LANGARA COLLEGE CERTIFICATE PHOTOGRAPHY PROGRAM

An Introduction to the Digital SLR

Today's Digital SLR cameras offer image resolution greater than that produced by 35mm SLR film cameras. Digital SLR's of 6 megapixels or greater, especially those with 'full-frame' image sensors, have surpassed the quality of film. Larger image sensors allow larger pixels, thus gather light better.

Advantages:

There are numerous advantages in digital photography that have caused a wave of renewed interest in photography amongst the general population:

1. **Picture preview**: the 'instant gratification' of digital photography! Being able to see the photograph immediately allows for confirmation of your goals in respect to exposure (via the histogram as well as the LCD), lighting, composition, peoples' expressions etc. With film photography, there are no such luxuries, although the skilled photographer has always been able to rely on careful technique to ensure optimum results, and it is this approach that digital photographers should also adopt. This course stresses a thoughtful approach to picture-taking, whereby the image preview's role in the photographic process becomes secondary.

2. **Image deletion**: this control allows you to get rid of undesirable images, such as the one you took of your foot when you bumped the camera against your body. It permits 'instant editing', so that when you download your images, your kids will think you never take a bad picture! Don't be too hasty with this feature, however, as images often look much better on your computer monitor and also, you may ultimately find some hidden gems in the pictures you considered deleting. A much smarter alternative is to carry an extra memory card with you at all times.

3. **Image adjustment**: especially when shot in RAW format, digital photographs are easy to correct in areas such as white balance, exposure, contrast, colour balance, as well as re-sizing. All digital images require some degree of post-production, though it is highly-recommended that you strive to capture the image 'perfectly', to minimize your workload. Software programs such as **Adobe Lightroom** have made the processing of digital photographs quick and easy.

4. **Sharing images:** today's technology allows a photographer to take the picture and moments later share it with family on the other side of the world. Sometimes this can prove annoying, but mostly enjoyable!

Common Terminology

1. **Aperture (F-Stop):** refers to the camera's adjustable lens opening to control the amount of light entering the lens and reaching the camera's image sensor. The **F-stop** choice also controls the amount of **Depth of Field** in the image. The Aperture and the **shutter speed** together produce the exposure.

2. **Depth of Field (DOF):** the amount of sharpness in front of and behind the focused object, controlled primarily by the F-stop choice. A wider lens diameter, such as f2 will create shallow or less DOF; a smaller lens diameter, such as f16 will create deep or greater DOF.

3. **Exposure:** the amount of light your camera's sensor captures to produce an image; it is a combination of f-Stop and Shutter Speed, based upon a light meter reading of a set Sensitivity (ISO).

4. **Histogram**: a graphic representation which indicates the range of tones from dark to light in an image. (in camera & software)

5. **ISO (Sensitivity):** the number indicating the camera sensor's sensitivity to light; the higher the number, the less light needed for exposure. Digital cameras have a control for adjusting the ISO for images; ISO numbers for digital and film are the same.

6. **JPEG:** a common file format for digital cameras. If a high quality, low compression JPEG is chosen, there will be little loss of quality in the image; some editing can be done in the computer, however some features cannot be changed, such as white balance.

7. **Megapixel**: (= to one million pixels) a measure of resolution; the more pixels contained in your sensor, the more image details.

8**. Noise**: randomly-spaced multi-colored speckles or pixels common in images shot at high ISO numbers; usually found in shadow areas (similar to grain in film).

9. **Pixel:** Picture element; the building block of a digital photo.

10. **RAW**: a file format which contains unedited image data; processing and editing is done in the computer with software such as Adobe Photoshop.

11. **Resolution:** the number of pixels that fit into a given space, as in your image sensor.

12. **Shutter Speed:** the length of time it takes the camera's shutter to expose the focal plane (image sensor). Together with the f-stop (Aperture) produces the exposure.

13. **SD Memory Card:** a type of reusable device which captures and stores your image data in the camera.

14. **White Balance:** a function on the digital camera to adjust the color temperature of the image to match the light source, so that white looks white in the picture.

15. **Workflow**: the post-production process of organizing and editing your digital images.

Digital Camera Components:

The Digital Single Lens Reflex (DSLR) Camera

A. Same viewing and taking lens (lenses are interchangeable)

B. Through the lens (TTL) light metering:
- -Matrix or Evaluative
- -Centre-weighted
- -Spot
- (includes metering through filters)

C. Image Sensor: digital 'film'; captures the light, located in the focal plane behind the shutter curtains
- -Resolution: # of megapixels & size of sensor
- -CCD or CMOS (light sensitive silicon chip)
- -most digital cameras use CCD
- -CMOS is used in Canon EOS series.

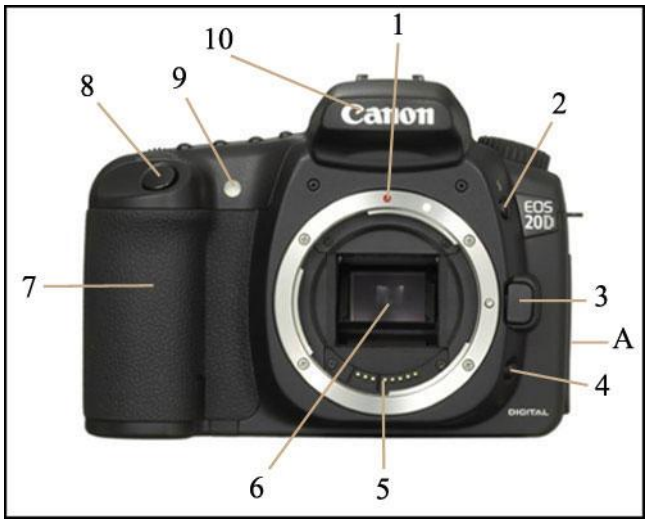
D. LCD: playback of image as well as:
- -histogram (graphic representation of exposure)
- -exposure data (f-stop, shutter speed etc)
- -highlight/shadow exposure warnings (blinking areas in image)

E. SD Memory Card: storage of the image for processing in the computer with software

F. Shooting Modes: (the following to be used in this course)
- -Manual
- -Aperture Priority (Av)
- -Shutter Speed Priority (Tv)

Let's look at each individual section of a digital SLR in more detail

For this example, a Canon 20D is used as the sample camera. While not all DSLR's are exactly the same, the features are very similar, and their controls produce the same results.

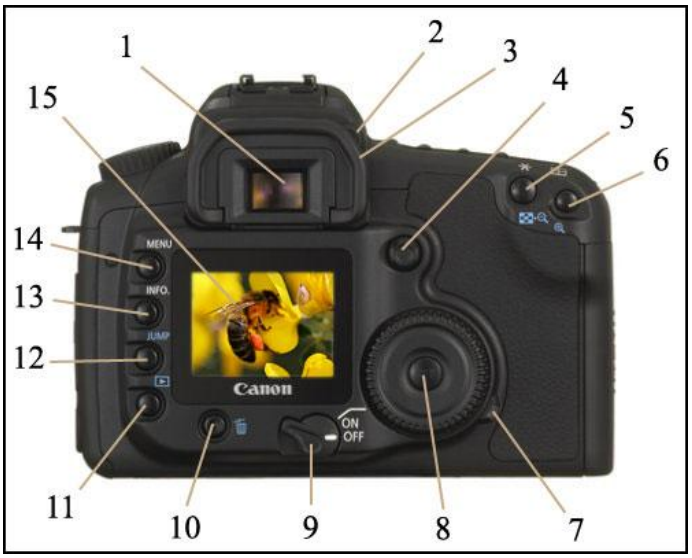


Digital SLR - Front

1. **Lens Alignment** - Each lens you use will have a similar red dot. It allows you to align, twist and click the lens in place more easily.
2. **Flash Pop Up Button** - Press this to activate the pop up flash. There will be similar buttons on all makes of camera. It is a kind of manual over-ride, useful for fill-in flash etc. If in full auto mode, the **camera** will decide whether or not to use the flash.
3. **Lens Release** - By pressing this in, you allow the lens to be twisted and released. **Note:** Try to change lenses out of dusty areas and try to have the camera switched off. The static produced when the camera is on will attract dust to the sensor.
4. **Depth of Field preview** - The depth of field determines how much of an image is in focus. For example, if you took a photo of someone with a mountain range in the background, and both the subject **and** the mountain range are in focus, you have deep or large depth of field. If the subject is in focus but the mountains are **blurred**, you have shallow or small depth of field. E.g. F16 gives deep depth of field and F2.8 gives shallow depth of field. This button will close the aperture to give you an idea (through the viewfinder) of what will be in focus.
5. **Lens contacts** - These line up with the contacts of any compatible lenses, allowing the **cameras** auto focus and other settings to work in time with your **lens's** settings.
6. **Mirror** - This mirror allows you to see, through the viewfinder, almost **exactly** what you will photograph by reflecting the image up, and into the eyepiece. It flips up the instant that you press the shutter release and returns once the picture is taken. Never touch the mirror with your fingers and use special cleaning equipment and solutions. Some mirrors can be replaced but it is costly. Any dust on the mirror **will not** appear in your photographs, so if in doubt, leave it alone.
7. **Grip** - Grip that is usually rubberized for more effective handling of the (sometimes cumbersome) digital SLR cameras.
8. **Shutter Release Button** - Without wanting to state the obvious, this **takes** the picture at whatever settings you have made. A half press will start the auto focus and exposure calculations.

9. **Focus Assist Beam** - Most modern Digital SLR 's have this now. It illuminates the subject in poor light to assist the auto focus. It will sometimes be used as an indicator for the self timer function (I.e. it will flash and beep during delay).
10. **Pop Up Flash** – Semi-professional or Prosumer DSLR's have a built in flash which, when on full auto, will pop up and fire when required. On the manual settings, you will normally have to activate it via a button (see No. 2) for more creative photography.

So that is the **front** of the camera...the back looks at first glance, to be more complicated.



Digital SLR - Back

1. **Viewfinder** - This is where it all happens. With most film or Digital SLR 's, you see about 95-98% of what you shoot. In here you will see the focusing ring at the centre of the image plus most of the other information such as shutter speeds, aperture settings etc.
2. **Diopter Adjustment** - Very handy if you are slightly long or short sighted. As in binoculars, you can adjust the viewfinder to match the difference in your eyes, enabling you to use the camera without your glasses or contact lenses.
3. **Rubber Eyecup** - This can be removed but is handy for 2 reasons. If you wear glasses, it will protect the lenses from scratching against the camera. Without glasses, it helps the viewfinder to **mould** around your eye and eliminate any surrounding glare.
4. **Joystick Dial** - On the Canon EOS 20D, this will allow you to move around a menu or image in display mode.
5. **Exposure Lock/Zoom Button** - On the Canon EOS 20D, this button serves 2 purposes. Firstly it is the Exposure Lock button. If you aim the camera at a scene and press this, it will record and keep (for a few seconds) **that** exact exposure whilst you re-compose and shoot. Good for if you are shooting into light and want control over the exposure. Doesn't work in the **manual** setting. Secondly, when using the image preview screen to look at your exposed images, using this button will zoom in on a specific area.
6. **Focus Point Selector/Zoom Button** - Again, on the Canon EOS 20D, this has 2 functions. Firstly, it is the Auto focus point selector. You can choose from a number of points as to which you would like to use. If you select **all** of them, the camera will pick the best point for individual circumstances, automatically. Secondly, when reviewing your images on the screen, this will zoom out of a specific area.
7. **Write Indication Light** - This will vary in its position depending on the camera you are using. When it flashes red, it is writing data from the recently exposed images, to the CF card or other media. If you

open the media door whilst it is flashing, you normally lose the images, much like opening the back of a film camera before rewinding the film.

8. **Jog Dial and Set button** - The jog dial will scroll through images or items in a menu, and the set button will select an image or setting in the menu.
9. **On/Off Button** - Switches the camera power on and off. On the 20D Digital SLR, it also activates/deactivates the jog dial. I normally leave the camera on at all times. The sleep mode kicks in after a few minutes and you can turn the power on quickly and instantly by pressing the shutter button.
10. **Erase Button** - Again, its position will vary according to your camera, but this will erase any selected images. You are normally asked first "**are you sure**" as a safeguard.
11. **Play Button** - When the camera is switched on, this will display the last image taken on the small screen. Then you can scroll through all the others.
12. **Jump Button** - Used to **jump** 2 or 3 images or menu items at a time. I rarely use this but is good if you are in a hurry.
13. **Info** - By pressing this, you will bring up all the information of any image that you select and view. It will tell you the exposure settings, white balance, date/time, image size, flash details in fact everything about the photo except the name of the subject! The 20D will also highlight any part of the image that is overexposed and **burnt out**.
14. **Menu Button** - This will bring up all the internal menu functions on the screen. You scroll through them using the dial and select buttons. See your camera manual for more details of what your camera can do from here.
15. **Screen** - Displays menus and images that have been exposed. It **will not** display the image (in real time) that you are looking at like most digital compact "point and shoots".

And now the top of the digital SLR camera.....

Digital SLR - Top

These buttons will vary from camera to camera, but the symbols are normally the same, and most Digital SLR 's have the same functions;

1. **Light for LCD Display** - Turns on the light to illuminate the LCD panel in low light conditions.
2. **AF/WB** - Auto focus/white balance setting. Pressing this brings up the choices for white balance (i.e. AUTO/daylight/sun/shadow/tungsten etc), and auto focus (i.e. One shot or Servo etc). One shot means that the camera will focus once and take the image, focused on that point regardless of how much you or the subject moves. Servo means the cameras focusing system will automatically keep tracking and re-focussing on the subject until you press the shutter. Great for sports/action shots!

3. **Drive/ISO** - Drive means **auto drive** or frame rate. You can take a single shot or have the camera on continuous mode which means it will keep firing at 3, 5 or 8 frames per second etc., (depending on your camera), until you remove your finger or the buffer (memory) is full. ISO is the film or sensor sensitivity. 100 ISO is standard sensitivity and will produce fine grain, clear images. 1600 or 3200 ISO on the film or sensor is **highly** sensitive, meaning you can shoot well in low light conditions without a flash, although you lose a bit in the quality and images will appear more grainy.
4. **Shutter Button** - (See No. 8 on the first section).
5. **Top Dial** - This is also used to change/alter various settings in either menu by scrolling up or down. Normally used to change shutter speeds or aperture settings.
6. **Metering/Flash Compensation** - The cameras **metering** system is in the screen that you see through the viewfinder when lining up a shot. It will measure the light settings of the scene and set the cameras shutter/aperture accordingly or at least let you know what you need to do to expose the image correctly. You can change from full, partial or spot metering, which means the camera will expose to the whole scene, a part of the scene (normally centre weighted) or a single point (spot). The flash compensation button will allow you to fool the camera into thinking that it needs more or less light from your flashgun or speedlite in order to expose the image correctly. It also allows you more creativity as you play with the settings. If a scene appears underexposed when you have used the flashgun, try increasing the flash compensation by a couple of stops.
7. **LCD Screen** - This will display all the exposure, speed ISO etc., settings that you currently have set. As you adjust or alter them, it will show on this screen. It also tells you how many photos you have left to take, and the remaining battery power.
8. **Hotshoe** - The area where you can place an external, dedicated speedlite or flashgun. **Dedicated** means that it is compatible with your camera and will adjust itself as you change the camera settings or zoom on the lens.
9. **Exposure control Dial** - Using this dial, you can be as creative or lazy as you wish, from **full auto mode** (like a point and shoot) to fully manual. It will normally include **easy** automatic settings for various modes such as sports, close up, landscape, night and portraits and will also allow you to control the built in flash and depth of field settings. If you are unsure, and a total newcomer to film or digital SLR photography, set it to **"P"** or (program) mode. This is fully automatic and will help you while you learn all about the camera and what it can do. Other functions are;
    - **Av - Aperture Priority** - Which allows **you** to set the aperture of the lens (i.e. F2.8 or F8) and the **camera** will select the correct shutter speed. This is good if you want more control over the depth of field (DOF) of your images. Remember F2.8 will have little DOF and F16 will have a lot, or much in focus.
    - **Tv - Shutter Priority** - This is the opposite. **You** set the shutter speed, and the **camera** will select the correct aperture. Great for sports or wildlife photography where you need control of the shutter speeds. 15th or 30th/sec is slow and 500th/sec is fast. Most digital SLR cameras have a range from 30 second exposure to about 8000th of a second.
    - **Manual** - **You** are in full control here. The cameras metering system will guide you but you need to set the shutter speed and aperture manually. Good for more creative control.
10. **Pop up Flash** - (See no. 10 in the first section)

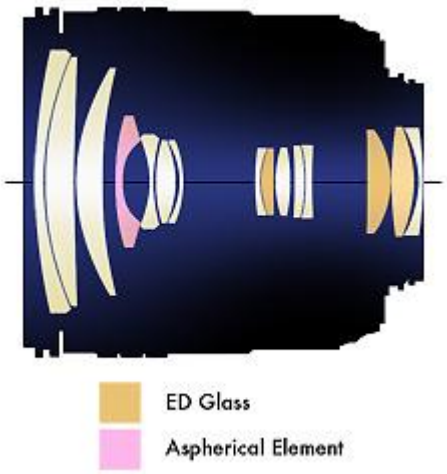
Lastly the underside of your camera;

Digital SLR - Base

1. **Battery compartment** - This is where the re-chargeable batteries live. It is normally best to have one or two spares even though the batteries last longer and longer these days. Most new Digital SLR 's will have the ability to affix a battery grip which will give you even **more** power, and give the camera a bulkier feel and therefore easier to grip (if you have big hands).
2. **Tripod Socket** - Allows you to attach the camera to most makes of tripod. The socket is normally placed to the exact centre of where the lens is for effective balance and weight distribution.

The Lens:

The lens is a series of lens elements refracting light rays onto the focal plane where the image sensor is located. Two distinct lens shapes are used: convex and concave



Typical Lens Cross-Section

LENS CHARACTERISTICS:

1. Focal Length
2. Speed

1. **FOCAL LENGTH** – Definition: the distance from the lens to the focal plane in millimeters, when the lens is set at infinity.

"Normal" or Standard Focal Length: replicates the perspective of human vision.
Film cameras have a standard lens focal length of 50mm. While higher end DSLR's match that focal length, most have a 1:1.5 or 1:1.6 **crop factor.**

For example:
50mm film camera standard lens = approx.35mm digital standard lens

Focal Length controls: the size of the subject on the sensor:

As focal length increases (telephoto lens)
-increased subject size, compressed depth, narrower angle of view
-40mm - 150mm (digital telephoto with 1:1.5 ratio)
(*60mm – 225mm film telephoto equivalent)*

-As focal length decreases: (wide-angle lens):
-decreased subject size, extended depth, wider angle of view
-12mm – 24mm (digital wide angle with above size-ratio)
(18mm – 36mm film wide-angle equivalent)

Variable Focal Lengths: optical zoom lens which is normally "slower" than fixed focal length lens (f1.8 versus f3.8, for instance).
High-end zoom lenses have fixed speed, which means the maximum aperture (eg. 2.8) remains constant throughout the focal length range. Most zoom lenses, however, have variable speed, ie different maximum apertures @ different focal lengths:
@ full telephoto= F 5.6 and @ full wide angle=F 4

Examples of Focal Length change: the following three images were shot from the same location…….

24mm

70mm

105mm

2. **LENS SPEED:**

Definition: the amount of light the lens allows through its widest aperture
A faster lens has a wider maximum opening; therefore, allowing more light to strike the sensor. Faster lens are desirable because they allow for easier shooting in low light and more dramatic shallow DOF.

Lens Speed is determined by the formula: $\frac{\textit{focal length}}{\textit{diameter of widest opening}}$

example: 50mm (focal length)
25mm (diameter of widest opening) = speed 2 or F 2

Lens speed is described as a ration on the front/side of the lens, as F 2 would be inscribed as 1: 2

As mentioned, many zoom lens have variable speeds depending upon which focal length is chosen and are inscribed for example: 1: 4~5.6

CAMERA SET-UP:

Menu Setting Items-note: Others not mentioned-refer to your manual

1. Set-up Menu: (First-time use)

   -USER (if available): registers the current settings to USER mode
   -Format: formats the SD memory card
   *must be done each time a new memory card is used
   -Date/Time/Language
   -LCD time/brightness display
   -Reset: resets to default settings (except date/time/language)

2. Custom Setting Menu:

   -EV steps: **set to ½ EV stops if possible**
   -Sensitivity: set the ISO – need to set each time when in Manual mode
   -ISO warning: set warning when exceeding a set higher ISO
   (ISO's higher then 200+ will have increased noise)
   -AF (Auto Focus) function/Superimpose area: (refer to manual)
   -Nose Reduction: **ON**- useful for long exposures
   -Color Space: set to **sRGB** for **JPEG** format; Adobe RGB for RAW
   -Color Temp: set to **Kelvin**
   -Preview method (DOF): set to optical
   -Reset: set to off (otherwise settings revert to default settings)

3. Rec. Mode Setting Menu:

   -JPEG Rec. Pixels: set to highest for greatest resolution
   -JPEG quality: set to highest
   -Image tone: set to natural (easiest for post-production editing)
   -Saturation: set to 0 or normal
   -Sharpness: set to 0 or normal
   -Contrast: set to 0 or normal
   -File Format: set to JPEG (or JPEG + RAW-if have)
   -Memory: set to on (saves settings when power is off)

4. Playback Setting Menu: (INFO button for playback)

   -Playback display: set to show histogram/bright/dark warning
   -Digital Preview: set to histogram/bright/dark area warning

EXPOSURE COMPONENTS:

1. Aperture (F-Stop) =Half of Total Exposure
2. Shutter Speed =Half of Total Exposure
3. Sensitivity (ISO)
4. Light Measurement (Light metering modes)

1. **Aperture – F-Stop:**

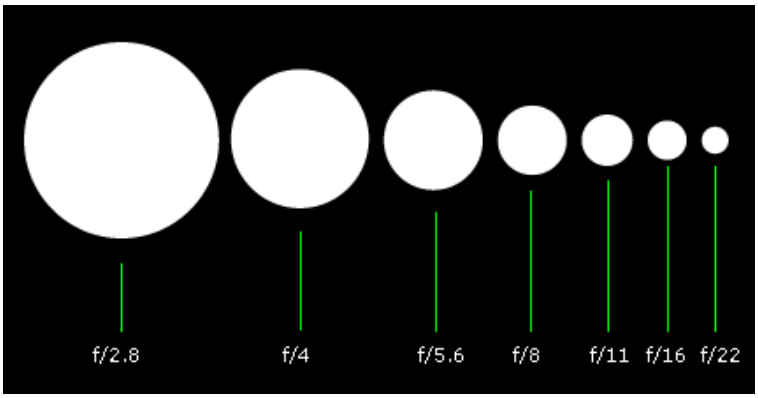
A. Controls the amount of light entering the lens and striking the sensor
-each full F-Stop represents a halving or doubling of exposure:

-*example:* F 4 allows twice the light than F 5.6 to enter the lens
F 8 allows half the light than F 5.6 to enter the lens

-also each ½ stop represents a halving or doubling of exposure:

-*example:* F 4.5 allows twice the light than F 6.7 to enter the lens
F 9.5 allows half the light than F 6.7 to enter the lens

Aperture/F-Stops – Typical Sequence of Full Stops:



B. Controls Depth of Field (DOF)

Definition: that area of the image in front of and behind the focused object that is also considered sharp.
-an image with shallow (less) Depth of Field has a focused subject, but a blurred foreground and background
-an image with a deep (greater) Depth of Field has a sharper foreground and background along with the focused subject

-As you stop down the lens (smaller aperture diameter), DOF increases

-As you open up the lens (larger aperture diameter), DOF decreases

examples:

F 2.8

F 16

2. **<u>Shutter Speed:</u>**

Definition: the measurement of the duration of time the camera's shutter is open to expose the focal plane where the image sensor is located. The measurement is in full seconds or fractions of one second.

NOTE: for 'hand-held' photography, use shutter speeds above 1/30 sec. to avoid camera shake and picture blur. Use a tripod for slower shutter speeds.

Controls exposure

The slower the shutter speed, the longer the exposure time.
The faster the shutter speed, the shorter the exposure time.

-a change of one full shutter speed also represents a halving or doubling of exposure; as does a change of one ½ stop shutter speed

example: changing from 60 (1/60) to 30 (1/30) = doubling of exposure
changing from 60 (1/60) to 125 (1/125) = halving of exposure

changing from 45 (1/45) to 20 (1/20) = doubling of exposure
changing from 45 (1/90) to 90 (1/45) = halving of exposure

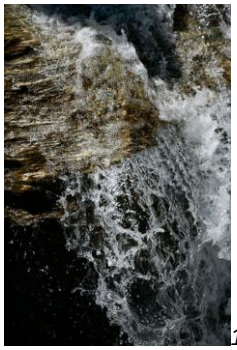
Shutter Speed Categories:
-Full Seconds
-B or Bulb: manually-timed in excess of shutter speed program (meter does not function)
-Fractions of one second: (Full Shutter Speeds)

2 (1/2) 4 8 15 30 60 125 250 500 1000 2000 4000 8000 12000 +

Controls Subject Motion

Blurring Motion = 30 (1/30) and slower shutter speed
Freezing Motion = 500 (1/500) and faster shutter speed
Panning Motion = 15 (1/15) 30 60 – depending upon speed of motion
Examples:


1/15 sec


1/2500 sec.

Panning