

SOLAR ECLIPSE PHOTOGRAPHY NOTES

APRIL 8, 2024

Prepared by: Joe Watson, April 3, 2024

DISCLAIMER: *You are responsible for the safety of yourself and your equipment.*

Use solar protection as you choose.

Open Source: This information is open source, available free to the public.

***These notes are particularly for shooting the April 8, 2024 Solar Eclipse.
Notwithstanding, many aspects apply to any solar photography,***

I have prepared these notes for myself to use with my personal gear to photograph the event. A few friends have asked me to share these notes so they can adapt it to their particular situation which I am here doing. Please remember to adjust all exposures and settings to match your equipment and expectations. Complete your on tests.

Keep these notes, they will work for you on the next total solar eclipse in 21 years in the USA, or somewhere else in the world about every one to three years. I will be 100 at the time of the next US total solar eclipse so I will optimistically file away these notes away. See you then.

FUN SUN FACTS TO KNOW

The Sun:

- The Earth is 92.95 million miles from the sun.
- It takes 8 minutes and 20 seconds for the sun's light to reach the side of your face so the light we see happened eight minutes ago. Poetically, the past is our present.
- The sun is a ball of plasma and gas, primarily composed of hydrogen and helium with a hot nuclear center.
- It rotates on its axis, but not like the earth. On average, it rotates about 27 days but the poles take 30 days and at its equator, it rotates every 24 days. Go figure?
- It is about 10,000 degrees F at its surface and up 27 million F at its core.
- The sun is 864,938 miles wide, about 110 times the Earth. A million earths could fit inside the sun.
- Yet, the sun and moon appear to be exactly the same size in the sky making the eclipse spectacular.
- What we see is the *photosphere* which is the first opaque layer of its atmosphere.
- The sunspots we see are cool places on the surface. You will see sunspots clearly on your images which help you to define the sharpness of your lens focus. Sunspots are often about the size of the earth. The sunspots you see will change location or be different because the sun is rotating on its axis.
- The Earth equator is rotating at 1,037 mph so totality happens quickly, say just over 4 minutes.

AXIS POINT DEVELOPERS, LLC

Buffalo Joe Productions

Joe Watson 281-932-4143

jwatson@apdlc.net www.apdlc.net www.WatsonWorldView.com

- The sun emits a white light. The yellow/orange we see is due to light going through the atmosphere which filters out the blue wavelength. There is more atmosphere the lower the sun gets in the sky making it appear more orange. Photographers add orange because we are accustomed to it.
- The sun and moon size appear to be about ½ degree in the sky.
- The sun moves its apparent visual diameter in the sky every four minutes; for a string of images, shoot every 5 minutes to achieve separation; this amount of motion is consistent everywhere.
- Motion blur with a telephoto lens does not occur until the shutter is slower than about 1/5th second.
- The ambient temperature may drop up to 20 degrees during totality; you might need a jacket or sweater.
- Wildlife will get confused and behave as if it is night. Listen for frog and insect sounds.

This eclipse is over in just over 4 minutes but length changes basis on your position inside the totality

One must be within the path of totality to get all types of images and perfectly see the sun corona. The closer you are to the center of the path of totality, the longer the eclipse lasts.

Solar eclipse phases are called:

- Penumbra-partial eclipse
- Umbra-full eclipse, or totality

Full event is over two hours approx.

GENERAL THOUGHTS

REGARDING PHOTOGRAPHING THE APRIL 8, 2024 SOLOR ECLIPSE

A proper solar filter is required for you and your camera; they are widely available:

- First, you know this, if you look directly at the sun, it can quickly, permanently blind you, never to heal. If you look at the sun through a DSLR view finder without an EVF or filter, it will fry your eyes much faster. Big Ouch!
- Finally, if you do not use correct solar filtration on your camera lens, the sun will destroy the sensor in your camera possibly beyond repair.
- Note: a standard 16 stop ND filter will not work because it does not have all of the protective coating. B&H sells a Tiffin solar filter for \$99 bucks.
- **Do not be stupid!!!** Carrying a white cane with a red tip is not a good choice. Don't look at it. Period!!!

Much has been written about this so I will not belabor the point. You are responsible for your choices.

What Kind of Camer and Lens Works:

- **Camera:** Almost any camera with a "solar" filter will capture the eclipse. A modern DSLR camera, whether a crop APSC or full frame DSLR will work very well.

The new mirrorless cameras are best because they have EVF (electronic view finders) which, with a filter on the lens, can be used without protective glasses, a great convenience adding to the pleasure of the experience.

- **Lens:**
 - **Telephoto Zoom** is a good choice in the range of 400 to 600mm. Longer becomes difficult and may be too long for a good corona shot. 500mm is about perfect.

AXIS POINT DEVELOPERS, LLC

Buffalo Joe Productions

Joe Watson 281-932-4143

jwatson@apdlc.net www.apdlc.net www.WatsonWorldView.com

- **Zoom:** I use a Canon 100 to 500 4.5 -7.1 F/stop. Find the sun at 100mm, then zoom in to 500mm.

EQUIPMENT LIST AND THINGS TO TAKE

This is my list so you will need to adjust it to suit your camera equipment inventory and shot expectations.

The purpose of this list is to both determine what equipment to use and to have an inventory list with all equipment inspected, cleaned, prepared, and ready to take along.

My plan is first to

- capture telephoto images and
- secondarily a wide-angle portrait with foreground.
- I will also set up a 360 GoPro to get B-roll.
- My friend Greg Wilm will film a slow, 60 frames per second, 4K, 360 degree shot of the all-around sunset. Go Greg! We will use an Autel EVO II Pro V3 set to Spot Light. No filter is needed because we will not image the sun.

Photo Equipment List:

1. **Lens cleaning kit;** professionally clean all cameras and lenses before eclipse day; re-clean on site. Take large cover bags in case the wind picks up and is likely to get your equipment dirty again.
2. **Solar filters,** 2 x 77 mm Tiffin solar filters from B&H; there are many filter options, but I find this most professional and convenient and they fit my lenses.
3. **“Exposure Shot Sheet”:** two pages (separate file): memorize it; practice it many times so you can do it blindfolded which is what will happen with the protective glasses.
 - a. shot sequence for each camera with steps and settings,
 - b. list of exposure settings,
 - c. bracketing method and setting,
 - d. filter and glasses protocol,
 - e. to-do sequence list
4. **Glasses,** primary framed and three paper secondary; attach primary glasses to a string to hang around your neck because you will take them off and on often many times.
5. **LP-6 Batteries, 8 x charged** with purchase dates less than one year: check quality of batteries, there will be no time to change batteries. With batteries, olde is slow, unlike me.
6. **Intervalometer, Remote Camera Release:** Canon Remote Controller; this is more capable than the one included in the cameras and eliminates camera shake.
7. **Cameras:**
 - a. Primary for telephoto: 1 x Canon R5 mirrorless; lens, Canon RF 100-500mm F4.5-7.1
 - b. Primary for Wide Angle: 1 x Canon R5 mirrorless; Canon RF 16-35mm F2.8; shoot portrait view to get land foreground and eclipse. Or, if the primary R5 telephoto fails, use this camera as the backup with the 100-500 telephoto. Backup camera if R5/100-500 combo fails, use Canon R7 sports/wildlife camera; 1.6 crop; lens EF 70-200mm with EF 1.4 teleconverter, equal to 448 mm.
 - c. *360 GoPro* w 2x charged batteries on tripod for shooting event B-roll of surroundings. Attach a Rode mic; set it and forget it.

AXIS POINT DEVELOPERS, LLC

Buffalo Joe Productions

Joe Watson 281-932-4143

jwatson@apdlc.net www.apdlc.net www.WatsonWorldView.com

8. **Video Monitor:** High nit, *daylight capable*, video monitor: mount in hot shoe for easy viewing. This is extremely helpful. Try it.
 - a. Daylight Monitor: FeelWorld Ultra Bright 3,000nit (1000 nit or less is difficult)
 - b. Small Rig mounting bracket on the hot-shoe
 - c. HDMI cable, 2 x HDMI micro to standard; test and re-test. This is a failure point.
9. **Tripods:**
 - a. Take 2 tripod head attachments for each head; wrenches/screwdrivers.
 - b. Primary Tripod is ProMedia carbon fiber heavy duty for R5 telephoto; Brono geared architectural head; suspend one gallon water jug for stability; include carriage net below for “stuff”.
 - c. Primary Commercial Heavy Aluminum for R5 with wide angle; pro video head, Sirui BCH30; suspend one gallon water for stability.
 - d. Light weight carbon fiber tripod for GoPro 360

Tripod notes: Must be heavy, strong, and steady; do not use light weight field tripods.

 - Tall enough to not break your back viewing because the sun is very high in the sky. Use a high nit, sunlight viewable video monitor for convenience, not for recording.
 - Test your tripod head to see if it points high enough.
10. **Sound recorder**, Zoom H5, for ambient sound; attach to the 360 GoPro tripod
11. **Neck straps** to use as safety straps on the tripods in case something gets dropped.

Things to take:

- 1 Neck strap/string for solar glasses which will go on and off a lot.
- 2 Chairs and small table between the tripods
- 3 Shade; large umbrella, all around hat
- 4 Head lamp with red and white light.
- 5 Large brick battery chargers to charge USB devices, etc.
- 6 Gaffer’s tape, scissors.
- 7 Rain: Umbrella for rain and shade for the cameras; rain covers for cameras in case of a temporary shower
- 8 Water, food, snacks
- 9 Ice Cooler:
 - a. Food
 - b. Snacks
 - c. Water
 - d. Soft drinks

PHOTOGRAPHY BASICS AND TIPS

Know your equipment completely. You will not have time to learn or fumble.

Practice: Practice, practice, and practice some more. Do not overcomplicate things with too much stuff, or have to ambitious a plan, or new equipment. Working with the solar filters and solar glasses is like working blind folded; not easy. Practice some more.

AXIS POINT DEVELOPERS, LLC

Buffalo Joe Productions

Joe Watson 281-932-4143

jwatson@apdlc.net www.apdlc.net www.WatsonWorldView.com

There are no re-dos or Mulligans.

Basics Camera Setup:

- **RAW:** Must shoot RAW. Shooting RAW and JPEG may slow things down too much.
- **Memory Card:** Use a large card, 256, and reformat before the shoot so you know it works and you have plenty of room. Record on two cards simultaneously, not sequential.
- **White Balance:** Set to Daylight to fix the color temp because auto can change during the eclipse process; most people just use auto but that is risky.
- **Stabilization:** Turn off the stabilization on both lens and camera. Canon, off on lens button will turn off on camera.
- **Manual Exposure:** This requires practice; it is harder than you think. Use *manual focus* to eliminate auto focus hunting. With a zoom telephoto, first set focus just closer than infinity, then zoom out to 100mm to find the sun; then, zoom in to 500mm and adjust focus. Establish perfect manual focus; perhaps, use auto focus to check focus on the edge of the sun first, then switch back to manual. I do not do that. Magnify focus to confirm focus. Once perfect focus is established for sure, use gaffer' tap on the focus ring and zoom ring to stop motion. The Canon RF 100-500mm has a zoom lock ring but I do not fully trust it so it will be taped. Focus does not change over time and will not need to be adjusted when recomposing. Check your diopter for correctness; it can get bumped.
- **Manuel Operations:** Set to full Manuel in as many ways as possible. Go through camera setting and set as many things as possible to "off" or natural or not automatic. Eliminate Servo, eye, people focus, etc. IBIS and lens stabilization off. Automatic is your enemy. No back button focus; shoot with main shutter release or better with remote release. Simplify camera settings as much as possible. Do not use the Cases as they will likely screw you up. Set up your camera so you can turn it off and on without auto changing settings.
- **Sturdy tripod;** counter-weight tripod for stability; if in a crowded area, put up barriers such as your chairs or an ice chest close to setup so others will not bump your set up; they will be looking up and crazy/wild. You need a fortress!
- **Remote Shutter Release:** This is a must to reduce camera shake. The Canon remote has a capable intervalometer which I will use. I avoid wireless release because it is one more thing to fail.
- **Electronic 1st Curtain, not Mechanical or Electronic:** To reduce camera shake; must test at all apertures and F/stops to confirm no problems for certain cameras. Or, shoot electronic, not mechanical.
- **BIG HINT:** Set up your camera so it can be turned off (e.g. to put on the filter) and on without changing any settings. For Canon mirrorless people, if you do not use full manual, it will always turn on to Case 3 and if that is not your solar set up, you will have to do the adjustments all over. This can be a calamity!

PHASES OF THE ECLIPSE

This system is used in most apps, so you need to know it.

C1-start of partial eclipse; need camera filter and glasses before this.

C2-Start of totality; diamond ring and then Baly's Beads occur here. You can remove the camera filter but leave glasses on until full totality.

AXIS POINT DEVELOPERS, LLC

Buffalo Joe Productions

Joe Watson 281-932-4143

jwatson@apdlc.net www.apdlc.net www.WatsonWorldView.com

C3-End of totality; Baley's Beads and then diamond ring occur at the end of totality; put on glasses for this and prepare to put on filter immediately after. You will probably need to turn off your camera for a few seconds before partial to put on the filter and then turn camera back on.

C4-End of partial eclipse; filter and glasses needed until this time.

It is approximately 77 minutes from beginning of C1 to end at C4

TIMING AND PHOTO THOUGHTS

Sun Motion is consistent everywhere.

- With a 500mm telephoto, the sun will move out of frame about every 7 minutes so recompose about every five minutes to avoid lens aberrations on the edge.
- Motion blur occurs at or below 1/5th second in theory but for safety I assume 1 second.

Key Types of Photos to Capture At Various Stages:

- Single image
- Composite, done in post
- High Dynamic Range, done in post
- Wide Angle or Telephoto

EXPOSER AND BRACKETING

I read that some photographers feel they have worked out the "best exposure" (Base Exposure) settings such as ISO 200, F11, 1/1000th which is what I use for Partial Eclipse Best/Base Exposure. Then they courageously just go with that setting.

I choose to be a little more conservative so through previous shooting and processing, I will pick my Base Exposure, which will be ISO 200, F11, 1/1000th for partial eclipse. Then, I auto bracket using the AEB (Auto Exposure Bracketing) in the R5 for 7 stops. I use the remote control to fire the seven shots.

How does AEB work? Set the Base Exposure in the middle of a 7 stop AEB. Set the sequence to -,0,+ at 1 stop exposures. Shoot high speed at 12 frames per second with AEB. It takes less than 2 seconds, and you can shoot again if needed. More is better. Less is not more, it is less. To confirm Base Exposure in AEB, which you learned from practicing, notice that the 7 vertical dash lines representing the exposures in the view finder will be in the middle when you are focused on the sun. If to the right, you are over exposed and if to the left, you are under exposed.

Constant ISO and Aperture: Pick ISO and F/stop and do not change them. Only vary shutter speed to keep it simple; you might have more than one set up like this. The telephoto and wide angle will not be the same exposure settings.

Base Exposure Partial Eclipse: this is the best exposure setting and is set in the middle of the bracket range.

AXIS POINT DEVELOPERS, LLC

Buffalo Joe Productions

Joe Watson 281-932-4143

jwatson@apdllc.net www.apdllc.net www.WatsonWorldView.com

- **Slightly Over Exposure:** Some say to overexpose by about .5 F/stops to get the needed detail in post.
- **Highlight Alert and Histogram:** If the highlight alert (blue tab, page 5) is blinking, or if the histogram is somewhere well right of center, you are overexposed. But, you should not fully trust this; it is just for near correct exposure set up; you must bracket. Sometimes the histogram will not work.
- **ISO Range: Range** ISO 100 to 400; I use ISO 200 on all partial eclipses.
- **Aperture Range:** 5.6 to 11; I use F/11. Use F/22 to get a more interesting corona flare for just a few shots during totality? Remember to balance shutter speed when using F/22.
- **Shutter Range:** 1/500 to 1/2,000 at the fast end, then bracket by backing down 7 stops. I use 1/1000th. You should have already learned your Base Exposure for Partial Eclipse by testing and practice and put that in the middle of the bracket range.
- **My Partial Eclipse Base Exposure:** ISO 200, F/11, 1/1000th. Bracket both sides of this at least 3 stops for a total of 7 images using Expos. Comp./AEB found on red page 2 and with progression set to – ,0, + for 7 stops on orange page 1.
 - During totality, Base Exposure is 5 stops wider, about ISO 200, F/11, 1/30th. Again, bracket 3 stops on both sides of this.
 - I will also shoot a few series at F/22 for a better corona. This will be ISO 800, F/22, 1/30th
- **Wide Angle Exposure:**
 - 16mm to 35mm lens; probably at 16mm because the sun will be very high in the sky.
 - Portrait mode, not landscape; be sure you have a mount system for portrait.
 - Aperture priority: -1.7 F/stop compensation; bracket that up to 7 F/stops

SHOOT THE SUN

Image Sequence, Timming Protocol:

- **Prior To Start of Partial Eclipse:** Complete full set up. Do not set up near heavy truck or car traffic as they will shake the ground. Take test pictures of the sun to assure proper focus, tap off focus and zoom.
- **Partial Eclipse; ISO 200, F/11, 1/1000th, filter on, glasses on before start:** Shoot one image every 5 minute: for each image set, bracketing 7 stops starting with shutter slow to fast with Base Exposure in the middle. Keep the sun centered in the frame. Use a timer to remember when to shoot.
- **Diamond And Baley's; ISO 200, F/11, 1/1000th, glasses on, filter off:** At start of Diamond, use same Base Exposure for Diamond and for Baley's as for partial eclipse, but must have **filter off camera** and must have **glasses on**; shoot a lot of pictures for 15 seconds with 7 F/stops using AEB bracketing to capture Diamond and Bailey's; shoot as many pics as you can.
- **Totality, ISO 200, F/11, 1/30th Lasts Just Over 4 Minutes; remove both filter and glasses. ENJOY!!!** Change exposure to **add about 5 F stops**. Base exposure say ISO 200, F/11, 1/30th.
 - Bracketing 7 stops with the new Totality Base Exposure in the middle of AEB, shoot several sets.
- **Totality Corona, ISO 800, F/22/1/30th, filter and glasses off;** change to F/22 to get a larger corona and change ISO to 800 and leave shutter speed at 1/30th.
 - Toward the end of totality, prepare for Baley's and diamond and partial by **switching back to Base Exposure ISO 200, F/11, 1/1000th with AEB bracketing getting ready for partial eclipse.**

AXIS POINT DEVELOPERS, LLC

Buffalo Joe Productions

Joe Watson 281-932-4143

jwatson@apdllc.net www.apdllc.net www.WatsonWorldView.com

- Look up and enjoy. Breath and relax along the way. Hug someone.
- **Totality Ends and then Second Baley's-Diamond Phase, ISO 200, F/11, 1/1000th, filter off, glasses on.** You are about to enter partial. You are about to enter partial eclipse; Change to Partial Eclipse Base Exposure, ISO 200, F/11, 1/1000th. Just before end of totality.
 - Baley's and then diamond ring happen quickly.
 - Shoot as many bracketed series of both as possible.
 - When finished with diamond ring, quickly turn off camera and install filter; then turn on camera before partial eclipse.
 - Note: Motion blur from sun/moon moving, no problem down to 1/2 second.
- **Second Contact or Start of Second Partial, ISO 200, F/11, 1/1000th, filter on, glasses on** before the end of totality, re-set back to Base Exposure ISO 200, F/11 and 1/1000th. **Glasses on, filter on.** Shoot with same settings as first partial: ISO 200, F/11, 1,000th one bracketed series every 5 minutes. Again, bracket at least 7 stops.

BIG HINT: Determine which images you want the most and concentrate on getting those. If the others don't happen, well you got what you really wanted and there will be another eclipse, somewhere soon.

That's it. Easy and fun. And, you hugged a stranger. Yea!

Any question, feel free to call Joe Watson at 281-932-4143 or email Jwatson@APDlIc.net.

Enjoy.

ABOUT THE AUTHOR:

Joe Watson is a Texas real estate developer and a member of the Explorers Club. He writes on a variety of subjects including politics and classic historical structures. He is a world traveler with a passion for exploration which he documents with photography. As an explorer, he brings skills as a field photographer, master diver, off-shore sailor, and multi-type rated pilot as well as useful field construction capabilities.

REFERENCE NOTES

WEB SITES:

www.timeanddate.com Very useful app

- Map
- Has markers with information
- Total solar eclipse if inside red lines
- Animation of at your location
- When partial starts, totality begins and ends, etc.

http://xjubier.free.fr/en/site_pages/solar_eclipses/TSE_2024_GoogleMapFull.html

AXIS POINT DEVELOPERS, LLC

Buffalo Joe Productions

Joe Watson 281-932-4143

jwatson@apdlIc.net www.apdlIc.net www.WatsonWorldView.com

<https://www.solareclipse timer.com> count down timer

[myux?4jhguyh3fyfxtgxhzwf3htr 4](#) Big party

<https://science.nasa.gov/eclipses/resources/?pageno=2>

<https://www.greatamericaneclipse.com/april-8-2024/>

www.nebulaphotos.com

<https://www.windy.com/-Clouds-clouds?clouds,29.738,-95.521,5> to show cloud cover forecast and current

<https://weather-radar-live.com/cloud-cover-map/>

www.eclipsophile.com/2024tse Jay Anderson

www.Mreclipse.com

[www.standhonda@stanHonda](#) on Adorama, Excellent YouTube video.

“National Parks At Night” for more information

www.Photoephemeris.com

- Sun rise and set and where during the day.

www.Sellurimu.com

- See other stars in the sky
- See objects you would not be able to see.
- Jupiter, Venus, Serus Saturn

Apps:

- www.MisterEclipse.com makes chart showing the size of the sun with different lens lengths.
- PhotoPhills app to find the sun
- Solar Eclipse Timer – Foxwood Astronomy

AXIS POINT DEVELOPERS, LLC

Buffalo Joe Productions

Joe Watson 281-932-4143

jwatson@apdlc.net www.apdlc.net www.WatsonWorldView.com