

# PixelShift2DNG

## Brief user manual

Version 1.0

### Application Purpose

In many contemporary cameras, a Pixel Shift mode has been implemented: the camera takes several pictures shifted by one pixel (or “half-pixel”), the unification of which allows one to either get rid of debayerization (resulting in better resolution and color and suppressing a large portion of the moiré), or allows one to increase the resolution (compared with a singular shot).

Today, the following cameras have had Pixel Shift (also called MultiShot) implemented:

- Olympus (E-M5-II, E-M1-II, E-M1X)
- Panasonic (DC-G9, DC-S1, DC-S1R)
- Pentax (K-1, K1-II, K3-II, KP)
- Sony (A7R-III / A7R-IV)
- Several medium format camera backs.

In Olympus and Panasonic cameras, combining together the source shots into the resulting RAW (or JPEG) is done by the camera processor, and it is impossible to affect this process – the resulting files are interpreted by processing programs as common RAW files.

In Sony and Pentax cameras, the intermediate shots are saved; the user is offered the option to combine them on the computer during processing:

- **Pentax:** one DNG or PEF file is created, containing 4 shots.
- **Sony:**
  - **A7R-III/A7R-IV:** 4 separate ARW files are recorded
  - **A7R-IV/16 shot:** 16 separate ARW files are recorded
  - The Sony Imaging Edge application can combine 4 ARW files into one ARQ file (which will contain the 4/16 source shots).

Not all RAW converters can fully support 4-shot containers (and, furthermore, work with 4 or 16 ARW files simultaneously). Specifically, Adobe programs transparently support combining images from Pentax containers, but doesn't support the ARQ format, and, furthermore, cannot deal with quartets of ARW files as with one image.

The program **PixelShift2DNG** is intended for converting quartets of Pixel Shift source shots – it unites 4 images from DNG/PEF/ARQ containers, or 4/16 separate ARWs – into one *normal, full-color* DNG file, compatible with most (but not all) RAW processing programs.

**PixelShift2DNG** can:

- Combine 4 or 16 source ARW files taken in Pixel Shift mode, and save the result in the DNG format.
- Convert ARQ file formats (ARW file groups previously unified by the program Sony Imaging Edge) or 4-shot PEF/DNG containers (taken with Pentax K1/K1-II/K3-II/KP cameras) to regular DNG files.

The resulting DNG files can later be processed in the applications that the user is familiar with.

## System Requirements

- OS and CPU
  - Windows 7 – Windows 10, 64-bit
  - or Mac OS X/macOS 10.6-10.14, 64-bit processor (*so, all Intel Macs, except for some models from 2005-06 with Core Solo and Core Duo processors*)
  - *There is no 32-bit version: merge process requires a lot of RAM, it is not possible on (memory-limited) 32-bit systems.*
- A minimum of 1GB of free RAM when merging 4-shot sequences, and a minimum of 4GB when merging 16-shot sequences.
- Screen resolution no less than 1600x900
- 50MB of disk space for the application

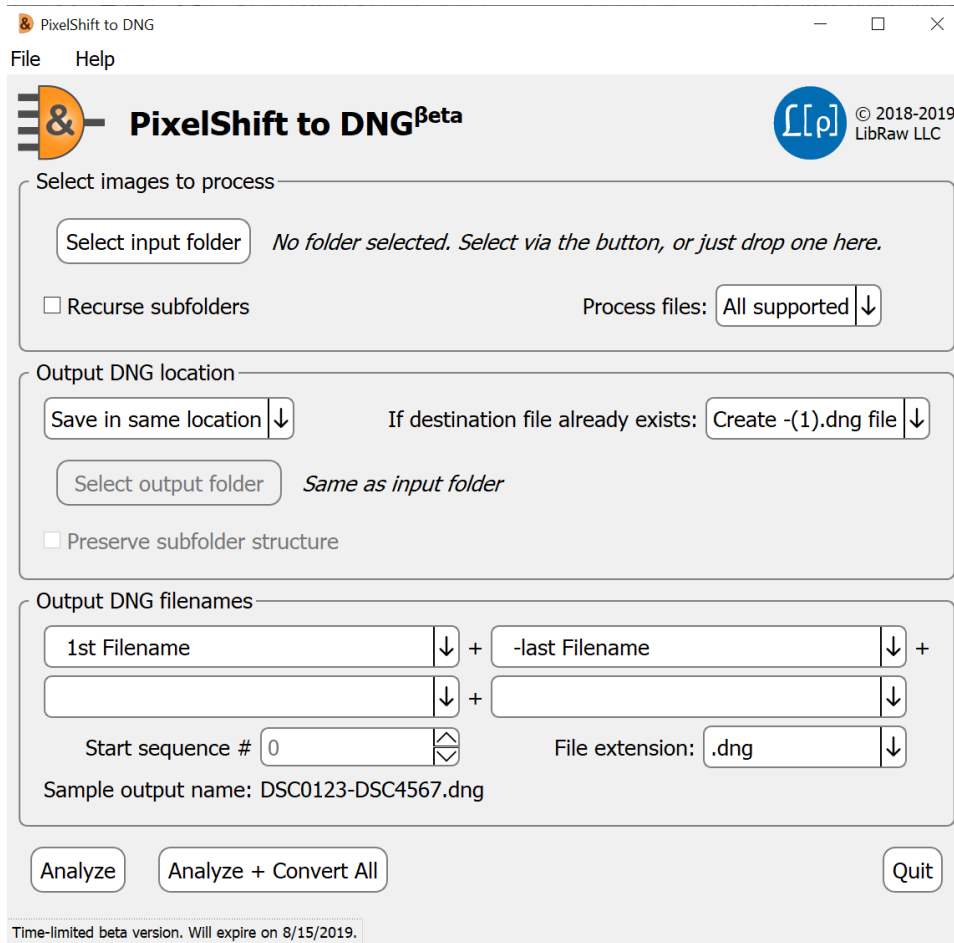
## Installing the program

- **Windows:** launch the installation file (*PixelShift2DNG-N.M.a.b-x64-Setup.exe*), read the license agreement, and upon agreeing to it, go through the installation Wizard
- **Windows/Portable** version: install the program as above, and then copy the **C:\Program Files\LibRaw\PixelShift2DNG** folder onto a flash drive. Now you can run the executable file **PixelShift2DNG.exe** on any Windows computer right from the flash drive. No drivers, DLLs, and so forth are installed into the system folders, so the program is completely autonomous
- **Mac:** open the installation disc image, read the license agreement (EULA.txt) and if you agree with it, drag the application icon into the **Applications** folder

## Using the program

### Program main screen

When first launching the program, you will see the following main screen:



The main screen of the **PixelShift2DNG** application contains four groups of controls:

- **Select images to process** – allows one to select the files to be processed and displays the number of files to be analyzed and processed
- **Output DNG Location** – allows one to set the output folder, and how to proceed if a destination file already exists
- **Output DNG filenames** – allows one to set the rules for generating the names for the output files
- **Action buttons** – allows one to launch an action or quit the program

#### Select Images to Process Group

- **Select input Folder** button allows one to select a folder with files one wants to process. Aside from this button, one can Drag-n-Drop a folder or a set of files into the program window
- **Recurse subfolders** – include subfolders while searching for files

- **Process files:** allows one to limit oneself to particular types while processing files (out-of-camera ARW files, ARQ files created by Sony Imaging Edge, PEF and DNG Pentax files).

Aside from the **Select input Folder** dialog and Drag-n-dropping something into the window, one can also pass files into the program via:

- Running the program from the command line, indicating the necessary folders/files in the command line after the name of the file to be launched
- Dropping files/folders onto the program icon.

In these two cases, as with Drag-n-dropping into the window, the rules for processing the received list are the same:

- If the names that were passed contained folder names, then the first folder in the list will be used
- If it only had filenames (*even from different folders*), all of the files will be processed.

#### Output DNG Location Group

Allows one to set the output folder

- The same as the input folder (*“Save in same location”*)
- A different one (*with the option of selecting it through “Select output folder” button*).

The setting **If destination file already exists** dictates what is done if the output DNG file already exists:

- **Skip convert** – doesn’t generate the file
- **Overwrite** – overwrites the file
- **Create **-(1).dng file**** – **-(1)…-(9)** will be added to the name of the file (*but if such files already exist, then **-(10).dng** will not be created*).

The option to **Preserve subfolder structure** becomes available if **Recurse Subfolders** (in the **Select images to process** group) is checked and the destination (**Output DNG location**) is set to **Save in new location**. If **Recurse Subfolders** is checked, the destination will contain a subfolder structure mirroring the structure in the source folder.

#### Output DNG filenames Group

This group sets the rules for generating the names of the output files.

These names are generated out of 1 to 4 elements:

- 1<sup>st</sup> Filename/FILENAME/filename – the name (*without extension*) of the first file in the group of 4/16 ARW files that was processed or the input ARQ/PEF/DNG file. Three options: maintaining symbol case, all to upper case, all to lower case, correspondingly.
- Only when processing quartets of ARW files:
  - Last Filename/FILENAME/filename – Name of the last file in the group (three letter case variants).
  - -Last Filename/FILENAME/filename – “dash” symbol and the name of the last file in the group.
- Number in the sequence, can contain 2-4 digits.

- EXIF date of the first file in a group of different formats (*dd, MM, yy, yyyy means, accordingly, the day of the month, the number of the month, two or four-symbol number of year*).
- Merged frames count: just numbers (04/16), or with PS/\_PS prefixes.
- Aside from choosing one of the above-mentioned options, one can also write any text one wants into the field (*other than forbidden symbols that can't exist in a filename*).

If, as one of the elements of the resulting name, the sequence number is chosen, then the start number can be set in Start Sequence #.

The file extension (*.dng or .DNG*) is set by the “File extension” parameter

The last line of this group is an example of a generated filename if the group started with DSC0123 and ended with the file DSC4567.

Action buttons group (in the lower part of the screen)

- **Analyze, Analyze + Convert All** – when pressing one of these buttons, the analysis window will open and the program will shift to analyzing the metadata of the files being processed.
- **Quit** – exit the program.

## Program Menu

- (Mac) **PixelShift2DNG**
  - **About PixelShift2DNG** – displays info about the application version
  - **Preferences** – displays the dialog that allows one to change the settings for output, as well as some other application settings
  - **Quit PixelShift2DNG** – exits the application
- **File:**
  - **Open Folder** – sets the source folder for conversion, same action as Select Input Folder in the main window
  - (Windows): **Preferences** – displays the dialog that allows one to change the settings for output, as well as some other application settings
  - (Windows): **Quit** – exits the application
- **Help:**
  - (Windows) **About** – displays info about the application version
  - **PDF Manual** – launches a PDF viewer (the default one on your computer) to display this Manual
  - **PixelShift2DNG Web Page** – opens application website in your default browser
  - **Contact Technical support** – opens the feedback page on the application website
  - **Check for updates** – manually checks for updates

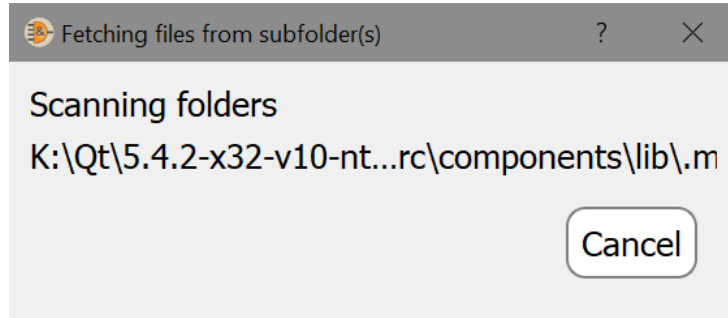
## Processing Start

After the source folder (and the destination, if necessary) is selected, press one of the buttons in the lower portion of the main application window:

- **Analyze:** to build a list of files for processing and display a metadata analysis window (described below). You will need to start processing by pressing one of the buttons in that metadata analysis window.

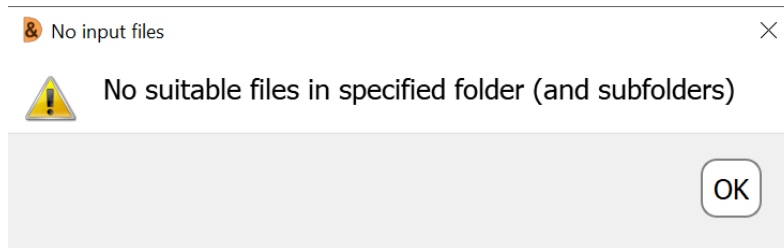
- **Analyze + Convert All:** a list of files to be processed will be built «behind the scenes» and the processing will be started automatically for all PixelShift files found in the source.

If the search for input files takes more than a second (as it is the case when there are a lot of subfolders and **Recurse Subfolders** option is on), you will see an informational window showing the progress of the folder scan:



Upon pressing **Cancel**, the file search will be interrupted and the program will return to the main window.

If no files with the requested extension are found in the selected folder (subfolder), the following message will be displayed:



If enough files for analysis and processing are found, then a window for metadata analysis and file processing progress will open.

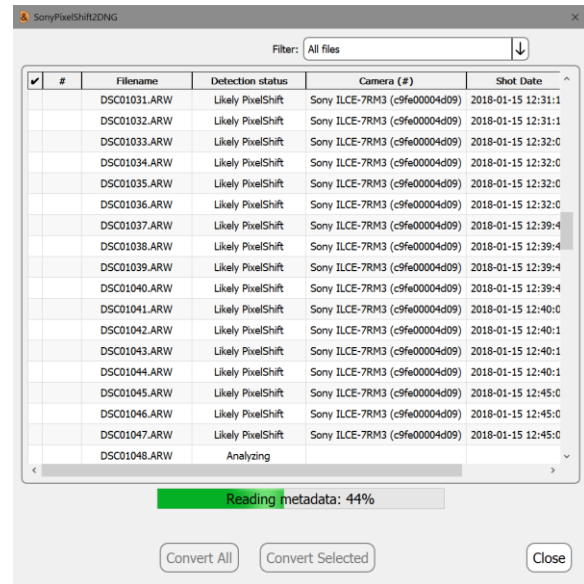
If enough files for analysis and processing are found, the metadata analysis / file processing progress window will open.

## Metadata analysis and file processing process window

When processing ARW files, **PixelShift2DNG** reads the metadata of all of the files passed to it with the goal of separating Pixel Shift groups (4/16 ARW files) from the rest.

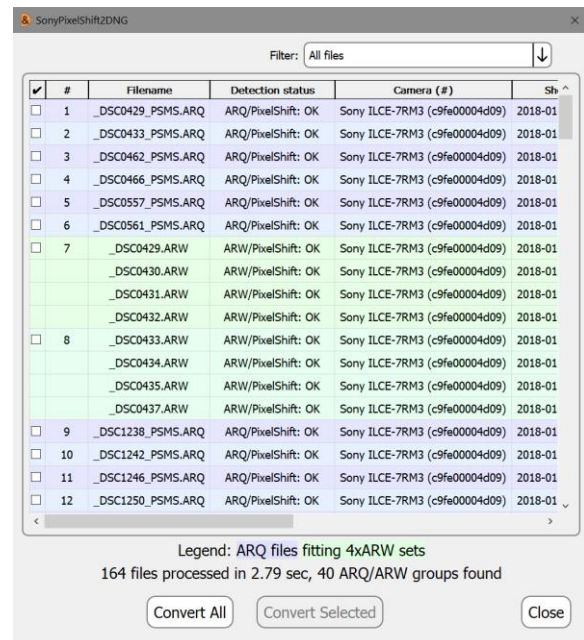
The files in the analysis window are sorted in the following order:

1. Folder (if files from different folders are passed to it).
2. Camera serial number.
3. Extension (ARQ files will be first).
4. Camera shot number
5. Filename.
6. Date of shot.



When analyzing the data, one of the following statuses will be displayed in the Detection status column:

- **ARQ PixelShift** – ARQ file, guaranteed Pixel Shift.
- **Likely PixelShift** – the metadata indicates Pixel Shift mode.
- **Not PixelShift** – the image was not taken in Pixel Shift mode.
- **Not A7RM3/4** – the file isn't from the Sony A7R-III/IV.
- **Pentax: PixelShift** – the file is from a Pentax camera, taken in the Pixel Shift mode.
- **Pentax: single frame** – the file is from a Pentax camera, taken in the regular mode.



If there are a lot of files in the folder, then the **Filter** setting, over the table of files, can be useful:

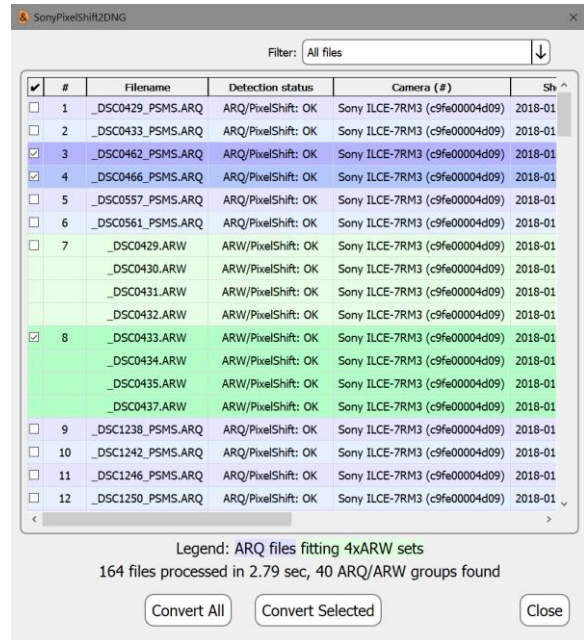
- **All files** – displays all files.
- **Sony A7RM3/4 or Pentax files** – only files from the A7R-III/IV camera or (any) Pentax camera.
- **A7RM3/4 PixelShift files only** – only files from Sony A7R-III/IV, whose metadata indicates Pixel Shift mode.
- **Pentax PixelShift files only** – only Pentax files, whose metadata indicates Pixel Shift mode.

Regardless of the state of this setting, as-of-yet unanalyzed files will be displayed in any case.



After reading all of this metadata, the files will be grouped in potential Pixel Shift groups, and the status of these groups will be marked by the color of the background:

- **Blue** – ARQ/PEF/DNG files, without a doubt Pixel Shift (*the problem of comparing metadata was solved with the Sony program*).
- **Green** – quartets of ARW files that have no problems with their metadata.
- **Yellow-green** – groups of ARW files that have no problems with their metadata.
- **Pink** – quartets (or 16x) of ARW files that have most of their metadata indicating Pixel Shift mode, however something with the group isn't quite right:
  - Too much of a time difference between shots, according to EXIF.
  - File metadata in quartet does not match single Pixel Shift sequence.
  - The camera's serial number or folder doesn't align (*even in this case, the program will try to gather files into quartets, though there is no way that there can be any certainty in the result*).



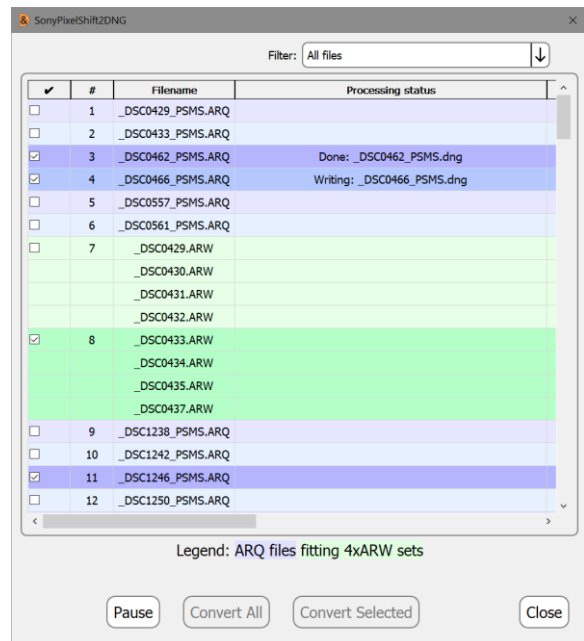
If one needs to process only some of the selected groups, they can be marked with a checkbox in the first column, and one can press **Convert Selected** in the bottom part of the window.

If one needs to convert the entire selected group, use the **Convert All** button. After pressing one of the above-mentioned buttons, **PixelShift2DNG** will start converting the quartets of ARW files (*or ARQ/PEF/DNG files*) into DNGs. During this, the **Pause** button appears in the window, which allows one to pause (*and later continue*) the process.

The **Close** button stops the conversion process after finishing the current file's conversion and closes the window.

The stages of conversion are displayed in the **Processing status** column:

- **Processing started** – group conversion has begun.
- **Output to Filename** – the name of the output





file has been generated.

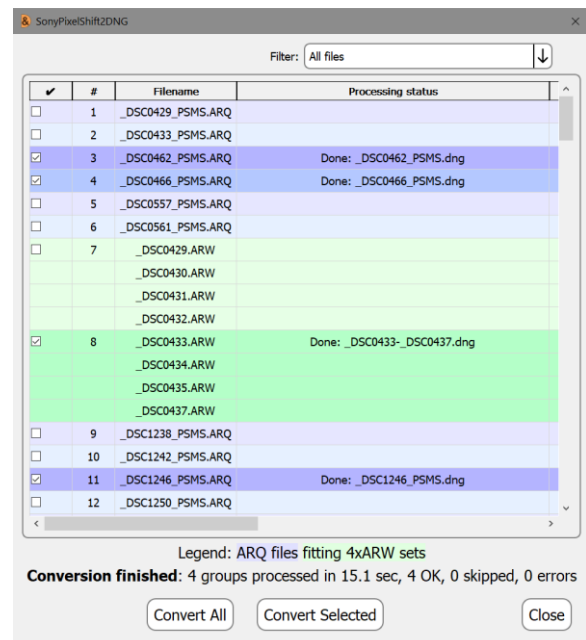
- **Decoded Filename** – the RAW file (*an ARQ/PEF/DNG file or one ARW from a quartet*) has been read and decoded.
- **Writing Filename** – the output file is being written.
- **Done: Filename** – the group processing is done, the DNG file has been recorded.
- Error notifications:
  - **Filename already exists** – the file hasn't been processed because the output file already exists, and the mode "do not overwrite" was set on the program's main screen.
  - **Output filename generation failed** – an output filename could not be generated (for example, the mode "add -(1) to the name" was selected, but all of the (1)...(9) names were already taken by existing files).
  - **Bad output folder Foldername** – an output folder has been selected which cannot be saved into (*doesn't exist, is not writable*).
  - **Could not write Filename** – cannot write a file (*there is no room, cannot write into the output folder, overwrite existing files has been set, but the file is a read-only*).
  - **Could not open Filename** – cannot open the input file (*for example, it was deleted between the metadata analysis phase and pressing the Convert button*).
  - **Could not decode Filename** – couldn't decode the RAW data from the file.

After finishing the processing, the **Pause** button disappears, and the **Convert All/Convert Selected** buttons become active once more.

The application displays the processing statistics above the Convert... buttons:

**Conversion finished:** message

- Number of file groups that were processed
- Sub-divisions:
  - Number converted to DNG
  - Number skipped, either because «do not overwrite» (**Skip converting**) was selected and the file with the requested name already existed, or «add -(1) to the filename» (**Create - 1.dng file**) while all possible combinations already existed in the destination
  - Number of errors due to problems with reading from source / writing to destination



To close the window, use the **Close** button, to exit the program, use the **Quit** button in the main window (or Ctrl-Q/Command-Q shortcut on Windows/Mac respectively).

## Program Settings

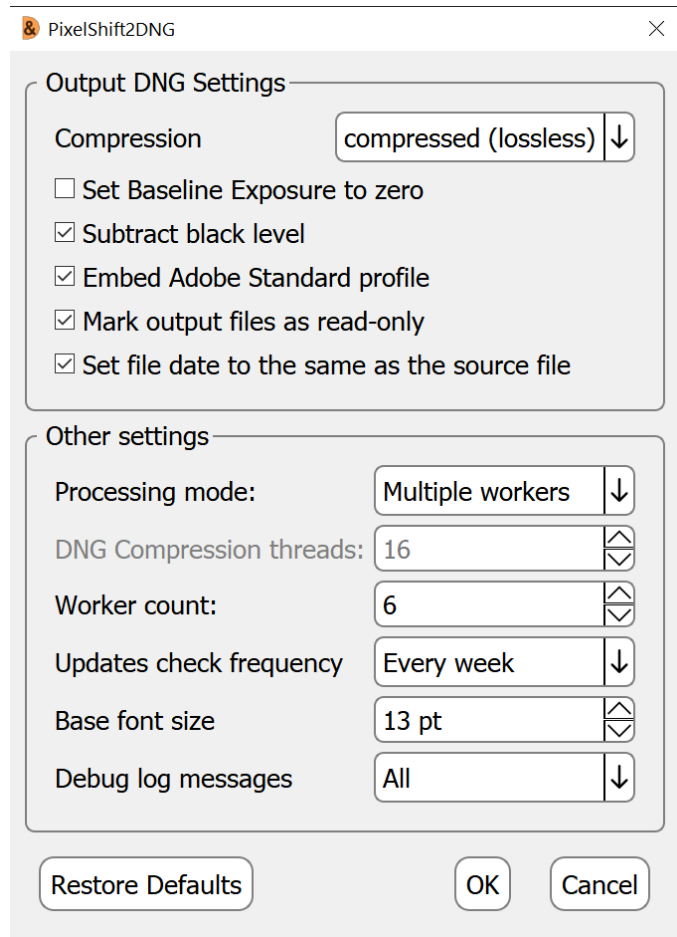
To access application settings,

- Windows: **Menu – File – Preferences** or **Ctrl-P**.
- Mac: **Menu – PixelShift2DNG – Preferences** or **Command-**,

Preferences dialog contains two settings groups:

### Output DNG Settings group:

- **Compression:** whether one wants to compress the resulting DNG.
- **Set Baseline Exposure to zero:** sets DNG 'BaselineExposure' tag to zero (by default, this tag is set to match the lightness produced by Adobe converters, which may potentially cause false impression of highlights being clipped or too flat).
- **Subtract black level:** turns on subtracting black level in the output DNG. For properly-coded DNG interpretation, there's no difference as to whether the black level is subtracted or present as a tag in the DNG file, however some of the programs that process RAW (*for example, RawTherapee and Iridient Developer*) may work incorrectly with DNGs that have un-subtracted black levels. If, while processing the resulting DNG, you see a pink or blue highlight around the entire shot, select to apply black level subtraction here.
- **Embed Adobe Standard Profile** – when choosing this option, the Adobe Standard color profile will be turned on in the DNG file. If your RAW processing program doesn't understand such color profiles (*and/or uses its own, for example*), the option can be turned off and the resulting DNGs will be a little smaller.
- **Mark output files as read-only (Mac: as read-only/locked)** –resulting DNG files will have *read-only* (Windows) or *read-only* and *locked* (MacOS / OS X) attributes set. When editing such files in Adobe Camera Raw the DNG file will be kept intact: editing parameters will be saved in an sidecar XMP file, and not into the DNG. Because the original DNG file is not modified, there is no need to backup it for the second time. Thus, after the initial backup is completed the volume of the of the incremental backups is significantly decreased.
- **Set file date to the same as the source file** – **PixelShift2DNG** will set file creation and last modification dates to the same as the source file (1<sup>st</sup> file in group for 4-/16-files groups), allowing accurate sort by file date



**Other settings group:**

- **Processing mode** – sets the processing mode for multi-core processors:
  - **Single worker:** processing is performed in a single thread, while the compression for DNG output can still be performed in parallel threads; the number of parallel threads for compression is set by **DNG Compression threads** parameter. This mode is recommended for relatively slow data storage devices, such as USB drives.
  - **Multiple workers (default):** several processing threads are launched; each thread is processing its own files. The number of threads is set by **Worker count** parameter.  
Before processing starts, **PixelShift2DNG** will estimate required memory usage, compare it with computer installed memory and may prompt to switch to Single Worker mode if installed memory may be not enough.
- **Updates check frequency:** sets the frequency for the automatic updates check, ranging from **Never** to **Every program run**.
- **Base font size:** allows one to change the font size to better fit the size of your monitor and application window.
- **Debug log messages:** switches on an auxiliary window containing the debug information that is necessary to provide user support. The window becomes available in the main Menu – Help section.

**Hidden parameters:**

The maximum number of simultaneously running processing threads, affecting the number of DNG Compression threads and Worker count, is set by the hidden parameter `HardThreadsLimit` (`HardThreadsLimit =16` by default). This parameter can't be changed through the settings available in GUI. If you need to increase the value of `HardThreadsLimit`:

- Windows: Registry Editor, `HKCU\Software\LibRaw LLC\PixelShift2DNG\HardThreadsLimit`
- Mac: open Terminal window and execute  
`defaults write com.libraw-llc.PixelShift2DNG HardThreadsLimit <value>`

## Known quirks and problems

1. For single images taken with the A7R-III camera with a Sony lens mounted, Adobe Camera Raw and Lightroom automatically turn on chromatic aberration correction. For files made by **PixelShift2DNG**, this option needs to be turned on manually (*in the Lens correction tab*), or use a preset with this option.
2. Some of the programs (*for example, DXO Photolab and darktable*) refuse to open files from cameras that they do not recognize, even in DNG format.

## Getting in touch with us

To get in touch with us, use:

- Website feedback form, **PixelShift2DNG** section:  
<https://www.fastrawviewer.com/contact/PixelShift2DNG-feedback>
- E-Mail: [ps2dng-feedback@libraw.com](mailto:ps2dng-feedback@libraw.com)