TVET CERTIFICATE V in ELECTRONIC SERVICES

CAMERA MAINTENANCE

ELSCM501

Maintain Camera

Competence

Credits: 6

Learning hours: 60

Sector: Technical Services

Sub-sector: Electronic Services

Module note Issue date: October, 2020

Purpose statement

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.

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Learning Unit 1 – Prepare the camera maintenance work

LO 1.1 – Select materials, tools and equipment

- Content/Topic 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.

- Content/Topic 2: Classification of tools and their uses

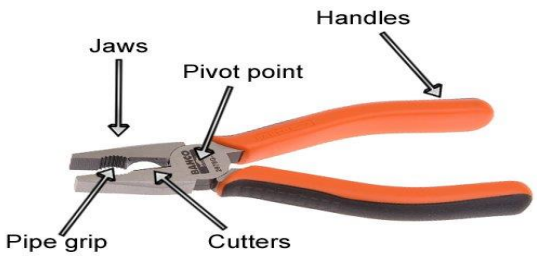
✓ **Repairing tools**

Soldering irons: A soldering iron is an 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 work pieces.

- **Screwdriver: Screwdriver** is tool, 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.

- **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.



- **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.

- **Crimping tools:** A crimping tool is a device used to conjoin two pieces 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**

- **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.
- **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.
- **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**

- **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.

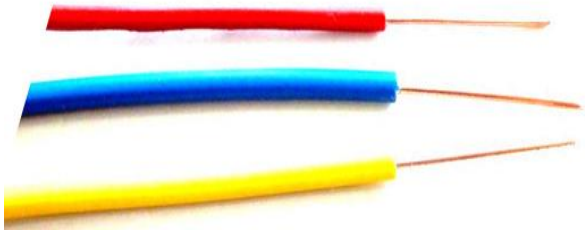
The familiar **camera tripod** looks like this:

- Content/Topic 3: Classifications of materials and their use

✓ **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**

- **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 metal work pieces.

Soldering tin

- **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

- **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

✓ **Equipment and their uses**

- **Camera**

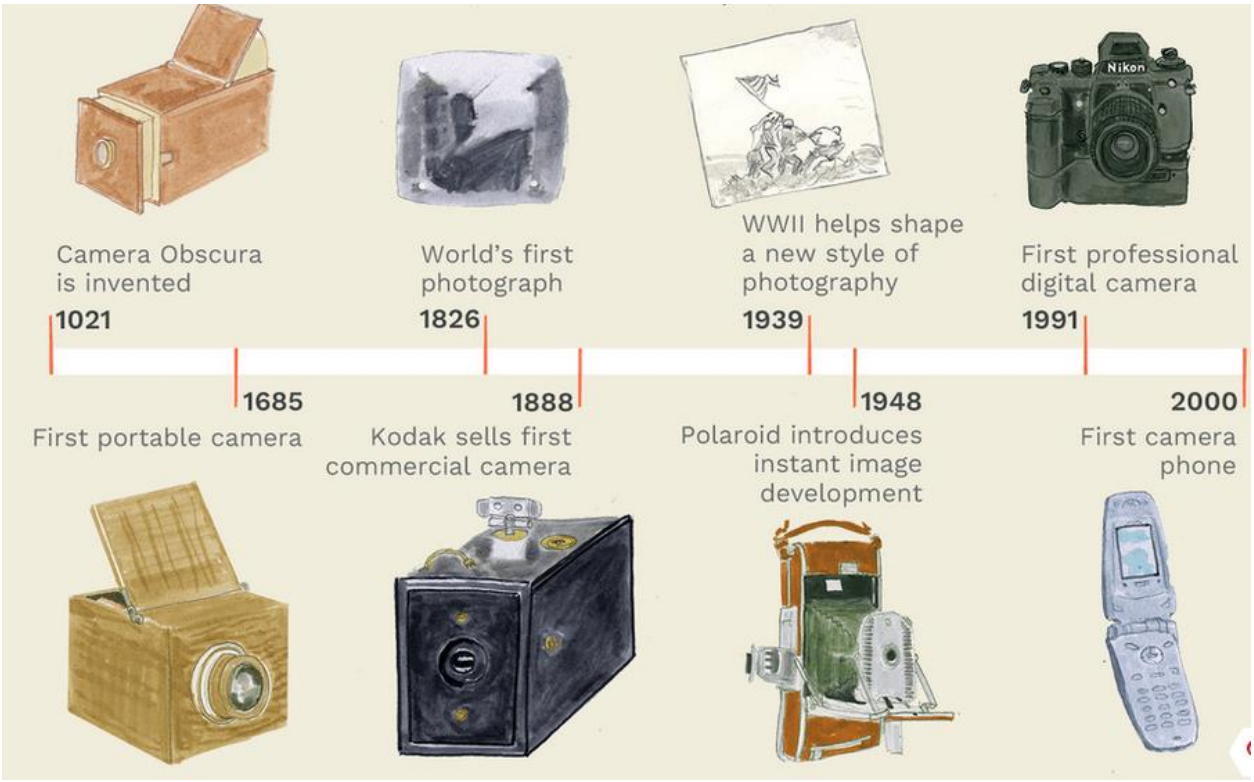
Camera is a device that consists of a lightproof chamber with an aperture fitted with a lens and a shutter through which the image of an object is projected onto a surface for recording (as on a photosensitive film or an electronic sensor) or for translation into electrical impulses (as for television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

A camera is an electronic device that captures pictures, movies or other visual images either digitally or on film.

Cameras

- **Technologies of camera**



The **history of the camera** begins even before the introduction of photography. Cameras evolved from the camera obscura through many generations of photographic technology –

daguerreotypes, calotypes, dry plates, film – to the modern day with digital cameras and camera phones.

In summary

- The Ancient Greeks and Chinese used an optical device called the 'camera obscura' to project an image of the surroundings on to a screen. This invention played an important role in the development of cameras and photography.
- Although designs existed earlier, it wasn't until the 1800s that practical cameras were developed.
- The 'Kodak' camera was developed by George Eastman and went on sale in 1888, pioneering the use of photographic film. It was simple box camera with a single shutter speed and fixed focus lens.
- Around the year 1913, a German optical engineer named Oskar Barnack made a prototype compact camera that used 35 mm film. Named 'Lecia', it was put into production in 1925 after further developments.
- Reflex cameras became popular in the 1920s and 1930s.
- Single lens reflex cameras (SLR) use a mirror and prism system to allow photographers to accurately see the image that will be captured. This system uses one optical light path whereas previous cameras had two, one through the lens to the film and the other to the viewfinder.
- Polaroid cameras hit the market in 1948, allowing photographers to produce images instantly. A special chemical process was used to used to produce prints from the negatives in under a minute.
- The popularity of instant cameras took off in 1965 with the introduction of the Polaroid Model 20 Swinger, one of the top selling cameras of all time.
- Despite the technology being around in 1949, disposable cameras didn't really catch on until the 1990s when Kodak models became popular. They are cheap alternatives designed to be used once, perfect for one off events such as birthdays and vacations.
- The first successful imaging technology using a digital sensor was made in 1969 by Willard S. Boyle and George E. Smith. In 2009, they were awarded the Nobel Prize in Physics for their contributions which paved the way for digital photography.
- The first commercial DSLR (digital single lens reflex) was launched by Kodak in 1991.
- Photos on digital cameras are typically compressed using the JPEG standard and stored on memory cards.
- The popularity of digital cameras exploded in the 2000s as technology improved and the costs of production decreased.
- Modern digital cameras produce detailed photos made up of a huge number of pixels.
- The technology behind cameras is improving all the time with additions such as touch screens and electronic viewfinders.

Types of Camera and functionality

Nowadays, cameras come in many different forms. These camera types include your favorite compact digital cameras, DSLRs, action cameras, new and improved film cameras, and even the latest mirrorless cameras. It may be hard to choose which type of camera to go for, but it's easy to figure out which one will work best for you once you find out more about each of them, what they're best for, and what their pros and cons are. Whether you're a beginner, a hobbyist, or a professional, you'll find a specific type of camera that will fit your lifestyle and photography needs from our list below.

Types of Cameras for Photography

- Compact Digital Cameras
- Digital SLR Cameras
- Mirrorless Cameras
- Action Cameras
- 360 Cameras
- Film Cameras
- Bridge Camera
- Phone camera
- CCTV camera

1. **Compact Digital Cameras**

Compact digital cameras

Compact digital cameras literally allow anyone to capture beautiful images by simply pointing the camera at the subject and clicking the shutter. Also known as a point-and-shoot camera, it is the most user-friendly of all camera types. It is smaller and lighter, doesn't require film or extra lenses, and does all the hard work of automatically adjusting its settings to deliver well-exposed photos every time. You won't have the freedom of adjusting the settings to your liking, but with a good artistic eye and a knack for composition, you should have no problem producing great photos.

Nikon Coolpix A10, Nikon Coolpix S3700, Canon IXUS 165, Canon Power shot D30 and Sony Cyber-shot DSC-W800 are examples of Compact camera.

2. **Digital SLR Cameras**

Digital single lens reflex cameras

DSLR (or digital single lens reflex) cameras take photos to the next level of image quality. This more "serious" type of camera is best known for delivering remarkably sharp and spectacular images, with beautiful background, and even high resolution videos with the help of their advanced sensors, manual settings, and wide range of interchangeable lenses.

Today, professional photographers and videographers from around the world mostly use DSLRs (now alternatively known as hybrid single reflex lens cameras or HDSLR) for commercial purposes. Many of Canon's and Nikon's DSLR cameras are being used for capturing hi-res images for magazines and billboards, and even full HD 1080p videos at up to 60fps for television shows and movies.

There are two types of DSLRs: the full-frame or 35mm, and the crop sensor or APS-C.

Nikon D7200, NikonD5500, Canon 7D, Canon 600D and Sony a77 are examples of DSLR camera.

3. **Mirrorless Cameras**

Mirrorless cameras

Mirrorless cameras are the latest in professional cameras—they are basically more compact DSLRs without the internal mirror that reflects light onto the sensor.

What's interesting about mirrorless cameras is that they are now capable of capturing incredible, high-resolution images with even faster shutter speeds and record ultra HD videos that only the most expensive, higher-end DSLRs can produce.

4. **Action Cameras**

Action camera

We've definitely seen the abundance and rising popularity of action cameras in the past few years, and it's not hard to see why. Common action cameras like the GoPro can fit in the palm of your hand, but they're some of the most durable and versatile types of digital cameras that offer very high-resolution output.

A wide range of accessories like waterproof housing and mounts allow the user to attach action cameras to helmets, bicycles, and even drones, which enable hands-free shooting in different types of situations. This opens up a whole new world of photographic possibilities, as this type of camera allows you to capture impressive wide-angle photos and videos with sound from almost any angle and environment, whether underwater or on top of a mountain.

5. **360 Cameras**

The 360-degree camera

The 360-degree camera takes half dome to full-circle panoramic photos and videos using back-to-back lenses. Like action cameras, some of them are also water resistant and mountable on many surfaces, such as on top of cars, helmets, or drones. Above all, they take the most realistic pictures and videos with stunning panoramic views that you can truly immerse yourself in, virtual reality style.

It's a very good camera choice for taking vacation photos that you can proudly show off to your loved ones and on social media. After all, we still can't get enough of this new Google Streetview-style photography and videography. However, because of its non-traditional

output, images cannot be printed unless they are cropped as a rectangular panoramic frame.

While mostly geared toward hobbyists, professional photographers can also benefit from this type of camera if they wish to create highly unique, immersive digital photos that allow them to capture a certain scene from all angles.

6. **Film Cameras**

Film camera

Film cameras may seem outdated in our new digital world, but they are by no means obsolete.

Today's film cameras provide more artistic output than ever before. Much to the delight of film photography enthusiasts, there are still classic 35mm film cameras being sold today with improved bodies and enhanced capabilities.

The younger generation has learned to love film cameras, thanks to the birth of instant and lomography cameras, which produces (and sometimes prints out) vintage-style photos with vignettes and Instagram-style "filters" with every click of the shutter. Rangefinder cameras, which manually measure subject distance, have been improved while retaining the vintage body and analog settings.

Film cameras obviously require more hard work in achieving your desired images, but they are loved for their unmatched ability to produce gorgeous, artistic photos that are great for galleries and photo albums.

7. Bridge Camera

Bridge camera

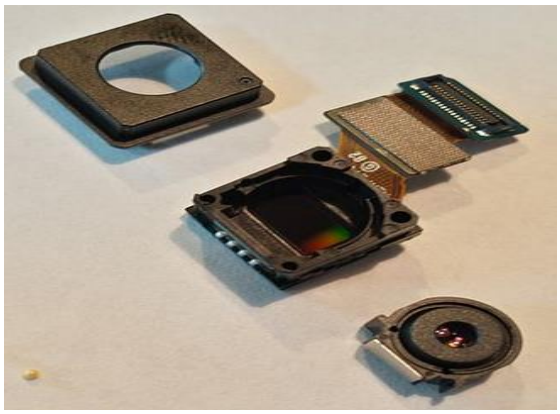
Bridge camera also known as Super zoom camera, Advanced compact camera, Advanced Digital camera and Hybrid camera. They come in different sizes and shapes, some are smaller and lighter as compact cameras but some have similar shape and larger as DSLRs. The main difference between bridge cameras and basic compact camera is that they have more controls on exposure settings. Bridge cameras have full auto exposure mode to semi auto exposure mode like Aperture priority, shutter priority and program mode. Another benefit is, they have a manual exposure mode that allows the photographers to get correct exposure than auto modes.

Unlike DSLRs, The lens on bridge cameras is ‘fixed’. The default lens cannot be removed and replace with other lens like on DSLRs. Keeping this in mind, camera manufacturers have already attached long zoom range lens.

Some bridge cameras have hot shoes feature for external flash and other useful features as in DSLRs. Bridge camera are cheaper than DSLRs and a bit expensive than compacts in the market. These types of camera also not useful for commercial photography but very suitable for personal or small home business, such as web basis business, reporter, journalists, small product business, family function etc.

Nikon Coolpix B700, Nikon Coolpix P900, Canon PowerShot SX540 HS, Canon PowerShot G3 X, Sony Cyber-shot DSC-H400 and Panasonic Lumix DMC-FZ200 are examples of Bridge camera.

8. Camera Phone



Camera phone

A **camera phone** is a mobile phone which is able to capture photographs and often record video using one or more built-in digital cameras. It can also send the resulting image over the telephone function. The first commercial camera phone was the Kyocera Visual Phone VP-210, released in Japan in May 1999. It was a cordless phone as distinct from a cellular mobile phone.

Most camera phones are simpler than separate digital cameras. Their usual fixed-focus lenses and smaller sensors limit their performance in poor lighting. Lacking a physical shutter, some have a long shutter lag. Photoflash is typically provided by an LED source which illuminates less intensely over a much longer exposure time than a bright and near-instantaneous flash strobe.

Most modern smartphones only have a menu choice to start a camera application program and an on-screen button to activate the shutter. Some also have a separate camera button, for quickness and convenience. A few camera phones are designed to resemble separate low-end digital compact cameras in appearance and to some degree in features and picture quality, and are branded as both mobile phones and cameras.

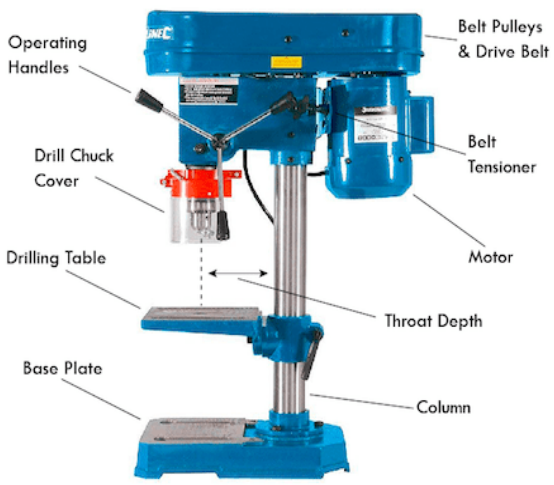
9. **CCTV Camera**

A closed-circuit television camera can produce images or recordings for surveillance or other private purposes. Cameras can be either video cameras, or digital stills cameras. Walter Bruch was the inventor of the CCTV camera. The main purpose of a CCTV camera is to capture light and convert it into a video signal. Underpinning a CCTV camera is a CCD sensor (charge-coupled device). The CCD converts light into an electrical signal and then signal processing converts this electrical signal into a video signal that can be recorded or displayed on the screen.

- **Drilling machine and accessories**

A **drilling machine**, called a drill press, is used to cut holes into or through metal, wood, or other materials.

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 a powered 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.

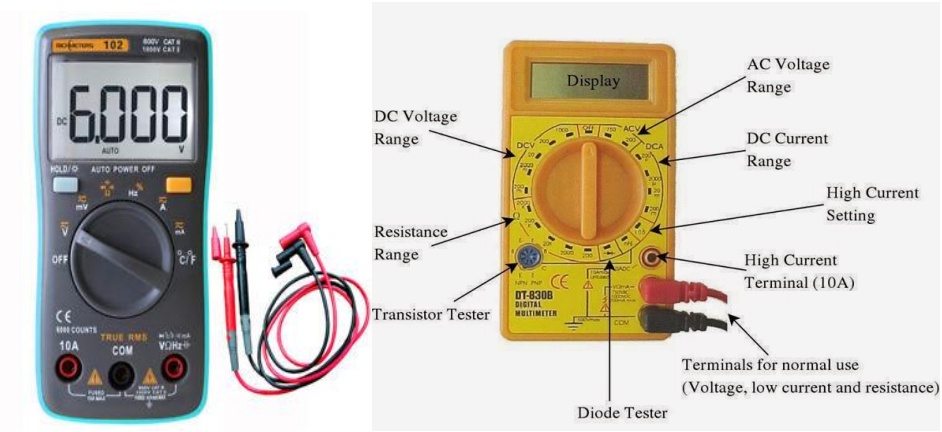
Soldering stations are widely used in electronics repair workshops, electronic laboratories, in industry. Sometimes simple soldering stations are used for household applications and for hobbies.

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.



Digital multimeter

- **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 is a 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

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**

Camera tester is device that process the action of trying different lenses and different camera settings to achieve the visual style and effect they want for the film. Rolling some tape well in advance of your shoot, in one of your locations or somewhere similar and experimenting will give you a huge advantage on the day of the shoot.

This means you will not 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. In addition, if you pack up right afterwards, it will ensure you don't forget any gear or accessories you'll need.

It can give a great boost to the quality of your footage if you can plan to set up in your location the day before, shoot a little test footage with full lights and sound, then review your test footage that night, making a few adjustments the next morning before the actual shoot to make everything perfect. Even if your actual location is not available the day before, just setting up all your gear somewhere similar and shooting some test footage will help prepare you for the shoot.

- **Lighting equipment**

Lighting or **illumination** is the deliberate use of light to achieve practical or aesthetic effects. Lighting includes the use of both artificial light sources like lamps and light fixtures, as well as natural illumination by capturing daylight.

Studio lights are any form of lighting equipment used by photographers, often when working in a photography studio, to enhance their photography. Most professional photographers have different light kits they use depending on the situation they find themselves shooting in.

- **Types of Lighting equipment**

1) Flash

The most commonly used light source today in photography – This can be the tiny little built-in flash in your camera or an external flash unit like the one above.

2) Strobe

The bigger brother of flash units, which are much more powerful. They are often used in studios as they require power plugs, but there are also portable strobes that come with battery packs.

3) Reflector cards

Reflector cards

Reflector cards are also known as bounce cards… or sometimes called “ping-pong bats” because of the shape. These are made of flexible material and attached to flash units so that you can fold it in various ways to shape the light.

4) Barn doors

Barn Doors

Barn doors are usually 4 pieces of moving leaves that are often attached to the strobes and floodlights to control the angle of the light – If not, they will just be “scattered” everywhere in a wide-angle fashion.

5) Beauty dish

Beauty dish

The beauty dish kind of looks like a satellite dish, but the purpose of it is actually to create a "ring of light". Usually used in glamour photography, beauty dishes produce charismatic portraits with a nice catch light in the model's eyes.

6) Diffuser

Diffuser

Diffusers are what I call "Tupperware". They are actually translucent pieces of plastic that you mount on a flash to give you softer lighting. Although the results are not as good as using a soft box, these caps and domes are small and extremely portable.

LO 1.2 – Setup the working environment

- Content/Topic 1: Cleaning techniques

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

Brushing: remove (dust or dirt) by sweeping or scrubbing using a brush.

Toweling: wipe or dry with a towel.

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

- Content/Topic 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. Always be aware of your surroundings and the people around you, no matter whether it is day or night,
2. Use well-lighted, well-traveled routes,
3. 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.
4. 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 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.

- Content /Topic3: 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:

- **Arrangement by uses:** the tools, materials and equipment of the same function are put on the same level.
- **Arrangement by size:** the tools, materials and equipment of the same size, weight are put on the same level.
- **Arrangement by types:** the tools, materials and equipment of the same type are put on the same level.

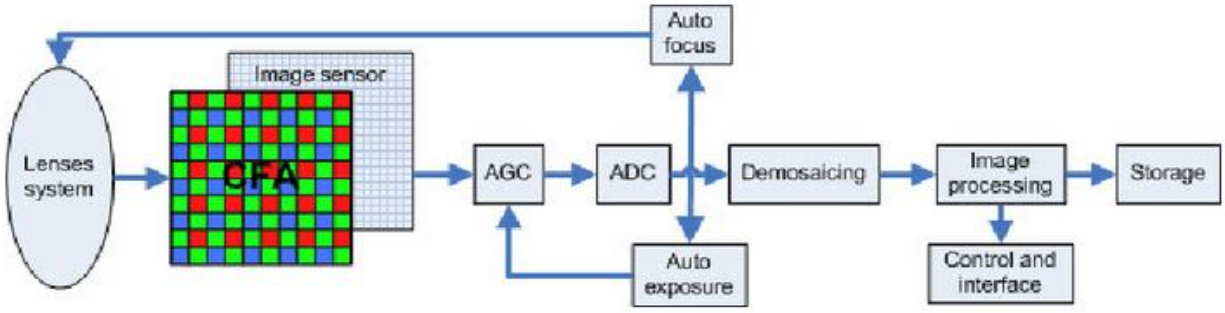
LO 1.3 – Check the camera parts

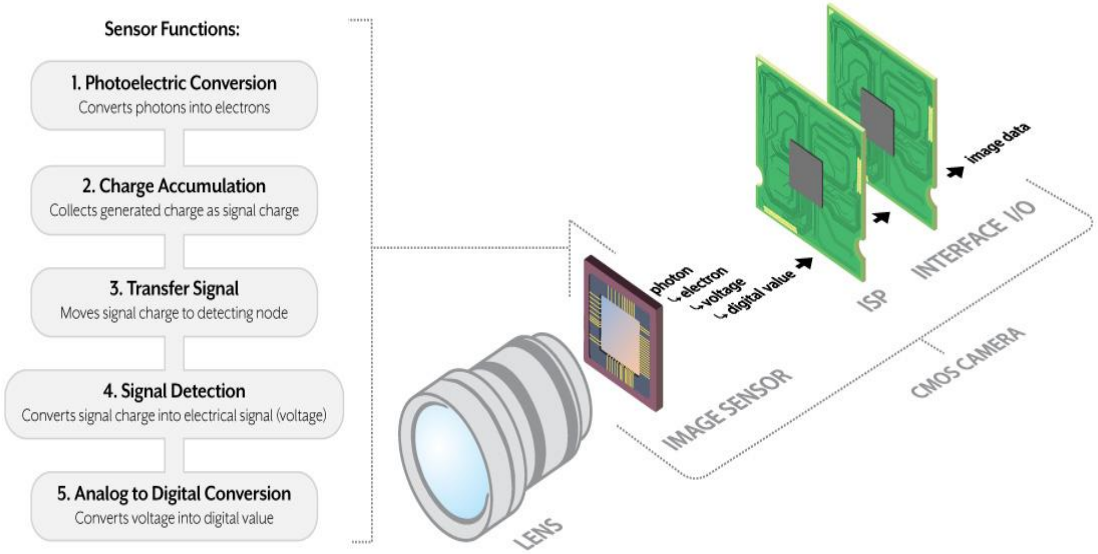
- Content/Topic 1: Introduction to camera operation
  - **Introduction to camera**

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.

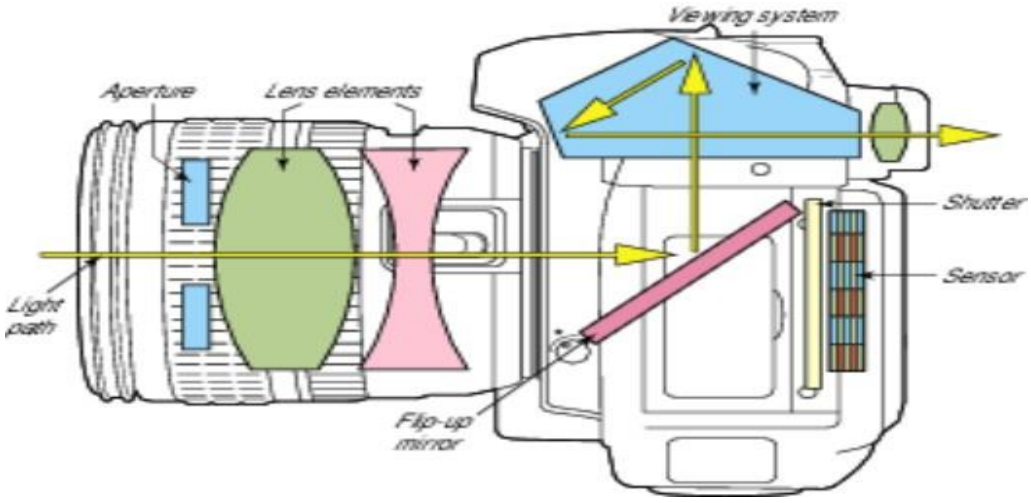
The term camera comes from the word camera obscura (Latin for "dark chamber"), an early mechanism for projecting images. The modern camera evolved from the camera obscura & functioning of the camera is very similar to the functioning of the human eye.

Block diagram of Camera





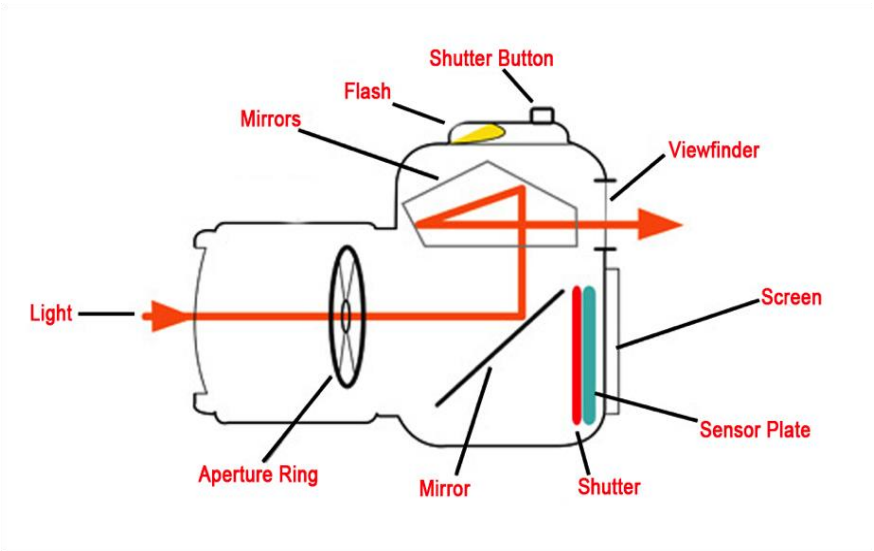
How a camera works



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.

- Content/Topic 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 an digital can be either a Charge Coupled Device (CCD) or a Complimentary 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 more 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.

- Content/Topic 3: Checking methods

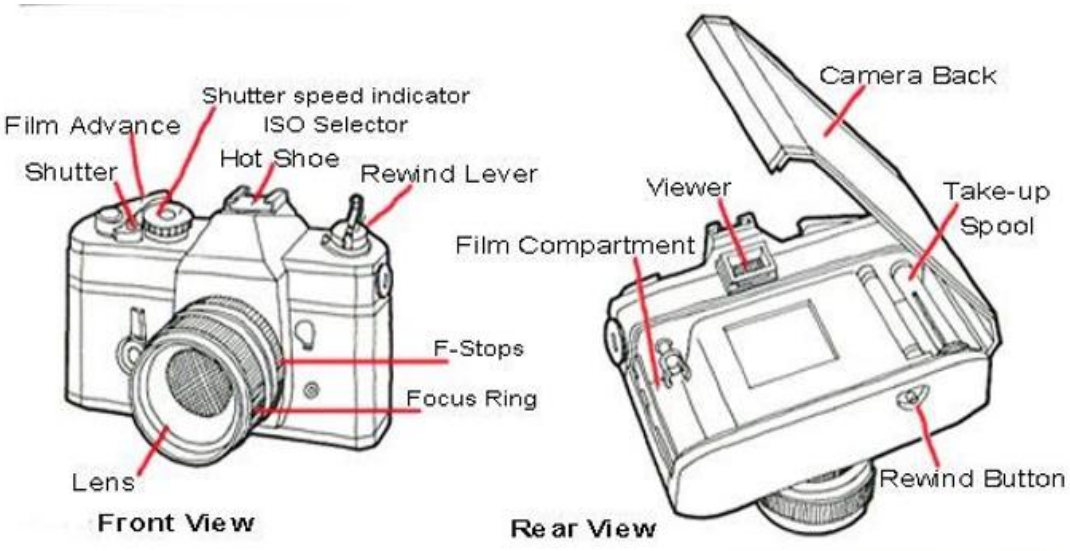
Visual checking

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.

- Content /Topic4: 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?

- ✓ **Power supply**

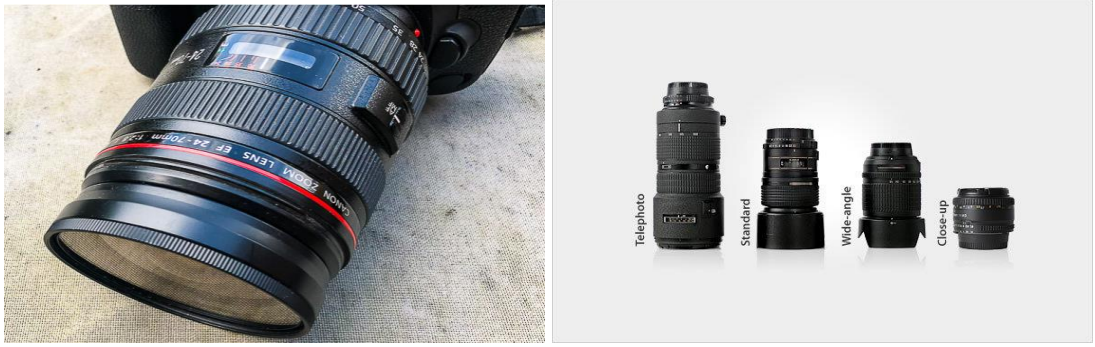
A **power supply** is a hardware component that supplies power to an electrical device such as camera. Most cameras use rechargeable battery as their power supply.

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

- ✓ **Lens**

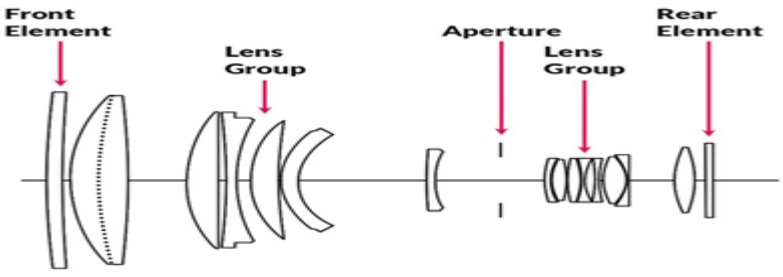
One of the most vital components of photography is the camera lens. Basic point and shoot cameras will come with a built-in lens that can not be changed. But even entry-level DSLRs will have an interchangeable lens to suit the shoot. There are two main types of lenses. Zoom lenses allow you to zoom in 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

- ✓ **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.

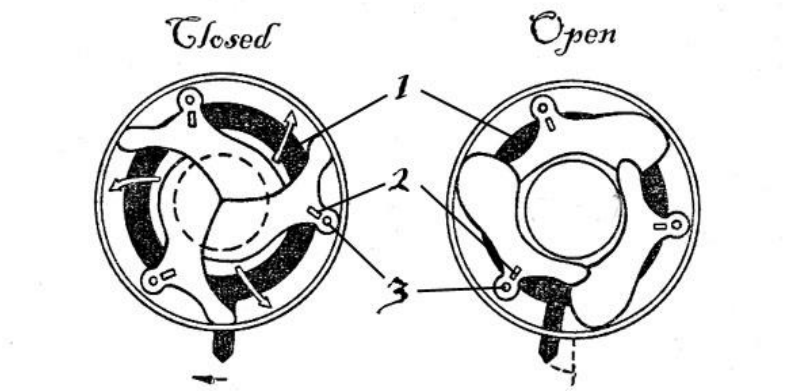
- ✓ **Body**

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.

- ✓ **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.

- ✓ **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.

- ✓ **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.

- ✓ **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 “mirrorless” 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.

- ✓ **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.

- ✓ **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.

- ✓ **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.

- ✓ **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).

- ✓ **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

- ✓ **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.

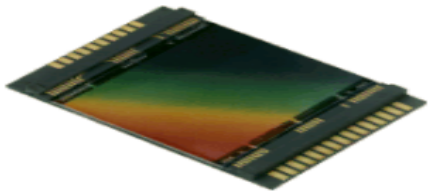
- **Shutter button:** You press this button to pre-focus the camera and take a picture.
- **ISO setting:** The ISO determines how sensitive the sensor is to light. You use higher ISO settings to take pictures in low light conditions. On many cameras, a dial is used to change the ISO. Some cameras use 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.

✓ **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.

Learning Unit 2 – Rectify camera faults

LO 2.1 – Identify the fault

- Content/Topic 1: Identification of camera faults

✓ **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, yet it can take some time to master the exposure.

Ach setting controls exposure differently:

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

Shutter speed: controls the duration of the exposure.

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.

Aperture is referred to the lens diaphragm opening inside a photographic lens. The size of the diaphragm opening in a camera lens REGULATES amount of light passes through onto the film inside the camera the moment when the shutter curtain in camera opens during an exposure process.

Common camera aperture problems

1) **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 edges 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 drama or help direct the viewer's eye to the centre of the frame, so it might be a creative tool you want to embrace in some shots.

2) **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 tonnes of light in. Sometimes your camera can't adjust to a shutter speed fast enough – or an ISO low enough – to compensate.

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 slightly smaller aperture, such as f/5.6.

3) **The smallest apertures still produce soft images**

As we've already stated, it's best not to use your smallest aperture wherever possible. This is because smaller apertures create an optical phenomenon called diffraction. Diffraction is where the hard edges of your aperture bend light entering the lens.
Bending happens at any aperture setting but is more pronounced in smaller apertures, causing a fuzzy appearance in your photos. The result is softer, lower contrast photos.

The only way to avoid the softer images is to decrease the aperture by one half or one full stop.

4) **Your aperture changes automatically in aperture priority mode**

This usually only occurs when you're using a zoom lens. First, check that you're not on auto mode. If you're on aperture priority mode and the aperture is changing automatically, it could be that your lens has a maximum aperture that changes depending on how far you zoom in.

For example, the Canon 18-55mm kit lens changes the maximum aperture from f/3.5 to f/5.6 when you zoom from 18mm to 55mm.

5) **You can't get the blurry background**

If you can't get the blurry background, you might not have a large enough aperture to achieve the shallow 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.

6) **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 – sticky blades or a broken spring, for example. 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.
Sticky blades are a common issue in old lenses, which have oil on their blades. When the oil congeals, the blades are slow to close. Or they don't close at all.

You might also get a sticky 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 blades, it's best to drop off your camera at a specialised 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

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.

If you do find your camera requires repairs, always refer to a repair and maintenance professional.

ISO

In very basic terms, **ISO** is simply a camera setting that will brighten or darken a photo. As you increase your ISO number, your photos will grow progressively brighter. For that reason, ISO can help you capture images in darker environments, or be more flexible about your aperture and shutter speed settings.

The ISO is more a technical and abstract characteristic of modern cameras. Before the age of digital sensors, the ISO described the chemical sensitivity of the film. The more sensitive the film was, the less light was needed for a well-exposed photograph, but the quality seemed to suffer. Today, we have digital sensors but still the concept of ISO.

In general, when I think about the camera settings I would try to keep the ISO at 100. This way you get the best image quality and with every increase in ISO the noise increases as well.

Therefore I would only increase the ISO when my other options (aperture & shutter speed) are already at their limits and cannot be changed anymore.

❖ ISO in Traditional/Film Photography

In traditional (film) photography ISO (or ASA) was the indication of how sensitive a film was to light. It was measured in numbers (you've probably seen them on films – 100, 200, 400, 800 etc). The lower the number the lower the sensitivity of the film and the finer the grain in the shots you're taking.

❖ ISO in Digital Photography

In Digital Photography ISO measures the sensitivity of the image sensor. The same principles apply as in film photography – the lower the number the less sensitive your camera is to light and the finer the grain.

Higher numbers mean your sensor becomes more sensitive to light which allows you to use your camera in darker situations. The cost of doing so is more grain (although cameras are improving all the time and today many are able to use high ISO settings and still get very useable images).

An example of a situation you might want to choose a higher ISO would be photographing an indoor sporting event where the light is low and your subject is moving fast. By choosing a higher ISO you can use a faster shutter speed to freeze the movement.

- **ISO Settings and Grain**

As mentioned – the cost of choosing higher ISO settings is that you begin to get higher grain or noise in your images or videos the higher you go.

I'll illustrate this below with two enlargements of shots that I just took – the one on the left is taken at 100 ISO and the one of the right at 3200 ISO.

100 ISO is generally accepted as a 'normal' or 'standard' ISO and will give you lovely crisp shots (with little to no noise/grain).

Most people tend to keep their digital cameras in 'Auto Mode' where the camera selects the appropriate ISO setting depending upon the conditions you're shooting in (it will try to keep it as low as possible) but most cameras also give you the opportunity to select your own ISO also.

When you do override your camera and choose a specific ISO you'll notice that it impacts the aperture and shutter speed needed for a well exposed shot. For example – if you bumped your ISO up from 100 to 400 you'll notice that you can shoot at higher shutter speeds and/or smaller apertures.

- ✓ **Hardware frequent faults**

- **Lens problems**

Lens errors are very common in digital cameras and mostly it is found in camera that has barrel style lenses. 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 slightly.

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. Try to gently push the extracted lens unless it gets straight and no longer crooked or tilted.

Lenses suffer from common problems like distortion, flare, ghosting, aberrations, and so forth. These issues aren't necessarily an indication of lack of quality. Rather, they are common camera lens problems that you have to learn to overcome.

Let's go over solutions to these and other common lens problems.

❖ Barrel Distortion

The Problem: Barrel distortion causes straight lines to look curved and images to look as though they have rounded edges (like a barrel). What's more, the middle of the photo appears to be bloated and is larger in the frame than the edges of the shot.

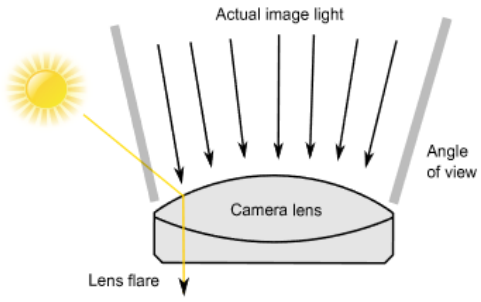
This effect is typically not desired unless you're using a fisheye lens to purposely get that distorted look. The image above was taken with a fisheye lens and represents a great example of barrel distortion. Note how the horizon appears to be bent, the edges of the shot are minimized, and the buildings in the center have an exaggerated size.

The Cause: Barrel distortion is most commonly caused by the combination of being too close in proximity to your subject and using a wide focal length.

The Solution: Adjust your positioning such that you're further away from the subject. To still get an up-close view, use a longer focal length lens so you can more easily fill the frame with the subject.

❖ Lens flare and Ghosting

- **Lens flare**



Lens flare

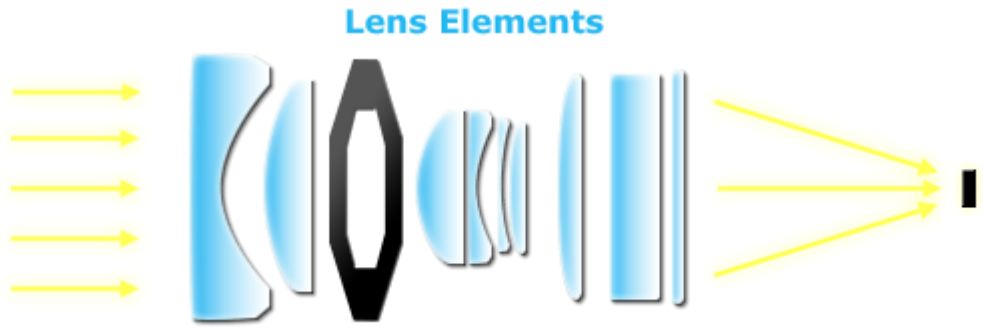
Lens flare refers to a phenomenon wherein light is scattered or flared in a lens system, often in response to a bright light, producing a sometimes undesirable artifact within the image. This happens through light scattered by the imaging mechanism itself, for example through internal reflection and scattering from material imperfections in the lens. Lenses with large numbers of elements such as zooms tend to exhibit greater lens flare, as they contain a relatively large number of interfaces at which internal scattering may occur. These mechanisms differ from the focused image generation mechanism, which depends on rays from the refraction of light from the subject itself.

Flare manifests itself in two ways: as visible artifacts, and as a haze across the image.

Flare is particularly caused by very bright light sources. Most commonly, this occurs when shooting into the sun (when the sun is in frame or the lens is pointed in the direction of the sun), and is reduced by using a lens hood or other shade.

Flare can take many different forms, from radial streaks from the light source to rainbow circles or arcs. In other instances, light sources can take on a glow much larger than their apparent size to the naked eye. Flare can also appear as a bright spots (ghosting) or a general reduction in contrast (veiling flare).

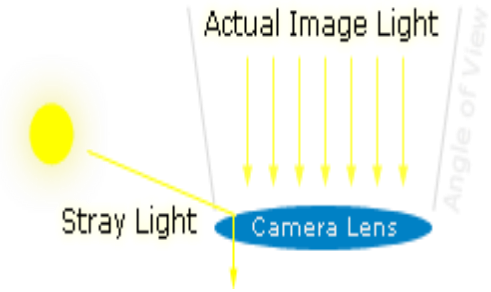
Lens flare is caused by non-image light which does not pass (refract) directly along its intended path, but instead reflects internally on lens elements any number of times (back and forth) before finally reaching the film or digital sensor.



Lens elements

Note: The aperture above is shown as being behind several lens elements.

Lens elements often contain some type of anti-reflective coating which aims to minimize flare, however no multi-element lens eliminates it entirely. Light sources will still reflect a small fraction of their light, and this reflected light becomes visible as flare in regions where it becomes comparable in intensity to the refracted light (created by the actual image). Flare which appears as polygonal shapes is caused by light which reflects off the inside edges of the lens aperture (diaphragm), shown above.



appearance of flare light

- **Ghosting**

Ghosting, like flare, is due to reflected light hitting the sensor. However, in contrast to the sample of flare above, ghosting occurs when the reflected light closer to the focal plane. The

result is that the reflections are essentially more in focus and thus appear as bright and more distinct points in the frame.

- **What causes ghosting and flaring?**

Flaring, also known as "veiling flare", occurs when light reflects off the lens, or other elements such as the lens barrel and mirror box, making part or all of an image appear soft or hazy.

Ghosting, also known as "ghosting flare", is caused by a strong light source being reflected repeatedly. It appears as a clear artefact that is usually located symmetrically opposite to the light source.

- **Some factors that influence flare and ghosting**

- **Number of lens elements:** The more lens elements, the more things there are inside the lens that can reflect light.

- **Focal length:** A shorter focal length makes the light source appears smaller, which can make ghosting and flaring less visible.

- Anti-reflective coatings: Some lenses, such as those from Canon's L series, have special anti-reflective coatings that help to reduce flaring and ghosting.

- Dust and dirt: Dust accumulating inside the lens, as well as dirt and smudges on the front lens element or UV filter can all cause additional light reflection, contributing to ghosting and flaring.

Know this: Ghosting and flaring is not always bad!

In general, ghosting and flaring are considered to degrade image quality. But if it is not necessary for your images to be absolutely clean and clear, you can also deliberately incorporate them into your images as an artistic effect.

- **How do I prevent unwanted ghosting and flaring?**

a) **Use a lens hood**

It's the very least that a photographer should do to address these effects.

(from left to right) EW-63C / ET-63

Each lens hood is shaped differently to match the characteristics of different lenses, so make sure you get the right one for your lens.

b) **Use something to block out excess light**

In a pinch, you can also cut out flare-inducing light using objects such as your hand, a hat, or a board-shaped object.

It's hard to completely eliminate ghosting and flaring. If you have done everything you can to prevent them but they are still visible in your images, you will have to fix them in post-processing. Warning: It can be a painful, time-consuming process!

If the ghosting and flaring area is not too big, you can use the cloning, brush or spot removal tools in your favorite post-processing software to correct the image.

- **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.

Tip – If you recharge NiMh and NiCd batteries before they are not fully drained then it will reduce their lifespan. On the other hand Li-ion batteries which mostly comes with newer models last longer and you can recharge them even they are not fully drained. 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**

If you find yourself holding the camera near a fluorescent light, the LCD screen image may flicker. Try moving the camera away from the fluorescent 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 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.

- **The Image I Saw on the LCD Looks Different Than the Actual Photo**

Some Canon point and shoot cameras don't exactly match the LCD image and the actual photo image. LCDs might only display 95% of the image that will be shot, for example. This difference is exaggerated when the subject is close to the lens. Look through the specification list for your Canon PowerShot camera to see if a percentage of scene coverage is listed.

- **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**

Sometimes camera's shutter gets stuck. In this case if shutter remained open then you will get a overexposed pictures and if shutter does not get opened at all then you will get black photos.

Solution

1. 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.
2. If the above trick does not help, then try to disrupt the shutter. You can use shutter priority or manual to adjust shutter speed to bulb or to the slowest probable settings if your camera allow manual modes. If your camera does not allow manual modes then you can also try to use scene setting that is made for taking pictures at low light such as sunset or fireworks. After this take a photo and while camera is still taking the photo, take out the battery (but do not switch off the camera).

- **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 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.

- **Rolling Shutter**

An electronic shutter (CCD) or global shutter (CMOS) allow exposure of the whole frame at the same time.

A rolling shutter will expose the frame line after line. The number of exposures equals the number of lines in the frame.

- **Memory card and slot faults**

- **Fixing SD Card Error**

Sometimes you may get frustrated 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 the 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.

- Content/Topic 2: Camera Disassembling process

✓ **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 pinpoint 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.

✓ **Remove power supply**

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

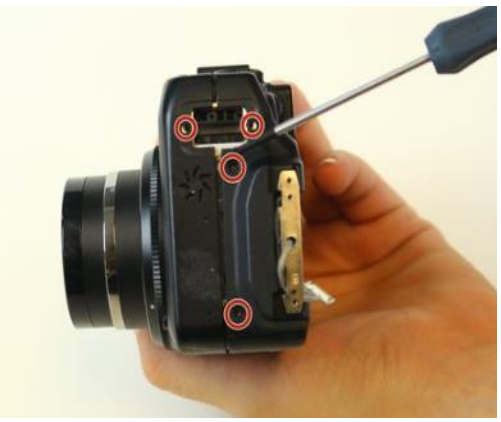
✓ **Remove Memory card**

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

✓ **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.

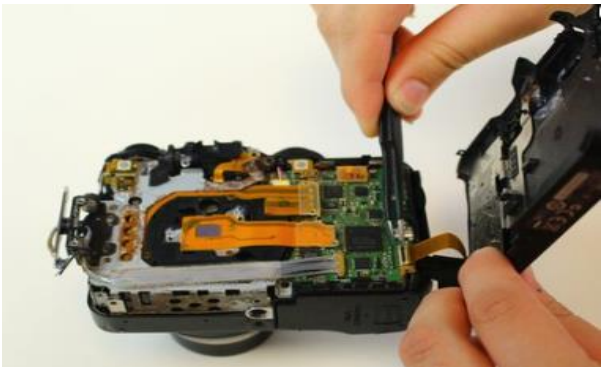
Remove the screw on the right side of the view finder on the back side of the camera.

- ✓ **Remove the cover**

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

Make sure all sides of the back case are loose 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 lid that must be flipped up before the cable can be removed. Use precision tweezers to remove the cable.



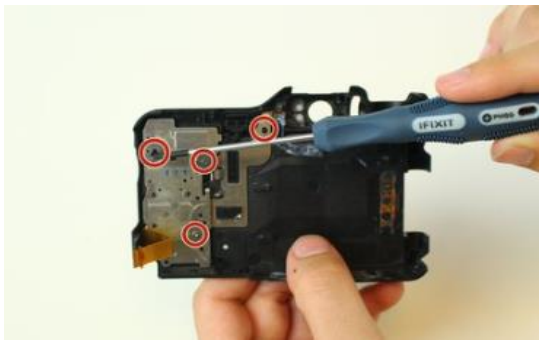
- ✓ **Separate Optical and visor system**

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.

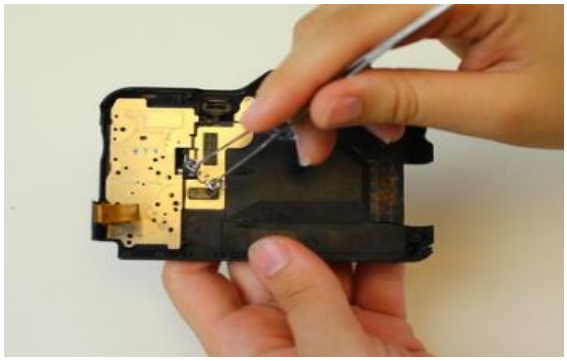
Vision sensors (VISOR) use images captured by a camera to determine presence, orientation, and accuracy of parts.

- ✓ **Disconnect camera internal parts**

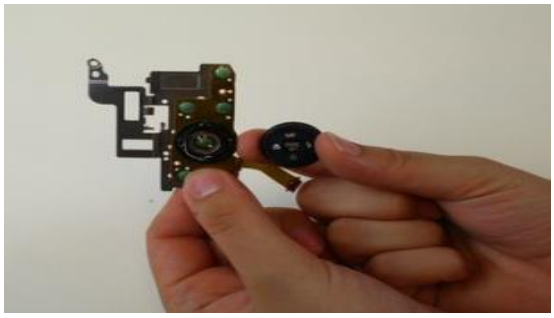
Remove the four screws from the metal plate using a Phillips-head 00 screwdriver.



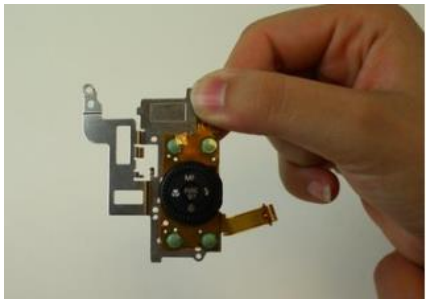
Remove the spring from its socket using precision tweezers allowing the metal plate with the function dial to be removed.



Using precision tweezers, pry the old function dial out of its socket leaving only a black, metal ring attached.



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



LO 2.2 – Fix the faulty component

- Content/Topic 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.

- ✓ **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.

- ✓ **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 close ups 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.**

- ✓ **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.

- ✓ **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).

- ✓ **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.

- Content/Topic 1: 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.

- ✓ **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.

- ✓ **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 auto focusing 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.

✓ **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.

- ✓ **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.

✓ **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**

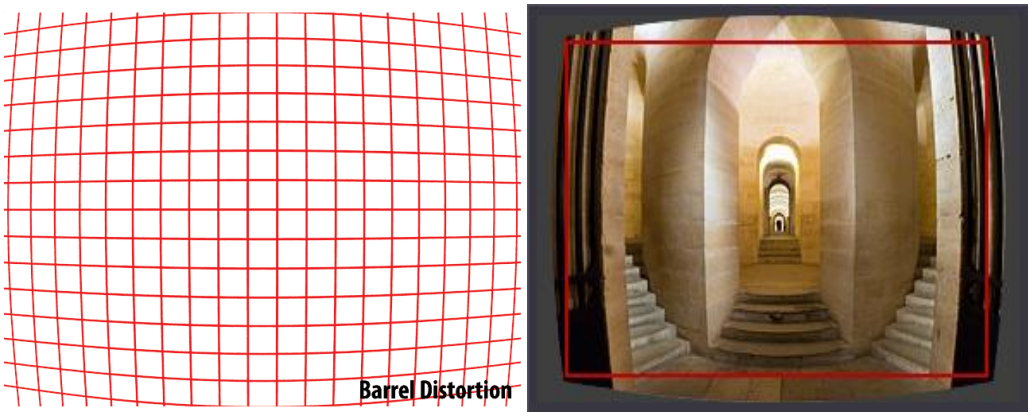
The first major category of lens distortion is optical distortion. Optical distortion can be attributed to the lens profile and the lens design. Sometimes optical distortion results from certain lens elements that are used to reduce other visual deformations such as spherical aberrations. There are three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

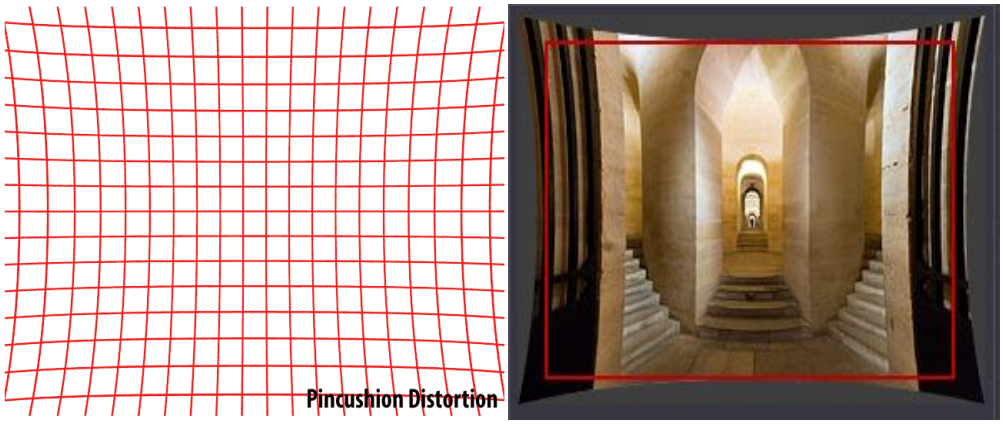


A good way to check for barrel distortion is to look for parallel lines in the area you are shooting and see if the lines appear parallel in your image. Barrel distortion often occurs when using wide-angle lenses. This is because the field of view of wide-angle lenses is wider than the image sensor on 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.

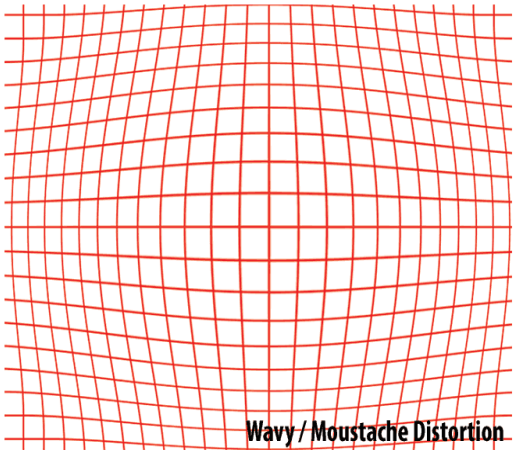
Instead of an image curving in, pincushion distortion causes straight lines to curve outwards from the center of the image. Telephoto lenses are the most common source of pincushion distortion because of the increased magnification on parts of the image closest to the edge of the frame. This is especially 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?**

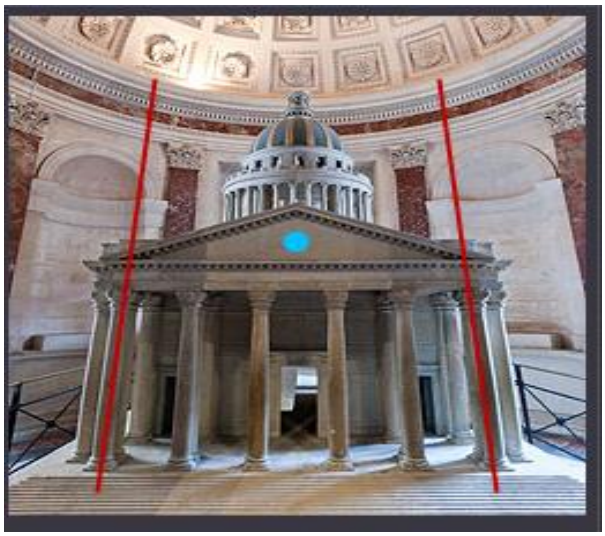
There are a number of things to keep in mind when trying to fix distortion in photographs, particularly related to the type of distortion.

- 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.

- Content/Topic 3: Fixing frequent Power supply fault

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.

- Content/Topic 1: Fixing frequent LCD problems

i. Image flicker

Suggestion solution:

a. Check your cables

It doesn't matter if you're using a VGA, HDMI, DVI, or display port 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.

ii. 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.

- Content/Topic 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.

- Content/Topic 6: Fixing of image sensor fault

Image sensors, called CCDs (charge coupled devices), are used to capture an image for a digital camera or camcorder. Light passes through the lens of a camera and strikes the CCD, which converts the light into electrons. In the case of the faulty CCDs, the sensor does not capture images normally.

- **Some of the common causes of general imaging sensor malfunction are:**

a) Electrostatic discharge (ESD) hits the camera and destroys the sensor. With extended head units, this often happens when the ribbon cable gets disconnected, either from the head or the board side, while the camera is powered.

b) Sensor manufacturer defects. While our quality control tests catch defective sensors before they are shipped, defects may not become apparent until after use or long periods of time.

c) Exposure to excessive heat, humidity, or strong sunlight for long periods of time.

- **How do you tell that your sensor is damaged?**

The first sign should be lines on your camera screen. This is also the most common sign. In case your sensor is scratched or damaged, you might see a band of multicolored lines on screen, which may make you think that the camera screen is the damaged part. Besides that, a damaged sensor can be noted by the presence of red spots on the video footage you have. Getting black spots on the video may be a sign that the sensor is dirty. Red spots, on the other hand, is a real siren. It shows that your sensor is going down.

➢ **Tips On Avoiding Sensor Damage**

How do you keep your sensor safe from damage? Here are a few great tips to use:

1. Always keep your camera capped, when you remove the lenses. This presents dust or moisture from penetrating past the AA glass to your delicate sensor.
2. Shooting in a relatively ‘ safe ‘ environments would be a great idea. Use areas that are less dusty, and clearer.
3. Buy your camera from recommended vendors. Second-hand cameras often come with more issues.
4. Clean your sensors and lenses regularly. I know it’s a messy job, but it helps a lot.

- Content/Topic 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.

- Content/Topic 8: Camera assembling process

  - **Introduction to assembling**

Assembling process means the production of an article of tangible property, whether the article is a finished to be serviced or maintained, by the combination of existing parts in a manner commonly regarded as assembling that results in a material of a common form, use, or name.

  - **Camera assembling process**

The assembling process starts where the disassembling has been ended and is performed as follow:

i. Connect camera internal parts
ii. Match Optical and visor system to the internal parts
iii. connect the cover
iv. Screw the necessary screws
v. Insert Memory card
vi. Insert power supply

LO 2.3 – Test the camera

- Content/Topic 1: Testing techniques

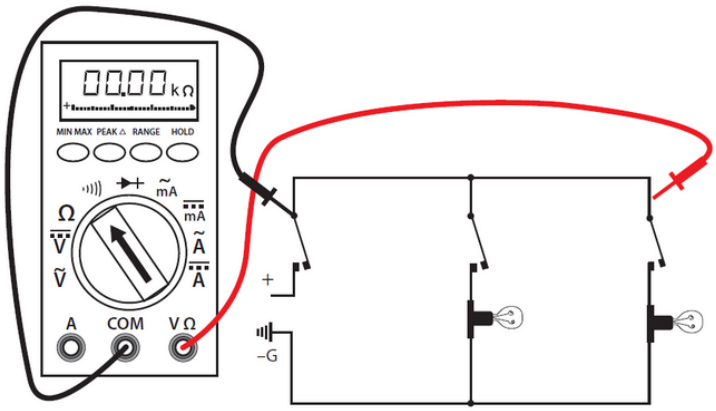
✓ **Continuity testing**

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.

✓ **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 potential difference 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

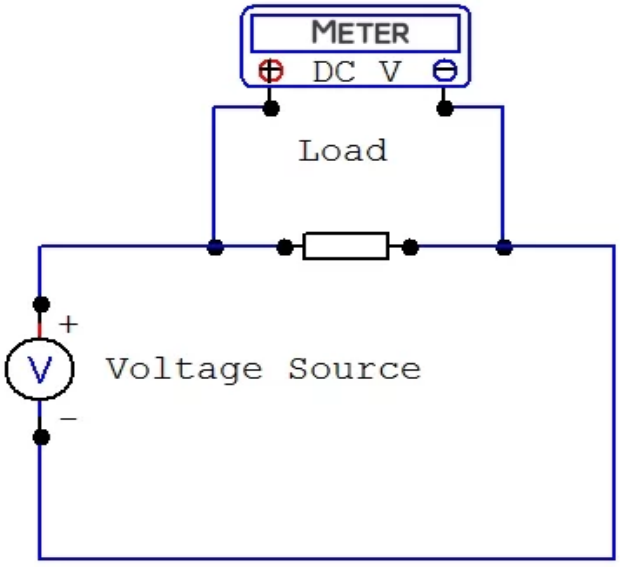
20 volt range will give more decimal places than on the 200 volt range. If the meter is auto ranging, turn the dial to the 'V' setting with the symbol for AC or DC.

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.

✓ **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.

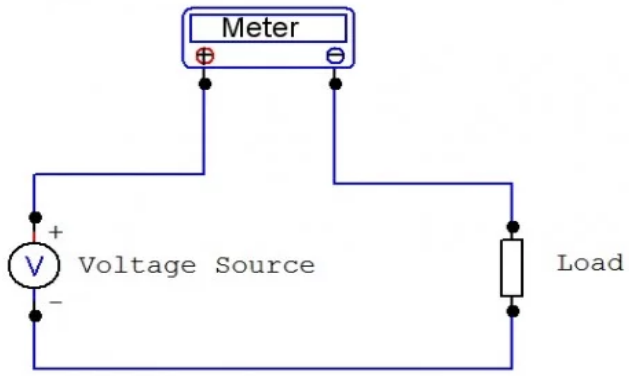
➢ **How to Measure Current**

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.

✓ **Electronic components testing**

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.

Once you have the component out of the appliance, you're ready to use the multi-meter. These devices test a lot of things, and the most common are continuity, voltage, and resistance:

- **Continuity tests measure if electricity can flow through the part.** Plug the two probes into the multimeter and set the dial to 'continuity.' If you place the red and black probes on either side of the part (some parts have diodes and are one-directional so you need to arrange the probes accordingly), and you get a read of approximately zero, electricity can flow through the part. If it can't, your multimeter will go towards one or displays OL for open loop. The question is whether electricity is supposed to flow through or not.
- **Resistance tests how much current is lost as electricity flows through a component or circuit.** It's measured in ohms, and it is slightly more complicated to test than continuity. Whereas continuity works on a range of zero to one (or OL), resistance can come in different strengths so you need to know how much resistance a given part *should* have. Then you'd manually set the range on your multimeter around that amount so the multimeter can provide a readout of if the resistance is lower or higher than that amount. You can fine tune the range by making it lower if the multimeter reads close to zero or by making it higher if it read one or OL (overload). Once you have a range in the device, place the probes on either side of the device to find the ohms of resistance. The component should be isolated from any power source otherwise you can ruin your meter. We prefer the use of an analog meter to accomplish this.
- **The third common test is for voltage, or the force of the electric pressure.** You'll need to know whether the appliance is DC (direct current) or AC (alternating current). Checking voltage can be very dangerous, be sure to get the proper training before attempting. Just like with resistance testing, you'll need to manually set the expected range and make sure both the multimeter can handle the maximum expected voltage.

Some components can be electrically ok, but a voltage check can ensure it is mechanically ok.

When you're testing components, always start with continuity. Both resistance and voltage tests rely on electricity passing through the part, and the multimeter won't know the difference between a part with the wrong resistance and a part with no continuity. You have to have the continuity information as a baseline for reading your other results.

- **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

✓ **Functionality of camera**

Functional testing verifies that each function of the device/camera 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.

Learning Unit 3 – Install studio camera

LO 3.1 – Conduct the site survey

- Content/Topic 1 Introduction to site survey

  - **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.

  - **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.

  - **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.

- Content/Topic 2: Studio camera installation factors

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.

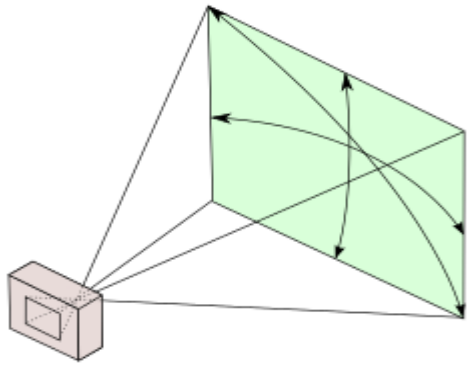
b) Visual angle

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.

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.

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).

LO 3.2 – Prepare the studio camera installation

- Content/Topic 1: Description of camera stands

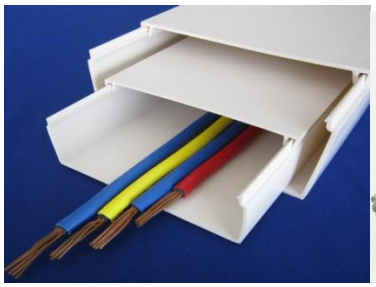
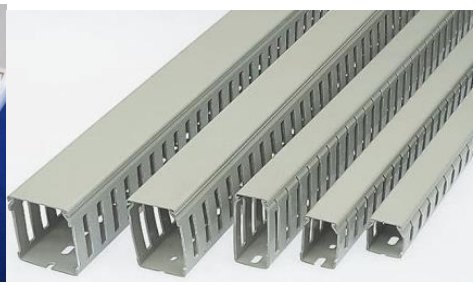
"Camera stand" is the generic term for any contraption that a camera sits on for stability. Camera stands covers the full range of tripods, studio stands.

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

- Content/Topic 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

- Content /Topic3: 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.

- Content /Topic 4: Drilling and fixing 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.

LO 3.3 – Interconnect studio camera parts

- Content /Topic 1: Types of camera

✓ **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.

✓ **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

- Content /Topic 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.

✓ **Steps of fixing and mounting the camera:**

1. Fixing the tripod

➢ **How to set-up a tripod**

a) Extend the legs starting from the wider top sections
b) Position the tripod with one leg pointing in the direction of the lens
c) Adjust the length of the lower leg sections to level the tripod
d) 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.

Learning Unit 4. Document the work done

LO 4.1 – Review the previous work

- Content/Topic 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 order to prevent that device**.**

- Content/Topic 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 technician.

LO 4.2 – Record the work process

- Content/Topic 1: Description of the work carried out

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

LO 4.3 – Write technical recommendation

- Content/Topic 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

Reference(s):

1. TOMOSY, T. (1993). Camera maintenance and repair (book1 ed.). New York: Amherst, NY: Amherst media.
2. http://www.rescuedigitalmedia.com/7-common-digital-camera-errors-their-solutions
3. (Retrieved on 30 May 2020)
4. https://en.wikipedia.org/wiki/Professional_video_camera (Retrieved on 03 June 2020)
5. https://www.scribd.com/doc/47306038/Types-of-Television-Camera (Retrieved on 03 June 2020)
6. http://www.largeformatphotography.info/forum/showthread.php?20176-View-Camera-vs-FieldCamera (Retrieved on 04 June 2020)
7. https://quizlet.com/125989975/parts-of-the-studio-camera-and-supporting-equipment-flashcards/ (Retrieved on 06 June 2020)