

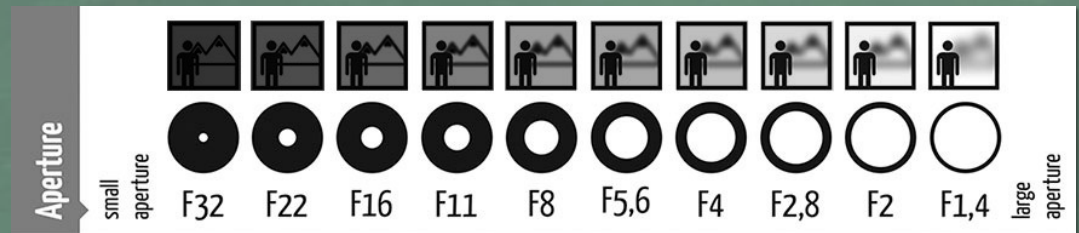
PICTURE; Exposure (image)

w1 9/8

CONTROL

1. Aperture

- exposure amount
- image focus



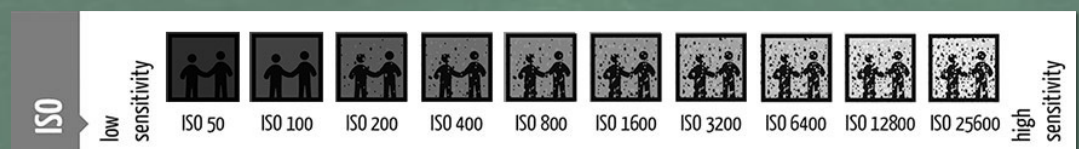
2. Shutter

- exposure time
- image motion



3. ISO

- exposure sensitivity
- image fidelity



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PICTURE; Exposure (image)

week 1 (9/8)

CONTROL

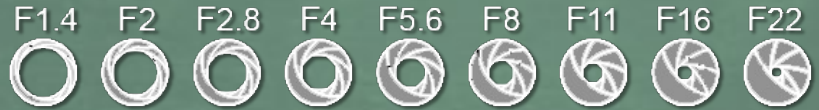
1. **Aperture**; opening in lens that is created from iris leaf positioning (open-close)
 - amount of light captured
 - image focus is affected
2. **ISO**; International Standards for Standardization
 - sensitivity (responsive) towards light captured
 - image fidelity (structure) is affected
3. **Shutter**; electronic regulation of progressive frame capture
 - time (duration) light is captured
 - image motion (direction, blur) is affected

PICTURE; Exposure (image)

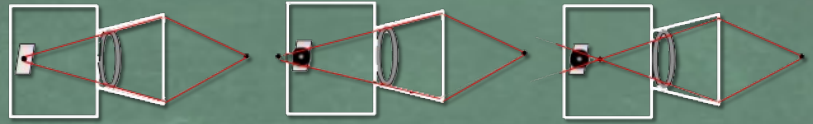
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APERTURE

1. F stop (T stop) scale
 · ratio of the iris diameter to the lens focal length

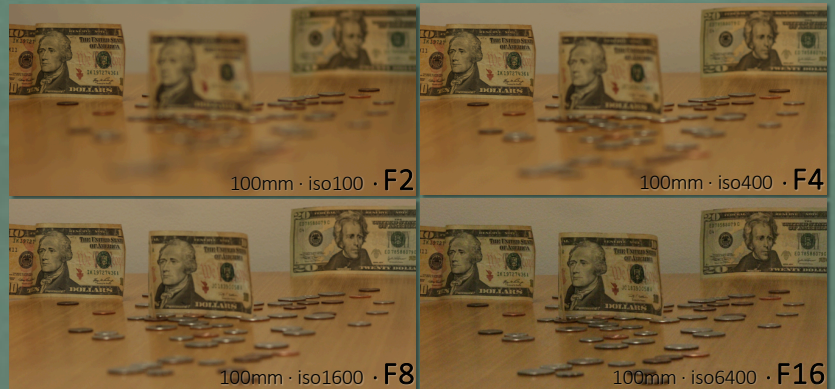


2. Circle of Confusion
 · acceptable focus point in relation to focal plane (camera sensor)



3. Depth of Focus
 · acceptable focal plane distance in relation to camera lens

4. Depth of Field
 · acceptable subject distance in relation to focal plane



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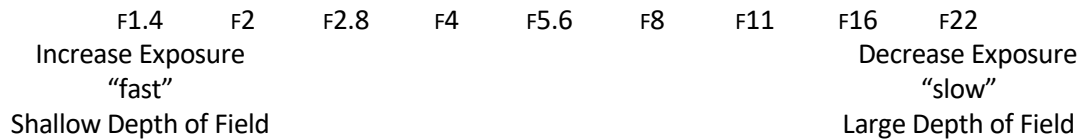
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PICTURE; Exposure (image)

week 1 (9/8)

APERTURE

1. **Measured**
 ▶ F stops



2. **Process**

- ▶ Circle of Confusion
- ▶ Depth of Focus

3. **Result**

- ▶ Depth of Field
- ▶ Changing the F stop will change the Depth of Field
 smaller number F stop lets in more light and reduces Depth of Field
 larger number F stop lets in less light and increase Depth of Field

NOTE ISO adjustment with F stop change to maintain Normal Exposure.

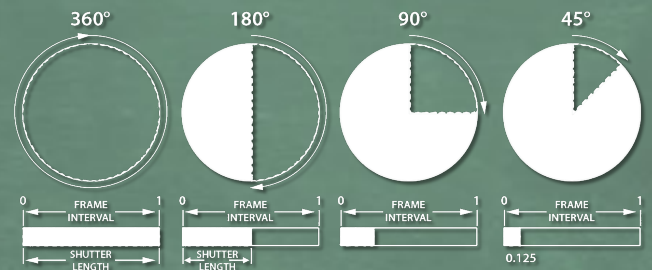
PICTURE; Exposure (image)

w1 9/8

SHUTTER

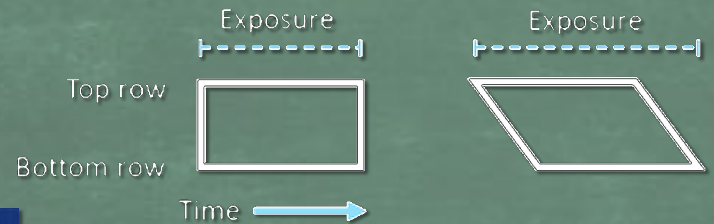
1. measured

- degree angle open
- 180° for cinema
- fraction of second
- $1/48^{\text{th}}$ of a second for 24^{FPS}



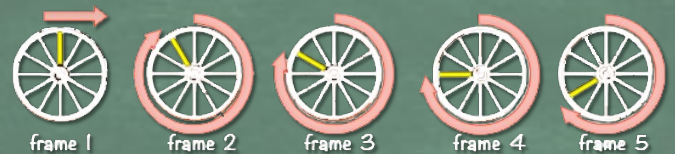
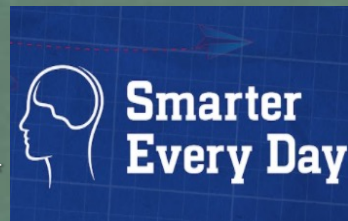
2. duration to obtain picture frames

- physical (open-close)
- electronic (process-record)



3. motion

- blur
- direction
- warp (rolling shutter)*



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PICTURE; Exposure (image)

week 1 (9/8)

SHUTTER

1. Measured

- angle; degree of opening
- time; fraction of second

NOTE For taking 24 frames per second, exposure time is half at $1/48$ of a second..

2. Process

- physical mirror opening and closing
- electronic processing and recording
 - rolling shutter; scans across sensor of time (milliseconds)
 - global shutter; scans full sensor

3. Result

- blur
- direction
- warp

REFERENCE

SmarterEveryDay; Rolling Shutter <https://youtu.be/dNVtMmLnoE>

PremiumBeat; Rolling & Global Shutter www.premiumbeat.com/blog/know-the-basics-of-global-shutter-vs-rolling-shutter/

Videomaker; Shutter Speed <https://youtu.be/9-Jum6TrC1o>

Teledyne Photometrics; rolling shutter <https://www.photometrics.com/learn/white-papers/rolling-vs-global-shutter>

PICTURE; Exposure (image)

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ISO

1. Measured

- ISO
International Organization of Standards
- Gain (dB)
signal amplification to processed image

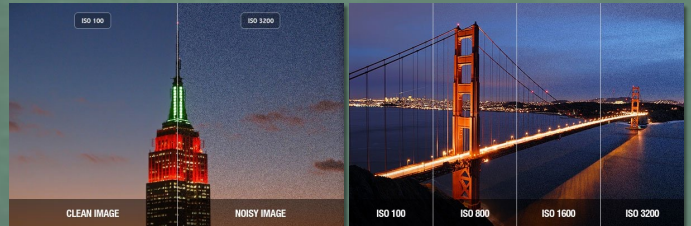
2. Light Sensitivity

- double sensitivity doubles numeric value
320* · 400 · 800 · 850* · 1600 · 3200 · 6400

3. Fidelity

- "clean" vs. "noisy"

	ISO 320	ISO 400	ISO 640	ISO 800	ISO 850	ISO 1600	ISO 3200	ISO 6400	ISO 12800	ISO 20000
18% Gray	3.9 Stops	4.2 Stops	4.9 Stops	5.2 Stops	5.3 Stops	5.3 Stops	5.3 Stops	5.3 Stops	5.3 Stops	5.3 Stops
Gain	-6dB	-4dB	0dB	2dB	2.5dB	8dB	14dB	20dB	26dB	30dB
	8.1 Stops	7.8 Stops	7.1 Stops	6.8 Stops	6.7 Stops	6.7 Stops	6.7 Stops	6.7 Stops	6.7 Stops	6.7 Stops



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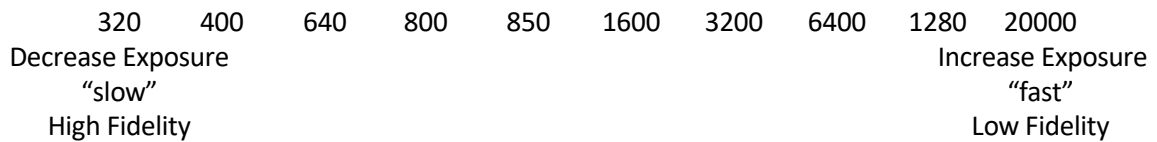
PICTURE; Exposure (image)

week 1 (9/8)

ISO

1. Measured

- ISO
- dB



2. Process

- Sensitometry of light.
increased sensitivity increases ISO numeric value
gain electronically process the amplification of signal

3. Result

- increased sensitivity decreases image fidelity and increases "noise"

REFERENCE

MasterClass; ISO www.masterclass.com/articles/learn-about-photography-what-is-iso#what-iso-numbers-mean
PHLEARN; ISO <https://phlearn.com/magazine/everything-you-need-to-know-about-iso-noise-color/>

PICTURE; Camera (Canon c100)

w1 9/8

CANON C100

1. power

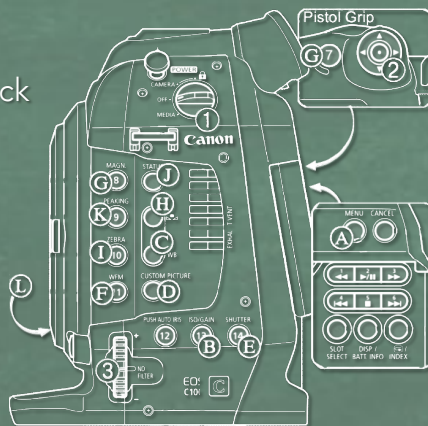
- battery
- on-off-playback

2. media

- format
- record time

3. set up

- [TechSheet C100 v1](#)
- record settings
- exposure settings



RECORD SETTINGS

frequency: 59.94 Hz (<i>default</i>)	TC: NDF (59.94Hz/24P specific)
bit rate: 24 Mbps LPCM (<i>default</i>)	file: AVCHD
shutter: 180°	color sample: 4:2:0 8bit (<i>internal SD</i>)
frame rate: 24P (23.978)	compression: MPEG-4 AVC/H.264
	4G SDHC ≈ 20min. record time

QUICK SET-UP

1. RESET Default Settings

default: MENU(A) ▶ Other Functions ▶ Reset ▶ All Settings

date/time: set

2. SETUP Camera

black level: MENU(A) ▶ Camera Setup ▶ ABB ▶ OK (*w/body cap on*)

shutter: MENU(A) ▶ Camera Setup ▶ Shutter ▶ Mode ▶ Angle

frame rate: MENU(A) ▶ Other Functions ▶ Frame Rate ▶ 24P

3. SELECT ISO

ISO/GAIN® (*ISO values displayed with Function Reset*)

4. SELECT Color Temperature

WB© Tungsten(3200K) · Daylight(5400K) · Kelvin° · Custom A · Custom B

5. FORMAT media

MENU(A) ▶ Other Functions ▶ Initialize Media



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PICTURE; Camera (c100)

week 1 (9/8)

BASIC CAMERA

1. Power

2. Media

- ▶ At 1080p, record time estimate 20min. / 4G
- ▶ Format
- ▶ Avoid microSD w/ adapter

3. Settings

- ▶ TechSheet_C100
 - resolution: 1080p
 - frame rate: 24P (23.978)
 - shutter: 180° (1/48)
- ▶ ISO menu settings / control