery charger		
Tweezers		
Canon camera		
DMM		
Camera tester		
Screw driver machine		
Soldering station		
PPE		
Soldering tin		
Screws		
Electronic components		
Battery		
Indicator: camera parts functionality are well checked		
Power supply		
✓ view finder		
✓ body		
✓ shutter release		
✓ aperture		
✓ image sensor		

✓ memory card slot		
✓ memory card		
✓ flash		
✓ LCD screen		
✓ CCD Sensor		
Indicator: checking methods are well identified		
✓ Visual checking		
✓ Measuring		
Indicator: camera disassembling process is well applied		
✓ User manual is well consulted		
✓ Power supply is well removed		
✓ Memory card is well removed		
✓ Screws are well removed		
✓ Cover is well removed		
✓ Internal camera parts are well disconnected		
Indicator: fault fixing techniques are well applied		
✓ Settings are well adjusted		
✓ Lens fault are well fixed		
✓ Battery well are well fixed		
✓ LCD problems are well fixed		
✓ Shutter release faults are well fixed		
✓ Image sensor faults are well fixed		
✓ Memory card slots faults are well fixed		
Indicator: testing techniques are well identified		
✓ Continuity testing		
✓ Voltage measurement		
✓ Current measurement		
✓ Electronic components testing		
✓ Functionality of camera		

QUALITY OF PRODUCT

Indicator: Camera parts are functioning correctly		
✓ Power system		
✓ Parts are well fastened		
✓ Power indicator		

RELEVANCE

Indicator: Camera is well repaired		
✓ Camera turns ON		
✓ No new fault is introduced		

Indicator: working conditions are respected		
✓ Time is respected		
✓ No waste of materials		

SAFETY

Indicator: Safety rules and guidelines are well respected		
✓ Individual safety precautions		
✓ electrical safety precautions		
✓ operating safety precautions		
Indicator: tools materials and equipment are well used		
✓ no materials are wasted		
✓ no equipment crushed		
✓ no tools broken		

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