

GeoExpress

Best Practices Key

**A step-by-step guide to using LizardTech™
GeoExpress™**

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Introduction

This document will help you navigate the most common workflows for which you are likely to be using LizardTech™ GeoExpress™ software. Many of the decisions you make and the options you select in compressing, manipulating and publishing imagery have impacts for downstream users. We want you to be able to understand and use best practices so that you and your end users can get the most out of your imagery.

This document uses the device of the “key” to steer you through common workflows based on your particular objectives. The key method enables you to skip irrelevant choices and bypass large amounts of unnecessary information. Once you’ve finished keying out a particular set of choices, a step-by-step procedure specific to your workflow is indicated. Additional helpful information is included in the right margin where applicable.

In the course of your workflow you will likely proceed through several keys and procedures.

Input and Output Formats

Many of the options and operations available to you in GeoExpress encoding are dependent on what output file format you select, so output format should be one of the earliest decisions you make. However, you cannot specify an output format in GeoExpress until you have loaded at least one image or mosaic into the job list, and that can’t happen until you decide what kind of job you’ll be performing – a single encode or a mosaic, an optimization, or perhaps despeckling or editing metadata. To complicate matters, characteristics of your input or source image may determine what output format you must use.

The process of matching encoding parameters to workflows is an iterative one. Nevertheless, we recommend that you start thinking as early as possible about both input and output formats and the options you might need so that, for example, you don’t waste time setting parameters that are not available in your chosen output format.

Following is a table showing which output formats support certain common operations and situations.

Support for Common Operations in GeoExpress Output File Formats

Situation/Requirement	Supported by Output File Format		
	MG2	MG3	JPEG 2000
Lossy output with maximum 3 bands, cropping but no advanced encoding, output less than 2 GB*	◆	◆	◆
Advanced encoding (reprojection, color balancing, despeckling, area of interest encoding, etc.)		◆	◆
Output file size greater than 2 GB*		◆	◆
Lossless output		◆	◆
Mosaic that has MrSID tiles as input		◆	◆
Multispectral input**			◆
Optimization (for MG3 input only***)		◆	

*When an image is selected in the job list, the estimated output file size is shown as “Target File Size” at the bottom of the Properties tab.

**When an image is selected in the job list, its color space is listed in the Image Properties panel of the Properties tab.

***To determine what format your input image is in, drag it into the Images tab of the job list. The file format is listed as “File Type” in the Image Properties panel of the Properties tab.

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To use this key, start at the beginning with Key 1 and proceed as instructed. Depending on your workflow, you will probably skip large portions and procedures in the following text. Read both options in a given key set before taking action or skipping to another section. Before you start, open GeoExpress.

Key I Compression or No Compression?

- ▶ If you do not wish to perform any compression, skip to **Procedure 16** or **Procedure 17** (see note).

▶ If you wish to compress an image or mosaic, continue to **Key I.A.**

Note: It is not necessary to compress your data if you only wish to do one of the following:

- Edit existing metadata (skip to **Procedure 16**)
- Despeckle existing MG3 or JP2. (skip to **Procedure 17**)

Key I.A Single Image or Mosaic?

- ▶ If you wish to encode or update a mosaic, skip to **Key I.B.**
- ▶ If you wish to encode a single image, continue to **Key I.A.1**

Key I.A.1 Optimize or Non-optimize Single Encode?

- ▶ If your input format is MG3 *and* you only want to perform one or more of the optimizations in List A at right, then continue to **Procedure 01**. (**Note:** To determine input format type, drag an image into the Images job list, then look in the “Image Properties” panel of the Properties tab.)
- ▶ If your input format is not MG3, or you wish to perform functions not in List A (see panel at right) such as color balancing, reprojection, cropping by vector overlay or despeckling, then skip to **Procedure 06**.

PROCEDURE 01 OPTIMIZING A SINGLE MG3 IMAGE

1. Click the **Add MrSID Optimize Image** button or choose **Add MrSID image to optimize** from the **Images** menu. **Note:** The “File Open” button is for project files – not for images.
2. Check image extents in the Properties tab. Does source image have proper positioning?
 - A. If yes, proceed to Step 3.
 - B. If no, check for the presence of world file in source directory.
 - i) If a world file exists, specify that it should be used by doing the following:
 - a. Click **More Optimize Options**. The Optimize Options dialog appears.

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List A – Optimizations

These are operations you can perform on MG3 images that were originally encoded as ‘optimizable’. These operations do not require the image to be decoded and reencoded, so they are very fast.

- Crop (by rectangle only)
- Demosaic
- Resample
- Further compress

Optimization Notes

Resampling – Resampling is creating images of lower resolution and smaller file size, and consequently less image detail.

Further Compression – The default in optimization is lossless encoding, but you may choose to further compress images. In optimization, lossless means that there will be “no further compression” than what already occurred in creating the input MG3 images. If you specify further compression, the compression ratios are not compounded. For example, if

- b. Select the **Input** tab.
 - c. Select the **Allow world files to override native georeferencing** checkbox, then skip to Step 4. **Note:** Use of world files removes the CRS or other georeferencing information from the image.
- ii) If no world file exists, you may create one (see information about world files in the GeoExpress online WebHelp or User Manual). However, a better practice would be to remove the image from the **Optimize** tab and follow the instructions in **Procedure 16** for adding metadata to an existing MG3 image, then add the newly edited output back to the **Optimize** tab.
 - iii) When finished, skip to Step 4.
3. Check for a valid coordinate reference system (CRS). Does GeoExpress recognize the CRS?
 - A. If GeoExpress recognizes the CRS (or if it is okay that it does not), proceed to Step 4.
 - B. If GeoExpress does not recognize the CRS and you wish to assign one:
 - i) Remove the image from the **Optimize** tab and add it to the **Edit Metadata** tab of the job list
 - ii) Select **Options > Metadata** to open the Metadata Manager.
 - iii) Select the **Image** tab and click **Select Coordinate Reference System**.
 - iv) Select desired CRS, click **OK** twice to exit dialog.
 - v) Execute the job by clicking **Apply Metadata to Selected Images**.
 - vi) Add the newly edited output to the **Optimize** tab.
 4. Preview the image by clicking the **Preview** tab of the Properties panel and verify that it looks correct. Continue to **Key I.A.2**.

Key I.A.2 Cropping

- ▶ If you don't wish to crop as part of your optimization, skip to **Key I.A.3**.
- ▶ If you wish to crop as part of your optimization, continue to **Procedure 02**.

PROCEDURE 02 CROPPING

1. Click the **Crop** icon or choose **Image Crop** from the **Tools** menu. The Image Crop dialog appears.
2. Click **Show Image**. The preview pane appears.
3. Choose cropping options and click **OK**. (**Note:** cropping by vector overlay not supported for optimizations.) Continue to **Key I.A.3**.

Key I.A.3 Demosaicking

- ▶ If you don't wish to demosaic or "tile out" images as part of your optimization, skip to **Key I.A.4**.

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you specify compression of 20:1 on an MG3 image that was previously encoded at 10:1, the output will not be 200:1; it will be one twentieth of the nominal size.

Coordinate Reference Systems

A coordinate reference system (CRS, sometimes also called a spatial reference system or SRS) defines the location of a point on a planar or spherical surface. An image can only be displayed in one CRS at a time.

- ▶ If you wish to demosaic or “tile out” images as part of your optimization, continue to **Procedure 03**.

PROCEDURE 03 DEMOSAICKING

1. Click the **Crop** icon or select **Image Crop** from the **Tools** menu. The Image Crop dialog appears.
2. Click **Show Image**. The preview pane appears.
3. In the Output Tiling subpanel, choose your desired row and column values. Leave the magnification at full resolution (1).
4. Click **OK**, then continue to **Key I.A.4**.

Key I.A.4 Resampling

Resampling is creating images of lower resolution and smaller file size, and consequently less image detail (see note at right).

- ▶ If you don't wish to resample as part of your optimization, skip to **Key I.A.5**.
- ▶ If you wish to resample as part of your optimization, continue to **Procedure 04**.

PROCEDURE 04 RESAMPLING

1. Choose **More Optimize Options** on the **Properties** tab. The Optimize Options dialog appears
2. Select the **Optimize Settings** tab
3. Select the **Resample image** checkbox and select a resample value from the drop-down menu.
4. Click **OK**, then continue to **Key I.A.5**.

Key I.A.5 Despeckling Output

- ▶ If your output image does not have nodata, or has discrete areas separated by nodata (for example, two or more islands), do not despeckle; skip to **Key I.A.6**.
- ▶ If your image is rotated, has been lossily compressed in the past, or has areas of nodata, select the **Despeckle Output** checkbox in the Encode Options subpanel of the **Properties** tab.

Key I.A.6 Further Compression or Not

- ▶ If you don't wish to further compress as part of your optimization, skip to **Key III**.
- ▶ If you wish to further compress as part of your optimization, continue to **Procedure 05**.

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Resampling

The resample feature enables zoom levels to be removed from an MG3 image, resulting in a smaller file with less detail. The number of levels to be removed is mapped to a “resampling factor,” which appears in a drop-down list and is based on the number of zoom levels the source file contains. The resampling factor is a power of two that relates to the amount of detail that is removed. For example, Resampling by a factor of 2 results in an image half as wide and half as high as the original, with a quarter of its size and detail. Resampling by a factor of 4 results in an image of one quarter the width and height and one-sixteenth the size and detail of the original, and so on.

PROCEDURE 05 SPECIFYING ENCODING RATIO

1. On the **Properties** tab, clear the **Lossless** checkbox. The encoding ratio field becomes available.
2. Specify an encoding ratio, then skip to **Key III**.

PROCEDURE 06 SETTING BASIC ENCODING OPTIONS

1. Click the **Add Encode Image** button or choose **Add image to encode** from the **Images** menu, then browse to and select an image. Alternatively, drag and drop image into **Images** tab of job list.
2. Select output format from drop-down menu in the Encode Options subpanel of the **Properties** tab.
 - A. If your input image has more than three bands and you'd like to preserve all of them, select one of the JPEG 2000 formats as output.
 - B. If your input image has three bands or less or you only wish to preserve three bands of a multibanded image, you may choose any output format. (**Note:** If you need to encode a file that will be lossless or larger than 2 GB, or you need to perform advanced encoding, select an output format other than MG2.

(See also the discussion of input and output formats in the Introduction.)
3. Check image extents in the **Properties** tab. Does the source image have proper positioning?
 - A. If yes, skip to Step 4.
 - B. If no, check for the presence of world file in the source directory.
 - i. If a world file exists, specify that it should be used as follows:
 - a. Click **More Encode Options**. The Encode Options dialog box appears.
 - b. Select the **Input** tab.
 - c. Select the **Allow world files to override native georeferencing** checkbox. **Note:** Use of world files removes the CRS or other georeferencing information from the image.
 - d. Click **OK**. If this corrects the positioning, skip to Step 4.
 - ii. If no world file exists or if using world files did not correct the positioning, choose **Metadata** from the **Options** menu to change image extents in the Metadata Manager.
4. Check for a valid coordinate reference system (CRS). Does GeoExpress recognize the CRS?
 - A. If yes, skip to **Key I.C**.
 - B. If no, choose **Metadata** from the **Options** menu to open the Metadata Manager, select the **Image** tab and click **Select Coordinate Reference System**. Choose your CRS and click **OK**, then skip to **Key I.C**.

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Further Compression

On the optimization tab, the “lossless” option means “keep the original file size”. On the other tabs, it means “compress losslessly starting from the nominal (raw) size”. (This could increase the file size.) Note, however, that on all tabs an encoding ratio of 20:1 means 20x smaller than the nominal (raw) size. GeoExpress reports the nominal (raw) size as the “Input Image Size” and the original file size as the “Input File Size”.

Errors

Here are some errors you may encounter while adding source images and what to do about them:

“Too many images” or “Image Does Not Exist” – Selecting large numbers of images to add using the Windows Open dialog sometimes results in an error saying that there are “too many images” or that the “image does not exist”, or referencing “bad” or “truncated” file names. If this happens, use Windows Explorer to navigate to the proper directory and drag images into job list.

“Unsupported image format.” – Check supported formats. Do not add world files to job list.

“Bad or damaged image.” – Input image may be corrupted.

Key I.B Mosaics

- ▶ If you wish to create a new mosaic with multiple coordinate reference systems, skip to **Procedure 08**.
- ▶ If you wish to create a new mosaic where all input tiles have the same coordinate reference system, continue to **Procedure 07**.

PROCEDURE 07 CREATING A NEW MOSAIC

1. Click the **Create New Mosaic** button or choose **Create new mosaic of images** from the **Images** menu. The Create New Mosaic dialog appears. Set the initial properties:
 - A. Change output file name and location and output format as necessary.
 - i. If your input tiles have more than three bands and you'd like to preserve all of the bands, select one of the JPEG 2000 formats as output.
 - ii. If all of your input tiles have three bands or less or you only wish to preserve three bands of multibanded tiles, you may choose any output format. (**Note:** If you need to encode a mosaic that will be lossless or larger than 2 GB, or you need to perform advanced encoding, select an output format other than MG2).See also discussion of input and output formats in Introduction.
 - B. If your input data includes tiles of different resolutions, select the **Enable multiresolution mosaicking** checkbox (MG3 and JPEG 2000 outputs only).
 - C. Select the **Create flat mosaic** checkbox and click **OK**. (See notes about flat and composite mosaics at right.)
2. Select the mosaic in the job list and click **Add Tiles** to populate Mosaic Tiles list. Browse for tiles and click **Open**. (Alternatively, drag tiles from Windows Explorer into the job list.)
3. Verify the CRS on the **Properties** tab.
 - A. If it is listed and correct, skip to Step 4.
 - B. If it is undefined or incorrect:
 - i. Right-click the mosaic name and choose **Metadata**. The Metadata Manager appears.
 - ii. Select the **Images** tab, and click the **Select Coordinate Reference System** button.
 - iii. Choose your CRS and click **OK**.
 - C. Click **OK** to exit the Metadata Manager. (**Note:** The properties tab will still display "Undefined" for the CRS.)
4. Check the extents information on the **Properties** tab. Do the source tiles have proper positioning?
 - A. If yes, skip to Step 5.
 - B. If no, check for the presence of world files in your source directory.
 - i. If there are world files, specify their use as follows:
 - a. Click **More Encode Options** or choose **Encode Options** from the **Options** menu. The Encode Options dialog appears.
 - b. Select the **Input** tab.

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Flat Mosaic vs. Composites

We recommend creating flat mosaics. The only advantage to a composite mosaic is the greater speed at which you can encode it. A composite image basically amounts to source images (tiles) in a wrapper. A decode from a composite results in decodes from each of the constituent tiles that contains data for the requested region or "scene". Low magnification views can be very slow (depending on the number of tiles the file has) because they likely touch all or most of the contained tiles. Zoomed-in views generally decode pretty quickly, since they tend to decode from a small number of the constituent tiles. All source tiles must have the same resolution. All source tiles must be of the same CRS. All source tiles must have the same bitdepth.

- c. Select the **Allow world files to override native georeferencing** checkbox. **Note:** Use of world files removes the CRS or other georeferencing information from the image.
 - d. Click **OK**. If this corrects the positioning, skip to Step 5.
 - ii. If no world file exists or if using world files did not correct the extents, choose **Metadata** from the **Options** menu to change image extents in the Metadata Manager.
5. Select the **Preview** tab of the **Properties** panel and inspect the mosaic. If you see any seam lines, set background and transparency values:
- A. Choose **Encode Options** from the **Options** menu.
 - B. Select the **Transparency** tab. By default the background and transparency values are set to black. If you have imagery that has nodata (sometimes called “collar data”) that is other than black, specify that color as your background and transparency values.
 - C. Click **OK**.
6. When the mosaic looks good in the Preview pane, skip to **Key 1.B.1**.

PROCEDURE 08 CREATING A NEW MOSAIC WITH MULTIPLE COORDINATE REFERENCE SYSTEMS

1. Click the **Create New Mosaic** button or choose **Create new mosaic of images** from the **Images** menu. The Create New Mosaic dialog appears. Set the initial properties:
 - A. Change output file name and location and output format as necessary.
 - i. If your input tiles have more than three bands and you’d like to preserve all of the bands, select one of the JPEG 2000 formats as output.
 - ii. If all of your input tiles have three bands or less or you only wish to preserve three bands of multibanded tiles, you may choose any output format. (**Note:** If you need to encode a mosaic that will be lossless or larger than 2 GB, or you need to perform advanced encoding, select an output format other than MG2.

See also discussion of input and output formats in Introduction.
 - B. Select the **Allow multiple projection systems** checkbox (MG3 and JPEG 2000 outputs only). **Note:** Selecting this checkbox also automatically selects the “Enable multiresolution mosaicking” checkbox.
 - C. Select the **Create flat mosaic** checkbox and click **OK**. (See notes on page 8 about flat and composite mosaics.)
 - D. Make other selections and click **OK**.
2. Select the mosaic in the job list and click **Add Tiles** to populate Mosaic Tiles list. Browse for tiles and click **Open**. (Alternatively, drag tiles from Windows Explorer into the job list.)
3. You must verify or assign the source CRS for each tile (see note at right). Click **More Tile Options**, then select each source tile to ensure that it has a CRS em-

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Errors

Here are some errors you may encounter while mosaicking and what to do about them:

“Too many images” or “Image Does Not Exist” – Selecting large numbers of images to add using the Windows Open dialog sometimes results in an error saying that there are “too many images” or that the “image does not exist”, or referencing “bad” or “truncated” file names. If this happens, use Windows Explorer to navigate to the proper directory and drag images into job list.

“Cannot create preview image. One or more source images have invalid CRS.” – Set CRS or disable multiple projection systems if unsure.

“Mosaic ONLY. Cannot apply transparency in a single image encode.” – Despeckle image.

bedded (look in the Mosaic Properties panel of the **Properties** tab).

- A. If each tile has the correct CRS embedded, skip to Step 4.
 - B. If the CRS is undefined or incorrect:
 - i. Assign input CRS by selecting a tile or tiles, and clicking **Assign**. The Coordinate Reference System Selector appears.
 - ii. Choose your CRS and click **OK**.
 - C. Once all CRSs are set, click **OK** to exit the Tile Manager.
4. Set output CRS.
- A. Click the **Reproject** button or select **Reproject** from the **Tools** menu. The Reprojection Manager appears.
 - B. In the Output Image subpanel, click **Select Coordinate Reference System**. The Coordinate Reference System Selector appears.
 - C. Use drop-down menus to set desired output CRS, (see note at right), then click **OK**. **IMPORTANT:** Do not use the Advanced Options button unless advised by LizardTech Technical Support to do so.
 - D. Click **OK** to exit the Reprojection Manager.
5. Check to ensure tiles have proper embedded positioning? If they do not, check for a world file in your source directory. If there are world files, specify their use as follows:
- A. Click **More Encode Options** or choose **Encode Options** from the **Options** menu. The Encode Options dialog appears.
 - B. Select the **Input** tab.
 - C. Select the **Allow world files to override native georeferencing** checkbox. **Note:** Use of world files removes the CRS or other georeferencing information from the image.
 - D. Click **OK**.
6. Select the **Preview** tab of the **Properties** panel and inspect the mosaic. If you see any seam lines, set background and transparency values:
- A. Click **More Encode Options** or choose **Encode Options** from the **Options** menu. The Encode Options dialog appears.
 - B. Select the **Transparency** tab. By default the background and transparency values are set to black. If you have imagery that has nodata (sometimes called "collar data") that is other than black, specify that color as your background and transparency values.
 - C. Click **OK**. When the mosaic looks good in the Preview pane, continue to **Key 1.B.1**.

Key 1.B.1 Setting Memory Usage Options

- ▶ If you selected JPEG 2000 as an output type, you do not need to set any options. GeoExpress does not calculate memory usage for JPEG 2000 images. Skip to **Key 1.C**.
- ▶ If you selected MG2 or MG3 as an output type, continue to **Procedure 09**.

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Verifying Source CRS

Because the tiles are in multiple coordinate reference systems, they must be reprojected into a common CRS.

Default and Custom WKTs

The default CRS is latlon EPSG:4326. For information on customizing the WKT see the GeoExpress online WebHelp or User Manual.

PROCEDURE 09 SETTING MEMORY USAGE OPTIONS

Check the Estimated Memory Usage in the lower right of the **Properties** tab (see note at right).

1. If you have enough available memory for the job (see note at right), continue to **Key I.C.**
2. If you selected MG3 and the estimate is too high for your available RAM:
 - A. Specify the use of temp files:
 - i. Click **More Encode Options** or choose **Encode Options** from the **Options** menu.
 - ii. Select the **Advanced Settings** tab.
 - iii. Select the **Use Temp File** checkbox and click **OK** (see note at right).
 - B. Lower the strip height value:
 - i. Click **More Encode Options** or choose **Encode Options** from the **Options** menu.
 - ii. Select the **Advanced Settings** tab.
 - iii. Lower the strip height value to 2 and click **OK**.
 - C. If the estimate is still too high, lower the block size value:
 - i. Click **More Encode Options** or choose **Encode Options** from the **Options** menu.
 - ii. Select the **Advanced Settings** tab.
 - iii. Lower the block size value to 32 and click **OK** (see note at right).
3. If you selected MG2 and the estimate is too high, the output file will most likely be too big for MG2 and the job will fail. If you regularly output very large files, we recommend that you use MG3 instead.

Key I.C Further Options or Not

- ▶ If you do not need to manipulate your imagery by reprojecting, cropping, color balancing, or other additional operations, skip to **Key II.**
- ▶ If you need to manipulate your imagery by reprojecting, cropping, color balancing, or other additional operations, continue to **Key I.C.1.**

Key I.C.1 Reprojecting

- ▶ If you don't wish to reproject or have already set source and output coordinate reference systems for your images, skip to **Key I.C.2.**
- ▶ If you wish to reproject images, continue to **Procedure 10.**

PROCEDURE 10 REPROJECTING

1. Click the **Reproject** icon or select **Reproject** from the **Tools** menu. The Reprojection Manager appears.

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Speed and Memory

There is a tradeoff between encode speed and memory usage. The more of an image can be placed in memory at a given time, the less time it will take to encode. For reasons of resource limitations, you might reduce the amount of memory an encode can use in favor of a longer encode time.

Available Memory

This will be 1.7 GB or less on a 32-bit system.

Using Temp Files

By default, GeoExpress uses the default Windows user temp directory to store these temporary files. You can specify an alternate directory by entering its full path name in the Temp Directory field (or browsing for it) on the General tab of the Preferences dialog.

Block Size

Lowering block size lowers memory usage but increases encode time. If longer encode times are problematic and your images are extremely large, we recommend using a 64-bit operating system with 4 GB or more RAM and the 64-bit version of GeoExpress.

2. In the Output Image subpanel, click **Select Coordinate Reference System**. Choose your CRS and click **OK**.
3. **IMPORTANT:** Do not use the **Advanced Options** button unless advised by LizardTech Technical Support to do so.
4. Click **OK** and continue to **Key 1.C.2**.

Key I.C.2 Cropping

- ▶ If you don't wish to crop images, skip to **Key I.C.3**.
- ▶ If you wish to crop images, continue to **Procedure 11**.

PROCEDURE 11 CROPPING

1. Click the **Crop** icon or choose **Image Crop** from the **Tools** menu. The Image Crop dialog appears.
2. Click **Show Image**. The preview pane appears.
3. Choose cropping options.
4. Click **OK** and continue to **Key 1.C.3**.

Key I.C.3 Adding Custom (User) Metadata

- ▶ If you don't wish to add custom metadata, skip to **Key I.C.4**.
- ▶ If you wish to add custom metadata, continue to **Procedure 12**.

PROCEDURE 12 ADDING CUSTOM METADATA

1. Right-click the job name and choose **Metadata** or choose **Metadata** from the **Options** menu. The Metadata Manager appears.
2. Select the **User** tab and add custom metadata tags as desired. **IMPORTANT:** Custom or "user" metadata is very different from image metadata. It is recommended that you not adjust any metadata settings on the Images tab in this procedure.
3. Click **OK** and continue to **Key 1.C.4**.

Key I.C.4 Color Balancing

- ▶ If you don't wish to color balance, skip to **Key I.C.5**.
- ▶ If you wish to color balance images or mosaics, continue to **Key I.C.4.a**.

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Key I.C.4.a Color Balancing Images or Mosaics

- ▶ If you are encoding a single image, skip to **Procedure 14**.
- ▶ If you are encoding a mosaic, continue to **Procedure 13**.

PROCEDURE 13 COLOR BALANCING A MOSAIC

1. Click the **Color Balance** icon or choose **Color Balance** from the **Tools** menu. The Color Balance Manager appears.
2. GeoExpress can automatically adjust the overall brightness, contrast and histogram values of each tile in three ways: it can match the values to each other, it can match the values of one or more tiles to a source tile, or it can match the values of an external file. You can also make many of these adjustments manually. To make these adjustments select the **Uniform Corrections** tab.
 - A. Matching tiles to each other:
 - i. in the Automatic Corrections subpanel, select **Match tiles to each other** from the drop-down menu,
 - ii. click **Apply Corrections**.
 - B. Matching to selected tile:
 - i. in the Automatic Corrections subpanel, select **Match to selected tile** in the drop-down menu,
 - ii. select the tile you wish to match to (if you know the name of the tile, simply click on its name in the tile list; otherwise activate the selection cursor above the Color Balance Viewing pane and then click the desired tile in the pane).
 - iii. click **Set Selected Tile As Source Tile**.
 - iv. Click **Select All Tiles** or select a group of desired tiles.
 - v. Click **Apply Corrections**.
 - C. Matching to an external file:
 - i. in the Automatic Corrections subpanel, select **Match to file** in the drop-down menu,
 - ii. Browse to desired file and click **Open**.
 - iii. Click **Select All Tiles** or select a group of desired tiles.
 - iv. Click **Apply Corrections**.
3. GeoExpress can automatically correct vignette, tilt and seamline artifacts within mosaics. To do this, select the **Non-uniform Corrections** tab.
4. Select checkboxes for the desired corrections.
5. If you are satisfied, click **OK** and continue to **Key I.C.5**.

Note: If you want to start over, click **Reset All Corrections**.

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PROCEDURE 14 COLOR BALANCING A SINGLE IMAGE

1. Click the **Color Balance** icon or choose **Color Balance** from the **Tools** menu. The Color Balance Manager appears.
2. From the **Band** drop-down list select a band or Intensity (for grayscale images only one band is available). Selecting a band enables you to modify it individually, while selecting Intensity enables you to manipulate the overall intensity of the image.
3. Make changes to histogram values by entering new values into the **Min**, **Max** and **Gamma** edit fields, or click and drag the slider controls below the histogram display.
4. Click **OK** and continue to **Key I.C.5**.

Key I.C.5 Despeckling

- ▶ If your output image does not have nodata, or has discrete areas separated by nodata (for example, two or more islands), do not despeckle; skip to **Key I.C.6**.
- ▶ If your image is rotated, has been lossily compressed in the past, or has areas of nodata, select the Despeckle Output checkbox in the Encode Options subpanel of the **Properties** tab.

Key I.C.6 Demosaicking

- ▶ If you don't wish to demosaic your output, skip to **Key II**.
- ▶ If you wish to demosaic or "tile out" your output, continue to **Procedure 15**.

PROCEDURE 15 DEMOSAICKING

1. Click the **Image crop** icon or select **Image Crop** from the **Tools** menu. The Image Crop dialog appears.
2. *[Optional]* Click **Show Image** or **Hide Image**. The preview pane appears or disappears accordingly.
3. In the Output Tiling subpanel, choose your desired row, column and magnification values.
4. Skip to **Key II**.

PROCEDURE 16 EDITING EXISTING METADATA

1. Click the **Add image to edit metadata** icon (alternatively, choose **Add image to edit metadata** from the **Images** menu, or select the **Edit Metadata** tab and drag an image onto the job list).

More Info

Histogram Controls

The black slider represents the minimum pixel value, the white slider represents the maximum pixel value, and the gray slider represents the gamma value. The range of values for the minimum and maximum controls are 0-255, and the maximum value cannot be less than or equal to the minimum value.

The gamma slider is restricted to a fractional position in between the minimum and maximum sliders. The range of gamma values is 0.102 – 9.99. The default value of 1.0 (no gamma correction) is exactly halfway between the minimum and maximum values.

The histogram controls adjust dynamically as the brightness and contrast values are changed.

2. Select one or more file names in the job list, then right-click anywhere on the selection and choose **Metadata** from the context menu. The Metadata Manager appears with tabs for User and Image metadata. If you selected only one image, there will also be a Viewer tab for viewing all the metadata tags.
3. Select the desired tab and add or edit custom metadata tags or image tags. **CAUTION:** Editing metadata on the Images tab could affect the appearance, behavior and positioning of the image.
4. Click **OK**. Skip to **Key III**.

PROCEDURE 17 DESPECKLING EXISTING IMAGERY

1. Click the **Add image to despeckle** icon (alternatively, choose **Add image to despeckle** from the **Images** menu, or select the **Despeckle** tab and drag an image onto the job list).
2. Select one or more file names in the job list, then right-click anywhere on the selection and choose **Despeckling Options** from the context menu. The Despeckling Options dialog appears with sliders for threshold and point density. If you selected only one image, there will also be a preview pane and a field for specifying an output file path and file name.
3. Confirm threshold, point density and output.
4. Click **OK**. Skip to **Key III**.

Key II Setting Encoding Ratio

- ▶ If you do not wish to modify the encoding ratio, skip to **Key III**.
- ▶ If you wish to modify the encoding ratio, continue to **Procedure 18**.

You should already have set output format. **WARNING:** If you change the output format now, many of the options you've set will be reset.

PROCEDURE 18 SETTING ENCODING RATIO

1. Select the **Properties** tab if it is not already selected.
2. In the Encode Options subpanel, set compression ratio.
 - A. For visually lossless images set the compression ratio at 20:1 for RGB, 10:1 for grayscale.
 - B. For mathematically lossless images, select the Lossless checkbox.

More Info

Errors

Here are some errors you may encounter while despeckling (and what to do about them if not explicit in message):

“Failed to despeckle image - MaskFinder exceeded the number of allowed points [52201]” – Try increasing the point density.

Chunks of valid image data missing in output – If source is very detailed around edges, lower the point density.

Encoding Ratio

On the optimization tab, the “lossless” option means “keep the original file size”. On the other tabs, it means “compress losslessly starting from the nominal (raw) size”. (This could increase the file size.) Note, however, that on all tabs an encoding ratio of 20:1 means 20x smaller than the nominal (raw) size. You can expect an average 2:1 reduction in raw image size with non-optimization lossless encoding. GeoExpress reports the nominal (raw) size as the “Input Image Size” and the original file size as the “Input File Size”.

Key III Setting Final Output Options

- ▶ If you have already set output path and output filename, skip to **Key IV**.
- ▶ If you wish to specify or confirm output path and filename, continue to **Procedure 19**.

PROCEDURE 19 SETTING OUTPUT PATH AND OUTPUT FILENAME

1. Select the **Properties** tab if it is not already selected.
2. In the Encode Options subpanel, specify or confirm the output path and filename. GeoExpress can output to a LizardTech Express Server (see the Express Server online WebHelp or User Manual), Spatial Express (see the Spatial Express online WebHelp or User Manual), or a file system. The default target is a file system.

Key IV Executing Job

The text on the Execute button depends on what tab of the job list you're working on and what jobs you have selected. It may say any of the following:

- Encode Selected Images
- Encode Selected Mosaics
- Update Selected Images
- Optimize Selected Images
- Apply Metadata to Selected Images
- Despeckle Selected Images
- Execute All Jobs

PROCEDURE 20 EXECUTING JOB

1. Select one or more jobs in the job list. Click the **Execute** button.
2. Congratulate yourself. You're done.

More Info