



<i>Title:</i> TOS Standard Operating Procedure (SOP): DSLR Configuration		<i>Date:</i> 03/10/2022
<i>NEON Doc. #:</i> NEON.DOC.001718	<i>Author:</i> Courtney Meier	<i>Revision:</i> D

TOS STANDARD OPERATING PROCEDURE (SOP): DSLR CONFIGURATION

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Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	01/27/2016	ECO-03528	Initial release: Content for the Nikon D800/D810 previously contained in Leaf Area Index protocol moved to this document. New content developed and added for Nikon D750.
B	03/20/2017	ECO-04391	Changes: <ul style="list-style-type: none">• Added instructions for setting shutter speed within ISO-auto software menu for extended monopole• Added instructions for configuring camera to save pictures to each card slot for automatic backup purposes• Added instructions for quick recall of upward/downward settings for D750 (U1 and U2 modes on main dial)• Added Heading sections to aid navigation of document
C	11/15/2017	ECO-05151	Changes: <ul style="list-style-type: none">• Updated ISO guidance to match protocol.• Added configuration instructions for using delayed self-timer shutter release.• Added configuration instructions for using remote wireless shutter release for collecting images with the extended monopole.
D	03/10/2022	ECO-06787	<ul style="list-style-type: none">• Revised logo



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1 DESCRIPTION

The Nikon DSLR must be configured appropriately in order to take satisfactory images for LAI analysis with the CanEye software. Configuration steps are broken down into two main sections below: 1) Settings adjusted prior to field work; and 2) Settings adjusted in the field. Both of these sections contains instructions grouped together by camera model. This document contains instructions for the cameras listed below:

- Nikon D750
- Nikon D800 / D810

1.1 Purpose

1.2 Scope

This document provides a change-controlled version of an Observatory procedure. Documentation of content changes (i.e. changes in particular tasks or safety practices) will occur via this change-controlled document, not through field manuals or training materials.

1.3 Applies To

The procedure described in this document is used in the following protocols:

Doc #	Title
NEON.DOC.014039	TOS Protocol and Procedure: Measurement of Leaf Area Index

1.4 Acknowledgments



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2 RELATED DOCUMENTS AND ACRONYMS

2.1 Applicable Documents

Applicable documents contain higher-level information that is implemented in the current document. Examples include designs, plans, or standards.

AD[01]	NEON.DOC.004300	EHSS Policy, Program and Management Plan
AD[02]	NEON.DOC.004316	Operations Field Safety and Security Plan
AD[03]	NEON.DOC.050005	Field Operations Job Instruction Training Plan

2.2 Reference Documents

Reference documents contain information that supports or complements the current document. Examples include related protocols, datasheets, or general-information references.

RD[01]	NEON.DOC.000008	NEON Acronym List
RD[02]	NEON.DOC.000243	NEON Glossary of Terms
RD[03]	NEON.DOC.005003	NEON Scientific Data Products Catalog

2.3 Acronyms

Acronym	Definition
DSLR	Digital Single Lens Reflex [camera]
LAI	Leaf Area Index

2.4 Definitions



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3 SAFETY

This document identifies procedure-specific safety hazards and associated safety requirements. It does not describe general safety practices or site-specific safety practices.

Personnel working at a NEON site must be compliant with safe field work practices as outlined in the Operations Field Safety and Security Plan (AD[02]) and EHSS Policy, Program and Management Plan (AD[01]). Additional safety issues associated with this field procedure are outlined below. The Field Operations Manager and the Lead Field Technician have primary authority to stop work activities based on unsafe field conditions; however, all employees have the responsibility and right to stop their work in unsafe conditions.



4 PERSONNEL AND EQUIPMENT

4.1 Equipment

Table 1. Equipment needed to implement the procedures in this document.

Item No.	R/S	Description	Purpose	Quantity*	Special Handling
Durable Items					
MX104649	R	DSLR camera body	Capture DHP images	1	N
MX104651	R	Fisheye lens	Capture DHP images	1	N
MX109639	S	Wireless remote shutter release (Vello FreeWave Plus for Nikon or similar)	Remotely focus camera and trip shutter release on Nikon D800/D810 camera models	1	N
MX111179	S	Nikon wireless shutter release	Remotely focus camera and trip shutter release on Nikon D750 camera model (will not work with D800/810)	1	N



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4.2 Training Requirements

All technicians must complete procedure-specific training for safety and implementation of this procedure as required in the Field Operations Job Instruction Training Plan (AD[03]).

4.3 Specialized Skills

Familiarity with Nikon DSLR cameras.



5 STANDARD OPERATING PROCEDURES

The DSLR cameras must be configured appropriately, and used in accordance with very specific settings in order to take satisfactory hemispherical photos for LAI analysis with the image analysis software.

5.1 Configuring the Nikon D800/D810

5.1.1 Settings Adjusted Prior to Field Work

There are several suites of settings that need to be adjusted prior to shooting, and these can be grouped into a few general categories:

- Settings adjusted with physical buttons and knobs
- Settings adjusted with the camera software (playback, shooting, custom setting, and setup menus).
- A customizable menu called “My menu” can also be modified so that frequently adjusted settings are readily available.

5.1.1.1 Settings Adjusted with Physical Buttons and Knobs

5.1.1.1.1 Shutter-release mode

Single shot (S) is the desired shutter-release mode for collection of most DHPs. To adjust:


1. Press the release button near the left control knob (below left), and with the button pressed
2. Rotate the outer-ring of the control knob until “S” is selected (below right).



Figure 1. Nikon D800/D810: Setting the shutter-release mode.



Self timer mode will allow up to 20 seconds to elapse between when the shutter-release button is pressed, and when the camera trips the shutter. This mode may be useful when using the monopod in some circumstances. To adjust:

1. Press the release button near the left control knob (**Figure 1, left**).
2. Rotate the outer ring of the control knob until  is selected.
3. To select the length of the shutter-release delay:
 - a. Press the “Menu” button on the back panel of the camera, and navigate to the Custom Settings menu (pencil icon).
 - b. Use the multi-selector to navigate to “c3: Self-Timer”, then select “Self-timer delay”.
 - c. Select from either 2, 5, 10 or 20 seconds, then press “OK”.

Remote control shutter release is required for collecting downward-facing images with the Extended Monopole.

- The D800/D810 must be configured with a 3rd party remote (see Section 4.1 for recommended equipment). Configure the camera to work with the remote according to manufacturer instructions.
- When configured with a remote control, the camera may regularly default to turning the 2-second delay ‘OFF’. Check frequently to ensure the delay is ‘ON’.

5.1.1.1.2 Image quality

Desired setting = RAW. To adjust, press the “QUAL” button on the left control knob (below left), and rotate the primary wheel until “RAW” is displayed in the top LCD (below right).



Figure 2. Nikon D800/D810: Setting image quality to RAW.



5.1.1.1.3 White balance

Desired setting = Auto. To adjust, press the “WB” button on the left control knob (below left), and rotate the primary wheel until “WB A” is displayed in the top LCD (below right).



Figure 3. Nikon D800/D810: Adjusting white balance settings.

5.1.1.1.4 Bracketing

Desired setting = OFF. To adjust, press the “BKT” button (located in different places on the D800 vs. the D810), and rotate the appropriate wheel until BKT disappears from the LCD on the top of the body.

5.1.1.1.5 Metering mode

Desired setting = Matrix Metering. To adjust, rotate the outer ring of the “AE-L/AF-L” button to the center position (see below).



Figure 4. Nikon D800/D810: Setting the metering mode.



5.1.1.2 Settings Adjusted with Software Menus

5.1.1.2.1 Display Options (Playback Menu)

Desired settings = show “Overview”. With this option enabled, it is possible to evaluate the histogram of each image after it is acquired. To adjust,

1. Press the “Menu” button, then use the “Multi-selector” button (circled below-right) to navigate to “Playback Menu → Playback display options”.



Figure 5. Nikon D800/D810: Playback Menu display options.

2. Use the Multi-Selector to check the box next to “Overview”.
3. Navigate to “Done” and press the “OK” button (the latter is located in the lower left of the image above).
4. To view histogram information for an image, press the “Play” button (circled in red below).



Figure 6. Nikon D800/D810: Location of the “Play” button.

5. Use the L and R arrow keys on the Multi-Selector to select the desired image.



- Press the Up and Down arrow keys on the Multi-Selector to bring up the “Overview” histogram information (below). The red circle indicates the file name.



Figure 7. Nikon D800/D810: Locating the file name in the “overview” histogram view during file playback.

5.1.1.2.2 File Naming (Shooting Menu)

Desired setting = DXX, where XX = the unique NEON Domain number. To adjust, press the “Menu” button, and select “Shooting Menu → File naming”. Enter the appropriate alpha-numeric characters. When finished, “DSC” should no longer be displayed, and your custom characters should be.



Figure 8. Nikon D800/D810: Shooting Menu file naming options.

5.1.1.2.3 Color Space (Shooting Menu)

Desired setting = sRGB. To adjust, press “Menu”, and select “Shooting Menu → Color space”. Select “sRGB” and press the “OK” button.



Figure 9. Nikon D800/D810: Shooting Menu color space options.

5.1.1.2.4 Active D-Lighting (Shooting Menu)

Desired setting = AUTO. To adjust, press “Menu”, and select “Shooting Menu → Active D-Lighting”. Select “Auto” and press the “OK” button.



Figure 10. Nikon D800/D810: Shooting Menu Active D-lighting options.

5.1.1.2.5 High ISO noise reduction (NR) (Shooting Menu)

Desired setting = Normal. To adjust, press “Menu” and select “Shooting Menu → High ISO NR”. Select “Normal” and press the “OK” button.



Figure 11. Nikon D800/D810: Shooting Menu high ISO noise reduction options.

5.1.1.2.6 ISO sensitivity settings (Shooting Menu)

Desired settings for shoulder height and ground-level cameraPosition:

- Minimum shutter speed = 1/30 s
- Maximum sensitivity = 12,800 (Hi1).
- To adjust, use the “Multi-Selector” and press the “OK” button on the desired settings.

Desired settings for extended monopole cameraPosition:

- Minimum shutter speed = 1/250 s
- Maximum sensitivity = 12,800 (Hi1)

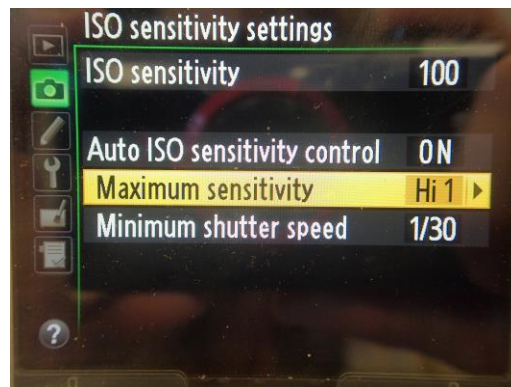


Figure 12. Nikon D800/D810: Shooting Menu ISO sensitivity settings menu.

5.1.1.2.7 Image Backup with Two Memory Cards

Desired setting for secondary card slot:

- Backup: Each picture is recorded to both the primary and secondary card slots
- To select:
 - Navigate to the ‘Secondary slot function’ option in the Shooting Menu.



- Choose 'Backup' and select.

5.1.1.2.8 Autofocus(Custom Settings Menu)

- Option "a2" (AF-S priority selection):
 - Option "a2" must be set to "Focus" in order for a 'beep' to be heard when the camera achieves focus lock when autofocus is turned on.

5.1.1.2.9 Metering and exposure (Custom Settings Menu)

- Option "b1" (ISO sensitivity step value):
 - Set to a value of "1/3". This allows finer control over exposure via ISO settings.
- Option "b2" (EV steps for exposure cntrl):
 - Set to a value of "1/3". This allows finer control over exposure via changes to shutter speed and aperture.

5.1.1.2.10 Time zone and date (Setup Menu)

The following settings must be adjusted:

- Time Zone
- Local time and date
- Date format = Y/M/D
- Daylight savings time – i.e. ON/OFF depending on time of year



Figure 13. Nikon D800/D810: Setup Menu options for timezone and date.

5.1.1.2.11 Image auto-rotation (Setup Menu)

Desired setting: Auto-Rotation = OFF. Required in order to force all captured images to Landscape orientation for compatibility with CanEye analysis. To adjust, use the multi-selector to navigate to "SETUP MENU → Auto image rotation → OFF" and press the "OK" button.



5.1.1.2.12 Customizing “My Menu”

Any settings for which quick access is desired can be added to the customizable “My Menu” screen (image below). To add a setting to “My Menu”,

1. Press “Menu”, then select “My Menu → Add items” (image below).
2. Scroll through the available settings menus until you find the setting you want to add to “My Menu”.
3. With the setting highlighted, press the “OK” button.
4. Press “OK” again. The “My Menu” screen should now be modified.



Figure 14. Nikon D800/D810: My Menu customization.

5.1.2 Settings Adjusted in the Field

5.1.2.1 Exposure mode

To adjust, press the Mode button, and rotate the primary wheel until the top LCD shows the desired mode (A or M, depending on camera orientation that will be used).



Figure 15. Nikon D800/D810: Setting the desired Exposure mode.

5.1.2.2 Auto focus mode (downward-facing photos)

Desired setting = AF-S Auto. To adjust,

1. Move focus switch to “AF”, then press and hold the button in the middle of the switch (below left).
2. Spin the primary and secondary wheels so the top LCD reads “AF-S” with “auto” above (below right).



Figure 16. Nikon D800/D810: Configuring focus mode to auto-focus for downward-facing photos.



5.1.2.3 Manual focus mode (upward-facing photos)

Desired setting = Manual. To adjust, set the focus switch to “M” (below left), and rotate the focus ring on the lens to “∞” (below right).



Figure 17. Nikon D800/D810: Configuring focus mode to manual for upward-facing photos.

5.1.2.4 ISO (sensor light sensitivity)

- *Downward-facing DHPs:* Desired setting = “ISO-auto”, initial ISO = 100. To adjust, press the “ISO” button on the left control knob (below left), then rotate the secondary wheel until “ISO-auto” is displayed (below right). Then, still pressing the “ISO” button, rotate the primary wheel until ISO = 100 is displayed in the top LCD.
- *Upward-facing DHPs:* Desired setting = “ISO” (manual), initial ISO = 400. To adjust, press the “ISO” button on the left control knob (below left), and rotate the secondary wheel until “ISO” is displayed (not “ISO-auto”). Then, still pressing the “ISO” button, rotate the primary wheel until ISO = 400 is displayed in the top LCD.



Figure 18. Nikon D800/D810: Configuring ISO settings for downward- and upward-facing photos.



5.1.2.5 Manually adjusting exposure with the Exposure Control meter

1. Look through the viewfinder to ensure the camera is metering the exposure for the scene you wish to capture.
2. Use the 'Primary wheel' to adjust the shutter-speed, and the 'Secondary wheel' to adjust the aperture until the image is properly exposed.
 - a. As you adjust the Primary and Secondary wheels, you will notice the Exposure Control meter at the bottom of the viewfinder moving left and right (see below, red circle).
 - b. The image is properly exposed when the exposure control indicator is centered.

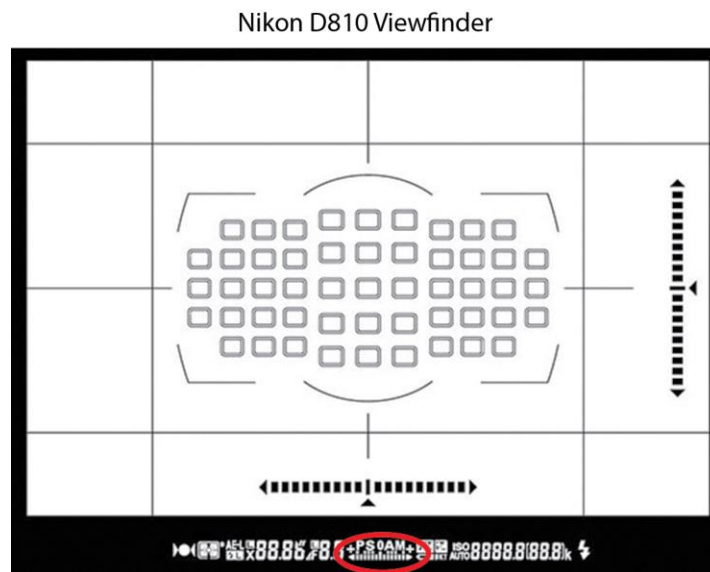


Figure 19. The Nikon D800/D810 viewfinder; the exposure control meter is circled in red.

5.2 Configuring the Nikon D750

The Nikon D750 must be configured appropriately in order to take satisfactory images for LAI analysis with the CanEye software.

5.2.1 Settings Adjusted Prior to Field Work

There are several suites of settings that need to be adjusted prior to shooting, and these can be grouped into a few general categories:

- Settings adjusted with physical buttons and knobs
- Settings adjusted with the camera software (playback, shooting, custom setting, and setup menus).
 - The camera software on the D750 is largely identical to that of the D800/D810.



- Reference software instructions in Section 5.1.1 above for software configuration steps.
- A customizable menu called “My menu” can also be modified so that frequently adjusted settings are readily available.

5.2.1.1 Settings Adjusted with Physical Buttons and Knobs

5.2.1.1.1 Shutter release mode


Single shot (S) is the desired shutter-release mode for collecting most DHPs. To adjust:

1. Press the button near the left control knob (left red circle), and
2. Rotate the outer-ring of the control knob until “S” is selected (right red circle).



Figure 20. Nikon D750: Setting the shutter-release mode.

Self timer mode will allow up to 20 seconds to elapse between when the shutter-release button is pressed, and when the camera trips the shutter. This mode may be useful when using the monopod in some circumstances. To adjust:

1. Press the release button near the left control knob (**Figure 1, left**). *Figure 1, left*.
2. Rotate the outer ring of the control knob until  is selected.
3. To select the length of the shutter-release delay:
 - a. Press the “Menu” button on the back panel of the camera, and navigate to the Custom Settings menu (pencil icon on the left).
 - b. Use the multi-selector to navigate to “c3: Self-Timer”, then select “Self-timer delay”.
 - c. Select from either 2, 5, 10 or 20 seconds, then press “OK”.



Remote control shutter release is required for collecting downward-facing images with the Extended Monopole. **Note:** Self-timer settings are ignored when using the remote control shutter release. To configure the D750 to work with the Nikon wireless remote shutter release (model ML-L3):

1. Press the “Menu” button on the back panel of the camera, and navigate to the Photo Shooting menu (camera icon on the left).
2. Highlight and select “Remote control mode (ML-L3)”.
3. Choose a remote control mode, then press “OK”.
 - a. For Extended Monopole image collection, select the ‘2s Delayed remote’ mode. This mode should allow enough time for the person holding the remote to move out of the photo.
4. Aim the remote at the infrared receiver on the front of the camera (**Figure 21**).
5. Press the button on the remote half-way to focus, and all the way to initiate the 2 s delay and trip the shutter.
6. If no photo is taken, or if too much time elapses, the “Remote control mode (ML-L3)” setting chosen in step (2) will automatically return to “Off” to save battery power.



Figure 21. Nikon D750: Front-side infrared sensor (red circle) for wireless shutter release.

5.2.1.1.2 Image quality

Desired setting = RAW. To set the image quality to RAW, press and hold the QUAL button (circled below), and rotate the primary wheel (circled upper right on camera) until RAW is displayed on the rear LCD.



Figure 22. Nikon D750: Configuring image quality settings.

5.2.1.1.3 White balance

Desired setting = AUTO. To adjust, press and hold the “WB” button on the back of camera (below), and rotate the primary wheel until the AUTO setting is displayed on the large LCD.



Figure 23. Nikon D750: Configuring white balance settings.



5.2.1.1.4 Bracketing

Desired setting = OFF. To adjust, press and hold the 'BKT' button (circled below). The rear LCD will show "OF" toward the top-center. Rotate the primary wheel until 'number of shots' = 0; the letters 'BKT' should be absent from the top LCD.



Figure 24. Nikon D750: Toggling bracketing on and off.

5.2.1.1.5 Metering mode

Desired setting = Matrix Metering. To adjust, press metering button (circled below) until matrix metering symbol is displayed on LCD screen (same square symbol as on button).



Figure 25. Nikon D750: Configuring the metering mode.



5.2.1.2 Settings Adjusted with Software Menus

- The camera software on the D750 is largely identical to that of the D800/D810.
- Reference software instructions in Section 5.1.1 above for software configuration steps that are required prior to field work.

5.2.2 Settings Adjusted in the Field

5.2.2.1 Exposure mode

To adjust, press the button on the left / top control wheel, and rotate the wheel until the top LCD shows the desired mode (A or M, depending on camera orientation that will be used).

5.2.2.2 Auto focus mode (downward-facing photos)

Desired setting = AF-S Auto. To adjust,

1. Move focus switch on lower front left of camera to “AF” (**Figure 27**), then press and hold the button in the middle of the switch.
2. Spin the primary and secondary wheels so the top LCD reads “AF-S” with “Aut” on the right (below).



Figure 26. Nikon D750: Top LCD display when camera is configured for single-servo auto-focus auto-mode, where the camera software automatically determines which of the 51 available focus points are used to focus the lens on the subject.



5.2.2.3 Manual focus mode (upward-facing photos)

Desired setting = Manual. To adjust, set the focus switch to “M” (below left), and rotate the focus ring on the lens to “∞” (below right).



Figure 27. Nikon D750: Focus mode switch, with auto-focus selector button in middle of switch.

5.2.2.4 ISO (sensor light sensitivity)

- *Downward-facing DHPs:* Desired setting = “ISO-auto”, initial ISO = 100. To adjust, press the “ISO” button (below left), then rotate the secondary wheel until “ISO-auto” is displayed. Then, still pressing the “ISO” button, rotate the primary wheel until ISO = 100 is displayed in the top LCD.
- *Upward-facing DHPs:* Desired setting = “ISO” (manual), initial ISO = 400. To adjust, press the “ISO” button (below left), and rotate the secondary wheel (on front) until “ISO” is displayed (not “ISO-auto”). Then, still pressing the “ISO button, rotate the primary wheel until ISO = 400 is displayed in the top LCD.



Figure 28. Nikon D750: Configuring ISO sensitivity settings.



5.2.2.5 Manually adjusting exposure with the Exposure Control meter

1. Look through the viewfinder to ensure the camera is metering the exposure for the scene you wish to capture.
2. Use the 'Primary wheel' to adjust the shutter-speed, and the 'Secondary wheel' to adjust the aperture until the image is properly exposed.
 - a. As you adjust the Primary and Secondary wheels, you will notice the Exposure Control meter at the bottom of the viewfinder moving left and right (see below, red circle).
 - b. The image is properly exposed when the exposure control indicator is centered.

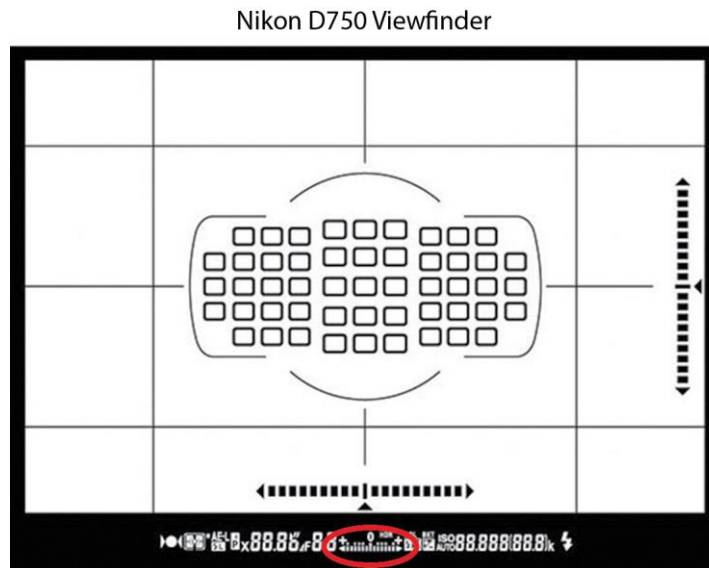


Figure 29. The Nikon D750 viewfinder; the exposure control meter is circled in red.

5.2.3 Quick recall of configured settings

The Nikon D750 has the ability to save frequently used settings, and once saved, these settings can then be instantly recalled using the 'U1' and 'U2' positions on the main mode dial. To speed (re-) configuration of the D750 for upward- and downward-facing photos:

- Upward-facing photos:
 - Set exposure mode to 'M'
 - Set initial recommended shutter-speed, aperture, and ISO
 - Set focus mode to manual
 - Save to settings to 'U1'.
- Downward-facing photos:
 - Set exposure mode to 'A'



- Set initial recommended shutter-speed, aperture, ISO
- Set focus mode to 'auto' as described above
- Save settings to 'U2'.

To save settings to 'U1' or 'U2':

1. Make the desired settings adjustments as indicated immediately above, and as described in previous sections.
2. Save user settings:
 - a. Press the **Menu** button
 - b. In the **Setup** menu (wrench symbol), highlight **Save user settings**, and press ► on the multi-selector pad.
 - c. Select **Save to U1** or **Save to U2**, and press ►
 - d. Select **Save settings**, and press **OK**.

To recall settings assigned to 'U1' or 'U2':

1. Set the focus switch to 'M' for upward-facing photos, or 'AF' for downward-facing photos.
2. Rotate the mode dial to the 'U1' or 'U2' position.

5.3 Lenses

5.3.1 Nikkor 16 mm Fisheye f/2.8

Fisheye lens f-stop ring

Newer models of the Nikkor 16mm Fisheye lens may have a manually-adjustable f/stop ring, and a switch that toggles manual lens control versus control through the camera body. We wish to maintain control of f/stops through the camera body. To do this:

1. Rotate the f/stop ring on the lens to f/22 (the "f22" text printed on the lens should be red).
2. Toggle the lens switch to the red dot. This will prevent further manual movement of the lens f/stop ring, and allow changes to f/stops to only occur via the camera.