

Use of Miles Eye Camera – Central & Adjustable Side Lighting (MEC-5-CASL-D3200-N85)

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Use of MEC-5-CASL-D3200 Iris Camera

A. Contents of the Camera Carry Case – MEC-5-CASL-D3200-N85



- Contents
- 1. Camera with macro lens
 - 2. Illuminator
 - 3. Alignment Target w/Protractor
 - 4. Zoom Lens
 - 5. Camera Battery Charger
 - 6. Cord Compartment
 - 6a. Camera batteries
 - 6b. Camera USB cord
 - 6c. Camera A/V cord
 - 6d. SDHC memory card (16GB)
 - 6e. USB Card Reader w/cord
 - 6f. Lens rear cap/body cap
 - 6g. Spare batteries (focus light)
 - 6h. #0 screwdriver (for battery case)



B. Preparing the Iris Camera for Use – MEC-5-CASL-D3200-N85

1. Open Camera Carry Case by pressing the button and lifting up each latch.



2. Remove the camera from the foam padding and set down.



3. Lift Illuminator out of foam-padded case



7. Place illuminator onto lens at the 9:00 position (Flash is in the up position, Mode=A):



8. Rotate Illuminator 90 degrees until it snaps into place at 12:00 position:



9. Rotate focus light power control clockwise to switch it on:



10. **Your camera is now ready to take iris pictures.** When complete with the photography, reverse these steps to put the camera away.

11. When storing the CASL Illuminator, the unit must be set for **Center Lighting** to fit into the foam cutout in the carry case. This is where the illuminator sliding shutter is in the center position:



C. Using the 3-Channel Illuminator Shutter

1. To switch from Center to **Left Side Lighting (for RIGHT EYE)**, slide the shutter to the right:



2. To switch from Center to **Right Side Lighting (for LEFT EYE)**, slide the shutter to the left:



3. To switch back to **Center Lighting**, slide the shutter back to Center position



4. For best results when using **Side Lighting**, have the light coming from the **temporal (lateral) direction**, so for Right Eye, have the light from the left (as you face client; for Left Eye, have the light coming from Right).



Position for Right Eye Side-Lighting



Position for Left Eye Side-Lighting

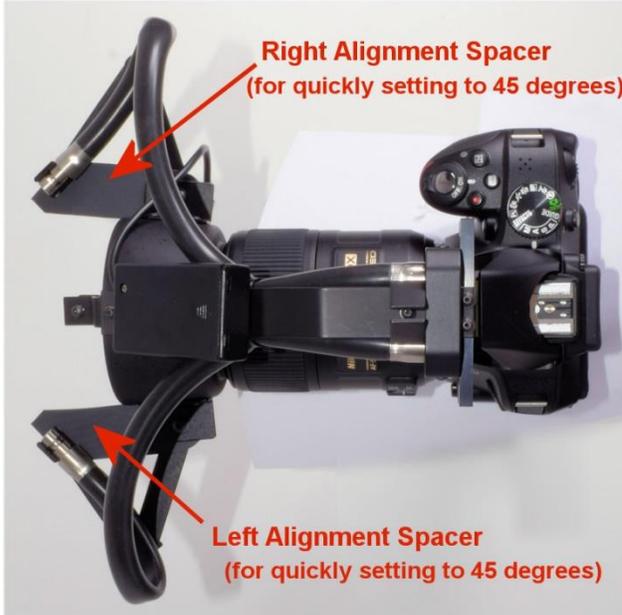
5. For “flat” or uniform illumination, use the **Central Lighting** position. This is the setting when the shutter is in the center position:



When storing the illuminator in the carry case, always return the shutter to this center position.

D. Setting the Angle of Illumination

1. The Adjustable Side-Lights include an Alignment spacer to make it easy to set the angle to the reference 45-degree position:

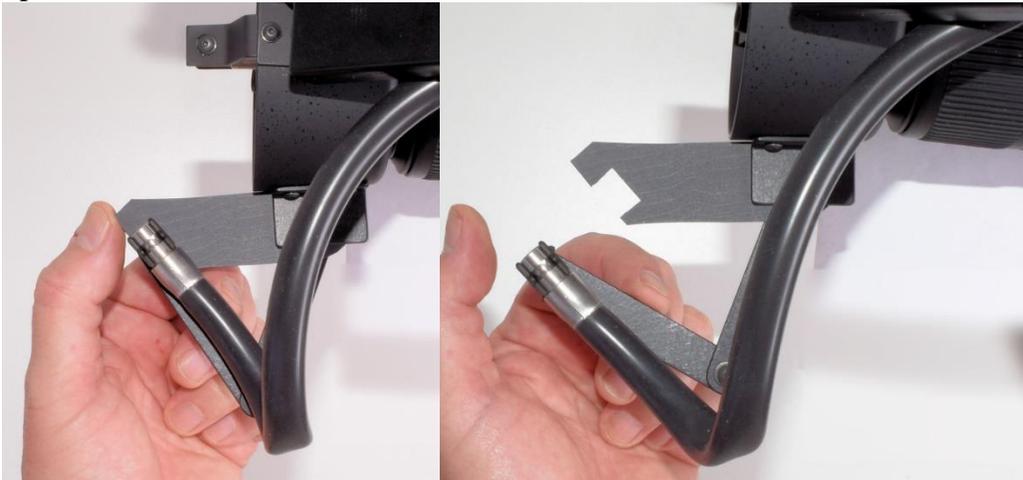


2. To change the angle to another setting, the first step is to loosen the 3 wingnuts on each side that is to be changed:

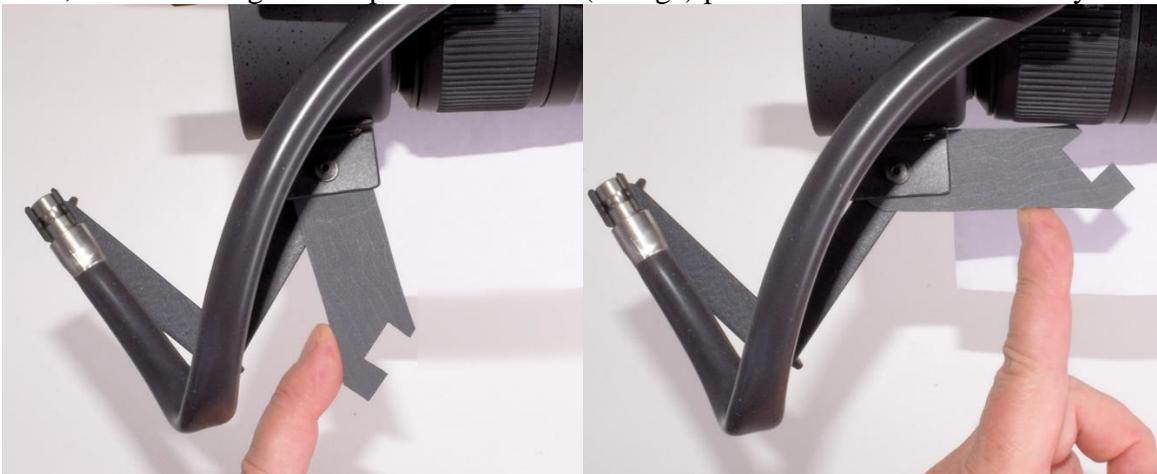




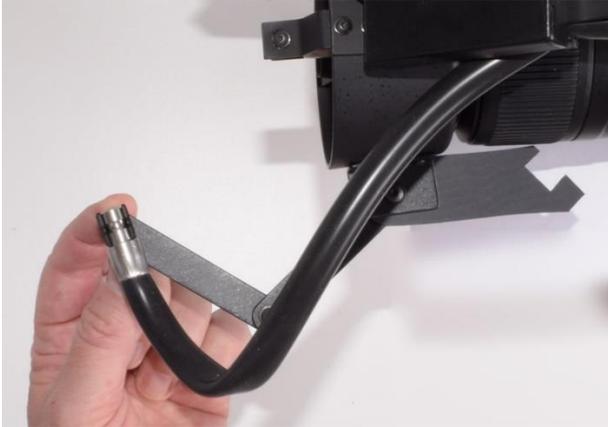
3. After loosening the 3 wingnuts, pull the output end of the lightguide away from the Alignment Spacer:



4. Next, rotate the Alignment Spacer to the rear (storage) position so it is out of the way:



5. Then Position the Lightguide output end where you want it to be:



4. You can choose any angle and distance from the iris. When it is in the correct position, tighten all three wingnuts on this side.

Using the Alignment Target with Protractor

1. For best results, use the Alignment Target with Protractor (enclosed in the carry case):



2. The Alignment Target is stored under the front of the illuminator, and can be lifted straight up to remove it from the foam holding it. When storing it back into the carry case, be sure to insert it prior to placing the illuminator into its compartment. The outer sides of the protractor fit into slots that are cut into the foam to hold it securely.
3. The Alignment target attaches to the bottom of the lens-hood via a magnetic mount. To attach it, bring it near the lens hood at the 6:00 position and allow it to snap into place:



4. When it is attached correctly, the Alignment Target will be centered and vertical.
5. The recommended distance for the output ends of the lightguide is 3.25 inches (83mm) from the iris:



6. Be sure to set the angle of the front end so the lightguide is pointing straight at the focus point (center of the protractor).

E. Getting Correct Exposure

Using Auto-Exposure (Recommended)

1. The camera is shipped with **Auto-Exposure**, via the Control for Built-in Flash set to the TTL (Through-the Lens) setting in the Set-Up Menu. In this auto-exposure mode, the flash will automatically be adjusted for a good exposure. The aperture should be in the range of f/16 to f/22.
2. This camera-lens-illuminator is optimized for autoexposure photography of the iris; it is especially easy to take consistently good iris images when using the Auto-Exposure Flash Mode. In this mode the flash power is adjusted by the camera to give a suitable exposure regardless of the aperture setting.
3. There is a tradeoff between the sharpness of a lower aperture such as 5.6 thru f/20 (sharpness improves with a lower f/number) due to less diffraction blurring when the aperture is at the lower number, and the depth of field, which becomes so small to get the entire iris in focus when the aperture is less than f/16. Consequently the best overall sharpness for iris photography is between f/16 and f/25.
4. With Auto-Exposure you can dial in whatever aperture you want, but best results will be found within this range of f/16 and f/25. Miles Research recommends f/22 for iris photography.
5. For sclera photography, having the larger depth of field is very important in order to get the entire visible surface of the sclera (including the bulbar conjunctival vessels) in focus, so the recommended aperture for scleral photography is the maximum aperture value – normally (with the 85mm lens) at f/45.

Using Manual Exposure (for the Advanced User)

6. It is also possible to use **Manual Exposure** where the aperture can be adjusted through a range of values and the best exposure later selected from the series of photos. To see how the camera settings can be changed, see Section M, Reference for Nikon D3200 Camera Settings (page 35).

F. Getting Correct Focus

Using Fixed Focus (Recommended)

1. For best results, use **Fixed Focus** mode, which is where the lens is set to its minimum (closest) focus, and the whole camera-lens is moved closer or further from the iris until proper focus is viewed in the viewfinder.
2. For using **fixed focus**, the lens is set to the **M** setting and the lens focus is dialed to a **minimum focus** (rotate focus ring all the way to 1:1, the opposite end from the “infinity” symbol), which is about 0.286 meters or 11.25 inches (as measured from the subject to the image sensor plane).
3. Hold the camera up to the client’s eye, and while viewing through the viewfinder, move closer or further from the eye until the image is sharply in focus, then take the picture.
4. It is also possible to use **manual focus**. For using **manual focus**, the **lens switch** is changed from the M/A setting to the **M** setting. The focusing is accomplished by rotating the focus ring of the lens until the iris is in focus as viewed through the viewfinder. The downside to this method is that the images will not all be at the same magnification.

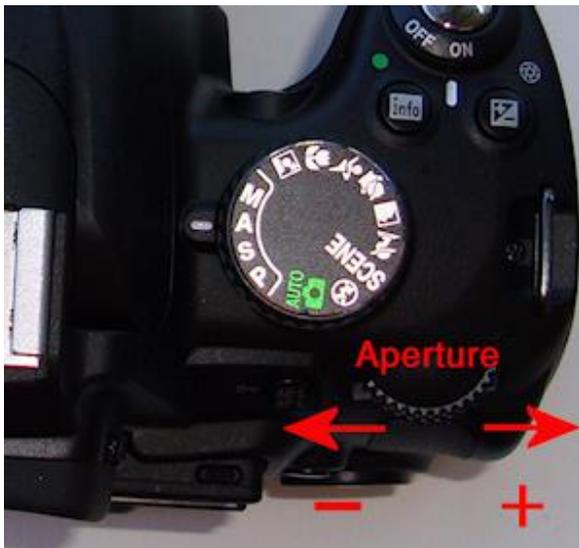
Using Auto-Focus (for the Advanced User)

5. This camera-lens-illuminator can also be used for autofocus photography of the iris, however the autofocus is not as reliable as your own focusing. Use of Auto-Focus works fairly well with the blue iris but often does not work with the brown iris.
6. Using Auto-Focus effectively requires considerable skill and experience and should be considered only by the more experienced iris photographer.

For imaging animal iris, it is usually best to use autofocus.

Setting the Viewfinder Focus (very important for all users)

7. Use the main command dial at the upper rear of the camera for **adjusting the aperture**.



The Main Command Dial is operated with the right thumb and is used to adjust aperture. Normally, the best practice is to take 3 or 4 pictures of each iris, each picture shot with a different consecutive aperture.

The **aperture dial** (situated where the right thumb would be when holding the camera with the right hand) is changed by the thumb; clicking the wheel **inboard (to left)** **decreases** aperture number and clicking the wheel **outboard (to the right)** **increases** it. Larger aperture values mean smaller aperture diameter -- less light will be allowed in. Images with higher f/numbers will be darker than those taken with lower f/numbers

7. **IMPORTANT: Adjust the Eyepiece Dioptric setting. (Initial Setup Only)** This is a small rotary switch to the right of the viewfinder that can go up or down through several positions, and is designed to match the viewfinder optics to your vision. When this is set: if you see the subject in focus, the camera sees it in focus. If you normally wear corrective lenses, always wear them when taking a picture. To make this adjustment for your eye:



How to Set Eyepiece Focus

1. Move the rotary switch to one end of the range (all the way up or down).
2. Look through the viewfinder at a bright surface (such as a white wall) that is in the distance (this white surface should appear blurry).
3. While viewing through the viewfinder, move the switch up and down through the range of positions until you can **see the black brackets ([]) in the viewfinder with maximum clarity and focus.**
4. Note the optimal position of this switch for your vision, and **always use this setting.** Once you set it for your eye's vision, you do not need to change it. If someone else uses the camera, they need to find the correct setting for their vision (and when you resume using the camera, you need to return this switch to the setting you found for your vision).

G. Using the Camera for Non-Iris Photography

1. **Note:** for general photography, use the enclosed Zoom lens (18-55mm). You may also use any Nikon autofocus lens that has a built-in motor (AF-S and AF-I).
2. **For general photography** using the included zoom lens, switch the top Mode dial to **AUTO**:

For Iris Photography:

Mode Dial set to **A** (Aperture Priority):



For General Photography:

Mode Dial set to **AUTO**:



3. When you return to iris photography, switch the top Mode dial back to **A** (A=Aperture Priority), and mount the 85mm macro lens-illuminator.

H. How to Take Perfect Iris Pictures

1. Be sure the client is comfortably seated and relaxed.
2. If a chinrest is not used, have the client open their own lids by putting the index finger touching the thumb up to the closed eye (using the arm on the same side of the eye being photographed), and then separating the index finger and thumb while holding them against the upper and lower lids respectively. Often this method is helped by having the elbow of this arm on a table.



The client covers the eye not being photographed with one hand and separates the lids with the other.

3. Have the client place the free hand (opposite of the iris side being photographed) over the opposite eye so as to prevent looking through it. Due to the fact that people have eye dominance (preferring to use one eye more than the other), it is important to have the client only looking through the eye being photographed, and looking straight into the camera lens. If people do not cover the opposite eye, they tend to look around the room with the uncovered eye, causing the eye being photographed to wander. Often it is helpful to have the client spread apart the eyelids with the index finger and thumb.
4. The client will see a small reflection of their eye in the camera lens, and may be guided to observe this in order to maintain correct positioning. Ask the client to observe the reflection of their eye in the camera lens. This will ensure the client's eye is lined up with the camera. Often it is helpful to have the client spread apart the eyelids with the index finger and thumb. An alternative method (if lid retraction is not needed) is to have the client put the chin on the palm with the elbow on the table.

For the right iris picture, the right arm is used for support this way, and for the left iris picture, it is reversed.

5. If a chinrest is used, adjust the height so the center of the iris is about 1" (25mm) below the bottom of the forehead rest.



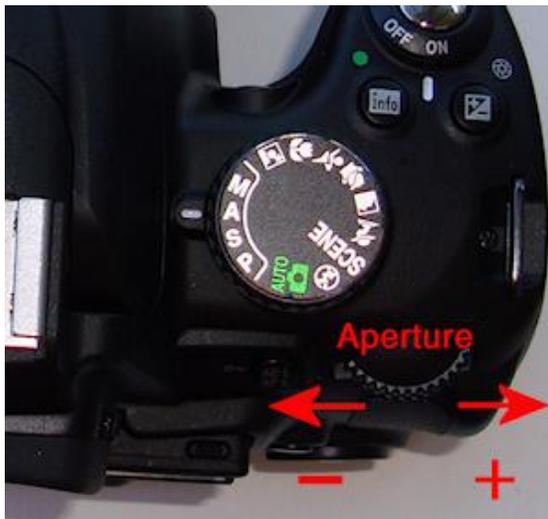
When a chinrest is used, lid retraction can be accomplished using two 6" cotton swabs in one hand to separate lids.

6. Bring the camera (with focusing light switched on) into alignment with the center of the iris by panning in from the lateral side. For handheld photography, it is best for the photographer to have both elbows on the table and the left hand supporting the lens. If a table is not available, the photographer can brace the camera with both elbows pressing on anterior ribs.



7. When pointing the camera (with the focus light on) at your client's eye, be conservative about exposing the client to the focus light. One wants to get nearly in position first with the light shining just past the client's face temporal to the eye or above it, pointing at the forehead, at the approximate range. The eye camera will focus at 3" away from the front illumination cone.
8. Using Fixed Manual Focus Mode: With one or both elbows on the table, rock toward or away from the client's eye (fractions of an inch here) until the image is sharp in the view finder. Focus on the collarete. You can normally get good camera stability with just one elbow on the table.

9. After taking a photo, the image will play back on the screen for 1 minute (this setting can be changed). Before changing the aperture, press the shutter release (picture-taking button) halfway lightly to discontinue the image playback; the aperture wheel (main command dial in A mode) can then be rotated to go to the next aperture.
10. Always take all the right eye pics first then all the left eye pics. If you take scleral pics, start with the iris of that eye, followed by the four quadrants of the sclera (normally Left, Right, Upper, Lower).
11. Adjust the camera position until the pupil of the iris is centered on the viewfinder. With this type of 1:1+ photography, focus is accomplished by moving the camera toward or away from the subject.
12. Adjust focus until the image is **sharp around the collarette** at the four cardinal points.
- 13. Take picture.**
14. Check exposure. The image may appear differently on the computer monitor compared to the LCD viewer; angle of view and ambient light will affect the apparent brightness in both cases..
15. **For Manual Exposure Only: Use exposure bracketing by Aperture.** Normally, it is best to take a sequence of images of each eye, and bracket the exposure by using a range of aperture values. Typically for a blue iris the range would be 29, 32, 36; for a brown iris 20, 22, 25. Use increasing numeric aperture numbers for the right eye, then the same sequence but in decreasing order for the left iris.
16. To increase the exposure (**Manual Exposure Mode Only**), adjust the Aperture using the main (rear) Command dial. The aperture number is shown in the viewfinder and on the display.



The **aperture dial** is operated with the right thumb. You must **discontinue image playback first** (by pressing the picture-taking button lightly). Rotation to the right (“outboard”) will increase the aperture number (less light); rotation to the left (“inboard”) will decrease the aperture. To bracket your exposure, take the right eye (first) with apertures ranging upwards across 3 or 4 settings, then photograph the left eye with the aperture ranging downwards through the same settings.

For brown irises, the image should be overexposed to bring out the low-contrast detail.
 For Blue iris use aperture 29, 32, 36, 40, 45, or 51
 For Brown iris use aperture 18, 20, 22, 25, 29, or 32

I. How to Transfer Iris Images Using the Card Reader

Three Methods

There are three basic methods of getting the iris images into a computer.

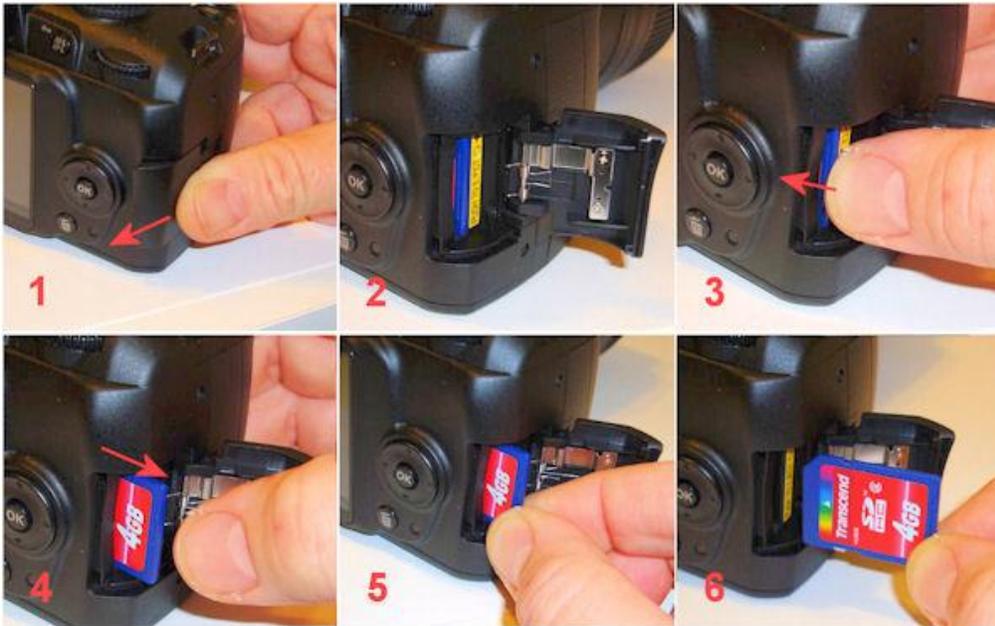
1. Eject the memory card and use a card reader with a computer to place the image files onto the hard drive. This is the simplest method, and can work with any computer or printer.
2. Attach the USB cord from the camera to the computer, and browse the memory card to select image files to copy. This method causes additional drain on the camera battery. The camera is basically being used as a card reader, and the transfer procedure is the same as Method #1.
3. Use a camera control program such as Nikon Camera Control Pro (\$180) while the camera is tethered to the computer via the USB cord. This method is best when using a chinrest, but it is also convenient even with handheld photography when the photography is being done right before a clinical review. One advantage of this method is that every captured image is stored on the hard drive and is never put on the memory card, *so there is no need for image transfer*. Another advantage is that *the newly captured image is immediately displayed* on the computer screen, where it can be reviewed for quality, focus, exposure, etc.

Method 1: Using the Card Reader

Removing the Memory Card From Camera

Start with the camera turned OFF.

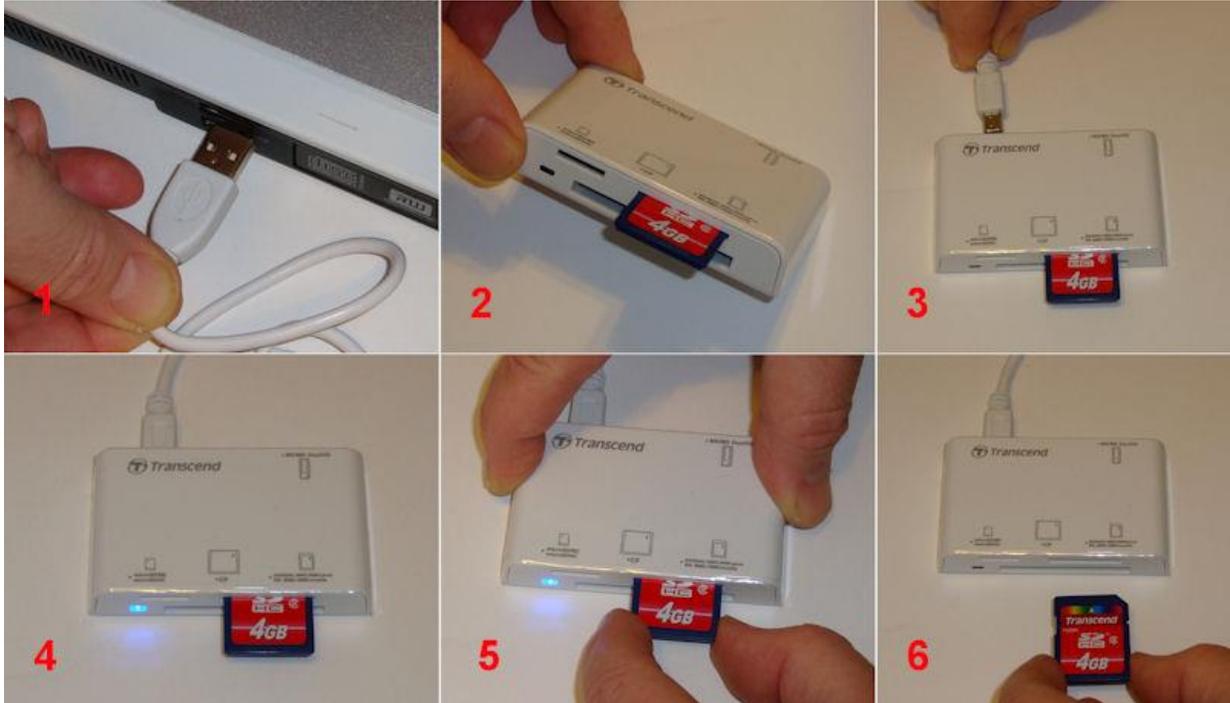
Note: as of 2011-04-20, the Nikon Camera Control Pro v.2.8 is **not** updated to work with the D5100.



1. Slide memory card door open by pushing it to the rear until it pops open
2. The SD card is visible
3. Push the card in slightly until it is unlocked and springs out
4. After pushing the card, it will now be released and protruding enough to grasp
5. Grab memory card and pull out
6. The card is now ready for the card reader.

Accessing the Memory Card Using the Card Reader

Start with the memory card reader unplugged.



1. Insert the white USB cord into the computer USB socket (Step 1)
 2. The SD Flash memory card socket is on the upper left of the front panel (Step 2)
 3. Plug the card reader's USB cord into the card reader's USB socket (Step 3)
 4. The blue light on the card reader will illuminate (Step 4)
 5. When complete with the transfer, discontinue the USB device (see below) and remove the card (Step 5)
 6. The memory card can now be returned to the camera (step 6)
-
7. The drive letters should show up in "My Computer" in a few seconds. Most Windows operating systems, including XP, Windows 7, Windows 10, will recognize the card reader without need of installing any driver from the mini-CD. When plugged in to a USB port, it shows the assigned drive letter.
 8. At this point the flash memory module can be opened up like any other folder on a disk drive. You can then copy pictures from the flash memory to the hard drive by dragging the filename/icons.
 9. Normally inserting a memory card will trigger a dialog box asking what you would like to do with the newly available drive letter. The simplest method is to open the memory card as a folder and drag image files over to a hard drive folder.
 10. Camera memory cards normally have a folder named DCIM (Digital Camera Image Memory). If the card is inserted into a camera it has never been in before, a new folder is created. For Nikon cameras, the folder is named something like 100D3200 (Nikon Camera D3200), and the image files have a prefix "DSC_" (Digital Still Camera). Other types of cameras may use slightly different file name prefix, or folder names, but they all will put new folders and files within the

top-level DCIM folder. You can store other folders and files on the memory card (normally at the root level), and the camera will disregard the extra folders.

11. IMPORTANT: When you are done transferring files via the USB memory card reader, you must be careful about how you disconnect it from Windows. First, close out any folders or programs (such as any picture viewer or browser window), so that nothing is referencing the memory card.
12. With Windows 2000 and Windows XP, you need to “Stop” the USB device by clicking a small icon in the lower right corner that has a green arrow on it.



- a. If you click it with the left button, a list of USB devices will pop up. Click on the “Mass Storage Drive” that has the drive letter associated with it.



- b. If you click it with the right button:
 - i. Click the popup “Safely Remove Hardware” with the left button.
 - ii. Select the Card Reader device (e.g. USB Mass Storage Device) and click Stop.
 - iii. Highlight the USB Mass Storage Device again and click Stop.



13. If the message complains that the folder is in use, check all folders, and even if it is not in use, click it again, possibly a third time. Then it will say it is safe to unplug your device. The LED light on the card reader will go off.
14. Disconnect the USB card reader from the computer.
15. Then remove the memory card.

Important – Card Usage:

- a. If you are using a card reader, close each window that is referring to the memory card, and any program that may be accessing it. Then go to the small icon tray at the lower right of the Windows toolbar (normally at the bottom of the screen) and left-click the icon with the left-pointing green arrow, then left-click the item in the list of USB devices that has 1 to 4 (depending on which card reader you have) drive letters. The most recently added USB device is usually at the top of this list.
- b. A message will pop up saying it is now safe to remove the USB device. Unplug the USB cord and then remove the memory card and re-insert it into the camera. If you do not see the USB icon with the green arrow, click the “<<” symbol to reveal all of the icons.
- c. If you are reading off the camera, the USB disconnection procedure may begin with the switching off of the camera.
- d. The camera must always be switched off when removing or inserting memory cards.
- e. Never switch off power or eject a card while data transfer activity is taking place.

Using The Card Reader – In Detail

Card Reader Disconnection In Detail – Multi-Slot Card Reader

Windows XP – Memory Card Reader Disconnection Procedure

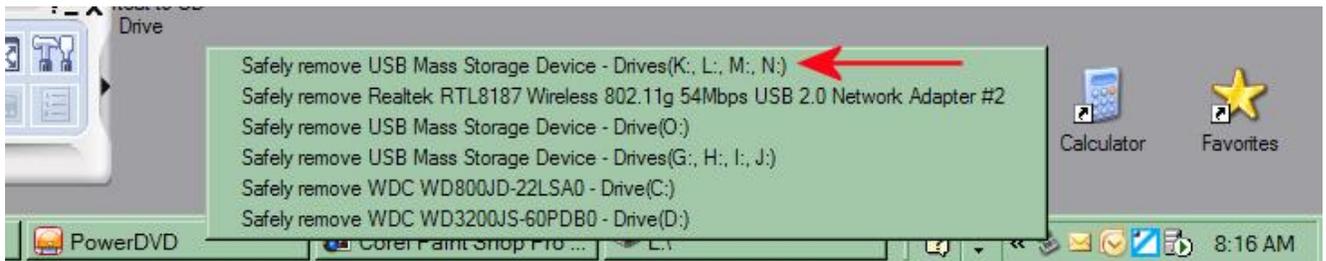
1. Close out all folders that reference the memory card reader drive letter. When closing a folder in Windows, pressing the shift key at the same time will also close all parent windows.
2. In the lower right part of the Windows XP Task Bar, locate the USB Device icon in the “Tray” area. If you see a “<<” symbol as seen below, click it once to reveal all the “Tray” icons:



3. Clicking this will expand the list of icons. Positioning the mouse pointer over the USB Device icon (has a green arrow) will display a help note saying “Safely Remove Hardware”:

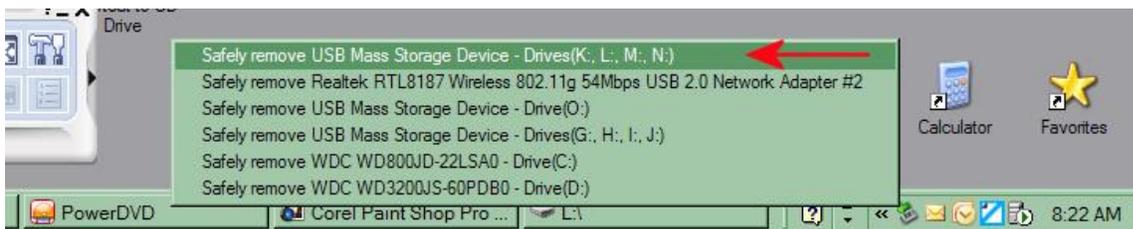


4. After clicking on the USB icon, a list of USB devices will pop up. Your computer may have quite a few USB devices attached and you need to know which drive letter corresponds to the Flash Memory Card. This will typically be the top line (most recent):



The Multi-Slot Card Reader will show up with 4 drive letters, even when some slots are empty, *except for Windows 7: only the socket containing a card will have a drive letter listed, and a different dialog box*. In this example, the lowest drive letter is the SD slot (second letter alphabetically is the CF slot).

5. Position the mouse over the top item with the drive letter corresponding to the Memory Card Reader (it becomes highlighted) and click this line as the menu item selection:



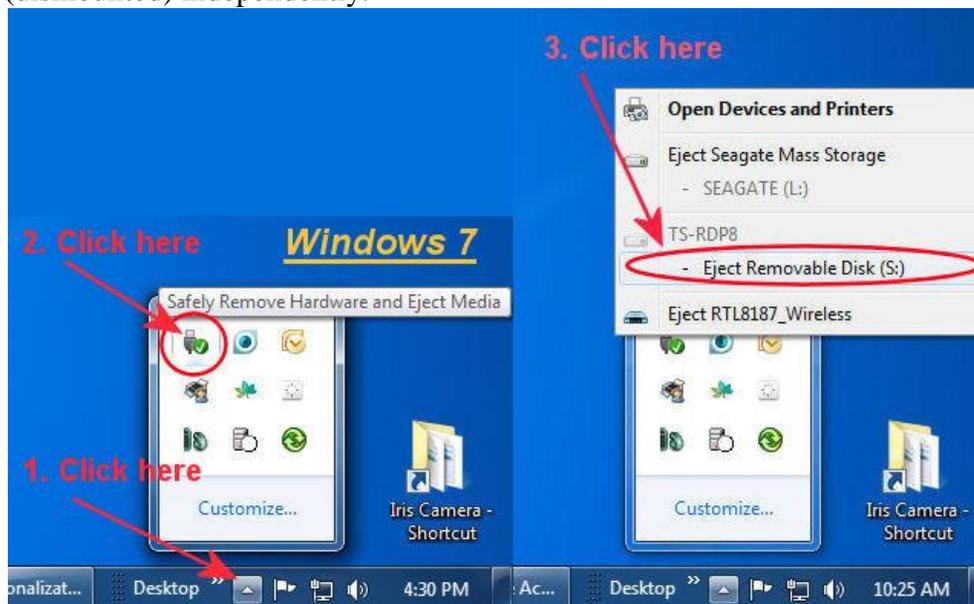
- The list will go away and a message will pop up indicating that it is “Safe To Remove Hardware”:



- After Clicking the Card Reader Device, The blue light on the Card Reader will go out, indicating that the power is no longer being supplied to the card reader and it is now safe to remove the card reader from the USB socket.

Windows 7 – Memory Card Reader Disconnection Procedure

- On Windows 7, the blue light does not go out, and the sockets are listed and “ejected” (dismounted) independently.



The procedure in Windows 7:

- Click the up-pointing arrow at the far left of the taskbar
 - Click the USB Disconnect icon
 - Click the “Eject Removable Disk” that corresponds to the memory card.
- In the above example using Windows 7, only the drive letter corresponding to the occupied memory card slot is shown, The Card Reader (depicted above) is the Transcend TS-RDP8, which has 4 different card slots.

J. How to Organize Eye Pictures

There are many possible methods of image management, but how best to download and organize a collection of eye pictures? I've been comparing the many ways of getting pictures from the camera, and different ways of storing them. This is a write-up of my current preferences in acquiring and organizing images from the digital eye camera. Image transfer is detailed here for Methods 1 and 2; a separate document details Method 3 (use of Nikon Camera Control Pro).

There are three basic methods of getting the iris images into a computer.

1. Eject the memory card and use a card reader with a computer to place the image files onto the hard drive. This is the simplest method, and can work with any computer or printer.
4. Attach the USB cord from the camera to the computer, and browse the memory card to select image files to copy. This method causes additional drain on the camera battery. The camera is basically being used as a card reader, and the transfer procedure is the same as Method #1.
2. Use a camera control program such as Nikon Camera Control Pro (\$180) while the camera is tethered to the computer via the USB cord. This method is best when using a chinrest, but it is also convenient even with handheld photography when the photography is being done right before a clinical review. One advantage of this method is that every captured image is stored on the hard drive and is never put on the memory card, *so there is no need for image transfer*. Another advantage is that *the newly captured image is immediately displayed* on the computer screen, where it can be reviewed for quality, focus, exposure, etc.

Step 1: Transferring Image Files to the Computer (Method 1 & 2: Using Card Reader/Camera)

1. After taking a batch of pictures, turn off the camera, eject the memory card and insert it into the card reader, then plug the card reader into a USB socket on the computer. ***Alternatively: Method 2 – Using the Camera as Card Reader:*** Attach the camera (powered off) to the computer with the Camera's USB cord. Turn on the camera.
2. The computer will ask what you want to do – which program you want to use to bring the images into the computer hard drive. It will raise a dialog box and normally, you select the last or second to last option, which is "Open Folder".
3. Select the Open Folder option, which has a yellow folder icon next to it and it will just open the memory card as a drive letter. You will first see a folder named "DCIM" (Digital Camera Image Memory). Open this, and you will see another folder named something like "100NCD50" or "101D3200" etc. Open this and you will see the list of image files. If the same card is used in different cameras, you will see a different folder for each camera. Create a destination folder with a name such as "2010-06-27 Iris – San Marcos" or "Iris Pics 20100627" etc. Drag the files from the source folder (on the memory card) to the destination folder (on the hard drive). To move the files instead of copying them, use a right-click drag, and then select "Move Here" instead of the default "Copy Here."
4. ***Alternatively:*** If you want to use software to transfer the image files (instead of just dragging them), I would recommend that you select the "Microsoft Scanner and Camera Wizard" since it has the best behavior and options. I do not bother with Nikon Picture Project but some people

find that it works well. The Microsoft Scanner and Camera Wizard is good at putting your image files into a logical place with conventional filenames. You can specify the directory name and the first part of the file name (left part), and it will use consecutive numbers to make the filename suffix (right part). I usually have it remove the pics from the camera at this time, because the default behavior is to download all the pics but leave a copy on the memory card, and the next time you have a new batch of pictures to transfer, you would not want to download the first batch again. The Wizard shows you a list of thumbnails of all the pics, with a checked checkbox by each one. When the Wizard is finished, just close out and then turn off the camera. It is now ready for the next batch and you disconnect the USB cable from the camera at this point. **For Advanced Users:** Alternatively, consider using Adobe Bridge and Camera Raw (part of Photoshop CS5) and work with the uncompressed NEF image file format.

Step 2: Selecting and Archiving Image Files on the Computer

5. Next, make a subfolder for each person using their last & first name as the folder name in proper case. Sometimes it is convenient to have the folder name prefixed with a 2-digit number that represents the sequence the clients were photographed in. I recommend using this filename convention (e.g. the first person is Jon Miles, and the folder name is either "Miles Jon" or "01 Miles Jon").
6. Then view the folder of downloaded pics in either Thumbnail mode or Filmstrip mode (Filmstrip mode is available only in Windows XP). The viewing mode is the second group of choices in the View menu in Windows. If the OS is XP and the top item is not "Filmstrip" then select the "Customize this folder" and specify "Pictures" for file type.
7. Sort the list of image files by name (which is also by time since the files are numbered sequentially in time) by clicking the Date Modified column header twice (once for Windows 7).
8. Select and drag groups of consecutive images corresponding to each client, into their corresponding folder.
9. Review the images in Filmstrip (Windows XP) or Thumbnail mode, and select the best image of each eye. In Windows Vista and Windows 7, use Windows Photo Gallery to browse, review, and select the images. I usually select images with the same aperture, and prefer the brighter images for the added detail.
10. Make a subfolder named "extra" in the client's folder and put all images in there except the selected right & left eye images.
11. A more advanced method: while browsing the sequence of iris images (in Filmstrip Mode, sorted by name), highlight the selected "best-overall" image, then copy and paste the file, then later rename the copy. When processing (selecting and renaming) a large number of image files, this method is best, since you can do all the select+copy+paste steps first (in filmstrip mode). Also it preserves the original image file of the selected best image, which can sometimes be useful. After this step, all the original image files for the client are in sequence, and after that would be the two copied files, with a name such as "Copy of DSC_01234.JPG" (Windows XP) or

“DSC_01234 - Copy.JPG” (Windows 7). The next step is to move all original image files into the “extra” folder and then do the renaming of the copied & pasted (selected) files.

Step 3: Renaming Image Files

12. For each selected image, rename the file with a format such as **LastName_FirstName_RE_20160706_01234.jpg** where “01234” are the original image file sequence number as set by the camera. Often it is convenient to retain this sequence number (as the last part of the file name) so as to have an index and reference to the original files. I archive all images (that are useable) from the camera for possible future reference, and the archive has the sequence numbering as the file name (e.g. “DSC_01234.JPG”), so it is easy to find other images taken at the same time.
13. Then open the image in a photo editor (such as Paint Shop Pro or Photoshop) and crop it down to the smallest rectangle that encloses the iris. This is saved with the same filename but a “c” at the end, prior to “.jpg” (c=cropped). Example: **LastName_FirstName_RE_20160706_01234c.jpg**
14. Next, adjust the image if necessary in terms of brightness and contrast, and save this version, adding an “e” (enhanced) to the filename. It is best to avoid this step by selecting images of matching brightness.
15. In some cases you may want to annotate the image with the client's name, eye (RE or LE) and date, and/or any other markings. Annotations can be done on a separate layer in programs such as Paint Shop Pro or Photoshop, then saved as both a layered image file and an exported JPG. Save this version with an “a” (annotated) at the end of the filename. So for example, if the image file (of e.g. my right eye) did not need enhancement and was processed, the resulting filename of the annotated image would be “Miles_Jon_RE_20100922ca.jpg”
16. **Alternatively:** the image can be left unannotated and the filename (which has the annotation data encoded into it) can be printed or displayed along with the image. Sometimes it is convenient to have the images in 2-up format (right and left cropped iris, side by side); the file name for this type of double-wide image file would be Last_First_2E_YYYYMMDD.jpg, etc.
17. If the client is provided with a CD, put the folder with their name (and all contents) onto the CD. Additional other info can be added onto the CD. Print a label for the CD using any CD disk label printing program, or just use a Word merge document template for CD Labels (available by email on request from info@milesresearch.com).
18. For most purposes (such as printing out a copy or emailing to the client), it is best to use the cropped and (optionally) annotated version of the image file. For best value, print one cropped-to-iris image on each letter-size sheet of premium glossy photo paper. The ink usually costs more than the paper, so it is best to use premium paper. Non-premium paper will have problems with the ink coming off or changing.

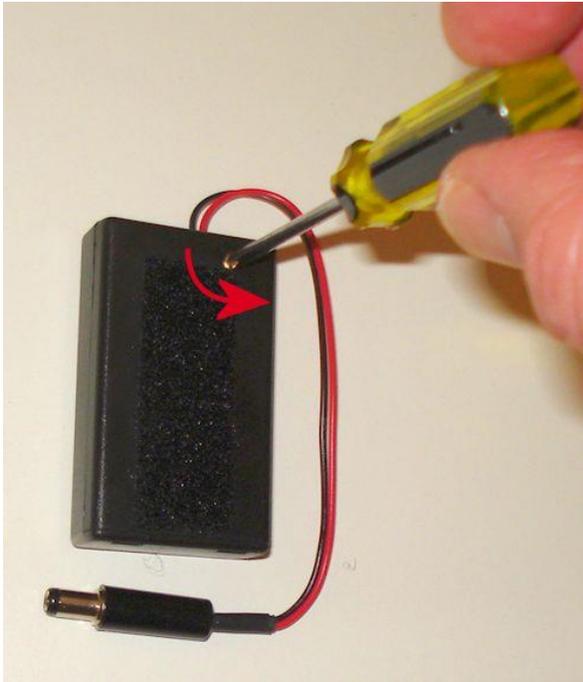
K. Camera Maintenance – Focus Light Battery Change

Focus Light Type 4 – AFL-1

(LED focus light with adjustable brightness)

Battery Change

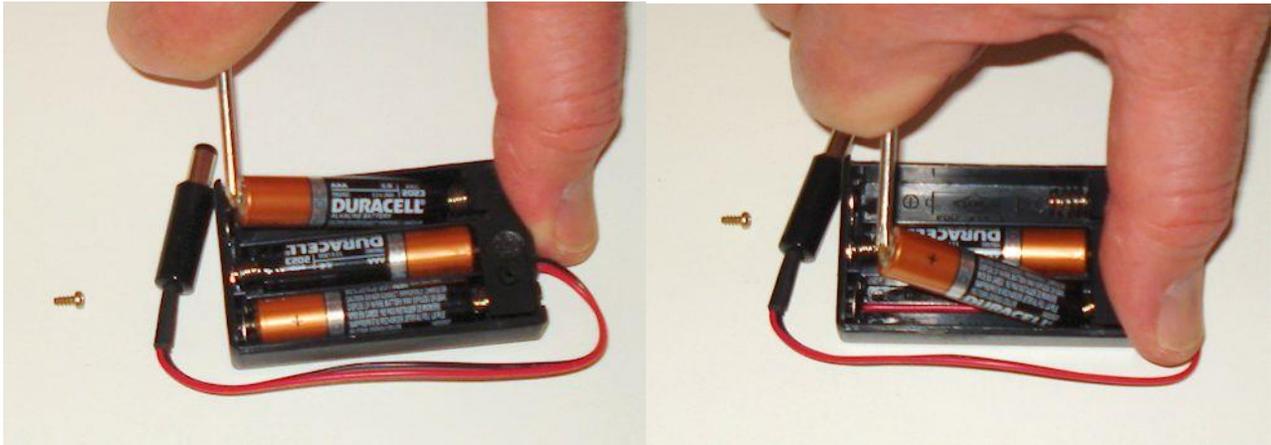
1. Remove the battery pack from the illuminator by separating it from the Velcro mount
2. Open the battery compartment by first removing the small Phillips screw (#1 size) near the edge of the Velcro:



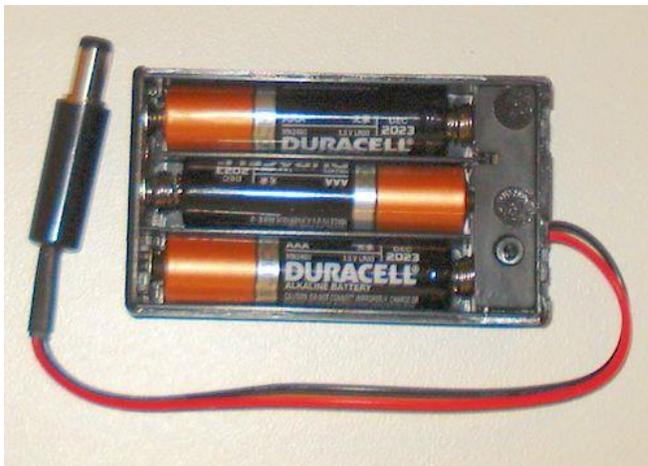
3. After removing the philips screw, slide the cover (the part with Velcro) in the direction of the screw hole. Press down slightly on the Velcro while sliding:



- Remove the 3 AAA batteries by prying them up at the (+) end (using the screwdriver):



- Have three (3) replacement batteries ready. The **battery type is AAA**.
- Put in the new batteries with the bottom end (negative) first



Replace the battery pack cover by sliding it back in place. Then replace the small Philips screw:



L. Reference for Nikon 85mm Lens Settings

A. Lens Settings – Nikkor 85mm VR Lens -- These steps are already done in manufacturing.

1. For using Autofocus: set the lens switch to **M/A**.
2. For using Manual or Fixed Focus: Put the lens in Manual Focus Mode
Set the lens setting to **M** (to the right, toward the lens mount). Set the lens to minimum focus and **always** keep it on minimum focus (closest focus is 0.286 m, 1:1).



3. Put the lens in **Non-VR** mode: the bottom switch for **VR** should be set **OFF** (to the right, toward the lens mount). This setting is not critical, but VR is not useful for flash photography so it may as well be disabled.

B. Using other lenses for General Photography – Nikon D3200

For general photography, remove the lens-illuminator assembly and attach another lens such as a zoom (the 18-55mm lens that is included in the kit), wide-angle, or macro lens.

C. Camera Switch Settings – Nikon D3200 –

When using the zoom lens, normally set the Mode to **AUTO**:



Set Mode Dial to **A** (Aperture Priority) for **Iris Photography**; Set to **AUTO** for **General Photography**

M. Reference for Nikon D3200 Camera Settings

For Iris Photography

Camera Switch Settings – Nikon D3200/D3300

1. Be sure that the Mode is set to **A** (Aperture-priority) for all iris photography.



Set Mode Dial to **A** (Aperture Priority) for **Iris Photography**; Set to **AUTO** for **General Photography**

Camera Menu Settings – Nikon D3200

Note: These steps are already done in manufacturing and are described here for reference. Only the two critical (required) steps are given in this list (Steps 2 and 3).

1. **View/Edit Menu Settings:**

- a. With camera switched on, press the Menu button
- b. Press left arrow to go to left vertical Navbar and select the second icon (camera) for Shooting Menu; Press Right Arrow to enter the submenu.

2. Set the camera's **White Balance to Flash:**

- a. Press the Down arrow; go down to White Balance
- b. Enter the submenu by pressing the right-arrow on the command disc
- c. Press Down Arrow until "Flash" is highlighted, then Press the OK button twice to confirm setting.

3. For non-Auto-Exposure: Put the camera in **Manual Flash Mode:**

- a. Press the Down arrow repeatedly to go down to Built-in flash; Press OK for submenu.
- b. Move down the submenu using the command disc and highlight **Manual** ; Press OK for submenu.
- c. Select **Full** – for full flash power; Press OK to confirm setting and exit submenu.
- d. *For less light*, select $\frac{1}{2}$ or $\frac{1}{4}$ power.

Note: If you want to use the larger apertures (e.g. f/8 thru f/16) to operate closer to the optimal performance point of the lens (5.6-8), then set flash power to 1/8.

4. For Auto-Exposure: Put the camera in **TTL Flash Mode:**

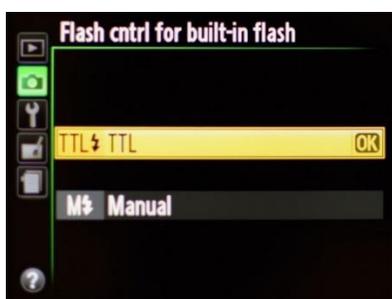
The main setting to check/set is the **Flash control for built-in flash**. It can be set to **Manual** or **TTL** (Through-The-Lens metering). In the past, most Miles Eye Cameras have been set to **Manual Flash - 1/2 Power**.



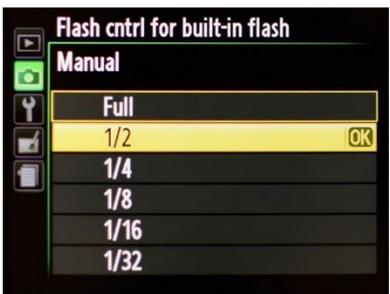
However it is a good idea to explore the use of Auto-Exposure, and the way to use Auto-Exposure is to set the Flash mode to **TTL**.

NOTE: The more advanced Nikon DSLR such as the 5000, 5100, 5200, 5300, 5500, and the 7000, 7100, 7200, as well as the D200, D300, D500, D750, D800, D810, etc, use a multi-section menu format, so for those cameras, go to section e [e.g. **e1. Flash control for built-in flash**], and make the required settings.

Press the Right Arrow until you are in the **Flash control for built-in flash** setting, then highlight the **TTL** option, and press OK:



Note: To return to Manual Flash, return to this menu item and select **Manual**, then select ½ **Power**:



5. Press the Menu button twice to exit all menus.
6. If you have further questions, please contact Jon Miles at jon@milesresearch.com

For detailed technical information on the D3200:
<http://www.dpreview.com/reviews/nikon-D3200/>

N. Menu Settings for Nikon D3200

Note: These steps are already done in manufacturing, but you may need to reset these setting if the camera is used in an automatic mode for other photography.

Iris Camera Menu Settings:

(initial setup for iris photography – camera is in A mode: top mode dial is set to “A”=aperture priority)

Shooting Menu

White Balance change from **AUTO** to **Flash**
(required for iris photography. Note: when using zoom lens, switch mode dial to AUTO will over-ride this setting)

Built-in flash – Auto Exposure: set to **TTL**
(Set aperture to 22; any value from 16 thru 25 will be okay)

Built-in flash – Manual Exposure: change from **TTL** to **Manual- 1 / 2 power**
(If images are tending too bright, set to 1 / 4 power.)

Setup Menu

Auto off timers change from **NORM** to **Custom (1 minute)**
(This will give the playback and info displays enough on-time to be read)

File number sequence change from **OFF** to **ON**
(This setting makes sure that each photo has a consecutive number, even after changing the memory card)

Settings Changes: Use of Iris Camera for General Photography

(Just change the Mode dial to Auto, and most settings will be made automatic. No need to edit the Menu selections.)

Menu Reference

The Nikon D3200 has five menus, each one signified by a different icon in the leftmost column. To access the menus, switch the camera on and press the **MENU** button on the back of the camera. Use the command disc (circular shaped control with four arrows) to move the highlighted selection: left or right to go into or out of a submenu; up or down to move the highlighted selection up or down.

The five icons arranged vertically in the left column are:

1. Playback Menu: Blue forward-pointing arrow (yellow → blue when in submenu)
2. Shooting Menu: Green camera icon (yellow → green when in submenu)
3. Set-up Menu: Gold wrench icon (yellow → gold when in submenu)
4. Retouch Menu: Purple paintbrush icon (yellow → purple when in submenu)
5. Recent Settings: Grey icon

Nikon D3200 Menu Settings (-- signifies a submenu & not a critical setting)

Playback Menu	Default	Iris Photography	GeneralPhotography
Delete	--	--	--
Playback folder	D3200	D3200	D3200
Playback display options	None	None	None
Image Review	ON	ON	ON
Rotate Tall	ON	ON	ON
Slide Show	2s	2s	2s
Print Set (DPOF)	--	--	--

Shooting Menu	Default	Iris Photography	GeneralPhotography
Reset shooting options	--	--	--
Set Picture Control (see Note 1)	SD	SD or VI	SD
Image Quality (see Note 2)	NORM	NORM	NORM
Image Size	L	L	L
White Balance (see Note 3)	Auto	Flash	Auto
ISO sensitivity settings (set Auto ISO off)	100	100	100
Active D-Lighting	OFF	OFF	OFF
Auto distortion control	OFF	OFF	OFF
Color space	sRGB	sRGB	sRGB
Noise reduction	ON	ON	ON
AF-area mode (see Note 4)	--	VF:Auto-area	--
Built-in AF-assist illuminator	ON	OFF	OFF
Metering	Center wtd	Spot	--
Movie Settings	--	--	--
Flash cntrl for built-in flash (see Note 5)	TTL	TTL or M ½	TTL

Setup Menu			
Reset setup options	--	--	--
Format memory card	--	--	--
Monitor brightness	0	0	0
Info display format (see Note 6)	Graphic	Classic/Blue	Classic/Blue
Auto info display	ON	ON	ON
Clean image sensor	--	--	--
Lock mirror up for cleaning	--	--	--
Video mode (see Note 7)	NTSC	NTSC	NTSC
HDMI	AUTO	AUTO	AUTO
Flicker reduction	60Hz	60Hz	60Hz
Time zone and date (see Note 8)	--	--	--
Language (see Note 9)	EN	EN	EN
Image comment	OFF	OFF	OFF
Auto image rotation	ON	ON	ON
Image Dust Off ref photo	--	--	--
Auto off timers (see Note 10)	Short	Custom: 1m	Custom: 1m
Self-timer	10s	10s	10s
Remote on duration	1m	1m	1m
Beep (pitch)	Low	High	High
Rangefinder	OFF	ON	ON
File number sequence (see Note 11)	OFF	ON	ON
Buttons	--	--	--
Slot empty release lock	LOCK	LOCK	LOCK
Print date	OFF	OFF	OFF
Storage folder	D3200	D3200	D3200
GPS	--	--	--
Firmware version	--	--	--
Retouch Menu	These commands are not used for iris imaging		
D-lighting	--	--	--
Red-eye correction	--	--	--
Trim	--	--	--
Monochrome	--	--	--
Filter effects	--	--	--
Color balance	--	--	--
Image overlay	--	--	--
NEF (RAW) processing	--	--	--
Resize	--	--	--
Quick retouch	--	--	--
Straighten	--	--	--
Distortion control	--	--	--

Fisheye	--	--	--
Color outline	--	--	--
Color sketch	--	--	--
Perspective control	--	--	--
Miniature effect	--	--	--
Selective color	--	--	--
Edit movie	--	--	--

Recent Settings

This is a short list of recently used commands

Notes

1. **Set Picture Control** – Set to SD=Standard for most uses. You may want to try VI=Vivid for more color emphasis.
2. **Image quality** – For more advanced technique, use NEF+JPG-Fine. Raw camera files represent the image with maximum detail and no compression. They can be as large as 25MB each, so this may not be necessary for routine operation.
3. **White Balance** – Set to Flash -- a required setting for standard iris imaging. Setting the top Mode dial to Auto will over-ride this setting, changing back to Auto-WB until the dial is set back to P/A/S/M Modes.
4. **AF-area mode** – Viewfinder: Single-point AF; Live view/movie: Normal-area AF. Using Single-point AF seems to give the best results for use of autofocus on the iris. The point to select should be the first point to either the right or left of the center point; this point will normally fall on the collarette area of the iris.
5. **Built-in flash** – for standard iris photography this is a required setting. If the images are too bright or the aperture needs to be at a lower number, then set the Flash power to ½ (or 1/4) instead of full. When using apertures in the range of f/8 to f/16, the flash power needs to be set as low as 1/4.
6. **Info display format** – Classic allows for easiest settings change (press <i> button to change a setting, then navigate items via control disc and press OK to edit setting).
7. **Use PAL (instead of NTSC)** -- if that is standard in your region.
8. **Time zone and date** – if you travel, then just change the time zone.
9. **Language** – Available languages for the D3200:

a. Czech	o. Portuguese (PT)
b. Danish	p. Russian
c. German	q. Romanian
d. English	r. Finnish
e. Spanish	s. Swedish
f. Greek	t. Turkish
g. French	u. Ukranian
h. Indonesian	v. Arabic
i. Italian	w. Chinese
j. Magyar	x. Chinese 2
k. Dutch	y. Japanese
l. Norwegian	z. Korean
m. Polish	aa. Thai
n. Portuguese (BR)	bb. Hindu
10. **Auto off timers** – normally the display will go blank in a few seconds to save battery life. This setting is more convenient at 1 minute for each timer (Playback/Menus, Image review, Live view (3m), Autometer-off). For keeping the aperture display on longer than 4 seconds, set the last item to 1m and the aperture display will show for a minute.
11. **File number sequence** – this is set to ON and is best always left ON. This way each photo taken with this camera will have a unique image number, even when changing cards. This avoids having two different images with the same name.

Exposure Guide – Aperture Settings for Manual Exposure Mode

Camera: D3200
Lens: Nikon 85mm
Illuminator: HCB/SCL/CASL/FLO
Flash: Manual 1/2-Power
ISO: 100
EV Step: 1/3

Brown: 16---18---20---22---25
Mixed: 18---20---22---25---29
Blue: 20---22---25---29---32---36
Sclera: 40---45

Do not use: 4.8, 5, 5.6, 6.3, 7.1, 8, 9, 10, 11, 13, 14
Use for brown: 16 thru 25
Use for blue or mixed: 18 thru 36
Use for sclera: 36, 40, 45

Exposure Guide – Settings for Auto Exposure Mode

Camera: D3200
Lens: Nikon 85mm
Illuminator: HCB/SCL/CASL/FLO
Flash: TTL
ISO: 100
EV Step: 1/3

Brown: 16---18---20---22---25
Mixed: 16---18---20---22---25
Blue: 16---18---20---22---25
Sclera: 40---45

Do not use: 4.8, 5, 5.6, 6.3, 7.1, 8, 9, 10, 11, 13, 14
When flash is set to TTL (Through-the-Lens metering):
Use for all iris colors: 16 thru 25 (for max sharpness)
Use for sclera: 40, 45 (for max depth of field)

Contact Miles Research for additional information or technical support

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