



SUMMIT EVOLUTION™

Digital Stereoplotter

**Professional Edition
and
Feature Collection Edition**

Operation Manual

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SUMMIT EVOLUTION Document for Professional and Feature Collection Editions

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List of Changes

The following lists show changes in this document for DAT/EM software versions 6.4, 6.3, 6.2, and 6.1.

Changes for Version 6.4

Version	Page(s)	Description
6.4.	7-9	The setting called "Photo Width" in aerial projects has been removed. It was obsolete, and was no longer used in any calculations.
6.4.	7-9	More information was added to this document regarding the "Use Fixed Base" setting in the Aerial and Close Range Project Edit dialog.
6.4.	11-1	SUMMIT EVOLUTION can now make projects and epipolarize imagery from ALOS, IKONOS, GeoEye-1, QuickBird, WorldView-1 and WorldView-2 satellites. The RPC project type has changed; SPOT-5 and ALOS project types have been added. New instructions have been added to this document.
6.4.	11-2	The dialogs and instructions for RPC satellites have changed.
6.4.	11-4	The SPOT-5 project type has been added. Instructions for it appear with the RPC project; the SPOT-5 setup and RPC setup steps are almost the same.
6.4.	11-13	ALOS is a new satellite project. In this project type, DAT/EM-generated epipolarization is available.
6.4.	17-6	There is a new Control Transfer method. Control may be transferred from a second instance of Summit Evolution. The second Summit must have a different, fully oriented project open. It provides coordinate values to the first instance of SUMMIT. The previously existing "from Orthophoto" and "from Vector File" methods are still available as well.
6.4.	22-2	The 3D device may be shared between two instances of SUMMIT EVOLUTION; give the SUMMIT window focus to transfer the 3D device to it. If three or more instances are running, only one instance can control the 3D input device.
6.4.	25-85,25-90	The POINT TRANSLATOR now offers save and load buttons to create and load a .reg file. The .reg settings file may be loaded by any same-version POINT TRANSLATOR.
6.4.	J-4	There is a new BUTTON MANAGER setting, Type=Plotter and Action=Ext movement toggle. This toggles the Relative Orientation Tie Points "Exterior Ground Movement Toggle" button.

Changes for Version 6.3

Version	Page(s)	Description
6.3.	3-3	Information was added for SUMMIT EVOLUTION PROFESSIONAL and FEATURE COLLECTION EDITIONS to use the system mouse as a 3D digitizer. This previously existing functionality was accidentally omitted from the documentation.
6.3.	19-20	The Relative Orientation Tie Points "Align" tool has a new "Two Point" option. Two points can help establish an alignment angle between two images.
6.3.	25-10	Multiple viewport settings are now saved in the project file and may be unique to the project. Previously, they were saved as a general SUMMIT EVOLUTION state. Users found that they wanted specific viewport settings for specific projects.
6.3.	25-41	Instructions have been added for setting the buttons for a system mouse.
6.3.	25-42	Cursor ground rings may now be toggled from a digitizer button.
6.3.	J-4	There is a new BUTTON MANAGER setting, Type=Plotter and Action=Give up 3D device. This releases SUMMIT EVOLUTION or LANDSCAPE's 3D input device and sets the system mouse digitizer instead. This allows another DAT/EM application to set the 3D input device.
6.3.	J-10	Cursor ground rings may now be toggled from a digitizer button.

Changes for Version 6.2

Version	Page(s)	Description
6.2.	5-1	The camera file plan table has changed. Hints are given for using the "New" and "Traditional" camera rotation methods.
6.2.	5-2, 7-2	There is now only one project type and camera file plan for aerial frame and aerial digital cameras such as the DiMAC, DMC, and UltraCam. All aerial film and digital camera projects have been combined into one project type.
6.2.	5-9, 5-10, 5-11	More information has been added regarding camera files for digital cameras.
6.2.	11-1	The Geomatica 10 project type was obsolete and has been removed.
6.2.	11-17	There is a change to DAT/EM-PCI ProPack projects. The PIX files must always be made by PCI Geomatica before creating the SUMMIT EVOLUTION project. Previously, there was a second method that allowed the PCI software to make the PIX files after the SUMMIT EVOLUTION project had been created.
6.2.	15-11	CORE Geospatial .DAT files may now be imported. Previously, .PAR files were the only choice.

Version	Page(s)	Description
6.2.	21-17,25-31	The Orientation>Use Measured Control dialog is now described. This dialog is not new, but was previously omitted from this document.
6.2.	25-7	There is a new separator character settings on the Options>Coordinates tab. This affects the appearance of the coordinate display in the status bar.
6.2.	25-38	The Stealth 3 input device has been added to the BUTTON MANAGER.
6.2.	25-95	Datam Info.exe has a new "Copy to Clipboard" button to copy the display contents into the Windows clipboard.
6.2.	28-4	There is new advice for what to do if the PROJECT VIEWER won't load images.
6.2.	28-14	The vector import step for orthophoto generation can now save and load layer checkmark configurations.
6.2.	28-21	The orthophoto generation process has a new multithreading setting.
6.2.	30-1	The Project Status Tracker is a new tool to help manage a project.
6.2.	F-7	A "Left Handed" setting was added to the Exterior Orientation Import Wizard. This allows you to import omega, phi, and kappa values expressed in a left-handed coordinate system.

Changes for Version 6.1

Version	Page(s)	Description
6.1.	Entire document	In this version, the SUMMIT EVOLUTION project file format has changed. It is now an XML file. The older ".smtprj" project file extension has been changed to ".smtxml" to reflect the change. The change has been made throughout this entire document; individual page links are not provided, because there would be too many.
6.1.	15-19	Merge/Extract Project can now list both .smtprj and .smtxml files, but will always output an .smtxml file.
6.1.	17-12	A new Export Exteriors option can export exterior orientation values to a text file.
6.1.	25-94	The Help menu documentation is new. This was omitted from the document in previous versions.

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Chapter 1. Summit Evolution Overview

SUMMIT EVOLUTION™ is a digital photogrammetric stereoplotter. It is offered in three Editions: PROFESSIONAL, FEATURE COLLECTION, and LITE. All editions are described in this chapter so that you can compare them.

Edition Comparison Chart

The features of each SUMMIT EVOLUTION edition include:

	PROFESSIONAL	FEATURE COLLECTION	LITE
Summit Project file creation	Yes	No	No
Perform orientation measurements	Yes	Interior orientation only.	No
Exports to and imports results of 3rd-party aerotriangulation	Yes	Imports only.	No
Import 3rd-party projects, including images and orientations.	Yes	Yes	DiAP, Z/I SSK, DVP and Socet Set only.
Includes the DAT/EM CONTOUR CREATOR for contour interpolation.	Yes	No	No
Includes the DAT/EM PROJECT VIEWER WITH ORTHOPHOTO AND MOSAIC tool for orthophoto and mosaic creation.	In most areas Yes, but depends on regional licensing agreements.	No	No
Includes the DAT/EM PROJECT STATUS TRACKER tools.	Yes	Yes	No
Provides the complete DAT/EM CAPTURE stereoplotter interface, data collection tools, and data editing tools for MicroStation®, AutoCAD®, or ArcGIS®	Yes	Yes	No. Some limited measurement and terrain following tools are provided. Please ask your DAT/EM representative about specific capabilities for MicroStation®, AutoCAD®, or ArcGIS®
3D ground coordinate digitizer control, including panning and zooming, of AutoCAD, MicroStation, or ArcGIS	Yes	Yes	Yes, but DTM-file-based Terrain Following must be used in order to control the Z coordinate.
Provides stereo SUPER/IMPOSITION™, which displays CAD/GIS vectors over the image view.	Yes	Yes	Yes
Stereo Viewing of oriented overlapping images; mono viewing of oriented orthophotos.	Yes	Yes	Yes
Provides image enhancement utilities	Yes	Yes	Yes
Includes the DAT/EM KEYPAD 252-button touch-sensitive keypad	No (may be purchased separately)	No (may be purchased separately)	No (may be purchased separately)

System Components

A current list of system components and compatible software and operating system versions may be viewed on the DAT/EM Systems website at www.datem.com.

Professional Edition Project Description

SUMMIT EVOLUTION PROFESSIONAL EDITION requires a data set that specifies everything needed to model the camera location relative to the image objects and calculate accurate ground coordinates. Then SUMMIT EVOLUTION acts as an interactive 3D digitizer for AutoCAD, MicroStation, or ArcMap¹. Ground coordinates, switch hits, and digitized object information pass to and from SUMMIT EVOLUTION and the CAD or GIS software.

The information set required for most PROFESSIONAL EDITION projects consists of the following items:

Data Set for a SUMMIT EVOLUTION Professional Edition Stereo Project	Read more about this in ...
1. At least two partially overlapping digital images.	<i>Chapter 4</i>
2. Calibration information about the camera or cameras that created the images.	<i>Chapter 5</i>
3. Control point data.	<i>Chapter 6</i>

The exception is for orthophoto projects (existing orthophotos, not orthophoto generation), which consist of the following items:

Data Set for a SUMMIT EVOLUTION Professional Edition Orthophoto Project	Read more about this in ...
1. At least one orthophoto image, preferably based on a GeoTIF format.	<i>Chapter 10</i>
2. For images that did not start as GeoTIF format, the ground coordinates of the image corners.	Step 6 on page 10-3.

1. ArcMap may be installed by ESRI's ArcView, ArcEditor, or ArcInfo products. Do not use ArcReader.

Once the image, camera, and control data set is ready, the non-orthophoto project work flow is as follows:

SUMMIT EVOLUTION Professional Edition Work Flow for Stereo Projects	Read more about this in ...
1. Import or create a project file that organizes the images and other project files.	<i>Chapter 7 (Aerial), Chapter 9 (Terrestrial), Chapter 8 (ADS40), Chapter 11 (RPC, PCI, ENVI, SAR), Chapter 10 (Orthophoto features) Chapter 15 (Import other).</i>
2. Perform orientation. Import or use pre-existing orientation, use SUMMIT EVOLUTION's orientation options, or use a combination of SUMMIT EVOLUTION and a third-party aerotriangulation package.	<i>Chapter 17, Chapter 18, Chapter 19, Chapter 20, Chapter 21</i>
3. Open two partially overlapping images in SUMMIT EVOLUTION.	<i>Chapter 22, Step 8</i>
4. Activate AutoCAD, MicroStation, or ArcMap.	<i>Chapter 22, Step 10</i>
5. Activate SUPER/IMPOSITION to view digitized features superimposed over the SUMMIT EVOLUTION image.	<i>Chapter 27</i>
6. Digitize objects into AutoCAD, MicroStation, or ArcMap.	<i>DAT/EM CAPTURE Operation Manual</i>

For orthophoto feature collection, the work flow is simplified, because only one image is used at a time and ground coordinates are based simply on the image's GeoTIF coordinate data:

SUMMIT EVOLUTION Professional Edition Work Flow for Orthophoto Projects	Read more about this in ...
1. Create a project file that organizes the images.	<i>Chapter 10</i>
2. Open one orthophoto image in SUMMIT EVOLUTION.	<i>Chapter 22, Step 8</i>
3. If available, load a DEM (LIDAR or DTM) file to be used with Terrain Following.	<i>Page 24-9</i>
4. Start AutoCAD, MicroStation, or ArcMap.	<i>Chapter 22, Step 10</i>
5. Activate SUPER/IMPOSITION to view AutoCAD or MicroStation objects superimposed over the SUMMIT EVOLUTION image.	<i>Chapter 27</i>
6. Digitize objects into AutoCAD, MicroStation, or ArcMap.	<i>DAT/EM CAPTURE Operation Manual</i>

Feature Collection Project Description

SUMMIT EVOLUTION FEATURE COLLECTION EDITION requires that orientation be completed by another source. In most cases, orientation has been completed by SUMMIT EVOLUTION PROFESSIONAL EDITION on another workstation. The FEATURE COLLECTION EDITION can perform interior orientation and import exterior orientation results from third-party aerotriangulation software. It can also import projects from other third-party softcopy workstations.

The information set required for most FEATURE COLLECTION projects consists of the following item:

Data Set for a SUMMIT EVOLUTION FEATURE COLLECTION EDITION Project	Read more about this in ...
<p>A completely oriented softcopy project, including images and support files, of one of the following formats:</p> <ul style="list-style-type: none"> SUMMIT EVOLUTION Z/I Imaging® ImageStation® SSK SOCET SET® DVP .par or .dat files Phorex 1 and 2, Zeiss photogrammetric interchange formats SUMMIT PC™ “SUMMIT 1” <p>Or, an exterior orientation file. This may be the results from a third-party aerotriangulation package or an exterior orientation file exported from another stereoplotter.</p>	<p><i>Chapter 15</i> (To import all formats except SUMMIT EVOLUTION, which may be opened directly.)</p> <p><i>Chapter 18</i> for interior orientation and <i>Chapter 21</i> for “Exterior Orientation: Import Exterior Method”</p>

Once the project is ready, the FEATURE COLLECTION project work flow is as follows:

SUMMIT EVOLUTION FEATURE COLLECTION Work Flow	Read more about this in ...
1. Import or open the project in SUMMIT EVOLUTION. If necessary, perform interior orientation and import an exterior orientation file.	<i>Chapter 7</i>
2. For a stereo project, open two partially overlapping images. For an orthophoto project, open one orthophoto image.	<i>Chapter 22, Step 8</i>
3. (Optional) If available, load a point distribution file to be used with Terrain Following. Terrain Following is most often used for orthophoto projects.	Page 24-9
4. Start AutoCAD, MicroStation, or ArcMap.	<i>Chapter 22, Step 10</i>
5. Activate SUPER/IMPOSITION to view digitized features superimposed over the SUMMIT EVOLUTION image.	<i>Chapter 27</i>
6. Digitize objects into AutoCAD, MicroStation, or ArcMap.	<i>DAT/EM CAPTURE Operation Manual</i>

Lite Edition Project Description

SUMMIT EVOLUTION LITE EDITION allows the user to view an existing stereoplotter project. Viewing is in stereo for stereo projects. Panning, zooming, and 3D positioning are all available. A system mouse with a wheel button is used as the digitizer controller. Some measurement and terrain following tools are available. Please ask your DAT/EM representative about specific capabilities that are active for AutoCAD, MicroStation, or ArcGIS.

The LITE EDITION's greatest use is to view and verify previously collected data. It requires that project creation, orientation, and most data collection be completed by another source. In most cases, orientation and data collection have been completed by SUMMIT EVOLUTION PROFESSIONAL or FEATURE COLLECTION EDITIONS on other workstations.

The information set required for most LITE EDITION projects consists of the following items:

Data Set for a SUMMIT EVOLUTION Lite Edition Project	
1.	A completely oriented project of any of the following types: <ul style="list-style-type: none"> SUMMIT EVOLUTION smtprj project, including images and support files. ISM DiAP, Z/I SSK, DVP .par or .dat files, or SOCET SET project, including images and any support files.
2.	The AutoCAD, MicroStation, or ArcGIS files that are associated with the project.
3.	(Optional) A ground points file to use with Terrain Following. Many formats are accepted.

Once the project is ready, the LITE EDITION project work flow is as follows:

SUMMIT EVOLUTION Lite Edition Work Flow	Read more about this in ...
1. Open the existing SUMMIT EVOLUTION, ISM DiAP, Z/I SSK, DVP .par or .dat files, or SOCET SET project.	<i>Chapter 22, Step 6</i>
2. For a stereo project, open two partially overlapping images. For an orthophoto project, open one orthophoto image.	<i>Chapter 22, Step 8</i>
3. (Optional) Load a ground point distribution file to be used with Terrain Following.	<i>Page 24-9</i>
4. Start AutoCAD, MicroStation, or ArcMap.	<i>Chapter 22, Step 10</i>
5. Activate SUPER/IMPOSITION to view digitized features superimposed over the SUMMIT EVOLUTION image.	<i>Chapter 27</i>
6. Right click the system mouse in the main image view to control the SUMMIT EVOLUTION cursor. Double right click or key in <Esc> to return to regular mouse mode. Toggle with right click and double right click at any time. Control Z with the system mouse's wheel button.	<i>page 3-3</i>
7. Use the DAT/EM measurement tools provided for your AutoCAD, MicroStation, or ArcGIS interface.	<i>DAT/EM CAPTURE Operation Manual</i>

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Chapter 2. Installation

The following checklist shows a summary of the SUMMIT EVOLUTION™ installation process. Detailed instructions appear in the DAT/EM Systems International “Installation Instructions Series” documents provided with the original product packaging and on the DAT/EM software disk.



SUMMIT EVOLUTION Installation Checklist

1. Make sure the following items are in place and working:
 - a.) The version of Windows recommended by DAT/EM for this version of the software.
 - b.) Non-DAT/EM-supplied components such as additional RAM, USB hub, additional communications ports, system mouse, and storage drives.
2. Install the stereo display system. See the “Installation Instructions Series” document for the particular type of display. These documents are available on the DAT/EM disk and on the DAT/EM website.
3. Install one or more 3D cursor control systems. See the “Installation Instructions Series” document for the particular type of 3D cursor.
4. Install the hardware lock. See the “Installation Instructions Series: DAT/EM Hardware Lock and Driver” document.
5. Install and configure the software. See the “Installation Instructions Series: Software Installation and Configuration” document:
 - a.) MicroStation®, AutoCAD®, and/or ArcGIS®
 - b.) DAT/EM software
 - c.) Coordinate transformation databases (optional)

For more information on how to set up a SUMMIT EVOLUTION-specific button configuration, see page 3-28 and *Appendix J*.

6. If DAT/EM-PCI ProPack models will be used, the DAT/EM-supplied PCI ProPack software must be installed and the licensed PCI lock must be attached to the computer. Please see the installation series file **DAT/EM Software Installation.pdf** file or contact DAT/EM Support (*Appendix L*) for more information.

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Chapter 3. Input Devices

SUMMIT EVOLUTION™ can accept input from the computer's keyboard, one or more system mouse devices, and a 3D digitizer device such as handwheels with foot pedals, or a variety of 3D mouse devices. This chapter shows how to set up and use these devices.

Note that the 3D input device should already be configured in SUMMIT EVOLUTION **Tools>Options>Input Devices**.

Use Button Manager to Set the Switch Functions

The Button Manager may be used to set the input device's switch functions at any time. See "Tools Menu > Button Manager" on page 25-38 for instructions. See *Appendix J* for a table of Button Manager settings.

Input Device Speed

The input device speed settings control how much the cursor moves in XY or Z compared to how much the device moves. See "Tools Menu > Input Speed" on page 25-37 for instructions.

Toggle X, Y, or Z Movement

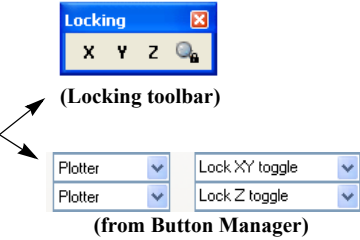
To prevent movement along a cursor control axis, select the **Toggle X Movement**, **Toggle Y Movement**, or **Toggle Z Movement** icons on the **Locking** toolbar or use a digitizer button that is set to **Type=Plotter** and **Action=Lock XY toggle** or **Lock Z Toggle**.

To toggle the ability for the cursor to move along an axis, choose a method:

- Use a digitizer button set to **Type=Plotter** and **Action=Lock XY toggle** or **Action=Lock Z toggle**.
- Select a **Toggle ... Movement** icon from the **Locking** toolbar.

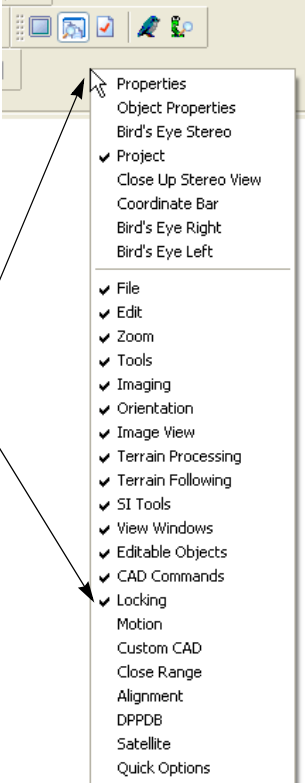
If the axis movement is off, the cursor will not move in the corresponding direction when the 3D digitizing device is moved.

To resume movement, click the **Toggle ... Movement** icon or button again.



(Locking toolbar)

(from Button Manager)



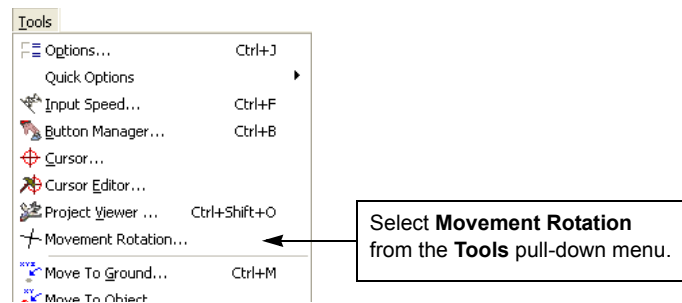
If you can't see the toolbar, right click on a blank part of the toolbar display area and check on **Locking**.

Change Movement Axes

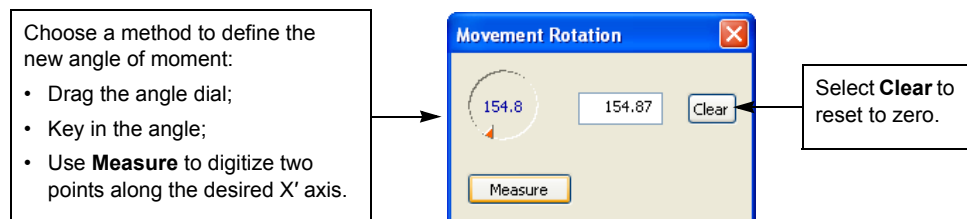
The default X and Y cursor movement is set to the kappa of the model. The **Movement Rotation** tool allows you to set a different angle. This may be useful, for example, when a set of streets and all the nearby buildings are oriented to an angle such as 25 degrees from kappa. If Movement Rotation is set to 25 degrees, it will be easy to move the cursor straight up and down the streets. This may be particularly useful with handwheels.

Perform the following steps:

Step 1) Select **Movement Rotation** from the **Tools** toolbar or pull-down menu.



Step 2) Either drag the angle dial to the desired angle, enter the angle in the field, or use **Measure** to digitize two points that define the angle of the X' axis. The Y' axis will be set automatically to 90 degrees from the X' axis.



Step 3) At any time, use **Clear** to reset the movement to 0 degrees from kappa.

System Pointing Device Mouse

The system (non-3D) mouse is the system pointing device. It also performs a vital function within SUMMIT EVOLUTION. It may be used for the following functions:

- Select menu items
- Pick a location on a Bird's-eye View. The main stereo view immediately moves to that point.
- Drag a rectangle on the Stereo Bird's-Eye View. The main stereo view moves and scales to that area.
- Select points for Quick Relative orientation.
- If it has a wheel, it can change the Z coordinate when SUMMIT EVOLUTION is the focus window.
- Normally, digitizer control is automatically given to the digitizing device that is moving. That is, if you move the mouse, the mouse gets control, and if you move the 3D device, the 3D device gets control.
- The SUMMIT EVOLUTION digitizer may be set to emulate the system mouse by setting a digitizer button to **Type=Plotter** and **Action=System Mouse toggle**. See *Appendix J*.

System Mouse Used as 3D Input Device

Purpose-built 3D digitizing devices are usually used for SUMMIT EVOLUTION PROFESSIONAL and FEATURE COLLECTION EDITIONS; however, if such a 3D device is not available, the system mouse may be used to control the stereoplotter cursor. The mouse is used alternately as the system pointing device and the SUMMIT EVOLUTION XY cursor controller.

To use the system mouse as a 3D input device, set SUMMIT EVOLUTION>**Tools>Options>Input Devices>System Mouse** on.

Multiple system mouse devices are supported. One, two, or more system mouse devices may be used. For two or more, call them Mouse1, Mouse2, Mouse3 ..., MouseN. The first mouse to move after SUMMIT EVOLUTION starts becomes Mouse1. Mouse 2, Mouse3, ..., and MouseN are all treated as Mouse2. BUTTON MANAGER (page 25-38) shows 10 buttons; buttons 1-5 are set for Mouse1 and buttons 6-10 are for Mouse2 and any others.

Button 2 on a system mouse device should always be set to **Type=None** in the BUTTON MANAGER (page 25-38).

- **Single Right Click:** To control XY cursor movement in SUMMIT EVOLUTION, position the system pointer over the image view and right click.
- **Double Right Click or <Esc> key:** To change back to regular system mouse mode, double right click or press the escape <Esc> key on the keyboard.



The mouse button functions change depending on whether or not the mouse is controlling SUMMIT EVOLUTION:

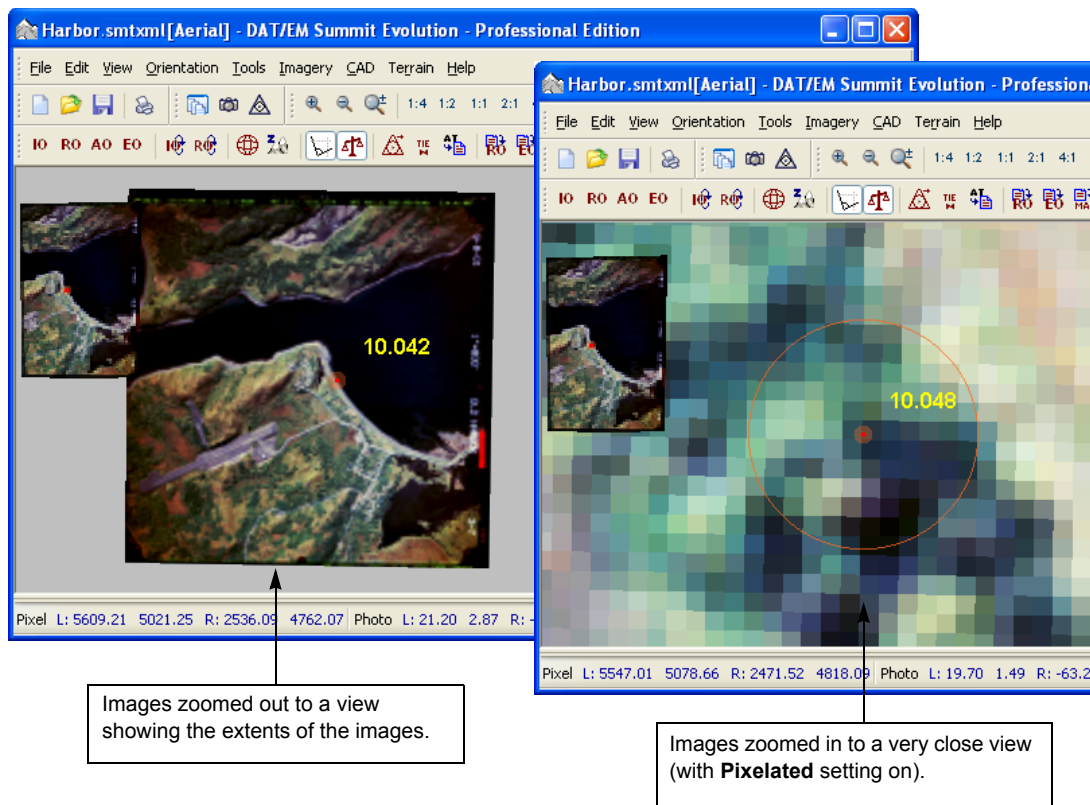
- BUTTON MANAGER's settings take effect when the mouse is controlling SUMMIT EVOLUTION (see "Tools Menu > Button Manager" on page 25-38).
- The regular system mouse button functions return when not controlling the stereoplotter.

Image Magnification Zoom Controls

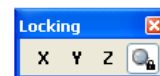
There are several methods to control the image zoom level. Unlimited zooming down to the subpixel level is possible in any images that contain zoom pyramids (such as SUMMIT image format **.smti** files).

Consider the following tips for using image view zooms:

- For the best possible orientation results, use a subpixel zoom, or no larger than 1:1 zoom, during orientation (if available). Use the same zoom to measure each point.
- Use any other view zooms for convenience once AutoCAD®, MicroStation®, or ArcMap® is active.
- If the images will not zoom down to the subpixel level, this indicates that the image format does not have full image pyramids. See *Chapter 4* and "Use Image Creation to Generate .SMTI or .PYR Files" on page 4-6 for more information.



- It is possible to lock the zoom level, which deactivates *all* of the zoom controls listed in the table below. Select (highlight) the **Toggle lock all zooming** option from the **Locking** toolbar. This may be useful when digitizing at a certain zoom level, such as 1:2; set the desired zoom first, then lock the zoom so that it cannot be changed accidentally.



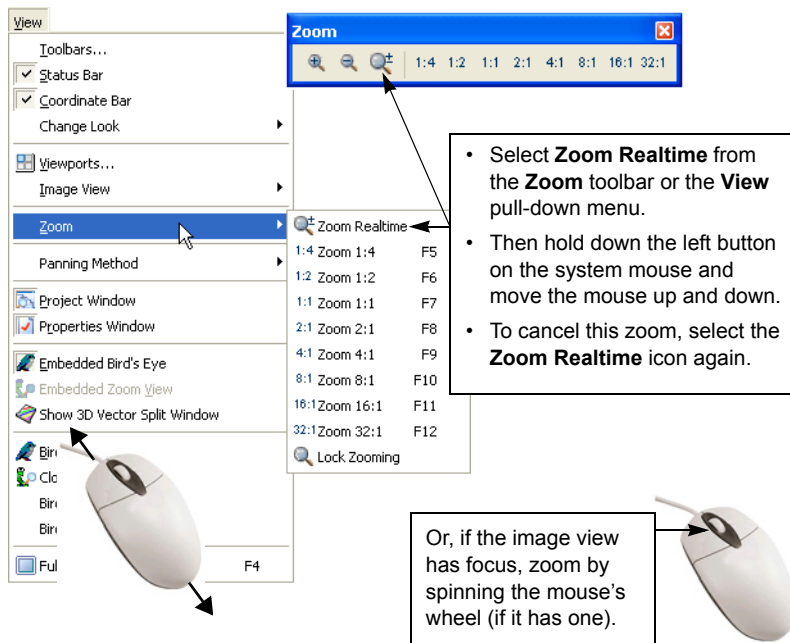
There are many options for zooming in the SUMMIT EVOLUTION image view:

Zoom Control Options		
<p>Icons, keys, and menu items:</p> <ol style="list-style-type: none"> Zoom In and Zoom Out icons; Zoom Ratio icons (such as 8:1); <F5> through <F12> or other function keys (to set them, see “Tools Menu > Shortcuts” on page 25-65); Zoom options from the View pull-down menu. 		<p>Choose a method:</p> <ul style="list-style-type: none"> Select a Zoom setting from the Zoom toolbar; Use the <F5> through <F12> function keys; Select a setting from the Zoom option of the View pull-down menu.

Zoom Control Options

Zoom with the system pointing device mouse:

- Zoom with the system mouse wheel (if it has one) *only if* SUMMIT EVOLUTION's image view is the focus window *and* the system mouse does not have control of the SUMMIT cursor (if it does, it will change Z instead of zooming).
- Select **Zoom Realtime** from the **Zoom** toolbar, hold down the left button on the system mouse, and move the system mouse up and down. To cancel this zoom, select **Zoom Realtime** again.



The the Page Up and Page Down keyboard keys:

- Zoom out by pressing the **Page Up** key.
- Zoom in by pressing the **Page Down** key.



Key in a value directly in the **Zoom** display/field on the status bar (page 25-6).

Map Scale 409.02 Zoom 0.50 Ground 23453.92 19025.67 12.83 ft

Key in a value directly in the **Zoom** display/field on the status bar.

Key in the map scale ratio to set the zoom to the map scale.

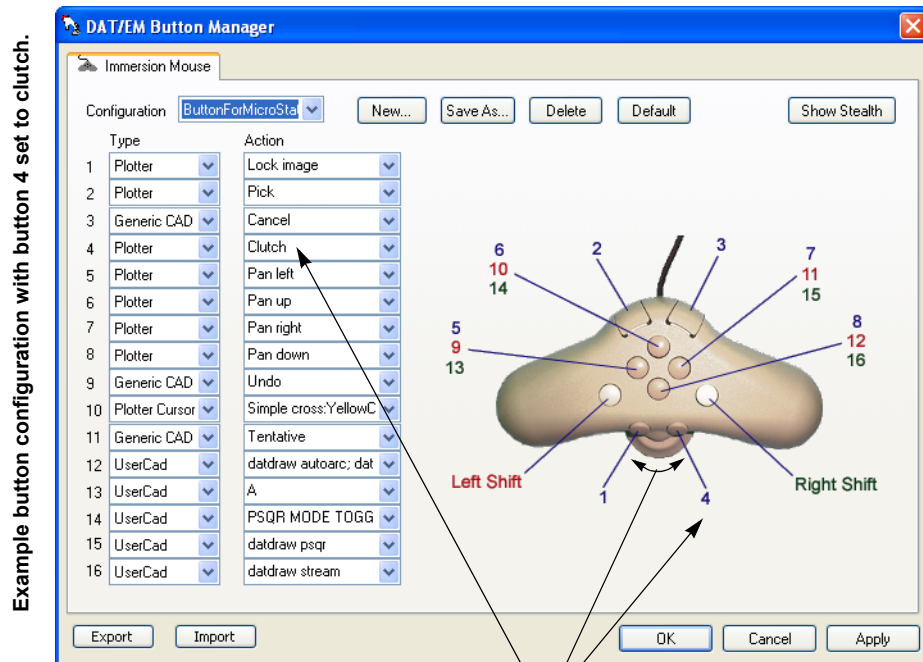
Map Scale 1000 Zoom 0.50:1 Ground 23453.92 19025.67 12.83 ft

Key in a ratio (1:___) value directly in the **Map Scale** display/field on the status bar. The example shows the entry for 1:1000.

- Hint:** To preserve the map scale zoom no matter how the CAD view zooms, uncheck **Always match image view...** on the **Main View** tab in **Options** (see Step 13 on page 22-5).
- Hint:** The model must have ground coordinates; the setting is saved between models; the setting is not saved between projects. The units must be correct in the project file. SUMMIT EVOLUTION must be displayed 100% on the stereo monitor, not overlapping the secondary monitor.

Zoom Control Options

Zoom by holding down a 3D mouse device's **Clutch** button and spinning the Z wheel:



To zoom with the SoftMouse, hold down the clutch button and spin the wheel.

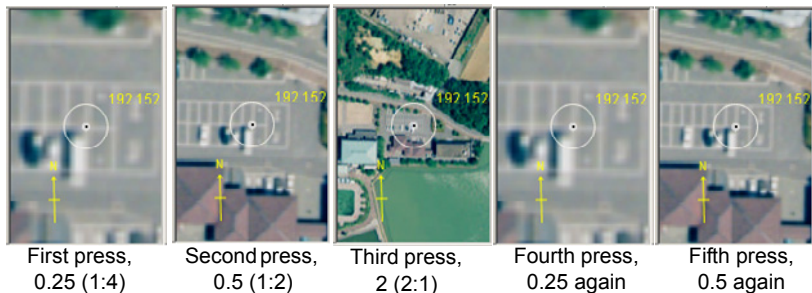
- When the clutch button is released, the wheel changes the depth coordinate.
- To check or set the clutch button, see page 25-38 or *Appendix J*.

Use **Type=Plotter Zoom** in the Button Manager to set a list of zoom levels on a button. Press the button multiple times to scroll through the zooms.

See page J-9 in *Appendix J* for detailed **Plotter Zoom** instructions.

12 Plotter Zoom 0.25:0.5:2

In this example, pressing the button five times gives the Image View zooms below:

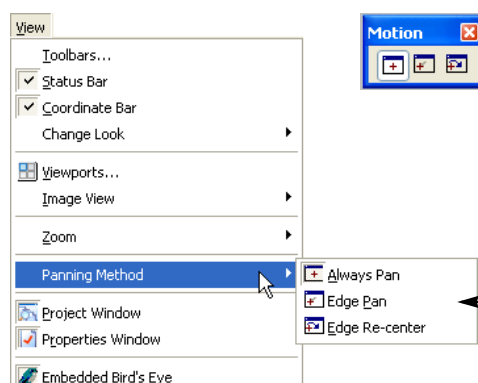


Automatic Image Panning

There are three methods of panning the images when the cursor is moved:

- Always Pan:** Keep the cursor still in the middle of the SUMMIT EVOLUTION window and have the images pan under the cursor.
- Edge Pan:** Move the cursor in the view and pan near the edge. The image pans as the cursor approaches the edge of the view, but the cursor stays near the edge of the view.
- Edge Re-center:** Move the cursor in the view and pan to the center. The image pans as the cursor approaches the edge of the view, and each pan centers the cursor in the window.

To change these display pan modes, select the desired option from the **Motion** toolbar or from **Panning Method** on the **View** pull-down menu:



Select from the **Motion** toolbar or the **Panning Method** option on the **View** menu.

- Select **Always Pan** to keep the cursor still in the middle of the SUMMIT EVOLUTION window and have the images pan under the cursor.
- Select **Edge Pan** to move the cursor in the view and pan near the edge. The image pans as the cursor approaches the edge of the view, but the cursor stays near the edge of the view.
- Select **Edge Re-center** to move the cursor in the view and pan to the center. The image pans as the cursor approaches the edge of the view, and each pan re-centers the cursor in the window.

Keyboard Cursor Control

The keyboard's arrow keys may be used for fine control of the cursor in the image view.



The arrow keys may be used for fine movement control of the cursor in the image view

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Chapter 4. Image Files

This chapter gives information about the input image format and making the SUMMIT EVOLUTION™ project images.

- Any type of stereo project must contain at least two images that partially overlap to form a stereo pair, also known as a *model*. Three dimensional measurements are possible in the area where the images overlap. There may be many models in a SUMMIT EVOLUTION project file.



- If a single image has an associated DTM (xyz points) file that covers the image area, a stereo mate may be created. In this way, a complete stereo model is created. This is commonly done for SAR (synthetic aperture radar) projects. See “Generate Stereo Mate” on page 4-11 below.
- An orthophoto project, which is not viewed in stereo, must have at least one orthophoto file.

The project’s images must be in a format that SUMMIT EVOLUTION can process. Some files must be converted to a different format using the SUMMIT EVOLUTION IMAGE CREATION tool. Image formats are discussed below.

Original Image Requirements

SUMMIT EVOLUTION can use many different image formats. Some of the TIF-type formats may be used as they are without translating them to the SUMMIT EVOLUTION **.smti** format, but other formats must either be converted or used with generated **.pyr** zoom pyramid files. The IMAGE CREATION tool (page 4-6) is used to create **.smti** or **.pyr** files.

Formats that must be converted to **.SMTI** or used with **.PYR** files (Sheet 1 of 2)

Formats that must be converted to .smti/.pyr	Image Information
BMP (.bmp)	Microsoft Windows bitmap format files should be 8 bits per pixel or 256 color/grayscale. Convert this format to .smti or use the .bmp images together with .pyr image pyramids. Using with .pyr files could be slow to tile at the 1X level.
JPEG (.jpg)	This format is commonly used for computer graphics viewing purposes. Beware of resolution loss with this format. Convert this format to .smti or use the .jpg images together with .pyr image pyramids.
PCX (.pcx)	ZSoft PC Paintbrush format. Convert this format to .smti or use the .pcx images together with .pyr image pyramids.
Summit 1.0 Images	Early versions of SUMMIT PC™ produced a set of several compressed TIF files for each image. Each set must be converted into a single .smti image. Do not create .pyr files for this format.
Targa (.tga)	Truevision (Targa) file format. Convert this format to .smti or use the .tga images together with .pyr image pyramids.

Formats that must be converted to .SMTI or used with .PYR files (Continued) (Sheet 2 of 2)

Formats that must be converted to .smti/.pyr	Image Information
TIF images produced by the Leica Geosystems ADS40 or ADS80 Digital Sensor	<p>It is sometimes possible for SUMMIT EVOLUTION to display these “1X .tif” files as they are without translating to .smti format, but they do not contain image zoom levels, and often the bit settings within the files do not match their file headers. In most cases, it is recommended to convert these files to the .smti format. Some – but not all – ADS40 images require the Force 12 bit setting on. ADS80 imagery should have Force 12 bit off. Converting to .smti will add image zoom levels, regulate the bit settings (if needed), and maximize image access speed. It is recommended to convert just one file first to determine whether the Force 12 bit setting is needed, then process the remaining images. Further instructions appear in Step 6 on page 4-9 and Step 9 on page 4-11.</p> <p>If the Force 12 bit setting is <i>not</i> needed, it is possible to use .pyr zoom pyramid files instead of .smti files. .Pyr files are used along with the original 1X .tif file. This file combination will only work if the 1X .tif file does not contain mistakes in its format (unfortunately common in ADS40 images). It is recommended to try one image pair as a test before creating .pyr files for a large project.</p>
TIF with image pyramid, tiled with tile size <i>other than 128 or 256 lines</i>	It is possible for SUMMIT EVOLUTION to use these files as they are without translating to the .smti format, but processing may be very slow. Convert these files to the .smti format to make them faster. Do not create .pyr files.
TIF with no image pyramid, untiled	General-purpose Tagged Image Format files do not contain image tiles or an image pyramid. Convert this format to .smti or use these original 1X .tif images together with .pyr image pyramids.

The following formats may be used in their original form, or they may be converted to .smti format. For some formats, converting to .smti can improve functionality or speed; for other formats, there is no noticeable difference after conversion. All of these formats already contain image zoom pyramids, so do not create .pyr files for them.

Formats that may be used as they are or may be converted to .SMTI (Sheet 1 of 3)

Formats that may be used as they are or may be converted to .smti	Image Information
DiAP image files (.sys, .sis, .sjs)	ISM DiAP image files may be used as they are as long as speed performance is acceptable. To increase performance, convert to .smti.
ECW (.ecw)	Enhanced Compressed Wavelet images by ER Mapper. While this format can be used directly by SUMMIT EVOLUTION, DAT/EM recommends converting to .smti images to increase processing speed.
JPEG 2000 (.jp2)	JPEG 2000 files may be used as they are as long as speed performance is acceptable. To increase performance, convert to .smti.
MrSID® (.sid) but <i>not</i> those with 16-bit per channel. Check with DAT/EM for future support plans.	MrSID (Multi-Resolution Seamless Image Database) files by LizardTech™. DAT/EM recommends using this format directly for high-end (faster) computers. If tiling is noticeably slow on low-end computers, then convert this format to .smti.

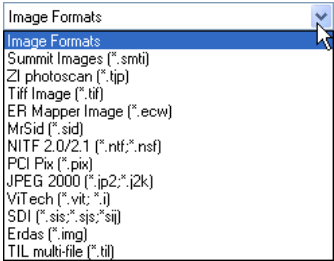
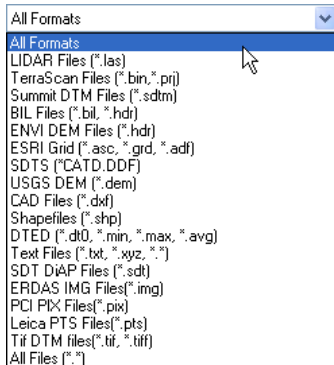
Formats that may be used as they are or may be converted to .SMTI (Continued) (Sheet 2 of 3)

Formats that may be used as they are or may be converted to .smti	Image Information
NITF (.ntf) With or without JPEG2000 and JPEG compression.	NITF is a United States Government file format used with DPPDB projects and some satellite projects. JPEG2000 NITFs contain zoom levels, so they may be used as they are without processing by the IMAGE CREATION tool. For non-JPEG2000 NITFs, use the original format only when zoom levels are not required. To activate zoom levels, use IMAGE CREATION to create .smti files and place both the .smti and the .ntf files together in the same folder.
PIX by PCI Geomatics (.pix)	A .pix file is a PCI image-database format. A PCI hardware lock and license is required to use .pix files. It is neither possible nor necessary to convert them to .smti . The project types that use these files appear in “DAT/EM-PCI ProPack Project” starting on page 11-17.
PYR by Inpho (with original 1x TIF file)	<p>A .pyr image is created by Inpho Match-AT software. It contains the zoom levels for an original .tif file. The two files, <filename>.tif and <filename>.pyr must be in the same folder.</p> <p>Use the .tif and .pyr files as they are. Do not convert them.</p> <p>Add the .tif files to the project; if the .pyr files are in the same folder, they will be found and used automatically.</p>
SMTI files by SUMMIT EVOLUTION	<p>These are also specially formatted .tif files containing an image pyramid and a tile size of 256 lines. They are created by SUMMIT EVOLUTION’s IMAGE CREATOR. The file extension may named either .tif or .smti.</p> <p>Many users like to call these .tif files “.smti,” because it is a quick reminder that they have been processed by the IMAGE CREATOR, and therefore contain image pyramids.</p>

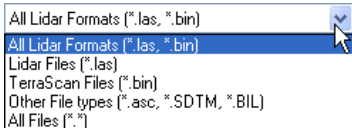
Formats that may be used as they are or may be converted to .SMTI (Continued) (Sheet 3 of 3)

Formats that may be used as they are or may be converted to .smti	Image Information
TIF with: image pyramid tiled with tile size of 128 or 256 lines	Any .tif file matching this description, including .tjp and .smti files, may be used directly in the .smtxml project file without converting it to the .smti format.
TIF with: Four or more bands	<p>IMAGE CREATION (page 4-6) can process four- or more-band imagery, but does not offer JPEG image compression for this format. The JPEG compression standard supports only three bands.</p> <p>IMAGE CREATION (page 4-6) can output up to ten bands in any order. It can also reduce or expand the number of bands, or place the same band in all three RGB screen viewing channels. For example, it could make a viewable image from the 4th infrared band by placing copies of it in the red, green, and blue channels of a 3-band output image.</p> <p>SUMMIT EVOLUTION displays the first three bands – channels 0, 1, and 2 – by default, but also offers its own Channel Manager (page 25-69 and page 25-73) to set any other band display order.</p> <p>DAT/EM VIEWER (<i>Chapter 29</i>) has an option under its View pull-down menu to display the fourth band.</p>
TJP by Z/I Imaging®	These are specially formatted tiled .tif files containing an image pyramid and a tile size of 128 lines. They may be used directly in the .smtxml project file without converting them to the .smti format.

The following is a special case where a single image that is not part of a stereo pair may be used to create its own stereo mate image:

Formats that can be used for stereo mate generation	Image Information
<p>A “single” image does not yet have an overlapping stereo mate that can be used to build a stereo model. There is at least one associated DTM (xyz points) file that covers the entire image area.</p> <p>The image is in of one of the following formats (Dec. 2011):</p>  <p>Hint: Images of other formats may first be converted to one of these formats using IMAGE CREATION (page 4-6).</p> <p>The DTM file(s) are in one of the following formats (Dec. 2011):</p>  <p>Hint: It may be useful to process DTM Files first using the POINT TRANSLATOR (page 25-84).</p>	<p>SAR (synthetic aperture radar) images are the most commonly in need of stereo mate generation, but other formats may also be used in this process.</p> <p>A group of “single” images in the same project may be processed at one time; the set of DTM files must cover the entire area of the set of images.</p> <p>Use the GENERATE STEREO MATE application to create a stereo mate for each image. See “Generate Stereo Mate” on page 4-11.</p>

The following is a special case where an image may be made from a points file:

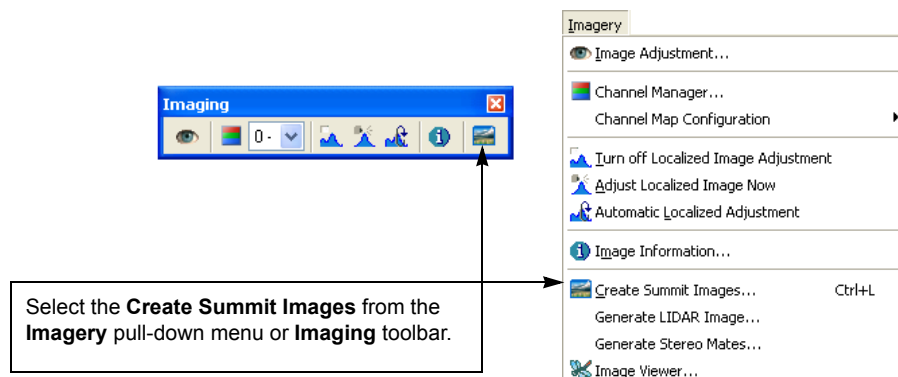
Points File Formats that can be made into an image	Information
<p>A LIDAR-format or other accepted format points file of one of the following formats (as of April 2011):</p> 	<p>Use the GENERATE LIDAR IMAGE application to create the image. See “Generate Images from LIDAR Files” on page 4-13.</p>

Use Image Creation to Generate .SMTI or .PYR Files

See the tables above in “Original Image Requirements” to determine if converting the files into the **.smti** format or creating **.pyr** format is necessary.

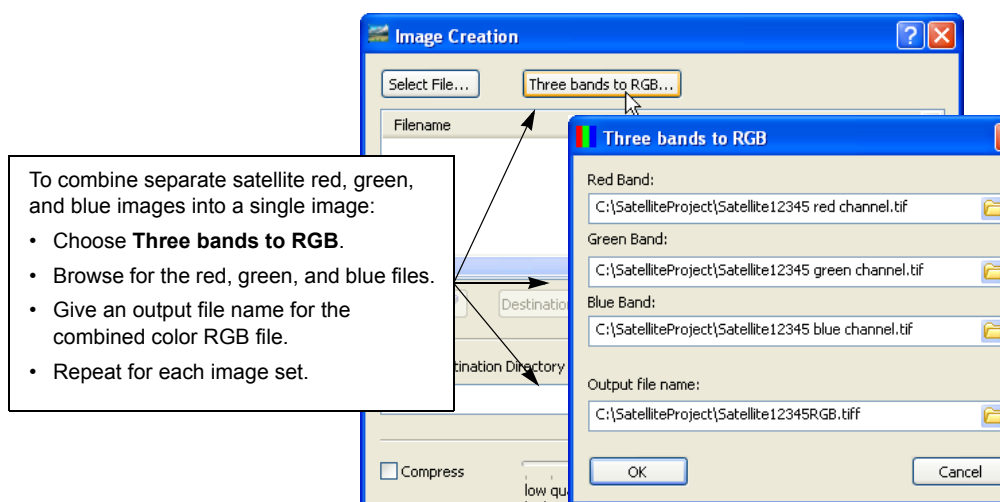
To convert files to the SUMMIT EVOLUTION **.smti/.tif** image format or to generate **.pyr** zoom pyramids only, perform the following steps:

Step 1) Select **Create Summit Images** from the **Imaging** toolbar or the **Imagery** pull-down menu.



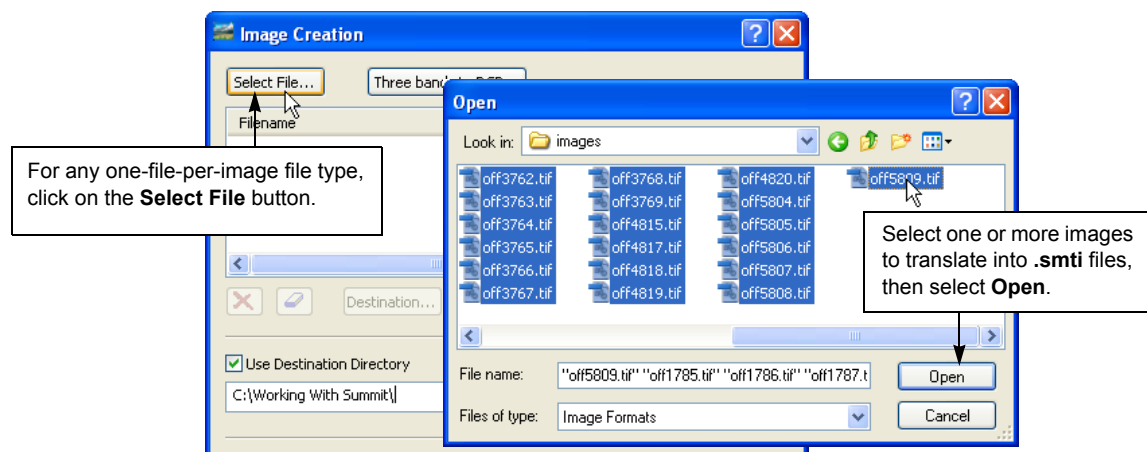
Step 2) Choose a method to open files:

- a.) For satellite projects that provide each image in three separate red, green, and blue color channel files, select **Three bands to RGB**. The three files must be the same size. This option combines the files into one three-band red, green, blue image.



- b.) For any other file type, choose **Select File**. Select one or more files. The files must be of one of the formats described in “Original Image Requirements” on page 4-1. Note the **Rotation** setting is applied to every file (see Step 6 below), so if multiple files are selected, they must all require the same rotation.

Note: JPEG (**.jpg**) files must be completely loaded into the computer’s memory in order to be converted. The **.jpg** image size that can be processed is limited to the amount of system memory.



Step 3) Choose a file output option:

- A **.smti** file is a GeoTIF file with image zoom pyramids added.
- **.Smti** and **.tif** are exactly the same format, but “**.smti**” is a name that tells you the image pyramids are present, and can easily be distinguished from 1X-only **.tif** files.
- DAT/EM documentation and Support technicians will usually call the files “**smti**” or “Summit images” even if you have chosen to name them “**.tif**”.
- The image pyramids may be written into a separate file using the Inpho **.pyr** output format. **.Pyr** files are **.tif** files that contain the zoom pyramids only (without the 1X level).

The advantage to **.pyr** files is that they may be discarded when the project is done. They also mean that the 1X image level exists in only one place: The original image.

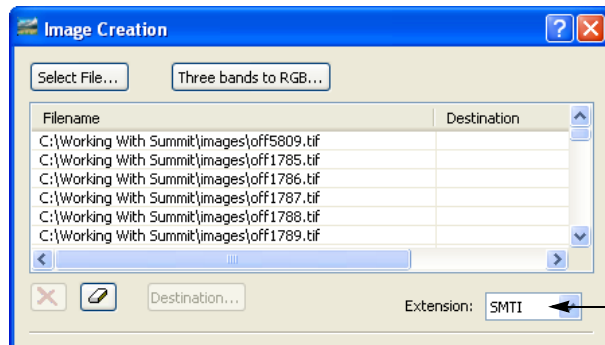
Tiling speed depends more on the original 1X file format than the **.pyr** files.

Do not make more **.pyr** files if you already have Inpho-generated **.pyr** files; they are the same.

Do not make **.pyr** files if you wish to use the **Force 12 bit** setting for ADS40/80 images.

If you use Channel Mapping, rotation, compression, or bit change settings, choose the “**New TIF & PYR**” setting. This will ensure that a 1X level file is created to match the image pyramids.

When adding the SUMMIT EVOLUTION images to a project, add the original (or any new 1X level) images. Do not add the **.pyr** files. SUMMIT EVOLUTION uses the **.pyr** files if it finds them in the same folder with the 1X images and if the original image does not already contain zoom pyramids.



File format choices:

- **SMTI** -- a GeoTIF file. This name tells you it was created by IMAGE CREATION.
- **TIF** -- exactly the same as the .smti file except for its name. This file extension can be confusing if the 1X-level input image was also called ".tif".
- **PYR** -- image pyramids without the 1X level. In order for SUMMIT EVOLUTION to use it, it must be located in the same folder as the 1X-level image.
- **New TIF & PYR** -- a new 1X-level image file and separate image pyramid files. Use this option if channel mapping, image compression, rotation, or bit number changes are used.

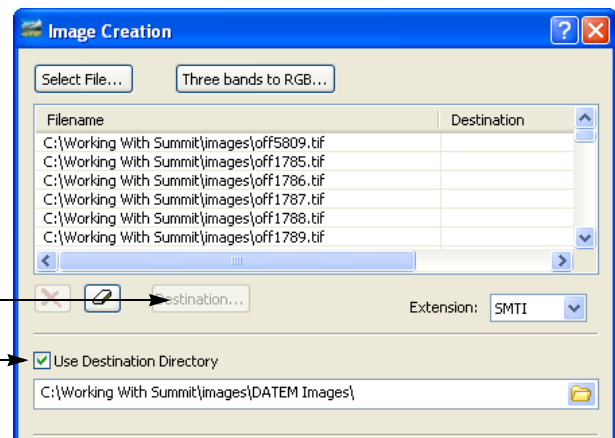
Step 4) Choose a method to set the output folder:

- To place all the output files in one folder, check on **Use Destination Directory**. Browse to and select the folder.
- Or, to use multiple output folders, *uncheck* **Use Destination Directory**. Highlight one or more input files in the **Filename** list. Select the **Destination** button and set the folder for the highlighted file(s). Repeat until all input files have a folder listed in the **Destination** column.

Note: If creating .pyr files only, do not set destinations. The setting will be ignored. The image pyramids will be placed in the same location as the original 1X images.

There are two ways to choose the folder for the output files:

- To place all the output files in one folder, check on **Use Destination Directory**. Browse to select the folder.
- Or, to use multiple output folders, *uncheck* **Use Destination Directory**. Highlight one or more input files in the **Filename** list. Select the **Destination** button and set the folder for the highlighted file(s). Repeat until all input files have a folder listed in the **Destination** column.

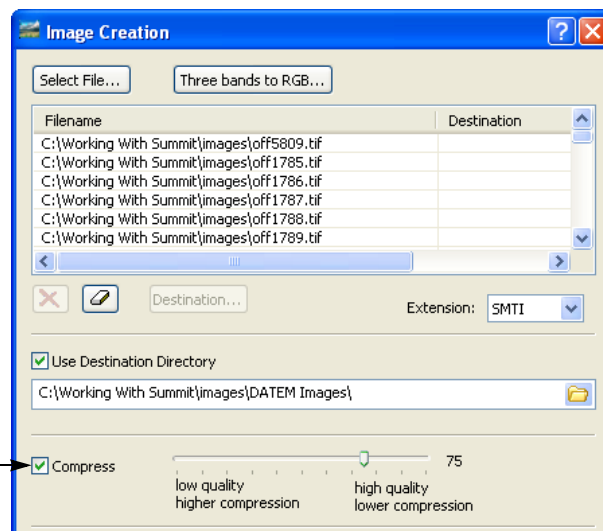


Step 5) Choose whether or not to compress the new files.

- Compressing the files will not speed up SUMMIT EVOLUTION's image accessing time.
- Compressing files is only useful to save space on the computer's hard drive.
- Compressing a file may reduce its resolution.
- Compression is not possible for four- or more-band imagery, because only three bands are supported by the JPEG compression standard. If desired, use **Channel Mapping** (Step 8 below) to output a 3-band image that is compatible with JPEG compression.

To compress a file, check on **Compress** and choose a compression setting.

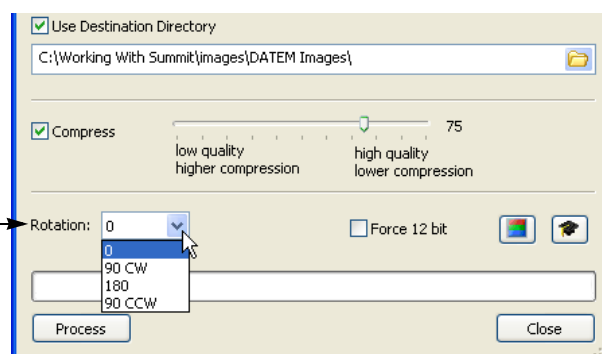
- In most cases, compression is not recommended due to the possibility of resolution loss.
- If there is enough file storage space, do not compress the file.
- Compressing a file does not speed up SUMMIT EVOLUTION's file access time.
- Compression is not offered for 4-band imagery, because JPEG compression does not support the fourth band.



- Step 6)** Set a **Rotation** angle that results in left-right overlap for stereo image pairs. This is simply 0 (zero) in most cases. A non-zero **Rotation** is required only when image pairs were scanned with a top-bottom overlap. Note that the setting is always 0 (zero) for orthophoto, satellite, and ADS40 images. (This setting is ignored for **.pyr**-only output. The image pyramids cannot be rotated differently than the original 1X image. Select “**New TIF & PYR**” to enable rotation in all files.)

Set a **Rotation** angle that results in left-right overlap for stereo image pairs. This is simply 0 (zero) in most cases. A non-zero **Rotation** is required only when image pairs were scanned with a top-bottom overlap.

Note that **Rotation** is *a*lways 0 (zero) for orthophoto, satellite, and ADS40 images.



- Step 7)** **Force 12 bit** is used for **ADS40 images only**. Some ADS40 imagery contains a bit setting that is not supported for DAT/EM image viewing (in general, supported formats are 8-bit, 12-bit, color, grayscale, and 4-band). Some ADS40 imagery contains a mixture of bit settings that do not match the number reported in the image header. If the whole ADS40 image or parts of the image contain unsupported bit settings, check on **Force 12 bit**. Non-12-bit portions will be output to 12 bit.

To determine whether or not **Force 12 bit** is required, try converting one image only with the setting on. View the image in SUMMIT EVOLUTION with a histogram adjustment applied to it. (It's easiest to open a blank aerial project. Drag and drop the file into the project. Open the image. Check on histogram adjustment in Image Adjustment and apply to the current image only.) Move around in the image. If the image contains areas of strangely colored pixels, the **Force 12 bit** setting was not needed. Please see additional ADS40 instructions on page 8-1.

This setting is ignored for **.pyr**-only output.

Step 8) The **Channel Mapping** option may be used to output a different band order or a different number of bands than the input file contains:

- **Channel Mapping** can swap the band order for up to ten bands. For example, create a blue, red, green image from a three-band red, green, blue image.
- **Channel Mapping** can reduce an up-to-ten-band image to a three-band image. For example, create an infrared, green, blue image from a red, green, blue, infrared image.
- JPEG compression is not possible on a four- or more-band image. If the input image has more than three bands, and compression is desired, use **Channel Mapping** to convert it to a three-band image.
- Channel mapping may be applied to the **.pyr**-only output format, but it is better to create a matched file set with “**New TIF & PYR**”.)

Please be aware that there is also an option to perform channel mapping in the SUMMIT EVOLUTION display only. See “Imaging Menu > Channel Manager” on page 25-69.

Some knowledge of the bands in the input file is required. Most, but not all, four-band images are red, green, blue, and infrared. For other four- or more-band files, please find out the band order from the image provider.

To use **Channel Mapping**, select the **Channel Mapping** button. Make settings as shown:

Select the **Channel Mapping** button.

Check on **Use Channel Mapping** to enable the channel choices.

Create 3 band image with these bands allows you to either reduce the number of bands down to three bands and/or swap the order of the bands. Choose the first, second, and third bands from the input file to map into the red, green, and blue channels in the output file.

Create various number of bands does the following:

- Inputs a 3- to 10-band image file and outputs a selected number of bands (from 3 to 10 bands).
- Allows you to choose which input bands to include, which bands to discard, and the order of the bands.

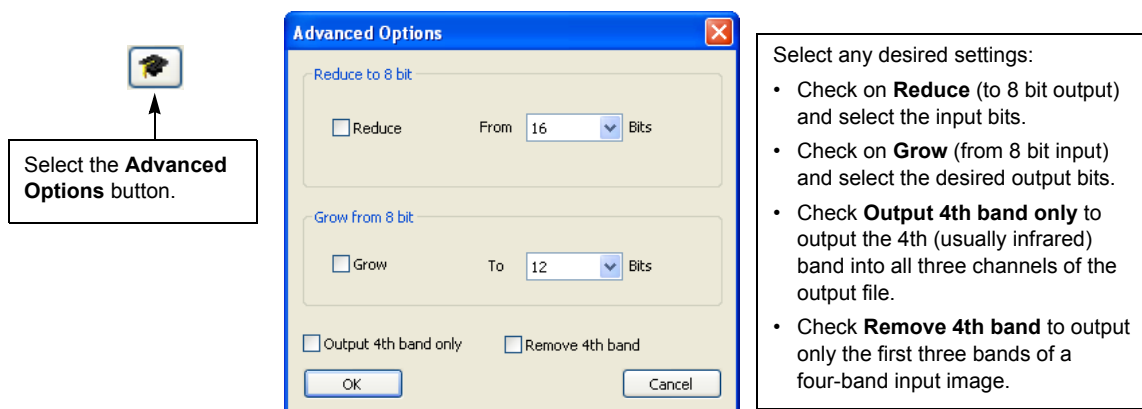
Ten channels, 0-9, are always offered. This does not mean that there are ten channels in each input file; the input files have not been read yet, so their channel numbers are not known yet. If this table contains a mapping that does not exist in the input file, then band 0 (the first band in the input file) will be substituted.

If **Number of Channels** is set to 1, a one-band image will be created. SUMMIT EVOLUTION treats a one-band image as grayscale, and displays the same band in all three display channels. For example, a single band value of 192 would be displayed as red=192, green=192, blue=192, which is a medium gray value.

When SUMMIT EVOLUTION first opens a more-than-3-band image, it displays the first three bands in the red, green, and blue display channels. Additional bands are ignored unless SUMMIT EVOLUTION's own channel manager (page 25-69) is used to further swap bands in the display.

#	Channel
0	4
1	5
2	8
3	4
4	5
5	5
6	6

Step 9) **Advanced Options** are used to change the bit settings in the output file, to output the fourth band only, or to remove the 4th band. (These settings are ignored for **.pyr**-only output. Choose “**New TIF & PYR**” if these settings are needed for **.pyr** files.)



Step 10) When the settings are complete, select the **Process** button to create the new images.

The new **.smti**, **.tif**, and/or **.pyr** files are now ready to be used in a SUMMIT EVOLUTION **.smtxml** project

Generate Stereo Mate

If a single orthophoto-type image has one or more associated DTM (xyz points) files that cover the entire image area, a stereo mate may be created. The result is a complete stereo model. Generating a stereo mate is commonly done for SAR (synthetic aperture radar) images, but may also be used for generated LIDAR images (page 4-13) or any other “single” orthophoto that has a point distribution file in its XY area that defines its elevation surface.

To use the Generate Stereo Mate application, perform the following steps:

Step 1) Prepare the following input:

- Prepare one or more “single” orthophotos (images that do not already have overlapping stereo mates). **Hint:** If the image format is not accepted by GENERATE STEREO MATE, if the image requires the addition of an image zoom pyramid, or if the image requires rotation or compression, process it first using IMAGE CREATION (page 4-6).
- Prepare one or more DTM points files. The resulting generated stereo mate depends very much on the accuracy and completeness of the DTM file(s). These files should contain a point distribution that is dense enough to adequately define the elevation surface in the entire area of the image(s). **Hint:** If necessary, use the DAT/EM POINT TRANSLATOR (page 25-80) to redistribute, extract, combine, or translate the DTM file(s).

Step 2) Select **Generate Stereo Mates** from the **Imagery** pull-down menu. This may also be activated from the **Generate Stereo Mates** button on the Project Edit dialog for a **SAR Stereo** project. Or, run **GenStereoMate.exe** from:

...\\Program Files\\Datem Software on 32-bit computers
 ...\\Program Files (x86)\\Datem Software on 64-bit computers

Step 3) Select **Add** under the **Image Files** and **DTM Files** lists. Browse for files.

- Multiple Images should all be part of the same general project area. (Process different projects during separate runs of Stereo Mate Creator.)
- One or more DTM masspoints (XYZ points) files are required to correctly generate the stereo mate. The area covered by the set of DTM files should completely cover the area of the set of image files.
- Images and DTM files must all be in the same coordinate system.

Step 4) Choose a setting for **Pixel Shift** and **Default Elevation** as described in the graphic below:

The screenshot shows the **Stereo Mate Creator** dialog box. It has two lists: **Image Files** and **DTM Files**. Below these lists are **Add...** and **Remove** buttons. At the bottom, there are input fields for **Pixel Shift** (set to 100) and **Default Elevation** (checked, set to 120). A **Generate** button and a **Close** button are at the bottom right.

Annotations:

- An arrow points from the **Add...** button under **Image Files** to a text box: "Select **Add** and select one or more image files."
- An arrow points from the **Add...** button under **DTM Files** to a text box: "Select **Add** and select one or more points files."
- An arrow points from the **Pixel Shift** input field to a text box: "Enter a value for **Pixel Shift**, which sets the amount of stereo relief. This is the number of pixels that the second image will be separated from the first image. A higher value results in higher relief. There is no value that works equally well for all images. Scale, flight height, and terrain type are all factors in choosing a pixel shift. In general, higher resolution images should be given a higher pixel shift."
- An arrow points from the **Default Elevation** checkbox to a text box: "**Default Elevation** may be used to process areas where there are holes or gaps in the DTM coverage. If used, set **Default Elevation** to the average elevation in the entire project. Note that it may be preferable not to use **Default Elevation**:
 • The results in **Default Elevation** areas are never as good as using accurate DTM points.
 • If **Default Elevation** is not used, black pixels will occur in areas where there is no DTM point coverage. These black pixels may be useful in identifying areas where the DTM was incomplete."

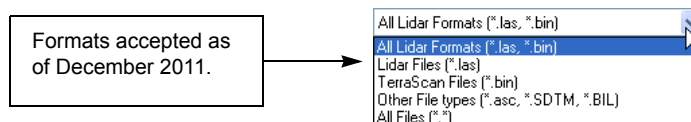
Step 5) Select **Generate** to create the image(s). These stereo pair images may now be used to create a stereo model.

Generate Images from LIDAR Files

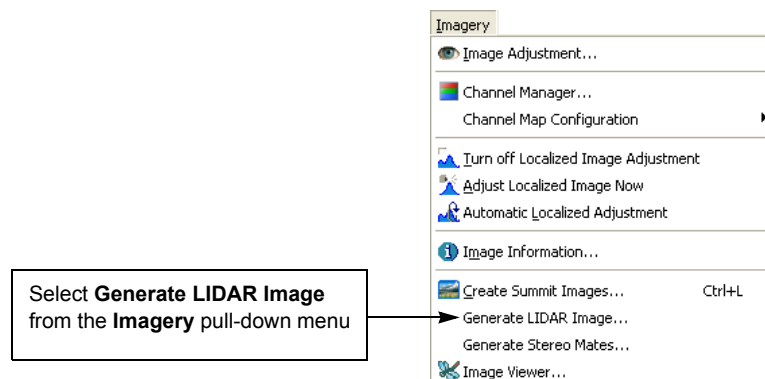
A **tif** image may be created from a LIDAR points file. Some other points file formats are also accepted.

To use the GENERATE LIDAR IMAGE application, perform the following steps:

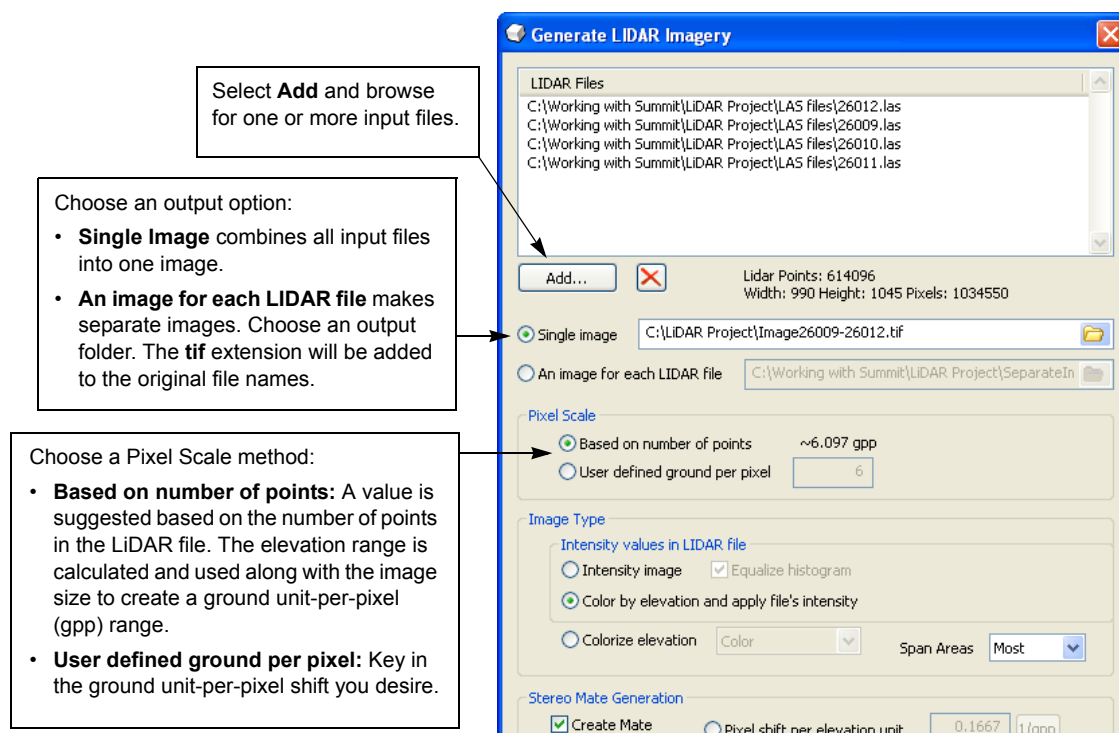
- Step 1)** Prepare one or more input files of one of the formats accepted by the application. As of April 2011, these formats are as follows:



- Step 2)** Select **Generate LIDAR Image** from the **Imagery** pull-down menu.



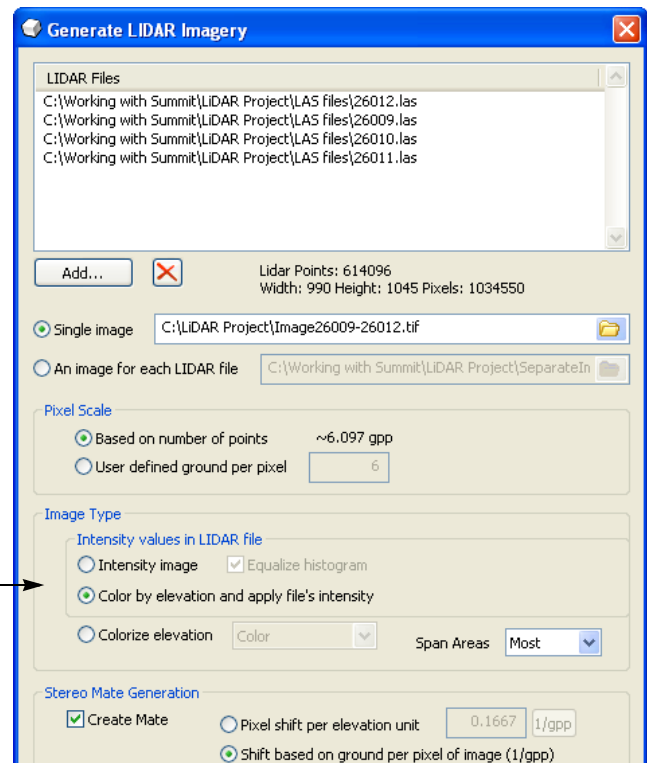
- Step 3)** Begin to make settings in the dialog:



Step 4) Continue to make settings in the dialog:

Choose an image type and other settings:

- **Intensity image** creates a grayscale image with darker pixels indicating higher intensity levels.
- **Equalize histogram** applies a histogram adjustment to the intensity levels.
- **Color by elevation and apply file's intensity** colors by elevation and further applies the intensity levels to the colors.
- **Colorize by elevation** creates a color image with reds indicating the highest elevations and blues indicating the lowest elevations. **Color** assigns a color based on the height alone. **Leveled color** assigns colors based on equal numbers of pixels per color. **Grayscale** is like **Color**, except that instead of red-green-blue colors, it assigns grayscale values based on height.
- **Span Areas** sets what happens if there are areas within the LIDAR data set without points. TIN-like triangles could either span the empty area or they could be removed. This affects stereo viewing. The range is from **Most** to **Hardly**; **Most** leaves all triangles in place and spans the area the most; **Hardly** removes all of the long triangle edges and does not span the gap.



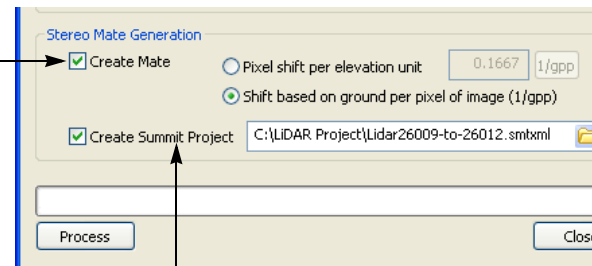
Step 5) Continue to make settings in the dialog:

Create Mate generates a stereo mate image for each image produced. When **Create Mate** is checked on, choose a shift method.

The pixel shift method sets the amount of stereo relief. This is the number of pixels that separate the second image from the first image. A higher value results in higher relief. There is no value that works equally well for all images. Scale, flight height, and terrain type are all factors in choosing a pixel shift. In general, higher resolution images should be given a higher pixel shift.

- **Pixel shift per elevation unit** may be user defined. The **1/gpp** button sets 1-ground-per-pixel in the field (this value is the same one used by **Shift based on ground per pixel of image**). This value may be viewed, used as it is, or changed as desired.
- **Shift based on ground per pixel of image** obtains the shift from the ground per pixel of the image.

Please note that if you are not satisfied with the stereo of the images generated, you may use **Generate Stereo Mates** from the **Imagery** pull-down menu to regenerate the stereo mates with a different ground/pixel value. See "Generate Stereo Mate" on page 4-11 for instructions.



Create Summit Project automatically makes a SUMMIT EVOLUTION **.smtxml** "LIDAR Stereo Images" project file out of the resulting images and their stereo mates.

Create Mate must be on in order for this option to be available.

Step 6) Select **Process**. The LIDAR images, stereo mate images (if selected), and SUMMIT EVOLUTION **.smtxml** project file (if selected) are generated.

If a **.smtxml** project file was not made already, it can be created at any time. See *Chapter 13*.

Chapter 5. Camera Definition Files

Some SUMMIT EVOLUTION™ projects require at least one DAT/EM-format camera file. Use the instructions in “Prepare a Camera File Plan” below to determine whether a new camera file is needed. If necessary, see “Create a Camera File” on page 5-7.

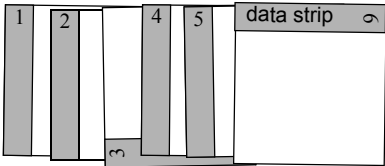
Prepare a Camera File Plan

Before creating the camera file and assigning camera files to project images, it is important to form a plan based on the project’s images. Choose a plan from the following tables:

In SUMMIT EVOLUTION LITE EDITION, the camera file often already exists or is created upon project import. The camera file plans are shown here anyway for informational purposes. The table may tell you whether a camera file is expected for certain project types or not.

Please note: As of SUMMIT EVOLUTION version 6.2, most projects can be automatically forced into left-right stereo and viewed with your choice of direction (north, south, east, or west) as upright as possible on the screen. This means that many of the “traditional” rotation settings are no longer necessary. Many of the “traditional” settings for camera rotations and image rotations are no longer used, although they are still offered for compatibility with SUMMIT EVOLUTION version 6.1 and lower. “New” camera file instructions appear in Case 1. “Traditional” camera file instructions appear in cases 8-11. The remaining cases are independent of such rotation settings.

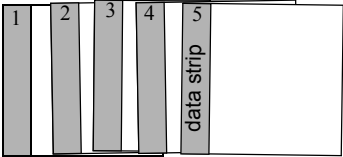
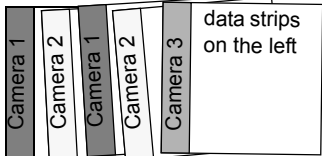
“New” Case 1 projects may not be immediately compatible with SUMMIT EVOLUTION version 6.1 and lower (“traditional” rotation settings would need to be added to make them compatible); however, older projects that contain various rotation settings are compatible with the “New” method and do not need to be edited.

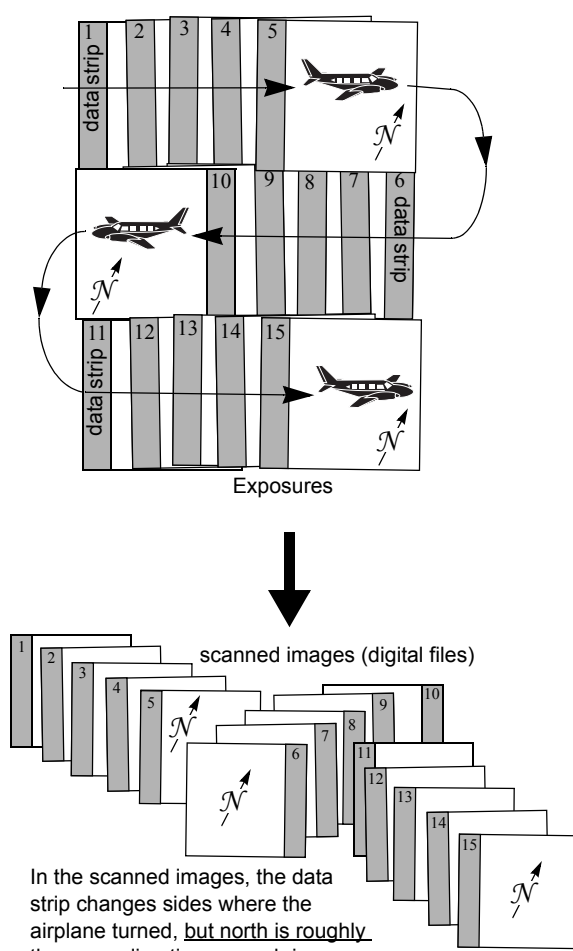
	Situations, Images, and Scan descriptions	Camera File Plan
C a s e 1	<p>The images were taken by one or more aerial frame and/or aerial digital cameras.</p> <p>The project file will always be used by SUMMIT EVOLUTION version 6.2 or higher.</p> <p>For aerial frame film-based imagery, any scanning rotation mistakes have been corrected by rotating the images in IMAGE CREATOR (see Case 2 below).</p>	<p>Use this “New” method for automatically enforced left-right stereo and display direction, available in SUMMIT EVOLUTION version 6.2 and higher. For each camera, one camera file is created with a zero rotation, and rotations remain at 0 (zero) for all images in the Project Edit dialog.</p> <ul style="list-style-type: none"> Create one camera file per camera (page 5-7). <p><i>There is no need to create additional 90°, 180°, or 270° rotated cameras.</i> <i>There is no need to set the x-axis direction of a digital camera, even if it is not zero with respect to the flight direction.</i></p> <ul style="list-style-type: none"> Later, in the Project Edit dialog, apply the camera file to its images (page 7-5). If there is more than one camera, be sure to match each camera to its own images. Later, in the Aerial Project Edit dialog, check on Automatically select best stereo view (page 7-10).
C a s e 2	<p>A mistake was made during scanning of film images; one or more images within a strip was scanned at a 90°, 180°, or 270° rotation.</p> <p>Example: Two images from a strip were scanned at 90° and 270° from the other images.</p> 	<ul style="list-style-type: none"> Use the DAT/EM IMAGE CREATOR (page 4-6) to rotate the images to the correct angle. Do not compress the images. <p>Please do not use a 3rd-party image editor, which may cause problems such as removing important information from the image header, changing the pixel size, changing the number of storage bits, etc.</p> <ul style="list-style-type: none"> When the images have been corrected by IMAGE CREATOR, choose another camera file plan (usually Case 1 above).
C a s e 3	<p>A 3rd-party camera file exists as part of a project that was set up on a 3rd-party stereoplotter.</p>	<p>See <i>Chapter 15</i> to import projects from non-SUMMIT EVOLUTION sources. A camera file will be created for some project imports, but not for others. See also “Case 4” below.</p>

	Situations, Images, and Scan descriptions	Camera File Plan
C a s e 4	<p>The project was imported from DVP or Socet Set, but a SUMMIT EVOLUTION camera file was not created.</p> <p>Question: Should I make a camera file?</p>	<p>Answer: No, you should not make a camera file. For some project import formats, the interior orientation is imported. A camera file is not necessary and is not created if an interior orientation is imported. Please note that the interior orientation for such projects cannot be remeasured or changed in any way.</p>
C a s e 5	<p>The image is an orthophoto.</p> <p>This includes orthophotos generated from LiDAR points (page 4-13).</p>	<p>Do not create a camera file. See <i>Chapter 10</i> to build an orthophoto project.</p>
C a s e 6	<p>The images is from:</p> <ul style="list-style-type: none"> • Leica Geosystems ADS40/80 Digital Sensor • VisionMap A³ • Satellite sensor RPC, ALOS, SPOT-5, epipolarized images processed with PCI Geomatics or ENVI software, or a SAR (Synthetic Aperture Radar) sensor 	<p>Do not create a camera file. Go directly to:</p> <ul style="list-style-type: none"> • <i>Chapter 8</i> to build an ADS40/80 project; • <i>Chapter 14</i> to build a VisionMap A³ project; • <i>Chapter 11</i> to build a satellite RPC, ALOS, SPOT-5, PCI, ENVI, or SAR project.
C a s e 7	<p>A Phorex 1 or Phorex 2 (Zeiss interchange format) camera file already exists.</p>	<p>Convert the Phorex camera file to a SUMMIT EVOLUTION camera file. See “Import Phorex Interchange Files” starting on page 15-13.</p>

The remaining cases show how to use the “Traditional” project method. To review:

- **“Traditional” method:** The user is responsible for defining all camera and image rotations in the project file. Rotated camera files and image rotation settings control whether a model opens in left-right stereo and has the desired screen direction (such as north up). The “Traditional” method should be used when the project file may be used later by SUMMIT EVOLUTION version 6.1 or lower.
- **“New” method:** The **Automatically select best stereo view** setting is responsible for enforcing left-right stereo and the desired screen direction. There is no need for rotated camera files or image rotation settings. The “New” method should be used with SUMMIT EVOLUTION version 6.2 and higher. The “New” method described in Case 1 above.

Case 8 Traditional	<p><i>The project will be opened later with SUMMIT EVOLUTION version 6.1 or lower:</i></p> <p>All images were taken by the same film-based frame camera.</p> <p>All images were scanned at the same angle <i>and</i> the data strip is on the same side of all scans.</p> <p>Example: In an aerial project, there was only one flight strip, and all images were scanned at the same rotation.</p> 	<p>This case is the same for the “New” and “Traditional” methods, because rotated camera files and image rotation settings are not needed at all. See Case 1 above.</p>
Case 9 Traditional	<p><i>The project will be opened later with SUMMIT EVOLUTION version 6.1 or lower:</i></p> <p>More than one camera was used to create the project images.</p> <p>There may or may not be a 180° rotation for some of the images within each camera’s image set. See “Case 10” below to see if it applies to any of the individual camera image groups.</p> <p>Example: In a close range project, three different cameras were used to create images.</p> 	<p><i>This describes the “Traditional” method where rotated camera files are used. Use this only if the project file will be opened later by SUMMIT EVOLUTION version 6.1 or lower:</i></p> <ul style="list-style-type: none"> • If necessary, turn on the Automatically create 180° rotated camera option on the Project tab on the Stereoplotter Options settings dialog (Step 1 on page page 5-7). • Create a separate camera file for each camera. • When assigning camera files to the images in the project, be sure to match the correct camera file or 180° camera file to each image (Step 6 and Step 7 on page 7-5).

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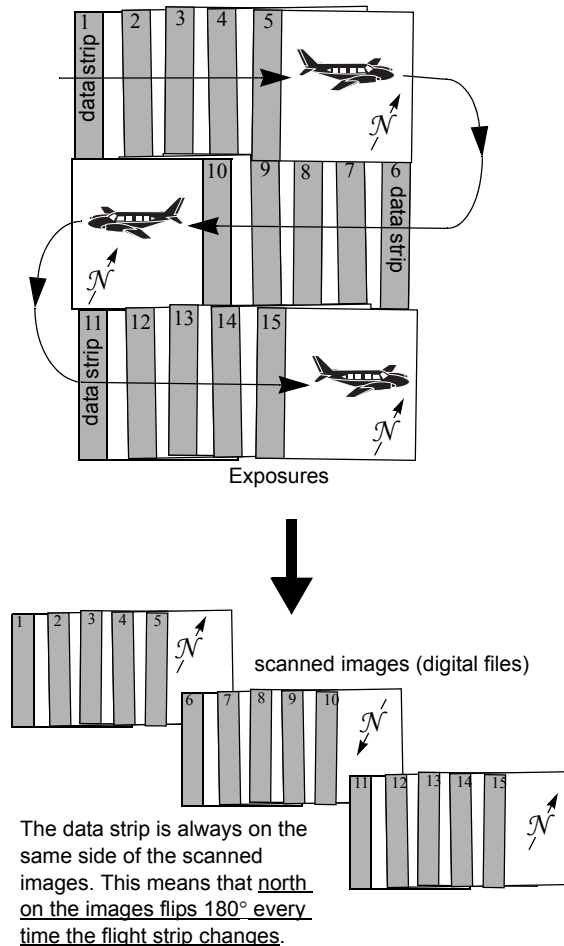
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The project will be opened later with SUMMIT EVOLUTION version 6.1 or lower:

One or more aerial film-based frame cameras were used. As the airplane turned to start a new flight line and image strip, the data strip switched from left to right. However, the images were all scanned with the **data strip on the same side of the scanner**. This results in every other strip scanned at 180° to the adjoining strips. **The north direction on the digital images flips 180° every time the strip changes.**

This case may apply to all images in a single-camera project or to a group of images taken by one of the cameras in a multi-camera project.

Example: In aerial photography, there were several flight strips. The airplane flew the first strip from west to east, then turned and flew the next strip from east to west, and so on. All images were scanned with the data strip on the same side of the scanner.



This describes the “Traditional” method where rotated camera files and image rotations are used. Use this only if the project file will be opened later by SUMMIT EVOLUTION version 6.1 or lower.

Method 1:

- Use the Image Creator (page 4-6) to rotate the images in every other flight strip by 180°. Do not compress or resize the images. Then go to Case 10 above.

Method 2 (recommended):

- Turn on the **Automatically create 180° rotated camera** option on the **Project** tab on the **Stereoplotter Options** settings dialog (Step 1 on page 5-7).
- Create a camera file with the data strip on the side that matches all the scanned images (Step 5 on page 5-12). When this camera file is saved, it creates a second camera file called **CameraFile_180.cam**.
- In the Project Edit window, assign *both* a 180° rotation angle *and* the 180° camera file to the images that have their north direction opposite to the images in the first flight strip (Step 6 and Step 9 starting on page 7-5).
- DO NOT assign a flight direction on the **Strips** tab. The flight direction should appear as **None Assigned** for every strip.

Create a Camera File

To create a new camera definition file or edit an existing file, perform the following steps:

Prerequisite: Have the camera calibration report ready. This report should be for the camera that was used for at least one of the project images. The report is supplied by the company or organization that calibrated the camera, such as the USGS, Deutscher Kalibrierdienst, or Schweizer Kalibrierdienst.

- Step 1)** If the imagery is from a digital CCD camera such as the DMC, UltraCam, or DiMAC, skip this step and go directly to Step 2. If always using this project with SUMMIT EVOLUTION version 6.2 and higher, skip this step and go directly to Step 2.

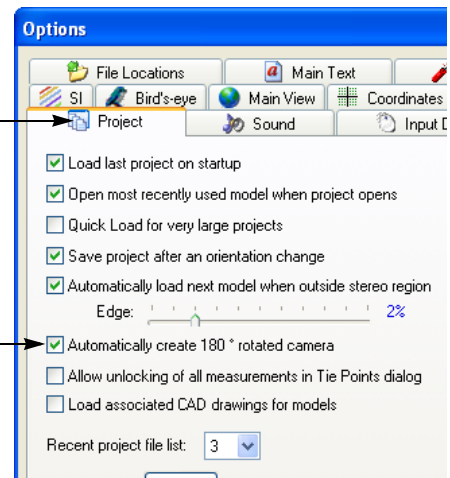
*If using this project later with SUMMIT EVOLUTION version 6.1 or lower, it may be necessary to create a 180° rotated camera file along with the unrotated camera file. Select **Options** from the **Tools** toolbar or pull-down menu. Select the **Project** tab, then check on **Automatically create 180° rotated camera**.*

“Traditional” projects only!

Select **Options** from the **Tools** toolbar or pull-down menu.



Select the **Project** tab.

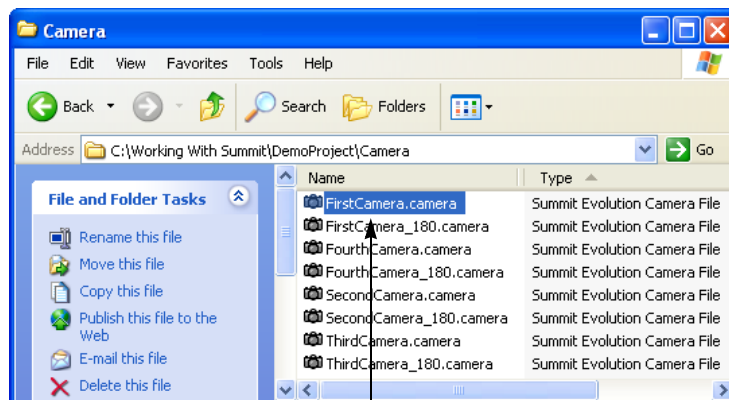
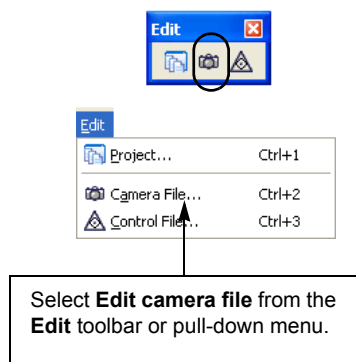


“Traditional” Method for projects to be opened in SUMMIT EVOLUTION version 6.1 or lower:

If the project requires it, turn on **Automatically create 180...** to create a 180° rotated camera file whenever a camera file is saved in the Camera File Editor. If the saved file is called **OriginalFileName.cam**, then the rotated file will be called **OriginalFileName_180.camera** and saved in the same folder.

Step 2) Start the camera editor dialog using one of the following methods:

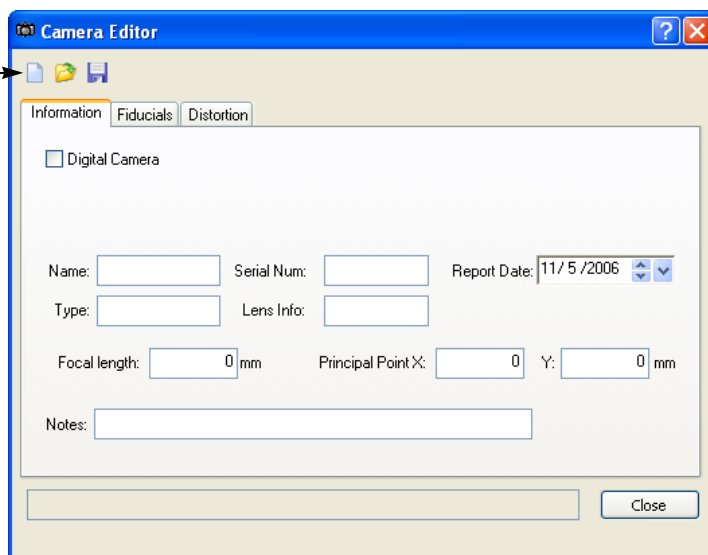
- Select the **Edit Camera File** from the **Edit** toolbar or pull-down menu.
- Double click the name of an existing **.cam** or **.camera** file shown in the Microsoft Windows Explorer or in a Windows “My Computer” window. This will only work if no other modal dialog boxes (such as Automatic Relative or Project Edit) are open.



Step 3) The Camera Editor dialog box appears. A file will be open if the Camera Editor was opened by double clicking the **.cam** or **.camera** file name. To open a new or different file:

- Open a new file by selecting the **Create New Camera File** icon.
- Open an existing file by selecting the **Open Camera File** icon.

- To start a new file, select the **New File** icon.
- To edit an existing file, select the **Open File** icon.
- To save changes to the camera file at any time, select the **Save Camera File** icon.



Step 4) Select the **Information** tab on the Camera Editor dialog. Enter the matching information from the camera's calibration report into the values on this tab.

- a.) If the camera is a digital CCD camera such as a DMC, DiMAC, or UltraCam, check on **Digital Camera**. Please note:
- The Leica Geosystems ADS40/80 and the VisionMap A³ do not require SUMMIT EVOLUTION camera files. See *Chapter 8* to set up an ADS40/80 project and *Chapter 14* to set up a VisionMap A³ project.
 - A hand-held-type (non-photogrammetric quality) digital camera *could* be used with SUMMIT EVOLUTION, but *only if* highly accurate image dimensions or field of view (FOV) angles are supplied to the Camera Editor. If these values are not known, or are rounded off to too few decimals, SUMMIT EVOLUTION will not be able to calculate accurate ground coordinates. The image dimensions or FOV would conceivably be values given to you by the camera's manufacturer; you can't measure them yourself. The image size would be "virtual film format dimensions" in millimeters with at least two decimal places, and the FOV in decimal degrees with at least four decimal places. Lens distortion values would also be needed. As of February 2011, DAT/EM has not heard of anyone who had enough information about their hand-held-type camera to be able to make a good camera file for it. If you find a way to do this, DAT/EM Support would be interested to hear of your method (see *Appendix L* for contact information).
 - Make the remaining digital camera settings as shown in the following graphics:

- For film-based cameras, uncheck **Digital Camera**.
- For digital cameras, check on **Digital Camera**.

(Digital cameras only)

- **Dimensions:** Enter the virtual film format dimensions in millimeters (to at least two decimal places). Use this setting for most photogrammetric-quality digital CCD cameras such as the DMC, DiMAC, and UltraCam.
- **FOV (field of view):** Enter angles in decimal degrees (to at least four decimal places). See notes above for more information.

Camera Editor - Demonstration

Information Fiducials Distortion

☒ Digital Camera

Rotation: 0 Dimensions FOV

Width: 92.16 mm Height: 165.888 mm

Width: 0° Height: 0°

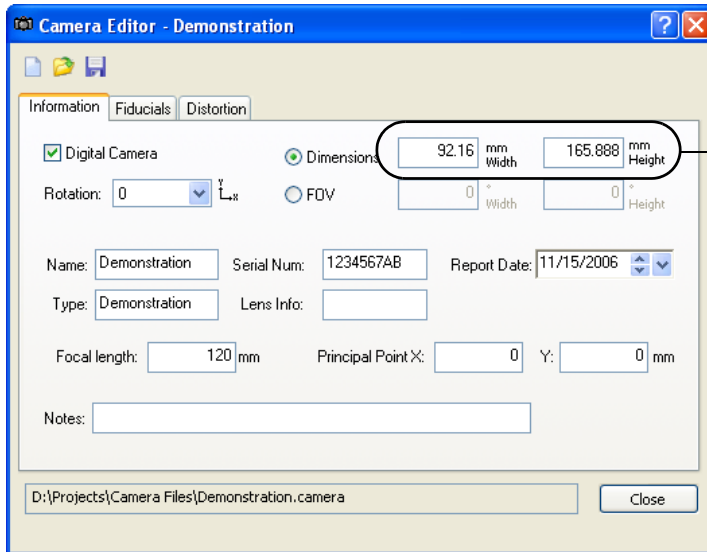
Name: Demonstration Serial Num: 1234567AB Report Date: 11/15/2006

Type: Demonstration Lens Info:

Focal length: 120 mm Principal Point X: 0 Y: 0 mm

Notes:

D:\Projects\Camera Files\Demonstration.camera Close



Camera Editor - Demonstration

Information | Fiducials | Distortion

☒ Digital Camera ☒ Dimensions 92.16 mm Width 165.888 mm Height

Rotation: 0 ☐ FOV 0° Width 0° Height

Name: Demonstration Serial Num: 1234567AB Report Date: 11/15/2006

Type: Demonstration Lens Info:

Focal length: 120 mm Principal Point X: 0 Y: 0 mm

Notes:

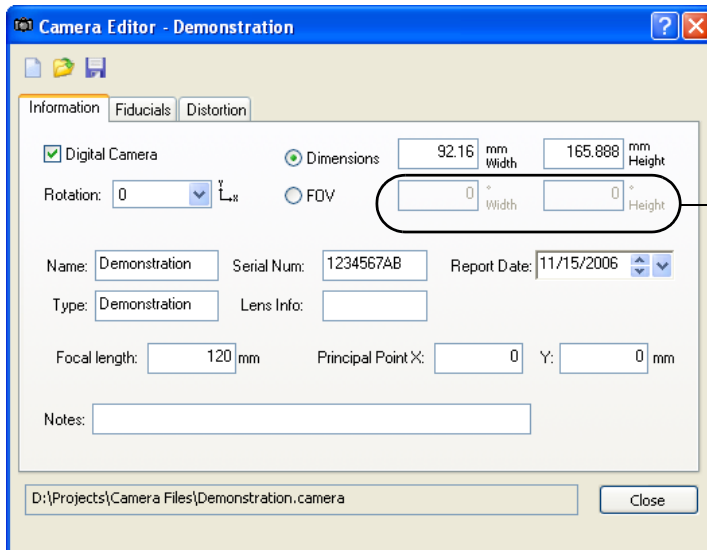
D:\Projects\Camera Files\Demonstration.camera Close

For **Dimensions**, enter the **Width** and **Height** values in millimeter units to at least two decimal places. Always enter the **Width** (x direction) and **Height** (y direction) values exactly as they appear on the camera calibration report.

It is common to have **Width > Height**; PLEASE DO NOT exchange the values in an attempt to make the height larger than the width!

It is true that **Width > Height** creates an initial top-bottom overlap situation, but this will be corrected in one of two ways:

- 1) top-bottom overlap will be corrected automatically in the display as of version 6.2.
- 2) top-bottom overlap may be corrected manually by setting 90 or 270 for **Mount Rotation** in the camera file and a matching image rotation in the Project Edit dialog.



Camera Editor - Demonstration

Information | Fiducials | Distortion

☒ Digital Camera ☒ Dimensions 92.16 mm Width 165.888 mm Height

Rotation: 0 ☐ FOV 0° Width 0° Height

Name: Demonstration Serial Num: 1234567AB Report Date: 11/15/2006

Type: Demonstration Lens Info:

Focal length: 120 mm Principal Point X: 0 Y: 0 mm

Notes:

D:\Projects\Camera Files\Demonstration.camera Close

For **FOV**, enter the **Width** and **Height** values in decimal degrees to at least four decimal places.

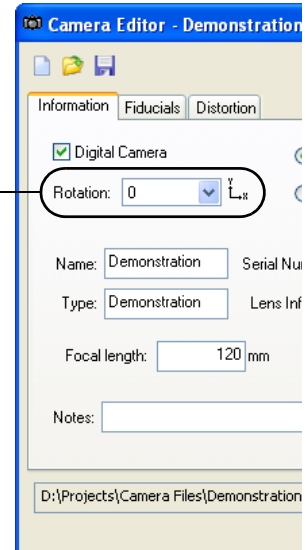
It is possible to have **Width > Height**; PLEASE DO NOT exchange the values in an attempt to make the height larger than the width!

It is true that **Width > Height** creates an initial top-bottom overlap situation, but this will be corrected in one of two ways:

- 1) top-bottom overlap will be corrected automatically in the display as of version 6.2.
- 2) top-bottom overlap may be corrected manually by setting 90 or 270 for **Mount Rotation** in the camera file and a matching image rotation in the Project Edit dialog.

For digital CCD cameras, there is a change for **Rotation** as of DAT/EM version 6.2.

- “**New**” for versions 6.2 and higher, the **Rotation** value may be set to **0** (zero) for all projects. Top-bottom overlap will be detected automatically and right-left overlap will be produced automatically. However, if you wish to set this value manually, you may; also, older projects that call for existing camera files that have a 90, 180, or 270 rotation will be used correctly. Please note that if you use a camera file with **Rotation** set to a non-zero value, you must also apply the same rotation value to each image that uses that camera (set the image rotation in Step 9 on page 7-6).
- “**Traditional**” for versions 6.1 and lower, the **Rotation** value was very important in order to produce left-right overlap in the main view. **Rotation** defines the direction of the digital camera’s X axis with respect to the direction of flight. This must be set correctly if planning to use the project with SUMMIT EVOLUTION version 6.1 or lower. Hint: This setting is 90 for many digital cameras! Please note that if you use a camera file with **Rotation** set to a non-zero value, you must also apply the same rotation value to each image that uses that camera (set this image rotation in the Project Edit dialog, Step 9 on page 7-6).
- More information will be presented below. You may also use the “?” Help for context-sensitive help on these dialog settings.



- b.) The **Principal Point X/Y** entries depend on the company or organization that calibrated the camera, such as the Deutscher Kalibrierdienst or the USGS. Note that in any case, either the Principal Point of Autocollimation (PPA) or the Principal Point of Symmetry (PPS) is chosen:
- If the calibration report lists either the PPA or the PPS as (0,0), then a correction has already been made to the fiducial coordinates. In this case, set both **Principal Point X** and **Principal Point Y** to 0 (zero).
 - If the calibration report lists a type of Fiducial Center (FC or FCC) as (0,0), then a non-zero correction must be entered. Set **Principal Point X** and **Y** to either the PPA or the PPS coordinate. It is up to the user to choose either the PPA or the PPS and use it consistently for that camera. (Not sure which to use? Other DAT/EM customers recommend using the PPS.)
 - DO NOT exchange the values in an attempt to correct for some other rotation issue. ALWAYS enter the X and Y values exactly as they appear on the camera calibration report. If you experience rotation issues, please contact DAT/EM Support for help.

Enter the focal length and principal point coordinate in millimeter units.

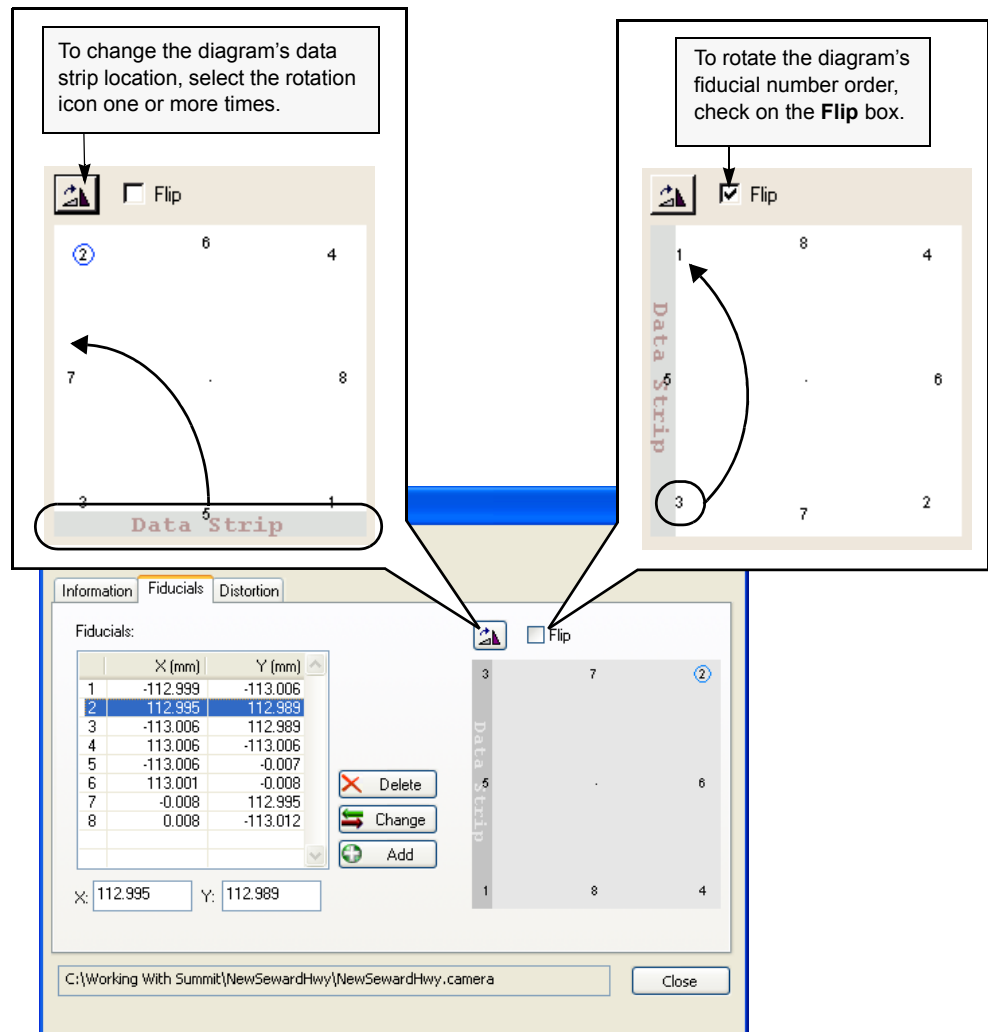
- If either the PPA or PPS is (0,0) in the calibration report, enter **0** for both **Principal Point X** and **Principal Point Y**.
- If the FC or FCC is (0,0) in the calibration report, enter either the PPA or the PPS.
- DO NOT exchange the values (X for Y and Y for X). If you have some rotation issue, please ask DAT/EM Support for help.

Calendar wizard:

- Click on the arrows to change months or years.
- Click on a day to set that date in the field.

Step 5) If the camera is *not* a digital camera, select the **Fiducials** tab on the Camera Editor dialog. Set the fiducial order and data strip location. Match the fiducial order and data strip of an image in the project that is considered to be unrotated. This is often the first image in a left-to-right exposure or flight strip:

- If necessary, check the **Flip** box to change the order of the fiducial numbers.
- If necessary, click the rotation icon one or more times until the data strip is positioned to match the data strip location for the camera and the camera's unrotated images.



Step 6) If the camera is *not* a digital camera, enter the fiducial information from the camera's calibration report into the fiducial list on this tab.

- To delete an existing fiducial from the list, click the system mouse on the fiducial to highlight it, then select the **Delete** button.
- To change an existing fiducial, either make the changes directly in the table cell or click the system mouse on the fiducial to highlight it, edit the fiducial in the **X:** and **Y:** edit line, then select the **Change** button.
- To add a new fiducial, enter the new fiducial information in the **X:** and **Y:** edit line, then select the **Add** button.

Fiducials tab.

The circled number is the current, highlighted fiducial.

Be sure to use millimeter units.

Click the system mouse on a line to highlight it. Make changes directly in the table cell or below in the **X:** and **Y:** fields followed by **Change**.

If there are only four fiducials, leave entries 5 through 8 blank.

- Make changes either directly in the table cell or in the **X:** and **Y:** fields. Activate changes from the **X:** and **Y:** fields by selecting the **Change** button.
- Enter new points in the **X:** and **Y:** fields. Select the **Add** button to add the line to the table.

	X (mm)	Y (mm)
1	-112.999	-113.006
2	112.995	112.989
3	-113.006	112.989
4	113.006	-113.006
5	-113.006	-0.007
6	113.001	-0.008
7	-0.008	112.995
8	0.008	-113.012

X: 112.995 Y: 112.989

Buttons: Delete, Change, Add

Data Strip: 3, 7, 2, 6, 1, 8, 4

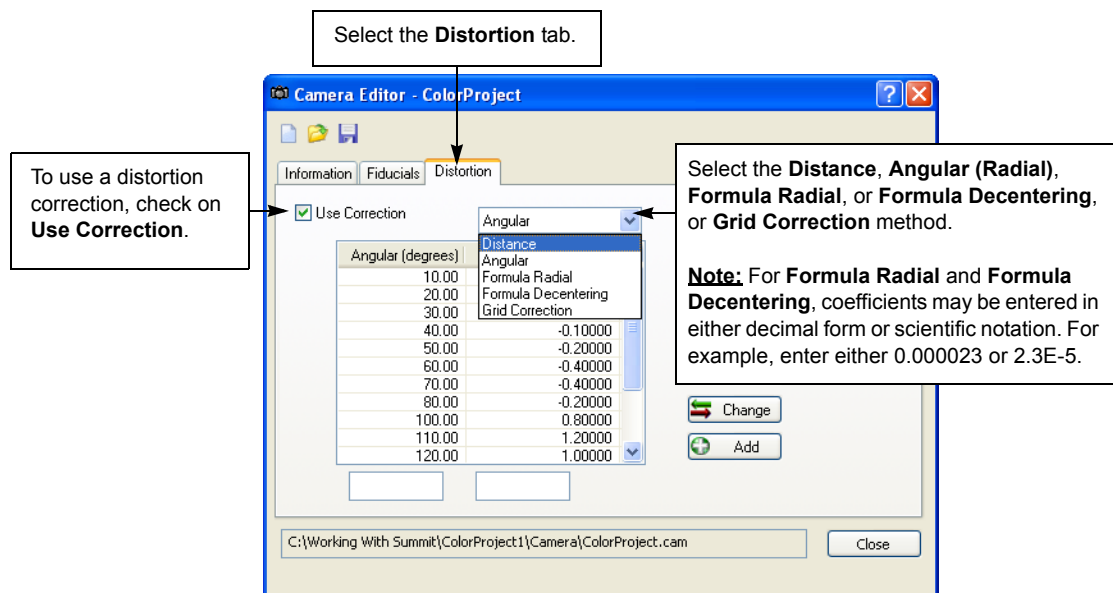
File path: C:\Working With Summit\NewSewardHwy\NewSewardHwy.camera

Close

Step 7) Select the **Distortion** tab on the Camera Editor dialog. To use a distortion correction, check on **Use Correction**, then select the **Distance**, **Angular**, **Formula Radial**, or **Formula Decentering** correction method:

- **Distance** distortion values may be entered with the radial distance (mm) in the left column and the distortion values (mm) in the right column.
- **Angular** distortion is also known as **radial distortion**. When selected, values may be entered with the angles (degrees) in the left column and the distortion values (mm) in the right column.
- **Formula Radial** values may be entered if the calibration report shows values for the K_n distortion formula. Values may be entered in either decimal form or scientific notation. For example, enter either 0.000023 or 2.3E-5. Be sure that the camera calibration report's equation for K values is the same as the one used by the DAT/EM camera file; if you are not sure, please use the distance distortion values instead.

- **Formula Decentering** values may be entered if the calibration report shows values for the P_n distortion formula. Values may be entered in either decimal form or scientific notation. For example, enter either 0.000023 or 2.3E-5. Be sure that the camera calibration report's equation for P values is the same as the one used by the DAT/EM camera file; if you are not sure, please use distance distortion values instead.
- **Grid Correction** may be used with a **cgrid** file that was made for the camera by Inpho's MATCH-AT aerotriangulation software.



Step 8) For all methods except **Grid Correction**, enter the distortion information given on the original camera report. Be sure to match the decimal places to the units requested in the column title¹.

- To fill in the list with default angles or distances in the first column, select **Add Default**.
- To delete an existing entry from the list, click the system mouse on the line to highlight it, then select the **Delete** button.
- To change an existing entry, either edit the value directly in the table cell or click the system mouse on the line to highlight it, edit the distortion value in the edit line, then select the **Change** button.
- To add a new entry, enter the new distortion information in the edit line, then select **Add**.

For **Grid Correction**, browse for an Inpho MATCH-AT **cgrid** file or an Intergraph **.dat** grid file.

1. Helpful unit conversions:

1 μm = micron = micrometer = 0.001 mm = 0.000001 meter
 $2\pi/360$ radians = 1 degree (0.01745329 radians \approx 1 degree)
 $\pi/200$ grads = 1 degree (0.01570796 radians \approx 1 degree)
 9 inches = 228.600 mm

To convert existing angular values to distortion values, select the **Convert** button. A warning appears to help prevent existing distortion values from being overwritten.

Be sure to use the indicated units:

- Use degrees and micrometers (meters x 10^{-6}) for **Angular**-type correction.
- Use mm and micrometers (meters x 10^{-6}) for **Distance**-type correction.

Click on a line to highlight it. Make changes directly in the table cell or below in the edit fields followed by **Change**.

- Make changes either directly in the table cell or in the edit fields below the table. Activate changes from the edit fields by selecting the **Change** button.
- Enter new points in the edit fields. Select the **Add** button to add the line to the table.

Camera Dialog

Angular distortions will be converted to distance distortions. Any previous distance distortion values will be replaced. Proceed?

Yes No

Information Fiducials Distortion

☒ Use Correction Angular

Angular (degrees)	Distortion (Micrometer)
10.00	0.10000
20.00	0.00000
30.00	-0.20000
40.00	-0.10000
50.00	-0.20000
60.00	-0.40000
70.00	-0.40000
80.00	-0.20000
100.00	0.80000
110.00	1.20000
120.00	1.00000

40.00 -0.10000

Convert Add Default Delete Change Add

C:\Working With Summit\ColorProject1\Camera\ColorProject.cam Close

Step 9) To save the camera file at any time, select the **Save Camera File** icon near the top of the dialog. *“Traditional” Method: Two files will be saved if **Automatically create 180° rotated camera** is checked on the Stereoplotter Options **Project** tab.*

Step 10) After saving the current file, another camera file may be opened and edited if necessary. When finished editing camera files, select **Close**.

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Chapter 6. Control Point Files

Control point files contain precise ground position measurements usually obtained by ground surveying, aerotriangulation, or airborne GPS.

Create **.con** control files in the following cases:

- To use SUMMIT EVOLUTION™ to measure ground control points for absolute or relative tie points orientation (measurement available in PROFESSIONAL EDITION only).
- To use the adjusted ground value point list results from a third-party aerotriangulation package (such as an Albany **.gpa** file) as a ground control list. This makes it possible to complete orientation in just two steps: interior orientation (if necessary) and import relative orientation.
- To check ground coordinates after importing exterior orientations that were created on another non-analog stereoplotter.
- To have pre-defined points available for the “Move to Ground” function (page 25-45). In this case, the points don’t need to be “real” control points; they may be any coordinates in the project where you want to drive the stereoplotter.
- To provide an opening cursor elevation in ADS40/80 Using Leica Kit projects (page 8-2).

The next sections in this chapter give instructions for starting a new control file, editing an existing control file, and importing either known- or unknown-format control files. Note that the adjusted ground value point list from third-party aerotriangulation packages are often imported as control files.

Open a New or Existing Known-Format Control File

If a control file has been supplied from a modern or older version of DAT/EM software or from a non-DAT/EM source, it may be one of the known formats that SUMMIT EVOLUTION recognizes. The known formats are as follows:

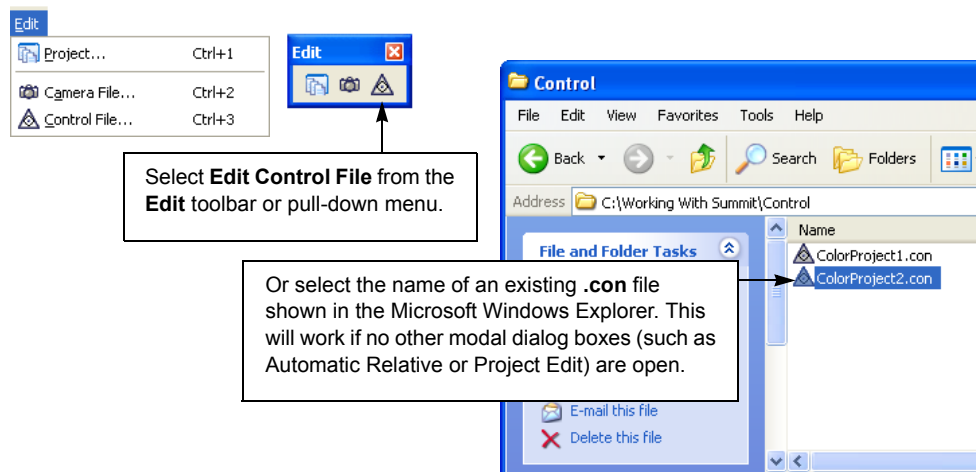
- .con** NT Control files (by SUMMIT EVOLUTION or a DAT/EM stereoplotter client for Windows NT)
- .par** DAT/EM DOS control files -- new format
- .par** DAT/EM DOS control files -- old format
- .bcp** Albany BC2 control files
- .gpa** Albany ground control files

Formats may also be imported and defined by the user.

To open a new file or an existing known-format control file, perform the following steps:

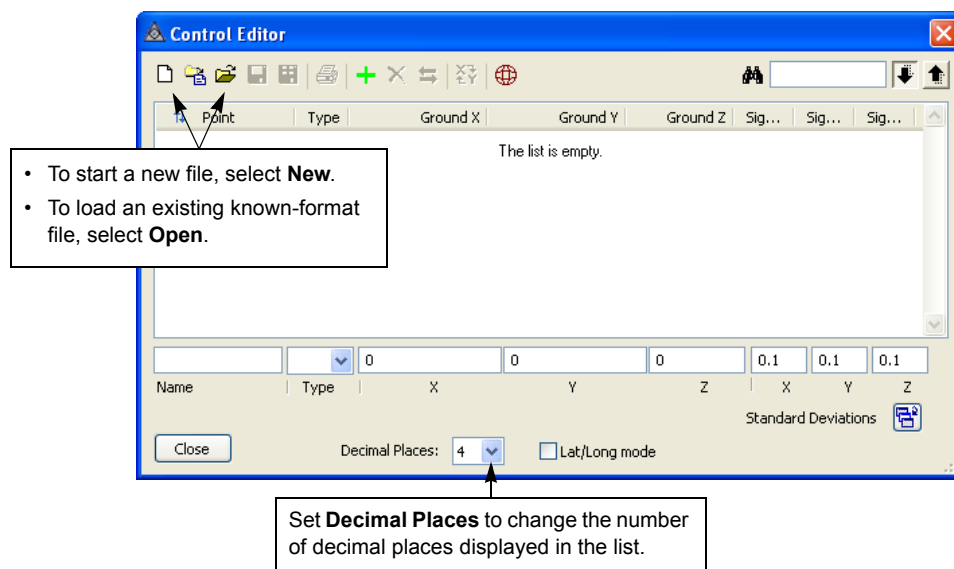
Step 1) Open a control file using one of the following methods:

- Select **Edit Control File** from the **Edit** toolbar or pull-down menu.
- Double click the name of an existing **.con** control file shown in the Microsoft Windows Explorer. This will work if no other modal dialog boxes (such as Automatic Relative or Project Edit) are open.



Step 2) A file will be open if the Control Editor was opened by double clicking the **.con** file name in the Microsoft Windows Explorer. To create a new file or open a different file, select one of the following options:

- Open a new file by selecting **New Control File** from the tool menu.
- Open an existing file by selecting **Open Control File** from the tool menu.



Step 3) If an existing file has a known format, it will be shown in the Control File dialog box. Go on to add points (page 6-7), edit points (page 6-8), and delete points (page 6-9) if desired.

Import an Unknown-Format Control File

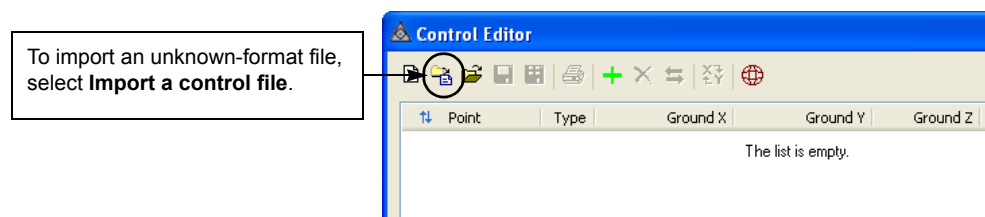
If the control file's format is not one of the recognized formats¹, define its format using the Import Control Wizard. The format will only need to be defined once; the Import Control Wizard will save the format for future use.

To use the Import Control Wizard, perform the following steps:

Step 1) Select **Edit Control File** from the **Edit** toolbar or pull-down menu.

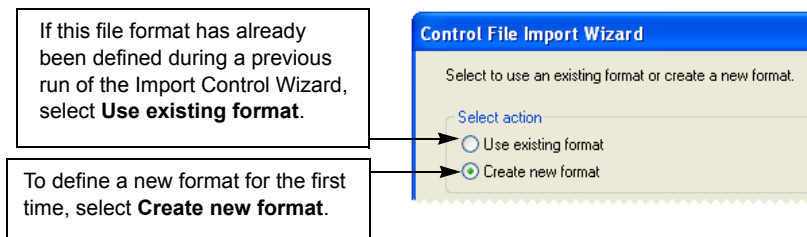


Step 2) Select **Import a control file** from the tool menu.



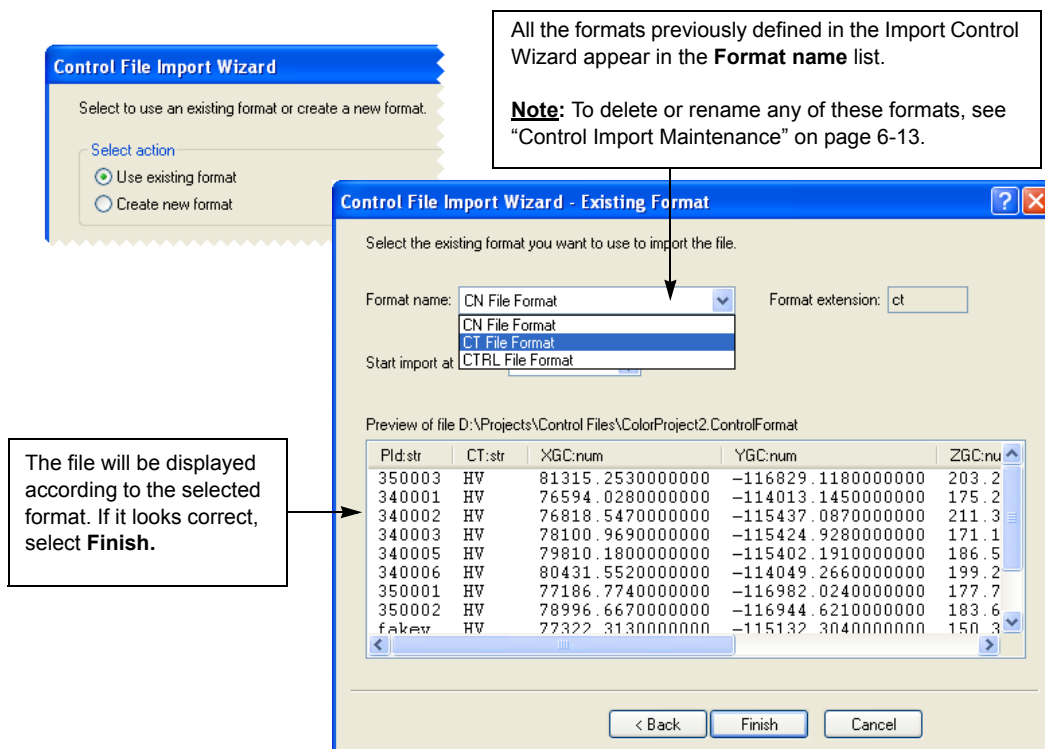
Step 3) Browse for the unknown-format control file.

Step 4) If the file's format has already been defined in the Import Control Wizard, select **Use existing format**. To define a new format, select **Create new format**. (This dialog box will not appear if no custom formats have been defined. Go on to the next step.)

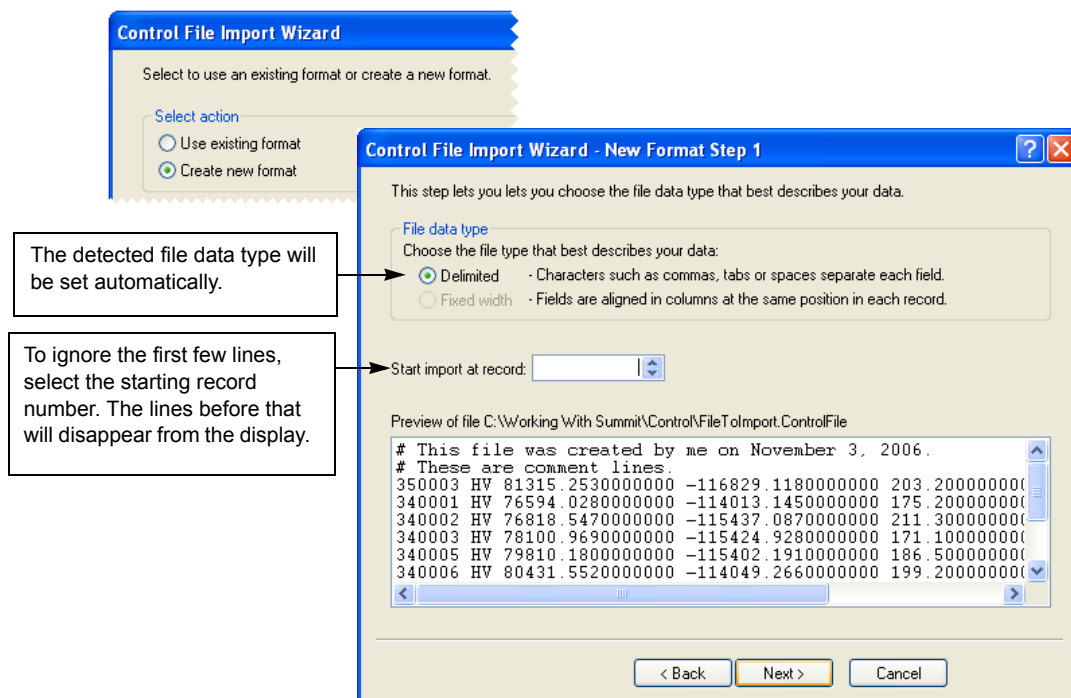


1. Recognized formats can be seen in the **Files of type** list in the Open dialog box. See "Open a New or Existing Known-Format Control File" on page 6-1. User-defined formats can be deleted or removed using the instructions in "Control Import Maintenance" on page 6-13.

- Step 5)** If **Use existing format** was selected, choose the format from the Existing Format list. The file will be imported and will be ready to edit. In this case, go on to page 6-7.



- Step 6)** If **Create new format** was selected, the New Format Step 1 dialog appears. Set the starting record number and select **Next**.



Step 7) The New Format Step 2 dialog box appears. Make settings that describe the file's format. The result of a setting will be shown immediately in the file list. If it looks incorrect, then try a different setting. Select **Next** when finished.

Set the field separator and check the result in the file list. Blue lines should appear between the data fields.

If there are characters that appear at the beginning of a comment line, enter them here. View the result in the file list. Comment lines should not be separated into fields by the blue lines.

An example of consecutive delimiters would be three spaces separating the X and Y fields. If there is more than one delimiter character between fields, check this option on.

An example of an initial delimiter would be five spaces that appear before the first data field in a line. If there are initial delimiters, check this option on and check the result in the file list. The first field should move all the way to the left.

Step 8) The New Format Step 3 dialog box appears. Comment lines are no longer shown. The first data field column is highlighted. All the labels at the top of all the columns show “Skip:str” as a default. For the highlighted column, select a **Field definitions** button and description that best describes the field. Then click each of the next columns and select **Field definitions** and descriptions for them.

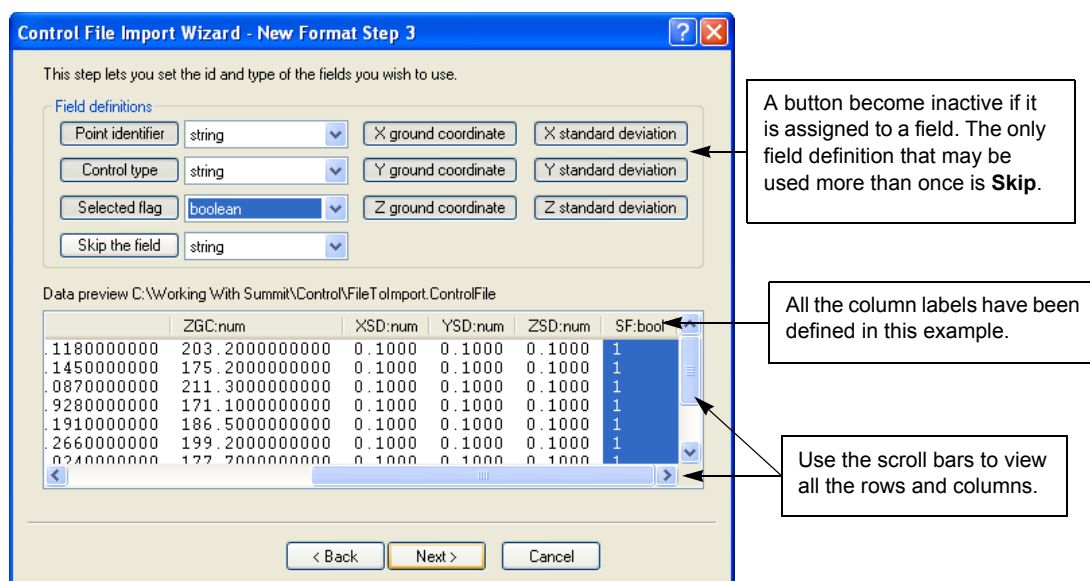
Select the button that describes the data in the highlighted field. From the pull-down list, select the description that best fits the field.

The label over the column shows the current field definition and data description.

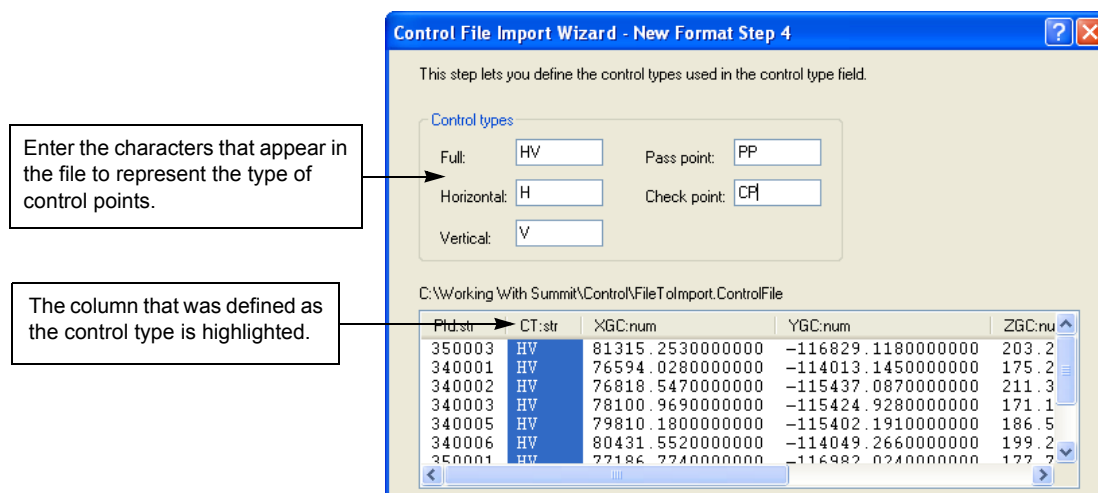
Use the scroll bar to view all the columns to the right and left.

Click on a column title to highlight that column.

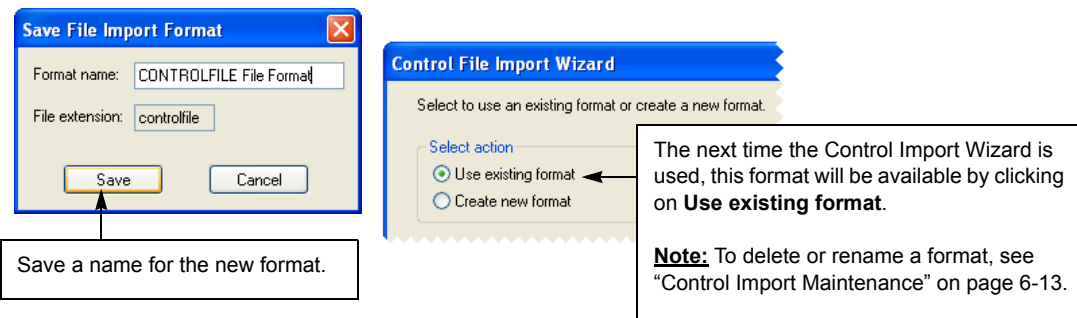
Step 9) When all the columns have been identified, view the file list to verify that it looks correct.



Step 10) Select **Next** again to activate the New Format Step 4 dialog. Enter the characters that represent horizontal-vertical, horizontal, vertical, pass point, and check point control points.



Step 11) Select **Finish** when done. A dialog box appears asking for a name for the new format.



Note: To delete or rename this format at any time, use the **Import Maintenance>Control Import Maintenance** option on the **Orientation** pull-down menu. See page 6-13 below.

Step 12) If correctly defined, the control file will be displayed in Control Editor dialog. Go on to add points (page 6-7), edit points (page 6-8), and delete points (page 6-9) if desired.

Add a New Control Point

To add a new control point to the file, perform the following steps:

Step 1) Enter values for the new point in the edit line near the bottom of the Control Editor dialog.

- a.) Enter the name of the control point in the **Name** field.
- b.) Select a point type from the pop-down menu in the **Type** field. The types of control points are as follows:

HV or **XYZ**¹ = horizontal and vertical point

H or **XY** = horizontal point only (vertical component will be ignored)

V or **Z** = vertical point only (horizontal component will be ignored)

- c.) Enter the X, Y, and Z coordinate values in the **X**, **Y**, and **Z** fields. (If the point is not a horizontal-vertical point, only the appropriate horizontal or vertical component is required.)
- d.) Enter standard deviation values for the X, Y, and Z components. The **standard deviation** (also known as σ , sigma) is a positive non-zero real number. The smaller the standard deviation, the more precise the coordinate. The standard deviation is related to *point weight* and *variance* as follows:

$$\sigma = \text{standard deviation}, \quad \sigma^2 = \text{variance}, \quad \frac{1}{\sigma^2} = \text{point weight}$$

If the **standard deviation** values are unknown, set them to 0.10. If they are set to 0.0 or to a negative number for active coordinate components, they will be automatically reset to +0.10.

1. The choice to display XYZ or HV format is made from the **Coordinates** tab of the **Stereoplotter Options** dialog. Activate this dialog from the **Options** on the SUMMIT EVOLUTION **Tools** toolbar or pull-down menu.

Step 2) Select **Add Control Point** from the tool menu.

2. Select Add Control Point to add the point shown from the fields below.

1. Enter the new point in the edit line.

Control Editor - C:\Working With Summit\Control\ControlFile9876.con

Point	Type	X	Y	Z	Sig...	Sig...	Sig...
350003	XYZ	81315.2530	-116829.1180	203.2000	0.100	0.100	0.100
340001	XYZ	76594.0280	-114013.1450	175.2000	0.100	0.100	0.100
340002	XYZ	76818.5470	-115437.0870	211.3000	0.100	0.100	0.100
340003	XYZ	78100.9690	-115424.9280	171.1000	0.100	0.100	0.100
340005	XYZ	79810.1800	-115402.1910	186.5000	0.100	0.100	0.100
340006	XYZ	80431.5520	-114049.2660	199.2000	0.100	0.100	0.100
350001	XYZ	77186.7740	-116982.0240	177.7000	0.100	0.100	0.100
350002	XYZ	78996.6670	-116944.6210	183.6000	0.100	0.100	0.100
350011	Z	0.0000	0.0000	180.1000	0.100	0.100	0.100

Name: 360056 Type: XYZ X: 79912.054 Y: -116782.891 Z: 154.760 Sig...: 0.1 0.1 0.1

Close Decimal Places: 4 Lat/Long mode Items: 9

Edit an Existing Control Point

To edit an existing point, perform the following steps:

- Step 1)** Click the system mouse on the control line to highlight it. It will appear in the edit line near the bottom of the dialog.
- Step 2)** Edit any of the values shown in the edit line.
- Step 3)** Select **Replace Control Point** from the tool menu.

3. Select Replace Control Point to edit the highlighted point based on the fields below.

1. Click on the line to highlight it.

2. Make changes in the edit line fields.

Control Editor - C:\Working With Summit\Control\ControlFile9876.con

Point	Type	X	Y	Z	Sig...	Sig...	Sig...
350003	XYZ	81315.2530	-116829.1180	203.2000	0.100	0.100	0.100
340001	XYZ	76594.0280	-114013.1450	175.2000	0.100	0.100	0.100
340002	XYZ	76818.5470	-115437.0870	211.3000	0.100	0.100	0.100
340003	XYZ	78100.9690	-115424.9280	171.1000	0.100	0.100	0.100
340005	XYZ	79810.1800	-115402.1910	186.5000	0.100	0.100	0.100
340006	XYZ	80431.5520	-114049.2660	199.2000	0.100	0.100	0.100
350001	XYZ	77186.7740	-116982.0240	177.7000	0.100	0.100	0.100
350002	XYZ	78996.6670	-116944.6210	183.6000	0.100	0.100	0.100
350011	Z	0.0000	0.0000	180.1000	0.100	0.100	0.100

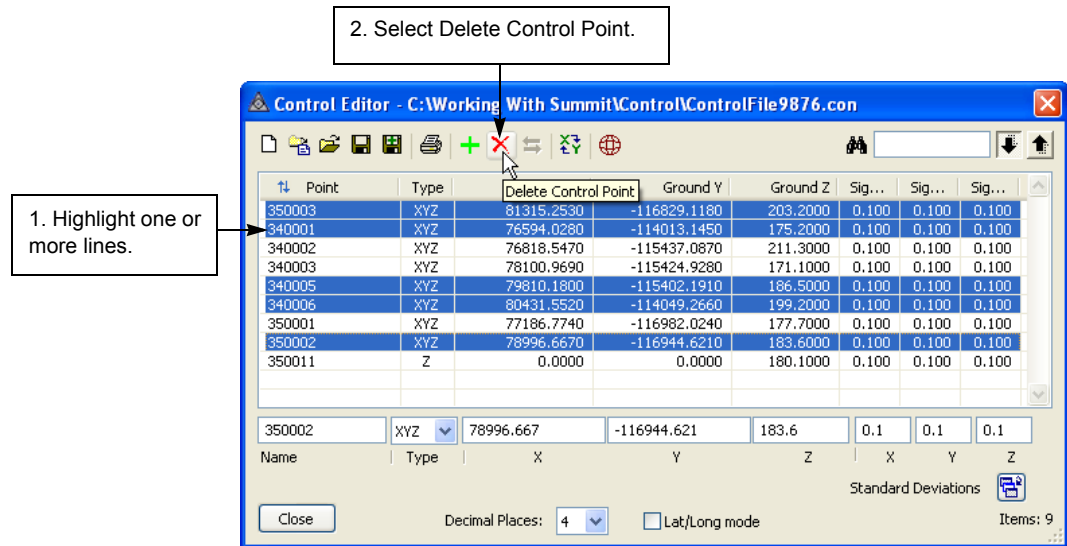
Name: 340003A Type: XYZ X: 78100.969 Y: -115424.928 Z: 171.1 Sig...: 0.1 0.1 0.1

Close Decimal Places: 4 Lat/Long mode Items: 9

Delete an Existing Control Point

To delete an existing point, perform the following steps:

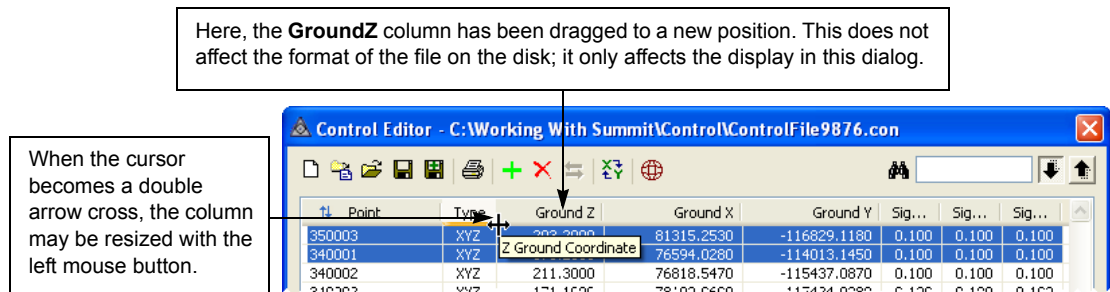
- Step 1)** Highlight one or more control lines with the system mouse. The <Shift> and <Ctrl> keys may be used to highlight more than one line.
- Step 2)** Select **Delete Control Point** from the tool menu.



Rearrange and Resize Columns in the Control Editor

The column display for the control point file may be rearranged and resized. Note that rearranging the X and Y columns by dragging them with the mouse is different than using the **Swap XY** tool. Rearranging columns does not affect the control file structure, but **Swap XY** does. See “Swap the X and Y Coordinates” on page 6-10.

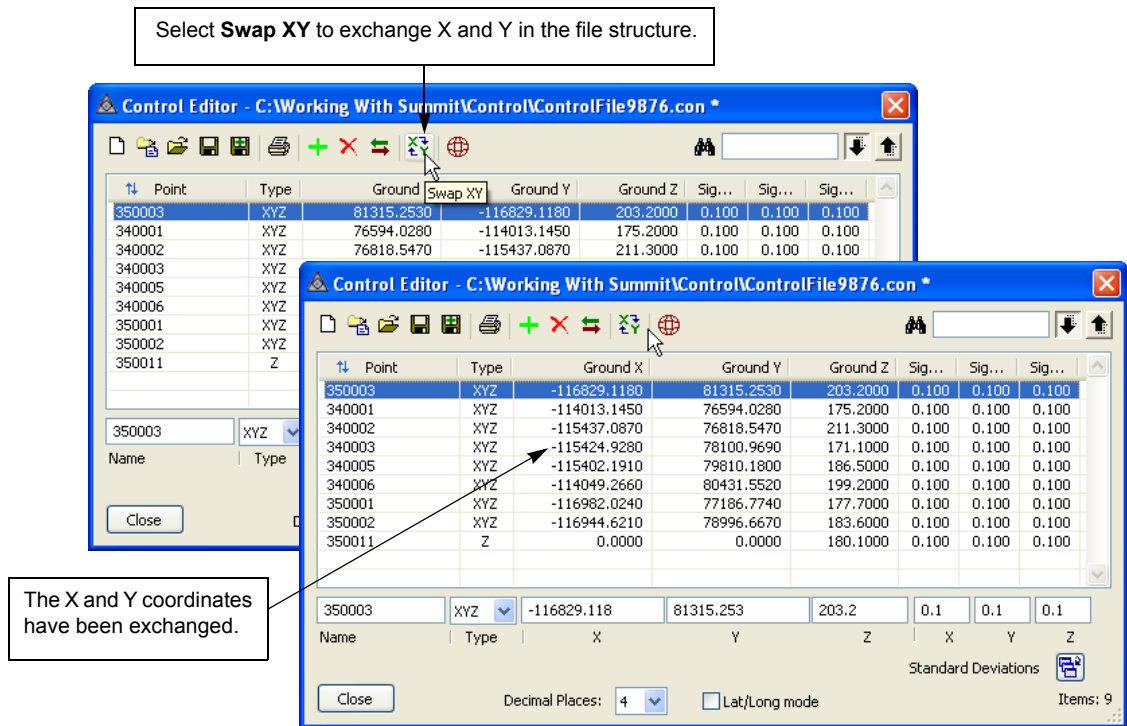
- To rearrange the column order, click and hold the left mouse button on a column title, drag it to the desired location, and release the mouse button. Rearranging the column order is a display convenience; it does not affect the control file structure.
- To resize a column, place the mouse cursor at the edge of the column to obtain the double arrow cross cursor. Click the left mouse button and drag the column to the desired width.



Swap the X and Y Coordinates

If X was mistaken for Y in the original control file entry, then they may be exchanged. Note that this is not just a display convenience; it exchanges X and Y in the file structure on disk. To swap the X and Y coordinates, perform the following steps:

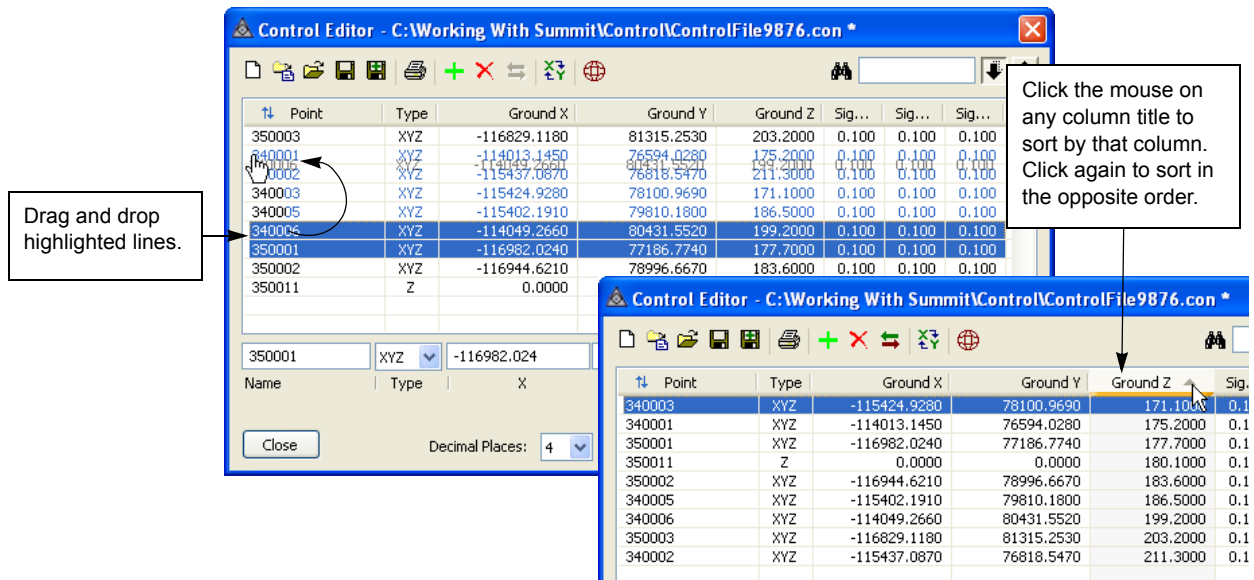
- Step 1)** Select **Swap XY** from the tool menu.
- Step 2)** If **Swap XY** is used in error, simply select it again.



Sort Control Points

Select one of the following methods to sort rows in the Control Editor:

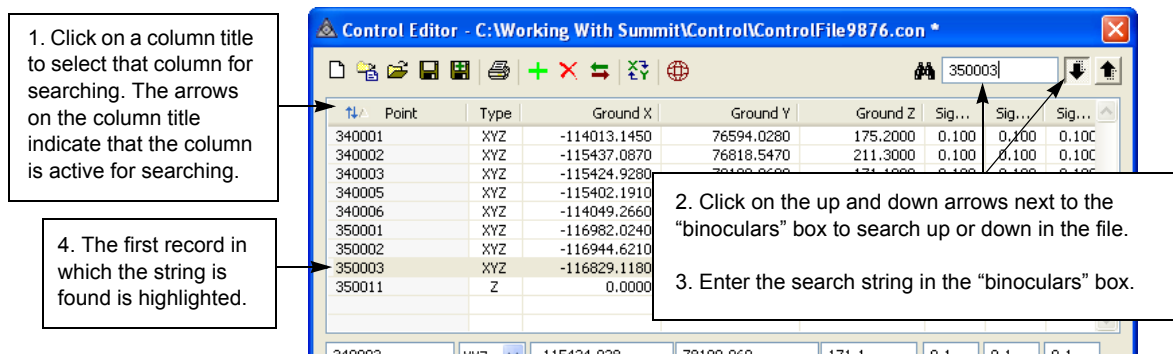
- Highlight one or more lines in the list. Drag and drop them to the desired location.
- Click the system mouse on one of the column headings. The rows will be sorted alphanumerically by that column. If the same column heading is clicked again, the rows will be sorted in the opposite order.



Search in the Control File

To find any character (or number) string in the control file, perform the following steps:

- Step 1)** Click on the column to be searched.
- Step 2)** Select the up or down arrow near the binoculars box to choose to search up or down in the file.
- Step 3)** Enter the search string in the box next to the binoculars symbol.

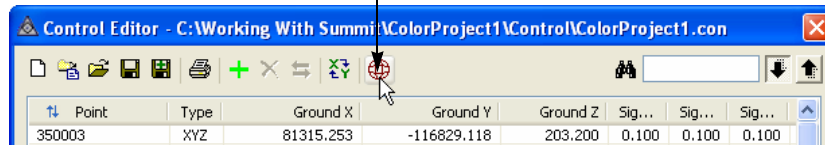


Transform the Control File to a Different Coordinate System

To transform the control file to a different coordinate system, perform the following steps:

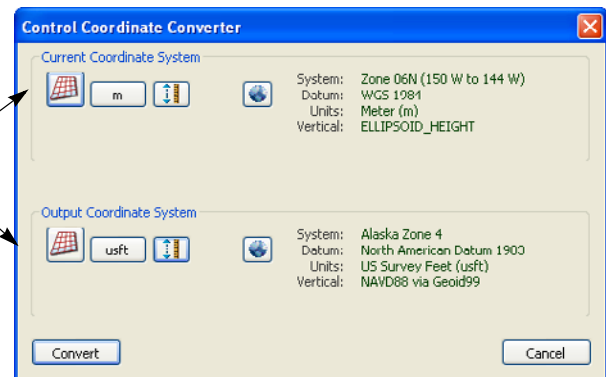
Step 1) Select **Convert Coordinates** from the tool menu.

To save the file under its original name, select Convert Coordinates.



Step 2) Select the **Coordinate System** buttons to choose an input and an output coordinate system. Select the input and output geoid **Height type** if it is required. If the coordinate system is not available, see the instructions in *Appendix C* to define new coordinate system components.

Select the **Coordinate System** buttons and choose an input and an output coordinate system, linear unit, and vertical reference.



Step 3) Select the **Convert** button to process the transformation. The transformed coordinates appear in the control file list.

Step 4) To prevent writing over the original file, select **Save As** and give the file a new name.

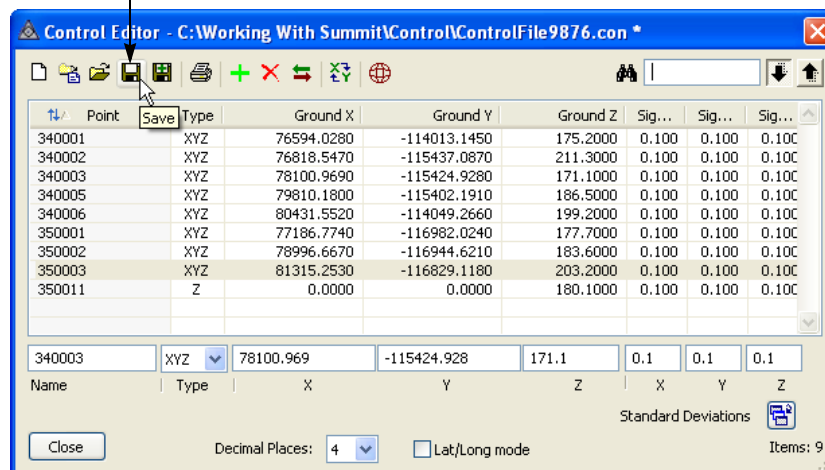
Save the Control File

Changes to the control point file may be saved at any time. Perform the following step:

Step 1) Choose a method to save the file:

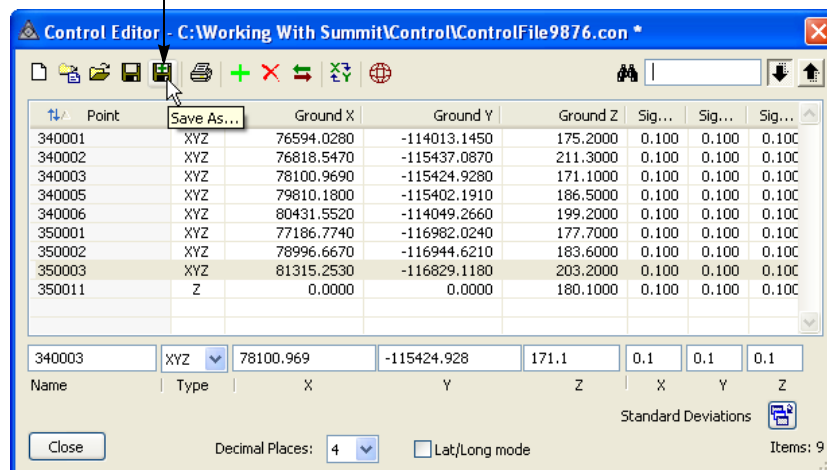
a.) To save the file under its original name, select **Save** from the tool menu.

To save the file under its original name, select **Save**.



b.) To save the file under a new name or in a different folder, select **Save As** from the tool menu, then specify the file name and location.

To save the file under a new name or in a different folder, select **Save As**.



Control Import Maintenance

To delete or rename formats that were created using the Control Import Wizard, use **Import Maintenance** on the **Orientation** pull-down menu. See "Orientation > Import Maintenance" on page 25-34.

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Chapter 7. Create Aerial Projects

The SUMMIT EVOLUTION™ **.smtxml** project file contains a list of all the project settings such as image names, orientation values, control point files, and camera file names. This chapter shows how to create a project file from images and support files produced by film-based aerial cameras, the DiMAC Systems Digital Modular Aerial Camera (DiMAC™), the Z/I Imaging® Digital Mapping Camera (DMC®), and the Vexcel UltraCam™ cameras.

- Note that many DiMAC projects are supplied in the form of Z/I Imaging files. It is faster to import these as a Z/I project (see “Import a Z/I ImageStation® SSK Project” on page 15-1) than to create a new aerial project.
- If the imagery was produced by a Leica Geosystems ADS40 Airborne Digital Sensor, see *Chapter 8*.
- If the imagery was produced by a VisionMap A3 camera, see *Chapter 14*.

About Aerial Projects

Please be aware of the following hints and notes about aerial projects:

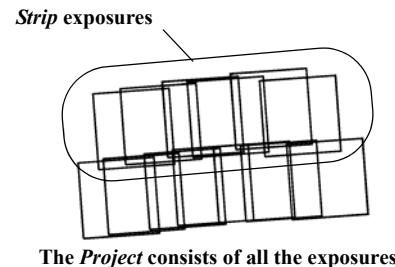
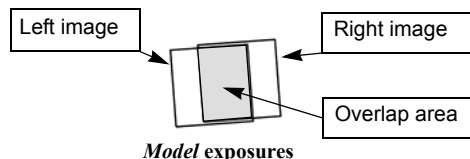
- The instructions given in this chapter are for most images that were taken from a camera in an airplane. There are some exceptions: For images produced by a Leica Geosystems ADS40 Airborne Digital Sensor, please see *Chapter 8*; for satellite and SAR imagery, see *Chapter 11*.
- All projects described in this chapter must list the images and camera files. If aerotriangulation data is available, a control file may not be required.

Note about Projects, Models, and Strips for square- or nearly square-format images

In a Summit **Project** definition, the image list is the only grouping necessary to use SUMMIT EVOLUTION's orientation. That is, grouping images into model pairs is not always required by SUMMIT EVOLUTION. However, **Model** and **Strip** groupings *are required* for Automatic Relative Orientation and for exporting orientation information to third-party aerotriangulation software.

Even if third-party aerotriangulation will not be used, it may save time to group the images into model pairs. Model pair definitions make it easier to open two files with one click of the mouse.

- A **stereo model** consists of two adjoining images on an image exposure strip. Three dimensional measurements are possible in the area where the two images overlap.
- A **strip** consists of a line of adjoining stereo models.
- A **project** consists of a group of all the stereo models — that is, all of the images — in the area to be mapped.



Create a New Aerial Project

To create a new project, perform the following steps:

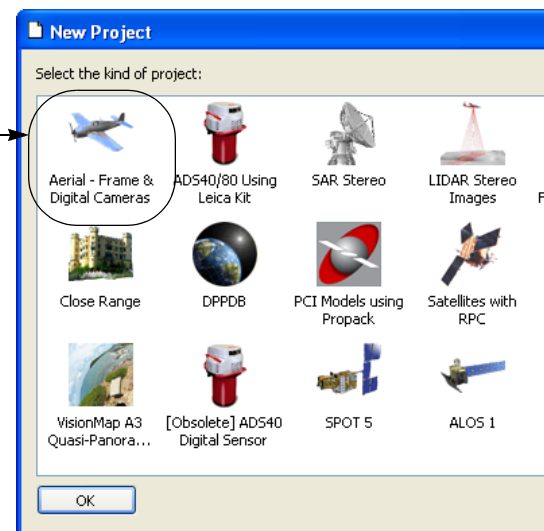
Step 1) Prepare the following:

- Prepare images according to the specifications shown in “Original Image Requirements” on page 4-1. If necessary, create **.smti** (SUMMIT EVOLUTION GeoTIF) images using the instructions in “Use Image Creation to Generate .SMTI or .PYR Files” on page 4-6.
- Prepare one or more camera files. For instructions, see *Chapter 5*.
- If they are required, prepare one or more control files. For instructions and to see if a control file is required, see *Chapter 6*.

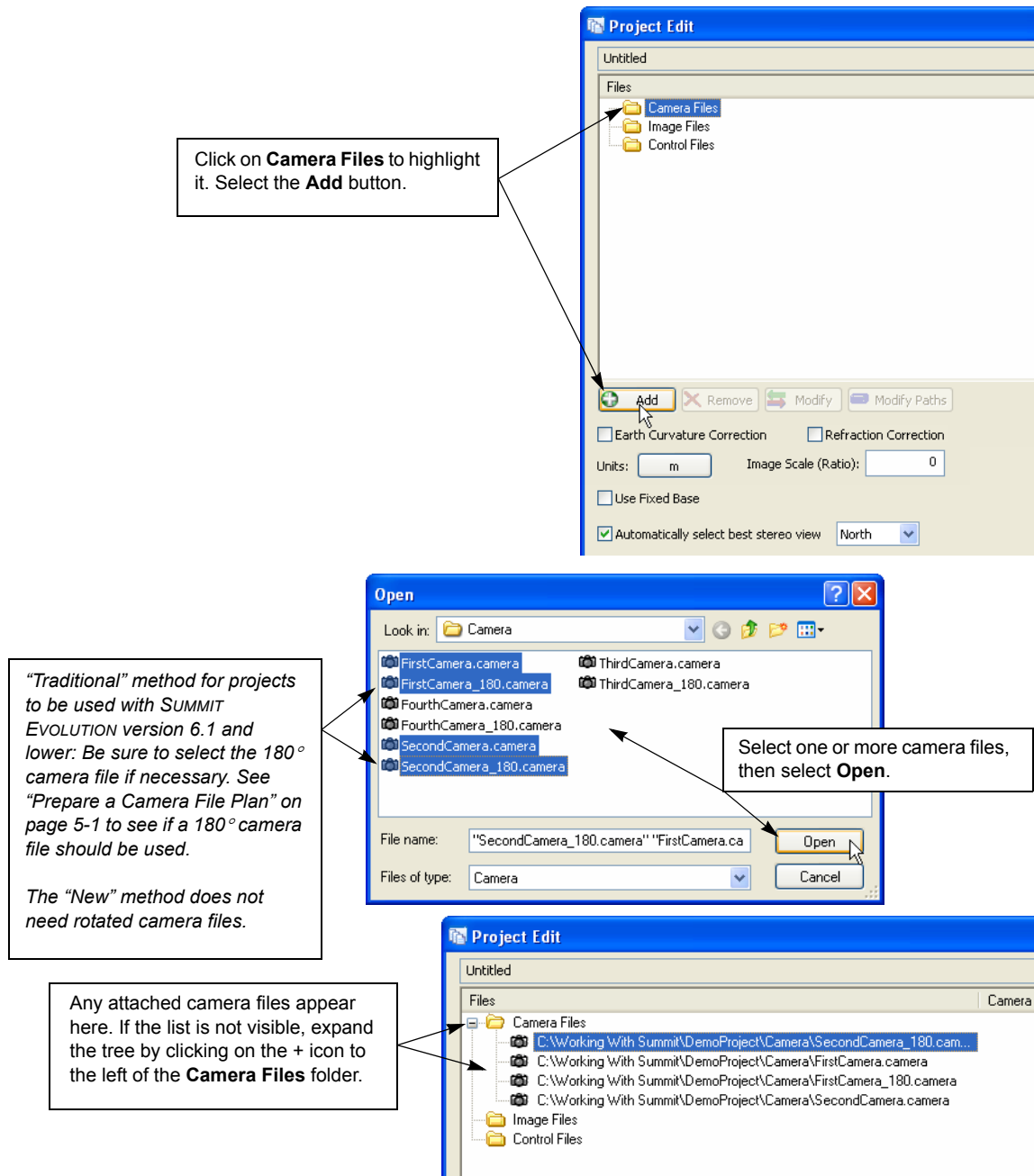
Step 2) To start a new project, select **New Project** from the **File** toolbar or pull-down menu. Choose the type of project from the options:

For a new project, select **New Project** from the **File** toolbar or pull-down menu. Then choose a new project type:

- Choose **Aerial Project** if the images originated from a digital or film-based aerial camera mounted in an airplane.
- Note:** The Leica ADS40 and the VisionMap A³ are sensors, not cameras. For the ADS40, see *Chapter 8*. for the A³, see *Chapter 14*.
- Instructions for the other types of projects are located in *Chapter 9* through *Chapter 15*.
- Many DiMAC projects are supplied in the form of a Z/I Imaging files. It is faster to import these as a Z/I project (page 15-1) than to create a new aerial project.



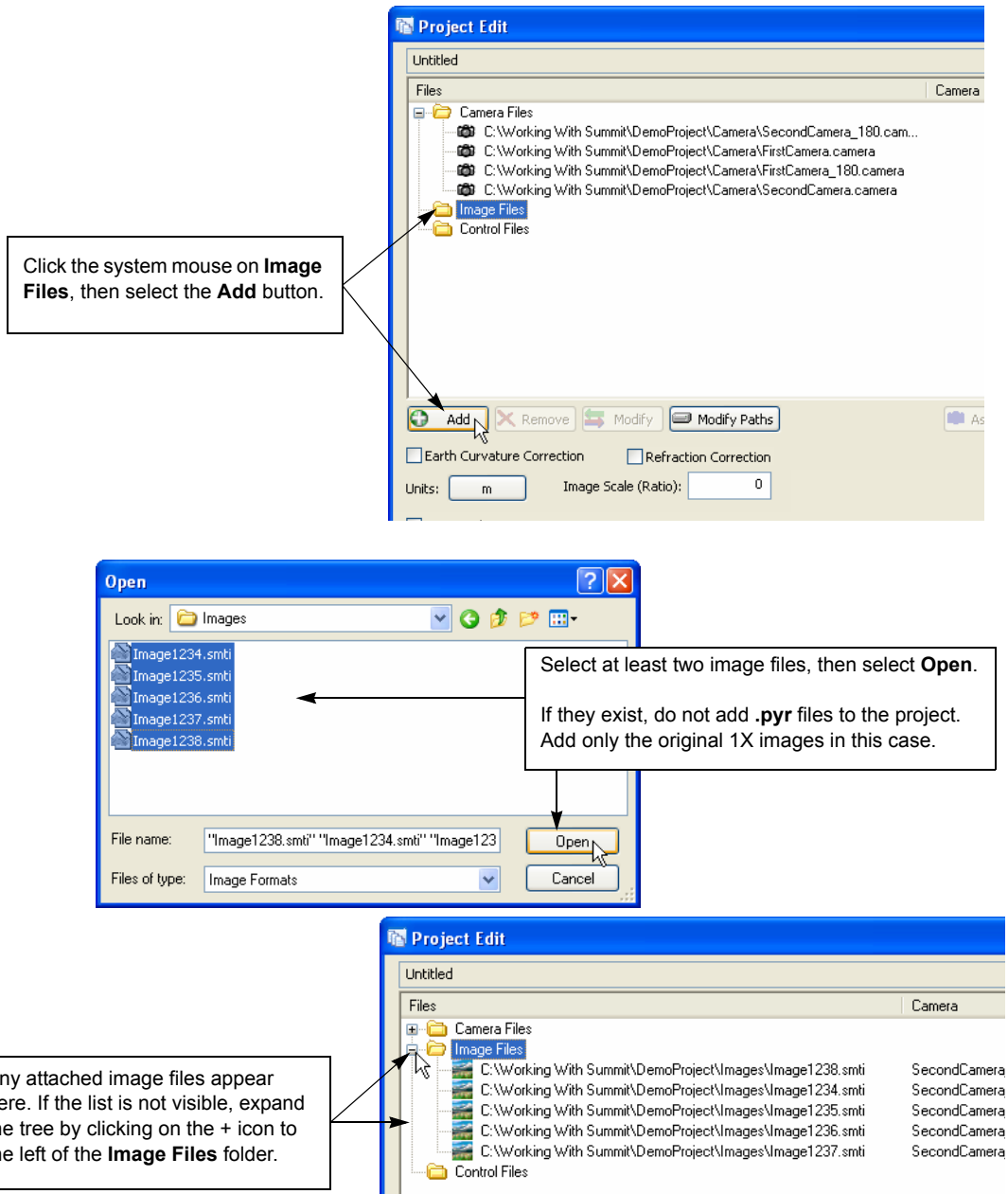
Step 3) For all camera types, click on **Camera Files** to highlight it. Select the **Add** button. Select one or more camera files. (Instructions for creating camera files are found in *Chapter 5*. Instructions for converting camera files from other project formats can be found in *Chapter 15*.) The **Add** button may be used as many times as desired to add all camera files. To select multiple files at one time, highlight one file name, then hold down the <Ctrl> key and click on individual files, or hold down the <Shift> key and select a continuous block of files by clicking on the last file.



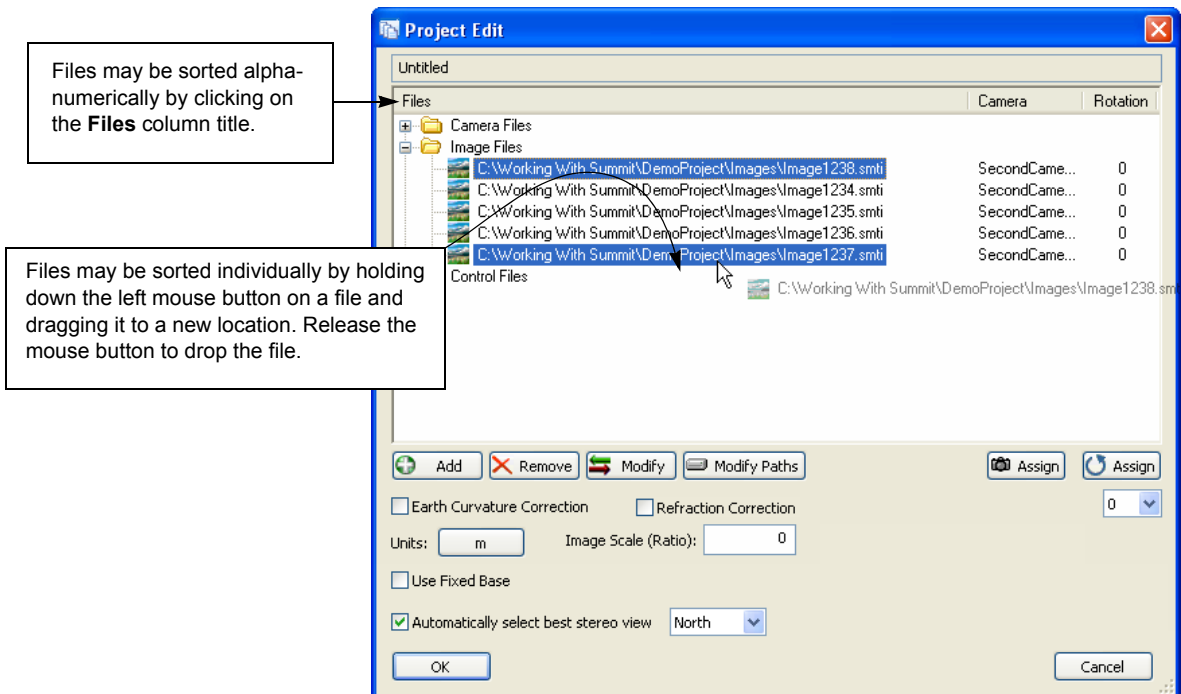
- Step 4)** Click on **Image Files**, then select the **Add** button. Select all of the image files for the project. Select at least two images forming one stereo pair. These images must conform to the formats described in “Original Image Requirements” on page 4-1.

If **.pyr** files are to be used, add the *original image files* to the project. Do not add the **.pyr** files to the project.

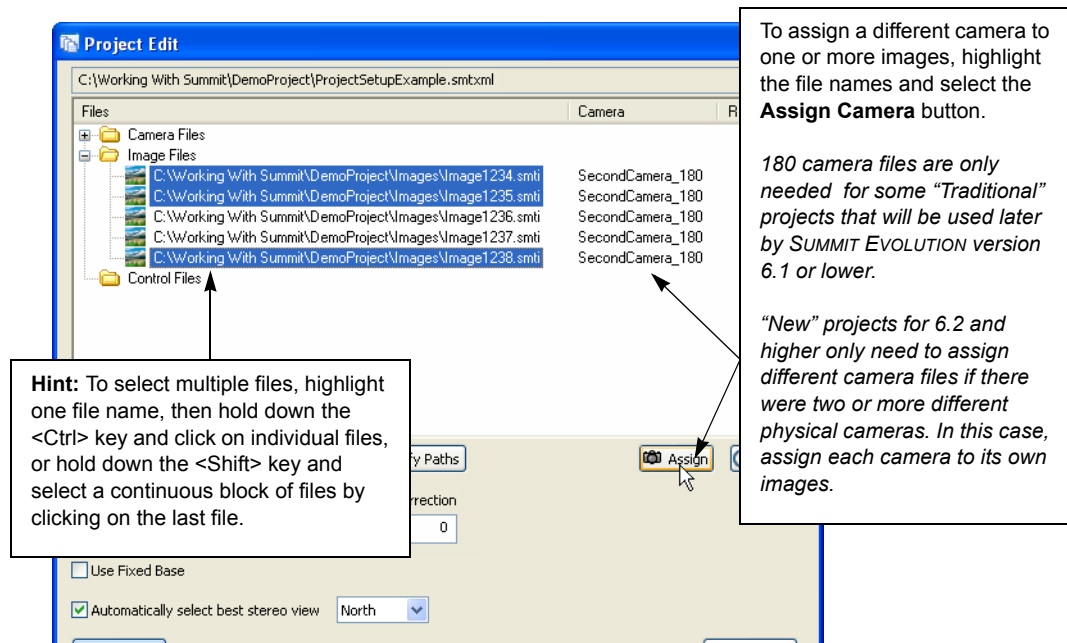
The **Add** button may be used as many times as desired to add more image files. To select multiple files at one time, highlight one file name, then hold down the **<Ctrl>** key and click on individual files, or hold down the **<Shift>** key and select a continuous block of files by clicking on the last file.



- Step 5)** When the images appear on the Project Edit list, they may be out of order. To sort the files alphanumerically (by their file names), click the system mouse on the **Files** column title above the file list. Individual files may also be highlighted and dragged to a new location. For more project editing ideas, see “Edit a Aerial Project Definition” on page 7-11.



- Step 6)** If more than one camera was used for the project images, assign each camera file to its own images. Highlight one or more images to be assigned to the same camera, then select the **Assign Camera** button. For more information on when to use a 180° rotated camera file, see “Prepare a Camera File Plan” on page 5-1.



- Step 7)** The Select Camera dialog appears listing the camera definition files that are associated with this project. Select the correct camera file and then select the **OK** button.
- Step 8)** Continue selecting images and assigning camera definition files until each image is matched with the correct camera file.
- Step 9)** There are two cases when an image rotation should be applied:

- a.) If a film image was scanned in a rotated position by mistake.

Note!

As an alternative to assigning an image rotation for a rotated scan, it is possible to correct the image using the IMAGE CREATION tool (page 4-11).

For more information on when to use image rotations and how to correct for image scan problems, see “Prepare a Camera File Plan” on page 5-1.

- b.) If a “Traditional” method digital camera file has a 90, 180, or 270 setting in the camera file, the same angle must be applied to the images.

Note!

If the project will always be used by version 6.2 or higher, the camera file should be set to 0 x-axis direction and the rotations assigned in the Project Edit dialog should also be 0.

If an image requires a rotation, click the system mouse on an image name to highlight it, select the rotation angle from the pop-down list, then select the **Assign Rotation Angle** button.

To assign a rotation angle to an image file, highlight the file name, select a rotation angle from the pop-down list, then select the **Assign** button.

Note! For the “New” project method used by DAT/EM 6.2 and above, do not assign a 180° rotation angle to correct for a flight direction change. The **Automatically select best stereo view** setting corrects for flight direction changes. For the “Traditional” method with version 6.1 and lower, assign the 180° rotated camera file.

Note! Instead of assigning a 90° or 270° project image rotation to correct for a mistakenly rotated scan, DAT/EM recommends rotating the image in the IMAGE CREATION tool (page 4-11). See the image and scan cases starting on page 5-1 for more image scan problems and solutions.

The screenshot shows the 'Project Edit' dialog box with the following table:

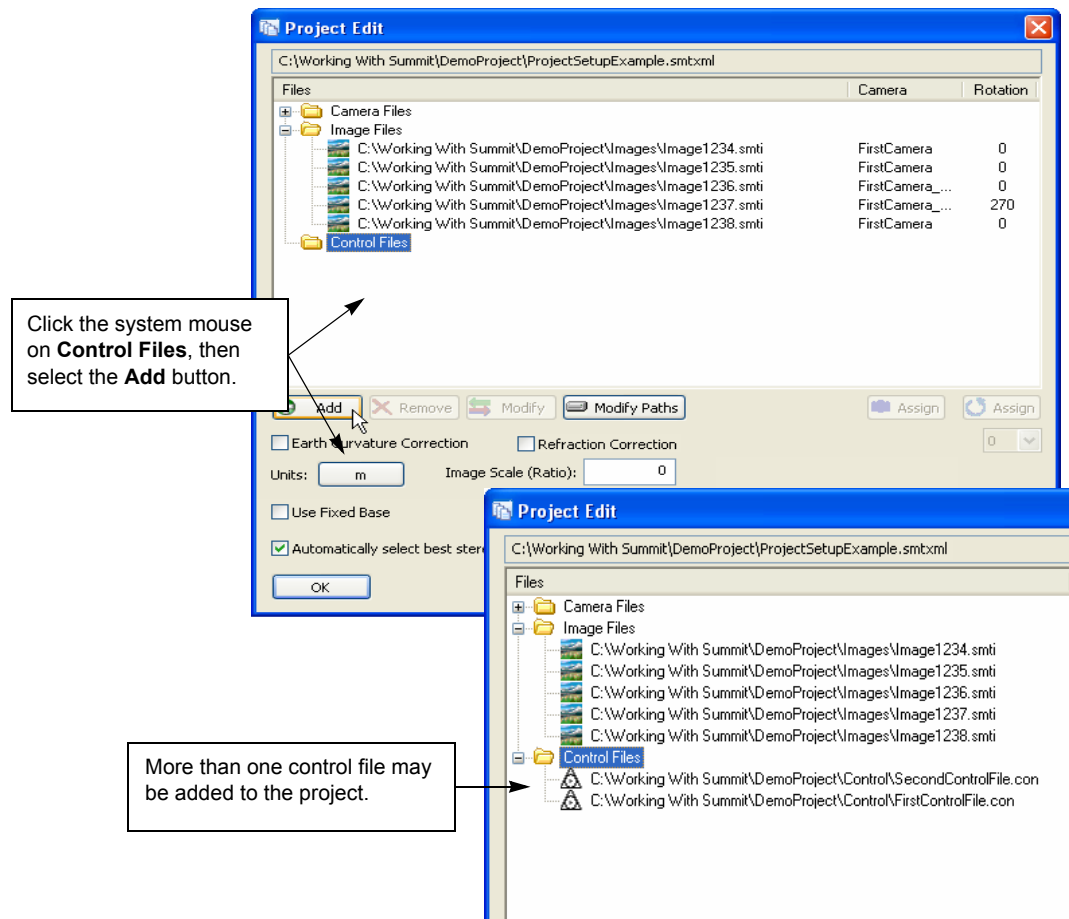
Files	Camera	Rotation
Working With Summit\DemoProject\Images\Image1234.smti	FirstCamera	0
Working With Summit\DemoProject\Images\Image1235.smti	FirstCamera	0
Working With Summit\DemoProject\Images\Image1236.smti	FirstCamera_180	0
Working With Summit\DemoProject\Images\Image1237.smti	FirstCamera_180	270
Working With Summit\DemoProject\Images\Image1238.smti	FirstCamera	0

Below the table are buttons: Remove, Modify, Modify Paths, Assign, and Assign. The 'Assign' button is highlighted with a callout. Below the buttons are checkboxes for 'Image Correction' and 'Refraction Correction', an 'Image Scale (Ratio)' field set to 0, and a checkbox for 'Automatically select best stereo view' which is checked. A dropdown menu for 'North' is also visible.


Step 10) Control files are required in the following cases:

- To use SUMMIT EVOLUTION to measure ground control points for absolute orientation.
- To use SUMMIT EVOLUTION to measure relative control points to export to a third-party aerotriangulation package.
- To use the adjusted ground value point list results from a third-party aerotriangulation package (such as an Albany **.gpa** file) as a ground control list. This makes it possible to complete orientation in just two steps: interior orientation and import relative orientation.
- To check ground coordinates after importing exterior orientations that were created on another non-analog stereoplotter.
- To drive the stereoplotter to ground coordinates using “Tools Menu > Move To Ground” (see page 25-45). A “fake” control file (that is, it may contain some kind of ground coordinates, which may not be real ground control points) may be used for this purpose. Even if it isn’t a real ground control file, it may be listed in **Control Files** in order for “Tools Menu > Move To Ground” to use it.

If control files will be specified, click on **Control Files**, then select the **Add** button. Select one or more control files. (Instructions for creating control files are found in *Chapter 6*.) The **Add** button may be used as many times as desired to add all control files. To select multiple files at one time, highlight one file name, then hold down the <Ctrl> key and click on individual files, or hold down the <Shift> key and select a continuous block of files by clicking on the last file.



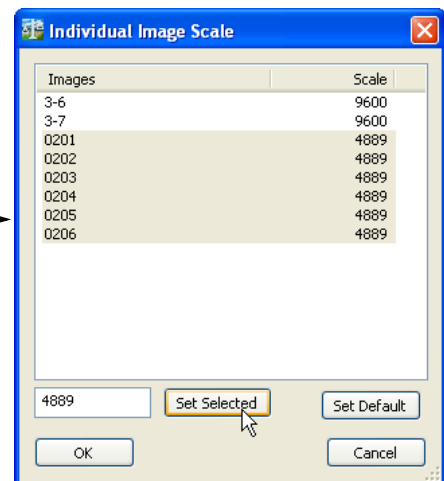
Step 11) Make settings in the lower area of the Project Edit dialog:

- a.) To use an Earth curvature correction during ground coordinate calculations, check on the **Earth Curvature Correction** setting. If this setting is on, the **Image Scale (Ratio)** must be entered correctly for each image. The image scale affects the correction calculation (see more information below).
- b.) Check on the **Refraction correction** setting to use an atmospheric refraction correction during ground coordinate calculations. Use this correction if all of the following are true:
 - The **Units** are **m** or **ft** (meters or feet).
 - The imagery was shot approximately straight down; there are no oblique images in the project.
 - The **Image Scale (Ratio)** is entered correctly. The image scale affects the correction calculation. The higher the image altitude, the greater the correction.
- c.) Select the correct project **Units**;
- d.) Enter the **Image Scale (Ratio)** according to the project specifications:
 - The **Image Scale** *must be set correctly* if either **Earth Curvature Correction** or **Refraction Correction** are *on*. The image scale affects the correction calculations.
 - **Image Scale** is used in three cases: When **Earth Curvature Correction** is on, when **Refraction Correction** is on, and when the **Match the zoom level of the active viewport** setting is on for multiple viewports (page 25-10). (If all three of these settings are off, the image scale settings are ignored.)
 - If the project's images are at different scales, use the  button. Set each image to its correct scale.

Make individual image scale settings:

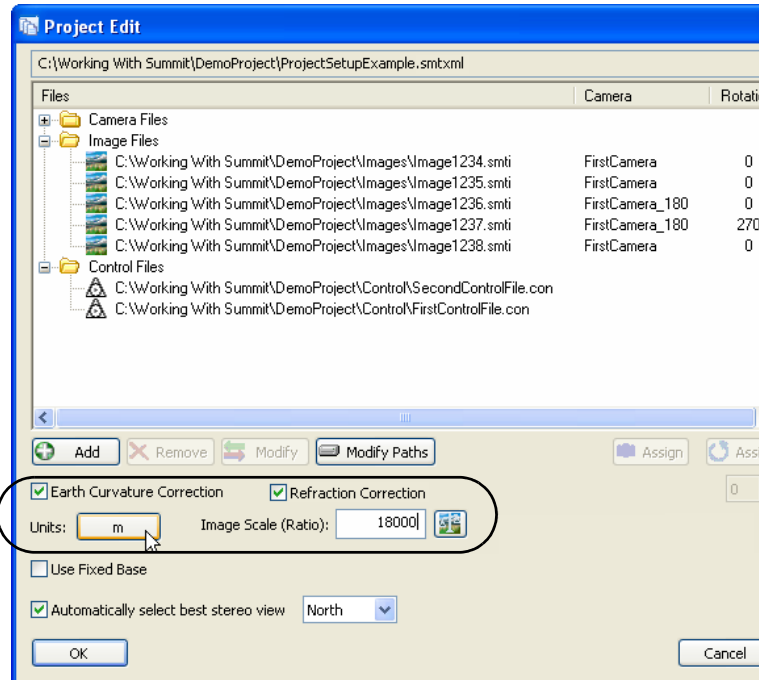
- The scales are initially set to "**Default**". "**Default**" is the value set in the main Project Edit dialog. To set or reset images to this value at any time, highlight them and select the **Set Default** button.
- Highlight all images that share the same scale, but have a different scale than "Default". Enter the scale in the field and select **Set Selected**.
- Repeat until all images are set to their correct scale setting.

Note: These scale settings are very important for **Earth Curvature Correction**, **Refraction Correction**, and for the **Match the zoom level of the active viewport** setting in multiple viewports.



Make additional settings:

- To use an Earth curvature correction during orientation calculations, check on **Earth Curvature Correction**. The image scale(s) must be correct if this setting is on.
- To use an atmospheric refraction correction during orientation calculations, check on **Refraction correction**. Use for non-oblique imagery with meters or feet units only. The image scale(s) must be correct if this setting is on.
- To select a different type of ground units, select the **Units** button and choose from the ground units list.
- Enter the **Image Scale Ratio(s)** according to the project specifications.



- e.) **Use Fixed Base** if OFF for the majority of projects. **Use Fixed Base** must be OFF for georeferenced projects. **Use Fixed Base** is used to enable absolute orientation into a relative coordinate system, which means that X, Y, and Z coordinates are in object or ground units, but that coordinate system is not georeferenced.

When **Use Fixed Base** is on, four additional fields appear. The first field is the distance between the cameras or aerial image centers. The distance should be exact for two fixed-distance cameras where the distance can be measured. The distance may be approximated for other aerial imagery; the more accurate the distance value, the better the scaling will be. If scaling doesn't matter in this project, the distance value may be left at the default of 1000; the only thing this will affect is the scaling of the units. The next three fields are the X, Y, and Z offsets for the coordinate system origin (used to prevent negative coordinates). Use your choice of units for the entries, but use the same units for each of the entries.

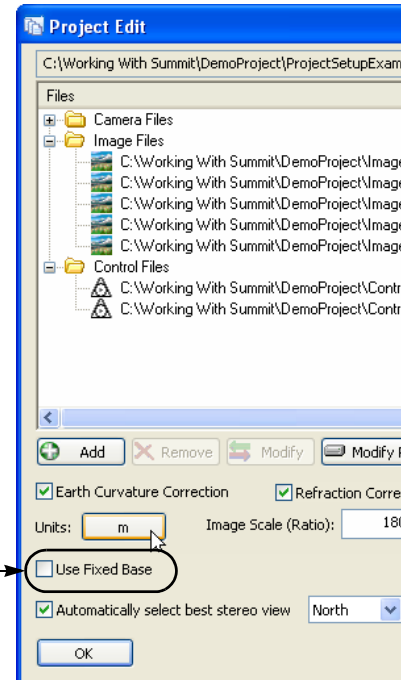
In a **Use Fixed Base** project with multiple adjoining images, each model will have its own local coordinate system origin. Adjoining models will not have adjoining coordinate ranges; instead, they will overlap. This means that digitizing may not start in one model and continue in the next.

When relative orientation is done in a **Use Fixed Base** project, "Non-Georeferenced Ground" appears with coordinates in the status bar, and digitizing may begin.

Use Fixed Base was originally implemented for a project where there were two cameras mounted under a helicopter. The cameras made simultaneous images, and the distance between the cameras was known. **Use Fixed Base** may also be used with aerial images to allow digitizing in non-georeferenced coordinates after a relative orientation. **Use Fixed Base** may also be useful for some close-range work, but please contact DAT/EM to discuss your particular project before proceeding.

- **Use Fixed Base** is OFF for most projects. If your project is to be georeferenced, leave this setting OFF.
- **Use Fixed Base** ON creates a project that is not georeferenced.
- **Use Fixed Base** was originally offered for a custom dual-camera project where two images were made simultaneously and the distance between the cameras was known. It may also be used in aerial and close range projects, but be aware the units may not be scaled like “real” ground units, and of course the coordinate system will not be georeferenced.
- When on, **Use Fixed Base** offers four additional fields. The first field is the distance between the cameras, an estimate of the ground distance between image centers, or the default value (if scaling does not matter). The next three fields are the X, Y, and Z offsets for the coordinate system origin (used to prevent negative coordinates, if desired). Use your choice of units for the entries, but use the same units for each of the entries.

☒ Use Fixed Base 1000.000 Offset x 1000.00 y 1000.00 z 1000.00



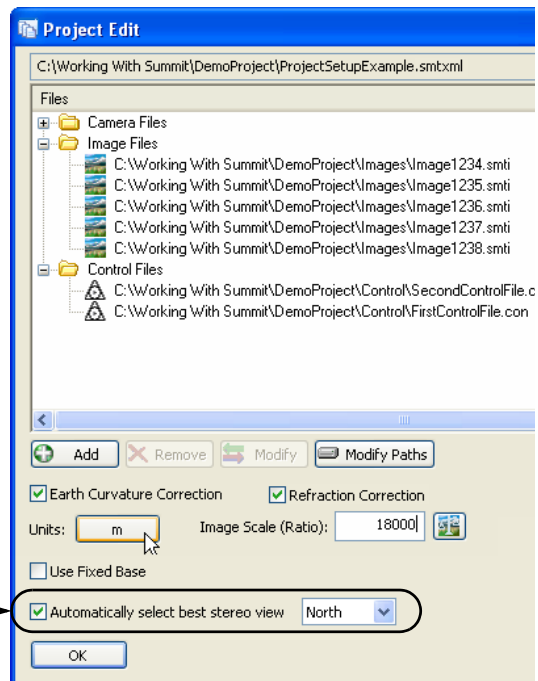
- f.) **Automatically select best stereo view** is ON for the majority of projects. This enforces left-right stereo and the selected direction (**North/South/East/West**) as upright as possible on the screen.

Automatically select best stereo view may be ON for both “New” (contains unrotated camera and unrotated images) and “Traditional” (could contain rotated cameras and rotated images) project files.

The only time **Automatically select best stereo view** should be OFF is when the project contains image rotations to correct for film images that were scanned in a rotated position.

- **Automatically select best stereo view (North/South/East/West)** is ON for most projects.
- **Automatically select best stereo view (North/South/East/West)** is OFF only when the project contains image rotations to correct for film images that were scanned in a rotated position. (A better alternative is to fix the image rotation with IMAGE CREATOR so that it does not need to a rotation angle in the project file in the first place.) It might also be off if you are setting up a project to be used with SUMMIT EVOLUTION version 6.1 or lower.

Hint: If the imagery was flown north-south, select **West** or **East** to be upright on the screen. Likewise, if the imagery was flown east-west, choose either **North** or **South** to be upright on the screen. This prevents any “screen direction flipping” when kappa in adjoining models fluctuates at + and - angles close to the selected direction. This would not be bad, but it would be visually distracting.



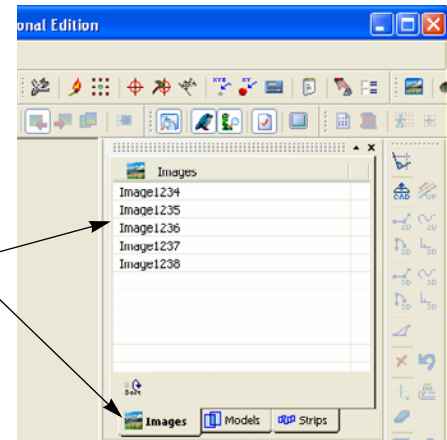
Step 12) When finished making project settings, select the **OK** button. To save all the project settings, select **Save** or **Save As** from the **File** toolbar or pull-down menu.

Select the **Save** or **Save As** from the **File** toolbar or pull-down menu.



The project images are now listed on the **Images** tab of the Project View display. (To turn on the Project View window, select **Project Window** from the **View** pull-down menu or hover the system mouse over its pinned tab on the right or left side of the window.)

The project's images appear listed on the **Images** tab of the Project View display.

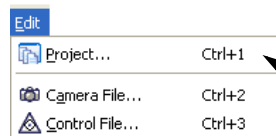


Edit a Aerial Project Definition

If necessary, changes may be made to any of the file names, file locations, or the image order defined earlier in the SUMMIT EVOLUTION project **.smtxml** file.

To edit the project, perform the following steps:

Step 1) If the project editor is not already displayed, select **Edit Project** from the **Edit** toolbar or pull-down menu.



Select **Edit Project** from the **Edit** toolbar or pull-down menu.

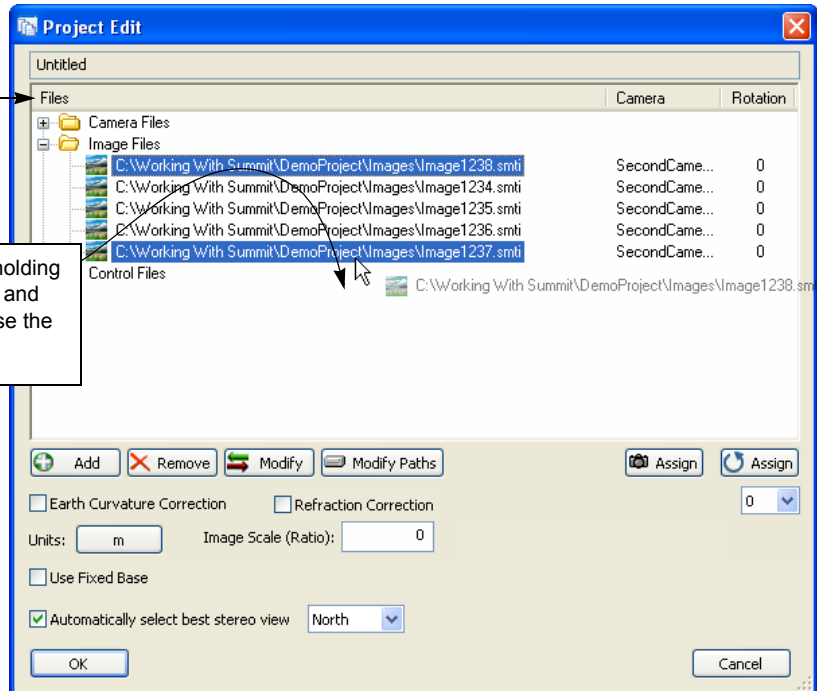
Step 2) Review the file list. If necessary, edit the project using any of the following steps.

Step 3) When the images appear on either the Images tab or in the Project Edit list, they may be out of order. To sort the files, choose one of the following methods:

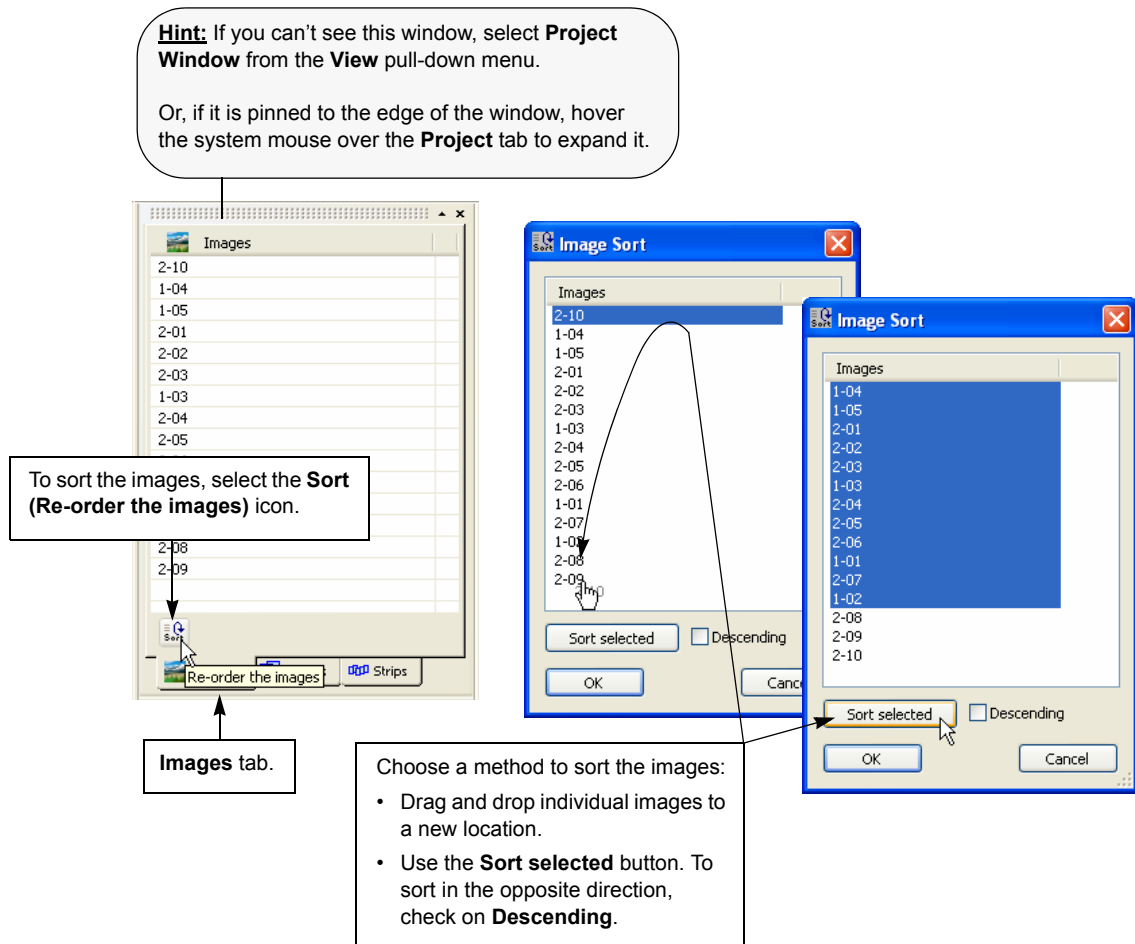
- a.) From the Project Edit list, click the system mouse on the **Files** column title above the file list. This sorts the files alphanumerically.
- b.) From the Project Editor, click and hold down the mouse button on an image name, drag the file name to the correct position, and release the mouse button.

Files may be sorted alpha-numerically by clicking on the **Files** column title.

Files may be sorted individually by holding down the left mouse button on a file and dragging it to a new location. Release the mouse button to drop the file.



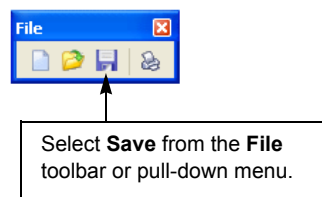
- c.) Select the **Image** tab on the Project Window, then select the **Sort (Re-order the images)** icon. Sort the image names by dragging and dropping with the mouse or by using the **Sort selected** button.



Step 4) Additional project editing may be done if necessary:

- To remove a camera, image, or control file, click the system mouse to highlight its name, then select the **Remove** button or press the <Delete> key.
- If one camera file, image file, or control file has been moved to a new folder, highlight the file name and select the **Modify** button to specify the new folder location.
- If all the camera files, all the image files, or all the control files have been moved to a new folder, select the **Modify Paths** button and specify the new location.

Step 5) When finished making project settings, select the **OK** button. To save any recent changes, select **Save** from the **File** toolbar or pull-down menu.



Group Images Into Models and Strips

Grouping the images into models may be required or simply done for convenience:

- Models are required in order to run Automatic Relative Orientation (Auto RO).
- Models are required for exporting to or importing from third-party aerotriangulation (AT) software.
- Model definitions enable the **Automatically load next model when outside stereo region** setting to work. This setting is found on the **Project** tab of the **Options** dialog.
- Models are simply convenient, because both right and left images can be opened with one click of the mouse in the Project window.

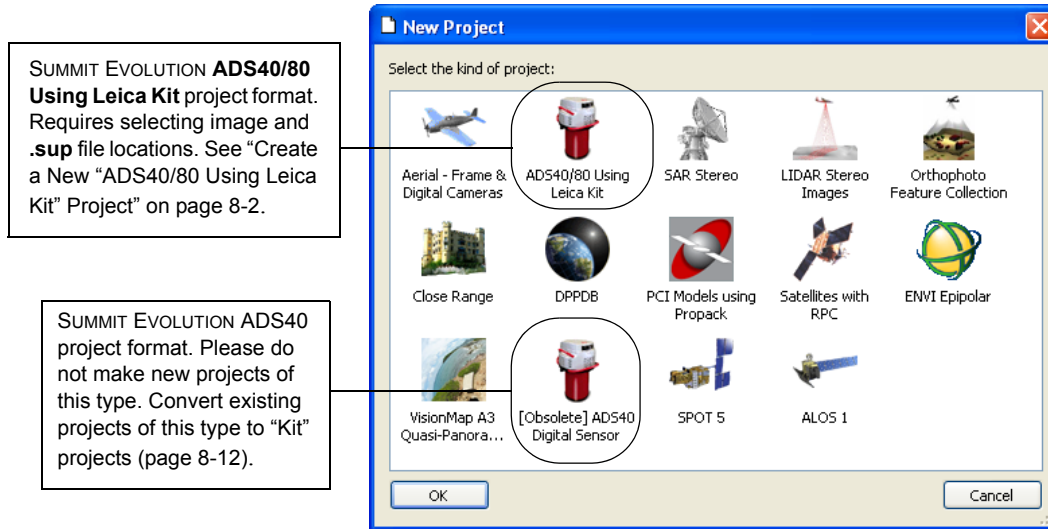
To build models and strips, see the instructions in *Chapter 16*.

Chapter 8. Create an ADS40/80 Project

The SUMMIT EVOLUTION™ **.smtxml** project file contains a list of all the project settings such as image names and camera file names. This chapter shows how to create a project file from images and support files that were made by the Leica Geosystems ADS40 or ADS80 (ADS40/80) Airborne Digital Sensor.

In the past, there have been multiple choices for making ADS40 projects. Now, DAT/EM recommends only the “ADS40/80 Using Leica Kit” project type. This builds a project based on images and ADS40 **.sup** files.

The ADS40 Digital Sensor “Select All Files” project type is obsolete. A tool is provided to convert existing projects of this type to the “ADS40 using Leica Kit” project type (see page 8-12).



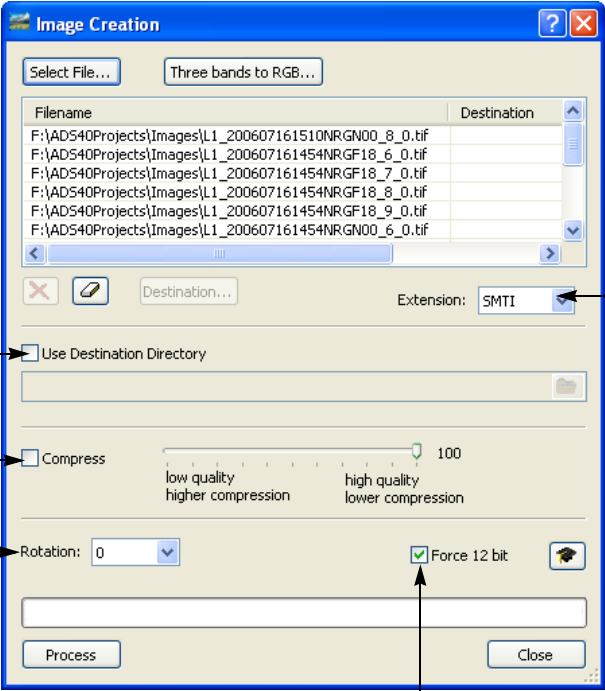
Create SMTI Images from the ADS40 TIFs

For the ADS40 project types, it is recommended to convert the original ADS40 **.tif** images to **.smti** images. There are two very good reasons to for the conversion:

- **To add zoom levels:** Original ADS40 images do not contain zoom levels. IMAGE CREATION will add zoom pyramids to the new **.smti** images. In some cases, the pyramids may be written to **.pyr** format, which are used together with the original 1X image; however, this must not be done if the **Force 12 bit** setting is needed for the 1X image.
- **Many ADS40 images or parts of the images have incorrect bit settings:** Many ADS40 images contain 16-bit settings or a mixture of different bit settings that do not match the bit information in the image header. IMAGE CREATION’s **Force 12 bit** setting converts all parts of the file to 12 bit so that it will display correctly.

You can assume that all the files from a specific sensor provided by a specific vendor are created the same. They either all have the mixed bit problem, or they all do not. To determine whether the files need the **Force 12 bit** setting on, convert *just one file* with the **Force 12 bit** setting on; drag the file into the SUMMIT EVOLUTION Project View’s Images tab; click on the file name to open it in SUMMIT EVOLUTION; apply a histogram correction if necessary; view the file. If there are distinct areas of incorrectly colored pixels, bright magenta pixels, or it “looks funny” in any way, then **Force 12 bit** was not necessary. If desired, convert the file again with **Force 12 bit** off, and use the same method to verify that it is correct. Proceed to process all the files with the determined **Force 12 bit** setting.

To convert the files, see instructions for IMAGE CREATION starting on page 4-6. Make settings as follows:



The screenshot shows the 'Image Creation' dialog box. It has a 'Select File...' button and a 'Three bands to RGB...' button. Below these is a list of files with columns for 'Filename' and 'Destination'. The 'Extension' is set to 'SMTI'. There are checkboxes for 'Use Destination Directory', 'Compress', and 'Force 12 bit'. A 'Rotation' dropdown is set to '0'. A 'Process' button and a 'Close' button are at the bottom.

Annotations:

- Destination is the user's choice.** (Points to the 'Destination' column in the file list)
- Do not compress. Compression will not speed up image access.** (Points to the 'Compress' checkbox)
- Do not rotate. Original ADS40 images are incapable of being improperly rotated. (This setting is mainly for improperly scanned aerial film.)** (Points to the 'Rotation' dropdown)
- Check on Force 12 bit if needed. (It is recommended to convert and view just one file first to determine whether the setting is needed or not.)** (Points to the 'Force 12 bit' checkbox)

Additional Notes (from right side):

- In the majority of cases, choose the **.smti** extension.
- The **.pyr** extension may be used *only if Force 12 bit* is not needed for the original 1X image. **.Pyr** creates the image pyramids only, and does not affect the original 1X image. The original 1X image is required as part of the project. If the **.pyr** option is desired, please try it on one image pair first to make sure the original 1X and the **.pyr** file combination will work for the particular project.

Once IMAGE CREATION has been run, the new images will be larger than the original files. This is due to the addition of image pyramids. The larger images will be more useful for zooming in and out, and they will be just as fast to access. They are worth the time it takes to create them.

Create a New “ADS40/80 Using Leica Kit” Project

This method uses SUMMIT EVOLUTION and the “Leica Kit” to build an ADS40 or ADS80 (ADS40/80) project based on the image files and the **.sup** files.

It is possible to export a “Select All Files” ADS40/80 project to an “Leica Kit” project using **Export>To Leica ADS40 Kit Project Type** on the **File** pull-down menu. After exporting, open the new Kit project and skip to Step 8 on page 8-6 to update the **sup** file paths. View the other settings and make any necessary additions or changes based on the instructions in this section.

To create an “ADS40/80 Using Leica Kit” project from images that were made by the Leica Geosystems ADS40 or ADS80 Airborne Digital Sensor, perform the following steps:

- Step 1)** Use the IMAGE CREATOR to convert the original ADS40/80 **.tif** images to **.smti** or **.pyr** images. See more information in “Create SMTI Images from the ADS40 TIFs” on page 8-1 above.
- Step 2)** Prepare the entire ADS40/80 file set that will be included in the project. This includes:
 - .sup** files (at least two files for two images that define a stereo pair, such as the forward and backward, the forward and nadir, or the nadir and backward images from the same scan set.)

And for each **.sup**, the files listed in the **.sup** as follows:

- **.ads** file (but not the **.ads_2**, **.ads_4**, **.ads_8**, etc. that are listed in the **.sup**)
- **.odf** (if it is listed in the **.sup**)
- **.odf.adj** (if it is listed in the **.sup**)
- **.cam**
- **.smti** or **.tif** image (if the **.smti** exists, it will be used instead of the **.tif**) or the original 1X **.tif** file plus the **.pyr** image pyramid file (if the **.tif** and the **.pyr** are in the same folder, they will be used together). In most cases, **.smti** files should be used.

If desired, make backups of the original **.sup** files. Rename the backups' extensions to **.supTXT**. Any files in the path tree(s) that have the **.sup** extension will be modified by **Update SUP File Paths** in Step 8 below.

Please note before you continue:

- A set of camera files consists of the forward, nadir, and backward camera files from the same ADS40/80 sensor and from the same calibration date. Unfortunately, ADS40/80 camera file names are often the same, even if they are not from the same sensor or from the same calibration date. For example, there might be two files called **NIRF18A.cam**, but they could be from two completely different ADS40/80 sensors.
- Organize data files so that the imagery, **.sup** files, **.cam** files, and other accompanying files are not mixed with files from a different sensor or camera calibration date. Do this by placing all the files that belong to each camera file set into its own unique folder (or folder tree).
- In order to set up this type of project, you will need to know whether your project will contain more than one camera file set.

Step 3) (Optional, but highly recommended) Create a “fake” control file that contains at least one vertical point. The ADS40/80 project does not need a control file for its orientation; however, a “fake” control file may be used for several purposes:

- To set the initial cursor Z for the first-opened model and individually opened models that are selected from the Project window.
- To set the best display scale for 2D SUPER/IMPOSITION (SI) in SUMMIT EVOLUTION. For more information about 2D SI, see “Superimposition of 2D Vector Data” on page 27-17.
- To set the best display scale for all SI in the PROJECT VIEWER tool.
- To provide a coordinate list to be used by the “Move to Ground” function (see “Tools Menu > Move To Ground” on page 25-45).

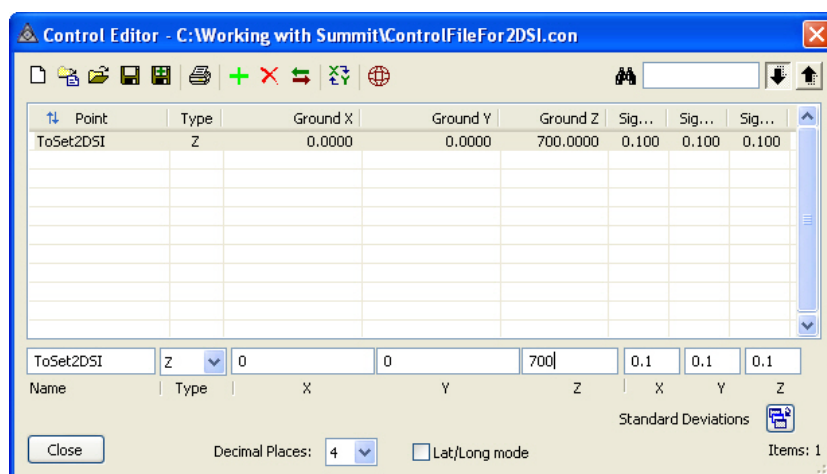
The average Z of all vertical values found in the control file will be used to set the initial cursor Z and to calculate the scale of 2D SI (when needed). Horizontal-only points will be ignored when calculating the average Z.

The file must be in the SUMMIT EVOLUTION **.con** file format. Use the Control Editor in SUMMIT EVOLUTION (*Chapter 6*). Add at least one vertical point to the file. To use with “Move to Ground” also, add any number of any kind of point, as long as at least one point has a vertical value.

Hint: To quickly collect many points around the project, wait until the rest of the project setup is complete (Step 19 is finished). Open the project in SUMMIT EVOLUTION and in the PROJECT VIEWER. Use the PROJECT VIEWER's **Move Summit by Pick** button (Step 9 on page 28-6) to move to various locations. Set the ground elevation, then use SUMMIT EVOLUTION's **Point Collector** tool (page 25-54) to create a list of coordinates and write them to a file. Import this file into the Control Editor (page 6-3). The file's format will need to be defined the first time only.

- Control files may also be imported from 3rd-party coordinate lists ("Import an Unknown-Format Control File" on page 6-3).
- The control file's coordinates must be expressed in the same coordinate system that is set as the output transformation for the project (see Step 12 on page 8-9 below).

Later in Step 11 on page 8-8 below, this file will be added to the project.



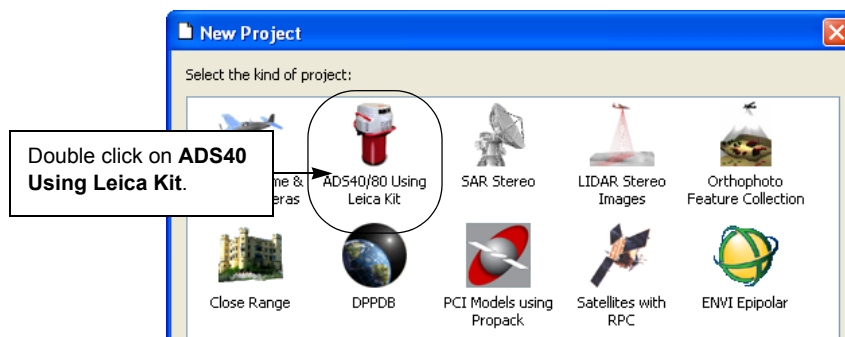
This control file contains only one vertical point at the average elevation of the project. If there are multiple points, the average elevation of the vertical values will be used.

Step 4) To start a new project, select **New Project** from the **File** toolbar or pull-down menu.

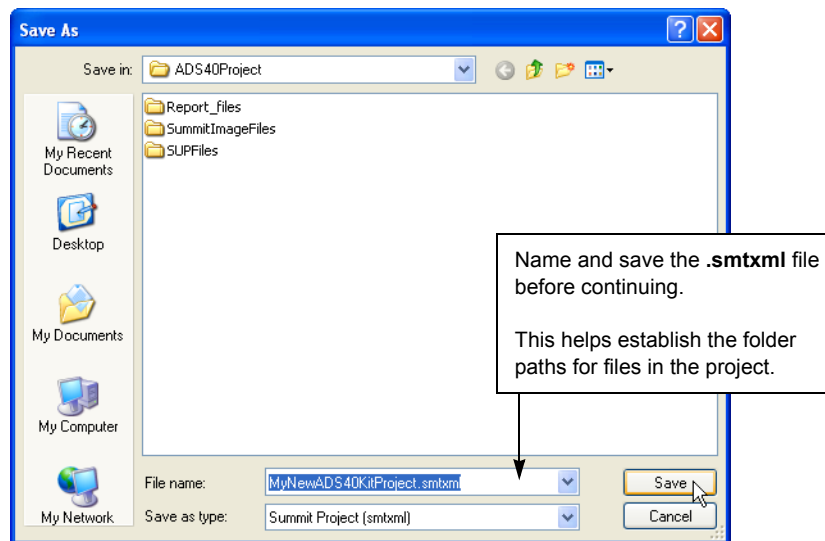
To start a new project, select **New Project** from the **File** toolbar or pull-down menu.



Step 5) Double click on **ADS40/80 Using Leica Kit**:

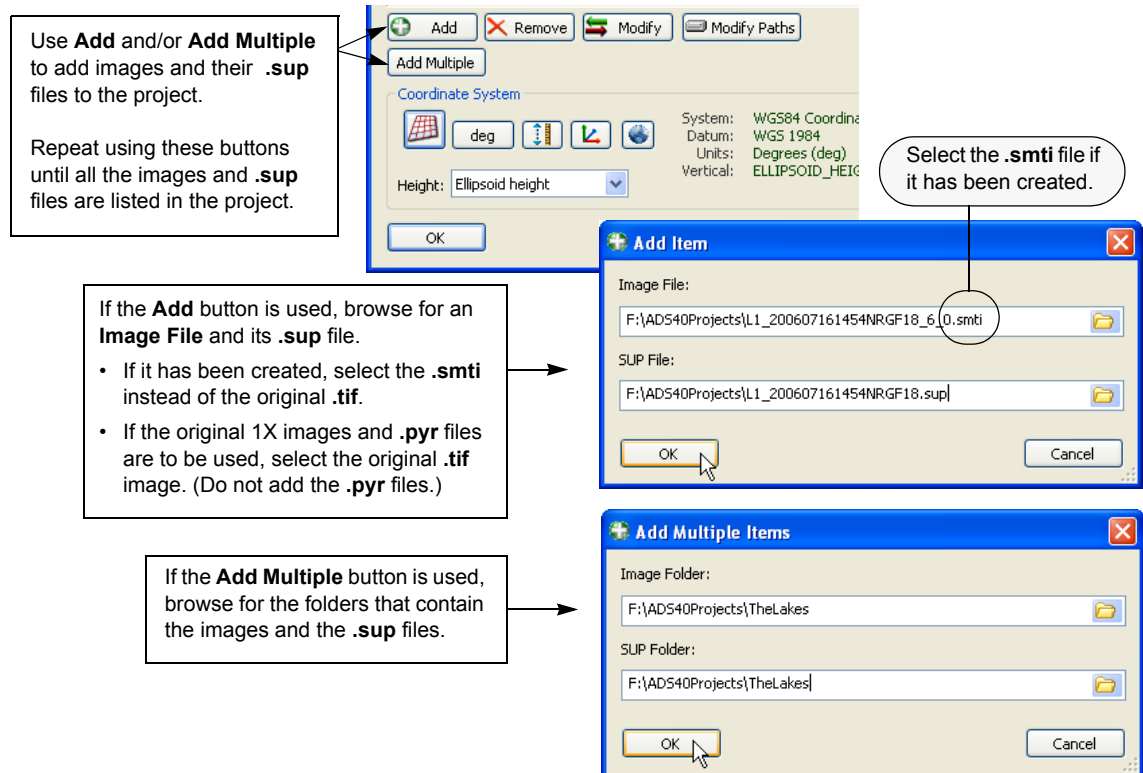


Step 6) The Save As dialog appears.



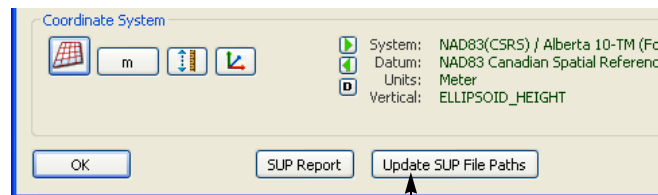
Step 7) The Project Edit dialog appears. Choose a method to find project files:

- Select **Add** to browse for and add one image file and one **.sup** file set at a time. Repeat until all images and their **.sup** files have been added to the project.
- Or, select **Add Multiple** to add all the images and **.sup** files that are found in a set of folders. If the files are in more than one location, repeat until all the paths have been added to the project.



Step 8) Select **Update SUP File Paths**. A list of **.sup** file appears; all the files are checked on by default.

- Leave all the files checked on if they all call for the same camera file set. That is, every **.sup** file in the list calls for an image that was taken by the same ADS40 sensor calibrated on the same date.
- Otherwise, run **Update SUP File Paths** multiple times. Each time, check on only those **.sup** files that call for the same camera file set. Repeat using **Update SUP File Paths** until all **.sup** files have been updated.



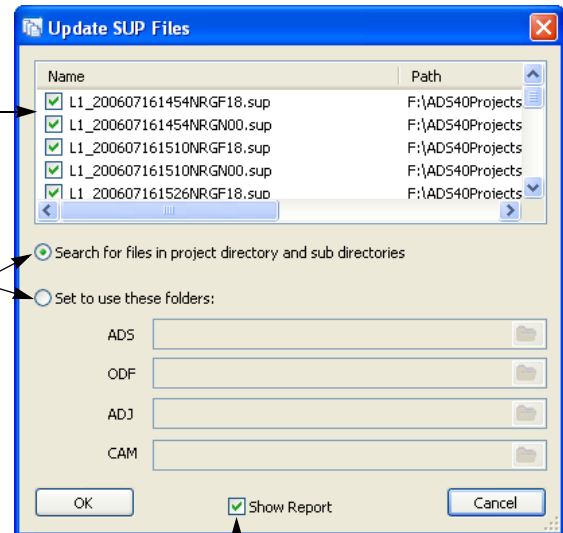
Select **Update SUP File Paths**.

All **.sup** files are checked on by default.

- Leave all the files checked on only if they all call for the same camera file set.
- If the **.sup** files call for different camera file sets, run **Update SUP File Paths** multiple times. Each time, check on only those **.sup** files that call for the same camera file set.

If all the files listed in each checked **.sup** are to be found in the same folder or folder tree under the location of the **.sup** file, select **Search for files in project directory and sub directories**.

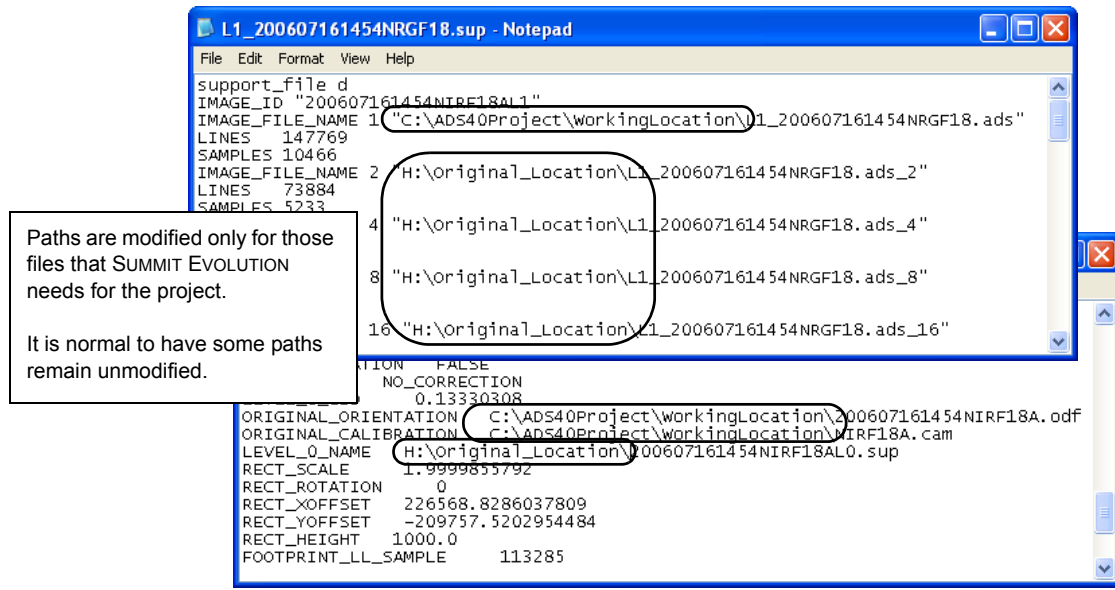
- Otherwise, select **Set to use these folders** and browse for the location of each type of file.



Check **Show Report** to open a temporary text file at the end of processing. It shows the results of each **.sup** file updated during this run of **Update SUP File Paths**.

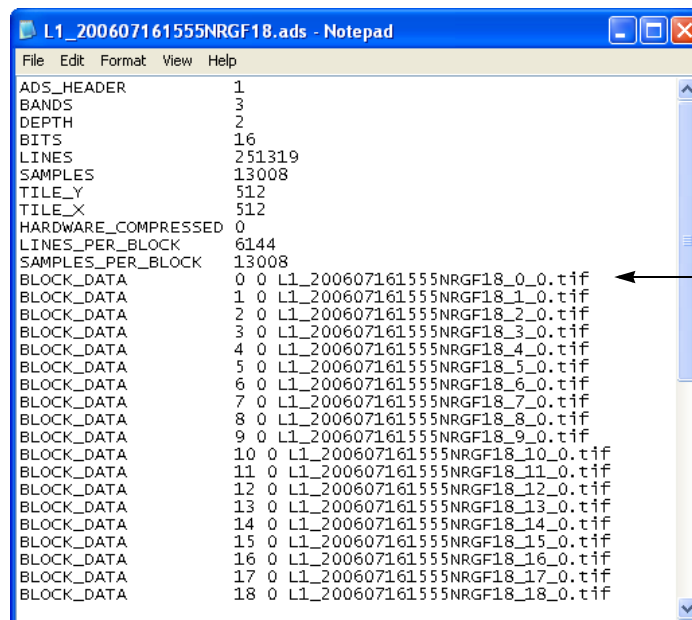
Update SUP Files Paths changes the paths within each **.sup** to the current location of the files. It does this only for the files that are needed by the SUMMIT EVOLUTION project.

- If images have been split up into multi-image blocks, only the **.sup** file for the end of each block will be modified. That is, if there are 160 images that make up eight split imagery blocks, only 16 of the 160 **.sup** files will be modified (eight for forward images, eight for nadir images, for example).
- It is normal to have some paths within each **.sup** file remain unmodified, because SUMMIT EVOLUTION does not use every file.



Example of paths in the .sup file after "Update SUP File Paths"

- Step 9)** If desired, select **SUP Report**. The software searches through each .sup file to see if the files in it are found. A report opens in Windows Notepad. *This may be done again at any time.*
- Step 10)** Choose a setting for **Combine split imagery blocks**. This is the user's choice. This setting may be toggled on or off at any time, even if the project has already been used to digitize data. The following is some information about split imagery blocks:



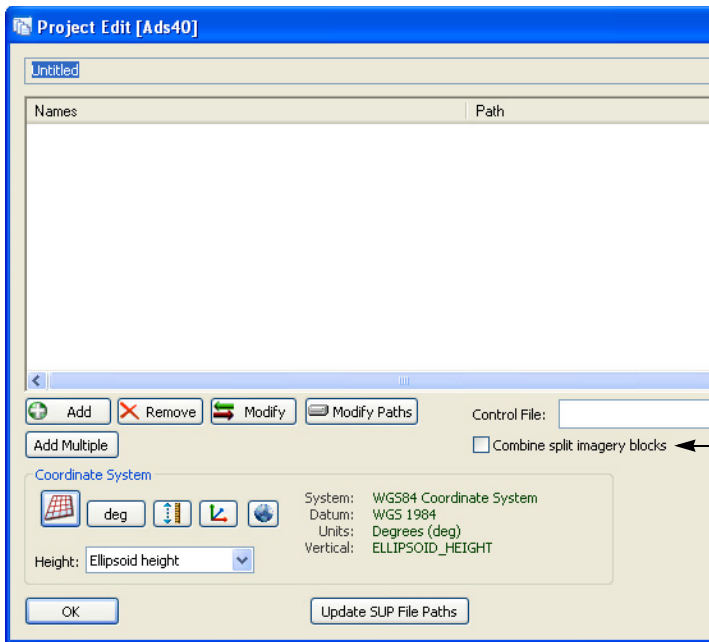
Example of the .ads file for a split imagery block

The .ads file for a split image block lists BLOCK_DATA and the names of all the images that belong to the set.

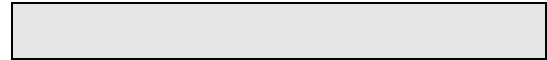
The number of blocks is not always the same. This example shows 19 blocks (0-18).

If .smti files are available in the same folder, they will be used instead of the .tif files.

If all of the .smti (or .tif) files are available, they may be displayed as one whole image using the **Combine split imagery blocks** setting.



The ADS40 images may have been split into several smaller files, or "split imagery blocks".



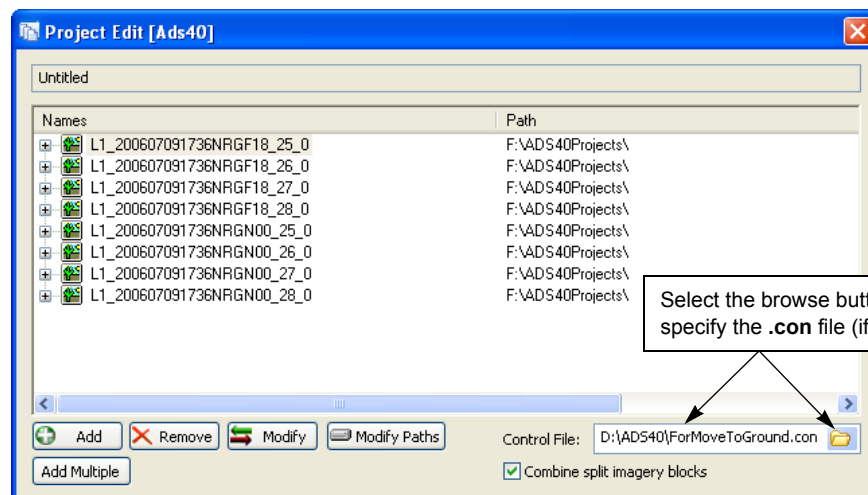
The original whole image is a long rectangle





If the image has been split, the .ads for each image lists the total number of split imagery blocks and their file names. The image's matching stereo image will be split into the same number of blocks.

- If **Combine split imagery blocks** is checked on, the separate files will be displayed together again as a long rectangle in the embedded bird's-eye view. This is a display setting, and does not change the image files on disk. All of the blocks from an image set *and* all the blocks in its matching stereo image must be added to the project in order for the combination to display correctly in stereo. If images are missing, they will appear black in that area of the bird's-eye view.
- If **Combine split imagery blocks** is on later when models are automatically generated, one model will be made per block.
- If **Combine split imagery blocks** is off, the bird's-eye view will display each individual small block.
- This setting may be toggled on or off at any time, even if the project has already been used to digitize data.

Step 11) (Optional) If a "control" (coordinates list) file was prepared in Step 2 (page 8-3), select it now. Use the **Control file** browse button to locate the .con file. This file is used by the "Move to Ground" (page 25-45) tool and to set an initial stereoplotter elevation when the first model opens.



Step 12) If desired, transform the coordinate system from WGS84 to another system. Make settings using coordinate system, units, vertical reference, and datum shift buttons. If the same output coordinate system settings may be used for other ADS40/80 projects in the future, use the green **Save as default coordinate system** arrow button, , to save the settings. These default settings may be restored later with the green **Load default coordinate system** arrow button, .

Make settings using coordinate system, units, vertical reference, and datum shift buttons.

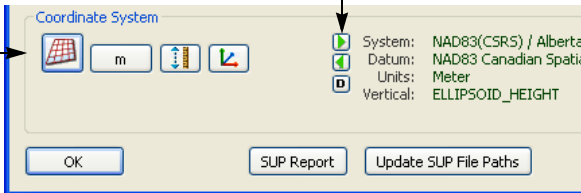
With these settings, the ADS40's Geodetic Latitude-Longitude system is transformed into the selected system using Blue Marble's coordinate transformation library. All ground coordinates shown in SUMMIT EVOLUTION and sent to AutoCAD, MicroStation, or ArcGIS are then in the selected system.

- If the same output coordinate system settings may be used for other ADS40 projects in the future, use the green **Save as default coordinate system** arrow button to save the settings.
- These default settings may be restored later with the green **Load default coordinate system** arrow button.
- To remove the coordinate system, select the "D" **Set to default coord system WGS84** button.

Note! If a "File not found" error is received, please see the "Install or Update the Coordinate Transformation Databases" section in the DAT/EM "Installation Instruction Series: Software Installation and Configuration" document.

Note! If the desired coordinate system is not offered, see *Appendix C*.

Note! DO NOT change the project's coordinate system after objects have already been digitized in the AutoCAD, MicroStation, or ArcGIS file. Choosing a coordinate system here does not translate previously existing CAD/GIS objects or files.



Step 13) When the project definition is complete and the **.sup** file paths have all been updated, select **OK** to close the Project Edit dialog.

Step 14) Select **Save** from the **File** toolbar or pull-down menu.

Step 15) DAT/EM recommends defining models for every ADS40/80 project. This is mostly for the user's convenience when opening models. To define models, see *Chapter 16*.

Grouping images into strips is not usually necessary when using ADS40/80 images; however, if for some reason you want to group the ADS40/80 models into strips, please follow the directions in *Chapter 16*, page 16-10.

Step 16) Open one image or one model in the ADS40/80 project.

There may be a delay while opening a model, because the files are extremely large; however, once it is open, processing is fast.

ADS40 imagery almost always has a very narrow pixel color range. Images can look completely dark, or dark enough that it is difficult to see features clearly. A histogram adjustment for all dark images is recommended.

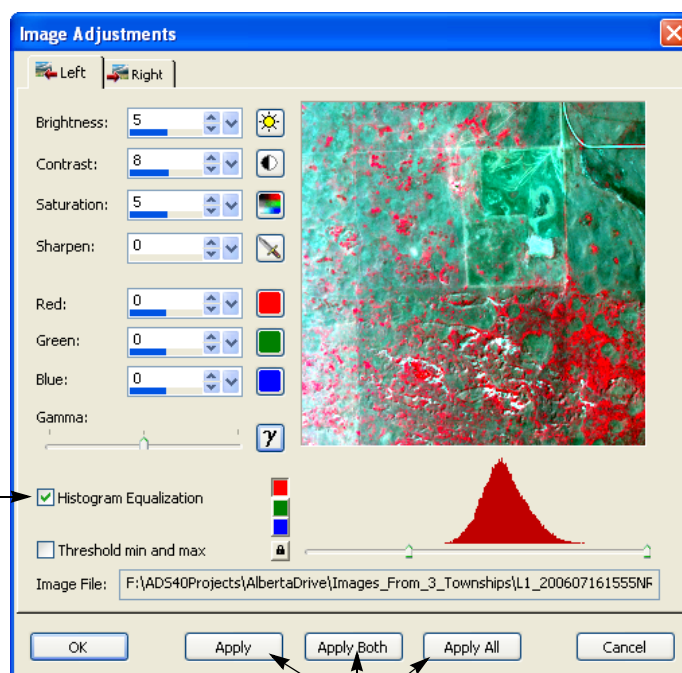
Step 17) Select **Image adjustment** from the **Imaging** toolbar from the **Imagery** menu. Check on **Histogram Equalization**. Make other settings as desired:

Select **Image Adjustment** from the **Imaging** toolbar or from the **Imagery** pull-down menu.



Note: The preview may not match the stereo view's color range. The preview is an 8 bit display; ADS40 imagery is often 12 bit. Use one of the **Apply** buttons to see the true effects of the selected adjustments in the stereo view.

Check on **Histogram Equalization**. Make other settings as desired.

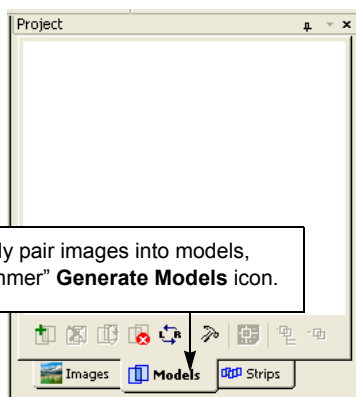


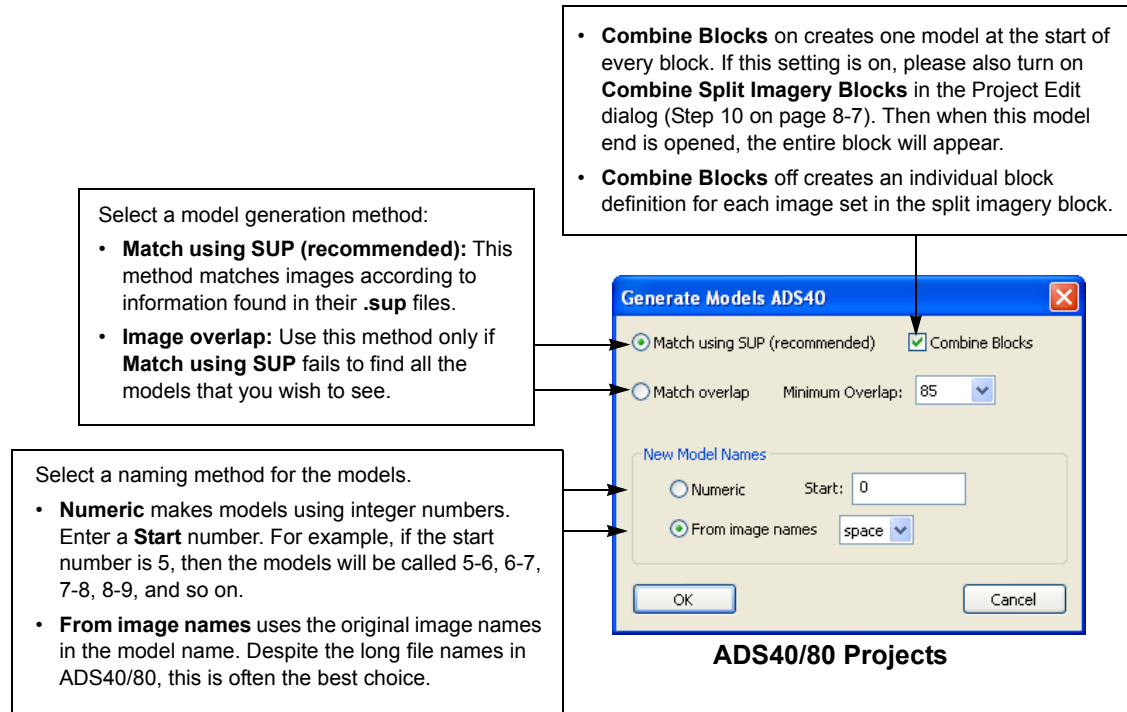
Choose how to apply the settings:

- **Apply** applies the settings to only the image shown on the currently active tab.
- **Apply Both** applies the settings to the two open images (if two are open).
- **Apply All** (recommended). This applies the settings to all images in the project.

Step 18) Generate models for the ADS40/80 project. The Generate Models dialog requires special settings for ADS40/80. This is also described in *Chapter 16*.

To automatically pair images into models, select "the hammer" **Generate Models** icon.





Step 19) If it is ever necessary, edit the project at any time. See “Edit an ADS40/80 Project” on page 8-11.

Edit an ADS40/80 Project

An ADS40/80 project may be edited to change any of the file names, file locations, or the image order.

To edit the ADS40/80 project, perform the following steps:

Step 1) Open the ADS40/80 Project Edit dialog. Select **Edit Project** from the **Edit** toolbar or menu.



Step 2) Review the file list. If necessary, edit the ADS40/80 project using any of the following steps.

- To delete an image file set, click on the image name and select the **Remove** button:
- If one of the file names or paths is incorrect, click on it to highlight it, then select the **Modify Item** button. Make the correction.
- If all of the ADS40/80 files have been moved to a new drive or folder, select the **Modify Paths** button. Make the correction for all the files. For the Leica Kit project, use **Update SUP File Paths** again.

Step 3) To save any recent changes, select **Save** from the **File** toolbar or pull-down menu.

Step 4) To change model and strip definitions, see *Chapter 16*.

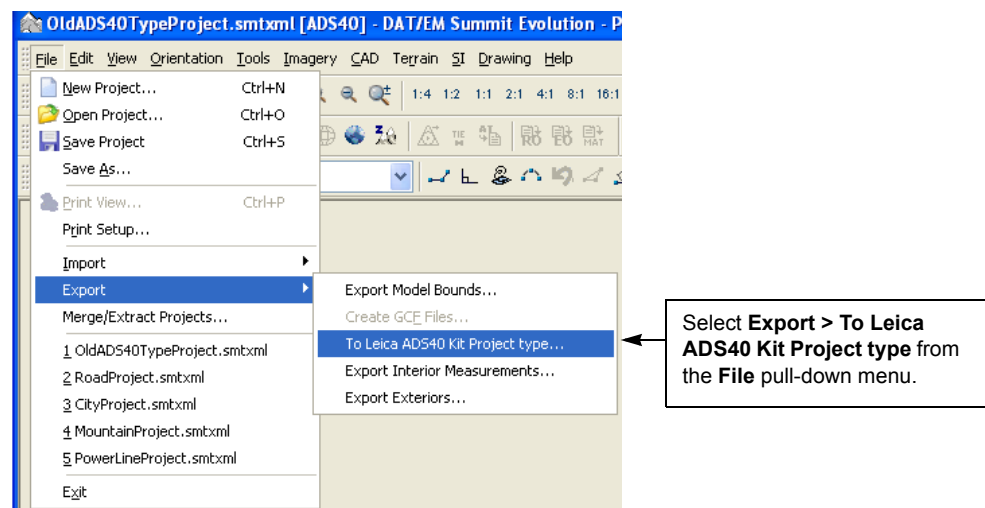
Export a “Select All Files” Project to a “Leica Kit” Project

To convert an older ADS40 project to an “ADS40/80 Using Leica Kit” project, perform the following steps:

- Step 1)** Open the older ADS40 project.
- Step 2)** If an error is received due to an older coordinate system definition from a previous version of the SUMMIT EVOLUTION’s Blue Marble coordinate transformation software, open the Project Edit dialog and select a current coordinate system. The coordinate system must be current and correct before exporting to the new project format.

It is acceptable to have no coordinate transformation active; that is, the coordinate system may be shown as the untransformed WGS84 latitude-longitude default used by the ADS40/80 sensor.

- Step 3)** From the **File** pull-down menu, select **Export** and **To Leica ADS40 Kit Project type**.



- Step 4)** Enter a name for the new project.
- Step 5)** Open the new ADS40/80 Kit project. Go to Step 8 on page 8-6 to update the **sup** file paths.

If desired, review the resulting project according to the settings shown in “Create a New “ADS40/80 Using Leica Kit” Project” starting on page 8-2. You may wish to re-create the model definitions with “Combine blocks” on (Step 18 on page 8-10); this results in one model definition for the end of each combined block.

The “Select All Files” ADS40 Project Type (Obsolete)

The “Select all Files” method used SUMMIT EVOLUTION to build an ADS40 project based on individually selected images and supporting files. This project method is obsolete. No further development is being done on this project type. Projects of this type may be converted to the “ADS40/80 Using Leica Kit” using the **Export>To Leica ADS40 Kit Project type** from the **File** pull-down menu.

To create a new ADS40/80 project, please see “Create a New “ADS40/80 Using Leica Kit” Project” on page 8-2.

Chapter 9. Create a Close-Range Project

The SUMMIT EVOLUTION™ **.smtxml** project file contains a list of all the project settings such as image names, orientation values, control point files, and camera file names. This chapter shows how to create a project file from images and support files that originated with close range (terrestrial) imagery.

About Close-Range Projects

Please be aware of the following hints and notes about close range projects:

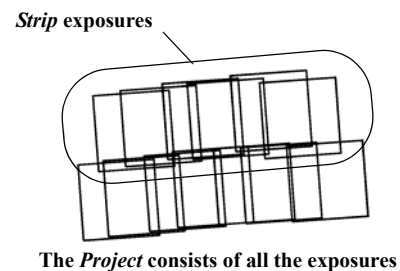
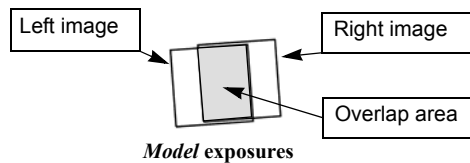
- All projects described in this chapter must list the images and camera files. If aerotriangulation data is available, a control file may not be required.
- When digitizing with a close range project, it is possible to define planes of movement for use with the Plane Following tool. When plane following is turned on for one of the planes, the stereoplotter automatically adjusts the cursor depth so that movement is parallel to the plane as the 3D device moves left and right. This makes it easier to move the stereoplotter along a building wall or surface using only the left-right 3D device controls. See “Plane Following for Close-Range Projects” on page 9-4.

Note about Projects, Models, and Strips for square- or nearly square-format images

In a Summit **Project** definition, the image list is the only grouping necessary to use SUMMIT EVOLUTION's orientation. That is, grouping images into model pairs is not always required by SUMMIT EVOLUTION. However, **Model** and **Strip** groupings *are required* for Automatic Relative Orientation and for exporting orientation information to third-party aerotriangulation software.

Even if third-party aerotriangulation will not be used, it may save time to group the images into model pairs. Model pair definitions make it easier to open two files with one click of the mouse.

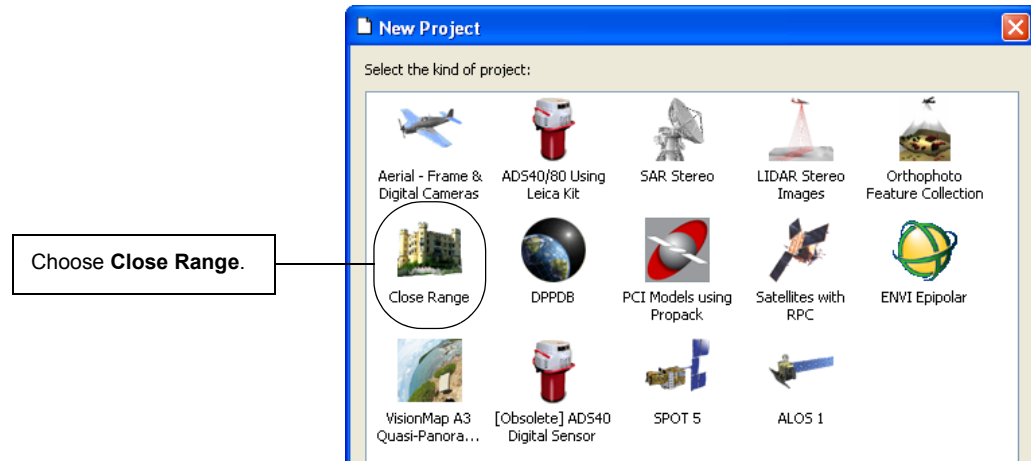
- A **stereo model** consists of two adjoining images on an image exposure strip. Three dimensional measurements are possible in the area where the two images overlap.
- A **strip** consists of a line of adjoining stereo models.
- A **project** consists of a group of all the stereo models — that is, all of the images — in the area to be mapped.



Create a New Close-Range Project

The creation of a close-range project is very similar to an aerial project. Follow the instructions for creating an aerial project on pages 7-2 through page 7-9, with the following exceptions:

- In Step 2 on page 7-2, select **Close Range** project instead of an aerial project.



- In Step 11 on page 7-8, the **Earth Curvature Correction**, **Refraction Correction**, and **Automatically rotate to best stereo view** settings are not offered for close range projects.

When choosing an orientation method for the close-range project, be aware that a relative orientation is always required. The relative orientation is used to define the orientation of the XYZ axes. Orientation methods are shown in *Chapter 17*.

Edit Project, Create Models, Create Strips for Close-Range Project

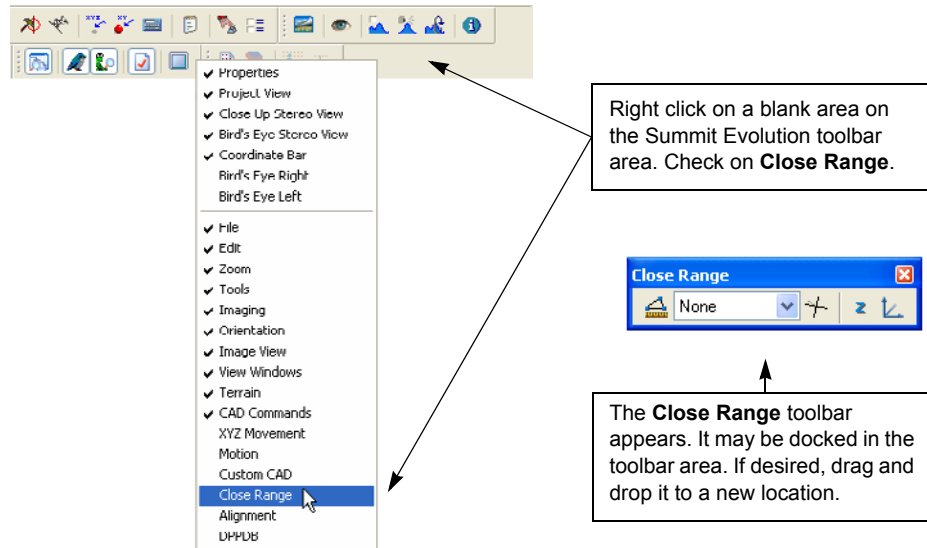
The method for editing a project file, creating models, and creating strips for a close range project is the same as for an aerial project. Please see the following pages for instructions:

- To make changes to the project definition, see “Edit a Aerial Project Definition” on page 7-11.
- To create image pairs (models), see “Group Images Into Models” on page 16-1.
- If image strips apply to this close range project, see “Group Models Into Strips” on page 16-10.

Turn on the Close Range Toolbar

Perform the following steps to display the **Close Range** toolbar:

- Step 1)** Right click on any blank area of the SUMMIT EVOLUTION toolbar area, or select **Customize Toolbars** from the **Tools** pull-down menu.
- Step 2)** Check on **Close Range** from the list of toolbars.



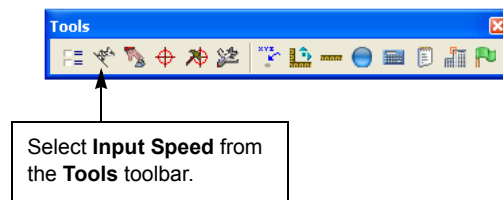
- Step 3)** The **Close Range** toolbar appears. If desired, drag and drop it to be either docked in the toolbar area or undocked anywhere else.

Set the Z Cursor Scale for Close-Range Projects

In most close range projects, the “Z wheel” does not control Z elevation the way it does in an aerial project. If an aerial project has just been used, the wheel’s movement scale may change the depth setting too much or too little per spin. It is possible to adjust the cursor wheel or foot wheel sensitivity by selecting a different **Z Magnitude** from the Input Device Speed dialog.

If the cursor wheel or foot wheel changes the depth too much or too little per spin, perform the following steps:

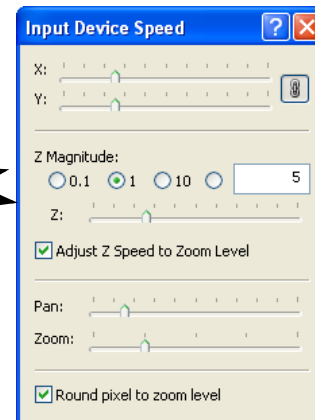
- Step 1)** Select **Input Speed** from the **Tools** toolbar or pull-down menu.



- Step 2)** Set the **Z Magnitude** higher or lower to control the depth of the movement per spin. Note that “Z” on this dialog means “depth” wheel control, which may actually be Y or a combination of X, Y, and Z for a close range project.

Step 3) Once the **Z Magnitude** is set, set the **Z** slider bar to make fine adjustments to the wheel sensitivity.

Set the **Z Magnitude**, then make fine adjustments with the **Z** slider bar.



Plane Following for Close-Range Projects

The Plane Following tool allows any number of planes to be defined. When plane following is turned on for one of the planes, the stereoplotter automatically adjusts the cursor depth so that movement is parallel to the plane as the 3D digitizing device moves left and right.

For example, assume the model images contain a building wall. The plane defined by the wall is not parallel to the camera lens positions.

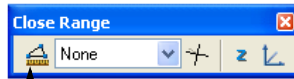
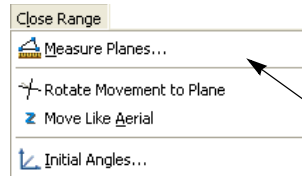
- Without plane following, all three stereoplotter direction controls – left, right, and depth wheel – would need to be constantly adjusted in order to move the cursor along the wall in X, Y, and Z.
- With plane following turned on, the depth control is automatically adjusted to move parallel to the wall's plane. Only two direction controls – left and right – are necessary to move the cursor along the wall in X, Y, and Z.

When plane following is on, the user may adjust the depth control at any time. Movement is parallel to the plane at the selected distance away from the plane. For example, if the plane is defined on a building wall, then the user moves the cursor 5 centimeters away from the wall, plane following keeps the cursor 5 centimeters away from the wall as the left and right cursor controls move.

Any defined close range planes are stored in the **.smtxml** project file.

To define close range planes, perform the following steps:

- Step 1)** Perform orientation in a close range project so that ground coordinates are displayed. See *Chapter 17* to determine the orientation procedure.
- Step 2)** Select **Measure Close Range Planes** from the **Close Range** toolbar or pull-down menu.



Select **Measure Close Range Planes** from the **Close Range** toolbar or pull-down menu.

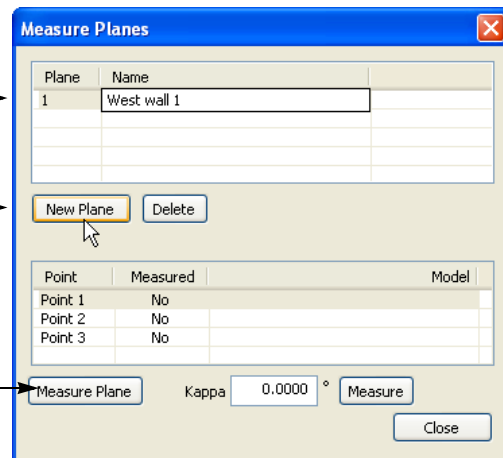
Hint: If you can't see this toolbar, select **Customize Toolbars** from the **Tools** pull-down menu, then check on **Close Range**.

- Step 3)** Either select an existing plane to remeasure or select **New Plane** and enter a name for the plane.
- Step 4)** Select the **Measure Plane** button:

Either:

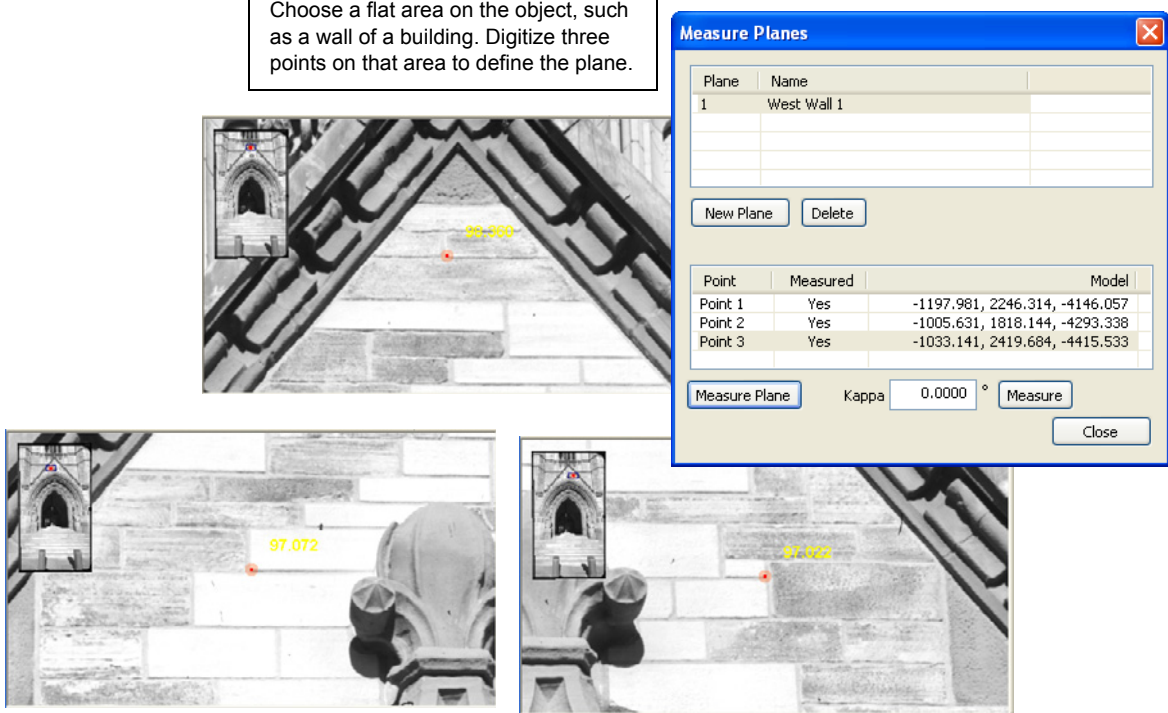
- Select any existing plane to remeasure (edit)
- Select the **New Plane** button and enter a name for the plane.

Select the **Measure Plane** button.

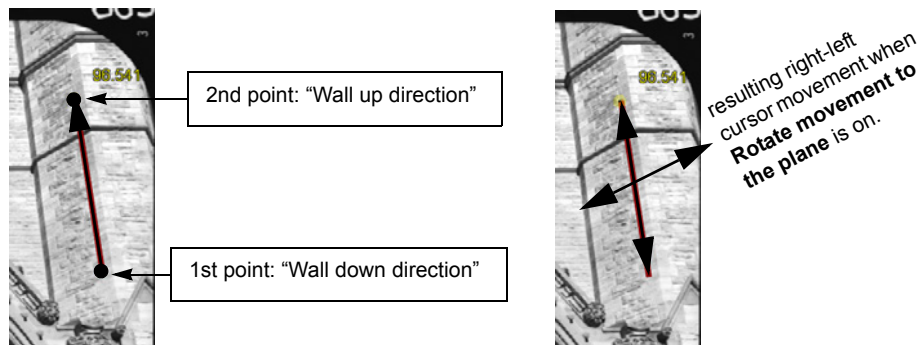


- Step 5)** Choose a flat area on the object in the images, such as a wall of a building.
- Position the cursor on any point on the flat area. For best results, select a location at the outside edge of the flat area. Adjust the depth control and digitize as **Point 1**.
 - Move the cursor to another point on the flat area. For best results, choose a location that is as far away as possible from the first point. Adjust the depth. Digitize as **Point 2**.
 - Move the cursor to a third point on the flat area. For best results, choose a location on the plane that is as far away as possible from the first and second points. Adjust the depth. Digitize as **Point 3**.
 - If editing is needed, highlight any of these points in the dialog, select **Measure Plane** so that “Measuring plane” appears in the lower left of the dialog, and digitize to replace the value. When finished, select the **Stop measure** button to set the values and prevent them from being overwritten the next time the pick button is pressed.

Choose a flat area on the object, such as a wall of a building. Digitize three points on that area to define the plane.



Step 6) To be able to change the default “screen right-left/screen up-down” cursor movement to be “plane right-left/plane up-down”, select the **(Kappa) Measure** button. Digitize a point at the bottom of the wall, then digitize a point higher on the wall in the direction you want to be considered “straight up on the wall”.



Step 7) If desired, repeat steps Step 3 through Step 6 to define more planes.

Step 8) To activate movement along one of the defined planes, position the cursor on the surface that was used for the plane definition or on a surface that is parallel to it. Choose the plane name from the **Plane to Follow** field on the **Close Range** toolbar or pull-down menu:

- As long as the plane name is selected, movement will be parallel to the plane; however, cursor movement along the plane is set by the **Rotate movement to the plane** setting shown in the next step.
- **Hint:** To drive the SUMMIT EVOLUTION cursor to the plane, open the **Measure Planes** dialog, select the plane name, and select one of the three points that define the plane.

Step 9) Choose a **Rotate movement to the plane** option. When off, cursor movement is “screen right-left/screen up-down”. When on, cursor movement is “plane right-left/plane up-down” oriented to the kappa of the plane (set kappa above in Step 6). If kappa is not set for the plane, there will be no difference between on and off.

- At any time, position the cursor on the surface that was used for the plane definition or on a surface that is parallel to it.
- Select the name of the plane in the field on the **Close Range** toolbar. When the name is in the field, plane following is on for that plane; however, right-left-Z wheel movement directions depend on the **Rotate movement to the plane** setting.
- To turn off plane following, set **None** in the field on the toolbar.



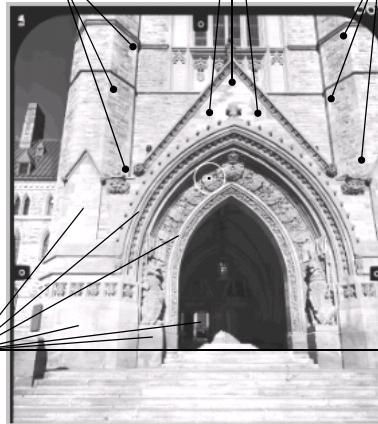
Choose a setting for panning controls using **Rotate movement to the plane**:

- **On** (highlighted) moves right-left on the plane according to the plane's kappa.
- **Off** moves right-left on the screen. Z wheel moves the floating mark perpendicular to the screen.
- If kappa is not set for the plane, there will be no difference between on and off.
- Do not turn on **Move like aerial** when **Rotate movement to the plane** is on.

Plane 1's three defined points

Plane 2's three defined points

Plane 3's three defined points



For example, this building has three planes defined for use with plane following. Notice that Plane 1 can be used for plane following along any of the surfaces that are parallel to Plane 1.

Rotate Movement to Plane

See Step 9 on page 9-7 above.

“Move Like Aerial” Movement Mode

Cursor movement for a close range project is often different from movement in an aerial project. With aerial images, the “Z wheel” control changes Z only. The camera was roughly parallel to the XY plane, so the user looks directly down on the XY plane.

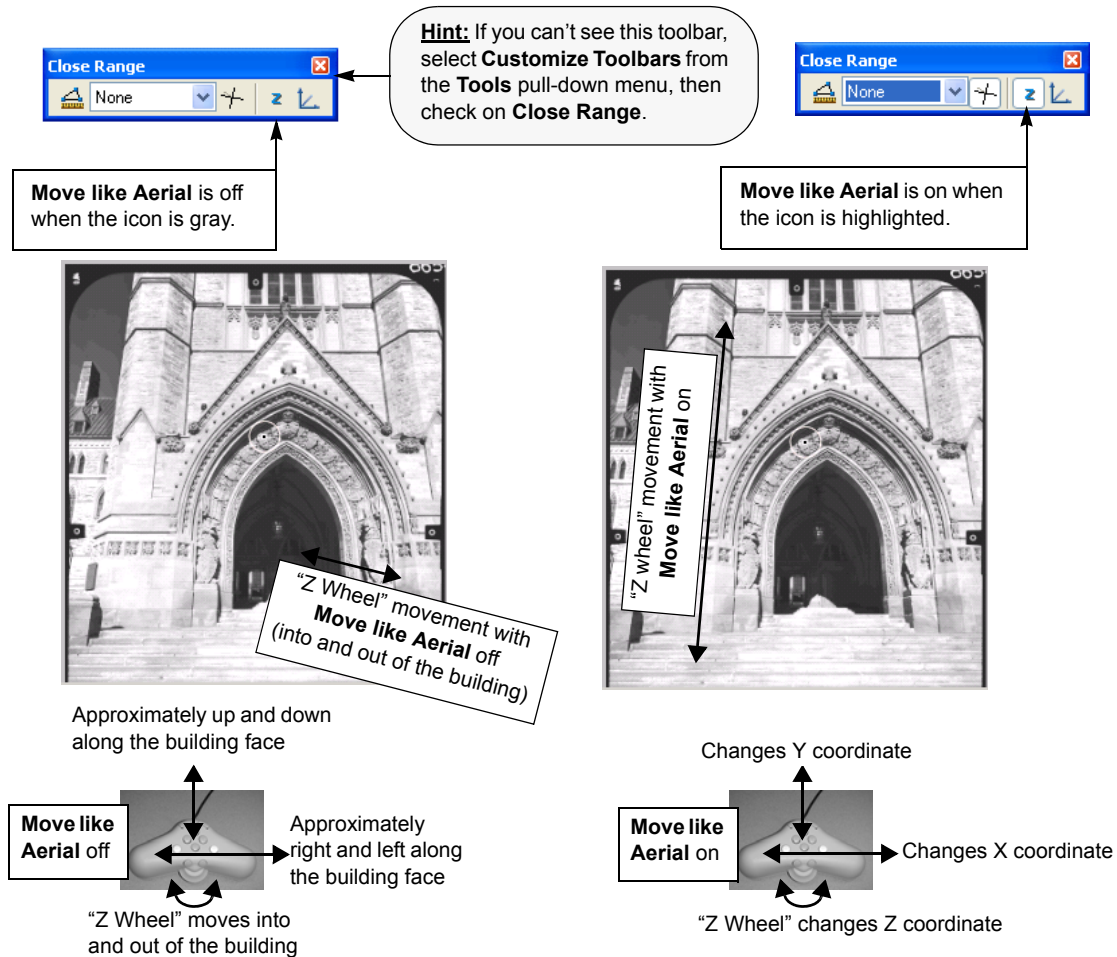
In most close range projects, the camera, and thus the user’s point of view, is not parallel to the XY plane. With most close range projects, the “Z wheel” control changes all three coordinate components, but has the visual effect of adjusting the depth toward and away from the user in the image view.

Note that the “Z wheel” or “Z foot disk” controls Z for aerial projects only; it may change Y or a combination of X, Y, and Z in close range projects, depending on the coordinate system for the project.

If desired, the movement mode may be toggled between close range and aerial-type movement modes. Perform the following steps:

- Step 1)** Select **Move like aerial** from the **Close Range** toolbar or pull-down menu. When the icon is highlighted, the “Z wheel” moves the cursor up and down in Z only; the right/left controls change X and Y only. Movement is relative to the ground rather than to the object.

Do not turn on **Move like aerial** when **Rotate movement to the plane** is also on.



- Step 2)** To return to the close range movement mode, select the **Move like aerial** icon or menu item again. When the icon is gray (not highlighted), the movement mode is reset to be relative to the object.

Chapter 10. Create an Orthophoto Feature Collection Project

This chapter shows how to create a SUMMIT EVOLUTION™ project file from pre-existing orthophoto images.

The pre-existing orthophotos may be from any source, including non-DAT/EM sources or from SUMMIT EVOLUTION's PROJECT VIEWER/ORTHO+MOSAIC application (pages 28-10 through 28-22). Note that there is an option in PROJECT VIEWER/ORTHO+MOSAIC to create the SUMMIT EVOLUTION project automatically (Step 4 on page 28-20).

About Orthophoto Projects

Please be aware of the following hints and notes about Orthophoto projects:

- An orthophoto project is effectively 2D unless a DTM file is available for use with the Terrain Following tool (see page 24-9).
- One orthophoto is viewed at a time.
- Stereo viewing is not possible with orthophotos.
- Unless a DTM file is available for use with Terrain Following (see page 24-9), the Z can only be set or changed manually by the user using the “Move To” tool in SUMMIT EVOLUTION, setting the active Z in MicroStation, or settings the elevation in AutoCAD. Elevation is not tracked or changed by the cursor unless Terrain Following is on.
- The XY coordinate system is based on the coordinates of the image corners.
- Mono (rather than stereo) SUPER/IMPOSITION™ of CAD objects is provided for the image view.
- It is best to use GeoTIF orthophoto files, because they provide coordinates for the image. If the image is not a GeoTIF, then the coordinates must be entered manually.

Create a New Orthophoto Project

To create a new project, perform the following steps:

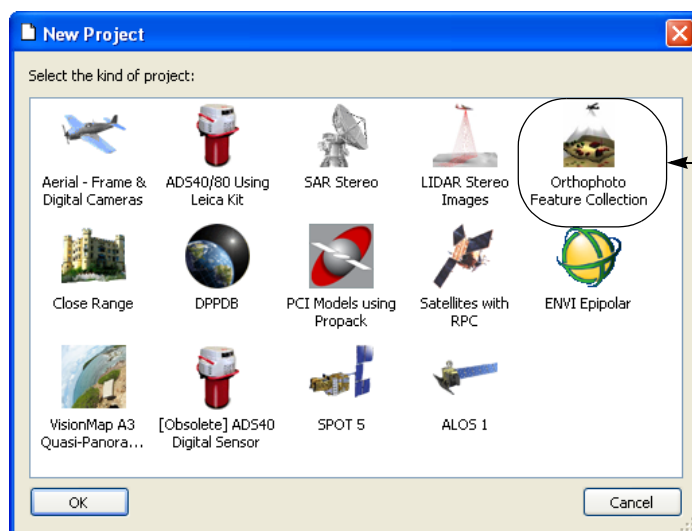
- Step 1)** Create **.smti** images from the original orthophoto image files. It is best to start with GeoTIF images, but other images may be used as long as the user is prepared to manually enter coordinates for the image corners. For instructions on creating **.smti** files, see “Use Image Creation to Generate .SMTI or .PYR Files” on page 4-6.

Step 2) (Optional) If a control or ground coordinate file will be specified in the project for use by the “Move to Ground” function, make sure it is in the SUMMIT EVOLUTION **.con** file format. If it is in another format, then import it now. See *Chapter 6* for information about control files; in particular, see “Import an Unknown-Format Control File” on page 6-3. Note the following:

- The only purpose of a control file is to enable the “Move to Ground” function to list coordinates for selection (see “Tools Menu > Move To Ground” on page 25-45).
- Points in the control file are not used in any way to calculate ground coordinate position.
- The “control” points can be any known coordinates in the ground coordinate range of the orthophoto. They do not need to be real control points.
- The file must be in the SUMMIT EVOLUTION **.con** file format. Use SUMMIT EVOLUTION’s Control Editor to open a **.con** file or import another format (see *Chapter 6*).

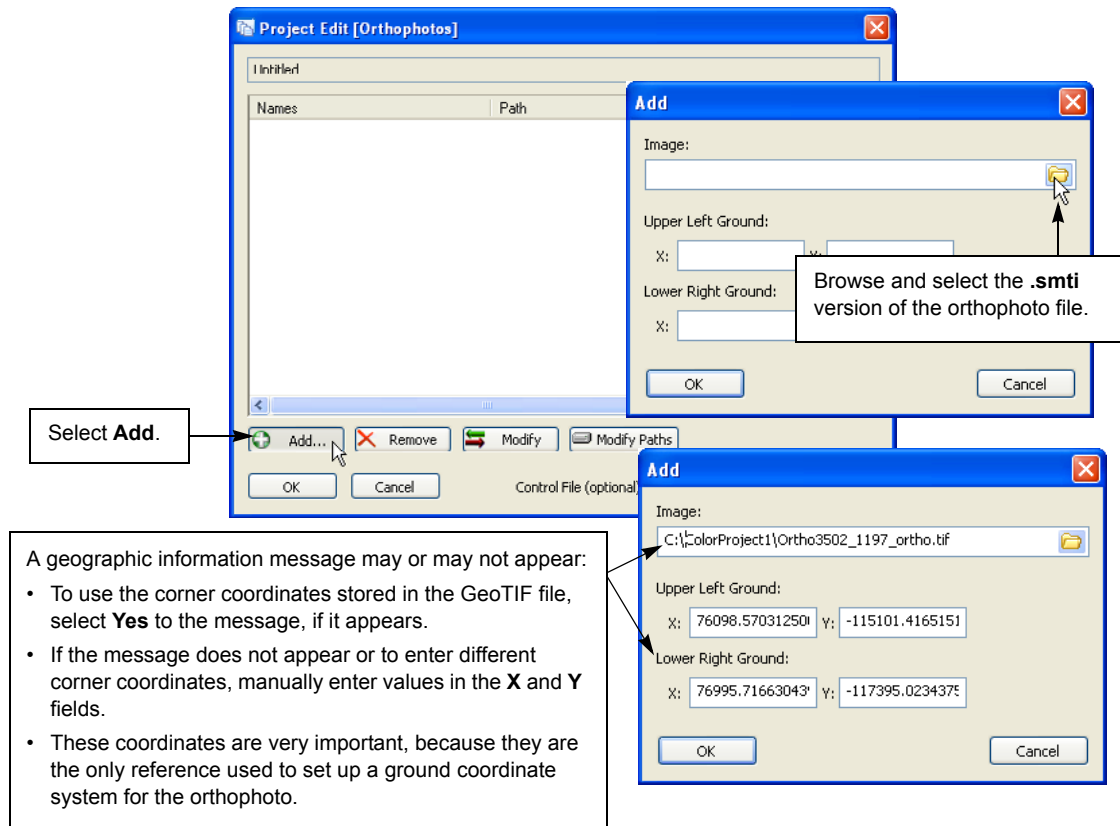
Step 3) To start a new project, select **New Project** from the **File** toolbar or pull-down menu.

Step 4) Select **Orthophoto Feature Collection**:



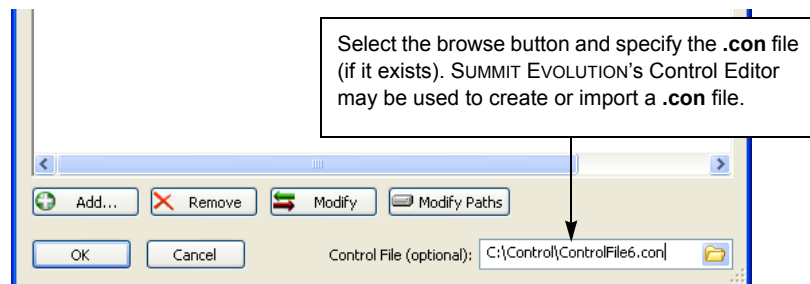
For a new project, select **New Project** from the **File** toolbar or pull-down menu. Then select **Orthophoto Feature Collection**.

- Step 5)** A Project Edit window appears. Select the **Add** button.
- Step 6)** Select one orthophoto file. This file must either be an **.smti** version of the orthophoto file or the original **IX** file and a **.pyr** file located in the same folder.
- If the original orthophoto was a GeoTIF file, a geographic information message appears. This geographic information is assumed to be the orthophoto's corner coordinates in ground units. Choose **Yes** unless you would like to enter other corner coordinates.
 - If the original orthophoto was not a GeoTIF file, manually enter the **Upper Left Ground** and **Lower Right Ground** coordinates in the **X** and **Y** fields.



- Step 7)** Repeat Step 5 and Step 6 until all **.smti** orthophoto images have been selected. Choose the images in the order you would like to see them in the image list; the image order does not matter to SUMMIT EVOLUTION. Note that the images are independent of each other. The images will not be grouped into models or strips.

Step 8) (Optional) If a control file was prepared in Step 2 (page 10-2), select it now. Use the **Control file** browse button to locate the **.con** file. This file is used by the “Move to Ground” tool only.



Step 9) When the project setup is complete, select **OK** to close the Project Edit dialog.

Step 10) Select **Save** or **Save As** from the **File** toolbar or pull-down menu. Give the new orthophoto project a name.

For a new project, select **Save** or **Save As** from the **File** toolbar or pull-down menu.



Edit an Orthophoto Project

The process used to edit an orthophoto project is the same as for an ADS40 project, except that simpler dialog boxes may appear for changing image files only. To make changes to the project definition, please use the instructions in “Edit an ADS40/80 Project” on page 8-11.

About Z in an Orthophoto Project

An Orthophoto Feature Collection project is inherently a 2D project, because only one image is used at a time. The Z control of SUMMIT EVOLUTION is disabled, because the user cannot see stereo, and therefore cannot accurately set the Z to the ground elevation. However, SUMMIT EVOLUTION and the CAD application are effectively working in a 3D environment. There are two ways to control the Z coordinate in an orthophoto feature collection project:

1. The first – and most useful – is to use a DTM (DEM) coordinate file with the Terrain Following tool. The Z then follows the elevations given in the DTM file. An accurate and reliable DTM file is essential, because the Zs assigned to CAD objects are completely based on the DTM. Please see page 24-9 for information on Terrain Following.
2. Use the **Move to Ground** tool to set the stereoplottor and the CAD application to a specific elevation. Please see “Tools Menu > Move To Ground” on page 25-45.

Chapter 11. Create a Satellite RPC, PCI, ENVI, or SAR Stereo Project

The SUMMIT EVOLUTION™ **.smtxml** project file contains a list of all the project settings such as image names, model definitions, and orientation information. This chapter shows how to create a project file from images and support files that originated with satellite adjusted RPC, ITT Visual Information Services ENVI epipolarized models, PCI Geomatica epipolarized **.pix** models, or SAR stereo:

Imagery Type	Sensor and/or Description	Source Company
Certain Satellites with stereo imagery with RPCs (Rational Polynomial Coefficient; sometimes also named RPB.)	<p>SUMMIT EVOLUTION can build a project, measure tie and control points, and optionally epipolarize imagery from the following RPC satellites:</p> <ul style="list-style-type: none"> • Japan Aerospace Exploration Agency ALOS “Daichi”; • GeoEye® IKONOS® and GeoEye-1; • DigitalGlobe® QuickBird, WorldView-1, and WorldView-2; • Satellite Imaging Corporation SPOT-5. <i>As of December 2011, the SPOT-5 project is considered a beta, due to the low number of test projects available at DAT/EM. If you have SPOT-5 stereo imagery, consider sharing it with DAT/EM to help in the development and verification of this project type.</i> <p>For any other brand of satellite that provides RPCs, please contact DAT/EM to discuss whether it is compatible.</p> <p>For all RPC projects except ALOS, see page 11-2. For ALOS, see page 11-13. Note that this does not include RPC projects prepared by PCI and ENVI products. See the PCI and ENVI below in this table.</p>	
PCI Geomatica epipolarized .pix file models	<p>Epipolarized .pix images from any PCI Geomatica epipolar models. This includes either satellite or non-satellite sources.</p> <p>DAT/EM-supplied PCI ProPack software and a ProPack-enabled PCI hardware lock must be installed on the computer.</p> <p>Note: The ProPack software available directly from PCI is NOT the same as the DAT/EM-supplied ProPack install. This software must be obtained from a DAT/EM installation disk or from www.datem.com.</p> <p>See page 11-17.</p>	<p>PCI Geomatics and DAT/EM Systems International</p> <p>Website: www.pcigeomatics.com</p>
ENVI Epipolarized Satellite Models	<p>The “ENVI Epipolar” project type uses any epipolarized satellite models that have been prepared by the ENVI DEM Extraction Module.</p> <p>See page 11-21.</p>	<p>ITT Visual Information Services</p> <p>Website: www.ittvis.com</p>
SAR Stereo (Synthetic Aperture Radar)	GeoSAR, See page 11-27.	EarthData® Website: www.earthdata.com
	STAR-3i® See page 11-27.	INTERMAP www.intermaptechnologies.com

Create a Summit Evolution Satellite RPC Project

These instructions are for the following satellites with RPC:

- GeoEye® IKONOS® and GeoEye-1; DAT/EM can epipolarize imagery from these satellites, if needed.
- DigitalGlobe® QuickBird, WorldView-1, and WorldView-2. DAT/EM can epipolarize imagery from these satellites, if needed.
- Satellite Imaging Corporation SPOT-5; DAT/EM can epipolarize imagery from SPOT-5, if needed. *As of December 2011, the SPOT-5 project is considered a beta, due to the low number of test projects available at DAT/EM. If you have SPOT-5 stereo imagery, consider sharing it with DAT/EM to help in the development and verification of this project type.*

For any other brand of satellite that provides RPCs, please contact DAT/EM to discuss whether it is compatible.

Instructions for other RPC projects are found in other sections: For JAXA ALOS “Daichi”, see page 11-13; for satellite projects that are prepared with PCI software, see page 11-17; for projects that are prepared with ENVI software, see page 11-21.

Notes about the RPC Project Type:

- When purchasing satellite imagery, keep in mind that “Adjusted RPCs” may be called “corrected RPCs” by some satellite providers; however, “corrected” may mean different things to different providers. *Please make sure you do not purchase pre-made orthophotos.* You may purchase pre-epipolarized images and pre-adjusted RPCs, or you may purchase the original versions and use the DAT/EM epipolarization and adjustment processes.
- If you purchase epipolarized imagery and/or adjusted RPCs, keep in mind that some epipolarization and adjustments are better than others. If there is parallax due to inadequate epipolarization, DAT/EM epipolarization may be needed to further correct the images. If an RPC’s ground solution is not satisfactory, measuring ground control points will be necessary to improve the RPC.
- Each satellite image has its own RPC (sometimes called RPB) orientation that provides its pixel-to-ground solution. The RPCs for two stereo images are independent from each other. That is, each individual image’s RPC has no relationship to the RPC for any another image.
- Aside from a traditional orthophoto project, the SUMMIT EVOLUTION RPC project is the only type where a single image has its own ground solution. In fact, a SUMMIT EVOLUTION RPC project can be made from one single image and its RPC file, which then behaves much like an orthophoto project, and can use Terrain Following (page 25-90) to control the Z value. More commonly, a stereo image pair is used for stereo viewing with full XYZ movement.
- Because the imagery is from satellite sources, each image could have been shot from any angle at any time. The original images in a stereo pair can be differently scaled and greatly out of alignment with each other. These images require epipolarization to improve stereo viewing. In non-scientific terms, two epipolarized images are images that have been rotated, twisted, scaled, or somehow manipulated such that they are in stereo alignment.

- Independently from epipolarization, each RPC may need to be adjusted to make it better at finding the actual ground coordinate. The RPCs may need to be adjusted through measuring at least one ground control point. Adjusted RPCs have a mathematical adjustment to their input and output that changes the output ground positions.
- Just because two images have good RPCs – good ground solutions – it does not mean the images are aligned well in stereo with each other. Epipolarization may be necessary to improve stereo viewing, without changing the RPCs at all.
- Likewise, just because two images have good stereo viewing – good epipolarization – it does not mean that both RPCs provide a good pixel-to-ground solution. Adjusting the RPCs may be necessary to improve the ground solution, without changing the images at all.
- In a stereo pair, it is possible for one RPC to be better than the other RPC; if good ground control points are measured, it is possible to preserve the good RPC and correct the bad RPC during the adjustments. Measuring ground control points can also help improve stereo viewing (although epipolarization may also be necessary for further improvement).

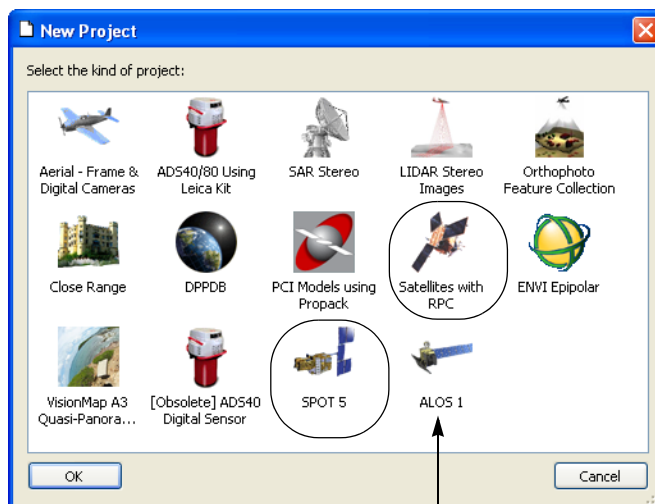
To create a **Satellites with RPC** project, perform the following steps:

- Step 1)** Create **.smti** or **.pyr** zoom levels from the supplied satellite image files. See “Use Image Creation to Generate .SMTI or .PYR Files” on page 4-6.
- EXCEPTION: JPEG2000 NITF files already contain zoom levels. It is not necessary to create **.smti** files from this format.
- Step 2)** If ground control is available, create a SUMMIT EVOLUTION **.con** file in the target coordinate system. See *Chapter 6*, “Control Point Files” for instructions. Measuring one or more control points is highly recommended for RPC projects. Note:
- Measuring ground control points is optional; however, measuring even one good control point can greatly improve the RPC ground solution.
 - The control file’s coordinates must be expressed in the same coordinate system as the output system for the project (to be set in Step 7 on page 11-5 below). Use the coordinate transformation tool in the Control Editor if necessary. (See “Transform the Control File to a Different Coordinate System” on page 6-12 and match the output system to be used in Step 7 on page 11-5 below).
 - Ground control points are measured later in the **Orientation>Tie Points** dialog (Step 12 below).
 - A control file may also be used with the “Move to Ground” function (see “Tools Menu > Move To Ground” on page 25-45).

Step 3) To start a new project, select **New Project** from the **File** toolbar or pull-down menu. Choose **Spot 5** for SPOT-5 imagery; choose **Satellites with RPC** for all other RPC projects (other than SPOT-5 and ALOS. ALOS instructions start on page 11-13).

For a new project, select **New Project** from the **File** toolbar or pull-down menu.

- Choose **SPOT 5** for SPOT-5 imagery;
- Choose **Satellites with RPC** for all other RPC satellites (other than ALOS and SPOT-5).



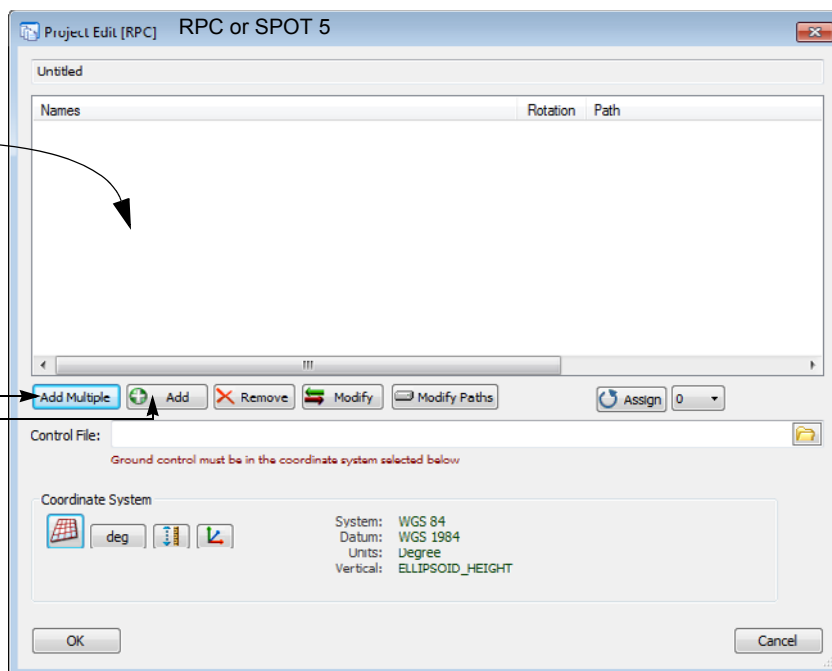
For ALOS projects, see page 11-13

Step 4) A Project Edit window appears. Either drag and drop the files into the dialog or select **Add Multiple** to find files automatically in a folder tree or **Add** to browse for individual files:

Drag and drop is allowed. Drag and drop the image file; the RPC will be found automatically if possible.

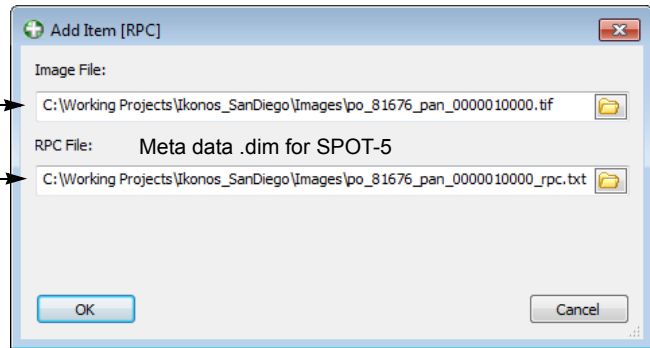
Either drag and drop image files into the dialog or select:

- **Add Multiple** if all the images and RPCs are in the same folder tree. Select the root of the folder tree. The subfolders will be searched automatically.
- **Add** to select images individually.

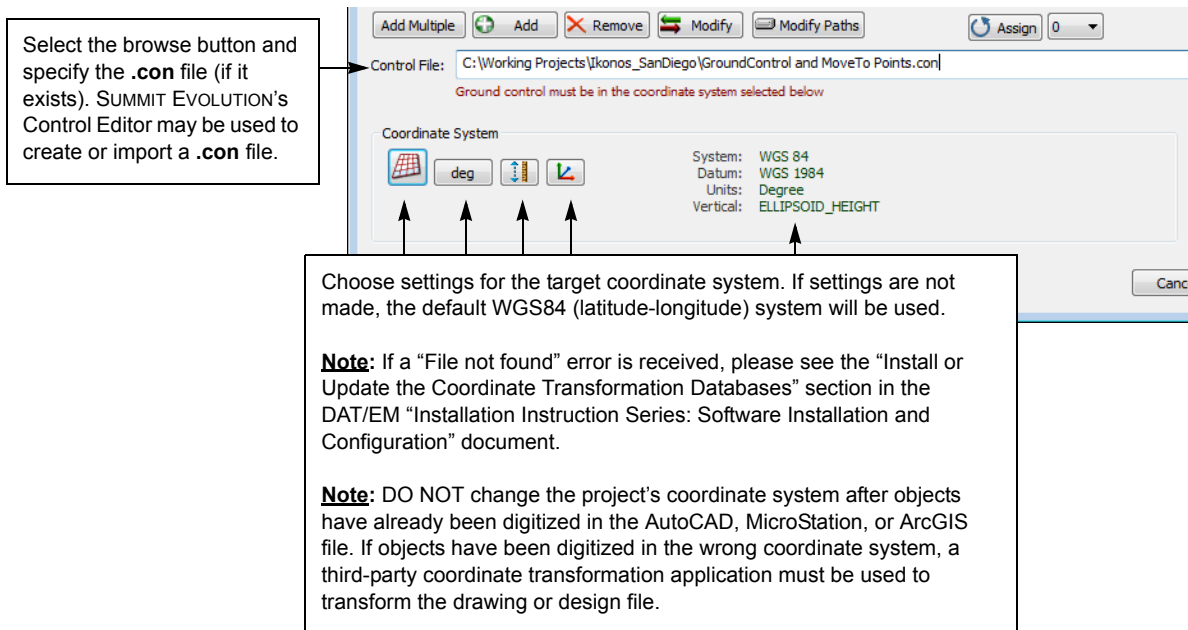


For **Add**, manually select the image and RPC files. Repeat **Add** until all images and RPCs have been added:

- Browse for the image file. This should be an **.smti** or **.tif** (with **.pyr** in the same folder) or another accepted format that has embedded zoom levels.
- The matching **.rpc.txt** – or **.rpb** for DigitalGlobe satellites or **.dim** for SPOT5 – may be found automatically. If not, browse for the file, which is part of the file set provided with the image.



- Step 5)** (This step is rarely done) Apply an image rotation only if it is suggested by DAT/EM Support. It is very rare for satellite images to need rotation; however, the settings are offered “just in case”. To apply an image rotation, highlight one or more images, choose **0, 90, 180, or 270**, and select the **Assign** button.
- Step 6)** If a control file was prepared in Step 3 (page 11-28), select it now. Use the **Control file** browse button to locate the **.con** file.
- Step 7)** To transform the coordinate system from the satellite’s latitude-longitude system to another system, use the **Select Coordinate System**, **Change Units**, **Select vertical reference**, and **Select Datum shift** buttons to make selections in the Blue Marble Geographics® GeoCalc® dialogs. (To customize the Geo Database, see *Appendix C.*)

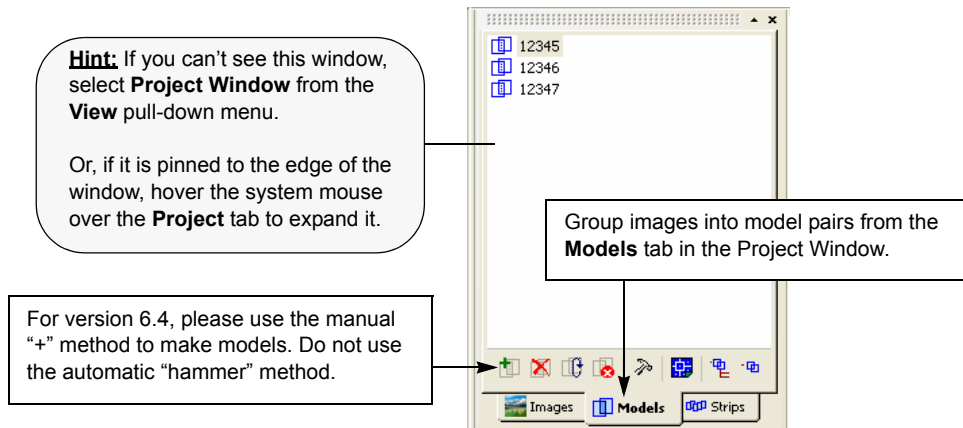


- Step 8)** When the project definition is complete, select **OK** to close the Project Edit dialog. For a new project, select **Save** or **Save As** from the **File** pull-down menu. Give the project a name.

For a new project, select **Save** or **Save As** from the **File** toolbar or pull-down menu.

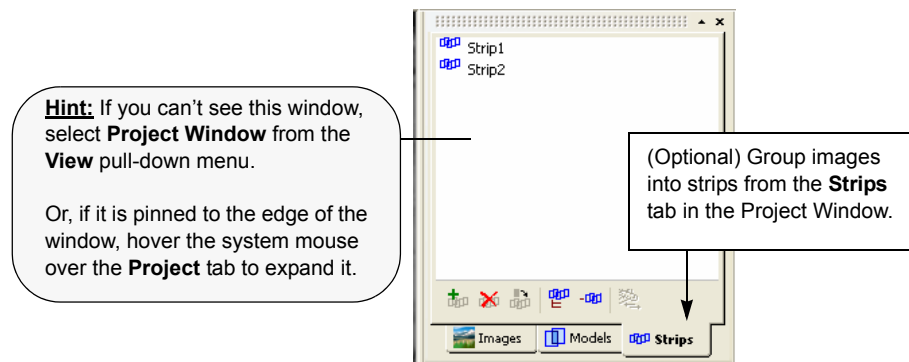


- Step 9)** Select the **Models** tab in the Project Window. Define models from each image pair. Use the instructions in “Group Images Into Models” on page 16-1. Please use the “+” method to make models manually (automatic model generation for satellite projects will be available in a future release of DAT/EM software).

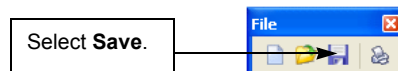


(Optional; may be done *any time* for AutoCAD or MicroStation, but not for ArcGIS.) Models may be associated with particular AutoCAD or MicroStation files. Select the **Associate CAD Drawing** icon from the **Models** tab in the Project Window. Highlight one or more models and assign an existing **.dgn** or **.dwg** file. For more detailed instructions and information, see Step 5 on page 16-8.

- Step 10)** (Optional) Images may be grouped into strips. Strip definitions are usually unnecessary for satellite projects, but if it would help organize the project better, define strips from the **Strips** tab in the Project Window. Use the instructions in “Group Models Into Strips” on page 16-10.



- Step 11)** After any of these Project Window-related changes, select the **Save**.



It is now time to digitize relative orientation and/or ground control points using the Tie Points dialog. Notes about relative tie and ground control points:

- For stereo imagery, *both ground control points and relative tie points* help establish a relationship between the left and right RPCs and improve stereo viewing.
- *Relative tie points* help improve stereo viewing, but they do not help adjust the RPC ground coordinate solution. In fact, in a stereo model, they could make one of the two RPCs worse.
- For both stereo and single-image projects, *ground control points* help adjust the RPC ground coordinate solution to be more accurate for each image. *Ground control points* are always recommended. Even just one good ground control point will improve the RPC(s) greatly.
- If several good, evenly distributed *ground control points* are available, it is not necessary to measure any *relative tie points* in stereo projects. The user may choose, however, to measure both relative and ground control points. If the ground control points are not evenly distributed, and especially if there is just one ground control point, DAT/EM recommends that you measure additional relative tie points.
- In stereo imagery, there is a difference between the RPC adjustment using only *relative tie points* as opposed to the adjustment using only *ground control points*. Both types of points improve stereo viewing, but only *ground control points* help the RPC pixel-to-ground coordinate solution. To describe this concept, we will use general, non-scientific terms: With *relative tie points only*, the RPC ground solutions for both images are adjusted toward their average. Now let's say that the original RPC for the left image is better than the original RPC for the right image. Let's call them the "almost perfect" RPC and the "off" RPC, which is off by 10 meters from actual ground coordinates. In this case, measuring *relative tie points only* adjusts both RPCs approximately 5 meters to match their average. This makes the "off" RPC somewhat better (now within 5 meters instead of 10), but makes the "almost perfect" RPC worse (it is now 5 meters off!). Now if instead (or in addition) you measure several *good ground control points*, the "almost perfect" RPC stays nearly the same, while the "off" RPC is adjusted about 10 meters to meet the "almost perfect" RPC. In this case, both adjusted RPCs are now individually as near as possible to the actual ground coordinates.

Step 12) Select **Tie Points** from the **Orientation** toolbar or menu. If there is a **.con** control file attached to the project, the control points will appear in the list automatically.

Troubleshooting hint: If the control points do not appear, it could be that their coordinate system does not match the project's coordinate system; out-of-range points will not appear. Apply a transformation to the **.con** file (page 6-12) before returning to this step.

Step 13) (For stereo imagery only) For stereo imagery, add as many relative tie points as desired. Enter the point name in the field and select **Add**.

- If ground control points are not available, add at least 3 relative tie points. As a general rule, add between 3 and 20 tie points. Distribute the points evenly, if possible.
- If several ground control points are available, it may not be necessary to measure relative tie points. If there are not very many ground control points, or if the ground control points are not evenly distributed, add relative tie points to help make an even distribution and help stereo viewing.

The ground control points must be expressed in the coordinate system set in Step 8 on page 11-16

- Control points from an attached .con file appear in the list. Uncheck any you do not wish to measure.
- (For stereo imagery only; does not apply to a single image.) To add a relative point, enter the point name in the field and select **Add**. Repeat to list as many relative points as desired.

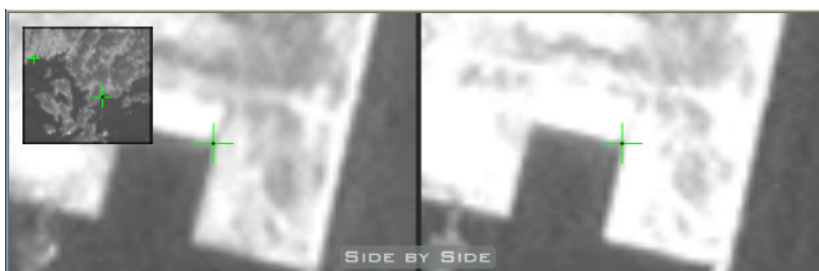
Measured	Identifier	Ground X	Ground Y	Ground Z	X Resi...	Y Resi...	X Resi...	Y Resi...
<input checked="" type="checkbox"/>	No Control...	132.397532	34.363059	0.515000				
<input type="checkbox"/>	No Control...	132.397565	34.363070	12.642000				
<input checked="" type="checkbox"/>	No Control...	132.397589	34.362960	27.095000				
<input type="checkbox"/>	No Control...	132.397545	34.362840	18.341000				
<input checked="" type="checkbox"/>	No Tie1							
<input checked="" type="checkbox"/>	No Tie2							
<input checked="" type="checkbox"/>	No Tie3							

Filter: **None** Checked Measured Extents
Shown: 7 Filtered: 0
☐ Side By Side

Step 14) (For stereo imagery only) Choose a **Side By Side** setting. When off, the images appear together in a stereo view. When on, the view splits to show the left and right image separately. There is no recommended setting; it depends on the user's preference and the particular project. Toggle **Side By Side** at any time.

- Side By Side** off: view in stereo.
- Side By Side** on: The view splits to show the left and right images separately.
- Toggle the setting at any time.
- The **Side By Side** setting has no effect if only one image is open.

Filter: **None** Checked Measured Extents
Shown: 7 Filtered: 0
☒ Side By Side



Optional side-by-side viewing mode

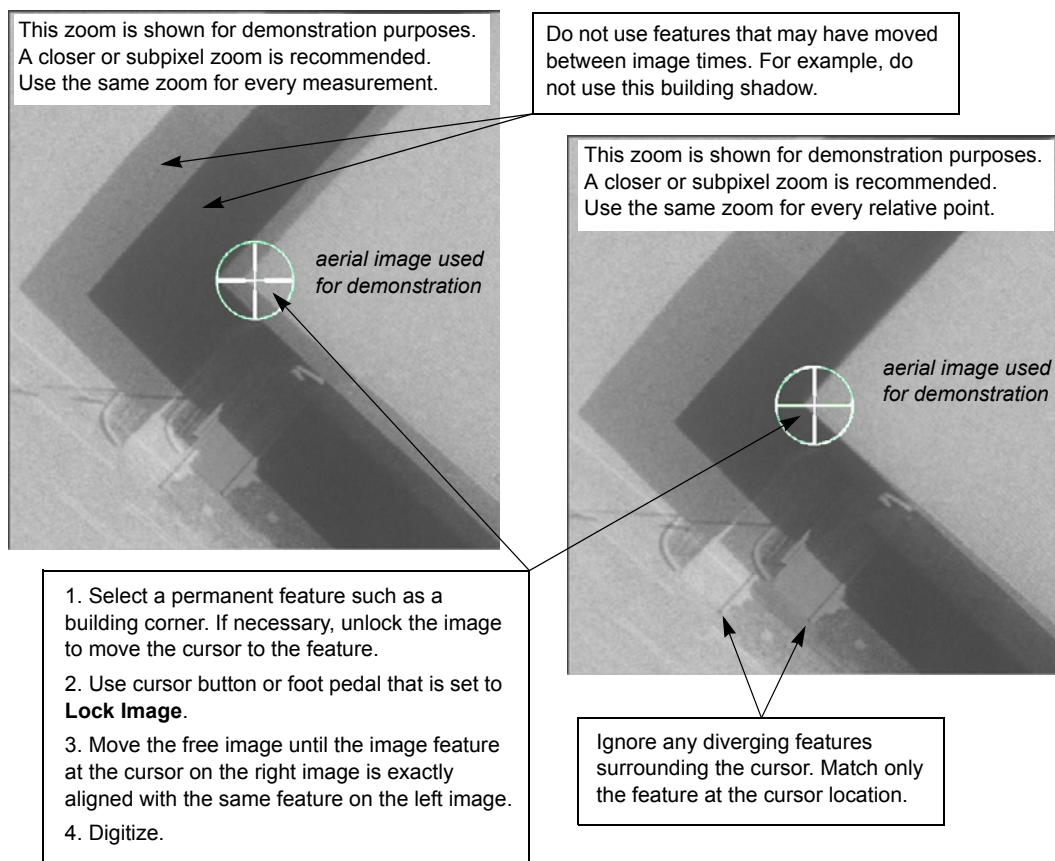
Step 15) Highlight a point to measure. This must be a control point for a single open image, and either a control point or a relative tie point for two open images.

Step 16) Position and measure the point:

- For relative tie points (two images open): At a convenient zoom level, navigate to a distinct, permanent feature on the images to use for image matching. For example, select a building corner or the edge of a road intersection. Do not select cars, boats, or any other objects that may have moved. Use the button set to **Type=Plotter, Action=Lock Image** to toggle the image lock and move the cursor to the same feature on both images.

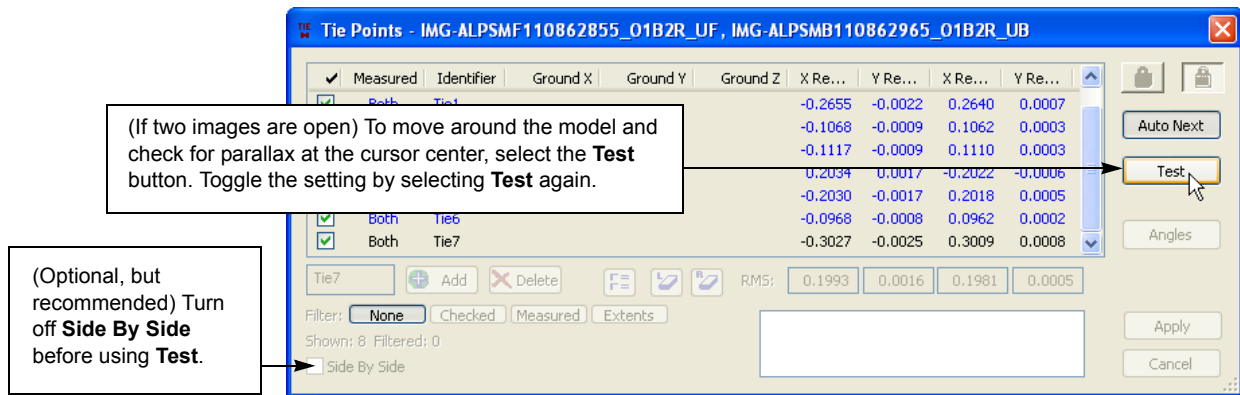
For ground control points (one or two images open): At a convenient zoom level, navigate to the ground control feature. For stereo imagery, use the button set to **Type=Plotter, Action=Lock Image** to toggle the image lock and move the cursor to the same feature on both images. For a single image, position the cursor on the ground control feature in that single image only.

- b.) Zoom in close enough to view good detail. Some users prefer to zoom in to a subpixel level; DAT/EM recommends to use the same image zoom for each point measurement. (**Hint:** A series of zoom levels can be set on a cursor button set to **Type=Plotter Zoom.**)
- c.) (If two images are open) Remove parallax from the point. Again, use the **Type=Plotter, Action=Lock Image** button to toggle the image lock and move the cursor to the same feature on both images. Either position the point completely manually or use the **Type=Plotter, Action=Align** button to help with the fine adjustment. **Align** can only find a match if the images are already roughly aligned. If the images do not find a match, it may be necessary to position the images even closer manually, then try **Align** again.
- d.) Digitize the point to record its position on the image(s).



Step 17) After digitizing, the cursor drives to the next point on the list. For each remaining point, repeat finding a point location, removing parallax, and measuring the position. To skip any point, highlight the next good point on the list and continue.

Step 18) (If two images are open) To verify the adjustment, turn off **Side By Side**, then select the **Test** button. Move around the model. In this mode, points may not be digitized, and the results from the relative orientation can not be changed. Check for parallax at the center of the cursor. Ignore diverging angles or differently scaled objects that appear away from the cursor; epipolar correction may be needed to fix these other issues. When finished, click the **Test** button again to return to the Tie Points dialog.



Step 19) When all the points have been digitized, it may be helpful to sort the residuals from highest to lowest. Click the system mouse on any of the **Residual** column headings. RPC projects show separate residual columns for left and right RPCs. If a single image is open, the “Right” residuals will remain blank.

To sort the residuals, click the system mouse on any of the **Residual** headings at the top of the list. Click again to sort in the opposite order.

If only one image is open, residuals only appear in the first two residual columns. This is expected.

X Residual	Y Residual	X Residual Right	Y Residual Right
-0.3027	-0.0025	0.3027	0.0008
-0.2655	-0.0022	0.2655	-0.0006
0.2034	0.0017	-0.2022	0.0005
-0.2030	-0.0017	0.2018	0.0005
-0.1117	-0.0009	0.1110	0.0003
-0.1068	-0.0009	0.1062	0.0003
-0.0968	-0.0008	0.0962	0.0002

Step 20) If the residuals are *not* acceptable, choose from the following options to improve them:

- Re-measure individual points to improve them. To do this, highlight the desired point by clicking its line in the Tie Points dialog. Remove parallax as before and digitize.
- To delete a bad point from the list, highlight the point and select the **Delete** button.
- Add more points and measure them.

Step 21) When the residuals are acceptable, select the **Apply** button. Select **Save** from the **File** menu or toolbar to save the project.

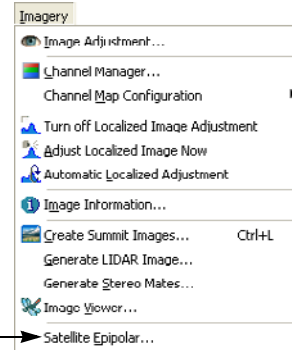
Step 22) Determine whether epipolarization is necessary. View objects in the images in stereo. If they appear to be scaled and/or rotated differently between the two images, the images could benefit from epipolar correction.

Note that epipolar correction may not be needed with some image pairs, while it may be needed in others. View each model to determine whether it requires epipolarization or not.

DAT/EM epipolarization is available for GeoEye® IKONOS® and GeoEye-1; DigitalGlobe® QuickBird, WorldView-1, and WorldView-2; Satellite Imaging Corporation SPOT-5; Japan Aerospace Exploration Agency ALOS-1.

If epipolarization is needed, select **Satellite Epipolar** from the **Imagery** pull-down menu. This runs a file from the Datem Software folder called **SatelliteEpipolar.exe**.

If epipolarization is needed, select **Satellite Epipolar** from the **Imagery** pull-down menu.



Step 23) Make settings. DAT/EM recommends to run a “quick test” first. The purpose of the “quick test” is to quickly get an idea of whether the epipolarization settings and potential results are satisfactory. Run the “quick test” followed by the “for real” process as follows:

- a.) **“Quick Test 16X”**: Set **Image Level=16X** and **Process**. This quickly generates the images based on the 16X zoom level. Open the resulting “quick test” project and view the results for a general idea whether the epipolarization settings are correct. Do objects in the images line up better? Are they scaled to each other better? If the results at 16X are good (with the exception of resolution, of course), discard the 16X project and run again “for real”.
- b.) **“For Real 1X”**: Set **Image Level=1X** and **Process**. This generates the project based on the original, highest resolution 1X images.

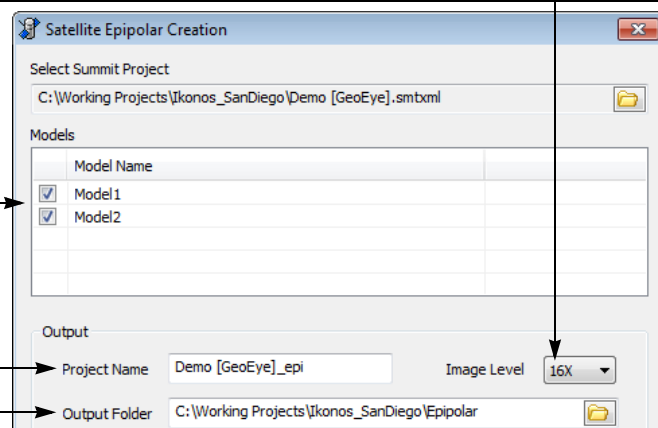
Note: Always create the final project with **Image Level=1X**.

Recommended: Run a “quick test” based on the **16X** image first. If satisfactory, run again “for real” with the **1X** image. Each “nX” option on this menu represents the 1X original image or a zoom level from its image pyramid. The higher the number, the lower the resolution.

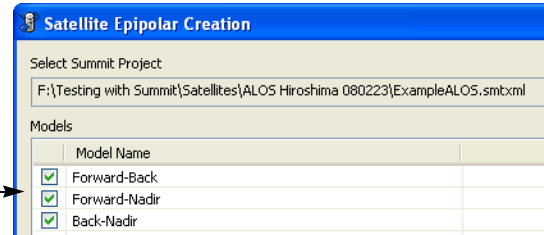
This selected level image will be used to generate the new images. Always use **1X** for the final project.

Check on the models to epipolarize.

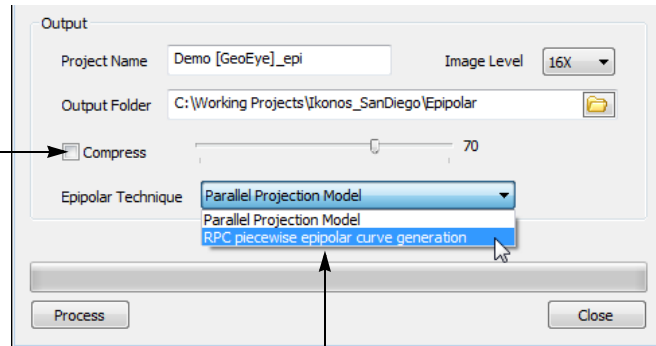
Project Name and Output Folder are the user's choice. A project of this name will be placed in the specified folder.



Note for ALOS projects: Epipolar correction may not be needed with some ALOS image pairs, while it may be needed in others. For example, correction may not be needed between the forward and backward images, while may be needed between the forward and nadir images.



(Optional) To compress the images, select **Compress** and select a compression setting on the slider. The lower the number, the more compression, but also the more resolution loss.



- **Parallel Projection Model:** This method is only available for WorldView and DigitalGlobe satellites, because these satellites provide a principal distance. This RPC is adjusted using tie and ground control points. This is a model on top of the RPC (adjusted or not). The new epipolar image has two transformations: First, the RPC ground-to-pixel solution gives the pixel on the original image; then it takes the result and finds the corresponding pixel on the epipolar image. In the Parallel Projection Model, the RPC (adjusted or not) does not change.
- **RPC piecewise epipolar curve generation (Recommended):** This method works for any RPC model and is considered more robust than the Parallel Projection Model. First, epipolar images are created. Since the image has changed, the original RPC ground-to-pixel solution can no longer be used. A new RPC is generated (based on the original) to reflect the manipulated image. Note that this does not change “where ground is”; technically, the RPC is different, but it still moves to the same relative locations. This can be thought of in simple terms that the RPC is different but the “orientation” is the same.

Step 24) Open the newly generated project if epipolarization was done. If it wasn't done, keep the original project open. Move around the image or stereo model to verify stereo viewing and coordinate readouts at known ground locations.

- If satisfactory, use this project for digitizing purposes.
- If the project is not satisfactory, the solution is almost always to go back and digitize more or better ground control points, possibly add some relative tie points in areas where there aren't any ground control points, and re-generate the epipolar images (if needed). If epipolarization was done, discard the epipolarized project. Re-open the original project and measure more or better ground control points (starting on Step 14, page 11-8), fill in relative tie points where needed, and continue with the remaining steps. If desired for WorldView and DigitalGlobe satellite imagery, try the other **Epipolar Technique** shown above in Step 23. For single-image projects, the only option to improve the project is to measure more or better ground control points.

ALOS-1 “Daichi” Satellite (DAT/EM Epipolarization Available)

SUMMIT EVOLUTION has a satellite project type for ALOS-1 “Daichi”. ALOS is the Advanced Land Observing Satellite, and is also known as “Daichi”, by the Japan Aerospace Exploration Agency. This satellite ceased operations in May 2011. An ALOS-2 satellite is planned, but will probably require a different DAT/EM project type; please contact DAT/EM regarding ALOS-2 data when it is available.

ALOS-1 is a special type of RPC satellite. For more information about RPC project concepts, see the “Notes about the RPC Project Type” on page 11-2. The first part of the ALOS project setup is different from other RPC projects; these steps are shown below, then the user is asked to return to the RPC project type to finish the setup.

To create a new **ALOS** satellite project with the option for DAT/EM to epipolarize the images, perform the following steps:

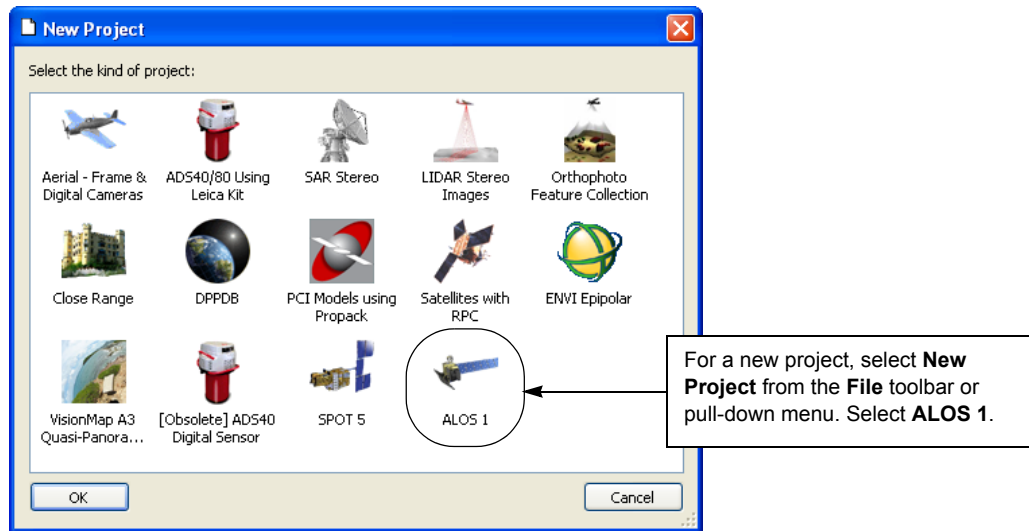
Step 1) Preparation steps:

- a.) If any other brand of photogrammetric software has been used to process the ALOS files in the past, please remove any non-DAT/EM **.tif** files and any non-DAT/EM image zoom level files from the ALOS data folders. The ALOS 1X-level **.tif** files should be the only images present.
- b.) Arrange the ALOS data files and folders within a single folder tree. For example, create a main folder called **C:\ALOSProject** and arrange the folders in **C:\ALOSProject\Set1**, **C:\ALOSProject\Set2**, **C:\ALOSProject\Set3**, ..., **C:\ALOSProject\SetN**. Or, in a smaller project, all files could be placed in **C:\ALOSProject** (for example) without subfolders. Later, you will browse to the root folder, and the entire folder tree will be searched automatically.
- c.) (Optional at this time) Image pyramids (zoom levels) may either be created now or during the ALOS project creation stage shown below in Step 5. Step 5 will only generate **.pyr**, **.smti**, or **.tif** (with zoom level pyramids) if it does not find them in the same folder as the ALOS 1X **.tif** file. If you wish to do this now, use IMAGE CREATION to make the zoom levels for the ALOS images (see “Use Image Creation to Generate .SMTI or .PYR Files” on page 4-6).

Step 2) If ground control is available, create a SUMMIT EVOLUTION **.con** file in the target coordinate system. See *Chapter 6*, “Control Point Files” for instructions. Measuring one or more control points is highly recommended for ALOS and all other RPC projects. Note:

- Measuring ground control points is optional; however, measuring even one good control point can greatly improve the ALOS RPC ground coordinates.
- The control file’s coordinates must be expressed in the same coordinate system as the output transformation for the project (to be set in Step 8 on page 11-16 below). Use the coordinate transformation tool in the Control Editor if necessary. (See “Transform the Control File to a Different Coordinate System” on page 6-12 and match the output system to be used in Step 8 on page 11-16 below).
- Ground control points are measured in the **Orientation>Tie Points** dialog.
- A control file may also be used with the “Move to Ground” function (see “Tools Menu > Move To Ground” on page 25-45).

Step 3) To start a new ALOS-1 project, select **New Project** from the **File** toolbar or pull-down menu. Choose **ALOS 1**:

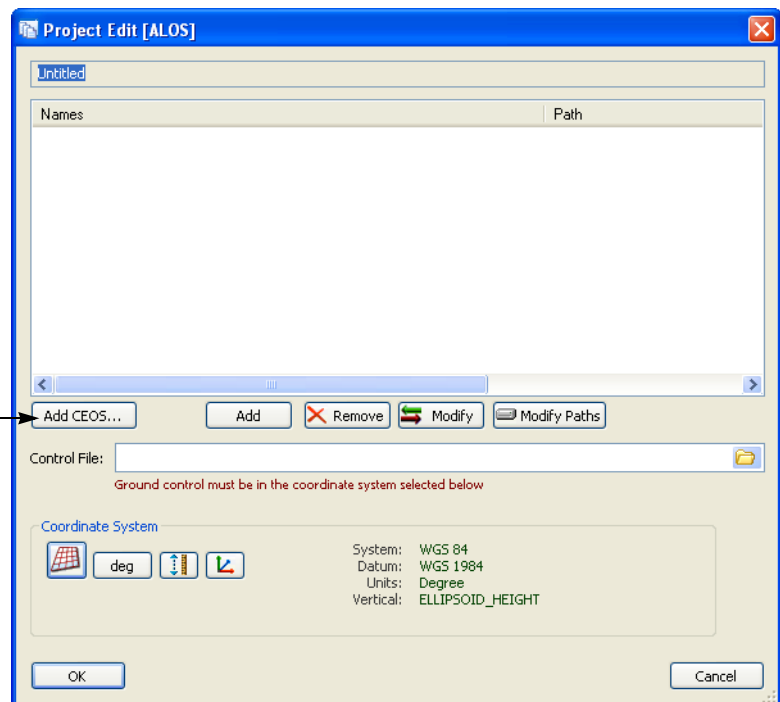


Step 4) A **Project Edit [ALOS]** window appears. Select the **Add CEOS** button.

- Please do not drag and drop image files into the ALOS project type.
- A CEOS project is a scene that is broken up into multiple tiles. Use the **Add CEOS** button whether or not this is a CEOS project; it works for whole scenes as well.

Drag and drop is not allowed for ALOS files.

Select **Add CEOS**.



Step 5) Select the folder that contains the ALOS image and data files. The image files may be in subfolders under the selected folder:

Browse for the folder that contains the ALOS data (the ALOS data may be in subfolders under the selected folder). This folder and all subfolders in this folder tree will be searched.

(Optional) If desired, choose **Use JPEG Compression** and set a compression level.

Choose a method to combine images:

- **Combined images only via TIL (recommended):** Note that a TIL – or “tile” – file is a text file that contains links to other images. An ALOS scene typically consists of three or four separate, overlapping images. The TIL file is generated to put the scene back together. The DAT/EM TIL writer supports overlapped image tiles. *The DAT/EM TIL file format is different from other brands of TIL files; if a TIL file from another company already exists in the folder, it must be removed/renamed and any of the other company’s image pyramids removed/renamed before proceeding with the DAT/EM project.*
- **Combined images and all sub images:** This option uses the TIL file images plus any other found images. This should only be used in the rare case where the **Combined images only via TIL** setting does not work well, and after making sure another company’s TIL file is not the problem.

Importing ALOS CEOS data

Select folder with ALOS CEOS data
F:\Testing with Summit\Satellites\ALOS Hiroshima 080223

Image zoom levels

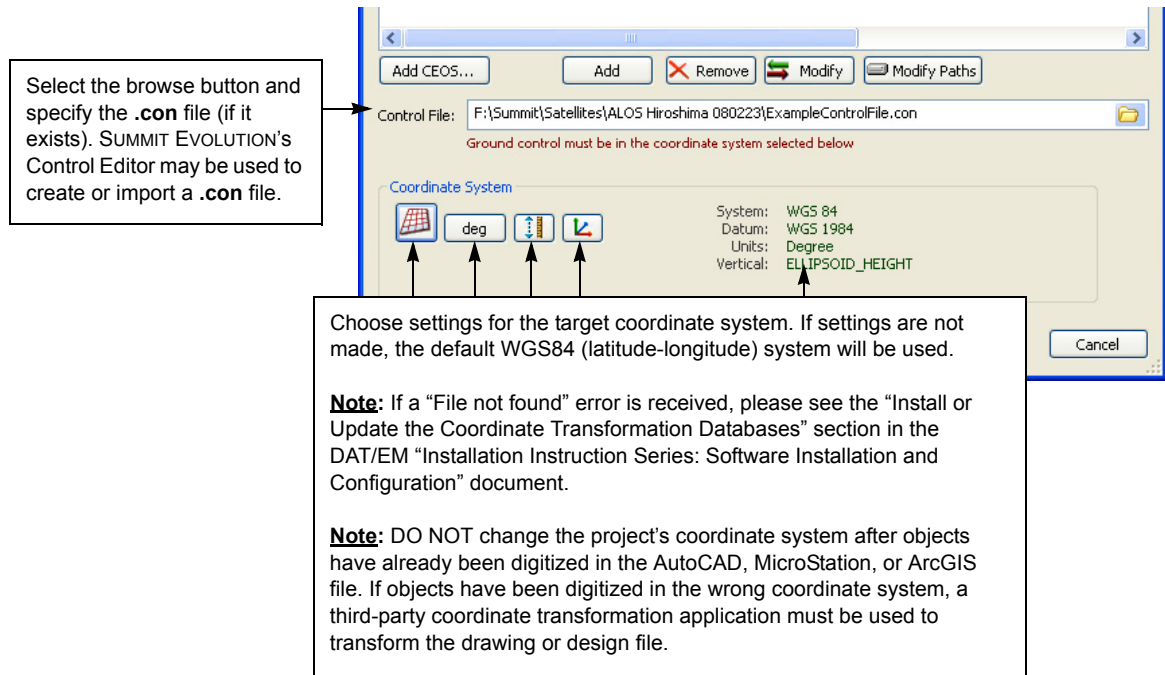
☒ Use JPEG Compression 75

☒ Combined images only via TIL (recommended)
☐ Combined images and all sub images

Step 6) Select **Process**. At this time, the following happens:

- The image zoom levels are created, if needed. If the image zoom levels already exist in a **.tif** or **.smti** file, the image creation step will be skipped, so that image zoom level creation is not repeated.
- If **Combined images only via TIL** was on, a **til** file is generated for each scene. Note that an ALOS scene is usually made up of three or four separate, overlapping images. The **til** file is generated to put the scene back together. **Note:** If **til** generation errors are received, it could be because another company’s brand of **til** file already exists, and it is not the same format as a DAT/EM **til** file. If a **til** file from another company already exists in the folder, please remove/rename it and rename/remove any of the other company’s image pyramids before proceeding with the DAT/EM project.
- The RPC data is automatically read and regenerated. They are regenerated in order to apply the pixel shifts required for a SUMMIT EVOLUTION project. Therefore, the RPC in the SUMMIT project **.smtxml** file will not match the data in original ALOS **RPC-*** files, and the original files may not be used in the final project.
- The SUMMIT project **.smtxml** file is created.
- The message, “Import completed,” appears when it is done.
- The Project Edit [RPC] dialog appears with the ALOS project files in it.

- Step 7)** (Optional, but highly recommended) If a control file was prepared in Step 2 (page 11-13), select it now. Use the **Control file** browse button to locate the **.con** file.
- Step 8)** Select a coordinate system for the project. To transform the coordinate system from the satellite's WGS84 latitude-longitude system to another system, use the **Select Coordinate System**, **Change Units**, **Select vertical reference**, and **Select Datum shift** buttons to make selections in the Blue Marble Geographics® GeoCalc® dialogs. (To customize the Geo Database, see *Appendix C*.)



- Step 9)** When the project definition is complete, select **OK** to close the Project Edit dialog.
- Step 10)** For a new project, select **Save** or **Save As** from the **File** pull-down menu. Give the project a name.

For a new project, select **Save** or **Save As** from the **File** toolbar or pull-down menu.



- Step 11)** Perform Step 9 on page 11-6 through Step 24 on page 11-14.

The remainder of the ALOS project setup is exactly the same as all other RPC project types. This includes measuring tie and ground control points and generating the epipolar images, if needed. Please find these steps starting on page 11-6 of the "Create a Summit Evolution Satellite RPC Project" section above.

DAT/EM-PCI ProPack Project

DAT/EM-PCI ProPack Projects create a SUMMIT EVOLUTION project from **.pix** imagery that was made by PCI Geomatica software. **.Pix** imagery is a PCI proprietary format, and can be the result of epipolarizing and adjusting satellite imagery or other types of imagery.

To use the DAT/EM-PCI ProPack project type, the SUMMIT EVOLUTION workstation must have a PCI hardware lock licensed for the DAT/EM-PCI ProPack and the DAT/EM-PCI ProPack software must be installed. Please note that this software is different from other PCI ProPack software. DAT/EM supplies the software on the DAT/EM installation disk or on the DAT/EM website; it is not available directly from PCI.

The PCI Geomatica license and the DAT/EM-PCI ProPack license are separate PCI product licenses. The Geomatica software that creates the epipolar **.pix images** may be used on any workstation, but the SUMMIT EVOLUTION and DAT/EM-PCI ProPack licensing must be used together.

DAT/EM-PCI ProPack Project: Install ProPack

When the PCI ProPack hardware lock is available, perform the following installation steps:

Step 1) Preparation:

- a.) Completely install SUMMIT EVOLUTION or a SUMMIT EVOLUTION update, version 4.4 or higher. (The ProPack project type does not exist in version 4.3 and lower.)
- b.) Uninstall any previous (older) version of ProPack. This may be done by running **\Propack\Disk1\setup.exe** from the DAT/EM installation disk and choosing “Uninstall.”
- c.) Attach the PCI ProPack-licensed hardware lock to the computer.

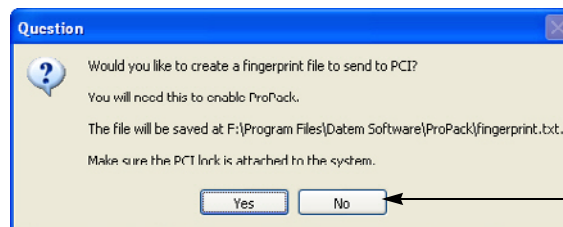
Step 2) Log on to an account that has administrator privileges.

Step 3) Run the DAT/EM-PCI ProPack software installation. The software can be found on the DAT/EM installation disk or on the DAT/EM website:

- a.) Run **\Propack\Disk1\setup.exe** from the DAT/EM installation disk.
- b.) Or, go to **www.datem.com**. Select **Downloads** and **Optional Items**. Select the latest available **ProPack** installation. (Note that these installations do not always change at the same time as the DAT/EM software releases. The latest one will be posted on the website.)

Step 4) A “Question” dialog appears for creating a fingerprint file:

- a.) Answer **No** only if ProPack has been authorized previously for the attached PCI ProPack hardware lock. The authorization code does not change for software updates.

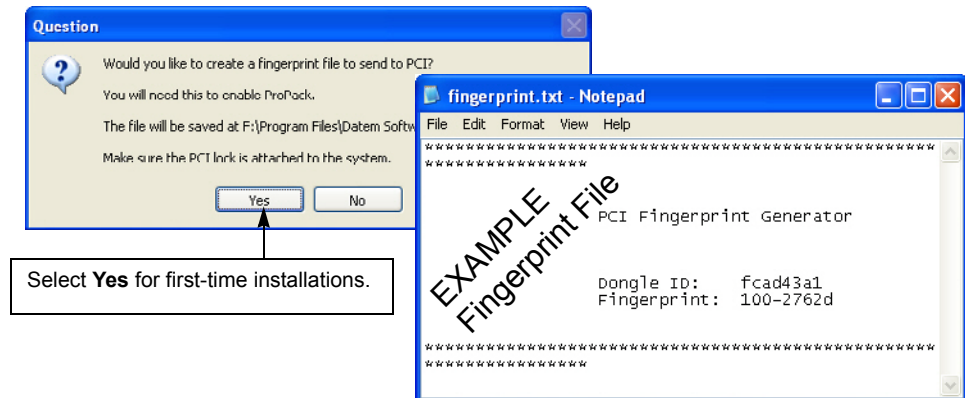


Select **No** only if ProPack has been authorized previously for the attached PCI ProPack hardware lock.

- b.) Answer **Yes** for first-time installations. Submit the resulting fingerprint file to DAT/EM Support (email support@datem.com) for a ProPack authorization file. When the authorization file is received, rename it if necessary to **LSERVRC.TXT** and copy it to the folder:

...\\Program Files\\Datem Software\\ProPack\\EXE on 32-bit computers
 ...\\Program Files (x86)\\Datem Software\\ProPack\\EXE on 64-bit computers

If the file does not have the correct name and location, SUMMIT EVOLUTION will encounter errors with ProPack satellite projects. It is recommended to keep a backup of this file; it will work for future updates installed with the same hardware lock.



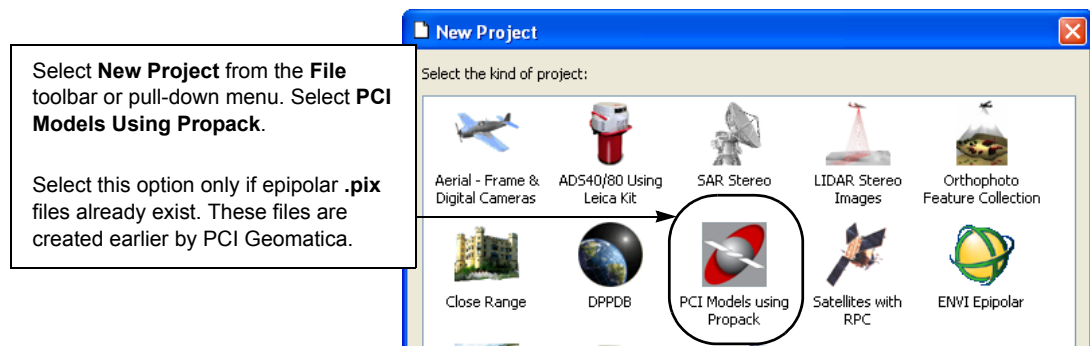
DAT/EM-PCI ProPack Project: Build the Project

If epipolar **.pix** images already exist, they may be used to quickly create a SUMMIT EVOLUTION project. These **.pix** files may be from any original sources, such as satellites or aerial frame cameras. Perform the following steps:

Step 1) Prepare the following:

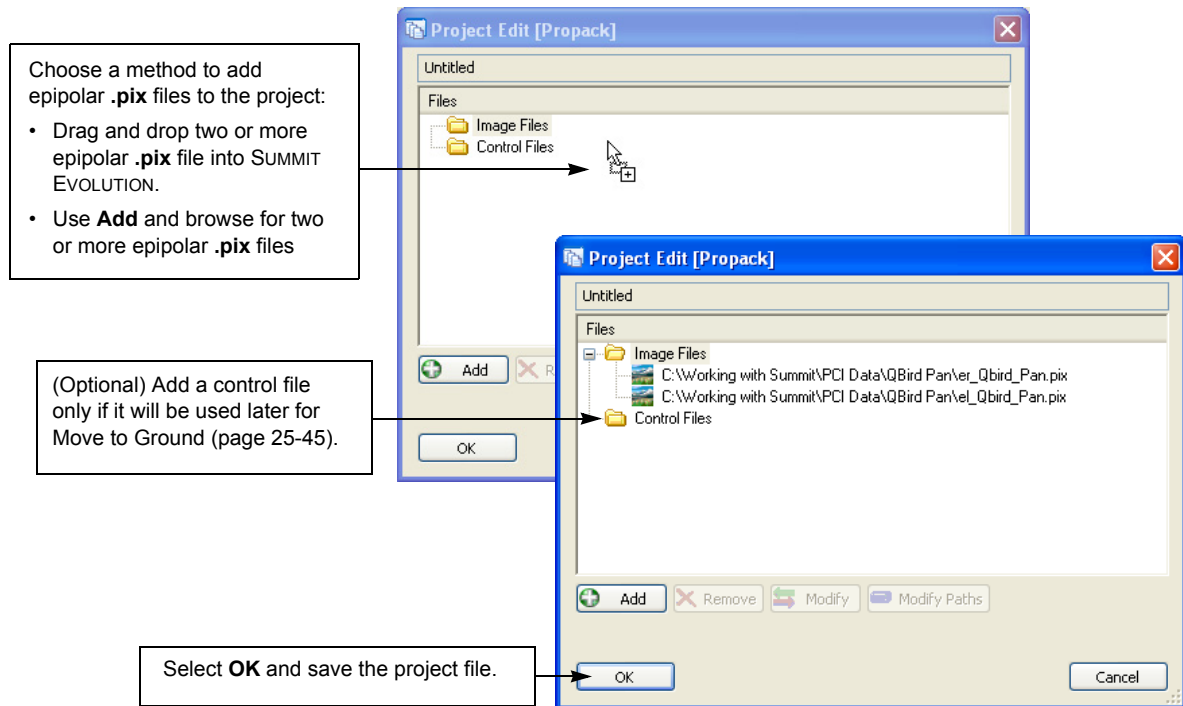
- Any existing PCI Geomatica *epipolar* models. The **.pix** files must be epipolar.
- (Optional) A ground control file to use with the “Move to Ground” function (page 25-45).
- The ProPack hardware lock must be attached to the computer.

Step 2) Select **New Project** from the **File** toolbar or pull-down menu. Select **PCI Models Using Propack**.



Step 3) Either drag and drop the epipolar **.pix** files into SUMMIT EVOLUTION or use **Add** to browse for them.

Step 4) (Optional) Add a control file only if it will be used later for Move to Ground (page 25-45). A control file is not required for the project itself.

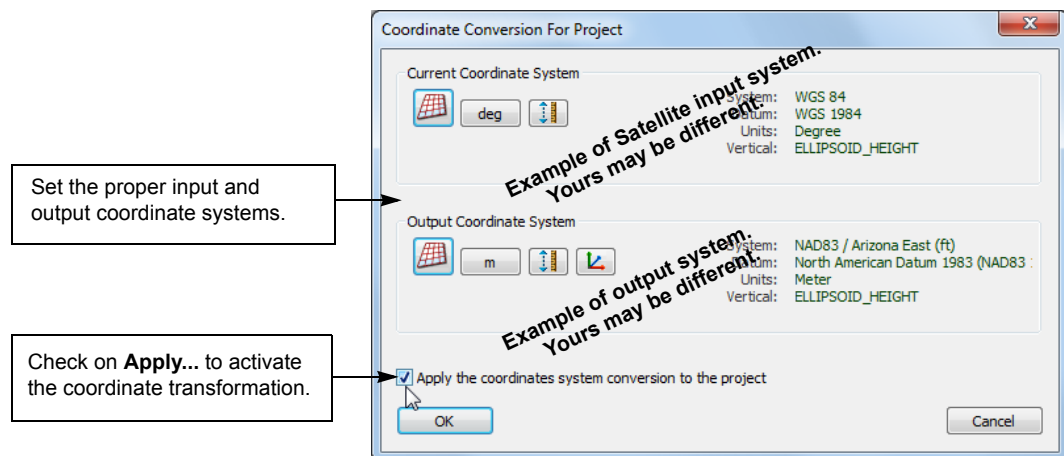


Step 5) Select **OK** to close the Project Edit dialog.

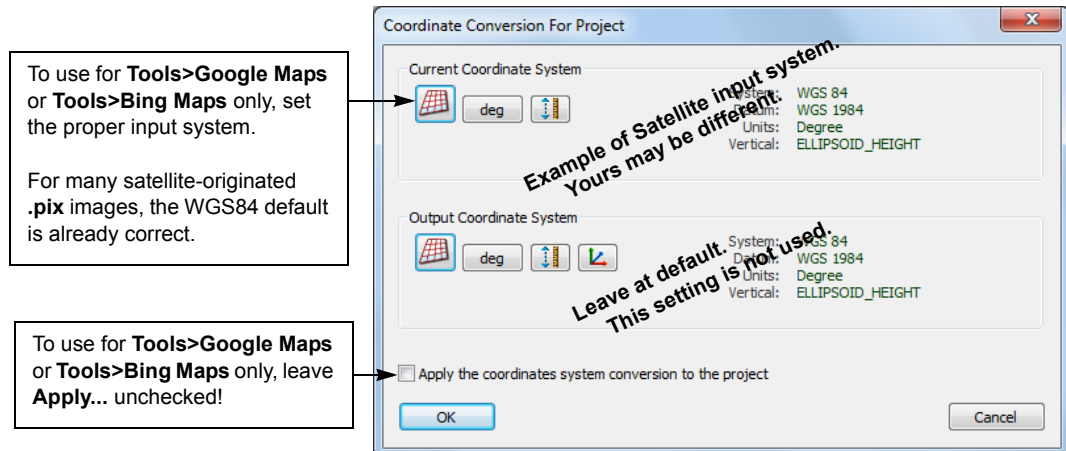
Step 6) Select **Save** or **Save As** from the **File** pull-down menu.

Step 7) Make coordinate system selections as follows:

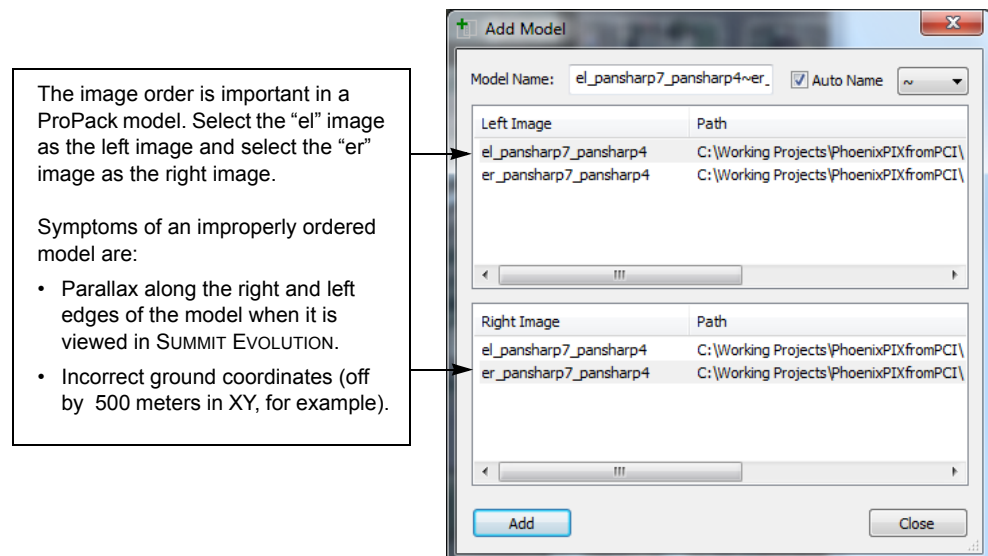
- a.) **If coordinate transformation is needed:** Select **Coordinate Conversion** from the **Orientation** toolbar or pull-down menu; select an input and output coordinate systems. If the **.pix** imagery is originally from a satellite source, the “WGS84” default may be correct as it is; set an output system only in this case. Check on the **Apply the coordinates system conversion to the project** checkbox. For more detailed information, see “(Optional) Calculate Exterior Orientation to Use Later” on page 17-7.



- b.) **If coordinate transformation is not needed:** (Optional, but recommended) Even if a coordinate system conversion is not needed, set an input coordinate system so that the **Tools>Google Maps** and **Tools>Bing Maps** options may be used to verify that the model order is correct. Select **Coordinate Conversion** from the **Orientation** toolbar or pull-down menu; select an *input* coordinate system. If the **.pix** imagery is originally from a satellite source, the “WGS84” default may be correct as it is; otherwise, set the input system. Since a coordinate system transformation is not needed, **DO NOT** check the **Apply the coordinates system conversion to the project** checkbox.



- Step 8)** Use the **Models** tab on the Project Window to pair each set of “el” and “er” images into models. The image order in the model is important. The “el” image must be listed as the left image. The “er” must be listed as the right image.



Step 9) Verify the models. For each model in the project:

- a.) Open the model.
- b.) View the stereo at the center of the project. View a building or other object that has obviously increasing elevation. If the model is in pseudo stereo, select the **Toggle Stereo/Pseudo** button on the **Image View** toolbar. This is an acceptable view correction for certain Geomatica projects, and seems to depend on how the Geomatica project was processed. Not all projects will require this setting.
- c.) View stereo at the center of the model and along the left and right edges of the model. Zoom in. If there is parallax at the right and left edges, but not at the center, the model could be defined backwards. Return to Step 8 above and define the model in the opposite order, then verify the new model using this method again.
- d.) Open **Tools>Google Maps** or **Tools>Bing Maps**. Verify that the SUMMIT EVOLUTION and the Google/Bing Maps cursors are at *approximately* the same location. Some displacement (such as 1 or 2 meters) is normal in comparison to some of the Google/Bing Maps orthophotos; however, if you see a large displacement, such as 500 meters, the model could be defined backwards. Return to Step 8 above and define the model in the opposite order, then verify the new model using this method again. If there is always a large displacement, be sure the input coordinate system is defined correctly in Step 7 above.

ENVI Epipolar Project

SUMMIT EVOLUTION can make a project from ENVI DEM Extraction Module epipolar images. The ENVI DEM Extraction Module and SUMMIT EVOLUTION licenses may be on different workstations, if desired:

- The workstation that is used to prepare the ENVI epipolar images must have a valid license of the ENVI DEM Extraction Module. For information, see ITT Visual Information Solutions, www.ittvis.com.
- A SUMMIT EVOLUTION workstation does not require ENVI licensing. Once the ENVI epipolar images have been prepared, they may be opened on any SUMMIT EVOLUTION workstation.

To prepare a SUMMIT EVOLUTION ENVI Epipolar project, perform the following steps:

Step 1) On a workstation that has a valid ENVI DEM Extraction Module license, follow the manufacturer's instructions to run the Extraction Module to prepare (epipolarize) the satellite imagery. Hints:

- DO NOT change the ENVI “**Epipolar Parameter Reduction Factor**” setting. That is, do not make the images smaller. If this setting is changed, SUMMIT EVOLUTION will not be able to read the resulting image.
- Choose **Float** (not **Integer**) accuracy.
- SUMMIT EVOLUTION does not require ENVI to generate a DTM; however, if you decide to generate this file, be careful of the file size. The default ENVI setting makes a DTM point for every pixel, easily resulting in a 300 million points or more for each model. This may be much too dense for practical use. Please see the manufacturer's instructions for more information.
- For each left-right image pair, save tie points into an ASCII **.pts** file.
- If ground control points have been measured, save the ground control points into an ASCII **.pts** file. (More ground control points may be measured in SUMMIT EVOLUTION later. A minimum of two or three ground control points should be measured in ENVI, SUMMIT EVOLUTION, or both.)
- Name the **.pts** files to match the images. It is very important that each **.pts** file can be matched by name to the correct model in the SUMMIT EVOLUTION project.
- For the left model image, run ENVI image generation three times, once for each band. The result should be three **.hdr** files and three matching single-band epipolarized “raw ENVI” images: red, green, and blue. For the right model image, repeat to generate the individual red, green, and blue bands. Repeat for all remaining left and right image sets in the project.
- Keep the **.hdr** files and the matching raw image files together in the same folder.
- SUMMIT EVOLUTION requires the following ENVI files for each stereo model: Three **.hdr** files (red, green, and blue), three raw images (red, green, and blue), and one **.pts** file.

Step 2) Decide what type of images to use in the SUMMIT EVOLUTION project and run IMAGE CREATION if needed:

- The **.hdr** files are added to the SUMMIT EVOLUTION project. SUMMIT EVOLUTION then looks for matching images in the following order: **.smti**, **.tif**, ENVI raw images. That is, if the ENVI raw image and an **.smti** file are both present, the **.smti** file will be used.
- The ENVI raw images do not have zoom level pyramids. They will work in a SUMMIT EVOLUTION project, but it is impossible to zoom in closer than the 1X level with them.
- The ENVI raw images are single-band images. Individually, they will display as grayscale in SUMMIT EVOLUTION.
- IMAGE CREATION can add zoom level pyramids and it can combine the red, green, and blue bands into a single RGB color image. This is highly recommended.

To add zoom level pyramids and/or to combine the bands into color images, open IMAGE CREATION (page 4-6) and make settings:

- a.) Choose whether to use **Three bands to RGB** to create color images (recommended) or to use **Select** to make single-band images (to display as grayscale).

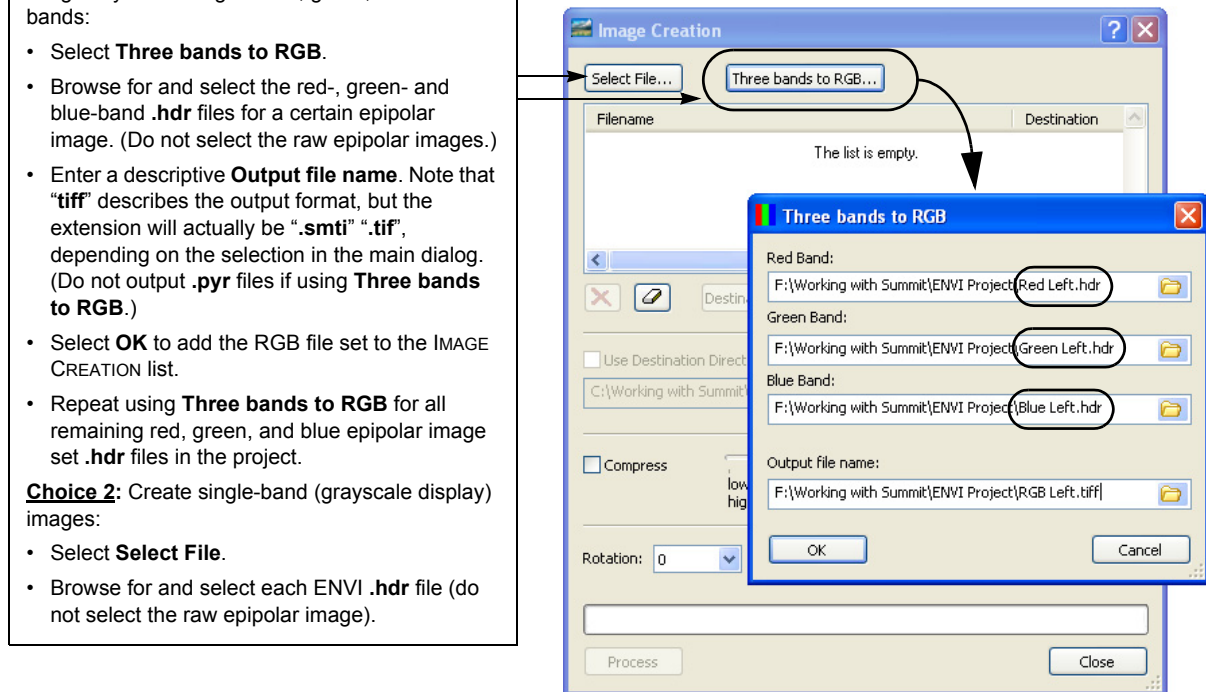
Choice 1 (recommended): Create RGB color images by combining the red, green, and blue bands:

- Select **Three bands to RGB**.
- Browse for and select the red-, green- and blue-band **.hdr** files for a certain epipolar image. (Do not select the raw epipolar images.)
- Enter a descriptive **Output file name**. Note that “**tiff**” describes the output format, but the extension will actually be “**.smti**” “**.tif**”, depending on the selection in the main dialog. (Do not output **.pyr** files if using **Three bands to RGB**.)
- Select **OK** to add the RGB file set to the IMAGE CREATION list.
- Repeat using **Three bands to RGB** for all remaining red, green, and blue epipolar image set **.hdr** files in the project.

Choice 2: Create single-band (grayscale display) images:

- Select **Select File**.
- Browse for and select each ENVI **.hdr** file (do not select the raw epipolar image).

The ENVI raw images must exist in the same folder as the **.hdr** files. The raw images will be found automatically based on the **.hdr** file names specified in **Image Creation**.



- b.) Do not set **Type** to **PYR** if using **Three bands to RGB**; select **SMTI** or **TIF** instead. (**PYR** may be selected if the **Select File** method was used to browse for files.)
- c.) Choose a **Compress** setting. DAT/EM recommends to check **Compress** on and set the slider to about **85**. The ENVI raw images are 11-bit written out as 16-bit, which means that bits 12-16 store only zeros. A compression setting of about 85 removes many of the zeros, safely reducing the file size without affecting the resolution. (Settings lower than about 75 may reduce the resolution.)
- d.) **Rotation** could potentially be set to 180, if needed. The 90 and 270 settings are probably not useful for ENVI projects. The majority of projects will use **Rotation=0**.
- e.) Do not check **Force 12 bit**. Do not use **Advanced settings**.
- f.) **Channel Mapping** could be used, and is the user's choice. **Note:** Channel mapping can be applied as a display choice within SUMMIT EVOLUTION as well; it may not be necessary to apply it here in the IMAGE CREATION stage.

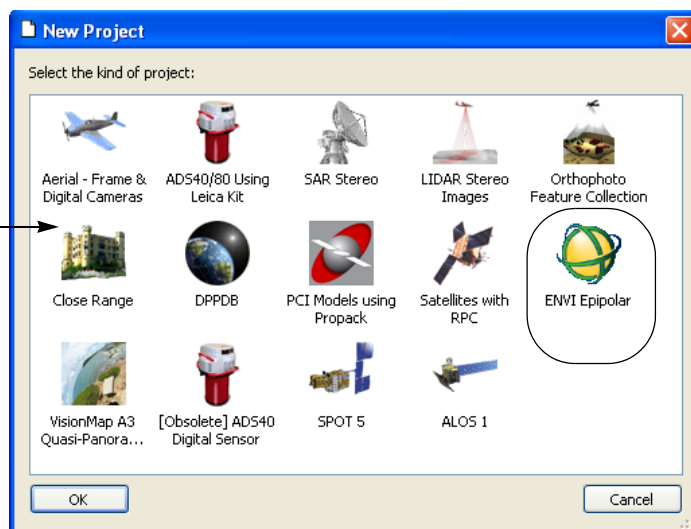
Step 3) Use the SUMMIT EVOLUTION Control Editor (*Chapter 6*) to prepare one or more control files. While a control file is not always strictly required, it is highly recommended.

- Measuring ground control points – even just two or three points – in ENVI and/or SUMMIT EVOLUTION can greatly reduce display parallax and improve the ground solution in the SUMMIT EVOLUTION model.
- If the points have already been measured in ENVI, they do not need to be measured again in SUMMIT EVOLUTION. The **.con** file should contain only the points to measure in SUMMIT EVOLUTION.
- A control file that contains vertical control can help set the cursor Z near the ground when a model is first opened. (If a control file doesn't exist, a “best guess” Z will be set when a model first opens.)
- Ground control points in the **.con** file must be in the same coordinate system that will be set in the SUMMIT EVOLUTION project file (below in Step 9 on page 11-26).

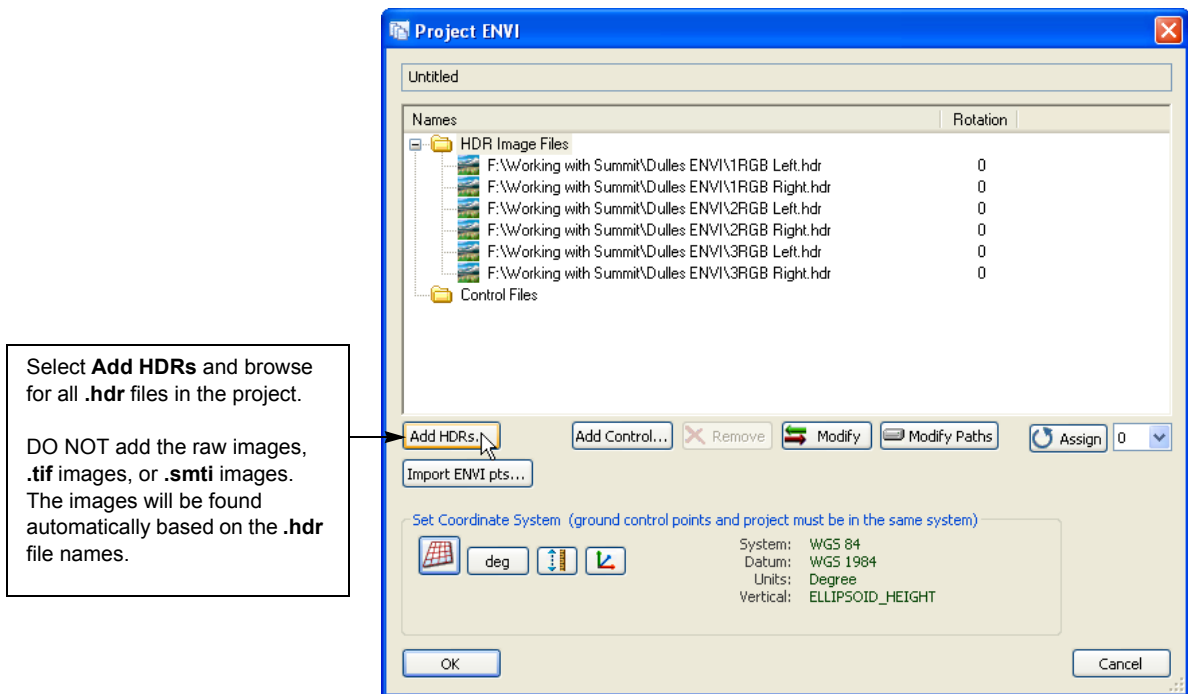
Note: Tie points and ground control points measured earlier within the ENVI software may have been in a different coordinate system than the SUMMIT EVOLUTION project file. ENVI tie points and ground control points are stored in pixel coordinates; therefore, they will port over to the SUMMIT EVOLUTION project independently of any coordinate system setting.

Step 4) Select **New Project** from the **File** toolbar or pull-down menu. Select **ENVI Epipolar**.

Select **New Project** from the **File** toolbar or pull-down menu. Select **ENVI Epipolar**.



Step 5) Select **Add HDRs** and browse for all **.hdr** files in the project.

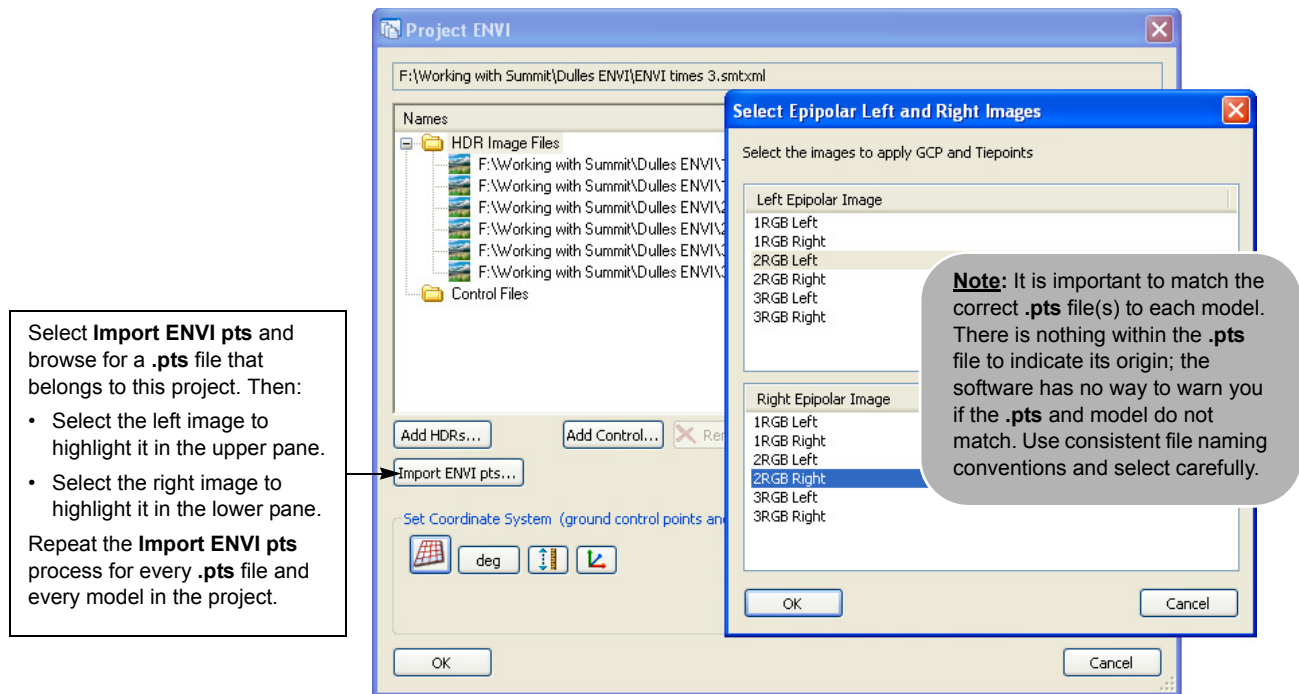


Step 6) Select **Import ENVI pts** files one or two times to import ENVI tie points and/or ground control points:

- **Tie Points .pts**: For most projects, import the tie points **.pts** file. The only time tie points are not needed is when many ground control points were measured in ENVI or many ground control points will be measured in SUMMIT EVOLUTION. As a general rule, however, if you have a tie points **.pts** file, import it now.
- **Ground Control Points .pts**: If ground control points were measured in ENVI, import the ground control **.pts** file.

Browse for an ENVI tie points **.pts** file. A dialog appears asking for this **.pts** file to be matched with its left and right model image. Select the left model to highlight it in the upper pane, and select the right model to highlight it in the lower pane.

Step 7) Repeat the **Import ENVI pts** process for every **.pts** file and every model in the project.



Step 8) If at least one control file exists, select **Add Control** and browse for the **.con** file(s).

Step 9) If the native WGS84 (latitude-longitude) system is not desired, use the **Set Coordinate system...** buttons to set a different coordinate system. This system should match the coordinate system used in the **.con** file(s) (Step 3 on page 11-24 and Step 8 above).

Step 10) Select **OK** to close the Project Edit dialog.

Step 11) Select **Save** or **Save As** from the **File** pull-down menu. Save the **.smtxml** project file.

Step 12) Select a model to open it. Decide whether or not to measure additional ground control points. Consider:

- Ground control points that were measured in ENVI and imported from the ground control **.pts** file do not need to be remeasured in SUMMIT EVOLUTION.
- If there is no parallax in the SUMMIT EVOLUTION model display, there is no need to measure more ground control points.
- Some satellites, such as CARTOSAT, may require more ground control points, because their RPC solution from the vendor was not very good. You'll know if you have one of these if the ENVI project was set up correctly and the **.pts** files were imported, but there is still parallax in the SUMMIT EVOLUTION model view.
- If there is parallax, measuring one or more ground control points in SUMMIT EVOLUTION will greatly reduce the parallax and improve the ground solution.

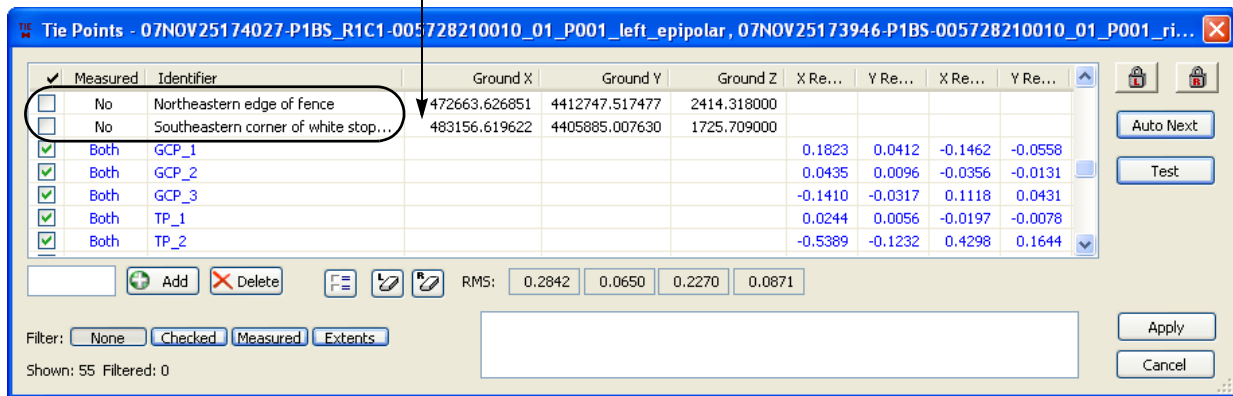
Step 13) If there is parallax in the view, select **Tie Points** from the **Orientation** pull-down menu or toolbar.

- The “TP_” and “GCP_” points are the tie points and ground control points (if any) imported from the ENVI .pts file.
- Do not re-measure any of the existing ENVI points. If they have very high residuals, this might indicate a problem preparing the original ENVI models; this problem should be resolved in ENVI instead of SUMMIT EVOLUTION.
- Measure at least one ground control point (ground control points found in the .con control file will be in the Tie Points dialog list).
- Measure enough ground control points to remove parallax.

Select **Import ENVI pts** and browse for a .pts file that belongs to this project. Then:

- GCP_ points are ENVI ground control points from a .pts file.
- TP_ points are ENVI tie points from a .pts file.
- Any other points are from .con files. These are the points that may be measured now. Measure one or more of them until parallax has been reduced enough.

Note: For ENVI projects, the residual units are pixels.



SAR Stereo Project

These instructions are for a SUMMIT EVOLUTION **SAR Stereo** (Synthetic Aperture Radar) project type using imagery from an EarthData GeoSAR or InterMap STAR-3i sensor.

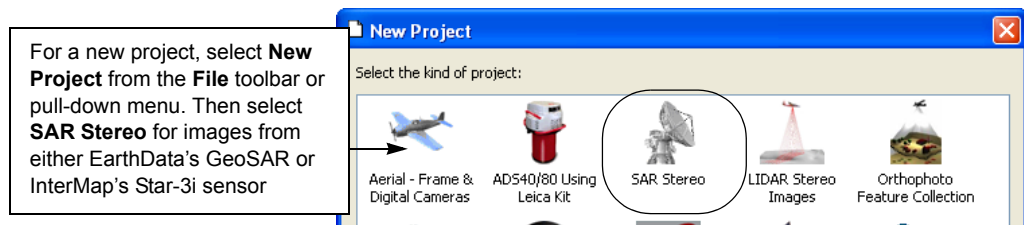
To create a new project, perform the following steps:

- Step 1)** (For .tif files only, not for PCI .pix) Create .smti images from the original SAR graphics files. See “Use Image Creation to Generate .SMTI or .PYR Files” on page 4-6.

EXCEPTION: JPEG2000 NITF files already contain zoom levels. It is not necessary to create .smti files from this format.

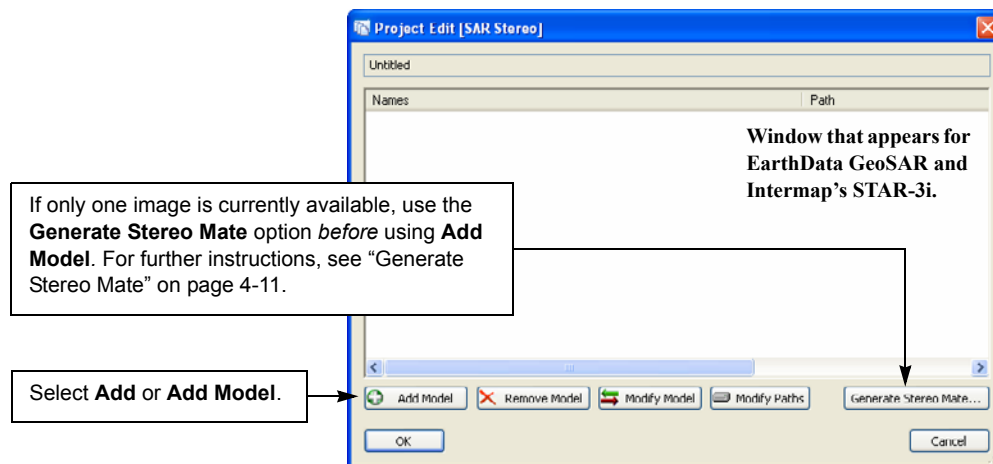
- Step 2)** (This may be done now or later in Step 4 on page 11-28) If necessary, use the GENERATE STEREO MATE application to create stereo mate images for each original SAR image. See page 4-11.

Step 3) To start a new project, select **New Project** from the **File** toolbar or pull-down menu. Choose the **SAR Stereo** project type.

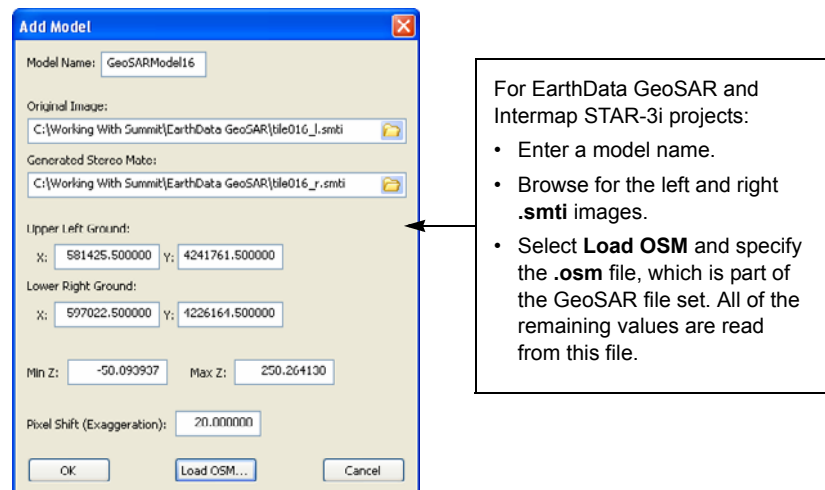


Step 4) The Project Edit [SAR Stereo] window appears.

- For a SAR Stereo project that only has one image covering a certain area, use the **Generate Stereo Mate** button before adding a model to the project. This launches the GENERATE STEREO MATE application, which generates a second image using the first image and a DTM file as input. (Note that stereo image creation may have been done earlier in Step 2 on page 11-27.) For further instructions, see "Generate Stereo Mate" on page 4-11.
- Select **Add Model**.



Step 5) Select the files and folders required by the type of project:



Step 6) Repeat Step 4 and Step 5 until all images or models are listed.

- Step 7)** When the project definition is complete, select **OK** to close the Project Edit dialog.
- Step 8)** For a new project, select **Save** or **Save As** from the **File** pull-down menu. Give the project a name.

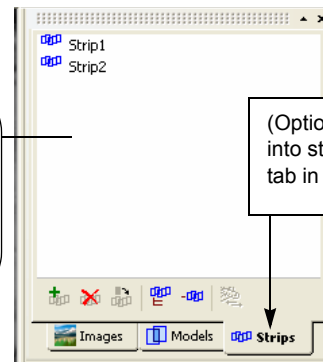
For a new project, select **Save** or **Save As** from the **File** toolbar or pull-down menu.



- Step 9)** (Optional; may be done *any time* for AutoCAD or MicroStation, but not for ArcGIS.) Models may be associated with particular AutoCAD or MicroStation files. Select the **Associate CAD Drawing** icon from the **Models** tab in the Project Window. Highlight one or more models and assign an existing **.dgn** or **.dwg** file. For more detailed instructions and information, see Step 5 on page 16-8.
- Step 10)** (Optional) Images may be grouped into strips. Strip definitions are usually unnecessary for SAR projects, but if it would help organize the project, define strips from the **Strips** tab in the Project Window. Use the instructions in “Group Models Into Strips” on page 16-10.

Hint: If you can't see this window, select **Project Window** from the **View** pull-down menu.

Or, if it is pinned to the edge of the window, hover the system mouse over the **Project** tab to expand it.



(Optional) Group images into strips from the **Strips** tab in the Project Window.

- Step 11)** After any of these Project Window-related changes, select the **Save**.

Select **Save**.



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Chapter 12. Create a DPPDB Project

The SUMMIT EVOLUTION™ **.smtxml** project file contains a list of all the project settings such as image names, model definitions, and orientation information. This chapter shows how to create a project file from DPPDB (Digital Point Positioning Data Base) data. This chapter contains only UNCLASSIFIED information.

About DPPDB Projects

The DPPDB format is a stereo-image-based product developed by the United States Government.

- The DPPDB project covers a nominal 60 nautical mile (NM) by 60 NM area, and consists of high resolution national imagery stereo pair sets and supporting data.
- DPPDB project images are always NITF (**ntf**) files, and the NITF files are specified in the SUMMIT EVOLUTION project file. If **smti** zoom pyramid files are made, they must be placed in the same folder as the NITF files. SUMMIT EVOLUTION accesses both the **ntf** and the **smti** when they are found together in the folder.
- DPPDB projects are in the WGS84 coordinate system. Coordinate conversion may be set if desired.
- If the DPPDB project has CADRG map files with it, they may be displayed and coordinates selected with the PROJECT VIEWER tool. See *Chapter 28*.

Supporting DPPDB imagery is very important toward promoting the use of SUMMIT EVOLUTION for classified U.S. government projects and commercial U.S. government contractors.

Create a New DPPDB Project

To create a new DPPDB project, perform the following steps:

Step 1) Decide whether or not to create SUMMIT EVOLUTION **smti** image files. Consider the following:

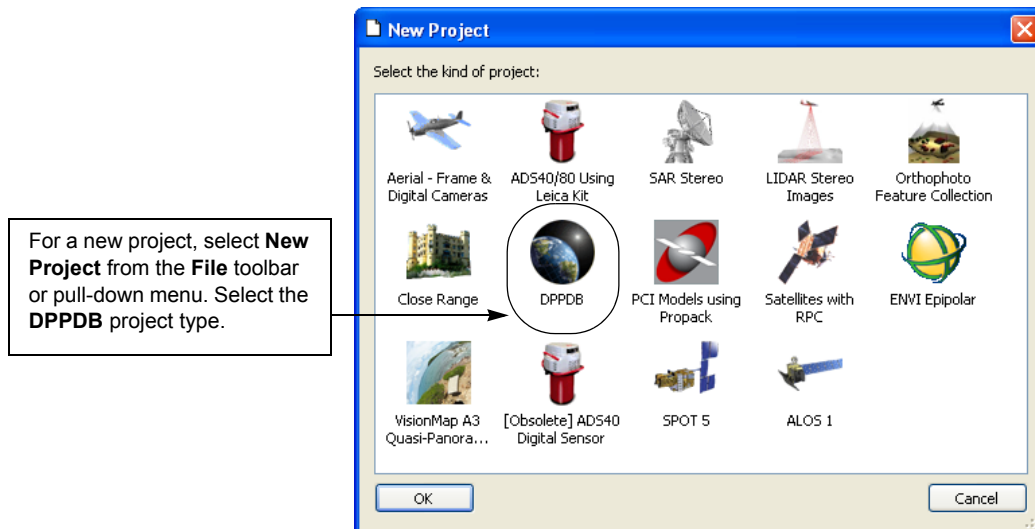
- The original NITF files can be opened and viewed directly in SUMMIT EVOLUTION.
- Original non-JPEG2000 NITF file do not contain zoom pyramids, which means they do not offer unlimited zoom levels or the bird's-eye view.
- NITF files that use JPEG2000 already have zoom levels; it is not necessary to create **smti** images for these files.
- The original DPPDB models come in NITF file pairs: full size and 8X. You can't zoom closer than 8X.
- Because of the size of most NITF files, creating **smti** images is time consuming and takes a large amount of disk space.
- The **smti** zoom pyramids increase mapping productivity by offering the bird's-eye view and smooth, interactive, unlimited zooming.
- If **smti** file are created, they must be placed in the same folder as the NITF files. Both the **ntf** and **smti** files will be used if they are available.

In effect:

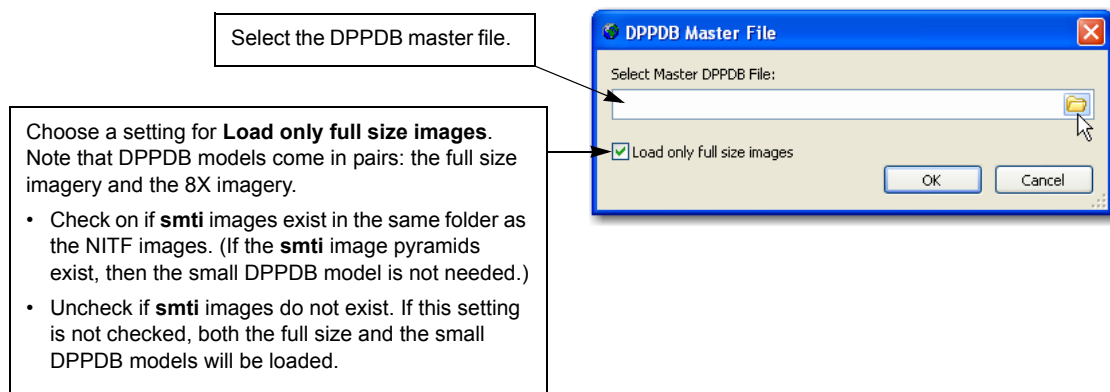
- For a quick import and a quick look at the DPPDB models, do not create **smti** images.
- For non-JPEG2000 NITF files, for a detailed look with full zooming capabilities, create **smti** images.
- For NITF files that use JPEG2000, do not create **smti** images.

To create **smti** images from non-JPEG2000 NITF image files, see “Use Image Creation to Generate .SMTI or .PYR Files” on page 4-6.

Step 2) To start a new project, select **New Project** from the **File** toolbar or pull-down menu. Choose the **DPPDB** project type:



Step 3) The **DPPDB Master File** dialog appears. Use the **Browse** button to select the project's master file. Choose a **Load only full size images** setting.

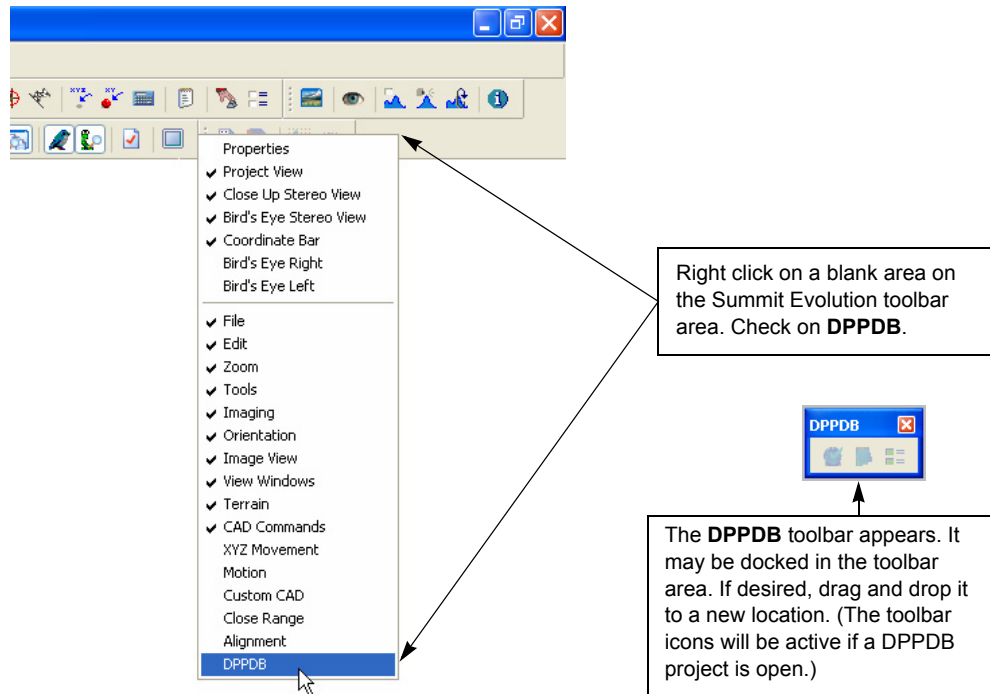


The Master file is read, the project is immediately opened in stereo, and it is ready for viewing and digitizing.

Turn on the DPPDB Toolbar

Perform the following steps to display the **Close Range** toolbar:

- Step 1)** Right click on any blank area of the SUMMIT EVOLUTION toolbar area, or select **Customize Toolbars** from the **Tools** pull-down menu.
- Step 2)** Check on **DPPDB** from the list of toolbars.



- Step 3)** The **DPPDB** toolbar appears. If desired, drag and drop it to be either docked in the toolbar area or undocked anywhere else.

Troubleshooting DPPDB Projects

Problem	Solution
There is no bird's-eye view and it won't zoom in very far.	Create smti images from the NITF image files. The tif extension may be used, if desired. Be sure to place the smti (or tif) files in the same folder as the original NITF files. See "Use Image Creation to Generate .SMTI or .PYR Files" on page 4-6.
The smti images were created, but there is no bird's-eye view and it won't zoom in very far.	The smti (or tif) files must be located in the same folder as the original NITF files. If the smti (or tif) files are found in that folder, they will be used.

Chapter 13. Create a LIDAR (Generated) Stereo Project

This chapter shows how to create a SUMMIT EVOLUTION™ project file from images that have been made from LIDAR-generated (or other generated stereo) image files.

Create a New LIDAR (Generated) Stereo Project

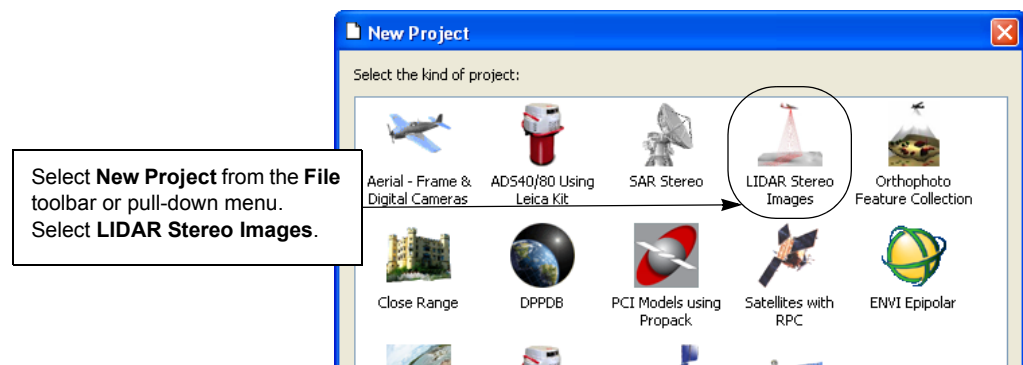
Use these instructions only if the Create LIDAR Images tool (page 4-13) did not already create a SUMMIT EVOLUTION .smtxml “LIDAR Stereo Images” project file.

To create a new “LIDAR Stereo Images” project, perform the following steps:

- Step 1)** Use the **Create LIDAR Images** application to create images from the LIDAR (or other accepted format) files. See “Generate Images from LIDAR Files” on page 4-13 for instructions. The stereo mates and the .smtxml SUMMIT EVOLUTION project file may be created during this process or by using the instructions below.

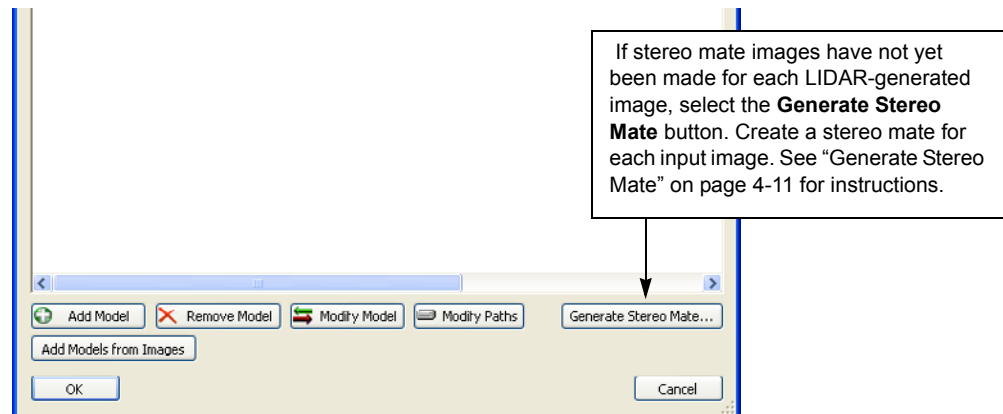
It is recommended to place the images and stereo mate images together in the same folder. This will make it easier and faster to select model images later.

- Step 2)** Select **New Project** from the **File** toolbar or pull-down menu. Select **LIDAR Stereo Images**:



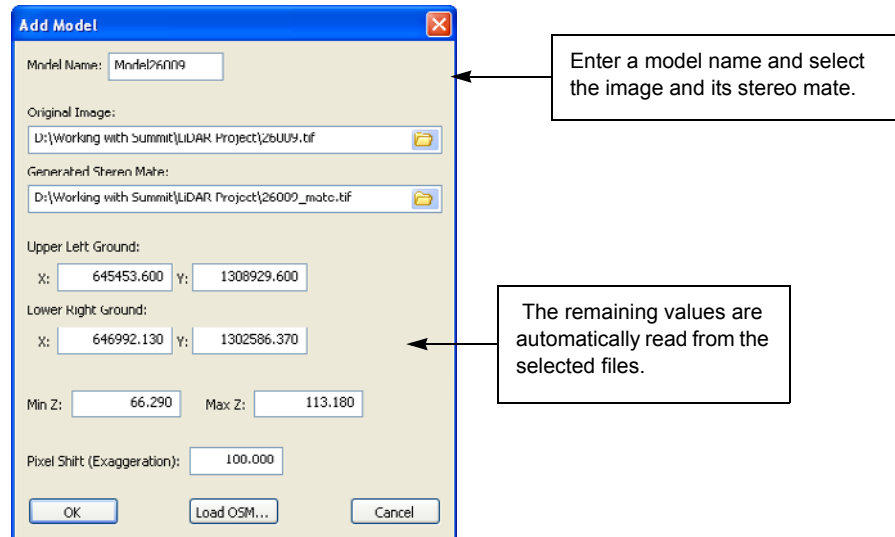
- Step 1)** A Project Edit window appears. If stereo mate images have not yet been made for each LIDAR-generated image, select the **Generate Stereo Mate** button. Create a stereo mate for each input image. See “Generate Stereo Mate” on page 4-11 for instructions.

It is recommended to place the images and stereo mate images together in the same folder. This will make it easier and faster to select model images later.



Step 2) Choose a method to add models to the project:

- a.) To add multiple models at one time, select **Add Models from Images**. Select one or more images and their stereo mates. Repeat as necessary to select models from other folders.
 - Use this option if all multiple images and their stereo mates are in the same folder.
 - This option assumes that the file names match according to DAT/EM's “_mate” naming convention. For example, **26012.tif** and **26012_mate.tif**.
- b.) Or, to add a single model, select the **Add Model** button. Define the model. Repeat as necessary to add more models.



Step 3) When the project setup is complete, select **OK** to close the Project Edit dialog.

Step 4) Select **Save** or **Save As** from the **File** toolbar or pull-down menu. Give the new project a name.

For a new project, select **Save** or **Save As** from the **File** toolbar or pull-down menu.



Edit a LIDAR Stereo Project

The process used to edit a LIDAR Stereo project is the same as for an ADS40 project, except that simpler dialog boxes may appear for changing image files only. To make changes to the project definition, please use the instructions in “Edit an ADS40/80 Project” on page 8-11.

Chapter 14. Create a VisionMap A³ Project

This chapter shows how to create a SUMMIT EVOLUTION™ **.smtxml** project file from images and support files produced by the VisionMap A³ sensor.

About VisionMap A³ Quasi-Panoramic Projects

The VisionMap A³ Quasi-Panoramic project uses images and **.dat** file pairs that originate with the VisionMap A³ camera. In order to set up this project, the following items are required:

- At least two side-overlapping images that can form a stereo model (**.tif** or **.jp2**).
- A **.dat** file for each image, with the same name as the image, stored in the same folder as the image
- Know the output coordinate system. The coordinate system that is native to the A³ image-**.dat** file combination is not usually used for digitizing, because it is geocentric, which means that Z is measured from the center of the Earth.

Create a VisionMap A³ Quasi-Panoramic Project

To create a new VisionMap A³ project, perform the following steps:

Step 1) Prepare the images and/or image pyramids using IMAGE CREATION (*Chapter 4*):

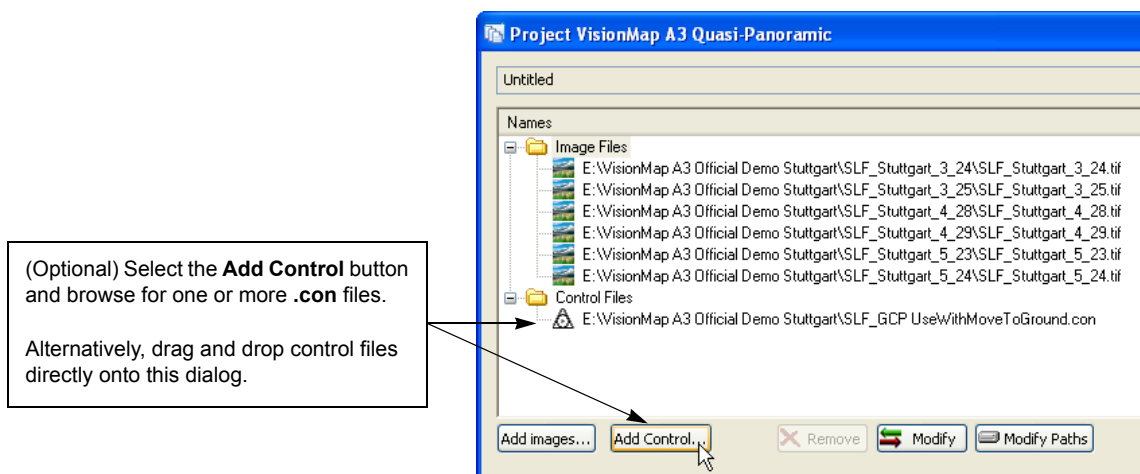
- If the original images are JPEG 2000 (**.jp2**) format, use IMAGE CREATION to create new **.smti** or **.tif** files. Creating a tiled TIFF file is recommended, because JPEG 2000 is too slow to access and reduces performance. After converting to **.smti** or **.tif**, the **.jp2** files are no longer needed, and may be removed from the folder.
- If the original images are **.tif**, use IMAGE CREATION to create **.pyr** files. If desired, check on **Compress** and set a value 75 or higher. Store the **.pyr** files in the same folder as the **.tif** and **.dat** files.
- The image files, **.dat** files, and **.pyr** files (if used) should all be stored in the same folder.

Step 2) (Optional, but recommended) Prepare a control file for the project. Control files are optional for VisionMap A³ projects. The VisionMap A³ project does not need a control file for its orientation; however, a control file – whether it contains real ground surveyed points or “fake” control points – may be useful for the following purposes:

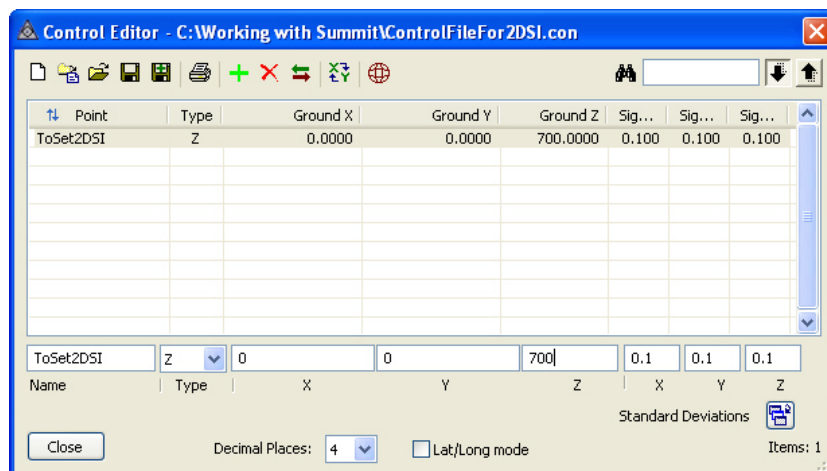
- To set the initial cursor Z for the first-opened model and individually opened models that are selected from the Project window. The average Z of all vertical values found in the control file will be used to set the initial cursor Z
- To set the best display scale for 2D SUPER/IMPOSITION (SI) in SUMMIT EVOLUTION. For more information about 2D SI, see “Superimposition of 2D Vector Data” on page 27-17.
- To set the best display scale for all SI in the PROJECT VIEWER/ORTHO+MOSAIC tool (*Chapter 28*).
- To provide a coordinate list to be used by the “Move to Ground” function (see “Tools Menu > Move To Ground” on page 25-45).

The file must be in the SUMMIT EVOLUTION **.con** file format. Use the Control Editor in SUMMIT EVOLUTION (*Chapter 6*). Add at least one vertical point to the file. The points could be real ground surveyed points or they could be any points that represent any ground location or any elevation in the project.

- Control files may also be imported from 3rd-party coordinate lists (“Import an Unknown-Format Control File” on page 6-3).
- The control file’s coordinates must be expressed in the same coordinate system that is set as the output transformation for the project (see Step 6 on page 14-4 below).

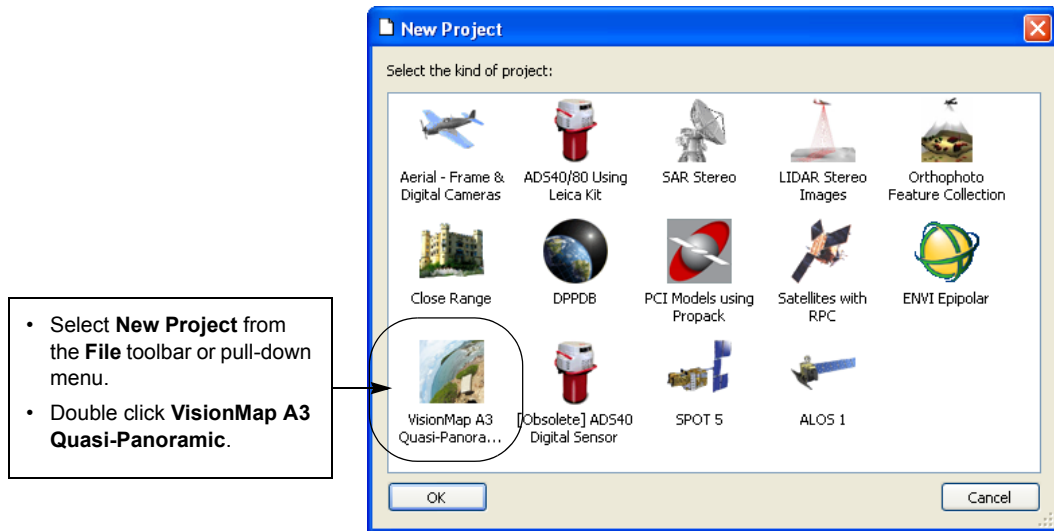


Hint: To quickly collect many points around the project, wait until the rest of the project setup is complete (Step 11 is finished). Open the project in SUMMIT EVOLUTION and in the PROJECT VIEWER. Use the PROJECT VIEWER’s **Move Summit by Pick** button (Step 9 on page 28-6) to move to various locations. Set the ground elevation, then use SUMMIT EVOLUTION’s **Point Collector** tool (page 25-54) to create a list of coordinates and write them to a file. Import this file into the Control Editor (page 6-3). Add the file to the project at any time using the instructions in Step 5.



This control file contains only one vertical point at the average elevation of the project. If there are multiple points, the average elevation of the vertical values will be used.

- Step 3)** Select **New Project** from the **File** toolbar or pull-down menu. Choose **VisionMap A3 Quasi-Panoramic** from the project options:

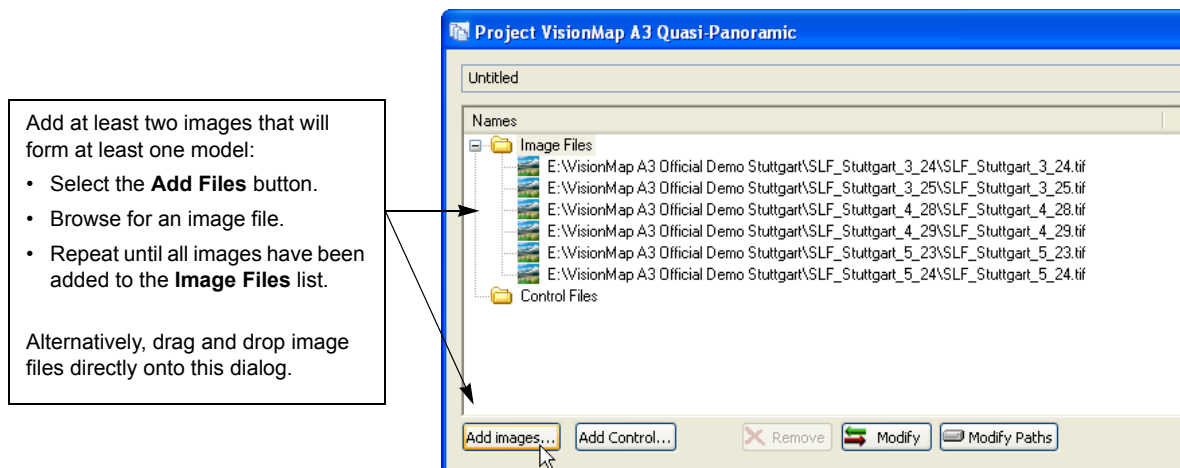


- Step 4)** The Project VisionMap A3 Quasi-Panoramic dialog will appear. Select the **Add images...** button. Browse for at least two overlapping images that will form a stereo model. If necessary, repeat until all images have been added to the **Image Files** list.

Note: You may also drag and drop image and control files from Windows Explorer or My Computer directly onto the Project VisionMap A3 Quasi Panoramic dialog.

Note: If **.jp2** images have been converted to **.smti** or **.tif**, select the **.smti** or **.tif** files.

Note: If **.pyr** files have been made from original 1X **.tif** images, select the 1X **.tif** files; the **.pyr** files will be found automatically if they are in the same folder.

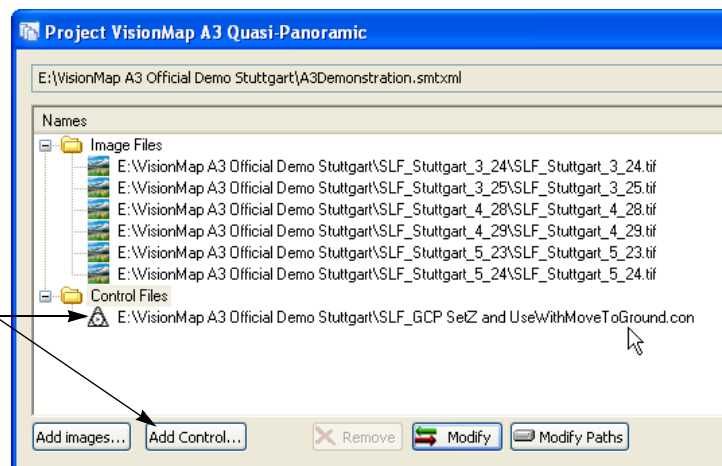


- Step 5)** (Optional, but recommended) If a control file has been prepared (Step 2 on page 14-1 above), add the control file to the project. Select the **Add Control** button. Browse for one or more control files. Alternatively, drag and drop control files directly onto the Project dialog.

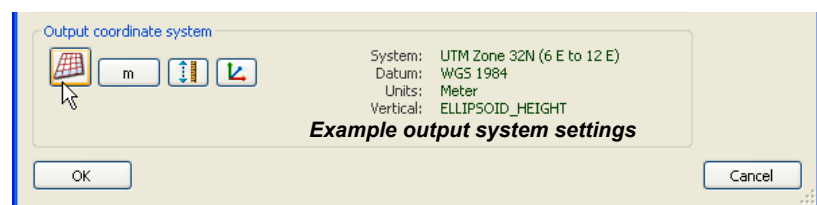
Add at least two images that will form at least one model:

- Select the **Add Control** button.
- Browse for a control file.
- Repeat to add more control files, if necessary.

Alternatively, drag and drop control files directly onto this dialog.



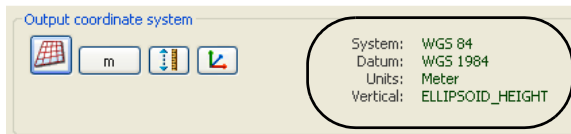
- Step 6)** Set an output coordinate system in the **Output Coordinate System** section. Make settings using coordinate system, units, vertical reference, and datum shift buttons.



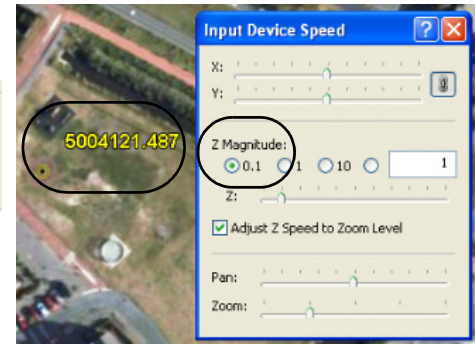
- **Note!** If a "File not found" error is received, please see the "Install or Update the Coordinate Transformation Databases" section in the DAT/EM "Installation Instruction Series: Software Installation and Configuration" document. The latest files are available for download from www.datem.com.
- **Note!** If the desired coordinate system is not offered, define a new coordinate system using the instructions in *Appendix C*.
- **Note!** DO NOT change the project's coordinate system after objects have already been digitized in the DAT/EM Drawing Objects, AutoCAD, MicroStation, or ArcGIS. Choosing a coordinate system here does not translate previously existing objects or files.

Note: The coordinate system that is native to the A³ files is geocentric; it measures Z from the center of the Earth. If you decide *not* to apply a coordinate transformation, you may need to adjust **Tools>Input Speed** to **0.1** and expect a very high Z value.

- If a coordinate transformation is *not* applied, set **Tools>Input Speed** to **Z Magnitude 0.1**.
- If a coordinate transformation is *not* applied, expect a very high Z value that is measured from the center of the Earth.



Here, a coordinate transformation is *not* applied.
The output is the same as the sensor system.

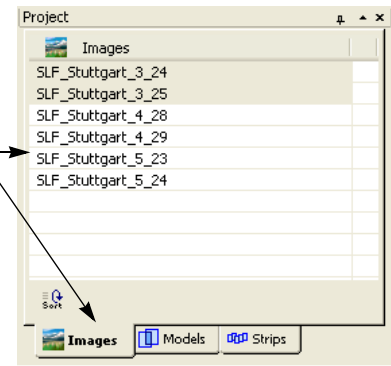


Step 7) Select **OK** to close the dialog.

Step 8) Select **Save As** from the **File** pull-down menu. Give the project a name and save it.

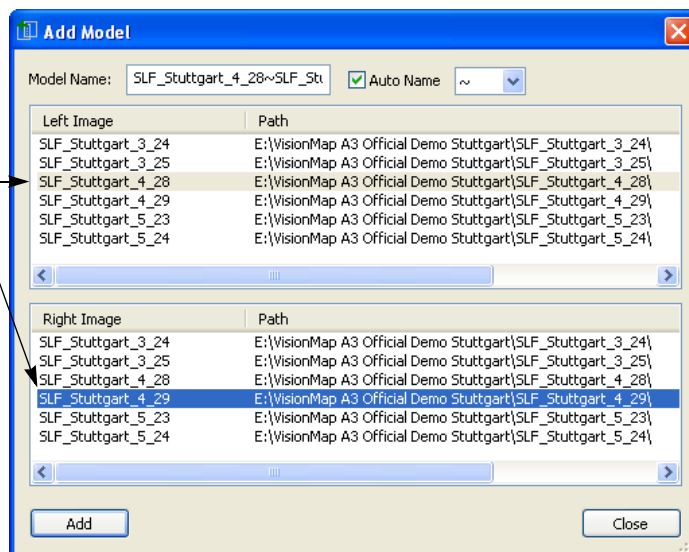
The project images are now listed on the **Images** tab of the Project window. (To turn on the Project window, select **Project Window** from the **View** pull-down menu or hover the system mouse over its pinned tab on the edge of the window. See page 25-16.)

The project's images appear listed on the **Images** tab of the Project window display.



Step 9) Select the **Models** tab on the Project window. Select the **Add Models** icon. Select a left image in the upper list and a right image in the lower list. Select **Add**. Repeat until all models are defined.

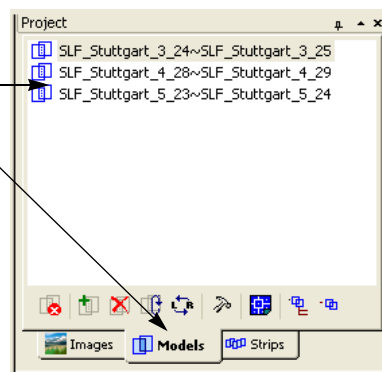
Select a left and right image, then select **Add**. Repeat until all models have been made.



Step 10) The models are now listed on the **Models** tab of the Project window display.

- Click on any model name to open it in a single viewport or the active viewport.
- If multiple viewports are open (page 25-10), drag a model into a viewport to open it in that viewport. A³ projects are especially suitable to use with **Open Multiple Models**, because they often have multiple models that contain the same ground location in stereo.

The project's images appear listed on the **Models** tab of the Project View display.



Step 11) To save the newest project settings, select **Save** from the **File** toolbar or pull-down menu.

Select the **Save** from the **File** toolbar or pull-down menu.



Chapter 15. Import, Merge, and Extract Projects

All editions of SUMMIT EVOLUTION™ can import and convert projects that were created on or for other digital stereoplotters. The following formats can be imported:

- Z/I Imaging® ImageStation® SSK (page 15-1 below)
- SOCET SET® select all files (page 15-5)
- SOCET SET® select by **.sup** file (page 15-7)
- ISM DiAP (page 15-9)
- DVP **.par** or **.dat** files (page 15-11)
- Phorex 1 and 2, Zeiss photogrammetric interchange formats (page 15-13)
- SUMMIT PC™ “SUMMIT 1” (page 15-17)

Existing SUMMIT EVOLUTION **.smtxml** projects can also be imported, merged together or parts extracted, then exported to a new **.smtxml** file (page 15-19).

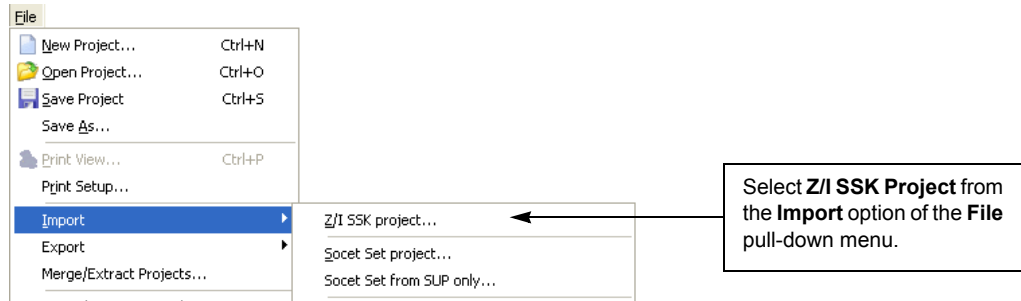
Import a Z/I ImageStation® SSK Project

When importing a Z/I Imaging ImageStation SSK project into SUMMIT EVOLUTION, keep in mind the following hints:

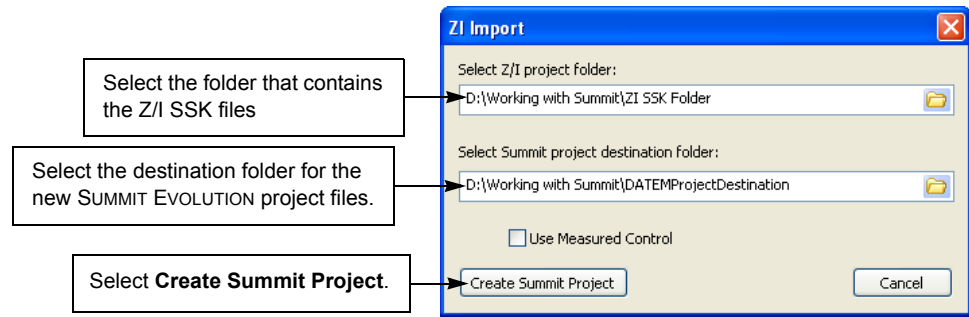
- It is not necessary to make **.smti** images. The “overviews” **.tif** images can be used directly by SUMMIT EVOLUTION.
- It is not necessary to manually open a new project before importing the Z/I SSK project. This import option automatically closes any open project and then automatically starts a new project.
- It does not matter if the image and support files have been moved to different folders since the Z/I SSK project was created. However, the Z/I SSK **camera**, **control**, **photo**, **model**, and **project** files must be together in the same folder. The images may be located anywhere.
- During the import, the SUMMIT EVOLUTION project is created by listing the file names and folders exactly as they appear in the Z/I SSK project. If the image files have been moved to a different folder, first import the Z/I SSK project, then specify new paths with the **Modify** and **Modify Paths** buttons in the Project Edit dialog. Instructions are given in the steps below.
- For convenience, a 180-degree camera file is created for every directly imported camera file.

Perform the following steps to import a Z/I ImageStation SSK project into SUMMIT EVOLUTION:

Step 1) Select **Z/I SSK Project** from the **Import** option of the **File** pull-down menu:



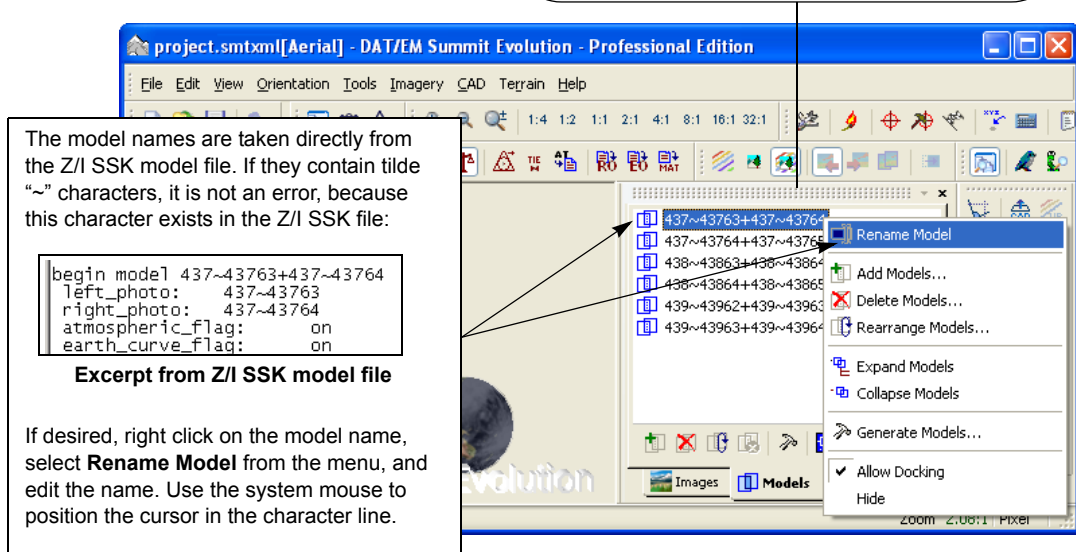
Step 2) Select the folder that contains the Z/I SSK project files (they must be together in one folder), then select the destination folder for the new SUMMIT EVOLUTION project files, then select **Create Summit Project**:



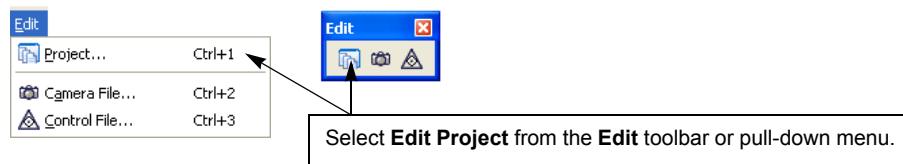
- Step 3)** If any of the Z/I files, which include **camera**, **control**, **photo**, **model**, and **project**, are missing from the folder, errors will appear. Errors such as a missing camera file will result in canceling the import process. If it is only the control file that is missing, SUMMIT EVOLUTION will attempt to use exterior orientations to complete the orientation. If this is not desired, discard the imported project, place the control file in the correct location with the other Z/I files, then start this import process again.
- Step 4)** If there was a project already open in SUMMIT EVOLUTION, it will be closed now automatically. If changes have been made to that project and it has not been saved, a message appears. Choose whether or not to save the old project:
- Step 5)** (Optional) Review the names of the models as they appear on the **Models** tab in the Project Window. The names were taken directly from the Z/I model file, which may use tilde “~” characters. If desired, right click on each model, select **Rename model**, and change the model names using the mouse to position the cursor (the arrow keys will not position the cursor).

Hint: If you can't see this window, select **Project Window** from the **View** pull-down menu.

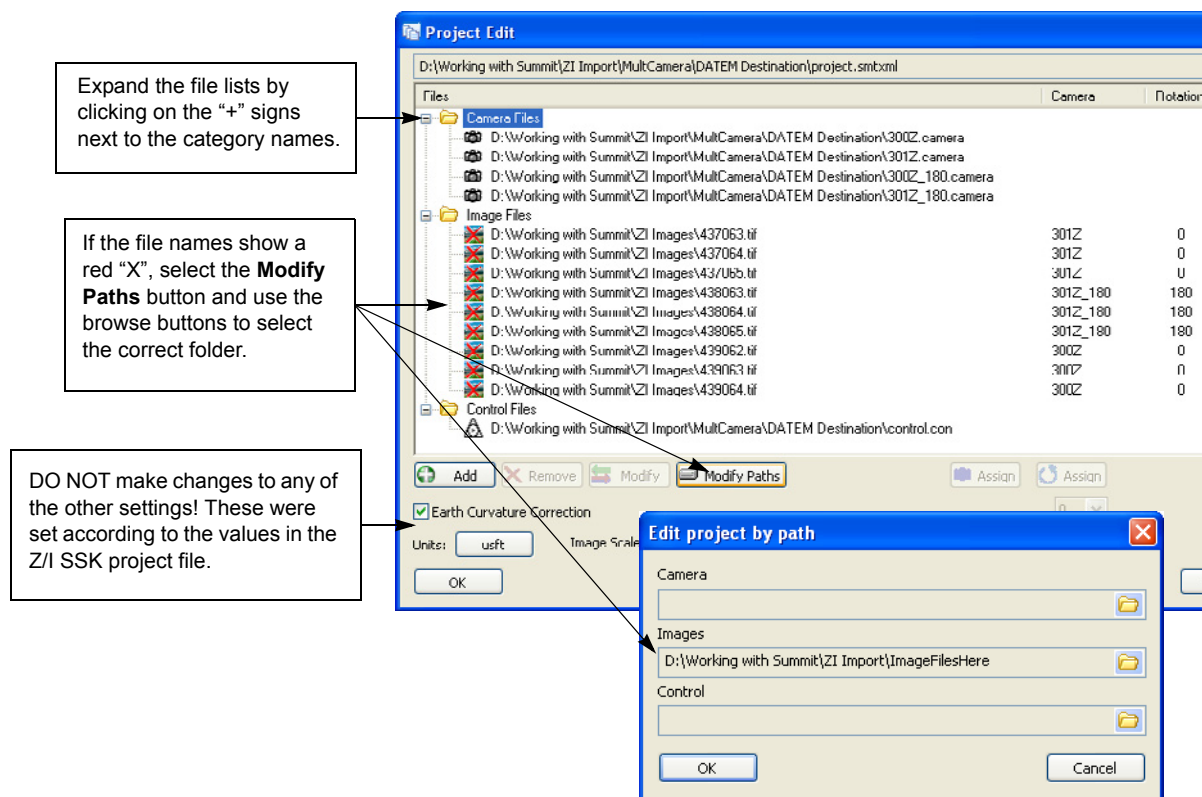
Or, if it is pinned to the edge of the window, hover the system mouse over the **Project** tab to expand it.



- Step 6)** Review the file names in the **.smtxml** project file to see if the image and support files were found in the folders that the Z/I model file specified. Select **Edit Project** from the **Edit** toolbar or menu.



Step 7) (For non-ADS40 projects) Do not make changes to any of the settings in the Project Edit dialog *except* to modify the paths. Expand the Camera, Images, and Control lists. If a red “X” appears next to the names, then select the **Modify Paths** button and use the browse buttons to select the correct folder locations. When the paths are correct and the files are found, the red “X” symbols disappear.



Step 8) If this is an ADS40 project, the **sup** files must be updated now. See “Create a New “ADS40/80 Using Leica Kit” Project” on page 8-2 for more information on ADS40 **sup** files and project settings.

Step 9) The name assigned to the new project is the original name of the Z/I project plus the **.smt.xml** extension. To save under the assigned name, select **Save** from the **File** pull-down menu. To assign a different name, select **Save As** from the **File** pull-down menu and give the project a new name.

The SUMMIT EVOLUTION project is now complete and orientation is done, because the completed orientation was imported from the Z/I project. Ground coordinates are available and digitizing may begin.

Import a SOCET SET® Project: Select All Files Method

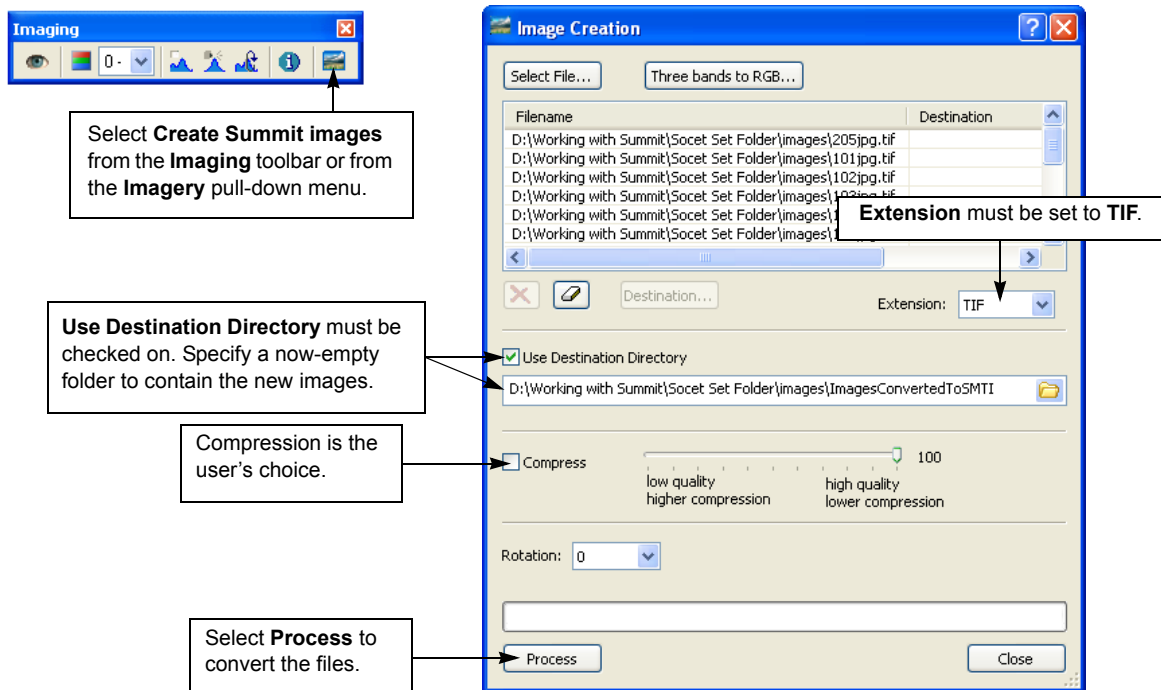
Most Socet Set projects may be imported file-by-file and converted into SUMMIT EVOLUTION projects.

- Note that for Professional and Data Collection Editions, it is also possible to set up a project in the Project Editor, perform automatic interior orientation, then import the Socet Set exterior orientation matrix using the Import Matrix Exterior icon. Set Files of type to Socet Set (adjext.0) when specifying the exterior matrix file. See page 21-4 for more information on importing exterior orientation.
- For Leica Socet Set ADS40 projects, please see *Chapter 8*.

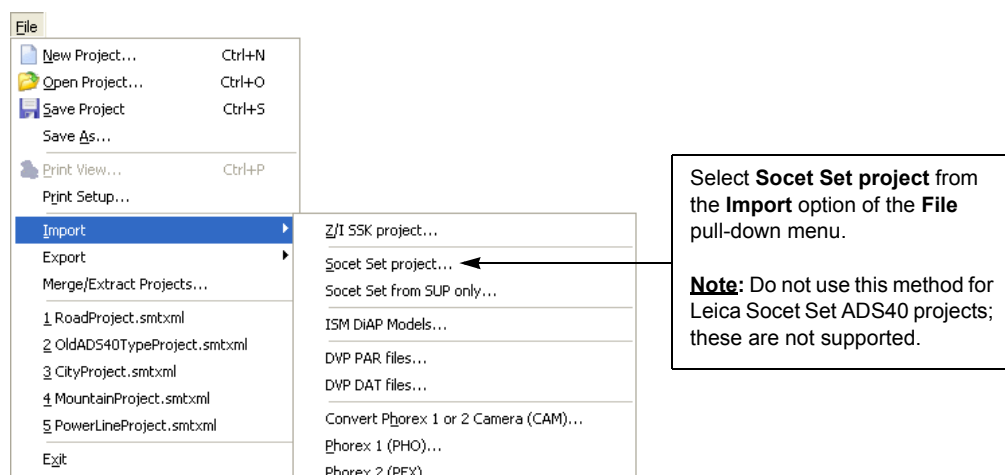


Perform the following steps to import the entire Socet Set project into SUMMIT EVOLUTION:

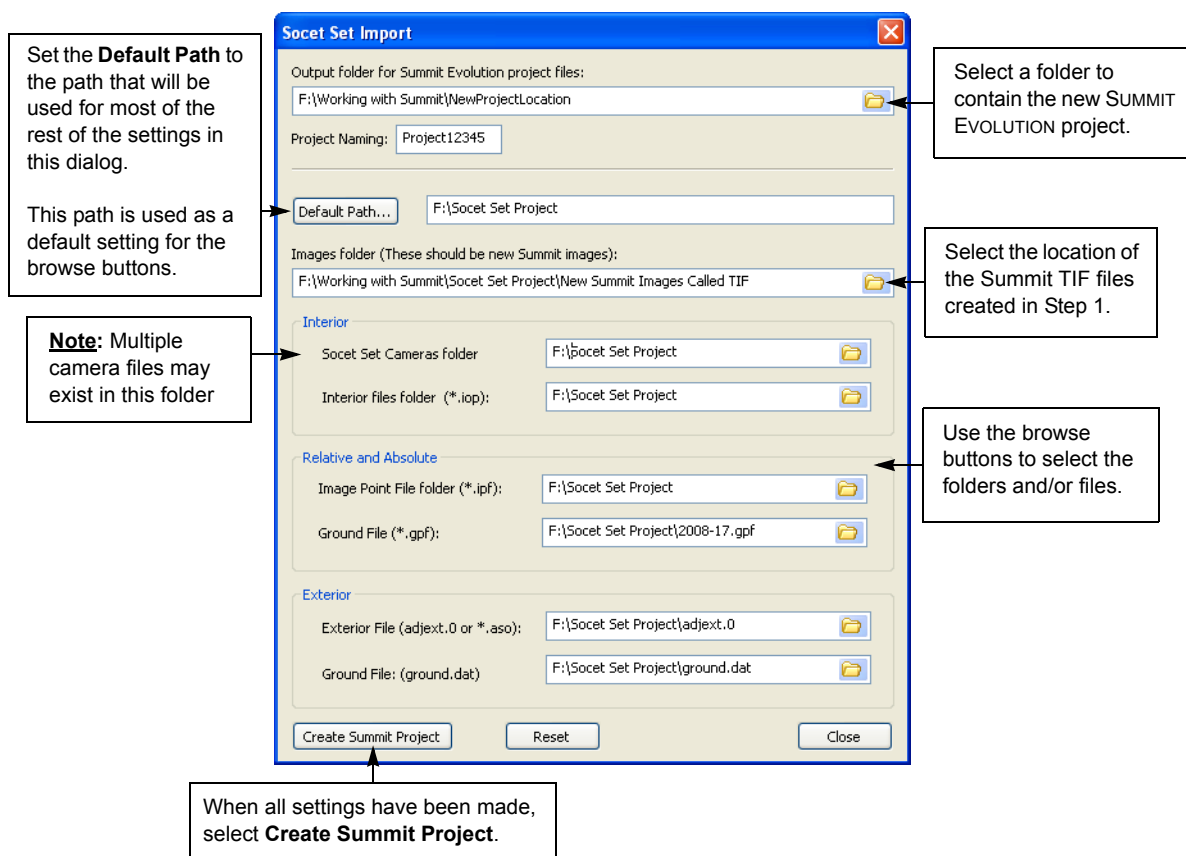
- Step 1)** Select **Create Summit Images** from the Imaging toolbar or from the **Imagery** pull-down menu. The following two settings are very important:
- Use **Select Files** and browse for all of the original **.tif** image files.
 - Set the file **Extension** to **TIF**. (If they are set to **SMTI**, they will not be found by some processes later.)
 - Check on **Use Destination Directory**. Specify a now-empty folder that is to contain the new Summit TIF files. (Do not create the new files in the same folder that contains the original Socet Set images, because with the TIF extension, they would have the same names.)



Step 2) Select **Socet Set project** from the **Import** option of the **File** pull-down menu. **Note:** Do not use this method for Leica Socet Set ADS40 projects; see *Chapter 8*.



Step 3) Make settings in the Socet Set Import dialog box, then select **Create Summit Project**:



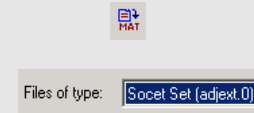
Step 4) The new project will open in SUMMIT EVOLUTION. If there was a project already open, it will be closed automatically.

The SUMMIT EVOLUTION project is now complete and orientation has been imported. Ground coordinates are available and digitizing may begin.

Import a SOCET SET Project: Select SUP File Method

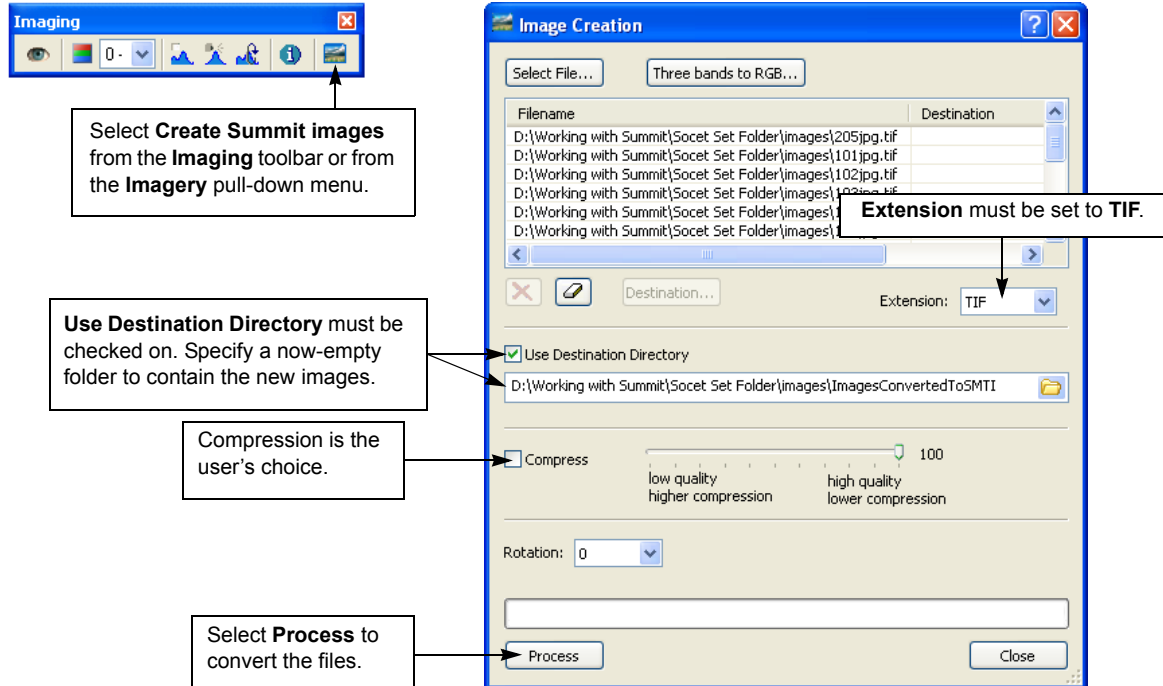
Some Socet Set projects – but not all – may be imported directly from their **.sup** files and converted into a SUMMIT EVOLUTION project.

- Note that for Professional and Data Collection Editions, it is also possible to set up a project in the Project Editor, perform automatic interior orientation, then import the Socet Set exterior orientation matrix using the Import Matrix Exterior icon. Set Files of type to Socet Set (adjext.0) when specifying the exterior matrix file. See page 21-4 for more information on importing exterior orientation.
- For Leica Socet Set ADS40 projects, please see *Chapter 8*.

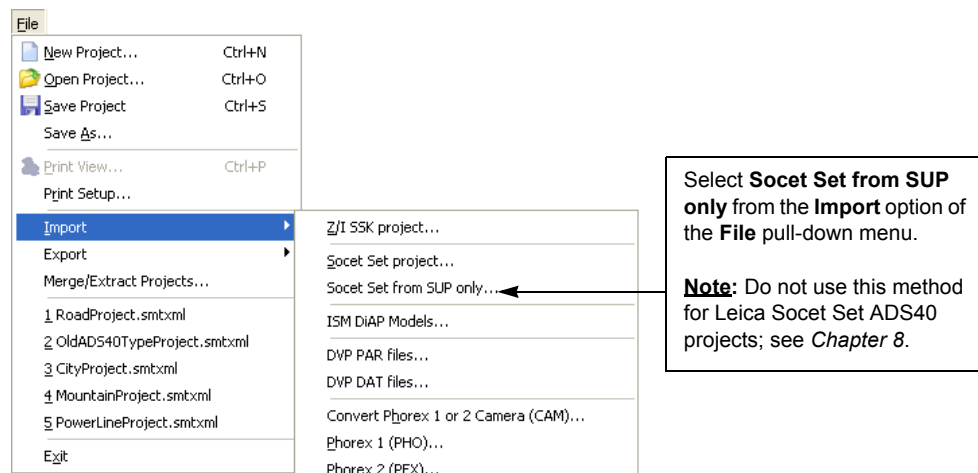


Perform the following steps to import a Socet Set project based on its **.sup** files:

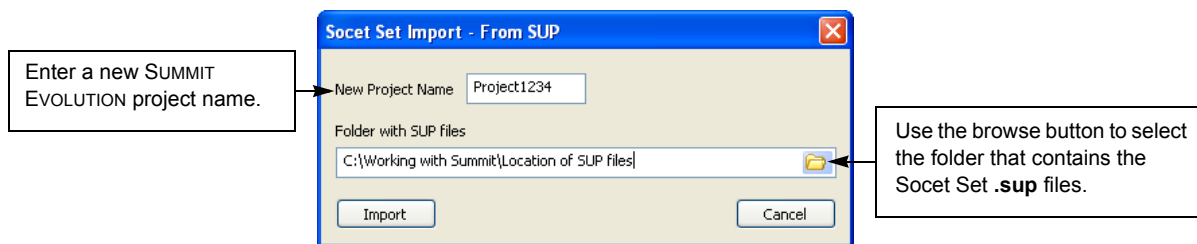
- Step 1)** Make a new folder and move the Socet Set original **.tif** image files to it.
- Step 2)** Select **Create Summit Images** from the Imaging toolbar or from the **Imagery** pull-down menu. The goal is to replace the Socet Set **.tif** image files, which do not contain image pyramids, with SUMMIT EVOLUTION **.tif** files. The following two settings are very important:
 - a.) Use **Select File** and browse for the original **.tif** image files that were moved in Step 1.
 - b.) Set the file **Extension** to **TIF**. (If they are set to **SMTI**, they will not be found later.)
 - c.) Check on **Use Destination Directory** and set the folder to the original location of the Socet Set image files (where the images were before they were moved in Step 1).



Step 3) Select **Socet Set from SUP only** from the **Import** option of the **File** pull-down menu. **Note:** Do not use this method for Leica Socet Set ADS40 projects; see *Chapter 8*.



Step 4) Make settings in the Socet Set Import dialog box, then select **Create Summit Project**:



Step 5) The new project will open in SUMMIT EVOLUTION. If there was a project already open, it will be closed automatically.

The SUMMIT EVOLUTION project is now complete, but it must be verified. Some Socet Set projects do not import exterior orientations correctly using the .sup file method, especially if they have a coordinate system translation applied in the original Socet Set project.

Step 6) Open the new project in SUMMIT EVOLUTION. Check the ground coordinates. Compare known-coordinate objects with the coordinate readout in SUMMIT EVOLUTION. If the ground coordinates are not correct, then the exterior orientations in the project are not correct. Usually, all other parts of the project are correct, such as the image and model definitions and the interior and relative orientations. Choose a method of correcting the exterior orientations:

- Choice 1: Select **Clear Orientations** from the **Orientation** pull-down menu. Clear the exterior orientations only for all the images. Select **Import Matrix Exterior** from the **Orientation** toolbar. Import the **adjext.0** file or any other exterior orientation file that is available for these images.
- Choice 2: Discard this project file. Use the import method shown in "Import a SOCET SET® Project: Select All Files Method" on page 15-5.

Import ISM DiAP Models

ISM DiAP models may be imported and converted into a SUMMIT EVOLUTION project. Perform the following steps to import a set of DiAP models into SUMMIT EVOLUTION:

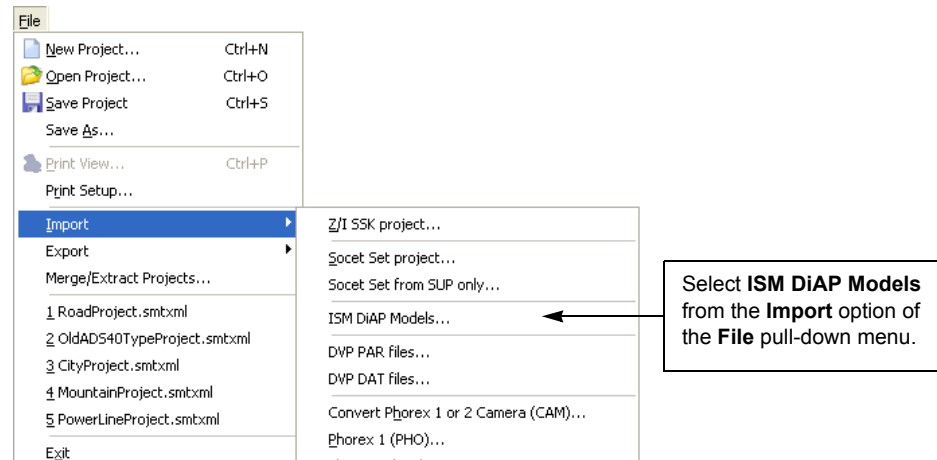
Step 1) Choose whether or not to convert the images into tiled TIFF files:

- a.) **Choice 1: Use SIS, SYS, or SJS files without conversion:** It is usually acceptable for SUMMIT EVOLUTION to use the **sis**, **sys**, or **sjs** files directly. Processing may be slightly slower than for converted files, but this small speed difference may not be noticeable.
- b.) **Choice 2: Convert files to tiled TIFF format:** Processing may be slightly faster. SUMMIT EVOLUTION's IMAGE CREATION tool is used to convert the **sis**, **sys**, or **sjs** files to tiled TIFF format. IMAGE CREATION stores scale values from the DiAP images into private TIFF tags. Do not use any other conversion application – not even DiAP's "SIS to Tiff" S2T translator – to make the **tif** files, because only IMAGE CREATION can produce the correct tags.

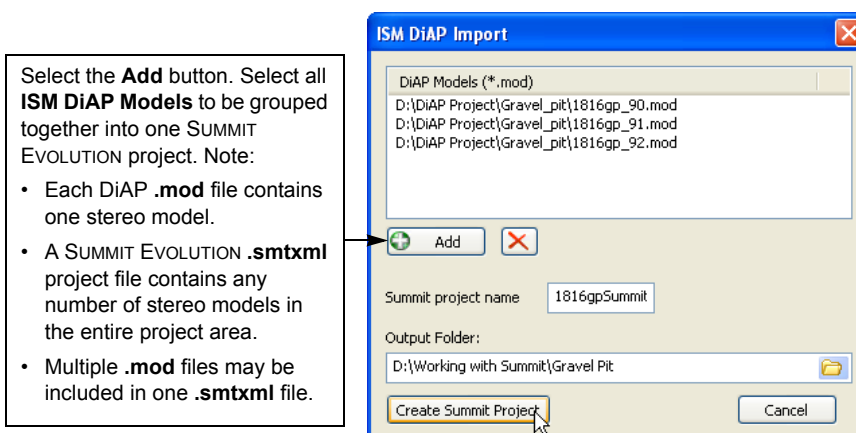
To convert and use the image files:

- Select **Create Summit Images** from the Imaging toolbar or from the **Imagery** pull-down menu. The output file extension can be either **smti** or **tif**. For more instructions, see page 4-6.
- Move the **sis**, **sys**, or **sjs** files to another location before the import. In order to use the **tif** or **smti** files produced by IMAGE CREATION, the **tif** or **smti** files must be the only files found during the import process. SUMMIT EVOLUTION looks for **sis**, **sys**, or **sjs** files first, and if it does not find them, it looks for **tif** or **smti** files.

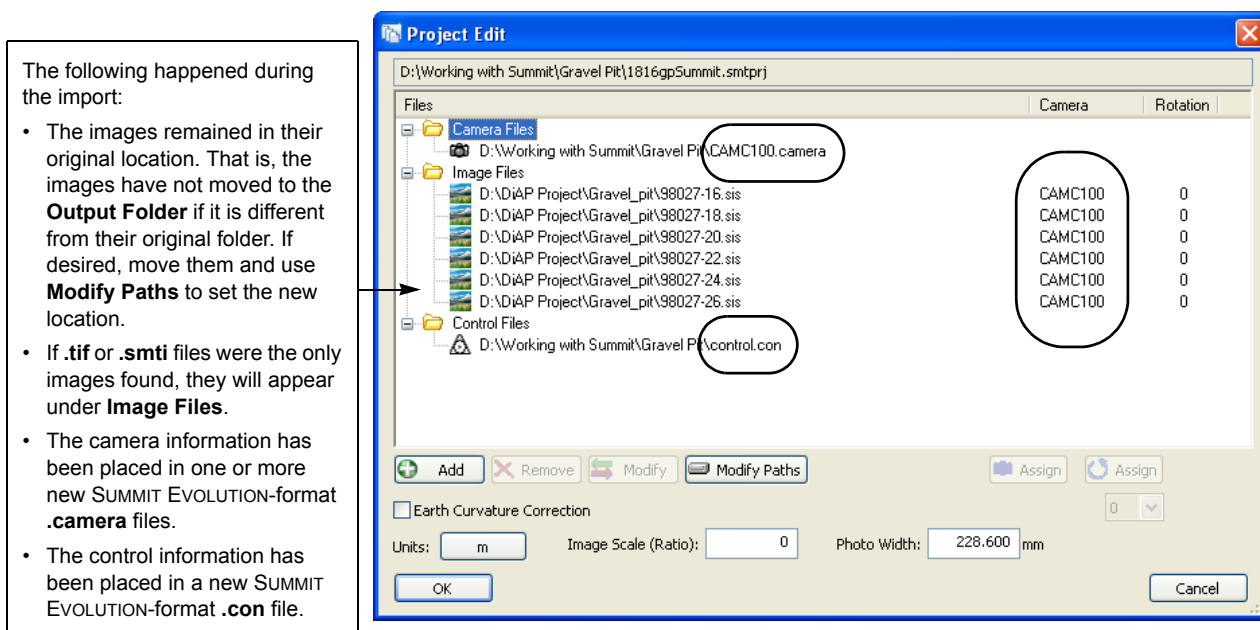
Step 2) Select **ISM DiAP Models** from the **Import** option of the **File** pull-down menu.



Step 3) Make settings in the ISM DiAP Import dialog box, then select **Create Summit Project**:

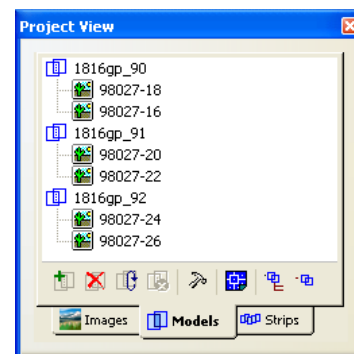
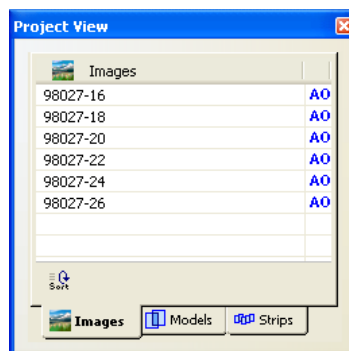


Step 4) If desired, review the SUMMIT EVOLUTION project file that was created:



In the Project View:

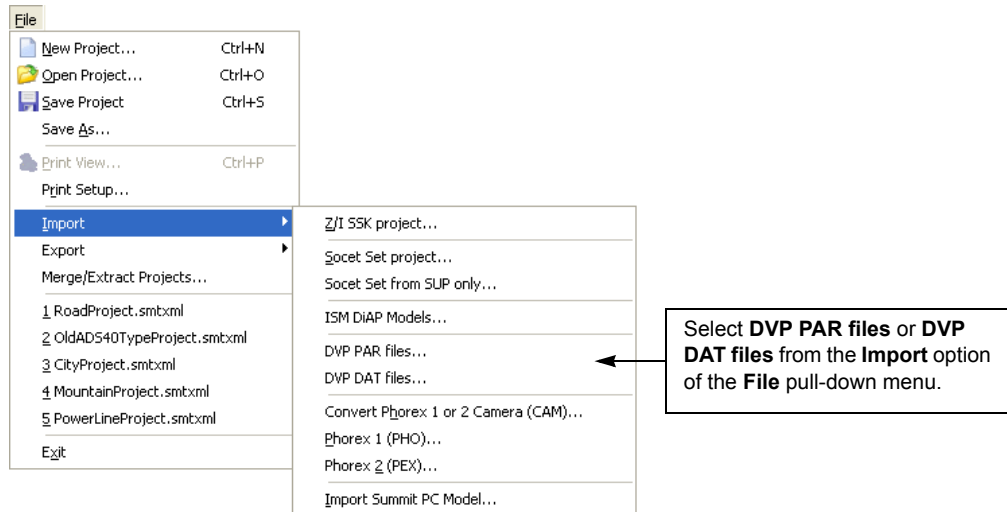
- On the **Images** tab, the images list the type of orientation that was done in the original DiAP model. Here, it is "AO" for Absolute Orientation.
- On the **Models** tab, there is one model per original DiAP **mod** file.



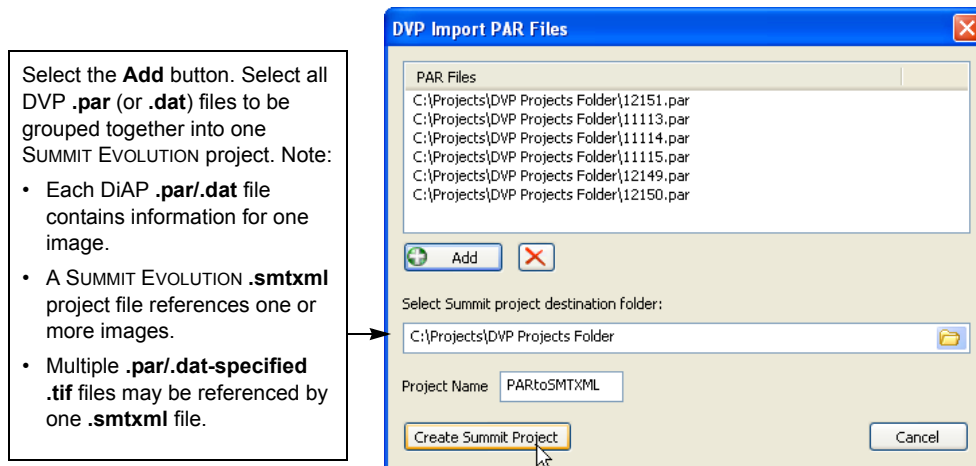
Import DVP PAR or DAT File Projects

CORE Geospatial DVP **.par** or **.dat** files may be imported and converted to a SUMMIT EVOLUTION project. Perform the following steps:

- Step 1)** Determine whether you have DVP **.par** files or **.dat** files ready to import. It is helpful to place the corresponding image files either in the folder specified inside the **.par/.dat** files or in the same folder as the **.par/.dat** files. The import process will look in those two locations for the image files. If they are not found, the user may use **Modify Paths** in the Project Editor later.
- Step 2)** Select the import option that matches the type of files: **DVP PAR files** or **DVP DAT files** from the **Import** option of the **File** pull-down menu.



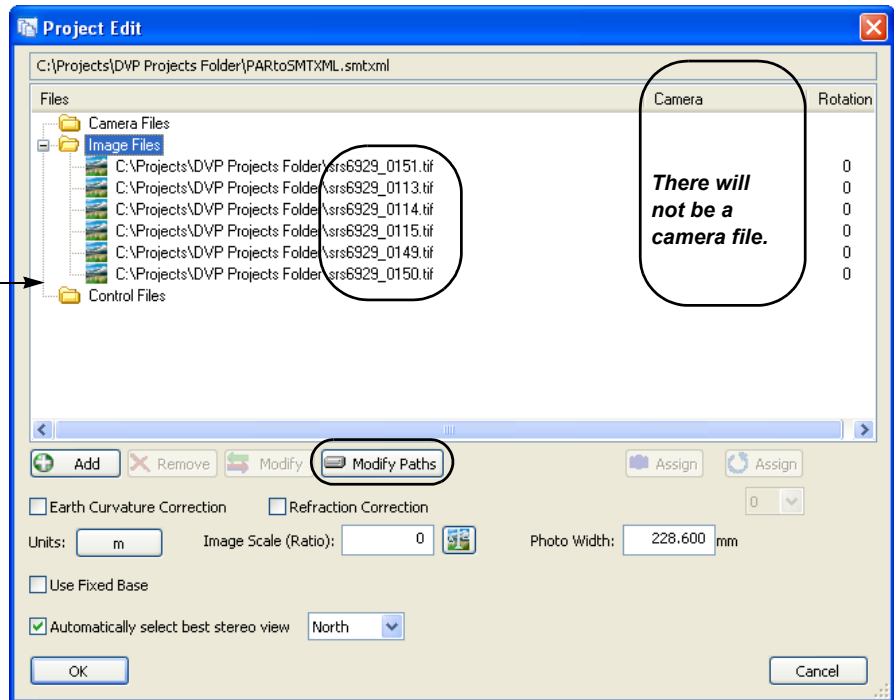
- Step 3)** Make settings in the DVP Import PAR Files or DVP Import DAT files dialog, then select **Create Summit Project**:



Step 4) If desired, review the SUMMIT EVOLUTION project file that was created:

About the resulting SUMMIT EVOLUTION project:

- It is normal that there is no camera file. Interior values are imported from the DVP files, and may not be changed.
- If the file names appear in red, use **Modify Paths** to locate the images.
- The images remained in their original location. That is, the images have not moved to the **Output Folder** if it is different from their original folder. If desired, move them and use **Modify Paths** to set the new location.

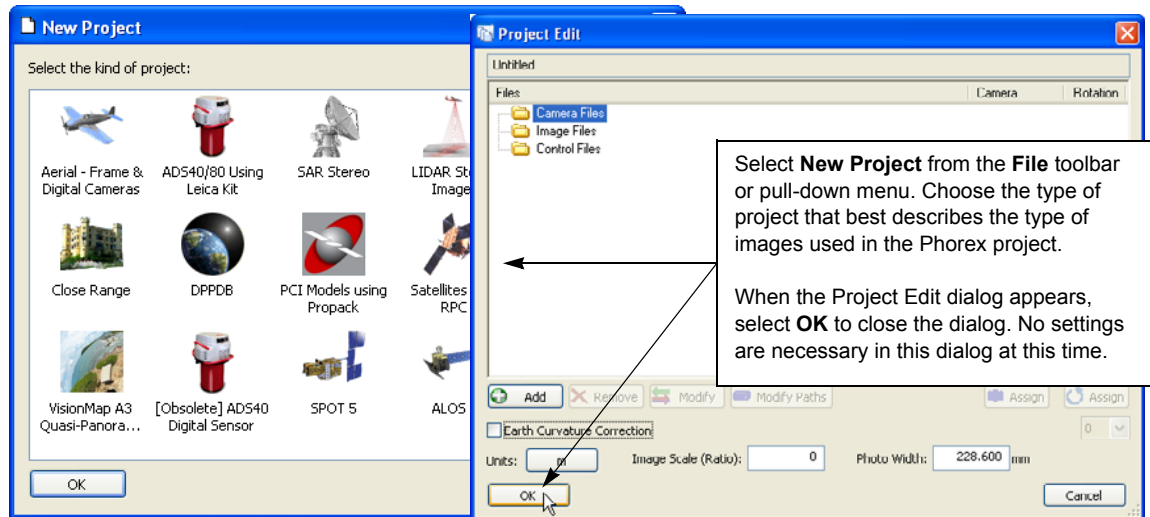


Import Phorex Interchange Files

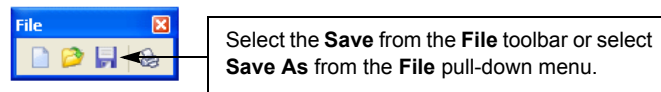
SUMMIT EVOLUTION offers the ability to convert and import Phorex 1 and 2 **.cam** and **.pho/.pex** files. Note that Zeiss Phorex file formats are not all the same. This SUMMIT EVOLUTION import utility was designed to work with Phorex files produced by Inpho's MATCH-AT software.

Perform the following steps to convert the Phorex **.cam** file to SUMMIT EVOLUTION's camera file format and import the Phorex **.pho** file:

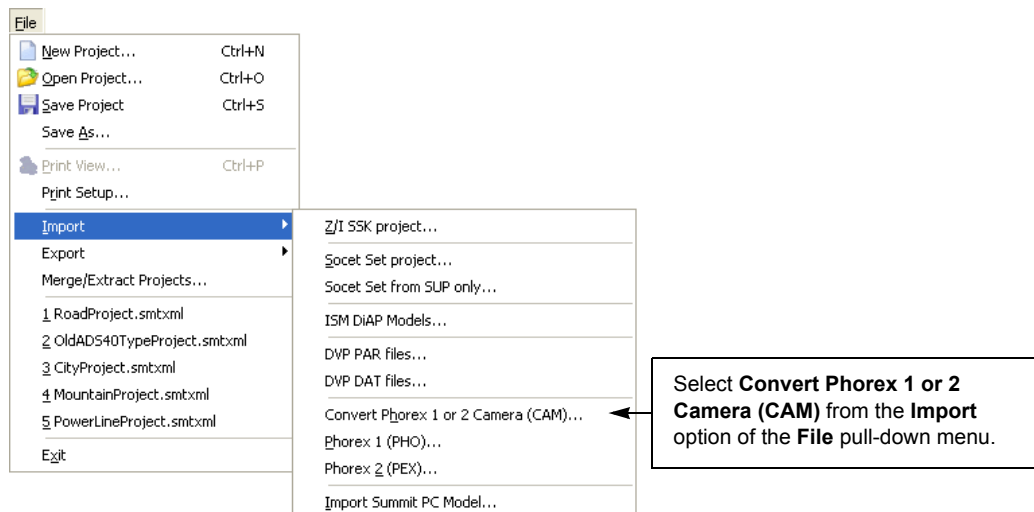
- Step 1)** Start a new project. Select **New Project** from the **File** toolbar or pull-down menu. Choose the type of project that best describes the type of images used in the Phorex project:



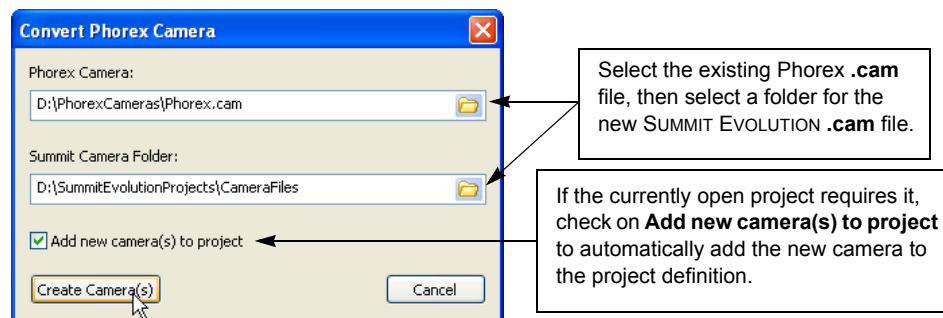
- Step 2)** Select **Save** or **Save As** from the **File** toolbar or pull-down menu. Give the new project a name.



- Step 3)** Select **Convert Phorex 1 Camera (CAM)** from the **Import** option of the **File** pull-down menu.



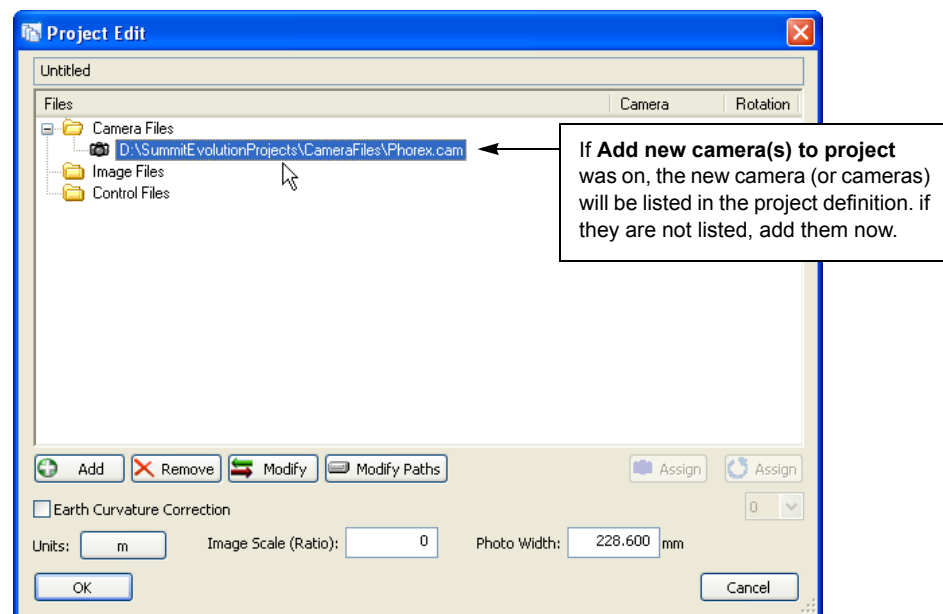
- Step 4)** Select the Phorex **.cam** file, then choose a file folder and name for the new SUMMIT EVOLUTION camera file(s). Note that if the Phorex camera file contains information about more than one camera, a separate SUMMIT EVOLUTION camera file will be made for each camera.
- The camera file extension is **.cam** for a Phorex camera file. The file extension may be either **.cam** or **.camera** for a SUMMIT EVOLUTION camera file.
 - The file names and extensions may be the same as long as the folders are different.
 - The folder for the new SUMMIT EVOLUTION **.cam** file must already exist.
- Step 5)** To automatically add the new camera file(s) to the current project, check on **Add new camera(s) to project**. If the currently open project does not require these camera files, then do not check this setting; it may be added later to any open project from the Project Edit dialog box.



Step 6) Select the **Create Camera(s)** button.

Step 7) Select **Cancel** when finished.

Step 8) If **Add new camera(s) to project** was on, notice that the camera files are now shown in the Project Edit camera list. If it was not added automatically, then add it now manually (see page 7-3):

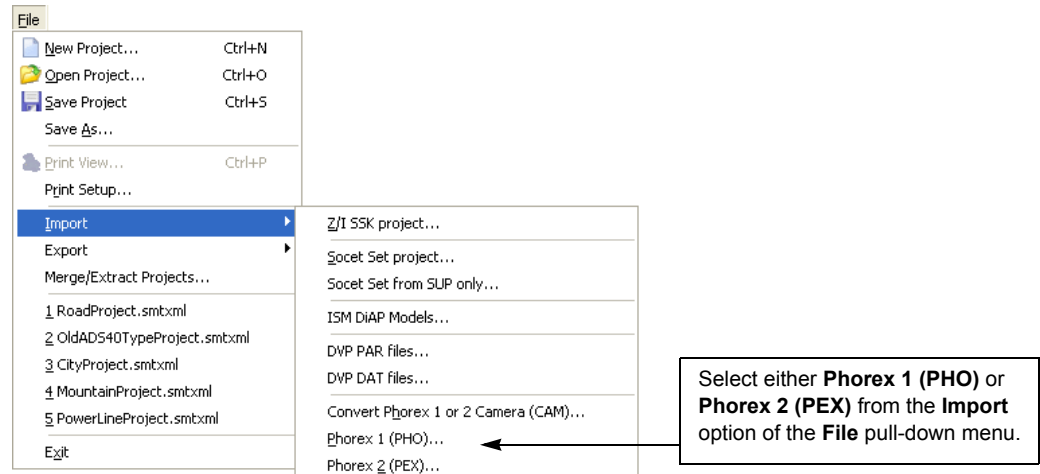


Step 9) Specify all image files names in the project (Step 4 through Step 5 starting on page 7-4).

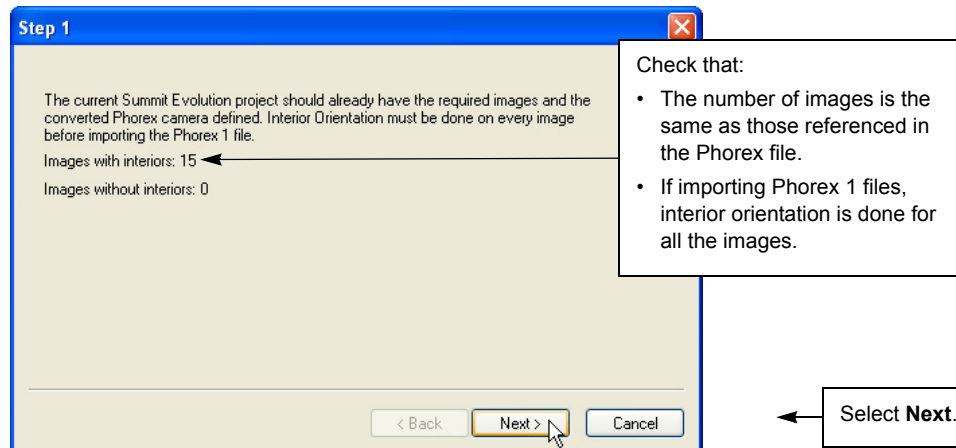
In order to automatically create model definitions, do not change the image names very much from the image names used when the Phorex **.pho** file was created. Additional leading alpha-numeric characters are ignored, but numeric file name components should not be changed. For example, an image called **12345** in the **.pho** file may be called **Image12345.smti** in the SUMMIT EVOLUTION project file, but don't rename the file to **East45.smti**. If the file names are very different, the images must be matched manually.

Step 10) If importing Phorex 1 files, perform SUMMIT EVOLUTION's interior orientation, automatic (page 18-1) or manual method (page 18-7) for all the images. (This is not necessary for Phorex 2 files.)

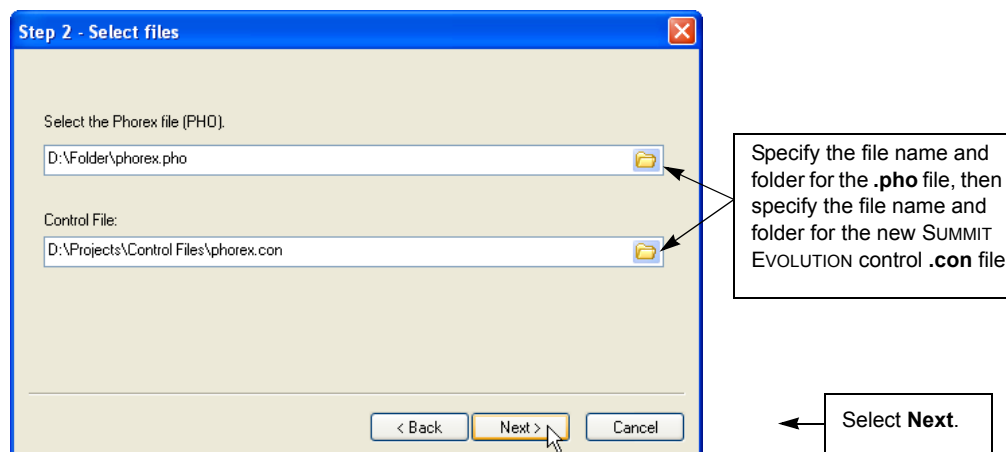
Step 11) Select either **Phorex 1 (PHO)** or **Phorex 2 (PEX)** from the **Import** option of the **File** menu:



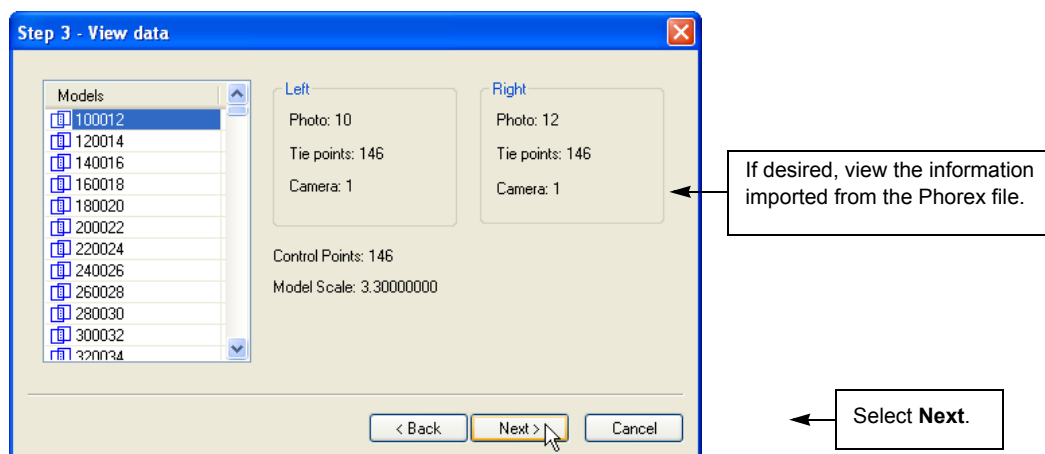
Step 12) Check the display that is shown in the Step 1 dialog box:



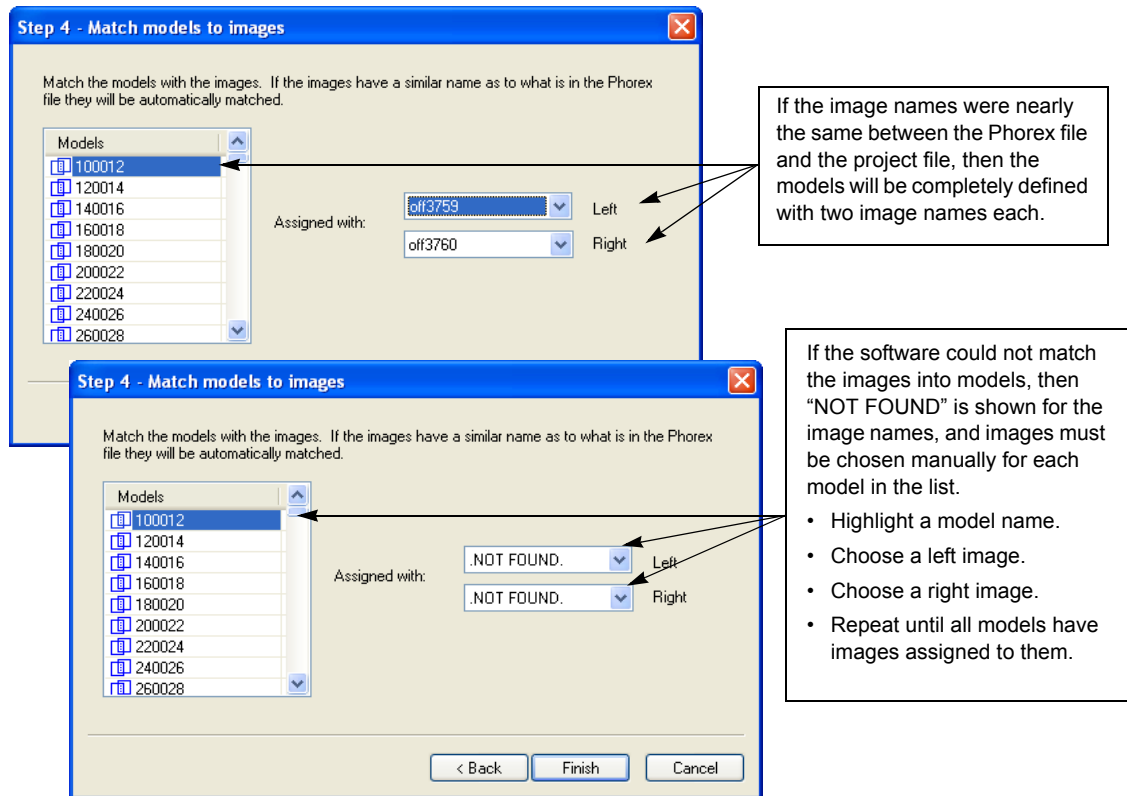
Step 13) Specify the file name and folder for the **.pho** or **.pex** file, then specify the file name and folder for the new SUMMIT EVOLUTION control **.con** file:



Step 14) For Phorex 1 files, view the imported data, then select **Next**:



Step 15) The next step shows a set of model names and a display of the images that make up each model. If the image names were nearly the same between the Phorex file and the project file, then the models will be completely defined with two image names each. If the software could not match the images into models, then “NOT FOUND” is shown for the image names, and images must be chosen manually. To choose the images manually, highlight the model name, select a left image, then select a right image. Repeat until all images have been matched to model names.



Step 16) When all models have two images assigned to them, select **Finish**. Orientation is then complete and digitizing may begin.

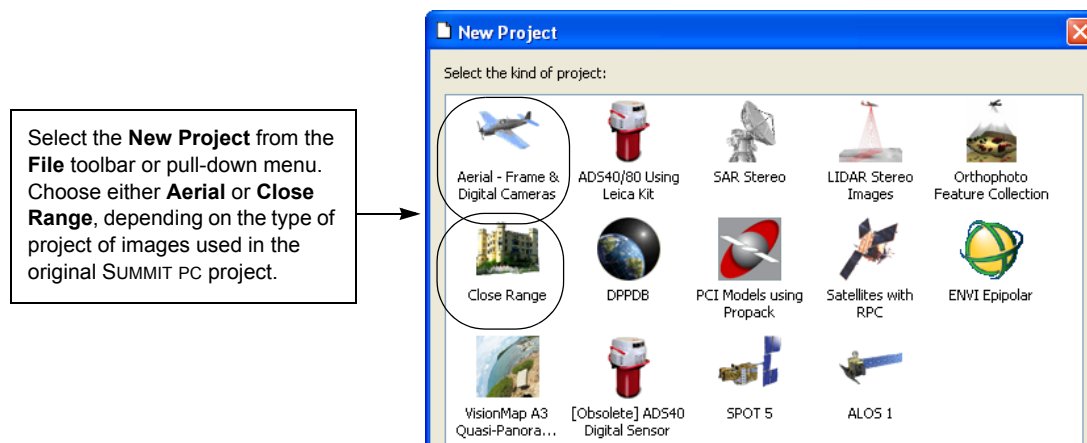
Import Summit PC Models

When importing a SUMMIT PC **.mod** model into SUMMIT EVOLUTION, keep in mind the following hints:

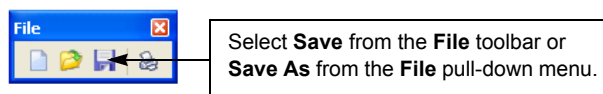
- The import process automatically creates one **.smti** image from each set of separate SUMMIT PC image pyramid files.
- This import option *adds* one or more models to the *currently open* project. This is the only import option that processes by selected models (rather than an entire project) and does not close the currently open project before starting the import. This enables the user to add more SUMMIT PC models as needed to the SUMMIT EVOLUTION project.
- If possible, the image, camera, bird's-eye, and control files listed in the SUMMIT PC models should be located in their original folders.

To import one or more SUMMIT PC models, perform the following steps:

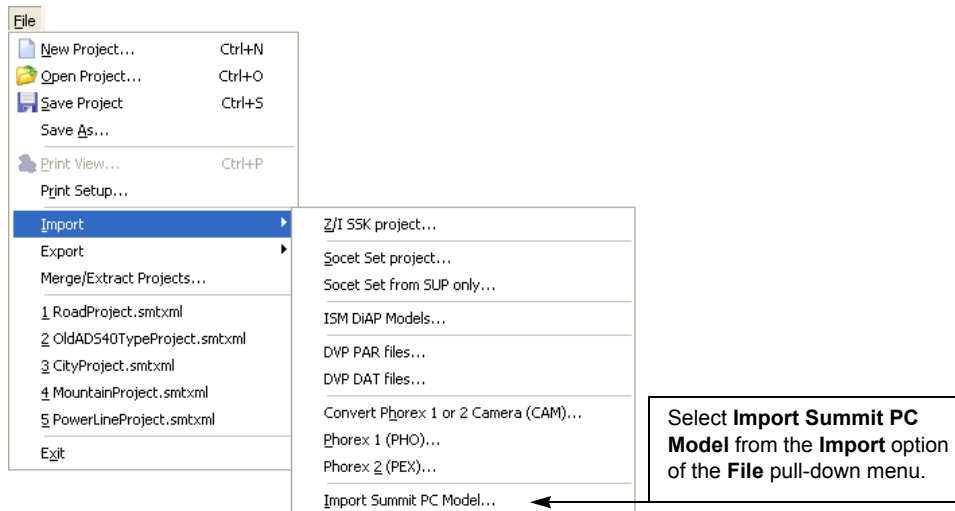
Step 1) Select **New Project** from the **File** toolbar or pull-down menu. Choose either **Aerial Project** or **Close Range**, depending on the type of images used in the original SUMMIT PC project:



Step 2) Select **Save** or **Save As** from the **File** toolbar or pull-down menu. Give the new project a name.



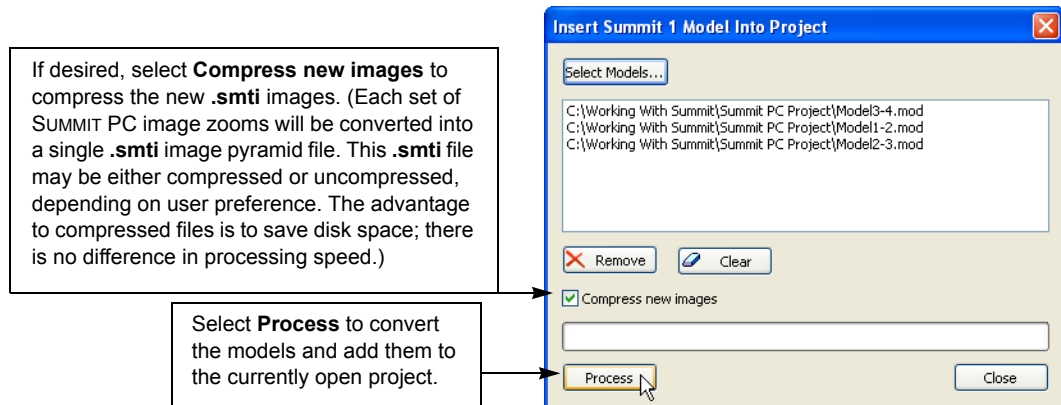
Step 3) Select **Import Summit PC Model** from the **Import** option of the **File** pull-down menu:



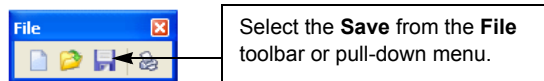
Step 4) Select the **Select Models** button to browse for and select SUMMIT PC models.

- One or more models may be selected.
- Multiple models may be selected by holding down the <Ctrl> key and clicking on each .mod model file.
- The **Select Models** button may be used as many times as necessary.
- To remove a model, highlight its line in the list and select the **Delete** button. Or, to remove all the models from the list, select the **Clear** button.

- Step 5)** When the model list is complete, select the **Process** button. Each of the selected models along with the models' camera and control files will be added to the currently open SUMMIT EVOLUTION project.



- Step 6)** If the project requires editing, such as to sort the images, specify different folders, or edit the imported project specifications, follow the directions starting on page 7-11.
- Step 7)** If the import was successful, save the project file again. Select **Save** from the **File** toolbar or pull-down menu.



Merge and Extract Summit Evolution Projects

Existing SUMMIT EVOLUTION **.smtxml** and pre-version-6.1 **.smtprj** projects can be imported, merged together or parts extracted, then exported to a new **.smtxml** file (page 15-19).

When merging projects, be aware of the following:

- Input projects must be of the same type, such as all aerial or all ADS40 Kit. “Aerial” projects include Aerial Project, DMC, UltraCam, and DiMAC project types.
- If there is a coordinate transformation applied to one project, the same transformation should be applied to all the projects before merging. Two projects are not considered to be in the same coordinate system if one is being actively transformed into a coordinate system, but the other project is already in that coordinate system and does not have coordinate transformation turned on.
- If merging projects that have different cameras, make sure the camera file names are also different. For example, problems will occur if two cameras are physically different instruments, but their camera files are both named **camera.cam**.
- If merging projects that have files *other than camera files* that have the same file names, make sure the files remain in different folders. For example, two different files called **control.con** could exist in the merged project as long as their paths were different.

To merge or extract parts of projects, perform the following steps:

- Step 1)** Open your choice of Windows file browser. For example, select **My Computer** from the Windows **Start** menu. Browse to the folder(s) where the **.smtxml** and/or **.smtprj** files are stored.

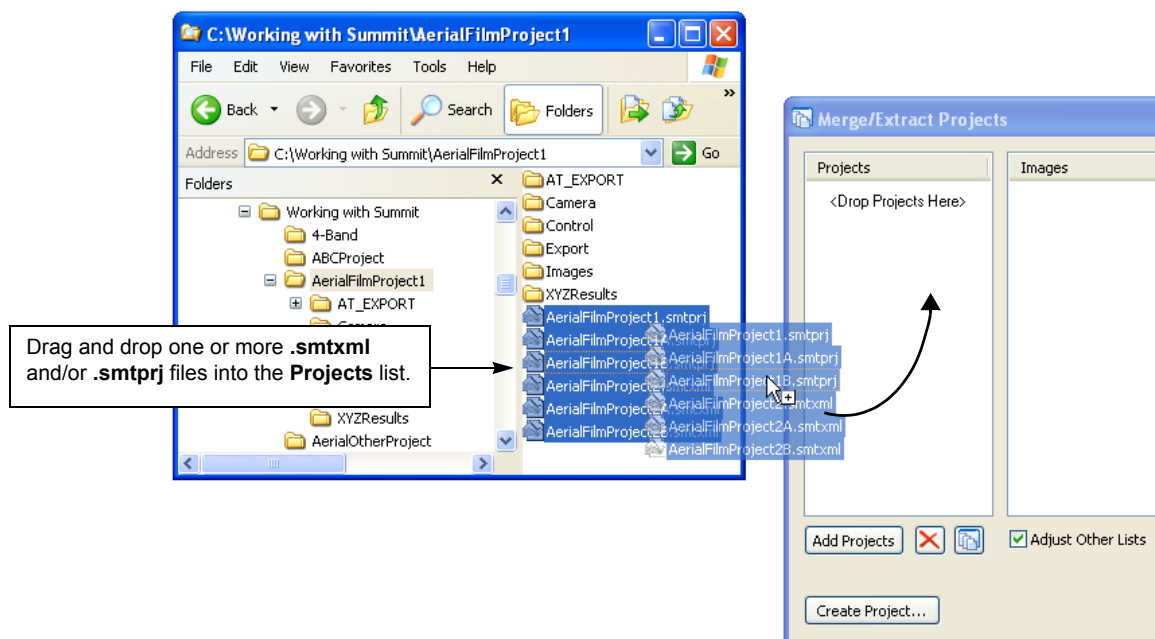
Step 2) Select **Merge/Extract Projects** from the **File** pull-down menu in SUMMIT EVOLUTION.

The application that appears is independent of any project that might be open in SUMMIT EVOLUTION, and will not affect the open project; however, if SUMMIT EVOLUTION's currently open project will be used by the Merge/Extract tool, be sure to save it now so that the most current version is on the disk.

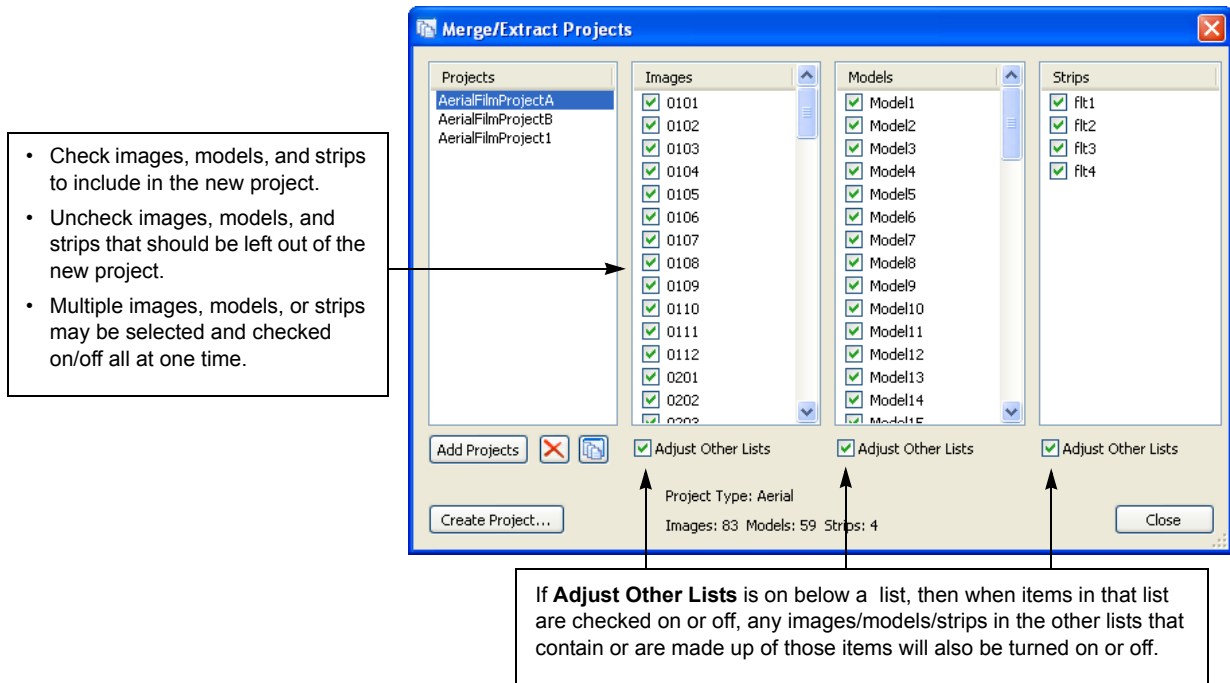
Step 3) From the Windows file browser, drag and drop one or more **.smtxml** and/or **.smtprj** files onto the **Projects** list in the Merge/Extract Projects dialog.

- To extract parts of a single project, drag that one project onto the **Projects** list.
- To merge and/or extract parts of multiple projects, drag two or more projects onto the **Projects** list. The projects must all be of the same type, such as all aerial projects. "Aerial" projects that may be combined include Aerial Project, DMC, UltraCam, and DiMAC types. All other project types must match each other exactly, or the merge process will refuse to combine them. (To verify a project's type, open the project in SUMMIT EVOLUTION. The project type will be shown in corner brackets, [], in the title bar:

ColorProject.smtxml[Aerial] DAT/EM Summit Evolution



Step 4) Check on the images, models, and strips to include in the new project. Uncheck any that should be left out.



Step 5) When the lists are ready, select **Create Project**.

Step 6) Enter the new project's file name in the Save As dialog.

The new project is created immediately. The output file extension is always **.smtxml**, even if the input files were pre-version-6.1 **.smtprj**. It is not opened automatically in SUMMIT EVOLUTION.

Step 7) If desired, open the new project and review its components in the Project Edit dialog. Some common items to review are:

- If the project type should have multiple camera files, are all the camera files listed? Do they all have different file names? If any two cameras have the same file names, the images may have trouble referencing to the correct camera.
- Are all the images there? If they are not, it could be that the input projects were not of the same type.
- Is there a coordinate transformation applied, and is it the correct one? Be aware that there can be only one coordinate transformation selection, and it will be applied to all parts of the project.

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Chapter 16. Define Models/Strips and Edit Project Definitions

The SUMMIT EVOLUTION™ **.smtxml** project file contains a list of all the project settings such as image names, orientation values, control point files, and camera file names. It also contains any model and strip definitions that have been made using the Project window. This chapter shows how to:

- Use the **Project** window to add model definitions to the project file (below)
- Use the **Project** window to edit, view, and use models (page 16-5)
- Use the **Project** window to add strip definitions to the project file (page 16-10)
- Use the **Project** window to edit, view, and use strips (page 16-11)
- Use the **Project** window (page 16-13) and the **Project Edit** dialog (page 16-15) to edit project file definitions.

Group Images Into Models

There are several reasons to group the images into models:

- Models are required in order to run Automatic Relative Orientation (Auto RO).
- Models are required to export to and run third-party aerotriangulation (AT) software.
- Model definitions enable the **Automatically load next model when outside stereo region** setting to work. This setting is found on the **Project** tab of the **Options** dialog.
- Models are simply convenient, because both right and left images can be opened by picking on the model name in the **Project** window.

Models may be made for any project that has stereo imagery. Do not build models for orthophoto projects.

To build models, perform the following steps:

- Step 1)** Open, create, or import the **smtprj** project file. Two or more images that form a stereo overlap area must be defined in the project. The project must be open in SUMMIT EVOLUTION.
- Step 2)** If the window is not currently displayed, select **Project Window** from the **View** menu. The window may be docked or undocked, pinned or unpinned; if pinned, hover the system mouse cursor over its tab to display it.
- Step 3)** Select the **Models** tab from the Project Window.

Step 4) Group the project images into models using either the automatic or manual method:

- a.) In most cases, the images may be paired into models automatically. To do this, select “the hammer” **Generate Models** icon and make settings in the Generate Models dialog:

Any stereo project type must be open. This includes any project type except Orthophoto.

Hint: If you can't see this window, select **Project Window** from the **View** pull-down menu.

Or, if it is pinned to the edge of the window, hover the system mouse over the **Project** tab to expand it.

To automatically pair images into models, select “the hammer” **Generate Models** icon.

Select a model generation method:

- Use **Match exteriors** if the images already have exterior orientation measurements. This option is especially useful for Applanix users after completing interior orientations and importing the Applanix camera exteriors.
- Use **By image order** if the images are listed in order on the **Images** tab. Note that this method will create an extra model out of the end image of one strip and first image of the next strip. Any incorrect models may be deleted later.

Select a naming method for the models.

- Select **Numeric** to make models using integer numbers. Enter a **Start** number. For example, if the start number is 5, then the models will be called 5-6, 6-7, 7-8, 8-9, and so on.
- Select **From image names** to use the original image names in the model name. For example, if the original images are called 456LMN.smti and 987OPQ.smti, then the model name will be 456LMN-987OPQ.

Check on **Don't regenerate already created models** if some models have already been created, and you want to keep those models. This setting may be helpful if you are adding new models to an existing project.

Check on **Only images that have an exterior** to prevent making models out of images that do not have an exterior orientation.

Set a **Minimum Overlap** value. This depends on the project, but in general:

- An overlap of 20 includes corner overlap models.
- An overlap of 25 to 45 includes side overlap models, but excludes corner overlap models.
- An overlap of 50 to 90 includes only traditional models with a large stereo viewing area.

Enter a best guess of the average Z value in the project or accept the default.

Generate Models

Model Generation:

- ☒ Match exteriors Z: 497.110 Minimum Overlap: 50
- ☐ By image order

Naming:

- ☐ Numeric Start: 0
- ☒ From image names

Options:

- ☒ Don't regenerate already created models
- ☒ Only images that have an exterior

OK Cancel

The **Generate Models** Dialog varies depending on the type of project. See ADS40/80 below.

Select a model generation method:

- **Match using SUP (recommended):** This method matches images according to information found in their **.sup** files.
- **Image overlap:** Use this method only if **Match using SUP** fails to find all the models that you wish to see.

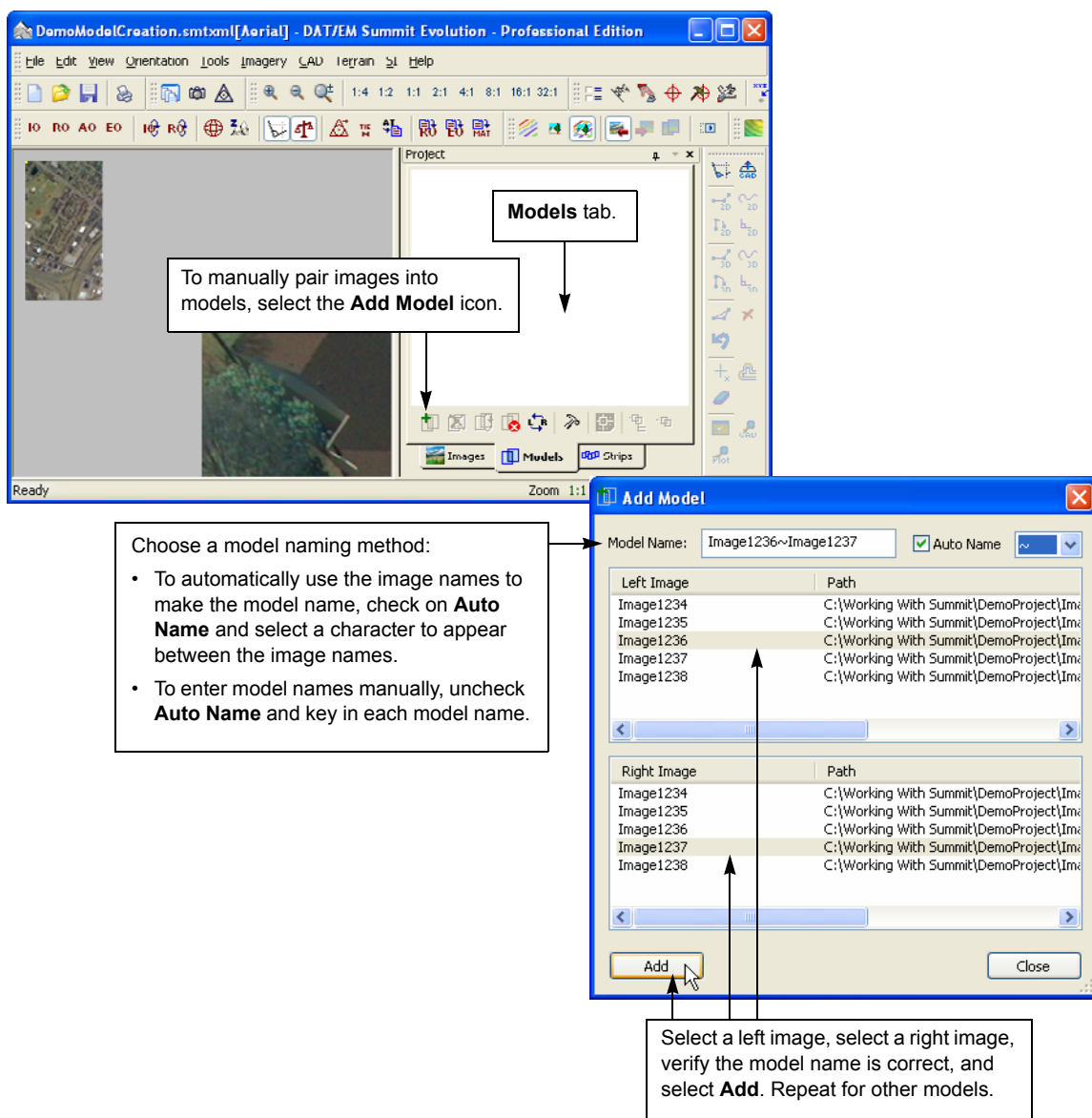
- **Combine Blocks** on creates one model at the start of every block. If this setting is on, please also turn on **Combine Split Imagery Blocks** in the Project Edit dialog (Step 10 on page 8-7). Then when this model end is opened, the entire block will appear.
- **Combine Blocks** off creates an individual block definition for each image set in the split imagery block.

Select a naming method for the models.

- **Numeric** makes models using integer numbers. Enter a **Start** number. For example, if the start number is 5, then the models will be called 5-6, 6-7, 7-8, 8-9, and so on.
- **From image names** uses the original image names in the model name. Despite the long file names in ADS40/80, this is often the best choice.

ADS40/80 Projects

- b.) To manually specify model pairs, select the **Add Model** icon. Choose a naming method, select the left image, select the right image, and select **Add**. Repeat for the remaining models.



Step 5) To save changes to the project file, select **Save** from the **File** toolbar or pull-down menu.



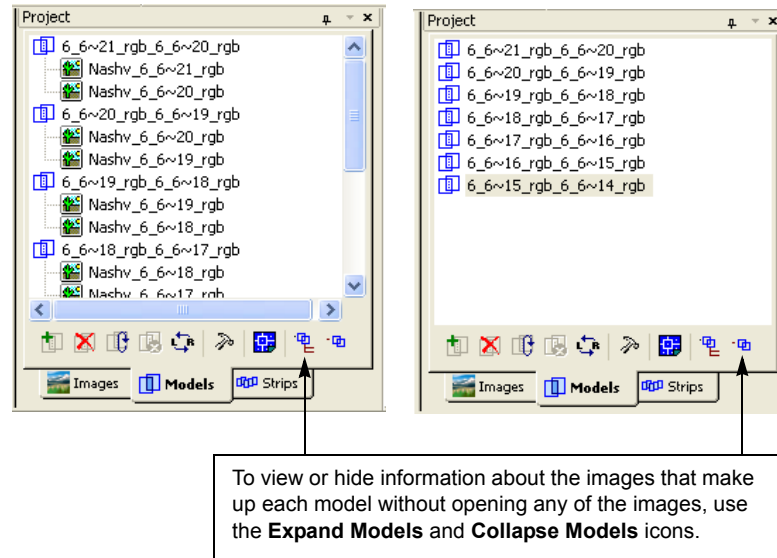
Select **Save** from the **File** toolbar or pull-down menu.

Edit, View, and Use Existing Models

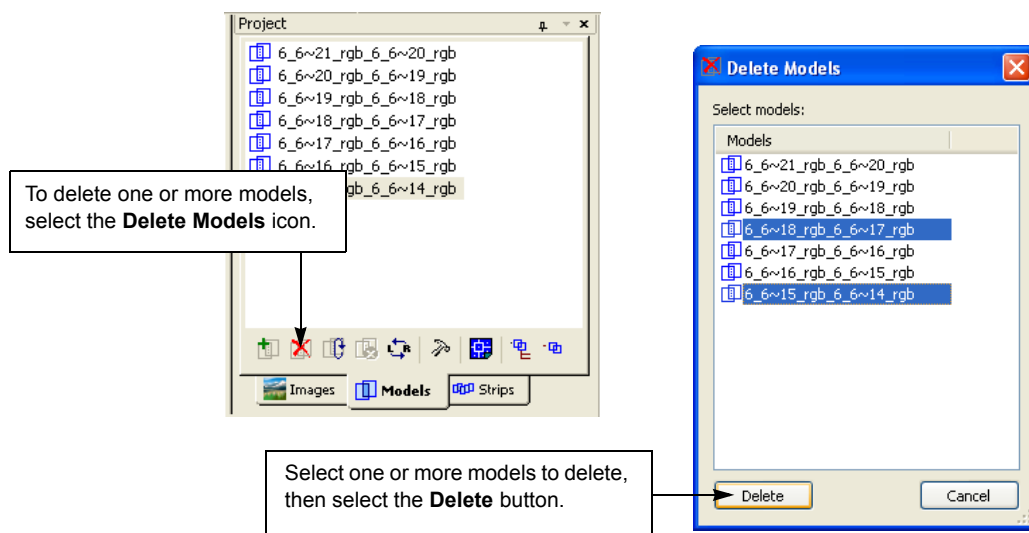
After models have been created, there are several options to edit, view, and use model definitions.

To edit, view, and use models from the **Project** window, perform the following steps:

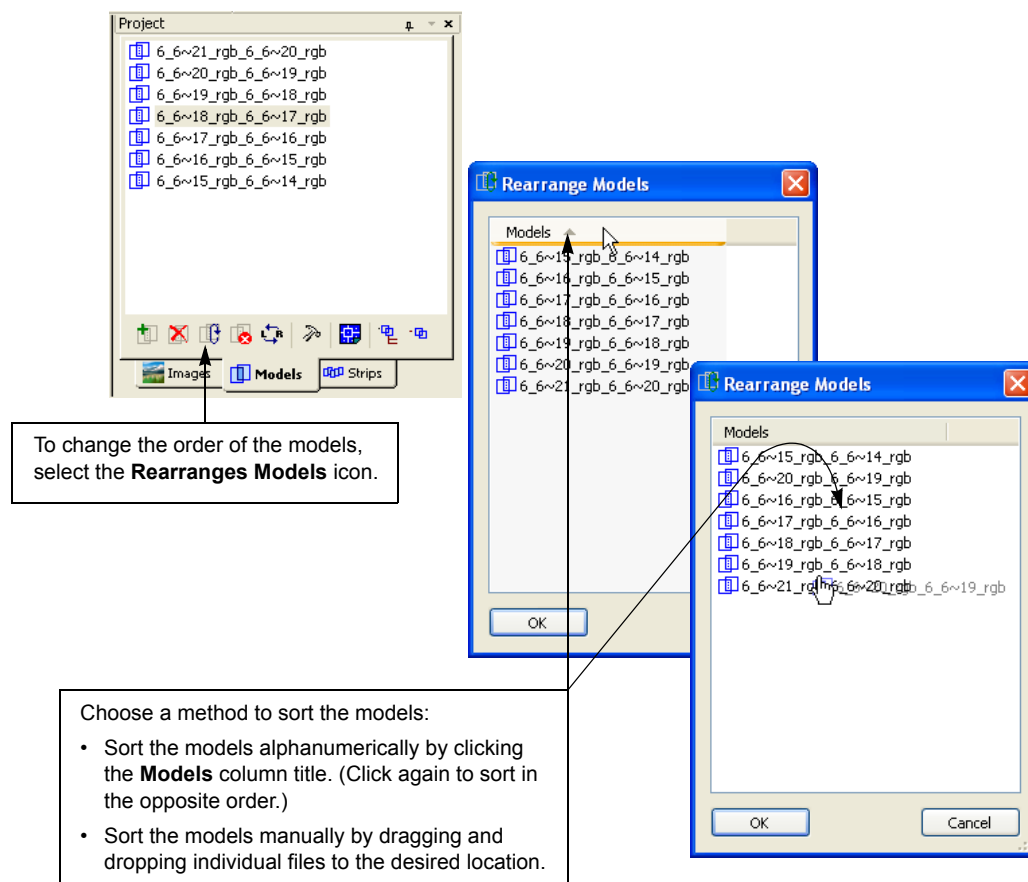
- Step 1)** Open, create, or import the **smtxml** project file. Two or more images that form a stereo overlap area must be defined in the project. The project must be open in SUMMIT EVOLUTION.
- Step 2)** If the window is not currently displayed, select **Project Window** from the **View** menu. The window may be docked or undocked, pinned or unpinned; if pinned, hover the system mouse cursor over its tab to display it.
- Step 3)** Select the **Models** tab from the Project Window.
- Step 4)** If models don't already exist, see "Group Images Into Models" on page 16-1 above.
- Step 5)** Choose any of the following model options:
 - a.) **To view or hide information about the models** shown on the **Models** tab without opening the files, use the **Expand Models** and **Collapse Models** icons. (Note that double clicking on the model name is another way to show the tree information, but the model images will also be opened.)



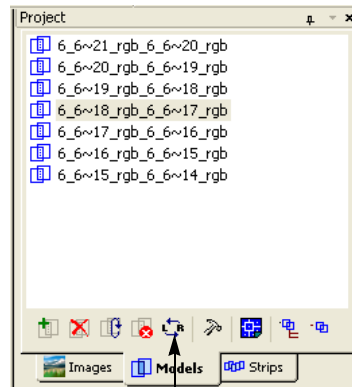
- b.) **To delete one or more models** from the list, select the **Delete Models** icon, select one or more models to delete, and select the **Delete** button.



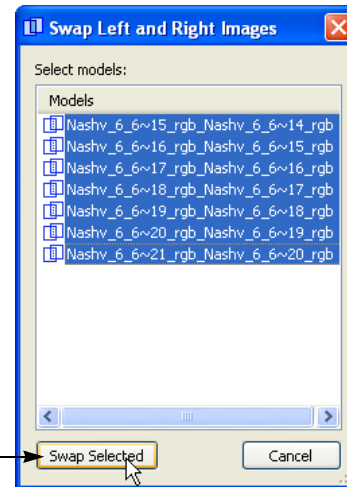
- c.) **To rearrange the order of the models**, select the **Rearranges Models** icon. Sort by clicking on the **Models** column title or drag and drop files into a different order.



- d.) **To swap the left and right image order** in an existing model, select the **Swap Left and Right Images** icon.



To swap the left and right image order in an incorrectly ordered model, select the **Swap Left and Right Images** icon.

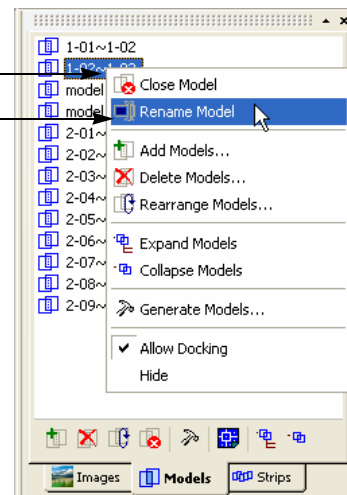


Select the models and select the **Swap Selected** button.

Note that the model name may not change, but the two images that make up the model will change order. The results can be viewed with the expanded view setting shown in Step 5.

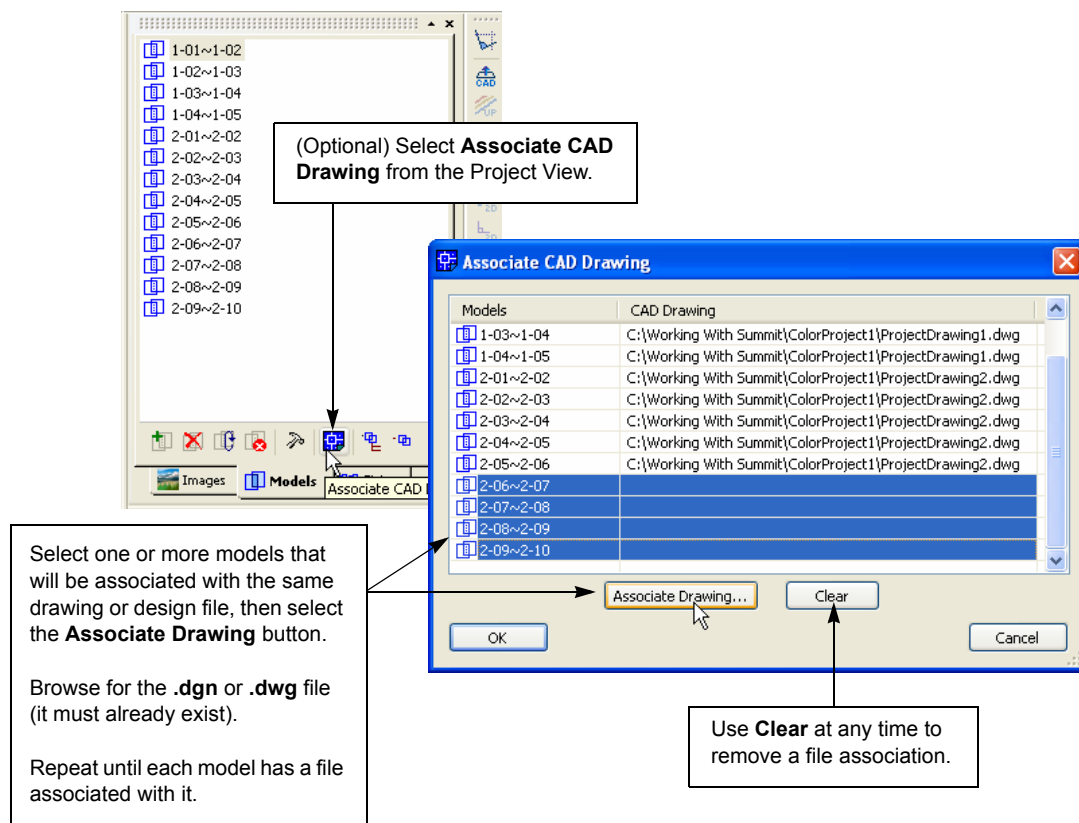
- e.) **To rename a model**, right click on the model name in the Project Window, select **Rename model**, and enter the new name. Use the mouse to position the cursor (the arrow keys will not position the cursor, because they are active in the stereo view).

To rename a model, right click on the model name, select **Rename Model** from the menu, and edit the name. Use the system mouse to position the cursor in the character line.

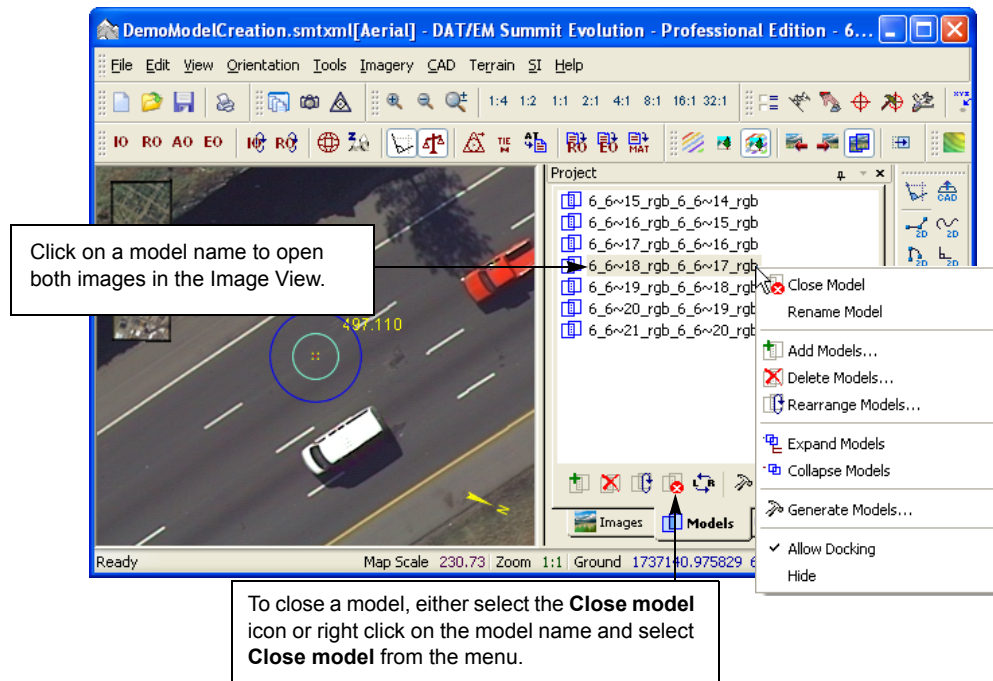


f.) To associate AutoCAD or MicroStation files with models, select **Associate CAD Drawing** from the **Models** tab. Highlight one or more models, select **Associate drawing**, and browse for the specific drawing or design file (the file must already exist). Note the following about file association:

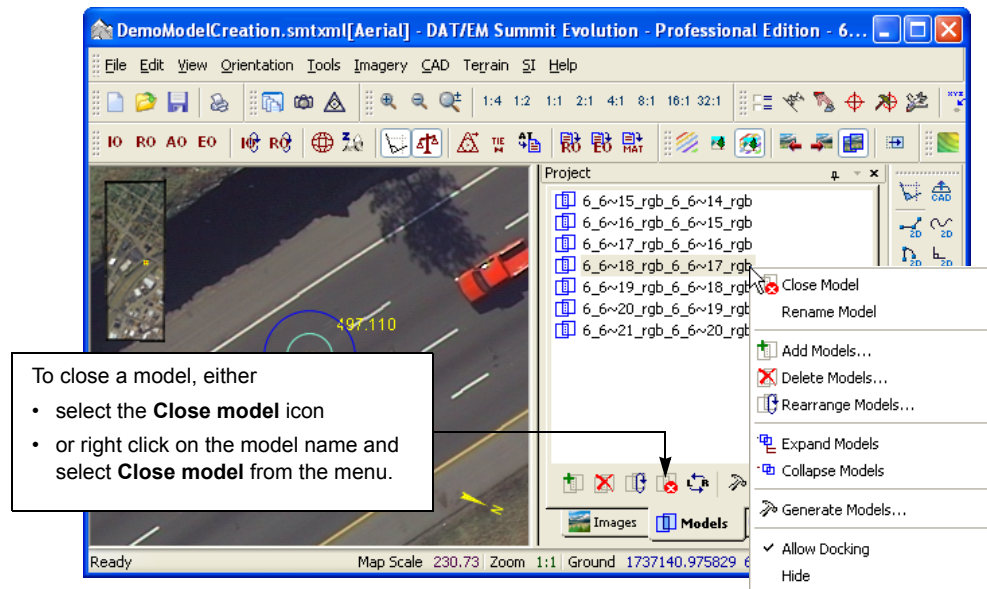
- CAD file associations may be set or cleared at any time.
- This function does not apply to ArcGIS files with DAT/EM CAPTURE for ArcGIS. It works for AutoCAD and MicroStation only.
- If a drawing or design is associated with a model, SUMMIT EVOLUTION forces AutoCAD or MicroStation to open that file when the model is opened.
- If AutoCAD or MicroStation is not yet running, SUMMIT EVOLUTION's **CAD to front** option on the **CAD Commands** toolbar starts the most recently used CAD application and tries to open the associated drawing or design. This process will not work well if the associated file type does not match the most recently used CAD application. For AutoCAD, it will not open the file if AutoCAD is set to display an opening dialog. In either of these cases, simply open the correct CAD application and file manually.



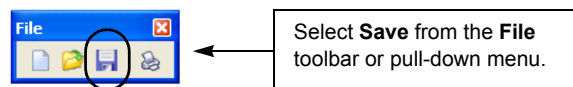
- g.) **To open a model**, click on a model name in the Project Window.



- h.) **To close a model**, either select **Close Model** from the **Models** tab or right click on the model name and select **Close model** from the menu.



- Step 6)** To save changes to the project file, select **Save** from the **File** toolbar or pull-down menu.



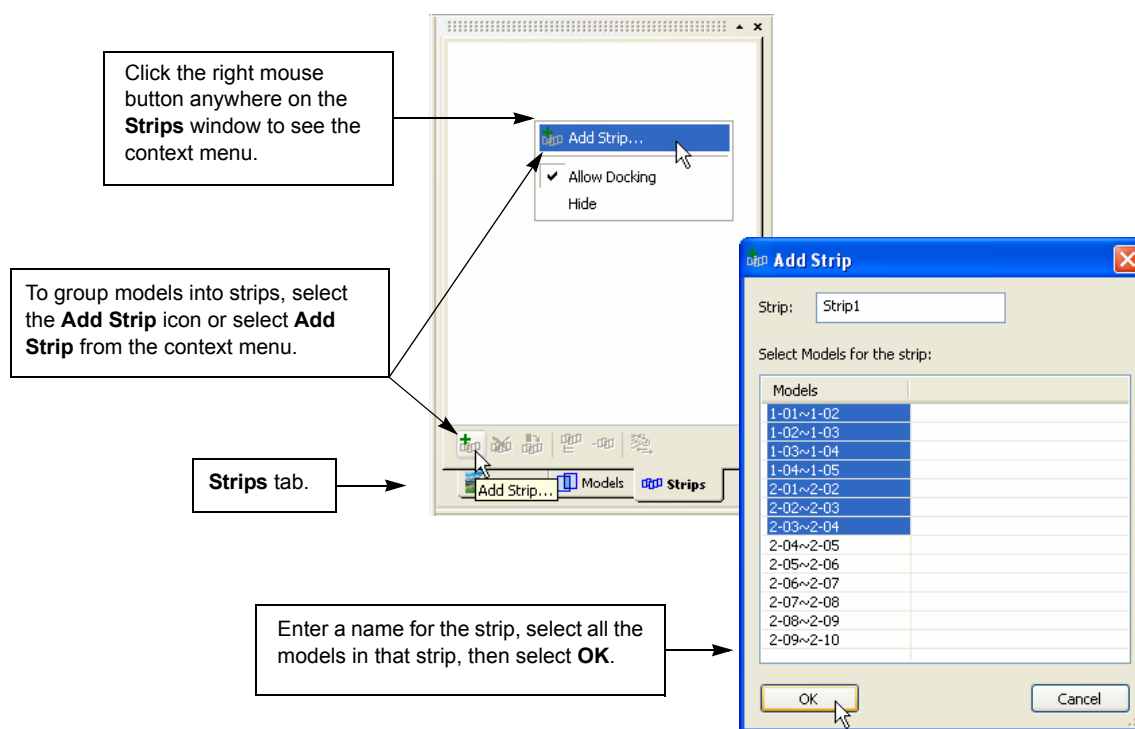
Group Models Into Strips

Grouping models into strips is required in the following cases:

- For the user's convenience. It may be useful to see which images and models are in a certain strip.
- To export to or import from a third-party aerotriangulation (AT) package. Some AT packages require strip definitions to be present.

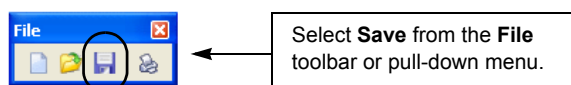
To create strips from the **Project** window, perform the following steps:

- Step 1)** Open, create, or import the **smtxml** project file. Two or more images that form a stereo overlap area must be defined in the project. The project must be open in SUMMIT EVOLUTION.
- Step 2)** If the window is not currently displayed, select **Project** window from the **View** menu. The window may be docked or undocked, pinned or unpinned; if pinned, hover the system mouse cursor over its tab to display it.
- Step 3)** Select the **Models** tab from the **Project** window. Before strips can be defined, there must be model definitions listed on this tab, and the model definitions must be correct. If models don't already exist or to make changes to the models, see "Group Images Into Models" on page 16-1 and "Edit, View, and Use Existing Models" on page 16-5.
- Step 4)** Select the **Strips** tab from the Project Window.
- Step 5)** Select the **Add Strip** icon or select **Add Strip** from the context menu. Enter a name for the strip, select all the models in the strip, and select **OK**.



Step 6) Repeat adding strips until all the models in the strip have been included.

Step 7) To save changes to the project file, select **Save** from the **File** toolbar or pull-down menu.



Edit, View, and Use Existing Strips

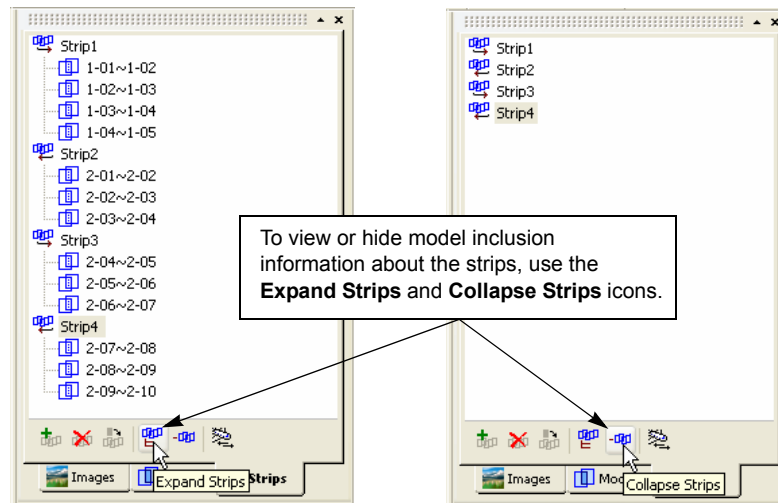
After strips have been created, there are several options to edit, view, and use strip definitions.

To edit, view, and use strips from the **Project** window, perform the following steps:

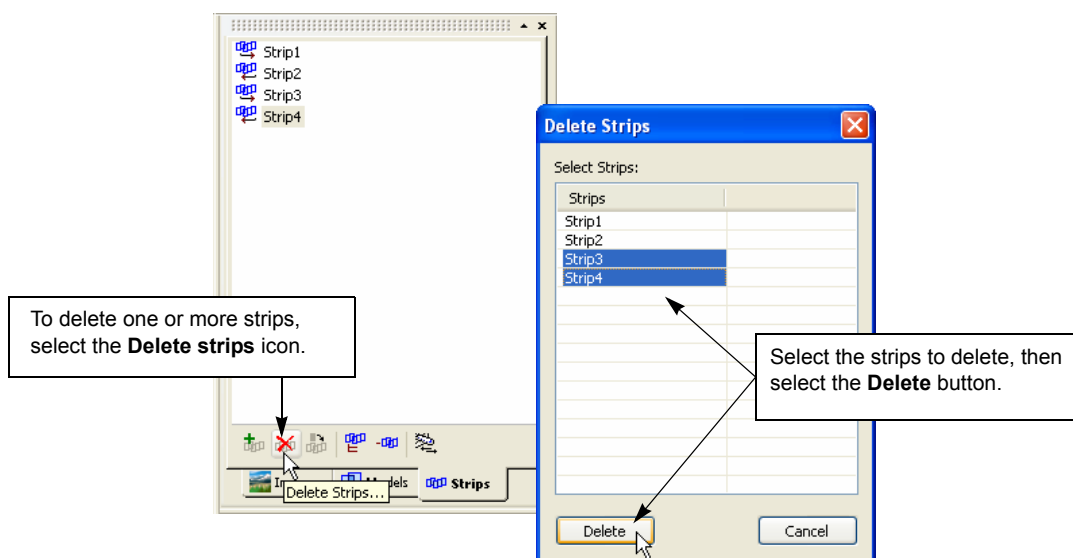
- Step 1)** Open, create, or import the **smtxml** project file. Two or more images that form a stereo overlap area must be defined in the project. The project must be open in SUMMIT EVOLUTION.
- Step 2)** If the window is not currently displayed, select **Project** window from the **View** menu. The window may be docked or undocked, pinned or unpinned; if pinned, hover the system mouse cursor over its tab to display it.
- Step 3)** Select the **Models** tab from the **Project** window. Before strips can be defined or edited, there must be model definitions listed on this tab, and the model definitions must be correct. If models don't already exist or to make changes to the models, see "Group Images Into Models" on page 16-1 and "Edit, View, and Use Existing Models" on page 16-5.
- Step 4)** Select the **Strips** tab from the Project Window.
- Step 5)** If strips don't already exist, see "Group Models Into Strips" on page 16-10 above.
- Step 6)** Choose any of the following strip options:

Note about Flight Direction: Please note that the **Flight Direction** setting is considered obsolete. It is still available in case your 3rd-party aerotriangulation (AT) software requires it, but to DAT/EM's knowledge, it is no longer used. If your AT package requires it, please contact support@datem.com and let us know.

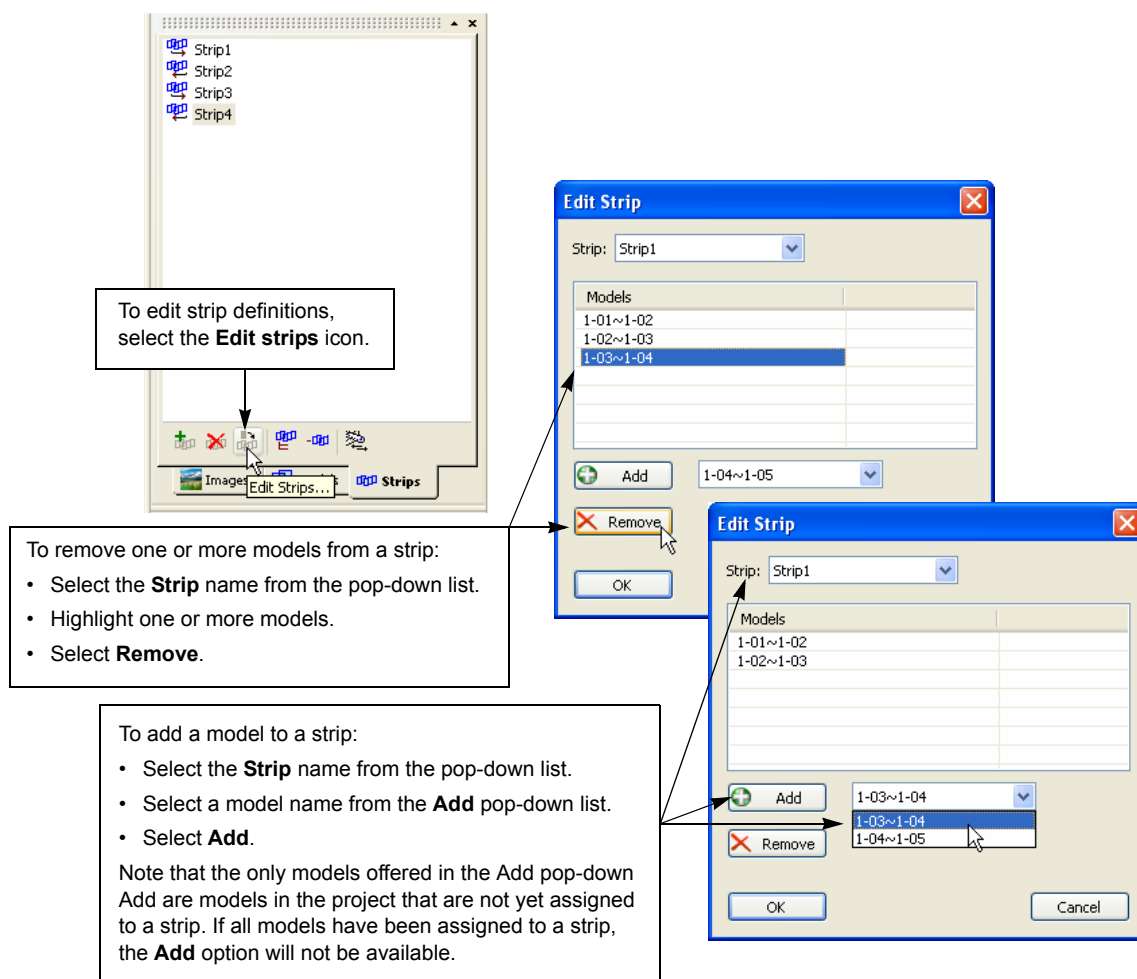
- a.) **To view or hide strip information**, use the **Fully expand the tree** and **Collapse the tree** icons. (Note that double clicking on the strip name is another way to show or hide the tree information.)



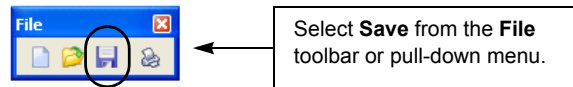
- b.) To delete one or more strips from the list, select the **Delete strips** icon:



- c.) To edit the strip definitions, select the **Edit strips** icon. Select a strip. Add and/or remove models from the selected strip.



Step 7) To save changes to the project file, select **Save** from the **File** toolbar or pull-down menu.



Edit Project Files

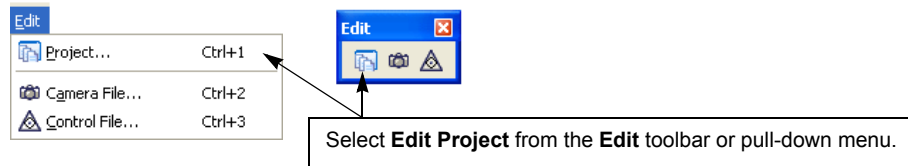
The SUMMIT EVOLUTION™ **.smtxml** project file contains a list of all the project settings such as image names, orientation values, control point files, and camera file names. It also contains any model and strip definitions that have been made using the **Project** window. This chapter shows how to edit project files using the **Project Edit** dialog and the **Project** window.

Use the Project Edit dialog to Edit the Project

The Project Edit dialog allows you to edit the main project settings such as the image list. The most common editing task is to modify the file paths after the project has been moved to a different drive.

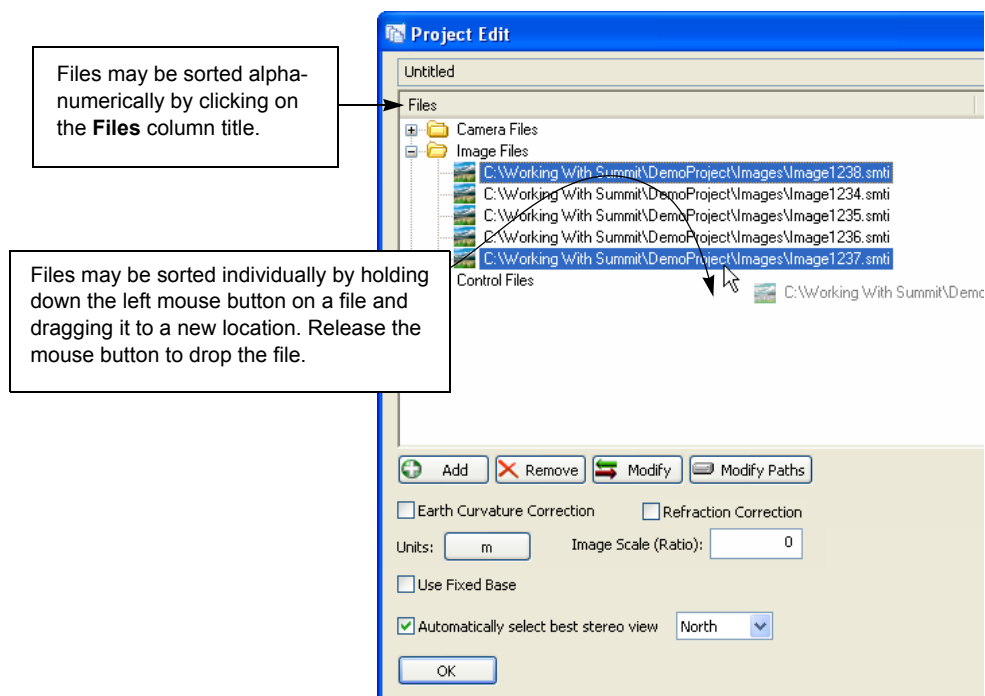
To use the Project Edit dialog to edit the project, perform the following steps:

Step 1) Select **Project** from the **Edit** menu or toolbar. This activates the Project Edit dialog for the currently open project. The dialog looks different depending on the type of project.



Step 2) Choose any of the following ways to edit the project:

- a.) **Add files** to the list. Select the **Add** or **Add multiple** button (availability of these buttons depends on the project). Add files exactly as was done during the initial project setup. This may not be available or advisable for imported projects.
- b.) **Delete files** from the list. Select the camera file(s), image file(s), or control file(s) in the respective file list and select the **Delete** button.
- c.) **Sort files** in the list. Choose one of the following methods:
 - From the Project Edit list, click the system mouse on the **Files** column title above the file list. This sorts the files alphanumerically.
 - From the Project Edit dialog, drag and drop the files. Click and hold down the mouse button on an image name, drag the file name to the correct position, and release the mouse button.



- d.) **Modify the path and/or file name for selected files.** If specific camera file(s), image file(s), or control file(s) has/have been renamed or moved to a new folder, highlight the file name(s) and select the **Modify** button to specify the new folder location.
- e.) **Modify the paths for groups of files.** If all the camera files, all the image files, and/or all the control files have been moved to a new folder, select the **Modify Paths** button and specify the new location. This dialog will ask for paths for the types of files included in the particular project type. Hint for ADS40/80: If you change the paths here, also use the **Update SUP File Paths** button to update the paths in the SUP files.
- f.) **For ADS40/80 only, edit the SUP file paths.** Use **Update SUP File Paths** any time the drive and/or folder location has changed for any of the ADS40/80 files. If the SUP files themselves have relocated, use **Modify Paths** first.
- g.) **Edit the coordinate system settings.** This can be done from the Project Edit dialog for ADS40/80, A³, satellites with RPC, ENVI, and DPPDB only. For all other project types, see "Orientation Menu > Coordinate Conversion" on page 25-28. **Note:** Changes to the coordinate system settings affect the output ground coordinates for the SUMMIT EVOLUTION cursor position; these settings will not translate previously digitized vector objects. Make all coordinate system settings *before* digitizing begins.
- h.) **For Aerial projects, edit the settings such as** camera and rotation assignments, **Earth Curvature Correction**, **Refraction Correction**, **Units**, **Image Scale**, **Use Fixed Base**, and **Automatically select best stereo view** settings. Use the dialog's "?" for descriptions of each setting.

Step 3) Save the file project after making changes. Select **Save** from the **File** toolbar or pull-down menu.



Select **Save** from the **File** toolbar or pull-down menu.

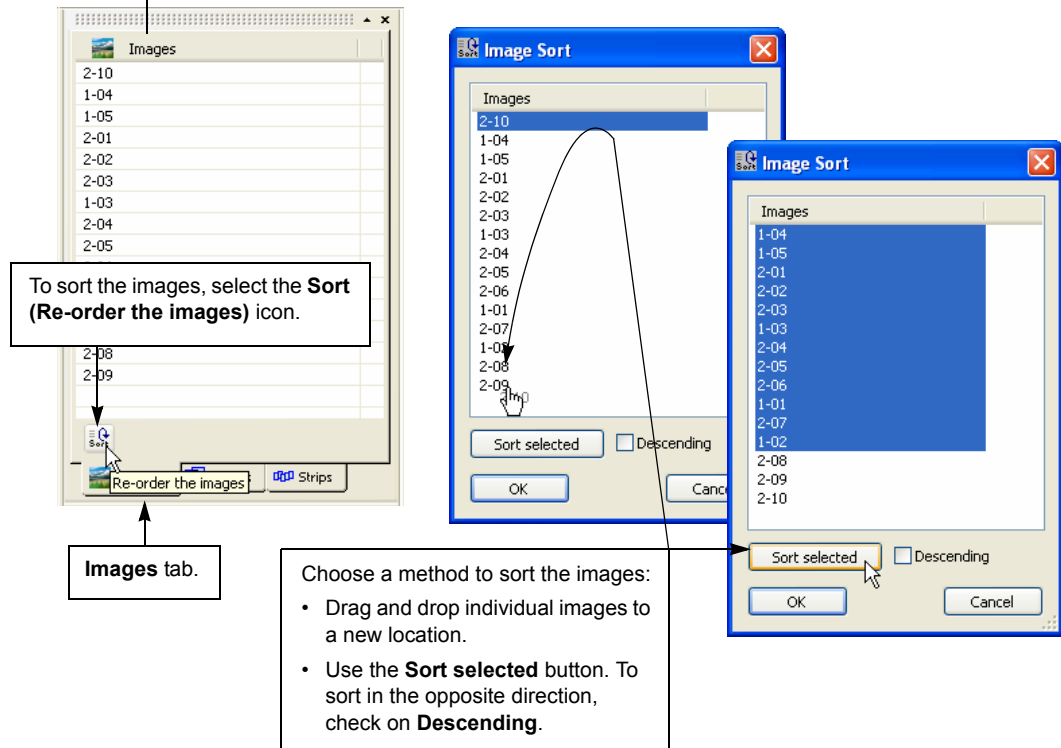
Use the Project Window to Edit Image Order, Models, and Strips

The Project window allows you to edit settings such as image list order, model definitions, and strip definitions. To use the Project window to edit project settings, perform the following steps:

- Step 1)** If the window is not currently displayed, select **Project** window from the **View** menu. The window may be docked or undocked, pinned or unpinned; if pinned, hover the system mouse cursor over its tab to display it.
- Step 2)** Choose any of the following methods to edit the project:
- Sort image files from the Images tab.** Click on the **Images** tab to select it. Select the **Sort** icon at the lower edge of the tab. Select the **Image** tab on the Project Window, then select the **Sort (Re-order the images)** icon. Sort the image names by dragging and dropping with the mouse or by using the **Sort selected** button.

Hint: If you can't see this window, select **Project Window** from the **View** pull-down menu.

Or, if it is pinned to the edge of the window, hover the system mouse over the **Project** tab to expand it.



- Delete, add, sort, or swap left-right direction for model definitions.** See "Group Images Into Models" on page 16-1 and "Edit, View, and Use Existing Models" on page 16-5.
- Add, delete, or edit the models in strip definitions.** See "Group Models Into Strips" on page 16-10 and "Edit, View, and Use Existing Strips" on page 16-11.

- Step 3)** To save changes to the project file, select **Save** from the **File** toolbar or pull-down menu.



Select **Save** from the **File** toolbar or pull-down menu.

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Chapter 17. Orientation Methods

Before planimetric data may be collected into a CAD system using SUMMIT EVOLUTION™, orientation must be complete so that ground or object coordinates may be used. SUMMIT EVOLUTION can either calculate a complete orientation or it can import the orientation results produced on another non-analog stereoplotter or by a third-party aerotriangulation package.

Choose an orientation method from the table below.

Choose an Orientation Method

There are many methods of completing orientation. Some project types even provide their own orientation. Select a situation from the table, then follow the method steps. For detailed instructions on each step, follow the page references given in the step:

Situation	Orientation Method
<u>Satellite RPC, ALOS, SPOT-5, SAR, DAT/EM-PCI ProPack Epipolar, ENVI Epipolar Projects</u>	<u>Use the Instructions in Chapter 11:</u> Each of these projects already has ground coordinates, but sometimes they can be adjusted. These projects are described in <i>Chapter 11</i> .
<u>Use VisionMap A³ Orientation:</u> The images were produced by the VisionMap A ³ camera and each image has a corresponding .dat file.	<u>Use A³ Project Orientation:</u> Orientation is already complete once the project file is defined. See <i>Chapter 14</i> to build a VisionMap A ³ project, then go to <i>Chapter 22</i> to start up and begin digitizing.
<u>Use ADS40/80 Project Orientation:</u> The images were produced by the Leica Geosystems ADS40/80 Digital Sensor.	<u>Use ADS40/80 Project Orientation:</u> Orientation is already complete once the project file is defined. See <i>Chapter 8</i> to build an ADS40/80 project, then go to <i>Chapter 22</i> to start up and begin digitizing.
<u>Import Applanix camera exterior files:</u> Applanix Camera Exterior files are available.	<u>Import Applanix camera exterior files:</u> <ol style="list-style-type: none"> 1. Perform SUMMIT EVOLUTION's interior orientation, automatic (page 18-1) and/or manual method (18-7). <i>Not needed for digital cameras.</i> 2. Import camera exteriors (page 21-4). 3. Automatically generate models using exteriors (page 16-2). 4. Perform optional orientation-related procedures if desired (starting below on page 17-7).

Situation	Orientation Method
<p><u>Import Phorex Interchange Files:</u> Phorex .cam and .pho files are available.</p> <p>Note that Zeiss Phorex file formats are not all the same. This SUMMIT EVOLUTION import utility was designed to work with Phorex 1 and Phorex 2 files produced by Inpho's MATCH-AT software.</p>	<p><u>Import Phorex Interchange Files:</u> Complete instructions for this special case are located in "Import Phorex Interchange Files" on page 15-13. Briefly, the steps consist of the following:</p> <ol style="list-style-type: none"> 1. Open a new project and specify all image files names in the project (Step 4 through Step 5 starting on page 7-4). 2. For Phorex 1 format, perform SUMMIT EVOLUTION's interior orientation automatic (page 18-1) or manual method (page 18-7) for all images. <i>Not needed for digital cameras.</i> 3. Import the .cam file using the Convert Phorex 1 or 2 Camera (CAM) option from Import on the File pull-down menu. Add this camera to the project. 4. Import the Phorex 1 or 2 file(s) using the Import Phorex 1 (PHO) or Import Phorex 2 (PEX) option from Import on the File pull-down menu. 5. Perform optional orientation-related procedures if desired (starting below on page 17-7).
<p><u>Aerial Project, Measure Orientation:</u></p> <ul style="list-style-type: none"> • The images are from aerial photography. • Ground control point coordinates are available. There are enough points in each model to calculate a solution for each model. • SUMMIT EVOLUTION's built-in orientation functions will be used. That is, absolute orientation will be measured. • Third-party aerotriangulation will NOT be used. 	<p><u>Aerial Project, Measure Orientation:</u> Perform a complete orientation for an aerial project using SUMMIT EVOLUTION's built-in orientation functions.</p> <ol style="list-style-type: none"> 1. If desired, turn on the Earth curvature correction setting (Step 11 on page 7-8). 2. Perform SUMMIT EVOLUTION's interior orientation, automatic (page 18-1) and/or manual method (page 18-7). <i>Not needed for digital cameras.</i> 3. Perform SUMMIT EVOLUTION's relative orientation, automatic (page 19-2), manual (page 19-5), and/or tie points method (page 19-14). 4. Perform SUMMIT EVOLUTION's absolute orientation (<i>Chapter 20</i>). 5. Perform optional orientation-related procedures if desired (starting below on page 17-7).

Situation	Orientation Method
<p><u>Close-Range Project, Measure Orientation:</u></p> <ul style="list-style-type: none"> • The images are from close range (terrestrial) photography. • Ground control point coordinates are available. There are enough control points in each model to calculate a solution in each model. • SUMMIT EVOLUTION's built-in orientation functions will be used. That is, absolute orientation will be measured. • Third-party aerotriangulation will NOT be used. 	<p><u>Close-Range Project, Measure Orientation:</u> Perform a complete orientation for a close range project using SUMMIT EVOLUTION's built-in orientation functions.</p> <ol style="list-style-type: none"> 1. When starting a new project, select a Close Range project type (page 9-2). 2. Perform SUMMIT EVOLUTION's interior orientation, automatic (page 18-1) and/or manual method (page 18-7). <i>Not needed for digital cameras.</i> 3. Perform SUMMIT EVOLUTION's relative orientation automatic (page 19-2), manual (page 19-5), and/or tie points method (page 19-14). 4. Perform SUMMIT EVOLUTION's absolute orientation (<i>Chapter 20</i>). 5. Perform optional orientation-related procedures if desired (starting below on page 17-7).
<p><u>Key In Exterior Orientation Values:</u> Exterior orientation values for these images were calculated on another stereoplotter or by another outside source, but the values are <i>not</i> available in an ASCII digital file.</p> <p>For example, the exterior orientation values are printed on paper.</p>	<p><u>Key In Exterior Orientation Values:</u> Perform interior orientation. For close-range projects only, perform relative orientation. For all projects, key in the exterior orientation values into the exterior orientation dialog box:</p> <ol style="list-style-type: none"> 1. Models and strips must be defined in the project (<i>Chapter 16</i>). 2. Perform SUMMIT EVOLUTION's interior orientation, automatic (page 18-1) and/or manual method (page 18-7). <i>Not needed for digital cameras.</i> 3. For close-range projects only, perform SUMMIT EVOLUTION's relative orientation automatic (page 19-2), manual (page 19-5), and/or tie points method (page 19-14). For close-range (terrestrial) projects, a relative orientation is required to define the orientation of the XYZ axes. 4. Enter the exterior orientation values into the exterior orientation dialog box (page 21-3). 5. Repeat entering the exterior orientation values for each image in the project. 6. Perform optional orientation-related procedures if desired (starting below on page 17-7).

Situation	Orientation Method
<p><u>Export IO and RO to aerotriangulation software, run AT, import AT results:</u> A third-party aerotriangulation (AT) software is installed on the computer and is ready to use for this project.</p>	<p><u>Export IO and RO to aerotriangulation software, run AT, import AT results:</u> Use a third-party aerotriangulation package for orientation:</p> <ol style="list-style-type: none"> 1. Models and strips must be defined in the project (<i>Chapter 16</i>). Attach a control file that contains at least the number and types of ground control points that the AT software requires. 2. Perform SUMMIT EVOLUTION's interior orientation, automatic (page 18-1) and/or manual method (page 18-7). <i>Not needed for digital cameras.</i> 3. Perform SUMMIT EVOLUTION's relative orientation automatic (page 19-2), manual (page 19-5), and/or tie points method (page 19-14) to establish the initial two-image relative points for every model. 4. Perform SUMMIT EVOLUTION's relative tie points method (page 19-14) to measure strip edge tie points and control points as required by the AT software. 5. Export to the AT package (page 21-4). 6. Run the AT package. Most brands of AT software will be launched automatically by SUMMIT EVOLUTION. 7. Choose a method of importing AT results: <ol style="list-style-type: none"> a.) If there is an AT exterior orientation file: Import the AT exterior orientation file (Step 16 on page 21-8). Note that after importing exterior orientation, any previous SUMMIT EVOLUTION relative orientation is deactivated so that it does not interfere with the AT's exterior results. b.) Or, if there is an AT relative orientation file, but no exterior orientation file: Import the AT adjusted ground point list (such as the Albany .gpa file) into the Control Editor and save in the .con file format (<i>Chapter 6</i>). List the new .con file in the Project Editor definition as a control file (Step 10 on page 7-7). Import the AT relative orientation file (Step 2 on page 19-34). Note that SUMMIT EVOLUTION calculates exterior orientation after importing the relative orientation. 8. Perform optional orientation-related procedures if desired (starting on page 17-7).

Situation	Orientation Method
<p><u>Import Existing Relative or Exterior Orientation:</u></p> <ul style="list-style-type: none"> • A third-party aerotriangulation (AT) software was used to calculate orientation for these images while they were set on another non-analog stereoplotter. • The resulting <i>digital</i> relative or exterior orientation file(s) can be accessed from the SUMMIT EVOLUTION computer. 	<p><u>Import Existing Relative or Exterior Orientation:</u> Import the relative or exterior orientations that were created using aerotriangulation on another stereoplotter.</p> <ol style="list-style-type: none"> 1. Models and strips must be defined in the project (<i>Chapter 16</i>). 2. Perform SUMMIT EVOLUTION's interior orientation, automatic (page 18-1) and/or manual method (page 18-7). <i>Not needed for digital cameras.</i> 3. If this is a close-range (terrestrial) project, and relative orientation will not be imported, then perform SUMMIT EVOLUTION's relative orientation automatic (page 19-2), manual (page 19-5), and/or tie points method (page 19-14). For close-range projects, a relative orientation is required to define the orientation of the XYZ axes. 4. Choose one of the following methods: <ol style="list-style-type: none"> a.) If there is an AT exterior orientation file: Import the AT exterior orientation file (Step 16 on page 21-8). Check the ground coordinate values around the strips in the project. If they are completely wrong, it could be that the imported exteriors were upside down. In this case, see Step 22 on page 21-10 for a correction method. b.) Or, if there is an AT relative orientation file, but no exterior orientation file: Import the AT adjusted ground point list (such as the Albany .gpa file) into the Control Editor and save in the .con file format (<i>Chapter 6</i>). List the new .con file in the Project Editor definition as a control file (Step 10 on page 7-7). Import the AT relative orientation file (Step 2 on page 19-34). Note that SUMMIT EVOLUTION calculates exterior orientation after importing the relative orientation. 5. Perform optional orientation-related procedures if desired (starting on page 17-7).

Situation	Orientation Method
<p><u>Control Transfer from Orthophoto, Vector File, or another SUMMIT Project:</u></p> <ul style="list-style-type: none"> • There is an aerial SUMMIT EVOLUTION project that lacks exterior orientation. Interior orientation is done or can be done for the project. Control point coordinates may or may not be available and may or may not be complete. In any case, you do not intend to measure a complete absolute orientation based on a ground control points. • If using the orthophoto option, one or more orthophotos exist that cover the area of the SUMMIT EVOLUTION project that you wish to orient. The orthophoto(s) may be from a different source than the images in the SUMMIT EVOLUTION project. The orthophotos may be scanned orthorectified maps, as long as the digital format is that of a typical orthophoto, that is, it contains standard TIFF-world georeference information. Also, a DTM distribution exists that covers at least part of the area. Many formats, including LIDAR files, are accepted. • If using the vector file option, a 3D-accurate vector file exists and contains objects in the area of the SUMMIT EVOLUTION project that you wish to orient. • If using the SUMMIT EVOLUTION project option, there is a second project of any type that is fully oriented and contains imagery for the same area as the SUMMIT EVOLUTION project that you wish to orient. 	<p><u>Control Transfer from Orthophoto, Vector File, or another SUMMIT Project:</u></p> <p>Use the Control Transfer tool in SUMMIT EVOLUTION. This requires both SUMMIT EVOLUTION and a choice of <i>one</i> of the following:</p> <ol style="list-style-type: none"> a.) DAT/EM VIEWER with an orthophoto in the same geographic area; also required is a DTM point distribution file in the same geographic area. b.) DAT/EM VIEWER with a 3D-accurate vector file in the same geographic area. Accepted formats are .dwg, .dxf, .dgn, and .shp. c.) A second instance of SUMMIT EVOLUTION with a different, fully oriented project in the same geographic area. <p>The result is an exterior orientation based on coordinates from an orthophoto plus DTM file, 3D vector file, or another SUMMIT EVOLUTION project.</p> <ol style="list-style-type: none"> 1. Define the project file in SUMMIT EVOLUTION. It is not necessary to add control files to the project, but if you do, do not use them for orientation within this instance of SUMMIT EVOLUTION. 2. Perform SUMMIT EVOLUTION's interior orientation, automatic (page 18-1) and/or manual method (page 18-7). <i>Not needed for digital cameras.</i> 3. For each image in the project, use the Control Transfer tool to produce an exterior orientation (page 21-10). 4. Perform optional orientation-related procedures if desired (starting below on page 17-7).

Optional Orientation-Related Procedures

Once orientation is complete and ground coordinates are available, there are a few optional orientation-related procedures:

- Apply a coordinate conversion (transformation) to the ground coordinates (page 25-28)
- Create report files of selected models. The user specifies the models and the file contents. See “Tools Menu > Reports” on page 25-53.
- Report interior orientation measurements in a text file. See “(Optional) Export Interior Measurements” on page 17-11.
- Create a quick orientation snapshot of the currently open model. See “Help Menu > Orientation Snapshot” on page 25-94.
- Toggle the epipolar correction. See “Orientation Menu > Epipolar Correction” on page 25-27.
- Toggle the scale correction (“Orientation Menu > Scale Correction” on page 25-27)
- Perform a Z index (page 17-7)
- Export model limit coordinates to DXF format (page 17-10)

These sections appear below.

(Optional) Calculate Exterior Orientation to Use Later

If an absolute orientation has been done, exterior orientation values can be produced to use later on another stereoplotter. Complete instructions for doing this are shown in “Exterior Orientation: Calculated by Summit Evolution” starting on page 21-3.

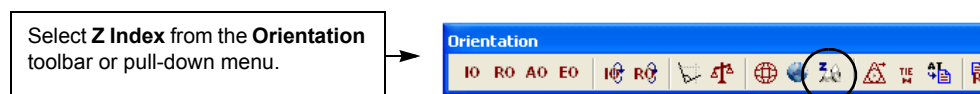
(Optional) Z Index

A new Z index may be applied any time after an absolute orientation has been successfully calculated. A Z index introduces a Z offset from the original Z that was set by the orientation measurements. Sometimes it is used when the stereoplotter operator changes, and the two operators determine where the floating mark is “on the ground” differently.

- Z indexing is not a completely accurate method of correcting for operator differences. It is always preferable to perform a complete orientation.
- DAT/EM includes Z index due to user demand. *Please be very careful* not to introduce a large offset error when making Z index measurements.
- Another method is to apply a Z index based on points loaded in Terrain Following. Please see “Terrain Following Toolbar” on page 24-9.

If you still want to go ahead with a Z index, perform the following steps:

Step 1) Select **Z index** from the **Orientation** toolbar or pull-down menu.



Step 2) Choose a method to use for Z indexing:

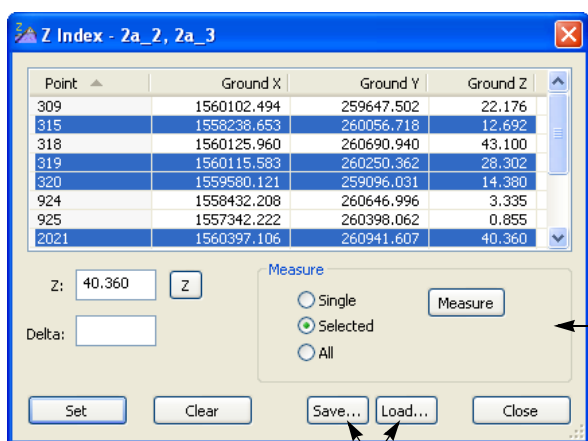
- a.) To Z index from a single control point, turn on **Single** in the Measure area, then select one point from the list. Carefully position the stereoplottor on the selected control point and digitize. Review the **Delta** that appears after the point is digitized. Press the **Set** button to activate the Z index delta.
- b.) To Z index from an average of multiple selected control points, turn on **Selected** from the Measure area. Choose a method to highlight multiple points:
 - Hold down the <Ctrl> key and click multiple points;
 - Or, use **Load** to quickly re-highlight a previously saved list of points.

Select the **Measure** button and digitize the points in order, being sure to position the stereoplottor carefully for each point. If desired, use the **Finish** button that appears during digitizing to end the digitizing before the last point is digitized. Review the average **Delta**. Press the **Set** button to activate the Z index delta.

If desired, use the **Save** button to save a list of the selected points so that they may be quickly highlighted again later.

(More choices continue on next page)

- c.) To Z index from an average of all of the control points, turn on **All** in the Measure area. Select the **Measure** button and digitize the points in order, being sure to position the stereoplottor carefully for each point. If desired, the **Finish** button that appears during digitizing may be used to end the digitizing before the last point is digitized. Review the average **Delta**. Press the **Set** button to activate the Z index delta.



There are three methods to perform a Z index using one or more control points:

- To Z index from a single point, turn on **Single**, then select one point from the list.
- To Z index from an average of multiple selected points, turn on **Selected**, then hold down the <Ctrl> key and click multiple points. Select the **Measure** button to start digitizing.
- To Z index from an average of all of the points, turn on **All**. Select the **Measure** button to start digitizing the points in order.

To quickly highlight the same points again later:

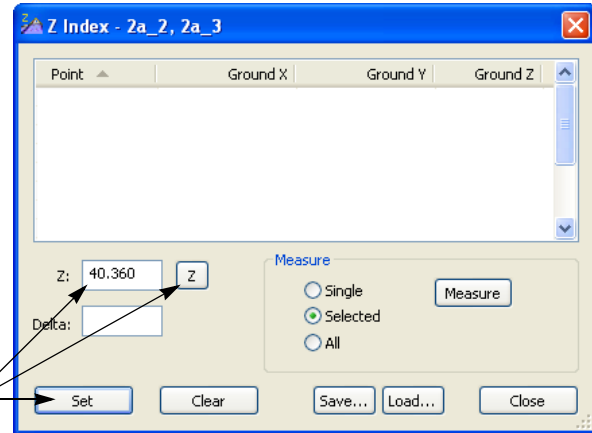
- **Save** saves a list of the currently highlighted points in a **zindex** file.
- **Load** re-highlights the point numbers from a selected **zindex** file.

- d.) A Z index may be done on any image feature that has a known elevation, but is not necessarily a control point. Enter the elevation of the feature in the **Z** field (do not use the **Z** button). Carefully position the stereoplottor on the feature and select the **Set** button.

- e.) A Z index may be done between two operators. The first person carefully positions the stereoplotter on a distinct image feature (such as the corner of a building) and presses the **Z** button. The elevation that the person read for the point appears in the **Z** field. Then the second person carefully positions the stereoplotter on the same feature and selects the **Set** button.

There are two methods to perform a Z index without using control points:

- A Z index may be done on any image feature that has a known elevation. Enter the feature's elevation in the **Z** field (do not use the **Z** button). Position the stereoplotter on the feature and select the **Set** button.
- A Z index may be done between two operators. The first person positions the stereoplotter on a distinct image feature and presses the **Z** button. Then the second person positions the stereoplotter on the same feature and selects the **Set** button.



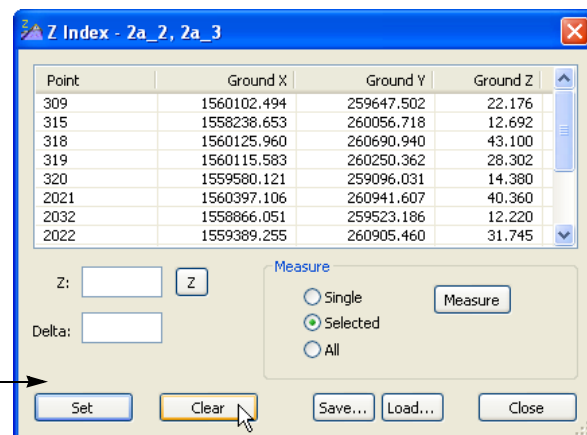
- Step 3)** Review the offset that is displayed in red on the status bar at the lower right of the SUMMIT EVOLUTION window. *Every Z measurement from this time on will be offset by this number from the original Z calculated during orientation:*



Hint: This display appears on the status bar. To turn on the status bar, select **Status Bar** from the **View** pull-down menu.

The active Z index appears in red at the lower right of the SUMMIT EVOLUTION window.

- Step 4)** At any time, the digitized Z index may be removed and the original calculated value may be restored. To do this, activate the Z Index dialog again by selecting **Z Index** from the **Orientation** toolbar or pull-down menu. Then select the **Clear** button.

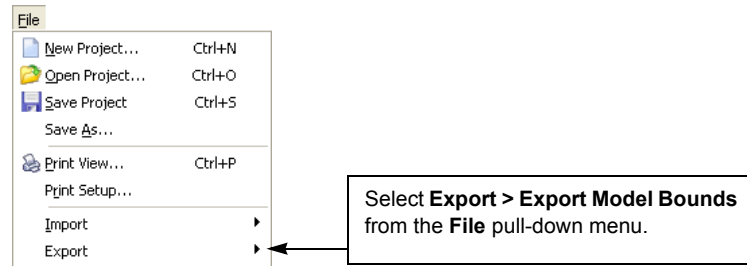


Select **Clear** to remove any active Z index and restore the original elevation value.

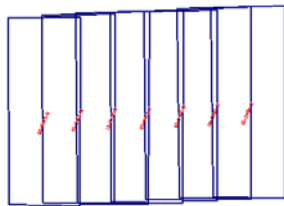
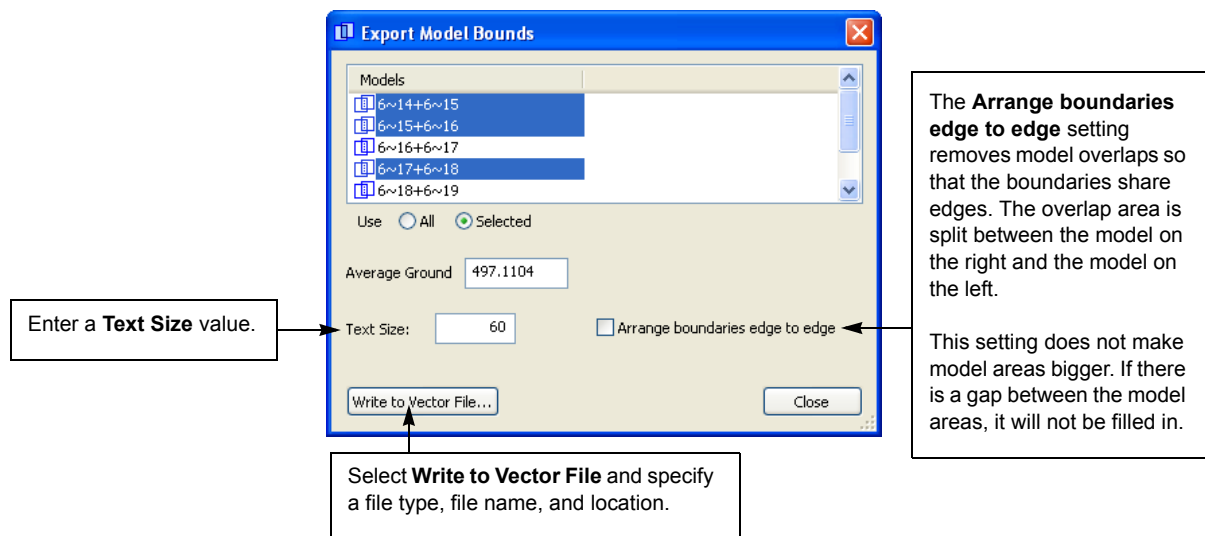
(Optional) Export Model Bounds

The **Export to Model Bounds** tool creates a **dxf**, **dwg**, **dgn**, or **shp** file that contains a polygon and model name text for each model in the project. Ground coordinates must be available before using this tool. Perform the following steps:

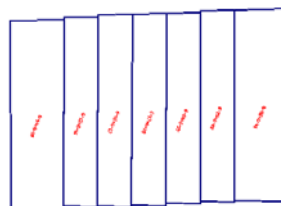
Step 1) Select **Export Model Bounds** from **Export** option on the **File** pull-down menu.



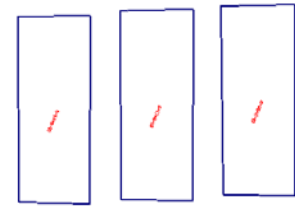
Step 2) Enter a **Text Size** and select **Write to Vector File** and specify a file type, file name, and location.



Example of **Arrange boundaries edge to edge** off. Overlaps allowed.



Example of **Arrange boundaries edge to edge** on. Overlaps split.



Arrange boundaries edge to edge does not fill in gaps.

The resulting vector file contains one closed polyline/polygon for each model. For **dxf**, **dwg**, or **dgn** formats, it also contains one text entity for each model name. Each closed polyline contains the lower left, lower right, upper right, and upper left coordinates of the model, and is placed on a layer/level called **ModelBounds**. Each text element (for **dxf**, **dwg**, or **dgn**) contains a model name, and is placed on a layer/level called **ModelName**.

(Optional) Export GCF Files

If desired, **gcf** (Ground Control File) orientation output files may be created from one or more models in the project. The **gcf** file line format is:

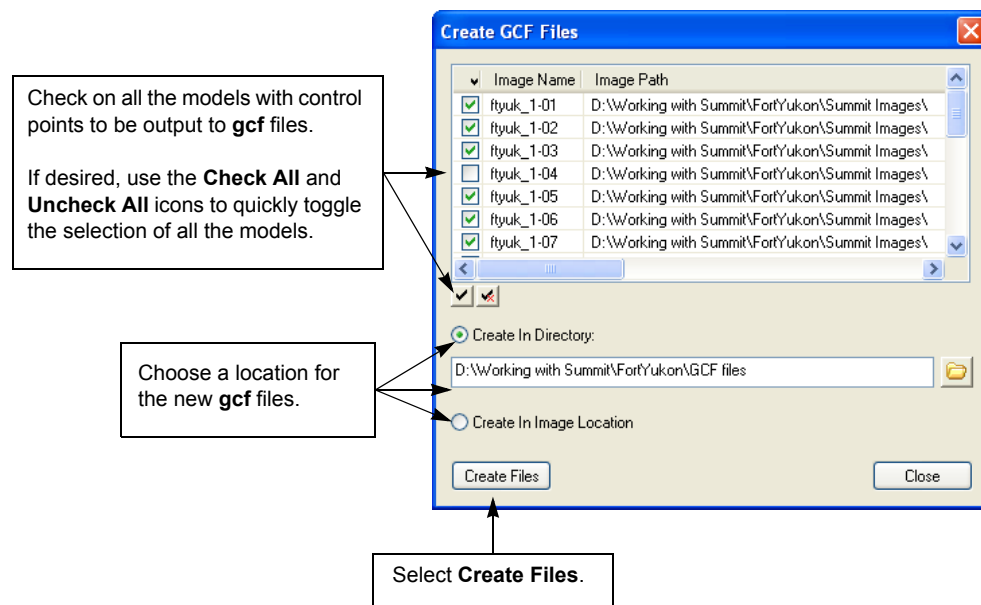
```
<Tab><Tab>"pointname"<Tab>Flag1YesNo<Tab>Flag2YesNo<Tab>PixelX<Tab>PixelY<Tab>GroundX<Tab>GroundY<Tab>GroundZ
```

The following is an example of two control points in a **gcf** file (invisible tab characters separate each field):

```
"340002"YesNo3654.0961421218.98653776818.547000-115437.087000211.300000
"350001"YesNo4423.4271354082.63512577186.774000-116982.024000177.700000
```

Perform the following steps:

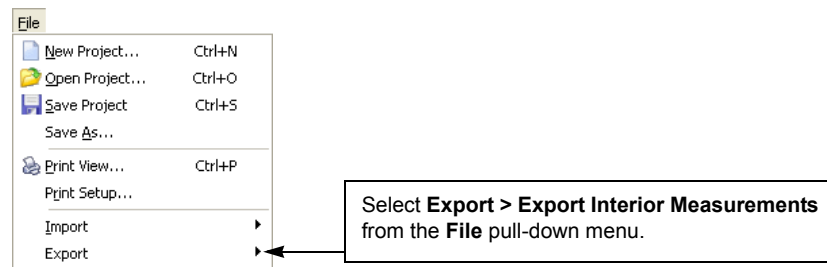
- Step 1)** Select **Create GCF Files** from the **Export** option of the **File** pull-down menu:
- Step 2)** Check on the models to output to **gcf** files.



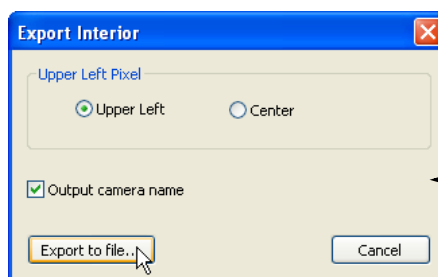
(Optional) Export Interior Measurements

The **Export Interior Measurements** tool creates an ASCII text file that contains the interior orientation values. Interior orientation must be complete before using this tool (*not needed for digital cameras*). Perform the following steps:

- Step 1)** Select **Export Interior Measurements** from **Export** option on the **File** pull-down menu.



Step 2) Enter a **Text Size** and select **Write to Vector File** and specify a file type, file name, and location.

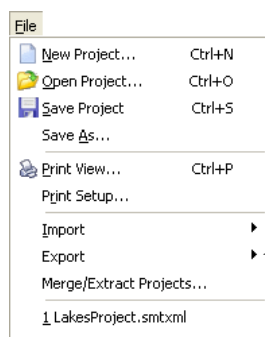


Make settings and select **Export to file**.

(Optional) Export Exteriors

The **Export Exteriors** tool creates an ASCII text file that contains the interior orientation values. An applicable project must be open; for example, exterior values may exist in an aerial frame camera project, but they do not exist in an ADS40/80 sensor project. Exterior orientation must be complete in the applicable project before using this tool. Perform the following steps:

Step 1) Select **Export Exteriors** from **Export** option on the **File** pull-down menu.



Select **Export > Export Exteriors** from the **File** pull-down menu.

Step 2) Name the file. A space-delimited text file is created. The angles are in decimal degrees. The format is:

x y z omega phi kappa

	x	y	z	omega	phi	kappa
Nashv_6_6~21_rgb	1736223.22120	664036.74829	3442.50914	1.06860400	1.22047900	113.16789900
Nashv_6_4~14_rgb	1740141.05213	660200.82328	3368.37855	-0.08808600	-1.01548400	-64.93857300
Nashv_6_4~15_rgb	1739844.45715	660864.10602	3367.92196	-0.08664100	-0.87876500	-64.77522400
Nashv_6_4~16_rgb	1739544.53731	661522.16774	3371.98749	-0.08762700	-0.75013800	-64.86842800
Nashv_6_4~17_rgb	1739246.14340	662184.70826	3390.06269	-0.17571700	-1.02163600	-65.05332300
Nashv_6_4~18_rgb	1738952.07207	662849.73126	3405.76412	-0.41772900	-1.06412400	-65.76580500
Nashv_6_4~19_rgb	1738657.55087	663513.39003	3414.52035	-0.51263300	-1.15970900	-66.05090400
Nashv_6_4~20_rgb	1738362.82720	664179.04835	3408.25679	-0.48430100	-1.38923500	-66.24853900
Nashv_6_4~21_rgb	1738082.51101	664852.63001	3389.58864	-0.44945100	-1.66818500	-66.39662600
Nashv_6_6~14_rgb	1738372.32349	659453.86481	3417.27695	1.15445600	0.96578400	112.70109900
Nashv_6_6~15_rgb	1738059.92197	660103.69565	3430.17959	1.14404000	1.18395100	112.82544400
Nashv_6_6~16_rgb	1737755.02561	660760.15006	3440.88414	1.01513100	1.46013100	112.82820100
Nashv_6_6~17_rgb	1737450.54774	661416.17219	3448.41811	1.17330100	1.25256200	112.93188500
Nashv_6_6~18_rgb	1737140.81056	662069.32450	3452.50062	1.38432700	1.10561100	113.04497600
Nashv_6_6~19_rgb	1736829.89769	662721.84808	3451.76373	1.32332500	1.34785700	113.13110600
Nashv_6_6~20_rgb	1736526.37985	663379.44799	3451.08236	1.14846000	1.44556500	113.10965300

Example of an Export Exteriors file

Chapter 18. Interior Orientation

When should interior orientation be done?

Interior orientation is *required for all orientation methods* listed in “Choose an Orientation Method” in *Chapter 17*. The exception is for digital cameras, which have built-in interior orientation.

- To use SUMMIT EVOLUTION’s automatic interior orientation procedure, see “Interior Orientation: Image Processing “Automatic or Auto” Method” on page 18-1.
- To manually measure fiducial or reseau locations, see “Interior Orientation: Selection “Manual or Measurement” Method” on page 18-7.

A combination of these two methods may be used. For example, let’s say the automatic method misses one fiducial because there is a large scratch over it; that fiducial may be measured later using the manual method, thus completing the interior orientation.

Note that any interior orientation points, regardless of how they were obtained, can be viewed at any time in the Interior Orientation (selection method) dialog.

Interior Orientation: Image Processing “Automatic or Auto” Method

The image processing method of interior orientation uses image processing to search for fiducial marks. The user is prompted to measure one, two, selected, or all fiducials, then the software automatically searches the images for matching marks. Any of the resulting marks may be re-measured manually by the user if desired. In speech, the image processing method is called the “automatic interior” or “auto interior” method.

The image processing method will not detect reseau marks. See the “Interior Orientation: Selection “Manual or Measurement” Method” on page 18-7 if reseau marks are present.

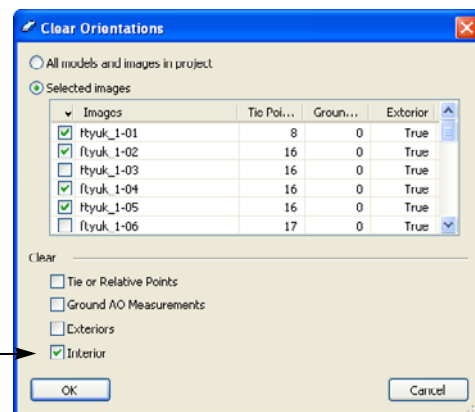
All images in the project that use the same camera are processed at one time. If more than one camera is assigned to images in the project, the fiducials are sampled for each camera.

To use the image processing method of interior orientation, perform the following steps:

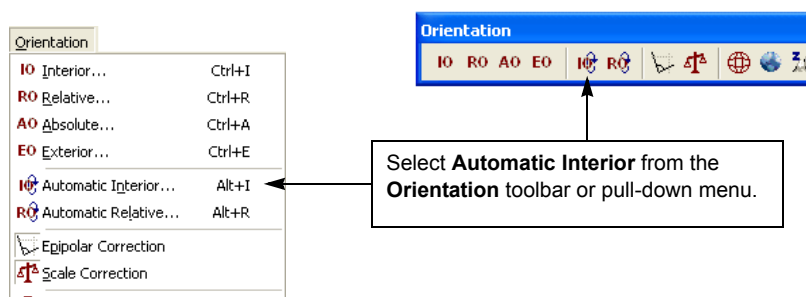
- Step 1)** (Optional, used when orientation cannot be corrected by other methods) Any existing completely “bad” orientation may be cleared by selecting **Clear Orientations** from the **Orientation** menu:

(Optional) Any existing completely “bad” or incorrect orientations may be cleared by selecting **Clear Orientations** from the **Orientation** pull-down menu.

Select images and the type(s) of orientation to clear.

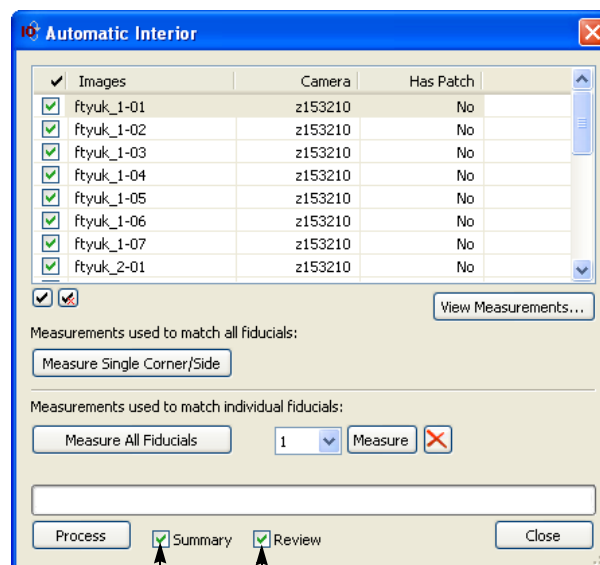


Step 2) Select **Automatic Interior** from the **Orientation** toolbar or pull-down menu.



Step 3) Choose settings as follows:

- Check on **Summary** to produce a text file showing interior orientation details such as image name and fiducial locations.
- Check on **Review** to activate the Interior Orientation dialog box showing the results of the automatic interior orientation. The interior orientation points may then be checked or remeasured.



(Optional) Check on **Summary** to see interior orientation results in the Windows Notepad text editor after **Process** finishes.

(Optional) Check on **Review** to see interior orientation results in the Interior Orientation dialog after **Process** finishes.

Step 4) Check on the images to process for interior orientation. To toggle the check marks on all images at once, select the checkmark icons below the list.

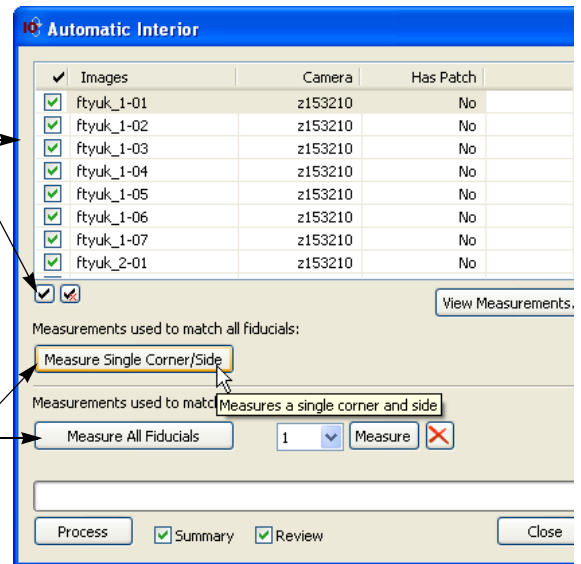
Step 5) If more than one camera is assigned in the project, highlight an image assigned to the first listed camera that shows "No" patch has been measured.

Step 6) Choose a measurement method:

- Select **Measure Single Corner/Side** to measure only one corner and one side (if any) fiducial.
- Select **Measure All Fiducials** to measure every fiducial on the open image.

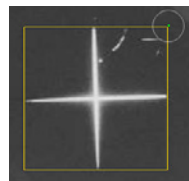
- Check on the images to process for interior orientation. To toggle all the images at once, use the checkmark icons.
- Highlight an image that has a camera showing **No** for **Has Patch**.

- Choose either **Measure Single Corner/Side** or **Measure All Fiducials**.
- Follow the Image View prompts to measure one or more fiducials.

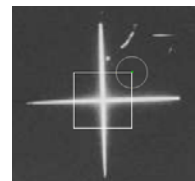


Step 7) The Image View prompts to digitize a fiducial. The cursor is placed near the fiducial on the highlighted image. Zoom in until the pixels of the fiducial are visible. Use this zoom for all fiducial measurements.

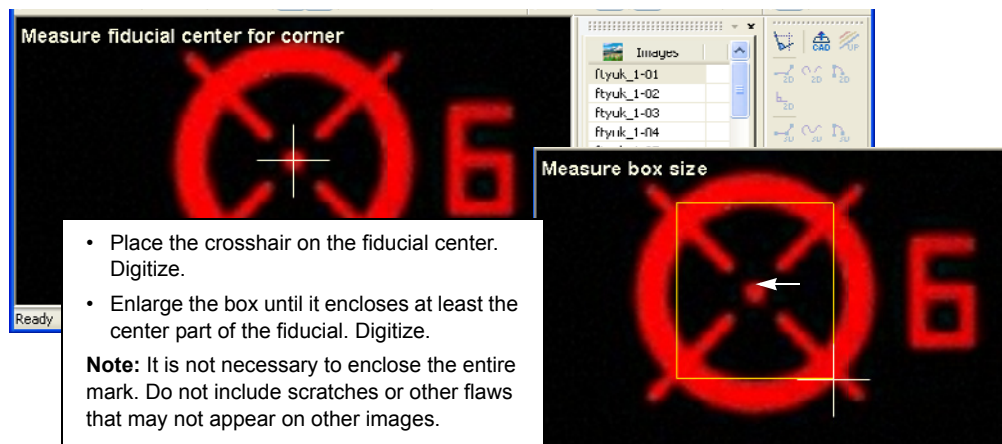
Step 8) Digitize the center of the fiducial. Then enlarge the box and digitize at least a portion of the fiducial's center. Do not include scratches or other flaws that may not appear on other images.



Wrong!
Do not include extra objects.



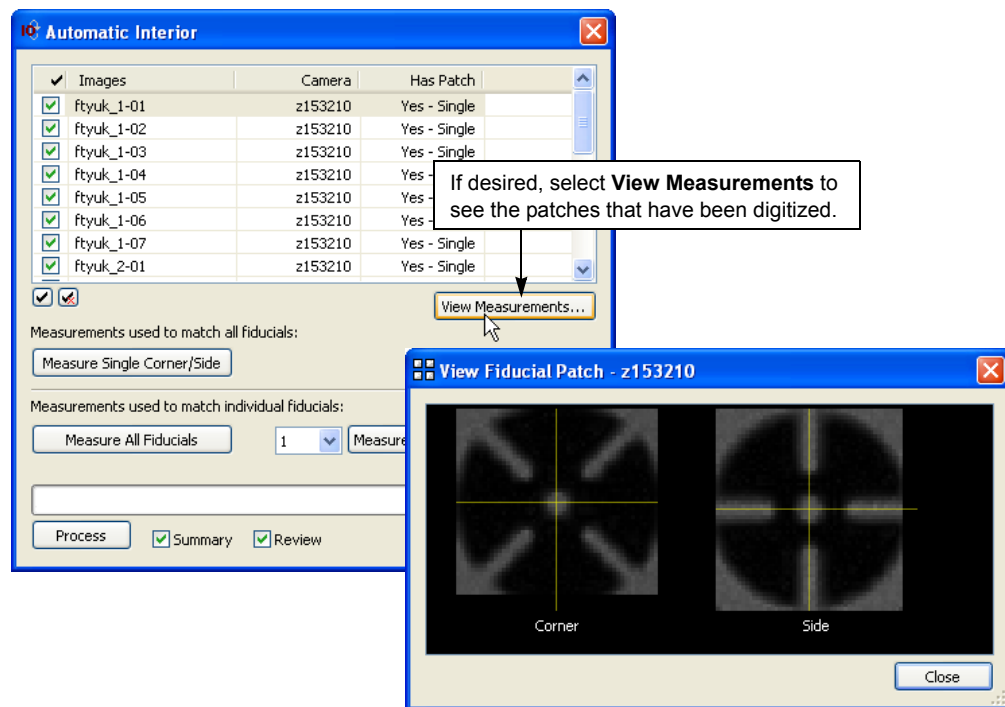
Right!
Digitize the center area.



- Place the crosshair on the fiducial center. Digitize.
- Enlarge the box until it encloses at least the center part of the fiducial. Digitize.

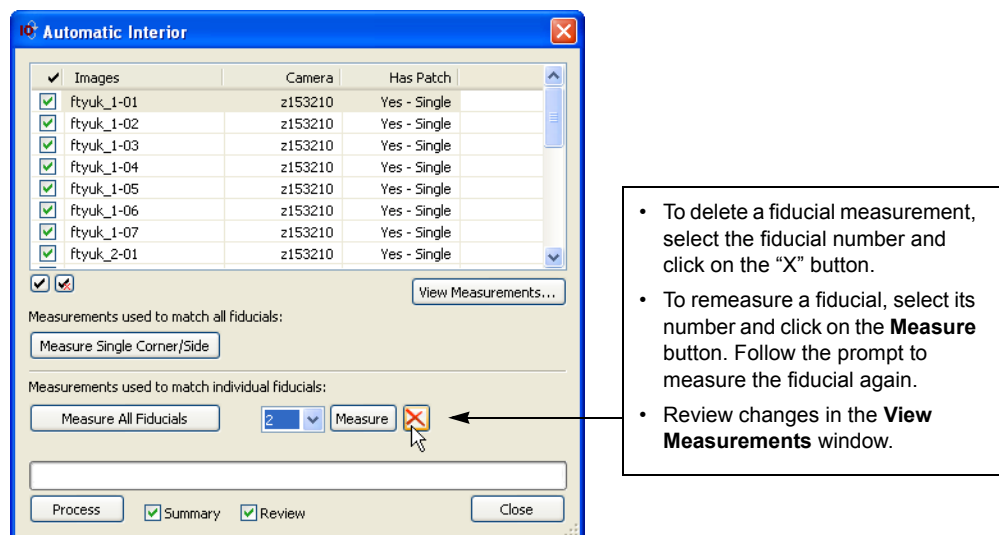
Note: It is not necessary to enclose the entire mark. Do not include scratches or other flaws that may not appear on other images.

- Step 9)** If side fiducials exist, or if **Measure All Fiducials** is used, then follow the prompts to digitize each additional fiducial.
- Step 10)** If desired, select the **View Measurements** button. A window displays all measured patches. The window may be turned on or off at any time.

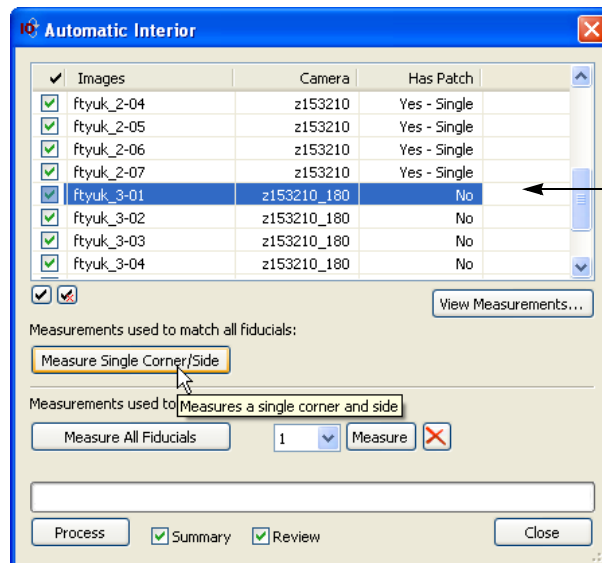


- Step 11)** If necessary, delete or remeasure a fiducial.

- View existing measurements and fiducial numbers in the **View Measurements** window.
- To delete a fiducial measurement, select the fiducial number and click on the "X" button.
- To remeasure a fiducial, select the fiducial number and click the **Measure** button. Follow the prompt to measure the fiducial again. Review changes with **View Measurements**.



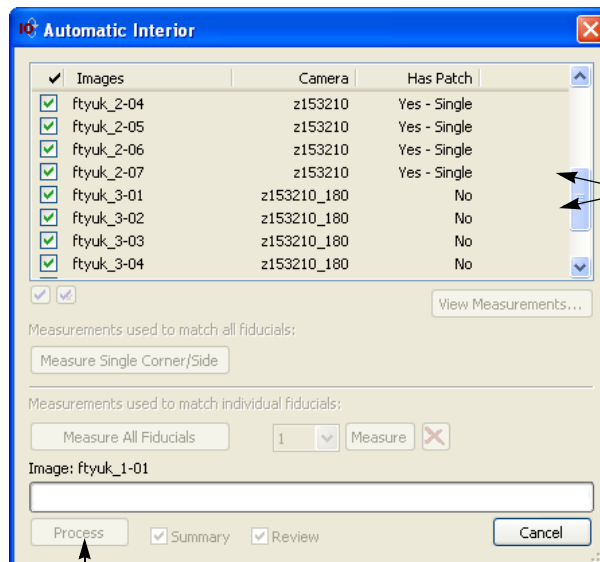
Step 12) If there is more than one camera assigned to images in the project, highlight the next image that shows **Has Patch** set to **No** and measure its fiducials. Repeat for each camera until all checked images show **Has Patch** set to **Yes**.



In order to process all images at once, patches must exist for all cameras.

Measure fiducials for each additional camera. All checked images should show **Has Patch** set to **Yes**.

Step 13) Select **Process** to run interior orientation on all checked images that have **Has Patch** set to **Yes**.

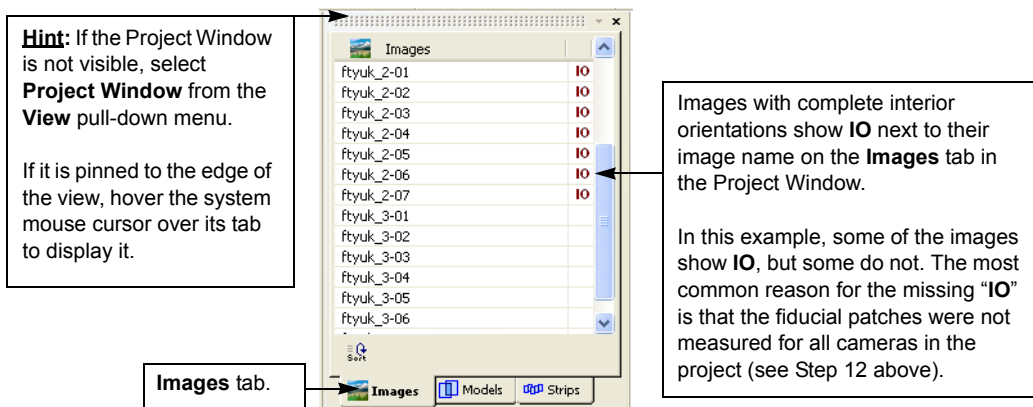


In this example, more than one camera is assigned to the checked images. Patches have been measured for only one camera, so several images show **Has Patch** set to **No**. There are two options in this case:

- Select **Process** to process only the checked images that show **Has Patch** set to **Yes**.
- Measure fiducials for each camera so that all checked images show **Has Patch** set to **Yes**. Then select **Process** to perform interior orientation on all checked images.

Select the **Process** button. **Process** will only complete interior orientation for checked images that have **Has Patch** set to **Yes**.

Step 14) If the processing was successful, images with a complete interior orientation show **IO** next to their image name on the **Images** tab in the Project Window:



- If the processing was not successful, usually due to an obscured or missing mark, a message appears. In this case, it may be necessary to remeasure the patches and reprocess or perform manual readings (page 18-7).
- If **Summary** was checked on before **Process** was selected, then the summary text file appears in a Windows text editor. Review and save the file if desired.
- If **Review** was checked on before **Process** was selected, then the Interior Orientation dialog box appears after processing. This is the same dialog that appears for the selection method, shown in "Interior Orientation: Selection "Manual or Measurement" Method" below. Review the points and residuals and manually remeasure if desired.

Step 15) (Optional) If desired, check the interior orientation results. Highlight images from the **Images** tab on the Project Window, then select **IO** or **Interior Orientation** from the **Orientation** toolbar or pull-down menu. The interior residual results are shown in the dialog box. Highlight any point to show it in the Image View. Any mark may be digitized manually using the instructions shown in "Interior Orientation: Selection "Manual or Measurement" Method" below.

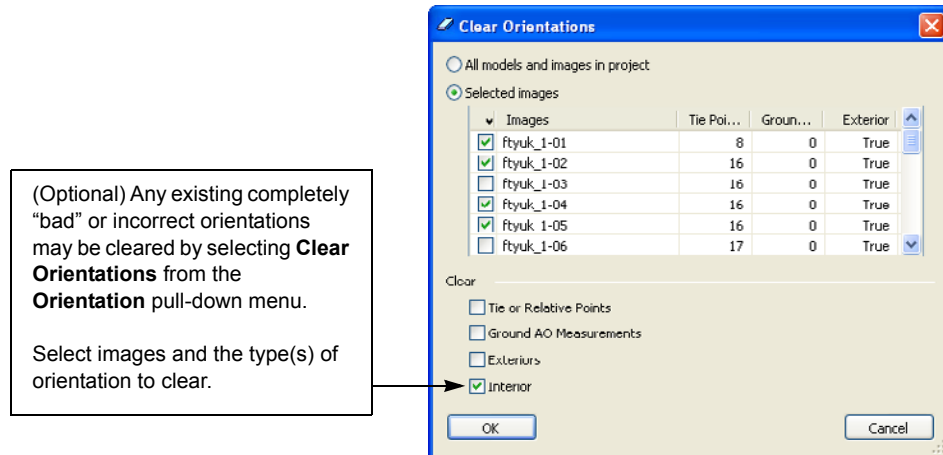
Interior Orientation: Selection “Manual or Measurement” Method

The manual selection method of interior orientation requires the user to digitize each fiducial or reseau mark. The software helps by placing the cursor near the mark to be digitized. For a description of interior orientation and the method used by SUMMIT EVOLUTION, see *Appendix E*.

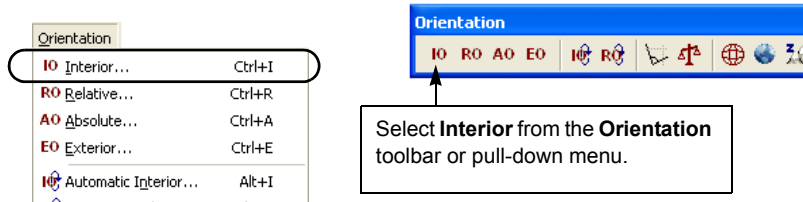
In speech, the selection method may be called the “manual” or “measurement” method.

To use the manual selection method of interior orientation, perform the following steps:

- Step 1)** (Optional, used when orientation cannot be corrected by other methods) Any existing completely “bad” orientation may be cleared by selecting **Clear Orientations** from the **Orientation** menu:

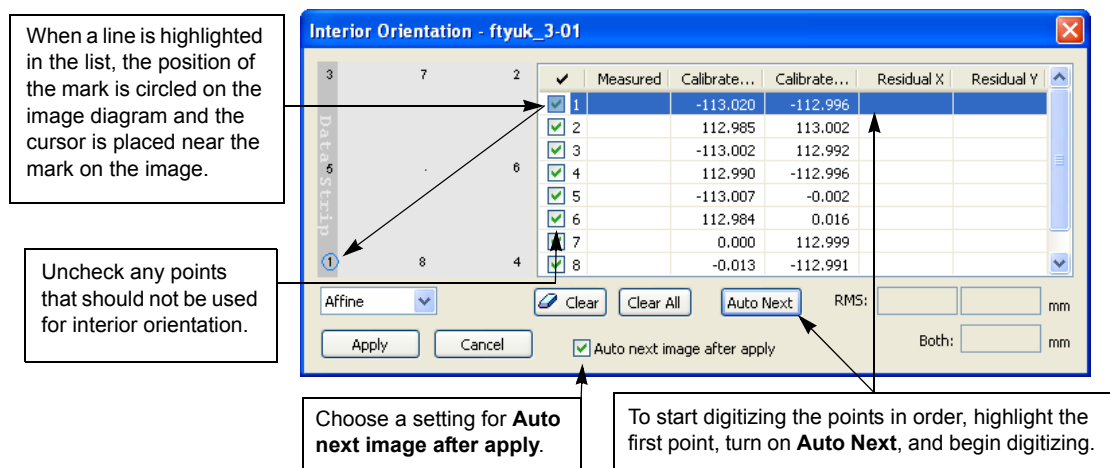


- Step 2)** Select **Interior** from the **Orientation** toolbar or pull-down menu.



Step 3) The interior orientation dialog appears with all fiducial or reseau marks checked on for measuring. Make the following settings:

- Uncheck any points that should not be used for interior orientation. Note that the points may be turned on or off at any time, even after they have been measured.
- If desired, check the **Auto next image after apply** box. If it is on when the **Apply** button is selected, the next image in the project automatically opens for interior orientation.



Step 4) To digitize points, highlight the first point, turn on the **Auto Next** button, and begin digitizing. When **Auto Next** is on, the cursor moves near each fiducial or reseau mark and waits for it to be digitized. **Auto Next** is useful to quickly measure each mark for a new model. If a point is misread, it may be corrected later by highlighting and re-measuring it. Perform one of the following actions:

- To digitize the highlighted point, first zoom in close enough to view the pixels at the center of the mark. Position the cursor at the center of the mark and press the digitizing switch. The cursor automatically moves near the next mark.
- To skip the highlighted mark and move near the next mark, click the system mouse to uncheck the point's box in the list.
- Continue digitizing the other points.



Place the cursor at the center of the fiducial or reseau mark, then digitize.

Step 5) After measuring each mark, review the residuals. To improve residuals for a point, select the point to highlight it in the list. Either digitize it or uncheck it.

To improve residuals, either uncheck bad points or highlight and redigitize them.

When redigitizing individual points, **Auto Next** should be off.

	Measured	Calibrate...	Calibrate...	Residual X	Residual Y
1	Yes	-113.020	-112.996	-0.0125	0.0218
2	Yes	112.985	113.002	-0.0422	0.0617
3	Yes	-113.002	112.992	0.0069	-0.0114
4	Yes	112.990	-112.996	0.0077	-0.0135
5	Yes	-113.007	-0.002	-0.0063	0.0013
6	Yes	112.984	0.016	0.0225	-0.0364
7					
8					

	Measured	Calibrate...	Calibrate...	Residual X	Residual Y
1	Yes	-113.020	-112.996	0.0051	-0.0005
2	Yes	112.985	113.002	0.0037	0.0038
3	Yes	-113.002	112.992	-0.0037	0.0020
4	Yes	112.990	-112.996	-0.0028	-0.0002
5	Yes	-113.007	-0.002	-0.0028	-0.0032
6	Yes	112.984	0.016	-0.0022	-0.0052
7	Yes	0.000	112.999	0.0025	-0.0016
8	Yes	-0.013	-112.991	0.0002	0.0048

Step 6) Another option to improve residuals is to clear one or more points before redigitizing them. This shows what the residuals of the other points would be without the “bad” point affecting the results. You can then be sure any new measurements fit within the desired residual range.

Other options before redigitizing:

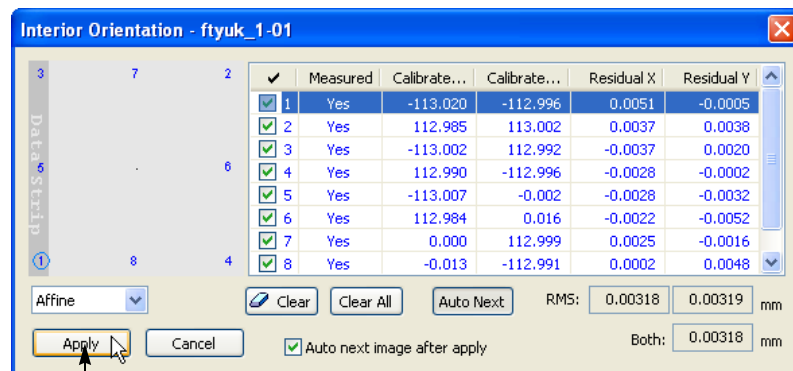
- The **Clear** option removes the measurement from the highlighted point.
- The **Clear All** option removes the measurements from all the points.

	Measured	Calibrate...	Calibrate...	Residual X	Residual Y
1	Yes	-113.020	-112.996	0.0040	-0.0018
2	Yes	112.985	113.002	0.0039	0.0040
3	Yes	-113.002	112.992	-0.0049	0.0007
4	Yes	112.990	-112.996	-0.0027	-0.0000
5		-113.007	-0.002		
6	Yes	112.984	0.016	-0.0020	-0.0050
7	Yes	0.000	112.999	0.0020	-0.0022
8	Yes	-0.013	-112.991	-0.0003	0.0043

	Measured	Calibrate...	Calibrate...	Residual X	Residual Y
1		-113.020	-112.996		
2		112.985	113.002		
3		-113.002	112.992		
4		112.990	-112.996		
5		-113.007	-0.002		
6		112.984	0.016		
7		0.000	112.999		
8		-0.013	-112.991		

Step 7) If **Clear** or **Clear All** have been used, redigitize the points that no longer show residual values.

Step 8) When the residuals are acceptable, select **Apply**.



Step 9) If **Auto next image after apply** was on, the next image in the project opens. It is also possible to open the next image by clicking on it in the Project Window. Measure the fiducials for each image in turn.

Interior Orientation Distortion Removal Tool

The Interior Orientation Distortion Removal Tool (“IO Distortion Removal”) does not perform interior orientation. It is a special tool to transfer the camera distortions from the camera file to the pixels in the image. It inputs camera-lens-distorted images and outputs corrected-for-camera-distortion images.

This tool is optional. It is provided due to a special customer request. The majority of DAT/EM customers will not need to use this tool.

All of the following are required in order to use IO Distortion Removal:

- Any aerial project that has...
- ...a complete interior orientation with acceptable residuals.
- ...a camera file that has distortions applied.

IO Distortion Removal outputs the following:

- An aerial project that has...
- ...new images adjusted for camera distortions
- ...a camera file that does not have distortions applied.

To use the IO Distortion Removal Tool, perform the following steps:

Step 1) Prepare a Summit Evolution **.smtxml** aerial project that has:

- a.) **Images** of any type accepted for SUMMIT EVOLUTION aerial projects.
- b.) **A camera file** that has the distortions applied. *The camera file must be the type that can be opened in SUMMIT EVOLUTION's Camera Editor dialog (page 5-7); imported projects that do not have a camera file may not be used. The Use Correction setting must be on when viewed in the Camera Editor. Any of the distortion methods may be used: Distance, Angular, Formula Radial, Formula Decentering, or Grid Correction. (For more information about camera distortion settings, see Chapter 5, Step 7 starting on page 5-13.)*
- c.) **A complete interior orientation** of the type that is visible in SUMMIT EVOLUTION's Interior Orientation dialog (page 18-7); it must not be embedded as in some types of imported projects. Relative and exterior orientations are optional and will not affect the output.

Step 2) Start the **IODistortRemoval.exe** application. If the default folders were used during installation, this will be located here:

- (Windows XP) <drive>:\Program Files\Datem Software\IODistortRemoval.exe
- (Windows 7) <drive>:\Program Files (x86)\Datem Software\IODistortRemoval.exe

Step 3) Browse for the input SUMMIT EVOLUTION aerial project and make other settings.

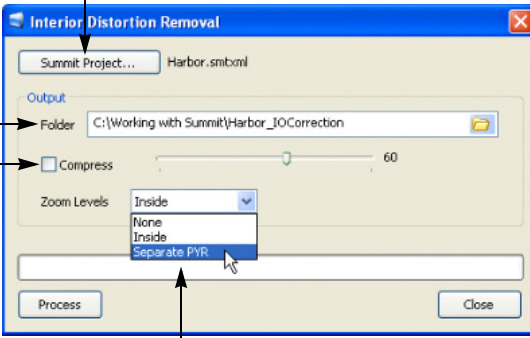
Select the **Summit Project** button. Browse for the input aerial **.smtxml** project.

Select an output folder. *This must be different from the original project folder. Many of the new files will have the same names as the originals, so they must be kept in a separate folder!*

Compress is an option to compress the output images, and is the user's choice. (The input images are not changed in any way.)

If image compression is desired, check on **Compress** and use the slider to choose a compression setting.

- In most cases, compression is not recommended due to the possibility of resolution loss.
- If there is enough file storage space, do not compress the file.
- Compressing a file does not speed up SUMMIT EVOLUTION's file access time.
- Note that the JPEG compression standard supports 1-, 2-, and 3-band imagery; for more bands, leave **Compress** unchecked.



Choose a **Zoom Levels** setting:

- **None**: Creates a 1X-level image only.
- **Inside**: Creates output images that include the 1X level and several embedded zoom levels.
- **Separate PYR**: Creates two images per input image, a **.tif** file that contains the 1X level and a separate **.pyr** file that contains all of the zoom levels.

Step 4) Select **Process**.

Step 5) Find the resulting files:

- A new SUMMIT EVOLUTION **.smtxml** project
- New images that have the camera distortions applied.
- A new camera file. This is a copy of the original camera file with the distortion values present, but turned off. That is, **Use Correction** is **off** when viewed from the **Distortion** tab of the Camera Editor (page 5-13).
- Any other project files, such as control files, will be copied directly to the new folder.

Note: Since many of the new files are named the same as the original files, please be careful to keep them in separate folders. If desired, use SUMMIT EVOLUTION to rename the project and modify file names.

Chapter 19. Relative Orientation

Not included in Feature Collection Edition

When should relative orientation be done?

See “Choose an Orientation Method” in *Chapter 17* to choose an orientation procedure. Then if the procedure steps require relative orientation, use this chapter.

- To use SUMMIT EVOLUTION’s automatic relative orientation procedure to find points shared by two images, see “Relative Orientation: Image Processing “Automatic or Auto” Method” on page 19-2.
- To manually measure relative points shared by two images, see “Relative Orientation: Two-Image Selection “Manual Measurement” Method” on page 19-5.
- To manually measure relative points shared by two, three, or more images, see “Relative Orientation: Tie Points Selection Method” on page 19-14. This method is often required to measure “triple overlap” points for export to third-party aerotriangulation packages.
- To import relative orientation results from a third-party aerotriangulation package or from another non-analog stereoplotter, see “Relative Orientation: Import Relative Method” on page 19-34.

A combination of these methods may be used. For example, the Automatic method may be used first to find most of the two-image relative points in most of the models; then the Manual method may be used to measure points in any heavily forested or featureless models that did not succeed in the Automatic method; then the Tie Points method may be used to measure control points on the strip ends and strip-to-strip overlap points. All of the points may then be exported to a third-party Aerotriangulation software package.

Note that any relative orientation points, regardless of how they were obtained, can be viewed at any time in the Tie Points dialog (page 19-14).

Note that if an exterior orientation is imported, any previous relative orientation is deactivated so that it will not interfere with the exterior orientation results. If for some reason you wish to reactivate the relative orientation, “Reactivating Other Orientations after Exterior Orientation” on page 21-17.

Relative Orientation: Image Processing “Automatic or Auto” Method

Not included in Feature Collection Edition

The image processing method of relative orientation uses image processing to compare pixel groupings on the left and right photos and determine relative points from matched sets. All selected images in the project may be run at one time. Automatic relative orientation finds relative points shared by two images only.

- It will succeed in terrain where there are distinct features such as rocks, buildings, curbs, and roads.
- It will not succeed in densely forested, snowy, or flat and featureless areas. That is, if every pixel is very much like the ones around it, a relative point will not be found. If you suspect this might happen, a combination of relative orientation methods may be used. For example, if the automatic method fails to find points in some models, the Selection method (page 19-5) may be used to align and measure Von Gruber points, and then the Automatic method may be run again to add more points, if needed. It doesn't matter in which order the relative orientation methods are run, and it doesn't matter whether the points in a model were found by a combination of the Automatic method, the Selection method (page 19-5), and the Tie Points method (page 19-14).

If desired, the image processing method may be followed by the tie points method to add “triple overlap” or strip overlap points that are shared by more than two images.

In speech, the image processing method may be called the “automatic relative” or “auto relative” method. For a description of relative orientation and the method used by SUMMIT EVOLUTION, see *Appendix E*.

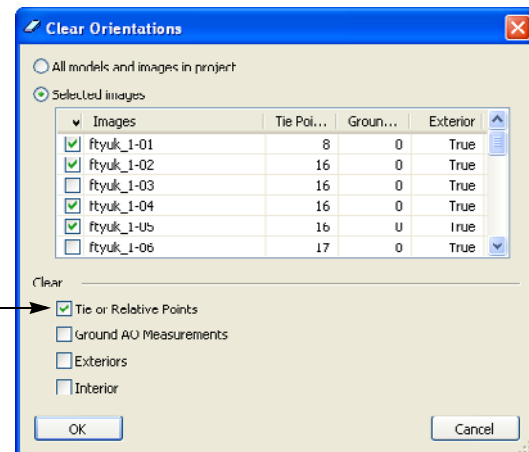
Perform the following steps:

Step 1) Preparation: Perform the following in preparation for automatic relative orientation:

- (Optional, to be done when existing orientation cannot be corrected by other methods) Any *existing* orientation that is “bad” or incorrect may be cleared by selecting **Clear Orientations** from the **Orientation** menu:

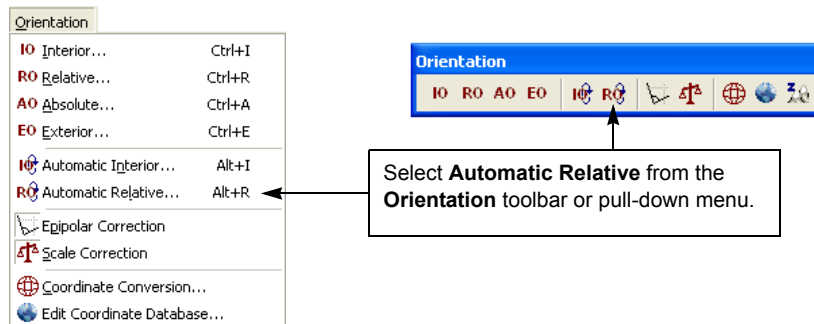
(Optional) Any existing incorrect orientations may be cleared by selecting **Clear Orientations** from the **Orientation** pull-down menu.

Select images and the type(s) of orientation to clear.

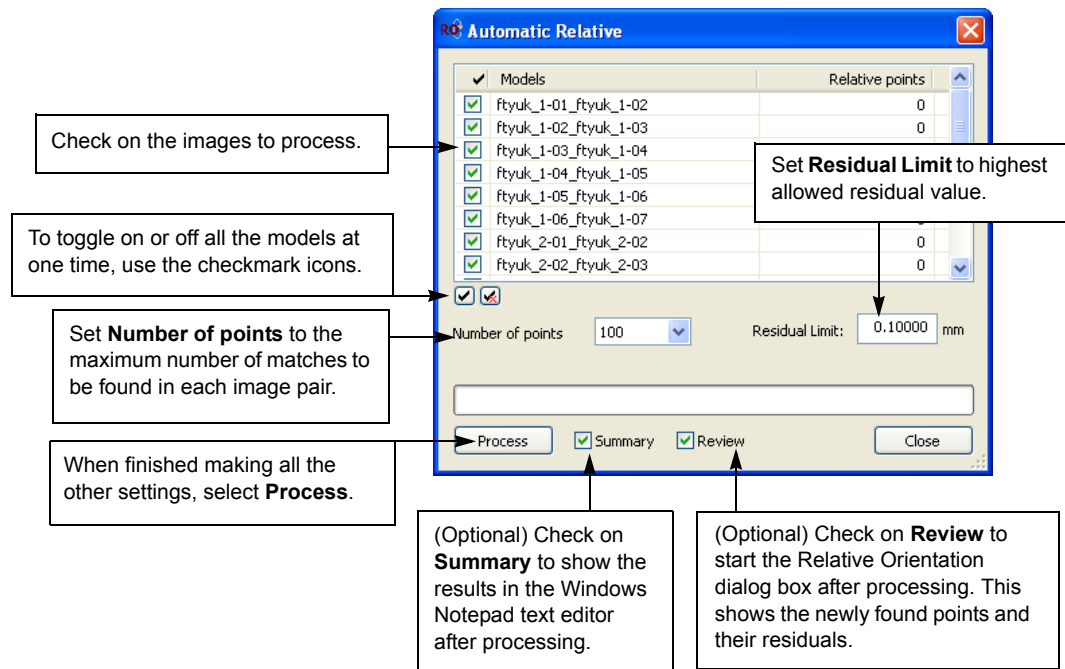


- Models must be defined in the project file (*Chapter 16*).
- Perform interior orientation for all models in the project (*Chapter 18*).
- Open any model in the project.

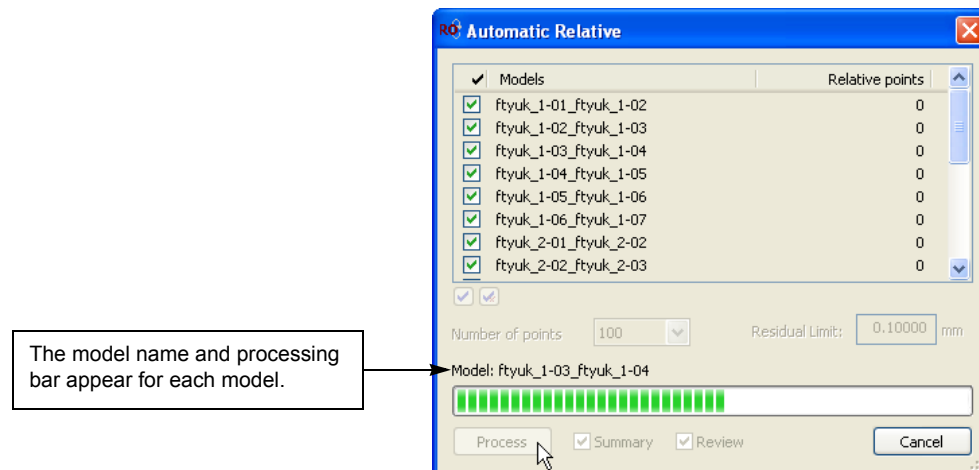
Step 2) Select **Automatic Relative** from the **Orientation** toolbar or pull-down menu.



Step 3) Make settings as follows:



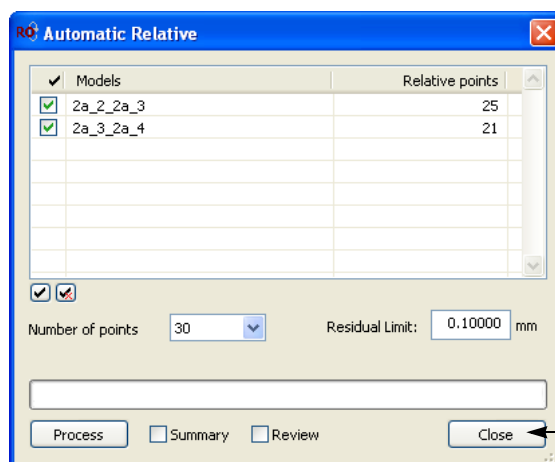
Step 4) A processing message appears for each checked model:



Step 5) When the processing is finished, two new windows may appear:

- If **Review** was checked on, the Relative Orientation dialog appears to show the newly found relative points and their residuals. If desired, add, delete, or re-measure points using the instructions on page 19-5.
- If **Summary** was checked on, the Windows Notepad text editor appears to show a summary of the results.

Step 6) If the automatic relative results are acceptable, select **Close** to end automatic relative orientation.



If the automatic relative results are acceptable, select **Close**.

If the number in the **Relative points** column is too low or zero, then the model is too featureless for pixel matches to be found. In this case, use the selection method (below) to manually align and measure points.

What if Automatic Relative doesn't work?

Automatic Relative relies on pixel pattern matching. It may not be able to find matches if there are large, featureless areas in the images such as:

- Large areas of water or trees
- Flat fields that have uniform vegetation and no plow patterns
- Snow or flat ground that has no vegetation or rocks

If Automatic Relative Orientation fails in a model, measure the orientation manually. If desired, run the automatic method again after manually measuring the Von Gruber positions. See "Relative Orientation: Two-Image Selection "Manual Measurement" Method" below.

Note that a successful automatic relative orientation remains active until an exterior orientation is imported. If an exterior orientation is imported, any previous relative orientation is deactivated so that it will not interfere with the exterior orientation results. If for some reason you wish to reactivate the relative orientation after an exterior orientation has been imported, see page 21-17.

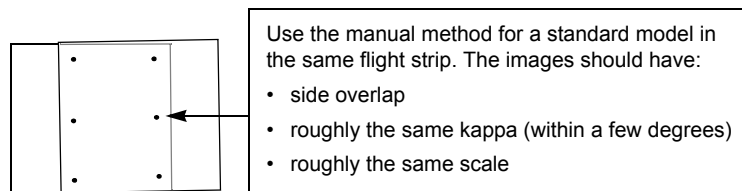
Relative Orientation: Two-Image Selection “Manual Measurement” Method

Not included in Feature Collection Edition

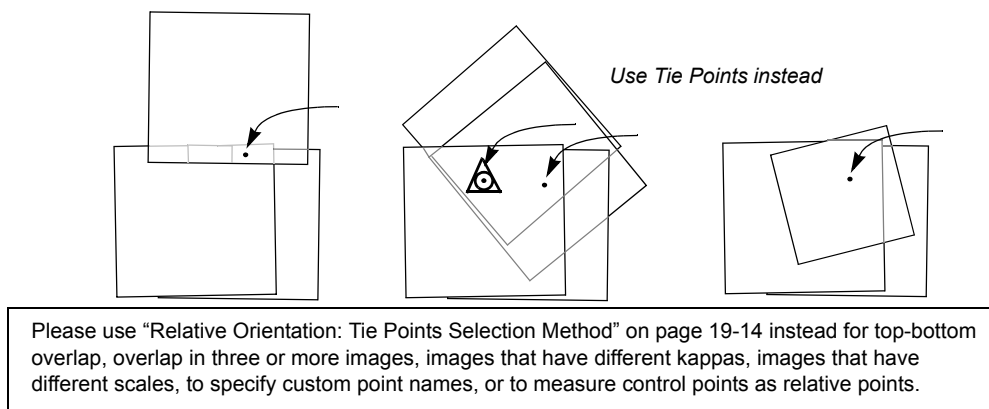
The two-image selection method of relative orientation offers measurement of points that appear in the overlap area of two open images. For this method, the user chooses relative point locations, removes parallax, and digitizes each point. The selection method may be used alone or in combination with the automatic and tie points methods.

The two-image selection method may also be called the “manual method”.

- **When to use:** Use the manual method for two images that form a model in the same flight strip. The images should have side overlap, roughly the same kappa, and roughly the same scale.



- **When NOT to use:** The manual method should not be used for more complicated situations. Use “Relative Orientation: Tie Points Selection Method” on page 19-14 instead for top-bottom overlap, overlap in three or more images, different kappa angles, different scales, to use an estimated exterior orientation to help position the cursor, to use custom relative point names, or to measure control points as relative points.



It may be necessary to use the manual method in models where the terrain is too featureless for the automatic method to find enough pixel matches. If automatic relative fails to find points the first time, use the manual method to measure Von Gruber positions, then try automatic relative again. The automatic, manual, and tie points methods may be used in any combination and in any order.

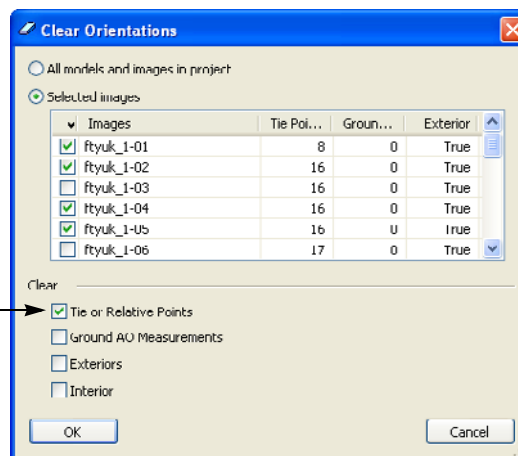
Perform the following steps:

Step 1) Preparation: Perform the following to prepare for manual relative orientation:

- (Optional, to be done when existing orientation cannot be corrected by other methods) Any *existing* orientation that is “bad” or incorrect may be cleared by selecting **Clear Orientations** from the **Orientation** menu:

(Optional) Any existing incorrect orientations may be cleared by selecting **Clear Orientations** from the **Orientation** pull-down menu.

Select images and the type(s) of orientation to clear.



- b.) Use the Button Manager (page 25-38) to make a button configuration just for use with Relative Orientation. Suggested settings:

Type=Plotter with Action=Pick

Type=Plotter with Action=Lock Image

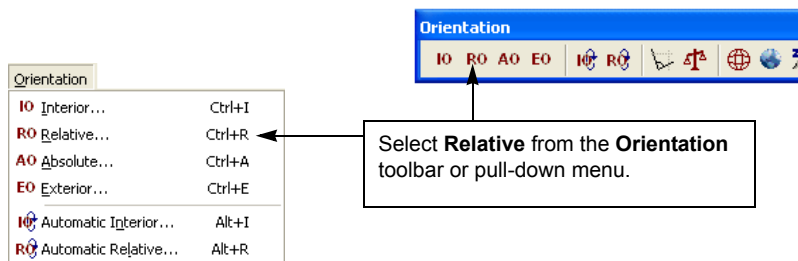
Type=Plotter with Action=Align

Type=Plotter with Action=Pan Left, Pan Right, Pan Up, and Pan Down

Type=Plotter Zoom and Action=.25:.5:1:4:8 (or your choice of zooms)

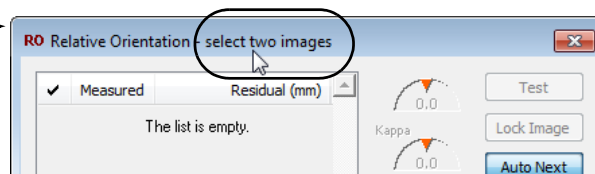
- c.) Models must be defined in the project file (*Chapter 16*).
 d.) Perform interior orientation for all models in the project (*Chapter 18*).
 e.) Open any model in the project.

Step 2) Select **Relative** from the **Orientation** toolbar or pull-down menu.



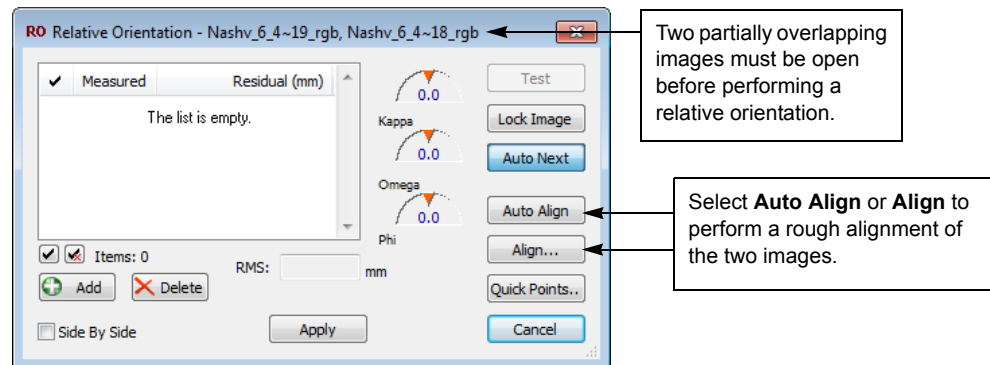
Step 3) If “select two images” appears at the top of the Relative Orientation dialog, then two partially overlapping images are not yet open in the SUMMIT EVOLUTION window. Open two adjoining images (or one model), then continue.

If “select two images” appears, open a model, then continue.

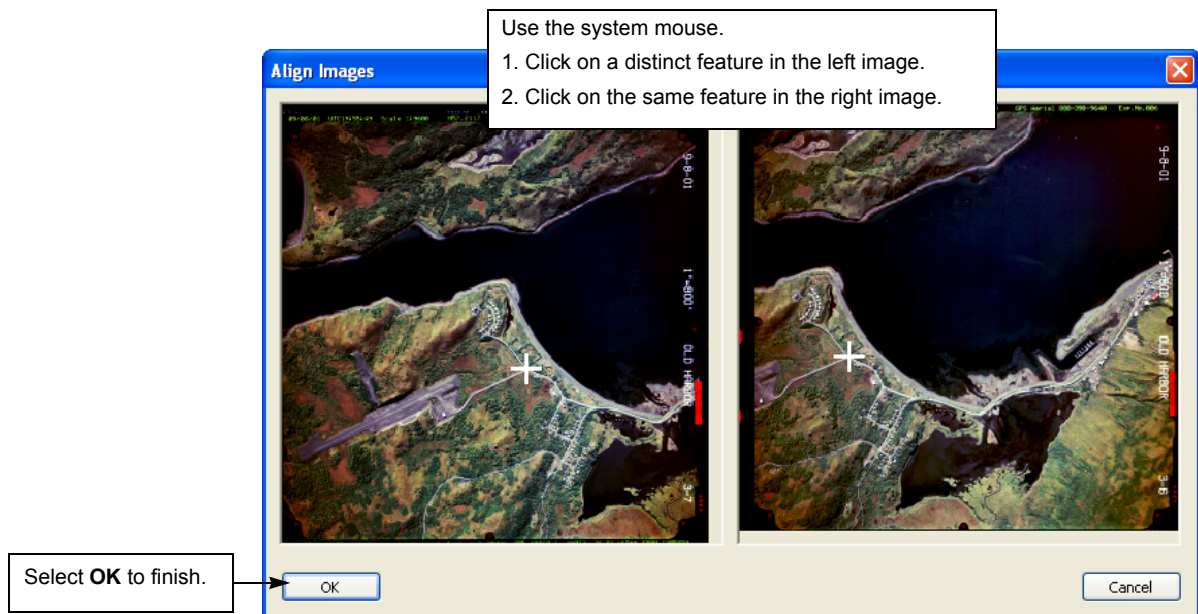


Step 4) A rough alignment between the right and left photo is required to reduce the search radius for pixel matching. Select one of the alignment methods:

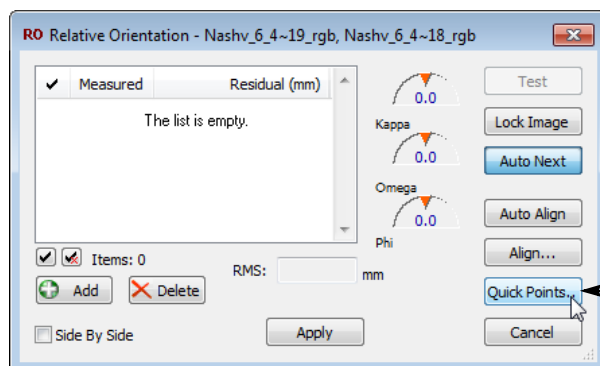
- Select the Auto Align button:** Image processing is used to select a match between the right and left images. No user input is required.
- Select the Align button:** The user selects the same feature on the right and left images.



Step 5) If the **Align** button was selected, the Align Images dialog appears. Click the system mouse on a distinct permanent feature in the left image. Click on the same feature in the right image.



- Step 6)** A list of at least six relative point locations must be created within the image overlap area. Select **Quick Points** and choose one of the following methods to add locations for relative points:
- Von Gruber Points:** If planning to use Von Gruber points, set the desired **edge distance percentage**. The lower the percentage, the closer the Von Gruber points will be placed to the edge of the overlap area. Set the number of **Von Gruber** points, then select one of the buttons to place the Von Gruber points on one or both edges of the right image.
 - Select Your Own Points:** Use the system mouse to select at least six points inside the dashed yellow rectangle that indicates the image overlap area.
 - Combination:** Add automatic Von Gruber points and then use the system mouse to add more points inside the overlap area.
 - Use a Saved Point Layout:** To use any previously saved point layout, set its name in the field and select the **Load** button.



Select **Quick Points**.

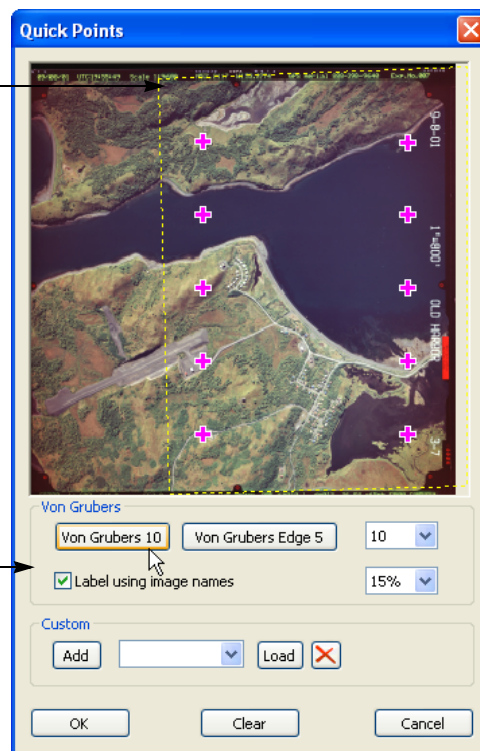
The right image area is outlined with a dashed yellow rectangle.

Choose a method:

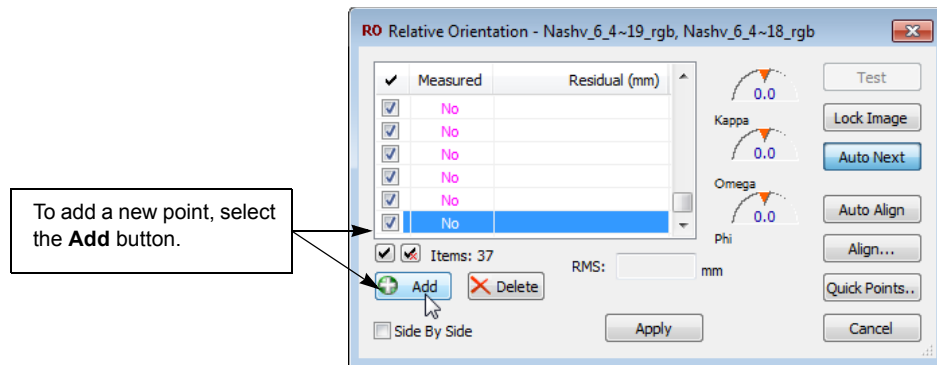
- **Von Grubers 6/8/10/12** automatically selects the number of evenly spaced locations along the right and left edges. Set the desired number in the field to the right.
- Or, **Von Grubers Edge 3/4/5/6** automatically selects the number of points along the right side of the right image.
- Or, use the system mouse to pick at least six points across the overlap area.
- Or, select a combination of **Von Grubers** and pick points with the system mouse.
- To use any previously saved point layout, set its name in the field and select the **Load** button.
- To include the image name in the point label, check on **Label using image names**.

If desired, save a custom point configuration to use again later.

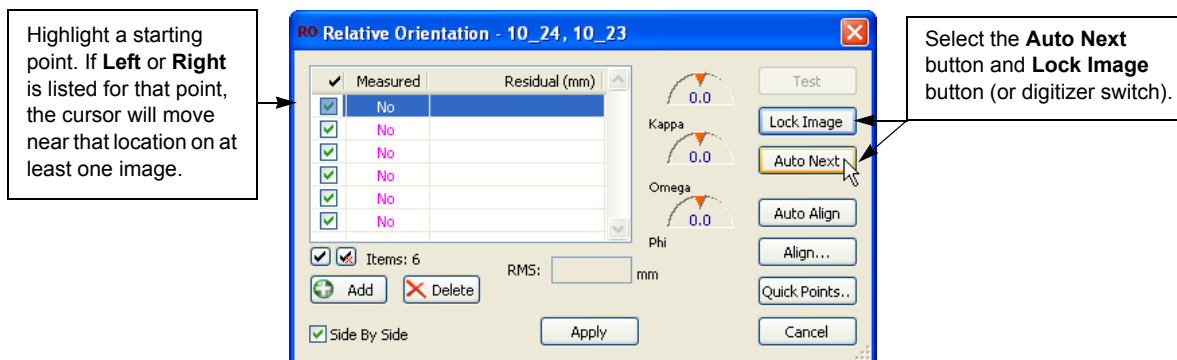
- Select points as desired in the overlap area.
- Enter a name in the layout field.
- Select **Add**.



- Step 7)** (Optional) To add another point at any time, select the **Add** button. A new point will appear at the bottom of the list. Since neither the left nor right image location is assigned to an added point, the cursor will not move when the point is highlighted. If desired, the Bird's-eye View may be used to help find a location to digitize the new point.

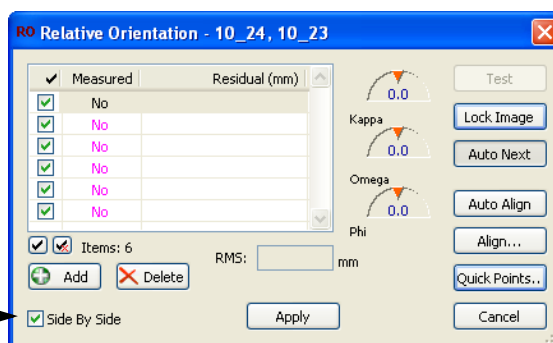


- Step 8)** When the list of points is complete, highlight the first point to be digitized. If the highlighted point was a point selected using **Quick Points**, the left image location is known, and the cursor will be placed on that point. If the highlighted point was added using the **Add** button, it does not yet have a right or left location, so the cursor will not move and the user must choose a location.
- Step 9)** Select the **Auto Next** and **Lock Image** buttons. Note that the movement of one image may also be toggled using a button that is set to **Type=Plotter** and **Action=Lock Image**.



Step 10) Choose a **Side By Side** setting. When off, the images appear together in a stereo view. When on, the view splits to show the left and right image separately. There is no recommended setting; it depends on the user's preference and the particular project. Toggle **Side By Side** at any time.

- **Side By Side** off: view in stereo.
- **Side By Side** on: The view splits to show the left and right image separately.
- Toggle the setting at any time.

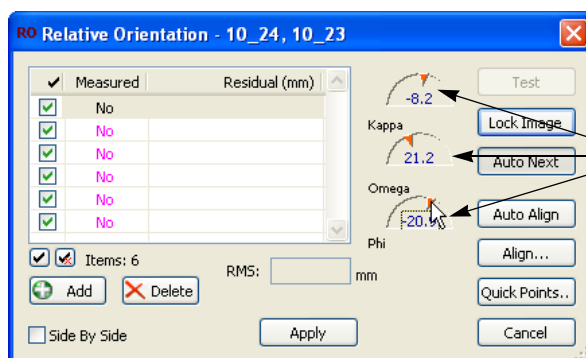


Side-by-side viewing mode

Step 11) Zoom in close enough to view good detail of a distinct feature on the images (page 3-3). Some users prefer to zoom in to a subpixel level to measure relative orientation points. It is recommended to use the same image zoom for reading every relative point.

Step 12) In the general area of the cursor, find a distinct, permanent feature on the images to use for image matching. For example, select a building corner or the base of a fence post. Do not select cars, boats, shadows, or any other objects that may have moved between the image exposures. If necessary, unlock the image to move the cursor closer to the object, then lock it again.

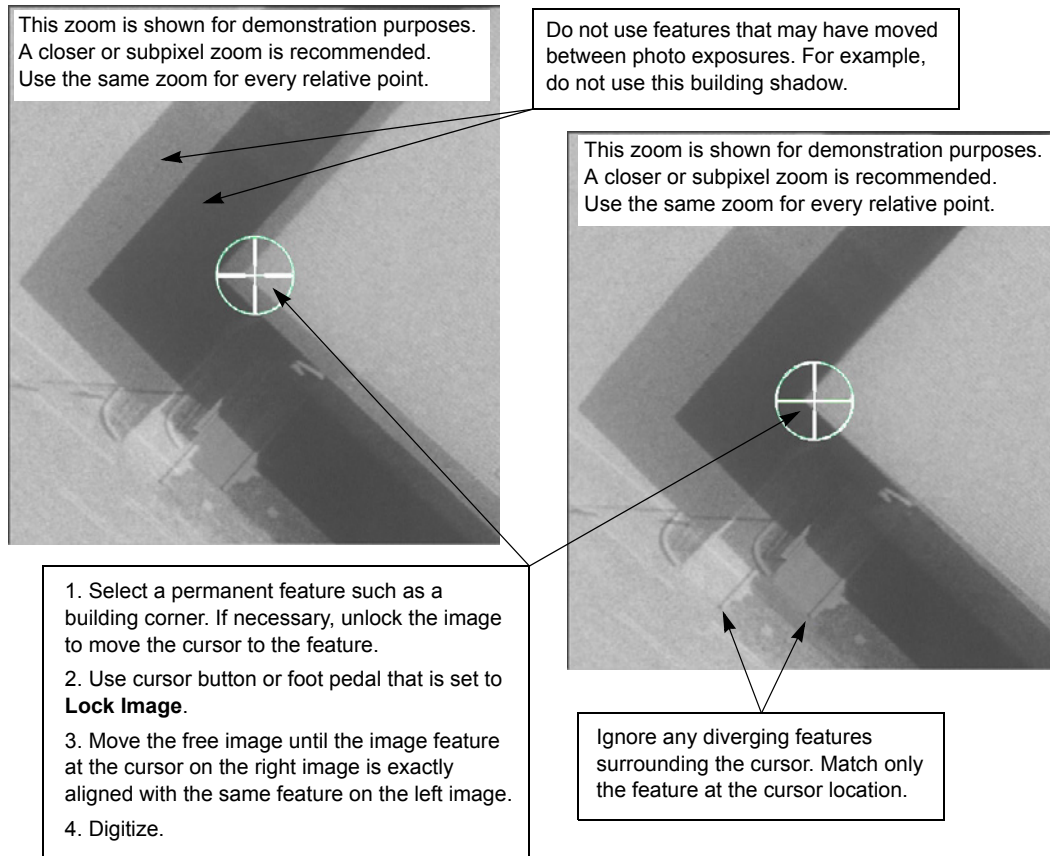
Step 13) (Optional) If angular divergence is extreme, adjust kappa, omega, and phi by dragging the angle pointers with the system mouse. The angle settings appear immediately on the images, making it easier to align the first few points. After a few points have been digitized and a mathematical solution has been calculated, the angle pointers will be disabled and the manually-set angles overwritten.



Kappa, omega, and phi angles may be manually set for the first few relative points. Drag the pointers with the system mouse. The angle settings appear immediately on the images.

Step 14) Remove parallax from the selected point. This may be done automatically or manually:

- **Automatically:** Press the cursor button that is set to **Type=Plotter** and **Action=Align**. The images must be coarsely aligned before **Align** can find a match. If the images do not move to a very close match, it may be necessary to use the **Type=Plotter** with **Action=Lock Image** button to lock one image and move the other image until the feature at the cursor location *almost* matches, then try **Align** again.
- **Manually:** Use the **Type=Plotter** with **Action=Lock Image** button to lock one image and move the other image until the feature at the cursor location matches. Ignore any diverging features surrounding the cursor. Match only the feature exactly at the cursor location.



Step 15) Once the parallax is removed, digitize the point to record the relative position of the images.

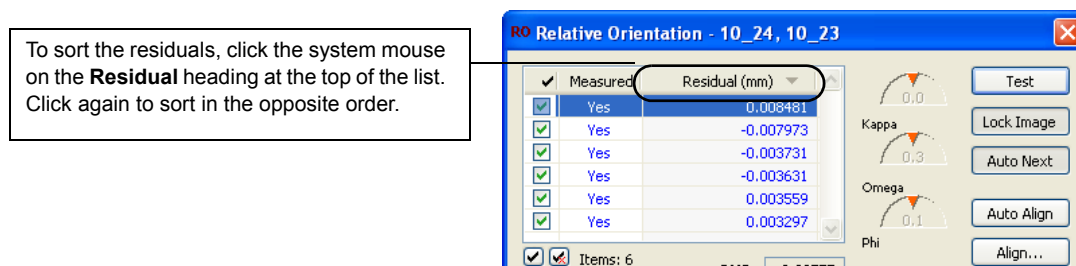
Step 16) (Optional) To skip any point, highlight the next good point on the list and continue.

Step 17) The cursor will be driven to the next point on the list. For each remaining point, repeat the method for removing parallax and recording or skipping the position.

Step 18) To verify the relative orientation and check parallax, turn off **Side By Side** (optional, but recommended), then select the **Test** button. Move around the model in model coordinates. In this mode, points may not be digitized, and the results from the relative orientation can not be changed. When finished, click the **Test** button again to return to relative orientation mode.



Step 19) (Optional) When all the points have been digitized, it may be helpful to sort the residuals from highest to lowest. Click the system mouse on the **Residual** column heading:

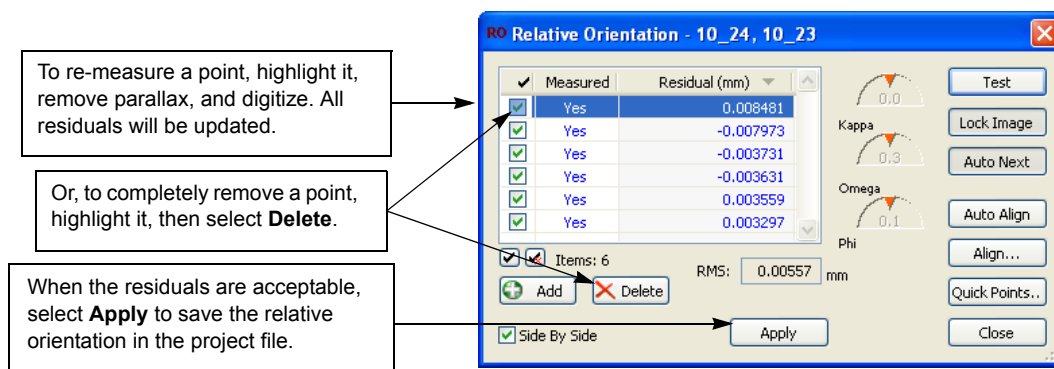


Step 20) If the residuals are *not* acceptable, re-measure individual points to improve them. To do this, highlight the desired point by clicking its line in the Relative Orientation dialog box. Choose a method to remove parallax and digitize points:

- Automatic Method:** Press the **Align** digitizer button (**Type=Plotter, Action=Align**). If the match is not found immediately, unlock the image to move the cursor closer to the object, then press **Align** again. (See **Align** on page 24-3.)
- Manual Method:** Use the **Type=Plotter** with **Action=Lock Image** button to lock one image and move the other image until the feature at the cursor location matches.

Once the parallax is removed, digitize the point.

Step 21) (Optional) To delete a point from the list, highlight the point and select the **Delete** button.



Step 22) When the residuals are acceptable, select the **Apply** button.

Step 23) Select **Save** from the **File** menu or toolbar to save the project.

When relative orientation is finished, there appears to be a slight Y rotation movement in the images as the automatic epipolar correction is activated. To find out more about this correction, see “Orientation Menu > Epipolar Correction” on page 25-27.

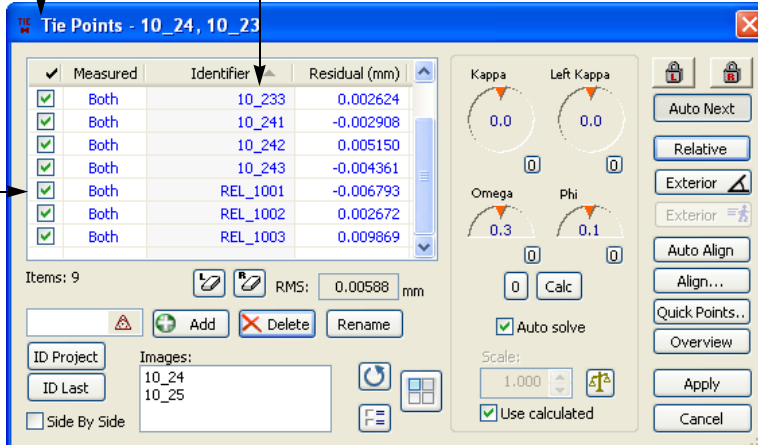
The points digitized using this regular selection method will be stored with the images. Internally, they are assigned a point name, then the left locations are stored with the left image, the right locations are stored with the right image. If the tie points method for relative orientation is started for either of these images, the points will be listed as having a measurement in that image.

To measure the same point in three or more images that have a common overlap area, the tie points method must be used. The tie points method may be started without losing the results of the regular selection method. See “Relative Orientation: Tie Points Selection Method” below.

To measure the same point in three or more images that have a common overlap area, the tie points method must be used. See “Relative Orientation: Tie Points Selection Method” below.

In the Tie Points dialog, the results of a previous selection method of relative orientation are shown as “REL_#” points or named Von Gruber points. They are valid points that may be used for the tie points method if desired.

If the adjoining model is opened, the points might list “Right” or “Left” as measured.



Measured	Identifier	Residual (mm)	
<input checked="" type="checkbox"/>	Both	10_233	0.002624
<input checked="" type="checkbox"/>	Both	10_241	-0.002908
<input checked="" type="checkbox"/>	Both	10_242	0.005150
<input checked="" type="checkbox"/>	Both	10_243	-0.004361
<input checked="" type="checkbox"/>	Both	REL_1001	-0.006793
<input checked="" type="checkbox"/>	Both	REL_1002	0.002672
<input checked="" type="checkbox"/>	Both	REL_1003	0.009869

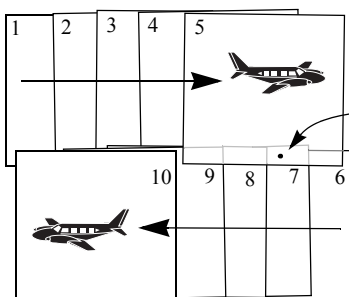
Note that a successful relative orientation remains active until an exterior orientation is imported. If an exterior orientation is imported, any previous relative orientation is deactivated so that it will not interfere with the exterior orientation results. If for some reason you wish to reactivate the relative orientation after an exterior orientation has been imported, see page 21-17.

Relative Orientation: Tie Points Selection Method

Not included in Feature Collection Edition

The tie points method of relative orientation offers the selection of relative points defined on the shared overlap area of two or more image pairs. The tie points method is especially useful to create input for a third-party aerotriangulation (AT) package.

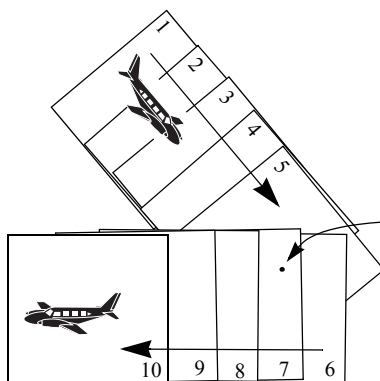
The tie points method allows measurement of multiple overlap points. That is, if there are three or more images that share an overlap area, the same point can be measured in all of these images. If desired, multiple view ports may be used to show every image pair that contains the point.



This point is shared by images 4, 5, 6, and 7.

- It can be measured in the side overlap area when the following images are open: 4 and 5; 6 and 7.
- It can be measured in the top-bottom overlap area when the following images are open: 4 and 6; 4 and 7; 5 and 6; 5 and 7.
- In some projects, a point may be shared by four or more images. The Tie Points dialog allows the point to be measured on any *two or more* images.

Measurement of multiple overlap points may be done using the Tie Points dialog box.



Tie points may be measured on any images that share the ground area of the point. If the kappa angles of any two overlapping images are very different, the images may be rotated temporarily to the best right-left viewing configuration.

Tie Points: Preparation

Perform the following steps to prepare for Tie Points relative orientation:

- Step 1)** Use the Button Manager (page 25-38) to make a button configuration just for use with Relative Orientation. Suggested settings:

Type=Plotter with Action=Pick

Type=Plotter with Action=Lock Image

Type=Plotter with Action=Align

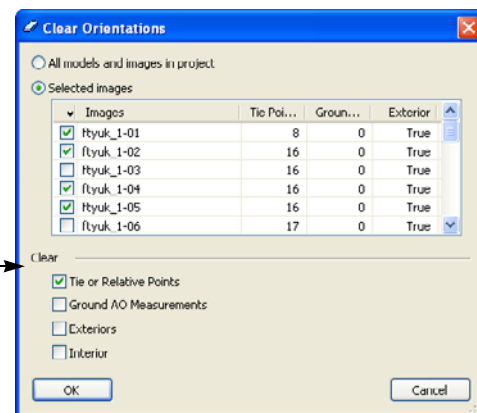
Type=Plotter with Action=Pan Left, Pan Right, Pan Up, and Pan Down

Type=Plotter Zoom and Action=.25:.5:1:4:8 (or your choice of zooms)

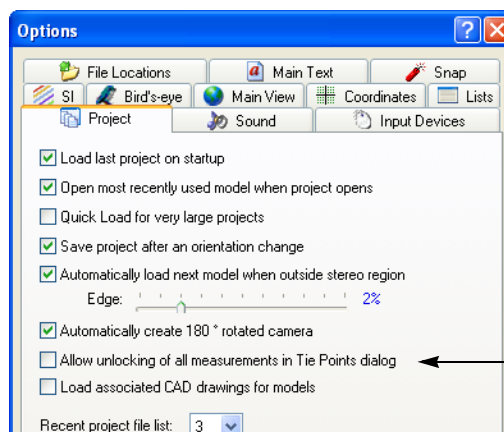
- Step 2)** If creating input for third-party aerotriangulation (AT) software, be familiar with the AT software's requirements for numbers and locations of measured control points. For example, it might require two full control points on each end of each strip and vertical control on cross strips. These requirements vary by brand of AT software.
- Step 3)** If creating input for third-party AT software, verify that one or more control files are referenced in the SUMMIT EVOLUTION **.smtxml** file. The control file(s) must contain the strip end and cross strip control points as required by the AT software. (These points will be measured during the Tie Points process as if they were relative points.)
- Step 4)** (Optional, to be done when existing orientation cannot be corrected by other methods) Any *existing* orientation that is "bad" or incorrect may be cleared by selecting **Clear Orientations** from the **Orientation** menu:

(Optional) Any existing "bad" or incorrect orientations may be cleared by selecting **Clear Orientations** from the **Orientation** pull-down menu.

Select images and the type(s) of orientation to clear.



- Step 5)** If it hasn't already been done, perform interior orientation for all the images (*Chapter 18*).
- Step 6)** If desired, perform Relative Orientation automatic method (page 19-2) and/or two-image selection method (page 19-5). Any existing relative points will be displayed by the Tie Points dialog.
- Step 7)** Know how "allow unlocking" is set. Select **Options** from the **Tools** toolbar or pull-down menu. Select the **Project** tab. Turn on **Allow unlocking of images in Tie Points dialog** *only if* you are planning to move relative point locations of triple overlap points that were previously measured in other image pairs. In most cases, the recommended setting is OFF!



In most cases, **Allow unlocking...** should be OFF! If it is off, a warning message appears if the user attempts to unlock an image and re-measure a point that has already been measured in a different image pair.

Turn this setting on only if you are planning to move relative point locations that are already measured in different image pairs. Be advised that re-measuring a triple overlap point affects the measurements for *all* image pairs that share that point. This may result in an incorrect triple overlap point, and may cause bad results in a third-party aerotriangulation package.

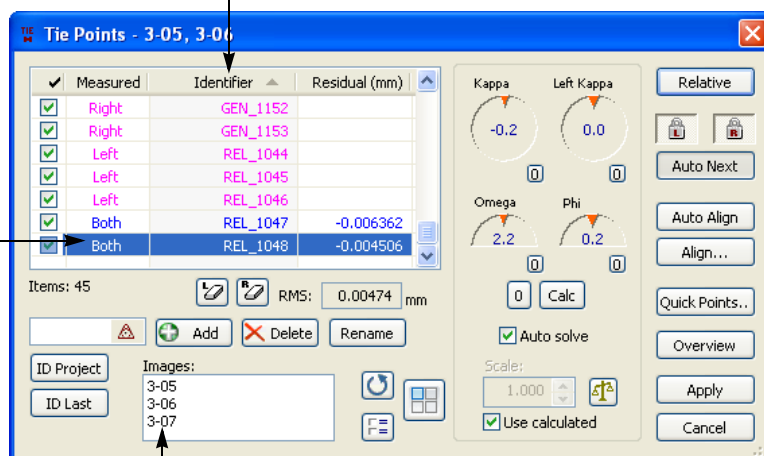
It is the user's responsibility to be sure that the point is recorded accurately in all images that share the point!

Step 8) Know how to recognize the different types of relative orientation points and their measurements shown in the Tie Points dialog:

Points listed in the **Identifier** column can be understood as follows:

- REL_# points were made by the selection method of relative orientation.
- GEN_# points were made by the image processing “automatic” method of relative orientation.
- Integer number points such as 8, 9, or 110 were made by the **Add** feature in either the regular selection method or in this dialog box. They could also have been made by the **Quick Points** feature in this dialog box.
- Any other names were probably added by the **GetID** and **Add** features on this dialog box or by importing points from a control list or aerotriangulation.

- If **Left**, **Right**, or **Both** appear in the **Measured** column, then the point has been measured already in the left, right, or in both images.
- In most cases, DO NOT check off points that show **Left**, **Right**, or **Both**. Checking them off will remove them from any relative orientation done in adjoining models.



The **Images** list shows the images that contain the highlighted point.

Tie Points: Start and Open One Model or Multiple Models

There are two methods to open images for tie points measurements: open just one model in the main stereo view, or open up to nine models in up to (9) view ports. You may choose either method at any time to suit the particular relative points you are measuring.

- Some points exist in only one image pair, such as a regular model relative points or control points. These points can be measured with just one model open.
- If the same relative point exists in multiple image pairs, such as a triple overlap point, **Multiple View Ports** may be used to display each image pair at the same time. The point may then be measured in turn in each of the image pairs that contain it.

The following instructions may be used when first starting the Tie Points dialog, or again at any time to change the number or list of open models:

Step 1) Select **Tie Points** from the **Orientation** toolbar or pull-down menu.



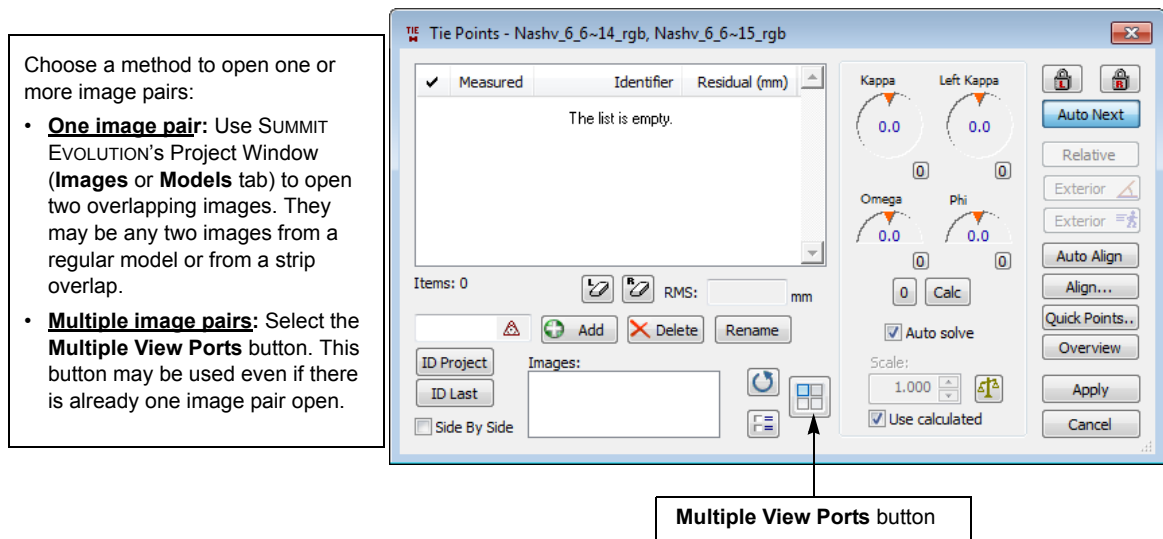
Select **Tie Points** from the **Orientation** toolbar or pull-down menu.

Step 2) The Tie Points dialog appears.

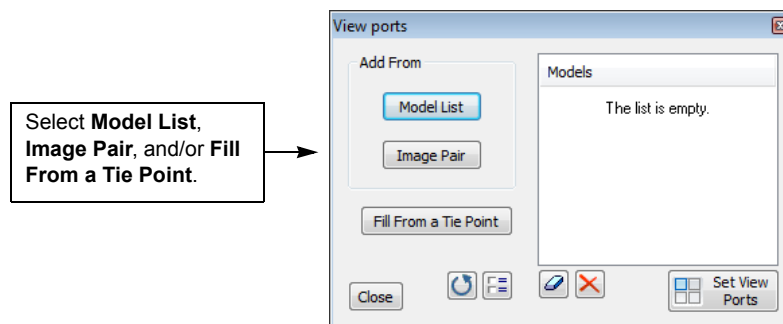
- If a model is already open, its name will appear at the top of the dialog and any existing relative points will appear in the list.
- If a model is not already open, the dialog will show “Select images” at the top.

Choose a method to open one or more image pairs:

- One image pair:** Simply open one model (or any two overlapping images) in SUMMIT EVOLUTION. Use the Project Window (**Images** or **Models** tab) to open two overlapping images. If multiple view ports were previously open, they will close when a model (or two images) is chosen from the Project Window.
- Multiple image pairs:** Select the **Multiple View Ports** button.

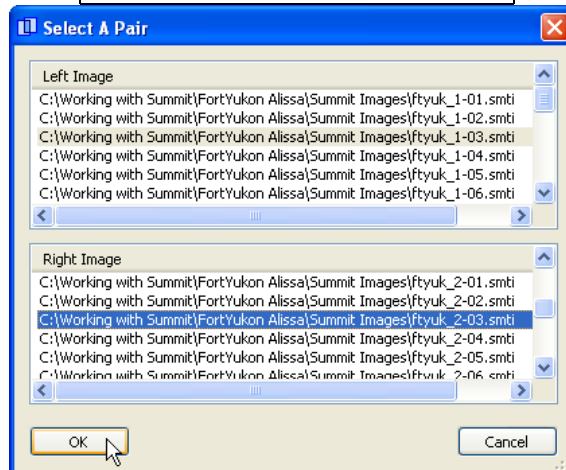
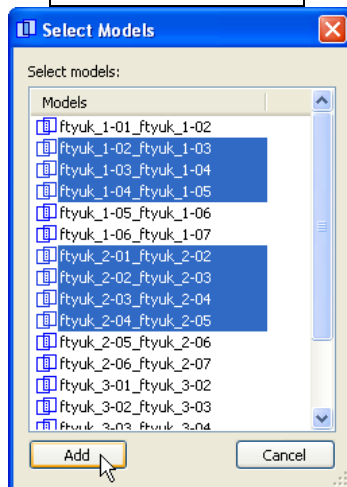


The **View Ports** dialog offers several methods to choose which models and/or image pairs to open. Select up to nine (9) pairs from any combination of **Model List**, **Image Pair**, or **Fill From Tie Point**:



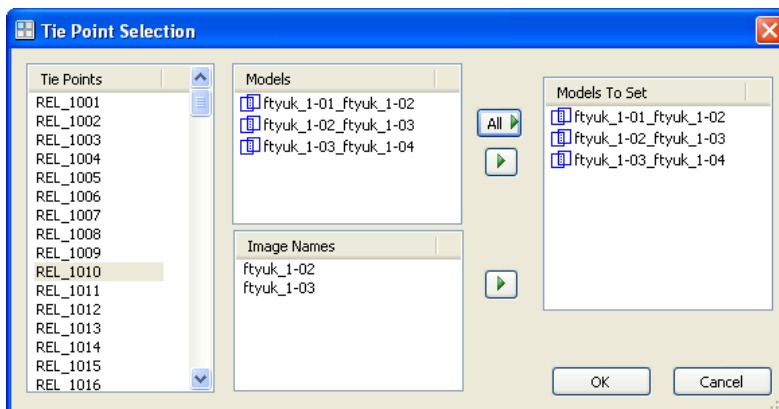
Model List: Select the desired models and select **Add**.

Image Pair: Select each left and right image (or each top and bottom image, which may be rotated later on the screen).

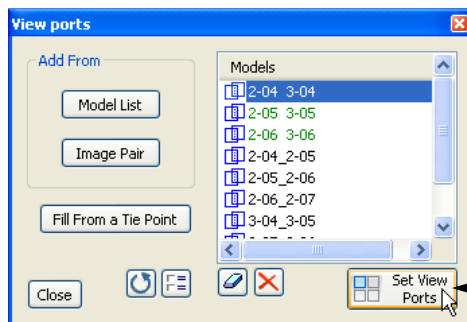


Fill From a Tie Point: Select the tie point. The models and images that contain the point are shown. Select models as needed:

- Choose models from the **Models** list and use the ">" or **All** button to move them to the **Models to Set** list.
- Choose any two images from the **Image Names** list and use the ">" button to move this "temporary model" to the **Models to Set** list. Repeat as necessary.



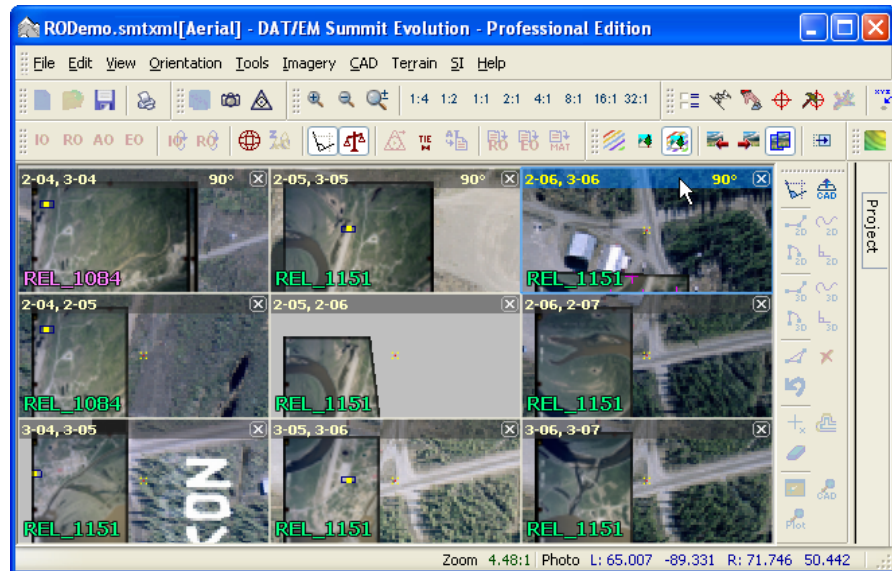
When the **Models** list is ready, select the **Open View Ports** button. Up to nine (9) view ports will open.



Select **Set View Ports**.

Up to nine view ports may be opened.

Click on a view port's title bar to make it active.



View port operation:

- To make a view port active, click on its title bar. When a view port is active, the options on the main **Tie Points** dialog apply to it. This includes the **Side By Side** setting, which splits each view port into two right and left image sections.
- The point number being measured is indicated in green at the bottom of the viewport.
- Zooms in one view port apply to all view ports.
- To close a view port, click on the “x” at the upper right of its window. The remaining view ports will be repositioned to best fit the display area.

The active model is either a single open model or the view port that has the highlighted title bar. No matter how many views are open — one to nine — the process is the same to measure a point in the active model.

Tie Points: Auto Align and Align

The first time a model or image pair is used with Tie Points, a rough alignment between the right and left (or top and bottom) photo is required to reduce the search radius for pixel matching. This is necessary only if the image pair does not already share a relative point or an alignment measurement.

Auto Align and **Align** is optional in the case where the images already have an (approximate) exterior orientation and you plan to use the **Exterior Ground Movement Toggle** button to move in (approximate) ground coordinates.

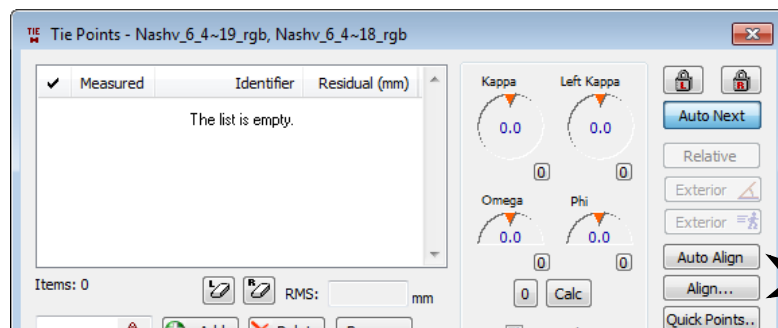
You can recognize models that need alignment by a few clues:

- The left and right (or top and bottom) images show completely different ground areas at the cursor.
- The relative point list may be blank.
- There are points in the list, but they are all measured “Left” only or “Right” only.

Any time the active model is not already aligned, perform the following steps:

Step 1) If multiple view ports are open, click on the title bar of the desired model or image pair.

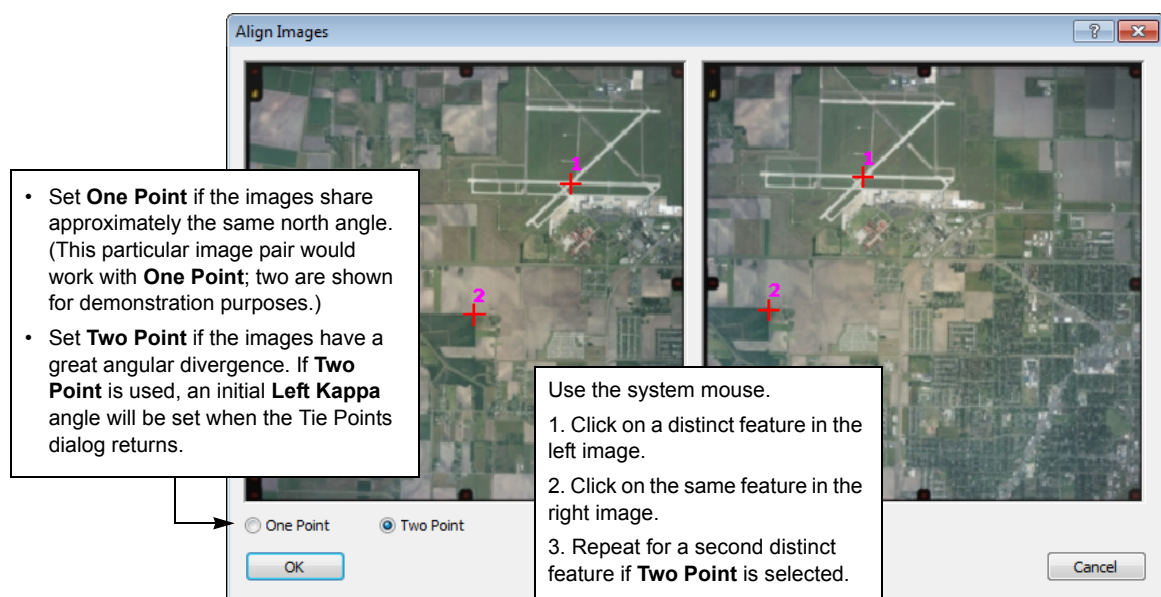
Step 1) Select an alignment method:



Select **Auto Align** or **Align** to perform a rough alignment of the two images.

The manual **Align** method may be necessary if angular divergence is extreme between the left and right images.

- Auto Align button:** Image processing is used to select a match between the right and left images. No user input is required. **Auto Align** works best if the two open images have a very small angular divergence.
- Align button:** The user manually matches one or two similar features on the two images. This method must be used if **Auto Align** fails for some reason. If the images have a great angular divergence, set **Two Point**, otherwise set **One Point**. Find an easy-to-see permanent feature in the left image (such as a building corner, but not a car) that also appears in the right image. Place the tip of the system mouse on the point and click the left mouse button. Repeat with the same feature on the right image. Repeat for another object if **Two** is set. Select **OK**.

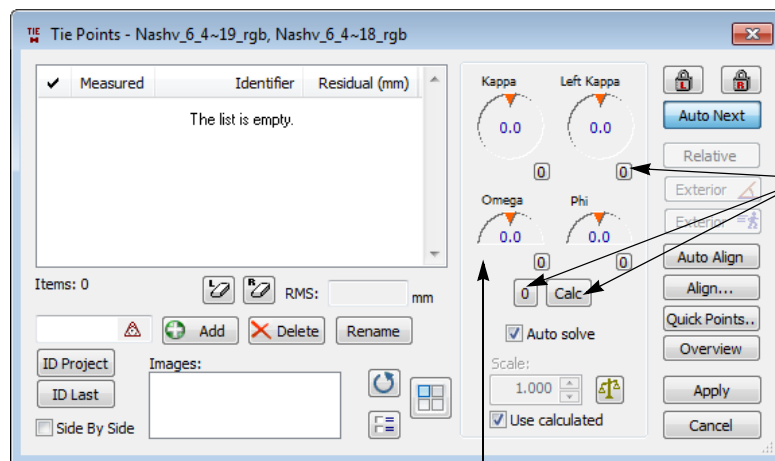


Tie Points: Scale and Rotation

For any active model, perform the following steps to help align, scale, size, and arrange the images left-to-right:

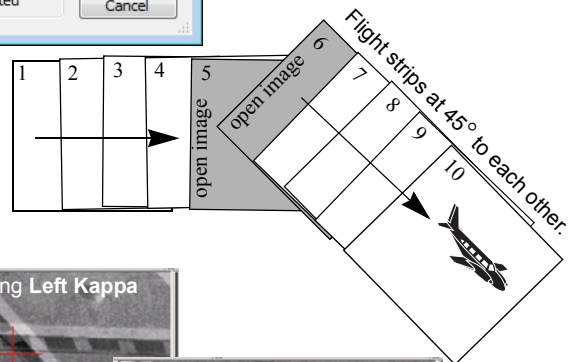
Step 1) If there is angular divergence between the two images, adjust the angle pointers to roughly align them. These angle settings are temporary visual aids; they are not used for calculations, and they are not saved when the Tie Points dialog is closed. These angle settings make it easier to see and accurately align a relative point. Hints:

- If enough relative points already exist in the images, **Omega**, **Phi**, and **Kappa** will already be set to a calculated value, which may be close to the actual alignment.
- **Left Kappa** is useful to visually set the same angle for two images that are rotated with respect to each other. For example, if two flight strips are oriented 45° from each other, and an image from both strips is open, set **Left Kappa** to 45° (or perhaps -45°) so that features in the two images are oriented to the same angle. An initial **Left Kappa** angle may have been set with the **Two Point** option in **Align** (see “Tie Points: Auto Align and Align” above).
- Select the **Calc** or **0** buttons at any time to reset **Kappa**, **Omega**, and **Phi** to their calculated values or to zero. The **Calc** button does not affect the **Left Kappa** setting.

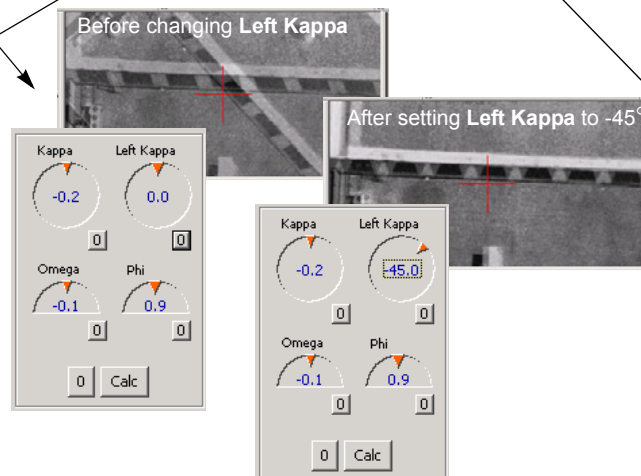


- Select the **Calc** button at any time to reset **Kappa**, **Omega**, and **Phi** (but not **Left Kappa**) to their calculated values, if available.
- Select the large **0** button to reset all four angles to 0.
- Select a small **0** button to reset that angle only to zero.

If it is helpful, align the images to roughly the same angles by using the angle dial settings. These angle settings are temporary visual aids only. **Hint:** These angle can also be set using the **Align > Two Point** method.



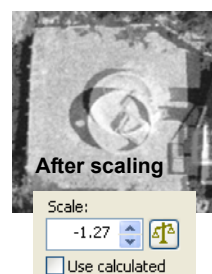
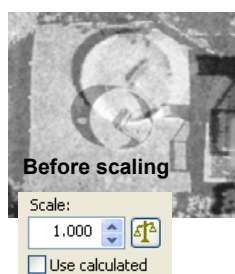
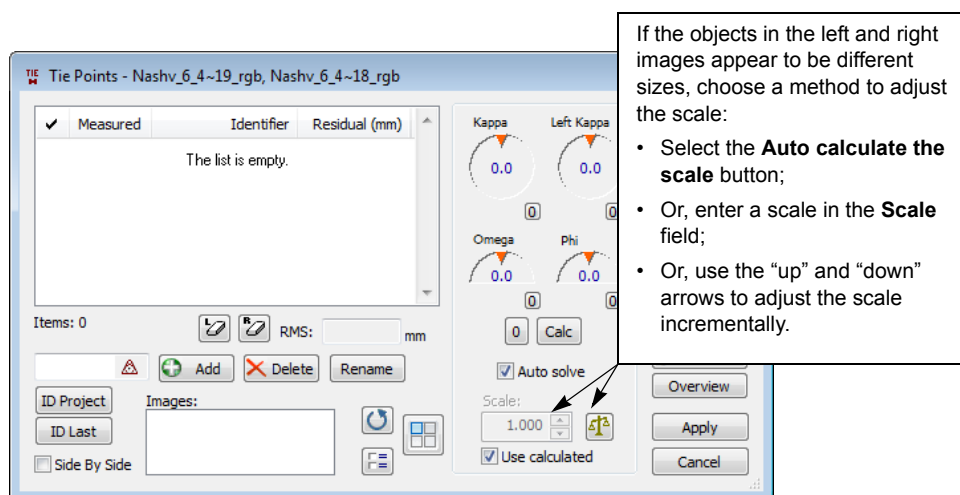
In this example, **Left Kappa** is used to align two images that are oriented 45° from each other. The images are from two different flight strips.



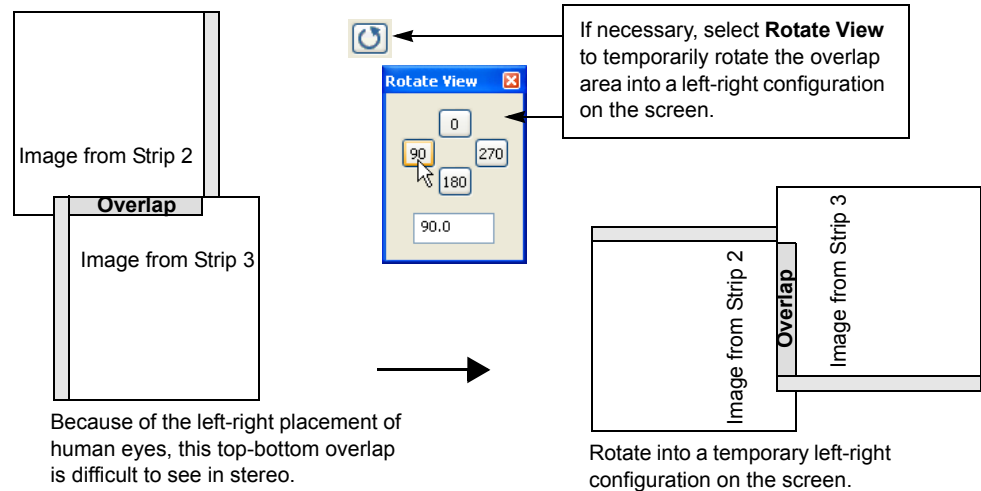
- Step 2)** The scale of the two images can be different, particularly if the images were taken from different altitudes. If the scale of the images is not the same, the same objects appear larger in one image than in the other. In this case, set the **Scale** value to view the images at the same size.

This scale setting is a temporary visual aid; it is not used for calculations, and it is not used after the Tie Points dialog is closed. When a scale is set, one image becomes larger and the other becomes smaller, so that the least possible change is made to the display of either image. The following are some hints for setting the scale:

- View an image feature that fits in the view and has easy-to-see edges, such as a building or small parking lot.
- Click on the **Auto calculate the scale** icon next to the **Scale** field. SUMMIT EVOLUTION will attempt to set the scale automatically.
- Or, to manually set the scale, set the desired scale in the **Scale** field. Either enter a number in the field or use the “up” and “down” arrows to change the scale incrementally.



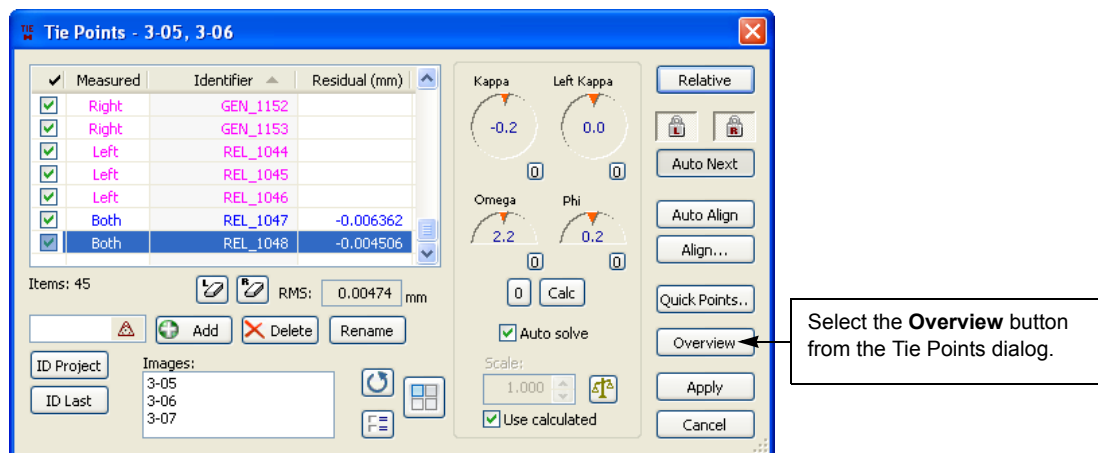
- Step 3)** If the two images do not have a natural left-right overlap, and you know the angle difference between them, select the **Rotate View** button. Choose or enter the angle that produces a left-right overlap configuration on the screen. This is a temporary visual aid that enables you to see well in stereo. (**Hint:** This angle can also be set using the **Align > Two Point** option.)



Tie Points: How to Use the Overview

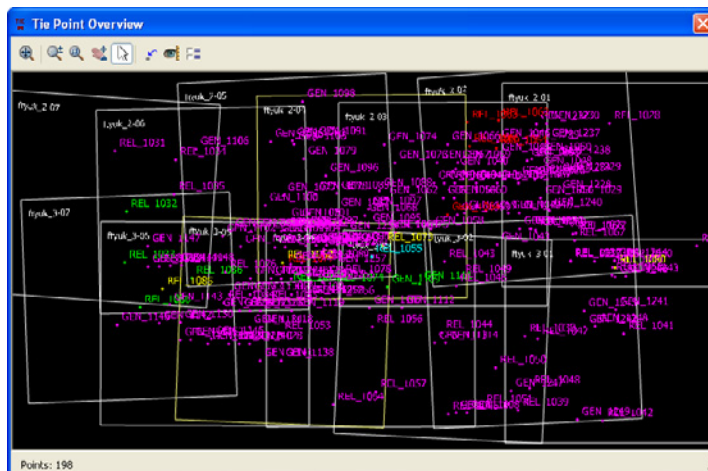
At any time, an overview of all the relative points in the entire project may be displayed in a separate window.

- Step 1)** Select the **Overview** button from the Tie Points dialog.



If desired, select the **Overview** button from the Tie Points dialog.

- The Overview window shows all the relative points in the entire project.
- Use the zoom and pan icons to adjust the display.
- The color of the text shows how many images contain measurements for that point. (Select this window's **Options** icon to adjust the colors of the text.)

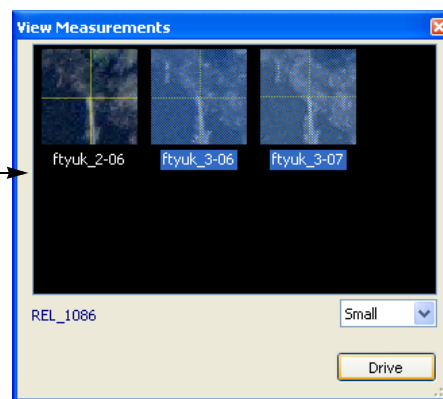


Step 2) Choose from the following overview tools:

- a.) Select the **Selection** icon, then click on a point to highlight it. Select the **View Measurements** icon. If desired, highlight one or two of the displayed images, then select **Drive** to open the image(s) and set the cursor at the measured relative point location. Note that the **Drive** function will close multiple view ports if they were previously open.

If desired, highlight one or two of the displayed images, then select **Drive** to open the image(s) and set the cursor at the measured relative point location.

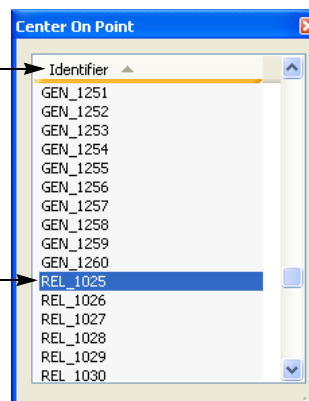
Note: Drive will close the currently open images if they are different than the highlighted images.



- b.) Or, select the **Center on Point** icon. If desired, sort the list by clicking on the "Identifier" column heading. Select a point name from the list. The overview display centers on the point.

Click on the "Identifier" column title to sort the points.

Select any point to center the Overview display on that point.



- c.) Use any of the panning or windowing icons to adjust the overview display.

Tie Points: Add Control Points, Von Gruber Points, and Other Points

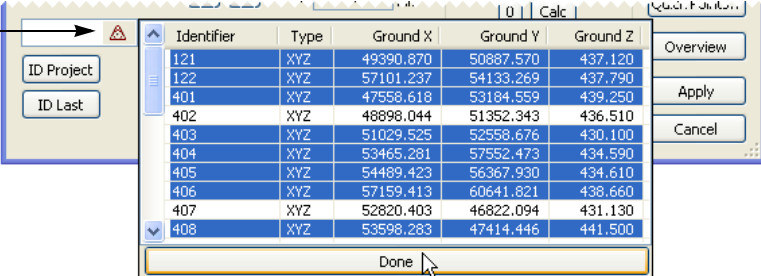
Add points to the list to prepare for relative point measurements. Perform the following steps that apply to your particular active model:

- Step 1)** If preparing input for a third-party aerotriangulation (AT) package, add the control points now. Select the control point icon next to the text field. A list appears showing all the control points in the project's **.con** control files. Select the points that are located in the active model and are also needed by the particular brand of AT software. Select the **Done** button. The points appear in the list of relative points.

If desired, measure the control points immediately. See "Tie Points: Measure Points" on page 19-27 for instructions. Return to this section at any time to add more points.

In preparation for running AT software, add the control points.

- Select the control point icon next to the text field. A list appears showing all the control points in the project's **.con** control file(s).
- Select the control points to use as AT input.
- Select the **Done** button.



In order for this list to be populated with point names, there must be at least one control file referenced in the **.smtxml** project file.

- Step 2)** For a regular left-right model, a list of at least six relative point locations must be created within the image overlap area of a regular model. For images with edge overlaps, three (or as required by the AT software) relative points must be created. These points may have been added already using one of the other relative orientation methods. If they do not already exist, select **Quick Points** and choose one of the following methods to add locations:
- Von Gruber Points:** If planning to use Von Gruber points, set the desired **edge distance percentage**. The lower the percentage, the closer to the edge of the overlap area.
 - Select **Von Grubers 6** to automatically select six evenly spaced locations in a large overlap area, such as in a pair of adjoining images from the same flight strip (a regular model).
 - Select **Von Grubers 3** to automatically select three points along one edge. **Von Grubers 3** is good for setting up triple overlap points in an edge overlap area.
 - Select Your Own Points:** Use the system mouse to select at least six points inside the dashed yellow rectangle that indicates the image overlap area.
 - Combination:** Add automatic Von Gruber points and then use the system mouse to add more points inside the overlap area.
 - Use a Saved Point Layout:** To use any previously saved point layout, set its name in the field and select the **Load** button.

After **Align** or **Auto Align** have been used, select the **Quick Points** button.

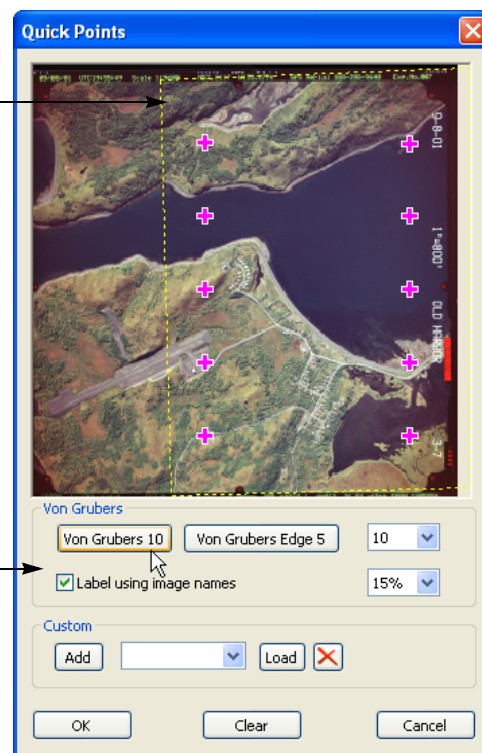
The image overlap area is outlined with a dashed yellow rectangle.

Choose a method to add at least 6 locations:

- **Von Grubers 6** automatically selects six evenly spaced locations along the right and left edges.
- Or, **Von Grubers Edge 3** automatically selects three points along the right side of the left image.
- Or, use the system mouse to pick at least six points across the overlap area.
- Or, select a combination of **Von Grubers** and pick points with the system mouse.
- To use any previously saved point layout, set its name in the field and select the **Load** button.
- To include the image name in the point label, check on **Label using image names**.

If desired, save a custom point configuration to use again later.

- Select points as desired in the overlap area.
- Enter a name in the layout field.
- Select **Add**.

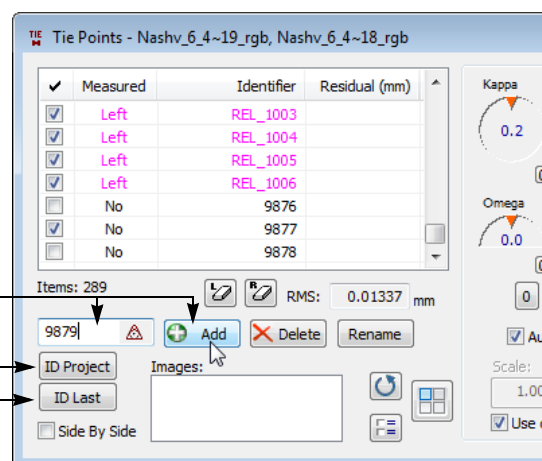


Step 3) If necessary, add more new points to the list using any of the following methods:

- Enter a point name in the text field, then select the **Add** button.
- Use the **ID Project** button to add one to the highest numeric relative point number found in the entire project. The suggested number appears in the text field. Select the **Add** button.
- Use the **ID Last** button to add one to the last numeric relative point added. The suggested number appears in the text field. Select the **Add** button.

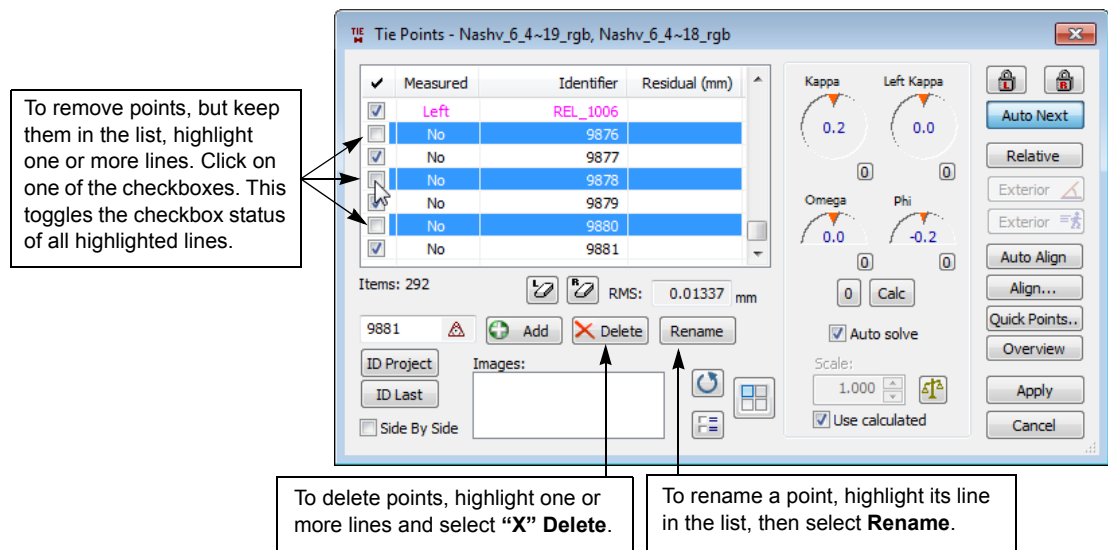
To add new points to the list, use any of the following methods:

- Enter a point name in the text field, then select the **Add** button.
- Use the **ID Project** button to add one to the highest numeric relative point number found in the entire project. The suggested number appears in the text field. Select the **Add** button.
- Use the **ID Last** button to add one to the last numeric relative point added. The suggested number appears in the text field. Select the **Add** button.



Step 4) If necessary, edit the relative points list:

- To delete a point from the list, highlight its line and select the “**X**” **Delete** button. If multiple lines are highlighted, **Delete** removes all of them.
- To remove a point, but keep it in the list, highlight it and uncheck its box. If multiple lines are selected, clicking on one checkbox toggles all of them.
- To rename a point on the list, highlight the point and select the **Rename** button. Enter the new point name in the dialog box that appears.



Tie Points: Measure Points

To measure any of the relative points that are currently in the list, perform the following steps:

Step 1) Click on a relative point in the list. If the point has at least one measurement or Von Gruber location in at least one image, the cursor will move to that image location. If multiple view ports are open, the cursor will move to the point in all view ports that contain the point in at least one image.

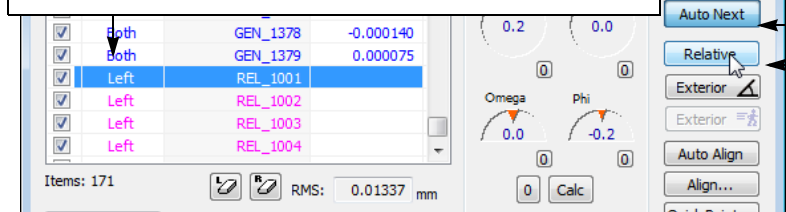
- Hint:** Are the two image areas very far from each other? Has **Align** been run on this image pair before? See “Tie Points: Auto Align and Align” on page 19-19.
- Hint:** Are the two images at different scales or angles? See “Tie Points: Scale and Rotation” on page 19-20.
- Hint:** You may change the view ports at any time. See “Tie Points: Start and Open One Model or Multiple Models” on page 19-16.
- Hint:** Are there already approximate exterior orientation values for the images? The exterior angles and exterior movement modes may be useful. see “Tie Points: Exterior Orientation Angles and Exterior Ground Movement Toggle” on page 19-32.

Step 2) Choose an **Auto Next** setting:

- To measure each point in the order it appears on the list, turn on **Auto Next**.
- To select and highlight each point individually in any order, turn off **Auto Next**.
- To measure the same point in multiple view ports, turn off **Auto Next**.

Highlight a starting point. If **Left** or **Right** is listed for that point, the cursor will move to that location on that image.

If the cursor does not move automatically, then it is up to the user to choose a good relative point location and move the cursor to it.



The screenshot shows a table of points with columns for selection, orientation, identifier, and residual. The 'Left' orientation is selected for REL_1001. To the right, the 'Auto Next' dialog is open, showing options for 'Relative', 'Exterior', and 'Auto Align'. The 'Relative' option is selected.

The left and/or right images may be locked automatically depending on the point's previous measurements.

Choose an **Auto Next** setting depending on whether or not you want to digitize each point in order.

Step 3) Zoom in close enough to view good detail of distinct features on the images. Some users prefer to zoom in to a subpixel level to measure relative orientation points. Zooming in to a subpixel level may be especially important when the relative orientation is to be exported to a third-party aerotriangulation package. It is recommended to use the same image zoom for every relative point.
Hint: The zoom is easy to set using the **Plotter Zoom** button shown in Step 1 on page 19-14.

Step 4) Identify the image motion and image controls that are available for the highlighted point. This will depend on whether the point has previous measurements, and whether any previous measurements came from the current image pair only or from different image pairs:

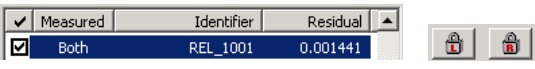
- | Measured | Identifier | Residual |
|-------------------------------------|------------|----------|
| <input checked="" type="checkbox"/> | No | 2034 |

If the highlighted point has neither a left nor a right measurement, the cursor will not be locked. It is up to the user to choose a good relative point location and move both images to it. Either the **L** or **R** lock buttons on the dialog box or the **Lock** digitizer button may be used to toggle the image movement.
- | Measured | Identifier | Residual |
|-------------------------------------|------------|----------|
| <input checked="" type="checkbox"/> | Left | REL_1001 |

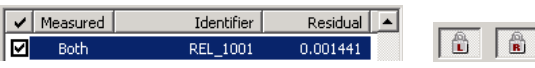
If the highlighted point has a left measurement already from running the **Quick Points** option, the cursor will be placed on that point in that image. Since this point is new and does not exist yet in another image pair, neither image will be locked. Either the **L** or **R** lock buttons on the dialog box or the **Lock** digitizer button may be used to toggle the image movement.
- | Measured | Identifier | Residual |
|-------------------------------------|------------|----------|
| <input checked="" type="checkbox"/> | Left | REL_1001 |

If the highlighted point has a left measurement already from a previous measurement in another image pair, the cursor will be placed on that point in that image. The left image will be locked. Use the **R** lock button on the dialog box to toggle the right image movement.
- | Measured | Identifier | Residual |
|-------------------------------------|------------|----------|
| <input checked="" type="checkbox"/> | Right | REL_1004 |

If the highlighted point has a right measurement already from a previous measurement in another image pair, the cursor will be placed on that point in that image. The right image will be locked. Use either the **L** lock button on the dialog box or the **Lock** digitizer button to toggle the left image movement.

- 

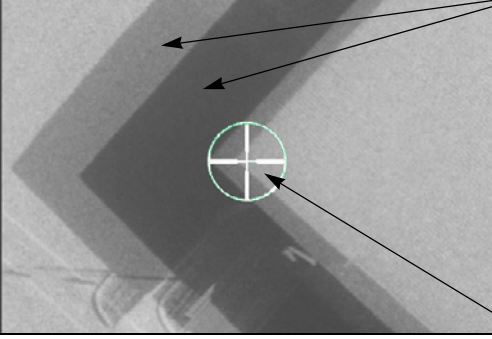
If the highlighted point has both a right and left measurement, but the point exists only in the two open images, this means the point was already measured in the current model (but not in adjoining image pairs). The cursor will move to the point. Neither image will be locked, and the point may either be checked or re-measured. Either the **L** or **R** lock buttons on the dialog box or the **Lock** digitizer button may be used to toggle the image movement.

- 

If the highlighted point has both a right and left measurement that were measured in other image pairs, the cursor will move to the point, but both images will be locked. This is to prevent changing a point that exists in an adjoining image pair. The image locking may be turned off if desired, but use caution when doing this. Note that an error message will only appear if the **Allow unlocking of all measurements in Tie Points dialog** is off on the **Project** tab of the Stereoplotter Options dialog (see Step 7 above on page 19-15).

Step 5) For points that have neither image locked: In the general area of the cursor, find a distinct, permanent feature on the images to use for image matching. For example, select a building roof corner or the base of a fence post. Do not select cars, boats, shadows, or any other objects that may have moved between the image exposures. If necessary, toggle the **Lock Image** button (**Type=Plotter** and **Action=Lock Image**) to unlock the image to move the cursor closer to the object, then lock it again and position.

This zoom is shown for demonstration purposes. A closer or subpixel zoom is recommended. Use the same zoom for every relative point.



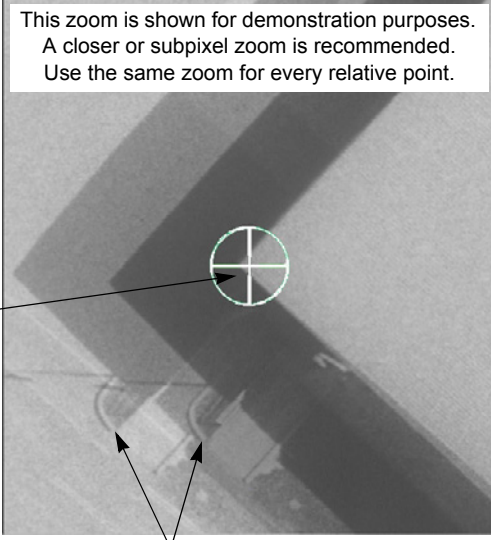
1. For new points, select a permanent feature such as a building corner. If necessary, unlock the image to move the cursor to the feature.

2. If it is not already automatically locked, use the **L** or **R Lock Image** button or the digitizer switch to freeze one image.

3. Move the free image until the image feature at the cursor on the right image is exactly aligned with the same feature on the left image.

4. Digitize.

Do not use features that may have moved between images. For example, do not use this building shadow.

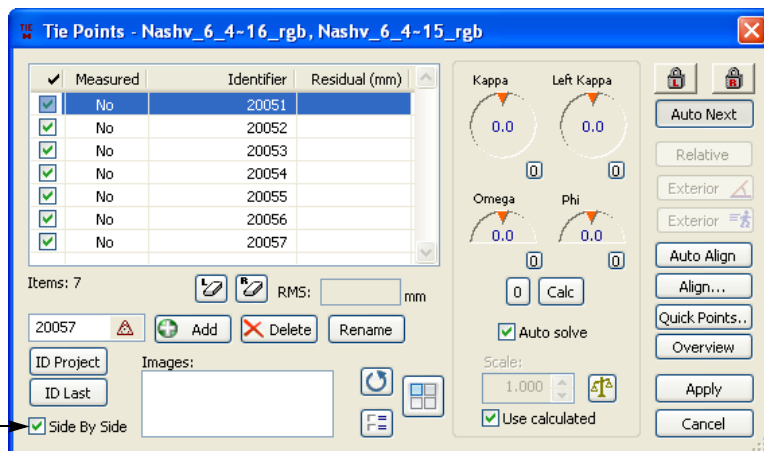


This zoom is shown for demonstration purposes. A closer or subpixel zoom is recommended. Use the same zoom for every relative point.

Ignore any diverging features surrounding the cursor. Match only the feature at the cursor location.

Step 6) Choose a **Side By Side** setting. When off, the images appear together in a stereo view. When on, each viewport splits to show the left and right image separately. There is no recommended setting; it depends on the user's preference and the particular project. Toggle **Side By Side** at any time.

- **Side By Side** off: view in stereo.
- **Side By Side** on: each viewport splits to show the left and right image separately.
- Toggle the setting at any time.



Two viewports shown in side-by-side mode

Step 7) Choose a method to remove parallax and digitize points:

- Manual Method:** Remove parallax from the point by locking one image (it may be locked automatically) and moving the other image until the feature matches exactly at the cursor location. Ignore any diverging features surrounding the cursor.
- Automatic Method:** First position the images manually to get them close. Press the **Align** digitizer button (**Type=Plotter, Action=Align**). This method usually gives faster and better pixel-for-pixel results than the manual method. If the match is not found immediately, unlock the image to move the cursor closer to the object, then press **Align** again. (See **Align** and its settings on page 24-3.)

Once the parallax is removed, digitize the point.

If multiple view ports are open, click on the title bar of next view port. Repeat the measurement in each view port until each individual image that contains the point has a measurement.

For each remaining point, repeat the method for removing parallax and recording the position.

- If **Auto Next** is on, the next point on the list is automatically highlighted. Otherwise, click on the next point in the list to digitize.
- (Optional) To skip any point, highlight the next good point on the list and continue.
- It is recommended to use the same image zoom for every measurement.

Tie Points: View Residuals and Results

When all the points have been digitized, check the residuals and work to improve them, if needed.

- Step 1)** Click the system mouse on the **Residual** heading at the top of the list to sort the residuals from highest to lowest:

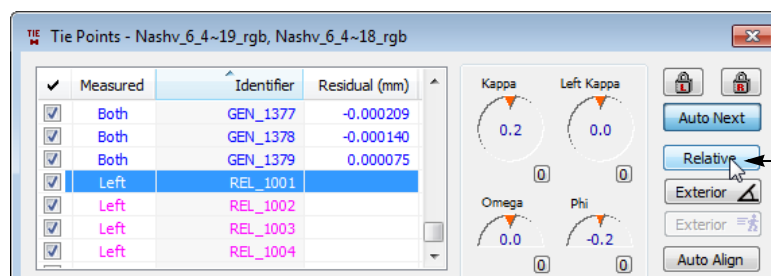
To sort the residuals, click the system mouse on the **Residual** heading at the top of the list. Click again to sort in the opposite order, highest to lowest.



- Step 2)** If the residuals are *not* acceptable, use any of the following options to improve them:

- (Optional) Re-measure individual points that are not yet completely locked. Highlight the desired point by clicking its line in the Relative Orientation dialog box. Align the right and left photos either manually or by using the **Align** tool. Digitize.
- (Optional) To remeasure a point after it has been locked in one or both of images that contain it, highlight the point and use the **R** or **L** eraser button. This deletes the measurement in that image, and affects the solution in every model that contains that image. Remeasure the point in any of the models that contain that image.
- (Optional) To remove a point from the active model's solution without deleting its measurement, uncheck it; the point remains in the list, but is not used as a relative point in the active model.
- (Optional) To completely delete a point from the list and from every other image that contains the point, highlight the point and select the **Delete** button.

- Step 3)** To verify the relative orientation and check parallax, select the **Relative** button. Move around the model in model coordinates and change the elevation settings. In this mode, points may not be digitized, and the results from the relative orientation may not be changed. When finished, click the **Relative** button again to return to relative orientation mode.



To move around the model in model coordinates, select the **Relative** button. Return to photo coordinates by selecting **Relative** again.

This button is available any time there are enough points to calculate residuals.

Tie Points: Apply and Finish

When the relative orientation is acceptable, select the **Apply** button. **Apply** writes the results to the project file. When relative orientation is finished, there may be a slight Y rotation movement in the images as the automatic epipolar correction activates. To find out more about this correction, see “Orientation Menu > Epipolar Correction” on page 25-27.

The points digitized using the tie points method are stored with the images. The left locations are stored with the left image, and the right locations are stored with the right image. If the tie points method for relative orientation is started again for either of these images, the points will be listed as having a measurement in that image.

Note that a relative orientation remains active until an exterior orientation is imported. If an exterior orientation is imported, any previous relative orientation is deactivated so that it will not interfere with the exterior orientation results. If for some reason you wish to reactivate the relative orientation after an exterior orientation has been imported, see page 21-17.

Tie Points: Exterior Orientation Angles and Exterior Ground Movement Toggle

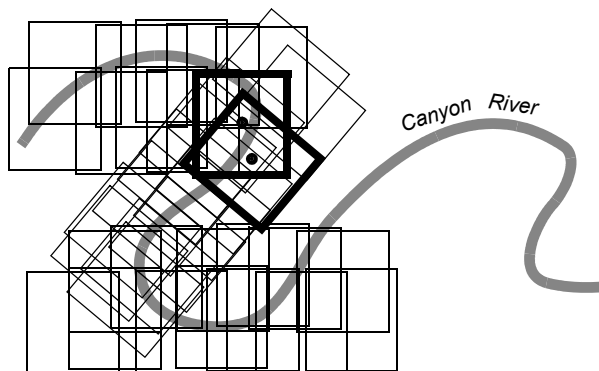
The **View Images using Exterior Orientation Angles** (Exterior Orientation Angles) and **Exterior Ground Movement Toggle** buttons may be used for the special case where there are existing exterior orientation (EO) values, which will be replaced after collecting more tie points and running an aerotriangulation process.

The Tie Points’ **Exterior...** options are only available when the images already have EO values (photo centers) applied. These values may be approximate and parallax may be expected with them, but they should be good enough to move the cursor in approximate ground coordinates.

The following is an example of a project that could use the **Exterior...** options in Relative Orientation Tie Points:

The project has images of an “S”-shaped river with steep banks and cliffs to either side of the river. The flight lines at the “S” curves overlap at very different angles. The images have GPS-IMU exterior orientation (EO photo center) values, but they are not very good due to the great elevation change. With the original GPS-IMU values, there is parallax. The user plans to measure new RO tie points and run a third-party aerotriangulation process to improve the EO values.

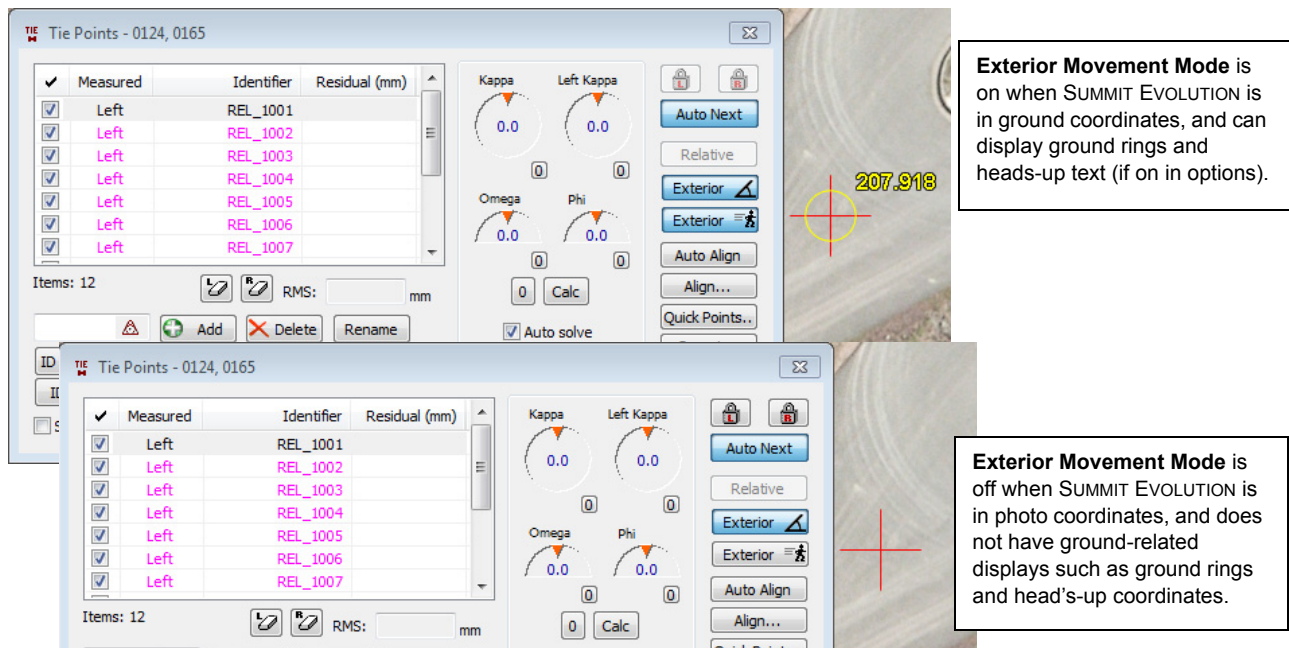
Tie Points’ **Exterior Orientation Angles** and **Exterior Ground Movement Toggle** help to position for relative point measurement in “difficult” models that already have approximate image centers.



The user activates **Exterior Orientation Angles** and **Exterior Ground Movement Toggle** to initially position the images. These options help rotate the images to the best right-left overlap, no matter how different their kappa angles are, and allow the user to navigate in approximate ground coordinates using the standard x, y, and z movement controls. The user moves the cursor in approximate ground coordinates (ignoring the parallax!) and quickly finds a good location for a tie point, then switches back to RO movement mode, finely positions the point, and measures it. Without these options, it would be difficult to move the cursor in the correct direction and difficult to see where the images match, especially in areas of great elevation change.

To use **Exterior Orientation Angles** and **Exterior Ground Movement Toggle** buttons, perform the following additional steps during tie points measurement:

- Step 1)** Use the Button Manager to set a button to **Type=Plotter** and **Action=Ext movement toggle**. This helps to quickly toggle the **Exterior Ground movement Toggle** button on the Tie Points dialog.
- Step 2)** Perform Tie Points measurement as described in “Tie Points: Measure Points” on page 19-27 above, except for the following changes:
 - a.) Select **View Images Using Exterior Orientation Angles**. This rotates the images into alignment with each other more finely than **Align>Two Point**.
 - b.) Select a point in the list to measure.
 - c.) Turn on **Exterior Ground Movement Toggle** using either the button on the dialog or the digitizer button set to **Type=Plotter** and **Action=Ext movement toggle**. **Hint:** You will know it's in exterior movement mode when ground coordinates are displayed in SUMMIT's coordinate display and the Z text appears near the cursor (if on in **Tools>Options>Main Text>Head's-up Coordinates>Show>Z.**)



- d.) Navigate to the desired relative orientation point and position the cursor as close to the ground as possible (there may be parallax if the existing EOs are not correct).
- e.) Turn off **Exterior Ground Movement**. Now movement is back to the usual relative orientation mode.
- f.) Finely position the image match. If desired, use **Aligns Images** from the **Alignment** toolbar. (Do not digitize in **Exterior Ground Movement** mode, because the point will carry the same parallax that exists with the current EO values.)
- g.) Digitize the point.
- h.) Repeat for each remaining point: Toggle to exterior ground movement mode, position in approximate ground coordinates, turn off exterior ground movement mode, position finely in relative movement mode, and digitize.

Relative Orientation: Import Relative Method

Not included in Feature Collection Edition

SUMMIT EVOLUTION can import third-party aerotriangulation (AT) results. If the AT software created a relative orientation file, but not an exterior orientation file, then use this “Import Relative Method.” SUMMIT EVOLUTION will calculate exterior orientation based on the relative orientation information.

If there is an exterior orientation file, go directly to “Exterior Orientation: Import Exterior Method” on page 21-4. If there is an existing exterior orientation file, it is not necessary to import or otherwise perform a relative orientation.

In order to use the “Import Relative Method,” the digital relative orientation file must be available as input.

Note! See Appendix C to import Phorex .cam and .pho files!

There is a separate import utility to import Phorex .cam and .pho files that were produced by Inpho’s MATCH-AT software. Complete instructions are located in *Appendix C*.

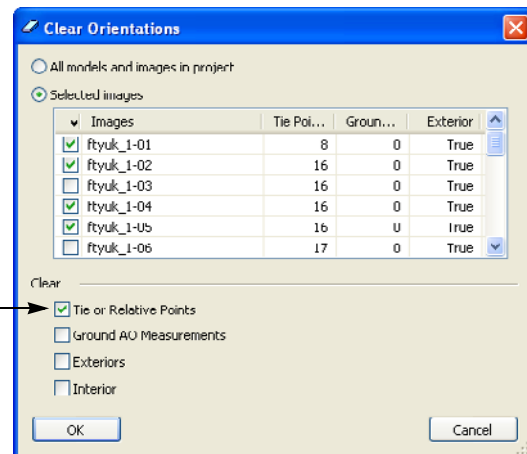
To import a relative orientation file, perform the following steps:

Step 1) Preparation: Perform the following in preparation for importing relative orientation:

- a.) (Optional, to be done when existing orientation cannot be corrected by other methods) Any *existing* orientation that is “bad” or incorrect may be cleared by selecting **Clear Orientations** from the **Orientation** menu:

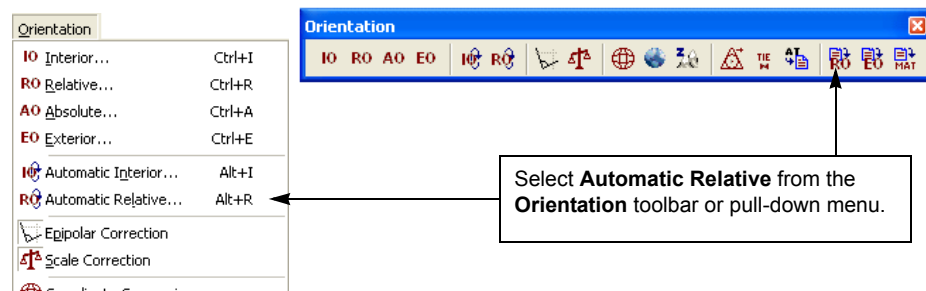
(Optional) Any existing incorrect orientations may be cleared by selecting **Clear Orientations** from the **Orientation** pull-down menu.

Select images and the type(s) of orientation to clear.

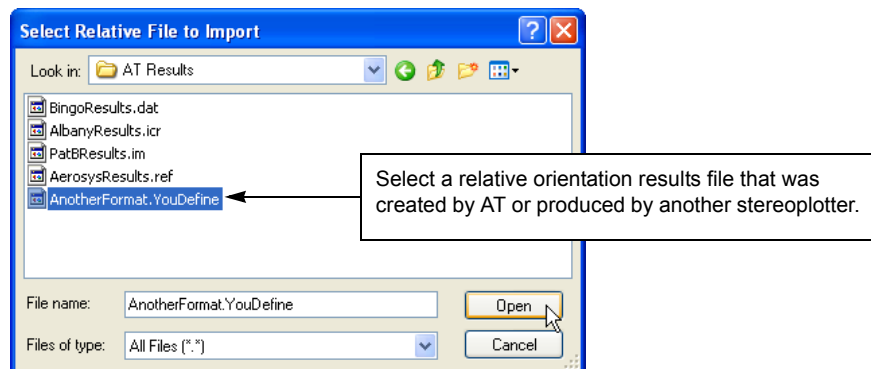


- b.) Specify models and strips in the project definition (*Chapter 16*).
- c.) Perform interior orientation for all models in the project (*Chapter 18*).
- d.) Open any model in the project.

Step 2) Select **Import Relative** from the **Orientation** toolbar or pull-down menu.



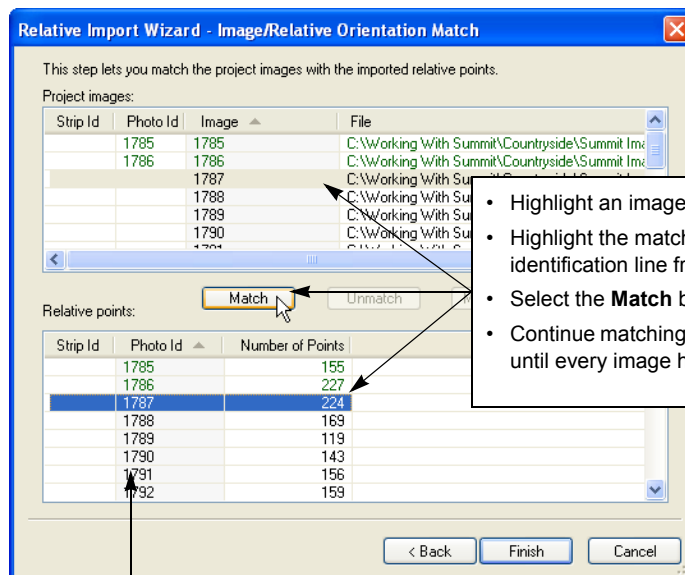
Step 3) Select the relative orientation results file that was created by a third-party aerotriangulation (AT) software or produced by another stereoplotter.



Step 4) The Relative Import Wizard appears. This utility helps import both known- and unknown-format relative orientation files. For instructions on using the Relative Import Wizard, please see *Appendix G*.

Step 5) At the end of the Relative Import Wizard, the image names must be matched to the relative orientation's strip and photo identifications. In some cases, this may be done automatically (the image names appear in green text if they are matched automatically). If the image names and photo IDs appear in black on the lists, then they must be matched manually.

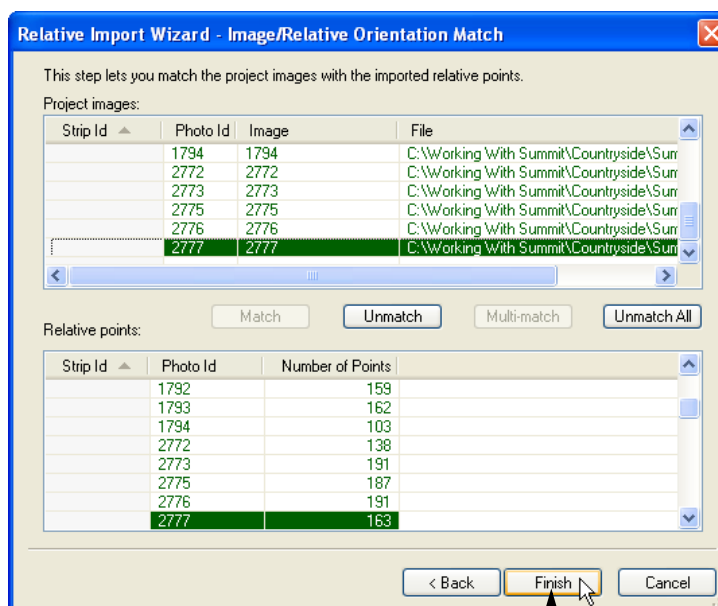
- Highlight an image name from the top list, then highlight its matching strip and photo identification from the lower list, then select **Match**. Matched sets will turn green. Continue matching images and orientations until every image has a match.
- If an image is mistakenly matched to the wrong photo identification, simply select them again and select **Unmatch**.



Note that it is possible to have more strip and photo identifications than images, especially if SUMMIT EVOLUTION is updating a portion of a project that was mapped previously on another stereoplottor.

- There may be more strip and photo identifications than images.
- Something is wrong with the project definition if there are more images than strip and photo identifications.

Step 6) When each image has a match, select **Finish**.



When each image has a match, select **Finish**.

Note that a relative orientation remains active until an exterior orientation is imported. If an exterior orientation is imported, any previous relative orientation is deactivated so that it will not interfere with the exterior orientation results. If for some reason you wish to reactivate the relative orientation after an exterior orientation has been imported, see page 21-17.

Chapter 20. Absolute Orientation

Not included in Feature Collection Edition

When should absolute orientation be done?

See “Choose an Orientation Method” in *Chapter 17* to choose an orientation procedure. Then if the procedure steps recommend absolute orientation, use this chapter.

The absolute orientation process relates the model system to the ground system. For a technical description of absolute orientation, see *Appendix E*.

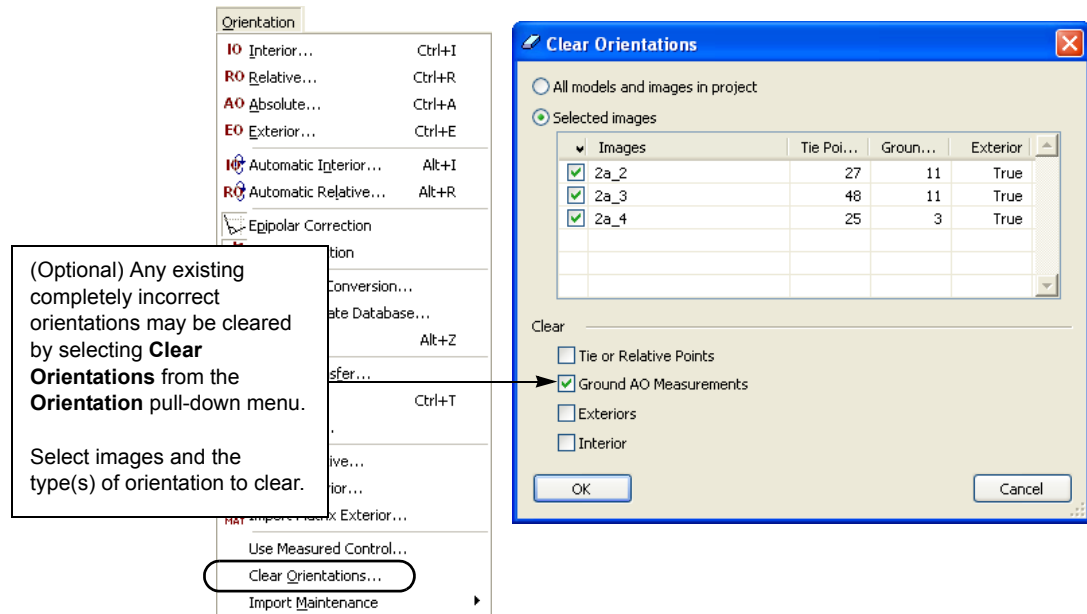
Ground coordinates are the end result of either absolute orientation or exterior orientation. Absolute orientation must be used when the exterior orientation values are not known and can't be calculated by an aerotriangulation package.

Absolute orientation may be done with or without the epipolar correction on. Epipolar correction, which removes Y parallax, is turned on automatically after the relative orientation is complete. It is recommended to leave the epipolar correction on for absolute orientation, but it may be toggled on and off if desired. See “Orientation Menu > Epipolar Correction” on page 25-27.

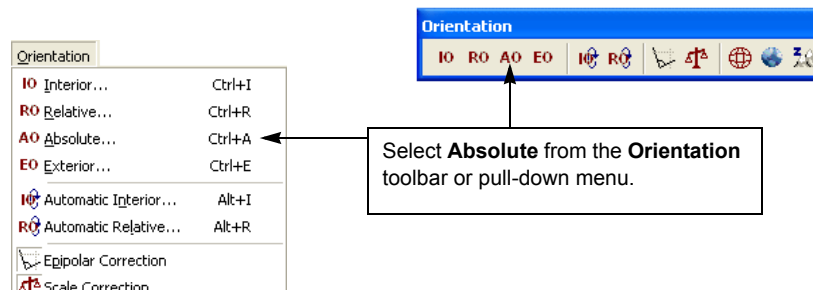
Before starting absolute orientation, a control file must be specified in the project file (*Chapter 6* and page 7-7). The control file may contain all the control points for a multi-image project.

Perform the following steps:

- Step 1)** (Optional, used when orientation cannot be corrected by other methods) Any existing orientation that is incorrect may be cleared by selecting **Clear Orientations** from the **Orientation** menu:

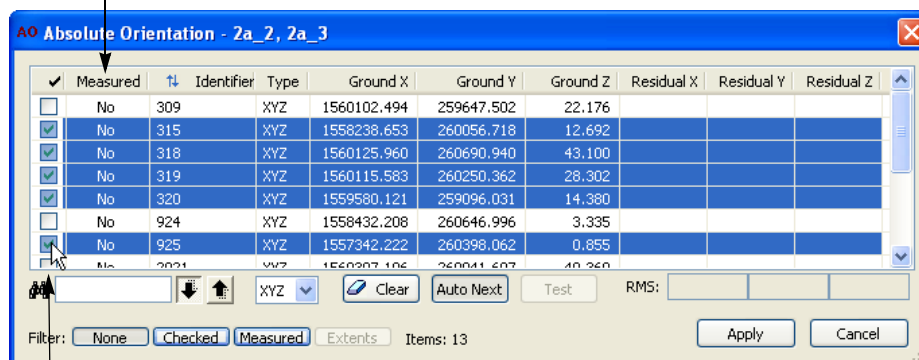


Step 2) Select **Absolute** from the **Orientation** toolbar or pull-down menu.



Step 3) Check on points to be used for absolute orientation. DO NOT uncheck any points that show **Left** or **Right** measured. Instead, select the **Extents** button from the **Filter** area, then check on any additional desired points to be used in the absolute orientation calculation for this model. Absolute orientation requires at least two points with horizontal components (XY or H) and three points with vertical components (Z or V) in order to calculate a solution.

- If **Left** or **Right** appear in the **Measured** column, then the point has been measured in only the left or right image. This happens when the same control point appears in at least three partially overlapping images, and the point has already been digitized in the previous or next pair of images (model). It is possible that if enough common control points have been measured in the adjoining image pairs, an absolute orientation solution could be displayed immediately. In that case, go on to measure any additional points that do not have **Both** listed in the **Measured** column.
- If **Both** appears in the **Measured** column, then this point already has a measurement for both the left and right image. This point may have been digitized earlier using the open model, or it could have been measured in the adjoining models.
- If **None** appears in the **Measured** column, then this point has not yet been digitized in either of the currently open images.

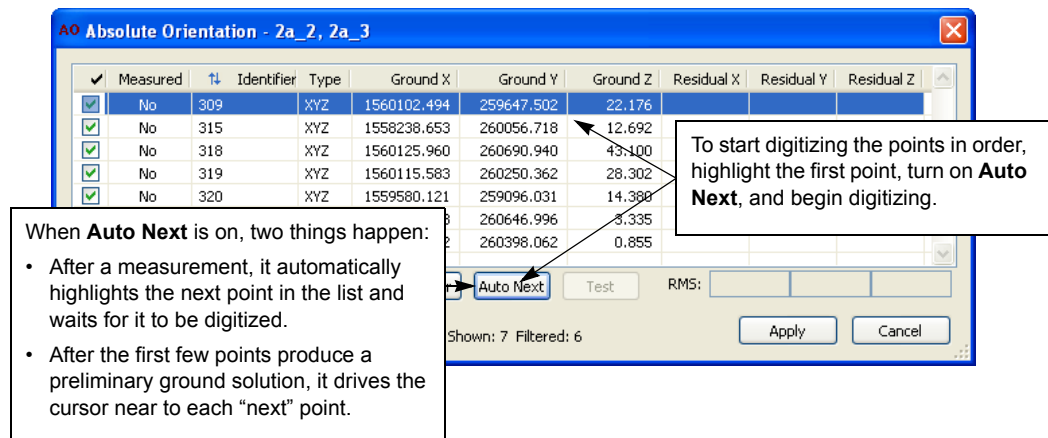


DO NOT uncheck a point showing **Right** or **Left Measured** just because it is not in this model. If the point is part of a valid orientation in another model, unchecking it will remove it from that other model's orientation calculation.

- Use the **Extents** button to show only the points in the current overlap area, then check on any additional points.
- It is not required to measure all checked points in the model. If a solution is reached using other points in the model, it is acceptable to have some points showing only **Left** or **Right** when orientation is applied.

Step 4) (Optional) Once the points for this model are checked on (points that have been measured in other models should also remain checked on), select the **Checked** button from the **Filter** area.

Step 5) Highlight the first point to be measured, then turn on the **Auto Next** button.



Step 6) Use the mouse to select the point's general area on the bird's-eye view.

Step 7) With the stereo eyeglasses on, carefully position the cursor directly on the point using X, Y, and Z position adjustments. Be sure to zoom in close enough to view the details of the control mark (see page 3-3 for a list of zooming methods). Perform one of the following actions:

- Digitize the location of the point, *or*
- To skip the highlighted point without measuring it, highlight the next point or uncheck the point. **Note:** Uncheck a point only if it lists **Measured=No**; if you uncheck a point that lists **Measured=Left** or **Right**, the point is turned off in every other model that used that point.

Step 8) The next checked point will be highlighted. If the cursor is not near the point on the images, select the area of the control point by clicking on the bird's-eye view.

After the first two horizontal and three vertical components of points have been digitized, two new things will happen:

- The cursor will be placed near the next point automatically.
- The list display option **Filter Model Extents** will become available. When this option is turned on, only control points that are within the extents defined by the measured control points will be displayed in the list. This shows the user if there are more unselected control points that are available within the model extents.

Step 9) Continue positioning and digitizing or skipping the control points.

Step 10) When all the points have been measured, view the residuals in the dialog box.

- If desired, click the mouse on the **Residual X**, **Y**, or **Z** column title to view the residuals sorted in order.
- To see if there are any other unselected points within the model extents, turn on **Filter Model Extents**.

Step 11) If the residuals are *not* acceptable, highlight and re-measure individual points to improve them:

Highlight and redigitize points that have high residuals.

To sort residuals, click on the column title. Click again to sort in the opposite order.

Filter: RMS: 0.26516 0.56393 1.15062

Filter: Shown: 7 Filtered: 6

Step 12) If residuals do not improve when the point is redigitized, you might suspect it is a “bad” point. It may be necessary to **Clear** or uncheck the point.

- Be careful when unchecking points; if the same point was used for orientation in an adjoining model, it will also be turned off for *both images* in that other model.
- Be careful when using **Clear** on a point that was measured earlier in another model. **Clear** removes the point’s measurements in both images in this model, which means it also removes the existing measurement in one image in the adjoining model. This can change the absolute orientation solution in the adjoining model! If you wish to do this, please review the point and the absolute orientation solution in the adjoining model later.

Uncheck points with care. If the same point was used for orientation in another model, it will also be turned off for both images in that model.

If desired, select the **Test** button. Move around the model and view the images with the current ground solution active. Select **Test** again to return to the Absolute Orientation process.

When the residuals are acceptable, select the **Apply** button.

Filter: Shown: 7 Filtered: 6

Step 13) If desired, select the **Test** button. Move around the model and view the images with the current ground solution active. This is a tool to help you decide whether the solution is acceptable. Select **Test** again to return to the Absolute Orientation process.

Step 14) When the residuals are acceptable, select the **Apply** button.

Chapter 21. Exterior Orientation

When should exterior orientation be done?

See “Choose an Orientation Method” in *Chapter 17* to choose an orientation procedure. Then if the procedure steps recommend exterior orientation, use this chapter.

Exterior orientation is the process of gathering enough information about individual images to be able to calculate the ground coordinate of each image center. Exterior orientation is usually calculated by a third-party aerotriangulation (AT) software package. The AT software may be run on another workstation or on the local SUMMIT EVOLUTION computer. Ground coordinates are the end result of exterior orientation.

Any time an exterior orientation is imported or keyed in, any existing relative and absolute orientations are deactivated so that they do not interfere with the exterior orientation. If for some reason you wish to reactivate a previous relative or absolute orientation, see page 21-17.

Exterior Orientation: Key In Values Method

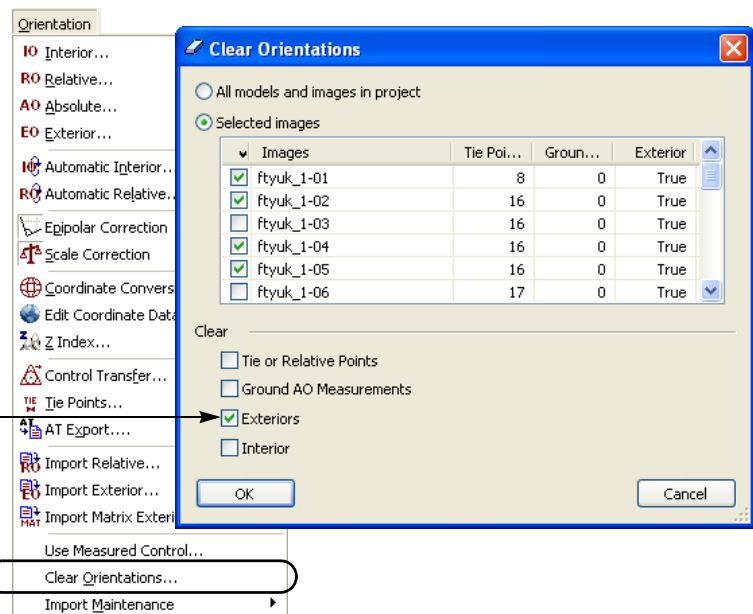
Not included in Feature Collection Edition

Use this method if exterior orientation values are known, but do not exist in a digital file. For example, the values may have been calculated on another stereoplotter and written down on a piece of paper. To key in values in the exterior orientation dialog box, perform the following steps:

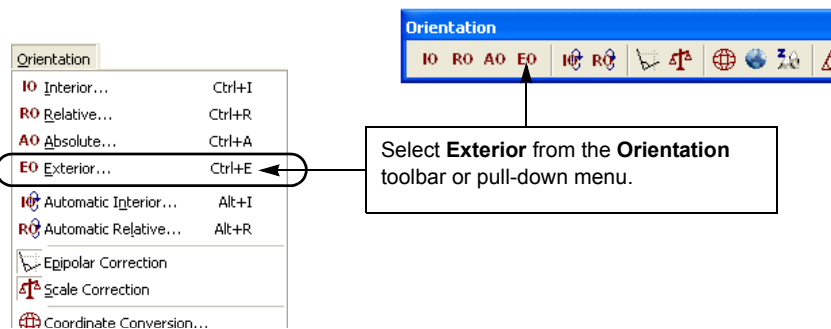
- Step 1)** Complete interior orientation (*Chapter 18*).
- Step 2)** (Optional, used when orientation cannot be corrected by other methods) Any existing orientation that is incorrect may be cleared by selecting **Clear Orientations** from the **Orientation** menu:

(Optional) Any existing completely incorrect orientations may be cleared by selecting **Clear Orientations** from the **Orientation** pull-down menu.

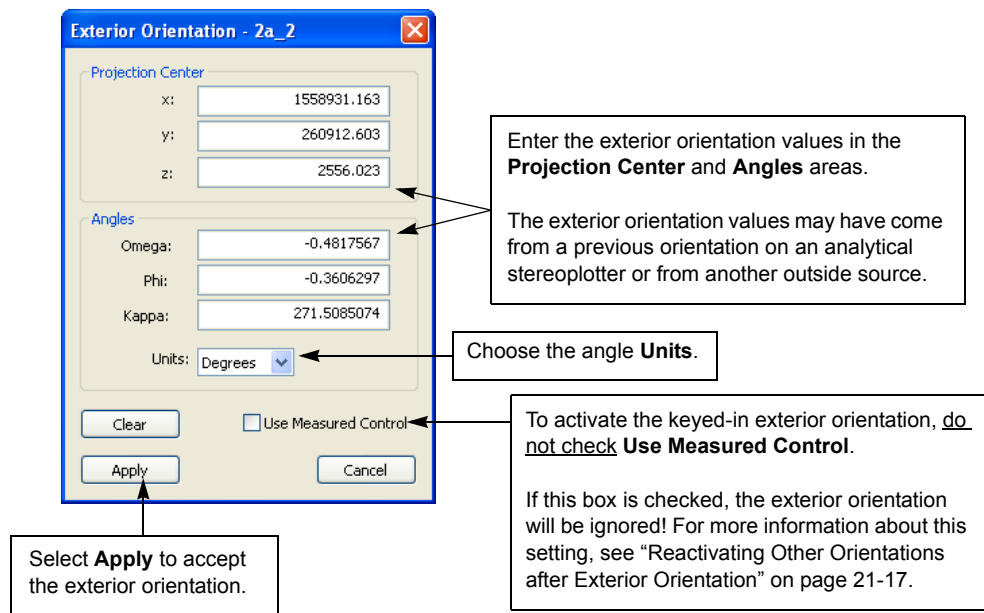
Select images and the type(s) of orientation to clear.



Step 3) Select **Exterior** from the **Orientation** toolbar or pull-down menu.



Step 4) To key in exterior orientation values produced by an outside source, make sure the **Use Measured Control** box is *not checked*. Then enter the values in the **Projection Center** and **Angles** areas. Choose the angle **Units**.



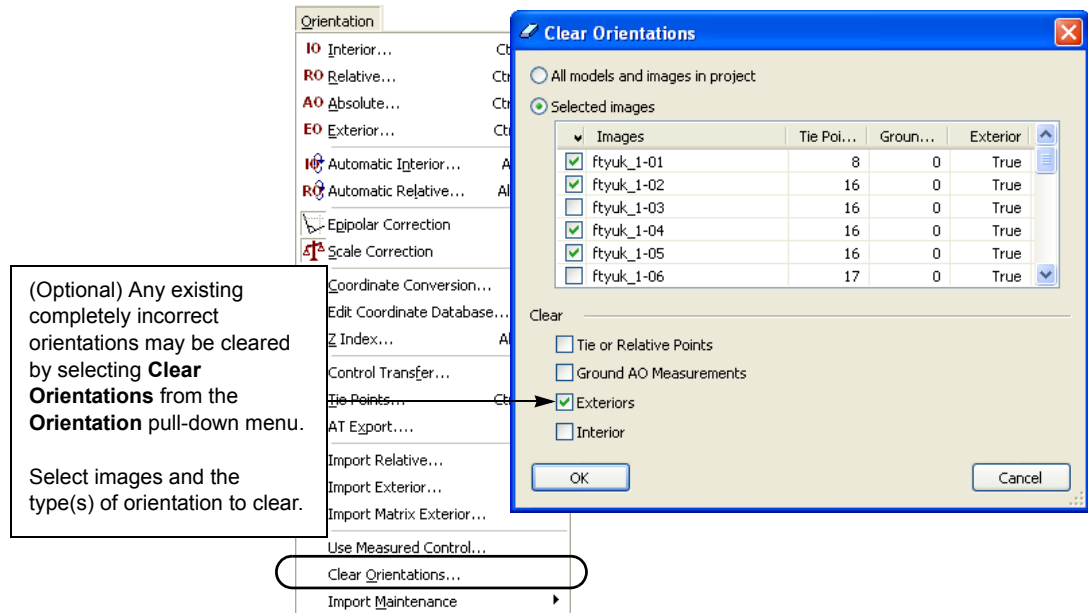
Exterior Orientation: Calculated by Summit Evolution

Not included in Feature Collection Editions

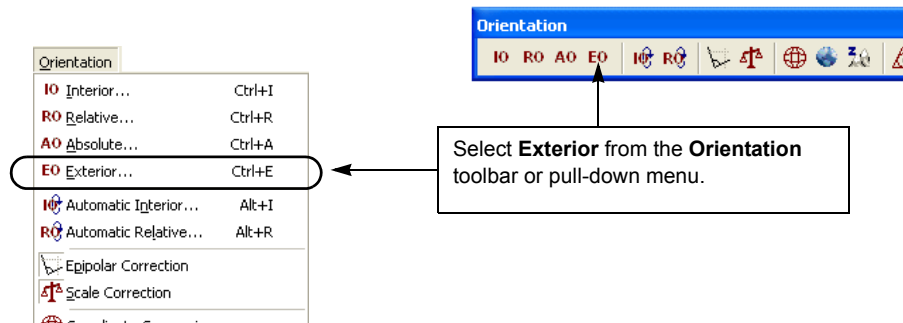
This method is only useful to produce values for use later to set the project on another non-analog stereoplotter. This method is not useful to SUMMIT EVOLUTION itself, because absolute orientation must already be complete in order for it to calculate the exterior orientation values.

To have SUMMIT EVOLUTION calculate the exterior orientation image centers, perform the following steps:

- Step 1)** Complete any method of interior orientation (*Chapter 18*).
- Step 2)** Complete any method of relative orientation (*Chapter 19*).
- Step 3)** Complete absolute orientation (*Chapter 20*).
- Step 4)** (Optional, used when orientation cannot be corrected by other methods) Any existing orientation that is incorrect may be cleared by selecting **Clear Orientations** from the **Orientation** menu:



- Step 5)** Select **Exterior** from the **Orientation** toolbar or pull-down menu.



- Step 6)** To generate exterior orientation values to be used later for setting this image on another stereoplotter, check on **Use Measured Control**. The exterior orientation results will appear in the **Projection Center** and **Angles** areas. Note the values, then **Cancel** the dialog box to finish.

Exterior Orientation - 3502_1197

Projection Center

X: 76231.3356
Y: -116186.7879
Z: 2502.3411

Angles

Omega: 0.03201088
Phi: -0.01377166
Kappa: -0.11520327

Units: Radians

☐ Clear ☒ Use Measured Control

If generating exterior orientation values to be used later for setting this image on another stereoplotter, an absolute orientation must be complete.

Check on **Use Measured Control**. The exterior orientation results will appear in the **Projection Center** and **Angles** areas.

Note the values, then **Cancel** the dialog box to finish.

Exterior Orientation: Import Exterior Method

SUMMIT EVOLUTION can import the orientation results from third-party aerotriangulation (AT) packages such as:

- AeroSys by Dr. Matt H. Stevens
- Albany OPM by ERIO Technologies
- BINGO-F by Gesellschaft für Industriephotoграмmetrie mbH
- PATB by K²-Photogrammetry and INPHO GmbH
- BLUH by Dr.-Ing. Karsten Jacobsen, Universität Hannover
- Applanix Corporation camera exteriors
- Other formats can be imported using the Exterior Import Wizard to help define the format.

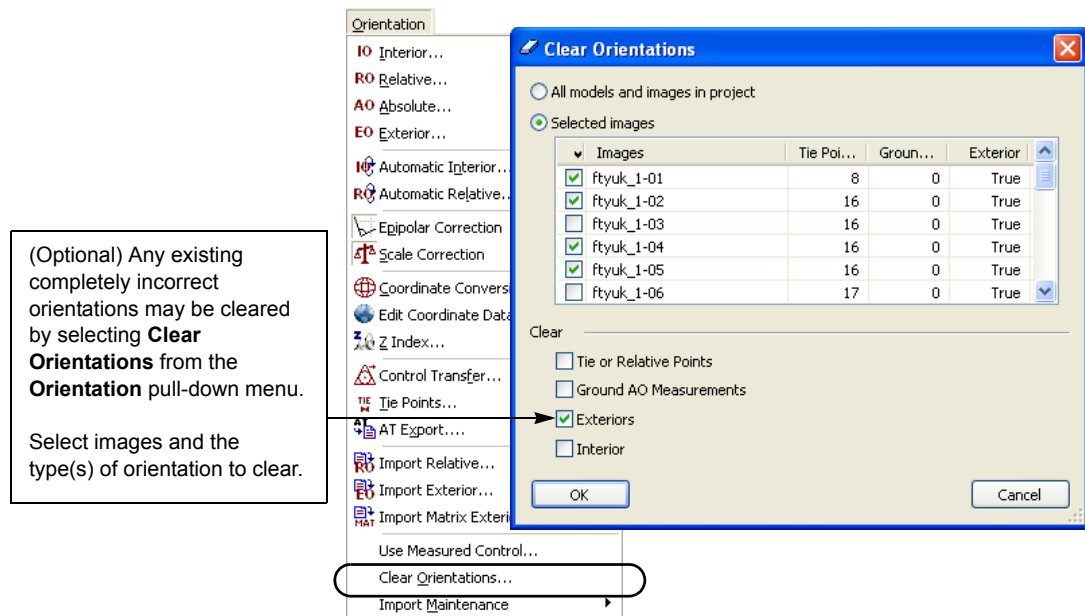
Note! See Appendix C to import Phorex .cam and .pho files!

There is a separate import utility to import Phorex **.cam** and **.pho** files that were produced by Inpho's MATCH-AT software. Complete instructions are located in *Appendix C*.

Aerotriangulation may have been run on another stereoplotter or it may be run on the local SUMMIT EVOLUTION workstation. If aerotriangulation is to be run on the local computer, the third-party orientation package must already be installed on the computer.

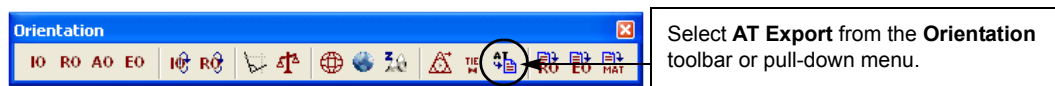
To import an exterior orientation file, perform the following steps:

- Step 1)** If importing Applanix camera exteriors, perform image processing “automatic” interior orientations for every image in the project (*Chapter 18*), then skip to Step 16 on page 21-8.
- Step 2)** For any aerotriangulation software other than Applanix, specify images, models, and strips in the project definition (*Chapter 16*). Strip definitions are required by the AT software.
- Step 3)** Complete SUMMIT EVOLUTION’s interior orientation for every image in the project (*Chapter 18*).
- Step 4)** **Case 1:** If SUMMIT EVOLUTION will be used to export its relative orientation to a third-party aerotriangulation (AT) software and automatically run the AT software to produce an exterior orientation file, then complete SUMMIT EVOLUTION’s relative orientation for every image in the project (*Chapter 19*). Use any of the DAT/EM relative orientation methods: Image processing method (page 19-2); two-image selection method (page 19-5); or tie points selection method (page 19-14). Note that some third-party AT packages require tie points to be measured.
- Case 2:** If the exterior orientation file already exists, relative orientation is not necessary. In this case, go directly from interior orientation to importing the exterior file.
- Step 5)** (Optional, used when orientation cannot be corrected by other methods) Any existing orientation that is incorrect may be cleared by selecting **Clear Orientations** from the **Orientation** menu:



- Step 6)** If the exterior orientation file already exists (perhaps because aerotriangulation was already run on another stereoplotter), then skip to Step 16.

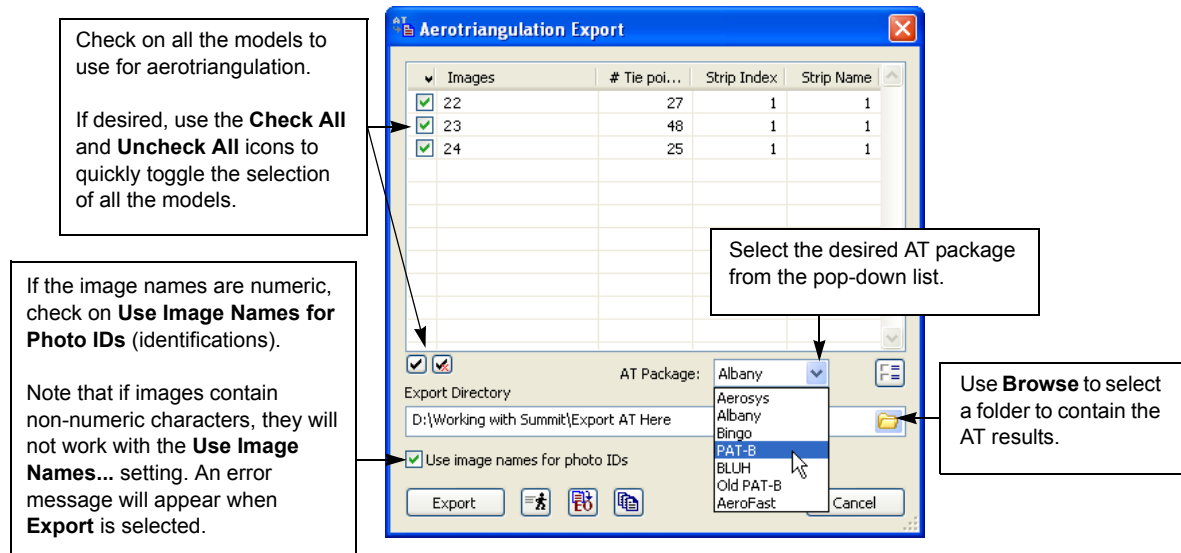
If a third-party aerotriangulation package will be run on the local computer, then use SUMMIT EVOLUTION to export the interior and relative orientation results to the AT package, run the AT package, and import the results. Select the **AT Export** from the **Orientation** toolbar or pull-down menu:



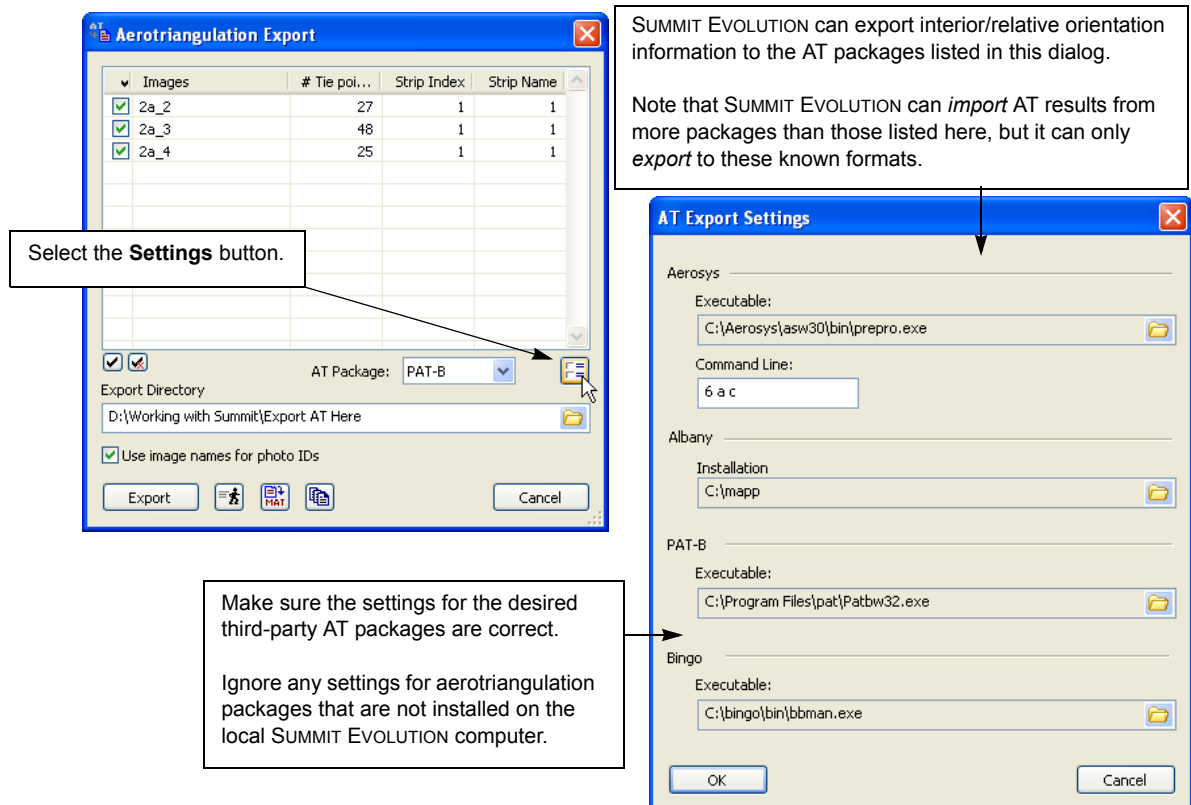
- Step 7)** Select the models to use for aerotriangulation. If desired, use the **Check All** and **Uncheck All** icons to quickly toggle the selection of all the models.
- Step 8)** Use **Browse** to select a folder to contain the AT results.

Step 9) Select an AT package from the pop-out list.

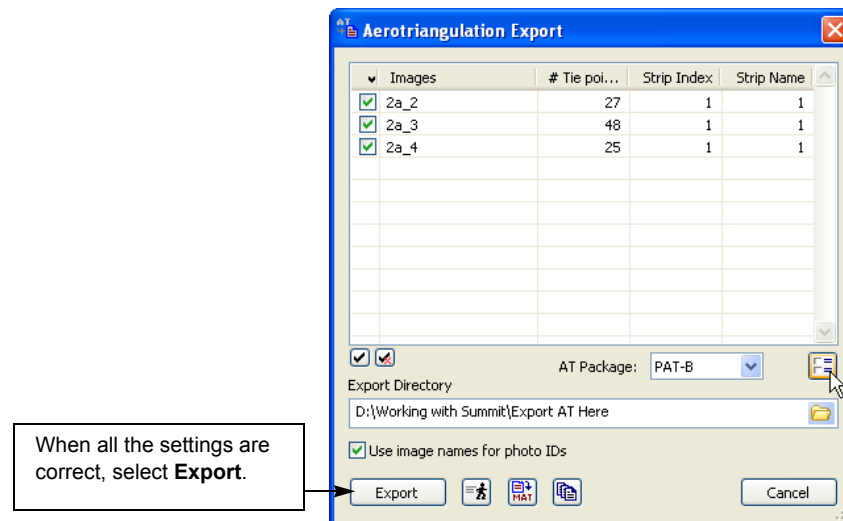
Step 10) If the image names are numeric, that is, if they contain only the characters 0 through 9, then check on **Use Image Names for Photo IDs**. This will help automate matching image names and photo identifications during the last step of the import process.



Step 11) Select the **Settings** button. Make settings for running the desired third-party AT software. Information on file names, locations, and commands can be found in the manufacturer's documentation. Ignore any settings for aerotriangulation packages that are not installed on the local SUMMIT EVOLUTION computer.



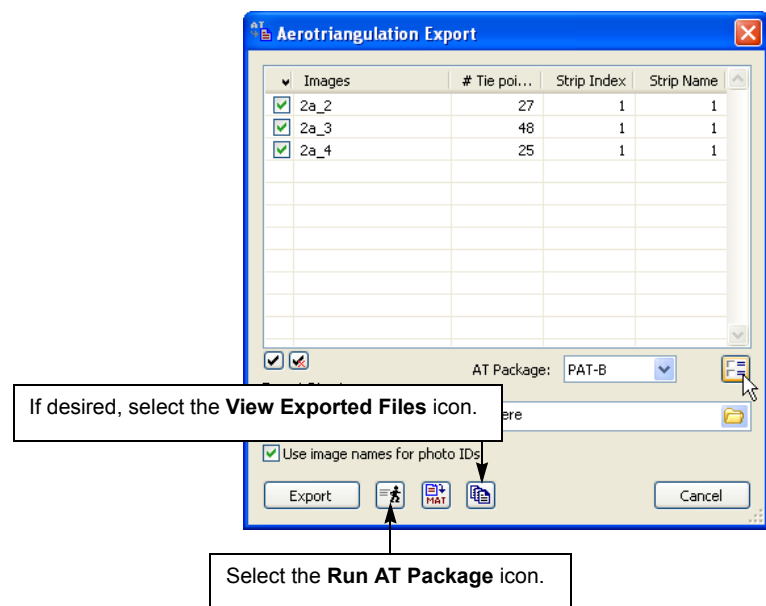
Step 12) When all the settings are correct, select the **Export** button.



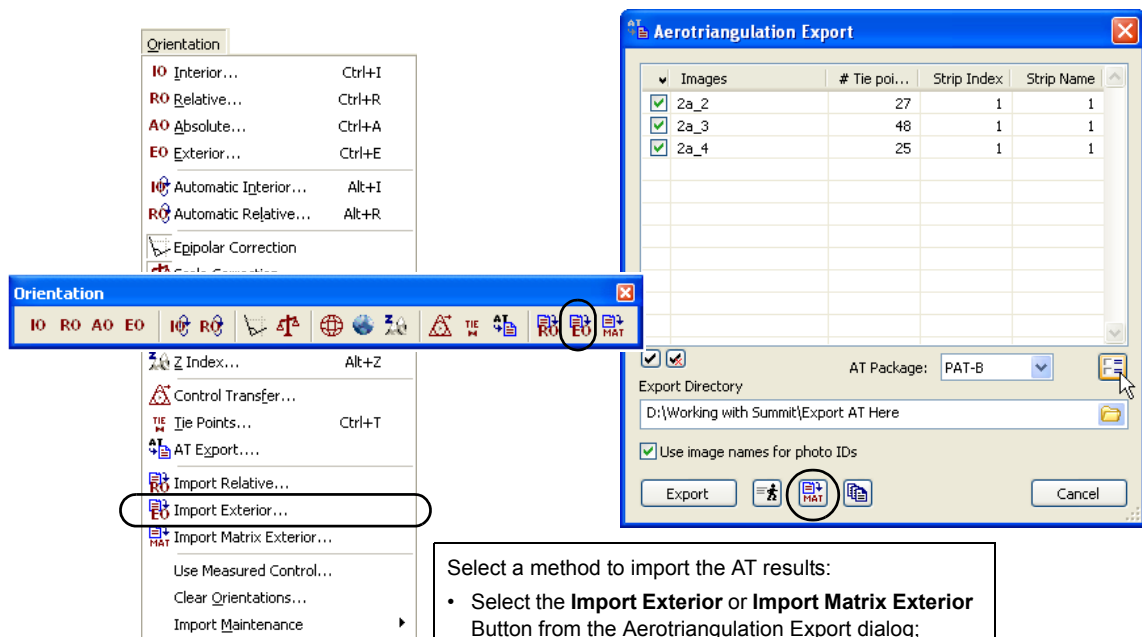
Step 13) If the export was successful, a message appears. Select **OK** to return to the AT Export dialog.

Step 14) If desired, view the exported files in a text editor. Select the **View Exported Files** button. A text editor appears, which may be turned off again at any time.

Step 15) Select the **Run AT Package** button to activate the third-party software. The AT software may ask for user input. For information on the AT software, see the manufacturer's documentation.

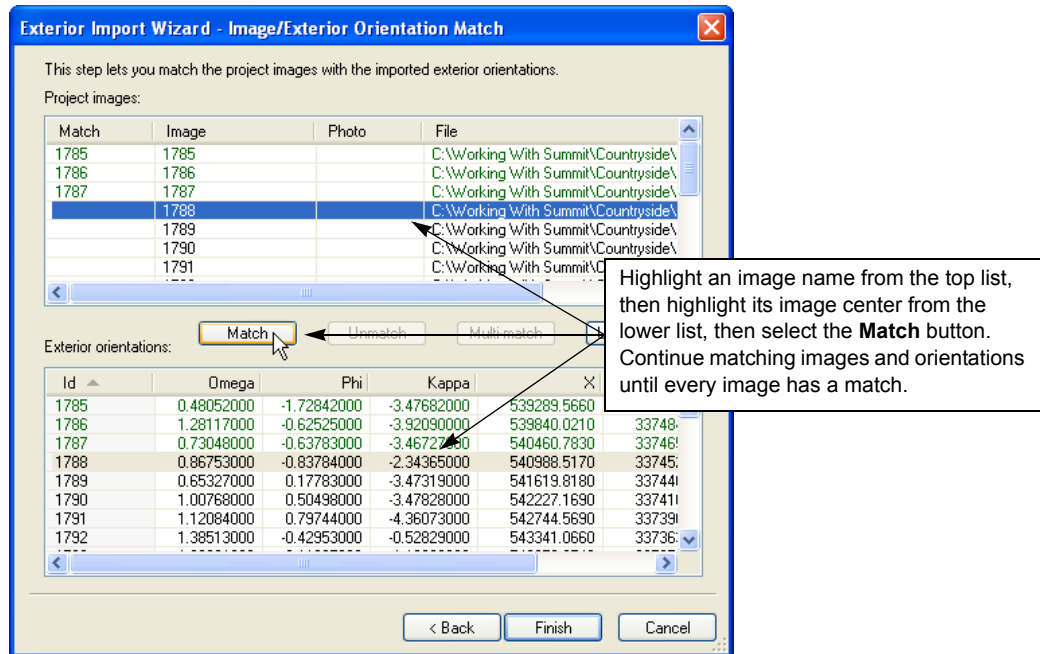


Step 16) Import the AT results. If the Aerotriangulation Export dialog is still active, select the **Import Exterior/Matrix Exterior** button. Otherwise, select **Import Exterior** from the **Orientation** toolbar or pull-down menu.



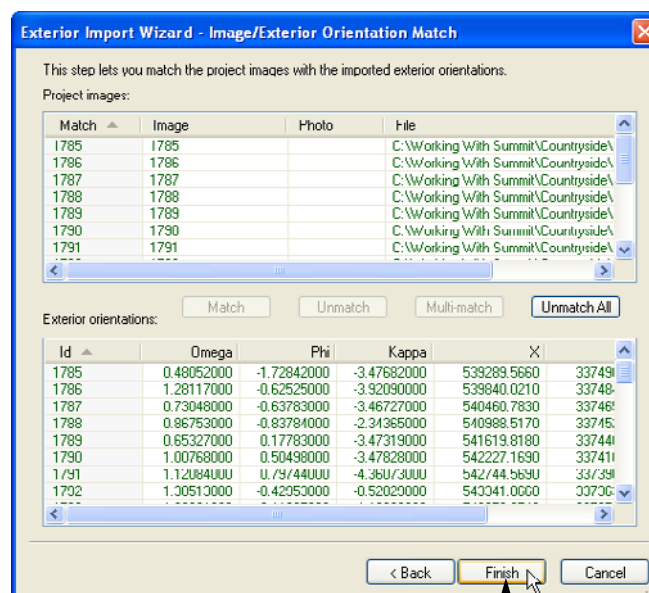
Step 17) The Exterior Import Wizard appears. This tool helps import both known- and unknown-format AT results. For instructions on using the Exterior Import Wizard, please see *Appendix F*.

Step 18) At the end of the Exterior Import Wizard process, a dialog box appears showing a list of exterior orientations available and a list of the images. If the image names and the photo identifications were the same, they will be automatically matched. Otherwise, the user must match them. To match images and orientations, highlight an image name from the top list, then highlight its image center from the lower list, then select the **Match** button. Continue matching images and orientations until every image has a match.



Step 19) If an image and orientation are mistakenly matched, simply select them again and select **Unmatch**.

Step 20) When all the images have a match, select **Finish**.



When each image has a match, select **Finish**.

When the AT exterior orientation results have been imported, there appears to be a slight Y rotation movement in the images as the epipolar correction is activated. To find out more about this correction, see “Orientation Menu > Epipolar Correction” on page 25-27.

When the AT exterior orientation results have been imported, any existing relative orientation is deactivated so that it will not interfere with the exterior orientation results. If for some reason you want to reactivate relative orientation, see page 21-17.

Step 21) If using Applanix camera exteriors, models may now be generated. See instructions in *Chapter 16*.

Step 22) Move around each strip in the project to check ground coordinates. Verify that the exterior orientations were imported and applied correctly.

Exterior Orientation: Control Transfer Method

Not included in Feature Collection Edition

Control Transfer is a process that transfers ground coordinates from a coordinate input source to a SUMMIT EVOLUTION aerial project that needs exterior orientation. An exterior orientation photo center value (EO) and ground coordinates are the result of **Control Transfer**.

Use this method of exterior orientation when no other more accurate method is available. This method is used primarily when neither an absolute orientation nor an aerotriangulation can be done, which is often due to no surveyed ground control or no stereo pair. **Control Transfer** is sometimes used to generate a photo center (exterior orientation) for a single aerial image that is then used to make a single orthophoto.

The results of this method can vary widely depending on factors such as the resolution of the input, accuracy of the orthophoto or vector file contents, and the choice and visibility of point locations.

The following table shows the required input and three transfer choices for **Control Transfer**:

SUMMIT EVOLUTION project that needs exterior orientation	Coordinate source(s) that cover at least part of the same geographic area
A SUMMIT EVOLUTION aerial project with one or more images. <ul style="list-style-type: none"> • Interior orientation is complete (automatic for digital images). • Relative orientation is optional. 	Choice 1: An orthophoto and a DTM point file. The orthophoto opens in the DAT/EM VIEWER and provides the (x,y) coordinates of objects that can be matched in the SUMMIT EVOLUTION images. The DTM point file provides the z coordinate at the object locations.
	Choice 2: A .dwg, .dxf, .dgn, or .shp vector file that contains accurate-to-ground objects that can be matched in the SUMMIT EVOLUTION images. There should be at least four objects per target image. The vector file opens in the DAT/EM VIEWER and provides full (x,y,z) coordinates for each matched object.
	Choice 3: A second, fully oriented SUMMIT EVOLUTION project open in a second instance of SUMMIT EVOLUTION. The second instance provides full (x,y,z) coordinates for each matched object.

To use **Control Transfer**, perform the following steps:

Step 1) Define an aerial project (*Chapter 7*). It is not necessary to add control files to the project; if control files are added to the project, do not use them for other types or orientation, such as Absolute Orientation (use only with **Move To Ground**, page 25-45).

Step 2) Prepare one of the following input sets to provide XYZ data:

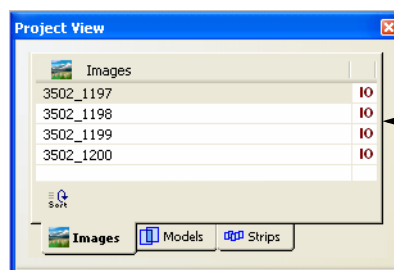
- **Choice 1:** A **Vector File** in **.dxf**, **.dwg**, **.dgn**, or **.shp** format. The file must contain at least four objects per image to be oriented. The objects should be accurate in (x, y, z) and can be easily found on the image(s) to be oriented. If two images will be open, the objects must be located within the stereo overlap area.

Hint for the following special case: Control Transfer from vector file will be used to calculate a photo center for a single aerial image; ground control is visible in the image; a ground control file is available. Import the ground control list as points into AutoCAD, MicroStation, or ArcGIS. Be sure to use all available decimal place digits. Use the resulting **dwg**, **dgn**, or **shp** file as the vector file for **Control Transfer**.

- **Choice 2:** An **Orthophoto** and a **DTM file**. The orthophoto must cover at least part of the area of the aerial images. The DTM file must also cover at least part of the area of the aerial images, and it must contain accurate-to-ground (x, y, z) points near at least four identifiable objects that are found on both the orthophoto and the aerial image(s). If two images are open, the orthophoto and the DTM points must cover at least part of the images' stereo overlap area.
- **Choice 3:** A different, **fully oriented SUMMIT EVOLUTION project** in at least part of the same geographic area. "Fully oriented" means it has ground coordinates visible in the lower right of the SUMMIT EVOLUTION status bar. It must either be in the destination coordinate system or its coordinate system description must be fully known for later coordinate transformation.

The SUMMIT EVOLUTION image(s) and the vector file/orthophoto and DTM/second project do not need to have exactly the same extents, but they must all overlap each other in an area large enough to measure at least four distinct object locations.

Step 3) Interior orientation is required. For aerial frame cameras, perform SUMMIT EVOLUTION's interior orientation, automatic (page 18-1) or manual method (page 18-7). In the Project View, **IO** should appear next to every image. "IO" appears automatically for digital cameras.

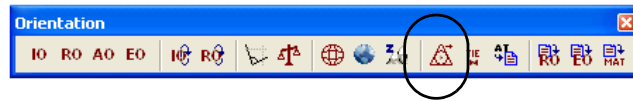


In the Project View, **IO** should appear next to every image in the project.

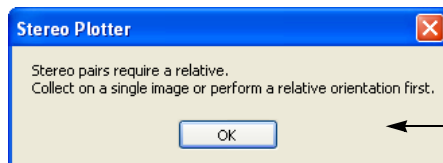
Note: If the Project View is not visible, select **Project Window** from the **View** pull-down menu in SUMMIT EVOLUTION. Or, it may be pinned to the edge of the window; wave the system mouse cursor over its tab to display it.

Step 4) (Optional) If a relative orientation (RO) is done, measurements may be made on two overlapping aerial images at one time. RO is optional; if RO is not done, measurements will be made on one image at a time. If desired, perform SUMMIT EVOLUTION's relative orientation, automatic (page 19-2), manual method (page 19-5), or tie points method (page 19-14).

- Step 5)** Open either one or two images in SUMMIT EVOLUTION:
- If only an interior orientation is done, open one image.
 - If a relative orientation is done, open a model of two overlapping images.
- Step 6)** Select **Control Transfer** from the Orientation toolbar or select **Control Transfer** from the **Orientation** pull-down menu. The Control Transfer dialog opens.



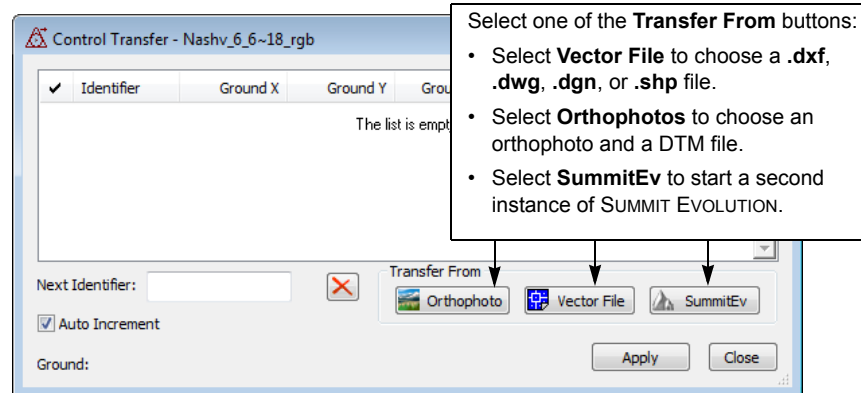
If a “stereo pair” message appears, it is because there are two images open, but only an interior orientation available. If two images are open, a relative orientation must be done; if one image is open, only an interior orientation is required.



If this message appears, choose a method to correct the problem:

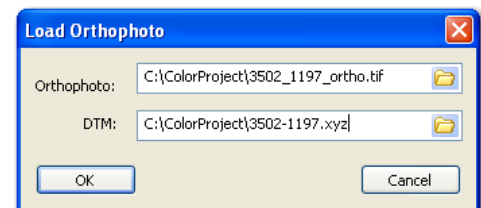
- To make measurements on one image at a time: Close the dialog, open just one image in SUMMIT EVOLUTION, and start **Control Transfer** again.
- To make measurements on two images at a time: Close the dialog, perform relative orientation in SUMMIT EVOLUTION, open two overlapping images, and start **Control Transfer** again.

- Step 7)** Select one of the **Transfer From** buttons on the Control Transfer dialog: **Orthophoto**, **Vector File**, or **SummitEv**.



- Step 8)** This step depends on which transfer method was selected:

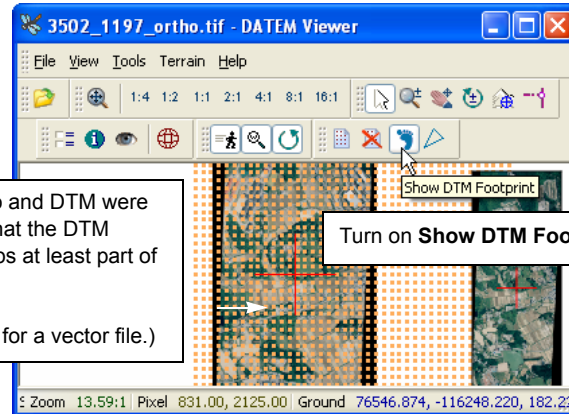
- Orthophoto:** If **Orthophoto** was selected, browse for the orthophoto and DTM file. If the DTM file is not one of DAT/EM's known formats, the ASCII File Import Wizard appears. Use the Wizard to identify the contents of the DTM file and save the format definition for future use. The DAT/EM VIEWER opens automatically and loads the orthophoto. Click on (highlight) the **Show DTM Footprint** icon. A simple dot pattern appears to show the DTM extents (this is a pattern, not the actual individual point locations). Verify that the DTM overlaps at least part of the orthophoto. See *Chapter 29* for further instructions on using the DAT/EM VIEWER application.



For Orthophoto and DTM

If an orthophoto and DTM were loaded, verify that the DTM footprint overlaps at least part of the orthophoto.

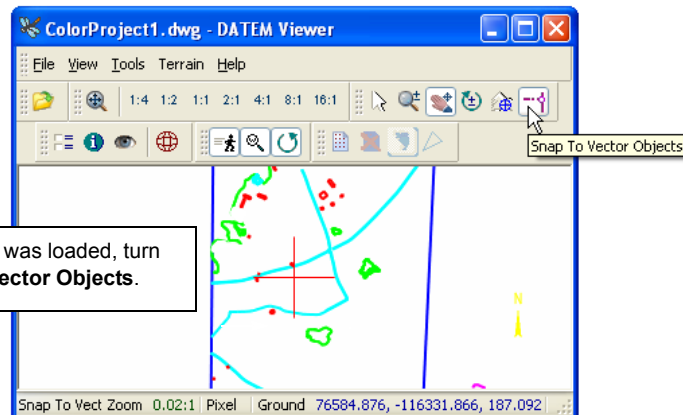
(Not necessary for a vector file.)



- b.) **Vector File:** If a vector file was selected, browse for and open the vector file. Immediately click on (highlight) the **Snap to Vector Objects** icon on the **Tools** toolbar in the DAT/EM VIEWER. See *Chapter 29* for further instructions on using the DAT/EM VIEWER application.

For Vector File:

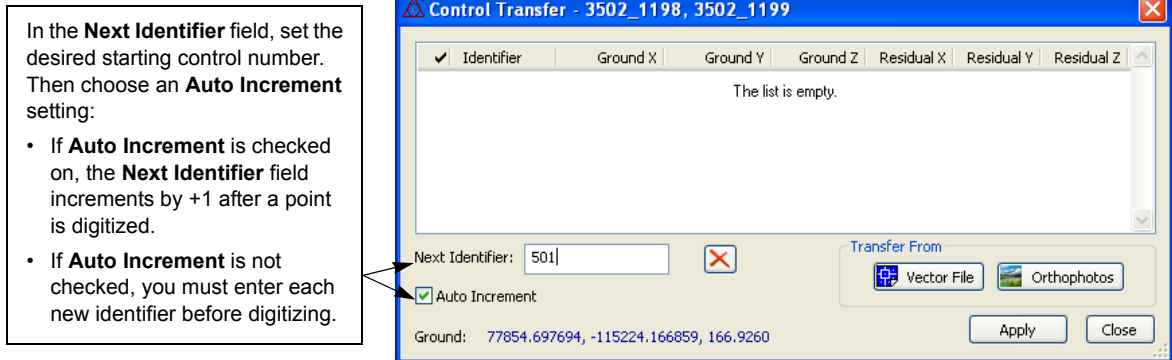
If a vector file was loaded, turn on **Snap to Vector Objects**.



- c.) **SummitEv:** If **SummitEv** was selected, a second instance of SUMMIT EVOLUTION opens (even if **Allow multiple instances of SUMMIT** is off on the **Tools>Options>Project** tab). Position both of the two SUMMIT windows on the stereo display so that they may both display in stereo. Open the second, fully oriented SUMMIT EVOLUTION project in the second instance of SUMMIT EVOLUTION. Call the to-be-oriented project “Project-1 in SUMMIT-1”, and call the second project in the second instance “Project-2 in SUMMIT-2”. In Project-2, open the image or model that at least partially overlaps the geographic area of the image/model in Project-1. Determine whether a coordinate transformation is needed. What is the desired final coordinate system in Project-1? If a coordinate transformation is needed, there are two choices: 1) Apply a coordinate transformation now in Project-2 *before* transferring control, or, 2) Wait to apply a coordinate transformation in Project-1 *after* transferring control. (See “Orientation Menu > Coordinate Conversion” on page 25-28.)

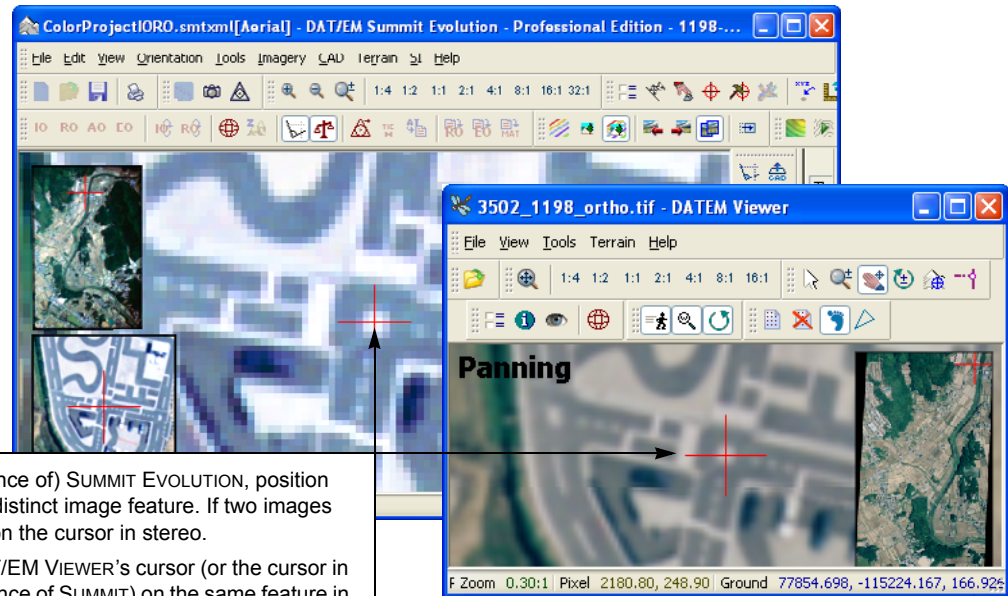
When using Control Transfer, you may automatically transfer the 3D input device control between instances of SUMMIT. For a SUMMIT window to gain control of the input device, simply click on its window with the system mouse (or use another method to give focus to the desired window, such as <Ctrl><Tab>). The 3D device will stay with this SUMMIT until the other SUMMIT gains focus.

Step 9) Enter any desired number in the **Next Identifier** field in the Control Transfer dialog. Choose an **Auto Increment** setting: When checked on, the **Next Identifier** field increments by +1 after a point is digitized; when off, you must enter each new identifier before digitizing. Alphanumeric characters are allowed (A,B,C,...1,2,3...), but **Next Identifier** only works for numbers.



Step 10) Position and digitize as follows:

- In (the first instance of) SUMMIT EVOLUTION, position the cursor on a distinct image feature in the aerial image(s) that can also be found in the orthophoto, vector file, or second SUMMIT project. Zoom in close enough to position accurately.
- In DAT/EM VIEWER or in the second SUMMIT project, pan with the system mouse or 3D device to position the cursor on the same feature. Zoom in close enough to position accurately. (See "Navigating in the DAT/EM VIEWER" below for information on positioning and zooming.) If a vector file is loaded and **Snap to Vector Objects** is on, the nearest vector will snap to the cursor location whenever panning movement stops.
- Make sure there is a valid Z coordinate in the DAT/EM VIEWER's or second SUMMIT's coordinate bar *and* at the lower left of the Control Transfer dialog. If there is not, then this position is outside the DTM footprint or a vector at ground level is not snapped, and this location should not be used.
- Digitize with the pick button in (the first instance of) SUMMIT EVOLUTION.



- In (the first instance of) SUMMIT EVOLUTION, position the cursor on a distinct image feature. If two images are open, position the cursor in stereo.
- Position the DAT/EM VIEWER's cursor (or the cursor in the second instance of SUMMIT) on the same feature in the orthophoto/vector file/images. Zoom in close enough to position accurately.
- Be sure there is a Z coordinate in the DAT/EM VIEWER's coordinate bar and in the Control Transfer dialog. If there isn't, do not use this location.
- Digitize with (the first instance of) SUMMIT EVOLUTION's pick button.

The Z coordinate in the DAT/EM VIEWER indicates that this location is within the DTM footprint.

Navigating in the DAT/EM VIEWER

Use the DAT/EM VIEWER's **Tools** toolbar and the system mouse for movement/zoom options:



DAT/EM VIEWER's **Tools** toolbar

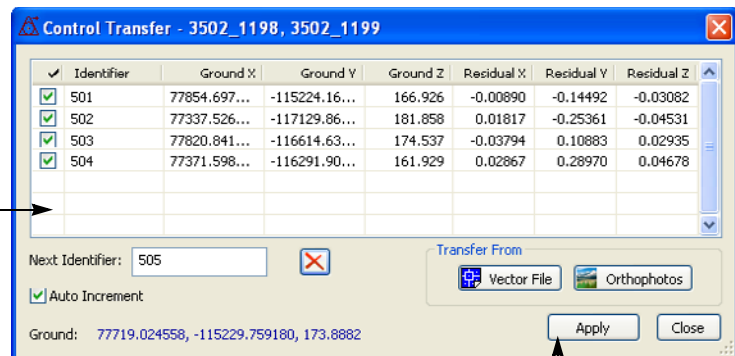
- **Selection Pointer:** Use to click on locations in the DAT/EM VIEWER's bird's-eye view.
- **Zoom Realtime:** Hold down the left mouse button and move the mouse up and down to zoom in and out. Note that the system mouse wheel (if it has one) may also be used to zoom in and out.
- **Pan:** Hold down the left mouse button and move the image under the cursor. Use to position the cursor on a specific feature.
- **Rotate the View:** Hold down the left mouse button and move up and down to rotate the view clockwise and counterclockwise. Note that a view rotation set in this way will be overwritten any time SUMMIT EVOLUTION has a full orientation and DAT/EM VIEWER's **Rotate with Summit** icon is on (highlighted).
- **Move Summit by Pick:** Pick a point on the DAT/EM VIEWER's image to automatically move SUMMIT EVOLUTION to the same ground coordinate. Works only when SUMMIT EVOLUTION has a complete orientation.
- **The right mouse button** toggles between the pointer and the most recent non-pointer setting (zoom realtime, pan, rotate view).
- **The system mouse wheel** (if it has one) may be used to zoom in and out.

Step 11) Repeat Step 9 and Step 10 until a solution is displayed in the Control Transfer dialog. This will occur after three points for a relative-oriented stereo pair and after four points for a single image.
Note: If all digitized points are very close to each other, exterior orientation will be obtained; however, DAT/EM recommends carefully choosing a spread-out distribution.

Step 12) Review the residuals in the Control Transfer dialog. Digitize more points or delete points as desired to improve the residuals. To try to improve an existing point, click on it to highlight it and remeasure. When the solution is acceptable, select **Apply**.

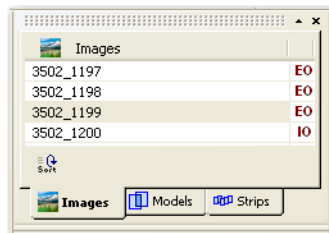
When three (for stereo) or four (for mono) points are measured, a solution is calculated.

- Review the **Ground Z** column. If any values are 0 (zero), the point was measured outside the DTM area or when not snapped to a vector. Highlight the point **Identifier** and select the “X” button. Measure another point with a valid Z value.
- More points may be digitized if desired, or click on existing points and remeasure them.
- Sort any of the Control Transfer columns by clicking on the column headers (such as **Residual Y**).
- To delete a point, select its point **Identifier** and select the “X” button.
- When the residuals are acceptable, select the **Apply** button.



When the residuals are acceptable, select the **Apply** button.

Step 13) After **Apply**, SUMMIT EVOLUTION's Project View shows **EO** next to the image name(s). At this time, if **Move with Summit** is on in the DAT/EM VIEWER (for orthophoto or vector file methods), the SUMMIT EVOLUTION cursor will move the DAT/EM VIEWER cursor *as long as* the coordinates in SUMMIT EVOLUTION are within the DAT/EM VIEWER's orthophoto or vector file extents.



In this example, **Control Transfer** is finished for the first three images. **EO** appears when a successful control transfer solution is applied.

Step 14) Repeat Step 5 through Step 13 until **EO** has been established for every image in the SUMMIT EVOLUTION project. Note the following exceptions:

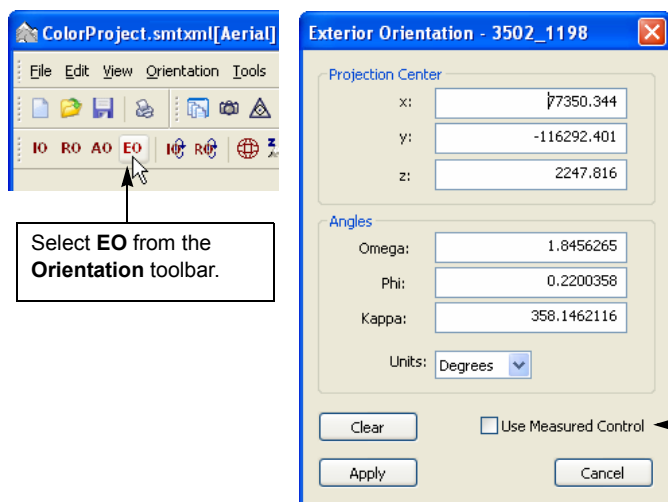
- Skip Step 6 (do not select the **Control Transfer** icon again) if the Control Transfer dialog is still open.
- Skip Step 7 (do not select the **Orthophoto**, **Vector File**, or **SummitEv** button again) if the new SUMMIT EVOLUTION image uses the same orthophoto and DTM files/vector file/second SUMMIT model as the previous image.
- Skip Step 7 (do not select the **Orthophoto** or **Vector File** button again) if a new orthophoto and DTM file or vector file can be loaded directly from the **File** menu in the currently running DAT/EM VIEWER application. Note that a new DAT/EM VIEWER instance is started every time **Orthophoto** or **Vector File** is selected. By contrast, the **SummitEv** button will not open a third instance of SUMMIT EVOLUTION.

Reactivating Other Orientations after Exterior Orientation

When an exterior orientation is imported or keyed in, SUMMIT EVOLUTION deactivates any existing relative and absolute orientations so that they won't interfere with the exterior orientation. It does this by automatically turning off (unchecking) the **Use Measured Control** setting in the Exterior Orientation dialog. Any existing relative and absolute orientations are then ignored. The advantages to this are:

- The same exterior orientation can be set on multiple stereoplotters to produce the same results on each stereoplotter;
- You know the exterior orientation is set exactly as the third-party aerotriangulation (AT) software calculated it or exactly as it was used on another stereoplotter.
- If the orientation is bad, and only the interior and exterior orientations are active, then you can troubleshoot more easily. Verify the interior orientation, check any keyed-in exterior values, or check the input to the AT software and re-run the AT.

You know that interior and exterior are the only active orientations when **Use Measured Control** is not checked in the Exterior Orientation dialog and there are nonzero values in the dialog box fields:

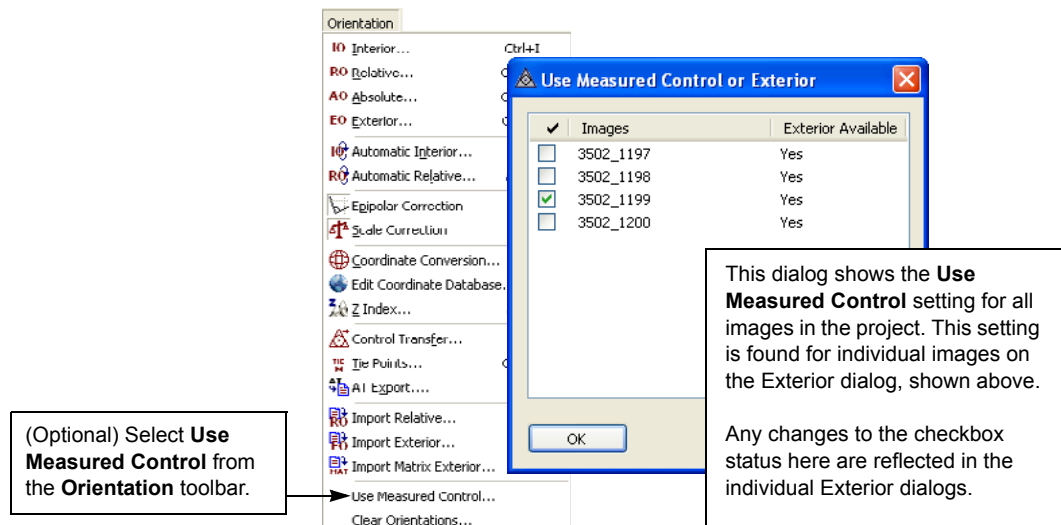


Select EO from the Orientation toolbar.

Interior and exterior are the only active orientations if **Use Measured Control** is off (not checked) and there are nonzero values in the dialog box fields.

- **Note:** This setting is turned OFF automatically when an exterior orientation is imported.
- **Should this setting ever be on?** This setting should be ON if exterior orientation will not be used or exterior orientation has not yet been imported, and there is an active relative or absolute orientation.
- To see this setting for all images in the project, select **Use Measured Control** from the **Orientation** pull-down menu. See below.

For convenience, there is a way to view and/or edit the current **Use Measured Control** setting for all the images in the project at one time. Select **Use Measured Control** from the **Orientation** menu:



(Optional) Select **Use Measured Control** from the **Orientation** toolbar.

This dialog shows the **Use Measured Control** setting for all images in the project. This setting is found for individual images on the Exterior dialog, shown above.

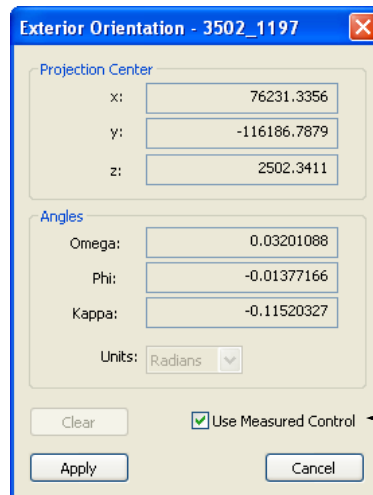
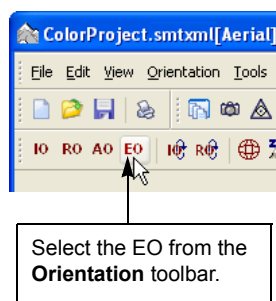
Any changes to the checkbox status here are reflected in the individual Exterior dialogs.

Images	Exterior Available
<input type="checkbox"/> 3502_1197	Yes
<input type="checkbox"/> 3502_1198	Yes
<input checked="" type="checkbox"/> 3502_1199	Yes
<input type="checkbox"/> 3502_1200	Yes

There may be a rare case when you want to reactivate the relative or absolute orientation after an exterior orientation has been imported or keyed in. DAT/EM offers these words of caution:

- If you're doing both an absolute orientation and an exterior orientation, then something is wrong with your process. Use either absolute or exterior, but not both.
- If the exterior orientation is bad, and you have decided to use relative points to improve it, please reconsider. If the exterior orientation is bad, there was probably something wrong with the input for aerotriangulation (AT) or the AT processing. It is better to fix the problem and re-run the AT software so that the exterior orientation is correct.
- If the exterior orientation is bad, consider clearing it so that there is no chance of activating it in the future. Use **Clear Orientations** from the **Orientation** pull-down menu.
- If you reactivate relative or absolute orientation and measure points, you create an orientation that is unique, at least for now, to your current stereoplotter workstation. If the same project is already being used with exterior orientation on other workstations, they will be using a different orientation than you. If multiple workstations are working on the same project, be sure everyone uses the same orientation solution (exterior only, in most cases).

If you still want to reactivate the relative or absolute orientation, so that the exterior orientation is ignored, check on **Use Measured Control** in the Exterior Orientation dialog box. Repeat for each image in the project:

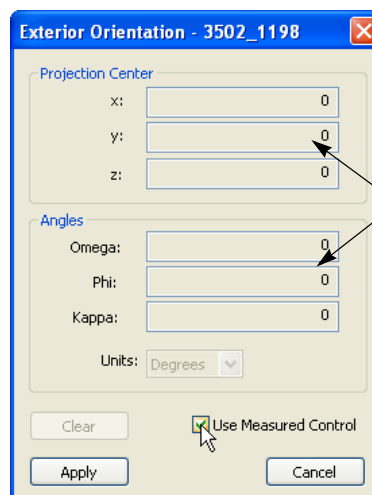


To reactivate relative or absolute orientation and ignore any existing exterior orientation, check on **Use Measured Control**.

- **Note:** Check on at your own risk. DAT/EM does not recommend checking this setting on if exterior orientation has been imported.
- **Should this setting ever be on?** This setting should be ON if exterior orientation will not be used or exterior orientation has not yet been imported, and there is an active relative or absolute orientation.

Please note:

- If **Use Measured Control** is ON, and the dialog box values change to zero, it means there is no existing absolute orientation to activate. There may or may not be a relative orientation. Ground coordinates are not available.
- If **Use Measured Control** is OFF, and the dialog box values change to zero, it means there is no existing exterior orientation to activate. Ground coordinates are not available.



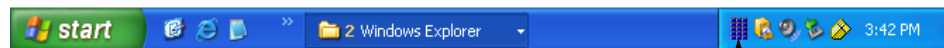
- If you check ON **Use Measured Control**, and the dialog box values change to zero, it means there is no existing absolute orientation to activate. There may or may not be a relative orientation.
- If you turn OFF **Use Measured Control**, and the dialog box values change to zero, it means there is no existing exterior orientation to activate.

Chapter 22. Step-by-Step Project Procedure

This chapter shows how to proceed through a SUMMIT EVOLUTION™ project. It shows a step-by-step procedure with references to detailed instructions that appear in the next few chapters.

To start a SUMMIT EVOLUTION session, perform the following steps in order:


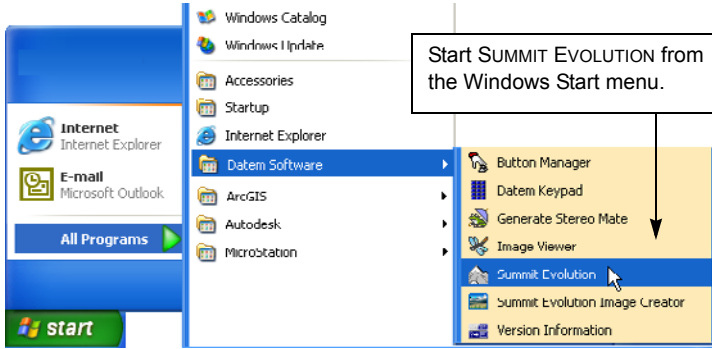
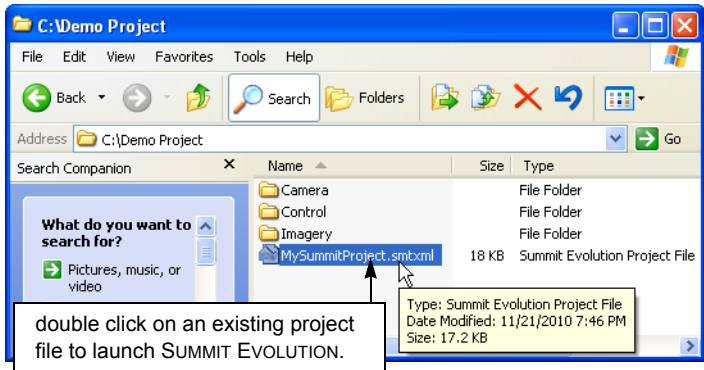
- Step 1)** Turn on power to all system components. Hardware and software installation should be complete, and the user should be familiar with the input devices (*Chapter 3*).
- Step 2)** Log on to any user account that has Power User or higher permission status. See “User Permissions” on page A-5 in *Appendix A* for more information about read-write permissions.
- Step 3)** The blue grid-like DAT/EM KEYPAD™ icon appears in the notification area of the Windows taskbar. Make sure the correct keypad file is open and ready for use. For instructions, please see the *DAT/EM KEYPAD Operation Manual*.



Windows XP shown. The same icon appears in Windows 7.

A blue grid icon in the notification area means the DAT/EM KEYPAD software is active. To open a different configuration file or for other information about the DAT/EM KEYPAD, see the *DAT/EM Keypad Operation Manual*.

- Step 4)** Start the SUMMIT EVOLUTION stereoplottor software. Use one of the following methods:

SUMMIT EVOLUTION Start Method	What this looks like
Double click the Summit Evolution icon on the Windows desktop.	 <p>Double click the Summit Evolution icon on the Windows desktop.</p>
a.) Select the Windows Start button. b.) Select Programs . c.) Select DAT/EM Software . d.) Select Summit Evolution .	 <p>Start SUMMIT EVOLUTION from the Windows Start menu.</p>
Double click the system mouse on the name of an existing .smtprj* or .smtxml file shown in the Windows Explorer or a Windows “My Computer” window. * A pre-version-6.1-format .smtprj file will be converted to .smtxml . A prompt may appear. A .smtprj.bak backup file will always be made.	 <p>double click on an existing project file to launch SUMMIT EVOLUTION.</p> <p>Type: Summit Evolution Project File Date Modified: 11/21/2010 7:46 PM Size: 17.2 KB</p>

Note If **Allow multiple instances of Summit** is on in the SUMMIT EVOLUTION **Options** dialog, then more than one SUMMIT EVOLUTION instance may run at a time. If a 3D input device is configured in **Options>Input Devices**, please note:

- Two instances of SUMMIT EVOLUTION may alternate using the 3D input device. Click with the system mouse on the desired SUMMIT EVOLUTION window (or otherwise give focus to that window) to activate the 3D device in that instance.
 - If three or more instances are running, only the first instance can use the 3D input device. The other instances are automatically set to **System Mouse**. For three or more instances, use **Options > Input Devices tab > System Mouse** to release or reset the device once it is free.
-

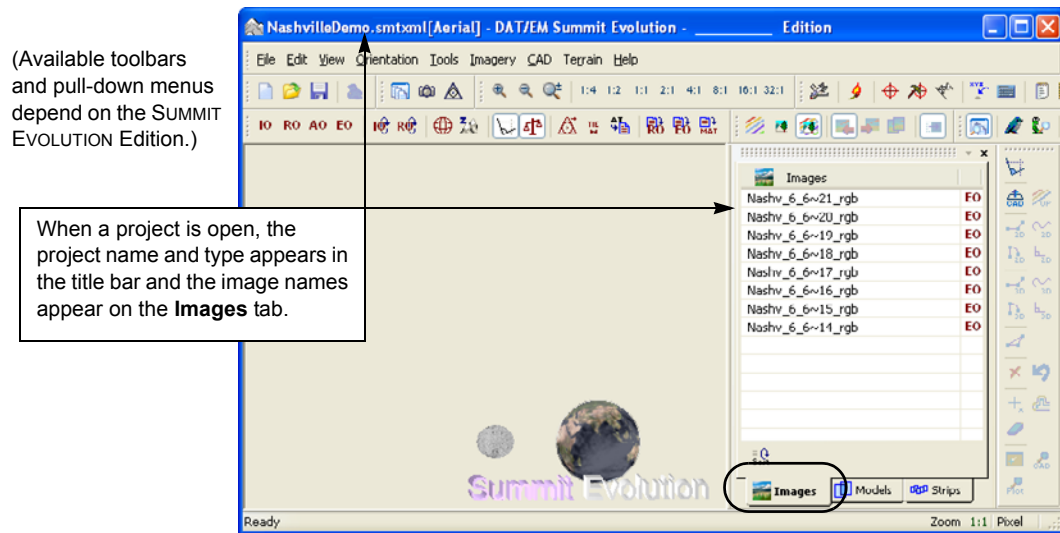
Step 5) (Professional Edition only) For a new project, prepare the following:

- a.) Two or more images for stereo projects, or at least one image for an orthophoto feature collection project (*Chapter 4*).
- b.) One or more camera definition files (Do not create for the ADS40, orthophoto, satellite, or SAR projects) (*Chapter 5*)
- c.) (Sometimes optional) One or more ground control files (*Chapter 6*)
- d.) (Optional) A DTM or LIDAR file for use with Terrain Following (page 24-9).

Step 6) If a project is not already open or to open a different project, choose one of the following methods:

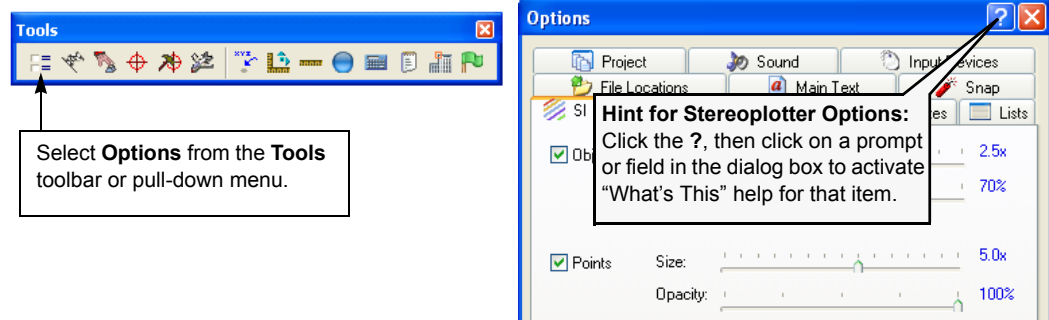
- To open an existing project, select **Open Project** from the **File** toolbar or pull-down menu and select the project name.
- To open a recently used project, select the project name from the **File** pull-down menu.
- To create and open a new aerial or close range project, see *Chapter 7*.
- To create and open a new ADS40 digital sensor project, see *Chapter 8*.
- To create and open a new orthophoto feature collection project, see *Chapter 10*.
- To create and open a new satellite or SAR imagery project, see *Chapter 11*.
- To import a Z/I, SocetSet, DiAP, DVP, Phorex, or SUMMIT PC project, see *Chapter 15*.

The name of the open project appears in the title bar and the images appear on the Project View's **Images** tab:



Note: To open a DAT/EM-PCI ProPack project type, the DAT/EM-supplied PCI ProPack software must be installed and the PCI lock must be attached to the computer.

- Step 7)** If desired, review the stereoplotter settings. Select **Options** from the **Tools** toolbar or pull-down menu. To learn more about any setting, click the “?” icon, then click on the item in the dialog box to activate context-sensitive help.



- Step 8)** For stereo projects, open two partially overlapping images. For orthophoto projects, open one image. Use one of the following methods:

Methods for Opening Images in SUMMIT EVOLUTION	
<p>Method 1. Stereo Projects: From the Images tab on the Project Window, click on the left image, then hold down the <Ctrl> key and click on the right image.</p> <p>Method 1. Orthophoto Projects: For orthophoto feature collection projects, click on one image name only.</p>	
<p>Method 2: If models have been defined, click on the model name from the Models tab on the Project Window. Both model images will open.</p> <p>Models are not used for orthophoto feature collection projects.</p>	
<p>Method 3: If strips have been defined, click on the model name from a strip on the Strips tab on the Project Window. Both model images will open.</p> <p>Strips are not used for orthophoto feature collection projects.</p>	

Note: If the model does not open, the most common reason is that the paths are not correct in the project file. Select **Project** from the **Edit** menu or toolbar. Select the “+” next to the **Camera Files**, **Image Files**, **Control Files** list (particular file lists may vary depending on the type of project). If the files are listed in red, use **Modify Paths** to correct the file paths. If this is an ADS40/80 project, it may also be necessary to use **Update SUP File Paths**. For more project editing instructions, see “Edit Project Files” on page 16-13.

- Step 9) Professional Edition:** Perform or import a complete orientation (start with *Chapter 17*). Ground coordinates — or object coordinates for a close range project — must be established as a result of any method of orientation.

Note that for imported projects, orthophoto, ADS40, satellite, and SAR projects, orientation is established in the project setup. Go to the next step.

Feature Collection Edition: For projects that require importing an exterior orientation, first complete an interior orientation (*Chapter 18*). Then import the exterior orientation file (“Exterior Orientation: Import Exterior Method” on page 21-4). All other projects types should already have a complete orientation.

Step 10) Start one of the following CAD or GIS packages:

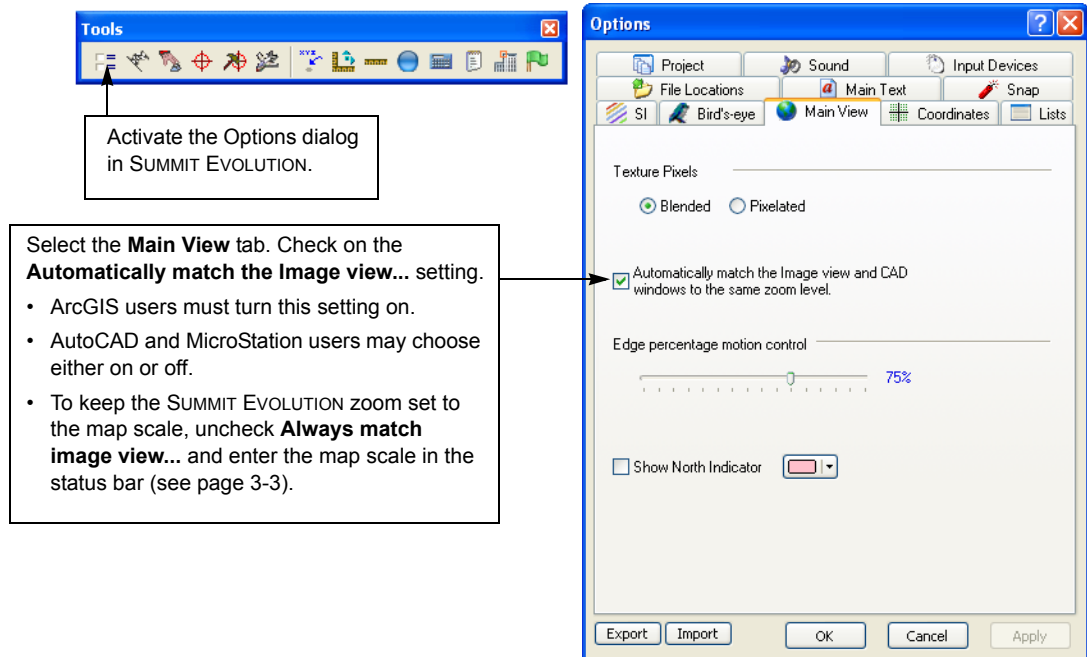
- a.) Start MicroStation® and open a design file based on DAT/EM’s 3D seed file, **dat_em(version).dgn**, then load the DAT/EM CAPTURE application. (See the *DAT/EM CAPTURE Operation Manual* for MicroStation configuration and startup information. When MicroStation is properly configured, the DAT/EM CAPTURE application loads automatically. If for some reason automatic loading has been disabled, load the DAT/EM applications manually now.)
- b.) Or, start AutoCAD® and open a drawing file based on DAT/EM’s **acad.dwt** template, then load the DAT/EM CAPTURE application. (See the *DAT/EM CAPTURE Operation Manual* for AutoCAD configuration and startup information. When AutoCAD is properly configured, the DAT/EM CAPTURE application loads automatically. If for some reason automatic loading has been disabled, load the DAT/EM applications manually now.)
- c.) Or, start ArcMap® from the ArcView®, ArcEditor®, or ArcInfo® modules of ESRI ArcGIS®. Open a map file. The communication between ArcMap and SUMMIT EVOLUTION starts automatically, and the **DAT/EM Capture** toolbars appear. Select the **DAT/EM Capture Coordinates** icon to activate the DAT/EM 3D coordinate display.

Step 11) For hardware setups that have stereo glasses: For stereo projects, put on the stereo glasses. Wear them whenever you need to see in stereo and/or set the Z coordinate.

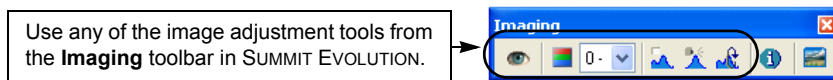
Step 12) For the first stereo (not orthophoto) project after a new SUMMIT EVOLUTION hardware installation, verify that the hardware’s pseudo/stereo setting is correct. Verify rising elevation appearance for stereo projects. View an object that has a distinct rise in elevation, such as a building or the top of a hill. If it looks like a depression, select the **pseudo/stereo** from the **Image View** toolbar (page 25-14) or verify that the Z Box or Z Screen switch is set correctly to **CE** or **CrystalEyes**. More information about the **pseudo/stereo** setting can be found on page 25-14.

Step 13) Choose a setting for **Always match image view...** on the **Main View** tab in the Options dialog. ArcGIS users must check this setting on; AutoCAD and MicroStation users may choose on or off.

Note: If you prefer to keep the SUMMIT EVOLUTION zoom set to the map scale, uncheck **Always match image view...** and enter the map scale in the status bar (see page 3-3).



Step 14) Adjust the image appearance or activate histogram equalization if necessary to make details visible on the image view. The image appearance may be adjusted again at any time (see page 24-6).



Step 15) If needed, start Terrain Following (page 24-9). Load a DTM or LIDAR file that will be used to set the Z coordinate.

Orthophoto Projects: If 3D digitizing is desired in an orthophoto project, Terrain Following must be on.

Step 16) (Optional) Place symbols and text at the control point locations. Use **lc** in AutoCAD, **ld cp <settings>** in MicroStation, or **Load Control Points** in ArcMap.

Step 17) (Optional) Add initial objects into the AutoCAD, MicroStation, or ArcMap file. These objects will be used to zoom to the model area and make SUPER/IMPOSITION settings:

- For AutoCAD, the blocks and text from the **lc** command may be used, or begin digitizing features or a border around the model or image. If the automatic zoom settings are not on, use AutoCAD's **zoom extents** command.
- For MicroStation, the cells and text from the **ld cp** command may be used, or begin digitizing features or a border around the model or image. If the automatic zoom settings are not on, use the **datem extents** command.
- For ArcMap, please see the *DAT/EM Capture for ArcGIS Operation Manual* for digitizing, Z, and editing information.

Step 18) Activate SUPER/IMPOSITION (SI) and verify its settings (for more information, see *Chapter 27*):

- Make settings from the **SI** tab on the **Stereoplotter Options** dialog in SUMMIT EVOLUTION.
- Make settings in SUMMIT EVOLUTION's SI Layer Manager (page 27-6).

- c.) Make sure the CAD-specific SUPER/IMPOSITION application is loaded in MicroStation or AutoCAD. If properly configured, it should load automatically.
- d.) For AutoCAD, use the **si on** and **si update** commands.
- e.) For MicroStation, turn on the **S/I display** in the MicroStation-specific SI application dialog box.
- f.) For ArcMap, SUPER/IMPOSITION displays automatically; however, to force a refresh at any time, click the **SI Update** icon on the **DAT/EM Capture Tools** toolbar.

Step 19) Digitize features.

- See the *DAT/EM CAPTURE Operation Manual* for digitizing and editing instructions. During the digitizing process, use any of the special tools and settings shown in this manual.
- Note that for orthophoto projects, Terrain Following (page 24-9) must be on in order to digitize in 3D.

Step 20) Archive the project and the files. It is recommended to archive the image and AutoCAD, MicroStation, or ArcGIS files at least for the following stages:

- Original image files
- SUMMIT EVOLUTION **.smti** image files, if used
- SUMMIT EVOLUTION **.smtxml** project file
- Control **.con** file, if used
- Camera **.cam** or **.camera** file (not used for orthophoto feature collection)
- 180° **.cam** or **.camera** file, if used
- Raw digitized, edited, and deliverable CAD or GIS files

The original images and CAD/GIS files should be easily accessible and matched to each other for future updates. Choosing an archiving method is the responsibility of the user.

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Chapter 23. AutoCAD, MicroStation, and ArcMap Options

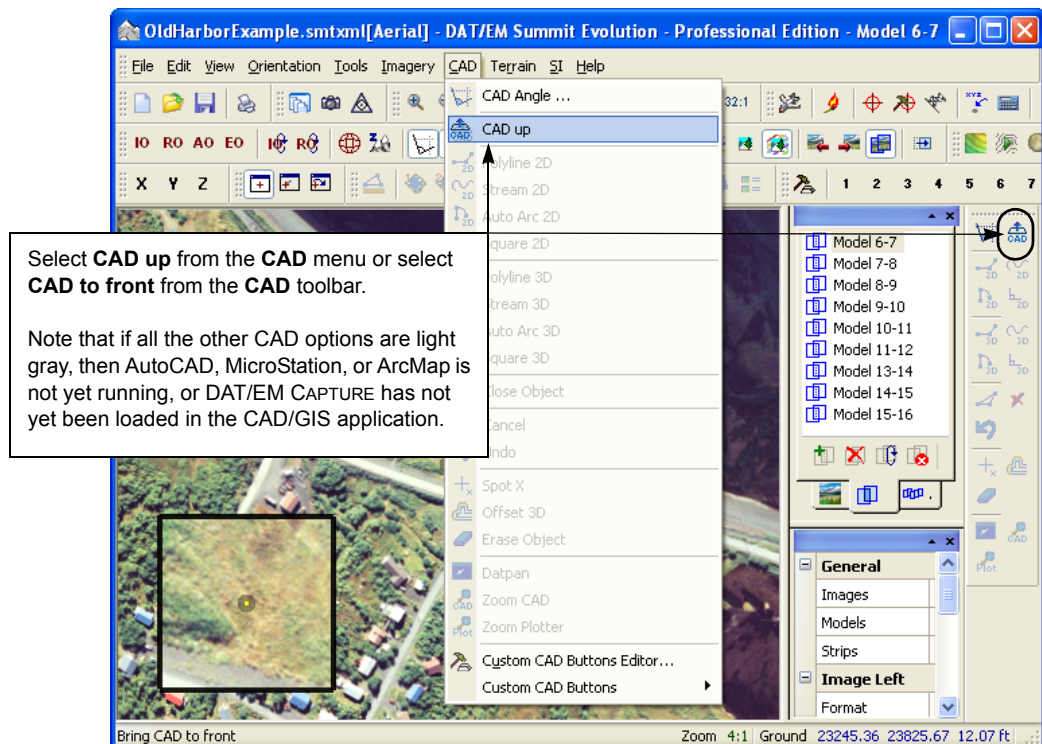
The CAD pull-down menu and CAD toolbar allow AutoCAD®, MicroStation®, ArcMap®, and DAT/EM CAPTURE™ commands to be activated from SUMMIT EVOLUTION™. There are also some commands that may be entered from AutoCAD, MicroStation, and ArcMap that affect SUMMIT EVOLUTION. For example, the ZOOMPLOT command entered from AutoCAD or MicroStation causes the SUMMIT EVOLUTION view to zoom to match the CAD view.

Start or Switch to AutoCAD, MicroStation, or ArcMap

If AutoCAD, MicroStation, or ArcMap is not yet running, it may be activated from SUMMIT EVOLUTION. Or, if AutoCAD, MicroStation, or ArcMap is already running, the same command will cause it to become the focus Window.

Perform the following step:

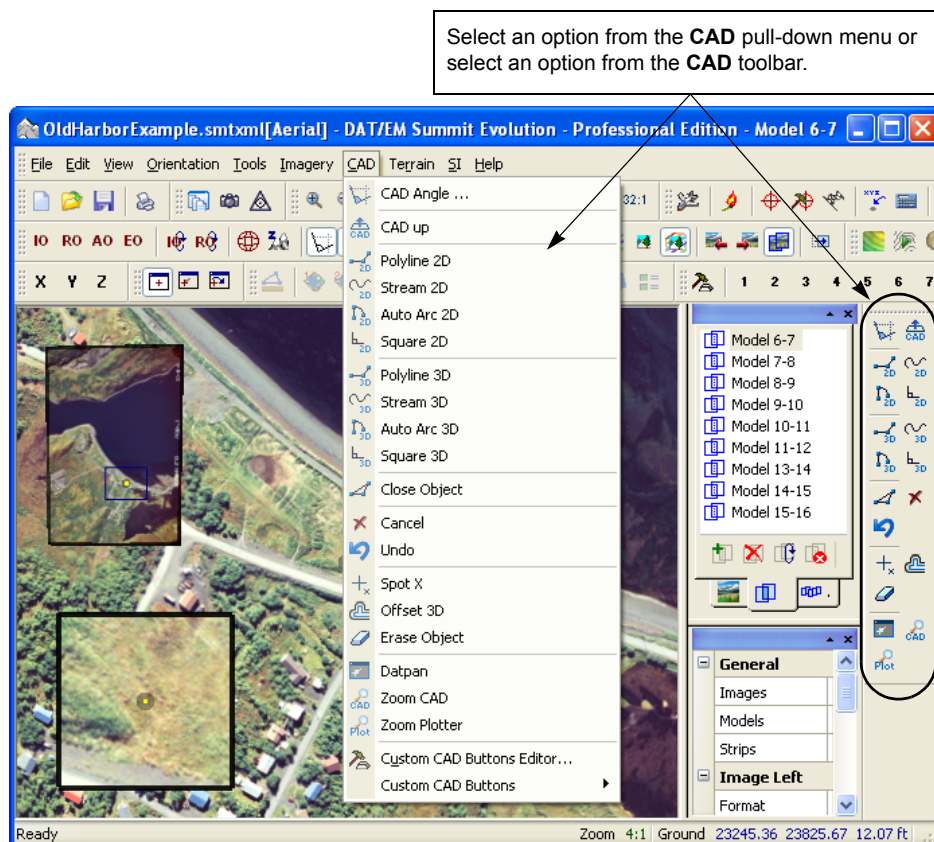
- Step 1)** Select either the **CAD to front** icon from the CAD toolbar or select **CAD up** from the CAD pull-down menu.
- If AutoCAD, MicroStation, or ArcMap is not already running, the most recently used of these three applications starts.
 - If AutoCAD, MicroStation, or ArcMap is already running, then focus is switched over to that application. If it has been sunk to the taskbar, then it will reappear as it becomes the active window.



Activate CAD/GIS Commands from Summit Evolution

The **CAD** pull-down menu and toolbar in SUMMIT EVOLUTION allow several preconfigured AutoCAD, MicroStation, ArcMap, or DAT/EM CAPTURE commands to be activated from the stereoplottter application. There is also an 8-button **Custom CAD** commands toolbar menu that may be configured by the user (see page 23-2 below). To use the preconfigured tools, perform the following steps:

Step 1) Select an option from the **CAD** pull-down menu or select an icon from the CAD toolbar.



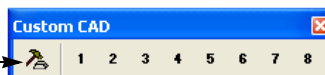
Step 2) The AutoCAD, MicroStation, ArcMap, or DAT/EM CAPTURE command is activated in the CAD/GIS application. Instructions for using these commands are documented in the *DAT/EM CAPTURE Operation Manual*.

Configure and Use the Custom CAD Toolbar

To configure and use the 8-button **Custom CAD** toolbar for AutoCAD, MicroStation, or ArcMap commands, perform the following steps:

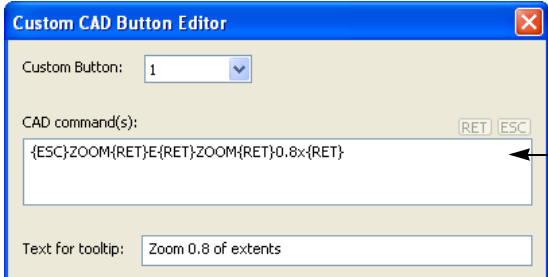
Step 1) Select **Custom CAD Buttons Editor** from the **CAD** pull-down menu or select **Custom button editor** on the **Custom CAD** toolbar:

- Choose a method to start the editor:
- Select **Custom CAD Buttons Editor** from the **CAD** pull-down menu
 - Or select **Custom button editor** from the **Custom CAD** toolbar.

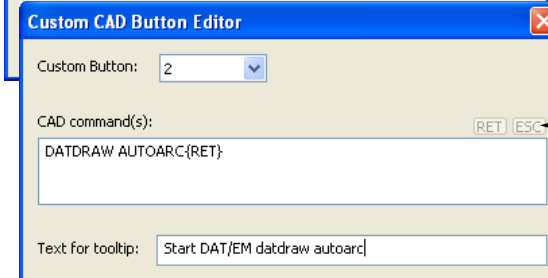


- Step 2)** Set the **Custom Button** field to the number of the button to configure.
- Step 3)** Enter the CAD command or a series of CAD commands in the **CAD command(s)** field. For AutoCAD and MicroStation, enter the commands as they would appear on the command line. For ArcMap, use the same syntax that is used for the DAT/EM KEYPAD (see *Chapter 3* and *Appendix B* in *The DAT/EM Keypad Operation Manual*).
- Step 4)** Enter a tool tip in the **Text tooltips** field. This tool tip will appear when the cursor is held still over the button number on the **Custom CAD** toolbar.
- Step 5)** (Optional) If an icon is available, browse for the file to set in **Image for toolbar**. The file should be 16x16 pixels and in **.tif**, **.bmp**, or **.icon** format.

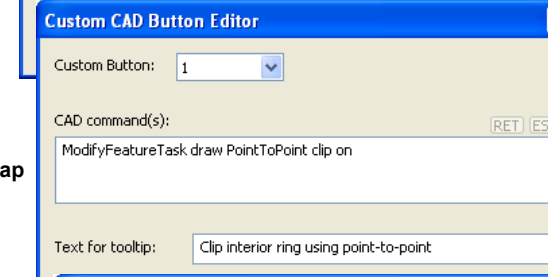
Example for AutoCAD



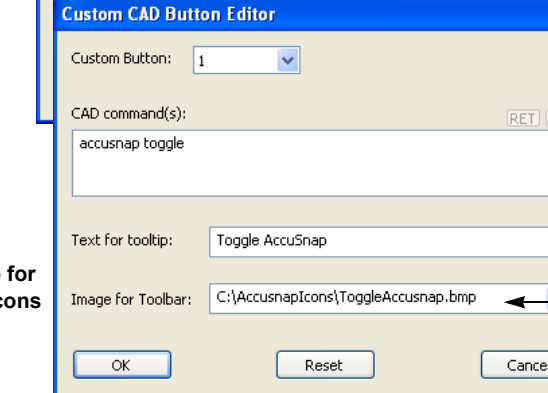
Example for MicroStation



Example for ArcMap



Example for button icons




- Set the **Custom Button** field to the number of the button to configure.
- Enter the command or a series of commands in the **CAD command(s)** field.
- Enter a tool tip in the **Text tooltips** field. This tool tip will appear when the cursor is held still over the button number on the **Custom CAD** toolbar.

If an <Enter> (return) or <Esc> character is required, click on the **RET** or **ESC** buttons to add them to the text line.

A custom icon may be assigned to each button. The icon should be:

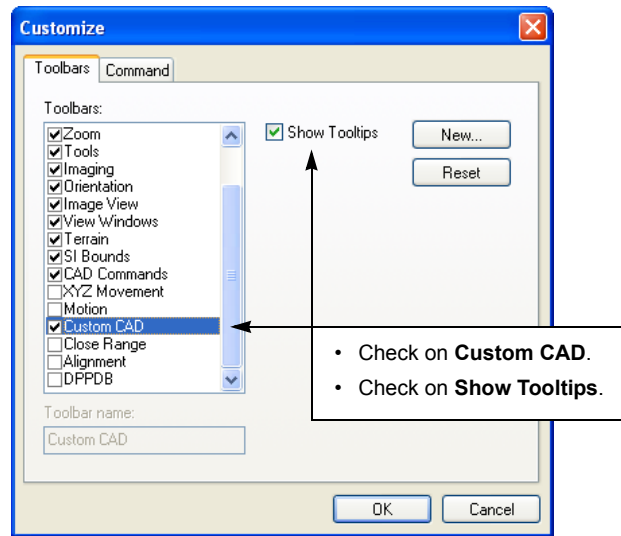
- 16 X 16 pixels
- **TIF**, **BMP**, or **ICON** format

If an icon is not defined or not found, the default "1, 2, 3, ..." icons will appear.

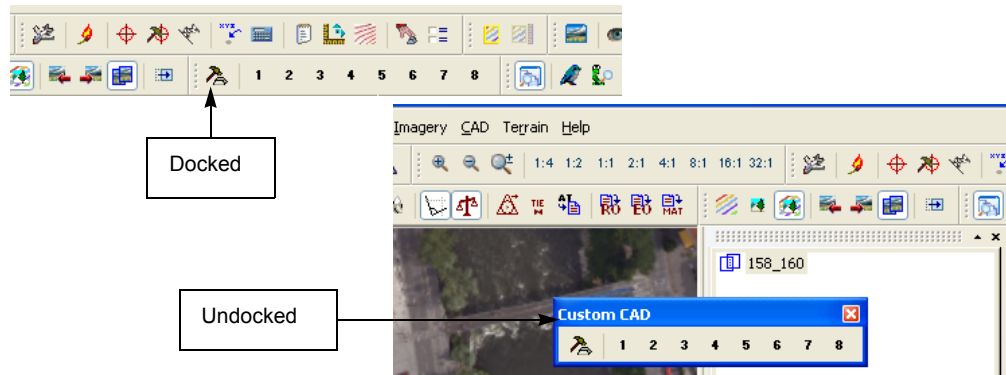


In this example, icons have been set to make the **Custom CAD** toolbar appear similar to the MicroStation **Accusnap** toolbar. If you would like copies of these Accusnap-like icons and instructions for their command strings, please contact DAT/EM Support.

Step 6) If the toolbar does not appear, make sure the toolbar is turned on for display. Select **Customize Toolbars** from the **Tools** pull-down menu and check on **Custom CAD** and **Show Tooltips**:



Step 7) Like any toolbar menu, the **Custom CAD** toolbar may be displayed either undocked or docked to the toolbar icon bar. Drag the toolbar to the desired location with the system mouse.



Step 8) Click the hammer icon on the **Custom CAD** toolbar at any time to activate the editor and change button settings.

Activate Summit Evolution commands from DAT/EM Capture

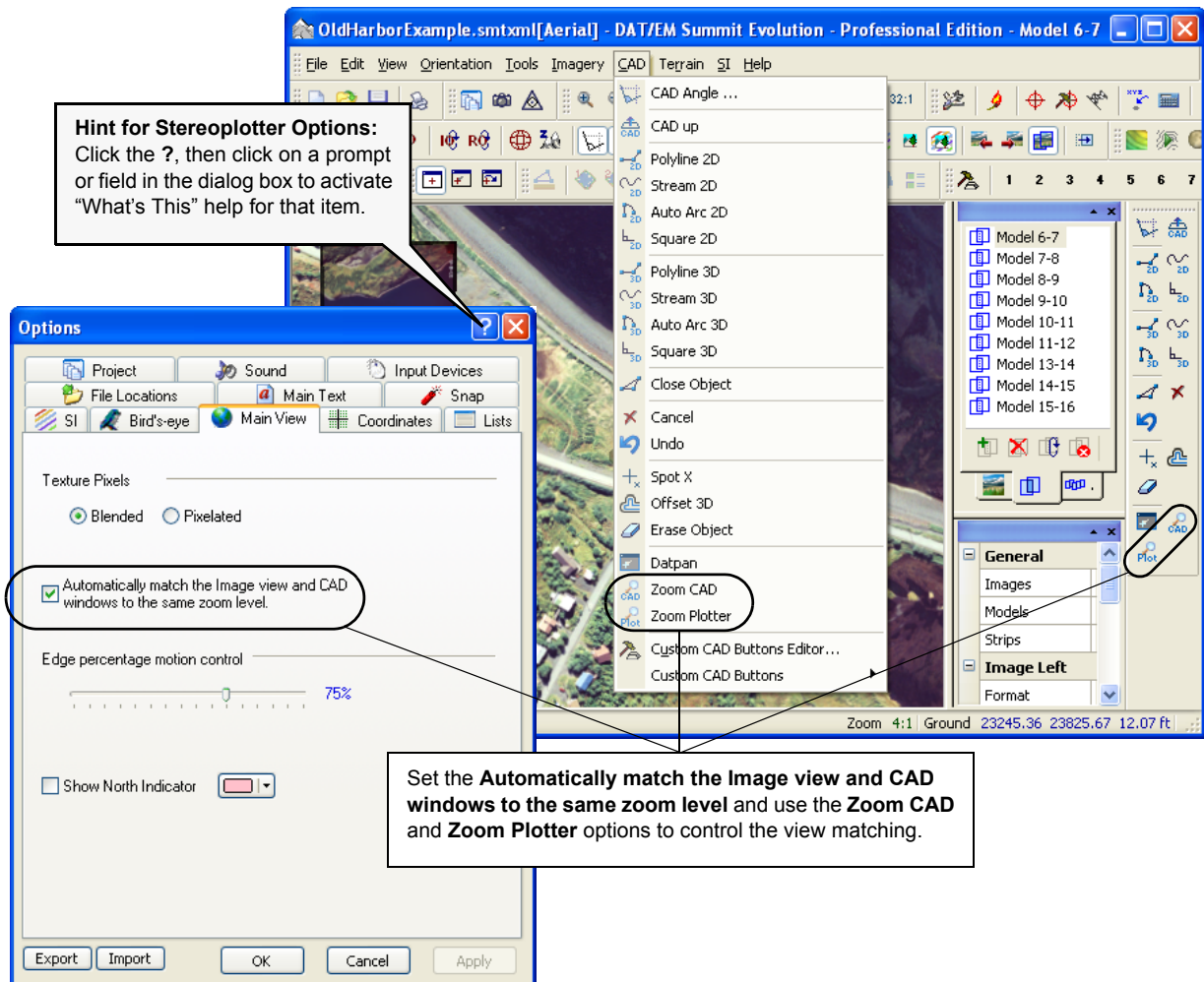
There are a few SUMMIT EVOLUTION commands that can be activated from AutoCAD, MicroStation, or ArcMap. These commands are simply entered from the AutoCAD or MicroStation command line or from a keypad key. These commands are as follows:

- **zoomplot** (see page 23-5)
- **button edit** in DAT/EM CAPTURE for MicroStation. Activates the Button Editor to set digitizer switches (see *Appendix J* for settings instructions)
- **buttons** in DAT/EM CAPTURE for AutoCAD. Activates the Button Editor to set glitzier switches (see *Appendix J* for settings instructions)
- **SUPER/IMPOSITION** commands (“The CAD-Specific Super/Imposition Application” on page 27-8)

Summit Evolution and CAD View Matching Controls

The user has several choices for automatically matching the CAD and SUMMIT EVOLUTION views:

- Set the CAD view and SUMMIT EVOLUTION view to be independent of each other. For example, SUMMIT EVOLUTION could be zoomed in to a sub-pixel view while the CAD view shows the entire project area. To do this, turn off **Automatically match the Image...** on the **Main View** tab of the stereoplotter options.
- Set CAD and SUMMIT EVOLUTION views to automatically zoom to the best fit of each other every time either application has a view location or zoom change. To do this, turn on **Automatically match the Image...** on the **Main View** tab of the stereoplotter options.
- Zoom the CAD view to the best fit of the SUMMIT EVOLUTION view when the ZOOMCAD command is selected. To do this, select the **Zoom CAD** icon on the CAD toolbar or select **Zoom CAD** from the **CAD** pull-down menu.
- Zoom the SUMMIT EVOLUTION view to the best fit of the CAD view when the **zoomplot** command is selected. To do this, select the **Zoom Plotter** icon on the CAD toolbar or select **Zoom Plotter** from the **CAD** pull-down menu.



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Chapter 24. Toolbars

The toolbars in SUMMIT EVOLUTION contain a wide variety of tools and settings. Many of the toolbars are described as part of a process in other parts of this manual; these are given cross references to the location of the documentation. Other tools are described in full in this chapter.

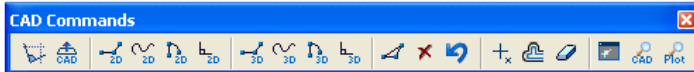
List of All Toolbars

The following is a list of all SUMMIT EVOLUTION toolbars and cross references that show where to find information on using either the whole toolbar or its individual tools:

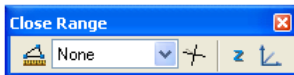
Alignment toolbar, page 24-3 through page 24-4 (complete instructions).



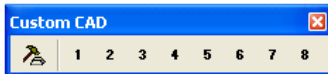
CAD Commands toolbar, page 24-5



Close Range toolbar, page 24-5



Custom CAD toolbar, see “Configure and Use the Custom CAD Toolbar” on page 23-2.



DPPDB toolbar is only used for DPPDB projects. See “Turn on the DPPDB Toolbar” on page 12-4.



Drawing File, **Drawing and Editing**, and **Drawing Tools** toolbars, *Chapter 26*



Edit toolbar, page 24-6



File toolbar, page 24-6



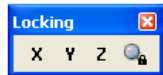
Image View toolbar, page 24-6



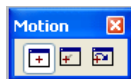
Imaging toolbar, page 25-67 through page 25-74 and IMAGE CREATOR on page 4-6



Locking toolbar, page 24-7



Motion toolbar, page 24-7



Orientation toolbar, page 24-7



Quick Options toolbar, page 24-7



Satellite toolbar, page 11-17



SI Tools toolbar, page 24-9



Terrain Following toolbar, see page 25-90.



Terrain Processing toolbar, page 24-9



Tools toolbar, page 24-9



View Windows toolbar, page 24-10



Zoom toolbar, page 24-10



Alignment Toolbar

The **Alignment** toolbar contains tools that search for the local ground elevation by matching pixels in the right and left images. If a match is found, the cursor is automatically set to the ground elevation.



- **Aligns Images** — On-demand search for an elevation match in the area of the cursor. Moves to Z if found. (Below.)
- **Snap Toggle** — Continuous search for elevation match in the area of the cursor. Moves to Z whenever found (page 24-4).

Alignment: Aligns Images

Aligns Images is an on-demand elevation matching tool; that is, it works one time only when activated. It searches in the area of the cursor for an elevation match, and if one is found, it moves the cursor to that Z coordinate. It does not move in X or Y.



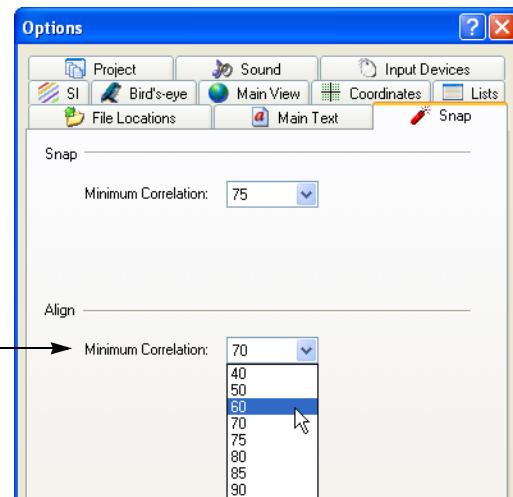
- Some orientations, including ADS40, do not allow **Aligns Images** and **Snap Toggle** (page 24-4) to work.
- It is not recommended to use **Aligns Images** and **Terrain Following** (page 24-9) at the same time.
- It is helpful to use **Aligns Images** during relative orientation (*Chapter 19*).

To use **Aligns Images**, perform the following steps:

Step 1) If necessary, make settings for **Aligns Images** from the **Snap** tab of the **Options** dialog:

Align > Minimum correlation sets the minimum degree of pixel matching in order for **Aligns Images** to move to a matched ground position.

- 40 is the least amount of matching.
- 90 is the most amount of matching.
- Start with 75, then increase if the match is not correct, and decrease if **Aligns Images** fails to move the cursor.



Step 2) The **Aligns Images** tool may be activated from the **Alignment** toolbar or from a digitizer button. If desired, set a digitizer button to **Type=Plotter**, **Action=Align**. (See *Appendix J* for more information.)

Step 3) At any time, select **Aligns images** from the **Imaging** toolbar, or press a digitizer button that is set to **Type=Plotter**, **Action=Align**.

The **Aligns Images** tool searches for an image match based on its **Minimum correlation** setting (Step 1 above). If a match is found, the cursor moves to the Z coordinate. If no match is found, it does nothing.

Alignment: Snap Toggle

Snap Toggle is similar to **Aligns Images**, except that it performs continuous elevation matching. Wherever the cursor moves, **Aligns Images** searches for an elevation match. Whenever a match is found, the cursor moves to that Z coordinate. It does not move in X or Y. Note that the cursor may seem to pause as it moves, because image matching is continuously calculated.



Note that **Snap Toggle** and **Aligns Images** (page 24-3) are only possible if there is an active Relative Orientation (RO) and either an Absolute Orientation (AO) or and Exterior Orientation (EO). If EO has been imported without an RO, **Snap Toggle** and **Aligns Images** will not be available. If an RO is available from the same source that created the EO, it may be imported in order to activate **Snap Toggle** and **Aligns Images**.

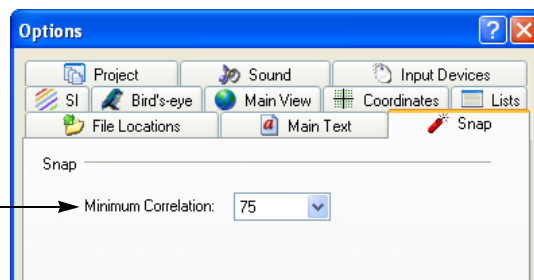
It is not recommended to use **Snap Toggle** and have **Terrain Following** (page 24-9) on at the same time.

To use **Snap Toggle**, perform the following steps:

Step 1) If necessary, make settings for **Snap Toggle** from the **Snap** tab of the **Options** dialog box:

Snap > Minimum correlation sets the minimum degree of pixel matching in order for **Snap Toggle** to move to a matched ground position.

- 40 is the least amount of matching.
- 90 is the most amount of matching.
- Start with 75, then increase if the match is not correct, and decrease if **Snap Toggle** fails to move the cursor.



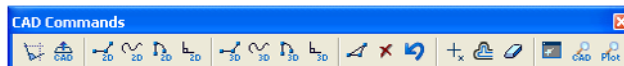
Step 2) The **Snap Toggle** tool may be activated from a toolbar icon or from a digitizer button. If desired, set a digitizer button to **Type=Plotter, Action=Snap toggle**. See *Appendix J*.

Step 3) At any time, select **Snap toggle** from the **Aligns Images** toolbar, or press a digitizer button that is set to **Type=Plotter, Action=Snap toggle**.

The **Snap Toggle** tool continuously searches for an image match based on its **Minimum correlation** setting (Step 1 above). Whenever a match is found, the cursor moves to the Z coordinate. If no match is found, it does nothing.

CAD Commands Toolbar

The **CAD Commands** toolbar is used to send commands directly to the CAD/GIS application.



The functions of the tools vary depending on whether AutoCAD, MicroStation, or ArcGIS is running at the time. Please see:

- “Start or Switch to AutoCAD, MicroStation, or ArcMap” on page 23-1
- “Activate CAD/GIS Commands from Summit Evolution” on page 23-2
- “Summit Evolution and CAD View Matching Controls” on page 23-5

Close Range Toolbar

The **Close Range** toolbar is used only for Close Range (Terrestrial) projects. Please see:



- “Turn on the Close Range Toolbar” on page 9-3
- “Plane Following for Close-Range Projects” on page 9-4
- ““Move Like Aerial” Movement Mode” on page 9-8.

Custom CAD Toolbar

The **Custom CAD** toolbar allows you to set toolbar buttons to perform AutoCAD, MicroStation, or ArcMap functions. For instructions, see “Configure and Use the Custom CAD Toolbar” on page 23-2



DPPDB Toolbar

The **DPPDB** toolbar is only used for DPPDB projects. For instructions, see “Turn on the DPPDB Toolbar” on page 12-4



Drawing File, Drawing and Editing, and Drawing Tools Toolbars

The three Drawing toolbars are used for creating, editing, and managing DAT/EM Drawing Objects. See *Chapter 26*.

Edit Toolbar

The **Edit** toolbar offers the project file editor, the camera file editor, and the control file editor.

- “Edit a Aerial Project Definition” on page 7-11 (most other project types refer to this chapter for project editing.)
- “Edit an ADS40/80 Project” on page 8-11
- *Chapter 5*, “Camera Definition Files”
- *Chapter 6*, “Control Point Files”
- “Define Models/Strips and Edit Project Definitions” on page 16-1



File Toolbar

The **File** toolbar offers file opening and saving options. It is used during project setup and opening. See “File Menu” on page 25-2.



Image View Toolbar

The **Image View** toolbar offers toggles and settings for the contents of the image view: Multiple viewports settings, right and left image display toggles, SUPER/IMPOSITION toggles, and stereo/pseudo toggle. See:

- “View Menu > Viewports” on page 25-10
- “SI Toggle from the Image View Toolbar” on page 27-8
- “View Menu > Image View” on page 25-14



Imaging Toolbar

The **Imaging** toolbar offers image viewing adjustments, image information, and the DAT/EM IMAGE CREATION tool. See:

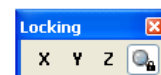
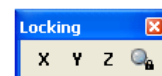
- “Imagery Menu > Image Adjustment Settings” on page 25-67
- “Imaging Menu > Channel Manager” on page 25-69
- “Imaging Menu > Histogram Adjustment Settings” on page 25-73
- “Imaging Menu > Image Information” on page 25-74
- “Use Image Creation to Generate .SMTI or .PYR Files” on page 4-6



Locking Toolbar

The **Locking** toolbar offers X, Y, and Z cursor movement locks and a zoom controls lock.

- For the **X**, **Y**, and **Z** locks, see “Toggle X, Y, or Z Movement” on page 3-1.
- The **Toggle lock all zooming** option, when on, locks all zoom controls. Zoom controls include the clutch+wheel on the 3D device, any keyboard shortcuts or 3D device buttons set to zoom in or zoom out, the **Zoom** key-in field on the status bar, and the **Zoom** toolbar and menu zooming options. This may be useful when digitizing at a certain zoom level, such as 1:2; set the desired zoom first, then lock the zoom so that it cannot be changed accidentally. See also the **Allow zoom with clutch** setting on the **Input Devices** tab of the SUMMIT EVOLUTION Options dialog.



Motion Toolbar

The **Motion** toolbar offers panning options. See “View Menu > Panning Method” on page 25-15.



Orientation Toolbar

The **Orientation** toolbar is used to start orientation procedures for projects that require them. See:

- *Chapter 17*, “Orientation Methods”
- “Optional Orientation-Related Procedures” on page 17-7
- *Chapter 18*, “Interior Orientation”
- *Chapter 19*, “Relative Orientation”
- *Chapter 20*, “Absolute Orientation”
- *Chapter 21*, “Exterior Orientation”
- *Appendix C*, “Define New Coordinate System Components”



Quick Options Toolbar

The **Quick Options** toolbar offers toggles of some commonly changed settings.



Pressing one of the icons on the **Quick Options** toolbar is the same as checking on or off its matching setting in the SUMMIT EVOLUTION Options dialog.

Three of the most-used quick options icons are on the toolbar by default after installation or after a toolbar reset:

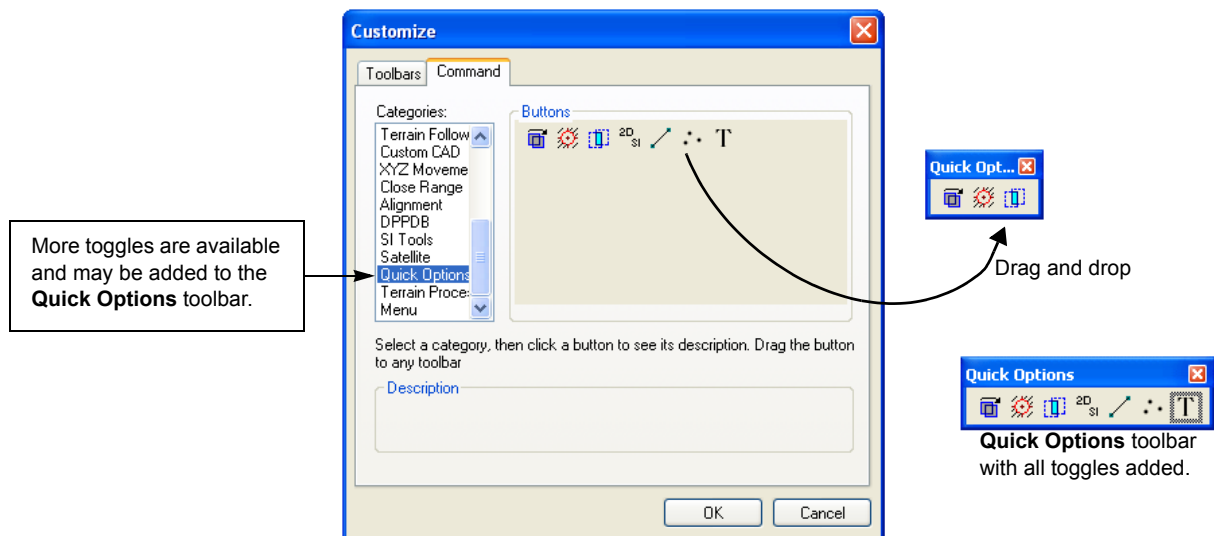
- Toggle auto load next model (**Options>Project tab>Automatically load next model when outside stereo region** setting)
- Toggle clip scope (**Options>SI tab>Clip Scope** setting)
- Toggle clip main view to stereo region (**Options>Main View tab>Clip to Stereo Region** setting)

More quick toggles are available, but are not on the toolbar by default. They may be added to the toolbar if they are needed:

- 2D Superimposition toggle (**Options>SI tab>2D - Object elevations at cursor** setting)
- Show SI objects toggle (**Options>SI tab>Objects** setting)
- Show SI points toggle (**Options>SI tab>Points** setting)
- Show SI text toggle (**Options>SI tab>Text** setting)

To add additional toggles to the **Quick Options** toolbar, perform the following steps:

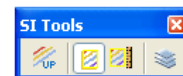
- Step 1)** Select **Customize Toolbars** from the **Tools** pull-down menu.
- Step 2)** Select the **Command** tab.
- Step 3)** Select the **Quick Options** Category.
- Step 4)** Drag and drop any toggle to the **Quick Options** toolbar (or to any other toolbar).



SI Tools Toolbar

The **SI Tools** toolbar is used to update the superimposed vector display, set user bounds, and start the SI Layer Manager. See:

- “SI Menu and Toolbar: Layer Manager” on page 27-6
- “SI Menu and Toolbar: SI User Bounds and Measure SI User Bounds” on page 27-5
- “SI Menu and Toolbar: Layer Manager” on page 27-6
- “SI Menu and Toolbar: Layer Manager” on page 27-6



Terrain Following Toolbar

The **Terrain Following** toolbar offers SUMMIT EVOLUTION’s Terrain Following functions. Terrain Following automatically adjusts the cursor’s Z based on one or more loaded points files. See: “Terrain Menu > Terrain Following Options (Multiple Options Described)” on page 25-90.



Terrain Processing Toolbar

The **Terrain Processing** toolbar starts tools that use or process terrain points. See:

- “Terrain Menu > Terrain Visualization” on page 25-76
- “Terrain Menu > Generate Contours” on page 25-80
- “Terrain Menu >: Generate Contours Using a Configuration File” on page 25-83
- “Terrain Menu > Translate or Distribute Points (Point Translator)” on page 25-84



Tools toolbar

The **Tools** toolbar offers a variety of important options. See:

- “Tools Menu” on page 25-36.
- *Chapter 28*, “Project Viewer and Ortho+Mosaic”.
- *Chapter 30*, “Project Status Tracker”.



View Windows Toolbar

The **View Windows** toolbar includes the Full Screen Mode toggle and several other buttons that start windows that are separate from the main image view.



- “View Menu > Full Screen” on page 25-24
- “View Menu > Project Window” on page 25-16
- “View Menu > Properties Window” on page 25-17
- “View Menu > Embedded Bird’s-Eye and Bird’s-Eye Stereo, Left, and Right” on page 25-19
- “View Menu > Embedded Zoom View and Close Up Stereo Window” on page 25-21

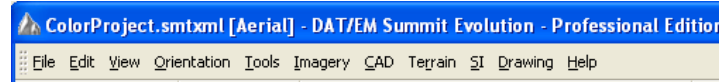
Zoom Toolbar

The **Zoom** toolbar offers some of the many main view zoom methods. See “View Menu > Zoom” on page 25-15.



Chapter 25. All Menus

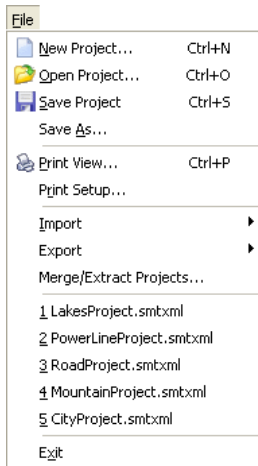
All of SUMMIT EVOLUTION's pull-down menus are listed here. Many of the items on the menus are described in other parts of this document; cross references are given if the information exists elsewhere.



- **File** menu, directly below.
- **Edit** menu, starting on page 25-3.
- **View** menu, starting on page 25-4.
- **Orientation** menu, starting on page 25-26.
- **Tools** menu, starting on page 25-36.
- **Imagery** menu, starting on page 25-67.
- **CAD** menu. These options are discussed in "Activate CAD/GIS Commands from Summit Evolution" on page 23-2 and "Configure and Use the Custom CAD Toolbar" on page 23-2.
- **Terrain** menu, starting on page 25-75.
- **SI** menu. These options are discussed in "SI Menu and Toolbar: SI User Bounds and Measure SI User Bounds" on page 27-5 and "SI Menu and Toolbar: Layer Manager" on page 27-6. Superimposition in general is discussed in *Chapter 27*.
- **Drawing** menu. These options are discussed in *Chapter 26*.
- **Help** menu, starting on page 25-94.

File Menu

The following are descriptions and cross references for the File menu:



New Project

Start a new SUMMIT EVOLUTION project. For detailed instructions, see *Chapters 7-14* for the particular type of project you wish to start.

Open Project

Browse for an existing **.smtprj** or **.smtxml** project to open. The older format **.smtprj** files will be converted to **.smtxml**.

Save Project

Save the current **.smtxml** project file.

Save As

Save the current **.smtxml** project file with a new name.

Print View

Print the contents of the current Main View.

Print Setup

Make printer settings.

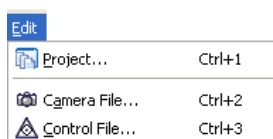
Import

- **Z/I SSK Project.** See “Import a Z/I ImageStation® SSK Project” on page 15-1.
- **Socet Set project.** See “Import a SOCET SET® Project: Select All Files Method” on page 15-5.
- **Socet Set from SUP only.** See “Import a SOCET SET Project: Select SUP File Method” on page 15-7.
- **ISM DiAP Models.** See “Import ISM DiAP Models” on page 15-9.
- **DVP PAR Files.** See “Import DVP PAR or DAT File Projects” on page 15-11.
- **DVP DAT Files.** See “Import DVP PAR or DAT File Projects” on page 15-11.
- **Convert Phorex 1 or 2 Camera (.CAM).** See “Import Phorex Interchange Files” starting on page 15-13.
- **Import Summit PC Model.** See “Import Summit PC Models” on page 15-17

Export	<ul style="list-style-type: none"> • Export Model Bounds. Export model boundary polygons to CAD/GIS. See “(Optional) Export Model Bounds” on page 17-10. • Create GCF Files. See “(Optional) Export GCF Files” on page 17-11. • To Leica ADS40 Kit Project Type. Export an older type of ADS40 project to the newer Kit type. See “Export a “Select All Files” Project to a “Leica Kit” Project” on page 8-12. • Export Interior Measurements. See “(Optional) Export Interior Measurements” on page 17-11. • Export Exteriors. See “(Optional) Export Exteriors” on page 17-12.
Merge/Extract Projects	See “Merge and Extract Summit Evolution Projects” on page 15-19.
(recent projects)	This is a list of the most recently open projects. To set the number of projects in the list, use Tools > Options > Project tab > Recent project file list . Changes to this setting take effect the next time SUMMIT EVOLUTION starts.
Exit	Close the SUMMIT EVOLUTION application.

Edit Menu

The following are descriptions and cross references for the **Edit** menu:

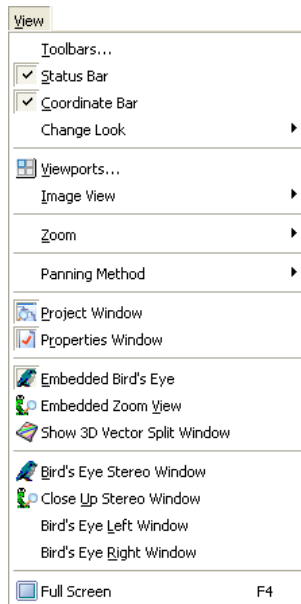


Project	Activate the Project Edit dialog for the currently open project. This dialog is different for each type of project. See <i>Chapters 7-14</i> for the particular type of project.
Camera File	Open the Camera Editor. The first camera file listed in the currently open project (if any) will open automatically. See <i>Chapter 5</i> .
Control File	Open the Control Editor. The first control file listed in the currently open project (if any) will open automatically. See <i>Chapter 6</i> .

View Menu

The **View** pull-down menu offers many view settings. The settings may also be quickly accessed from the **View Windows** toolbar and from the right click menu in the main stereo view.

The following are descriptions and cross references for the **View** menu:



Toolbars

See below, “View Menu > Toolbars” on page 25-5.

Status Bar

See “View Menu > Status Bar” on page 25-6.

Coordinate Bar

See “View Menu > Coordinate Bar” on page 25-8.

Look and Feel

See “View Menu > Look and Feel” on page 25-9.

Viewports

See “View Menu > Viewports” on page 25-10.

Image View

See “View Menu > Image View” on page 25-14.

Zoom

See “View Menu > Zoom” on page 25-15.

Panning Method

See “View Menu > Panning Method” on page 25-15

Project Window

See “View Menu > Project Window” on page 25-16.

Properties Window

See “View Menu > Properties Window” on page 25-17.

Embedded Bird’s Eye

See “View Menu > Embedded Bird’s-Eye and Bird’s-Eye Stereo, Left, and Right” on page 25-19.

Embedded Zoom View

See “View Menu > Embedded Zoom View and Close Up Stereo Window” on page 25-21.

Show 3D Vector Split Window

See “View Menu > Show 3D Vector Split View (with 2D Option)” on page 25-22.

Bird’s Eye Left / Right Window

See “View Menu > Embedded Bird’s-Eye and Bird’s-Eye Stereo, Left, and Right” on page 25-19.

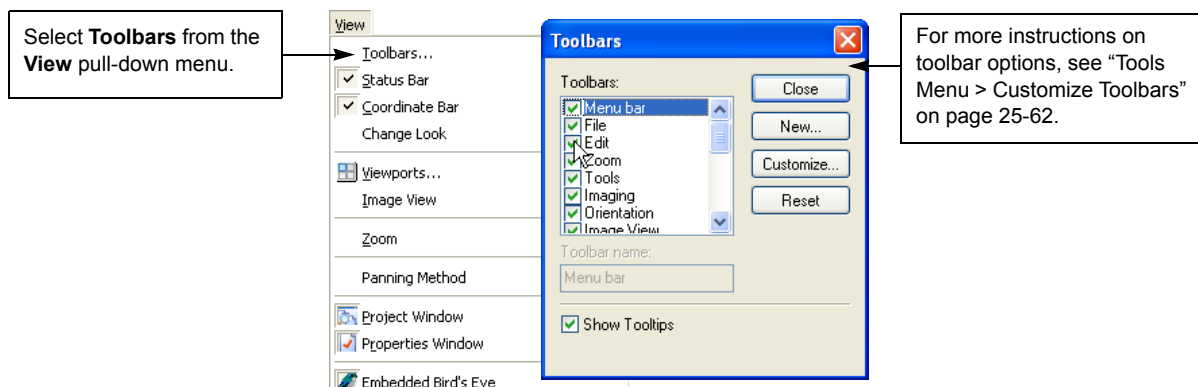
Full Screen

See “View Menu > Full Screen” on page 25-24.

View Menu > Toolbars

Toolbars appear along the top of the SUMMIT EVOLUTION window. Some toolbars are on by default after installation, but others are off until they are checked on by the user, usually for a particular type of project. To turn individual toolbars on or off, perform the following steps:

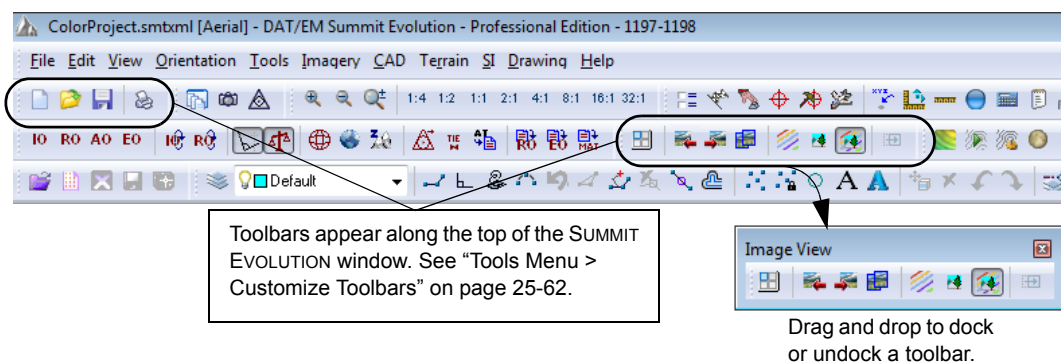
Step 1) Select **Toolbars** from the **View** pull-down menu.



Step 2) Check toolbars on and off from the dialog box. For more instructions on customizing toolbars, see "Tools Menu > Customize Toolbars" on page 25-62.

Toolbar hints:

- Right click in a blank area of the SUMMIT EVOLUTION toolbar display to see a menu of all toolbars. Check or uncheck individual toolbars from this menu.
- Toolbars may be docked within the application window, or undocked and placed anywhere. Drag and drop the menus to the desired location.
- To add another row to the toolbar display area, drag and drop a toolbar below the existing rows.
- Create a new toolbar or edit existing toolbars. See "Tools Menu > Customize Toolbars" on page 25-62.
- Toolbars are reset when DAT/EM software is reinstalled or updated. If you would like them to be reset to installation defaults at any time, see "Tools Menu > Reset Toolbars to Default" on page 25-64.

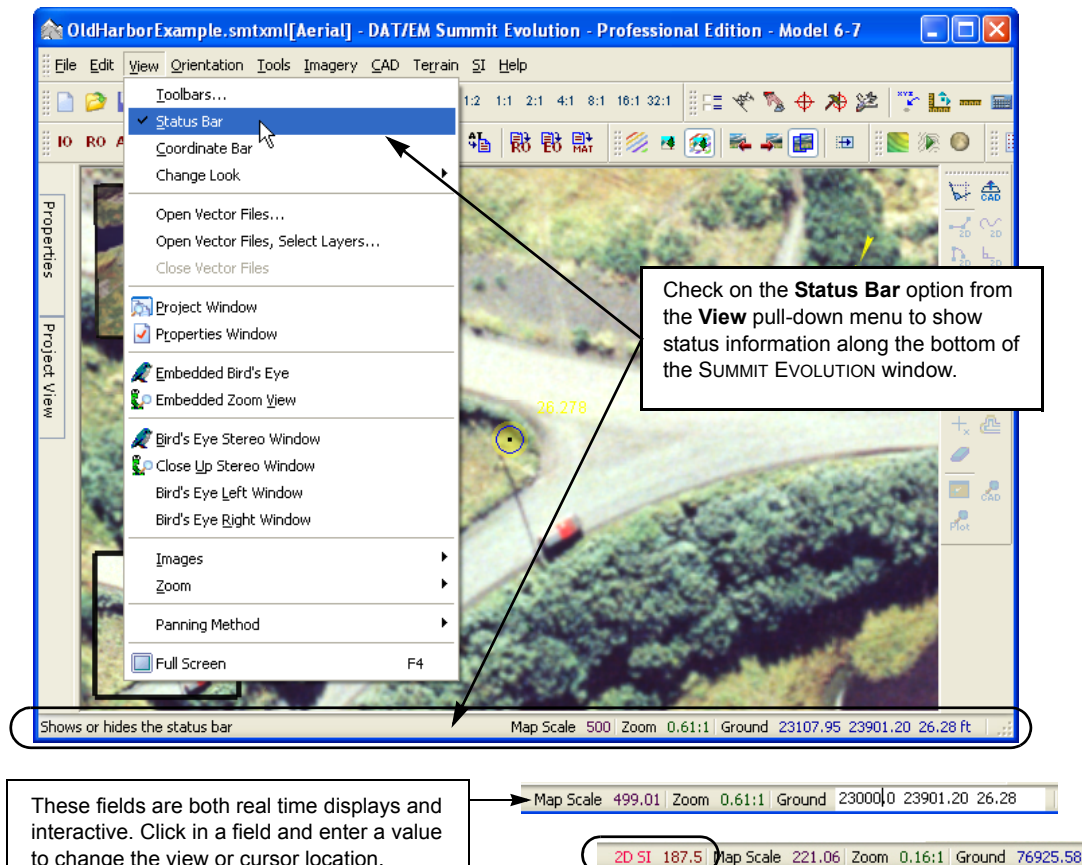


View Menu > Status Bar

The status bar displays information such as current ground coordinate, zoom setting, applied Z index value, and menu or status tips. The **Map Scale**, **Zoom**, and **Ground** fields are also interactive, so that new values may be entered and applied directly from these displays.

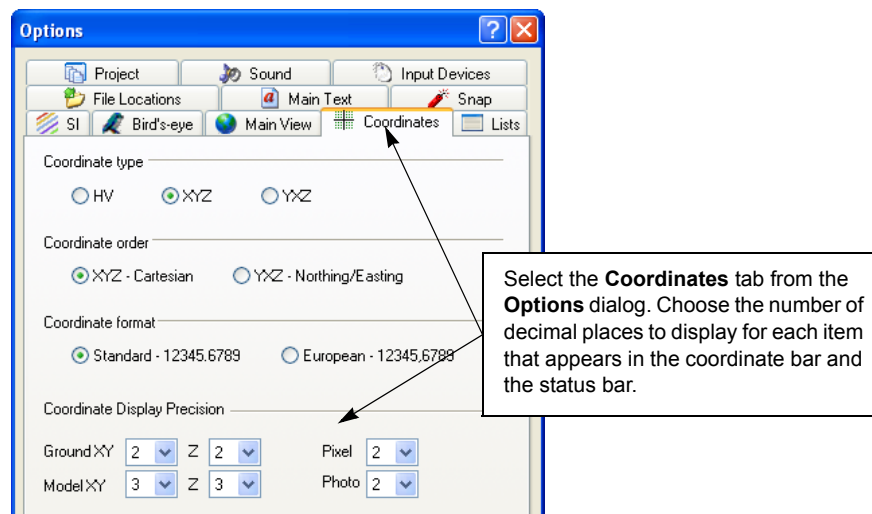
To display the status bar, perform the following steps:

- Step 1)** Select **Status Bar** from the **View** pull-down menu. A bar appears at the bottom of the SUMMIT EVOLUTION window.

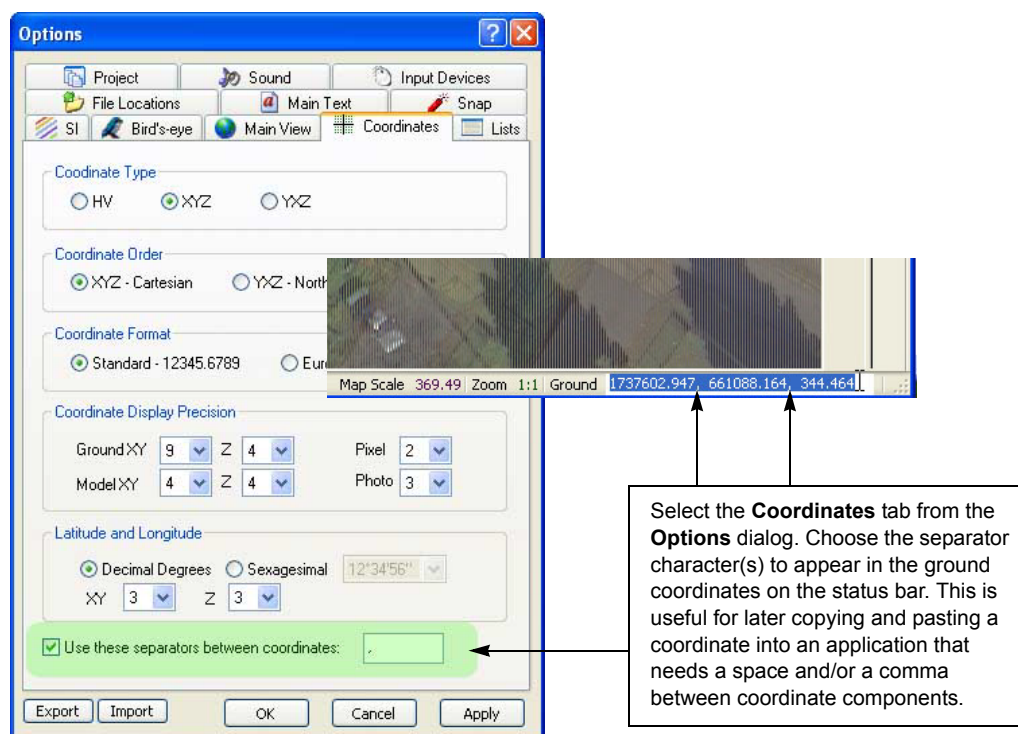


If 2D superimposition is on, **2D SI** appears on the status bar. See page 27-17 for more information about 2D SI.

- Step 2)** If desired, choose the number of decimal places to display in the status bar. Select **Options** from the **Tools** toolbar or pull-down menu. Select the **Coordinates** tab. Make settings in the **Coordinate Display Precision** area:



- Step 3)** If desired, choose one or more separator characters to display between the ground coordinate values in the status bar. Select **Options** from the **Tools** toolbar or pull-down menu. Select the **Coordinates** tab. Make settings in the **Use these separators...** field:

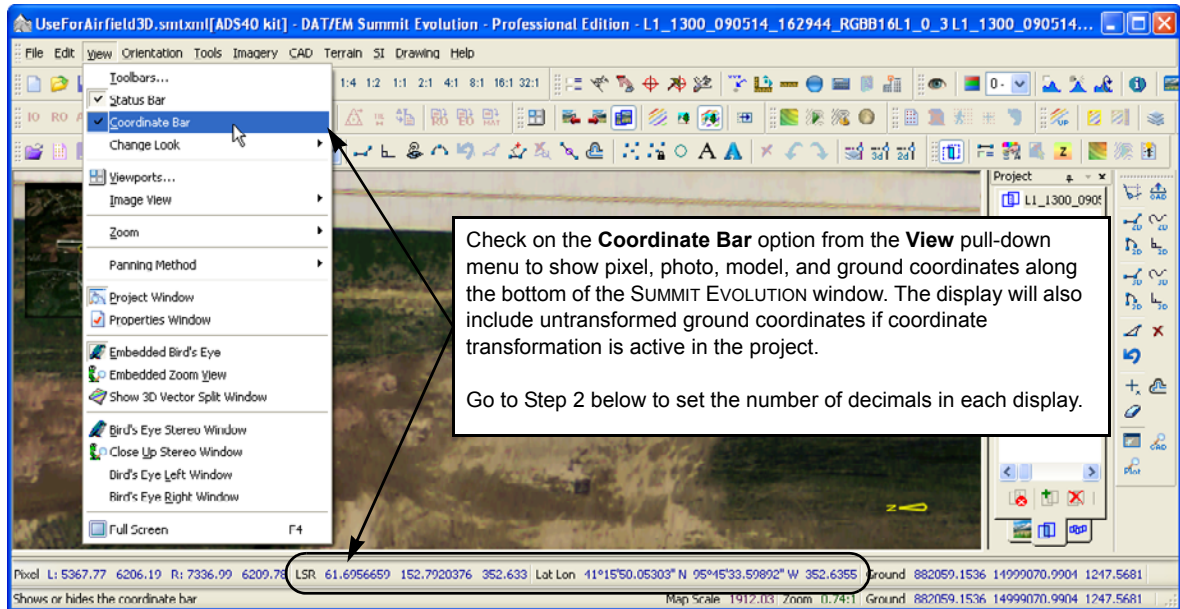


View Menu > Coordinate Bar

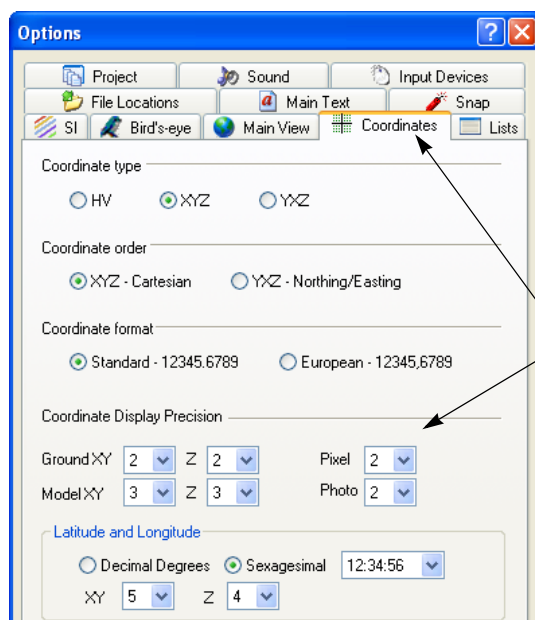
The coordinate bar displays a full running list of coordinates for the location of the cursor. It displays pixel, photo, model, and ground coordinates, if they are available in the current model. It also shows both the untransformed and the transformed ground coordinates for some project types that require or almost always use a coordinate transformation, such as ADS40/80, PCI ProPack, and VisionMap A³ projects.

To show the coordinate bar, perform the following steps:

- Step 1)** Select the **Coordinate Bar** option of the **View** pull-down menu. A coordinate display bar will appear along the bottom of the SUMMIT EVOLUTION window.



- Step 2)** If desired, choose the number of decimal places to display for each item that appears in the coordinate bar. Select **Options** from the **Tools** toolbar or pull-down menu. Select the **Coordinates** tab. Make settings in the **Coordinate Display Precision** area:

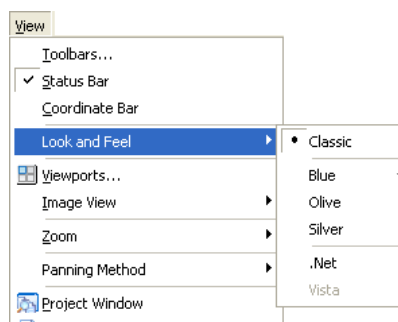


Select the **Coordinates** tab from the **Options** dialog. Choose the number of decimal places to display for each item that appears in the coordinate bar and the status bar.

View Menu > Look and Feel

The **Look and Feel** option of the **View** pull-down menu changes the color of the toolbars, menus, and display areas around the SUMMIT EVOLUTION window. When a different color is set, it affects all of the other DAT/EM applications, too, such as PROJECT VIEWER/ORTHO+MOSAIC and DAT/EM VIEWER.

To change the color, select **Look and Feel** from the **View** pull-down menu. Select a color scheme.



Select **Look and Feel** and a color from the **View** menu.

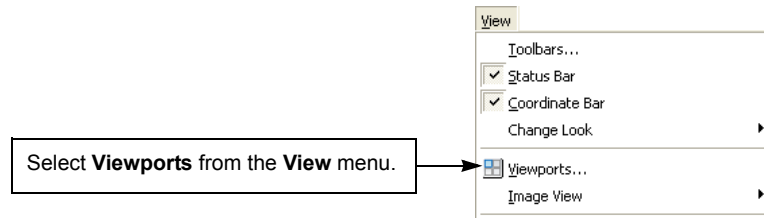
View Menu > Viewports

Multiple models may be opened at the same time. Please note:

- Multiple models may be opened in up to nine separate viewports, although performance may be better with fewer viewports. Performance depends on the computer, the operating system, and especially the size of the images in the project.
- **Automatically load next model** can be enabled in the active viewport (“Tools Menu > Options” on page 25-36).
- DAT/EM Drawing Objects will only appear in the active viewport.
- Multiple viewports are available for all project types except PCI Models Using Propack. This is a technical limitation of the Propack model type.
- Be careful opening multiple viewports for ADS40/80 projects and other projects with very large images. Use the Windows Task Manager to watch the computer’s memory usage, and be aware that performance may be slow.
- All functions should be available in any viewport, including Absolute, Interior, and Exterior orientation dialogs.
- The embedded close-up stereo view is not available with multiple viewports.
- 3D superimposition may be enabled in all viewports. If this uses too many system resources, it may be set to display in the active viewport only.
- Each viewport may have its own channel map applied. For example, show the RGB images in one viewport, and show the fourth infrared band for the same images in another viewport.
- Full Screen Mode (F4) is compatible with multiple viewports.
- Viewport settings are unique to the project and are saved in the **.stmxml** project file.

To use multiple viewports, perform the following steps:

Step 1) Select **Viewports** from the **View** pull-down menu or **Image View** toolbar.



Step 2) Make settings in the Viewports dialog:

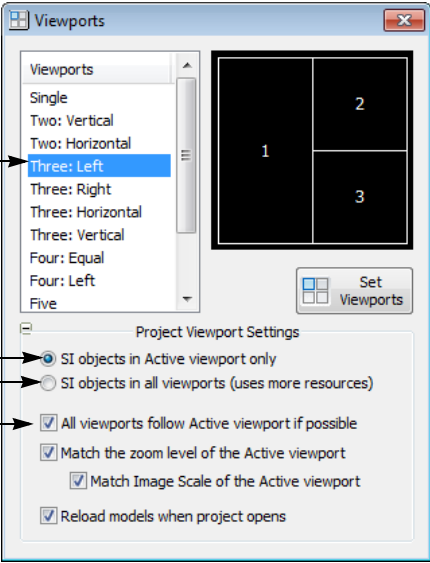
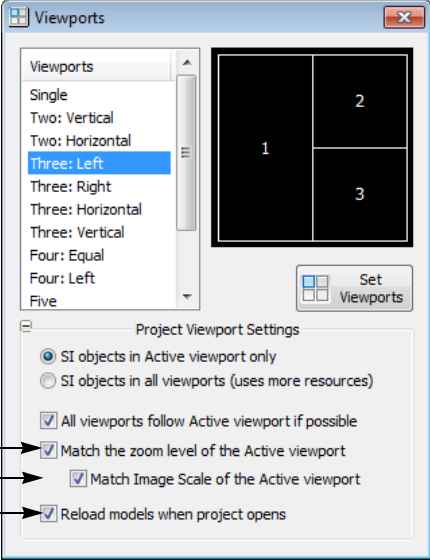
Choose the number of viewports.

Note: Open five, six, or nine viewports only if the images are small and the system has enough memory and other resources.

- **SI objects in Active viewport only** displays superimposed vectors in the active viewport only. This setting uses the least system resources.
- **SI objects in all viewports** is not recommended for large amounts of superimposed objects.

If **All viewports follow active viewport** is on, the active viewport controls the cursor location in every viewport, as long as the same ground coordinates are available in the other viewports. If this is off, the cursor moves in the active viewport only.

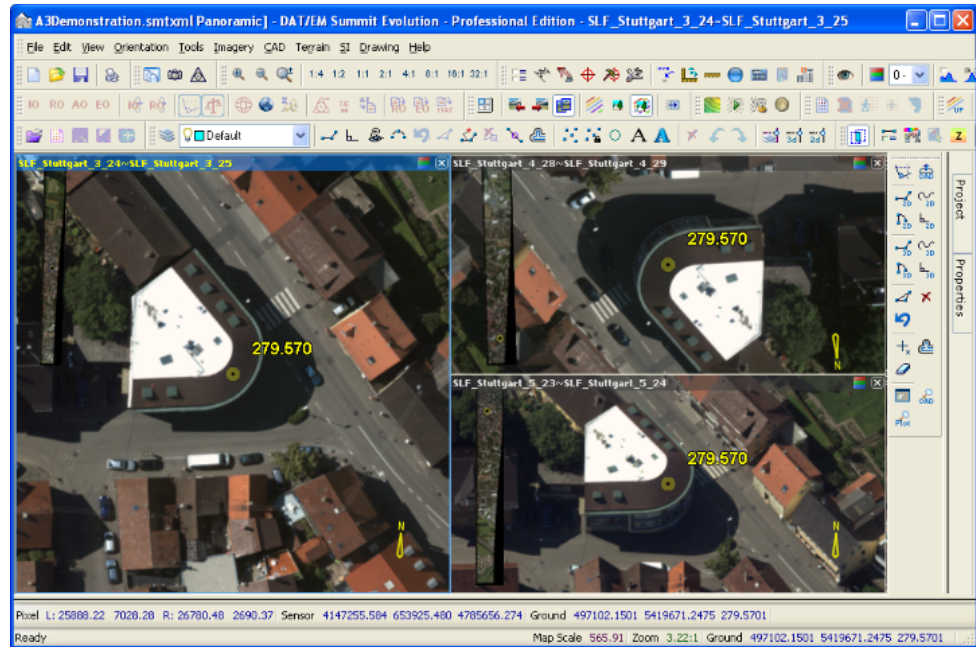
- **Match the zoom level of the active viewport on:** zooms all viewports to match any new zoom level in the active viewport. For this to work for imagery with mixed zoom levels, correct individual image zooms must be set in the project. (See Step 11 on page 7-8 for image scale settings in aerial and Close Range projects.)
- **Match image scale of the active viewport on:** All viewports zoom to match any new zoom level of the active viewport.
- **Reload models when project opens on:** The next time SUMMIT EVOLUTION opens this project, the same models will open in the viewports.


Step 3) Select the **Set Viewports** button to open the viewports in the SUMMIT EVOLUTION window.

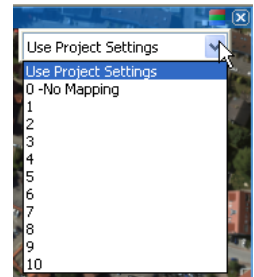
Step 4) Open images or models in the viewports. There are two different methods to do this:

- a.) Click on the title bar of the viewport to make it the active viewport. Select (highlight) an image from the **Images** tab or a model from the **Models** tab in the Project window.
- b.) Drag and drop an image from the **Images** tab or a model from the **Models** tab of the Project window onto the viewport. (The viewport does not need to be active.) If there is already an image or model open in the viewport, it will be closed and replaced by the new image or model.



Step 5) If desired, apply a channel map to one or more of the viewports:

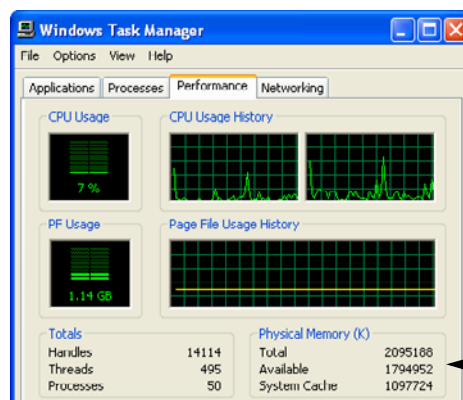
- Select the Channel Mapping icon  in the upper right corner of the viewport.
- Select the arrow button to expand the menu.
- Select a channel mapping setting.
- To create new channel maps and project channel map settings, see “Imaging Menu > Channel Manager” on page 25-69 and “Imaging Menu > Channel Map Configuration” on page 25-73.



For example, for a 4-band image, it is possible to display the RGB image (or model) in one viewport and the 4th (infrared) band in a second viewport. Open the same image (or model) in both viewports. Create a channel map to display the 4th band in all three channels. Apply the channel map to the second viewport only.

Step 6) Perform the following tasks at any time:

- Click the system mouse on a viewport's title bar to make it the active viewport.
- Drag an edge of a viewport to resize it.
- Toggle any of the settings in the Viewports dialog.
- Either close the Viewports dialog or leave it open. Closing the dialog will not close the multiple viewports.
- To close a model or image, select the "X" at the upper right corner of the viewport. Closing the images will not close the viewport.
- To check memory use, open the Windows Task Manager. Check the **Performance > Physical Memory > Available** report. Your computer's ability to open multiple models depends on how much RAM it has and how many other applications are using RAM. If the available memory becomes very low, close one or more viewports.

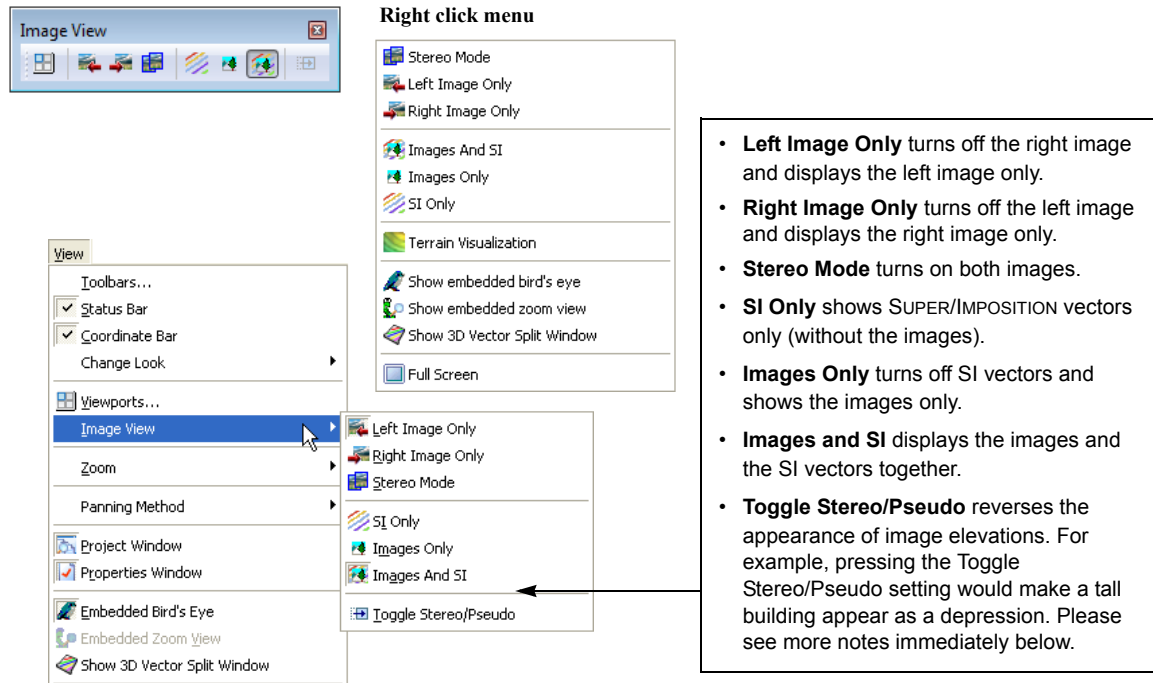


Task Manager for Windows XP shown.

Make sure there is enough **Available** memory to sustain multiple viewports.

View Menu > Image View

The **Images** option on the **View** menu offers the same settings that are found on the **Image View** toolbar and the right click menu from the main image view. These settings turn on and off the major image components such as the right image, the left image, and SUPER/IMPOSITION.

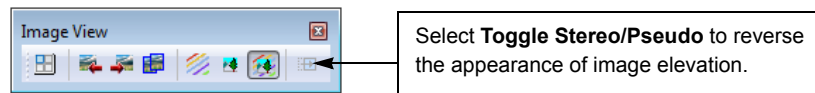


More information about **Toggle Stereo/Pseudo**:

In most cases, SUMMIT EVOLUTION automatically detects which image is on the left so that increasing elevations appear to rise.

If image elevations appear reversed when using a ZScreen for stereo viewing, it is usually because the ZScreen switch is set incorrectly. The switch should be set to **CE** or **CrystalEyes**. The **Toggle Stereo/Pseudo** setting may be used to temporarily correct for an incorrectly set ZScreen switch if desired:

- Step 1)** View a feature that has a distinct rise in elevation, such as a building or the top of a hill.
- Step 2)** If the feature looks like a depression, or as if it appears to be going into the ground, select **Toggle Stereo/Pseudo** from the **Image View** toolbar *or* check the ZScreen and Z box switch settings.

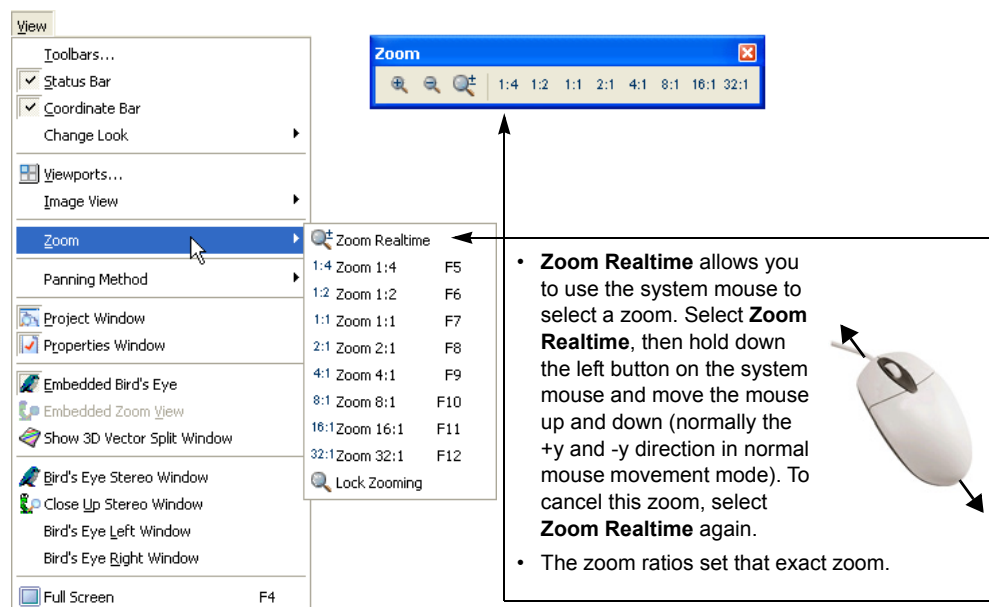


When SUPER/IMPOSITION is active, the Toggle Stereo/Pseudo switch may also be used to verify digitized objects on features that have a distinct change in elevation (such as hilltops). To do this, perform the following steps:

- Step 1)** With the elevation displaying correctly and SUPER/IMPOSITION on, digitize the object (such as elevation contours on a hilltop).
- Step 2)** Select **Toggle Stereo/Pseudo** from the **Image View** toolbar to reverse the elevation display. The object now looks like a depression.
- Step 3)** Verify that the elevation-reversed superimposed lines still appear to be formed to the elevation-reversed feature.
- Step 4)** Select **Toggle Stereo/Pseudo** again to restore the correct elevation display.

View Menu > Zoom

The **Zoom** option on the **View** toolbar offers the same settings that are found on the **Zoom** toolbar:

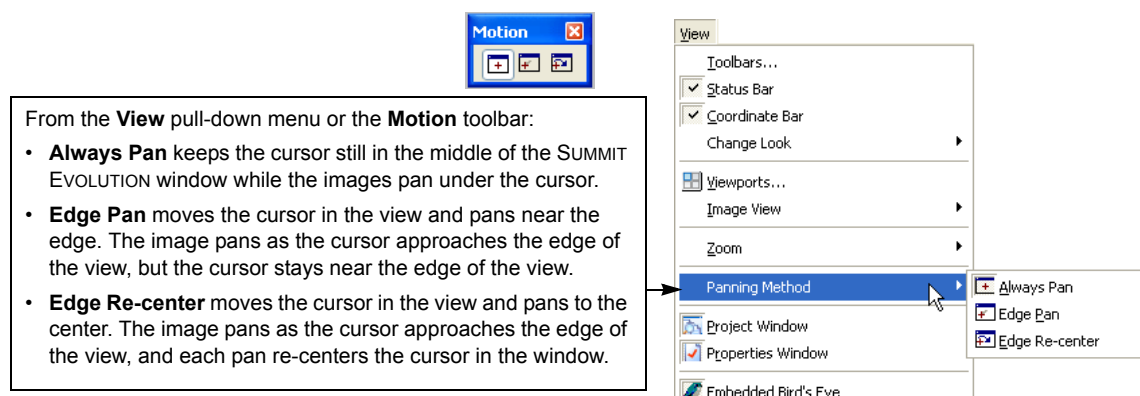


View Menu > Panning Method

The **Panning Method** option on the **View** toolbar offers the same settings that are found on the **Motion** toolbar. There are panning methods that determine how to pan the images when the cursor is moved:

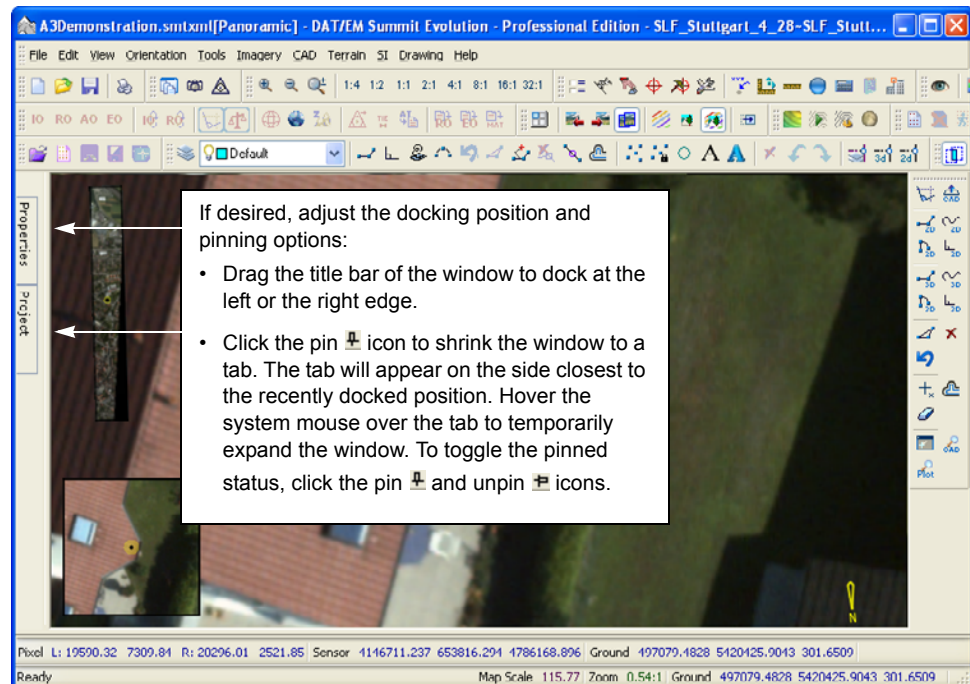
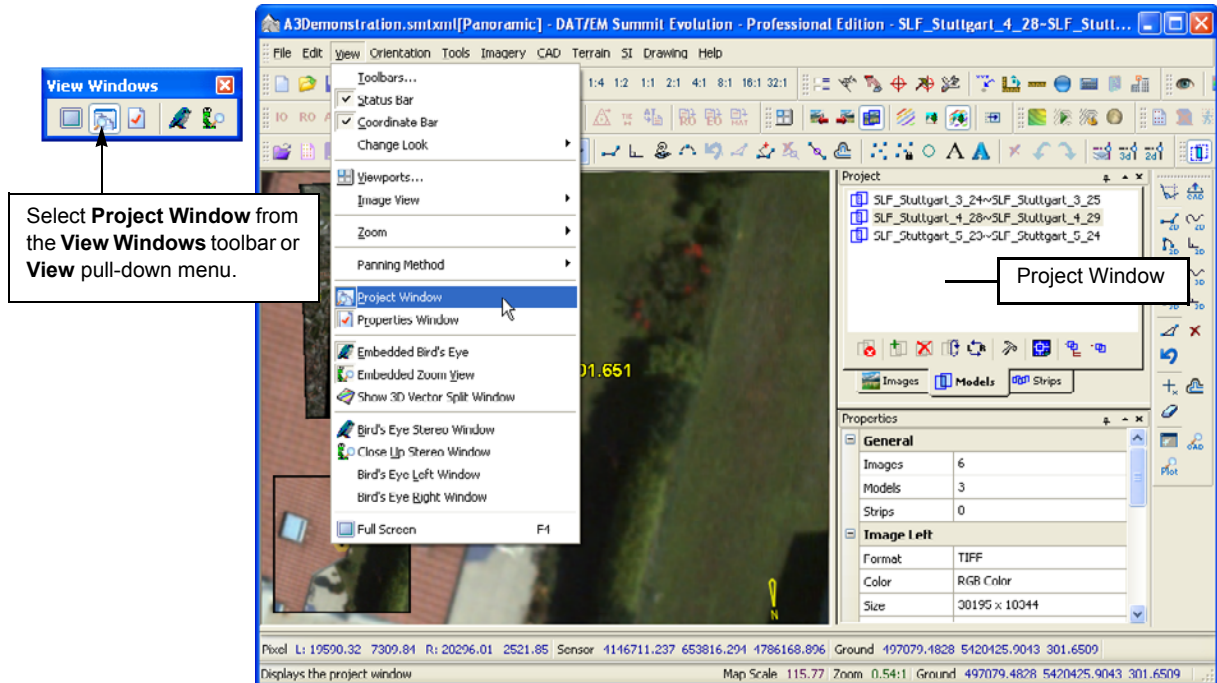
- Always Pan:** Keep the cursor still in the middle of the SUMMIT EVOLUTION window and have the images pan under the cursor.
- Edge Pan:** Move the cursor in the view and pan near the edge. The image pans as the cursor approaches the edge of the view, but the cursor stays near the edge of the view.
- Edge Re-center:** Move the cursor in the view and pan to the center. The image pans as the cursor approaches the edge of the view, and each pan centers the cursor in the window.

To change these display pan modes, either select the desired option from **Panning Method** on the **View** pull-down menu or the **Motion** toolbar:



View Menu > Project Window

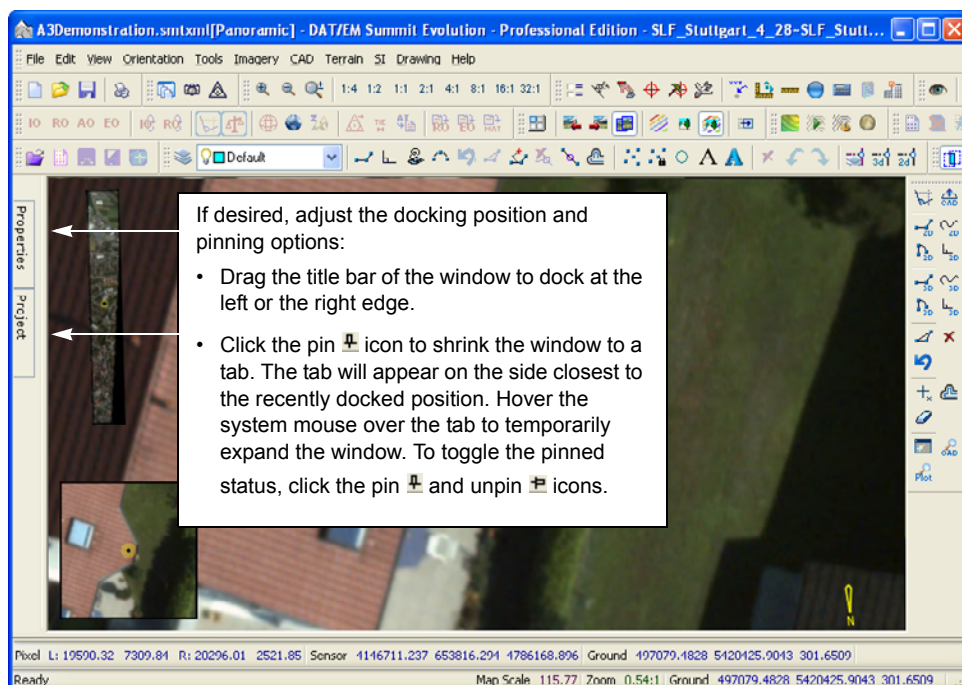
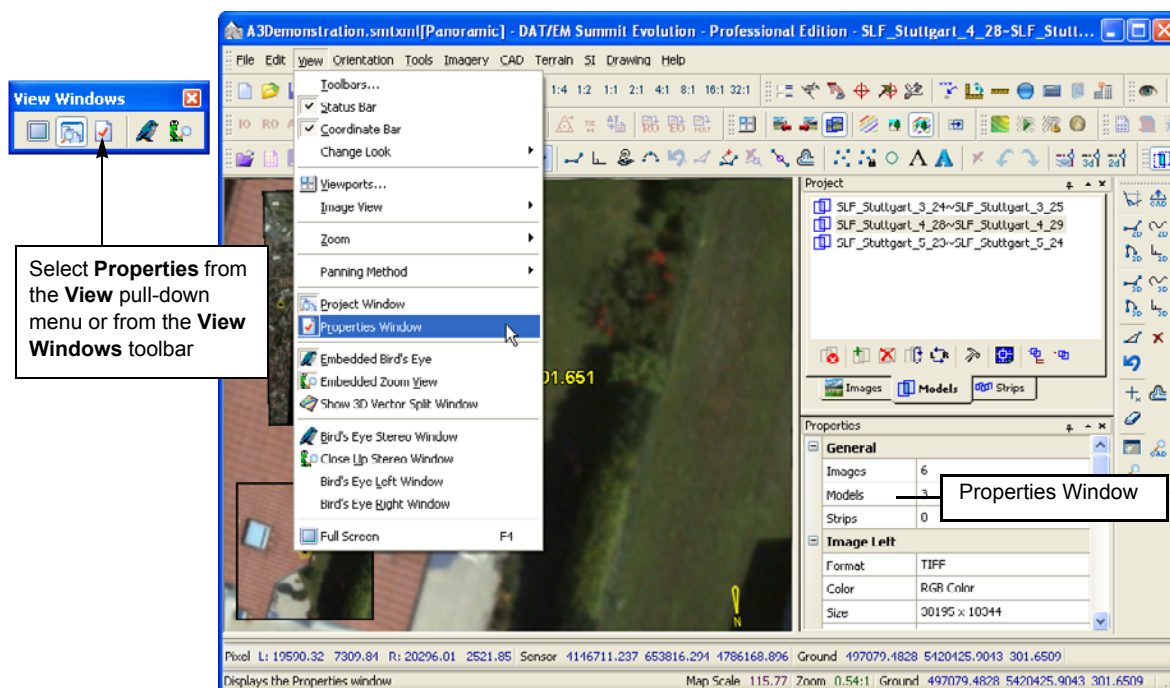
The Project Window shows the images, models, and strips as they are defined in the **smti** project file. The Project Window is also used to create model and strip definitions. To display the Project Window, select **Project Window** from the **View** menu or the **View Windows** toolbar. Position, pin, or unpin the window as desired.



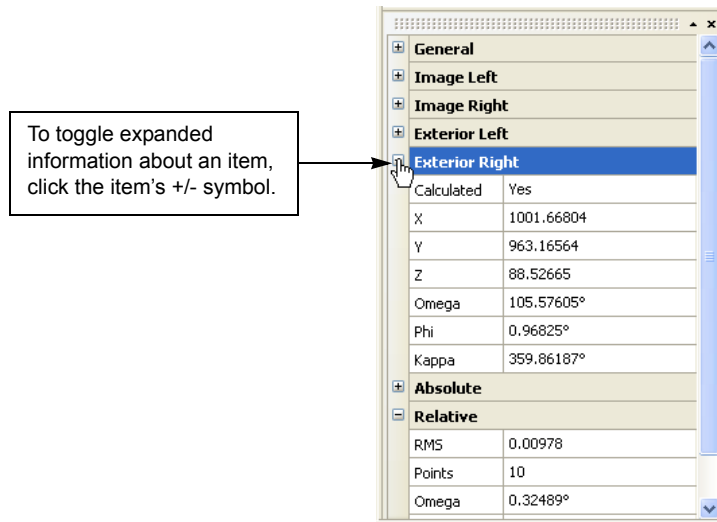
View Menu > Properties Window

The Properties Window shows the project details. Items in its list can be expanded to show more detail about orientations, file names, and other project properties. To display and use this menu, perform the following steps:

- Step 1)** To display the Properties Window, select **Properties** from the **View** menu or the **View Windows** toolbar. Position, pin, or unpin the window as desired.



Step 2) To toggle expanded information about an item listed in the Properties Window, use the system mouse to click the item's +/- symbol:



View Menu > Embedded Bird's-Eye and Bird's-Eye Stereo, Left, and Right

The bird's-eye view is an overview of the entire open model or image. It is a tool for better understanding and seeing the position of the cursor with respect to the entire model or image area. The stereoplotter cursor appears on the bird's-eye view as well as on the main image view.

There are three different types of bird's-eye views, which represent three different generations of the view. The older generations are still active in case some users prefer them. See the table below for specific view capabilities:

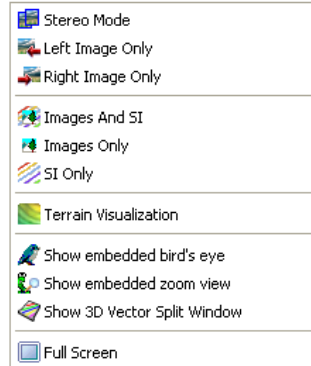
- **Left and Right Bird's-Eye Windows (oldest).** Not recommended in most cases. Toggle these views with the **Bird's-eye Left Window** and **Bird's-eye Right Window** options of the **View** pull-down menu.
- **Bird's-Eye Stereo Window.** Toggle this view with the **Bird's-eye Stereo Window** option on either the **View** toolbar or the **View** pull-down menu.
- **Embedded Bird's-Eye (newest).** Recommended. Instructions appear below the table.

Capability or Requirement	Bird's-Eye Left/Right	Bird's-Eye Stereo	Embedded Bird's-Eye
Click the left system mouse button on the bird's-eye image to move the SUMMIT EVOLUTION cursor to the selected coordinate.	Yes	Yes	Yes
Requires an image pyramid (SUMMIT EVOLUTION .smti file or other) in order to display.	Yes	Yes	Yes
Displays in a separate docking window.	Yes, but it uses more system resources.	Yes	No
Can display the left or right image by itself.	Yes	Yes	No
Displays superimposed vectors (to save refresh time and reduce clutter, points and blocks/cells/symbols are not displayed.)	No	No	Yes
Displays in stereo when possible.	No	Yes	Yes
Ability to toggle from color to greyscale.	No	Yes	Yes
Ability to change zoom independently of its display window size.	No	Yes	Yes
Use the right system mouse button to drag a rectangle over an area. SUMMIT EVOLUTION's main view zooms to the that area.	No	Yes	No
Can clip its extents to show the stereo region only	No	No	Yes
Displays in full screen mode (F4)	No	No	Yes
Fastest processing of superimposition data	No	No	Yes
Uses the least video memory	No	No	Yes

DAT/EM recommends the Embedded Bird's-Eye View, although the other views may be used at any time. Instructions are given here for the embedded view. Perform the following steps:

- Step 1)** Right click the mouse anywhere on the main stereo view. Choose **Show embedded bird's-eye** from the right click menu.

Right click anywhere on the main stereo view (but not on one of the embedded view areas). Select **Show embedded bird's eye**.



- Step 2)** To adjust the Embedded Bird's-Eye View, right click anywhere inside the area of the embedded view and choose from the right click menu:

Right click on the Embedded Bird's-Eye View area. Select settings from the right click menu.



- **Size bird's eye:** Use the arrow cursor to change the size of the view.
- **Move bird's eye:** Allows you to move the view to a new location.
- **Clip to stereo region:** Toggles the display of non-stereo regions.
- **Show SI:** Toggles the display of superimposed vectors.
- **Show As Greyscale:** Toggles color and grayscale display.
- **Show embedded bird's eye:** Toggles the embedded view display.

View Menu > Embedded Zoom View and Close Up Stereo Window

The Embedded Zoom View and the Close Up Stereo Window are tools for better viewing of the area immediately around the cursor. They offer a zoomed-in view with the cursor position in its center. The Embedded Zoom View is a newer generation of the older Close Up Stereo Window. The Embedded Zoom View has several advantages over the Close Up Stereo Window. See the table below for specific view capabilities:

- **Close-Up View Window.** Older technology. Toggle this view with the **Close Up Stereo Window** option on either the **View** toolbar or the **View** pull-down menu. This window may be docked in SUMMIT EVOLUTION or dragged to an undocked position.
- **Embedded Zoom View.** Recommended. Instructions appear below.

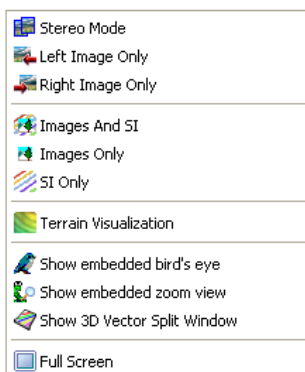
Capability or Requirement	Close Up View Window	Embedded Zoom View
Requires an image pyramid (SUMMIT EVOLUTION .smti file or other) in order to display.	Yes	Yes
Displays in a separate docking window.	Yes, but this is why it uses more system resources (it is slower) than the embedded view.	No
Displays superimposed vectors (to save refresh time and reduce clutter, points and blocks/cells/symbols are not displayed.)	Yes, but only the object currently being digitized.	Yes.
Displays in stereo when possible.	Yes	Yes
Displays in full screen mode (F4)	No	Yes
Fastest processing	No	Yes
Uses the least video memory	No	Yes

DAT/EM recommends the Embedded Zoom View, although the other window-type view may be used at any time. Instructions are given here for the embedded view. Perform the following steps:

- Step 1)** Right click the mouse anywhere on the main stereo view. Choose **Show embedded zoom view** from the right click menu.

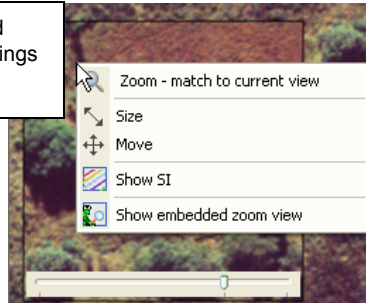
Right click anywhere on the main stereo view (but not on one of the embedded view areas). Select **Show embedded zoom view**.

This option is not available if multiple viewports are open.



- Step 2)** To adjust the Embedded Zoom View, right click anywhere inside the area of the embedded view and choose from the right click menu:

Right click on the Embedded Zoom View area. Select settings from the right click menu.



- **Zoom - match to current view:** sets the scale to be the same as the current main stereo area view.
- **Size:** Allows you to adjust the size of the embedded view.
- **Move:** Allows you to move the view to a new location within the main view.
- **Show SI:** Toggles the display of superimposed vectors.
- **Show embedded zoom view:** Toggles the embedded view display.

- d.) Hover the system mouse cursor over the lower edge of the embedded zoom view to show the zoom level bar. Set the desired view zoom.

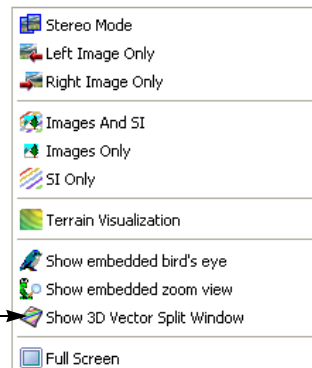
View Menu > Show 3D Vector Split View (with 2D Option)

The 3D Vector Split View shows the superimposed objects and any DAT/EM Drawing Objects in a 3D perspective view. This view may be toggled to a 2D “top-down” view, if desired.

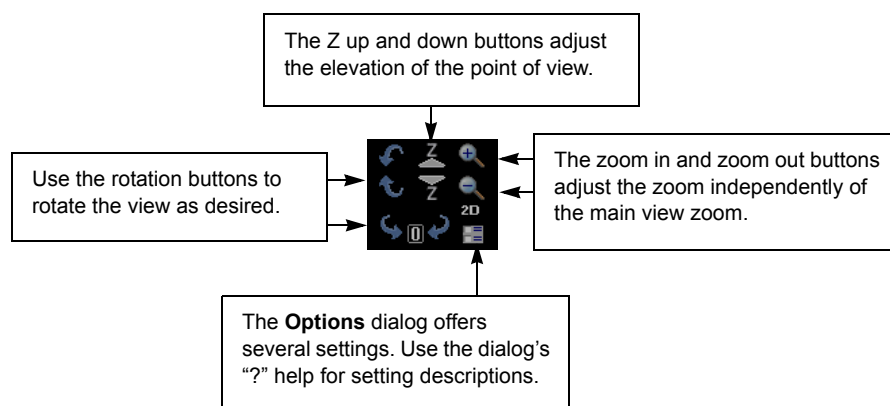
Perform the following steps:

- Step 1)** Right click the mouse anywhere on the main stereo view. Choose **Show 3D Vector Split Window** from the right click menu.

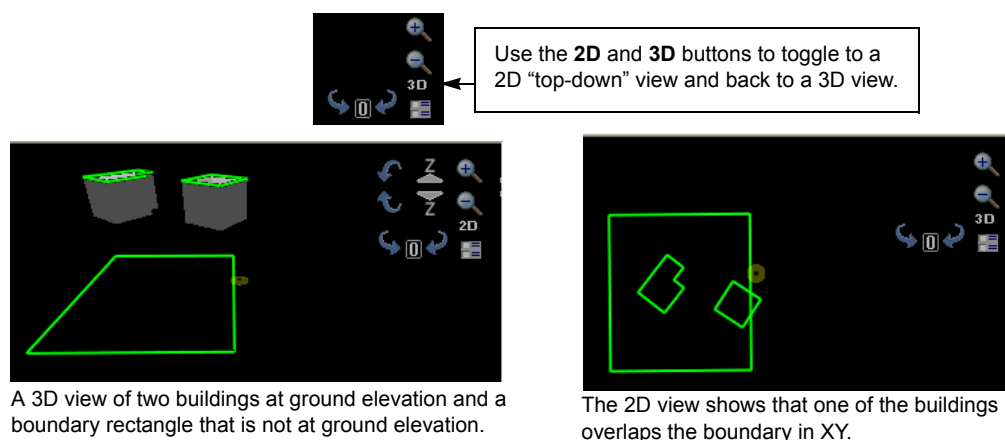
Right click anywhere on the main stereo view (but not on one of the embedded view areas). Select **Show 3D Vector Split Window**.



Step 2) To adjust the 3D Vector Split View, use the settings and options in the upper right corner:



Step 3) To toggle the view to 2D, select the **2D** button. The Z adjustment buttons disappear, and a **3D** button appears so that the view may be toggled back to 3D. This mode is useful when drawing exclusively with DAT/EM Drawing Objects, and CAD/GIS is not open to provide a top-down view. The 2D view is helpful for showing XY intersections of the vector objects. For example, if there is a digitizing boundary that is not at ground elevation, it is difficult to see in a 3D view whether objects have been digitized up to the boundary or not; press "2D" to see all vectors in a top-down view. Select the **3D** button to return to the 3D view at any time.



Step 4) To close the 3D Vector Split Window, right click the mouse anywhere on the main stereo view or the 3D Vector Split Window. Choose **Show 3D Vector Split Window** again to toggle it off.

View Menu > Full Screen

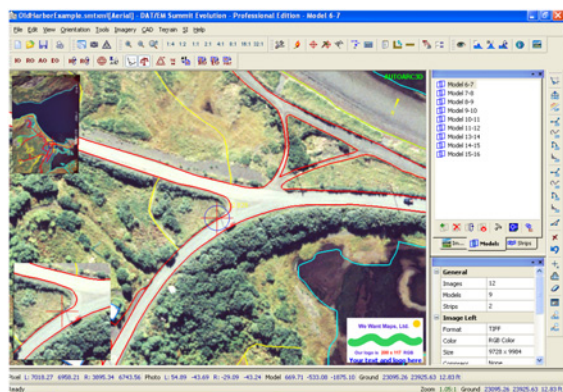
The **Full Screen** option on the **View** pull-down menu toggles the stereo view from Full Screen mode to the standard SUMMIT EVOLUTION window.

In Full Screen mode:

- The main stereo view expands to fill the entire screen. Multiple viewports are preserved if they are on.
- The toolbars, menus, title bar, coordinate bar, status bar, Project Window, Properties Window, and any other separate windows are not displayed.
- When the system mouse hovers over the top edge of the screen, the pull-down menus appear.
- To turn on a toolbar, hover the system mouse over the top edge of the screen until the pull-down menus appear. Right click the mouse on a blank area of the pull-down menu bar. Select the desired toolbar from the right click menu. The toolbar will dock to the menu bar at first; drag and drop it to an independent location.
- The Windows taskbar, if normally displayed, will not display; however, when another application has focus, the taskbar will appear.

Other ways to toggle Full Screen mode are:

- The <F4> function key (or any custom setting for this keyboard shortcut. To change or check function key settings, see “Tools Menu > Shortcuts” on page 25-65.)
- The **Full Screen** option on the **View Windows** toolbar (turns Full Screen on only).
- The **Close Full Screen** button available in Full Screen mode (turns Full Screen off only).



Full screen off



Full screen on

Either press **<F4>** again or select **Close Full Screen** to return to the standard view.

The pull-down menus appear when the system mouse hovers over the top edge.

The embedded bird's eye and zoom views display in Full Screen mode. As usual, right click directly on them to see a menu of embedded view options.



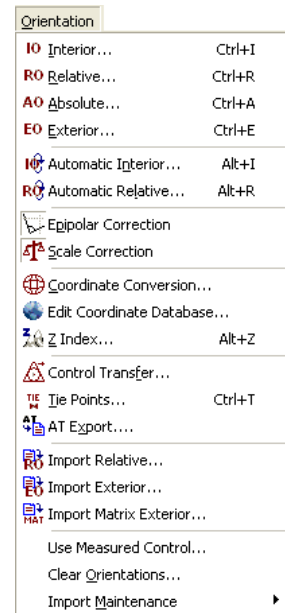
Full screen on

Right click in the image area to see a menu of display options.

Orientation Menu

The following are descriptions and cross references for the **Orientation** menu:

- **Interior.** See “Interior Orientation: Selection “Manual or Measurement” Method” on page 18-7.
- **Relative.** See “Relative Orientation: Two-Image Selection “Manual Measurement” Method” on page 19-5.
- **Absolute.** See *Chapter 20*.
- **Exterior.** See “Exterior Orientation: Key In Values Method” on page 21-1 and “Exterior Orientation: Calculated by Summit Evolution” on page 21-3.
- **Automatic Interior.** See “Interior Orientation: Image Processing “Automatic or Auto” Method” on page 18-1.
- **Automatic Relative.** See “Relative Orientation: Image Processing “Automatic or Auto” Method” on page 19-2.
- **Epipolar Correction.** See “Orientation Menu > Epipolar Correction” on page 25-27.
- **Scale Correction.** See “Orientation Menu > Scale Correction” on page 25-27.
- **Coordinate Conversion.** See “Orientation Menu > Coordinate Conversion” on page 25-28.
- **Edit Coordinate Database.** See *Appendix C*.
- **Z Index.** See “(Optional) Z Index” on page 17-7.
- **Control Transfer.** See “Exterior Orientation: Control Transfer Method” on page 21-10.
- **Tie Points.** See “Relative Orientation: Tie Points Selection Method” on page 19-14.
- **AT Export.** See “Exterior Orientation: Import Exterior Method” on page 21-4.
- **Import Relative.** See “Relative Orientation: Import Relative Method” on page 19-34.
- **Import Exterior.** See “Exterior Orientation: Import Exterior Method” on page 21-4.
- **Import Matrix Exterior.** See “Exterior Orientation: Import Exterior Method” on page 21-4.
- **Use Measured Control.** See “Orientation Menu > Use Measured Control” on page 25-31.
- **Clear Orientations.** See “Orientation Menu > Clear Orientations” on page 25-33.
- **Import Maintenance.** See “Orientation > Import Maintenance” on page 25-34.



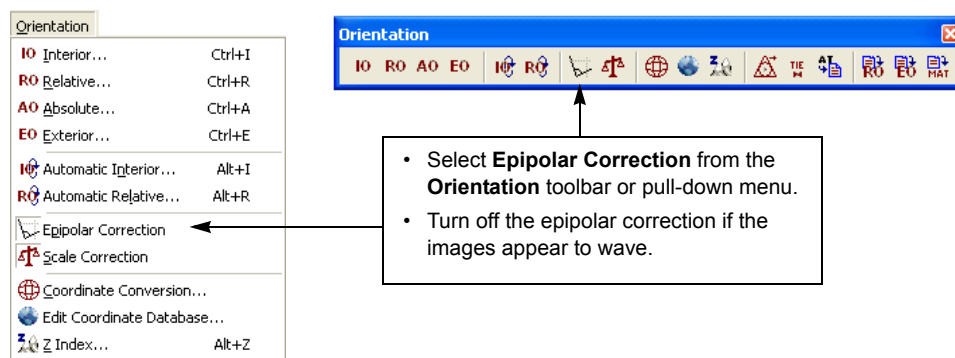
Orientation Menu > Epipolar Correction

SUMMIT EVOLUTION offers automatic epipolar image correction to remove Y parallax from the images.

- Epipolar correction clears Y parallax in the stereo area of the images.
- Epipolar correction is turned on automatically after any method of relative orientation is complete. The user may notice what appears to be a slight rotation in the images as soon as relative orientation is complete or aerotriangulation results have been imported.
- Epipolar correction may be toggled off and on if desired.
- After epipolar correction, the images will appear more crisp and clear to the user, and it may be easier to position the cursor at the ground elevation.
- Absolute orientation may be done with the epipolar correction on or off, but it is recommended to have the epipolar correction on.
- If an area on the images seems to move in a waving or shimmering pattern, it may be helpful to turn off the epipolar correction. This may happen in an area with no relative orientation points in a model with a large kappa rotation. The waving appearance may stop after the epipolar correction is turned off; however, it is recommended to review the orientation results and relative point distribution to make sure the model's orientation is complete and acceptable. Another setting that may reduce a small shaking or waving appearance is the **Texture Pixels>Blended** setting on the **Main View** tab of the Stereoplotter Options dialog.

If desired, perform the following steps to toggle the epipolar correction on and off:

- Step 1)** Open two images and complete interior and relative orientations or import aerotriangulation results. The epipolar correction is turned on automatically.
- Step 2)** To toggle the epipolar correction on or off, select **Epipolar Correction** from the **Orientation** toolbar or pull-down menu.



- Step 3)** If desired, toggle the epipolar correction on/off again at any time.

Orientation Menu > Scale Correction

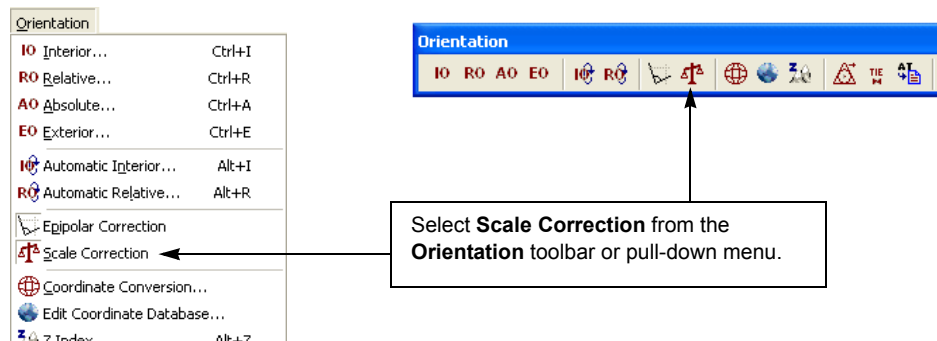
Scale Correction is available for the following project types: Aerial - Frame & Digital Cameras, Close Range, and PCI Using ProPack. Scale correction does not apply to the remaining project types.

Automatic image scale correction is used to view objects in the left image at the same size as in the right image. There is usually no reason to turn off scaling, except perhaps as a visual comparison.

- The image scale correction is a viewing aid for images that show objects at different scales. This could be a major scale difference caused by having a very different flying height or different camera for the two images, or it could be a minor difference caused by changes in altitude between exposures.
- Toggling the scale correction on or off does not affect the orientation, but it may be more difficult to position the floating mark if scaling is off.
- The scale correction is set on by default.

If desired, perform the following steps to toggle the scale correction on and off:

- Step 1)** Open two images and complete interior and relative orientations or import aerotriangulation results. The image scale correction is turned on automatically.
- Step 2)** To toggle the scale correction on or off, select **Scale Correction** from the **Orientation** toolbar or pull-down menu.



- Step 3)** Toggle the scale correction on/off again at any time.

Orientation Menu > Coordinate Conversion

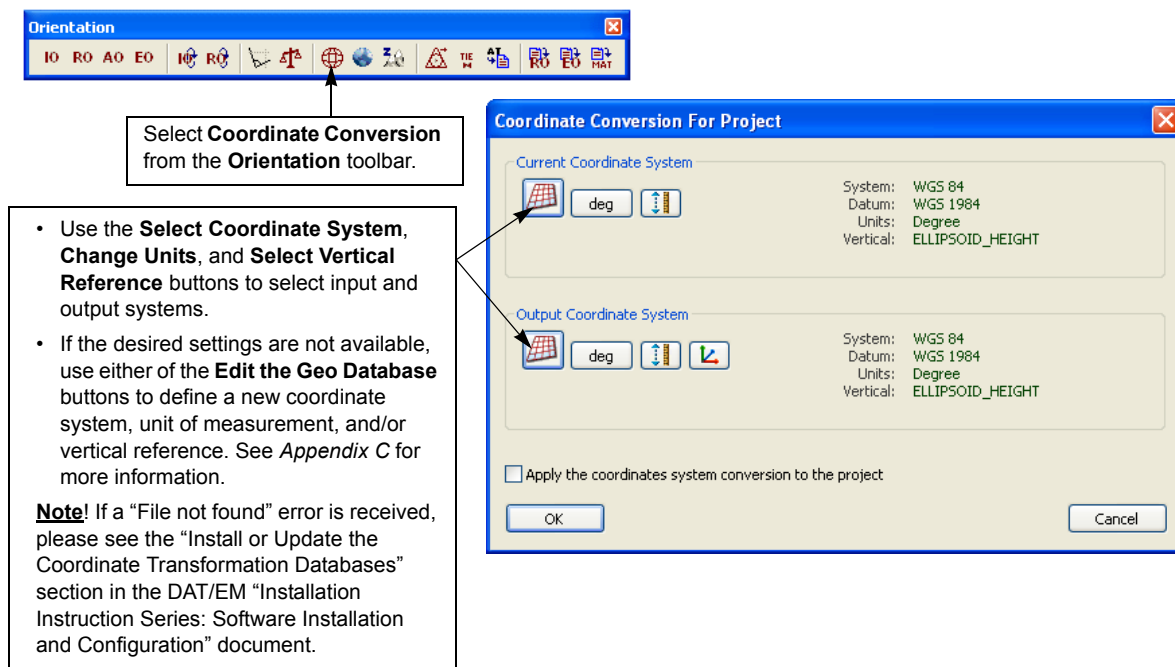
The **Coordinate Conversion** option is available for the following project types: Aerial - Frame & Digital Cameras, SAR Stereo, LIDAR Stereo Images, Close Range (although this may not apply in many cases), and PCI Using ProPack. The remaining project types either do not support coordinate conversion or the settings are mandatory and are selected directly from their Project Edit dialogs.

After orientation is complete in a compatible project type, it is possible to apply a coordinate conversion, also known as coordinate transformation, to the ground coordinates.

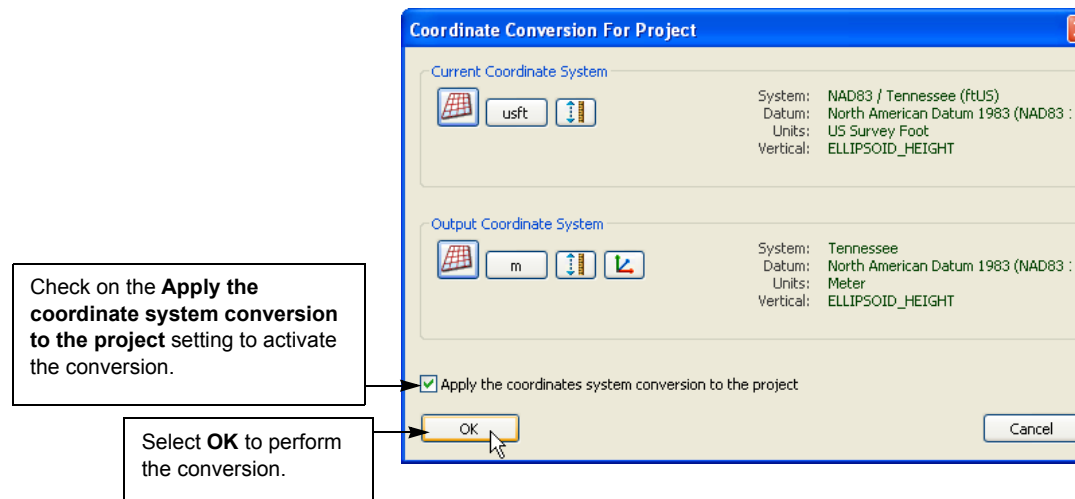
- This conversion is applied to the output ground coordinates *after orientation*.
- The conversion does not affect the orientation reports or the original project files such as ground control file coordinates. To convert a ground control file *before orientation*, see page 6-12.
- The conversion, when checked on, applies to the entire project (not just to the open model).
- The output coordinate system should be selected carefully before digitizing, and should not be changed after digitizing starts.
- Ground coordinate conversion may be used only if there is an active absolute orientation (AO) or there is a combination of relative orientation (RO) and exterior orientation (EO). Ground coordinate conversion works only if there is an active RO.
- Although ground coordinate conversion may be done for any type of project except orthophoto, it makes the most sense for aerial projects. For ADS40, satellite, and SAR projects, apply the correct coordinate system during project setup instead.
- The ground coordinate conversion settings are saved with the project file.

To apply a coordinate conversion at the ground coordinate stage, perform the following steps:

- Step 1)** Complete any type of orientation that results in a relative orientation (RO) and either an absolute orientation (AO) or an exterior orientation (EO). Note that RO is required.
- Step 2)** Select **Coordinate Conversion** on the **Orientation** toolbar. This is available only if there is an RO.

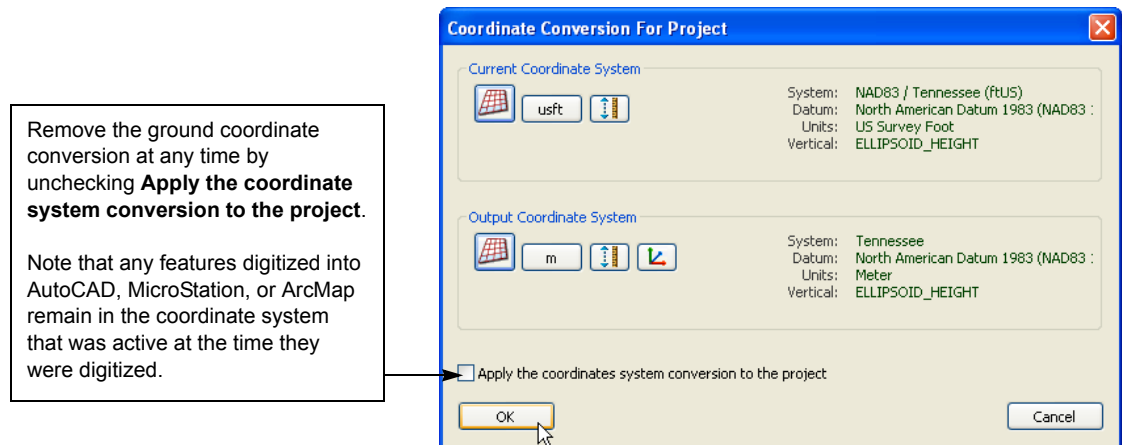


Step 3) Check on **Apply the coordinate system conversion to the project** to activate the conversion.



Step 4) Select **OK**. Any open model is closed. When a model is re-opened, the ground coordinates showing in SUMMIT EVOLUTION and AutoCAD, MicroStation, or ArcMap are transformed into the selected output coordinate system. Any features digitized *from now on* into AutoCAD, MicroStation, or ArcMap will be in the selected output coordinate system. (Previously digitized features remain in the coordinate system that was active at the time they were digitized!)

Step 5) At any time, the ground coordinate conversion may be removed by unchecking **Apply the coordinate system conversion to the project**. Any open model is closed. When a model is re-opened, the ground coordinates showing in SUMMIT EVOLUTION and AutoCAD, MicroStation, or ArcMap are back to the original coordinate system; however, any features digitized into AutoCAD, MicroStation, or ArcMap remain in the coordinate system that was active at the time they were digitized.



Orientation Menu > Use Measured Control

When an exterior orientation is imported or keyed in, SUMMIT EVOLUTION deactivates any existing relative and absolute orientations so that they won't interfere with the exterior orientation. It does this by automatically turning off (unchecking) the **Use Measured Control** setting, which is located in the **Use Measured Control** dialog and in the Exterior Orientation dialog. Any existing relative and absolute orientations are then ignored. The advantages to this are:

- The same exterior orientation can be set on multiple stereoplotters to produce the same results on each stereoplotter;
- You know the exterior orientation is set exactly as the third-party aerotriangulation (AT) software calculated it or exactly as it was used on another stereoplotter.
- If the orientation is bad, and only the interior and exterior orientations are active, then you can troubleshoot more easily. Verify the interior orientation, check any keyed-in exterior values, or check the input to the AT software and re-run the AT.

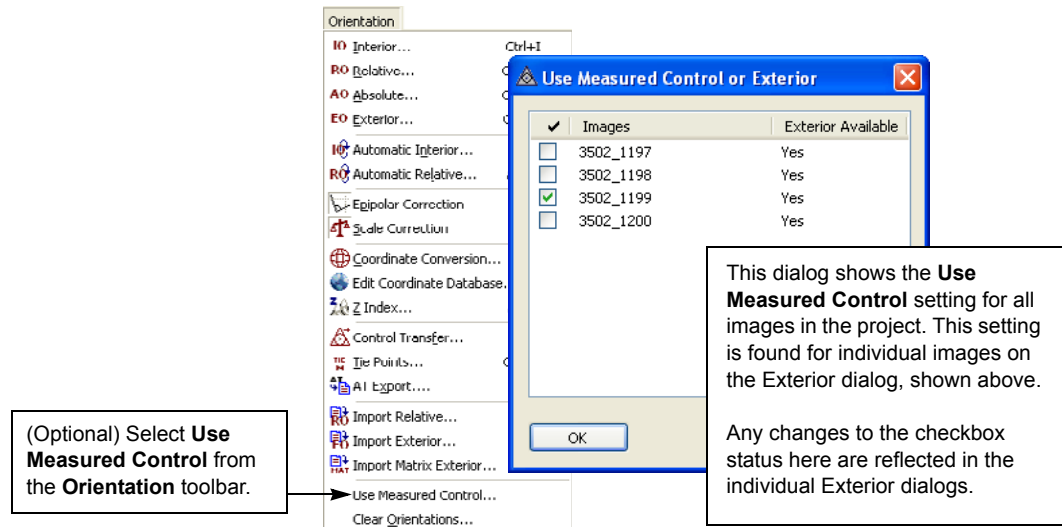
You know that interior and exterior are the only active orientations when **Use Measured Control** is not checked for every image in the Use Measured Control dialog or, if using the Exterior Orientation dialog, it is not checked and there are nonzero values in the dialog box fields:

Select EO from the Orientation toolbar.

Interior and exterior are the only active orientations if **Use Measured Control** is off (not checked) and there are nonzero values in the dialog box fields.

- **Note:** This setting is turned OFF automatically when an exterior orientation is imported.
- **Should this setting ever be on?** This setting should be ON if exterior orientation will not be used or exterior orientation has not yet been imported, and there is an active relative or absolute orientation.
- To see this setting for all images in the project, select **Use Measured Control** from the **Orientation** pull-down menu. See below.

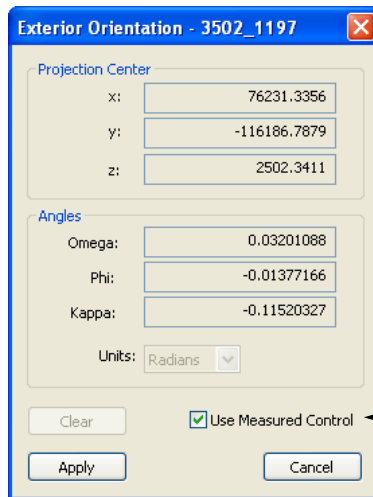
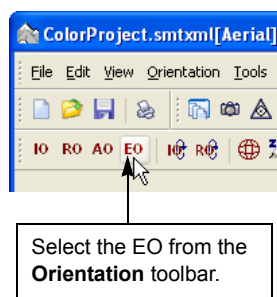
For convenience, there is a way to view and/or edit the current **Use Measured Control** setting for all the images in the project at one time. Select **Use Measured Control** from the **Orientation** menu:



There may be a rare case when you want to reactivate the relative or absolute orientation after an exterior orientation has been imported or keyed in. DAT/EM offers these words of caution:

- If you're doing both an absolute orientation and an exterior orientation, then something is wrong with your process. Use either absolute or exterior, but not both.
- If the exterior orientation is bad, and you have decided to use relative points to improve it, please reconsider. If the exterior orientation is bad, there was probably something wrong with the input for aerotriangulation (AT) or the AT processing. It is better to fix the problem at the source of the EO so that the exterior orientation is correct.
- If the exterior orientation is bad, consider clearing it so that there is no chance of activating it in the future. Use **Clear Orientations** from the **Orientation** pull-down menu.
- If you reactivate relative or absolute orientation and measure points, you create an orientation that is unique, at least for now, to your current stereoplottter workstation. If the same project is already being used with exterior orientation on other workstations, they will be using a different orientation than you. If multiple workstations are working on the same project, be sure everyone uses the same orientation solution (exterior only, in most cases).

If you still want to reactivate the relative or absolute orientation, so that the exterior orientation is ignored, check on all the image checkboxes in the **Use Measured Control** dialog, or, check on **Use Measured Control** in the individual image's Exterior Orientation dialog box. Repeat for each image in the project.



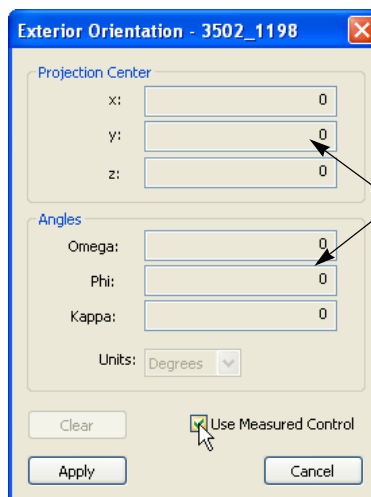
To reactivate relative or absolute orientation and ignore any existing exterior orientation, check on **Use Measured Control**.

- **Note:** Check on at your own risk. DAT/EM does not recommend checking this setting on if exterior orientation has been imported.
- **Should this setting ever be on?** This setting should be ON if exterior orientation will not be used or exterior orientation has not yet been imported, and there is an active relative or absolute orientation.

Please note:

- If **Use Measured Control** is ON, and the dialog box values change to zero, it means there is no existing absolute orientation to activate. There may or may not be a relative orientation. Ground coordinates are not available.

If **Use Measured Control** is OFF, and the dialog box values change to zero, it means there is no existing exterior orientation to activate. Ground coordinates are not available.



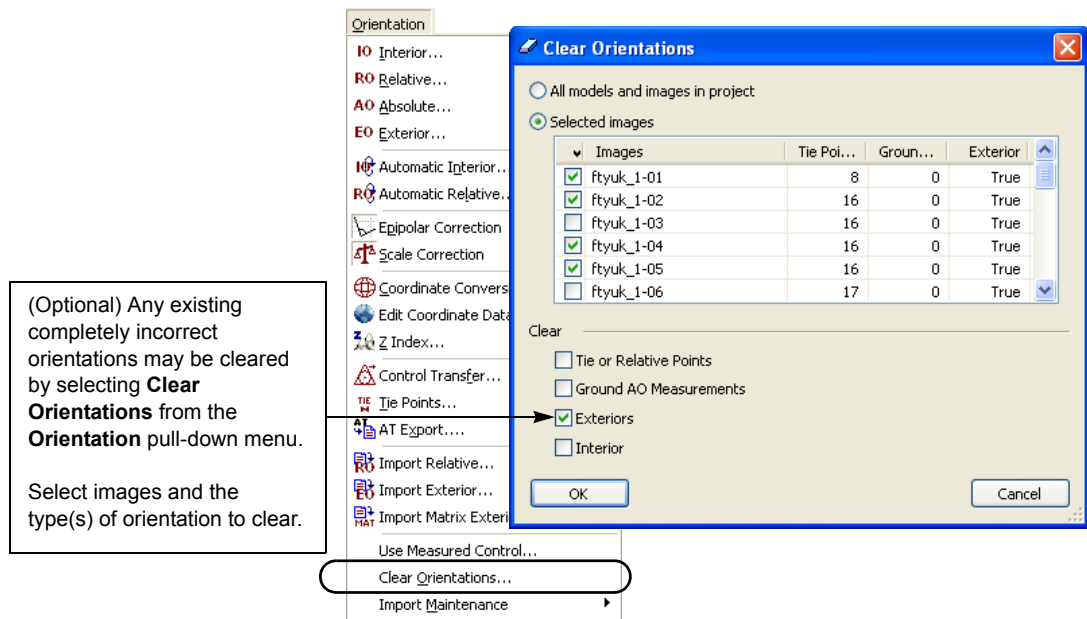
- If you check ON **Use Measured Control**, and the dialog box values change to zero, it means there is no existing absolute orientation to activate. There may or may not be a relative orientation.
- If you turn OFF **Use Measured Control**, and the dialog box values change to zero, it means there is no existing exterior orientation to activate.

Orientation Menu > Clear Orientations

The **Clear Orientations** option removes orientation values in the project file. This is intended to remove incorrect orientations that may exist in the project. It is usually used in preparation to correct the orientation.

Perform the following step:

- Step 1)** Select **Clear Orientations** from the **Orientation** menu.
- Step 2)** Use **All models...** or select **Select Images** and check on individual images that need to have a type of orientation cleared.
- Step 3)** In the **Clear** area, check on one or more types of orientations to clear.
- Step 4)** Select **OK** to clear the checked orientations.

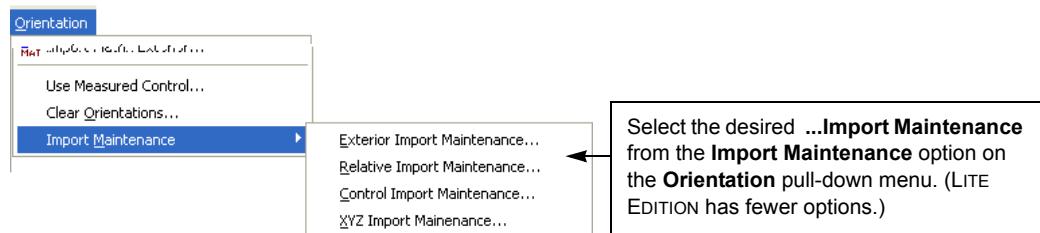


Orientation > Import Maintenance

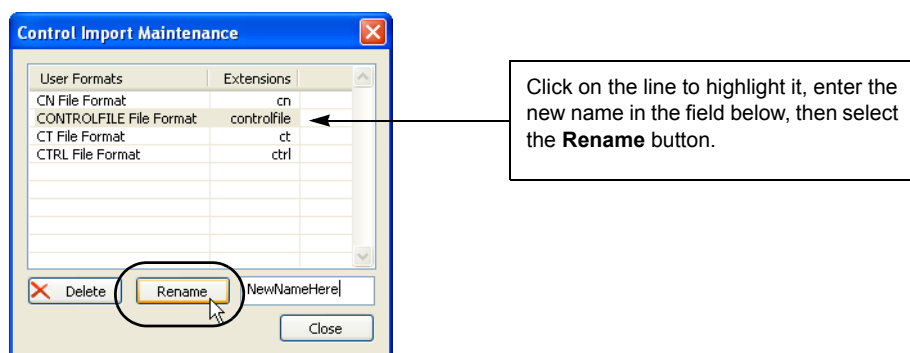
This option allows you to delete or rename previously defined formats for the Exterior (page F-10), Relative (page G-7), Control File (page 6-13), and ASCII xyz format Import Wizards.

To delete or rename formats that were created using one of the Import Wizards, perform the following steps:

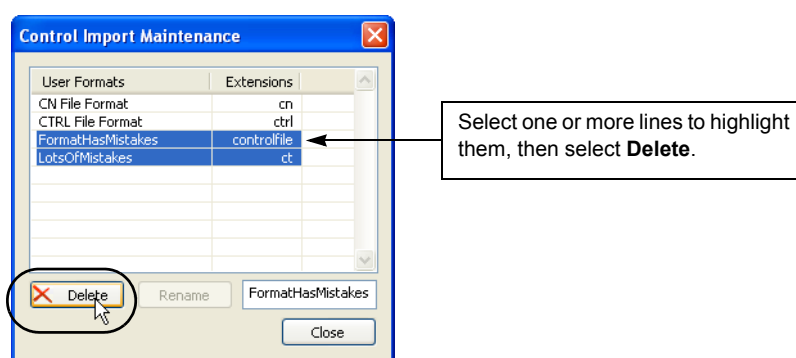
- Step 1)** Select the desired **...Import Maintenance** option from **Import Maintenance** on the **Orientation** pull-down menu. Formats that were saved previously with that type of Import Wizard are listed.



Step 2) To rename any of the listed formats, click on the line, enter the new name, and select **Rename**:



Step 3) To delete a format, click on the line to highlight it, then select the **Delete** button:



Step 4) When finished, select the **Close** button. The next time that Import Wizard starts, the list of known formats will reflect the changes made in the Import Maintenance dialog.

Tools Menu

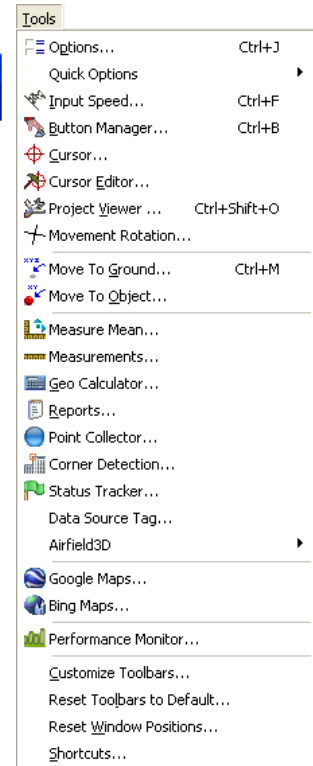
The **Tools** pull-down menu and toolbar contain several useful functions:

The **Tools** pull-down menu contains a few more items than the **Tools** toolbar. Items that are used the most often are on the toolbar.



These menu items are described in the following locations:

- **Options**, immediately below, page 25-36. Use the “?” tool in the dialog box for context-sensitive help.
- **Quick Options**. See page 25-37.
- **Input Speed**. See page 25-37.
- **Button Manager**. See page 25-38.
- **Cursor**. See page 25-41.
- **Cursor Editor**. See page 25-43.
- **Movement Rotation**. See page 25-44.
- **Project Viewer/Ortho+Mosaic** appears in *Chapter 28*.
- **Move to Ground**. See page 25-45.
- **Move to Object**. See page 25-48.
- **Measure Mean**. See page 25-49.
- **Measurements**. See page 25-50.
- **Geo Calculator**. See page 25-52.
- **Reports**. See page 25-53.
- **Point Collector**. See page 25-54.
- **Corner Detection**. See page 25-54.
- **Status Tracker**. See *Chapter 30*.
- **Data Source Tag**. See page 25-56.
- **Airfield3D**. See page 25-58.
- **Google Maps**. See page 25-58.
- **Bing Maps**. See page 25-60.
- **Performance Monitor**. See page 25-62.
- **Customize Toolbars**. See page 25-62.
- **Reset Toolbars to Default**. See page 25-64.
- **Reset Window Positions**. See page 25-64.
- **Shortcuts**. See page 25-65.

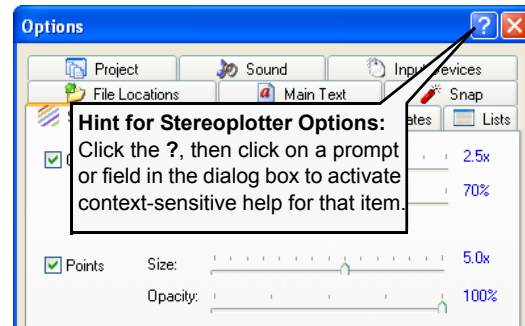


Tools Menu > Options

The Options dialog allows the user to make many SUMMIT EVOLUTION settings. Settings may be made at any time. To learn more about a setting, click the “?” icon at the upper left of the dialog, then click on the item in the dialog to activate context-sensitive help.

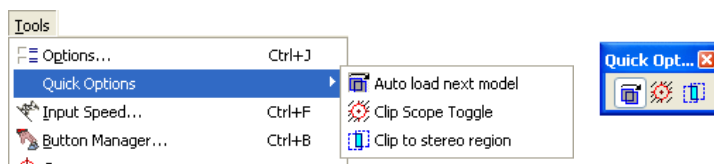


Select **Options** from the **Tools** toolbar or pull-down menu.



Tools Menu > Quick Options

Quick Options allow you to quickly set several of the most commonly changed settings in the **Options** dialog. These options on the menu are the same ones found on the **Quick Options** toolbar (see “Quick Options Toolbar” on page 24-7).



Selecting one of the quick options is the same as checking on or off its matching setting in the SUMMIT EVOLUTION Options dialog:

- **Auto load next model:** Toggle auto load next model (**Options>Project tab>Automatically load next model when outside stereo region** setting)
- **Clip Scope Toggle:** Toggle clip scope (**Options>SI tab>Clip Scope** setting)
- **Clip stereo region:** Toggle clip main view to stereo region (**Options>Main View tab>Clip to Stereo Region** setting)

Tools Menu > Input Speed

Input Speed sets the amount of cursor movement that should happen when the 3D digitizing device is moved in XY, its Z wheel spins, or its pan buttons are pressed.

Step 1) Select **Input Speed** from the **Tools** toolbar or pull-down menu.

Step 2) Choose settings. Changes take effect immediately. The dialog may be left open if desired.

The diagram illustrates the process of selecting and configuring the 'Input Speed' setting. It includes a screenshot of the 'Tools' menu with 'Input Speed...' selected, a callout box pointing to the 'Input Speed' icon on the toolbar, and a detailed view of the 'Input Device Speed' dialog box. The dialog box contains sliders for X, Y, Z Magnitude, Z, Pan, and Zoom, along with a checkbox for 'Adjust Z Speed to Zoom Level'.

Select Input Speed.

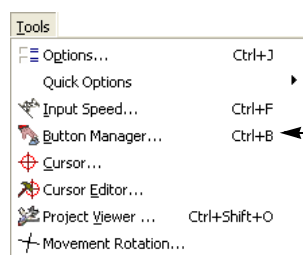
- The **X** and **Y** sliders control the amount of ground travel when the 3D input device moves in the X or Y direction. (This is a physical movement, not a pan button.)
- The **Z Magnitude** controls the amount of elevation travel per revolution of the Z wheel. Choose one of the preset values or enter a custom value in the field. Then use the Z slider to make fine adjustments.
- When **Adjust Z Speed to Zoom Level** is on, the Z speed is further adjusted by the stereo view's zoom level. As the view zooms in, the Z speed slows.
- The **Pan** slider sets the response speed of the four possible pan buttons. Pan buttons may be set by Button Manager to **Type=Plotter** and **Action=Pan Up, Pan Down, Pan Left, or Pan Right**.
- The **Zoom** slider sets the response speed of all interactive zooming methods. This includes zooming with a clutched Z wheel, a Z foot wheel, the Page Up and Page Down keyboard keys, and the system mouse wheel (when it is not the active 3D digitizer).

Tools Menu > Button Manager

The 3D digitizer device, such as handwheels with foot pedals, Immersion SoftMouse, or Stealth Mouse, has several programmable switches, buttons, or foot pedals. All of these switches will be called “buttons” in this section. Use the Button Manager to set the function of each switch.

Perform the following steps:

- Step 1)** Select **Button Manager** from the **Tools** toolbar or pull-down menu. Or, enter the **buttons** command from AutoCAD or the **button edit** command from MicroStation.

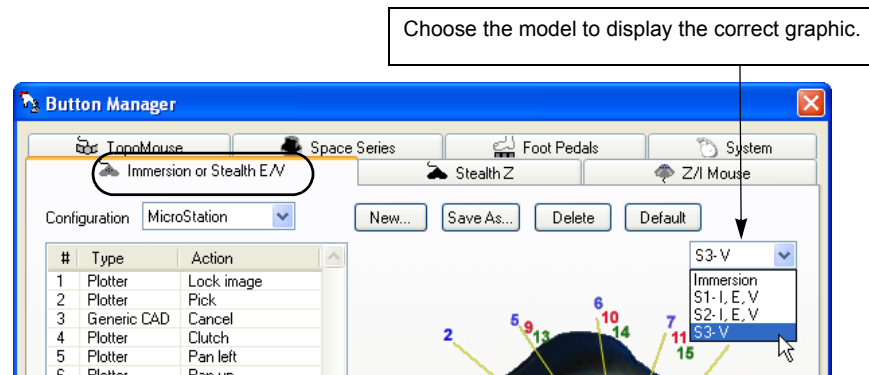


Select a method to activate the button manager:

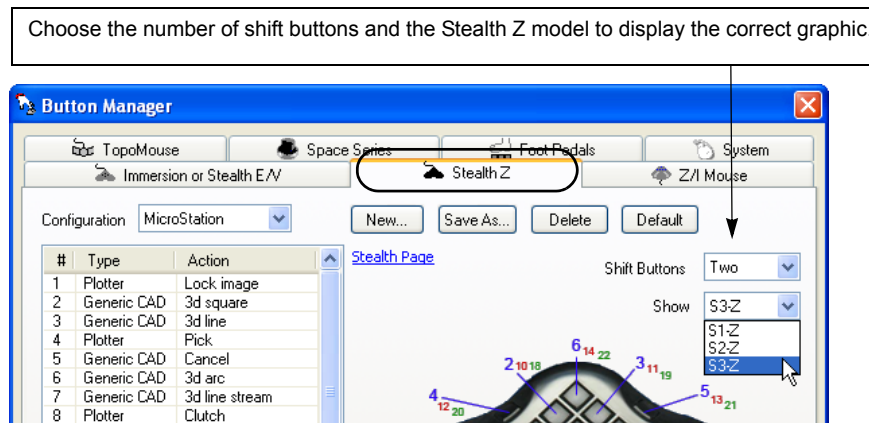
- Select **Button Manager** from the **Tools** toolbar or pull-down menu,
- Or, enter **buttons** from AutoCAD or **button edit** from MicroStation.

- Step 2)** Select a tab and, in some cases, the correct model and number of shifts:

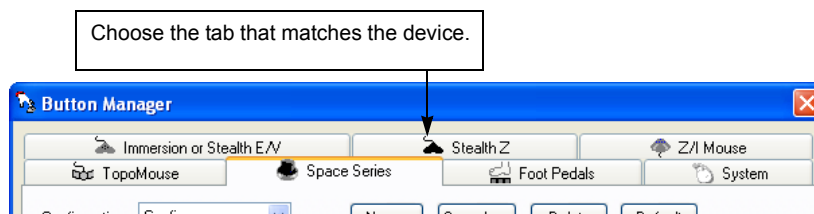
- a.) For an Immersion SoftMouse or a Stealth I, E, or V (Immersion emulation) models, choose the **Immersion or Stealth E/V** tab. On the right, select the correct Immersion or Stealth model to display the matching graphic.



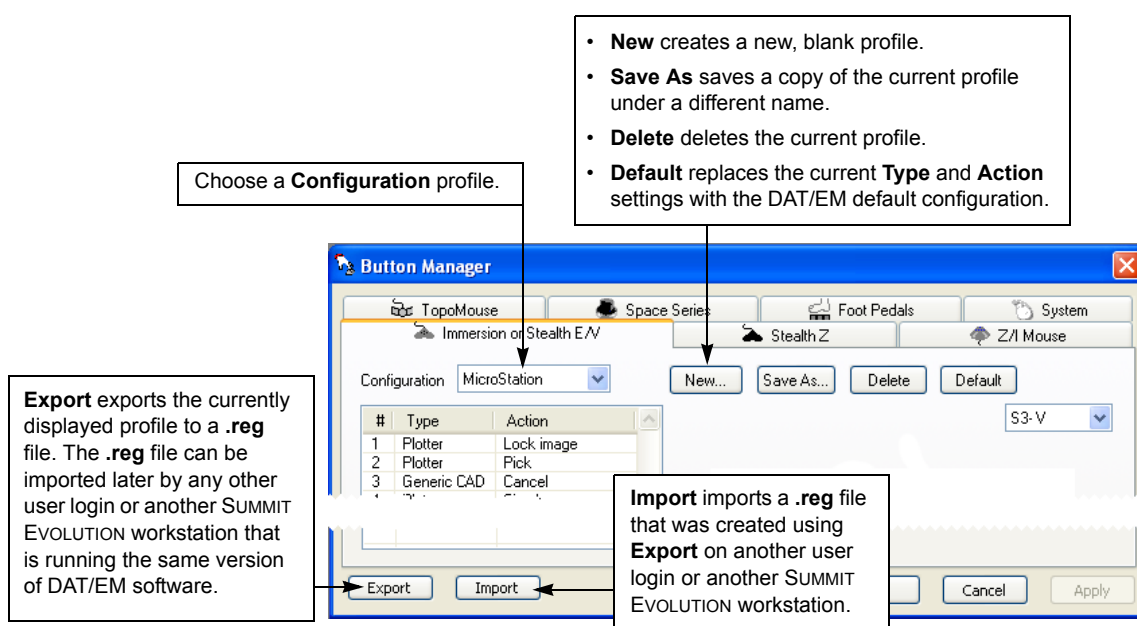
- b.) For a Stealth Z-Mouse, select the **Stealth Z** tab. On the right, select the correct Stealth Z model to display the matching graphic. Choose a setting in the **Use Shift Buttons** area.



c.) For all other device types, select the matching tab.



Step 3) Choose a **Configuration** profile. A default profile is provided with new installations. Custom profiles may be made for each person, project, product (SUMMIT EVOLUTION or LANDSCAPE) and interface type (AutoCAD, MicroStation, or ArcMap). If desired, use the **Import** button to import a **.reg** file that was created using **Export** from another user login or another SUMMIT EVOLUTION workstation.



Step 4) Set each button's **Type** and **Action**. See *Appendix J* for a table of **Type** and **Action** settings and their applications for AutoCAD, MicroStation, and ArcGIS. **Hint:** Press the hardware button to automatically highlight that button's **Type** field. The system mouse may also select fields.

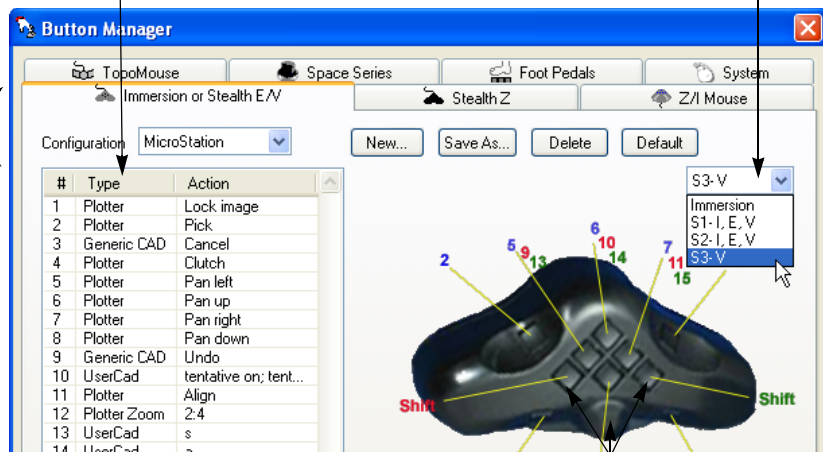
For each button number, select a function **Type** and an **Action**. See *Appendix J* for a table of **Type** and **Action** settings and their applications for AutoCAD, MicroStation, and ArcGIS (ArcMap).

Some tabs require a model selection to set the correct graphic in the display.

Note that the two optional footpedals that are installed with the SoftMouse use the settings for Button 1 and Button 4.



Same as Button 1 and Button 4

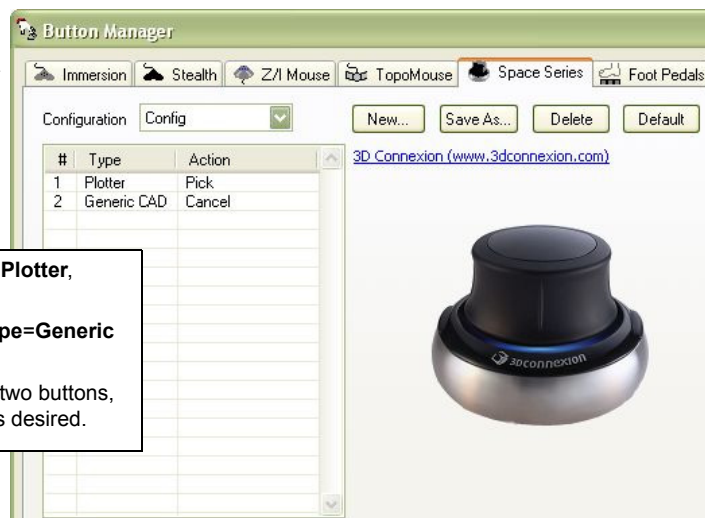


Note the following about using the SoftMouse, Stealth I-, E-, or V-Mouse buttons:

- When the **Left Shift** button is held down, buttons 9, 10, 11, and 12 are active.
- When the **Right Shift** button is held down, buttons 13, 14, 15, and 16 are active.
- If no shift buttons are held down, buttons 5, 6, 7, and 8 are active.
- When the button set to **Clutch** is held down, the wheel (under buttons 1 and 4) becomes an image zoom control.
- When the button set to **Clutch** is off, the wheel controls the depth coordinate (Z for aerial photography).

For the 3Dconnexion® SpaceNavigator™, SpaceExplorer™, or SpacePilot™, set the first two buttons to **Type=Plotter**, **Action=Pick** and **Type=Generic CAD**, **Action=Cancel**. For devices with more than two buttons, set the remaining buttons as desired (See *Appendix J* for a table of **Type** and **Action** settings).

Space Series tab



- Set the first button to **Type=Plotter**, **Action=Pick**
- Set the second button to **Type=Generic CAD**, **Action=Cancel**.
- For devices with more than two buttons, set the remaining buttons as desired.

For the system mouse used as the 3D input device, make special settings as shown:

For each button number, select a function **Type** and an **Action**. See *Appendix J* for a table of **Type** and **Action** settings and their applications for AutoCAD, MicroStation, and ArcGIS (ArcMap).

Button 2 should be set to **Type=None** in order to correctly toggle system mouse control of the SUMMIT EVOLUTION cursor.

Buttons 1-5 are for the first (or only) system mouse.

Buttons 6-10 apply to the second and any additional mouse devices. Additional mouse devices are all treated the same as the second mouse. Leave buttons 6-10 blank if only one system mouse is installed.

#	Type	Action
1	Plotter	Pick
2	None	
3	Generic CAD	Cancel
4	None	
5	None	
6	Plotter Zoom	.25;.5;.75;1;2;8
7	Plotter Curs...	(ringson);(ringsoff)
8	Shortcut Key	F4
9	None	
10	None	

Step 5) (Optional) If desired, use **Export** to write a **.reg** file that may be imported later by another user login or another SUMMIT EVOLUTION workstation.

Tools Menu > Get 3D Device

This command helps to share the 3D device between SUMMIT EVOLUTION and DAT/EM LANDSCAPE. This option may be used when both products are set to use the same 3D device. If LANDSCAPE currently has control of the device, select **Summit > Tools > Get 3D Device** to change the control to SUMMIT EVOLUTION.

Tools Menu > Cursor Select

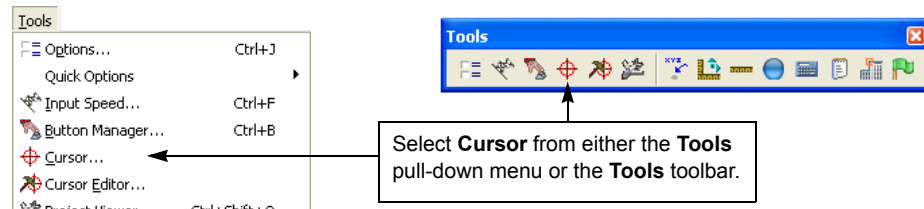
The user may select one of the cursor (floating mark) designs supplied with SUMMIT EVOLUTION or create a new cursor design using the cursor editor. For reference, the cursor file format is listed in *Appendix D*.

There are two ways to change the cursor display:

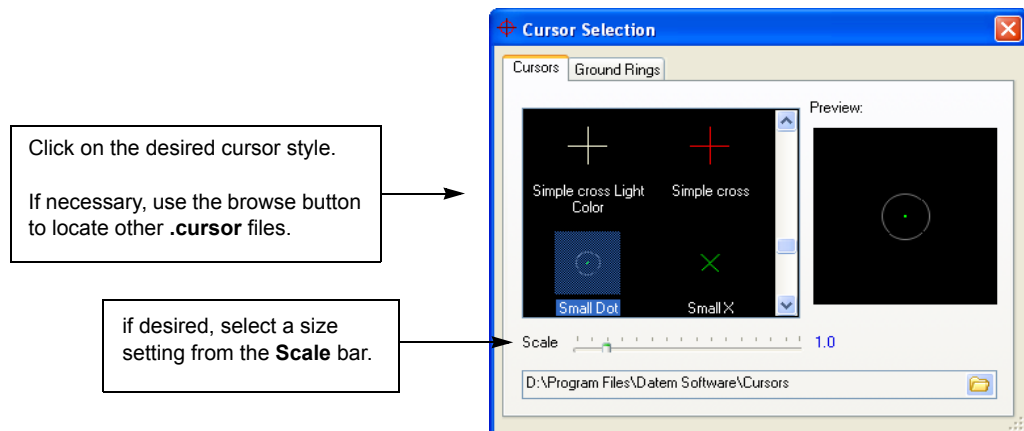
- Press a button set to **Type=Plotter Cursor** to scroll through a list of cursor designs. See page J-10 in *Appendix J* for instructions.
- Choose the cursor design from the Cursor Selection dialog. To use the Cursor Selection dialog and to edit cursor designs, see below.

To set a cursor style from the Cursor Selection dialog, perform the following steps:

Step 1) Select either **Cursor Select** from the **Tools** toolbar or **Cursor** from the **Tools** pull-down menu.



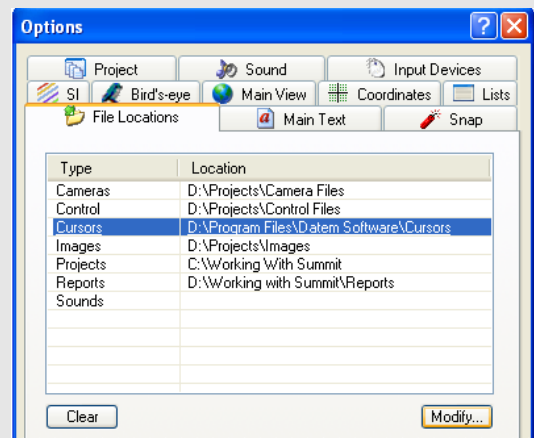
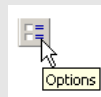
Step 2) Select the **Cursors** tab. Click on the desired cursor style. If desired, select a size setting from the **Scale** bar. If necessary, browse in a different folder for other **.cursor** files.



Q: Where does SUMMIT EVOLUTION and the Cursor Select dialog look first for cursor files?

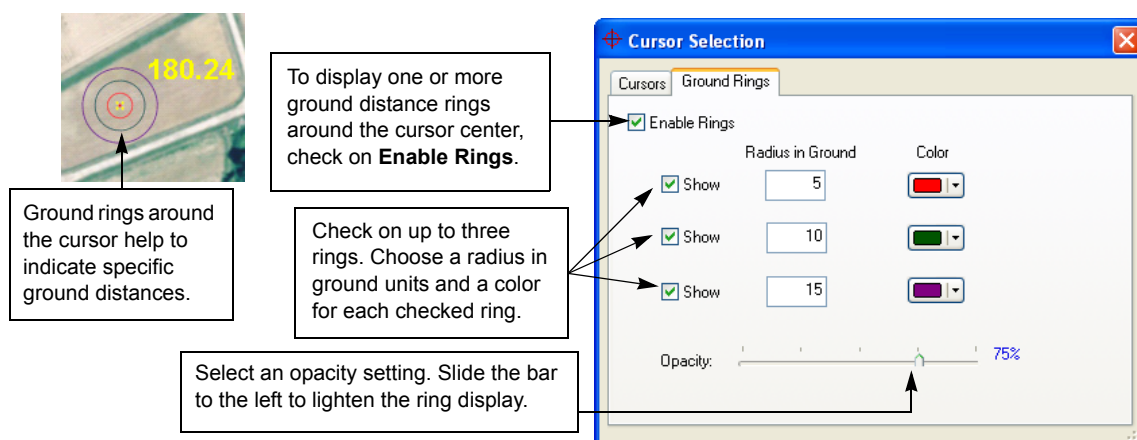
A: It looks in the folder listed in **Options>File Locations>Cursors**:

- Select **Options** from SUMMIT EVOLUTION's **Tools** toolbar;
- Select the **File Locations** tab;
- View the **Cursors** entry.
- To change, click on the **Cursors** entry and select the **Modify** button.



Step 3) Select the **Ground Rings** tab. Choose ground rings settings.

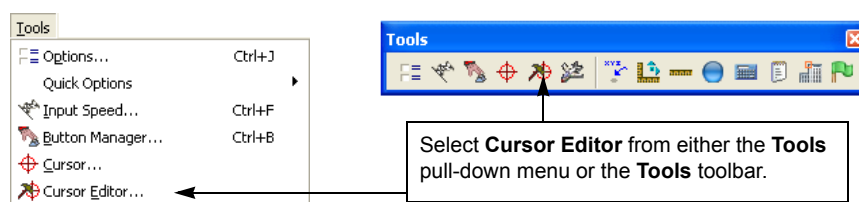
Note: As long as at least one ground ring **Show** setting is on, ground rings may be toggled on and off from a cursor button. See page J-10 in *Appendix J* for instructions.



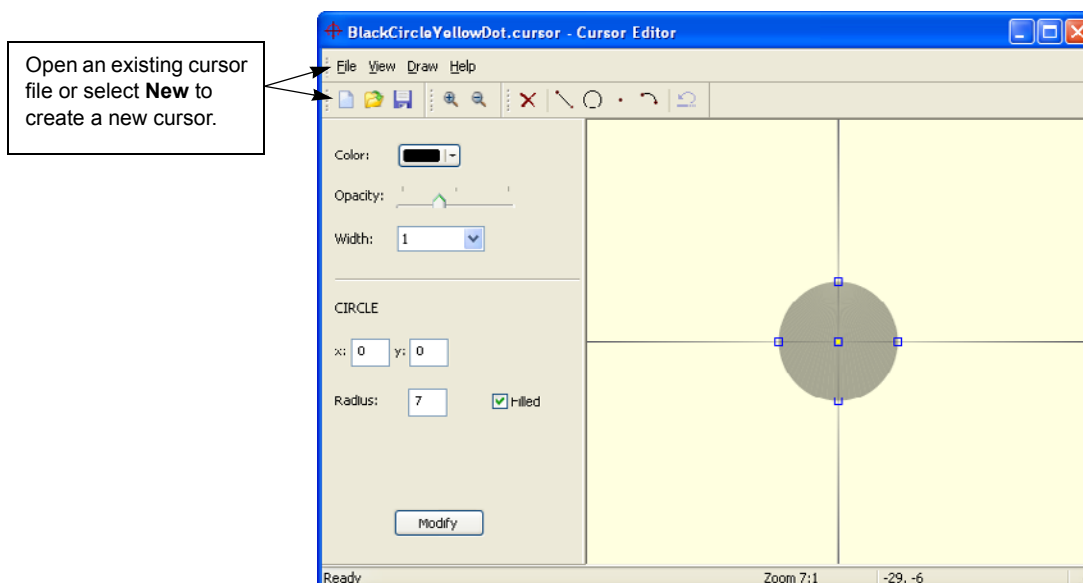
Tools Menu > Cursor Editor

The Cursor Editor may be used to edit the appearance of an existing cursor or to create a new cursor design.

Step 1) Select **Cursor editor** from the **Tools** pull-down menu.



Step 2) Either open an existing **.cursor** file or select **New** to create a new one.



Step 3) To draw a new graphical element, first select the **Color**, **Opacity**, and **Width** settings. Then select the **Line**, **Circle**, **Point**, or **Arc** icons and draw the object.

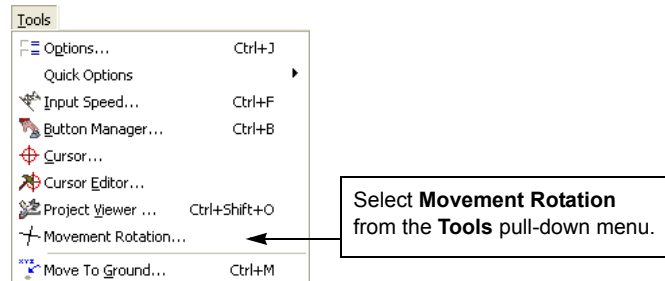
Step 4) To edit an existing object, select it and edit the object information. Select **Modify** to apply changes.

Tools Menu > Movement Rotation

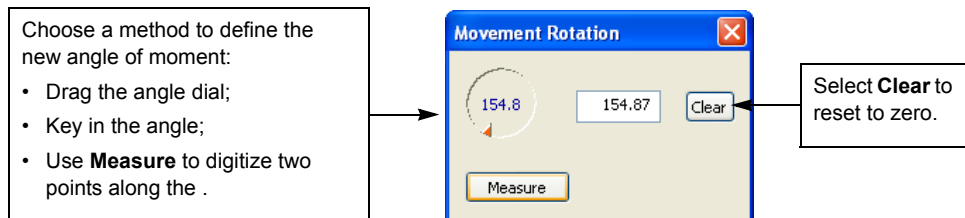
The default cursor movement for the screen right, screen left, screen up, and screen down directions is set to the kappa of the model. The **Movement Rotation** tool allows you to set a different angle. This may be useful, for example, when a set of streets and all the nearby buildings are oriented to an angle such as 25 degrees from kappa. If Movement Rotation is set to 25 degrees, it will be easy to move the cursor straight along the streets. This may be particularly useful with handwheels.

Perform the following steps:

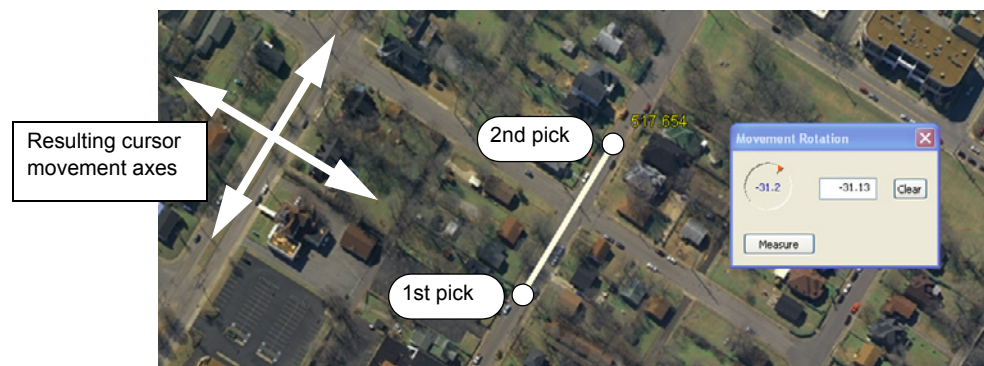
Step 1) Select **Movement Rotation** from the **Tools** toolbar or pull-down menu.



Step 2) Either drag the angle dial to the desired angle, enter the angle in the field, or use **Measure** to digitize two point that define the new angle to replace “screen up”. For handwheels, this is the direction to move when the left handwheel spins in the positive direction.



Measure the angle to replace the “screen up” direction. For handwheels, this is the direction to move when the left handwheel spins in the positive direction.



Step 3) At any time, use **Clear** to reset the movement to 0 degrees from kappa.

Tools Menu > Project Viewer/Ortho+Mosaic

Please see *Chapter 28*.

Tools Menu > Move To Ground

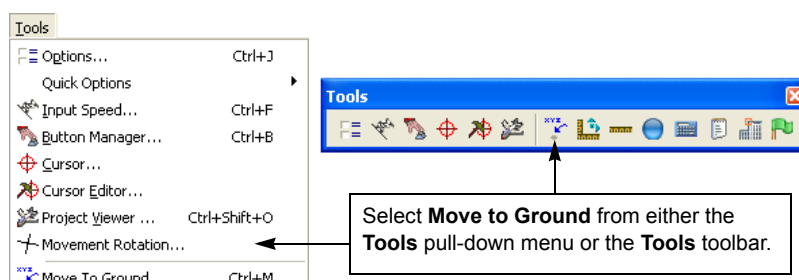
The **Move To Ground** tool lists points from control files and moves the SUMMIT EVOLUTION cursor to selected points. Control files are specified in the **.smti** project file. Control files can be:

- “Real” ground control files that contain points used for orientation;
- “Imitation” control files used only by **Move To Ground**. The points do not need to be true control points; they could be any coordinates that fit within the coordinate range of the project.

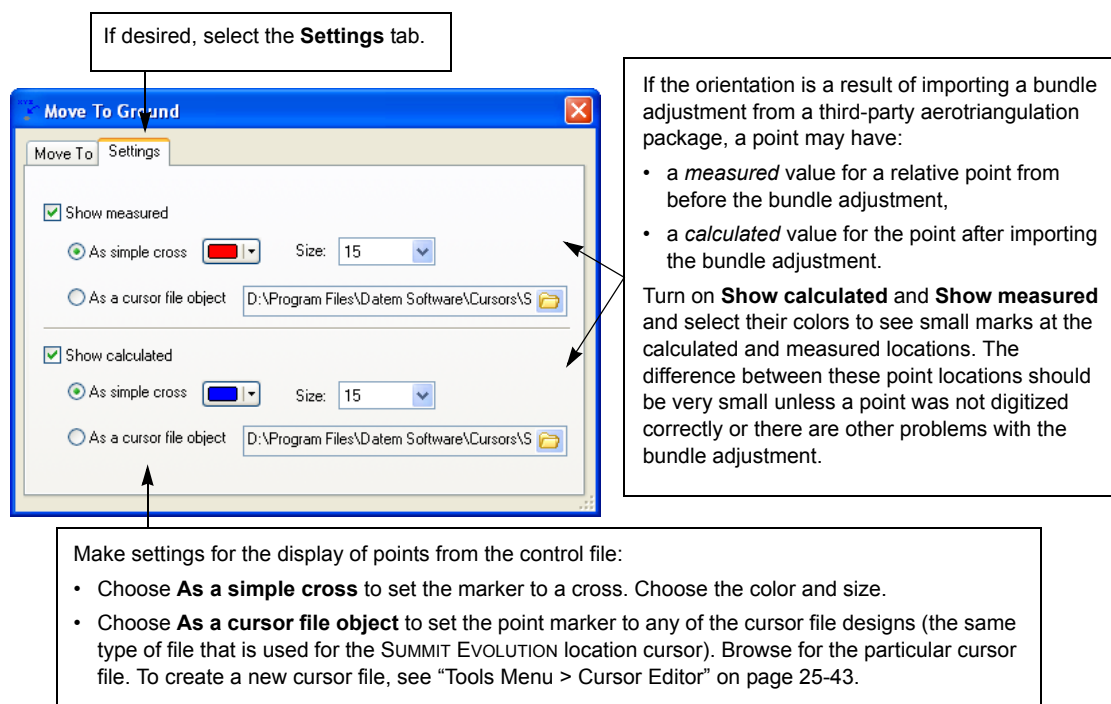
The **Fetch** and **Move** functions may be used even if there is no control file point list.

To move the cursor to a point from the list, perform the following steps:

Step 1) Select **Move to Ground** from the **Tools** toolbar or pull-down menu.



Step 2) If desired, select the **Settings** tab and make settings for the display of points from the control file:



Step 3) Select the **Move To** tab. Make checkbox settings:

Choose a **Show All** setting:

- If **Show All** is off, the list shows only those points that have been used for orientation in the open model.
- If **Show All** is on, the list shows all points in the control file.

Choose an **Allow Model Switch** setting:

- Note that if **Allow Model Switch** is not highlighted, it is because the **Automatically load next model when outside stereo region** setting is off on the **Project** tab of the Options dialog.
- If **Allow Model Switch** is on and the selected point is outside the currently open model, the model that contains the point is opened, then the cursor moves to the point.
- If **Allow Model Switch** is off and the selected point is outside the currently open model, the cursor will not move.

Identifier	Ground X	Ground Y	Ground Z
925	1557342.222	260398.062	
2021	1560397.106	260941.607	
2022	1559389.255	260905.460	
2031	1560239.068	259520.815	
2032	1558866.051	259523.186	
2033	1557296.468	259439.245	
cccccc	1559999.999	259999.999	

Move to measured appears only for projects that have measured control. Choose a **Move to measured** setting:

- If **Move to measured** is off, then the cursor moves to the ground coordinate as it appears in the control file.
- If **Move to measured** is on, then the cursor moves to the location that was measured for that point. Note that if the point has not been measured, the cursor will not move.

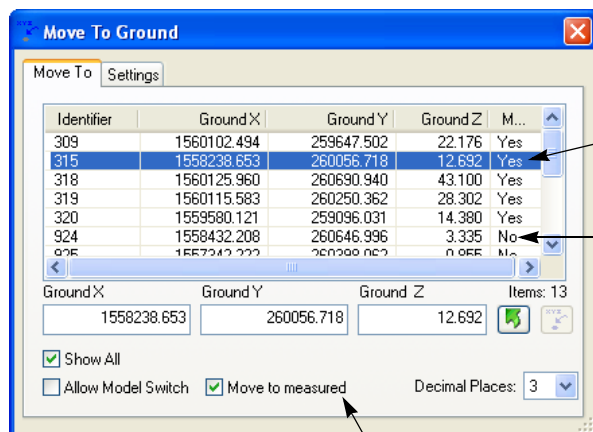
Step 4) Choose the number of decimal places to display and use for moving:

Identifier	Ground X	Ground Y	Ground Z	M...
925	1557342.222	260398.062	0.855	No
2021	1560397.106	260941.607	40.360	Yes
2022	1559389.255	260905.460	31.745	No
2031	1560239.068	259520.815	5.920	No
2032	1558866.051	259523.186	12.220	Yes
2033	1557296.468	259439.245	61.547	No
cccccc	1559999.999	259999.999	11.720	No

Set **Decimal Places** to the number of decimal places to display and use for moving.

Step 5) Choose one of the following actions:

a.) From the **Move To** tab, select one of the listed points to move to that point immediately.



Choice a) Select one of the listed control points. The cursor moves to that point immediately.

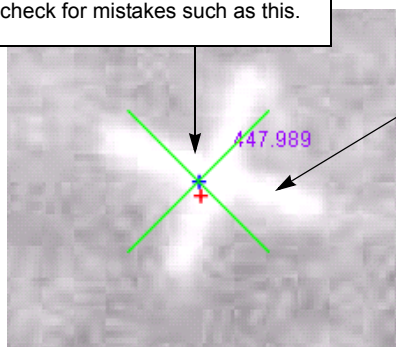
If the orientation is a result of importing a bundle adjustment from a third-party aerotriangulation package, a point may have ...

- a *measured* value for a relative point from before the bundle adjustment,
- a *calculated* value for the point after importing the bundle adjustment.

Different marks may be set for these two types of points from the **Settings** tab. The difference between these point locations should be very small unless a point was not digitized correctly or there are other problems with the bundle adjustment.

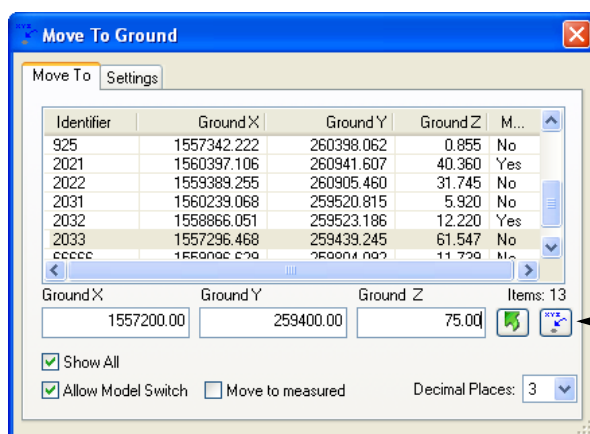
Relative points appear in the **Move to Ground** list only if the relative points file is given as a control file in the project (Step 10 on page 7-7).

This example shows a point that was measured incorrectly. Note that neither the measured point nor the calculated point is on the ground mark. **Move to Ground** may be used to check for mistakes such as this.



- Zoom in to the subpixel level to see the calculated and measured marks.
- The stereoplotter's cursor moves directly to the calculated point if **Move to measured** is off. It moves directly to the measured point if **Move to measured** is on.
- If desired, move the stereoplotter cursor slightly to see the other marks more easily.

b.) Enter a new point in the edit line fields, then select the **Move to ground** button.

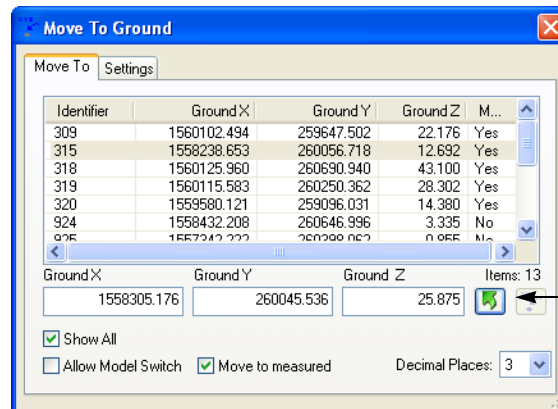


Choice b) Enter a new point in the fields, then select the **Move to ground** button.

Hint: A faster method may be to enter the coordinate directly into the SUMMIT EVOLUTION window's coordinate bar (see page 25-8).

Map Scale 499.01 Zoom 0.61:1 Ground 23000.0 23901.20 26.28

- c.) Obtain the exact coordinate of the current cursor location by selecting the **Fetch Point** button. Move the cursor away, then return to that point by selecting **Move**.



Choice c) Position the stereoplotter on a location to return to later.

- Select the **Fetch the current ground values** button to place the coordinate of the cursor location in the fields.
- At any time while the coordinate is still displayed in the fields, select **Move** to return to that point.

Tools Menu > Move To Object

To move the cursor to a location selected from a coordinate file list, perform the following steps:

- Step 1)** Prepare an input file. This file should be an ASCII file of the format:

```
Identifier Length GroundX GroundY
```

GroundZ and GroundY may be positive or negative, with any number of decimal places.

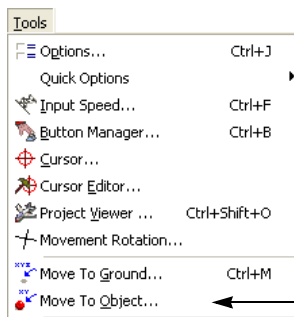
For example, this file was supplied by the client who requested this tool:

```
8333 1309      4440143 5276774
6125 1287      4347357 5522841
6124 1242      4341440 5529661
6124 1161      4340534 5530894
6029 1047      4403820 5538790
6939 1036      4515596 5431976
```

SUMMIT EVOLUTION reads in the Identifier and Length values, but it ignores the specific setting. This means they don't have to represent a real identifier or length value. The following file produced by DAT/EM CAPTURE's **xyzout** command from AutoCAD or MicroStation also works:

```
1 POINT 77782.935 -116759.778
2 POINT 77780.312 -116749.029
3 POINT 77788.479 -116750.115
4 POINT 77800.367 -116759.731
5 POINT 77790.189 -116763.706
6 POINT 77813.668 -116754.320
```

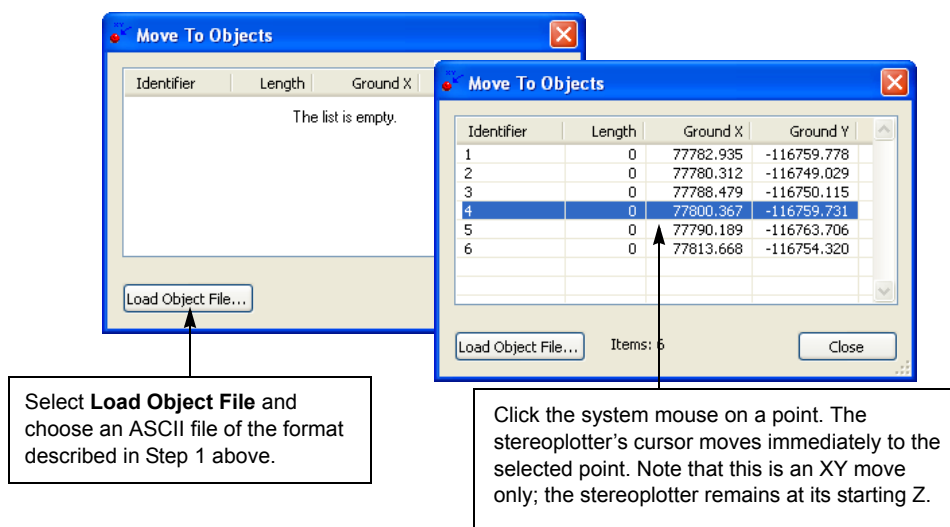
- Step 2)** Select **Move To Object** from the **Tools** pull-down menu.



Select **Move to object** from the **Tools** pull-down menu.

Step 3) Select **Load Object File** and browse for the ASCII text file prepared earlier.

Step 4) Select a point in the list to move the cursor to that coordinate.



Tools Menu > Measure Mean (Display Average Length)

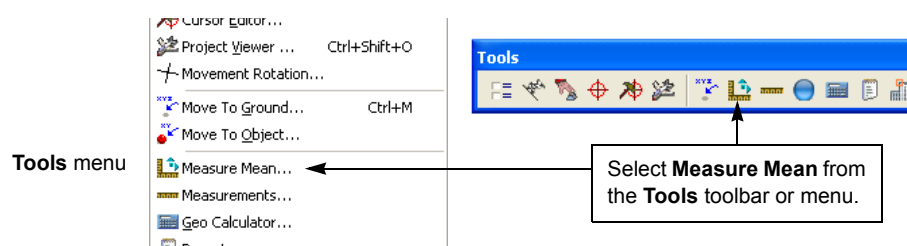
The **Measure Mean** tool allows you to digitize pairs of points for a sampling of lengths. It displays the arithmetic mean (average) of the lengths.

For example, find the average height of ten trees. Set **Measure Mean** to **Vertical**. Digitize at the base and at the top of each tree. **Measure Mean** displays the average height of the sampled trees.

Measure Mean may be used at the same time as **Show Measurements** (below on page 25-50).

To use **Measure Mean**, perform the following steps:

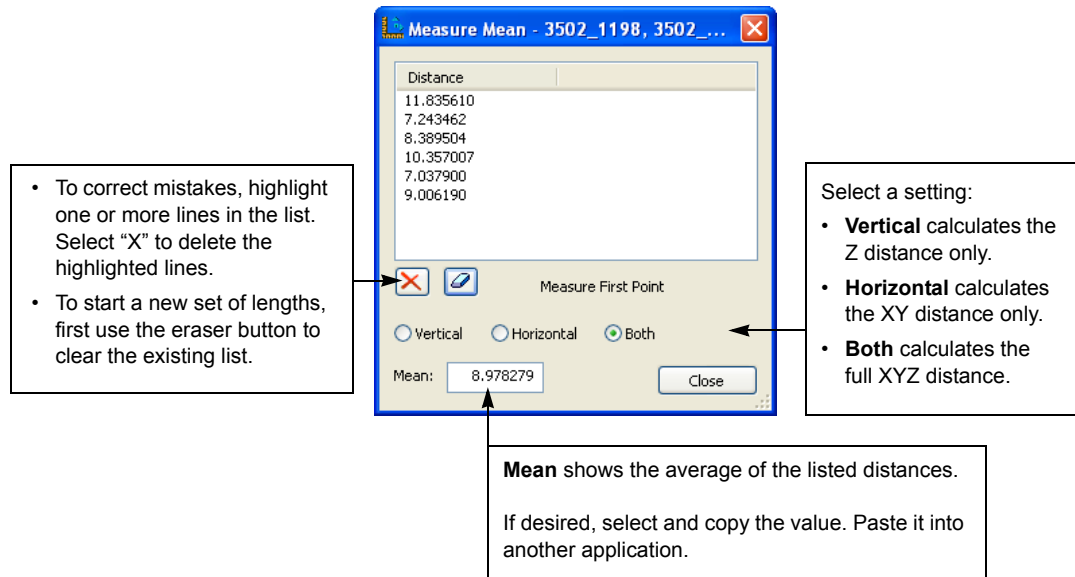
Step 1) Select **Measure Mean** from the **Tools** toolbar:



Step 2) Select the type of length: **Vertical** for Z only, **Horizontal** for XY only, or **Both** for the full XYZ (3D) distance.

Step 3) Digitize at the start and end of the first feature's length. (For example, at the base and top of a tree, or on the left and right sides of a road.) The measured length appears in the list.

Step 4) Repeat digitizing at the start and end of each feature's length. After each two points, another calculated length appears in the list, and a new average value appears in the **Mean** field.



- Step 5)** To correct mistakes, click on one or more incorrect list items to highlight them. Use the "X" button to delete the highlighted items. A new **Mean** appears. If desired, resume digitizing.
- Step 6)** To measure a new set of lengths, use the eraser button to clear the existing list. Repeat the steps to measure the new set of lengths.

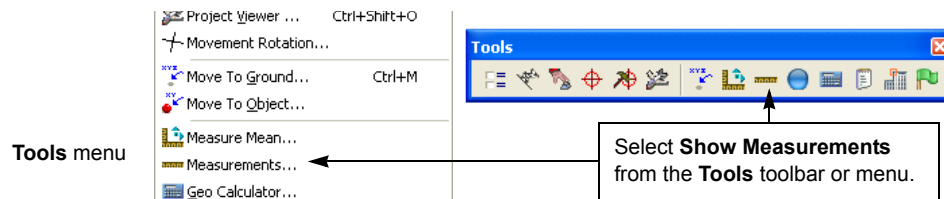
Tools Menu > Show Measurements

The **Show Measurements** tool shows information about a series of measurements and the current cursor position. It displays information such as azimuth and distance between the cursor and the last-digitized point. It also shows information such as total number of points in the series, area enclosed if these points were to define a polygon, and total length of the segments connecting the series of points.

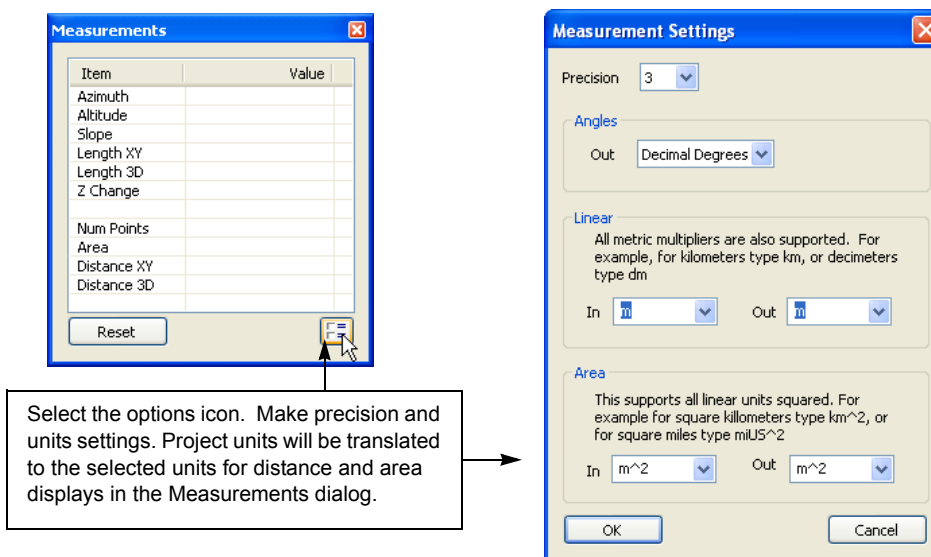
It may be useful to run both **Show Measurements** and **Measure Mean** (above on page 25-50) at the same time.

To use **Show Measurements**, perform the following steps:

- Step 1)** Select **Show Measurements** from the **Tools** toolbar:



- Step 2)** If necessary, select the options icon at the lower right of the dialog. Make settings.



Step 3) (Optional) If desired, start a CAD/GIS drawing command. It does not matter whether actual feature digitizing is happening at the same time as **Show Measurements** is running.

Note: **Show Measurements** uses points exactly where they are digitized in SUMMIT EVOLUTION; it does not adjust points to be the same as the ones changed by CAD/GIS commands such as building squaring or 2D line drawing.

Step 4) Digitize a point at the start of the feature of interest. (For example, digitize a point at the first corner of a farm field where you would like to see the total land area and rise in elevation.)

Step 5) Move the cursor to the next point of the feature. As the cursor moves, the items on the top of the **Measurements** dialog update in real time to show the current cursor position compared to the last-digitized point. Digitize the point. The items at the bottom of the dialog update to show the number of points digitized, XY area, and distances.

Step 6) Repeat digitizing any number of points along the feature.

Items listed at the top of the dialog show the current cursor position compared to the last-digitized point.

Reset clears the current measurements.

The following items display information about the digitized points:

- **Num Points:** Number of digitized points included in the calculations.
- **Area:** Area of the XY polygon that would be created by drawing segments between the points in order, including a segment between the first and last points, then projecting the segments onto the XY plane.
- **Distance XY:** Total of all XY segment lengths that would be created by drawing segments between the points in order, and then projecting the segments into the XY plane. This does not include a segment between the last point and the first point.
- **Distance 3D:** Total XYZ segment lengths that would be created by drawing segments between the points in order. This does not include a segment between the last point and the first point.

Item	Value
Azimuth	130°28'00.56"
Altitude	0°37'22.94"
Length XY	53.230
Length 3D	53.233
Z Change	0.579
Slope	-0.853
Num Points	5
Area	1760.046
Distance XY	186.891
Distance 3D	186.901

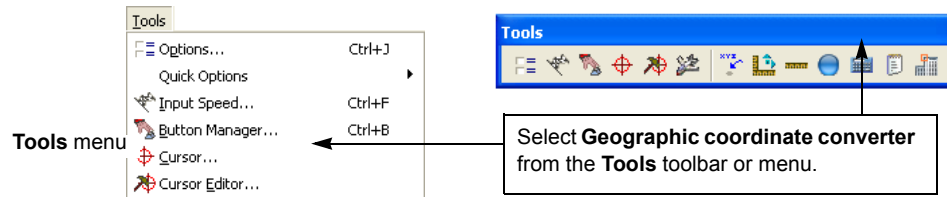
Step 7) Before starting a new feature, select the **Reset** button to clear the previous measurements.

Tools Menu > Geo Calculator

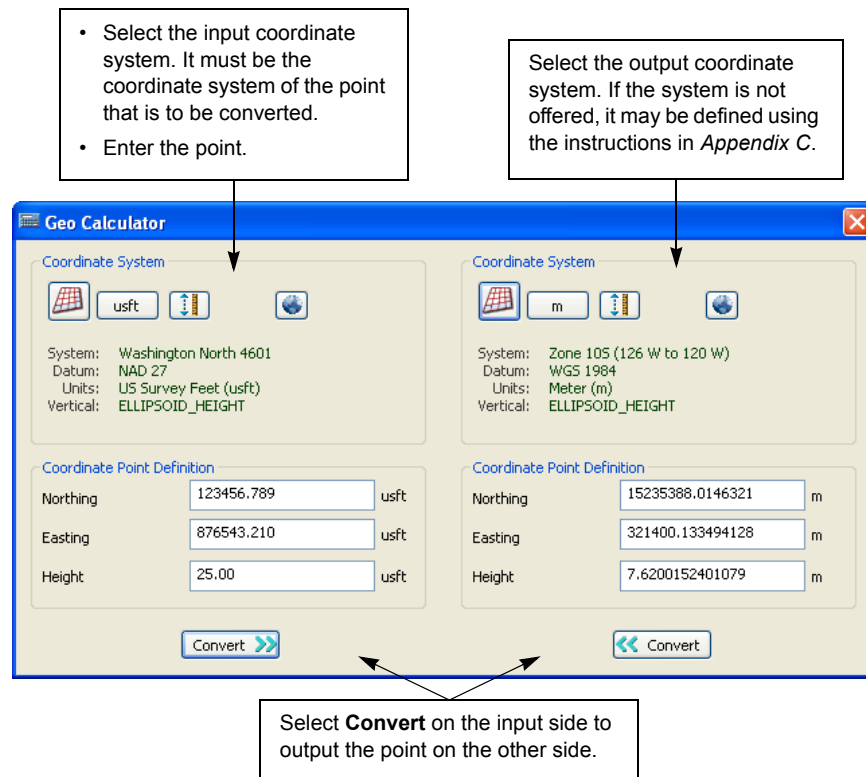
The Geo Calculator is a one-point-at-a-time coordinate transformation tool. It does not affect or depend on orientation in any way. It is available any time SUMMIT EVOLUTION is running, with or without an open project. It allows the user to enter a point, specify the point's original coordinate system, then choose to display the point transformed into another coordinate system.

To use the Geo Calculator, perform the following steps:

- Step 1)** At any time that SUMMIT EVOLUTION is running, select **Geographic coordinate converter** from the **Tools** toolbar:



- Step 2)** On either side of the dialog box, select the input point's coordinate system and enter the point.
- Step 3)** On the other side of the dialog box, select the output coordinate system. If the coordinate system or one of its components is not offered, it may be defined using the instructions in *Appendix C*.
- Step 4)** Select the **Convert** button on the input side. (Coordinates may be entered on either side to convert in either direction.)



- Step 5)** View or copy and paste the output point.

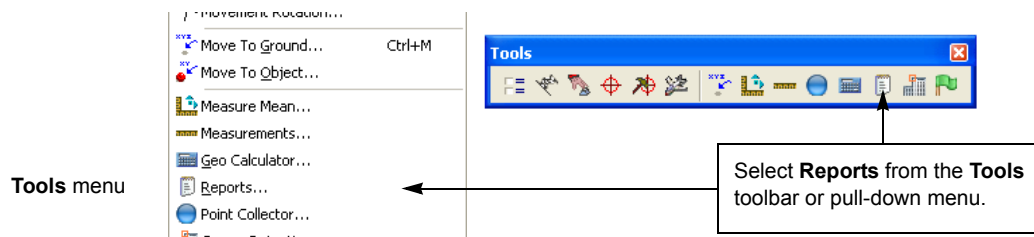
Tools Menu > Reports

Create Reports allows the user to configure and create orientation reports for any models in the project. This may not be available for all project types.

Reports reflect the coordinate system in the original control files; that is, they show coordinate conversions done to the control file (page 6-12) or digital sensor project file (ADS40, A³, satellite, SAR projects), but they do not show ground coordinate conversions done with the ground coordinate converter shown on page 25-28.

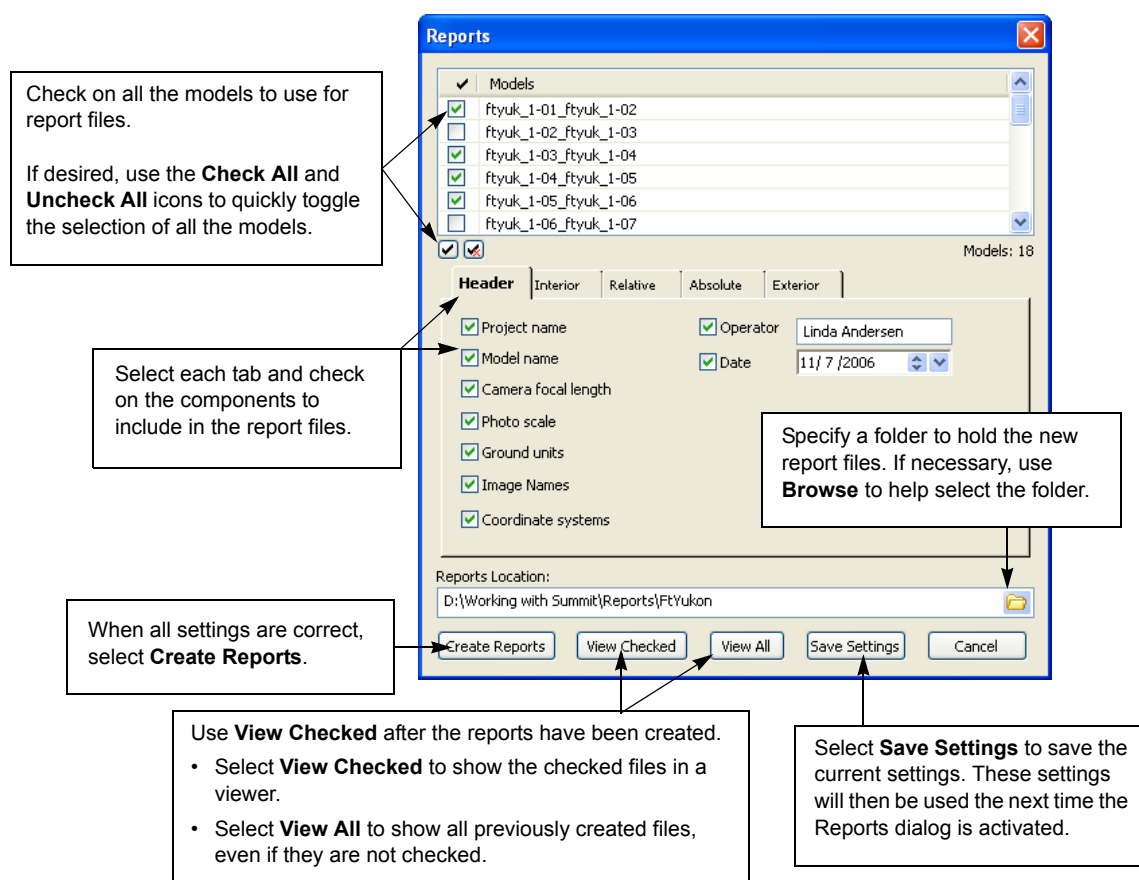
To create orientation reports, perform the following steps:

Step 1) Select **Create Reports** from the **Tools** toolbar or pull-down menu:



Step 2) Check on the models to use for reports. If desired, use the **Check All** and **Uncheck All** icons to quickly toggle the selection of all the models.

Step 3) Select each tab and check on the components to include in the report files.

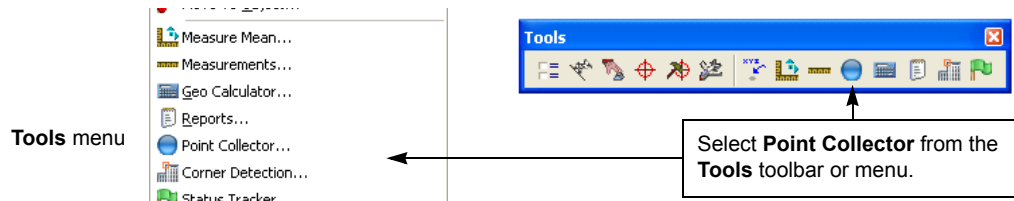


Tools Menu > Point Collector

The **Point Collector** tool records the coordinates of digitized locations in SUMMIT EVOLUTION. The list of coordinates can be written to an ASCII XYZ file.

To use **Point Collector**, perform the following steps:

Step 1) Select **Point Collector** from the **Tools** toolbar:

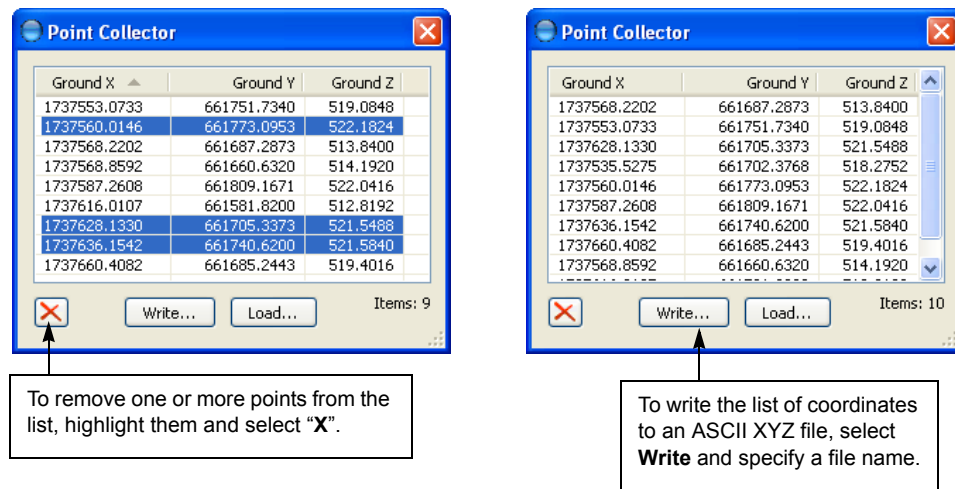


Step 2) To append a new list of points to an existing list, select **Load** and browse for the existing file. The points from that file will be displayed. New points will be added to the end of the list.

Step 3) Move the SUMMIT EVOLUTION cursor to the desired location and digitize. The coordinate appears in the list. Repeat digitizing any number of locations.

Step 4) To remove one or more points from the list, highlight them and select “X”. Hint: To select all the points, highlight one line and key in <Ctrl>A. Note that the list will also be cleared when the dialog box is closed and re-opened.

Step 5) To write the list of coordinates to an ASCII XYZ file, select **Write** and specify a file name.



Tools Menu > Corner Detection

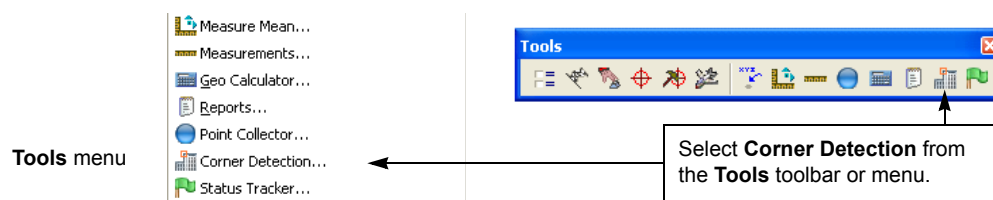
The **Corner Detection** tool works to help move the stereoplottor cursor to building corners.

- **Corner Detection** will work the best on color imagery.
- **Corner Detection** may be very slow with “ADS40 Using Leica Kit” projects, and will not work at all with the older “ADS40 Digital Sensor” projects.

To use **Corner Detection**, perform the following steps:

Step 1) Use the Button Manager (page 25-38) to set a digitizer button to **Type=Plotter** and **Action=Corner Detection Snap**.

Step 2) Select **Corner Detection** from the **Tools** toolbar:



Step 3) The Corner Detection dialog appears. Make settings:

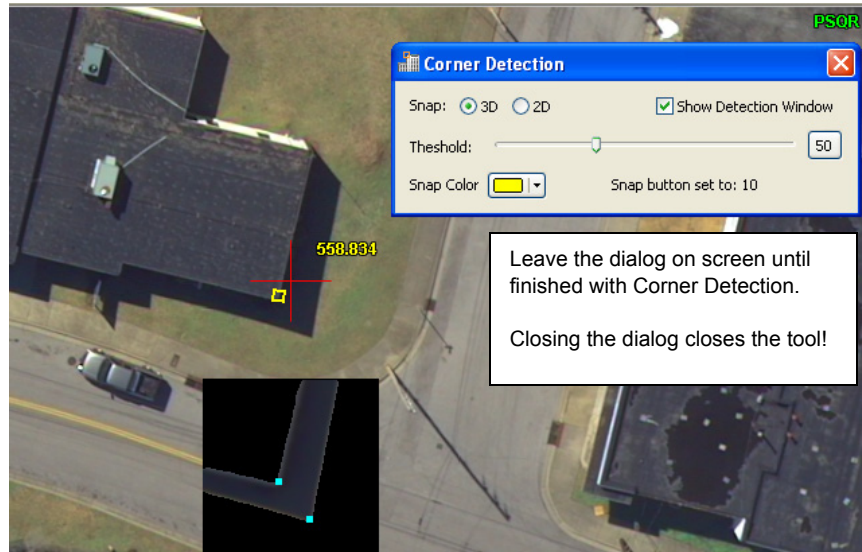
- **Snap 3D:** Moves the stereoplotter cursor to the XYZ of the snap point.
- **Snap 2D:** Moves the stereoplotter cursor to the XY of the snap point. The stereoplotter's Z value is not changed.
- **Show Detection Window:** Turns on a small inset window that shows all detected potential corners in the area. This may help in visualizing the potential corners and for setting a good **Threshold** value. If desired, right click on the window, select **Move window**, and select a new location. Here, it is shown just above the elevation text:



To position the detection window:

- Right click on the window.
- Select **Move Window**.
- Select a new location.

- **Threshold:** This is the color sensitivity for corner detection. If the building has many variations in color, set a higher value. If it is attempting to snap to many things in addition to actual corners, then set a lower value. Turn on **Show Detection Window** to help choose a good **Threshold** value.
- **Snap Color:** Sets the color of the snap indicator mark.
- **Snap button display:** Shows the cursor button, if any, that is currently set to **Type=Plotter** and **Action=Corner Detection Snap**. There must be a button with this setting in order to use Corner Detection. If, "No snap button set," appears, return to Step 1 to set the button.



- Step 4)** Start the desired drawing tool in SUMMIT EVOLUTION or in AutoCAD, MicroStation, or ArcMap. For example, start **Polyline Squaring** in Editable Objects or **PSQR** in MicroStation. The tool does not need to be a building drawing tool; it could be any tool that requires you to digitize a point or vertex.
- Step 5)** Position the stereoplotter cursor near the desired corner. A snap indicator mark appears at the nearest detected corner. When the mark is on the desired corner, press the **Corner Detection Snap** cursor button. The stereoplotter cursor will move to the detected corner (in either XY or XYZ, depending on the **Snap 3D/2D** setting). If the snapped-to point is acceptable, press the pick button to digitize the point.

It is also possible to digitize a point that is not a corner detection point. Simply position the stereoplotter cursor and digitize without pressing the **Corner Detection Snap** button.

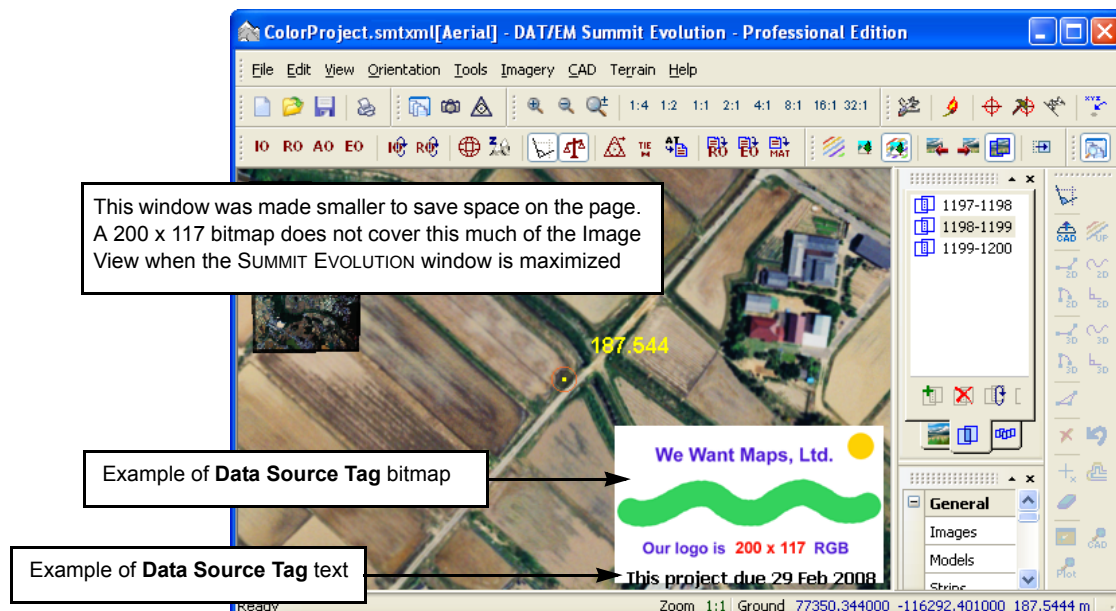
Tools Menu > Status Tracker

See *Chapter 30*.

Tools Menu > Data Source Tag (Bitmap and Text Display)

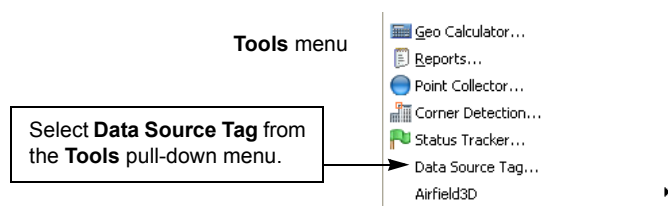
To add a bitmap image and text to a corner in the Image View, the bitmap image must conform to the following limits:

- The size limit for width and height is 1024 x 1024 pixels. (An image that is no larger than 200 x 200 pixels is a better choice, because it does not obscure so much of the Image View area.)
- The image does not need to be square. For example, it could be 200 x 100 pixels.
- It must be greyscale or RGB color (not indexed or other types of colors)



To display or stop display of a tag image and/or text, perform the following steps:

Step 1) Select **Data Source Tag** on the **Tools** pull-down menu.



Step 2) To show the tag information, check on the **Show Tag** checkbox and continue to the next step. To stop the display, check **Show Tag** off and stop here.

Step 3) If a line of text is desired, enter the text in the **Text** field. Select the **Font** button to make font appearance and color settings. Or, to prevent the text display, leave the field blank.

Step 4) If a bitmap image is desired, select the **Browse** button on the **Image** field. Select a bitmap (**bmp**) file that is greyscale or RGB color and is no larger than 1024 x 1024 pixels. Note that an image size of 1024 x 1024 is so large that it will cover most of the Image View. An image that is no larger than 200 x 200 pixels is a better choice.

Step 5) To remove one color from the bitmap's display, set its color in the **Color Key Transparency** RGB fields. You must know the color setting you need. **Hint:** It is possible to check the color settings in an application such as Adobe® Photoshop®, then set them in the **Color Key Transparency** fields.

For example, to remove the white background from this bitmap, set 255, 255, 255. To remove the "wave" line, which is a shade of green when viewed in color, set that green's 52, 210, 93:



Color Key Transparency set to
R=0, G=0, B=0



Color Key Transparency set to
R=255, G=255, B=255



Color Key Transparency set to
R=52, G=210, B=93

Tools Menu > Airfield3D

The **Airfield3D** option is used with SUMMIT EVOLUTION PROFESSIONAL EDITION and DAT/EM CAPTURE FOR ARCGIS. For complete instructions, please see the *Airfield3D Operation Manual*.

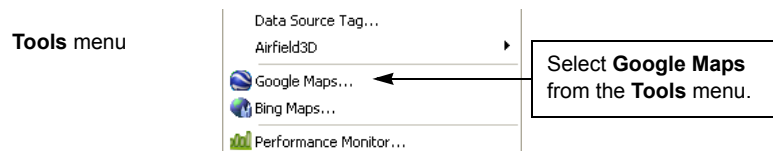
Tools Menu > Google® Maps™

The **Google Maps** option opens a Google Maps¹ window and shows the area of the SUMMIT EVOLUTION cursor. It works with the following conditions:

- The project is not a Close Range (terrestrial) project.
- The project has a known ground coordinate system.
- The computer has internet access.
- The Blue Marble coordinate transformation database is installed (available on the DAT/EM installation disk and from the DAT/EM website, www.datem.com).

To use the **Google Maps** option, perform the following steps:

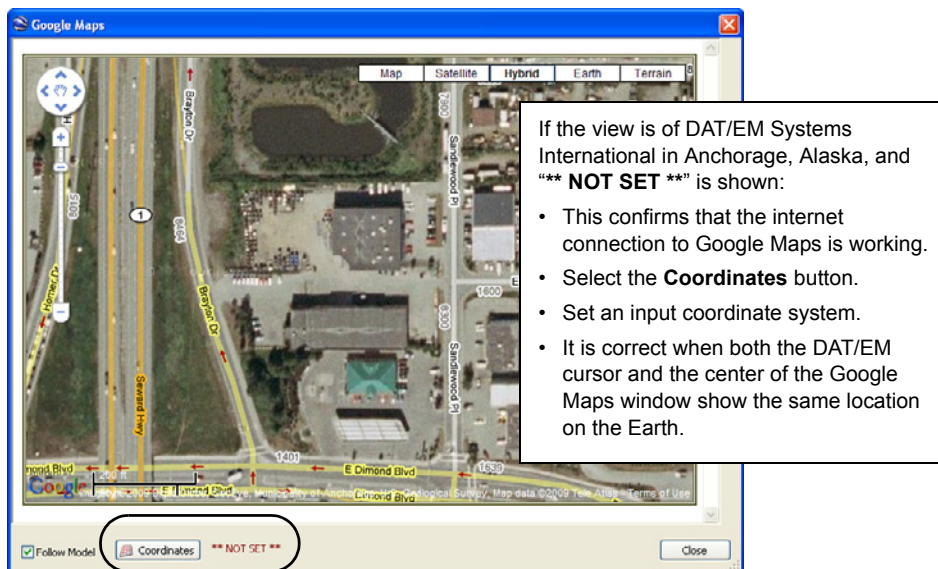
Step 1) Select **Google Maps** from the **Tools** menu:



Step 2) A **Google Maps** window opens. If necessary, select **Coordinates** to set the input coordinate system. Choose a **Follow Model** setting; if on, the Google Maps window will pan with the SUMMIT EVOLUTION cursor.

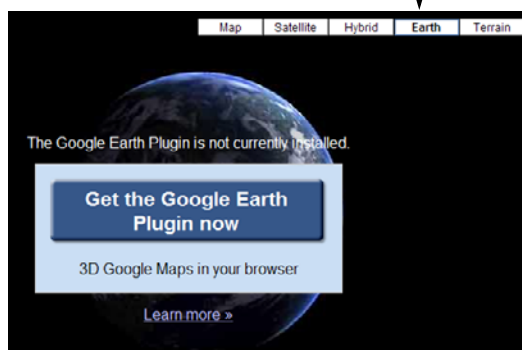
- If “** NOT SET **” is shown in the lower part of the window, then a coordinate system is not yet set in the project. Select the **Coordinates** button. Define the ground coordinate system and save the project. (This does not apply a coordinate transformation.)
- Some project types already have a coordinate system defined. No further settings are required for projects that already have a coordinate conversion applied or projects that are natively latitude-longitude, such as ADS40 and satellite projects.

1. Google and Google Maps are either registered trademarks or trademarks of Google, Inc. DAT/EM Systems International is not responsible for the availability or quality of the imagery that appears in Google Maps.



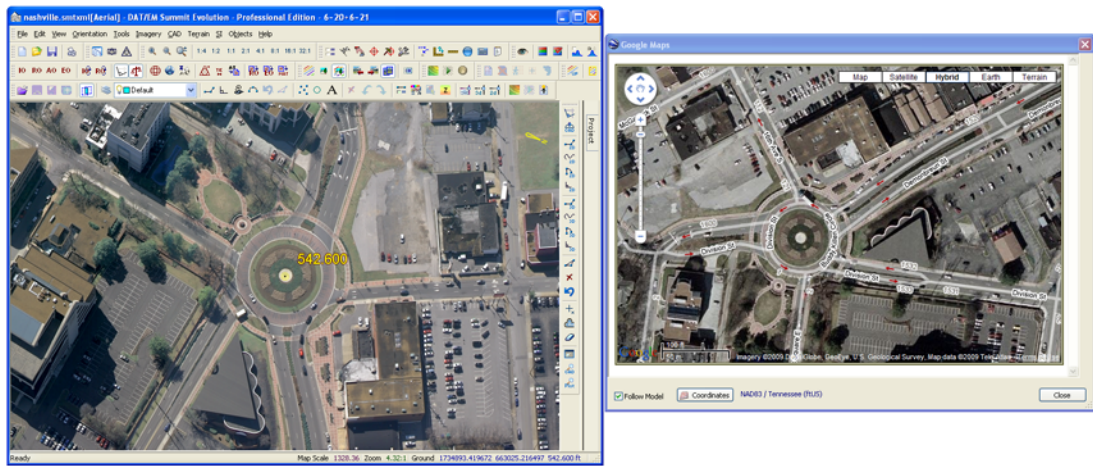
- If you select the **Earth** view, and the Google Earth™ plug-in is not installed, you will be prompted whether or not you'd like to add it. This is your choice. Get the plugin if you'd like to use the Google Earth options:

If you select **Earth** and the Google Earth plugin is not yet installed, expect to be prompted to install it.



- Once the coordinate system is set, the Google Maps view should show the same position on the Earth as the SUMMIT EVOLUTION cursor. As long as Google Maps has data for the area, it will be displayed in the view. Sometimes zooming out in the Google Maps window is required, depending on the imagery it has available in that area.

- The Google Maps window will not be rotated to the kappa of the SUMMIT EVOLUTION model. The Google Maps window is just like it would be if you opened it directly from www.maps.google.com; it is in latitude-longitude coordinates and north is up.



Tools Menu > Bing™ Maps

The **Bing Maps** option opens a Microsoft® Bing¹ window and shows the area of the SUMMIT EVOLUTION cursor. It works with the following conditions:

- The project is not a Close Range (terrestrial) project.
- The project has a known ground coordinate system.
- The computer has internet access.
- The Blue Marble coordinate transformation database is installed (available on the DAT/EM installation disk).

To use the **Bing Maps** option, perform the following steps:

Step 1) Select **Bing Maps** from the **Tools** menu:



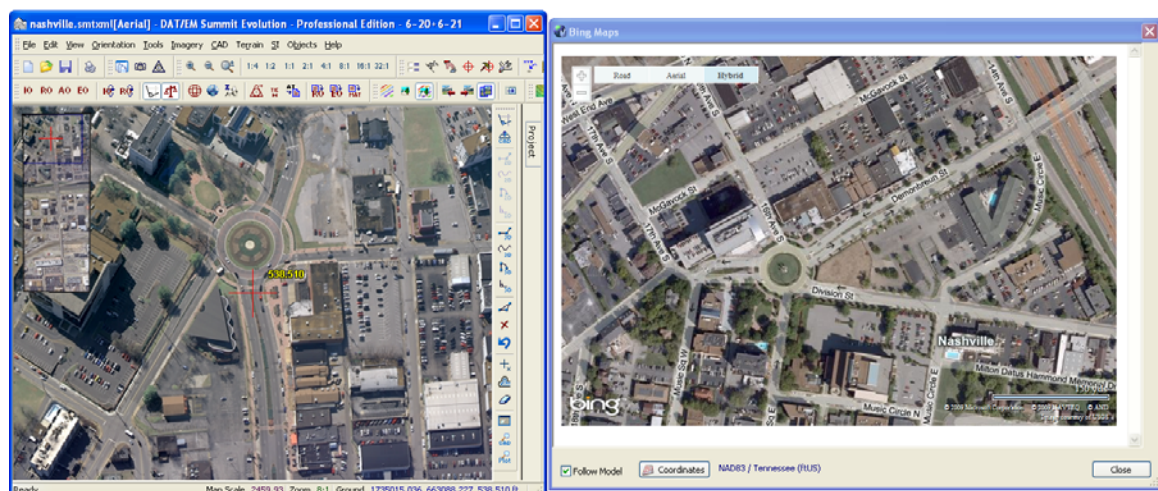
1. Microsoft and Bing are either registered trademarks or trademarks of Microsoft Corporation. DAT/EM Systems International is not responsible for the availability or quality of the imagery that appears in the Bing Maps window.

Step 2) A **Microsoft Bing** window opens. If necessary, select **Coordinates** to set the input coordinate system. Choose a **Follow Model** setting; if on, the Bing Maps window will pan with the SUMMIT EVOLUTION cursor.

- If “** NOT SET **” is shown in the lower part of the window, then a coordinate system is not yet set in the project. Select the **Coordinates** button. Define the ground coordinate system and save the project. (This does not apply a coordinate transformation.)
- Some project types already have a coordinate system defined. No further settings are required for projects that already have a full coordinate conversion applied or projects that are natively latitude-longitude, such as ADS40 and satellite projects.



- Once the coordinate system is set, the Bing Maps view should show the same position on the Earth as the SUMMIT EVOLUTION cursor. As long as Bing Maps has data for the area, it will be displayed in the view. Sometimes zooming out in the Bing Maps window is required, depending on the imagery it has available in that area.
- The Microsoft Bing Maps window will not be rotated to the kappa of the SUMMIT EVOLUTION model; it is in latitude-longitude coordinates and north is up.



Tools Menu > Performance Monitor

The Performance Monitor shows the current status of the video processing. To use the performance monitor, perform the following steps:

Step 1) Select **Performance Monitor** from the **Tools** pull-down menu:



Step 2) Observe the display as SUMMIT EVOLUTION is used.

Step 3) Choose an **SI performance boost** setting. **SI performance boost** is recommended for most modern video cards, especially nVidia cards. This setting will double superimposition performance for most video cards, but it will also double system memory use.

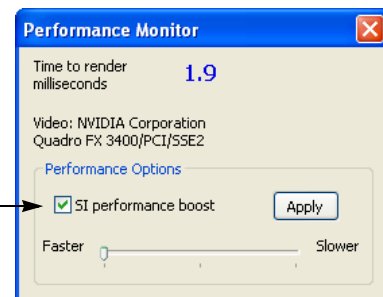
DO NOT use **SI performance boost** with 3DLabs Wildcat video cards; it will reduce performance for Wildcat cards.

You may check the **Time to render in milliseconds** while the SUMMIT EVOLUTION cursor is moving.

- Less than 30 is very good performance. The cursor movement will be smooth.
- 30 to 80 is acceptable performance.
- 80 to 100 is not quite acceptable.
- Greater than 100 is not acceptable. The cursor movement will be stop-and-go and appear very jerky.

While the cursor is still, rendering time may appear to go up, because SUMMIT EVOLUTION saves some processes for when the cursor is not moving.

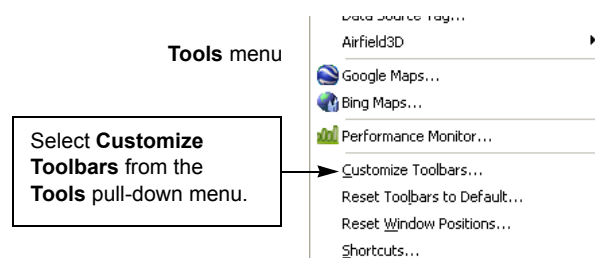
- Use **SI performance boost** with nVidia video cards.
- DO NOT use **SI performance boost** with 3DLabs Wildcat video cards.



Tools Menu > Customize Toolbars

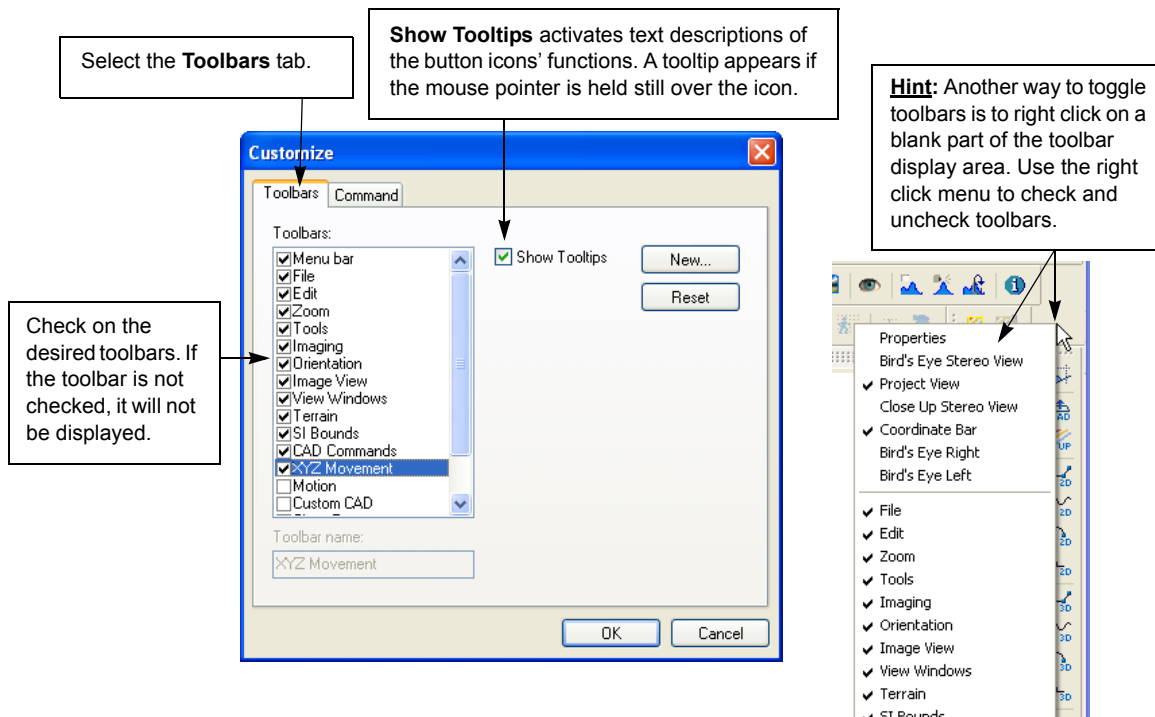
To turn the toolbar displays on or off, to create a new toolbar, and to add tools to any toolbar, perform the following steps:

Step 1) Select **Customize Toolbars** from the **Tools** pull-down menu.

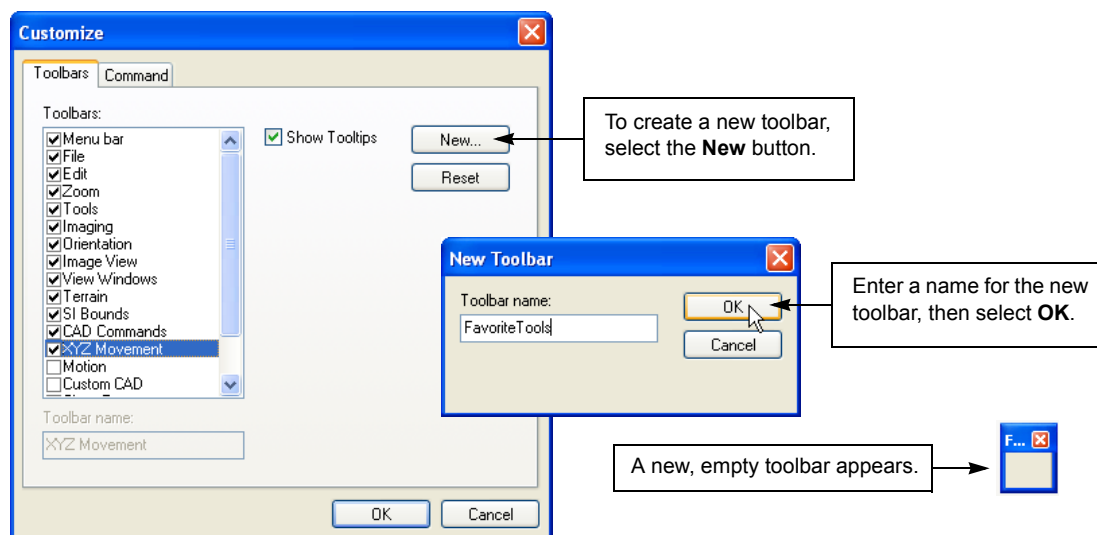


Step 2) Select the **Toolbars** tab.

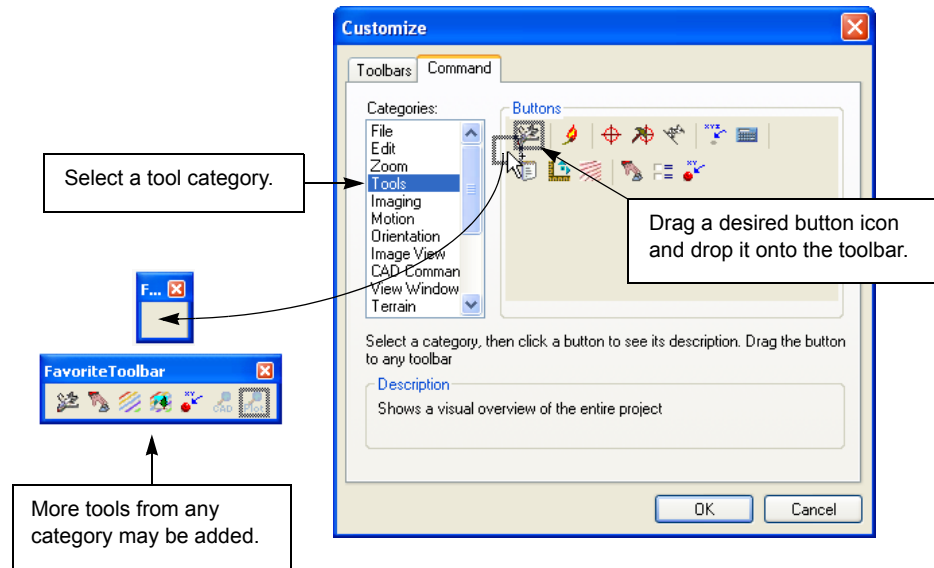
Step 3) Check on or off desired toolbars. Note that when the software is first installed, all the toolbars are checked on for display. The **Reset** option returns them all to their default installation configurations and display. **Hint:** Another method to turn them on or off is to right click on a blank area of the toolbar display area, then check or uncheck the toolbars from the right click menu.



Step 4) To create a new toolbar, select **New** from the **Toolbars** tab. Enter a name for the new toolbar. An empty toolbar appears on the SUMMIT EVOLUTION display:



Step 5) To add tools to any existing toolbar, select the **Command** tab. Select the first desired category. A list of the category's icons appears in the **Buttons** area. To add one of the buttons to the toolbar, click and hold down the left mouse button on the desired button icon, move the mouse pointer to the toolbar, and release the mouse button.



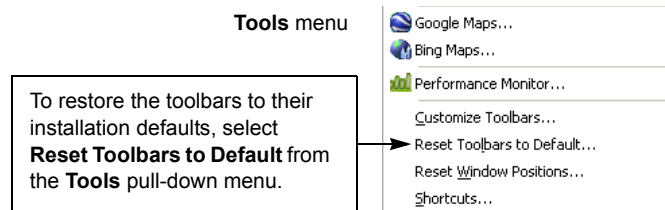
Step 6) Continue dragging and dropping any desired button icons onto the toolbar.

Step 7) If desired, select another category and continue dragging and dropping button icons onto the toolbar. When finished, select **OK**.

Tools Menu > Reset Toolbars to Default

To restore the toolbars to their installation defaults at any time, perform the following steps:

Step 1) Select **Reset Toolbars to Default** from the **Tools** pull-down menu. Please note that any custom “new” toolbars will be removed.

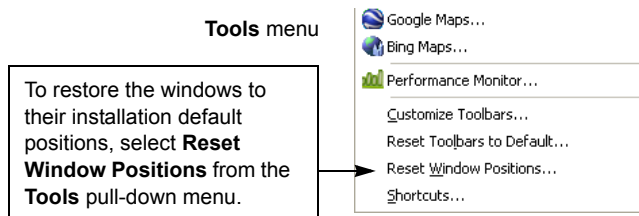


Step 2) A message appears to warn you that any new toolbars will be removed. If this is acceptable, select **Yes**. SUMMIT EVOLUTION must close in order for the command to complete.

Tools Menu > Reset Window Positions

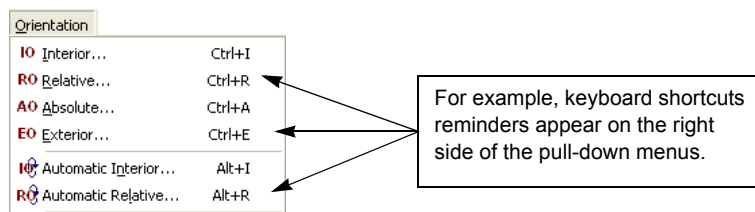
To restore the SUMMIT EVOLUTION windows to their installation default positions, perform the following step:

Step 1) Select **Reset Window Position** from the **Tools** pull-down menu.



Tools Menu > Shortcuts

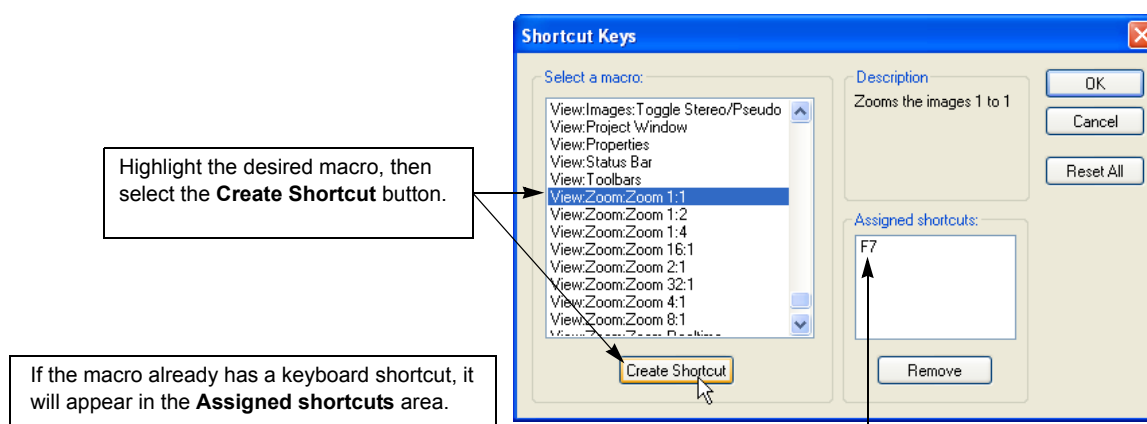
Keys or key sequences on the computer's keyboard may be set as shortcuts. That is, they can be set to activate commands or perform functions in SUMMIT EVOLUTION. There is a default set of keyboard shortcuts, such as F7 to activate the 1:1 zoom, or <Ctrl>S to save the project. These defaults are visible on the right side of the pull-down menus. For example,



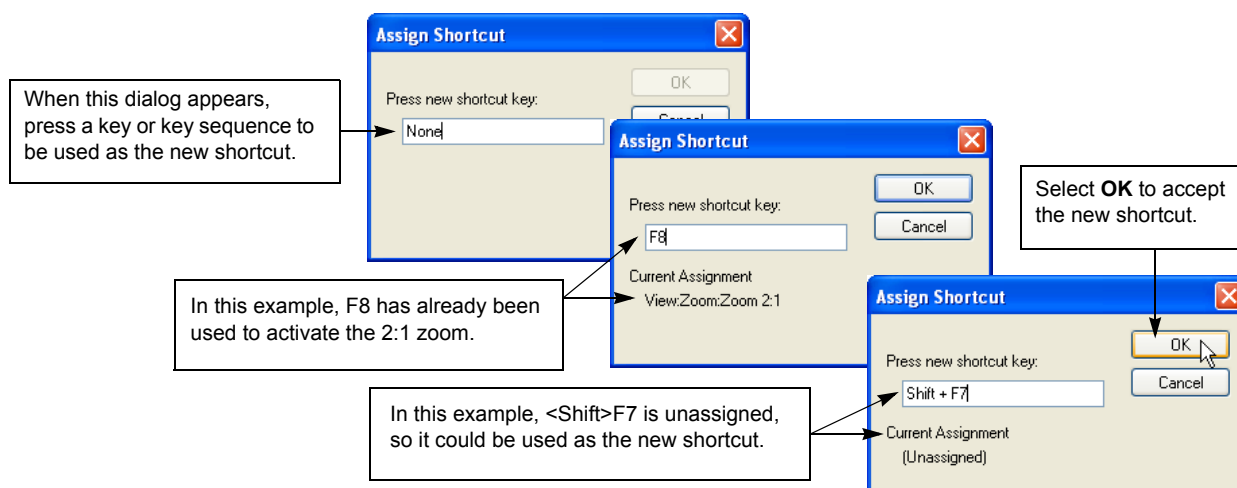
Be aware that keyboard shortcuts will be reset to the defaults each time SUMMIT EVOLUTION is installed. The keyboard shortcuts are stored in a file called **stereoplotter.mac**, which is placed in the **Datam** folder.

To set keyboard shortcuts, perform the following steps:

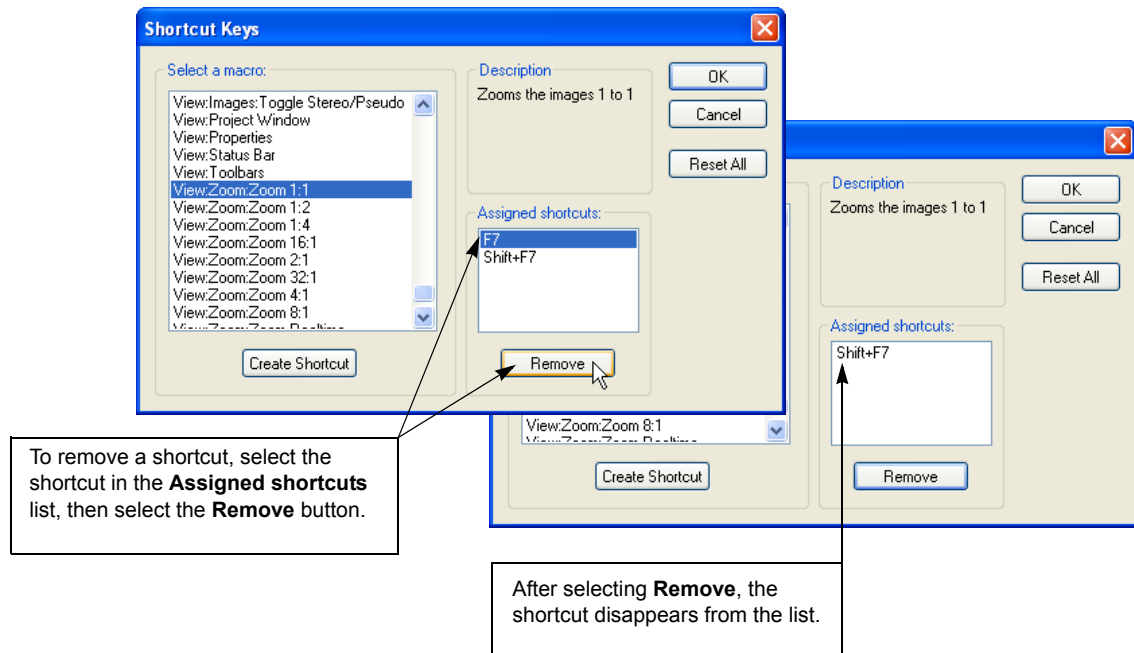
- Step 1)** Select **Shortcuts** from the **Tools** pull-down menu.
- Step 2)** Highlight the desired macro from the **Select a macro** list, then select the **Create Shortcut** button.



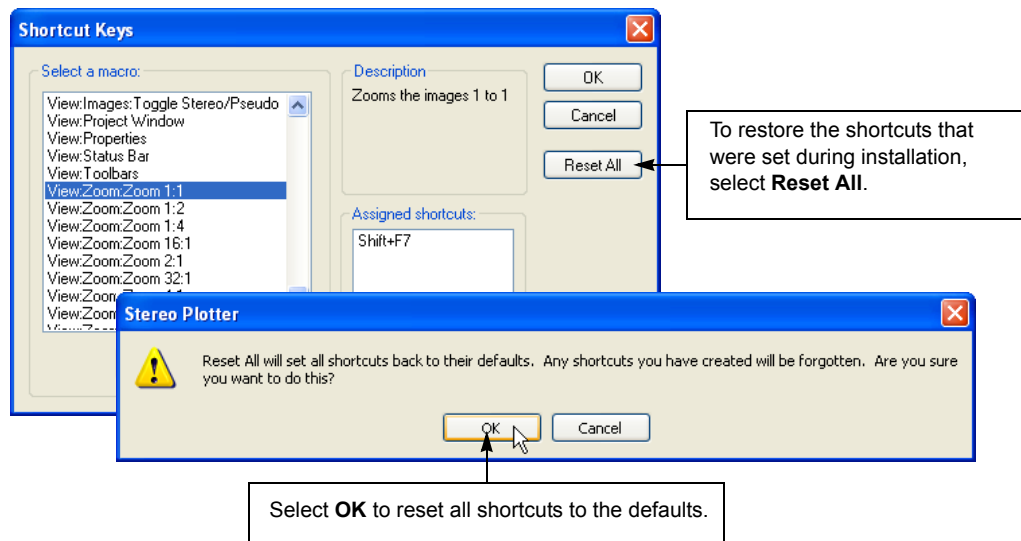
- Step 3)** Press a key (such as F9) or key sequence (such as <Ctrl><Alt>F9) on the keyboard. Notice that if that key sequence has already been used for another shortcut, a "Current Assignment" message will appear. If the key sequence has not been used, the message will indicate, "Unassigned."



Step 4) To remove a shortcut so that it is no longer assigned, select the shortcut in the **Assigned shortcuts** list, then select the **Remove** button.

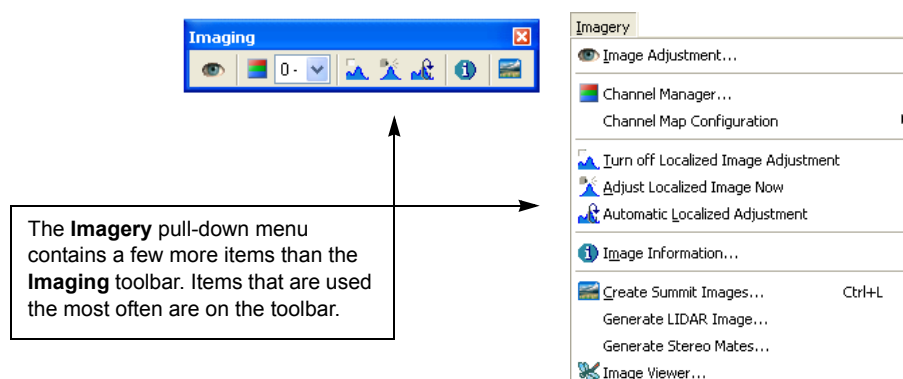


Step 5) If desired, reset all shortcuts to the settings they had when SUMMIT EVOLUTION was first installed. Select the **Reset All** button. A warning will appear,



Imagery Menu

The **Imagery** menu offers several items related to colors, bands, histogram adjustment, information, and image creation. Many of its tools are also available on the **Imaging** toolbar.



These menu items are described in the following locations:

- **Image Adjustment**, immediately below.
- **Channel Manager**, page 25-69
- **Channel Map Configuration**, page 25-73
- **Turn off Localized Image Adjustment**, **Adjust Localized Image Now**, and **Automatic Localized Adjustment**, page 25-73
- **Image Information**, page 25-74
- **Create Summit Images**. This option launches the IMAGE CREATOR application. Instructions for the IMAGE CREATOR are found in “Use Image Creation to Generate .SMTI or .PYR Files” on page 4-6.
- **Generate LIDAR Image**. This option launches the GENERATE LIDAR IMAGE application. See “Generate Images from LIDAR Files” on page 4-13.
- **Generate Stereo Mates**. This option launches the GenStereoMate.exe application. See “Generate Stereo Mate” on page 4-11.
- **Image Viewer**, page 25-75.

Imagery Menu > Image Adjustment Settings

The **Image Adjustment** option of the **Imaging** toolbar and the **Imagery** menu allows you to set brightness, contrast, saturation, color filters, gamma settings, and histogram equalization options. These settings may be applied to the left image, the right image, or all images.

To use **Image Adjustment**, perform the following steps:

Step 1) Select **Image adjustment** or from the **Imaging** toolbar or the **Imagery** menu:



Step 2) Make settings in the **Image Adjustments** dialog:

The Left and Right image settings are independent. Select the **Left** or **Right** tab to make settings for that image.

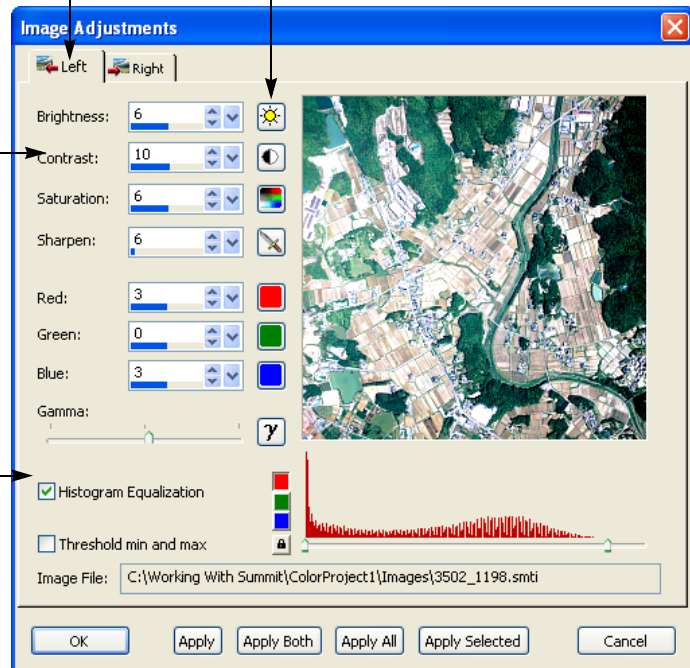
To reset a slider to its center value, click on the icon to the right of the slider.

Drag the sliding scales to adjust the brightness, contrast, saturation, sharpen*, color filters, and gamma settings. Changes can be viewed immediately on the preview window.

*** ATTENTION 3DLabs Video Card Users! DO NOT change the Sharpen setting if using an older 3DLabs video card! Setting a non-zero value with a 3DLabs video driver will cause Windows to crash.**

The pixels' brightness distribution for the selected color band is shown in the diagram in the lower right of the dialog box. A sharp spike in the original brightness distribution indicates that a histogram equalization may help to make image features more visible. There are three independent methods to activate a histogram equalization:

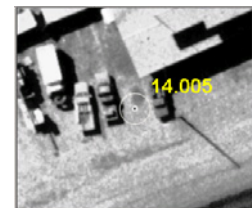
- Check on **Histogram Equalization** to activate a brightness adjustment based on the brightness distribution of the *whole original image*. (Note that there are also toolbar icons to activate histogram equalization just around the cursor. See the next step below for instructions.)
- Check on **Threshold min and max** to set a custom color distribution using the color button and slider bar pointers. To set all the color distribution sliders the same, click on (highlight) the lock button before moving the slider pointer. If the lock button is off, the slider pointers for each color may be set independently.
- The **Shift** setting affects 16 bit images such as ADS40 imagery. If the image is not 16 bit, the setting is ignored. If the images appear too dark, check on the **Shift** setting to shift the distribution toward the center of the spectrum.



Histogram Equalization Example



Histogram Equalization off

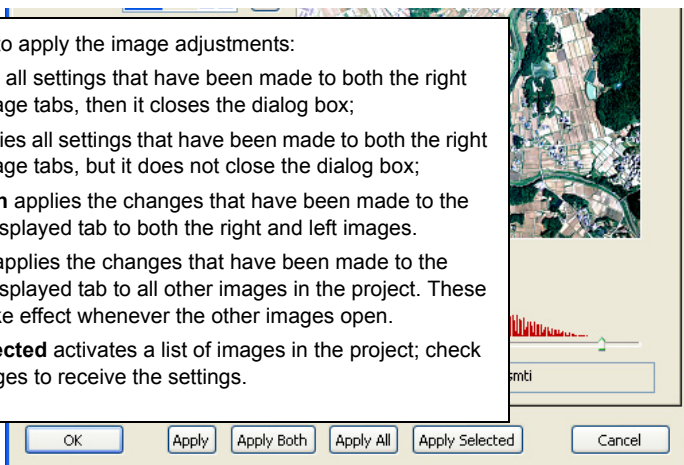


Histogram Equalization on

Step 3) Choose how to apply the image adjustments:

Choose how to apply the image adjustments:

- **OK** applies all settings that have been made to both the right and left image tabs, then it closes the dialog box;
- **Apply** applies all settings that have been made to both the right and left image tabs, but it does not close the dialog box;
- **Apply Both** applies the changes that have been made to the currently displayed tab to both the right and left images.
- **Apply All** applies the changes that have been made to the currently displayed tab to all other images in the project. These settings take effect whenever the other images open.
- **Apply Selected** activates a list of images in the project; check on the images to receive the settings.



Imaging Menu > Channel Manager

The **Channel Manager** has two main functions:

- It allows you to choose which of the image's color bands to display on the red, green, and blue display channels. For example, if there is an infrared band, it could be displayed on the blue channel instead of the usual blue band.
- For 9- to 16-bit imagery, it allows you to choose how to map the image's color ranges to display colors. The goal is to enhance – or spread apart – certain pixel colors for better viewing of subtle color differences. For example, this may help to see different shades of color in vegetation or to lighten and enhance features in areas of shadow.
- It allows you to store up to ten channel maps for each image in the project.

Even if you don't set a specific color map, a default map is always in effect for 9- to 16-bit colors to map them to the 8-bit display color range. The reason is that the human eye and the computer's monitor cannot detect or display the fine differences in color shades that exist in a 9- to 16-bit image. Examples of a default color map works as follows:

For a 12-bit image, each band has $(2^{12} - 1) = 4095$ individual colors. These colors must be forced to display in an 8-bit range of $(2^8 - 1) = 255$ colors. $4095/255 \approx 16$. Two colors from the image are mapped to one color in the display. For example, colors 1 and 2 from the image are mapped to color 1 in the display. Colors 3 and 4 from the image are mapped to color 2 in the display. Colors 5 and 6 from the image are mapped to color 3 in the display, and so on until colors 4094 and 4095 are mapped to color 255 in the display.

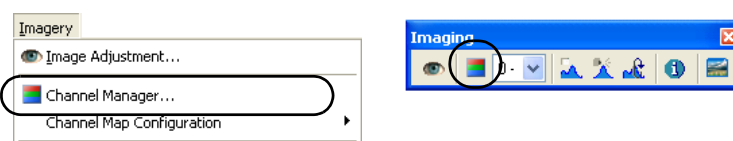
For a 16-bit image, each set of 257 image colors are mapped to one color in the display. Colors 1-257 are mapped to color 1 in the display, colors 258-514 are mapped to color 2 in the display, and so on. This means you cannot see the difference between color 258 and color 514 from the original image, because they are mapped to the same display color.

Why might you want to change the color map? Let's say that you are determining tree varieties using a 16-bit image. Two different varieties of trees have a subtle difference in their shades of green; one has leaves that are slightly darker green than the other's leaves. The 16-bit image certainly has them recorded as different colors, but the default color map "shrinks" these color ranges down to the same or very similar colors in the 8-bit color range display. Your eyes cannot see any difference in the two kinds of trees using the default color map. You could discard parts of the spectrum that are not used and the parts that don't interest you, such as near-black or near-white. Then with just the part of the spectrum that contains the trees, map fewer 16-bit colors to each output color. Instead of allowing it to map 257 colors to 1 color for the entire spectrum, you could set it to map 25 colors to 1 color for the shades of green that interest you. With your custom color map, the shades of green are spread out enough for you to clearly see the difference between the two types of trees.

In summary, a 9- to 16-bit image may contain more information on color – frequency of light radiation – than your eye can detect or the computer monitor can display. But with color mapping, you can force these colors to display as distinct, different shades that you can see clearly.

To use the **Channel Manager**, perform the following steps:

Step 1) Select **Channel Manager** or from the **Imaging** toolbar or the **Imagery** menu:



Step 2) Begin to make settings in the **Channel Manager** dialog:

Choose a **Configuration** number.

The ten channel maps associated with one image may be different from the ten channel maps associated with another image, even if the two images form a model. For example, Image A and Image B form ModelAB. Channel map configuration "4" in Image A could be different from channel map "4" in Image B. When ModelAB is open and Channel Map Configuration is set to "4" on the Imaging toolbar, both images have their individual "4" configurations applied at the same time in the main view.

Note! Applying the configuration stores/saves the settings to one or more images; it does NOT activate that configuration in the main view (it may update it, if it is already active). To activate the configuration in the display, use Channel Map Configuration on the Imaging toolbar.

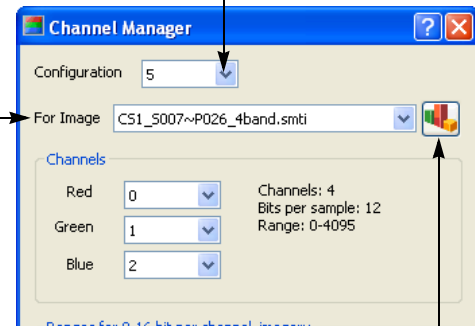
For Image is an image in the project that is used as:

- input for the histogram if the **Histogram** button is used
- the image that accepts the settings when the **Apply** button is used

This image is not required to be open. The default image is the open left image, or, if an image is not open, the first image in the project.

If **Apply Selected** is used, this image will be ignored unless it is checked on in the Select Images dialog.

Note! **Apply** stores/saves the settings to the image; it does NOT activate that configuration in the main view, even if the image is open. To activate the configuration in the display, use **Channel Map Configuration** on the **Imaging** toolbar.



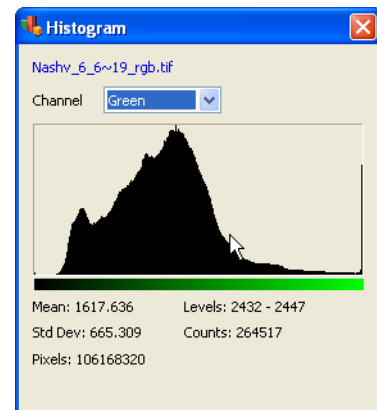
The **Histogram** button reads in the entire **For Image** file and produces an interactive histogram diagram.

This could take a very long time. Every pixel in the image is analyzed; nothing is estimated or skipped. Speed is limited by hardware and the size of the file. However, the results are worth the wait, because the information can help you choose the best possible pixel ranges.

Use the information on the histogram diagram to make **Use Ranges** settings in the Channel Manager dialog. Move the mouse cursor across the diagram to see dynamic **Levels** and **Counts** at the mouse pointer.

- **Levels** are the range of pixels at the mouse cursor location that would be mapped to a single pixel in the 8-bit display with **Use Ranges** OFF. (This shows the default to-8-bit mapping.)
- **Counts** are the number of pixels found within the **Levels** range.
- **Std Dev** stands for *standard deviation*.
- **Pixels** is the total number of pixels in the image.

Note: Multiple histogram diagram windows may be open at the same time. While other histogram windows remain open, change the **For Image** file and select the **Histogram** button again.



Example of a histogram diagram

Step 3) Continue to make settings in the **Channel Manager** dialog:

Channels are usually the red, green, and blue bands of an image. Some images also have infrared or false infrared channels. The number of channels in the image will be offered as numbers 0, 1, 2, 3, etc.

Because it is so common for so many images, the default settings are red=0, green=1, and blue=2. Please be aware that this band order is not the same for every image.

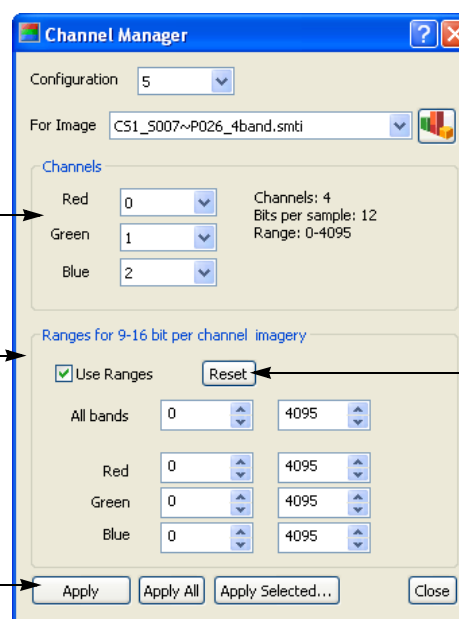
You may change which channel is mapped to which color band. The same channel may be set to more than one color.

Use Ranges allows you to set pixel ranges for 9- to 16-bit per channel imagery.

- Any colors below the lowest value will all be mapped to black.
- Any colors higher than the highest value will all be mapped to white.
- The remaining range of colors will be divided by 255, and the result is the number of original image colors that will be mapped to each 8-bit display color.

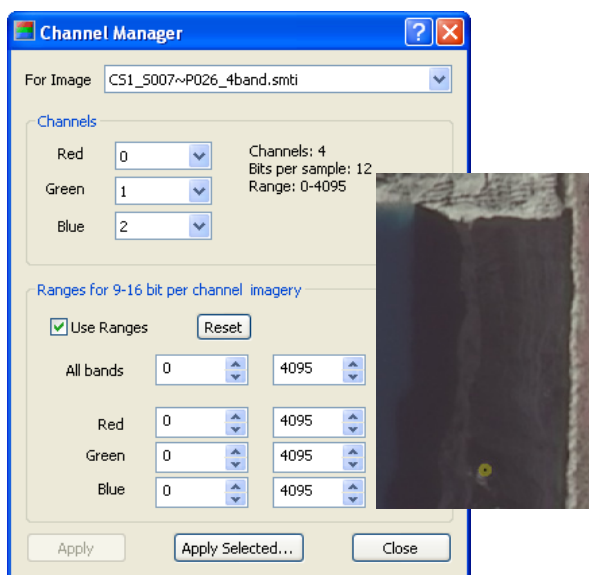
- **Apply** saves the settings for the **For Image** file only.
- **Apply All** saves the configuration for all images in the project.
- **Apply Selected** displays a list of all images in the project. Check on images to select them, then apply the configuration to all the checked images.

Note: The **Apply** options save the configuration in the list of ten configurations for an image, but they do not turn on the configuration in the current display. To turn on a configuration in the display, close the Channel Manager and choose a configuration number from the **Channel Map Configuration** setting on the **Imaging** toolbar

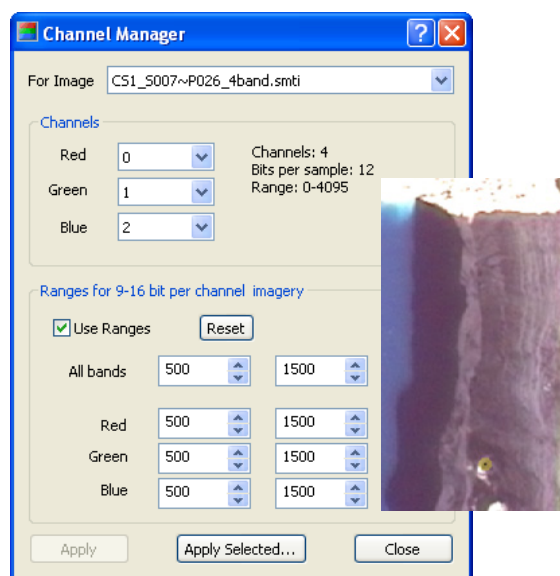


The **Reset** button sets the low values back to 0 (zero) and the high values back to the highest pixel color for the input image (such as 4095 for the 12-bit image shown here).

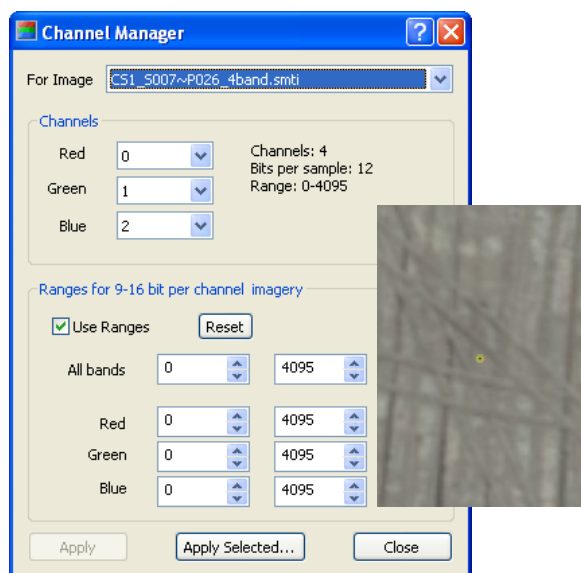
Examples of Use **Ranges** range mapping:



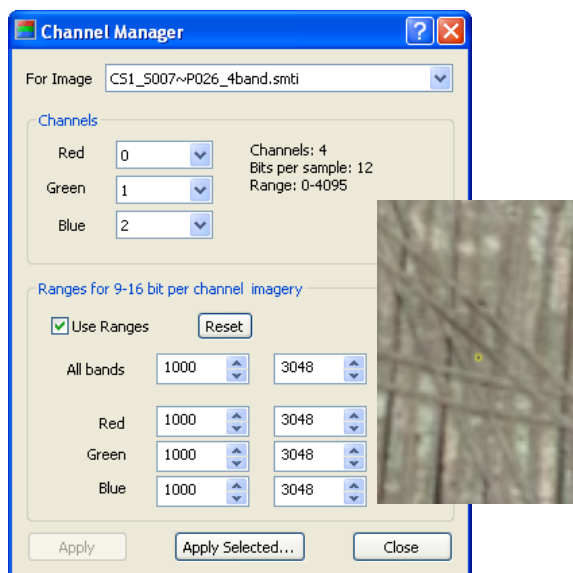
Example 1: In this 12-bit image at the default map of 0-4095, it is difficult to see ground features in this area of shadow.



Example 1: The darkest values (0-499, because the shadows are not completely black) are removed as well as the brightest part of the spectrum (1501-4095). Ground features in the shadows become more distinct.



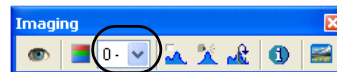
Example 2: In another area of the same 12-bit image, the shades of gray are too similar to each other. Features are indistinct.



Example 2: The darkest values (0-999) are removed as well as the brightest part of the spectrum (3049-4095). Ground features become more distinct.

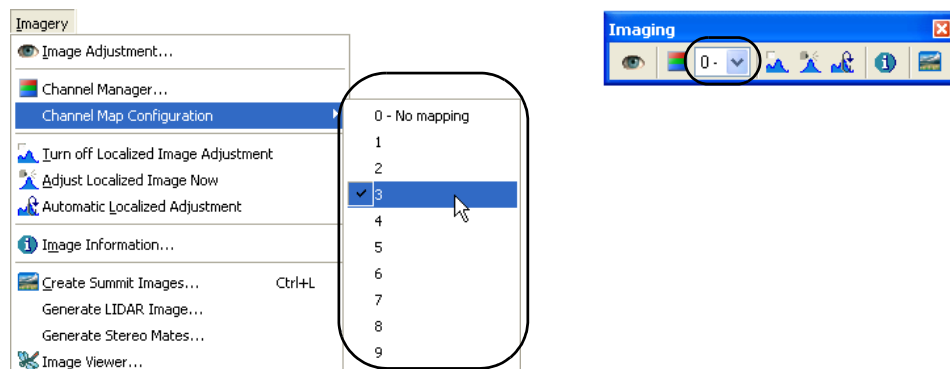
Step 4) Select **Apply** (apply to the **For Image** only), **Apply All** (apply to all images in the project), or **Apply Selected** (apply to checked images).

Note! The **Apply** options save the configuration in the list of ten configurations for an image, but they do not turn on the configuration in the current display. To turn on a configuration in the display, close the Channel Manager and choose a configuration number from the **Channel Map Configuration** setting on the **Imaging** toolbar.



Imaging Menu > Channel Map Configuration

The **Channel Map Configuration** option sets a channel mapping choice. Please note:



- Each image can have its own set of ten configurations. For example, if you choose “2”, and the two open images have different maps saved for “2”, then the map that is activated for the left image will be different than the map that is activated for the right image.
- Use the Channel Manager (page 25-69) to make the ten possible configuration settings for each image.
- **0 - No Mapping** deactivates channel mapping.

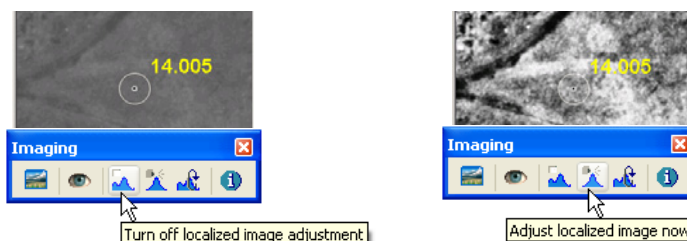
Imaging Menu > Histogram Adjustment Settings

There are three options on the **Imaging** toolbar that control localized histogram adjustments:



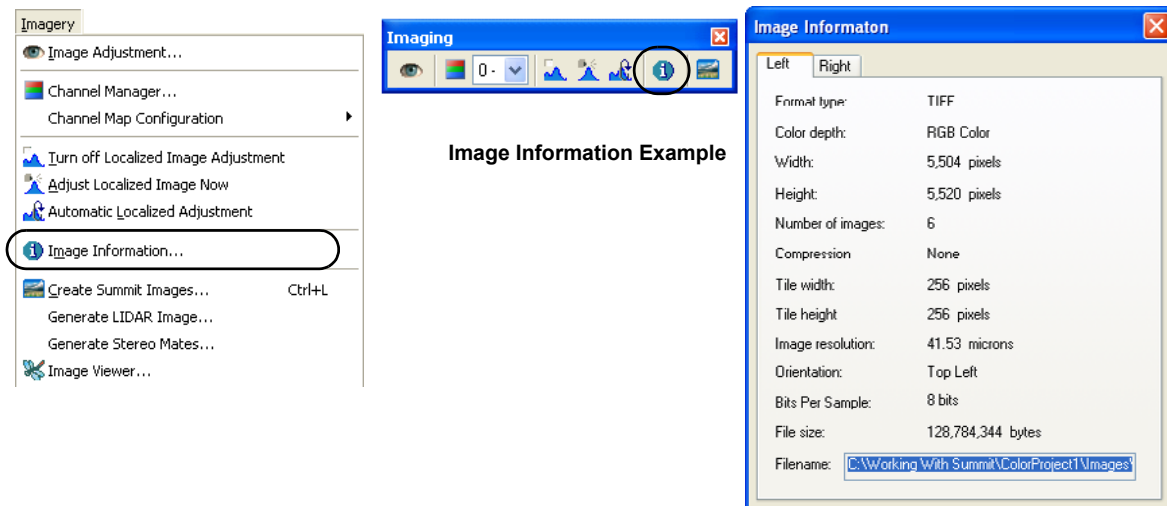
- **Turn off localized image adjustment** turns off the most recently selected *localized* image adjustment. That is, it turns off **Adjust localized image now** and **Automatic Localized Histogram**, but it does not affect the **Histogram equalization** checkbox setting on the dialog box shown in Step 2 of “Imagery Menu > Image Adjustment Settings” on page 25-68 above.
- **Adjust localized image now** activates a histogram equalization based on brightness of the image currently displayed in the Image View. This equalization stays the same even if the view is changed.
- **Automatic Localized Histogram** activates a histogram equalization based on brightness of the image displayed in the Image View. This equalization updates for the new view image every time the view changes. When panning, there may be a delay as each histogram is calculated.

Histogram Equalization Example



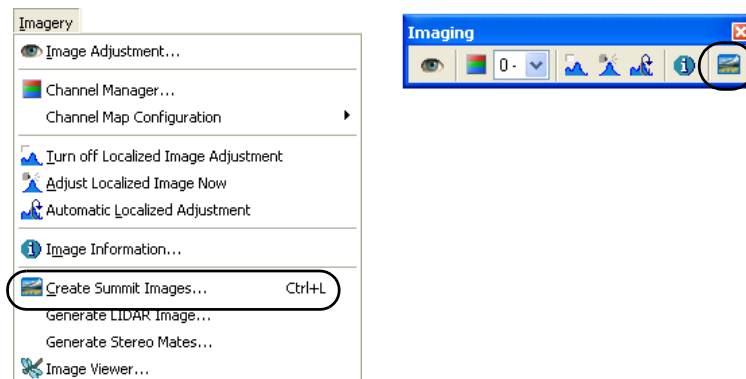
Imaging Menu > Image Information

The **Image Information** option of the **Imaging** toolbar and the **Imagery** menu offers information about the open image(s). If two images are open, there will be **Left** and **Right** tabs to show information about the individual images.



Imagery Menu > Create Summit Images

The **Create Summit Images** option of the **Imaging** toolbar and the **Imagery** menu launches the IMAGE CREATION application. See “Use Image Creation to Generate .SMTI or .PYR Files” on page 4-6 for instructions.



Imagery Menu > Generate LIDAR Image

The **Generate LIDAR Image** option on the **Imagery** menu launches the GENERATE LIDAR IMAGE application. See “Generate Images from LIDAR Files” on page 4-13.

Imagery Menu > Generate Stereo Mate

The **Generate Stereo Mate** option on the **Imagery** menu launches the **GenStereoMate.exe** application. See “Generate Stereo Mate” on page 4-11.

Imagery Menu > Image Viewer

The **Image Viewer** option on the **Imagery** menu launches the DAT/EM VIEWER application. This application opens a single image in any of the formats that SUMMIT EVOLUTION accepts, including orthophotos.

The DAT/EM VIEWER may either run by itself or at the same time as SUMMIT EVOLUTION. If it opens an orthophoto in the same coordinate area as the currently open SUMMIT EVOLUTION model, the SUMMIT EVOLUTION cursor may control the cursor in the DAT/EM VIEWER.

For IMAGE VIEWER instructions, see *Chapter 29*.

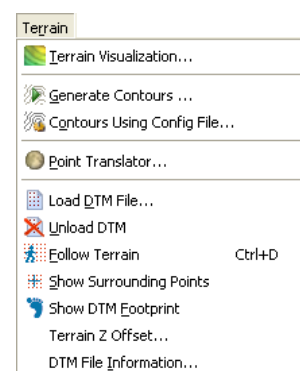
CAD Menu

The **CAD** menu offers to activate commonly used commands in AutoCAD, MicroStation, or ArcGIS. It also offers the editor and selections for the **Custom CAD** toolbar. These are discussed in “Activate CAD/GIS Commands from Summit Evolution” on page 23-2 and “Configure and Use the Custom CAD Toolbar” on page 23-2.

Terrain Menu

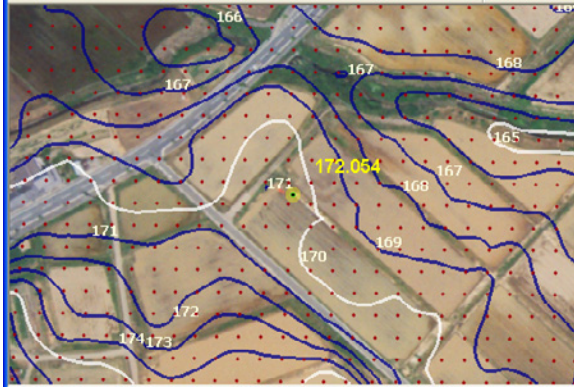
The options on the **Terrain** menu are described in the following locations:

- **Terrain Visualization.** “Terrain Menu > Terrain Visualization” on page 25-76.
- **Generate Contours.** “Terrain Menu > Generate Contours” on page 25-80.
- **Generate Contours Using Config File.** “Terrain Menu >: Generate Contours Using a Configuration File” on page 25-83.
- **Point Translator.** “Terrain Menu > Translate or Distribute Points (Point Translator)” on page 25-84.
- **Load DTM File, Unload DTM, Follow Terrain, Show Surrounding Points, Show DTM Footprint, Terrain Z Offset, and DTM File Information.** See below, “Terrain Menu > Terrain Following Options (Multiple Options Described)” on page 25-90.

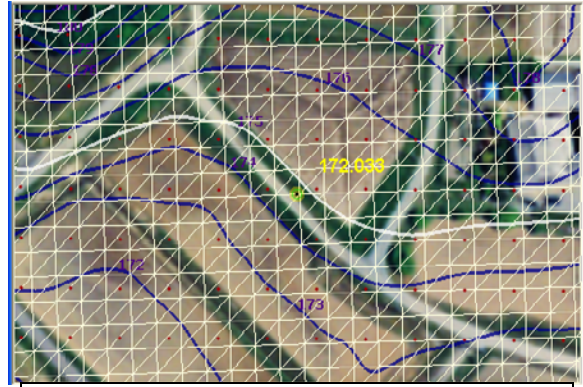


Terrain Menu > Terrain Visualization

The **Terrain Visualization** tool allows you to see TIN (Triangulated Irregular Network) lines and/or an estimate of the contours that could be generated based on the points and breaklines that are displayed in superimposition. Its purpose is to help verify the accuracy of the elevation data in preparation for actual contour generation.



Example of **Terrain Visualization** set to show contours and elevation labels.



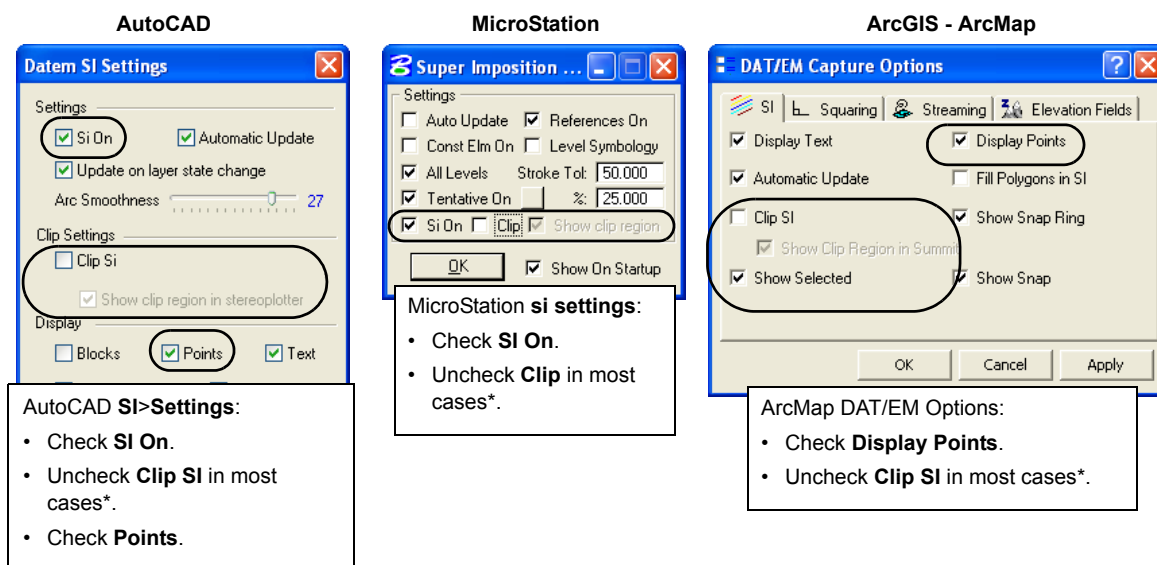
Example of **Terrain Visualization** set to show TIN, contours, and labels. (The points appear offset from the TIN because this graphic shows the left image only.)

The TIN and contours are estimated. Their accuracy falls off near the edges of the view.

To use **Terrain Visualization**, perform the following steps:

- Step 1)** Both SUMMIT EVOLUTION and DAT/EM CAPTURE in AutoCAD, MicroStation, or ArcMap must be running and have certain settings on. Prepare the following:
- a.) The elevation data must exist as point objects in the current drawing/design/map file. The point layer(s) must be selected for use in the SUMMIT EVOLUTION SI Layer Manager's **Terrain Visualization** list.
 - b.) If breaklines will be used, they must exist in the current drawing/design/map file. The breakline layer(s) must be selected for use in the SUMMIT EVOLUTION SI Layer Manager's **Terrain Visualization** list.

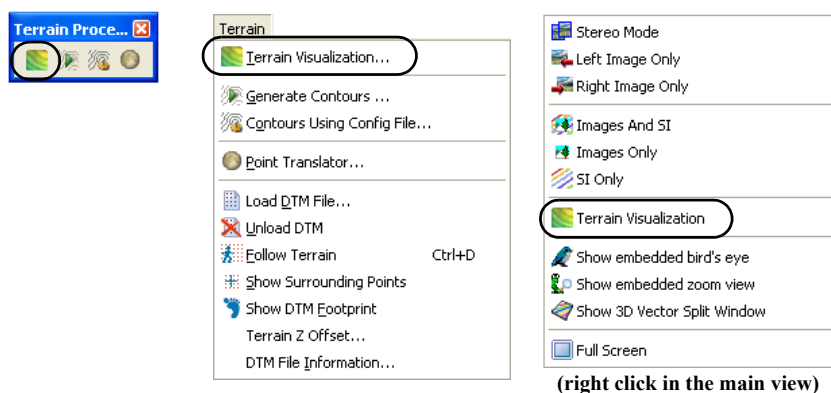
c.) Make the following settings depending on your DAT/EM CAPTURE package:



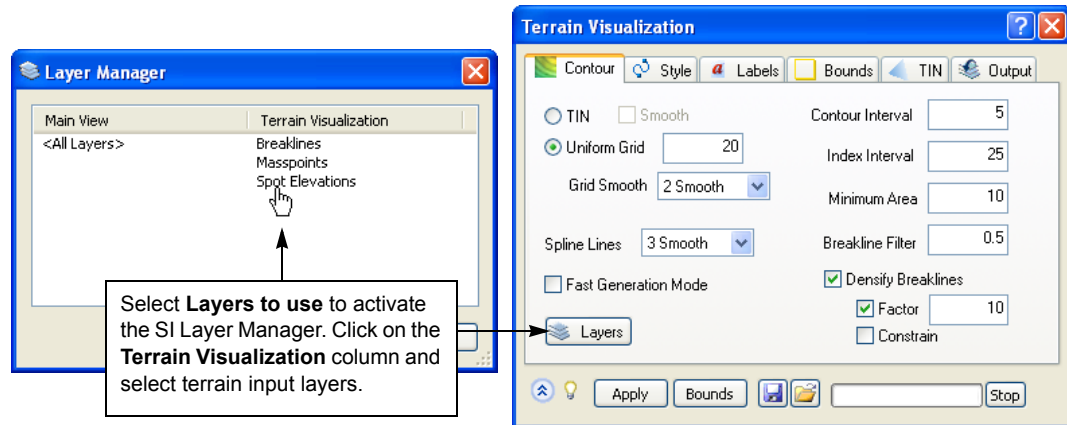
* DAT/EM recommends to turn off SI clipping from the CAD/GIS side in most cases. If the drawing/design/map file is extremely large, SUMMIT EVOLUTION may become slow to update Terrain Visualization contours when the view pans. If this happens, try turning on SI clipping to see if it improves the Terrain Visualization update speed (it may not). Note that in most cases, SI clipping will actually slow down Terrain Visualization.

Step 2) Choose a method to start Terrain Visualization:

- Select **Terrain Visualization** from the **Terrain Processing** toolbar:
- Select **Terrain Visualization** from the **Terrain** pull-down menu.
- Click the right mouse button in the SUMMIT EVOLUTION main view; select **Terrain Visualization** from the right click menu.



- Step 3)** Make settings on the **Contours** tab. Select the **Layers to use** button to activate the SI Layer Manager. Click on the **Terrain Visualization** column and select layers (MicroStation levels or AutoCAD/ArcGIS layers) as input for Terrain Visualization. Check only those layers that contain contour generation input such as DTM points and breaklines. For more information on the Layer Manager, see page 27-6.



- Step 4)** Return to the Terrain Visualization dialog. Make settings on each of the settings tabs. Use the “?” dialog help for information on specific settings. After making changes, select the **Apply** button.
- Step 5)** Pan and zoom to the view area in SUMMIT EVOLUTION where you wish to see the contours and/or TIN lines.
- Step 6)** Select the **Bounds** button. This sets the SI bounds and the visualization area to the current view size. If the number of superimposed points within the bounds are not too low or too high (set by **Maximum Points** on the **Bounds** tab), contours and/or TIN lines are estimated and displayed for that area.

Set bounds may be used again to reset the visualization area any time the view zoom changes.

Automatically update bounds allows the SI bounds to recenter around the cursor as soon as the cursor pans out of the current bounds area.

New contour/TIN lines are generated when the SI bounds recenter.



Use **Clip SI to bounds** only when both of the following conditions exist:

1. The CAD/GIS file contains an extremely large amount of data.
2. When Terrain Visualization processes too slowly.

Note: When **Clip SI to bounds** is first checked on, it attempts to set **SI Clipping** on in the CAD/GIS package. If this fails (usually because the CAD/GIS SI Settings dialog is already open), clipping may not be able to synchronize with the **Automatically update bounds** process.

- **Maximum points** prevents Terrain Visualization from trying to calculate TIN/contours when there are too many input points inside the current bounds.
- **Maximum Segments** is the maximum number of contour polyline segments that may be generated. If more segments are attempted, contour calculations will stop.

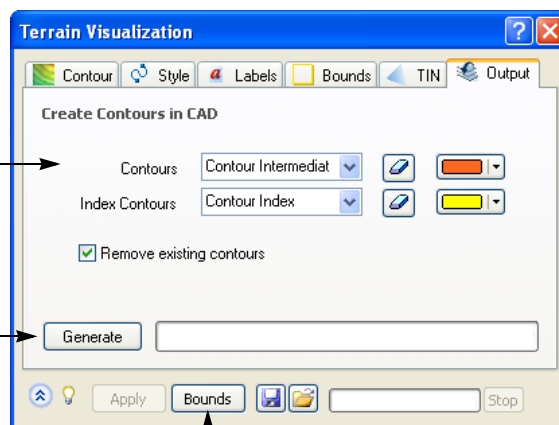
Bounds can be used to change the size of the SI bounds box after zooming.

- Step 7)** If desired, use the  **Collapse dialog** and  **Expand dialog** buttons to set the size of the dialog box. The Terrain Visualization dialog must remain on in order to show contour/TIN lines.
- Step 8)** If desired, use the Full Screen (page 25-24) option. Terrain Visualization works in both regular screen or full screen modes.
- Step 9)** If Terrain Visualization attempts to calculate TIN/contours with too much input, the status bar will indicate slow processing. If it is too slow, use the **Stop** button to cancel the calculation, then check the settings for **Set bounds** and **Maximum points** on the **Bounds** tab.
- Step 10)** (Optional) The contours viewed in Terrain Visualization may be exported to the active AutoCAD, MicroStation, or ArcMap session. Make settings on the **Output** tab and select **Generate**. Contours for the entire input area (not just the current bounds area) will be exported.
- Please use the dialog “?” for help on individual settings.
 - Note that if the **Contours** and **Index Contours** layers listed here are also included in the SI Layer Manager as breakline layers (Step 3 on page 25-78), the two layers will be ignored as breaklines. Please make sure that breaklines are *not* located on these contour layers.
 - Note that the output contours are very simple; they have no exterior bounds, exclusion areas, or depression detection. If more complex settings are desired, please use the CONTOUR CREATOR instead (see “Terrain Menu > Generate Contours” on page 25-80 below).

The **Output** tab allows settings to create contours for the entire input area and export them to AutoCAD, MicroStation, or ArcMap.

Note that these are simple contours. For more complex settings such as exclusion areas and depression detection, please use the CONTOUR CREATOR instead (page 25-80).

Select **Generate** to export the contours.



The current **Bounds** are ignored for **Output**. Contours for the entire input set are generated.

Terrain Menu > Generate Contours

Not included in Feature Collection Edition

SUMMIT EVOLUTION provides a contour generation application called CONTOUR CREATOR. It takes input from the CAD/GIS file and/or files and outputs elevation contours either into a file or directly into AutoCAD, MicroStation, or ArcGIS.

Note: Detailed instructions are in the *CONTOUR CREATOR Operation Manual* (available on the DAT/EM media disk or for download on www.datem.com). Brief, condensed instructions are given below.

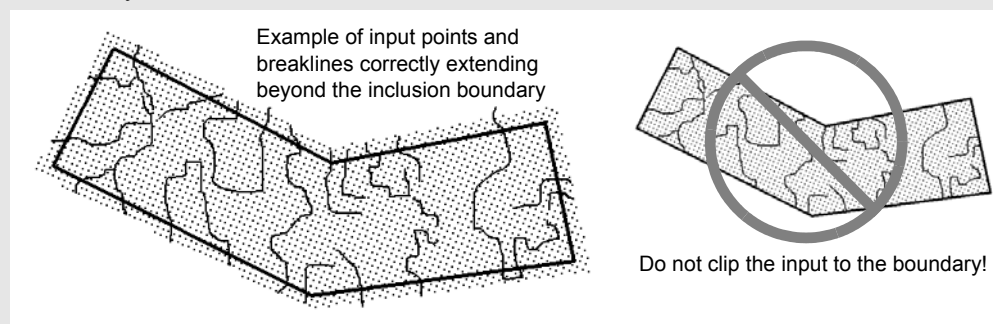
Before generating contours, prepare and verify the input data:

- Input data in one or more files (many formats accepted) or in the currently open CAD/GIS file. Input includes one or more sets of elevation points, breaklines, soft breaklines, borders, and exclusion areas.
- AutoCAD blocks and MicroStation shared cells will be treated as points (based on the block/cell insertion point).
- If needed, use the POINT TRANSLATOR (page 25-84) to process input files.
- If the input data is in the CAD/GIS file, use Terrain Visualization (page 25-76) to verify it.
- Perform any necessary editing of the input data.

Note: Input points, breaklines, soft breaklines, and exclusion areas should be provided for a certain distance outside the boundary. Input data outside the boundary affects the quality of the contours near the boundary.

The suggested distance is at least two “average grid sizes” past the boundary. That is, if there is a regular grid of input points at “n” ground units apart, provide input data for at least “2n” ground units beyond each inclusion area boundary.

For example, if the average grid size is 0.25 meters, provide data for at least 0.5 meters beyond the boundary.



To generate contours, perform the following steps:

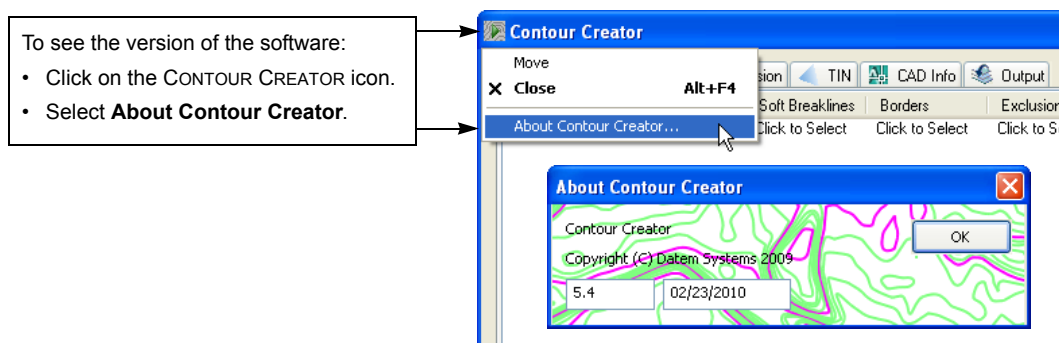
- Step 1)** If AutoCAD, MicroStation, or ArcGIS layers/levels will be used as either input or output, make sure that CAD/GIS application is currently running with DAT/EM CAPTURE loaded and that it has the correct file open. Make sure any layers or levels that will be used to import contours do not already contain objects that should be preserved. CONTOUR CREATOR may use contour replacement commands that can delete *everything* on the layer or level!

If one or more vector files will be used as input for exclusion areas or boundaries, prepare the vector file. They may be AutoCAD **.dwg**, MicroStation **.dgn**, ArcGIS **.shp**, or **.dxf** files. “Polygons” are found for AutoCAD closed polylines, MicroStation shapes, and ArcGIS shapefile polygons. If text is found inside a boundary polygon, the first line of the first text instance will be used as the boundary name, which is in turn used as the output file name.

- Step 2)** Select **Generate Contours** from the **Terrain Processing** toolbar or **Terrain** pull-down menu.



Note: To check the version number of the CONTOUR CREATOR application, click on the CONTOUR CREATOR icon at the upper left of the window; select **About Contour Creator**.

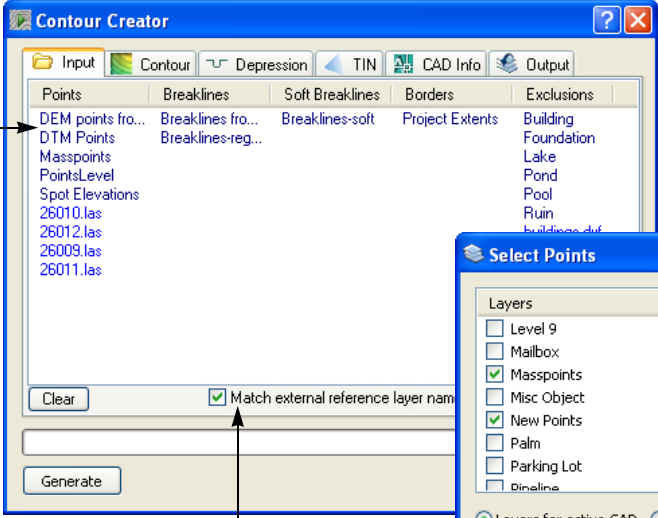


- Step 3)** (Optional) To use previously saved settings, select the **Open Settings File** button. Browse for a settings file that was saved earlier using CONTOUR CREATOR’s **Save Settings File** option. Continue with the following steps to review the settings.

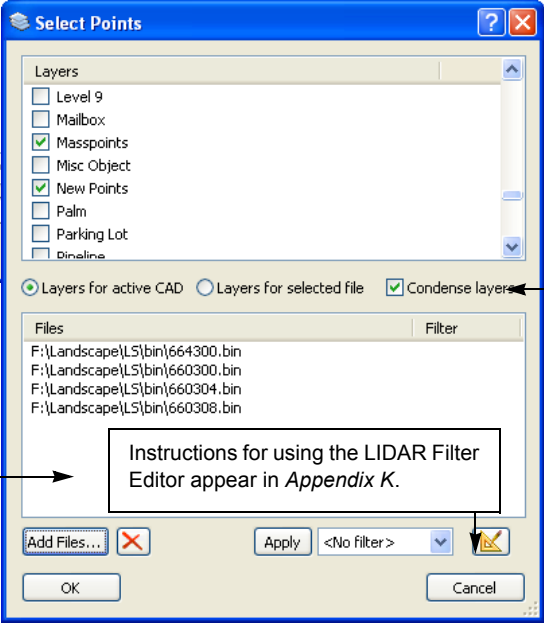
Step 4) Select the **Input** tab and make settings. Click directly on a list to make selections for that input type. It is acceptable to leave any list blank *except Points*.

Click directly on each list to make selections for that input type.

- The minimum requirement is to have one source of **Points** input.
- If an input type (other than **Points**) does not exist, leave that list blank.



If Match external reference layer names is on, layers checked on for the main file are automatically checked on for any external reference files that may be attached to the open AutoCAD or MicroStation file. This works well if the layer names are consistent among all the vector files.



Select one or more sources of input data:

- Check any layers/levels in the currently open CAD/GIS file that contain this type of input data.
- For data contained in files, select **Add Files** and select one or more input files.
- Both layers and files may be selected; however, for maximum processing speed, be careful not to select a file and a layer that contain exactly the same data.
- Only points, AutoCAD blocks, and MicroStation shared cells will be used for "Points" data; if a checked points layer contains linework objects, they will be ignored.
- Only linework objects will be used for "Breaklines" data; if a checked breaklines layer contains point objects, they will be ignored.

Instructions for using the LIDAR Filter Editor appear in *Appendix K*.

Condense Layers takes effect if an AutoCAD or MicroStation file has reference files attached.

- Condense Layers on:** If the same layer exists in both the main file and the reference file, the layer will appear only once in the list. Check on the layer to accept it in all files.
- Condense Layers off:** The main file's layers will be listed first, followed by any reference file layers. Reference file layers will be shown with the name of the file first, such as, "AttachedFileName|Layer9". To process the same layer in all files, it must be checked on for each file.

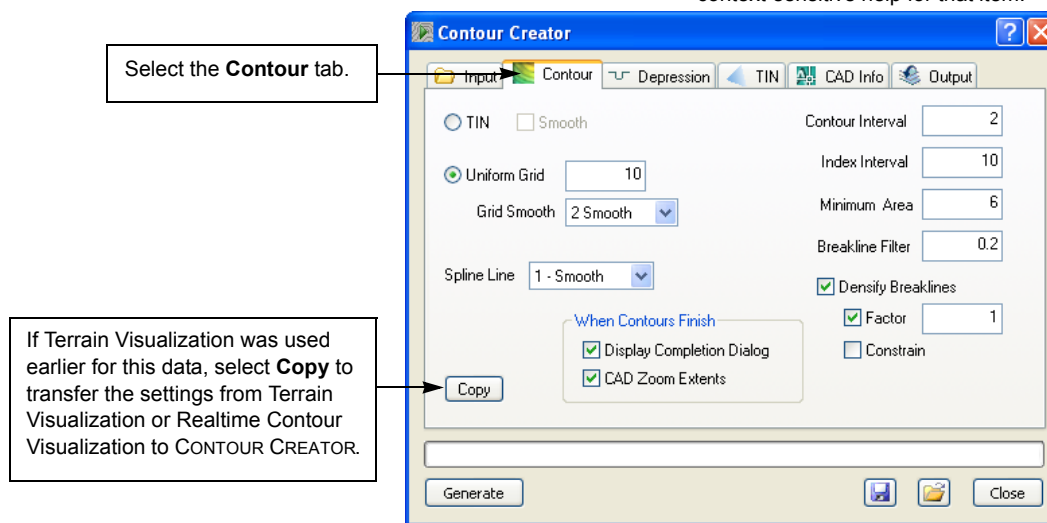
If there are no reference files, the **Condense Layers** setting is ignored. This setting does not apply to ArcGIS layers.

Step 5) Select the **Contour** tab.

Step 6) If Terrain Visualization (page 25-76) or Realtime Contour Visualization (page 26-29) was used earlier with the same data, select the **Copy** button to transfer the settings from Terrain Visualization to the **Contour** tab of the CONTOUR CREATOR. Choose which settings to use.

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Click the ?, then click on a prompt or field in the dialog box to activate context-sensitive help for that item.



- Step 7)** Select each tab in turn and make settings. Use the dialog's "?" to display context-sensitive help for each specific setting.
- Step 8)** To save the dialog configuration for future use, select the **Save Settings File** button. Save a **reg** file that may be used later by CONTOUR CREATOR's **Open Settings File** option or with **Generate contours using configuration file** (page 25-80).
- Step 9)** Select **Generate**. The contours are created and output to the specified layers or file.

Terrain Menu >: Generate Contours Using a Configuration File

Not included in Feature Collection Edition

Generate contours using a configuration file uses CONTOUR CREATOR to generate contours using a previously prepared configuration file. It does not activate the full CONTOUR CREATOR dialog.

To generate contours from the reduced dialog and a configuration file, perform the following steps:

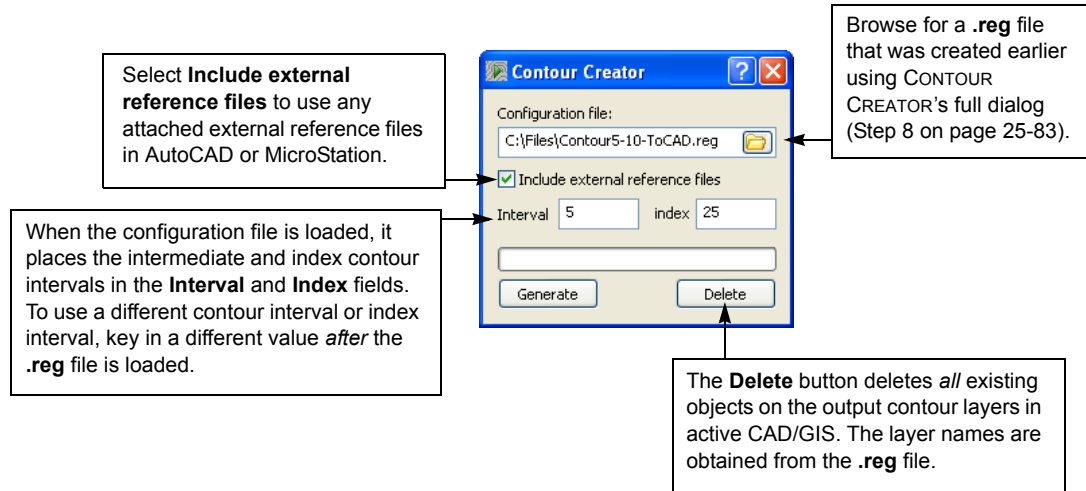
- Step 1)** Prepare the configuration file ahead of time. Run CONTOUR CREATOR from the full dialog as shown in "Terrain Menu > Generate Contours" on page 25-80 and save a configuration file as shown in Step 8 on page 25-83.
- Step 2)** Prepare the input. The same input settings that were saved in the configuration file will be used.
- If output is to go to active CAD/GIS, make sure AutoCAD/MicroStation/ArcGIS is running
 - If input is to be from active CAD/GIS, make sure the input layer/level names are the same as used for the configuration file.
 - If external reference files are to be used, be sure to attach them in AutoCAD or MicroStation.
 - If any input is to be from vector files, prepare the files.

Step 3) Select **Generate Contours using a configuration file** from the **Terrain Processing** toolbar or **Terrain** pull-down menu.



Select **Generate Contours using a configuration file** from the **Terrain Processing** toolbar or **Terrain** pull-down menu in SUMMIT EVOLUTION.

Step 4) The CONTOUR CREATOR's alternate, smaller dialog appears. Make settings:



Step 5) Select **Generate** to create the contours and output according to the **.reg** file's settings.

Terrain Menu > Translate or Distribute Points (Point Translator)

The POINT TRANSLATOR processes points files so that they can be in a more useful form. The POINT TRANSLATOR offers the following:

- Import many files, combine them, and output one file
- Import one or more files and cut into many files
- Change the point density
- Extract an area
- Reduce file size
- Filter LIDAR points
- Change file format
- Translate points to a different coordinate system
- Colorize TerraScan .bin files

Perform the following steps:

Step 1) Prepare one or more input files. These files must contain XYZ point data in one of the POINT TRANSLATOR's accepted formats. (A list of formats can be seen under **Files of type** when **Add Files** is used in Step 4 below.) Files may be of varying formats.

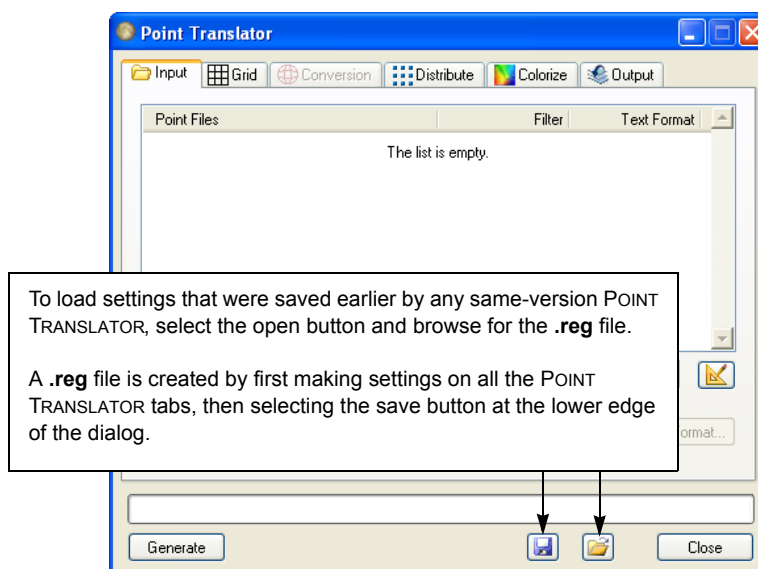
Step 2) If points will be extracted from the area inside one or more boundary polygons, create the polygon(s) in one of the following vector formats: **dxf**, **dwg**, **dgn**, or **shp**.

- Step 3)** Select **Translate or Distribute Points** from the **Terrain Processing** toolbar or select POINT TRANSLATOR from the **Terrain** pull-down menu.

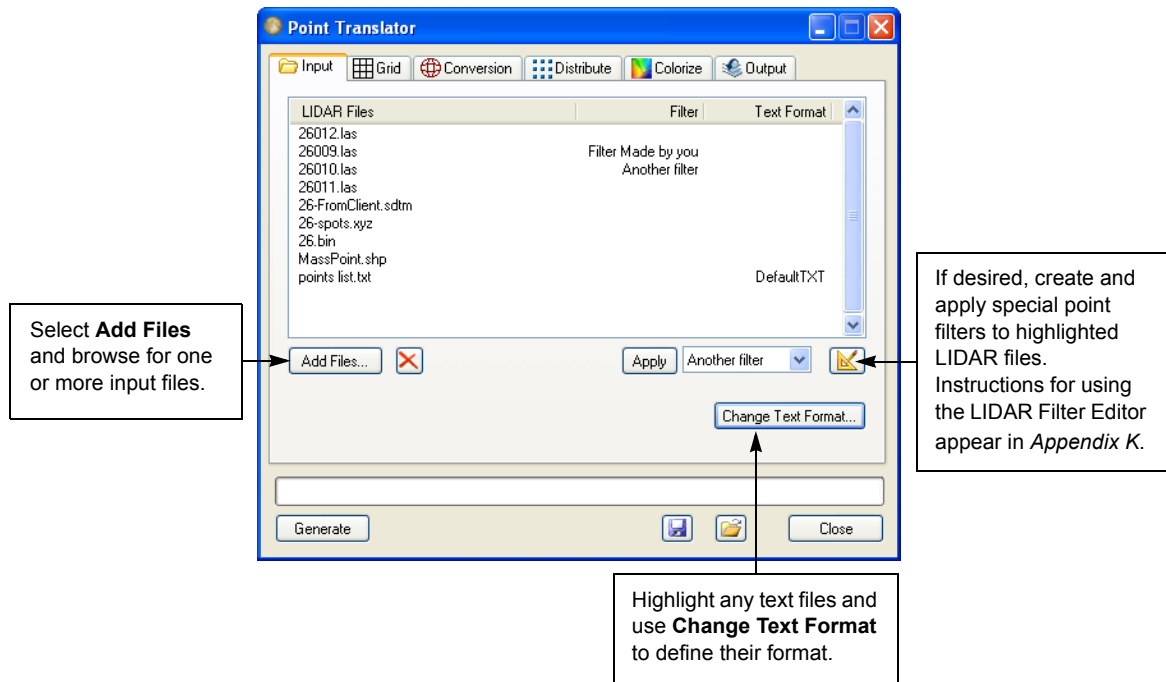


Select **Translate or Distribute Points** from the **Terrain Processing** toolbar.

- Step 4)** (Optional) To load settings that were saved previously by any same-version POINT TRANSLATOR, select the open button and browse for the **.reg** file.



- Step 5)** Select the **Input** tab. Select **Add Files** and browse for one or more files. The files may be of varying formats. Text files and LIDAR files have additional settings:
- Text files:** Define the format of text files. Select the desired text file(s) in the list. Select the **Change Text Format** button. Use the text format wizard to select an existing format or create a new format. Select **Apply** to set the format to the highlighted file(s). Verify that the correct format appears in the **Text Format** column.
 - LIDAR files:** If desired, create and apply a special filter to extract a subset of the points. Select the desired LIDAR file(s) in the list. Select an existing filter in the field, or select the **Edit LIDAR filters** button to create a new filter. Instructions for using the LIDAR Filter Editor appear in *Appendix K*. Select **Apply** to set that filter to the highlighted file(s). Verify that the correct filter name appears in the **Filter** column.



Step 6) Select the **Grid** tab. Check on **Create new files by grid or boundaries** only for the following purposes:

- a.) To cut a large-area point distribution into multiple smaller-area files;
- b.) To extract points from within boundary polygon(s). Boundaries must be in one of the following vector formats: **dxf**, **dwg**, **dgn**, or **shp**.

Note that the POINT TRANSLATOR can create any number of files, but processing becomes slow if the number reaches the Windows operating system's limit of concurrently open files. If you wish the Point Translator to create more than 500 files in one run, you may want to plan enough time for the process, or consider cutting the area into larger pieces first.

Check on **Create new files by grid or boundaries** only for the following purposes:

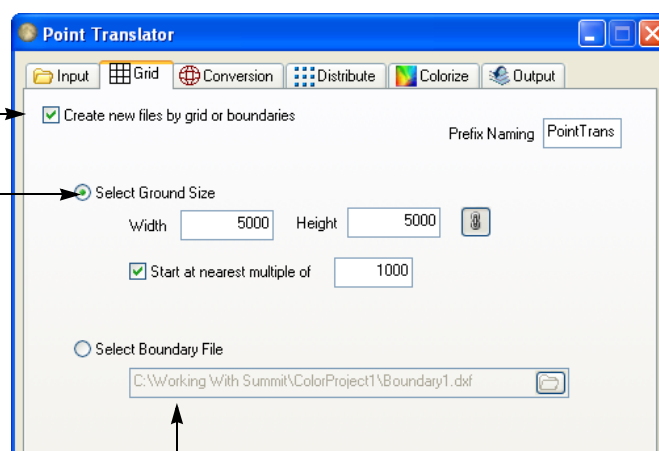
- To cut a large-area point distribution into multiple smaller-area files;
- Or, to extract points from within boundary polygon(s) defined in a vector format.

This setting must not be checked if multiple files are to be merged into one file (that setting is located on the **Output** tab).

Select Ground Size cuts the file into multiple smaller areas. Set the **Width** and **Height** in ground units.

- The POINT TRANSLATOR will cut the file into as many parts as necessary to output all the points in area blocks of this size.
- If **Start at nearest multiple of** is checked, the area blocks will each have a lower left corner evenly divisible by the specified number of ground units.
- If **Start at nearest multiple of** is not checked, the lowest left area block will start at the lowest left point in the input file(s), and the **Width** and **Height** distances will be started from that point.

In the example dialog, ground units are meters, the block size is 5km by 5km, and the blocks start at the nearest kilometer.



Select Boundary File extracts one or more areas of points that lie inside boundary polygon(s). The boundary polygon file may be in AutoCAD **dwg**, MicroStation **dgn**, ArcGIS **shp**, or **dxf** format.

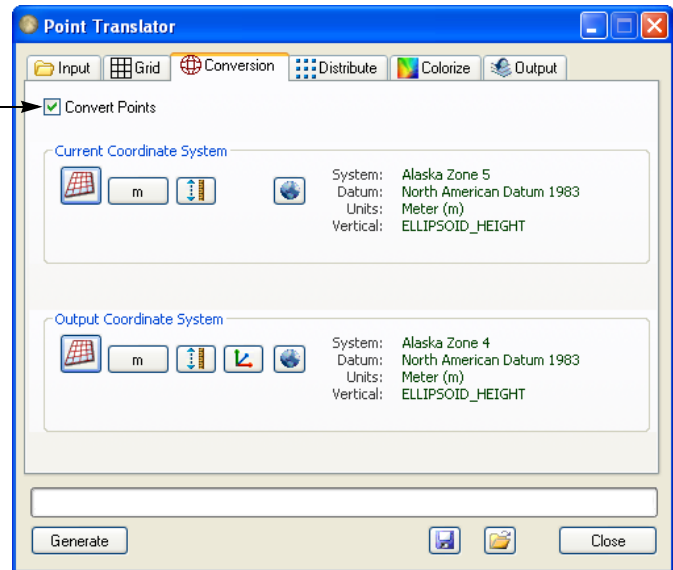
If text is found inside a boundary polygon, the text will become the name of the boundary polygon and the name of the output file.

- If multi line text is found, the first line is used.
- If more than one text object is located inside the polygon, the first one found will be used.

Step 7) If coordinate conversion will be applied to the points, select the **Conversion** tab.

Note that this tab will not be active if **Distribute Points** is checked on the **Distribute** tab. If redistribution and coordinate conversion are both desired, distribute the points first, then run POINT TRANSLATOR again to convert the points.

Check on **Convert Points** in order to translate the points to a different coordinate system. Specify the input and output systems.



Step 8) Select the **Distribute** tab. Check on **Distribute Points** only for the following purposes:

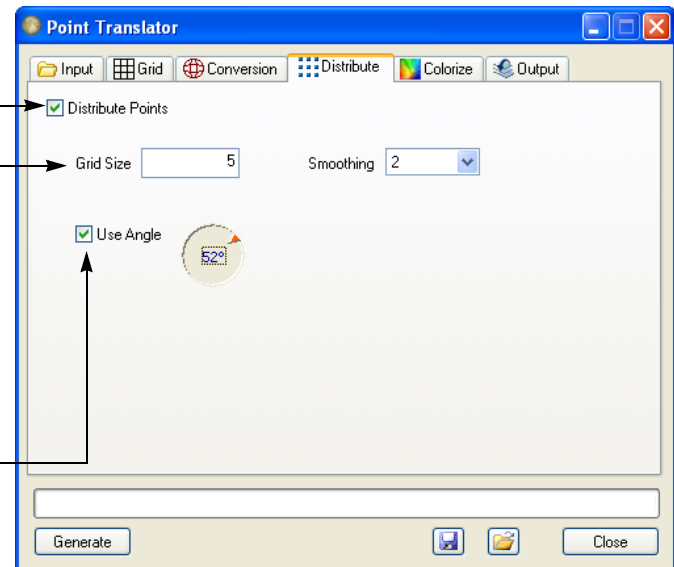
- a.) To change the point density;
- b.) To create a new evenly spaced grid of points;
- c.) To create a new evenly spaced rows of points at a specified angle.

Check on **Distribute Points** in order to change the density of the points or create a new evenly spaced grid of points at a specified angle.

Set the **Grid Size** to the desired spacing between points. As a rule, choose a grid size equal to or larger than the spacing in the original file(s). If the units are latitude-longitude, be sure to enter the distance in the appropriate decimal degree units.

Set the **Smoothing** value. The higher the number, the more smoothing. Smoothing reduces the effects of a single point that is much higher/lower than its surrounding points.

To rotate the new grid, check on **Use Angle** and set the angle. If **Use Angle** is off, zero degrees will be applied.



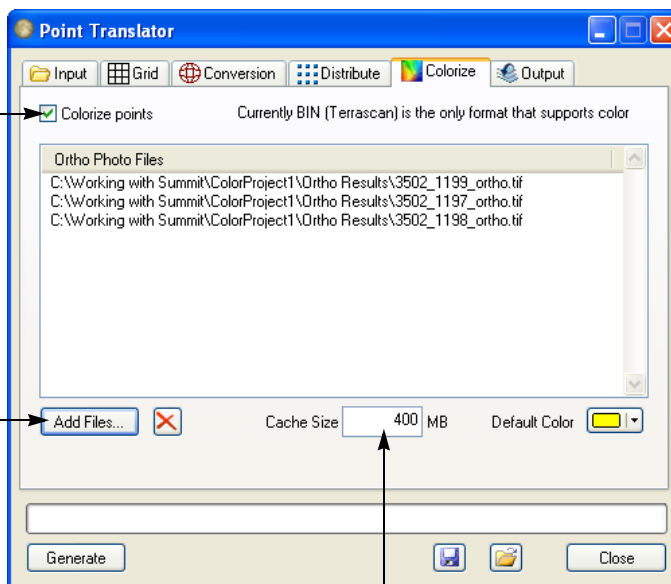
Step 9) It is possible to colorize TerraScan **.bin** files based on one or more orthophoto images. The **.bin** and orthophotos must be in the same area and the same coordinate system. Select the **Colorize** tab.

This option requires:

- Terrascan **.bin** files as point input;
- orthophotos in the same area and in the same coordinate system as the **.bin** files.

Check **Colorize points**.

Select **Add Files** and select one or more orthophotos.



There is usually no need to change the **Cache Size** from its default of 400. As the cache gets larger, it uses higher and higher orthophoto zoom levels up to level 1x. Thus, a larger cache increases the resolution of the color information; however, this usually has little effect on the output, because the **.bin** points are usually much lower resolution than the 1x **.tif** orthophoto. Change the **Cache Size** only if you have specific needs:

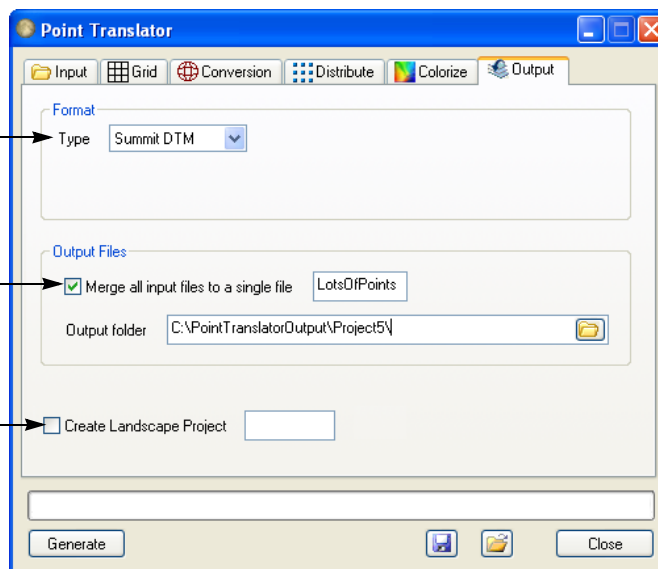
- Reduce (lower than 400) to use a low amount of memory. A lower value will force it to load a lower resolution, smaller orthophoto zoom level. This may reduce the color accuracy if set too low.
- Increase (higher than 400) to process very high resolution points.

Step 10) Select the **Output** tab. Make settings.

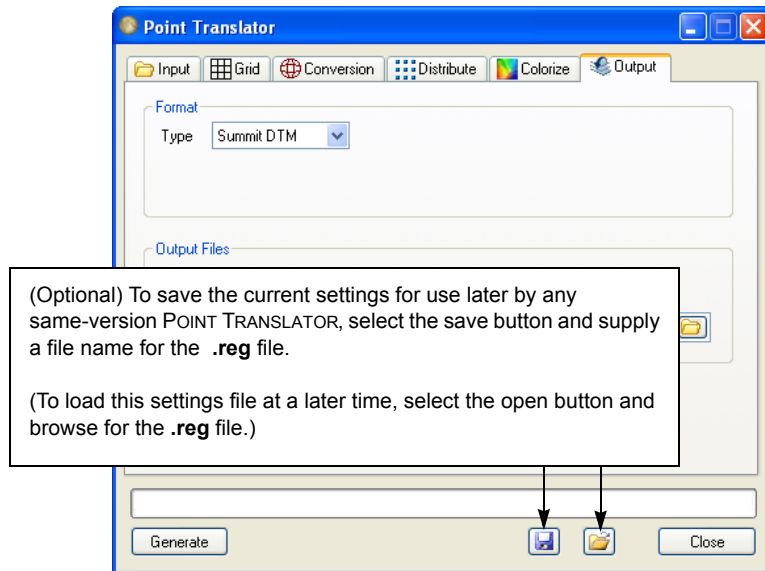
Select an output format.

To output one file only, select **Merge all input files into a single file** and set a file name and folder. Note that this option is not available if **Create new files by grid or boundaries** is checked on the **Grid** tab.

Check on **Create Landscape Project** to create a DAT/EM LANDSCAPE project.



Step 11) (Optional) To save the current settings for use later by any same-version POINT TRANSLATOR, select the save button and supply a file name for the **.reg** file.



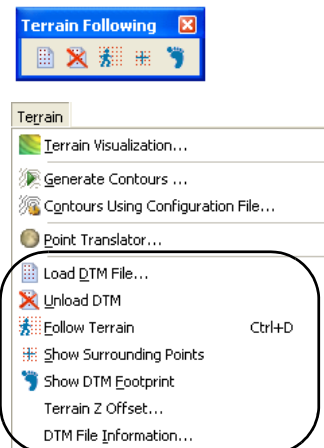
Step 12) Select **Generate** to create the file(s). Be aware that if more than 500 files are to be created, the process will run slowly due to a Windows operating system limit.

Terrain Menu > Terrain Following Options (Multiple Options Described)

The **Terrain Following** options on the **Terrain** menu and toolbar offer SUMMIT EVOLUTION's Terrain Following functions. This section shows how to use **Load DTM File**, **Unload DTM**, **Follow Terrain**, **Show Surrounding Points**, **Show DTM Footprint**, **Terrain Z Offset**, and **DTM File Information**. These options are presented together as a workflow.

Terrain Following automatically adjusts the cursor's Z based on one or more loaded points files.

- Terrain Following loads one or more points files from which it receives elevation information.
- Terrain Following can be toggled on and off as needed.
- When Terrain Following is on, Z is automatically set to an interpolated elevation, which is based on the surface made by the surrounding points.
- Adjustments or corrections may be applied. A constant Z offset may be applied to the cursor position relative to the surrounding surface *or* the surface may be used to set a Z index value.
- The points surrounding the cursor may be superimposed over the image view.
- Terrain following may be used during DTM collection with DAT/EM CAPTURE. The stereoplottter moves to the XY of the DTM node, Terrain Following places the Z at the interpolated elevation, then the operator further adjusts the Z to be exactly on the ground. As long as the operator does not move XY, Terrain Following will not interfere with the operator's Z adjustment.



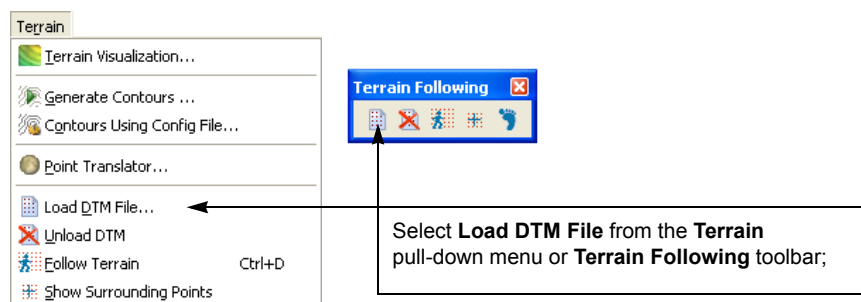
Perform the following steps to use Terrain Following:

Step 1) Prepare one or more points files. SUMMIT EVOLUTION can use any of the following file formats for terrain following. More formats may be added with each new release:

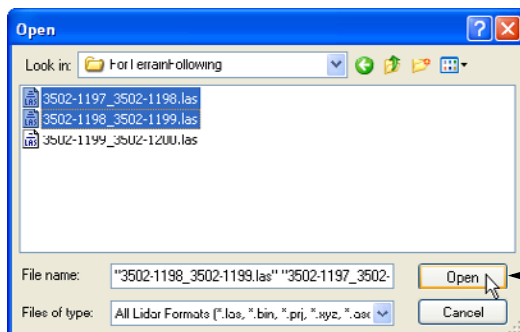
- LIDAR formats (.las and .xyz)
- Output from Inpho's MATCH-T.
- TerraScan formats (.bin and .prj)
- BIL files (.bil and .hdr)
- SUMMIT .sdtm file
- SDT DiAP Files (*.sdt)
- SDTS (*.CATD.DDF)
- USGS DEM (.dem)
- ESRI Grid (.asc, .grd, .adf)
- ESRI shapefiles (.shp)
- ERDAS IMG (.img)
- DTED (*.dt0, *.min, *.max, *.avg)
- CAD files (.dxf)
- Text files (.txt, .xyz, and *.*). These can be most ASCII XYZ files, including those made by DAT/EM CAPTURE's **xyzout** command.

Terrain Following can use any of these formats in their original form, but be aware that binary formats are much faster to process than text formats. For example, **.las** (LIDAR) format is much faster to process than an ASCII **.txt** file. The fastest Z interpolation is achieved with **.bil** format, which is a distributed format on an even grid at zero rotation. The DAT/EM POINT TRANSLATOR may be used to translate formats (see page 25-84 for instructions).

Step 2) Select **Load DTM File** from the **Terrain Following** toolbar or **Terrain** pull-down menu:

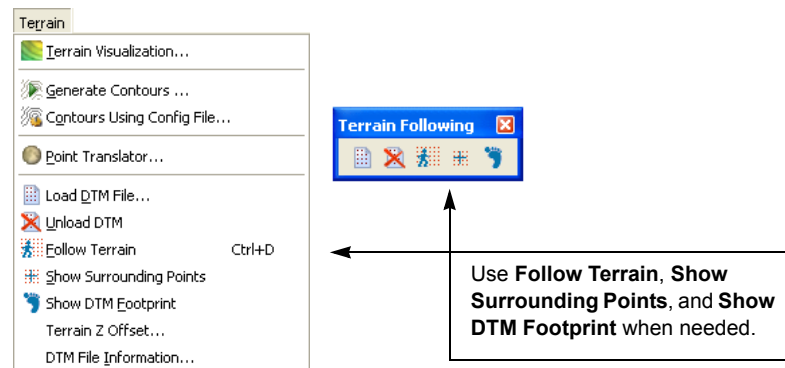


If available, choose binary format files; otherwise, choose the original format files. It is possible to open multiple files, but be aware of how many points there are. If there are more than 1.2 million points, SUMMIT EVOLUTION will filter out points evenly from the entire area so that the remaining points total about 1.2 million. It must do this so that it will not overload the system memory. The POINT TRANSLATOR may be used to extract points at a higher density, but a smaller area (page 25-84).



Step 3) Use any of the following settings and tools:

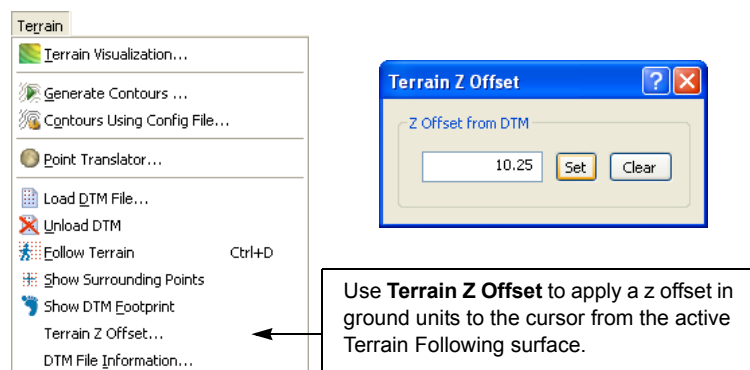
- To toggle Terrain Following, select **Follow Terrain** from the **Terrain Following** toolbar or pull-down menu. When Terrain Following is on, the cursor is controlled by the user in X and Y, but it is controlled by the loaded surface in Z. Terrain following may be toggled on and off as many times as needed.
- To superimpose the three points that are closest to the cursor, select **Show Surrounding Points** from the **Terrain Following** toolbar or pull-down menu. The surrounding points display is independent of other SUPER/IMPOSITION settings such as **Clip Scope**.
- To view the extents of each loaded points file, select **Show DTM Footprint** from the **Terrain Following** toolbar or pull-down menu. A fill pattern of points appears in the area of each DTM file; the points in the pattern are not actual point locations in the file.



- To obtain information about the total number of points and ground coordinate extents of the loaded DTM file(s), select **DTM File Information** from the **Terrain** pull-down menu. An information window appears to display these details.

Step 4) Corrections may be made to accommodate differences between the points files' terrain surface Z and a stereo model's orientation Z. There are two choices:

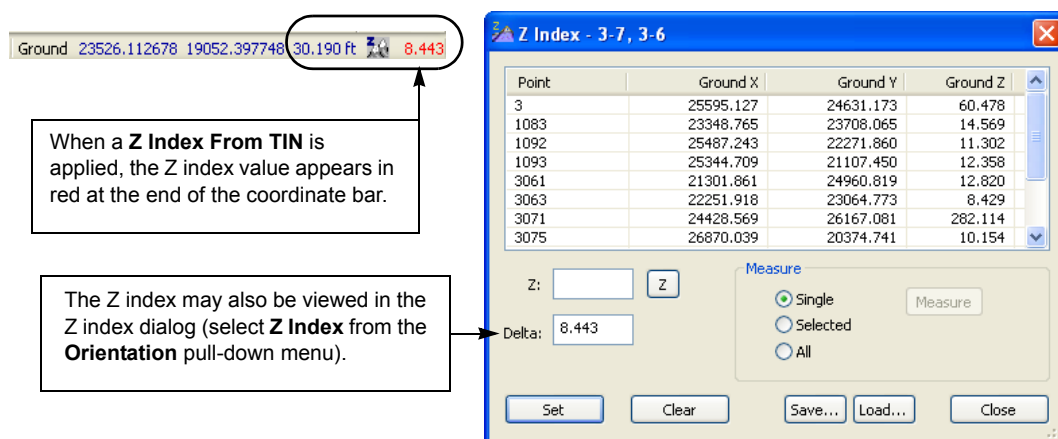
- To apply a simple cursor offset from the surface:** *Use this when the stereo model Z is correct, and the terrain files are known to be too high or too low, or simply for viewing purposes.* To make the cursor follow the terrain at a set value higher or lower than the loaded surface, select **Terrain Z Offset** from the **Terrain** pull-down menu. Enter the offset in ground units and select **Set**. To remove the offset at any time, select **Clear**. This does not affect the orientation-based Z in stereo models.



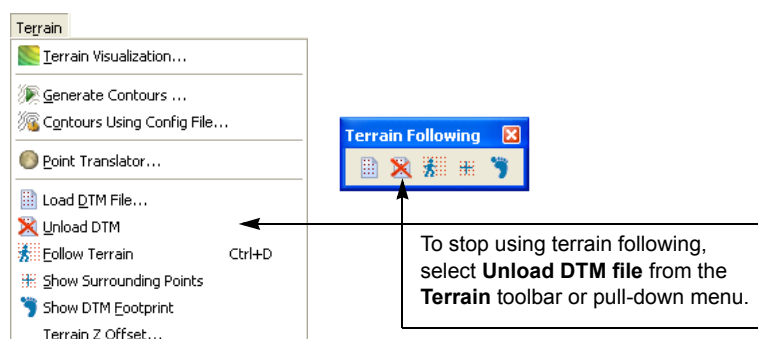
- b.) **To apply a Z Index based on the surface:** Use this when the terrain files are known to be more accurate than the stereo model's oriented Z. A TIN calculated from the loaded points may be used to calculate and set a Z index. The Z index is applied to a stereo model's orientation-based Z. Perform the following:

Set a button to **Type=Plotter** and **Action=Z Index From TIN** in the Button Manager (page 25-38); Load one or more terrain files; Turn off "Follow Terrain" temporarily; Place the cursor on the ground and press the **Z Index from TIN** button.

A Z index will be applied; a red Z index value will be displayed near the Z value in the coordinate bar, and may also be viewed in the Z Index dialog; this Z index *changes* the orientation-based Z in a stereo model.



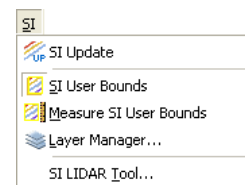
- Step 5)** To stop using Terrain Following and unload the terrain following file(s), select **Unload DTM File** from the **Terrain Following** toolbar or **Terrain** pull-down menu.



SI Menu

The SI Menu offers options to control superimposition. ("SI" refers to "superimposition" in the SUMMIT EVOLUTION Main View and other DAT/EM views that show superimposed vectors.) These options are discussed in:

- "SI Menu and Toolbar: SI User Bounds and Measure SI User Bounds" on page 27-5
- "SI Menu and Toolbar: Layer Manager" on page 27-6
- "Display Points Independently of CAD/GIS Using SiLidar.Exe" on page 27-14



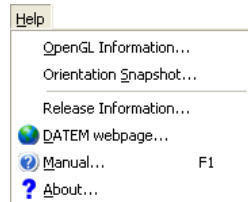
Superimposition in general is discussed in *Chapter 27*.

Drawing Menu

The **Drawing** menu offers options for vector file import and export within the SUMMIT EVOLUTION environment, polyline and point digitizing that takes place completely inside SUMMIT EVOLUTION (independently of CAD), realtime contour visualization, and DTM digitizing. These options are discussed in *Chapter 26*.

Help Menu

There are several help items and diagnostic tools on the **Help** pull-down menu. These are discussed here, below.

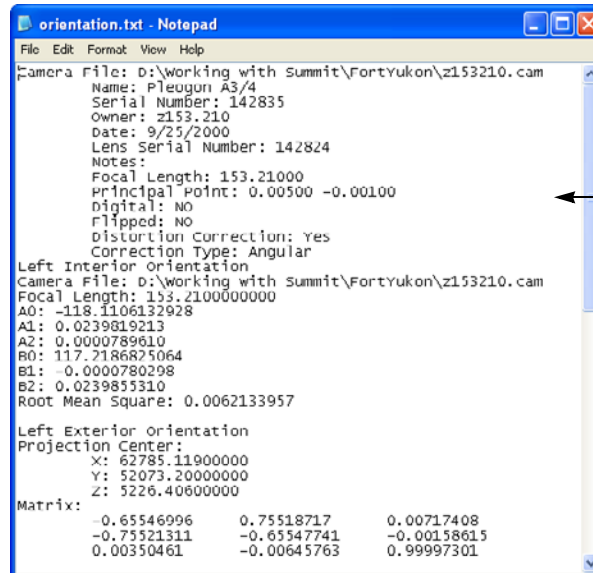


Help Menu > OpenGL Information

The **OpenGL Information** option on the **Help** pull-down menu is used for diagnostic purposes. Use this option is requested by DAT/EM Support.

Help Menu > Orientation Snapshot

Orientation Snapshot offers a quick way to show orientation parameters for the currently open model. A set format is used. To use, select **Orientation Snapshot** from the **Help** pull-down menu. A text editor appears showing the orientation details. If desired, save the file.



Orientation Snapshot shows orientation details for the current model in the Windows Notepad text editor. If desired, save the file.

To make more detailed orientation reports, see “Tools Menu > Reports” on page 25-53.

Help Menu > Release Information

Release Information launches the **Datem Info.exe** application. This is a diagnostic tool that gives information about the DAT/EM hardware lock, installed software versions, active licenses, and expired licenses.

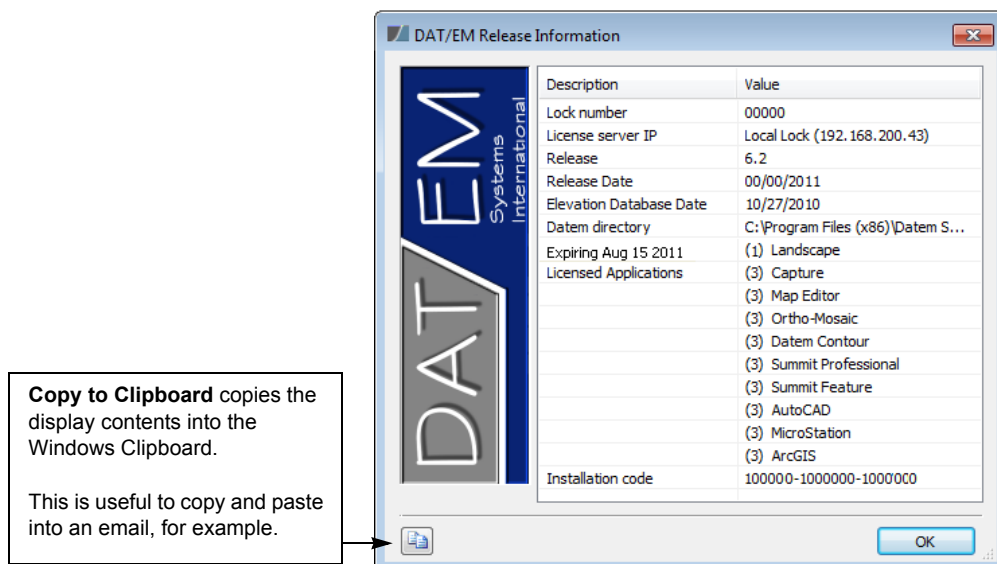
Note that there are several ways to activate this application:

- From SUMMIT EVOLUTION or LANDSCAPE's **Help** pull-down menu
- From the Microsoft Windows **Start** button > **All Programs** > **Datem Software** > **Release Information**
- By directly running the **...Program Files\Datem Software\Datem Info.exe** file on 32-bit computers or **...Program Files (x86)\Datem Software\Datem Info.exe** on 64-bit computers.

To activate from SUMMIT EVOLUTION, select **Release Information** from the **Help** pull-down menu.

The dialog displays current DAT/EM-related information such as the hardware lock number, the active licenses, and the installation keycode used to install the software.

It also has a **Copy to Clipboard** button that copies the displayed information into the Windows clipboard; this may be pasted into an email to send to DAT/EM Support, if needed.



Help Menu > DAT/EM Webpage

DAT/EM Webpage launches the default internet browser and visits DAT/EM Systems International at www.datem.com.

Help Menu > Manual

Manual launches Adobe Reader or Adobe® Acrobat® or Adobe Reader® (if it is installed on the computer; available at www.adobe.com) and opens the *SUMMIT EVOLUTION Operation Manual*. This is a **pdf** file.

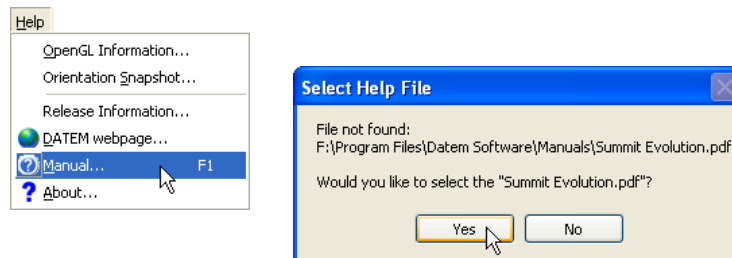
- SUMMIT EVOLUTION software updates that were downloaded from www.datem.com do not contain the operation manuals. Customers who have a current support contract may download the operation manuals separately from www.datem.com.
- DAT/EM installation disks contain the operation manuals.

The first time you use this option, it will ask for you to locate the file. The file names contain the version number. Perform the following steps:

Step 1) Either download the *SUMMIT EVOLUTION Operation Manual* from www.datem.com or find it on the DAT/EM disk. Copy this **pdf** file to the ...**Program Files**\Datem Software\Manuals folder for 32-bit computers, the ...**Program Files (x86)**\Datem Software\Manuals folder for 64-bit computers, or any other location you wish to use.

- Create the folder if it does not yet exist.
- For updates, remove or rename any older version of the file so that it will not be found. The version number is in the file name, such as “DATEM Summit Evolution 6.1.pdf”.

Step 2) Select the **Manual** option on the **Help** menu. Select **Yes** to browse for the manual.



Step 3) Browse for the file. When found, it will open in Adobe Reader, as long as that application is installed on the computer.

Help Menu > About

The **About** option on the **Help** menu shows a dialog that lists the lock number, the DAT/EM release version number, and the DAT/EM release date.

The **System Info...** (information) button displays a Windows System Information dialog, which shows items such as hardware resources and components. Use this option is requested by DAT/EM Support.

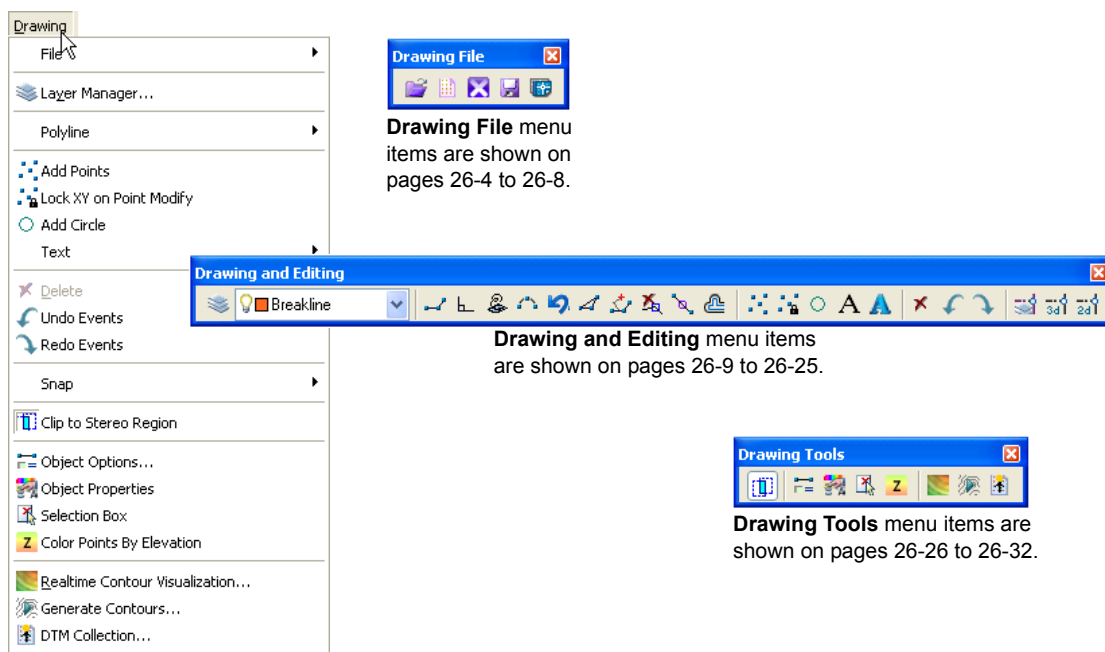
To view additional information, see “Help Menu > Release Information” on page 25-95.

Chapter 26. DAT/EM Drawing Objects

DAT/EM Drawing Objects is a collection of tools for:

- Vector file import and export within the SUMMIT EVOLUTION environment.
- Polyline and point digitizing that takes place completely inside SUMMIT EVOLUTION; it is independent of AutoCAD, MicroStation, and ArcGIS.
- Realtime contour visualization
- DTM digitizing

The DAT/EM Drawing Objects tools appear on three **Drawing** toolbars and on the **Drawing** pull-down menu.



It is important to know that DAT/EM Drawing Objects layers, polylines, and points are independent of AutoCAD, MicroStation, and ArcGIS. They exist only in SUMMIT EVOLUTION until they are saved into the active CAD/GIS or saved to a vector file.

This chapter shows a general discussion of drawing and editing followed by detailed instructions for each tool found on the menu and toolbar:

- “How to Draw DAT/EM Drawing Objects” on page 26-2
- “How to Edit DAT/EM Drawing Objects” on page 26-3
- “Drawing File Toolbar” on page 26-4
- “Drawing and Editing Toolbar” on page 26-9
- “Drawing Tools Toolbar” on page 26-26

How to Draw DAT/EM Drawing Objects

Digitizing with DAT/EM Drawing Objects may be done with or without AutoCAD, MicroStation, or ArcGIS ArcMap (CAD/GIS) running.

- If CAD/GIS is running, make sure that a digitizing command is not active in CAD/GIS when you are drawing with a DAT/EM Drawing Objects tool. The digitizer pick button hits will be sent to both the DAT/EM Drawing Objects tool and to CAD/GIS. It may be confusing when two commands take the same digitizer button hit.
- There are times when it is useful to have CAD/GIS running at the same time. For example, the **Send Objects to Active CAD** command (page 26-8) requires AutoCAD, MicroStation, or ArcMap to be running. Or, you may want to see vectors superimposed from CAD/GIS at the same time you want to digitize DAT/EM drawing objects.
- Managing which applications accept the digitizer button hits between DAT/EM Drawing Objects and active CAD/GIS is the user's responsibility.

True arcs are not drawn, because they are not compatible with some of the vector file output formats. For example, 3D arcs are not compatible with AutoCAD. The **Polyline Arc** (page 26-11) and **Add Circle** (page 26-20) commands draw simulated arcs made up of many short polyline segments.

The following is a very brief overview of drawing procedures with cross references to detailed information:

1. Import existing vector files, if desired (page 26-4 and page 26-5)
2. Create and/or set a layer (page 26-9)
3. Choose a drawing tool and draw the object:
 - a.) Polylines (page 26-11)
 - b.) Points (page 26-19)
 - c.) Circles (page 26-20)
 - d.) Text or text labels (page 26-21 and page 26-22)
4. Optional "extras" to use when needed:
 - a.) Snap to objects in 2D or 3D (page 26-25)
 - b.) Close a polyline (page 26-14)
 - c.) Undo and Redo (page 26-13 and page 26-25)
 - d.) Create polyline offsets (page 26-17)
5. To cancel the polyline drawing tools, press the digitizer's Cancel button or press the <Esc> (escape) key on the keyboard.

How to Edit DAT/EM Drawing Objects

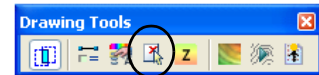
DAT/EM Drawing Objects polyline vertices, points, and text may be moved and otherwise edited using the stereoplotter cursor or by keying in new values into the Object Properties window.

To edit the layer, key in vertex coordinates, or change the closed/open status of a polyline, see “Object Properties Window: View Details and Edit Objects” on page 26-28.

To edit DAT/EM Drawing Object, perform the following steps:

- Step 1)** If a drawing mode is currently active, press the Cancel button on the 3D cursor one or two times until the drawing mode turns off (tool status is visible on the **Drawing and Editing** toolbar).
- Step 2)** Pick directly on the DAT/EM Drawing Object to select it.
- A marker appears at the lower left corner of the text.
 - Multiple objects may be selected. Continue clicking on more objects. An alternate method of multiple selection is to use the **Select objects with a box** tool that is found on the **Drawing Tools** toolbar. Drag a selection box over polylines and/or points.

Select objects with a box may be used to drag a selection box over one or more polylines and/or points.



- To deselect all objects, press the **Cancel** button or click the pick button in a blank area where there are no objects.
- Step 3)** Once the DAT/EM Drawing Object is selected, choose an editing method:
- **To key in changes or select layers for any object type:** Use the Object Properties Window to key in a new coordinate value, change the layer, change the open/closed status of a polyline, or change the character string of a text or label object. See “Object Properties Window: View Details and Edit Objects” on page 26-28.
 - **Move Points:** Choose snap settings, if needed. It is not necessary to snap to the point itself, but snapping is sometimes used to select the point’s destination. For example, use snapping to move a point onto a polyline. Use **Snap layers and options** and set **Snap to Objects 3D** or **Snap to Objects 2D** (page 26-25) as desired.
- Click a second time directly on the selected point; if the **Lock XY on Point Modify** setting is on (page 26-20), the stereoplotter movement will be restricted to Z only at this time. The vertex highlight changes to red and the vertex or point follows the cursor. Adjust the stereoplotter position. Pick again to drop the point at the new coordinate.
- **Move Text:** Pick again directly on the highlighted text anchor point. Adjust the stereoplotter position. Pick again to drop the text at the new coordinate.

- **Edit Polylines:** There are several options for polyline editing:
 - a.) To move a single vertex, pick on its vertex marker, position the stereoplotter, and pick again to drop the point at the new coordinate.



- b.) To close a polyline while it is still being drawn with the active drawing tool, use the **Close Polyline** tool from the **Drawing and Editing** toolbar shown on page 26-14.
- c.) To close an existing (complete) polyline, select it and toggle the open/closed setting in the Object Properties Window shown on page 26-28.
- d.) To redraw a section of a polyline or to replace/extend the end of a polyline, use the **Reshape Polyline** tool from the **Drawing and Editing** toolbar. See “Reshape Polyline” on page 26-15.
- e.) To delete a polyline vertex, use the **Delete Vertex** tool from the **Drawing and Editing** toolbar. See “Delete Vertex” on page 26-16.
- f.) To insert a new vertex into a polyline, use the **Insert Vertex** tool on the **Drawing and Editing** toolbar. See “Insert Vertex” on page 26-17.

To save objects after they have been edited, see “Save Objects to File” on page 26-8 and “Send Objects to Active CAD” on page 26-8.

Drawing File Toolbar

The **Drawing File** toolbar contains tools to manage vector files. The toolbar options are described below.



The **Drawing File** toolbar

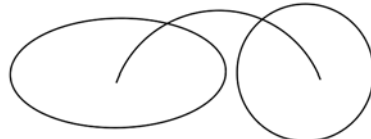
Load Polylines and Points from Vector Files

The **Load polylines and points from vector files** option on the **Drawing File** toolbar loads vector objects from **.dxf**, **.dwg**, **.dgn**, and **.shp** files. These vector objects have the following purposes:

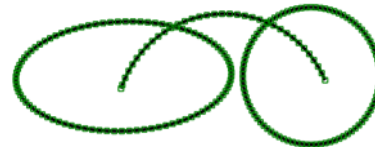
- Object viewing, editing, and export that does not require AutoCAD, MicroStation, or ArcMap to be running.
- Input as points and breaklines for **Realtime Visualization of Contours** (page 26-29).
- Use as polygon inclusion areas for DTM point digitizing (page 26-32).

Please note:

- When a vector file is loaded into DAT/EM Drawing Objects, all objects are loaded, but only those objects that are in or touch the current stereo region are displayed and may be edited. To view and edit the objects in the next stereo region, open the next stereo model.
- MicroStation curves and complex chains that contain arcs are not supported.
- Some arcs and arc-type objects such as ellipses or circles are accepted, but they will be automatically stroked into segments during import.



An ellipse, arc, and circle in CAD/GIS



The same features are stroked into polylines when imported as DAT/EM Drawing Objects. These are selected to show the many vertex markers.

Perform the following steps:

- Step 1)** Select **Load polylines and points from vector files** from the **Drawing File** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.

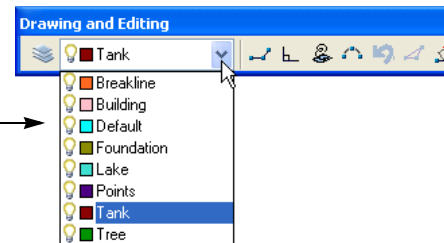
Select **Loads Polylines and points for Editing** from the **Drawing File** toolbar or pull-down menu in SUMMIT EVOLUTION.



- Step 2)** Browse for one or more **.dxf**, **.dwg**, **.dgn**, or **.shp** files. A combination of formats may be selected at one time.

As the files are imported, arcs are stroked into polylines and the layers/levels that contain vector objects are imported as DAT/EM Drawing Objects layers. The layer names may be viewed in the layer list on the **Drawing and Editing** toolbar.

Only those layers that contain objects in the input file will be added to the DAT/EM Drawing Objects layer list.



Only those objects that are in or touch the current stereo region are displayed and may be edited. To view and edit the objects in the next stereo region, open the next stereo model.

Load Point File Onto a Layer

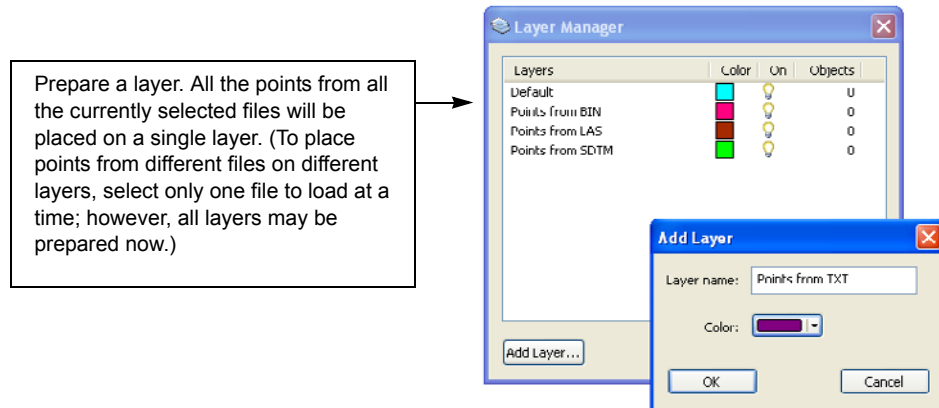
The **Load point file onto a layer** option on the **Drawing File** toolbar loads points files and places the points on a selected layer. Many point file formats are supported. These point objects have the following purposes:

- Object viewing, editing, and export that is independent of AutoCAD, MicroStation, or ArcMap
- Use as point input for **Realtime Visualization of Contours** (page 26-29)

Note: When a point file is loaded into DAT/EM Drawing Objects, all points are loaded, but only those points that are in or touch the current stereo region are displayed and may be edited. To view and edit the points in the next stereo region, open the next stereo model.

Perform the following steps:

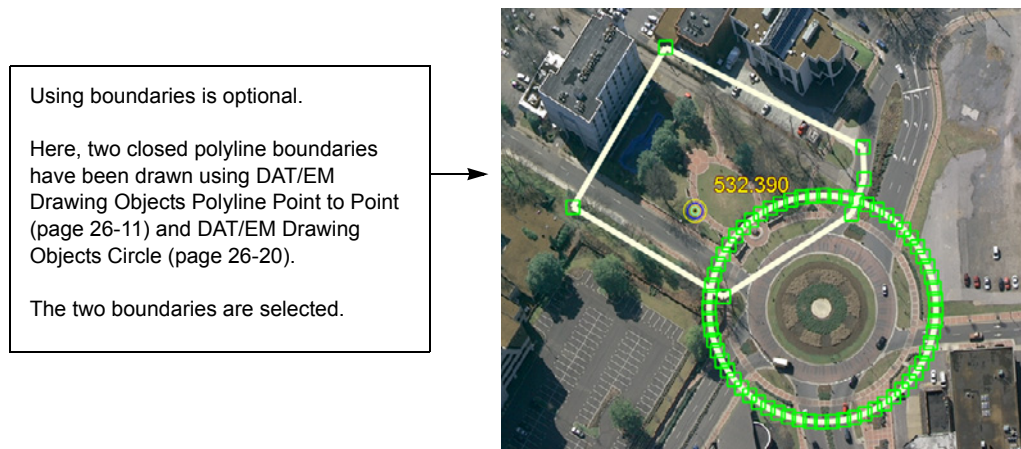
- Step 1)** Prepare the layer to receive the points. If the layer doesn't already exist, create it now. See "Drawing Layer Manager" on page 26-9 for instructions.



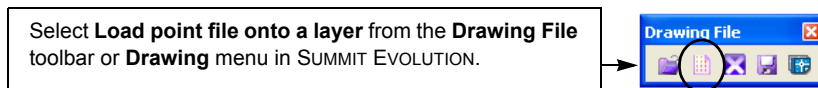
- Step 2)** (Optional) To load points only within existing DAT/EM Drawing Objects vector boundaries (closed polylines), prepare and select the closed polylines now. If they do not already exist, use the DAT/EM Drawing Objects drawing tools to draw one or more closed polylines. See "Polyline Point to Point, Squaring, Streaming, and Arc" on page 26-11 and "Add Circle" on page 26-20.

To close an existing, open polyline, select the polyline and use the **Open/Closed** option shown in "Object Properties Window: View Details and Edit Objects" on page 26-28.

Select one or more polylines to use as inclusion areas. To do this, press the cancel button once or twice to make sure the drawing tools are off. Using the stereoplotter cursor or the system mouse, click on the object(s). Selected objects show vertex markers.



- Step 3)** Select **Load point file onto a layer** from the **Drawing File** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.



- Step 4)** Browse for one or more files. A combination of formats may be selected at one time. For LIDAR files, apply a LIDAR filter if desired; for instructions, see *Appendix K*, “LIDAR Filter Editor.” Select **OK** to import the points.

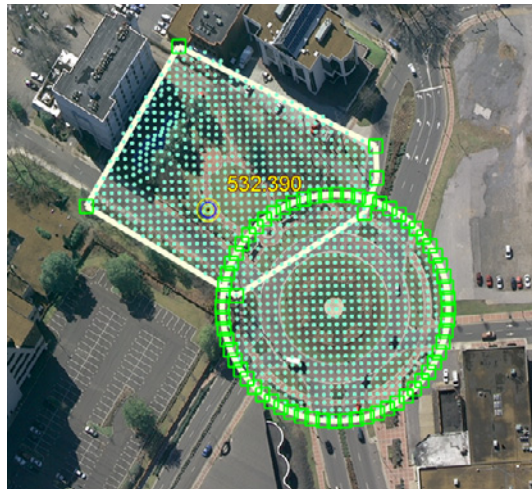
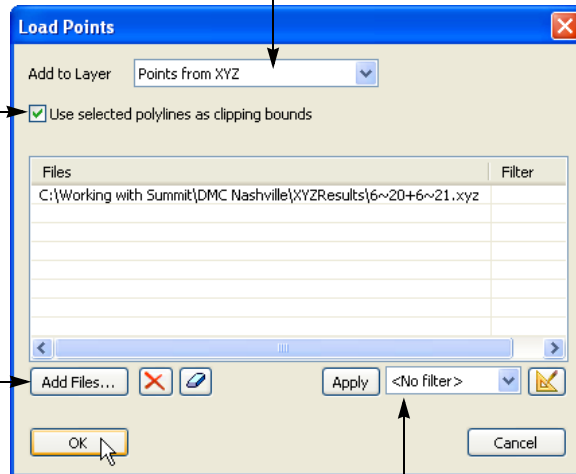
Set **Use selected polylines as clipping bounds**:

- **Not checked:** all the points from all the listed files will be imported.
- **Checked on:** If one or more closed polyline boundaries are currently selected, points will be imported inside the boundaries only. (If selected polylines are not found, this setting will be ignored.)

Set the layer for the points.

All of the points in all of the files listed in the **Files** column will be placed on this layer. To place points from different files on different layers, select only one file at a time.

Select **Add Files** and browse for one or more point files.



For instructions on creating LIDAR filters, see *Appendix K*, “LIDAR Filter Editor.”

Only those points that are in or touch the current stereo region are displayed and may be edited. To view and edit the points in the next stereo region, open the next stereo model.

Close All DAT/EM Drawing Objects

The **Close All Objects** option on the **Drawing File** toolbar unloads any previously loaded **.dxf**, **.dwg**, **.dgn**, and **.shp** files. It also removes any newly drawn polylines and points. Perform the following steps:

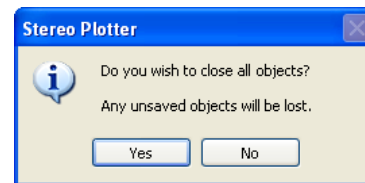
- Step 1)** The **Close All Objects** is not a save process. To save the objects before closing, use either **Save Objects to File** (page 26-8) or **Send Objects to Active CAD** (page 26-8) from the **Drawing File** toolbar.
- Step 2)** Select **Close All Objects** from the **Drawing File** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.

Select **Close All Objects** from the **Drawing File** toolbar.



- Step 3)** A message appears as a reminder to save the objects if necessary:

- Select **Yes** to close objects without saving
- Select **No** to stop the closing process and return to SUMMIT EVOLUTION to save or send the objects to an active CAD/GIS application (as shown in Step 1).



Save Objects to File

The **Save Objects to File** option on the **Drawing File** toolbar saves all of the current DAT/EM Drawing Objects to a **.dxf**, **.dwg**, **.dgn**, or **.shp** file.

Perform the following steps:

- Step 1)** Select **Save Objects to File** from the **Drawing File** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.

Select **Save Objects to File** from the **Drawing File** toolbar or **Drawing** pull-down menu in SUMMIT EVOLUTION.



- Step 2)** Set the file name and set **Save as Type** to the desired file format. Vector objects will be saved to the given file name with the **Save as Type** extension.

Send Objects to Active CAD

The **Send Objects to Active CAD** option on the **Drawing File** toolbar sends all current DAT/EM Drawing Objects to the actively running application: AutoCAD, MicroStation, or ArcMap.

- Please note that only one of the applications (AutoCAD, MicroStation, *or* ArcMap) should be running, otherwise it cannot be predicted which application will receive the objects.
- Please note that if neither AutoCAD, MicroStation, nor ArcMap is running, **Send Objects to Active CAD** will have no effect at all.

Perform the following steps:

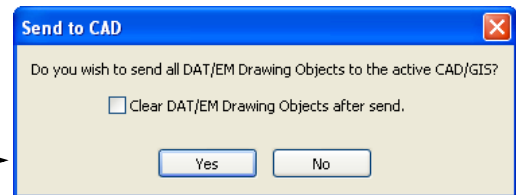
Step 1) Select **Send Objects to Active CAD** from the **Drawing File** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.

Select **Send Objects to Active CAD** from the **Drawing File** toolbar or **Drawing** pull-down menu in SUMMIT EVOLUTION.



Step 2) Verify that you want to export the objects into the active CAD/GIS application:

- Check on **Clear...** to remove the objects from SUMMIT EVOLUTION after they are sent to AutoCAD, MicroStation, or ArcGIS. If this is off, the objects remain in SUMMIT EVOLUTION; it may be difficult to see that the original objects are still there, because the new superimposed CAD/GIS objects are the same as the original objects.
- Select **Yes** to send the objects to AutoCAD, MicroStation, or ArcMap.
- Select **No** to cancel this request and do nothing.



Drawing and Editing Toolbar

The **Drawing and Editing** toolbar offers tools to draw and edit DAT/EM Drawing Objects inside SUMMIT EVOLUTION. These tools are described below.



The **Drawing and Editing** toolbar

Drawing Layer Manager

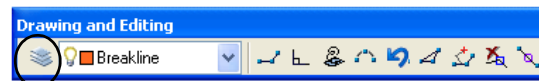
The **Drawing Layer Manager** option on the **Drawing and Editing** toolbar creates new DAT/EM Drawing Objects layers.

- DAT/EM Drawing Objects layers exist within SUMMIT EVOLUTION only, although they may be exported to a file (page 26-8) or sent to active CAD/GIS (page 26-8) later.
- DAT/EM Drawing Objects layers will not be saved for the next session of SUMMIT EVOLUTION.

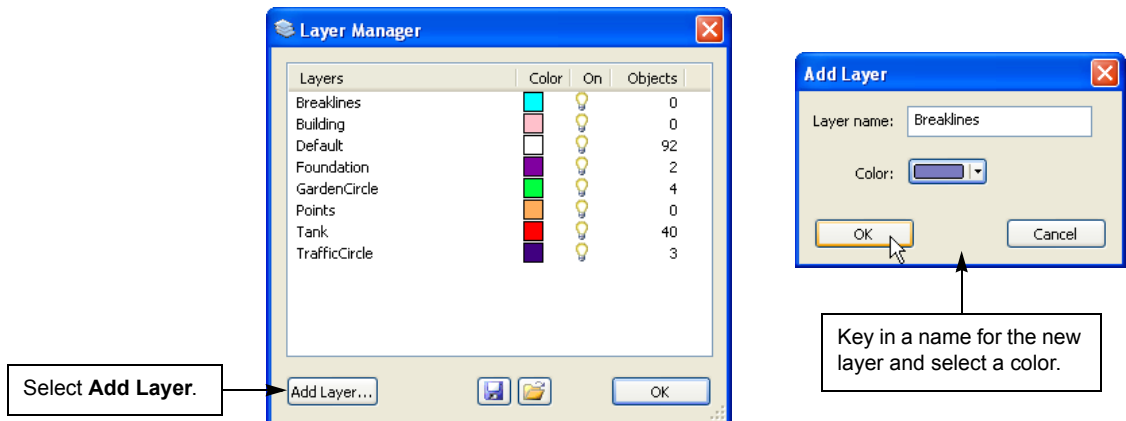
Perform the following steps:

Step 1) Select **Drawing Layer Manager** from the **Drawing and Editing** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.

Select **Drawing Layer Manager** from the **Drawing and Editing** toolbar.



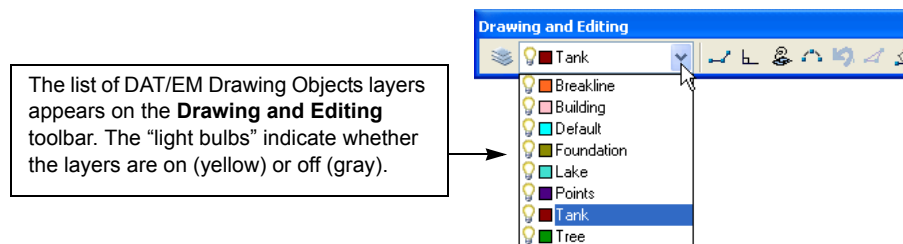
- Step 2)** The Layer Manager appears. To create a new layer, select **Add Layer**. Key in a name for the layer and select a color:



If the layer already exists, nothing will happen. New names only will become new layers.

- Step 3)** To change the color of an existing layer, click on its color in the **Color** column. Choose a new layer from the Color dialog.
- Step 4)** To hide a layer, click on its “light bulb” in the **On** column. Dark gray indicates the layer is off, and yellow indicates that it is on.

All of the layer names and each layer’s on/off status may be viewed next to **Drawing Layer Manager** on the **Drawing and Editing** toolbar.



Polyline Point to Point, Squaring, Streaming, and Arc

These tools are shown together, because they all create polylines.

The **Polyline Point to Point**, **Polyline Squaring**, **Polyline Streaming**, and **Polyline Arc** tools on the **Drawing and Editing** toolbar create new polylines inside the SUMMIT EVOLUTION environment. A common use for these polylines is as breaklines for **Realtime Visualization of Contours**.

The polyline drawing modes may be toggled during digitizing. For example, part of a polyline may be digitized in point-to-point mode, and another part in squaring mode.

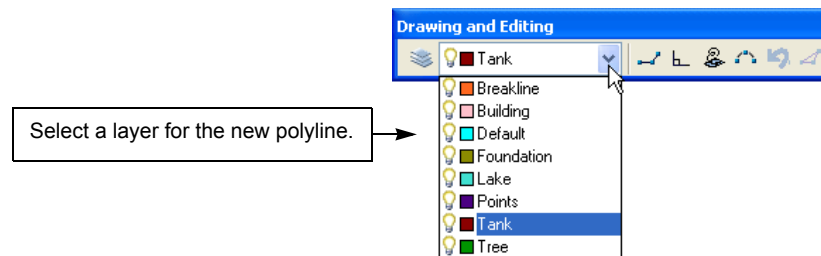
- In **Polyline Point to Point** mode, you digitize each individual vertex to add distinct segments.
- In **Polyline Squaring** mode, as you digitize each individual vertex, segments are forced to be square (90°) to each other if they fall within a set angle tolerance.
- In **Polyline Streaming** mode, you digitize a start point that also sets a “pen down” status. As the cursor moves, vertices are automatically added to the polyline according to tolerance settings.
- In **Polyline Arc** mode, you digitize a start point, a point along the arc, and an end point. The arc that is placed is a simulated arc that is stroked by many short segments.

The **Add Circle** tool also draws a polyline, but it results in a single closed polyline, and may not be toggled to other modes during drawing. It is discussed separately in “Add Circle” on page 26-20.

Polylines may be drawn while **Realtime Visualization of Contours** is on and currently drawing proposed contours. New polyline vertices will immediately affect the set of proposed contours.

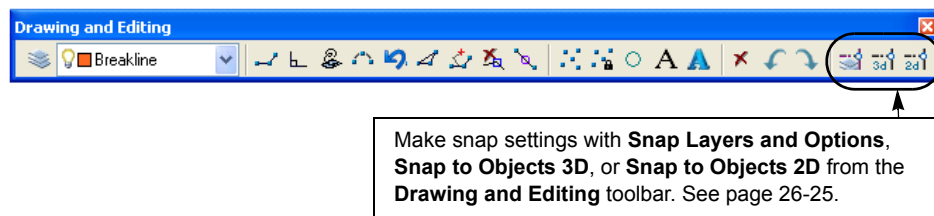
To draw a new polyline, perform the following steps:

Step 1) Select a layer from **Drawing Layers** on the **Drawing and Editing** toolbar.

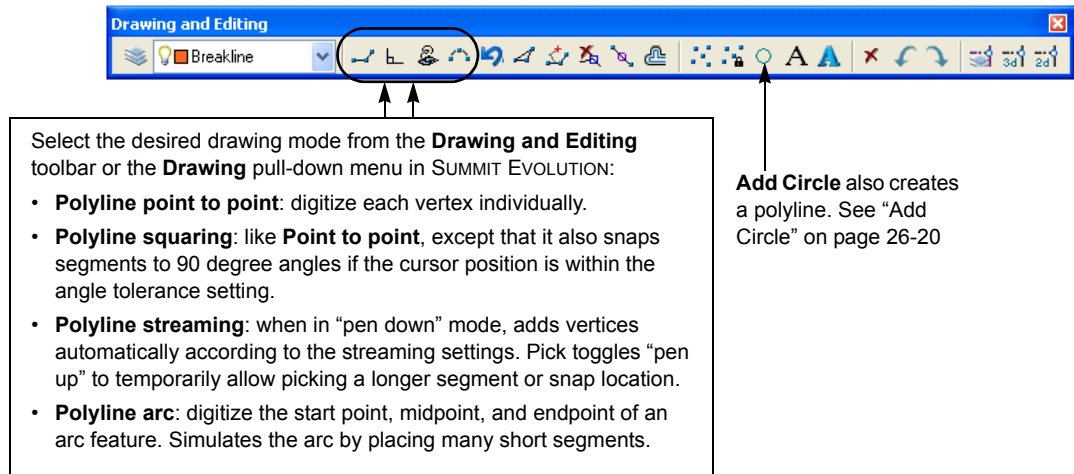


Step 2) If squaring or streaming modes will be used, set the squaring and streaming tolerances. See “Object Options” on page 26-26 for instructions.

Step 3) If necessary, make snap settings. See “Snap Options, Snap 3D, and Snap 2D” on page 26-25.



Step 4) Select the desired polyline drawing mode from the **Drawing and Editing** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.



Step 5) Use the pick button on the 3D cursor to digitize.

- For **Polyline Point to Point** mode, digitize each individual vertex.
- For **Polyline Squaring** mode, digitize each vertex. The cursor’s rubber band will indicate whether the vertex will snap to create a 90° corner. If “**When squaring, close polyline on Cancel**” is on (page 26-26), polylines will automatically close when they are finished, and two-segment polylines will automatically form a complete rectangle.

Hint: The angle tolerance may be changed during digitizing without stopping the polyline (page 26-26).

Hint: If “**close polyline on Cancel**” is on and there’s a special case where you don’t want to close the object or you don’t want to auto-complete a rectangle, switch to the **Polyline Point to Point** tool just before pressing the Cancel button.

- For **Polyline Streaming**, there are two modes: “Pen down” (add vertices automatically) and “pen up” (wait for the user to digitize the next point). If the first point is not snapped, it immediately starts “pen down” and points are added automatically as the cursor moves. If the first point is snapped, “pen up” status remains active, and more snaps are possible. To toggle from “pen up” to “pen down”, pick a non-snapped point.

During “pen down” mode, there are two choices:

1. Move the cursor along the feature. Points are added automatically according to the streaming settings.
 2. Select the pick button to set “pen up” mode. A rubber band appears between the last-added point and the cursor position, but now points are not added automatically. Pick a non-snapped point to toggle back to “pen down” mode, or snap and remain in “pen up” mode. After a snap, “pen up” remains active and more snaps are possible. To toggle from “pen up” to “pen down”, pick a non-snapped point. (You can change snapping settings during this process!)
- For **Polyline Arc** mode, if this is the start of the polyline, digitize the start point of the arc; otherwise the start point is the most recently added vertex, even if that vertex was added by a different drawing mode. Digitize a point along the arc and the arc endpoint. The arc will be simulated by many short segments.

During the digitizing process, either stay in the original drawing mode, or toggle to any of the other modes: **Point to Point**, **Squaring**, **Streaming**, or **Arc**.



Change any desired settings – streaming, squaring, snap 2D, snap 3D, snap off, snap layers, and the snap radius – during the digitizing process without stopping the polyline (see Step 2 and Step 3 above).

To remove the most recent vertex at any time during the digitizing process, select the **Undo Vertex** icon on the **Drawing and Editing** toolbar. The undo may be repeated all the way back to and including the first vertex.



Step 6) There are two ways to end the polyline:

- a.) **Close and Finish:** Select the **Close Polyline** icon to add a closing segment between the first and last vertices and finish the polyline. After closing, the drawing mode stays active and the next polyline may be started. If a Cancel button is received now, the drawing mode is turned off.

If you forget to close the polyline, it may be closed from the Object Properties window. See “Object Properties Window: View Details and Edit Objects” on page 26-28.

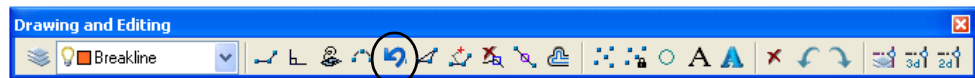
- b.) **Finish (usually open):** Select the Cancel button one time to finish the polyline.

After one Cancel button is received, the active drawing mode stays active, and the next polyline may be started. If two Cancel buttons are received, the drawing mode is turned off.

Note: To save objects after they have been digitized, see “Save Objects to File” on page 26-8 and “Send Objects to Active CAD” on page 26-8.

Undo Vertex (during polyline drawing)

To remove the most recent vertex while drawing a polyline, select the **Undo Vertex** icon on the **Drawing and Editing** toolbar. **Undo Vertex** may be repeated back to and including the first vertex.



See also “Undo and Redo” on page 26-25.

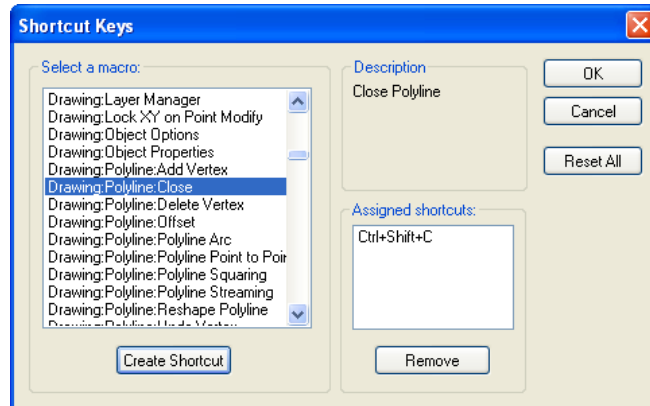
Close Polyline

The **Close Polyline** option on the **Drawing and Editing** toolbar allows you to finish drawing a polyline by closing it. A segment is drawn from the end of the polyline to the first vertex.

Note: It is not necessary to use **Close Polyline** if **Polyline Squaring** is on and the “**When squaring, close polyline on cancel**” setting is on (page 26-26). In that case, the Cancel button alone closes and finishes the polyline.

To close and end a polyline, perform the following steps:

- Step 1)** (Optional) If desired, set a function key to **Close Polyline** and set the function key on a digitizer button.

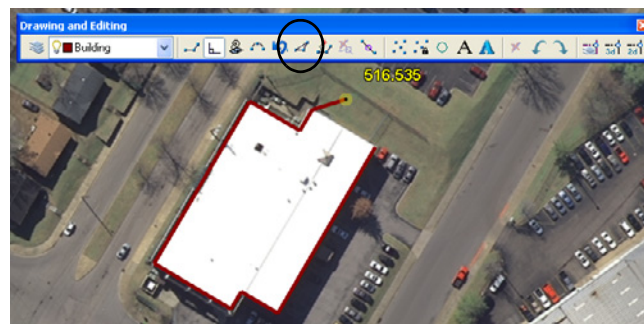


Example of shortcut key setting

13 Shortcut Key Ctrl + Shift + C
Example of BUTTON MANAGER setting

- (Optional) Use **Tools>Shortcuts** (page 25-65) to set **Drawing:Polyline:Close** to a shortcut key.
- Use **BUTTON MANAGER** (page 25-38) to set the shortcut to a button.

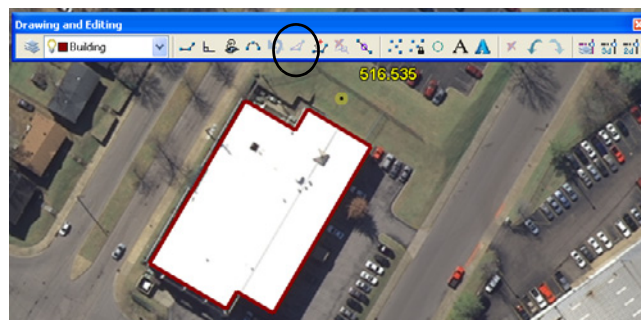
- Step 2)** Use the point-to-point, squaring, streaming, or arc drawing modes to draw each vertex in the object. (Do not press the Cancel button to end.)



Polyline drawing is active

(In this case, the “When squaring, close polyline on cancel” setting is off, and the user can choose to close the polyline or not.)

- Step 3)** While the drawing tool is still active, select the **Close Polyline** icon on the **Drawing and Editing** toolbar or use a button set to the Close Polyline function key. A closing segment is added and the object is finished.



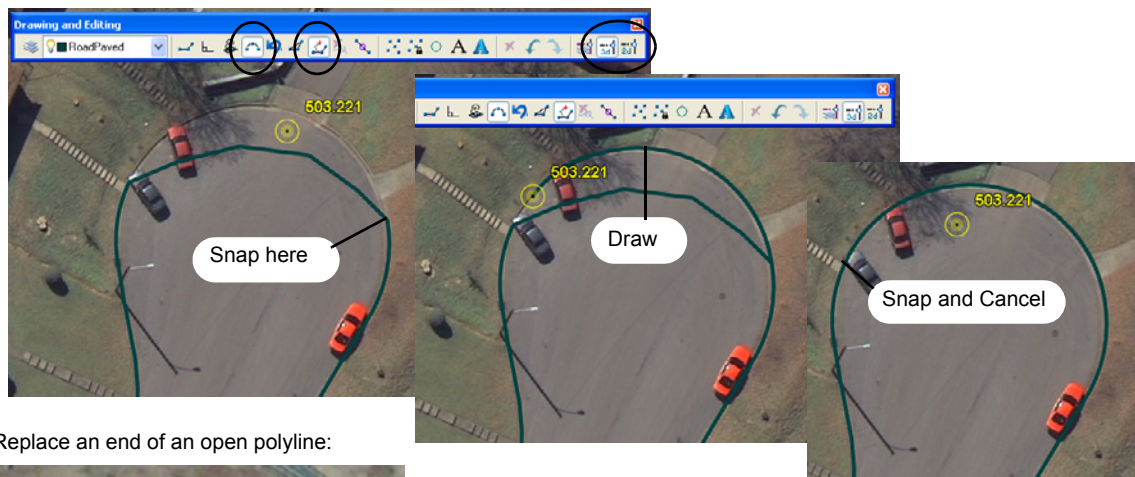
Select **Close Polyline** to close and finish.

Reshape Polyline

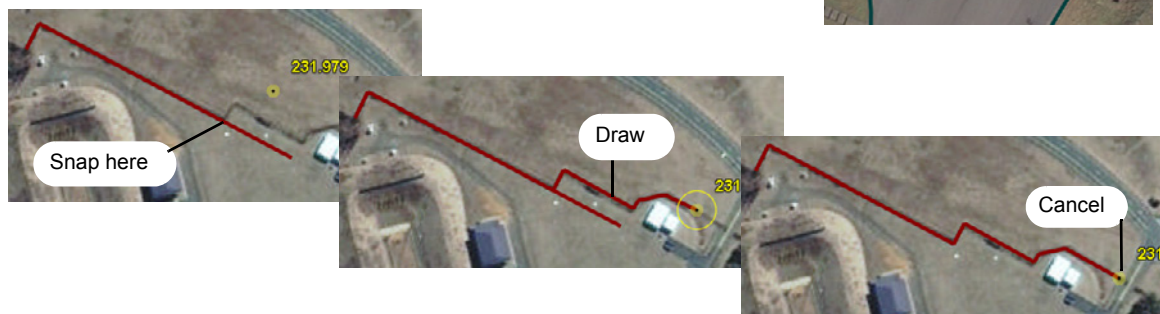
Reshape Polyline is used to edit more than one vertex of an existing polyline. It may also be used to replace or extend the end of an existing polyline. Perform the following steps:

- Step 1)** *It is not necessary to select the polyline first.* Select **Reshape Polyline** from the **Drawing and Editing** toolbar.
- Step 2)** Snapping is required for **Reshape Polyline**. The **Snap to Objects 3D** icon automatically highlights.
 - If desired, select **Snap to Objects 2D** from the **Drawing and Editing** toolbar to change the snap mode to XY only.
 - If necessary, select **Snap Layers and Options** and make snap layer settings. The layer of the object to be edited must be on for snapping.
- Step 3)** A DAT/EM Drawing Objects drawing tool is required for **Reshape Polyline**. If a drawing tool is active when **Reshape Polyline** starts, that tool will stay active; otherwise, **Polyline Point-to-Point** will turn on automatically. Change the drawing tool at any time during **Reshape Polyline**.
- Step 4)** Snap to the polyline and draw the new section. Draw as many vertices as you like. Change the drawing tool during drawing if desired.
- Step 5)** Choose a method to end:
 - To replace an interior part of an open or closed polyline, snap to the polyline again and press the Cancel button.
 - To replace the end of a polyline, draw the new end, then press the Cancel button (without snapping again).

Replace an interior section of a closed or open polyline:



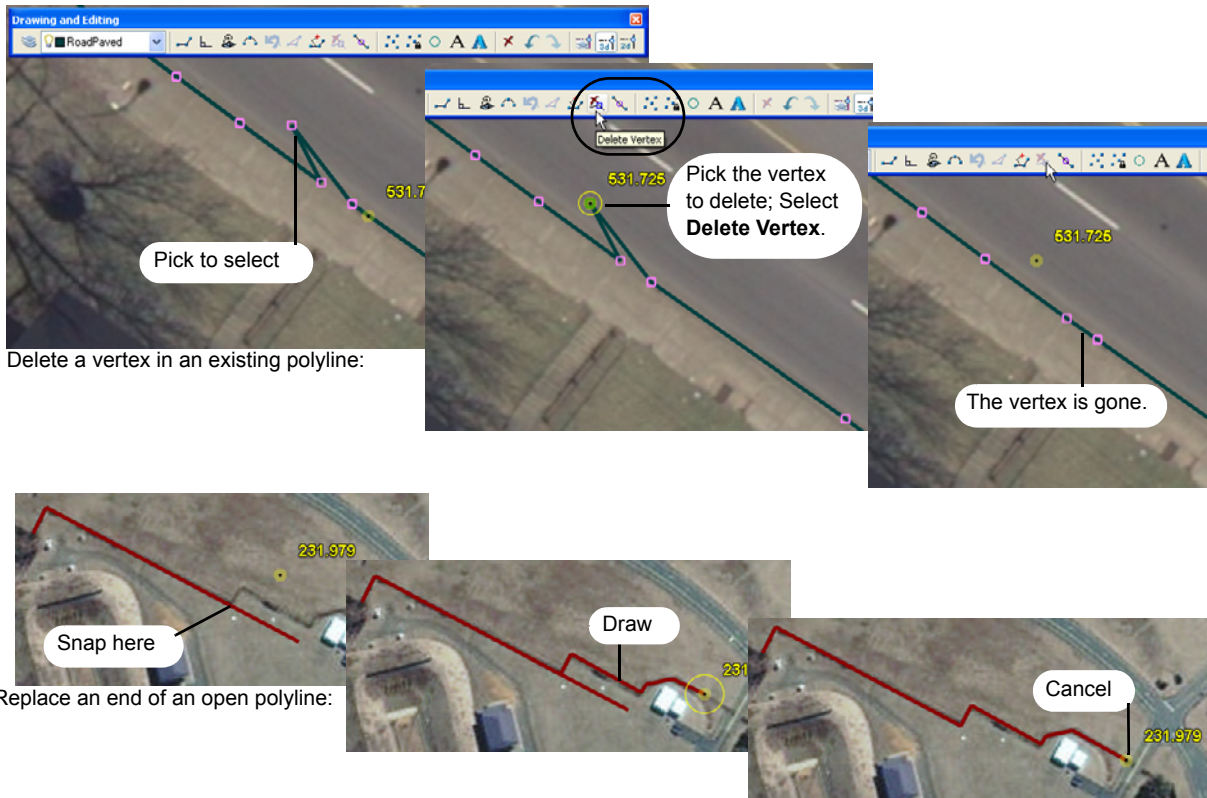
Replace an end of an open polyline:



Delete Vertex

The **Delete Vertex** option removes a vertex from an existing polyline. Perform the following steps:

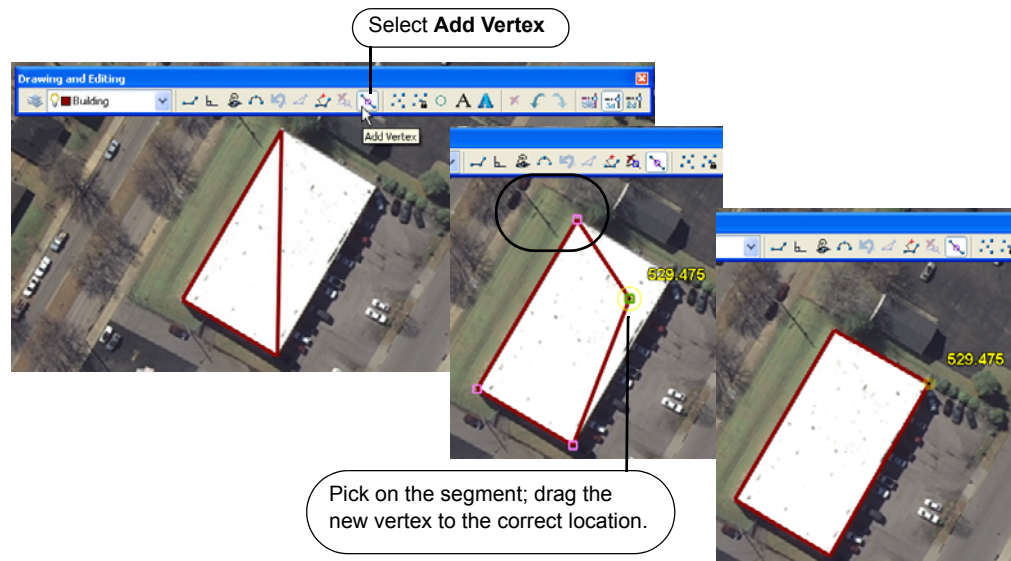
- Step 1)** If necessary, press the Cancel button one or two times to cancel any active DAT/EM Drawing Objects drawing tools.
- Step 2)** Pick on the polyline to select it.
- Step 3)** Pick on the vertex to delete.
- Step 4)** Select **Delete Vertex** from the **Drawing and Editing** toolbar.



Insert Vertex

The **Insert Vertex** option adds a vertex to an existing polyline. Perform the following steps:

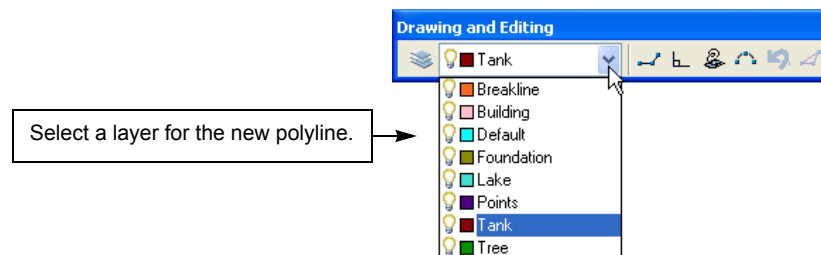
- Step 1)** Select **Insert Vertex** from the **Drawing and Editing** toolbar.
- Step 2)** Pick on the polyline segment where the vertex is to be added.
- Step 3)** Position the cursor at the location for the new vertex. Pick to place the vertex in that location.
- Step 4)** Repeat to add more vertices, or press the Cancel button to turn off the tool.



Create Polyline Offset

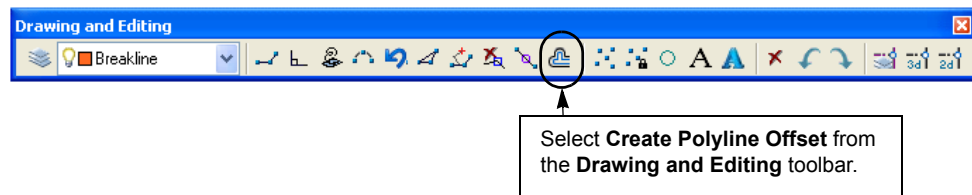
The **Create Polyline Offset** option creates a new polyline that is offset in XY and Z from a selected polyline. Perform the following steps:

- Step 1)** The new offset will be placed on the currently set DAT/EM Drawing Objects layer. Select a layer from **Drawing Layers** on the **Drawing and Editing** toolbar.



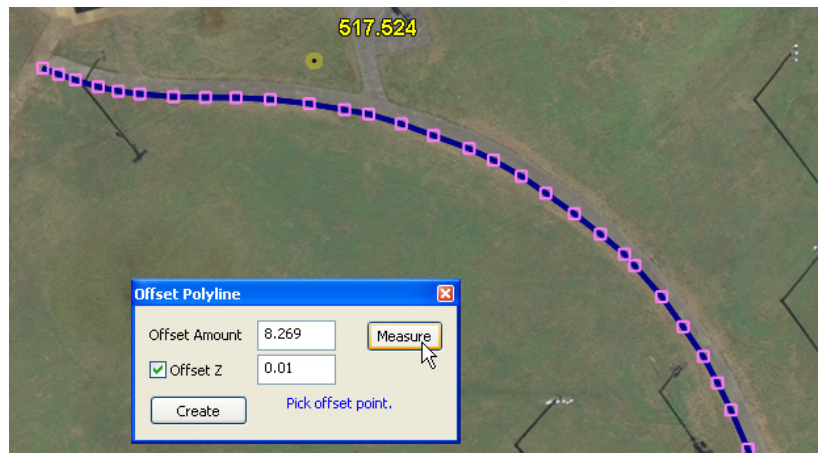
- Step 2)** If necessary, press the Cancel button one or two times to cancel any active drawing modes.
- Step 3)** Pick on an existing polyline to select it.

Step 4) Select **Create Polyline Offset** from the **Drawing and Editing** toolbar.

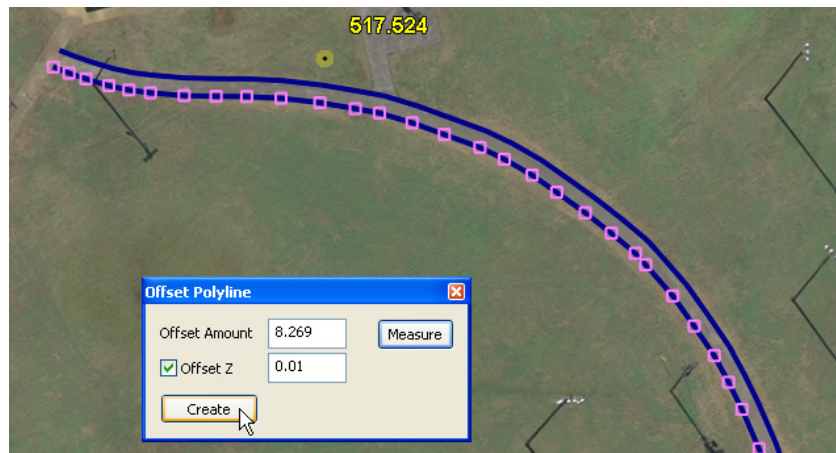


Step 5) Either key in the **Offset Amount** (XY distance) and **Offset Z** distance, or select the **Measure** button and use the stereoplotter cursor to pick a point in the stereo view at the offset distance from the selected polyline.

If **Offset Z** is off, the elevation of the new polyline's vertices will match the elevation of the nearest part of the original polyline.



Step 6) When the offset values are set correctly, select the **Create** button. The offset polyline is made.



Step 7) To make more offsets:

- **To offset the same polyline again:** Keep the same polyline selected. Key in or measure the new offset values and select **Create** again.
- **To offset a different polyline:** The Offset Polyline dialog may remain on the screen while making a different selection. Pick on a blank area to clear the current selection, then pick the polyline to offset. Select only one polyline to offset at a time. Make settings in the dialog, and select **Create**.

Create New Points

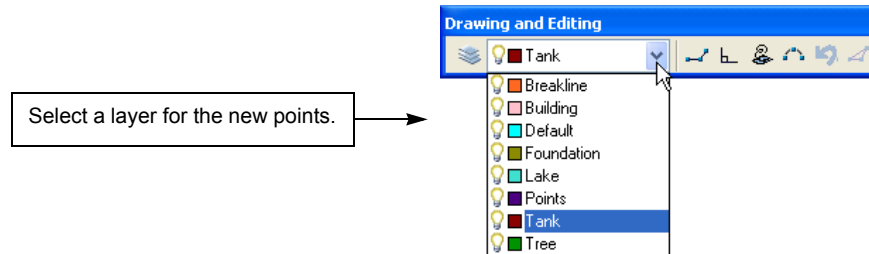
The **Create New Points** option on the **Drawing and Editing** toolbar allows you to draw one or more points.

Points may be drawn while **Realtime Visualization of Contours** is on and currently drawing proposed contours. New points will immediately affect the set of proposed contours.

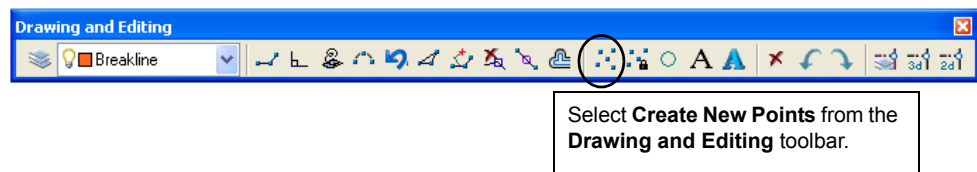
Snapping is not active when the point tool is on.

Perform the following steps:

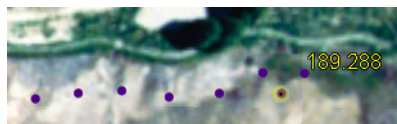
Step 1) Select the layer for the new points from the **Drawing and Editing** toolbar.



Step 2) Select **Create New Points** from the **Drawing and Editing** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.



Step 3) Use the pick button on the 3D cursor to digitize each point.



Notes:

- Press the Cancel button one time to turn off the **Create New Points** drawing mode. This is not like the polyline drawing options, which require two Cancel buttons to cancel the drawing mode.
- To edit the XYZ or Z of a selected point, see “Lock XY on Point Modify” below.
- To save points and other objects, see “Save Objects to File” on page 26-8 and “Send Objects to Active CAD” on page 26-8.

Lock XY on Point Modify

The **Lock XY on Point Modify** setting determines whether a point is modified in XYZ or Z only. Perform the following steps:

Step 1) Decide whether to edit the Z only or the full XYZ of the point:

- To edit the Z only, turn on (highlight) the **Lock XY on point modify** icon from the **Drawing and Editing** toolbar.
- To edit the full XYZ coordinate, turn off the **Lock XY on point modify** icon. It is off if it is not highlighted.



Choose a setting for **Lock XY on point modify** on the **Drawing and Editing Objects** toolbar.

Step 2) If necessary, press the Cancel button one or two times to cancel any active drawing modes.

Step 3) Pick on the point to select it.

Step 4) Pick on the point again to move it. Position the stereoplotted cursor at the new XYZ or Z value and pick again to complete the point edit.

Add Circle

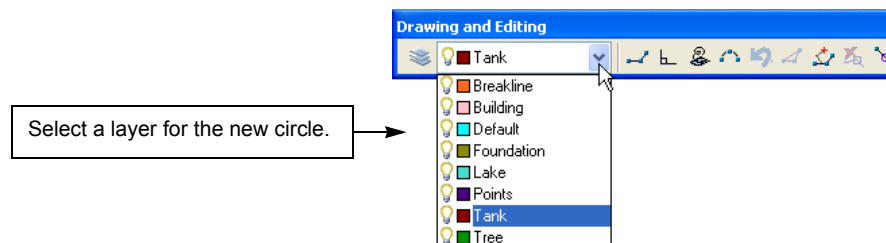
The **Add Circle** option on the **Drawing and Editing** toolbar allows you to draw a “circle” that is simulated by many short segments. The result is a closed polyline that has many vertices.

Circles may be drawn while **Realtime Visualization of Contours** is on and currently drawing proposed contours. New points will immediately affect the set of proposed contours.

Snapping is not active while drawing a circle.

Perform the following steps:

Step 1) Select the layer for the new circle from the **Drawing and Editing** toolbar.

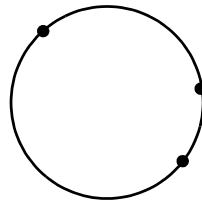


- Step 2)** Select **Add Circle** from the **Drawing and Editing** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.



Select **Add Circle** from the **Drawing and Editing** toolbar or pull-down menu in SUMMIT EVOLUTION.

- Step 3)** Use the pick button on the 3D cursor to digitize any three points on the circle.



Digitize any three points on the circle.

The circle is placed as a closed polyline made up of many vertices.

Create New Text

The **Create New Text** option on the **Drawing and Editing** toolbar allows you to place single-line text.

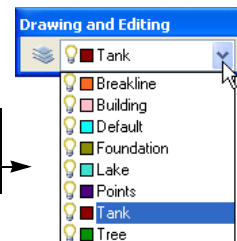
Snapping is not active when the text tool is on.

Perform the following steps:

- Step 1)** Select the layer for the new text from the **Drawing and Editing** toolbar.

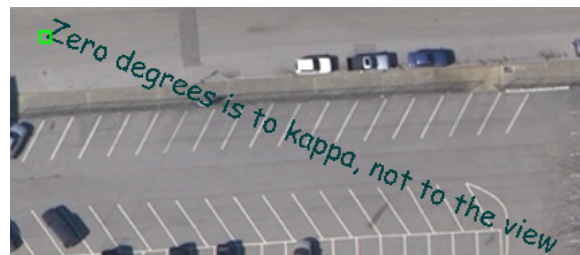
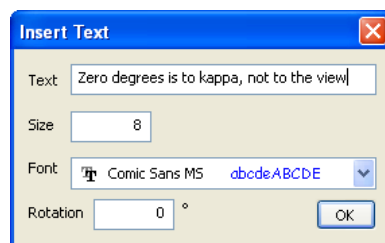
- Step 2)** Select **Create New Text** from the **Drawing and Editing** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.

Select a layer for the new text.



- Step 3)** Use the pick button to select the lower left corner of the text.

- Step 4)** Enter the text string and make settings in the Insert Text dialog.



- Step 5)** If desired, repeat Step 3 and Step 4 to create more text.

Text Labeling

The **Text Labeling** option on the **Drawing and Editing** toolbar allows you to place text from a list of repeatable text labels. Labels are stored in a list, and may be used again at any time.

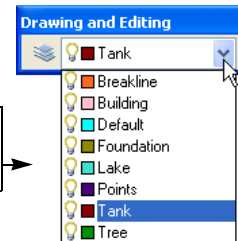
Snapping is not active when this text tool is on.

Perform the following steps:

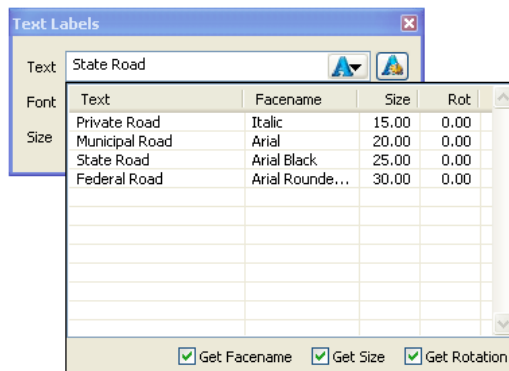
Step 1) Select the layer for the new text from the **Drawing and Editing** toolbar.

Step 2) Select **Text Labeling** from the **Drawing and Editing** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION.

Select a layer for the new labels.



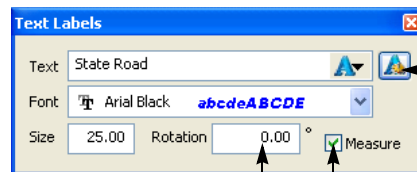
Step 3) Either enter a new text string or select an existing label from the list. If selecting an existing label, choose **Get Facename**, **Get Size**, and **Get Rotation** settings; if on, the stored settings are used, and if off, the current dialog settings are used.



Either enter a new text string or select an existing label.

When **Get Facename**, **Get Size**, or **Get Rotation** are checked on, the facename (font), size, and rotation angle are selected with the label. When off, the current dialog box setting is retained and overrides the stored value.

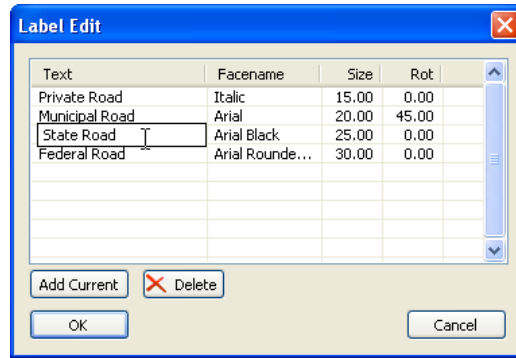
Step 4) To add the current string to the label list or to edit the existing labels, select the **Add and edit labels** button to the right of the **Text** field:



To add to or edit the list of labels, select **Add and edit labels**.

About text angles:

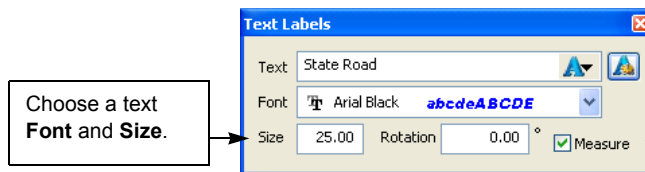
- Zero (0.00) degrees is to the model's kappa, not to current stereoplotter view.
- Check on **Measure** to select the angle using the stereoplotter's cursor.



Use the Label Edit dialog to manage the list of stored text labels.

- Select **Add Current** to add the string from the **Text** field (in the Text Labels dialog) to the list.
- Click directly on any field in the table to edit the text string or value.
- To delete a label, click in any field in the label's line and select the "X" button.

Step 5) Make other settings:

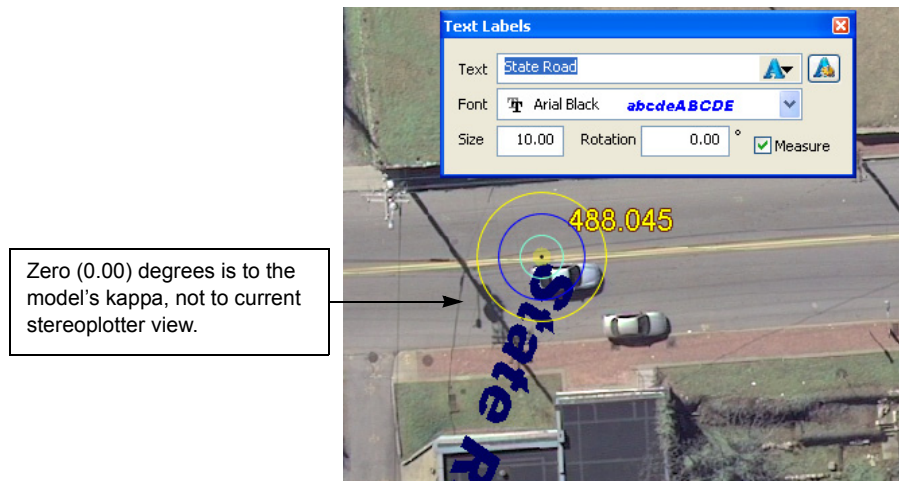


Choose a text **Font** and **Size**.

About text angles:

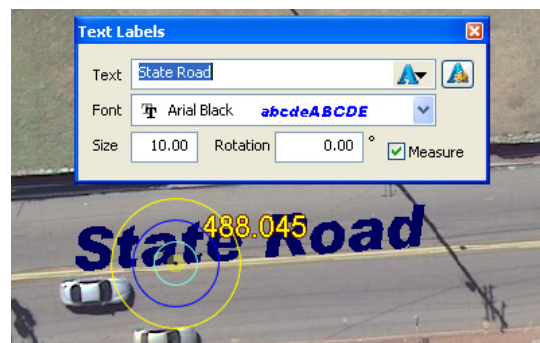
- Zero (0.00) degrees is to the model's kappa, not to current stereoplottter view.
- Check on **Measure** to select the angle using the stereoplottter's cursor.

Step 6) Use the pick button to select the lower left corner of the text.



Zero (0.00) degrees is to the model's kappa, not to current stereoplottter view.

Step 7) If **Measure** is checked on, move the cursor to drag the text to the correct angle. Pick again. That angle will become active for the next placement of the text.



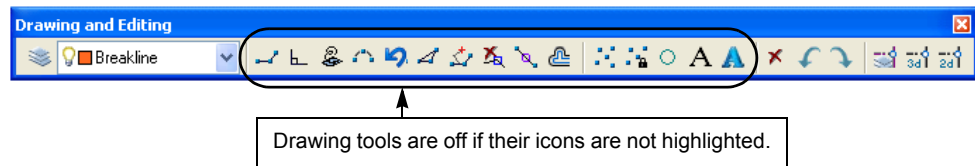
Step 8) If desired, position and pick again to place the same text label in another location, or repeat Step 3 to Step 7 to place different text labels.

Delete DAT/EM Drawing Objects

There are two ways to delete DAT/EM Drawing Objects:

1. **Delete All DAT/EM Drawing Objects:** To delete *all* DAT/EM Drawing objects, whether or not they have been saved, see “Close All DAT/EM Drawing Objects” on page 26-8.
2. **Delete Selected DAT/EM Drawing Objects:** To delete only selected objects, perform the following steps:

Step 1) If a drawing mode is currently active, press the Cancel button on the 3D cursor one or two times until the drawing mode turns off (tool status is visible on the **Drawing and Editing** toolbar).



Step 2) Select the object(s):

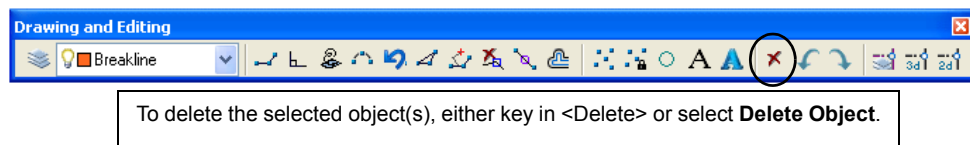
- Click directly on the object. Vertex markers will appear when the object is selected. For text, the text insertion point will be marked at the lower left of the text.
- Multiple objects may be selected. Continue clicking on more objects.
- An alternate method of selection is to use the **Select objects with a box** tool that is found on the **Drawing Tools** toolbar. Drag a selection box over the objects.

Select objects with a box may be used to drag a selection box over one or more polylines and/or points.



- Note: To clear a selection, click the pick button in a blank area where there are no objects.

Step 3) To delete the selected DAT/EM Drawing Object(s), either press the <Delete> key on the keyboard or select **Delete Object** from the **Drawing and Editing** toolbar.



- **Undo** may be used to replace the objects if the delete was a mistake. See “Undo and Redo” on page 26-25.
- To save the set of remaining objects, see “Save Objects to File” on page 26-8 and “Send Objects to Active CAD” on page 26-8.

Undo and Redo

The **Undo** and **Redo** options work to undo/redon DAT/EM Drawing Object tasks such as drawing a polyline or deleting a point.

To use **Undo** and **Redo**, perform the following steps:

- Step 1)** Make a mistake such as accidentally deleting a polyline.
- Step 2)** Select **Undo** from the **Drawing and Editing** toolbar. If necessary, select **Undo** multiple times until multiple mistakes are undone.
- Step 3)** If **Undo** is used in error, use **Redo** immediately to, in effect, “undo the undo”.

See also “Undo Vertex (during polyline drawing)” on page 26-13.

Snap Options, Snap 3D, and Snap 2D

Snapping may be used for drawing and editing functions with DAT/EM Drawing Objects. To make settings and toggle 2D or 3D snapping, perform the following steps:

- Step 1)** Use **Snap layers and options** to make layer, snap radius, and snap type settings.

Make snap settings.

- Select **Snap to all layers** to snap to all DAT/EM Drawing Objects.
- Or, select individual layers. Snapping will only be active for DAT/EM Drawing Objects on selected layers.

Set the Snap Radius to the number of pixels from the center of the cursor where snapping should take place.

Select Show to draw a snapping indicator circle around the center of the cursor.

Select Snap layers and options from the Drawing and Editing toolbar.

- **Nearest** snaps to the nearest point along a polyline segment.
- **Vertex** snaps to the nearest vertex on a polyline.
- **Midpoint** snaps to the midpoint of the nearest polyline segment.

- Step 2)** To turn on snapping, select the toolbar icon to highlight it:

- **Snap to Objects 3D** snaps to the polyline in X, Y, and Z.
- **Snap to Objects 2D** snaps to the polyline in X and Y only.

Select **Snap to Objects 3D** or **Snap to Objects 2D** from the **Drawing and Editing** toolbar.

- Step 3)** To turn off snapping, click the snap icon again to unhighlight it.

Drawing Tools Toolbar

The **Drawing Tools** toolbar offers several view settings and tool settings, as well as advanced tools for contouring and DTM collection. These options are described below.



The **Drawing Tools** toolbar

Clip Objects to Stereo Region

The **Clip Objects to Stereo Region** option on the **Drawing Tools** toolbar does not display objects that are completely outside the stereo region of the current model.

Perform the following steps:

- Step 1)** Select **Clip Objects to Stereo Region** from the **Drawing Tools** toolbar or from the **Drawing** pull-down menu in SUMMIT EVOLUTION. The option is on if it is highlighted on the toolbar.

Select **Clip Objects to Stereo Region** from the **Drawing Tools** toolbar or **Drawing** pull-down menu in SUMMIT EVOLUTION.



- Step 2)** At any time, select the option again to restore the display of all DAT/EM Drawing Objects, even if they are outside the model. The option is off if it is not highlighted on the toolbar.

Object Options

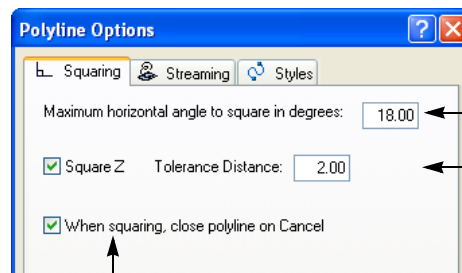
Object Options offers tabs for tool settings such as the squaring tolerance for the **Polyline Squaring** tool and the minimum segment length for the **Polyline Streaming** tool.

- Step 1)** Select **Object Options** from the **Drawing Tools** toolbar.

Select **Object Options** from the **Drawing Tools** toolbar.



- Step 2)** Make settings on the **Squaring** tab:



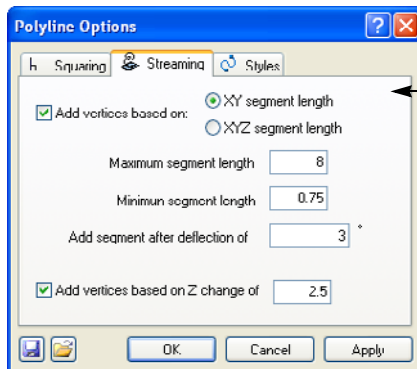
- **When squaring, close polyline on Cancel:** When this is on, the Cancel button closes and ends the polyline if the **Polyline Squaring** tool is on. It also automatically completes a rectangle if only three corners (two segments) have been digitized.

Hint: If this setting is on, but there's a special case where you don't want to close the object or you don't want to auto-complete a rectangle, switch to the **Polyline Point to Point** tool just before pressing the Cancel button.

Hint: To change the open/closed status of an existing polyline, toggle the setting in the Object Properties window (page 26-28).

- **Maximum horizontal angle to square in degrees:** During squared digitizing mode, a corner is squared only if its digitized angle is less than or equal to this angle in degrees. There is no ideal setting that will work for every project; it depends on the scale and quality of the imagery. If you are not sure what to set, try 16 degrees, and then adjust it later if necessary.
- **Square Z:** This behaves like an XY snap. While digitizing a building, if the Z has changed, but XY has not changed more than the Tolerance Distance, then the digitized point will be snapped in XY to the previous point. The squaring angle is retained from the previous segment. This allows you to digitize at the top and bottom of a vertical building wall, even if the lower point is not completely visible in the images.
- **Tolerance Distance:** This sets the XY snap radius for **Square Z**.

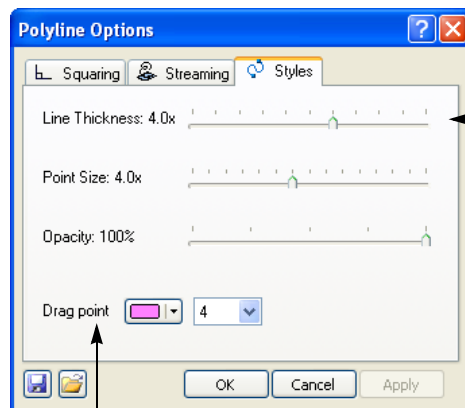
Step 3) Make settings on the **Streaming** tab:



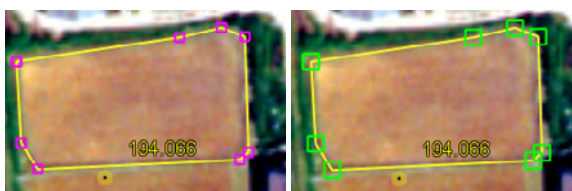
Hint: To add segments that are all the same length, set **Minimum segment length = Maximum segment length** and set **Add segment after deflection of = 0**.

- **Add vertices based on** determines whether "segment length" (in the next two settings) means an XY length or an XYZ length. **XY segment length** checks for the minimum and maximum segment lengths based on how long the segment is in XY only. **XYZ segment length** checks for the minimum and maximum segment lengths based on how long the segment is in XYZ. To add segments that are all the same length, set **Minimum segment length = Maximum segment length** and set **Add segment after deflection of = 0**.
- **Maximum segment length:** No segment in the polyline shall be longer than the **Maximum segment length**. If this distance has been traveled from the last vertex, a point is added to the polyline, even if the deflection angle has not been exceeded.
- **Minimum segment length:** No segment in the polyline shall be shorter than the **Minimum segment length** with three exceptions:
 1. The last segment (or the segment just before a closing segment) may be shorter.
 2. The closing segment may be shorter.
 3. A Z change with **Add vertices based on Z change of** on can override the **Minimum segment length**.
- **Add segment after deflection of angle** determines whether to add a segment that is shorter than the **Maximum segment length**. The angle of deflection of the proposed segment is compared to the angle of the previous segment. A vertex is placed if both the angle and the **Minimum segment length** have been exceeded.
- **Add vertices based on Z change of** may be used either alone or with the **XY/XYZ segment length** methods to add vertices based on Z change. To add vertices based purely on Z change, uncheck **Add vertices based on** above to deactivate it, then check on **Add vertices based on Z change of** and set the Z distance. Or, to add vertices based on either an XY/XYZ change or a Z change, check on both the **Add vertices based...** settings. In this case, a Z change will be allowed to override the **Minimum segment length**.

Step 4) Make settings on the **Styles** tab:



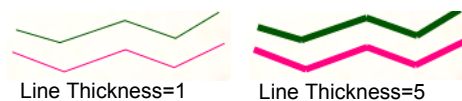
- **Drag point** controls how the vertex markers look on a selected DAT/EM Drawing Object.



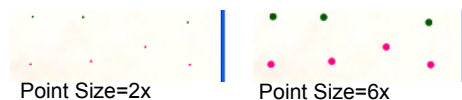
Color=magenta, Size=4

Color=green, Size=7

- **Line Thickness** regulates the thickness of polyline objects on DAT/EM Drawing Objects layers.



- **Point Size** regulates the size of point objects on DAT/EM Drawing Objects layers.



- **Opacity** controls whether you can see the images through the DAT/EM Drawing Objects. **Opacity** set to 100% would make the DAT/EM Drawing Objects a uniform color with no image features showing through them. **Opacity** set to 0% would make the objects invisible. This setting applies to all object types on DAT/EM Drawing Objects layers: Polyline, points, and text.



Opacity=50%

Opacity=100%

Object Properties Window: View Details and Edit Objects

The **Object Properties** window offers information and editing for one or more selected DAT/EM Drawing Objects. To use Object Properties, perform the following steps:

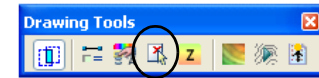
Step 1) Select **Object Properties** from the **Drawing Tools** toolbar. The Object Properties window appears. This window may be docked to the SUMMIT EVOLUTION window or it may be dragged and dropped to display independently.



Step 2) If a drawing mode is currently active, press the Cancel button on the 3D cursor one or two times until the drawing mode turns off.

Step 3) Select object(s):

- Click directly on the object to select it. Vertex markers or a text insertion point marker will appear when the object is selected.
- Multiple objects may be selected. Continue clicking on more objects.
- An alternate method of selection is to use the **Select objects with a box** tool that is found on the **Drawing Tools** toolbar. Drag a selection box over the objects.
- Note: To clear a selection, click the pick button in a blank area where there are no objects.



Step 4) View details and edit, if desired. The information shown and the edits available depend on whether one or multiple objects are selected. When only one object is selected, its specific information is shown in the Object Properties window; make edits if desired.

If one object is selected, its specific information will be displayed:

- **Layer:** To change the object's layer, select a different layer from the pop-down menu.
- **Vertex number:** The indicated vertex coordinate is shown. To view a different vertex, select its number in the "number of n" field.
- **Vertex fields:** To edit a vertex, set its vertex number in the "number of n" field and key in different coordinates in its **vertex X, Y, and Z** fields.

Go moves the stereoplotter's cursor to the displayed vertex.

Open/Closed displays a polyline's current open or closed status. If desired, edit by selecting the opposite setting.

When multiple objects are selected, the only item that may be changed is the objects' layer. The same layer will be applied to all of the selected objects:

If multiple objects are selected:

- Only the objects' layer may be edited.
- If a new layer is selected, this same layer will be applied to all of the selected objects, even if they were originally on different layers.

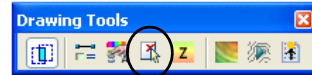
Select Objects with a Box

Objects can be selected singly by first making sure the drawing tools are off, then picking directly on each object. An alternate method of selection is to use the **Select objects with a box** tool that is found on the **Drawing Tools** toolbar.

Step 1) Select **Select objects with a box** from the **Drawing Tools** toolbar.

Step 2) Use the system mouse to drag a selection box over the objects.

Select objects with a box may be used to drag a selection box over one or more polylines and/or points.

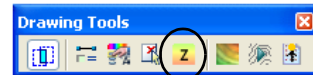


Color Points by Elevation

The **Color Points by Elevation** option overrides point objects' layer colors. It colors the points by their elevation, with reds indicating highest elevation and blues indicating lowest elevation.

Step 1) Select (highlight) **Color Points by Elevation** from the **Drawing Tools** toolbar. Any DAT/EM Drawing Objects that are points will change color according to their elevation.

Select **Color Points by Elevation**.



Step 2) Select (unhighlight) **Color Points by Elevation** again at any time to return the points to their original layer colors.

Realtime Visualization of Contours

One of the main reasons that DAT/EM Drawing Objects exist is to provide **Realtime Visualization of Contours**, which reacts immediately to point and breakline edits. The object drawing and editing tools are designed to aid in import, collection, editing, and export of points and breaklines for **Realtime Visualization of Contours**.

- The goal of **Realtime Visualization of Contours** is to produce the best possible input data set for actual contour generation (page 25-80).
- **Realtime Visualization of Contours** is faster to react to edits and breakline additions than **Terrain Visualization** (page 25-76), which is slowed by the fact that edits take place within CAD/GIS, and then must be communicated to SUMMIT EVOLUTION through SUPER/IMPOSITION before the proposed contours can be updated.

To use **Realtime Visualization of Contours**, perform the following steps:

Step 1) Prepare initial input points and/or breaklines:

- “Load Polylines and Points from Vector Files” on page 26-4
- “Polyline Point to Point, Squaring, Streaming, and Arc” on page 26-11
- “Create New Points” on page 26-19

Step 2) Select **Realtime Visualization of Contours** from the **Drawing Tools** toolbar:

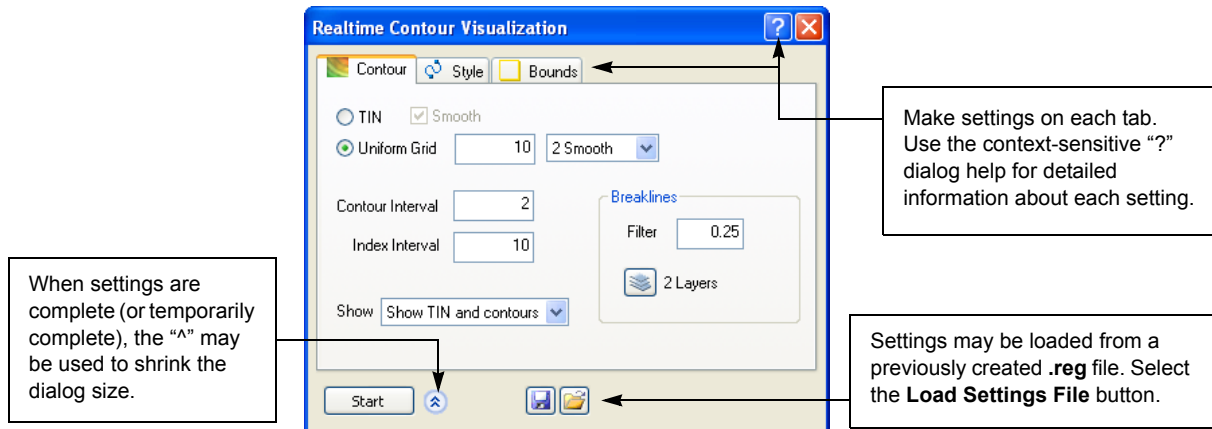
Select **Realtime Visualization of Contours** from the **Drawing Tools** toolbar.



Note! Do not confuse **Realtime Visualization of Contours** on the **Drawing Tools** toolbar with **Terrain Visualization** on the **Terrain Processing** toolbar (page 25-76), which uses superimposed vectors from AutoCAD, MicroStation, or ArcGIS as input. **Realtime Visualization of Contours** uses DAT/EM Drawing Objects as input.

Step 3) Make settings on each tab of the Realtime Contour Visualization dialog. Use the context-sensitive “?” dialog help for detailed information about each setting.

Settings may also be imported using the **Load Settings File** option. Select a **.reg** file that was created earlier using the Realtime Contour Visualization **Save Settings File** option on any same-version SUMMIT EVOLUTION or LANDSCAPE workstation.



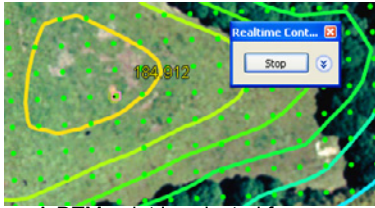
Step 4) Select the **Start** button. If desired, select the “^” button to shrink the dialog to a smaller size while contour visualization is active.

Contours and/or TIN lines will be displayed in the area that was specified on the **Bounds** tab. These are for viewing only; they are not permanent and may not be saved. They are used to verify data, to see areas where points and/or breaklines must be edited.

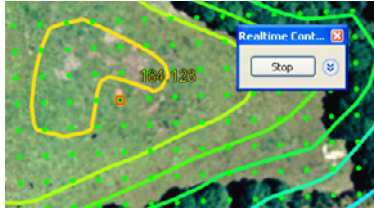
Step 5) Edit or digitize new points and/or breaklines wherever necessary. Use the following tools:

- Create new objects using “Polyline Point to Point, Squaring, Streaming, and Arc” on page 26-11, “Create New Points” on page 26-19, and “Add Circle” on page 26-20.
- Edit objects using “Close Polyline” on page 26-14, “Reshape Polyline” on page 26-15, “Delete Vertex” on page 26-16, “Insert Vertex” on page 26-17, “Create Polyline Offset” on page 26-17, “Delete DAT/EM Drawing Objects” on page 26-24, and “Object Properties Window: View Details and Edit Objects” on page 26-28.
- “Clip Objects to Stereo Region” on page 26-26.
- “Object Properties Window: View Details and Edit Objects” on page 26-28.
- “DTM Collection” on page 26-32.

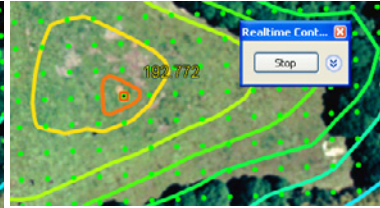
As points and vertices are selected to edit, the contours and/or TIN lines update in real time as the cursor drags the point. And as new polyline breaklines are drawn, the contours update in real time to show the effects of the new breakline. View the proposed contours and/or TIN lines as you edit and digitize.



A DTM point is selected for edit. The stereoplotter cursor is at the point's original elevation.



As the stereoplotter cursor is set to a lower elevation than the original point, the shape of the contour changes. The point has not yet been dropped.



As the stereoplotter cursor is set to a higher elevation than the original point, the contours adjust again to the proposed point location. The point has not yet been dropped.



A contour based entirely on DTM points crosses a ditch as if the ditch were not there. The DTM points do not happen to be located in the lowest part of the ditch.



A breakline is drawn along the ditch. Here, the cursor elevation is much lower than the actual ditch elevation, causing the contour to warp too much.



As the stereoplotter cursor is set to the actual ditch elevation, the contour adjusts appropriately at the ditch.

- Step 6)** Save your work whenever significant changes have been made and again when finished. Choose a method: “Save Objects to File” on page 26-8 or “Send Objects to Active CAD” on page 26-8.

Remember that DAT/EM Drawing Objects layers, polylines, and points exist only in SUMMIT EVOLUTION until you write them out to CAD/GIS or save them to a CAD/GIS vector file. If you close SUMMIT EVOLUTION without using one of these save options, all work will be lost.

Generate Contours from Objects

The **Generate Contours from Objects** option on the **Drawing Tools** toolbar does two things:

1. It makes a temporary **dwg** file that contains all of the current DAT/EM Drawing Objects.
2. It activates the CONTOUR CREATOR and automatically lists the temporary **dwg** file in the **Points** and **Breaklines** input columns.

This is a convenient way to activate the CONTOUR CREATOR and supply it with the current DAT/EM Drawing Objects as input. Besides having the temporary **dwg** file listed automatically, the CONTOUR CREATOR behaves exactly as shown in “Terrain Menu > Generate Contours” on page 25-80.

An alternative to using this option is to save the DAT/EM Drawing Objects (page 26-8) and activate the CONTOUR CREATOR separately (page 25-80). DAT/EM recommends activating the CONTOUR CREATOR separately if **Soft breaklines**, **Borders**, or **Exclusions** will be added as input types. This is simply because it is usually easier to browse to a file that you made yourself than to browse to the temporary file.

DAT/EM recommends the following process to use **Generate Contours from Objects**:

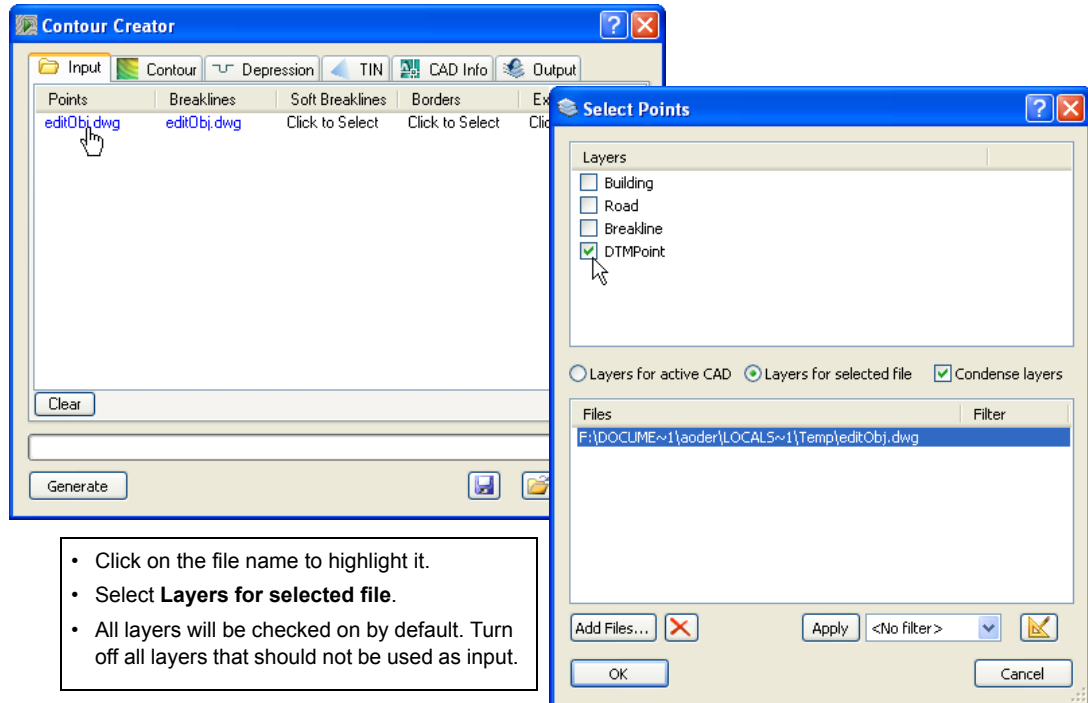
- Step 1)** Prepare DAT/EM Drawing Objects (26-4 to 26-29) and use **Realtime Visualization of Contours** (26-29) to verify that the objects are correct.

Step 2) Select **Generate Contours from Objects** option on the **Drawing Tools** toolbar:

Select **Generate Contours from Objects** from the **Drawing Tools** toolbar.



Step 3) Click on “editObj.dwg” in the **Points** and **Breaklines** columns.



- Click on the file name to highlight it.
- Select **Layers for selected file**.
- All layers will be checked on by default. Turn off all layers that should not be used as input.

Step 4) Continue with all other settings. See “Terrain Menu > Generate Contours” on page 25-80 for full CONTOUR CREATOR instructions.

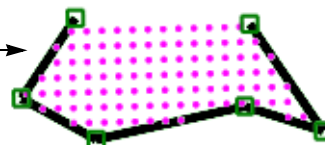
DTM Collection

DTM Collection in DAT/EM Drawing Objects is similar to the DTM collection functions offered in DAT/EM CAPTURE for AutoCAD, MicroStation, and ArcGIS. It drives SUMMIT EVOLUTION to rows or grid locations contained inside a polygon and allows you to digitize new points.

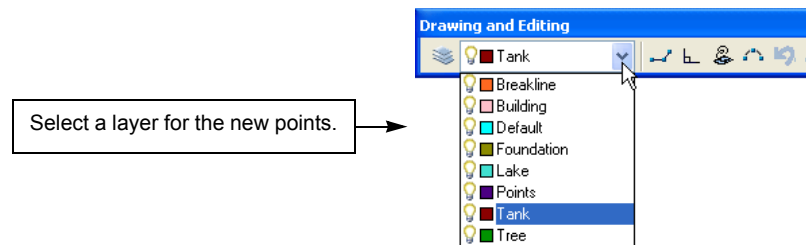
To use **DTM Collection**, perform the following steps:

Step 1) Prepare one or more polylines to be used as inclusion areas. Points will be digitized inside these polylines. Open polylines will be treated as if they are closed polygons:

Polylines may be closed or open. Open polylines will be treated as if they are closed polygons.



Step 2) Select the layer for the new points from the **Drawing and Editing** toolbar.



Step 3) If only certain polylines on a layer will be used as inclusion areas, select them now. (If all the polylines on a layer will be used, it is not necessary to select them.)

- Click directly on the polyline to select it. Vertex markers will appear when the polyline is selected.
- Multiple objects may be selected. Continue clicking on more polylines.
- An alternate method of selection is to use the **Select objects with a box** tool that is found on the **Drawing Tools** toolbar. Drag a selection box over the polylines.

Select objects with a box may be used to drag a selection box over one or more polylines and/or points.



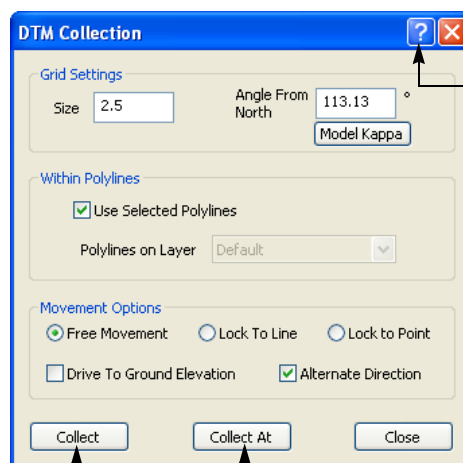
- Note: To clear a selection, click the pick button in a blank area where there are no objects.

Step 4) Select **DTM Collection** from the **Drawing Tools** toolbar:

Select **DTM Collection** from the **Drawing Tools** toolbar.



Step 5) Make settings on the DTM Collection dialog. Use the context-sensitive “?” dialog help for detailed information about each setting. When settings are complete, select either **Collect** to start at the first point of the first polyline or select **Collect At** to choose a starting point.



Use the context-sensitive “?” dialog help for detailed information about each setting.

When settings are complete, choose a start button:

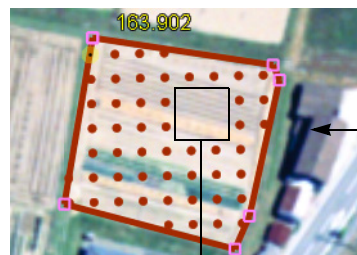
- **Collect** starts at the first point of the first polyline.
- **Collect At** allows you to choose the start location. Select a location nearest the desired start point that is inside one of the inclusion polylines. Digitizing will start at the closest possible grid location or row to the selected point.

Step 6) Choose options while the point digitizing mode is active:

- **Digitize points.** Set the stereoplotter's elevation and digitize points on the grid, along the grid row, or anywhere, depending on the movement mode selected in the DTM Collection dialog. (Information about the movement modes may be found using the context-sensitive “?” dialog help.)
- **Skip points.** Use the 3D cursor's Cancel button to skip a point/row and move to the next point/row.
- **Stop or temporarily suspend digitizing.** Select the **Stop** button on the DTM Collection dialog.

To resume digitizing, start DTM Collection again. If points are already found on some of the grid locations inside the inclusion polyline, the cursor will drive to the next undigitized location. In some cases, such as when the DTM Collection settings have changed or if you'd like to start inside a different inclusion polyline, use **Collect At** and select the starting point instead.

Digitizing will automatically stop and focus will return to the DTM Collection dialog when all the points/rows inside all the inclusion polylines have been digitized.



Points were skipped in this area

- Digitize points using the pick button.
- Skip points using the cancel button.
- The ability to move off the point or row depends on the selected movement option.

Helpful Hint: Use the 2D Mode in the 3D Vector Split Window

When drawing exclusively with DAT/EM Drawing Objects, there is often no CAD/GIS view open to show a 2D “top-down” view. This makes it difficult to check XY-only intersections. For example, if a digitizing boundary polygon is at $Z=0$ (not “on the ground”) and the average elevation in the digitizing area is $Z=1000$, the boundary will not be visible with the objects in the usual 3D superimposition view or in the 3D Vector Split Window. The $Z=0$ boundary is being displayed literally at $Z=0$. In this case, it is difficult to see how far to digitize before reaching the boundary.

A **2D** option is offered in the 3D Vector Split Window to toggle it to a top-down view. This is useful for checking XY-only intersections. Try the 2D option when not all the DAT/EM Drawing Objects are at ground elevation.



2D/3D toggle in the 3D Vector Split View

Note: To turn on the 3D Vector Split Window, select **Show 3D Vector Split Window** from the **View** pull-down menu. For more information, see “View Menu > Show 3D Vector Split View (with 2D Option)” on page 25-22.

Chapter 27. Super/Imposition (SI)

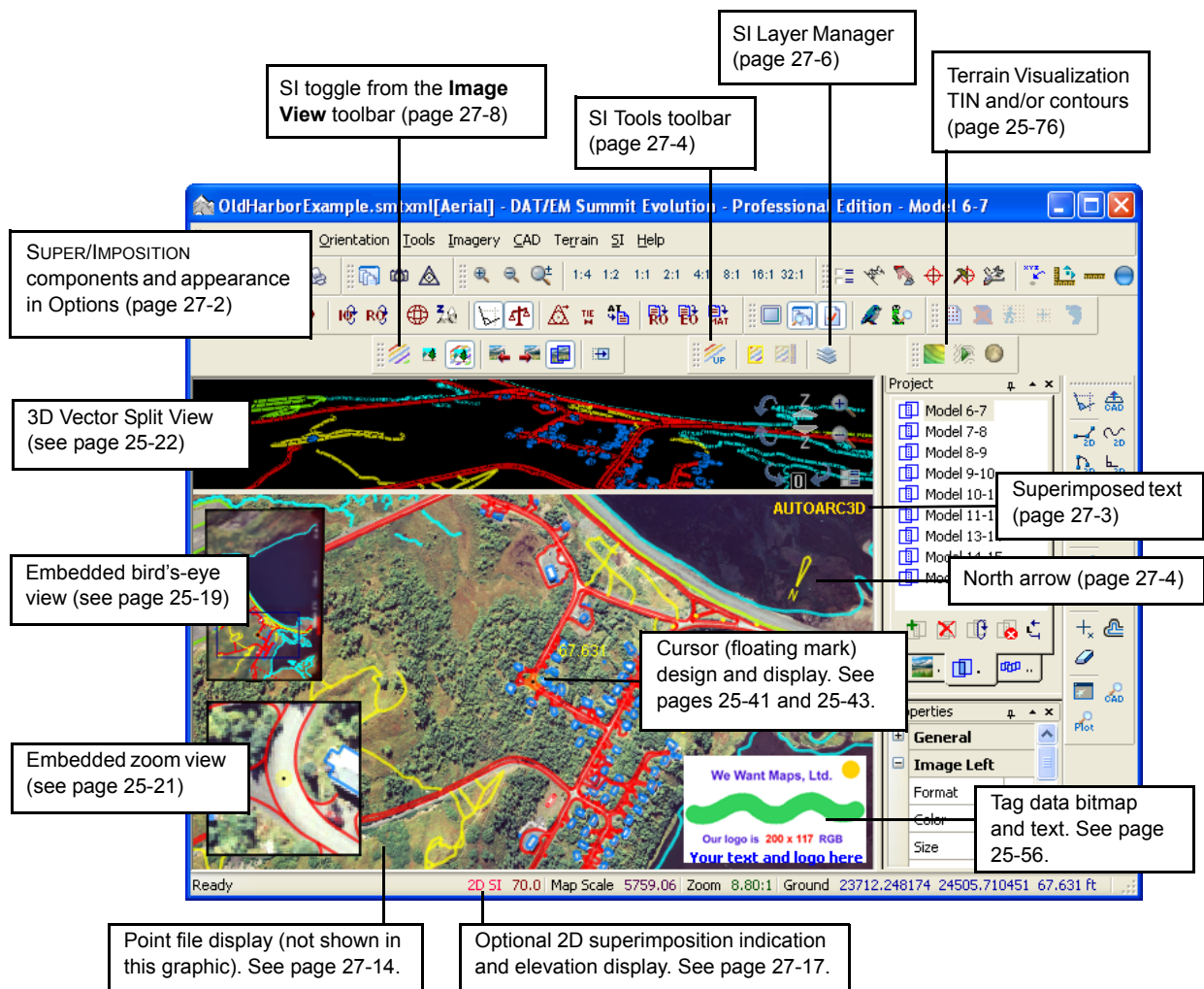
SUMMIT EVOLUTION is equipped with full color stereo SUPER/IMPOSITION (called “SI” for short). It can superimpose the following types of information over the main image view:

- Vector data from MicroStation, AutoCAD, or ArcMap
- Vector files in **.dxf**, **.dwg**, **.dgn**, or **.shp** format, loaded directly (not open in the CAD/GIS software)
- Point files in many formats, such as LiDAR files (not open in the CAD/GIS software)
- Visual aids such as text tips, north arrow, cursor tips, Terrain Following points, and Terrain Visualization TIN lines and contours.

SI is used to verify object appearance, location, and elevation for 3D data. An option is also available to display 2D data to verify its XY location.

SI is available in the main image view, the embedded bird’s-eye view, and to a more limited extent in the embedded zoom view.

SI is controlled using the Options dialog, the **SI** pull-down menu, the **SI Tools** toolbar, and the settings provided by DAT/EM CAPTURE in AutoCAD, MicroStation, or ArcGIS.



SI Settings in Options

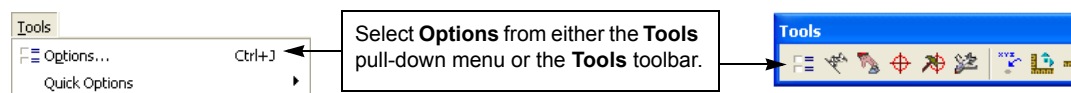
The SUMMIT EVOLUTION Options dialog contains several settings that affect SI display components:

- SI tab, see page 27-2 below.
- Main Text tab, see page 27-3 below.
- Main View tab, see page 27-4 below.

SI Settings in Options: SI Tab

Many of the SUPER/IMPOSITION (“SI”) settings are made from the **SI** tab of the **Options** dialog:

Step 1) Select **Options** from the **Tools** toolbar or pull-down menu.



Step 2) Select the **SI** tab. Begin to make settings:

- Choose whether or not to display **Objects***. **Objects** are any CAD/GIS object that is not a point or text.
- Choose a **Thickness** and **Opacity** setting for the display of these objects.

- Choose whether or not to display **Points***. **Points** consists of any point elements in AutoCAD, point geometry in ArcGIS, and zero-length line strings in MicroStation.
- Choose **Thickness** and **Opacity** setting for the display of points.

Choose whether or not to display **Text*** from the AutoCAD, MicroStation, or ArcGIS file.

- If **Clip Scope*** is on, there will be no superimposition of objects within the set radius around the cursor.
- **Clip Scope** does not affect superimposed message or coordinate text.

If **Selected Vertex** is on and objects are selected in AutoCAD, MicroStation, or ArcGIS, their vertices are marked in SUMMIT EVOLUTION's superimposition display. The color and size settings determine their appearance.

For MicroStation, only the most recently selected object in a multiple selection obtains vertex markers.

SI performance boost is recommended for most modern video cards. This setting will double superimposition performance for most video cards, but it will also double system memory use.

- DO NOT use this setting with 3DLabs Wildcat video card.
- See also: Performance on the Main View tab, used for SUMMIT EVOLUTION in general.

* **Hint:** Settings marked with an asterisk, *, have quick toggle icons for the **Quick Options** toolbar. Toggling the icon is the same as checking on and off the setting in the Options dialog. See “Quick Options Toolbar” on page 24-7.

Step 3) Continue to make settings:

If **2D, object elevations at cursor*** is checked on, superimposed objects appear to the eye at the current cursor elevation. If it is off, they appear “on the ground” at their digitized elevations.

Important! Information about the display of 2D CAD/GIS data appears in “Superimposition of 2D Vector Data” on page 27-17.

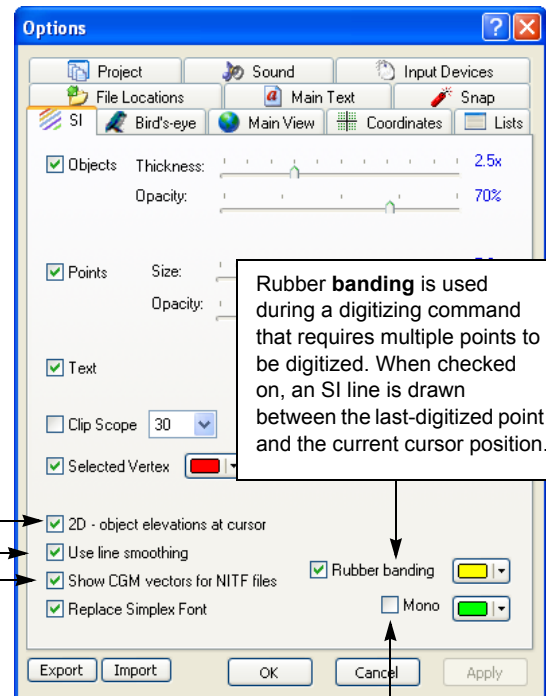
Choose whether to **Use line smoothing**. If line smoothing is checked on, the superimposed lines are aliased-blended with the background to produce better looking lines. Adjacent pixels are blended with the lines to produce non-jagged smooth lines (no pixel stair stepping).

- **Use Line smoothing** is only available if **Objects Thickness** is set to **1.0x**.
- Note that the CAD/GIS application does not use aliasing, so lines and other objects may look jagged in the CAD/GIS view even if they are smoothed in the SUMMIT EVOLUTION view. Turn off **Use line smoothing** to have the SI display match the CAD/GIS display.
- In most cases, the small additional processing time for **Use line smoothing** is not noticeable.

Show CGM vectors for NITF files affects projects with NITF image files only. The NITF format allows vector information, called CGM vectors, to be added to the image. To see these CGM vectors, check this setting on.

Rubber **banding** is used during a digitizing command that requires multiple points to be digitized. When checked on, an SI line is drawn between the last-digitized point and the current cursor position.

If **Mono** (monochrome) is checked on, all the superimposed vectors are set to a single color.



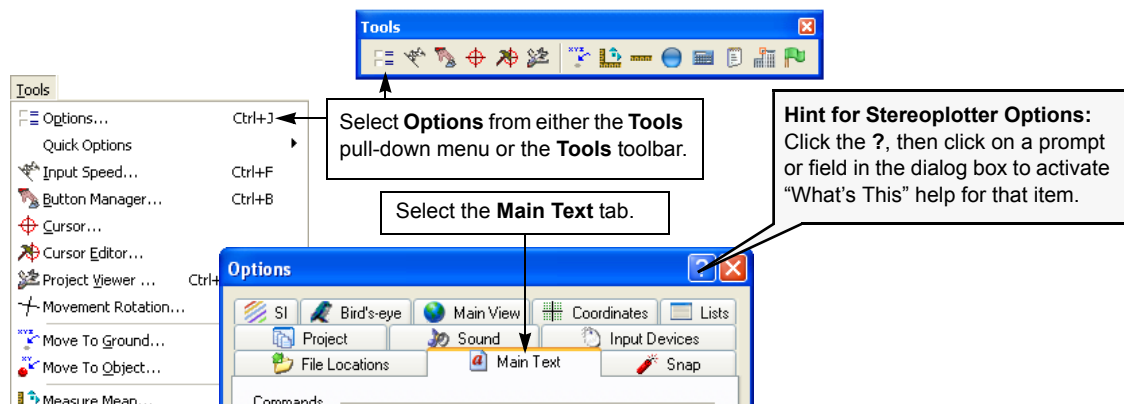
* **Hint:** Settings marked with an asterisk, *, have quick toggle icons for the **Quick Options** toolbar. Toggling the icon is the same as checking on and off the setting in the Options dialog. See “Quick Options Toolbar” on page 24-7.

SI Settings in Options: Main Text Tab

Superimposed text may be displayed in the Image View. This text can show X, Y, and Z cursor coordinate and current CAD/GIS command. To control the text display, perform the following steps:

Step 1) Select **Options** from the **Tools** pull-down menu.

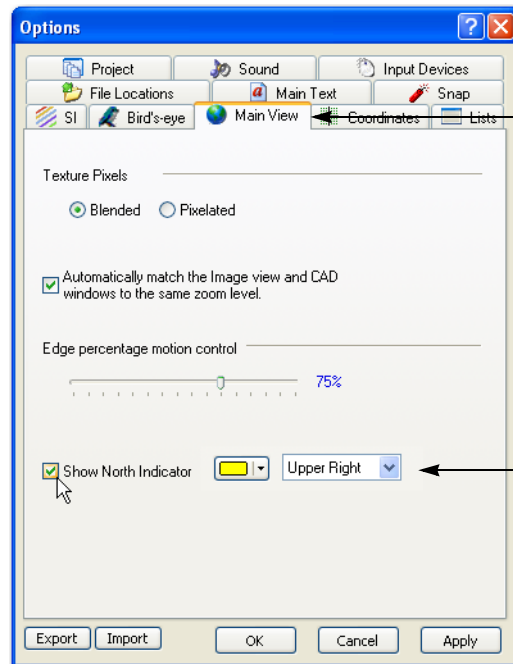
Step 2) Select the **Text View** tab. Make any desired settings. For setting information, use the “?” icon to activate “What’s This” help for that dialog box setting.



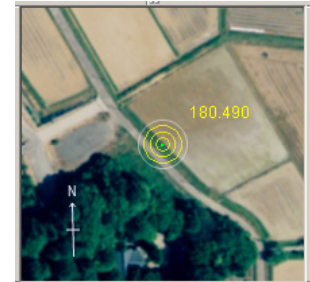
SI Settings in Options: Main View Tab (North Arrow)

To add a small north arrow to the lower left of the stereo view, perform the following steps:

- Step 1)** Select **Options** from the **Tools** toolbar or pull-down menu:
- Step 2)** Select the **Main View** tab.
- Step 3)** Check on **Show North Indicator** and select a color.



Main View tab



- Check on **Show North Indicator**.
- Select a color.
- Select a corner for the display.
Note that the embedded bird's-eye view and the embedded zoom view will draw over the north arrow. It should be placed in a free corner.

SI Menu and Toolbar

The **SI** pull-down menu and **SI Tools** toolbar offer superimposition settings:

- “SI Menu and Toolbar: SI User Bounds and Measure SI User Bounds” on page 27-5 below.
- “SI Menu and Toolbar: Layer Manager” on page 27-6

SI Menu and Toolbar: SI User Bounds and Measure SI User Bounds

If there are many CAD or GIS file objects outside the current area of interest, it may be useful to limit the Super/Imposition (SI) display area. This removes unnecessary objects from the SI database, and speeds up the SI refresh rate.

There are two ways to limit the Super/Imposition (SI) display area:

- **Model Bounds:** Clips to the current model bounds.
- **User Bounds:** Clips to a rectangular area that you select. This area may be smaller *or* larger than the current model bounds.

Note: SI clipping should be OFF in the CAD/GIS package when using **Terrain Visualization**. Except in some extremely huge files, SI Clipping may slow down Terrain Visualization's refresh after a pan. See more information on page 25-76.

In ArcGIS, objects that are completely outside the SI bounds are not displayed. Objects that either partially overlap or are completely inside the SI bounds are displayed.

In AutoCAD and MicroStation, if an object's bounding rectangle (made from its maximum and minimum XY extents) is completely outside the SI bounds, the object is not displayed in SI. If an object's bounding rectangle either overlaps or is completely inside the SI bounds, the object remains in the display. Because the object's bounding rectangle is used, not the object itself, some linework that is outside the SI bounds may be displayed. This is normal; the display is still more limited, and still refreshes faster.

The SI bounds affect the SI display only; they do not affect the AutoCAD, MicroStation, or ArcGIS display.

To limit the SI display, perform the following steps:

Step 1) Turn on **Clip SI** in AutoCAD, MicroStation, or ArcGIS:

In AutoCAD:

- **SI Settings** command
- Check on **Clip Si**

See more information on page 27-12.

In MicroStation:

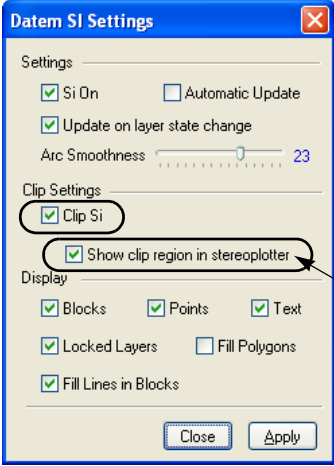
- **SI Settings** command
- Check on **Clip**

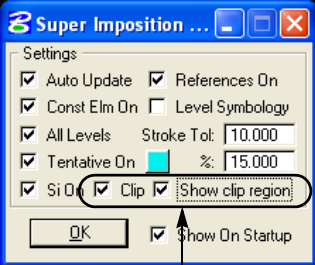
See more information on page 27-9.

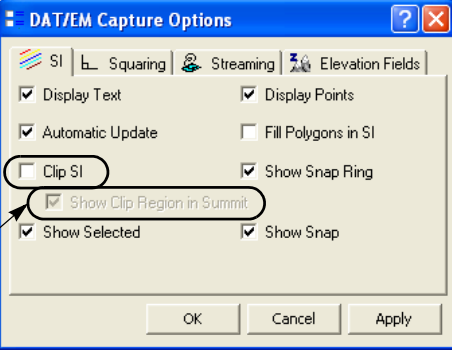
In ArcGIS:

- Display the **SI** tab of the DAT/EM Capture Options dialog.
- Check on **Clip SI**

See more information on page 27-14.







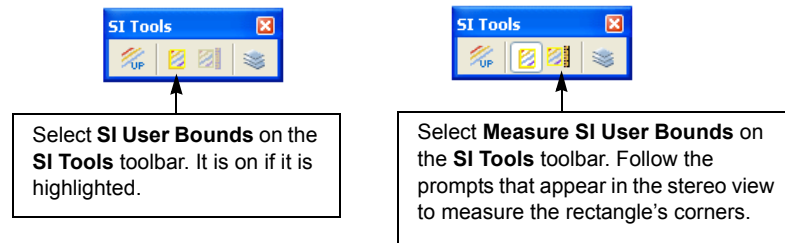
Choose a setting for **Show Clip Region**. If checked on, a rectangle appears in the stereo view to show where the SI bounds are defined.

As long as SUMMIT EVOLUTION's SI User bounds have not yet been set, clipping is now set to the current model bounds. Choose what to do next:

- If clipping to the model bounds is the desired result, stop here.
- To change the clipping bounds to a rectangle that you select, continue to the next step.

Step 2) Select **SI User Bounds** on SUMMIT EVOLUTION's **SI Tools** toolbar. It is on if it is highlighted.

Step 3) Select **Measure SI User Bounds** from the **SI Tools** toolbar.



Step 4) Follow the prompts that appear in the stereo view to measure the bounding rectangle's corners.

- The rectangle may either be completely inside one model or it may span multiple models.
- To define a rectangle that spans more than one model, you may open different models and use the Bird's-Eye view to position the cursor while the "SI User Bounds: Pick First Corner" and "SI User Bounds: Pick Second Corner" prompts are active.
- Pick the corners with the stereoplotter's pick button, not the system mouse.

SI Menu and Toolbar: Layer Manager

The SI Layer Manager sets the CAD/GIS layers that may be displayed as superimposed vectors. It also set the layers that may be used as input for Terrain Visualization (page 25-76). The Layer Manager has two main purposes:

1. It allows a different set of layers to be superimposed in the main stereo view than are displayed in the CAD/GIS view.
2. It allows layers to be superimposed in the main stereo view that are not to be included as input for Terrain Visualization. For example, all layers could be superimposed, while only two layers containing DTM points and one layer containing breaklines are used as input for Terrain Visualization.

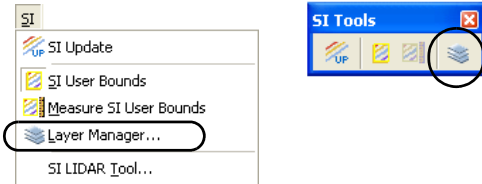
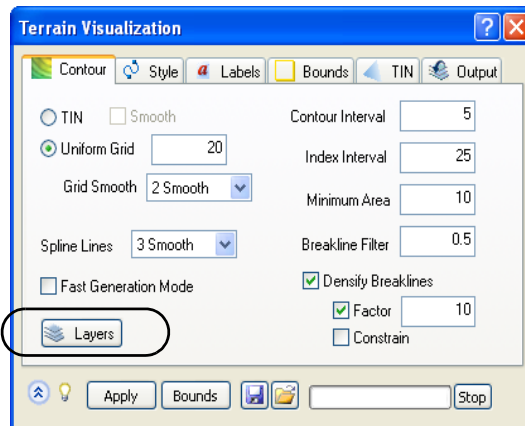
"Layers" refers to AutoCAD layers, MicroStation levels, or ArcGIS layers (shapefiles and Personal Geodatabase Feature Classes) that are shown in ArcMap's Table of Contents. When the SI Layer Manager is started, it obtains the current layer names from the file that is currently open in AutoCAD, MicroStation, or ArcGIS. If this layer list has changed since the last time the Layer Manager was used, it attempts to match the previous settings, but if that is impossible, it defaults to "All Layers" for SI and "None" for Terrain Visualization.

The Layer Manager should be used any time specific layers were previously selected, and the CAD/GIS file has changed. It also should be used before Terrain Visualization is started.

To use the Layer Manager, perform the following steps:

Step 1) Choose a method to start the Layer Manager:

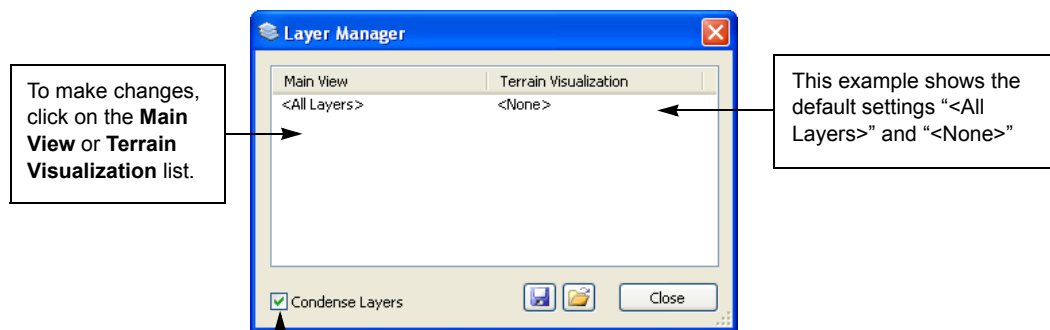
- Select **Select SI Layers** from the **SI Tools** toolbar;
- Select **Layer Manager** from the **SI** pull-down menu;
- Select the **Layers to use** button from the **Contour** tab on the Terrain Visualization dialog).



Choose a method to start the Layer Manager:

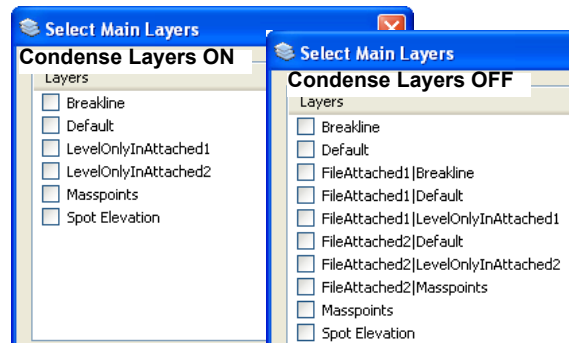
- Select **Select SI Layers** from the **SI Tools** toolbar.
- Select **Layer Manager** from the **SI** pull-down menu.
- Select the **Layers to use** button from the **Contour** tab on the Terrain Visualization dialog (page 25-78).

Step 2) The Layer Manager dialog appears. The columns may show the default settings (<All Layers> in the **Main View** column and <None> in the **Terrain Visualization** column), or they may show previously selected layers.

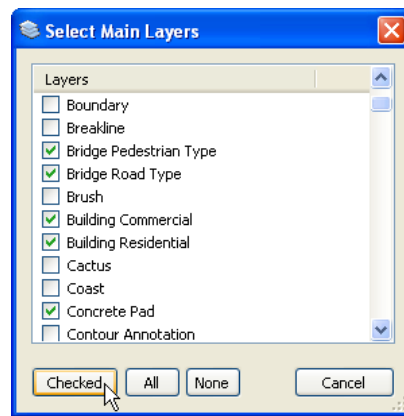


If the open AutoCAD **dwg** or MicroStation **dgn** file has attached reference files, **Condense Layers** determines how the layers/levels from the file should appear:

- **On:** If a layer/level in the reference file has the same name as a layer/level in the main file, the layer/level will appear only once in the list. A checked layer/level will be used from every file that contains it.
- **Off:** Every layer/level in the reference file will be listed separately and can be turned on and off separately. If a layer/level is found in a reference file, the file name will appear in front of the layer/level name.



Step 3) To make changes, click the system mouse on the layer list (or on the words “<All Layers>” or “<None>”). The Select Main Layers or Select Terrain Layers dialog will appear. Make layer choices:



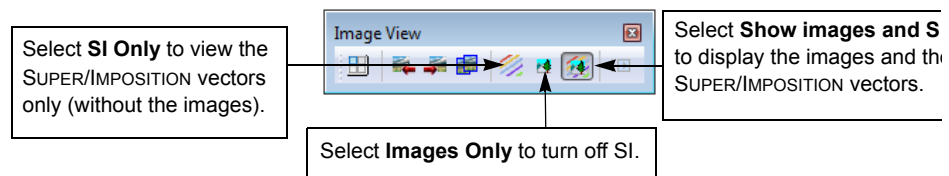
Make layer choices:

- **To use checked layers only:** Check on individual layers to include in SI or as Terrain Visualization input, then select the **Checked** button.
- **To use all layers:** Select the **All** button.
- **To use no layers:** Select the **None** button.

The settings take effect immediately when the **Checked**, **All**, or **None** buttons are used. That is, the current Layer Manager lists show the currently active settings. The Layer Manager dialog may remain displayed on the screen or it may be closed.

SI Toggle from the Image View Toolbar

If desired, toggle the SI and image displays on and off using the SUMMIT EVOLUTION **Image View** toolbar options or by selecting settings from the **Images** option of the **View** pull-down menu:



The CAD-Specific Super/Imposition Application

Vector superimposition from AutoCAD and MicroStation requires a CAD-specific SUPER/IMPOSITION application to be loaded. In ArcGIS, SUPER/IMPOSITION is included in the DAT/EM Capture application, and starts automatically when ArcMap is started.

Settings are made from AutoCAD, MicroStation, and ArcGIS to regulate SUPER/IMPOSITION. These are described below in the following sections:

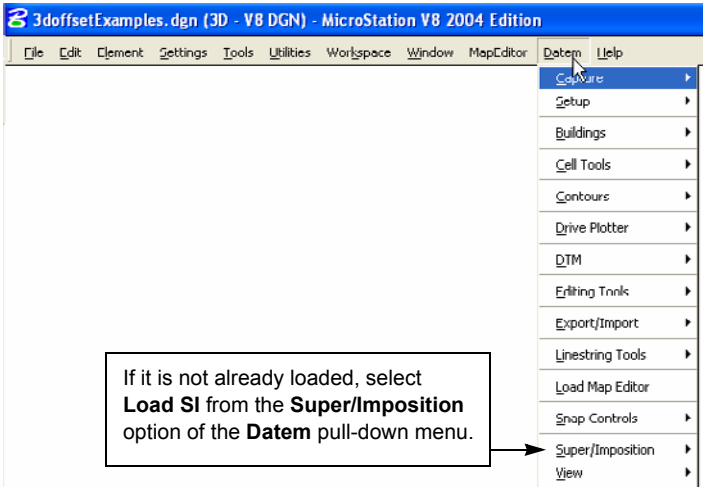
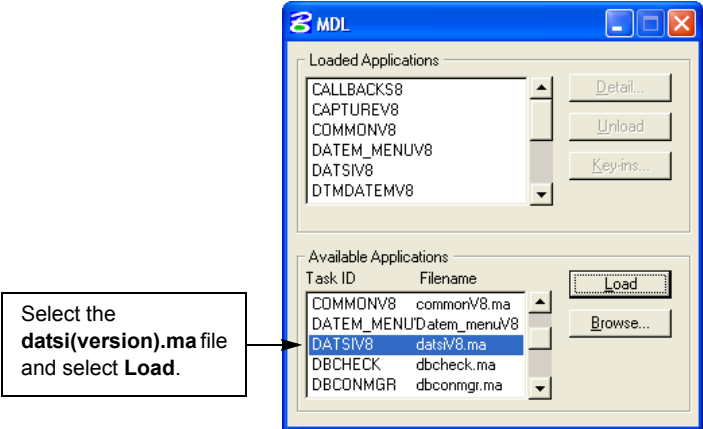
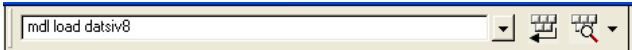
- Application and settings for MicroStation, page 27-9.
- Application and settings for AutoCAD, page 27-12.
- Settings for ArcGIS, page 27-14.

Once AutoCAD or MicroStation is started, load the CAD-Specific SI application software. This application communicates the vector information to SUMMIT EVOLUTION.

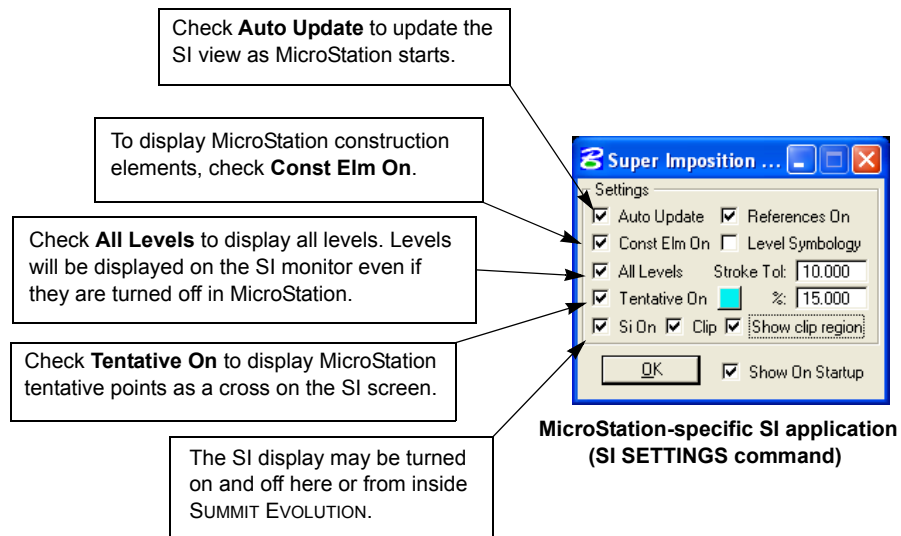
There is a limit of 5000 different layers or levels that may be displayed and listed by SUPER/IMPOSITION. This number includes layers/levels from both the main file and any attached reference files.

MicroStation-Specific Super/Imposition Application

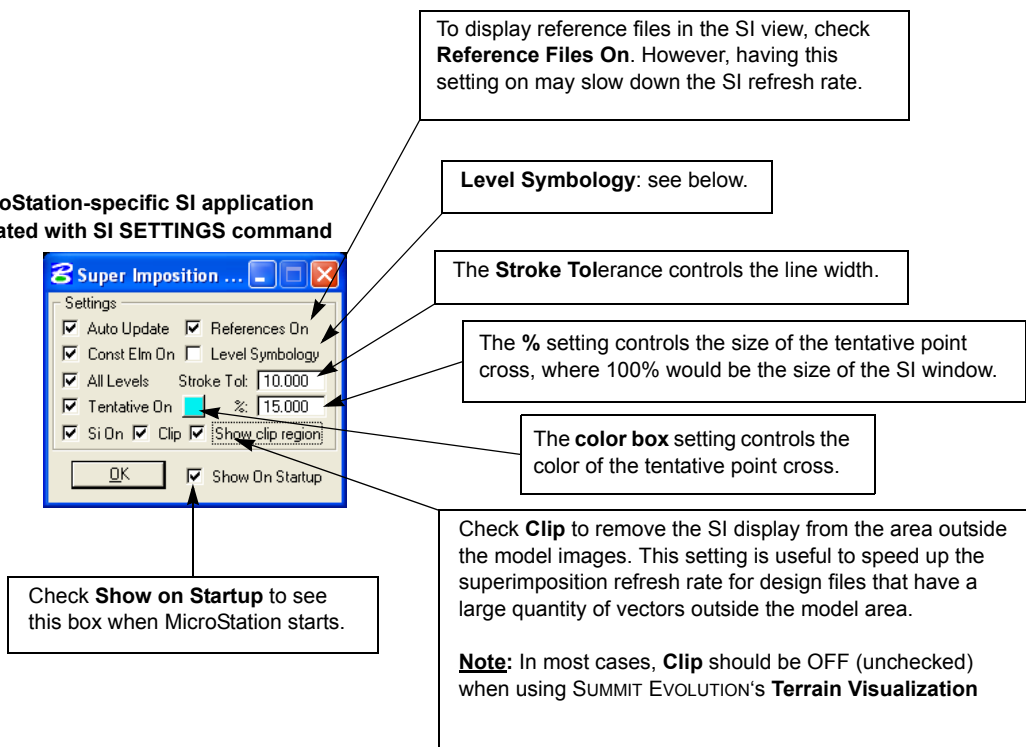
When MicroStation is started, select one of the following methods to load **datsi(version).ma**, which is the CAD-specific SI application for MicroStation.

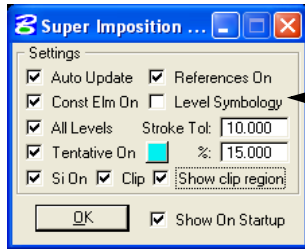
Load datsi(ver).ma Method	What this looks like
Load datsi(version).ma automatically whenever MicroStation starts.	See “Configure the Application Loading Variable” in <i>Chapter 4`</i> of the <i>DAT/EM CAPTURE Operation Manual</i> for instructions.
Select Load SI from the Super/Imposition option of the Datem pull-down menu.	 <p>If it is not already loaded, select Load SI from the Super/Imposition option of the Datem pull-down menu.</p>
Load datsi(version).ma from the MicroStation’s Load MDL Application option from the pull-down menus.	 <p>Select the datsi(version).ma file and select Load.</p>
Enter the command from the MicroStation command window.	

The settings dialog box appears:



MicroStation-specific SI application activated with SI SETTINGS command



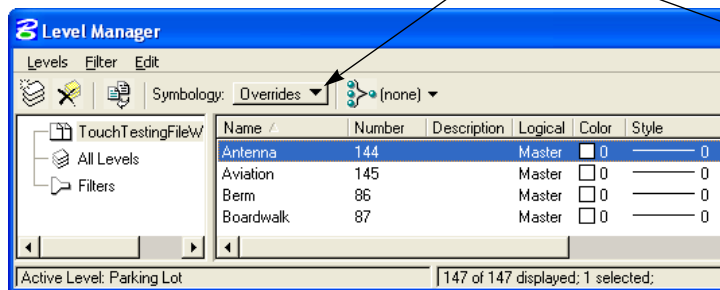


MicroStation-specific SI application activated with SI SETTINGS command.

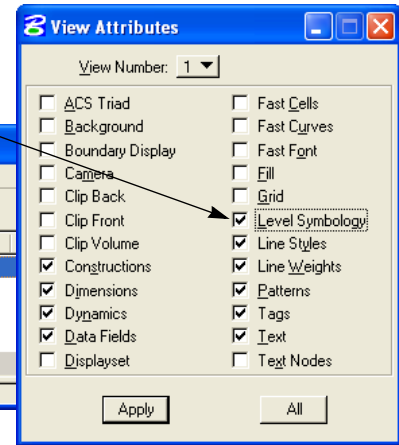
The **Level Symbology** setting is independent of MicroStation's View Attributes **Level Symbology** setting and the Level Manager's **Symbology** setting:

- If **Level Symbology** is checked on, SI displays MicroStation's "Overrides" attributes. It displays overrides *even if MicroStation's does not*. The override settings may be viewed from MicroStation's Level Manager when **Symbology** is set to **Overrides**.
- If **Level Symbology** is off, SI displays MicroStation's "Bylevel" attributes. It displays Bylevel *even if MicroStation displays overrides*. The Bylevel settings may be viewed from MicroStation's Level Manager when **Symbology** is set to **Bylevel**.

Overrides and Level Symbology control the attributes display in the MicroStation view, but not in the SI view.



MicroStation's Level Manager



MicroStation's View Attributes

If both the SUMMIT EVOLUTION settings and the MicroStation-specific SI application have SI ON checked, then the SI image will be displayed to match the digitized objects in the file.

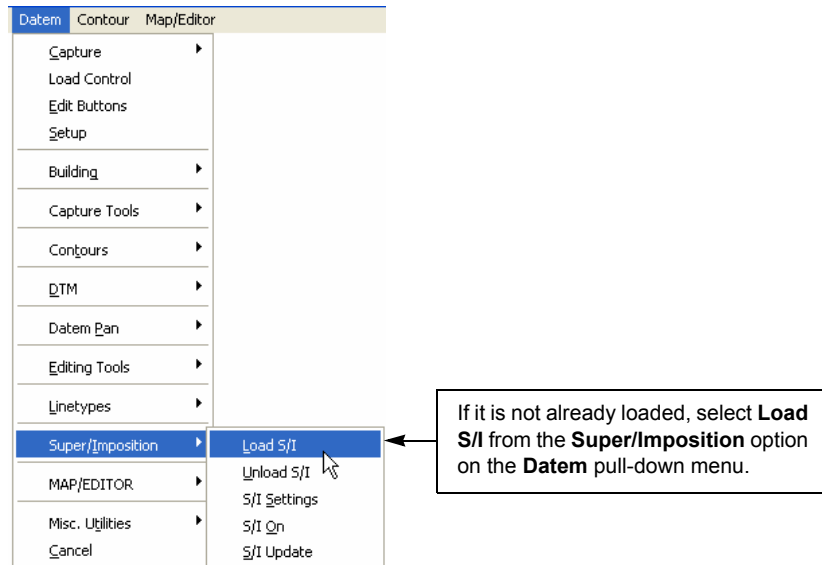
Once **datsi(version).ma** is loaded, there are several commands available:

SI Command in MicroStation	Command Purpose
SI OFF	Turn off the SI display.
SI ON	Turn on the SI display (SI must also be turned on in SUMMIT EVOLUTION).
SI SETTINGS	Activates the MicroStation-specific application dialog box.
SI UPDATE	Refresh the SI graphics. If the Auto Update option is off on the main dialog box, then SI UPDATE may be necessary when a MicroStation design file that contains elements is opened.

AutoCAD-Specific SI Application

When AutoCAD is started, load **si(version).arx**, which is the CAD-specific SI application for AutoCAD. This may be done automatically from the **acad.rx** file or from the Startup Suite. For more information on configuring AutoCAD menus and toolbars, see the *DAT/EM Capture Operation Manual*.

If **si(version).arx** is not already loaded, select **Load S/I** from the **Datem** pull-down menu in AutoCAD.



Once **si(version).arx** is loaded, the **SI** commands are available from the AutoCAD Command line. These commands are also available on the **Datem** pull-down menu and the **Super Imposition** toolbar.



SI Command in AutoCAD	Command Purpose
si off	Turn off the SI display (also available from SUMMIT EVOLUTION).
si on	Turn on the SI display (SI must also be turned on in SUMMIT EVOLUTION).
si settings	Activates the Datem SI Settings dialog. See details on the dialog box components below.
si update	Turn on or refresh the SI graphics.

If SUMMIT EVOLUTION has **si on** checked on and **si update** has been used in AutoCAD, then the SI image will be displayed to match the digitized objects in the file.

The Datem SI Settings dialog box components are as follows:

Hint: Hover the mouse cursor over dialog box item to see helpful tooltips.

When **Si On** is checked, SUPER/IMPOSITION is turned on for display. Note that it must also be turned on in SUMMIT EVOLUTION.

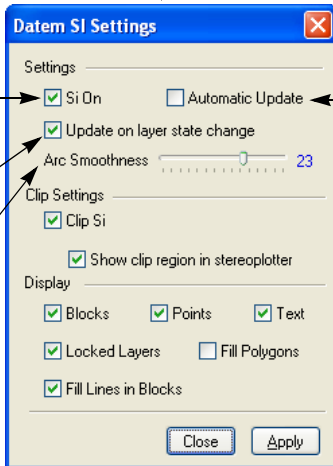
When **Update on layer state change** is checked, the superimposed vectors refresh when layers are frozen or thawed.

Arc Smoothness sets the number of straight segments used to stroke arcs. If many arcs exist in the file, SUPER/IMPOSITION will refresh faster if this is set lower.

If **Automatic Update** is on, the superimposed vectors will update any time a change is detected in the AutoCAD file.

If **Automatic Update** is off, the superimposed vectors will not update every time a change is detected. This may be useful if there is a large amount of data, especially DTM points arrays, to be redrawn.

Note that it is not possible to immediately detect all changes to the AutoCAD drawing. AutoCAD may not make information about deleted objects available. Use the **si update** command at any time to force a refresh of the graphics.



The screenshot shows the 'Datem SI Settings' dialog box. It has a title bar with a close button. The 'Settings' section contains 'Si On' (checked), 'Automatic Update' (unchecked), 'Update on layer state change' (checked), and 'Arc Smoothness' (slider at 23). The 'Clip Settings' section contains 'Clip Si' (checked), 'Show clip region in stereoplotter' (checked), and 'Display' options: 'Blocks' (checked), 'Points' (checked), 'Text' (checked), 'Locked Layers' (checked), 'Fill Polygons' (unchecked), and 'Fill Lines in Blocks' (checked). There are 'Close' and 'Apply' buttons at the bottom.

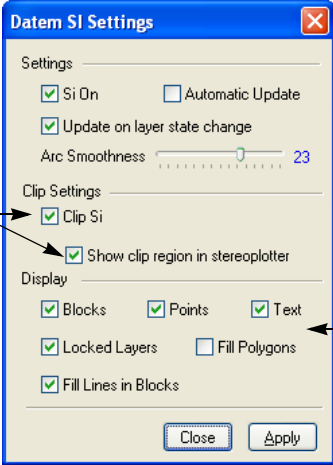
Note: In most cases, **Clip Si** should be OFF (unchecked) when using SUMMIT EVOLUTION's **Terrain Visualization**.

Clip SI limits the area of the SUPER/IMPOSITION display. This setting may speed the refresh rate if there are many objects outside the current area of interest. The result of this setting depends on the **SI User Bounds** setting in SUMMIT EVOLUTION:

- If SUMMIT's **SI User Bounds** is off, **Clip Si** clips the SI view to the edges of the current model.
- If SUMMIT's **SI User Bounds** is on and defined, **Clip Si** clips the SI view to the defined user bounds.
- If **Show clip region in stereoplotter** is on, a rectangle will appear around any defined user bounds area.

An object is clipped if it lies completely outside the clipping bounds. Objects that overlap the clipping bounds remain in the display.

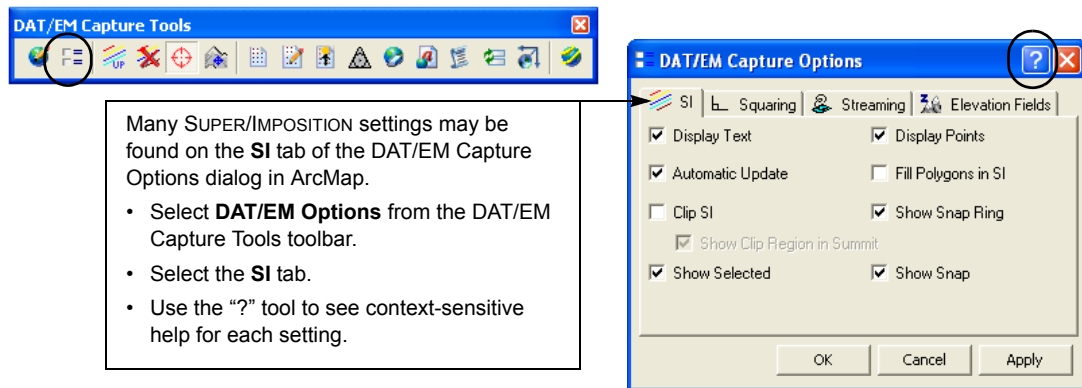
Check on the types of AutoCAD objects to superimpose in the stereo views.



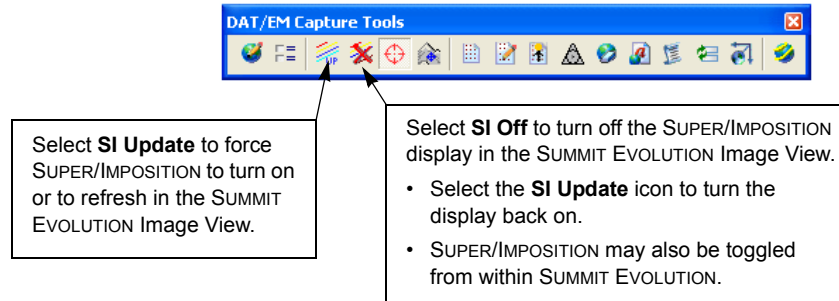
This screenshot is similar to the first one but with different annotations. Arrows point from the 'Clip Si' checkbox to the 'Note' section and from the 'Display' section (specifically 'Points', 'Text', and 'Fill Lines in Blocks') to the 'Check on the types of AutoCAD objects' box.

Super/Imposition Tools for ArcGIS

For DAT/EM STEREO CAPTURE for ArcGIS (ArcMap interface), there are several SUPER/IMPOSITION settings that may be made from the **SI** tab of the DAT/EM Options dialog:



SUPER/IMPOSITION can also be refreshed or turned on and off using icons on the DAT/EM Capture Tools toolbar:

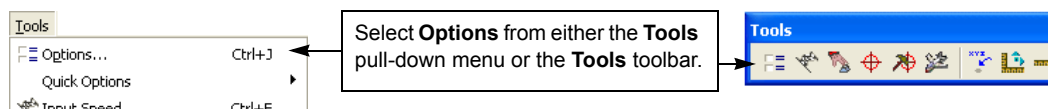


Display Points Independently of CAD/GIS Using SiLidar.Exe

It is possible to display point files in SUPER/IMPOSITION without importing them into AutoCAD, MicroStation, or ArcGIS file. This is especially useful when the point files are so large that it is not possible or practical to import them into CAD/GIS files.

Files of many formats may be displayed using the **SiLidarTool.exe** application. Perform the following steps:

- Step 1)** Select **Options** from the **Tools** toolbar or pull-down menu. Select the **SI** tab. Turn on the **Points** checkbox and make settings for the point size display.



- Step 2)** Choose a method to start the **SiLidarTool.exe** application:

- a.) From the Windows Start menu, select **All Programs>Datem Software>Utilities>SI MassPoint Tool**.
 - b.) From a Windows Explorer window, double click **SiLidarTool.exe**. This is usually located in the **\Program Files\Datem Software** or **\Program Files (x86)\Datem Software** folder.
- Step 3)** The SI Lidar Tool dialog appears. Note that this application loads many formats, not just LiDAR formats. Begin to make settings:

The screenshot shows the SI Lidar Tool dialog box. It has a blue title bar and a white background. On the left, there is a list of input files under the heading 'Input LIDAR files'. Each file has a corresponding filter listed next to it. On the right, there is a table of field names and values. At the bottom, there are several controls: a 'Browse' button (represented by a folder icon), an 'Apply' button, a dropdown menu for filters, a 'Maximum points to load' input field, a 'Format Not Found' button, a 'Color by elevation' dropdown, an 'Ignore Bounds' checkbox, and a 'Close' button. Annotations with arrows point to these controls and provide detailed instructions.


Select an image on the left to see its information on the right.

Select the **Browse** button. Add one or more points files.

- Binary file formats are recommended for their speed. To translate ASCII files to a binary format, use the Point Translator (page 25-84).
- Point files should be in the same coordinate system as the SUMMIT EVOLUTION project. To translate the files, use the Point Translator (page 25-84).

Maximum points to load restricts the number of points allowed for binary files. This reduces the memory usage and speeds the refresh rate. For ASCII or text files, this setting has no effect.

LIDAR filters may be applied to compatible file types. Points that are excluded using a LIDAR filter will not be displayed.

If a new filter is needed, select the  button to launch the LIDAR Filter Editor (see instructions in *Appendix K*). Select one or more files to highlight them, select a LIDAR filter name, and select the **Apply** button. The name of the LIDAR filter will appear in the **Filter** column.

Step 4) Continue to make settings:

The screenshot shows the SiLidar Tool dialog box. It has a list of input files on the left, a filter dropdown set to 'EverythingExceptClass7', a table of field names and values on the right, and various control buttons at the bottom. Callouts point to specific settings:

- Color By setting:**
 - **None** displays all points in a single color.
 - **Color by elevation** colors each point based on its Z value. Rainbow-like colors are used, with reds for the highest elevations and blues for the lowest.
 - **Color by file** colors each point according to its source file.
 - **Color by flightline** works for file sources that store flight line information. If the information is available, points are colored by flight line, and each successive flight line has a different color.
 - **Color by return** works for file sources that store point return values. If the information is available, points are colored by their return value, and each return value has a different color.
- Intensity icon:** For formats that store intensity values, turning on (highlighting) the intensity icon applies intensity values to the point display. When intensity is on, colors made by **Color by elevation**, **Color by file**, **Color by flightline**, and **Color by return** will be further affected by the intensity values.
- Draw... and Clear... buttons:** Draw... and Clear... toggle the points display on and off. Use **Draw** to refresh the display after changing the display settings.
- Ignore Bounds checkbox:**
 - Choose an **Ignore Bounds** setting:
 - **Ignore Bounds** should usually be off. When off, points are only loaded in the current SUMMIT EVOLUTION model's area.
 - If **Ignore Bounds** is checked on, all points are loaded (up to the **Maximum points...** number if the file is binary), no matter how far outside the model they are.

Step 5) Select the **Draw...** button.

Step 6) To remove or redraw the points in the SUPER/IMPOSITION display, choose from:

- To toggle the display of these points, select the **Clear...** and **Draw...** buttons.
- To toggle the display of all types of superimposed points (from **SiLidarTool.exe**, CAD/GIS, and vector files all at the same time), use the **Points** checkbox in SUMMIT EVOLUTION's Options dialog.
- To refresh with different settings, make settings, then select the **Draw...** button.
- To remove a file, click on the file in the list, select the "X" button, and select **Draw...** to refresh the display using any remaining files.
- To stop the points display, close the **SiLidarTool.exe** application.

Superimposition of 2D Vector Data

Use this information to:

- Correctly superimpose 2D AutoCAD, MicroStation, and ArcGIS vectors in SUMMIT EVOLUTION's SUPER/IMPOSITION (SI) with a stereo project.
- Correctly set SI for all 2D and 3D vectors in PROJECT VIEWER/ORTHO+MOSAIC.

Commonly encountered 2D vector data:

- 2D ArcGIS shapefiles or feature classes, which have no elevation at all
- MicroStation objects that have been imported from a 2D MicroStation DGN file, and now have Z=0
- AutoCAD data at Z=0 or some other fixed Z that does not represent the ground elevation

The superimposition of 2D data on a 3D stereo model can never be perfectly positioned or scaled, but with certain settings, it can be displayed very close to the actual ground features in the stereo view.

Problems can occur when some or all of the vectors to be superimposed have no elevation or do not have the correct ground elevation in AutoCAD, MicroStation, or ArcGIS. SI vectors do not appear at all or do not match the corresponding ground features in the stereo view. Problems could occur in both SUMMIT EVOLUTION and PROJECT VIEWER/ORTHO+MOSAIC products. In PROJECT VIEWER/ORTHO+MOSAIC, which does not have a 3D display, *all* SI vectors are considered 2D.

Symptoms of having incorrect settings for 2D SI:

- Superimposed vectors are not visible for any 2D data in AutoCAD, MicroStation, or ArcMap
- Superimposed vectors for 2D objects are visible, but offset from the ground features they represent
- Superimposed vectors for 2D objects, if visible, are scaled incorrectly – usually too big – or warped compared to the ground features they represent.



With **2D SI** on and set too high or too low, all objects – both 2D and 3D – are scaled incorrectly. With **2D SI** off, 2D objects may not be visible at all.



Setting **2D SI** closer to the actual ground elevation improves scaling and position. It can never be perfect, but it can be much better.

Full 3D vectors can be “placed in XY, tipped, tilted, and scaled to match a *changing* view depth in real time” in a photogrammetrically oriented stereo model view. But 2D vectors can only be “placed in XY and scaled for a *constant* (flat) view depth.” Because 2D vectors are missing an accurate ground Z, they cannot be tipped, tilted, and correctly scaled to match the real time cursor Z. However, by assigning the 2D vectors a display Z that is close to the actual ground elevation, they can be “placed in XY and scaled close to the cursor Z instead of at Z=0.” They are still missing their tip and tilt and real time matching to the actual cursor Z, but they are much closer. This is why 2D SI can never be perfect, but it can be made better with the correct 2D SI settings.

Projects that contain a great elevation difference – mountains, for example – may show more scaling and offset problems in 2D SI. This cannot be avoided. The flatter the ground, the better the 2D SI will appear.

A mixture of 2D and 3D vectors must be displayed as if they were all 2D. The 2D SI settings must be on whenever any of the CAD/GIS objects have Z=0 or have no Z at all.

Certain 2D SI settings must be made in order for SUMMIT EVOLUTION to correctly superimpose 2D vectors on a 3D model and for PROJECT VIEWER/ORTHO+MOSAIC to shift SI vectors close to its image display.

When the 2D SI setting is initially turned on in a project, SUMMIT EVOLUTION tries to determine a good display Z for the 2D SI. It looks for this value in the following order:

- **Initial Best Guess:** Elevation taken from the orientation. The ability to find a good value depends on the type of project and the type of orientation. For ADS40 projects, the supplied Z is always very high.
- **Higher Priority:** The average Z in any attached control file.
- **Highest Priority:** User-entered **2D SI Z** value.

When PROJECT VIEWER/ORTHO+MOSAIC must display SI vectors, it uses whatever **2D SI** elevation SUMMIT EVOLUTION would use, whether or not **2D SI** is currently on in SUMMIT EVOLUTION. All SI vectors – from both 2D and 3D objects – will always be slightly offset from image features in PROJECT VIEWER/ORTHO+MOSAIC, because its display is not in stereo. If the offset is very great or bothersome, it can be improved by using the control file method shown below.

Make these settings in SUMMIT EVOLUTION. They will affect both SUMMIT EVOLUTION and PROJECT VIEWER/ORTHO+MOSAIC.

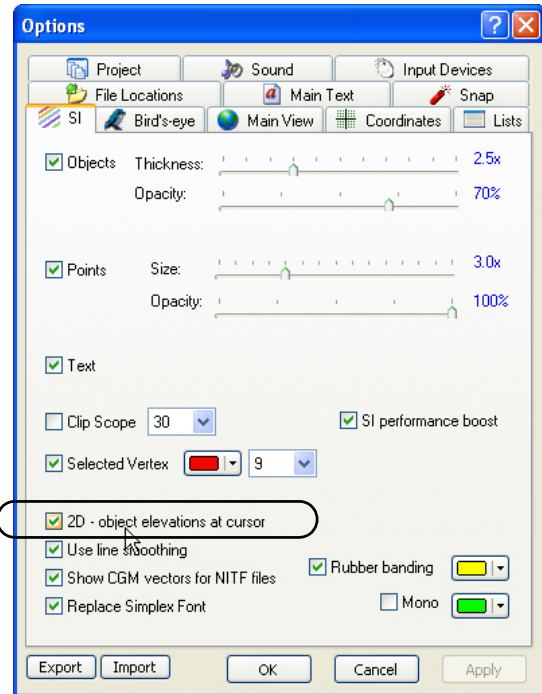
Perform the following steps.

Step 1) Turn on the **2D - object elevations at cursor** setting on the SUMMIT EVOLUTION **Tools > Options > SI** tab.

When the **2D - object elevations at cursor** setting is on, red “2D SI (elevation)” text appears on the status bar at the lower edge of the SUMMIT EVOLUTION window. This serves both as a reminder and to show you the average elevation that is being used to display and scale the 2D SI. You may edit this value directly from this field.

2D SI 187.5 Map Scale 221.06 Zoom 0.16:1 Ground 7

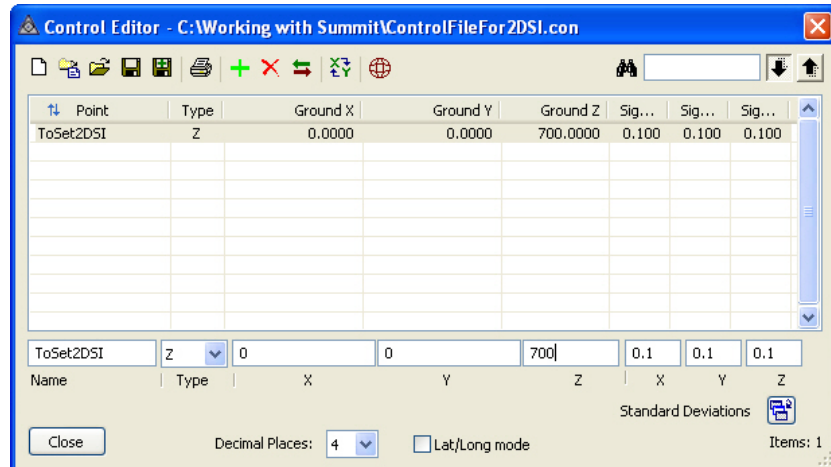
The **2D SI** display/setting is located on the status bar. Click on the value to edit it.



Hint: If desired, add the **2D SI** icon to the **Quick Options** toolbar and use it to quickly toggle between 3D and 2D SI. Toggling the icon is the same as checking on and off the **2D - objects elevations at cursor** setting in the Options dialog. For information about turning on the **Quick Options** toolbar and adding **2D SI** to it, see “Quick Options Toolbar” on page 24-7.

Step 2) Provide an average project Z from which to start calculating the vector positions and scaling. Use one of the following methods:

- **Method 1:** If the project has a real ground control file already attached to the project, the average control Z will be automatically taken from it. (Horizontal-only points are ignored.) You don’t need to do anything.
- **Method 2:** If the project doesn’t have a control file — perhaps it is not needed for the type of orientation in this project — create a “fake” control file that contains one vertical control point at the average Z of the project. Use the Control Editor (*Chapter 6*). Add one vertical point at the estimated average Z of the project. Save the file. Use the Project Edit dialog (**Edit > Project**) and add the control file to the project. Save the project (**File > Save Project**). Exit and restart SUMMIT EVOLUTION to re-open the project. When the project re-opens, this control point will be used to set the 2D SI position.



This control file contains only one vertical point at the average elevation of the project. If the file contains more points, their average Z will be used.

A control file is especially useful for ADS40 Kit projects. The control file's Z will be used for 2D SI and also to set the initial cursor Z close to the ground in the first-opened ADS40 model. For more information about ADS40 Kit projects, see "Create a New "ADS40/80 Using Leica Kit" Project" on page 8-2.

- **Method 3:** Key in the average project Z or current area Z in the **2D SI** status bar field. Click directly on the display in the status bar and key in the new value.

Key in a new value at any time. An SI Update will happen when the new value is entered.

This value is not saved permanently in the project.

This option is especially useful to recalculate 2D SI positioning in mountainous areas where the average project Z is much different than the Z in the area where you are currently working.



The **2D SI** display/setting is located on the SUMMIT EVOLUTION status bar when **2D - object elevations at cursor** is checked on in Options. Click directly on the **2D SI** Z value and key in the desired setting.

Hint: Set the cursor on the ground, view the cursor's Z coordinate, and enter that elevation in **2D SI**.

Chapter 28. Project Viewer and Ortho+Mosaic

The SUMMIT EVOLUTION PROJECT VIEWER has the following main functions available in all editions and regional versions of the software:

- See a project overview of all the images in the SUMMIT EVOLUTION project (28-1 below)
- Create a JPEG or BMP file from the PROJECT VIEWER view (28-8)
- Automatically open an image in DAT/EM VIEWER (28-10)

SUMMIT EVOLUTION PROFESSIONAL EDITION provides an extended PROJECT VIEWER called “PROJECT VIEWER/ORTHO+MOSAIC” or simply “ORTHO+MOSAIC”. It contains all the functions of the basic PROJECT VIEWER plus orthophoto and mosaic generation tools, except where prohibited by regional agreements:

- ORTHO+MOSAIC: Create orthophotos from an aerial projects (28-10)
- ORTHO+MOSAIC: Create orthophoto mosaics from DAT/EM orthophotos (28-22)

Project Overview Tools - Available in All Versions

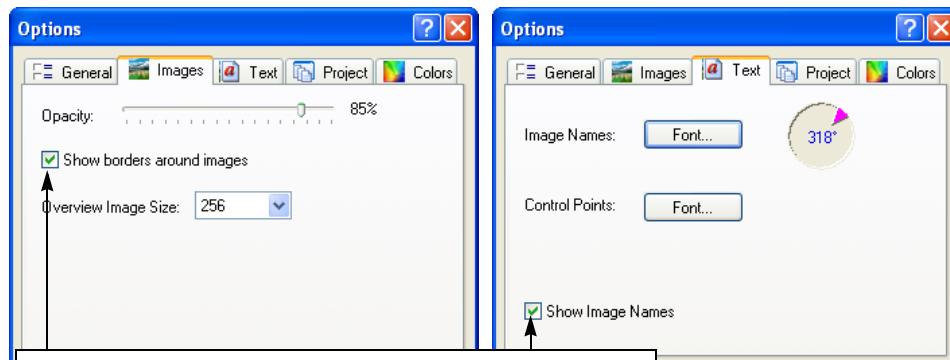
The PROJECT VIEWER/ORTHO+MOSAIC application shows all the image boundaries and images in the project fit into one window. To use the PROJECT VIEWER/ORTHO+MOSAIC, perform the following steps:

- Step 1)** Select **Project Viewer** from the **Tools** toolbar or pull-down menu in SUMMIT EVOLUTION. Alternatively, it may be started from Windows **Start > All Programs > Datem Software > Orthophoto and Mosaic Creator**. The first time it opens a project, all images are checked on.

Select **Project Viewer** from the **Tools** toolbar or pull-down menu in SUMMIT EVOLUTION.



- Step 2)** Depending on the options that are set, the currently open SUMMIT EVOLUTION project may automatically open in the PROJECT VIEWER/ORTHO+MOSAIC. If it does not, or to open a different project, select **Open** from the **File** toolbar or pull-down menu. Choose a project.
- Step 3)** These instructions assume that borders and image names are displayed. From the PROJECT VIEWER/ORTHO+MOSAIC window, select **Options** from the **Tools** toolbar or pull-down menu. On the **Images** tab, check on **Show borders around the images**. On the **Text** tab, check on **Show Image Names**. If desired, drag the angle pointer to adjust the angle of the image name text display. Make any other desired settings. Use the “?” icon for dialog box help.



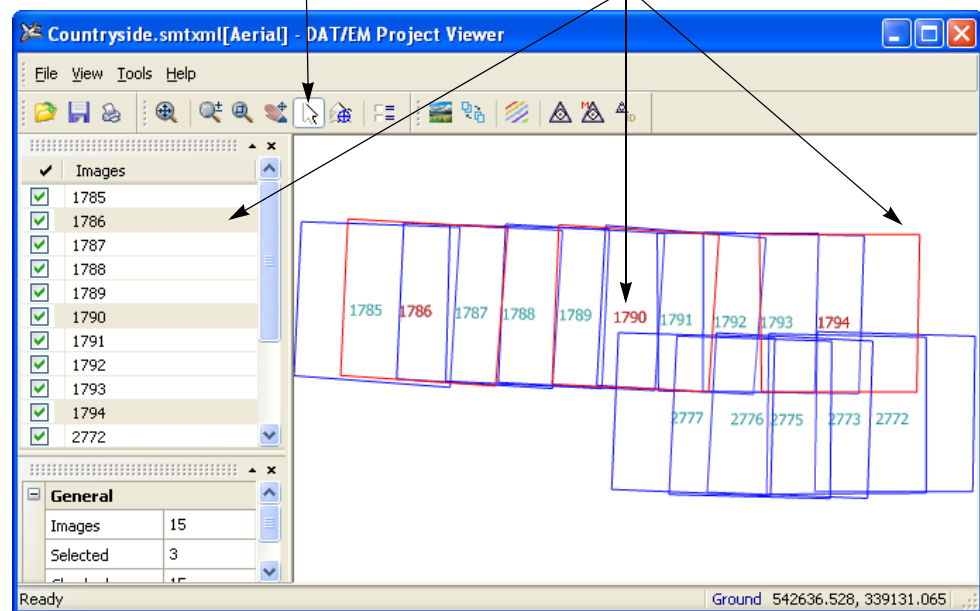
- Check on **Show borders around images** on the **Images** tab.
- Check on **Show Image Names** on the **Text** tab.

Step 4) Become familiar with how to select one or more images. To select images, first highlight the **Selection Pointer** icon, then choose a method:

- a.) To select one image, click on its image name, its image border, or its image name in the **Images** list.
- b.) To select more than one image, hold down the <Ctrl> key and click on the image names, image borders, or image names in the **Images** list.
- c.) To select a continuous block of images, click on the starting image name in the **Images** list, hold down the <Ctrl> key, and click on the ending name in the **Images** list.
- d.) To select all the images, click on one image in the **Images** list, then key in <Ctrl>A.

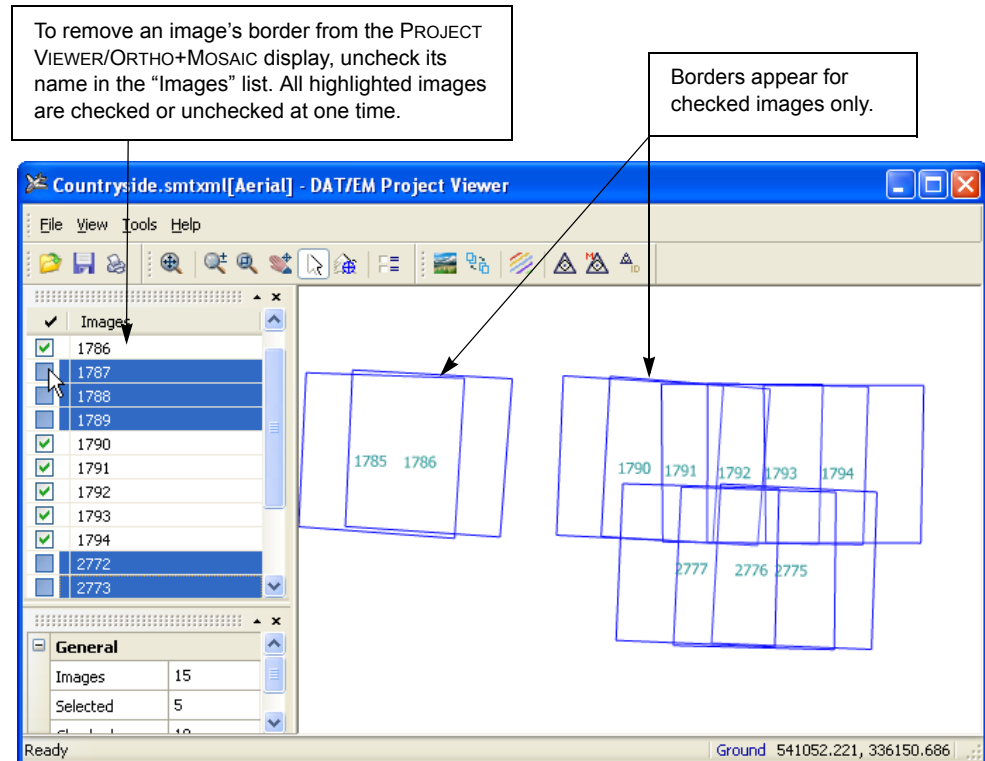
To select borders or image names, the **Selection Pointer** must be highlighted on the **Tools** toolbar.

- To select one image, click on its image name, its image border, or its image name in the **Images** list.
- To select more than one image, hold down the <Ctrl> key and click on the image names, image borders, or image names in the **Images** list.
- To select a continuous block of images, click on the starting image name in the **Images** list, hold down the <Shift> key, and click on the ending name in the **Images** list.
- To select all images, highlight one image name in the **Images** list, then key in <Ctrl>A.



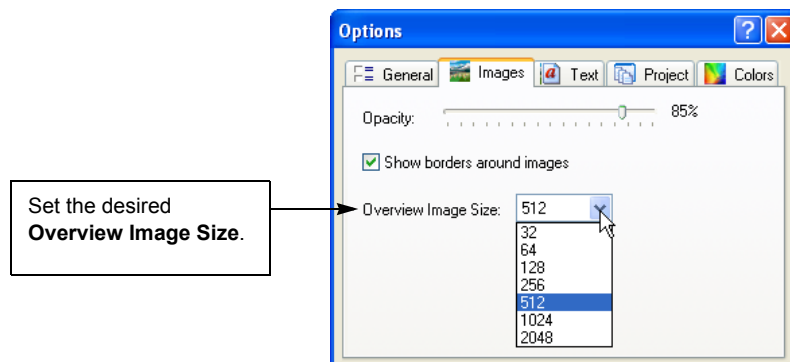
Step 5) Borders appear for checked images only:

- a.) To check or uncheck only one image, either click in the box of a single highlighted image, or click in the box of an unhighlighted image.
- b.) To check or uncheck multiple images with one click, select multiple images using the instructions in Step 4. Click on the checkbox for one of the selected images; all selected images are checked or unchecked at the same time.

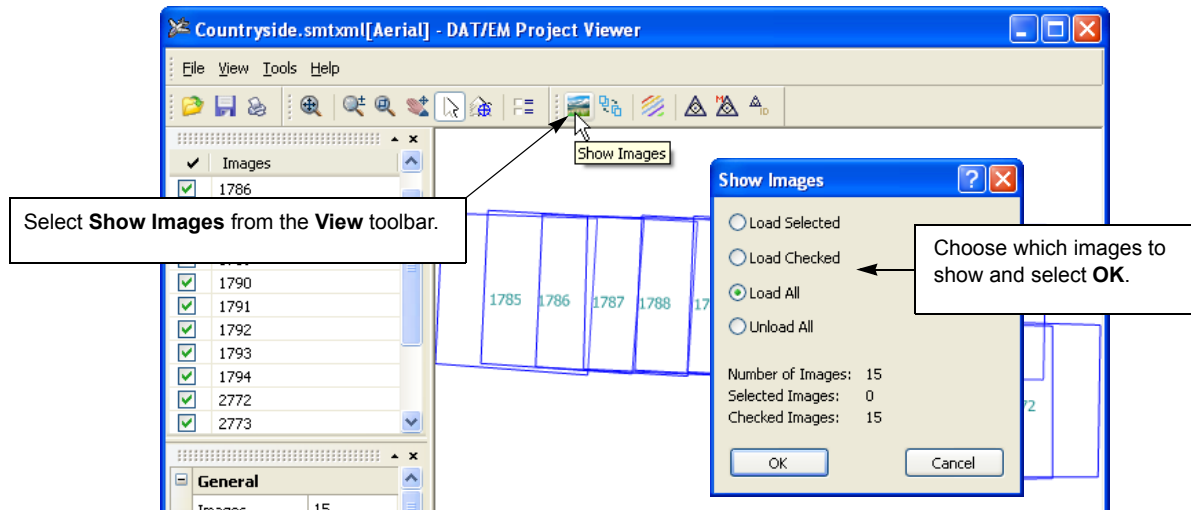


Step 6) If desired, turn on the image display:

- First check the image resolution. The lower the resolution, the faster the images are to load. A lower setting is recommended for very large original images (such as ADS40/80) or for a high number of images. In the **Options** dialog, set an **Overview Image Size** on the **Images** tab:



- Select **Show Images** from the **View** toolbar. Choose the images to show. Note that PROJECT VIEWER/ORTHO+MOSAIC can display images that are 8- or 12-bit color/grayscale or any images that have been output from SUMMIT EVOLUTION's IMAGE CREATOR application. If the images do not display, it could be that the images do not have the expected image levels to match the currently set **Overview Image Size** shown above; in this case, increase the **Overview Image Size** or process with IMAGE CREATOR and try again.



A red "X" icon appears in the lower right of the display as the images are loading. If necessary, click the "X" to cancel loading the images. If allowed to complete, the images appear in the display:

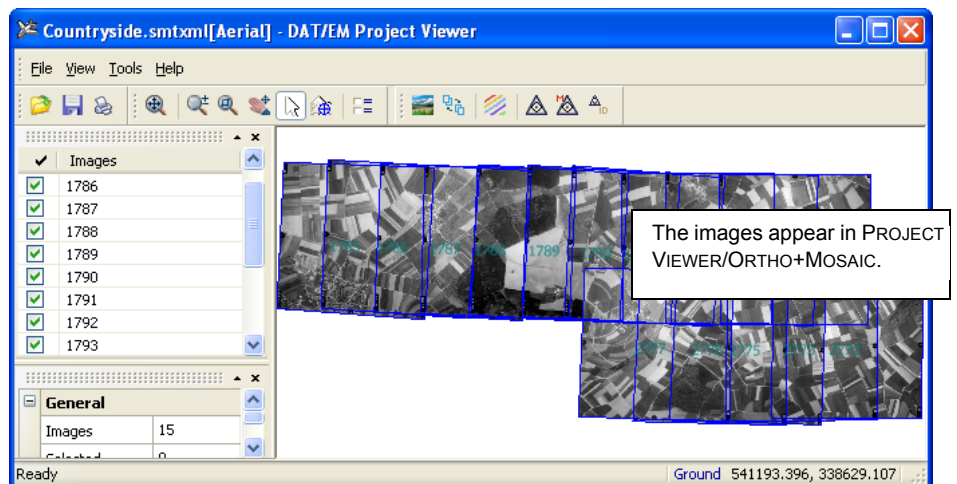
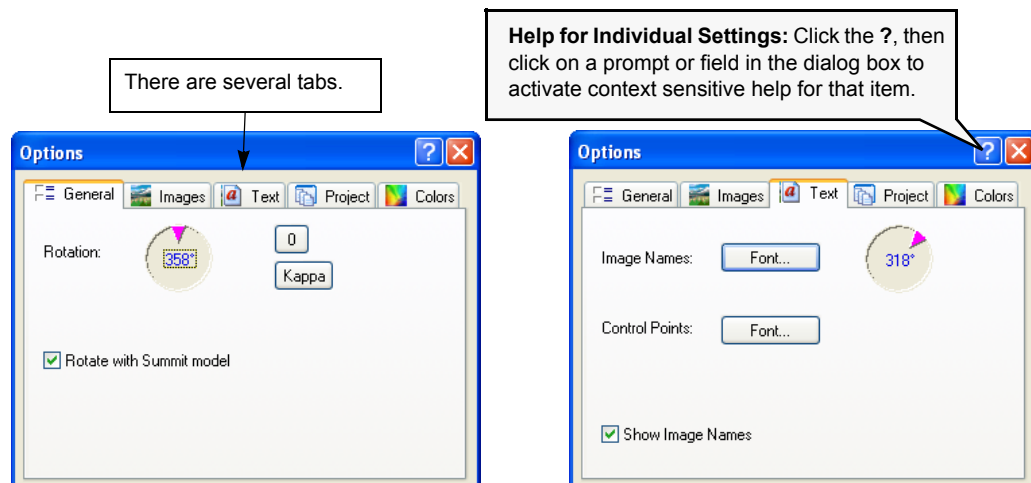
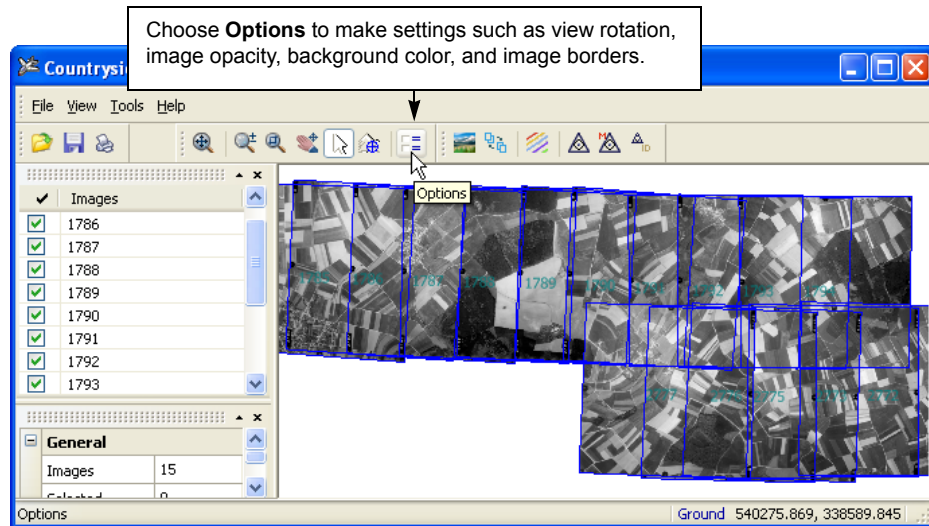
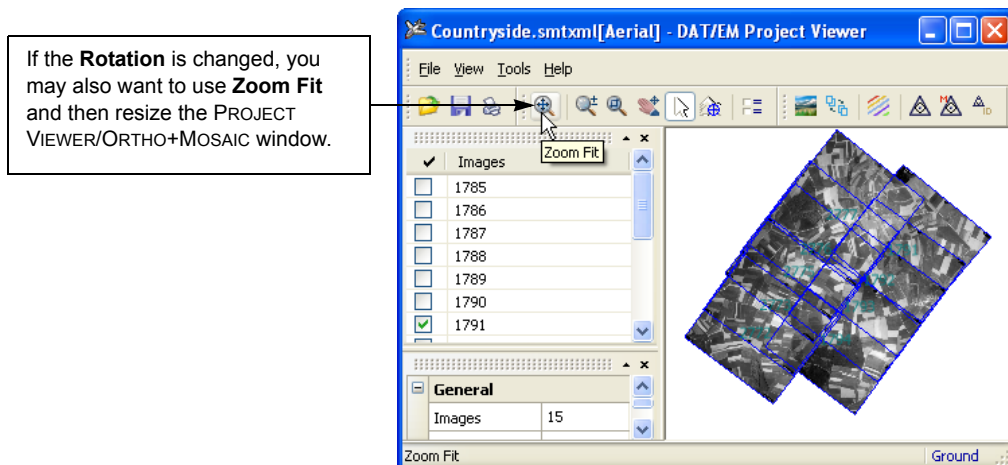


Image adjustments found in the project at the time it was opened will be applied to the images. These include SUMMIT EVOLUTION settings such as histogram adjustments, brightness, and applied channel maps.

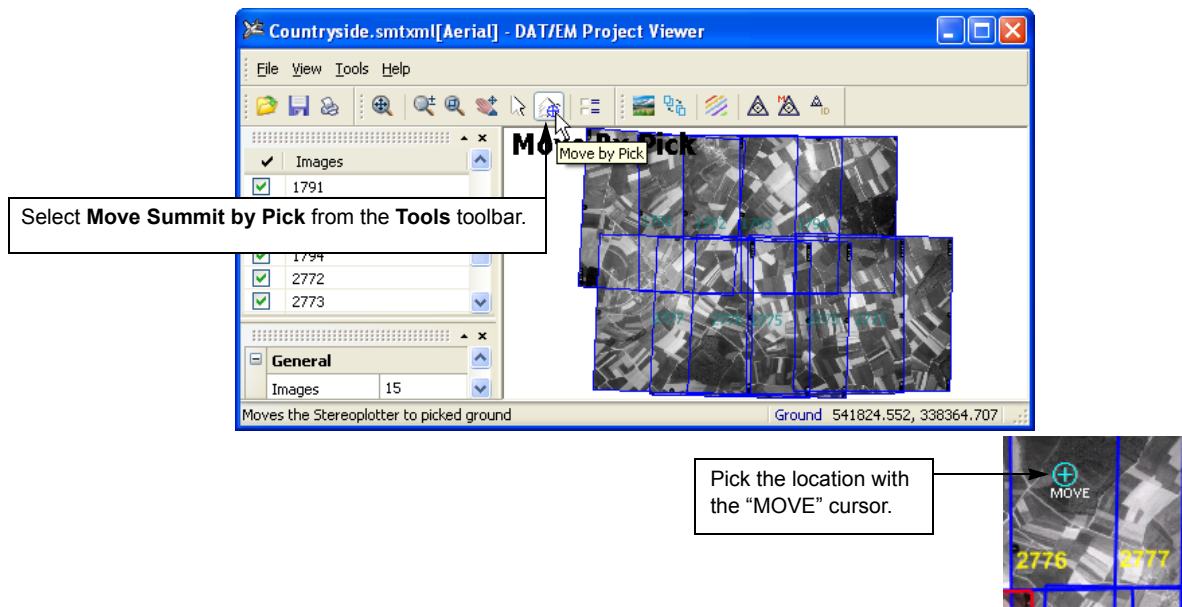
- Step 7)** If desired, use **Options** from the **Tools** toolbar to change settings such as view rotation, image opacity, background color, and image borders.



- Step 8)** If the **Rotation** is changed, you may also want to use **Zoom Fit** from the **Tools** toolbar and/or resize the PROJECT VIEWER/ORTHO+MOSAIC window.

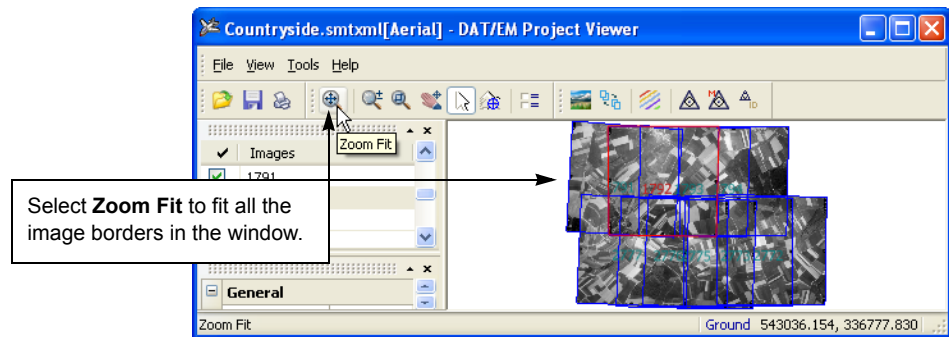


- Step 9)** PROJECT VIEWER/ORTHO+MOSAIC may be used to move the SUMMIT EVOLUTION main view cursor to a selected coordinate. Select **Move Summit by Pick** from the **Tools** toolbar, then use the “MOVE” cursor to select the point on the PROJECT VIEWER/ORTHO+MOSAIC image area. The SUMMIT EVOLUTION cursor moves to that coordinate and opens the model (or orthophoto image) that contains the point. Note that the two images opened may not be an image pair matched on the **Models** tab; they are the two closest images to the selected point.

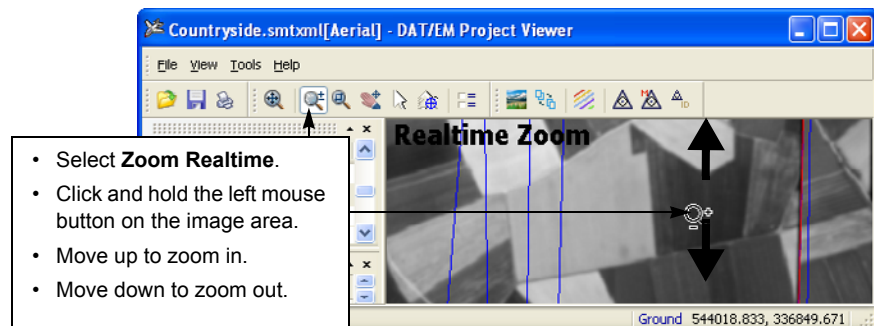


- Step 10)** Use any of the image window tools at any time:

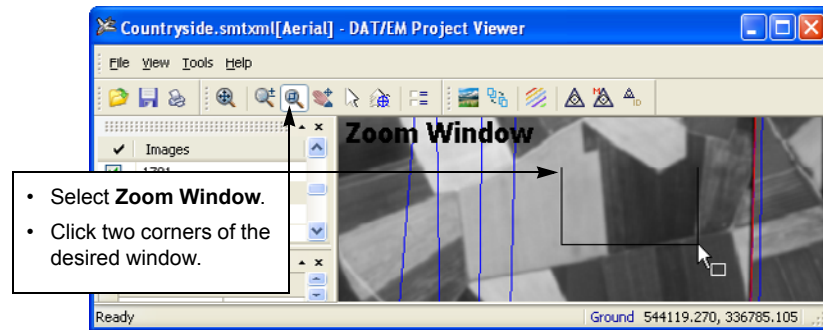
- a.) Select **Zoom Fit** to fit all the image borders in the window:



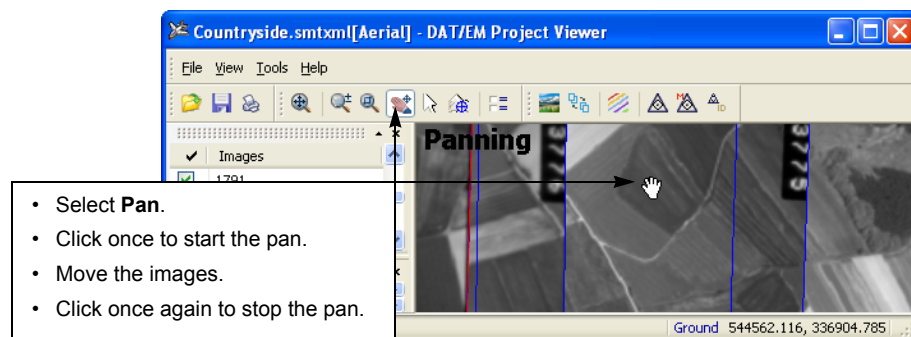
- b.) Select **Zoom Realtime** to activate the realtime zoom. Click and hold the left mouse button and move the mouse up or down to increase or decrease the zoom.



- c.) Select **Zoom Window** click two corners of the desired window.

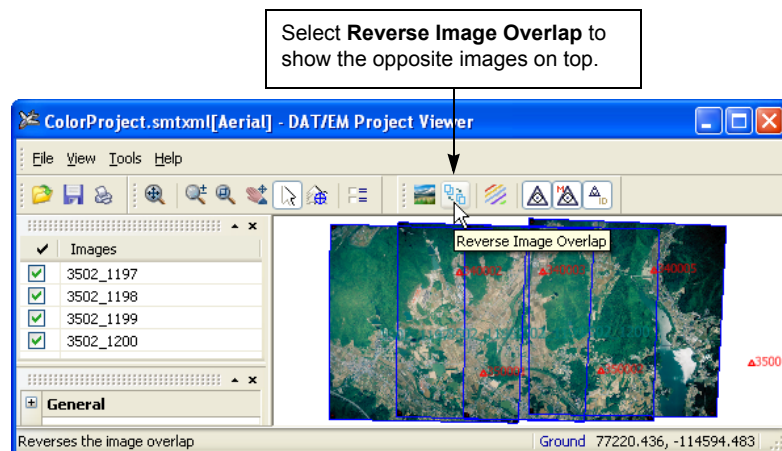


- d.) Select **Pan** to activate image panning. Click once on the images to start the pan. Move the images. Click once again to stop the pan.

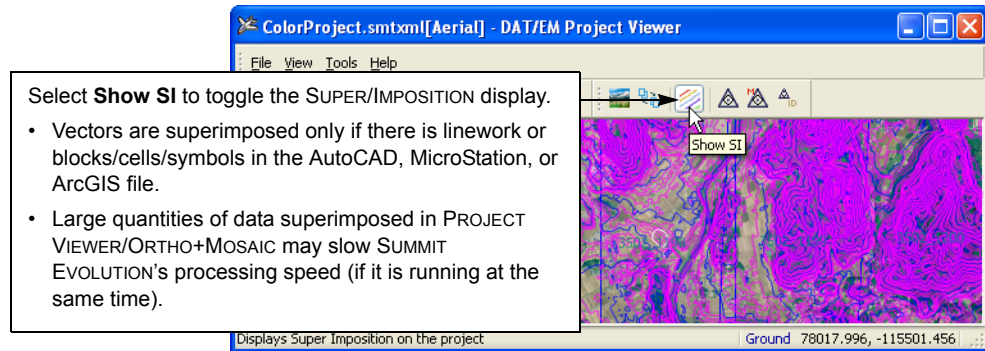


Step 11) Use any of the image display toggles at any time:

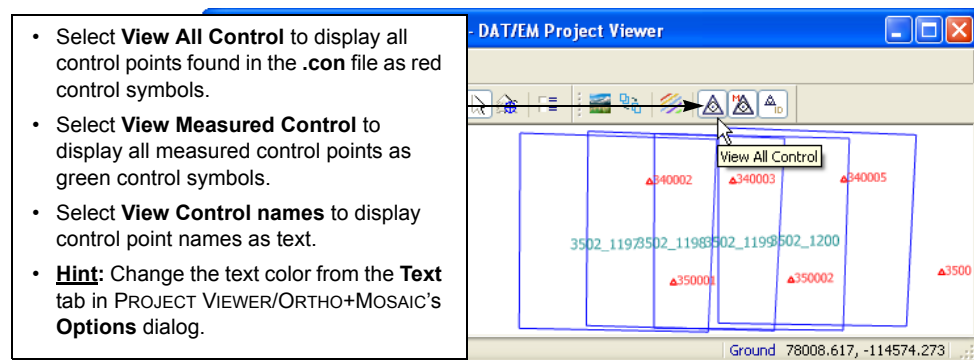
- a.) Toggle the image overlap direction from right to left or from left to right using **Reverse Image Overlap** from the **View** toolbar.



- b.) Toggle the SUPER/IMPOSITION display of previously digitized linework and cell/block/symbol objects using the **Show SI** icon. To speed processing, text and point objects are not displayed. The superimposed linework may not exactly line up with the image features in PROJECT VIEWER/ORTHO+MOSAIC, because it is not a stereo display and the digitized features are 3D. If PROJECT VIEWER/ORTHO+MOSAIC is running while using SUMMIT EVOLUTION to digitize objects, it is recommended to set **Show SI** off to increase SUMMIT EVOLUTION's processing speed.



- c.) Toggle the display of control points using **View All Control**, **View Measured Control**, and **View Control Names** from the **View** toolbar.

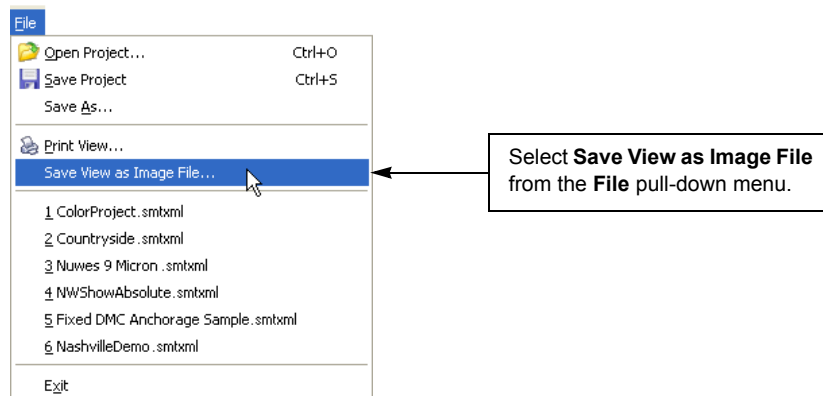


Create JPEG or BMP from the Display - Available in All Versions

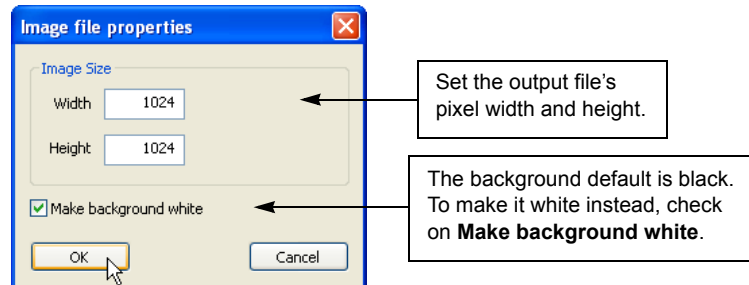
Sometimes it is useful to create a graphic from the PROJECT VIEWER/ORTHO+MOSAIC display. The graphic may be useful in a report or other documentation about a project.

To create a graphic file from display, perform the following steps:

- Step 1)** Use the instructions in the sections above to adjust the components of the PROJECT VIEWER/ORTHO+MOSAIC display. The display items that are currently on will appear in the output graphic.
- Step 2)** Select **Save View as Image File** from the **File** pull-down menu.



- Step 3)** Set **Width** and **Height** to the number of pixels of the output file. A higher pixel number makes a higher resolution output file, but also increases the file size on disk. Although a default of 1024 by 1024 pixels is offered, there is no “best” file size that works for every case. The settings depend on how the output file will be used.
- Step 4)** The background default is black. To make it white instead, check on **Make background white**.

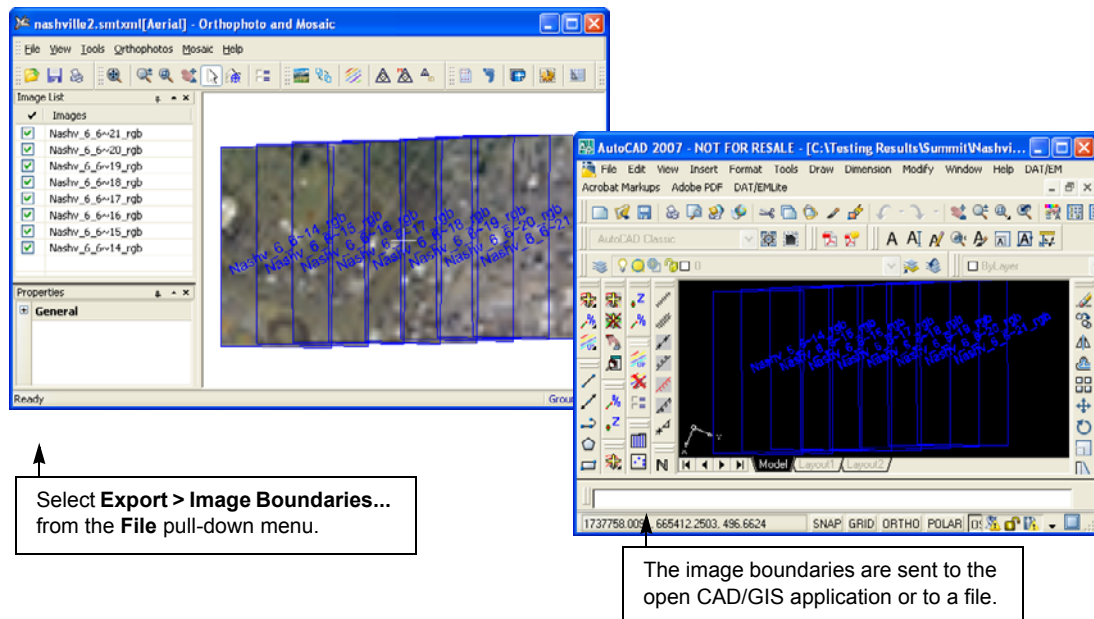


- Step 5)** Select **OK** and choose an output file location and file name. Choose either the BMP or JPEG file format from the **Save as type** field. Select **Save** to create the file.

Export Image Boundaries to CAD File or Active CAD - Available in All Versions

PROJECT VIEWER/ORTHO+MOSAIC can export image boundary lines and image file names to a vector file or to active CAD/GIS. Perform the following steps:

- Step 1)** Open a project in PROJECT VIEWER/ORTHO+MOSAIC.
- Step 2)** Make settings for image boundary color and image text color using the Options dialog tabs shown in Step 3 on page 28-1.
- Step 3)** If sending to active CAD, be sure AutoCAD, MicroStation, or ArcMap is running.
- Step 4)** Select **Export > Image Boundaries to CAD file** or **Export > Image Boundaries Send to CAD** from the **File** pull-down menu. If sending to a file, set a file name and type.



Open an Image in DAT/EM Viewer

PROJECT VIEWER/ORTHO+MOSAIC can be used to open individual images in the DAT/EM VIEWER application. This could be useful for independent viewing, zooming, or investigation purposes. Perform the following step:

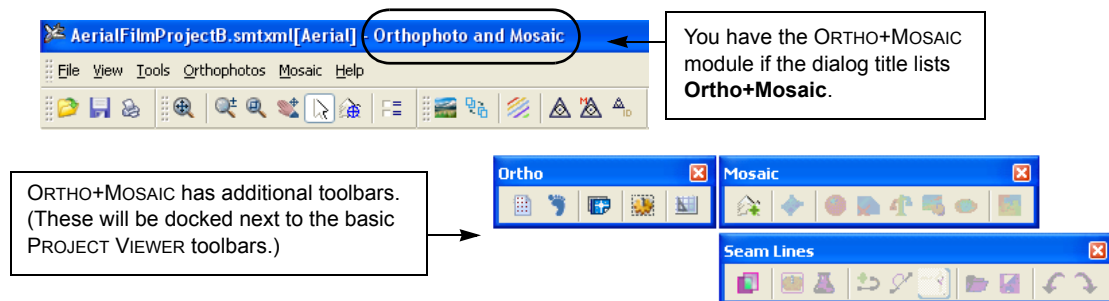
Step 1) With a project open in PROJECT VIEWER/ORTHO+MOSAIC, choose a method:

- Double click on an image name in the Image List window. (If the window is not visible, select **Image List Window** from the **View** toolbar.)
- With the Selection Pointer arrow active (find it on the **Tools** toolbar), double click inside an image area in the image view. (Images do not need to be loaded in PROJECT VIEWER/ORTHO+MOSAIC in order for this to work.)

Having an image open in DAT/EM VIEWER does not affect the general operation of PROJECT VIEWER/ORTHO+MOSAIC.

Create Orthophotos

The ORTHO+MOSAIC module is provided with SUMMIT EVOLUTION PROFESSIONAL EDITION in some geographic regions. If your PROJECT VIEWER provides the ORTHO+MOSAIC module, the dialog will be labeled “Ortho+Mosaic” and will contain additional **Ortho**, **Mosaic**, and **Seam Lines** toolbars:



The extended version will be called ORTHO+MOSAIC in the instructions below. This refers to the version of **ProjectViewer.exe** that has ORTHO+MOSAIC activated.

To create orthophotos, the following components are required:

- A SUMMIT EVOLUTION project of one of the following types: Aerial, ADS40/80 Using Leica Kit, ADS40 Digital Sensor, PCI Models Using ProPack, Satellites with RPC, and ENVI Epipolar.

For aerial projects, the project may contain one or more images. Each image to be used for orthophoto generation must have a known photo center (exterior orientation, EO). The photo center may be from any source, such as from absolute orientation (*Chapter 20*), control transfer from orthophoto (page 21-10), control transfer from vector file (page 21-10), or aerotriangulation import (page 21-4).

For ADS40/80 projects, if SUMMIT EVOLUTION can open the images without producing any error messages, then there is enough information to create orthophotos. ADS40/80 always have image pairs, so please use at least two images that form a stereo model.

For PCI Models using ProPack projects, if SUMMIT EVOLUTION can open the images without producing any error messages and the orientation is complete, then there is enough information to create orthophotos. Please use at least two images that form a stereo model.

- One or more Digital Terrain Model (DTM) XYZ point distributions that cover the area of the desired orthophoto(s). For text and point-list binary formats, see page 28-12. For vector formats (**dgn**, **dwg**, **shp**, **dxf**), see page 28-14.
- One or more sources that contain objects such as 3D buildings and other man-made features, breaklines, and additional elevation points. Sources may be one or a combination of the following formats:
 - a.) Vector files that contains points, blocks/cells, closed polylines/polygons/shapes, segment data, or breaklines. See page 28-14.
 - b.) Polygon shapes currently superimposed in the ORTHO+MOSAIC's display. These shapes may include 3D buildings and other man-made features. See page 28-19.

Instructions to create orthophotos appear in the sections below.

About the Orthophoto and Mosaic Project Files

When you begin the orthophoto project, you will start by opening a SUMMIT EVOLUTION **.smtxml** project file in the ORTHO+MOSAIC application.

- In DAT/EM software version 6.2 and lower, all orthophoto and mosaic settings were saved back to and "<OPS>" section in the **.smtxml** file; this caused problems, because SUMMIT EVOLUTION and ORTHO+MOSAIC could run at the same time and possibly overwrite the other's settings.
- In DAT/EM software version 6.3 and above, whenever either SUMMIT EVOLUTION or ORTHO+MOSAIC opens a project, it checks for an "<OPS>" area of the **.smtxml** project file. If found, the settings are transferred to a new **.omXml** file *only if it does not yet exist*. The <OPS> area is then removed from the **.smtxml** file.
- In DAT/EM software version 6.3 and above, orthophoto- and mosaic-specific settings are stored in a file called:

<original folder>\settings_<project name>\<project name>_ortho.omXml.
- More orthophoto and mosaic settings files may be created. They are also stored in the settings folder:

<original folder>\settings_<project name>
- **Save As** has been removed from ORTHO+MOSAIC. When ORTHO+MOSAIC prompts to save, it now refers to the **.omXml** file and not the **.smtxml** project.

A note about backward compatibility

The <OPS> area is no longer created in a SUMMIT EVOLUTION **.smtxml** project starting in version 6.3. If a **.smtxml** is created by version 6.3 or higher, it will not provide orthophoto and mosaic settings to any version 6.2-or-lower ORTHO+MOSAIC. If an orthophoto project is passed between newer and older DAT/EM versions, choose a solution:

- a.) Recommended. Upgrade all DAT/EM software to the same version, 6.3 or higher.
- b.) Copy the <OPS> data from the **.omXml** file and paste it to the bottom of the **.smtxml** file before opening the **.smtxml** file with version 6.2 or 6.1.

Image Adjustments and Channel Mapping in Summit Evolution

SUMMIT EVOLUTION's image adjustments and channel mapping settings may be used during orthophoto generation. Please make any orthophoto-input-related settings in SUMMIT EVOLUTION *before* opening the project in the ORTHO+MOSAIC application.

To save the project settings in the proper order, perform the following steps:

- Step 1)** Start the SUMMIT EVOLUTION application. (The ORTHO+MOSAIC application should not be running at this time.) Open the project file that will be used later for orthophoto generation.
- Step 2)** In SUMMIT EVOLUTION:
 - a.) Use **Image Adjustments** from the **Imaging** toolbar. Apply desired image adjustments for each of the images in the project.
 - b.) Use the **Channel Manager** from the **Imaging** toolbar. Apply desired channel and range mapping.

The goal of these settings is to provide the best colors for orthophoto generation (rather than for the best digitizing visibility).

Please note: During orthophoto generation setup, there will be separate options for whether to use the image adjustments and whether to use the channel mapping.

- Step 3)** Save the project from SUMMIT EVOLUTION.
- Step 4)** (Optional; to save computer resources) Close SUMMIT EVOLUTION.
- Step 5)** Open the project in the ORTHO+MOSAIC application.
- Step 6)** Proceed with setting up the orthophoto generation as shown in the sections below.

Select DTM Files for Orthophoto Input

Using a DTM distribution that covers the orthophoto area is highly recommended for the best orthophoto results.

DAT/EM uses the term “DTM” as a generic description to mean any file that contains a set of accurate XZY ground points in the coordinate range of the desired orthophoto. DAT/EM has simply chosen “DTM” out of the many terms that are in common use, such as DEM, DSM, masspoints, LiDAR, and many more.


An orthophoto may be created without DTM input, but this is not recommended. The results are much better if accurate ground elevations are supplied.

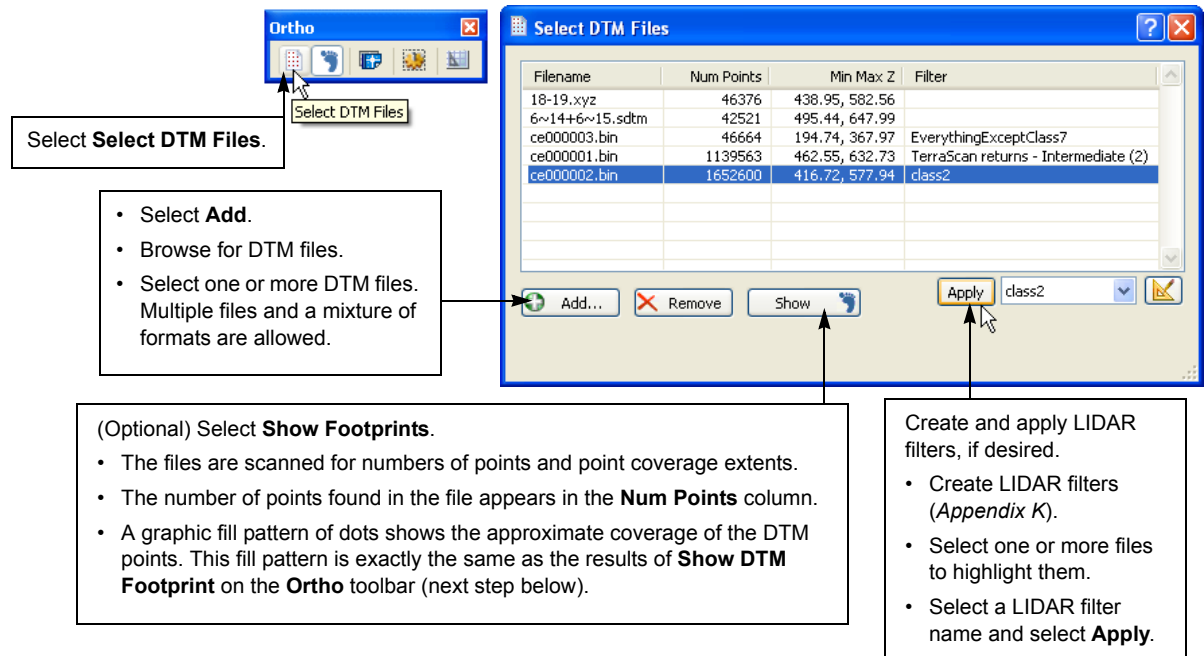
- If the DTM points are in a vector format file (**dgn**, **dwg**, **shp**, **dxg**), please see page 28-14 instead.
- Use the instructions below for non-vector formats, such as text and binary.
- Multiple files and multiple formats may be imported.

Select DTM files before running orthophoto generation.

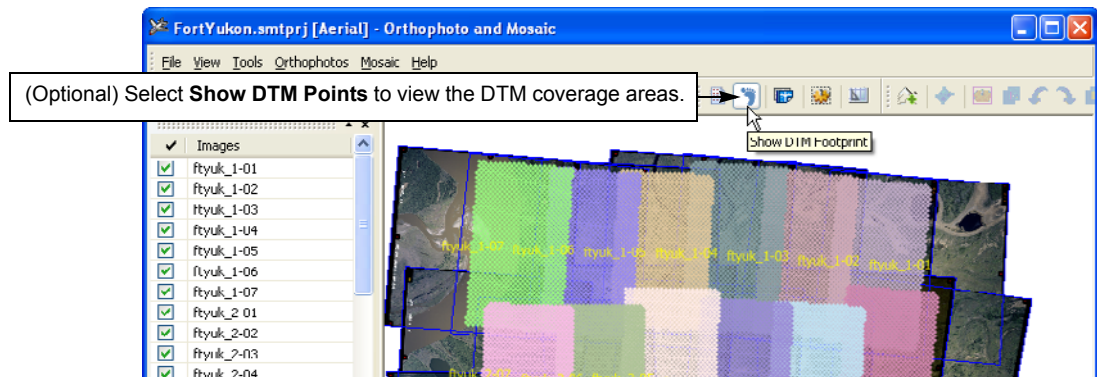
To select one or more DTM files, perform the following steps:

- Step 1)** Open an **Aerial, ADS40/80 Using Leica Kit, DAT/EM ADS40, or PCI Models Using ProPack .smtxml** project in the ORTHO+MOSAIC application. Make any desired view settings. Note that it is not necessary to load the images in order to create orthophotos.

- Step 2)** Select the **Select DTM Files** icon on the **Ortho** toolbar. Use the **Add** button to browse for and select files. Multiple files and a mixture of formats are allowed.
- Step 3)** LIDAR filters may be applied to compatible file types. Points that are excluded using a LIDAR filter will not be used as input for orthophoto generation. If a new filter is needed, select the  button to launch the LIDAR Filter Editor (see instructions in *Appendix K*). Select one or more files to highlight them, select a LIDAR filter name, and select the **Apply** button. The name of the LIDAR filter will appear in the **Filter** column.
- Step 4)** (Optional) If desired, select the **Show DTM Footprints** button to scan the DTM files for number of points and point coverage areas. If this option is used, the DTM footprints will be available for display on the main ORTHO+MOSAIC window; however, this may be very slow to process if the files are ASCII XYZ files, LIDAR files, or if the files have a large number of points.



- Step 5)** (Optional) Select the **Show DTM Footprint** icon from the **Ortho** toolbar to toggle the DTM footprints on or off at any time. Note that the DTM footprint “points” are really a graphical fill pattern, not the true point locations.



- Step 6)** Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the list of DTM files to the settings file, <original folder>\settings_<project name>_<project name>_ortho.omXml.

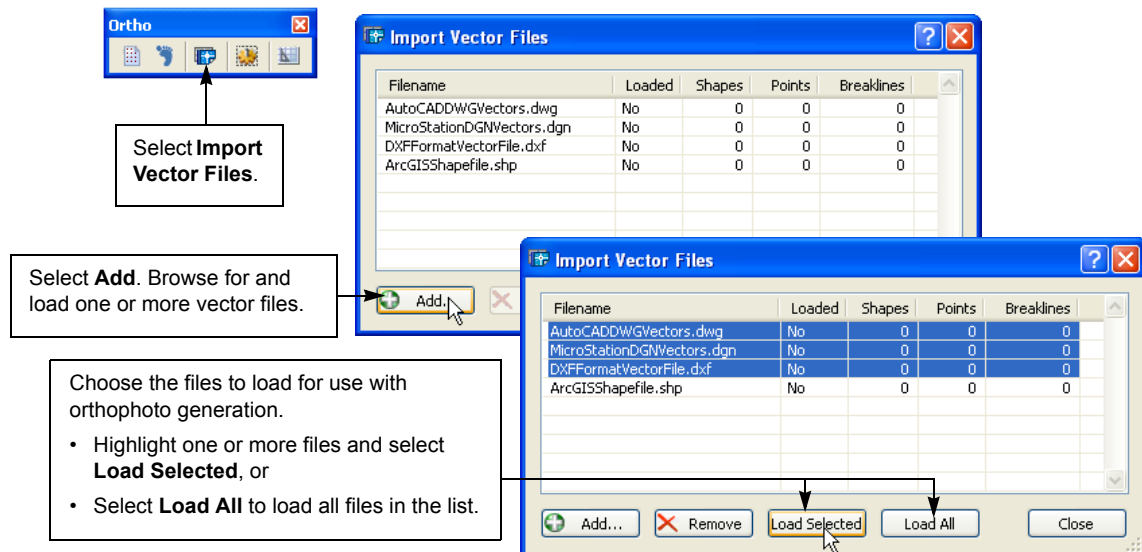
Import Vector Files for Orthophoto Input

Objects in a vector file may be used as 3D input for orthophoto generation.

- The vector files may contain objects for shapes (AutoCAD closed polylines, MicroStation shapes, and ArcGIS polygon-geometry shapefiles), points (AutoCAD points, MicroStation points, or ArcGIS point-geometry shapefiles), and lines (AutoCAD polylines, MicroStation line strings, and ArcGIS polyline-geometry shapefiles). These are objects such as plan data, 3D buildings, and breaklines.
- Vector files may be in AutoCAD **dwg**, MicroStation **dgn**, ArcGIS **shp**, or **dxf** format. Multiple vector files and multiple formats are allowed.
- Each type of 3D data should be on a separate layer/level in the vector file. For example, place all buildings on a layer/level that is separate from DTM points. Data types will be matched with layers/levels when the file is loaded.
- The objects in the vector file should be accurate in X, Y, and Z.

To import objects from vector files, perform the following steps:

- Step 1)** Select **Import Vector Files** from the **Ortho** toolbar. Select the **Add** button and select one or more files.
- Step 2)** Choose a method to activate the vector files for use by orthophoto generation:
- a.) Select individual files from the list and select **Load Selected**;
 - b.) Or, select **Load All** to load all the files.



- Step 3)** As each vector file opens, assign layers to each type of input.

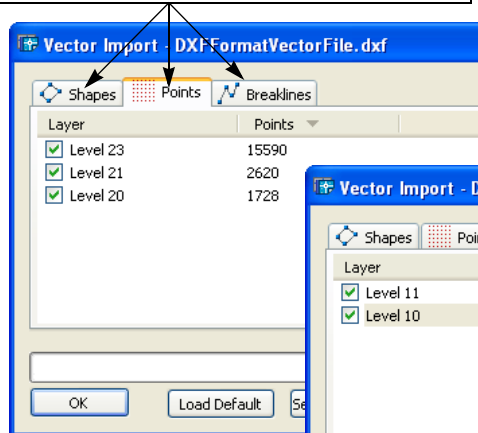
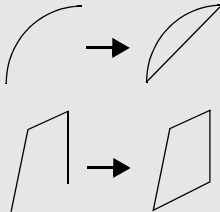
If you often use files that have the same layer/level name schema, use the **Load Default** and **Save As Default** buttons to share settings with different project sessions.

- To load previously used and saved layer checks, select **Load Default**. View the tabs to make sure the expected layers are checked and to look at the status of any new or different layers.
- To save the current layer checks for future use, select **Save As Default**.

A dialog appears for each vector file. The layers found in the file are listed.

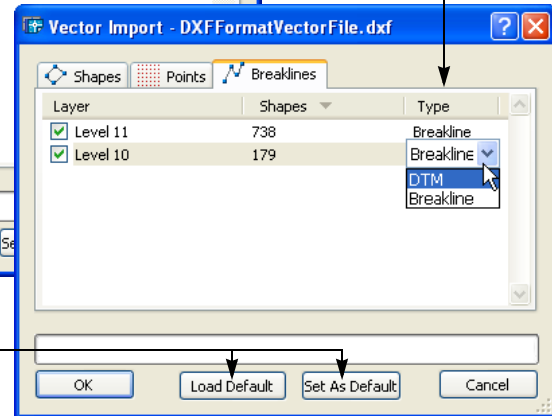
- Select the **Shapes**, **Points**, and **Breaklines** tab for each dialog.
- Check on the layers that match the tab's title. For example, check on the building layer(s) on the **Shapes** tab.

Note: Unclosed objects on **Shapes** layers will be used, but they will be processed as if they have a closing segment:



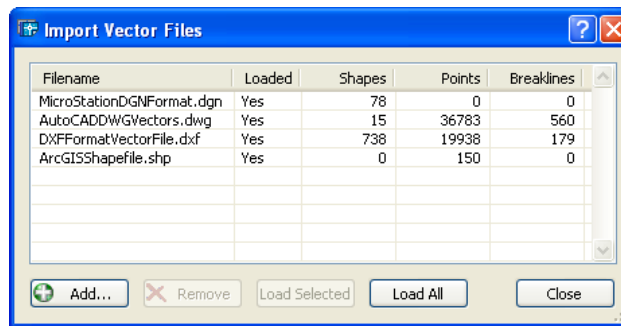
The **Breaklines** tab has a special **Type** setting. Click directly on the current setting to activate the field choices.

- **Breakline:** Recommended for true breaklines. Interpolates elevations along the segments of the breaklines. That is, it automatically densifies the breaklines if necessary.
- **DTM:** Used only for the special case where only the vertices, not the segments, should be used as elevation data.



- **Load Default** loads previously saved layer/level checkmarks.
- **Save as Default** saves the current layer/level checkmarks for future use on files with the same layer/level name schema.

Step 4) When finished loading files and checking layers, the number of objects are listed for each file and objects appear superimposed on the ORTHO+MOSAIC image view:



File statistics appear in the Select Vector Files dialog. The objects appear superimposed over the image view. Select **Close** when finished.

Step 5) Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the list of vector files to the settings file, <original folder>\settings_<project name>\<project name>_ortho.omXml.

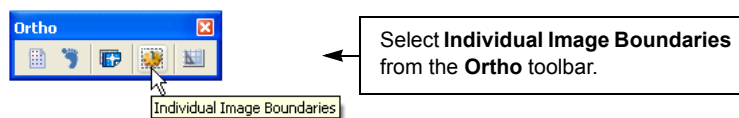
Create or Import Orthophoto Image Boundaries

If boundaries are not specified, every part of every image must be processed, and the largest possible area is used to make each orthophoto. This results in unnecessary processing time as ground areas are processed and re-processed for each overlapping image. To prevent this, generate and edit boundaries so that they contain only those areas that should be processed.

To generate or import boundaries and edit them, perform the following steps:

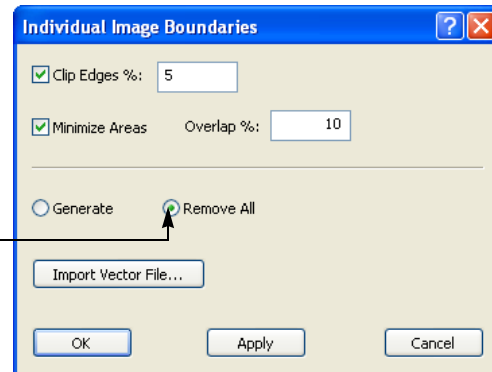
- Step 1)** (Optional) In Step 4 below, you will be given the option to automatically create orthophoto boundaries and/or to import them from **dxf**, **dwg**, **dgn**, or **shp** vector files. If image boundaries will be imported, prepare the file as follows:
- Multiple vector files are allowed, but individually and all together they should contain only one boundary per image. A newly imported or newly generated boundary will replace any boundary that already exists in the same image.
 - If multiple boundaries for the same image are found in the same vector file, only one of the boundaries will be imported. You will not know which one will be chosen, so it is always best to have just one boundary per image.
 - **Dxf** and **dwg** (AutoCAD drawing) files should contain closed polylines around the desired orthophoto boundary areas. One orthophoto boundary is imported per image area; additional boundaries in the same image area will be discarded. Closed polyline boundaries should be on one or more separate layers from other non-boundary closed polylines. All other object types – including open polylines – are allowed on any layer, because they will be ignored. You will be able to select the boundary layers.
 - **Dgn** (MicroStation design) files should contain type 6 shapes around the desired orthophoto boundary areas. One orthophoto boundary is imported per image area; additional boundaries in the same image area will be discarded. The boundary shapes should be on separate levels from other type 6 shapes. The boundary levels should not contain type 14 complex shapes; however, type 14 complex shapes are allowed on non-boundary levels. All other non-shape types are allowed on the boundary level, because they will be ignored. You will be able to select the boundary levels.
 - **Shp** files should be polygon-geometry ArcGIS shapefiles. They should contain polygons around the desired orthophoto boundary areas. One orthophoto boundary is imported per image area; additional boundaries in the same image area will be discarded. The shapefiles should not contain any extra non-boundary polygons, unless they are completely outside all the images in the entire project area.

Step 2) Select **Individual Image Boundaries** from the **Ortho** toolbar:



Step 3) (Optional) If boundaries already exist that you'd like to replace, select **Remove All** and **OK**. Then activate the dialog again and continue.

(Optional) If boundaries already exist that you'd like to replace, select **Remove All** and **OK**. Then select **Individual Image Boundaries** from the **Ortho** toolbar again.



Step 4) Choose a method to draw the boundaries. More than one method may be used, and more than one vector file may be imported; however, be aware that any newly imported or newly generated boundary in an image will replace any boundary that already exists in the same image.

- a.) To create boundaries automatically, make settings to regulate the boundary generation, then select **Generate** and **OK**:

- If **Clip Edges** is off, the boundaries will be the same as the image edges.



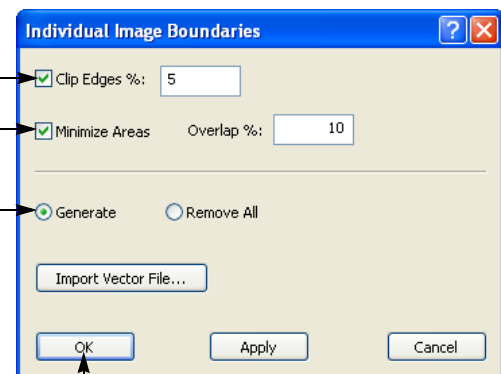
- If **Clip Edges** is on, the boundaries are inside the image edges by the given percentage.



- If **Minimize Areas** is off, the boundaries will not be reduced based on overlap with other images.



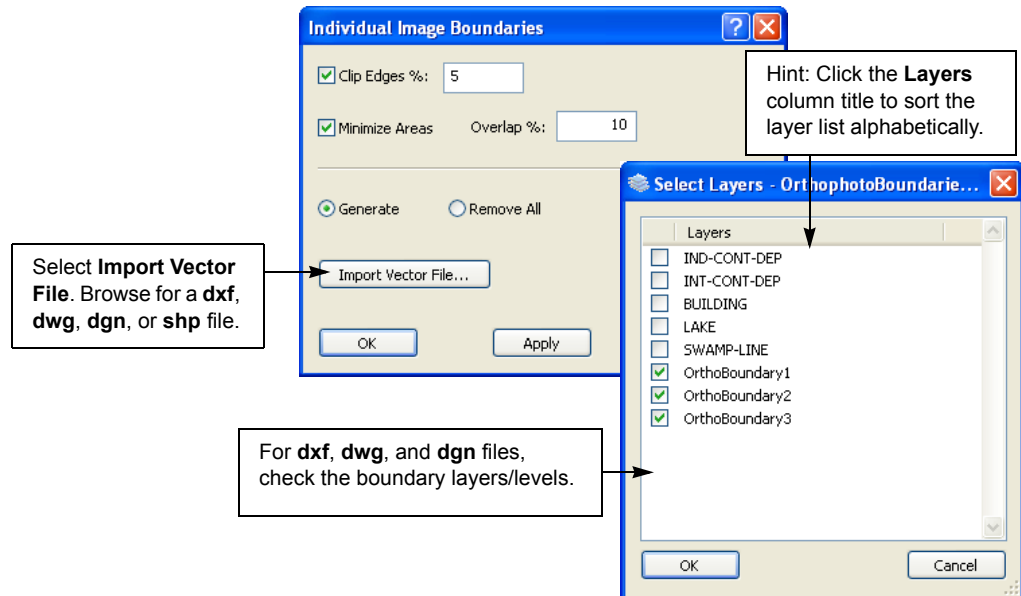
- If **Minimize Areas** is on, the side-to-side overlap is reduced to overlap only by the given percentage. This reduces total processing time in the overlap areas.



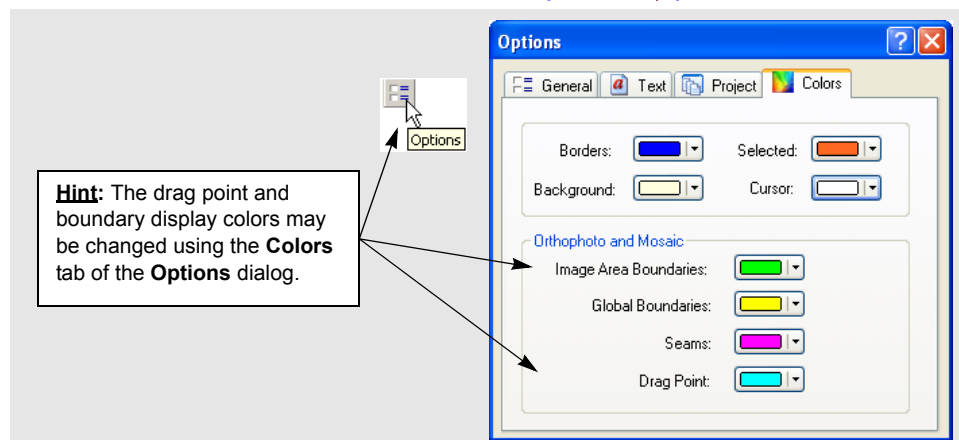
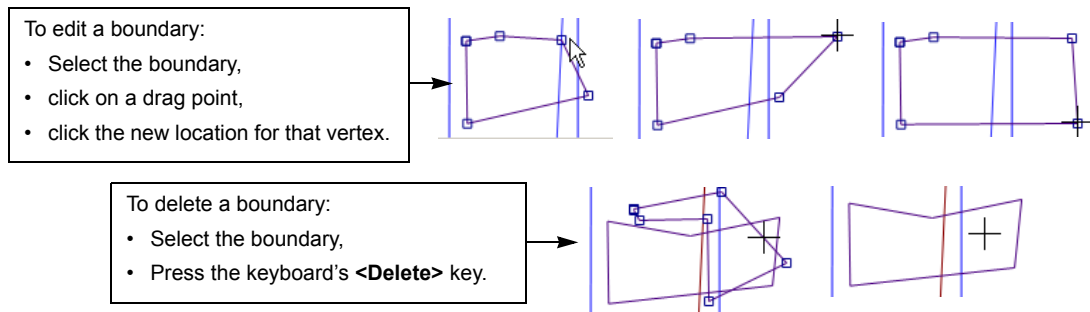
Select **Generate** and **OK** to create the boundaries.

- b.) To import the boundaries from a **dx**f, **dw**g, **dgn**, or **shp** file, select **Import Vector File**. Browse for the file. For **dx**f, **dw**g, and **dgn** files, select the boundary layers/levels. For **shp** files, all polygons in the shapefile will be imported.

If necessary, repeat to import another vector file. Multiple vector files are only useful if each file contains boundaries for different image areas. Only one boundary is allowed per image. Any newly imported boundary in an image will replace any boundary that already exists in the same image.



- Step 5)** To edit a boundary, either select its line in the list or click directly on the boundary outline. Drag points appear at the vertices. Click on a drag point and then click the new location for that vertex.



- Step 6)** Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the current boundaries to the settings file, <original folder>\settings_<project name>\<project name>_ortho.omXml.

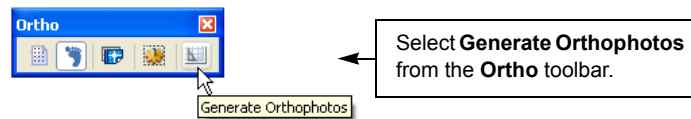
Generate Orthophoto Images

To generate orthophotos, perform the following steps:

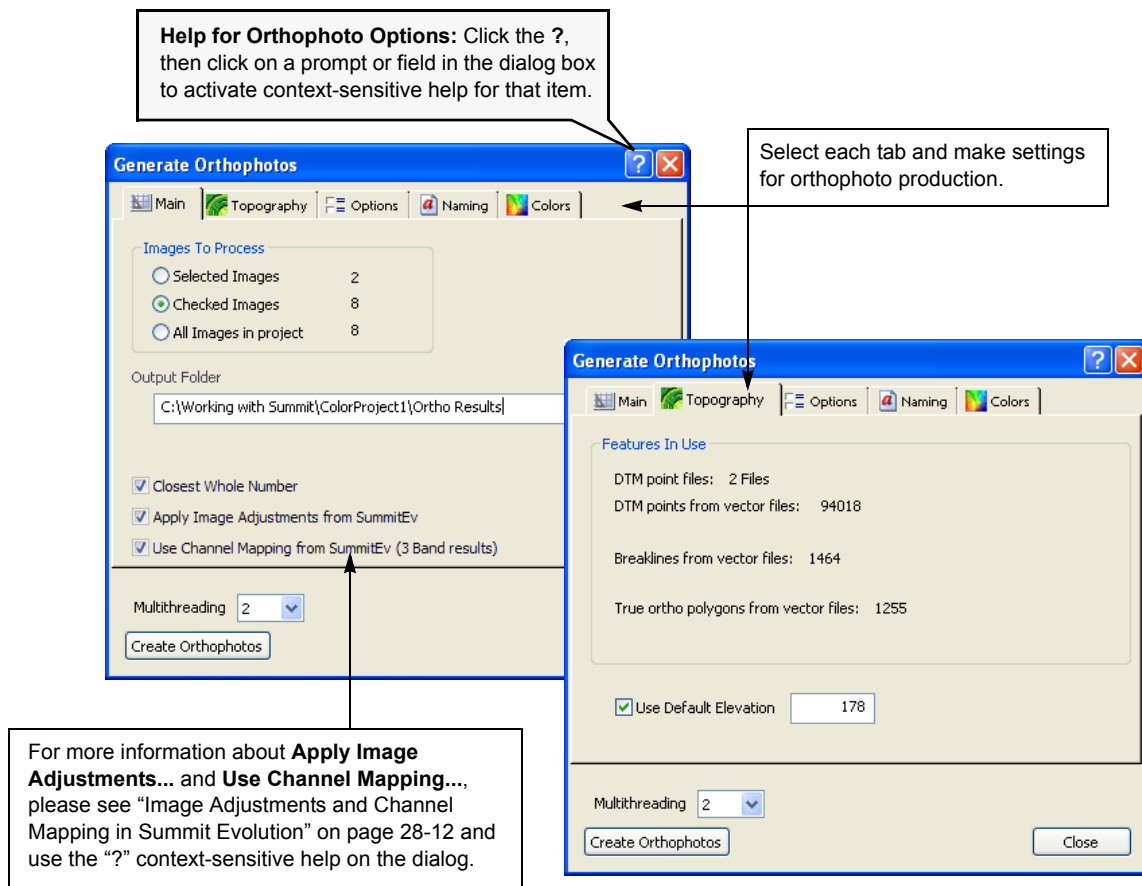
- Step 1)** Make sure the system is ready to generate orthophotos:

- DTM files have been loaded (page 28-12).
- Vector files have been imported (page 28-14).
- Orthophoto boundaries have been created (page 28-16).

- Step 2)** Select **Generate Orthophotos** from the **Ortho** toolbar.



- Step 3)** Select each tab in turn and begin to make settings:



Step 4) Choose the remaining tabs and continue to make settings:

Help for Orthophoto Options: Click the ?, then click on a prompt or field in the dialog box to activate context-sensitive help for that item.

Generate Orthophotos

Main | **Topography** | Options | Naming | Colors

Scale

☐ Use average pixel size of all images Ave: 0.541991
☐ Use individual image pixel size
☒ User-defined pixel size ground per pixel

Resampling method:

North Azimuth: °

☒ Generate Summit Evolution Orthophoto Project
☒ Generate TFW Files

Multithreading:

Create Orthophotos

Select each remaining tab and make settings.

Generate Orthophotos

Main | Topography | **Options** | Naming | Colors

☒ Postfix
Image name:

☐ Prefix
 Image name

☐ Fixed Name
 Numeric

Multithreading:

Create Orthophotos

Time-Saving Hint: If you plan to use ORTHO+MOSAIC to make a mosaic from the orthophotos, or to easily view the orthophotos in SUMMIT EVOLUTION, check on **Generate Summit Evolution Orthophoto Project**. A .smtxml file is generated at the same time as the orthophotos.

Generate Orthophotos

Main | Topography | Options | **Naming** | Colors

Background

RGB: Grayscale:

True Ortho Vector

RGB: Grayscale:

Multithreading:

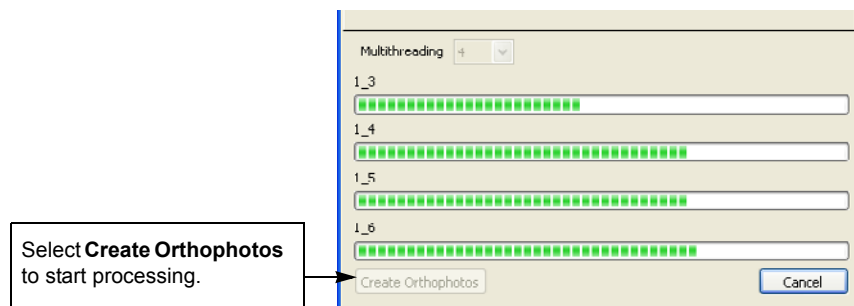
Create Orthophotos

Step 5) Set **Multithreading** to the number of threads to use for orthophoto generation.

- **Multithreading=1** will generate one orthophoto at a time. **Multithreading=2** will generate two orthophotos at a time, and so on. The higher the setting, the more memory and computer processing resources will be used.
- A “thread” is a path of execution. The operating system (OS) determines which processor a thread will use. If a thread is taking a large amount of processing, the OS will send the next thread to the next processor. Setting **Multithreading=2** is roughly synonymous with processing one orthophoto on one processor and another orthophoto on a second processor. However, if the computer is already running a processor-intensive application, the OS may send both orthophoto threads to the same processor. Thus, overall speed of orthophoto generation is dependent on what other applications are currently running.
- Set **Multithreading** to the maximum number only if orthophoto generation is the only task to be run on the computer. Setting the maximum number will make orthophoto processing as fast as possible, but it will prevent any other tasks from running at an acceptable speed.
- If **Multithreading** is set to the maximum number while another resource-intensive application is running (such as SUMMIT EVOLUTION, LANDSCAPE, aerotriangulation software, or some antivirus scans), the computer could run out of resources and crash. Resources include processors, memory, and disk access. Please be aware of what you are asking the computer to do.
- Never run orthophoto generation in multiple instances of ORTHO+MOSAIC with **Multithreading** set at the maximum number in any of them. This could cause the computer to run out of resources and crash.
- **Question:** I have two orthophoto generation jobs to run. Is it better to run them one at a time with **Multithreading=4** or two instances at a time set to **Multithreading=2**?

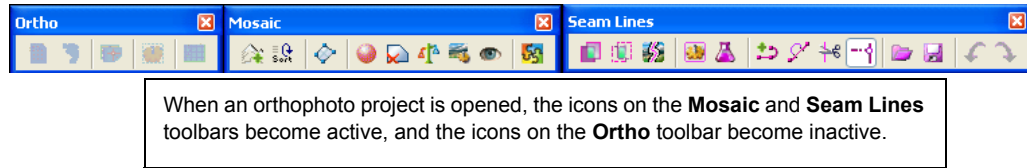
Answer: It is better to run them one at a time with **Multithreading=4**. If multiple instances are running, even with less-than-maximum multithreading settings, overall performance will be slower. Two instances require more memory and more processing overhead. If the computer runs out of memory, the computer will crash.

Step 6) Select **Create Orthophotos** to start processing. The processing time varies greatly depending on the speed of the computer, the size of the images, disk access speed, the amount of memory, the number of images, the output resolution, the number of processors selected in the **Multithreading** field, and what other tasks the computer is running at the same time. Processing bars show the progress of each image:



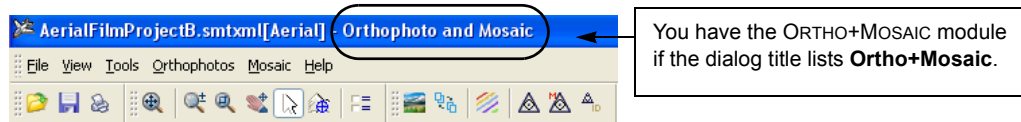
Step 7) When processing is finished, a message box shows the elapsed time. Close the message box and the Generate Orthophotos dialog.

- Step 8)** It is now possible to use the orthophoto images. If the **Generate Summit Evolution Orthophoto Project** option was checked on the **Options** tab, it is now possible to open the new orthophoto project in either ORTHO+MOSAIC or SUMMIT EVOLUTION. If you plan to make a mosaic from the orthophotos, open the new project in ORTHO+MOSAIC. Notice that the icons on the **Mosaic** and **Seam Lines** toolbars become active when an orthophoto project is opened:



Create an Orthophoto Mosaic

The ORTHO+MOSAIC module is provided with SUMMIT EVOLUTION PROFESSIONAL EDITION in some geographic regions. If your PROJECT VIEWER provides the ORTHO+MOSAIC module, the dialog will be labeled “Ortho+Mosaic” and will contain additional **Ortho**, **Mosaic**, and **Seam Lines** toolbars:



The extended version will be called ORTHO+MOSAIC in the instructions below. This refers to the version of **ProjectViewer.exe** that has ORTHO+MOSAIC activated.

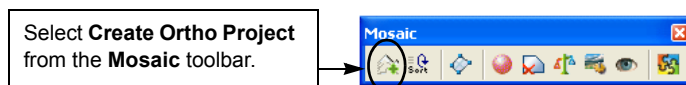
Orthophoto mosaics may be made from a SUMMIT EVOLUTION orthophoto project that has two or more images. The orthophoto images must have been made by ORTHO+MOSAIC (see instructions starting on page 28-10). The orthophoto project must be open in ORTHO+MOSAIC. Instructions to create a mosaic appear in the sections below.

Open the Orthophoto Project

Before generating the orthophoto mosaic, the input orthophoto project must be open.


Note: The orthophoto images must have been created by ORTHO+MOSAIC provided with SUMMIT EVOLUTION PROFESSIONAL EDITION (see instructions starting on page 28-10). ORTHO+MOSAIC-produced orthophotos have special embedded information that is required by the mosaic generation process. Orthophotos made by other brands of software are not compatible.

- Step 1)** If orthophotos exist, but they are not yet defined in a SUMMIT EVOLUTION **.smtxml** project file, then select **Create Ortho Project** from the **Mosaic** toolbar:



Select **Add**, browse for and select the orthophoto images, then select **Create Ortho Project**.

Step 2) Open a SUMMIT EVOLUTION orthophoto project in ORTHO+MOSAIC. Choose a method:

- Open the orthophoto project in SUMMIT EVOLUTION, then start ORTHO+MOSAIC using the **Project Viewer** icon, , on the **Tools** toolbar in SUMMIT EVOLUTION. If ORTHO+MOSAIC's **Automatically load Summit projects** option is checked on, it initially opens the same project that is open in SUMMIT EVOLUTION.
- Or, if ORTHO+MOSAIC is already running, open the project in ORTHO+MOSAIC. Note that different projects may be open in SUMMIT EVOLUTION and ORTHO+MOSAIC at the same time. Also, SUMMIT EVOLUTION does not need to be running in order to use ORTHO+MOSAIC; they are separate applications.
- ORTHO+MOSAIC may also be started from Windows **Start > All Programs > Datem Software > Orthophoto and Mosaic Creator**. Open an orthophoto project.

Once an orthophoto project is open, the **Mosaic** toolbar becomes active. Continue on to “Change Image Order (Sort)” below.

Change Image Order (Sort)

The order of the images affects both the display and the generation of the mosaic. Images that are higher in the image list have a higher priority, which means it will be used before the images below it. As the generation approaches a seam, images that are higher in the list will be checked first. The image order is important in triple (or more) areas or any time more than two images could be used in an area.

The display will reflect the current image order by drawing images that are higher on the list over images that are lower on the list.

Together, the image drawing order and the **Clip Images Using Seam Lines** setting make the display WYSIWYG (What you See is What You Get). What you see in the display is the order and priority of the mosaic input. It will correctly display which images will be used to either side of the seam.

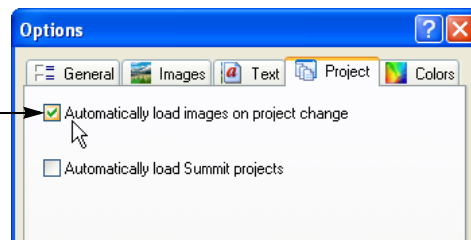
Change the image order at any time. It will be easiest to see the effects of image order after seams have been drawn.

To sort images to set their priority, perform the following steps:

Step 1) Sorting images is a project change. Select **Options** from the **Tools** toolbar or menu. Select the **Project** tab. Choose a setting for **Automatically load images on project change**:

- **On**: Images will reload automatically after sorting images.
- **Off**: Images will not reload automatically. The user will choose when to reload the images using **Show Images** from the **View** toolbar or menu.

The **Automatically load...** setting determines whether or not images reload after images are sorted.



Step 2) At any time, select **Change Image Order** from the **Mosaic** toolbar or menu.

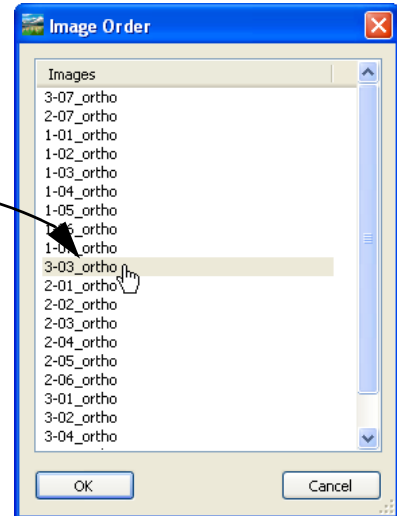
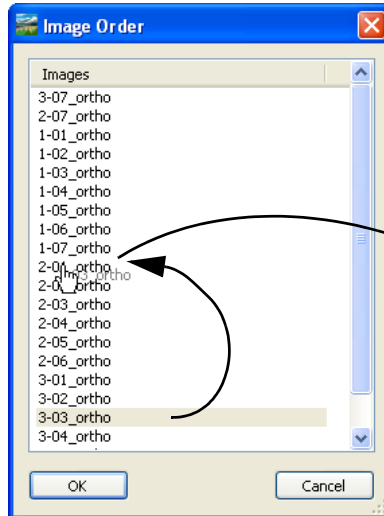
Step 3) Drag and drop files into a different order in the list.

Select **Change Image Order (Sort)** from the **Mosaic** toolbar or menu.



Drag and drop images into a different order.

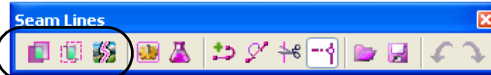
- Images that are higher on the list will be displayed over – and have processing priority over – any images below.
- Image order matters most in areas where there is more than one overlapping image on the same side of a seam.



Step 4) Select **OK** to close the Image Order dialog. The images will unload. Whether or not the images reload automatically depends on the **Automatically load images on project change** setting made in Step 1 above (page 28-23). If the images do not automatically reload, reload them at any time using **Show Images** from the **View** toolbar or menu.

Step 5) Other settings that affect the image display are **Highlight Overlap Areas**, **Clip to Overlap Areas**, and **Clip Images Using Seam Lines**. They are discussed below in the seam editing instructions.

Other settings that affect image display at the seams.



Create and Edit Mosaic Image Boundaries

If desired, **Mosaic Image Boundaries** may be used to define the area(s) to be output into individual mosaic output files.

- If there are no boundaries, a single mosaic file will be created from the entire extents of all the orthophotos. Its file name is set in **Mosaic Output File** on the **Main** tab of the **Create Mosaic** dialog.
- If boundaries are defined, one image will be output per boundary. The filenames will be set to the names of the boundaries. If the boundaries are not named, the file names will be set to name set in **Mosaic Output File** on the **Main** tab of the **Create Mosaic** dialog plus a “_bn” extension, where “n” is the boundary number.

Boundaries may be drawn manually, drawn by an even grid, and/or imported from text or vector files.

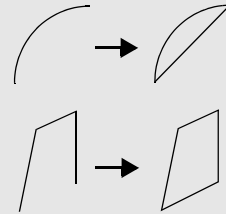
Perform the following steps only if you would like to output a specific area or output multiple mosaic files:

Step 1) If text or vector files will be used to import boundaries, prepare files now:

- **Vector Files**

Objects in **dxg**, **dwg**, **dgn**, or **shp** vector files that can be vectorized into polygons will be used as boundaries. Objects that are not already closed will be assumed closed (a closing segment will be added between the endpoints). If text is found inside a polygon in a **dxg**, **dwg**, or **dgn** file, the first line of the first text instance will be used as the boundary name, which is in turn used as the output file name.

Note: Unclosed objects in vector files will be used, but they will be processed as if they have a closing segment:



- **Text Files**

The text file formats are as follows: Note that *UL* means *Upper Left*, *LR* means *Lower Right*, etc.

TXT Format 1 Example:

MosaicTileName	ULeasting	ULnorthing	LReasting	LRnorthing
im2385_305	238500.00	31500.00	239500.00	30500.00
im2385_315	238500.00	32500.00	239500.00	31500.00
im2385_325	238500.00	33500.00	239500.00	32500.00

TXT Format 2 Example:

```
TileName, UL-XY, UR-XY, LR-XY, LL-XY, RotationInDegrees, PixelResolution
1, 9946.43, 6652.59, 12446.43, 6652.59, 12446.43, 75152.59, 9946.43, 5152.59, 0.00, .25
2, 11512.15, 6388.92, 13701.60, 7595.72, 14425.67, 26282.04, 12236.23, 5075.26, 28.8627, .25
3, 13896.74, 6784.76, 15631.23, 4984.33, 14550.97, 23943.64, 12816.48, 5744.07, -46.0688, .25
```

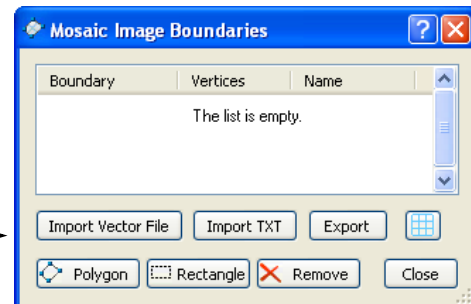
Note that the rotation in degrees and pixel resolution fields must be present, but the values are not used by the DAT/EM software.

Step 2) Select **Mosaic Image Boundaries** from the **Mosaic** toolbar:

Select **Mosaic Image Boundaries** from the **Mosaic** toolbar.

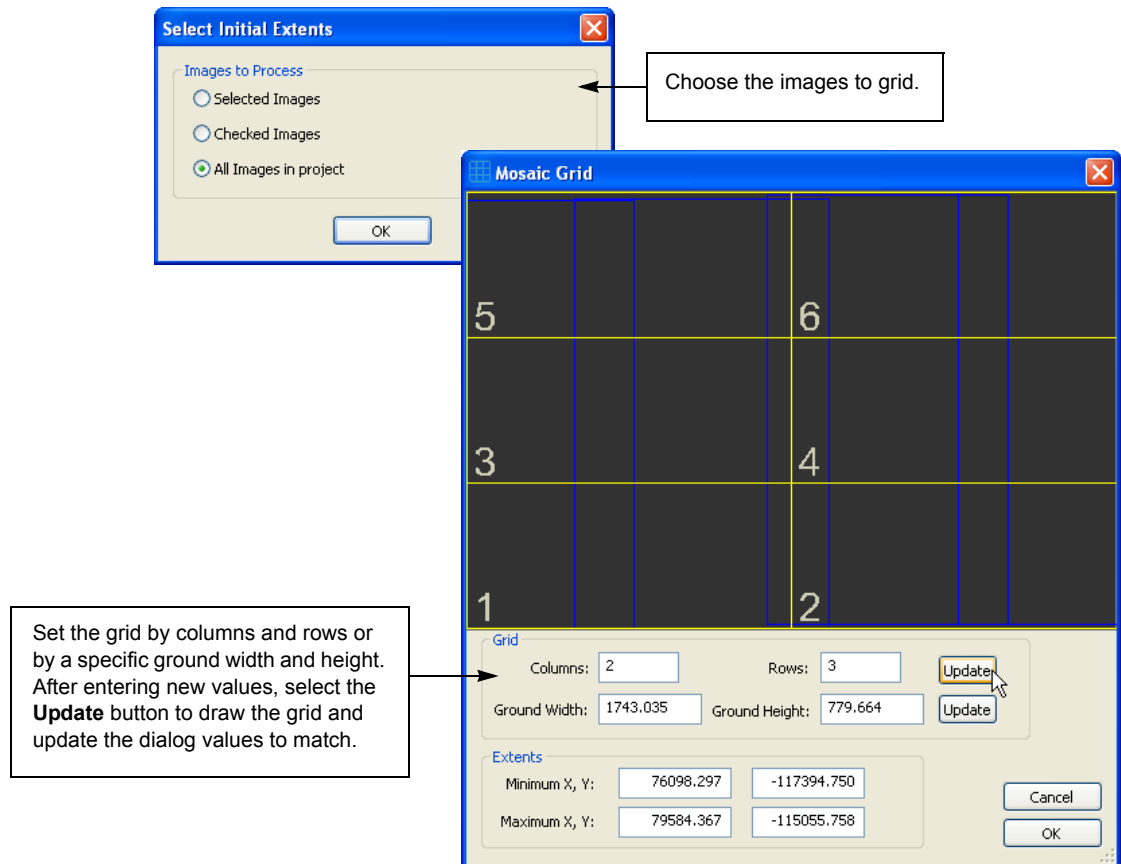


Each boundary method is described below.

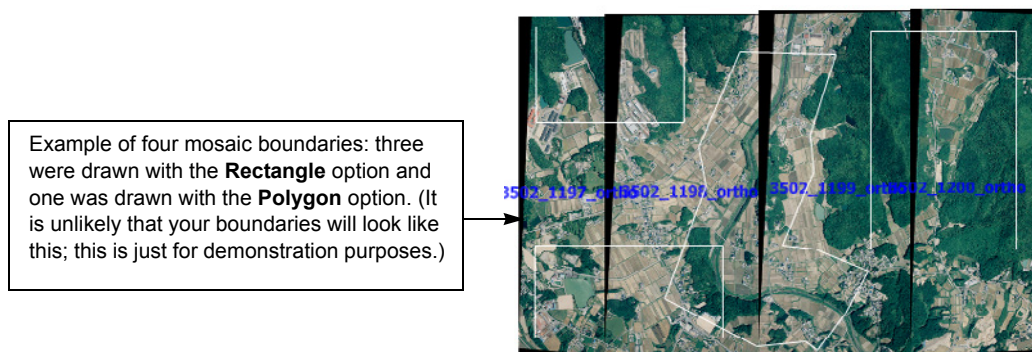


Step 3) Choose one or more methods to add boundaries:

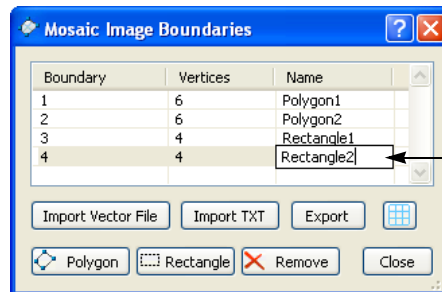
- Import TXT:** To import boundaries from a text file, select the **Import TXT** button. Browse for one or more files in the formats that are listed above in Step 1.
- Import Vector File:** To import boundaries from vector files, select **Import Vector File** and select **dxf**, **dwg**, **dgn**, or **shp** files. Vector files and their contents are described above in Step 1.
- Create Boundaries using Grid:** To create boundaries on an even rectangular grid, select the **Create boundaries using grid** button. Choose the images to grid:



- Polygon and Rectangle:** To draw boundaries manually, use the **Polygon** and/or **Rectangle** buttons. Draw one or more boundaries around the areas to be made into separate mosaic files.



- Step 4)** Boundary names shown in the **Name** column will be used as output file names. (If a boundary is not named, it will be set to the name in **Mosaic Output File** on the **Main** tab of the **Create Mosaic** dialog plus a “_bn” extension, where “n” is the boundary number.) If desired, name or rename any boundaries now. Click the system mouse in the **Name** column and key in the name.

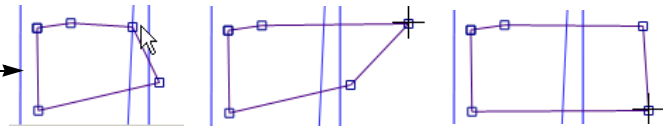


Name or rename boundaries. The name will be used as the output file name for that boundary.

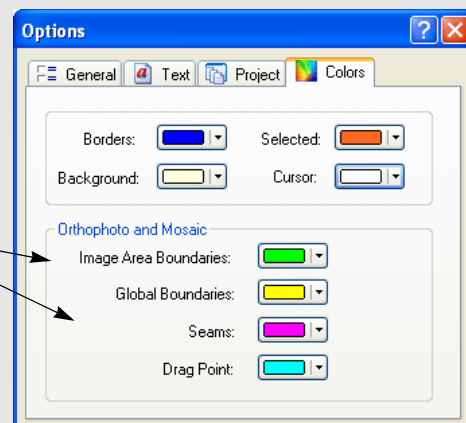
- Step 5)** Edit boundaries if necessary. Any boundary from any source may be edited. To edit a boundary, either select its line in the list or click directly on the boundary outline. Drag points appear on the boundary outline. To change a vertex location, click on a drag point and then click the new location for that vertex (this is not a drag and drop function).

To edit a boundary:

- Select the boundary,
- click on a drag point,
- click the new location for that vertex.



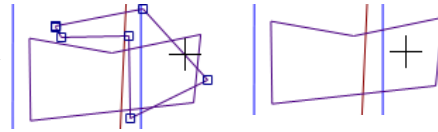
Hint: The drag point and seam display colors may be changed using the **Colors** tab of the **Options** dialog.



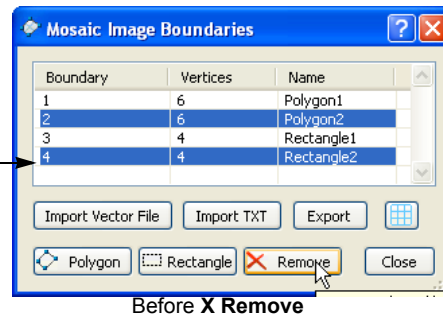
- Step 6)** Delete boundaries if necessary. To delete one boundary, select the boundary, then press the **<Delete>** key or the **X Remove** button. To delete multiple boundaries, select the multiple boundaries in the Mosaic Image Boundaries dialog's list, then select the **X Remove** button:

To delete one boundary, either delete its line in the Mosaic Image Boundaries dialog, or:

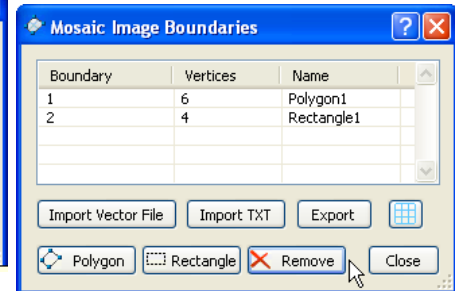
- Select the boundary,
- Press the keyboard's <Delete> key.



To delete multiple boundaries, select their lines in the boundary list and select **X Remove**.



Before X Remove



After X Remove

Step 7) Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the boundaries to the settings file, <original folder>\settings_<project name>\<project name>_ortho.omXml.

Generate and Edit Mosaic Seams

Mosaic seams define the line of transition between adjoining input orthophotos. If feathering is used during mosaic generation, the center of the feathering is along the seams. There are several choices for creating seams:

- **Choice 1:** Use **Create Seam Lines** to generate single-segment seams, then edit them if necessary. See “Automatically Generate Single-Segment Seams” below on page 28-29.
- **Choice 2:** Use **Create Optimized Seam Lines** to generate multi-segment seams, then edit them if necessary. Optimized seams use image processing to create seams that follow geographic features. Optimized seams take much longer to generate, but may require much less editing. See “Automatically Generate Multi-Segment Optimized Seam Lines” on page 28-31.
- **Choice 3:** Use the **Add Seam Line** tool to draw seams manually. Either draw all seams or add seams after automatic seam generation. See “Add Seam Lines Manually” on page 28-32.
- **Choice 4:** Use **Import Seams** to import seams from a **dxg**, **dwg**, **dgn**, or **shp** vector file. See “Import Seam Lines” on page 28-34.
- **Choice 5:** Generate single-segment seams, but don't view or edit them. This is done later by checking on **Automatically Generate Seams** on the **Auto Adjust** tab on the Generate Mosaic dialog. If you would like to use this option, skip this section and go on to “Remove Hot Spots” on page 28-40.

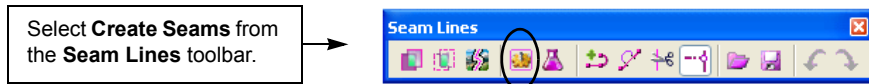
The seam method described here was added in DAT/EM software version 4.4. It has many improvements over the older method and is recommended; however, if you prefer the older seam line method, it is still available. Instructions for the older method appear in *Appendix I*.

Automatically Generate Single-Segment Seams

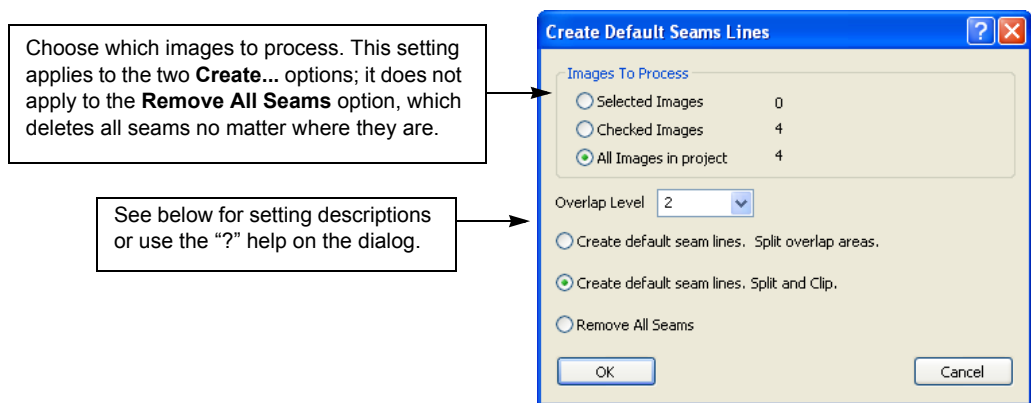
Use **Create Seam Lines** to generate single-segment seams. Single-segment seams are drawn roughly down the center of an overlap area; they are fast to generate, but for the best blending and feathering, they must be edited later to follow image features such as roads, buildings, or water edges.

Perform the following steps:

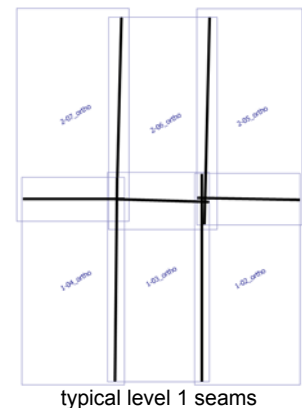
Step 1) Select **Create Seam Lines** from the **Seam Lines** toolbar:



Step 2) Make settings:

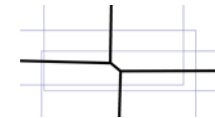


- **Overlap Level=1** draws a seam down the middle of the overlap area of any two overlapping images, but only if some part of their overlap area contains only those two images. **Overlap Level=1** is recommended in most cases. This will work for most typical orthophoto projects that originated from aerial images that were flown, for example, from east to west and west to east in strips that overlap slightly along the north and south edges. It will not work well for densely overlapping orthophotos.
- **Overlap Level=2** draws the seams that level 1 would draw *plus* it draws a seam down the middle of the overlap area of any three overlapping images, but only if some part of their overlap area contains only those three images.
- **Overlap Level=3** draws the seams that level 2 would draw *plus* it draws a seam down the middle of the overlap area of any four overlapping images, but only if some part of their overlap area contains only those four images.
- **Overlap Level=All** draws a seam down the middle of the overlap area of any set of two or more overlapping images.



Setting a level higher than 1 may result in multiple seams that are nearly the same. Extra seams are allowed, and may not affect the output mosaic very much, but they can significantly increase the mosaic processing time. Extra seams can be deleted during the editing stage shown in “Edit Seam Lines” on page 28-34.

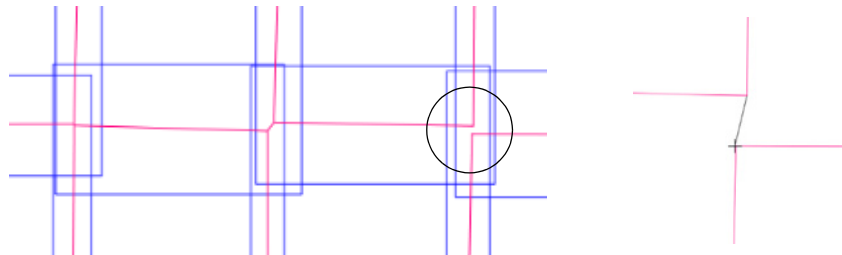
- **Create default seam lines. Split overlap areas** first deletes any existing seams. Then it draws new seams down the middle of the overlap areas. Crossing seams are drawn and are allowed, but they may increase the mosaic processing time due to the greater total seam length.
- **Create default seam lines. Split and Clip** first deletes any existing seams. Then it draws seam lines just like **Create...Split overlap areas**, but it also clips any overlapping seam ends and creates new “shortcuts” in areas of multiple crossings. This method takes longer to generate the seams, but it may reduce the mosaic processing time by reducing the total seam length.
- **Remove All Seams** deletes existing seams. This is usually done just before making new seams. It is not necessary before the two **Create...** options, because they automatically delete existing seams before making new ones.



Step 3) Select **OK** to generate run the selected options.

Step 4) Further processing may be necessary:

- Sometimes when **Split and Clip** runs, it leaves a gap between seam lines after trimming away multiple crossing seam endpoints. In this case, draw a seam line to span the gap. For instructions, see “Add Seam Lines Manually” on page 28-32:



- Sometimes these single-segment seams give a noticeable “blend line” to either side of them in the output mosaic, especially if the pixel coloring in adjoining orthophotos is very different. To reposition the blend and feathering path, edit the seams to run along geographic features such as roads, buildings, or water edges (see “Edit Seam Lines” on page 28-34). Another option that may help is to sort the images so that the other image is higher in the list; the higher an image is in the list, the higher priority it has (see “Change Image Order (Sort)” on page 28-23).

Reminder: Sort the images at any time – before, during, or after editing seams – to change their display and processing priority. See “Change Image Order (Sort)” on page 28-23.

Step 5) Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the seams to the settings file, <original folder>\settings_<project name>\<project name>_ortho.omXml.

Automatically Generate Multi-Segment Optimized Seam Lines

Use **Create Optimized Seam Lines** to generate multiple-segment optimized seams. These seams are drawn roughly down the center of an overlap area, then they are further processed to find the best path through the overlap region where the images are the most similar. This is a way to automatically follow, go around, or avoid geographic features for better feathering and blending and feathering results during mosaic processing.

Optimized seam lines are slow – sometimes very slow – to generate, but they usually require less hand editing later than the single-segment seam lines shown on page 28-29. If necessary, optimized seam lines may also be manually edited (editing is shown in “Edit Seam Lines” on page 28-34).



Example of an optimized seam line

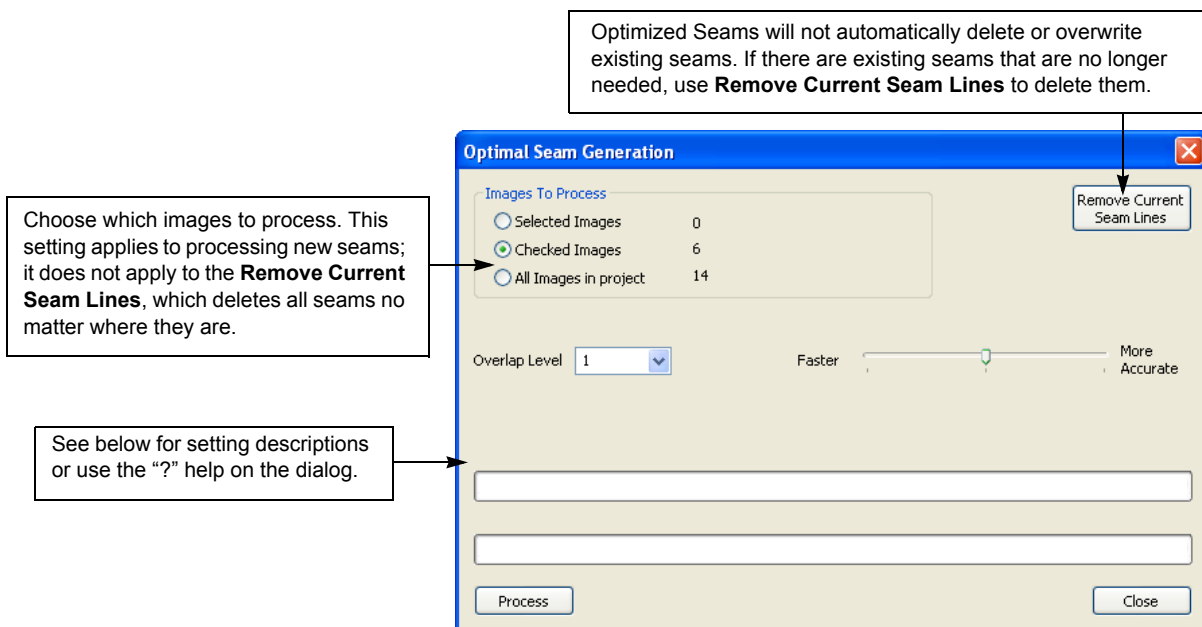
Perform the following steps:

Step 1) Select **Create Optimized Seam Lines** from the **Seam Lines** toolbar:

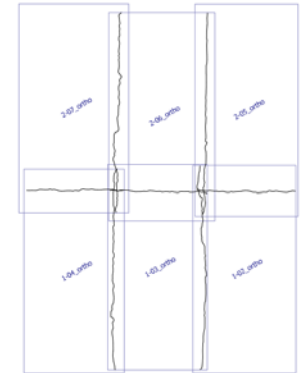


Step 2) If there are existing seams that are no longer needed, use **Remove Current Seam Lines** to delete them. Optimized Seam generation will not automatically delete or overwrite existing seams.

Step 3) Make settings:



- **Overlap Level=1** draws a seam roughly down the middle of the overlap area of any two overlapping images, but only if some part of their overlap area contains only those two images. **Overlap Level=1** is recommended in most cases. This will work for most typical orthophoto projects that originated from aerial images that were flown, for example, from east to west and west to east in strips that overlap slightly along the north and south edges. It will not work well for densely overlapping orthophotos.
- **Overlap Level=2** draws the seams that level 1 would draw *plus* it draws a seam roughly down the middle of the overlap area of any three overlapping images, but only if some part of their overlap area contains only those three images.
- **Overlap Level=3** draws the seams that level 2 would draw *plus* it draws a seam roughly down the middle of the overlap area of any four overlapping images, but only if some part of their overlap area contains only those four images.
- **Overlap Level=All** draws a seam down the middle of the overlap area of any set of two or more overlapping images.



typical level 1 optimized seams

Setting a level higher than **1** may result in multiple seams that are nearly the same. Extra seams are allowed, and may not affect the output mosaic very much, but they can significantly increase both the seam generation time and the mosaic processing time. Extra seams can be deleted during the editing stage shown in “Edit Seam Lines” on page 28-34.

- Step 4)** Select **OK** to generate run the selected options.
- Step 5)** Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the seams to the settings file, <original folder>\settings_<project name>\<project name>_ortho.omXml.

Add Seam Lines Manually

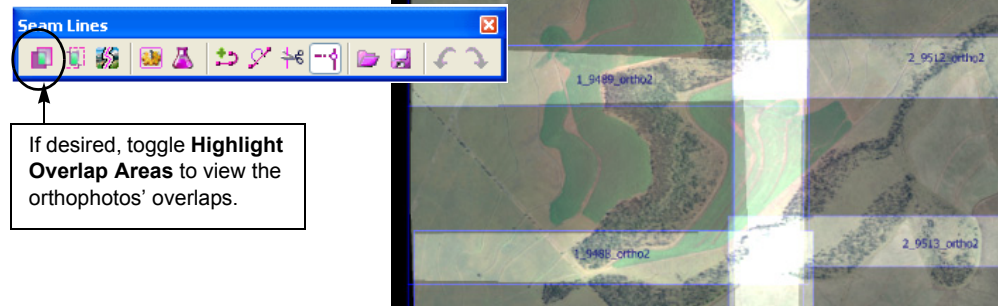
Seams may be drawn manually. All of the seams may be drawn manually, or manually drawn seams may be added to previously generated or imported seam sets.

To draw seam lines manually, perform the following steps:

- Step 1)** In most cases, the images should be displayed so that you can draw the seam line along the best path for future feathering and blending results. If images are not already displayed, or to change the image resolution, check the following settings (also shown in Step 6 on page 28-3):
- On ORTHO+MOSAIC’s **Options** dialog, set the desired resolution in **Overview Image Size** setting on the **Images** tab. If you intend to draw the seam line along the best path for feathering and blending results, set the highest resolution possible that will still load the images in a reasonable amount of time.
 - Select **Show Images** from the **View** toolbar. Choose the images to load.

Step 2) Set your preferred method(s) to display the overlap areas:

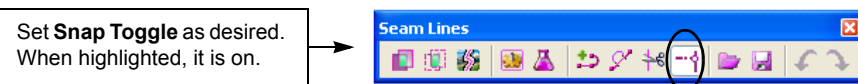
- a.) Turn on **Highlight Overlap Areas** from the **Seam Lines** toolbar. The colors will become lighter in stages depending on how many overlaps there are in the area. The single-image areas will be the darkest, and the areas with the most overlapping images will be the lightest.



- b.) Turn on **Clip to Overlap Areas**. Areas that do not overlap will not display.



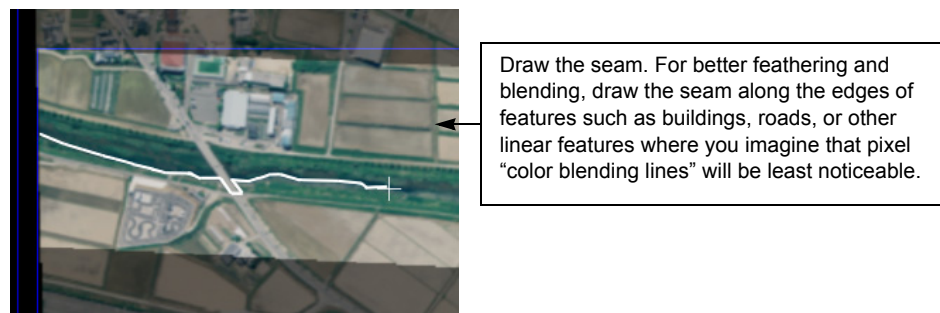
Step 3) Set **Snap Toggle** on the **Seam Lines** toolbar as desired. This setting allows new seam line vertices to snap to nearby existing seam vertices and segments. Toggle the setting at any time.



Step 4) Select **Add Seam Line** from the **Seam Lines** toolbar or key in <Ctrl>A:



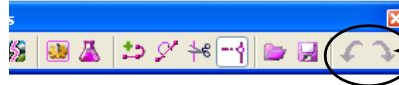
Step 5) Draw the seam line in an overlap area. Seam lines only affect the output mosaic if they are in image overlap areas. Any seam or part of a seam that is in a single-image area will be ignored.



Step 6) To finish drawing, choose a method:

- Click the right mouse button.
- Press the <Esc> keyboard key.
- Press the <Enter> keyboard key.

Step 7) At any time, use the **Undo** and **Redo** icons on the **Seam Lines** toolbar to undo/redo seam additions:



If desired, use **Undo** and **Redo** to undo/redo seam additions.

Reminder: Sort the images at any time – before, during, or after creating seams – to change their display and processing priority. See “Change Image Order (Sort)” on page 28-23.

Step 8) Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the seams to the settings file, <original folder>\settings_<project name>\<project name>_ortho.omXml.

Import Seam Lines

Seam lines may be imported from **dxf**, **dwg**, **dgn**, or **shp** vector files. Perform the following steps:

Step 1) Prepare the vector file. Seams should exist on a unique layer/level in the file. For ArcGIS, seams should be the only polylines in the shapefile. Objects in vector files that are AutoCAD polylines, MicroStation line strings, or ArcGIS polyline-geometry shapefiles may be used.

If desired, digitize the seam lines using SUMMIT EVOLUTION and AutoCAD, MicroStation, or ArcMap. Import the resulting file in the next step.

Step 2) (Optional) Importing seams from a vector file will not delete any existing seams. If there are existing seams that should be deleted, select **Create Seam Lines** from the **Seam Lines** toolbar, then select **Remove All Seams**.

Step 3) Select **Import Seams** from the **Seam Lines** toolbar. Browse for the vector file. Select the seam line layers/levels from the import list. Repeat to import another file if desired.

Reminder: Sort the images at any time – before, during, or after creating seams – to change their display and processing priority. See “Change Image Order (Sort)” on page 28-23.

Step 4) Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the seams to the settings file, <original folder>\settings_<project name>\<project name>_ortho.omXml.

Edit Seam Lines

Editing seams makes them follow nearby image features such as curved roads or water. Editing the seam to run along the image feature repositions the center of feathering, so that pixel blending appears more even along the feature.

Review the generated, manually drawn, and/or imported seams. If desired, edit the seams so that they run along nearby image features such as roads.

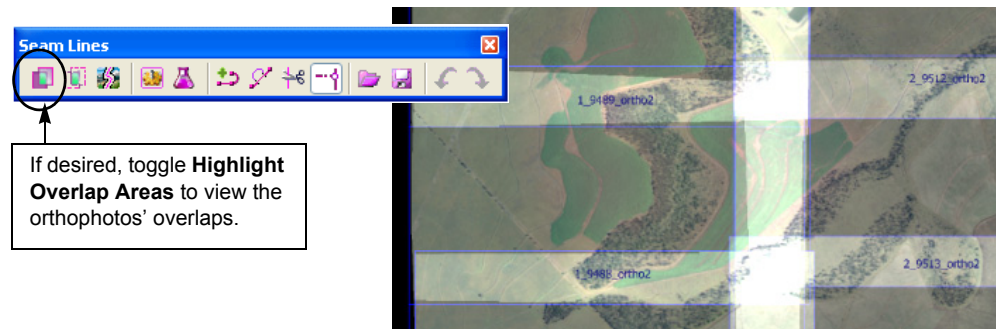
First, prepare to edit the seams by displaying images, choosing how to display the overlap areas, and sort the images at any time to change their processing priority:

Step 1) Display the images so that you can see where to draw the seam line along the best path for future feathering and blending results. If images are not already displayed, or to change the image resolution, check the following settings (also shown in Step 6 on page 28-3):

- On ORTHO+MOSAIC's **Options** dialog, set the desired resolution in **Overview Image Size** setting on the **Images** tab. If you intend to draw the seam line along the best path for feathering and blending results, set the highest resolution possible that will still load the images in a reasonable amount of time.
- Select **Show Images** from the **View** toolbar. Choose the images to load.

Step 2) Set your preferred method(s) to display the overlap areas:

- a.) Turn on **Highlight Overlap Areas** from the **Seam Lines** toolbar. The colors will become lighter in stages depending on how many overlaps there are in the area. The single-image areas will be the darkest, and the areas with the most overlapping images will be the lightest.



- b.) Turn on **Clip to Overlap Areas**. Areas that do not overlap will not display.



Step 3) Edit the seams. Choose one or more methods:

Reminder: Sort the images at any time – before, during, or after editing seams – to change their display and processing priority. See “Change Image Order (Sort)” on page 28-23.

Reminder: Toggle **Snap Toggle** on the **Seam Lines** toolbar at any time.

- Select a seam; drag and drop a vertex marker to move that vertex. See “Drag and Drop a Seam Vertex” below.
- Use the **Edit seam line with a polyline** tool. See “Edit Seam with a Polyline” on page 28-36.
- Use the **Clip Seam** tool. See “Clip Seam” on page 28-38.
- Use **Export Seam Lines** to export the seams to a vector file, then edit the vector file independently in AutoCAD, MicroStation, or ArcMap (usually with SUMMIT EVOLUTION and the original aerial project for digitizing). Use **Import Seams** to import the edited file. See “Export Seams for Edit or Backup” on page 28-39.

- Step 4)** Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the seam edits to the settings file, <original folder>\settings_<project name>\<project name>_ortho.omXml.

Drag and Drop a Seam Vertex

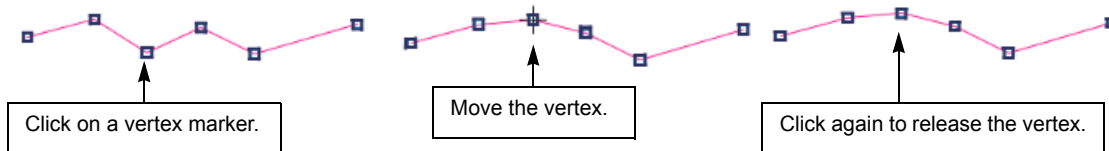
Individual seam vertices may be moved. Perform the following steps:

- Step 1)** Using the selection pointer (**Selection Pointer** on the **Tools** toolbar), click on the seam line to select it. Vertex markers appear.
- Step 2)** Set **Snap Toggle** on the **Seam Lines** toolbar as desired. This setting allows seam line vertices to snap to nearby existing seam vertices and segments. Toggle the setting any time.

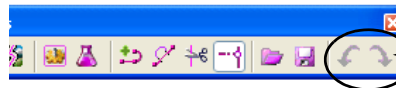
Set **Snap Toggle** as desired.
When highlighted, it is on.



- Step 3)** Click the left mouse button on a vertex marker, drag it to a new location, and click the left mouse button again to release it.



- Step 4)** At any time, use the **Undo** and **Redo** icons on the **Seam Lines** toolbar to undo/redo seam edits.

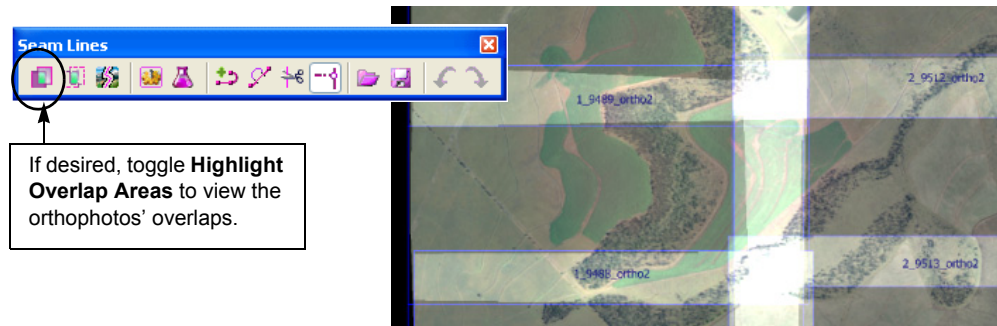


If desired, use **Undo** and **Redo** to undo/redo seam edits.

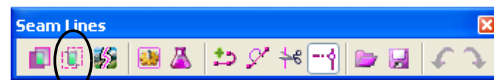
Edit Seam with a Polyline

Use the **Edit Seam Line with a Polyline** tool to replace a part of an existing seam line. Perform the following steps:

- Step 1)** Set your preferred method(s) to display the overlap areas:
- Turn on **Highlight Overlap Areas** from the **Seam Lines** toolbar. The colors will become lighter in stages depending on how many overlaps there are in the area. The single-image areas will be the darkest, and the areas with the most overlapping images will be the lightest.



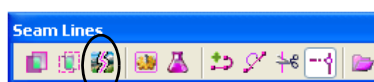
- b.) Turn on **Clip to Overlap Areas**. Areas that do not overlap will not display.



Select **Clip to Overlap Areas** from the **Seam Lines** toolbar.



- c.) Turn on **Clip Images Using Seam Lines**. Images will display based on their position to the right or left of seam lines.



Select **Clip Images Using Seam Lines** from the **Seam Lines** toolbar.



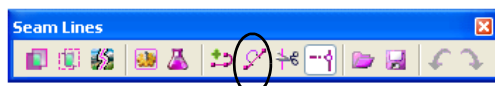
Here, **Clip Images Using Seam Lines** is off. Whole images display over others, no matter where the seam lines are.



Here, **Clip Images Using Seam Lines** is on. Seams affect the image display. Images are clipped to the seam lines.

Step 2) Click on the seam line to highlight it. Vertex markers appear along the seam when it is selected.

Step 3) Select **Edit Seam line with a polyline** from the **Seam Lines** toolbar or key in <Ctrl>E.



Select **Edit seam line with a polyline**.

- Step 4)** Digitize the first two points so that the first segment crosses the original seam. Digitize the new seam segments. Digitize the last two points so that the last segment crosses the original seam. Click the right mouse button to end the edit. This first and last crossing segments are trimmed off and the new segments are incorporated into the seam.



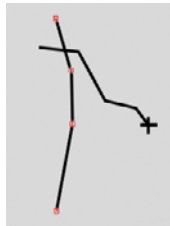
This seam line is too close to the edge of the overlap area. Edit it to allow the feathering distance to fall within the overlap area.



Click on the seam line to highlight it. Select **Edit seam line with a polyline** or key in **<Ctrl>E**. Draw the new segments, crossing the original seam at the beginning and the end. Click the right mouse button to finish.



The crossing segments are trimmed and the new segments are incorporated into the seam.



The first and last segments cross the original seam and are trimmed off at the intersection points.

- Step 5)** At any time, use the **Undo** and **Redo** icons on the **Seam Lines** toolbar to undo/redo seam edits.



If desired, use **Undo** and **Redo** to undo/redo seam edits.

- Step 6)** Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the seams to the settings file, **<original folder>\settings_<project name>\<project name>_ortho.omXml**.

Clip Seam

Use the **Clip Seam** tool to clip off the ends of existing seam lines. Perform the following steps:

- Step 1)** Select **Clip Seam** from the **Seam Lines** toolbar.

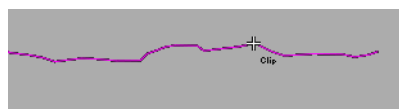


Select **Clip Seam**.

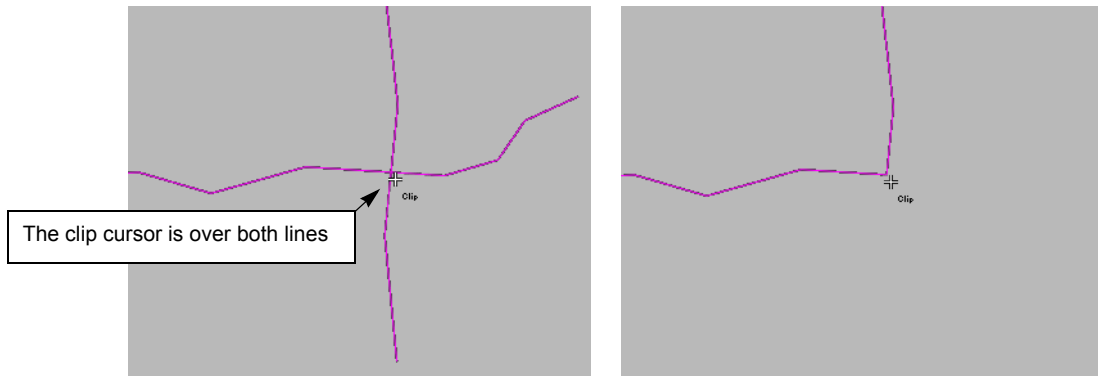
Note: **Snap Toggle** may be either on or off; it does not affect the clip tool.

- Step 2)** Position the cursor at one of the choices for clip locations:

- **Clip off the shorter end of one seam:** Position the cursor center at the cut location. The seam must be the only seam found under the cursor area.



- **Clip two seams to their intersection point:** Position the cursor near enough to the intersection so that the “+” part of the cursor touches both seams.



- Step 3)** At any time, use the **Undo** and **Redo** icons on the **Seam Lines** toolbar to undo/redo seam edits.

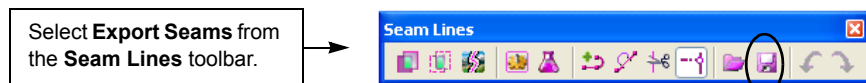


- Step 4)** Perform more clip operations or cancel the clip tool. There are three ways to cancel the tool:
- Click the right mouse button to change to the selection pointer.
 - Select **Selection Pointer** or **Pan** from the **Tools** toolbar.
 - Select **Clip Seam** from the **Seam Lines** toolbar again to toggle between “Clip” and the selection pointer.
- Step 5)** Select the **Save Settings .omXml** from the **File** menu or toolbar. This saves the seams to the settings file, <original folder>\settings_<project name>\<project name>_ortho.omXml.

Export Seams for Edit or Backup

Another method to edit existing seams is to use **Export Seam Lines** to export the seams to a vector file, edit the vector file independently, then use **Import Seams** to import the edited file. Seams may also be exported as a way to save them outside of the project file. Perform the following steps:

- Step 1)** Select **Export Seam Lines** from the **Seam Lines** toolbar. Save the seams in your choice of AutoCAD, MicroStation, or ArcGIS shapefile format. If this is for backup purposes, stop here.



- Step 2)** Edit the vector file independently. For example, SUMMIT EVOLUTION and DAT/EM CAPTURE could be used to edit the file, with either the original stereo project or the orthophoto project open in SUMMIT EVOLUTION. Be sure to keep the edited seam lines inside the orthophotos' image overlap areas. Do not create seams that are at the edge of the overlap area; leave a buffer at least as wide as the feathering distance that will be used during mosaic creation.

If editing the file in MicroStation, do not add arcs, complex chains that contain arcs, or complex shapes to the file. These elements types will cause the vector file import process to crash (unfortunately, this is not a DAT/EM process and cannot be fixed by DAT/EM).

- Step 3)** Use the instructions in “Import Seam Lines” on page 28-34 to re-import the vector file.

Remove Hot Spots

Hot spot removal is the process of brightening dark areas and darkening light areas on the orthophoto images. Examples of hot spots are lens vignette areas (dark image edges), sun reflection off water or glass surfaces, or brightness and shadows caused by uneven cloud cover. There are two choices for hot spot removal:

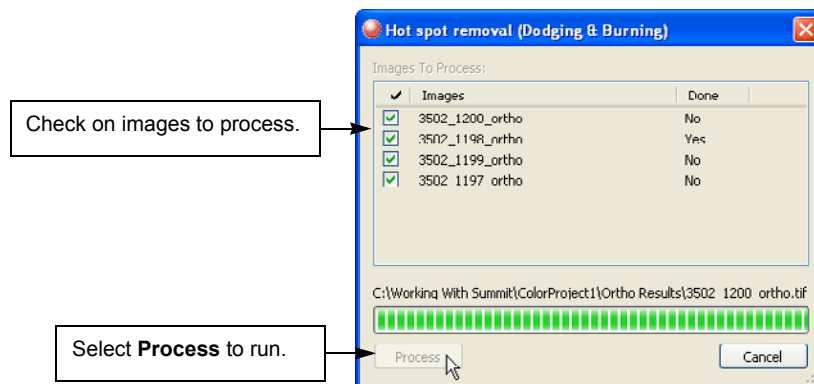
- **Choice 1:** Apply hot spot removal and view results. Use the instructions in this section (below).
- **Choice 2:** Apply hot spot removal without viewing results. This is done later from the **Auto Adjust** tab on the Generate Mosaic dialog. If you would like to use this option, skip this section and go on to “Apply Image Balancing” on page 28-42.

To remove hot spots and view results, perform the following steps:

Step 1) Select **Hot Spot Removal** from the **Mosaic** toolbar:



Step 2) Select images to process and select the **Process** button. The hot spot files are written to the following location: <original project folder>\hotSpot\<individual image file name>_hot.tif.



Step 3) Close the dialog and view the results directly on the images in the image view. (If the hot spot images exist, they will be loaded with **View>Show Images**.)

Specify Exclusion Areas

Using exclusion areas is optional. Exclusion areas are polygons that are drawn around areas of unusual pixel colors that should either be preserved or should not be made to affect other images. For example, a project might contain both land and water; exclusion areas around the water ensure that the histogram obtained from or applied to the land does not include the water's color distribution.

The areas inside exclusion areas are ignored in the following three processes:

- In obtaining the histogram from the “base image” in **Image Balancing** setup (Step 2 on page 28-42).
- In applying **Image Balancing** to the images (Step 3 on page 28-42).
- In applying **Manual Image Adjustments** (page 28-43).

Note that exclusion areas make the **Image Balancing** and **Manual Image Adjustments** processes take longer. The more exclusion polygons there are, the longer the processing takes. However, the results for some projects are well worth the extra time.

To use exclusion areas, perform the following steps:

- Step 1)** Prepare a vector file that contains one or more exclusion area polygons. Vector files may be in AutoCAD **dwg**, MicroStation **dgn**, ArcGIS **shp**, or **dxf** format. Multiple vector files and multiple formats are allowed. Exclusion area polygons should exist on a unique layer/level in the file. Objects in vector files that are polygons (AutoCAD closed polylines, MicroStation shapes, or ArcGIS polygons) will be used as boundaries.

Note: The more exclusion areas there are, the slower the image adjustment process will be.

- Step 2)** Select **Select Exclusion Areas** from the **Mosaic** toolbar.

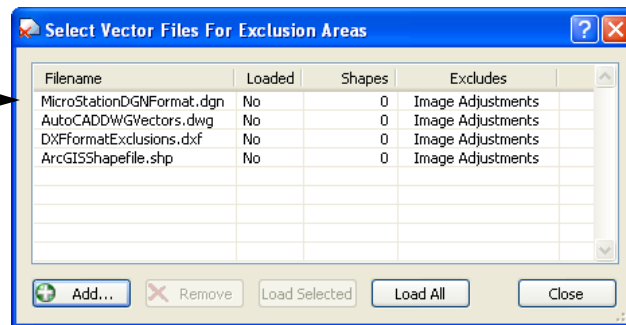
Select **Select Exclusion Areas** from the **Mosaic** toolbar.



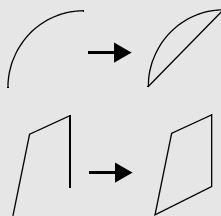
- Step 3)** Select the **Add** button and browse for one or more vector files. Select files from the list and use **Load Selected**, or use **Load All** to load all the files. For each file, a dialog appears showing all the layers found in the file; check on only those layers that contain exclusion area shapes.

Exclusions are saved as they are loaded in the following location: <original project folder>\Settings_<project name>\Exclusions\<vector file name>.datfile.

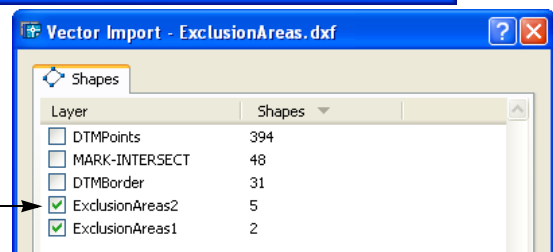
Select **Add** and browse for one or more vector files.



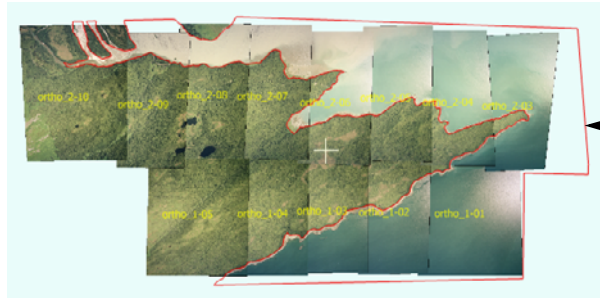
Note: Unclosed objects on **Shapes** layers will be used, but they will be processed as if they have a closing segment:



The layers in each vector file are listed. Check on only those layers that contain exclusion area shapes.



- Step 4)** When loaded, the number of shapes (polygons) found on checked layers in each file will be listed. The loaded exclusion areas appear superimposed over ORTHO+MOSAIC's images. Visually verify the exclusion areas. Keep in mind that the view is 2D, so that the superimposed lines may not seem to line up exactly with the images (this is normal. The offset will be greater with higher ground elevation).



The exclusion areas are superimposed over the images.

Note: Because ORTHO+MOSAIC does not have a stereo view, its superimposition display is in 2D, and the exclusion areas may appear a little off from the ground features they represent. This is normal, and is only due to the 2D display. The correct ground areas will be processed.

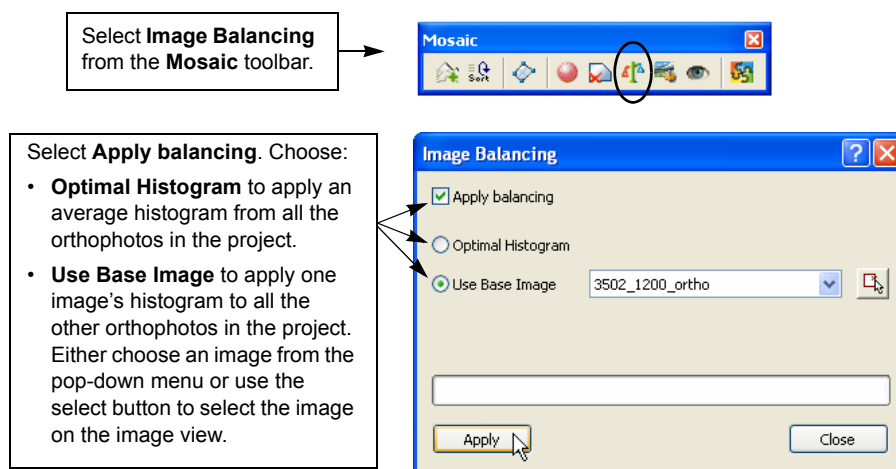
Apply Image Balancing

Image balancing applies histogram equalization to the orthophotos before the mosaic is made. Apply either an average histogram of all the images, or match all the images to a single image's histogram. Image balancing is used to match the color distributions in multiple images. If exclusion area vector files have been loaded, matching is only done in the areas that are not excluded. There are two choices for image balancing:

- **Choice 1:** Apply image balancing and view results. Use the instructions in this section (below).
- **Choice 2:** Apply image balancing without viewing results. This is done later from the **Auto Adjust** tab on the Generate Mosaic dialog. If you would like to use this option, skip this section and go on to "Apply Manual Image Adjustment" on page 28-43.

To apply image balancing and view the results, perform the following steps:

- Step 1)** If desired, load exclusion areas using the instructions on page 28-40 above.
- Step 2)** Select **Image Balancing** from the **Mosaic** toolbar.



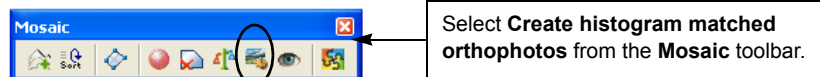
- Step 3)** Select **Apply** to run the image balancing. The image balancing settings are saved in the following location: <original project folder>Settings_<project name>\<image file name>_bal.BalMap.
- Step 4)** Close the dialog and view the results directly on the images in the image view.

Step 5) If desired, the image-balanced orthophotos may be exported to a new SUMMIT EVOLUTION **.smtxml** file. See “(Optional) Create Histogram Matched Orthophotos” on page 28-43 below.

(Optional) Create Histogram Matched Orthophotos

Creating histogram matched orthophotos is not required for mosaic generation. It is a tool to create histogram-adjusted orthophoto images and an associated SUMMIT EVOLUTION **.smtxml** file. It allows you to save the histogram and other pixel adjustments that are usually made to an orthophoto project during mosaic preparation. The result is another orthophoto project. To create histogram matched orthophotos, perform the following steps:

Step 1) Select **Create histogram matched orthophotos** from the **Mosaic** toolbar.



Step 2) Make settings in the dialog. Use the “?” dialog help for information on dialog settings.

Step 3) Select **Generate**.

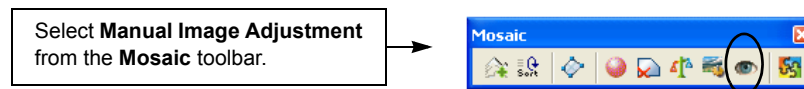
Apply Manual Image Adjustment

Select **Manual Image Adjustment** to apply individual settings for brightness, contrast, saturation, red, green, and blue. These settings may be applied to one image, all selected images, or all images. If exclusion area vector files have been loaded, adjustments only take effect in the areas that are not excluded.

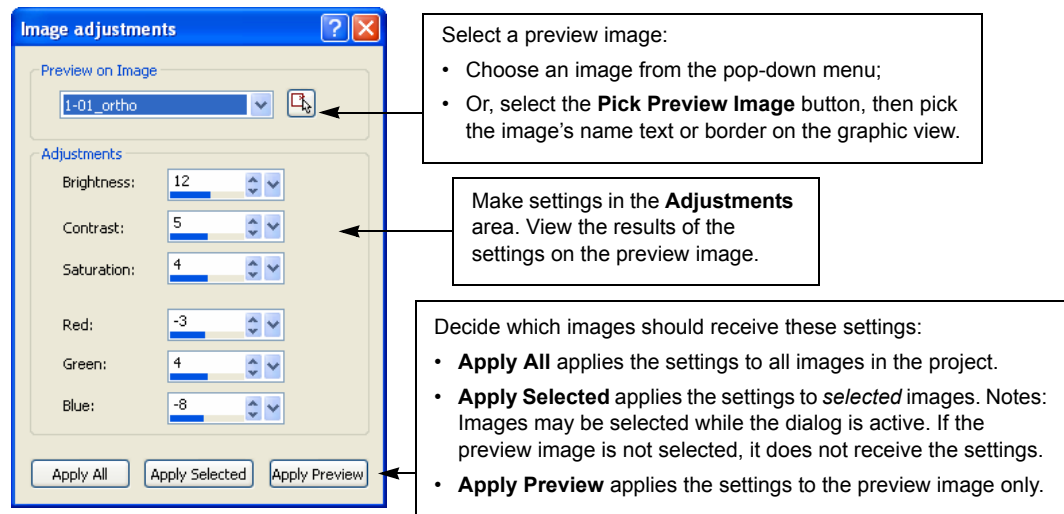
To apply manual image adjustments, perform the following steps:

Step 1) If desired, load exclusion areas using the instructions on page 28-40 above.

Step 2) Select **Manual Image Adjustment** from the **Mosaic** toolbar:



Step 3) Choose a preview image, make settings, and choose the images to receive the settings:



Generate the Mosaic Image(s)

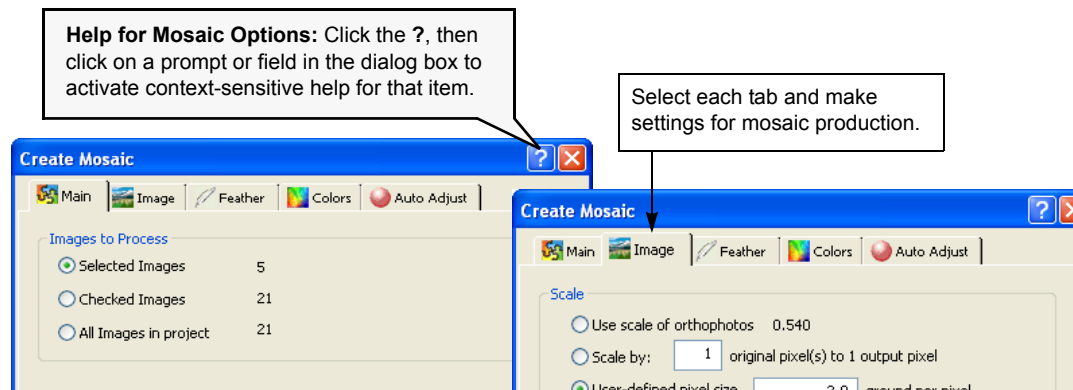
To generate the mosaic image(s), perform the following steps:

- Step 1)** Make sure any necessary preparation steps have been done. Some of these things can be done directly from the Create Mosaic dialog, and others you may wish to do ahead of time, depending on the project:
- Boundaries could be made to define specific areas for one or more output files (page 28-24). If there are no boundaries, only one output file will be made.
 - Seams could be generated, drawn, imported, and edited ahead of time (page 28-28 through page 28-34). If seams don't exist yet and if editing them is not required, they may be generated later from the Create Mosaic dialog.
 - Hot spots could be removed and reviewed ahead of time (page 28-40). This may be done later from the Create Mosaic dialog, or it may be omitted.
 - Exclusion are vector files may be loaded if needed (page 28-40).
 - Image balancing could be applied ahead of time (page 28-42). This may be done later from the Create Mosaic dialog, or it may be omitted.
 - Manual image adjustments could be applied if needed (page 28-43).
- Step 2)** Select **Generate Mosaic from Orthophotos** from the **Mosaic** toolbar.

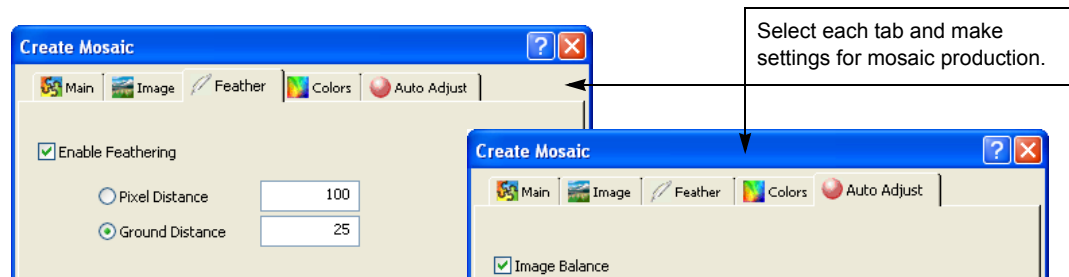


Select **Generate Mosaic from Orthophotos** from the **Mosaic** toolbar.

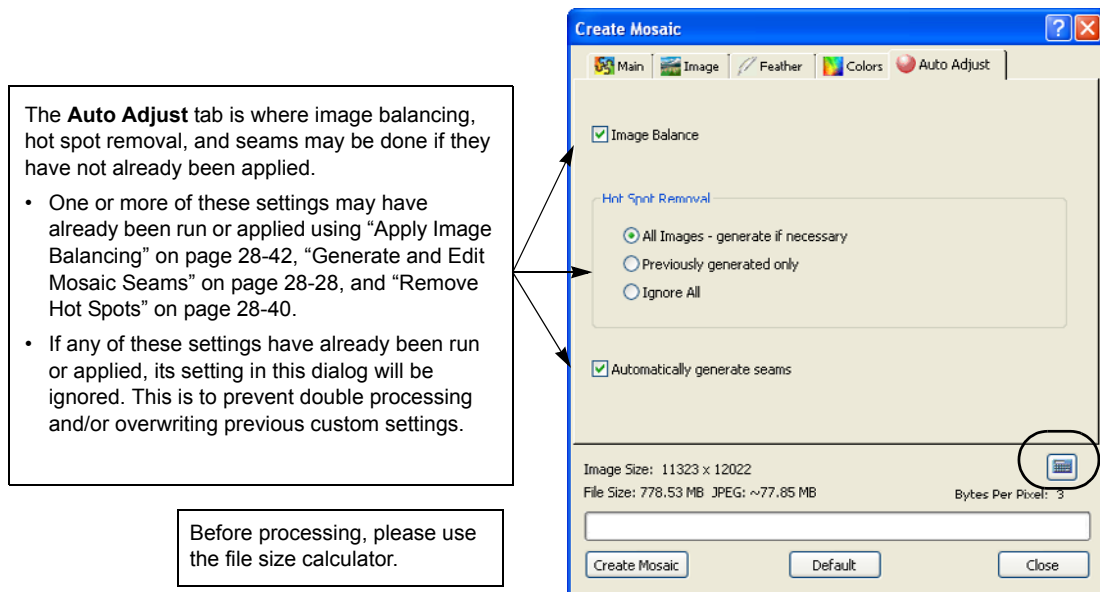
- Step 3)** Select each tab in turn and begin to make settings. Use the “?” for context-sensitive help:



- Step 4)** Continue to make settings on each tab. Use the “?” for context-sensitive help:



Step 5) Continue to make settings on each tab. Use the “?” for context-sensitive help:



Step 6) Before processing, select the calculator button in the lower right of the dialog. View the estimated mosaic file size and make sure it will fit on the selected drive. For more information on file size limits, use the “?” dialog help for this item.

Step 7) Select **Create Mosaic** to generate the mosaic image file(s).

The time needed to make the mosaic file(s) is dependent on many factors, such as the size and resolution of the input files, the size and resolution of the output file(s), the complexity of the seam lines, and the feathering distance.

At least one new image file is placed in the folder specified in the **Mosaic Output File** field on the **Main** tab. If boundaries were defined, the boundary names will be used to name the output files. If boundaries were defined, but the boundaries were not named, the files will be called **filename_b1.tif**, **filename_b2.tif**, **filename_b3.tif**, and so on.

The output mosaic is an orthophoto. The mosaic does not automatically open in SUMMIT EVOLUTION or ORTHO+MOSAIC; however, it may be opened in the DAT/EM VIEWER:

Step 8) (Optional) On the **Main** tab of the Create Mosaic dialog, select the **View** button. If the specified mosaic exists, the DAT/EM VIEWER launches and loads the mosaic file.

If multiple files were created, use **Open** from the **File** pull-down menu and choose which file to view. Or, drag and drop an image file onto the DAT/EM VIEWER. Multiple DAT/EM VIEWER instances may run at one time; it may be launched separately from Windows **Start>All Programs>Datem Software>Utilities>Datem Viewers**. More information about the DAT/EM VIEWER can be found in *Chapter 29*.

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Chapter 29. DAT/EM Viewer

The DAT/EM VIEWER has the following main functions:

- View an image, especially an orthophoto image.
- View one or more vector files (.dxf, .dwg, .dgn, .shp, or a combination of these formats) alone or superimposed over an orthophoto.
- When DAT/EM VIEWER's orthophoto has a similar coordinate range as the open SUMMIT EVOLUTION image(s), SUMMIT EVOLUTION can control DAT/EM VIEWER's cursor position, zoom, and rotation.
- Use with SUMMIT EVOLUTION's **Control Transfer** tool to create an exterior orientation based on a DTM point distribution and an orthophoto or vector file. **Control Transfer** is available in PROFESSIONAL EDITION only. For specific instructions on **Control Transfer**, see page 21-10.
- Use to optionally view the fourth band (usually color infrared) in a 4-band image (Step 3 on page 29-2).

Start the DAT/EM Viewer and Open Image and Vector Files

Many different kinds of image and vector formats may be opened by the DAT/EM VIEWER. It is most useful for orthophotos, because they are ground referenced and have the possibility of matching the coordinate range of vector files and SUMMIT EVOLUTION projects.

Multiple instances of the DAT/EM VIEWER are allowed to run at the same time; this is true even if SUMMIT EVOLUTION's **Allow multiple instances of Summit** setting is off.

To start the DAT/EM VIEWER and open an image and/or vector files, perform the following steps:

- Step 1)** To start the DAT/EM VIEWER, choose the desired method:
- a.) From the Windows **Start** menu, select **Datem Viewers** from the **DAT/EM Software Utilities** group.
 - b.) From the DAT/EM software folder, start the **OrthoViewer.exe** application.
 - c.) Select **Image Viewer** from the **Imagery** pull-down menu in SUMMIT EVOLUTION.
 - d.) In the PROJECT VIEWER/ORTHO+MOSAIC application, double click on any image name in the image list or double click on an image area.
 - e.) Start SUMMIT EVOLUTION's **Control Transfer** tool, which automatically launches the DAT/EM VIEWER and opens an orthophoto image or a vector file. This is a method of exterior orientation. For detailed instructions, please see page 21-10.
- Step 2)** (Optional) Open an image. If an image is not yet open or to load a different image, choose the desired method:
- a.) Select **Open** from the **File** pull-down menu.
 - b.) Select the **Open** icon from the toolbars.
 - c.) Drag and drop an image into the DAT/EM VIEWER window.
- Step 3)** (Optional) Open one or more vector files. The allowed formats are AutoCAD **dxf** or **dwg** drawing files, MicroStation **dgn** design files, and ArcGIS **shp** shapefiles.
- a.) To open files and import every layer/level, select **Open Vector Files** from the **File** menu.

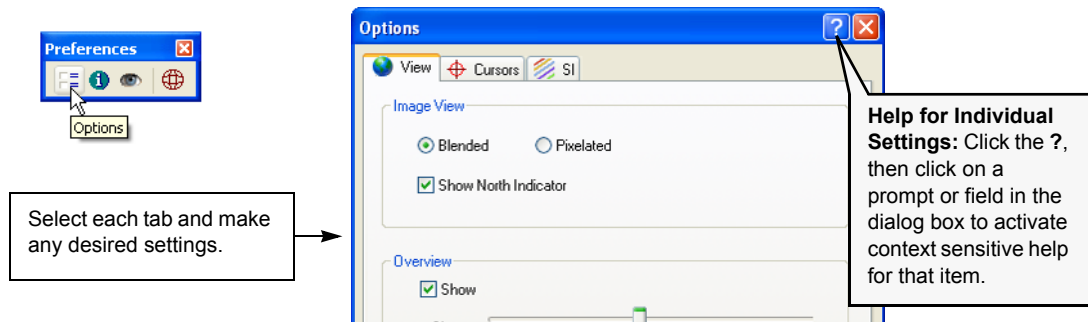
- b.) To open files and select certain layers/levels from each file, select **Open Vector Files, Select Layers** from the **File** pull-down menu.
- c.) Drag and drop vector files (**dxg, dwg, dgn, shp**) onto the DAT/EM VIEWER window.

Step 4) If desired, start more instances of DAT/EM VIEWER and open more image and/or vector files.

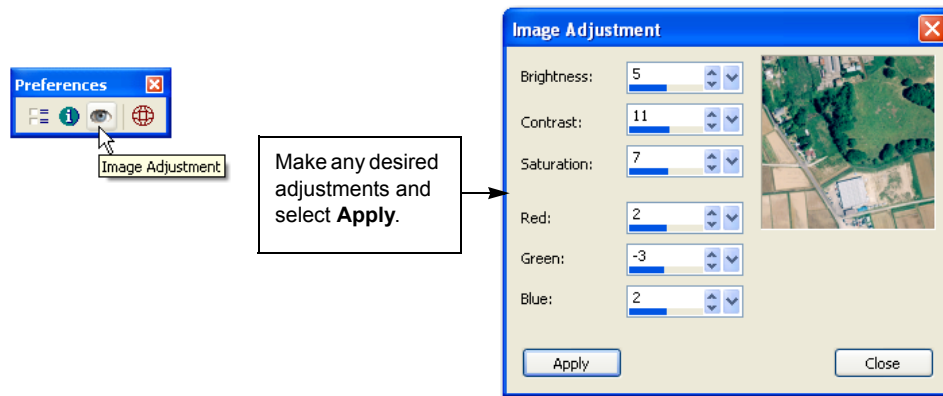
View Settings

The DAT/EM VIEWER offers several view choices.

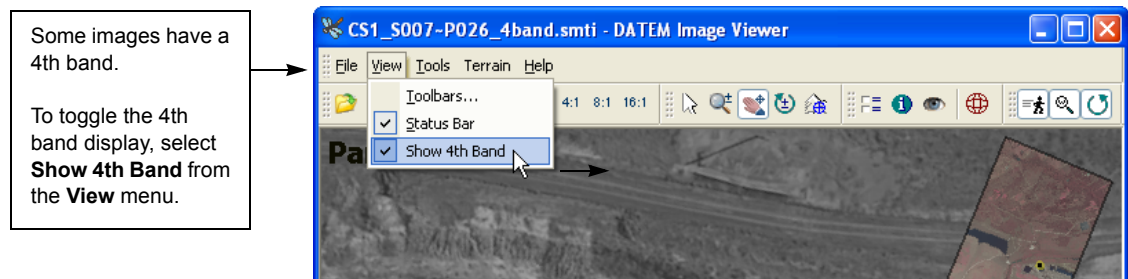
- Step 1)** From the DAT/EM VIEWER window, select **Options** from the **Tools** pull-down menu or select the **Options** icon from the **Preferences** toolbar. Select each tab and make any desired settings. Use the “?” icon for information on individual settings.



- Step 2)** To make color, brightness, contrast, and saturation adjustments, select **Image Adjustment** from the **Preferences** toolbar or from the **Tools** pull-down menu.



- Step 3)** Some images have a 4th band, which is usually a color infrared band with its energy intensity levels mapped to a viewable grayscale image. To toggle display of this band, select **Show 4th Band** from the **View** pull-down menu. (If the option is not active, the image does not have four bands.)



Settings to Move, Zoom, and Rotate with Summit Evolution

The settings on the DAT/EM VIEWER's **Summit Tools** menu set whether movement, zooming, and rotation should be controlled by SUMMIT EVOLUTION. These settings are effective only if all of the following conditions are true:

- An orthophoto is open in DAT/EM VIEWER.
- SUMMIT EVOLUTION has a model or orthophoto open that has ground coordinates. If using an orthophoto project, **Terrain Following** (page 24-9) may be used in SUMMIT EVOLUTION to communicate Z coordinates to the DAT/EM VIEWER; otherwise, it will communicate only X and Y.
- SUMMIT EVOLUTION's model or orthophoto's ground coordinates are within the coordinate range of the DAT/EM VIEWER's orthophoto.

Use the DAT/EM VIEWER's **Summit Tools** toolbar and the system mouse for movement and zoom options:



DAT/EM VIEWER's **Summit Tools** toolbar



•**Move with Summit:** The DAT/EM VIEWER cursor follows the SUMMIT EVOLUTION cursor.



•**Zoom with Summit:** DAT/EM VIEWER's zoom matches SUMMIT EVOLUTION's zoom.



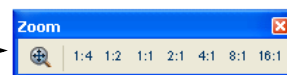
•**Rotate with Summit:** DAT/EM VIEWER's image rotation matches SUMMIT EVOLUTION's rotation.

Navigating in the DAT/EM Viewer

Use the DAT/EM VIEWER's **Tools** and **View** toolbars and the system mouse for movement and zoom options.

The **Zoom** toolbar offers a **Zoom Fit** and several set zoom levels. Simply click on an icon to immediately set that zoom level. Note that if **Zoom with Summit** is turned on on the DAT/EM VIEWER's **Summit Tools** toolbar, the zoom will be changed again as soon as SUMMIT EVOLUTION changes its zoom.

Click on any of the **Zoom** toolbar icons to immediately set that zoom level.



DAT/EM VIEWER's **Zoom** toolbar



DAT/EM VIEWER's **Tools** toolbar



•**Selection Pointer:** Use to click on locations in the DAT/EM VIEWER's bird's-eye view.



•**Zoom Realtime:** Hold down the left mouse button and move the mouse up and down to zoom in and out. Note that the system mouse wheel (if it has one) may also be used to zoom in and out.



•**Pan:** Hold down the left mouse button and move the image under the cursor. Use to position the cursor on a specific feature.



•**Rotate the View:** Hold down the left mouse button and move up and down to rotate the view clockwise and counterclockwise. Note that a view rotation set in this way will be overwritten any time SUMMIT EVOLUTION has a full orientation and DAT/EM VIEWER's **Rotate with Summit** icon is on.



•**Move Summit by Pick:** Pick a point on the DAT/EM VIEWER's image to automatically move SUMMIT EVOLUTION to the same ground coordinate. Works only when SUMMIT EVOLUTION has a complete orientation.



•**The right system mouse button** toggles between the pointer and the most recent non-pointer setting (zoom realtime, pan, rotate view).



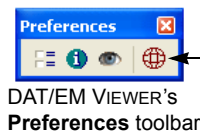
•**The system mouse wheel** (if it has one) may be used to zoom in and out.

Coordinate Conversion for an Orthophoto

The DAT/EM VIEWER offers coordinate conversion for orthophoto images.

This may be especially useful with SUMMIT EVOLUTION's **Control Transfer** tool. Coordinate conversion may be used to set the orthophoto's ground coordinates to the desired output system for the SUMMIT EVOLUTION project.

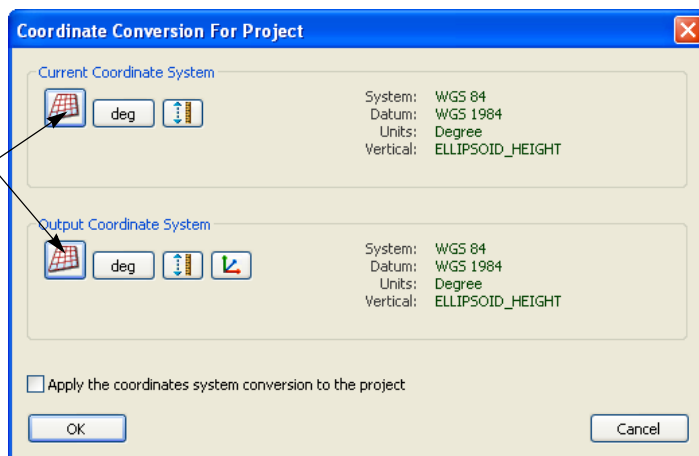
To use coordinate conversion, select the **Change Coordinate System** icon from DAT/EM VIEWER's **Preferences** toolbar.



To convert an orthophoto's coordinate system, select the **Change Coordinate System** icon from the **Preferences** toolbar.

- Use the **Select Coordinate System**, **Change Units**, and **Select Vertical Reference** buttons to select input and output systems.
- If the desired settings are not available, see *Appendix C*.

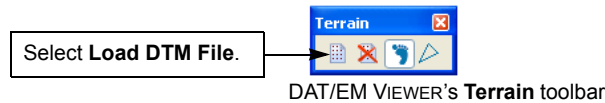
Note! If a "File not found" error is received, please see the "Install or Update the Coordinate Transformation Databases" section in the DAT/EM "Installation Instruction Series: Software Installation and Configuration" document.



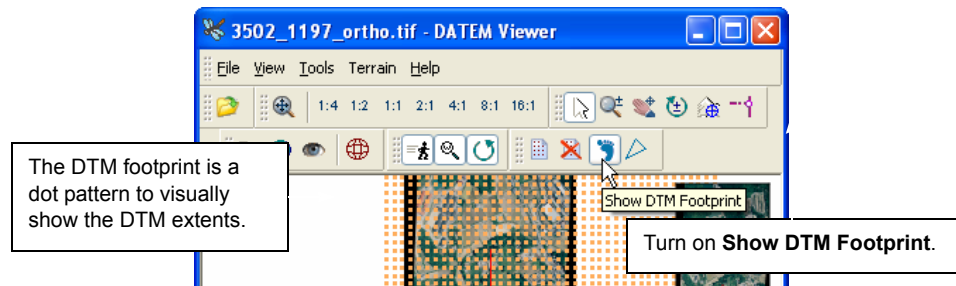
Load a DTM File for Terrain Following in an Orthophoto

The DAT/EM VIEWER can perform **Terrain Following** similar to SUMMIT EVOLUTION's **Terrain Following** (described on page 24-9). An orthophoto has an XY ground coordinate system. When a DTM point distribution file is loaded, the DAT/EM VIEWER can also follow Z based on the DTM points that surround the cursor.

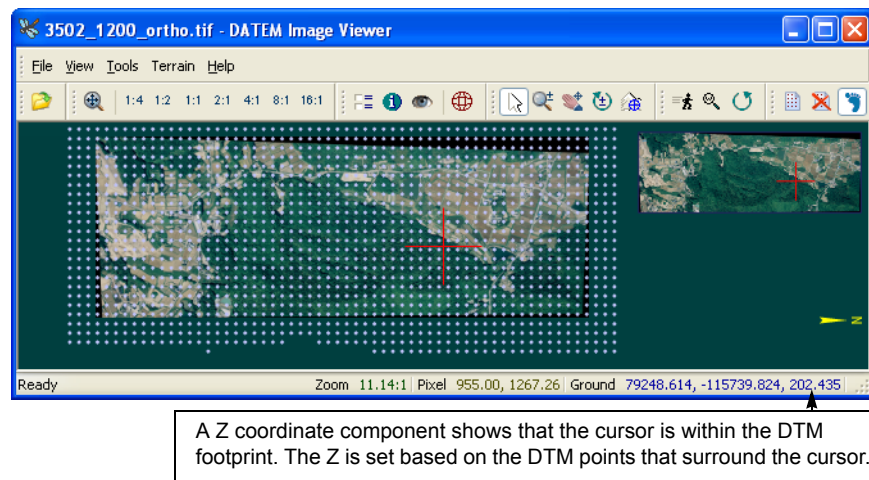
- Step 1)** Open an orthophoto in the DAT/EM VIEWER.
- Step 2)** Select the **Load DTM File** icon from the DAT/EM VIEWER's **Terrain** toolbar.



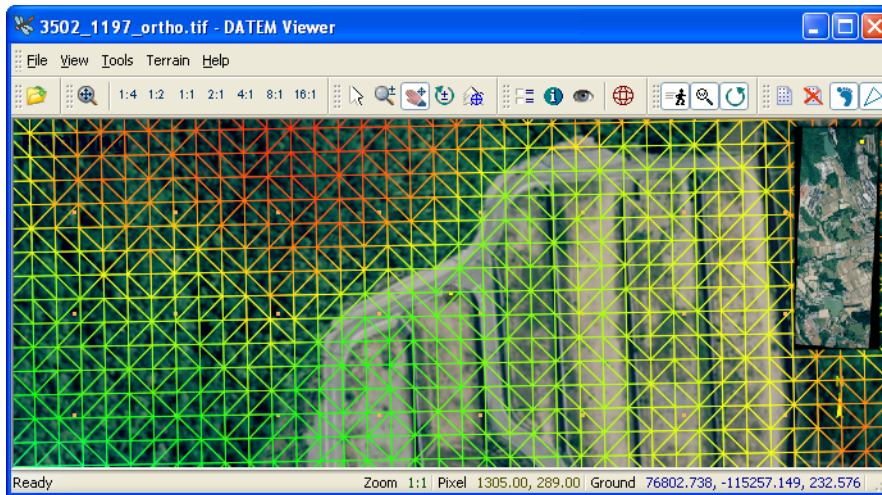
- Step 3)** Browse for and open a DTM point distribution file. If the DTM file is not one of DAT/EM's known formats, the ASCII File Import Wizard appears. Use the Wizard to identify the contents of the DTM file and save the format definition for future use.
- Step 4)** If desired, select (highlight) the **Show DTM Footprint** icon. A simple dot pattern appears to show the DTM extents. The dots are not the actual locations of the DTM points; it is just a pattern to visually check the DTM extents.



Once the DTM file is loaded, a Z coordinate component appears in the coordinate bar at the lower right of the DAT/EM VIEWER window. If the cursor moves out of the DTM footprint area, the ground coordinate display reverts back to XY only.



- Step 5)** If desired, select **Show height triangles** to draw vectors between adjoining DTM points. The vectors are colored by elevation, with red tones at high elevations and blue tones at low elevations. This looks similar to a TIN, but of course it is not, because the display is 2D. It is a visual aid.

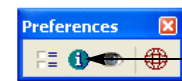


Show height triangles draws vectors between the DTM points and colors them by elevation.

- Step 6)** At any time, select the **Unload DTM File** icon to remove the DTM file.

Show Information About the Open Image

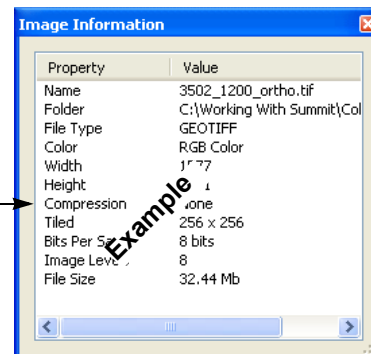
To see information about the image that is open in the DAT/EM VIEWER, select the **Image Information** icon from the **Preferences** toolbar:



DAT/EM VIEWER'S
Preferences toolbar

Select the **Image Information** icon from the **Preferences** toolbar.

An information box appears to show details about the image.



Chapter 30. Project Status Tracker

The Project Status Tracker is a project management tool for SUMMIT EVOLUTION projects. It divides the project into a grid of areas – or imports custom areas – and keeps a database that contains information about those areas. The particular information to be tracked is defined by the user.

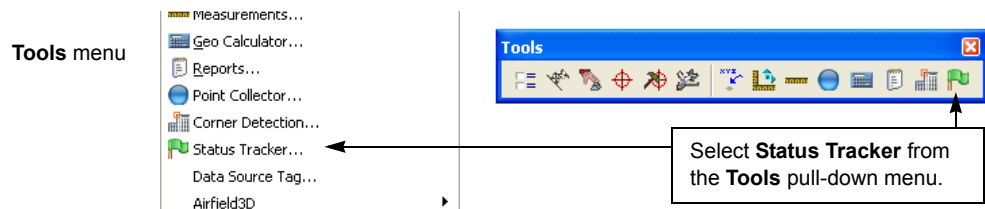
The Project Status Tracker database is stored in the Microsoft Access-format **.mdb** format.

Open an Existing Project Status Tracker Database

If there is an existing Project Status Tracker database for this project, perform the following steps to open it:

- **Prerequisite 1:** A fully oriented project must be open in SUMMIT EVOLUTION. In the case of an existing database, make sure the project matches the areas in the database.
- **Prerequisite 2:** The Project Status Tracker was used previously to create an **.mdb** file, which is to be opened again.

Step 1) Select **Status Tracker** on the **Tools** pull-down menu.



Step 2) Select **Open Database** from the **File** pull-down menu or from the toolbar:



Step 3) Browse for the existing **.mdb** and open it.

Close the Current Database

To close the currently open database, select **Close Database** from the **File** pull-down menu or from the toolbar in the Project Status Tracker.



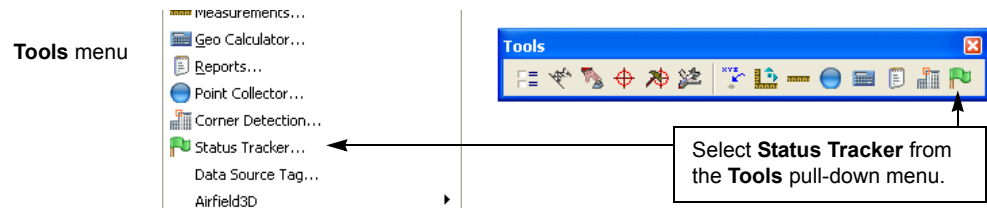
This option closes the database, but it does not delete it; it can be re-opened at any time using the instructions above in “Open an Existing Project Status Tracker Database”.

Start a New Project Status Tracker Database

To start a new tracking project, perform the following steps:

- **Prerequisite 1:** A fully oriented project must be open in SUMMIT EVOLUTION.
- **Prerequisite 2:** Before generating a new database, turn on SUMMIT EVOLUTION **Tools > Options > Project > Automatically load next model when outside stereo region**. This allows the Project Status Tracker to calculate the project extents.
- **Prerequisite 3:** If you plan to import tracking areas from a **dxf, dwg, dgn, or shp** file, prepare a file that contains closed polylines (AutoCAD), shapes (MicroStation), or shapefile polygons (ArcGIS) to define the tracking areas.

Step 1) Select **Status Tracker** on the **Tools** pull-down menu.



The Project Status Tracker window appears.

Step 2) Choose a method to begin a new project:

- a.) **Choice A. Import Areas from CAD:** Import areas from a **dxf, dwg, dgn, or shp** file. Select **Create Database from CAD file** from the **File** pull-down menu. This option is not on the toolbar.

Browse for the CAD file. This file must contain closed polylines, shapes, or polygons. For some file types, a dialog will appear to ask which layers/levels to use; check on the layers that contain the boundaries. Set the **Start ID numbers at** number to the first integer ID (identification) of the first polyline/shape/polygon boundary. Select **OK** and name and save the database.

- b.) **Choice B. Automatic Grid:** Automatically generate boundaries in a rectangular grid pattern. Select **Create Database** from the **File** pull-down menu or from the toolbar.



Make settings in the Create New Database dialog:

Project Extents are the lower left and upper right coordinate limits that must be contained in the tracking boxes. The default values are the stereo extents detected in the currently open project.

Grid Size is the length (X direction) and width (Y direction) in ground units of each rectangular tracking box.

Start ID numbers at is the first integer ID (identification) of the first tracking box. Remaining boxes are numbered consecutively.

Calculate Extents resets the **Project Extents** coordinates to the extents of all the stereo areas in the currently open project.

Calculate updates the number of boxes display. Use **Calculate** again any time the other dialog values have changed.

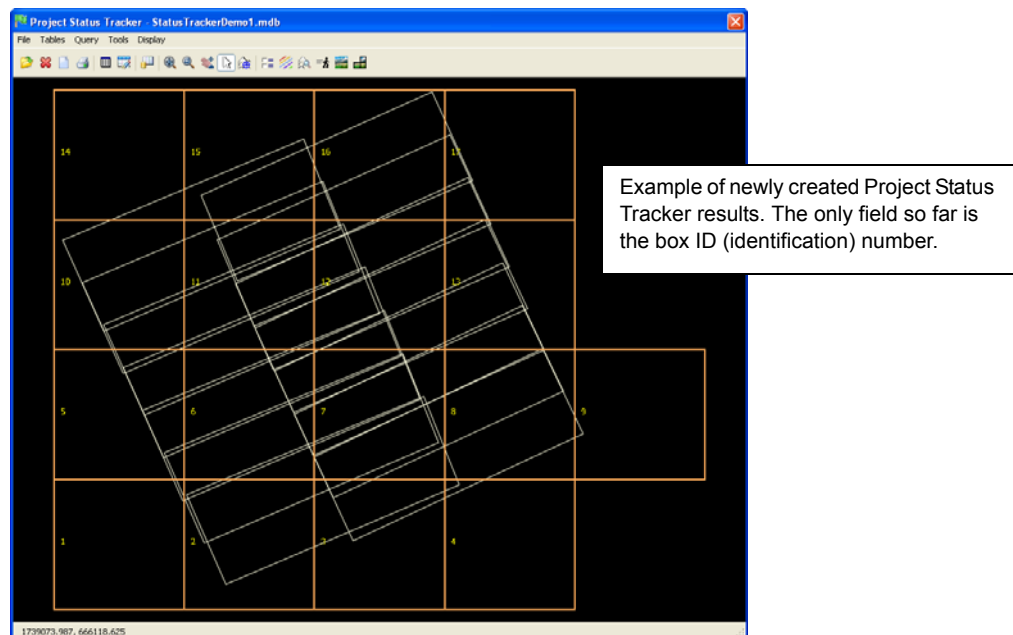
If **Remove grid areas...** is off, the grid boxes will fill a rectangular shape that contains the entire project. If the stereo areas do not completely fill the rectangle, there may be empty grid boxes.

The **Start at multiple of** setting determines the starting coordinate of the first grid box.

When off, the starting coordinate will be the current **Project Extents** corner. For example, if the extents corner is (123456.789, 98765.432), the starting coordinate will also be (123456.789, 98765.432).

When on, the starting coordinate will be reduced to the closest multiple of the set value to the **Project Extents** corner. For example, if the extents corner is (123456.789, 98765.432) and Start at multiple of=1000, the starting coordinate will be (123000.000, 98000.000).

Step 3) Select **OK** to enter a name and folder for the new database and to create the tracking boxes with their associated ID numbers.



Step 4) (Optional) If desired, additional areas may be imported from a **dx**f, **dw**g, **dgn**, or **shp** file. These areas will be added to the existing areas; their ID (identification) numbers will continue from the highest ID number already in the project. Import additional areas at any time, even after fields have been defined. If fields already exist, the same fields will be applied to any newly imported areas.

To add areas, select **Import Areas from CAD file** from the **File** pull-down menu. This option is not on the toolbar. Browse for the file and check on layers if required.

At the end of creating this database, there will be a new Microsoft Access-format **.mdb** database in the specified location.

Define and/or Import Database Fields

Immediately after the new database has been created (as shown above in “Start a New Project Status Tracker Database”), there is only one field, which is the GridID (identification) number. If you were to use the selection pointer to click on an area in the Project Status Tracker window, you would see only **GridID**:

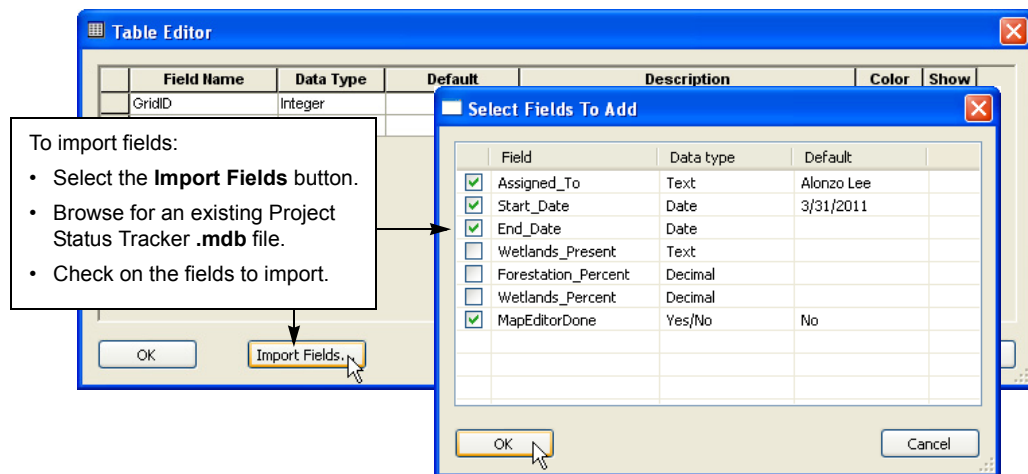


Define additional database fields. It is completely the user's choice which fields to add. Perform the following steps:

Step 1) To define or import database fields, select **Edit User Table** from the **Tables** menu or the toolbar.



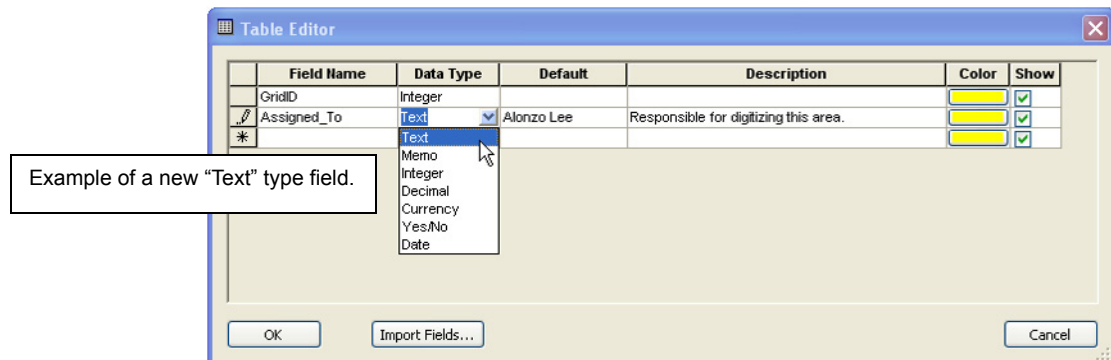
Step 2) (Optional) To import fields from an existing Project Status Tracker **.mdb** file, select **Import Fields**.



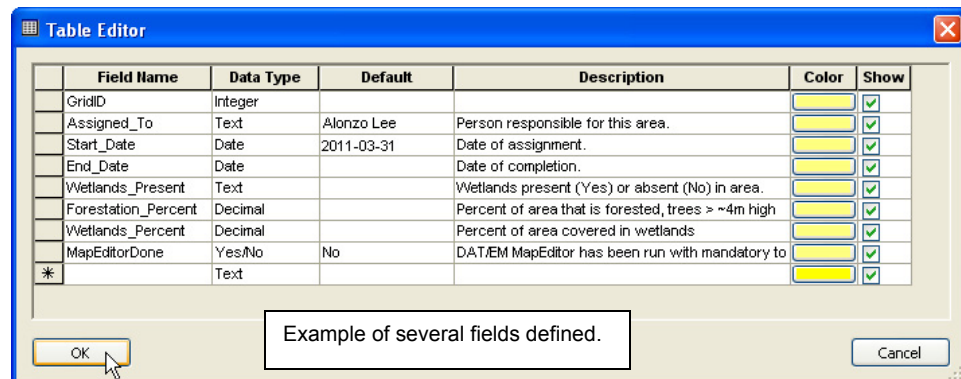
Step 3) Add any fields desired for this project. The choice of fields to track is up to the user. For each field, set:

- **Field Name:** The single-word field name. Spaces are not allowed. For example, “Assigned_To” is allowed, but “Assigned To” is not allowed.
- **Data Type:** Set the type to match the data to be entered.
- **Default:** If all fields – or even most fields – will contain the same value, or to indicate a “Not set yet” value, enter a universal setting in **Default**. Make sure the setting matches the selected **Data Type**, that is, “Yes” or “No” for a “Yes/No” **Data Type**, a number without any decimal places for the integer type, and so on. This setting will be applied to the record for every status tracker box now, and can be changed individually later. Leave blank if desired.
- **Description:** Enter any text string or leave blank.
- **Color:** Choose any color.
- **Show:** The **Show** setting is a display choice. When checked on, the value for this field will be displayed inside the tracking box in the Project Status Tracker window. The field and associated data continue to exist whether the checkbox is on or off.

For example, let’s say you want to assign different areas of the project to two employees. Create a field called “Assigned_To” and define it as a “Text” type so that it will take a person’s name in the field. Setting a **Default** name is optional.



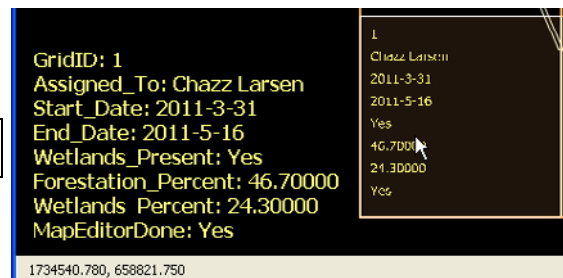
Step 4) Select **OK** to add the new fields to the database. The items that had **Show** checked on will appear as text in the status tracker boxes in the project.



Notes:

- All fields will be applied to any future imported areas (see Step 4 on page 30-4), even if the fields were defined before the areas were imported.
- More fields may be added at any time and will apply to all areas.
- Hover the system mouse (selection pointer mode) over an area to see information for checked fields in the lower left of the window. For example:

Example of fields in the display



Edit Existing Records

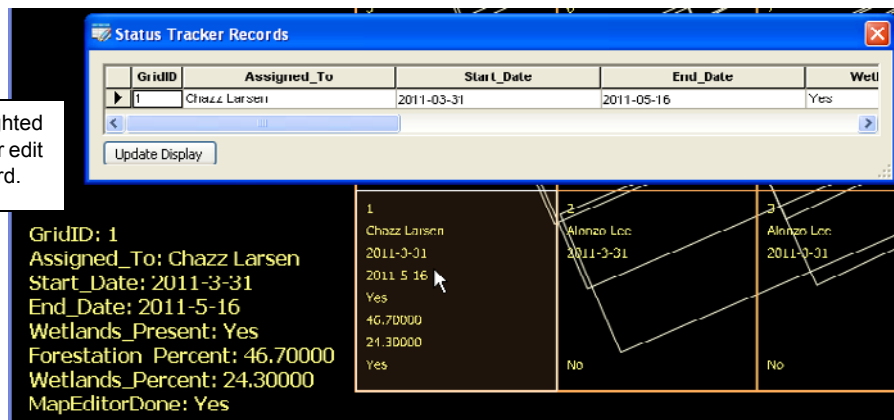
Records may be edited using the Project Status Tracker tools or by any other means of editing a standard **.mdb** database. The methods offered by the Project Status Tracker will be discussed here.

To edit existing records, perform the following steps:

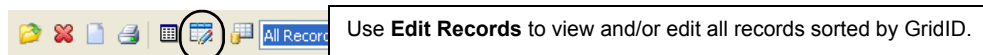
Step 1) Choose a method:

- To view and potentially edit only one record for a specifically selected area, use the system mouse (selection pointer active) to hover over the desired area until its border is highlighted, then click once to activate a table that contains only that record.

Click on the highlighted area to view and/or edit only that one record.



- To view and potentially edit all records listed in one table, select **Edit Records** from the **Tables** pull-down menu or from the toolbar. A table appears listing all the records sorted by GridID.



View and/or edit any table cell except the GridID.

The GridID is the Primary Key, and may not be changed.

Single Cells:

- A single cell may be edited by making the change directly in the cell.

Multiple Cells:

- Drag the system mouse pointer over multiple cells in a column to select a block of cells, then edit using **Selected Range > Set**.
- Hold down the <Shift> key and click on the first and last cells to select a continuous block of cells.
- Hold down the <Ctrl> (control) key and click on individual cells to select a disjointed set of cells.
- Multiple cells selections are only allowed within the same column only.
- Edit multiple cells edit using **Selected Range > Set**.
- The <Delete> key deletes (clears) all values in the selected cells.

GridID	Project_Name	AverageGroundZ	Done	Total_Lake_Area
55	Our Fair City	1250	<input checked="" type="checkbox"/>	168.24
56	Our Fair City	1250	<input type="checkbox"/>	
57	Our Fair City	1250	<input type="checkbox"/>	
58	Our Fair City	1250	<input type="checkbox"/>	
59	Our Fair City	1250	<input checked="" type="checkbox"/>	249.01
		1250	<input checked="" type="checkbox"/>	852.7
		1250	<input type="checkbox"/>	
		1250	<input checked="" type="checkbox"/>	0
		1250	<input type="checkbox"/>	
		1250	<input type="checkbox"/>	
		1250	<input type="checkbox"/>	
		1250	<input type="checkbox"/>	
		1250	<input type="checkbox"/>	
		1250	<input checked="" type="checkbox"/>	402.34
		1250	<input type="checkbox"/>	

Selected Range: 1250 Set

Step 2) To edit, click in any field or select multiple fields in a column. Enter a new value in a single field, or use the **Selected Range / Set** to edit multiple fields.

Step 3) Select **Update Display** or **OK** to apply the new value(s).

Use the Query Manager

Use the Query Manager to search for certain records to display in the Project Status Tracker window. All records that do not match the query will be removed from the display, but they remain in the database. A query controls what is displayed, but does not affect the contents of the database.

Step 1) Select **Query Manager** from the **Query** pull-down menu or from the toolbar.



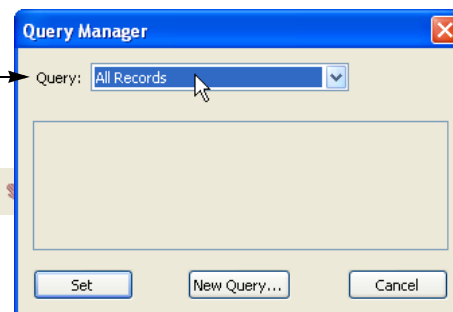
Step 2) Set an existing query, edit an existing query, or build a new query.

- To clear any active query, select **All Records** followed by the **set** button. All records will be displayed in the Status Tracker Records window. (A faster way to clear the query is to select **All Records** from the main toolbar.)

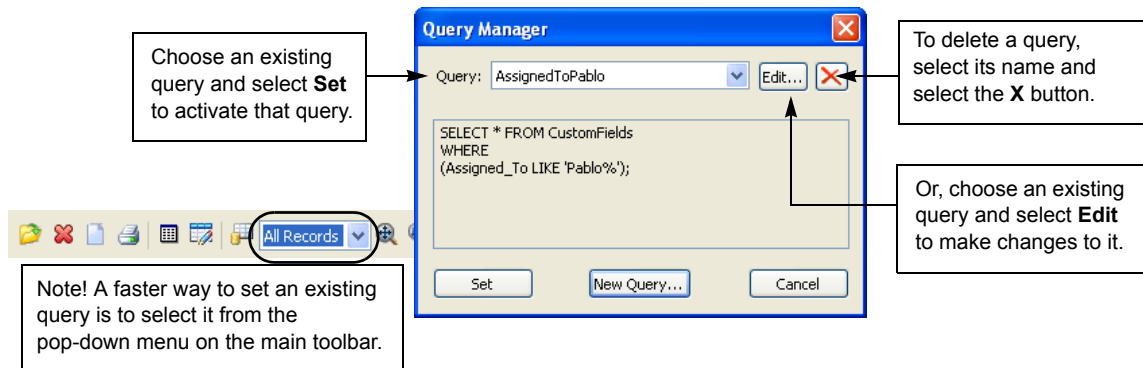
All Records (followed by **Set**) clears any active query.



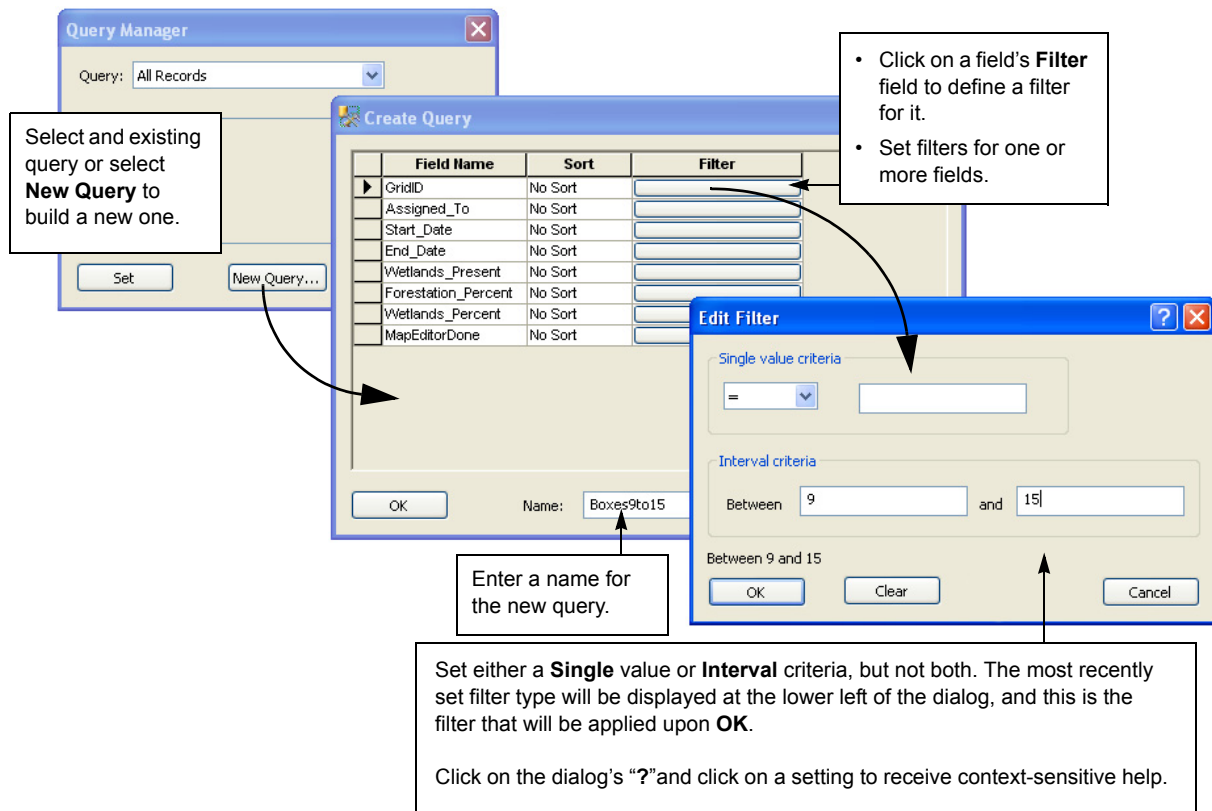
Note! A faster way to clear a query is to select **All Records** on the main toolbar.



- To set an existing query, select the query name followed by the **Set** button. Only the records that meet the query criteria will be displayed in the Status Tracker Records window. (A faster way to set an existing query is to select it from the main toolbar.)



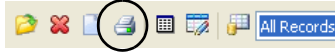
- To create a new query, select the **New Query** button and build a query:



Navigate and Control the View in the Project Status Tracker

The following are choices for navigating and controlling the view in the Project Status Tracker window.

Print



Use **Print** to print the area diagram for the whole Status Tracker project or for the current view.

Clear or Set a Query



Use the pop-down menu to set an existing query or **All Records** to clear the query. This is a quick way to set existing queries without starting the Query Manager dialog.

Zoom Fit



Use **Zoom Fit** to zoom all of the currently open status tracker boxes and boundaries to the extents of the Project Status Tracker view area.

Zoom Window



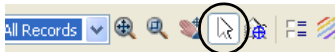
Use **Zoom Window** to Click the corners of a window and zoom to that window area.

Panning



Use **Panning** to change the cursor to the hand icon. Click the hand icon to move the view and click it again to accept the view. To cancel the hand cursor, select **Selection Pointer** from the toolbar.

Selection Pointer



Use the **Selection Pointer** to hover over areas and see their data preview or to pick on an area to open its data in the Status Tracker Records dialog.

The **Selection Pointer** may also be used to cancel other cursor styles, such as the **Panning** (hand) cursor or the **Move by Pick** cursor.

Move by Pick



Use the **Move by Pick** cursor to pick a location in the Project Status Tracker view and move SUMMIT EVOLUTION's cursor to that coordinate. To cancel the **Move by Pick** cursor, select **Selection Pointer** from the toolbar.

Options



Use **Options** from the **Display** menu to make color and decimal number settings. Use the "?" help icon and click on an option to receive context-sensitive help for each item.

Show SI

Use **Show SI** from the **Display** menu or from the toolbar to show superimposition in the Project Status Tracker window. Vectors will appear if they are currently available for SUMMIT EVOLUTION.

Show in Stereo Model

Use **Show in Stereo Model** to draw the Status Tracker areas in SUMMIT EVOLUTION's Main View. The Status Tracker areas (grid rectangles and/or CAD areas) will be drawn in superimposition in SUMMIT's Main View. They will be drawn at the *current stereoplotter elevation*. If that elevation is not satisfactory, reset SUMMIT's elevation and toggle the **Show in Stereo Model** icon to redraw the vectors.

Follow Stereo Model

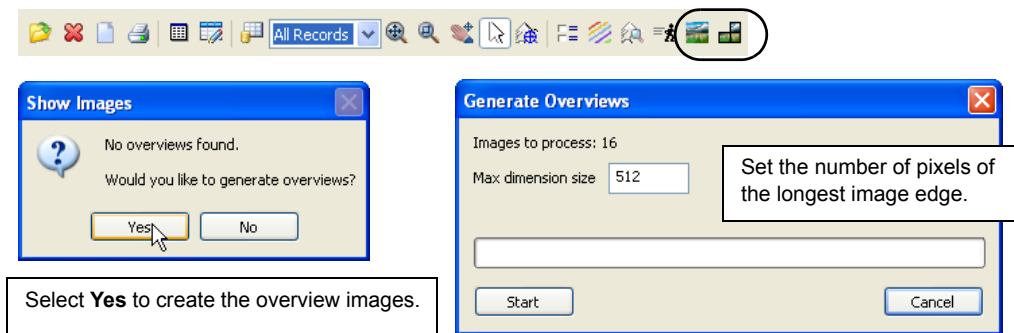
Use **Follow Stereo Model** to always zoom the Status Tracker window so that SUMMIT EVOLUTION's current coordinate position is shown in the Status Tracker window. This setting will be most obvious when the Status Tracker window is zoomed in. As the SUMMIT cursor leaves the window, the window recenters to always contain the new SUMMIT position. If this setting is off, the SUMMIT cursor can leave the current Project Status Tracker view, but the view will not change.

Show Overviews

Overviews are small, low-resolution versions of the project images. They may be displayed inside the Project Status Tracker window.

It is possible to show overviews only if overview images have been created.

- Step 1)** Select either **Show Images** (to show all images) or **Show Images in Current View** (to show from the **Display** menu or from the toolbar).
- Step 2)** If the overview images do not exist yet, it will ask whether you would like to create them:



Select **Yes** to create the overviews and display them in the view.

The images only need to be created one time. They are stored in a folder under the database's project folder. For example, if the database is called **C:\Work\TrackerProjects\TrackingProject3.mdb**, the overview images will be placed in the **C:\Work\TrackerProjects\TrackingProject3_mdb_Images** folder. When the project is finished, these images may be deleted, if desired.

Appendix A. Administrator and User Read-Write Permissions

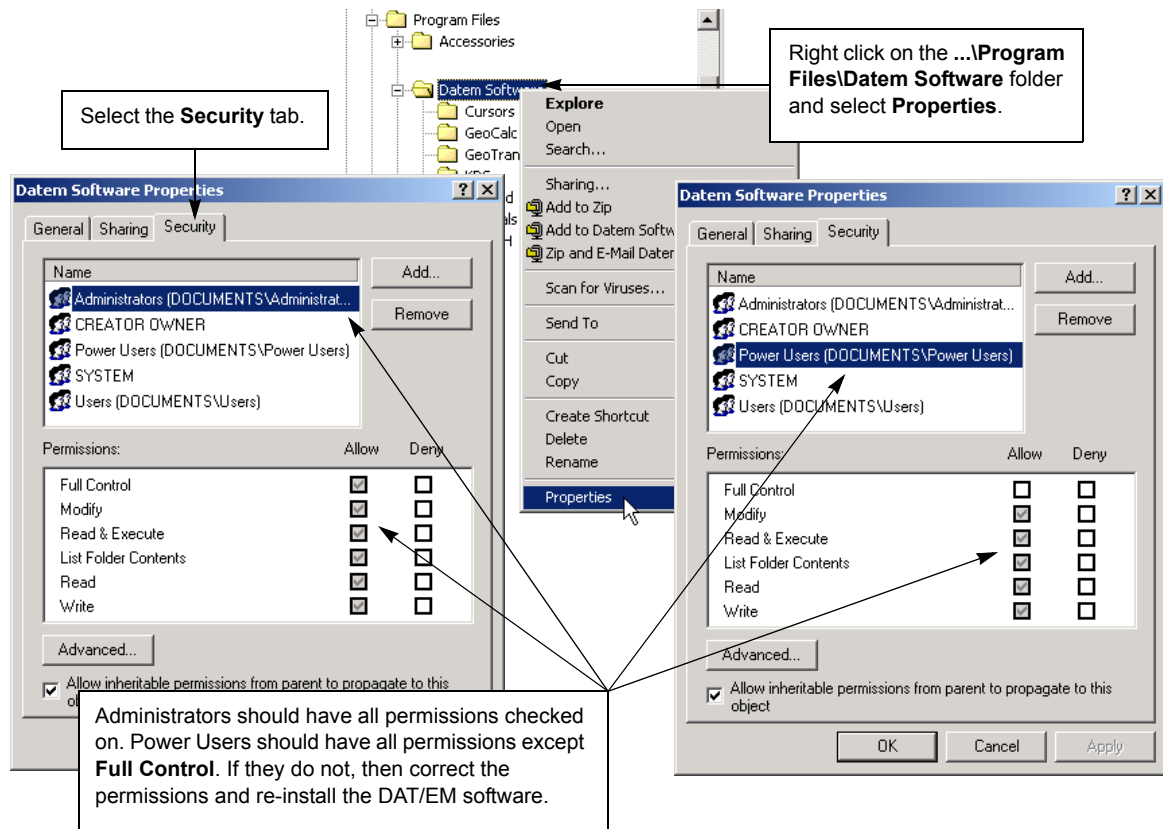
For Windows 7, please contact DAT/EM Support if you have questions about user permissions.

In order to install and run DAT/EM software, two main conditions must exist:

1. If a network administrator logs on to install the DAT/EM software, the network administrator must have local domain permissions.
2. If a user logs on to run DAT/EM software, that user must be able to read and write to HK_CURRENT_USER and to read HK_LOCAL_MACHINE in the registry. That is, users must have at least Power User status.

If the permissions are set incorrectly, the DAT/EM software installation may complete without error messages, but the software will not run after installation. Symptoms of incorrect permissions include, but are not limited to:

- (If it is present) The stereoplottter application, such as **StereoPlotter.exe** for SUMMIT EVOLUTION™, will not run. It gives a system administration error message.
- (If it is present) The blue DAT/EM KEYPAD™ grid icon does not appear in the notification area of the Windows taskbar after login. When you select **Programs>Datem Software>Datem Keypad** from the Start menu, it will not start. It gives a system permission error message.
- After installation, the permissions are not adequate in the ...**Program Files\Datem Software** folder. To check this, right click on the ...**Program Files\Datem Software** folder in the Windows Explorer. Select **Properties** from the menu. Select the **Security** tab. **Administrators** should have all permissions allowed. **Power Users** (or any users who will run the DAT/EM software) should have all permissions except **Full Control**.



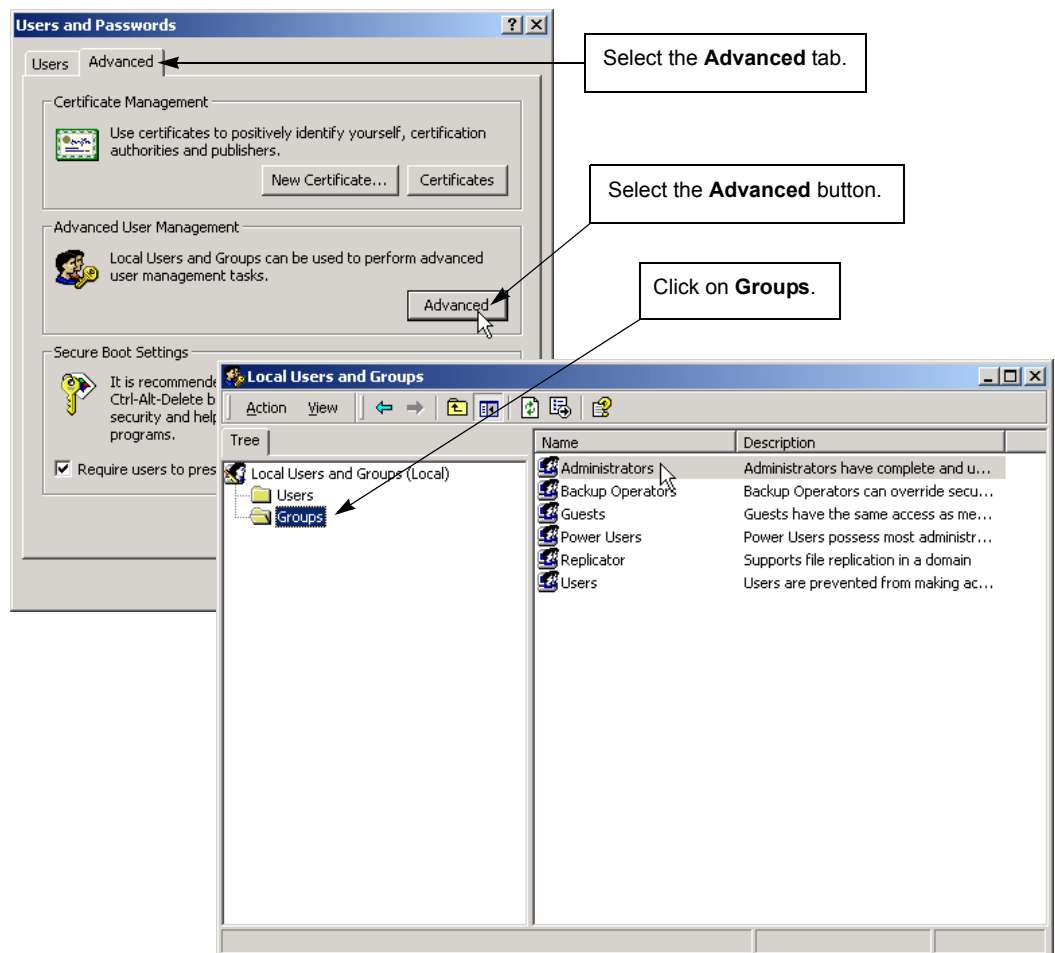
Network Administrator Permissions

Some problems have been reported when a network Administrator installs DAT/EM software on a local machine, but the network Administrator does not have local domain Administrator permissions.

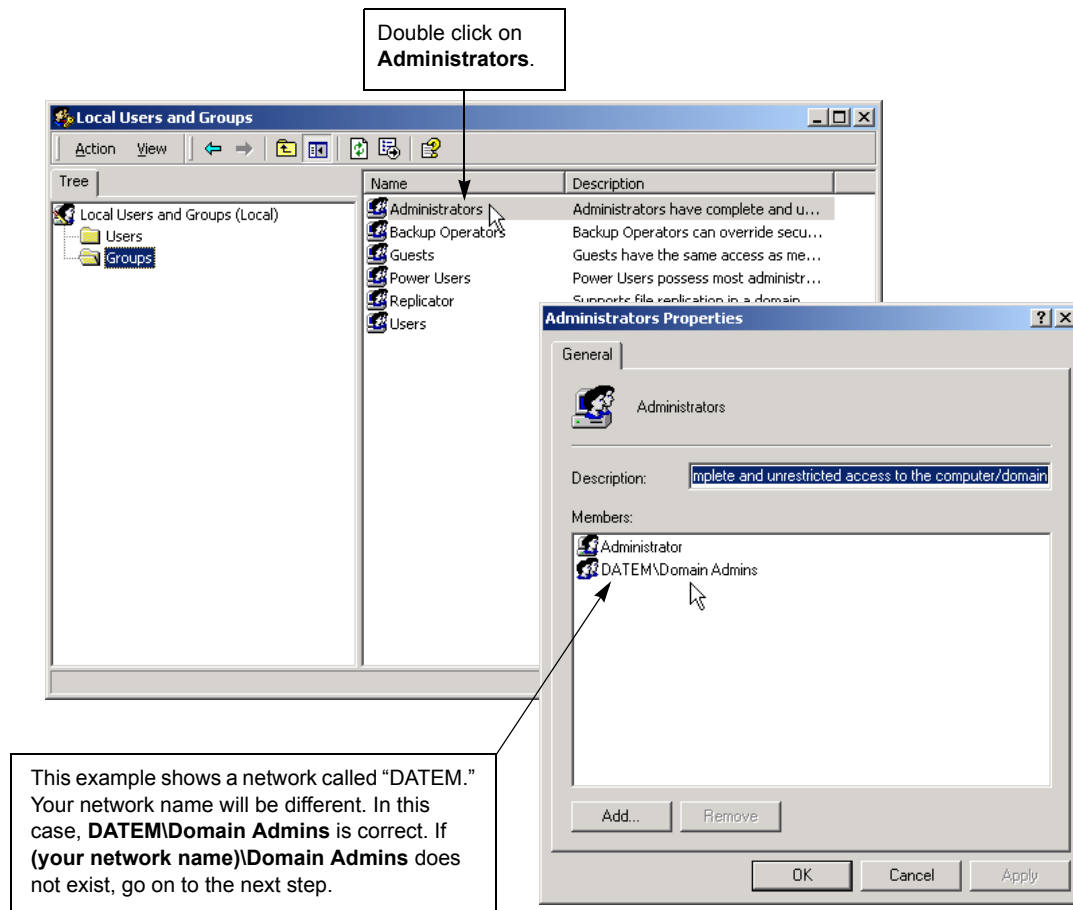
The information here is intended as a basic guide to check network administrator permissions. It is not intended as a complete discussion on network administration issues.

If a network Administrator intends to install DAT/EM software on a local machine, verify network Administrator permissions. Perform the following steps:

- Step 1)** Log in as Administrator on the local machine.
- Step 2)** From the Control Panel on the local machine, double click **Users and Passwords**.
- Step 3)** Select the **Advanced** tab, then select the **Advanced** button.
- Step 4)** Click on the **Groups** folder to highlight it on the Local Users and Groups dialog.



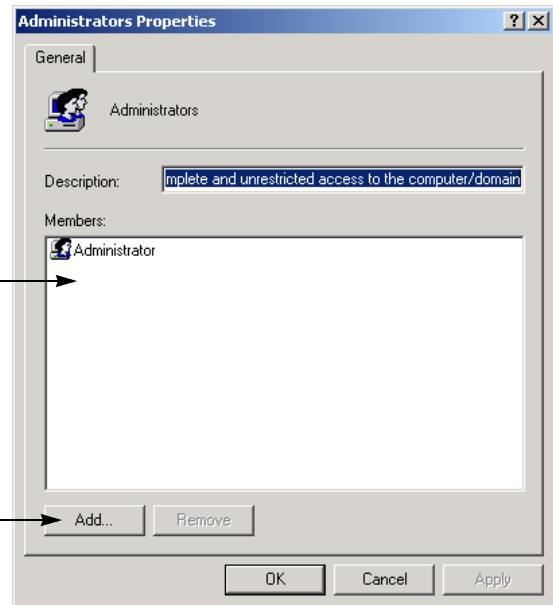
- Step 5)** Double click on **Administrators**. If “(your network name)\Domain Admins” appears in the list, go on to “User Permissions” on page A-5 below. If “(your network name)\Domain Admins” does not appear in the list, go on to the next step.



Step 6) Select the **Add** button.

Perform these steps if **(your network name)\Domain Admins** is not listed. Note that there may be other items in this list.

Select the **Add** button.

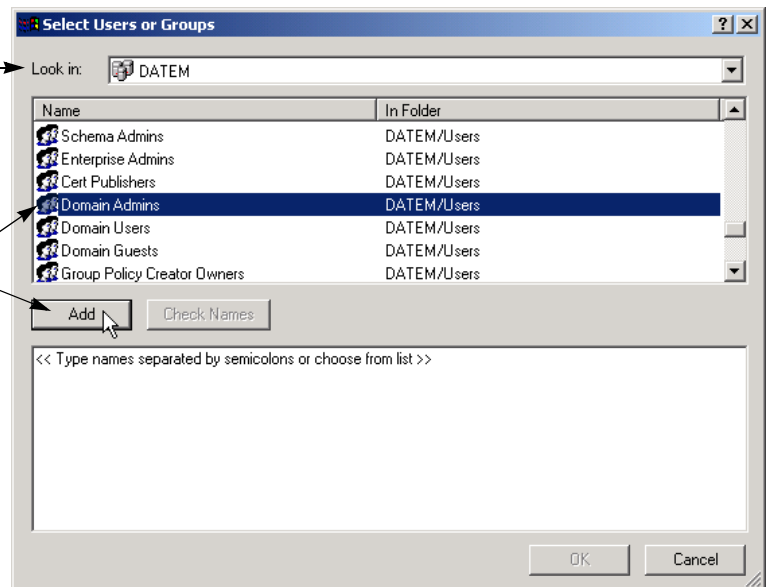


Step 7) Change the **Look in** field from the name of the local machine to the name of the network. In this example, the network name is "DATEM." Your network name will be different.

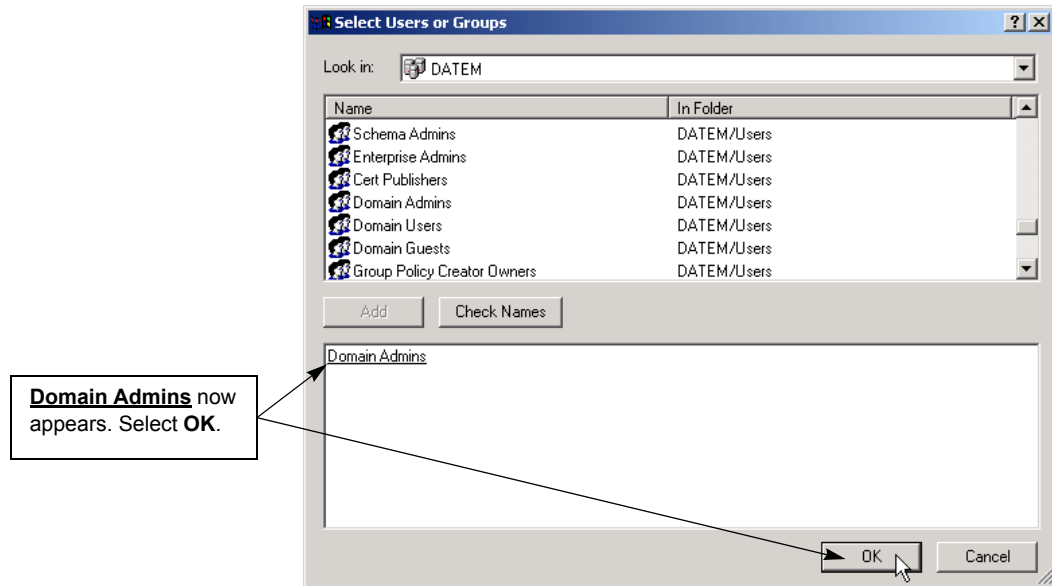
Step 8) Scroll down in the list and click on **Domain Admins** to highlight it. Select the **Add** button.

Change **Look in** from the name of the local machine to the name of the network. In this example, the network name is "DATEM." Your network name will be different.

Select **Domain Admins**, then select the **Add** button.



Step 9) **Domain Admins** now appears in the lower area on the dialog. Select **OK** to this dialog and to all previous dialogs to finish the Users and Passwords changes.



Step 10) It is now a good idea to check the users' permissions. See "User Permissions" below.

User Permissions

The users who log in to run the DAT/EM software should have at least Power User status. That is, each user must be able to read and write to HK_CURRENT_USER and to read HK_LOCAL_MACHINE in the registry.

The information here is intended as a basic guide to check existing user permissions. It is not intended as a complete discussion on setting up user accounts.

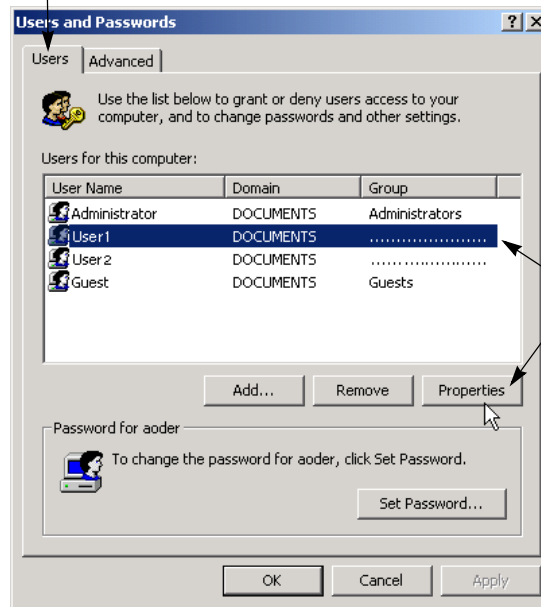
To verify the permissions on an existing user account, perform the following steps:

- Step 1)** Log in as Administrator on the local machine.
- Step 2)** From the Control Panel, select **Users and Passwords**.
- Step 3)** Select the **Users** tab.
- Step 4)** Look at each user account that will be used to run DAT/EM software. They should *not* be Restricted Users. They must be set to Power Users or higher in permission status. For any user account that does not have adequate permissions, go on to the next steps.

Step 5) Under the **User Name** heading, select a user account that does not have Power User or higher permission status.

Step 6) Select the **Properties** button.

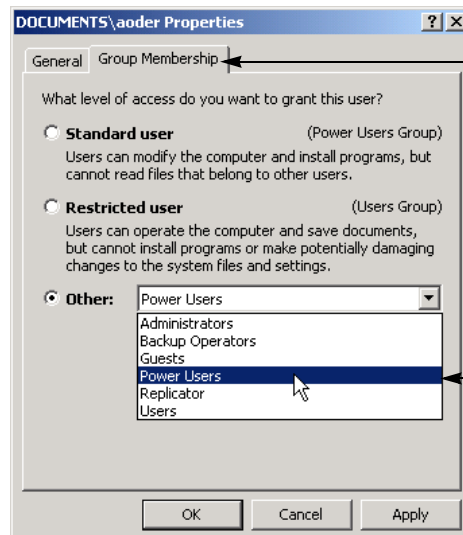
Select the **Users** tab.



- Select a user account that does not have Power User or higher permission status.
- Select **Properties**.

Step 7) Select the **Group Membership** tab.

Step 8) Select the **Other** radio button and select **Power Users** or any setting that is higher in permission status, such as Administrators, if that is desired.



Select the **Group Membership** tab.

Set **Power Users** or higher in permission status, such as Administrators.

Step 9) Select **Apply** or **OK** to activate any new settings.

Step 10) Repeat to Step 5 through Step 9 for each user who will run DAT/EM software.

Appendix B. Network Hardware Lock Troubleshooting

A network hardware lock may be used to manage multiple licenses for SUMMIT EVOLUTION PROFESSIONAL and FEATURE COLLECTION Editions and other DAT/EM software. In the case a network hardware lock cannot be found by one or more of the production workstations that need to use it, perform the following troubleshooting steps.

Please note that SUMMIT EVOLUTION LITE EDITION always uses its own local hardware lock. It is acceptable to have SUMMIT EVOLUTION LITE EDITION workstations with their own hardware locks on the same network as other DAT/EM software that access a network lock. A LITE lock and a network lock will not interfere with each other.

Check the Hardware Lock Location

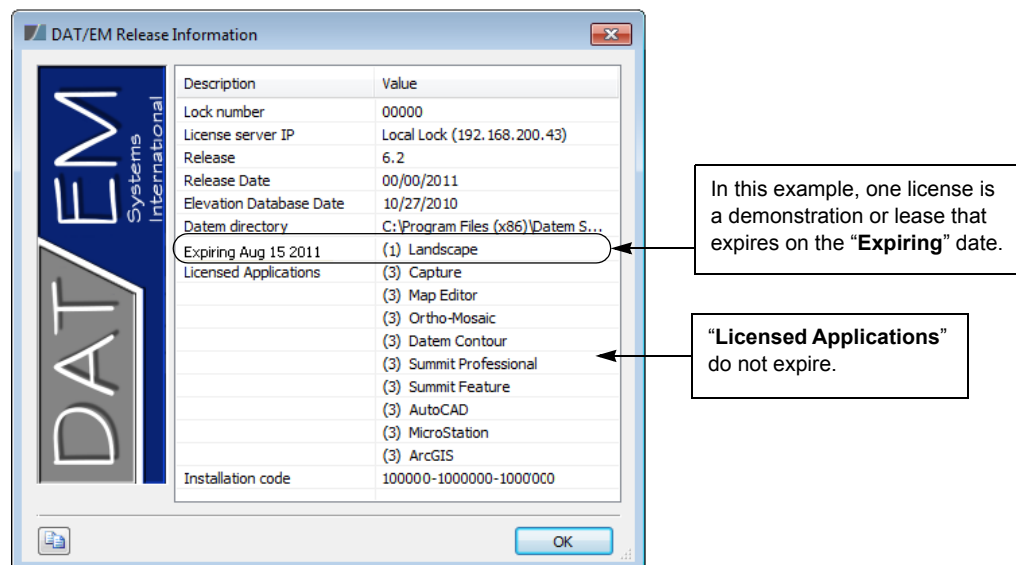
The first hardware lock checks are the simplest:

- Step 1)** Check that the computer that holds the DAT/EM network lock is powered on and properly set up as part of the network.
- Step 2)** Check that the DAT/EM network hardware lock is still firmly attached to the USB port.

Check for Active DAT/EM Licenses

Sometimes DAT/EM software licenses are set to expire, especially if they are provided as a demonstration. To check that the licences are current, perform the following steps:

- Step 1)** Use the DAT/EM production computer that is giving the hardware lock error. From the Windows **Start** menu, select **Datem Software** and **Release Information**.
- Step 2)** View the information shown in the dialog. If there is an “Expiring on” list, check the expiration date against the current date. Items listed under “Licensed Applications” do not expire. Check that the DAT/EM software package that you wish to run is listed with an active license.



Example of DAT/EM Release Information

- Step 3)** To correct any licensing problems, contact DAT/EM Support (see *Appendix L*).

If the DAT/EM Release Information dialog does not appear with licensing information in it, go on to the next troubleshooting steps below.

Match the Sentinel Driver Versions

If the network lock can't be found immediately after a DAT/EM update has been installed on the production computers, it could be that the Sentinel hardware lock driver needs to be updated on the network lock server. The SafeNet Sentinel version installed on the lock server should match the version on the production computers.

Perform the following step:

- Step 1)** This step depends on whether the computer needs a complete DAT/EM install or just the Sentinel driver:
- a.) If the computer that holds the hardware lock is also used for DAT/EM production, install a complete DAT/EM upgrade. All computers that use the network hardware lock should have the same DAT/EM version installed. DAT/EM "Installation Instructions Series: DAT/EM Hardware Lock and Driver" document.
 - b.) If the computer that holds the hardware lock is only used as a hardware lock server, upgrade the Sentinel driver alone. See the "Install or Update the Sentinel Driver for a Network Hardware Lock" section in the DAT/EM "Installation Instructions Series: DAT/EM Hardware Lock and Driver" document.

Renew the IP Address

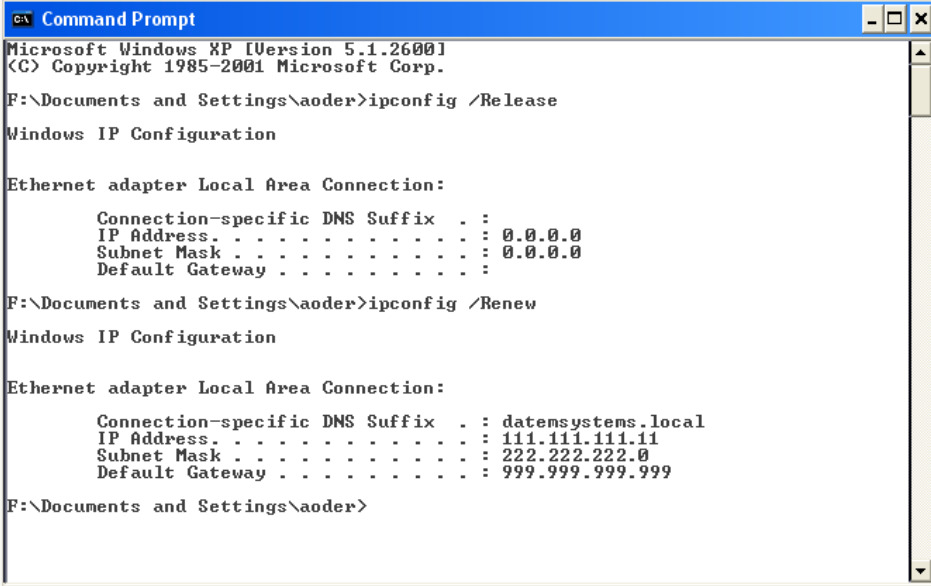
If suddenly the network hardware lock cannot be found from a single DAT/EM production workstation, the IP address for the computer may have expired. Network IP addresses are usually renewed automatically, but if not, you can force a new IP address to be assigned.

These instructions are for Windows XP.

- Step 1)** On the DAT/EM production computer that is giving the hardware lock error, log on to an account that has administrator privileges. Close any DAT/EM software that is giving a hardware lock error message.
- Step 2)** From the Windows **Start** menu, select **Accessories** and **Command Prompt**.
- Step 3)** Enter the following two commands:
- ```
(any path)> ipconfig /Release
(any path)> ipconfig /Renew
```



It should report “0.0.0.0” upon release and a new IP address upon renewal. For example:



```

Command Prompt
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

F:\Documents and Settings\aoeder>ipconfig /Release

Windows IP Configuration

Ethernet adapter Local Area Connection:

 Connection-specific DNS Suffix . :
 IP Address : 0.0.0.0
 Subnet Mask : 0.0.0.0
 Default Gateway :

F:\Documents and Settings\aoeder>ipconfig /Renew

Windows IP Configuration

Ethernet adapter Local Area Connection:

 Connection-specific DNS Suffix . : datemsystems.local
 IP Address : 111.111.111.11
 Subnet Mask : 222.222.222.0
 Default Gateway : 999.999.999.999

F:\Documents and Settings\aoeder>

```

- Step 4)** Start the DAT/EM software again. There may be a longer-than-usual delay while the software searches for the lock, but if it is found now, it will be faster in the future.

## Rule out a Problem with the USB Port or Server Computer

If all other tests and checks so far have failed to fix the problem, and all DAT/EM production workstations give the same hardware lock error (none of them can run DAT/EM software), try to rule out a problem with the USB port or computer that holds the hardware lock:

- Step 1)** First exit all DAT/EM software sessions on all network computers, even if they are just showing hardware lock error messages.
- Step 2)** Move the hardware lock to a different network computer that has DAT/EM software installed.
- Step 3)** Try starting DAT/EM software on any of the DAT/EM production workstations. It may be slower to activate than usual; first it checks the last known location of the network hardware lock, then it searches for the lock locally and on other network locations.
  - If the lock can be found in its new location, troubleshoot the original server computer. For example, check that the Sentinel driver is still installed on it, its USB ports are working, and it is properly connected to the network.
  - If the lock still can't be found in its new location, contact DAT/EM Support (see *Appendix L*).

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## Appendix C. Define New Coordinate System Components

SUMMIT EVOLUTION offers Blue Marble Geographics® GeoCalc® coordinate transformations. Coordinate transformations may be applied to entire projects and to control files. Many common coordinate system components, including items such as linear units, angular units, and ellipsoids, are already stored in the Blue Marble Geo Database and listed as choices on the Coordinate System dialogs. If a particular coordinate system or coordinate system component is not listed, it may be added to the Geo Database.

The Blue Marble Geo Database files must be installed before using any coordinate transformation tools in SUMMIT EVOLUTION. See the “Install or Update the Coordinate Transformation Databases” section of the DAT/EM “Installation Instruction Series: Software Installation and Configuration” document.

To create a new coordinate system or system component, perform the following steps:

**Step 1)** Before starting, be sure to know the exact details of the coordinate system component that will be defined. For example, to define a new linear unit, you must know its exact conversion factor to meters. As another example, to define a new ellipsoid, you must know the values for the semi-major axis, semi-minor axis, flattening, inverse flattening, eccentricity, and second eccentricity. Pay careful attention to the number of decimal places required to define these values correctly.

**Step 2)** Select **Edit the Geo Database** on the SUMMIT EVOLUTION **Orientation** toolbar or menu.

Select **Edit the Geo Database** from the **Orientation** toolbar.



**Step 3)** The Blue Marble library Edit Datasource dialog appears. Select the “+” to expand the list of existing selections next to the type of item you wish to add. Verify that the desired selection is *not* already offered in the list. If it is not, perform the following:

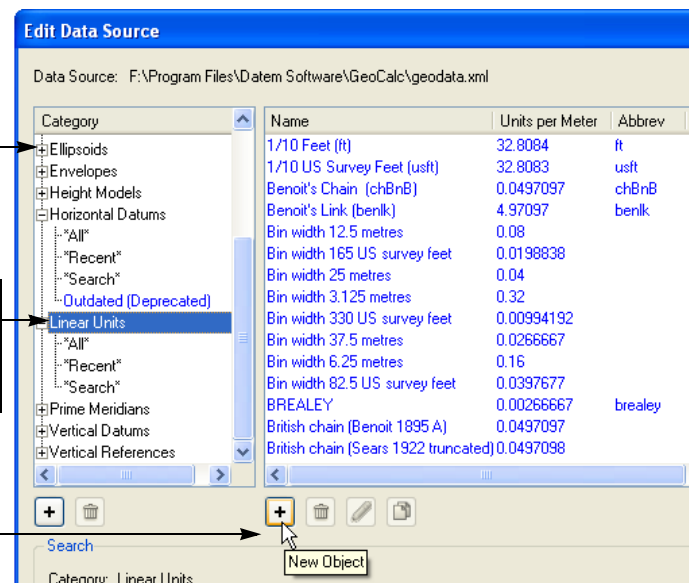
- Click on a folder heading where you wish to add a new item. Either select the + button below the list or right click on the data type heading and choose **New Category** from the menu.
- Make definition settings in the dialog box and select **Save**.

- Click “+” next to any item of interest.
- Verify that the desired selection is *not* already offered in the list.

Click on the desired category to highlight it.

For example, select **Linear Unit**.

Choose **New Object** below the **Name** list.



Example for a new **Linear Unit**:

Enter a **Name** for the new unit. The name must be different than any of the existing item names.

- **Hint:** Add the abbreviation in parentheses to the end of the name. For example, enter, **New Unit (nu)**. Be sure to enter the same abbreviation in the **Abbreviation** field on the **Definition** tab.

**Linear Unit Editor**

Identification | Definition

Name: Light Year (ly)

Remarks: Demonstrate how to add a new linear unit to the Geo Database.

| Issuer | Code                           |
|--------|--------------------------------|
| GC     | a4b6f8b1-d63a-417f-9fb7-63dd0f |

Enter the definition of the new item. The fields vary depending on what type of item is being added.

- **Hint:** Be very careful to include all known place values. For example, instead of entering **9.46e+15** for a light year (effectively truncating the known place values), enter either **9460730472580800** or **9.460730472580800e+15**.

**Linear Unit Editor**

Identification | Definition

Abbreviation: ly

Units Per Meter: 9,460,730,472,580,800


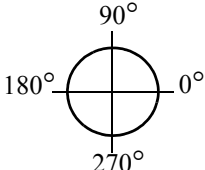
OK Cancel



## Appendix D. Cursor File Format


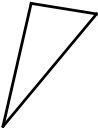
A cursor file editor is available from the **Cursor Editor** option of the **Tools** pull-down menu (see page 25-41 to select a cursor and page 25-43 to use the cursor editor). It is usually not necessary to know the format components if the cursor editor is used.

The cursor file uses the following format components:

| Description       | Format                                                                                                                                                                                                                                                                                                             | Example                                                                             |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Set Color         | <b>Color: &lt;red&gt; &lt;green&gt; &lt;blue&gt; &lt;transparency&gt;</b> <ul style="list-style-type: none"> <li>Red, green, blue, and transparency values are all (<math>0 \leq \text{value} \leq 255</math>).</li> <li>Color only needs to be specified for the first object and to change the color.</li> </ul> | CIRCLES<br>Color: 255 0 15 150<br>Filled: 1<br>Radius: 10.0<br>Vert: 0.0 0.0<br>END |
| Set Width         | <b>Width: &lt;width in pixels&gt;</b> <ul style="list-style-type: none"> <li>The width is a real number greater than zero.</li> <li>Specify the width for the first object. After that, specify it only to change the width.</li> </ul>                                                                            | CIRCLES<br>Width: 2.0<br>Filled: 1<br>Radius: 10.0<br>Vert: 0.0 0.0<br>END          |
| Comment indicator | <b>;A comment is a semi-colon followed by any characters</b><br><b>;Blank lines are ignored</b>                                                                                                                                                                                                                    | ;This is a comment line<br><br>;Comments are ignored<br>;Blank lines are ignored    |

| Description                                                                                  | Format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Example                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Arc</p>  | <pre> ARCS Radius: &lt;projected circle radius(A) in pixels&gt; Start: &lt;angle in degrees of arc(1A) start&gt; End: &lt;angle in degrees of arc(1A) end&gt; Vert: &lt;center (X,Y) of projected circle for arc(1A)&gt; Start: &lt;angle in degrees of arc(2A) start&gt; End: &lt;angle in degrees of arc(2A) end&gt; Vert: &lt;center (X,Y) of projected circle for arc(2A)&gt; . . . Start: &lt;angle in degrees of arc(nA) start&gt; End: &lt;angle in degrees of arc(nA) end&gt; Vert: &lt;center (X,Y) of projected circle for arc(nA)&gt;  Radius: &lt;projected circle radius(B) in pixels&gt; Start: &lt;angle in degrees of arc(1B) start&gt; End: &lt;angle in degrees of arc(1B) end&gt; Vert: &lt;center (X,Y) of projected circle for arc(1B)&gt; Start: &lt;angle in degrees of arc(2B) start&gt; End: &lt;angle in degrees of arc(2B) end&gt; Vert: &lt;center (X,Y) of projected circle for arc(2B)&gt; . . . Start: &lt;angle in degrees of arc(nB) start&gt; End: &lt;angle in degrees of arc(nB) end&gt; Vert: &lt;center (X,Y) of projected circle for arc(nB)&gt; . . . END </pre> <ul style="list-style-type: none"> <li>Radius is a real number greater than zero. If the arc were extended to make a whole, projected circle, then the radius value would be the radius of that circle.</li> <li>Vert is the center of the projected circle in pixel units. (0.0, 0.0) is the center of the window. Use any real numbers.</li> <li>The start and end values are the degree measurements along the projected circle. Negative or positive real numbers may be used.</li> </ul>  | <pre> ARCS Color: 255 255 0 220 Width: 1.000 Radius: 40.000 Start: -30.0 End: 30.0 Vert: 0.000 0.000 Start: 60.0 End: 120.0 Vert: 0.000 0.000 Start: 150.0 End: 210.0 Vert: 0.000 0.000 Start: 240.0 End: 300.0 Vert: 0.000 0.000  Radius: 20.000 Start: -30.0 End: 30.0 Vert: 0.000 0.000 Start: 60.0 End: 120.0 Vert: 0.000 0.000 Start: 150.0 End: 210.0 Vert: 0.000 0.000 Start: 240.0 End: 300.0 Vert: 0.000 0.000 END </pre> |

| Description                                                                                     | Format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Example                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Circle</p>  | <p><b>CIRCLES</b><br/> <b>Filled:</b> &lt;1 for filled, 0 for unfilled circle(1)&gt;<br/> <b>Radius:</b> &lt;radius in pixels of circle(1)&gt;<br/> <b>Vert:</b> &lt;(X,Y) of center of circle(1)&gt;<br/> <b>Filled:</b> &lt;1 for filled, 0 for unfilled circle(2)&gt;<br/> <b>Radius:</b> &lt;radius in pixels of circle(2)&gt;<br/> <b>Vert:</b> &lt;(X,Y) of center of circle(2)&gt;<br/>         .<br/>         .<br/>         .<br/> <b>Filled:</b> &lt;1 for filled, 0 for unfilled circle(n)&gt;<br/> <b>Radius:</b> &lt;radius in pixels of circle(n)&gt;<br/> <b>Vert:</b> &lt;(X,Y) of center of circle(n)&gt;<br/> <b>END</b></p> <ul style="list-style-type: none"> <li>• Radius is a real number greater than zero.</li> <li>• VERT is the center of the circle in pixel units. (0.0, 0.0) is the center of the window. Use any real numbers.</li> <li>• For a semi-transparent filled circle, specify a color with a transparency value less than 255 (such as 150).</li> </ul> | <pre>CIRCLES ;First circle Color: 255 0 15 150 Width: 2.0 Filled: 1 Radius: 10.0 Vert: 0.0 0.0 ;Second circle same color Width: 1.0 Filled 0 Radius 5.0 Vert: 0.0 0.0 END</pre>                                                    |
| <p>Line</p>  | <p><b>LINES</b><br/> <b>Vert:</b> &lt;starting (X,Y) of segment(1)&gt;<br/> <b>Vert:</b> &lt;ending (X,Y) of segment(1)&gt;<br/> <b>Vert:</b> &lt;starting (X,Y) of segment(2)&gt;<br/> <b>Vert:</b> &lt;ending (X,Y) of segment(2)&gt;<br/>         .<br/>         .<br/>         .<br/> <b>Vert:</b> &lt;starting (X,Y) of segment(n)&gt;<br/> <b>Vert:</b> &lt;ending (X,Y) of segment(n)&gt;<br/> <b>END</b></p> <ul style="list-style-type: none"> <li>• (X,Y) is in pixel coordinates. Use any real numbers. (0.0, 0.0) is the center of the window.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                           | <pre>LINES Color: 255 255 128 200 Width: 1.000 Vert: -2.000 0.000 Vert: -7.000 3.000 Vert: -2.000 0.000 Vert: -7.000 -3.000 Width: 1.500 Vert: -7.000 3.000 Vert: -25.000 3.000 Vert: -7.000 -3.000 Vert: -25.000 -3.000 END</pre> |

| Description                                                                                   | Format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Example                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Point<br>    | <pre>POINTS Vert: &lt;(X,Y) of point(1)&gt; Vert: &lt;(X,Y) of point(2)&gt; . . . Vert: &lt;(X,Y) of point(n)&gt; END</pre> <ul style="list-style-type: none"> <li>(X,Y) is in pixel coordinates. Use any real numbers. (0.0, 0.0) is the center of the window.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                  | <pre>POINTS Color: 255 0 0 255 Width: 2.000 Vert: 0.000 0.000 ;Second point, new color Color: 100, 150, 0 255 Vert: 10.0 5.0 ;Third point, new width Width: 3.000 Vert: -10.0 -5.0 END</pre>                         |
| Triangle<br> | <pre>TRIANGLES Vert: &lt;(X,Y) of first vertex of triangle(1)&gt; Vert: &lt;(X,Y) of second vertex of triangle(1)&gt; Vert: &lt;(X,Y) of third vertex of triangle(1)&gt; Vert: &lt;(X,Y) of first vertex of triangle(2)&gt; Vert: &lt;(X,Y) of second vertex of triangle(2)&gt; Vert: &lt;(X,Y) of third vertex of triangle(2)&gt; . . . Vert: &lt;(X,Y) of first vertex of triangle(n)&gt; Vert: &lt;(X,Y) of second vertex of triangle(n)&gt; Vert: &lt;(X,Y) of third vertex of triangle(n)&gt; END</pre> <ul style="list-style-type: none"> <li>(X,Y) is in pixel coordinates. Use any real numbers. (0.0, 0.0) is the center of the window.</li> </ul> | <pre>TRIANGLES Color: 0 255 255 70 Width: 3.000 Vert: 0.000 50.000 Vert: 42.000 -28.000 Vert: -42.000 -28.000 Color: 200 255 255 200 Width: 2.000 Vert: 0.000 0.000 Vert: -3.000 40.000 Vert: 3.000 40.000 END</pre> |



## Appendix E. Orientation Information

Photogrammetric orientation is the process of modeling the camera's position in space relative to the image objects' position to produce accurate ground coordinates. Before the camera takes the image, certain control points on the ground or terrestrial object are marked at known coordinates. These control points, together with the fiducial marks placed on the image by the camera, can be measured by the stereoplotter. Orientation calculations then convert the image coordinate system to a ground coordinate system. With SUMMIT EVOLUTION, these ground coordinates are then sent to AutoCAD, MicroStation, or ArcMap so that digitized objects are placed in the ground coordinate system.

The user must complete the three main components of orientation:

- **Interior Orientation:** Measure the camera's fiducial or reseau marks on each image.
- **Relative Orientation:** Measure relative positions of at least six objects that appear on both the right and left images.
- **Absolute Orientation:** Match the right and left image at the ground control points.

There are several third-party aerotriangulation packages that replace the relative and absolute orientations steps. The aerotriangulation results may be imported into SUMMIT EVOLUTION.

### Interior Orientation

Interior orientation is the mathematical process of transforming rectangular coordinates from a two-dimensional right-handed Cartesian system to another two-dimensional right-handed Cartesian system. The common terminology used in photogrammetry is transforming "machine coordinates" into "photo coordinates."

- The **machine coordinate** system could be an x-y comparator system, a mechanical x-y coordinate system used for analytical plotters, or, as is the case in SUMMIT EVOLUTION, a row & column (pixel) system used for digital plotters.
- The **photo coordinates** are defined by the calibrated fiducial coordinates that are obtained from the calibration report for the camera.

SUMMIT EVOLUTION uses the overdetermined affine transformation for interior orientation. The affine transformation has 6 parameters:

| Parameter of the Affine Transformation | Description                                                                                                                                                                                                     |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) Rotation angle                      | The angle formed by the X axis of the photo system and the X axis of the machine system.                                                                                                                        |
| 2) Non-orthogonal angle                | A small angle that indicates that one system has X and Y axes that are non-orthogonal. The photo system is typically non-orthogonal because the side fiducials do not define perfectly orthogonal X and Y axes. |
| 3) Scale factor in X                   | Scale factor for distortion along the +X axis.                                                                                                                                                                  |

| Parameter of the Affine Transformation | Description                                                                                          |
|----------------------------------------|------------------------------------------------------------------------------------------------------|
| 4) Scale factor in Y                   | Scale factor for distortion along the +Y axis.                                                       |
| 5) Translation along the X axis        | Distance in the X direction from the origin of the machine system to the origin of the photo system. |
| 6) Translation along the Y axis        | Distance in the Y direction from the origin of the machine system to the origin of the photo system. |

A counterclockwise rotation looking down the positive X axis is defined as positive.

The solution process for this overdetermined system uses a least squares solution to solve for the parameters. The procedure requires that some common points have their coordinates known in both the machine coordinate system and the photo coordinate system. These common points are the fiducial marks.

To perform interior orientation, see *Chapter 18*.

## Relative Orientation

Relative orientation is the mathematical process of determining the relative position and attitude of two photographs in a stereo pair with respect to an arbitrary 3D reference coordinate system. The primary purpose of relative orientation is to orient the two photographs so that each corresponding pair of rays from the two photographs intersect in space. This is accomplished by making five pairs of rays intersect. SUMMIT EVOLUTION uses six pairs of rays, with the sixth pair acting as a check. These points are commonly referred to as Von Gruber Points, named after Otto Von Gruber, who invented the mathematics for relative orientation in 1924.

To perform relative orientation with SUMMIT EVOLUTION, see *Chapter 19*.

## Absolute Orientation

Absolute orientation is the process of scaling, leveling, and orienting a relatively oriented stereoscopic model to the ground reference coordinate system. This process relates the model system to the ground system. Mathematically, the process may be defined simply as a problem of a 3D to 3D coordinate transformation, commonly referred to as a three-dimensional similarity transformation with seven parameters.

To perform absolute orientation with SUMMIT EVOLUTION, see *Chapter 20*.

## Exterior Orientation

Exterior orientation is the process of gathering enough information about individual images to be able to calculate the ground coordinate of each image center. The interior and relative orientations provide the information necessary to calculate exterior orientation. Exterior orientation is calculated by a third-party aerotriangulation (AT) software package.

Ground coordinates are the end result of either exterior orientation or absolute orientation. As far as the user is concerned, having exterior orientation done in both the right and left images is equivalent to having an absolute orientation done for the image pair. The user must choose whether to do an absolute or an exterior orientation based on the project specifications and whether there is a third-party AT package available.

## Appendix F. Exterior Import Wizard

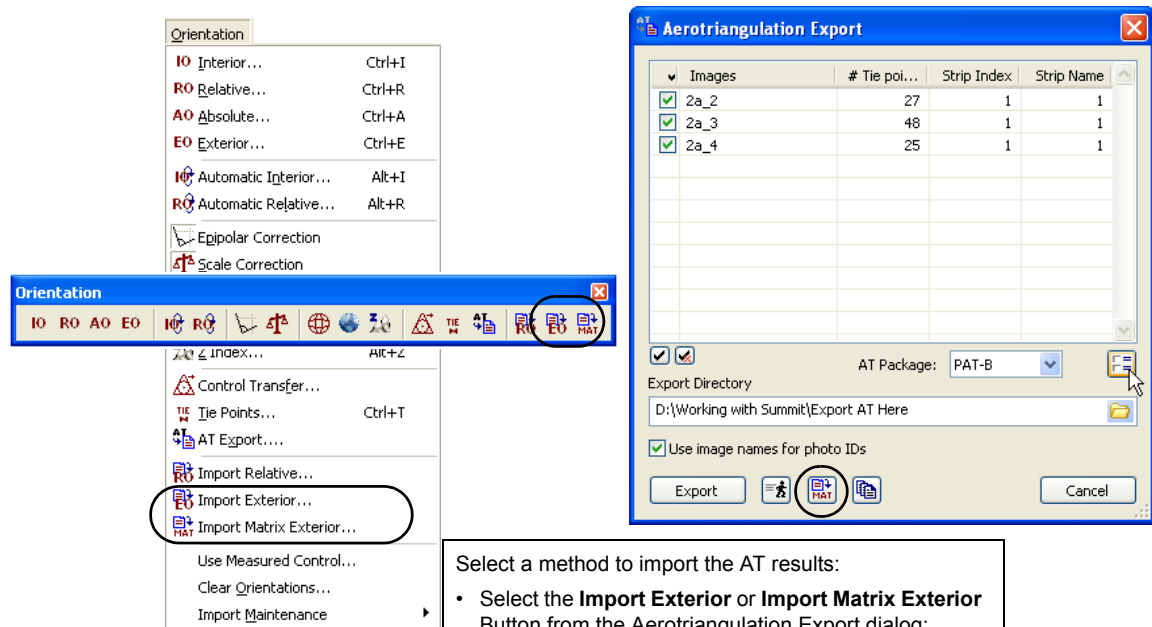
The Exterior Import Wizard is activated when importing the results of a third-party aerotriangulation (AT) software. Some formats are already built in and recognized by the Exterior Import Wizard. These formats are called the “known” formats, such as Applanix, Aerosys, BLUH, and any formats that the user has previously specified. If the file format is not already built in and has not been previously specified, it is an “unknown” format, and the user can define the format using the Exterior Import Wizard.

- To import a known or previously specified format file, see page F-1 below.
- To import an unknown format file, see page F-5 below.

### Import a Known-Format AT File

To import the results of aerotriangulation from a known or previously specified format, perform the following steps:

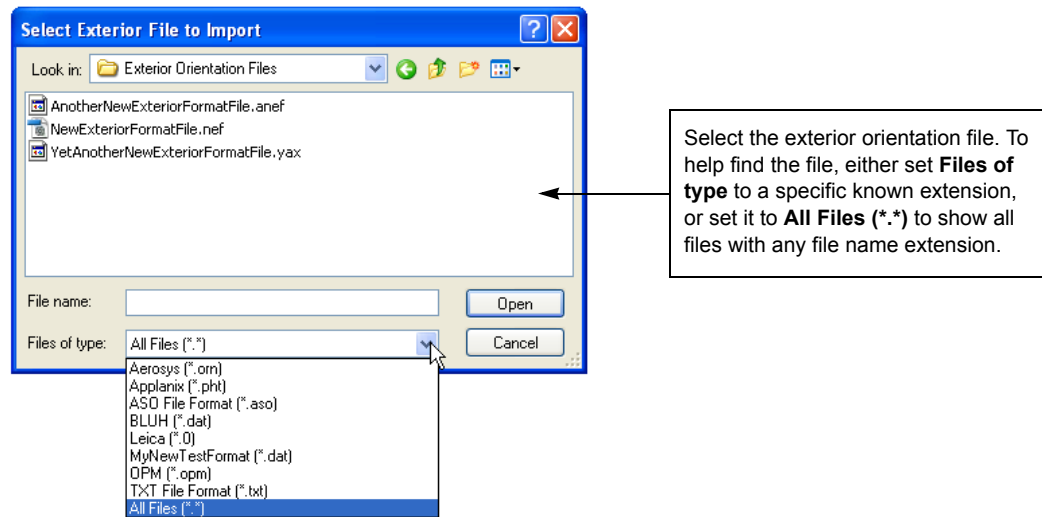
- Step 1)** If the Aerotriangulation Export box is active, select the **Import Exterior** or **Import Matrix Exterior** button. Otherwise, select the **Import Exterior** or **Import Matrix Exterior** from the **Orientation** toolbar or pull-down menu.



Select a method to import the AT results:

- Select the **Import Exterior** or **Import Matrix Exterior** Button from the Aerotriangulation Export dialog;
- For Bingo, PAT-B, or Socet Set matrix files, select the **Import Matrix Exterior** button. For all other formats, select the **Import Exterior** button.
- Or, select **Import Exterior** or **Import Matrix Exterior** from the **Orientation** toolbar or pull-down menu.

**Step 2)** Choose an exterior orientation file of either a known or previously defined format.

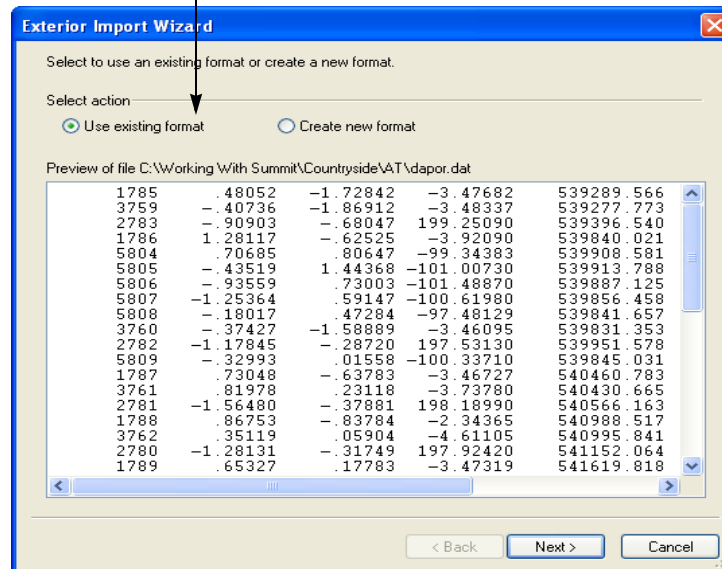


**Step 3)** The Exterior Import Wizard checks the file extension, such as **.opm** or **.dat**, against the list of formats that are already known. If it matches a known format extension, the **Use existing format** option is automatically selected.

| Question about known formats                                                                                                                                                                                                             | Answer                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>What if the file extension is different than most files of this type, but I know the file format is a commonly known format?</p> <p>In other words, <b>Create new format</b> is selected, but I know this file is a known format.</p> | <p>Select <b>Use existing format</b>. You will be able to choose the format you want even if the file extensions don't match.</p>                                                                                                                          |
| <p><b>Create new format</b> is selected, but I'm sure I specified this format while using a previous version of SUMMIT EVOLUTION.</p>                                                                                                    | <p>The first few versions of the Exterior Import Wizard stored the user-specified settings in the registry where they would be overwritten by software updates. From now on, they will not be overwritten. Go to page F-5 to specify the format again.</p> |
| <p><b>Use existing format</b> is selected because someone already saved a format definition for this file type. However, I know from previous experience that the definition is incorrect.</p>                                           | <p>Cancel the Exterior Import Wizard. Delete the incorrect file definition using <b>Exterior Import Maintenance</b> shown on page F-10. Then go to page F-5 to specify a new, correct format for this file type.</p>                                       |

**Step 4)** Select **Use existing format** and then select the **Next** button.

- If the aerotriangulation results file is in a known format such as Aerosys, PAT-B, Bingo, Albany, or a previously specified format, then turn on **Use existing format**.
- To specify a new format, see page F-5.

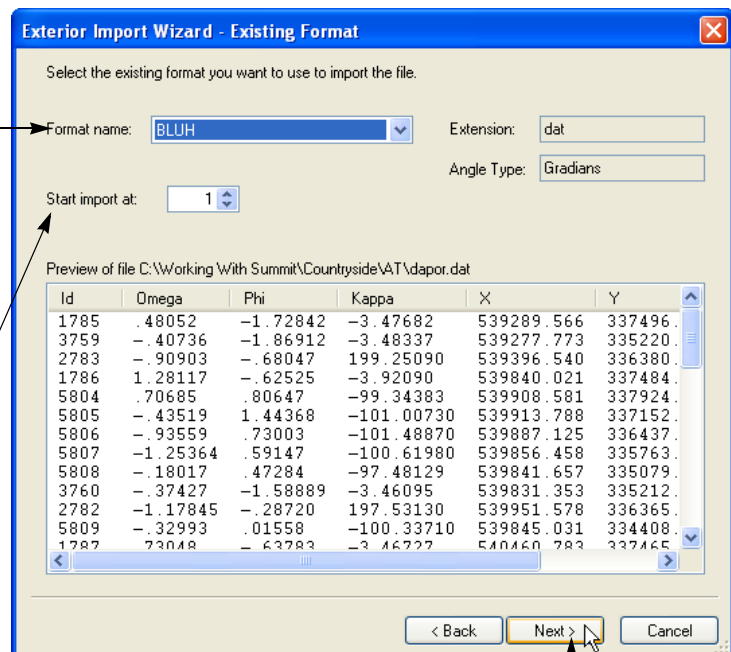


**Step 5)** The software will try to match the file extension to a known format definition and automatically set the format name. For cases where the file extension does not match the format definition, select a format name. Then select a starting record, which is the first line in the file that contains exterior orientation data.

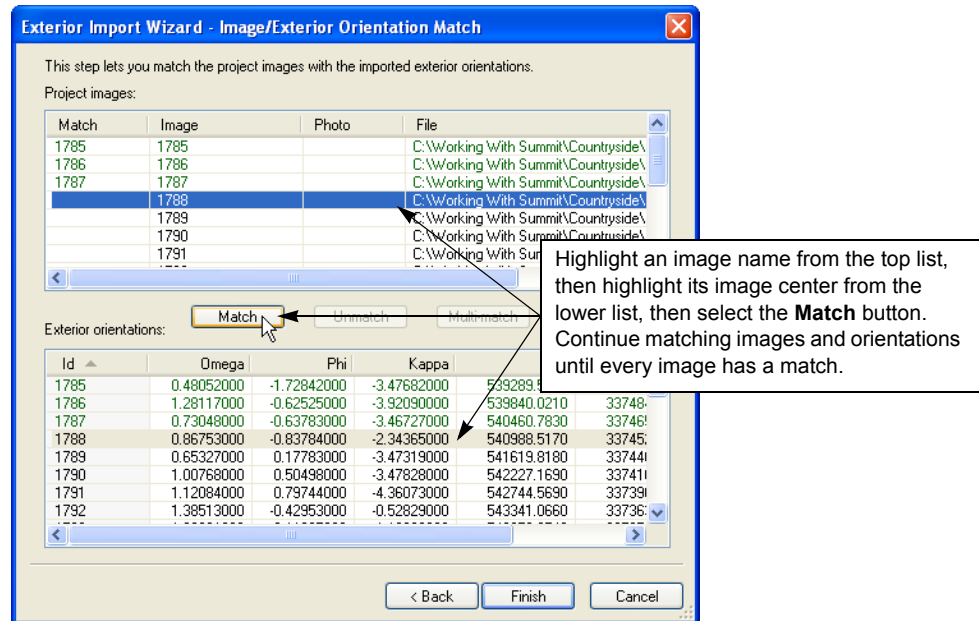
If it has not been automatically selected, select a format. If the format is not listed, go to page F-5.

**Note:** To rename or delete any of the custom formats, see "Exterior Import Maintenance" on page F-10.

Select a starting import record, especially if additional lines that do not contain exterior orientation data have been added to the top of the file.

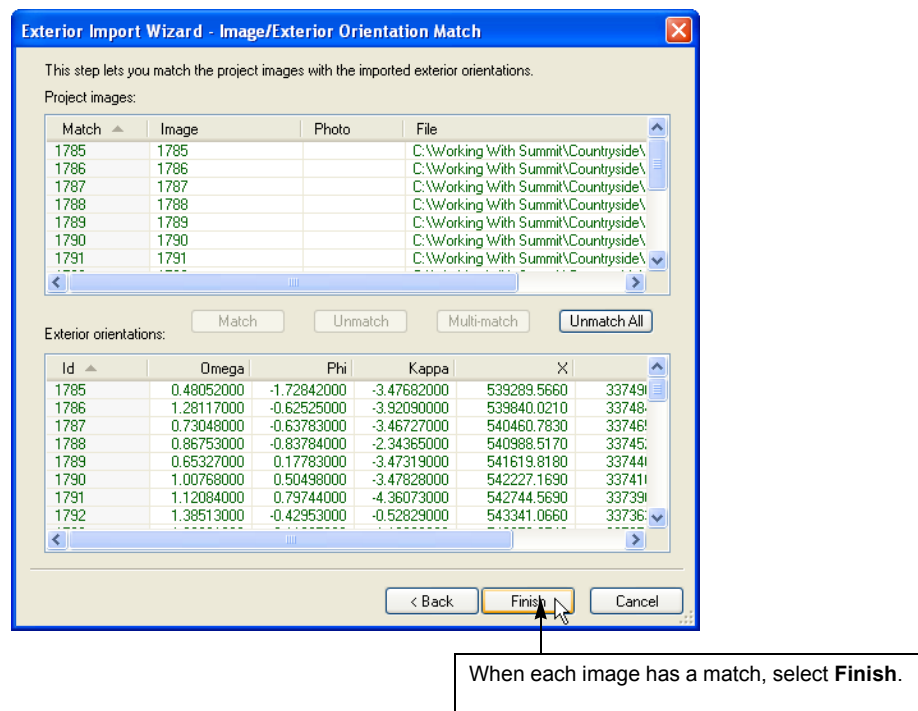


- Step 6)** A box appears showing a list of exterior orientations available and a list of the images. If the AT file contained image names associated with the exterior orientations, then the orientations and images will be matched. Otherwise, the user must match them. To match images and orientations, highlight an image name from the top list, then highlight its image center from the lower list, then select the **Match** button. Continue matching images and orientations until every image has a match.



- Step 7)** If an image and orientation are mistakenly matched, simply select them again and select **Unmatch**.

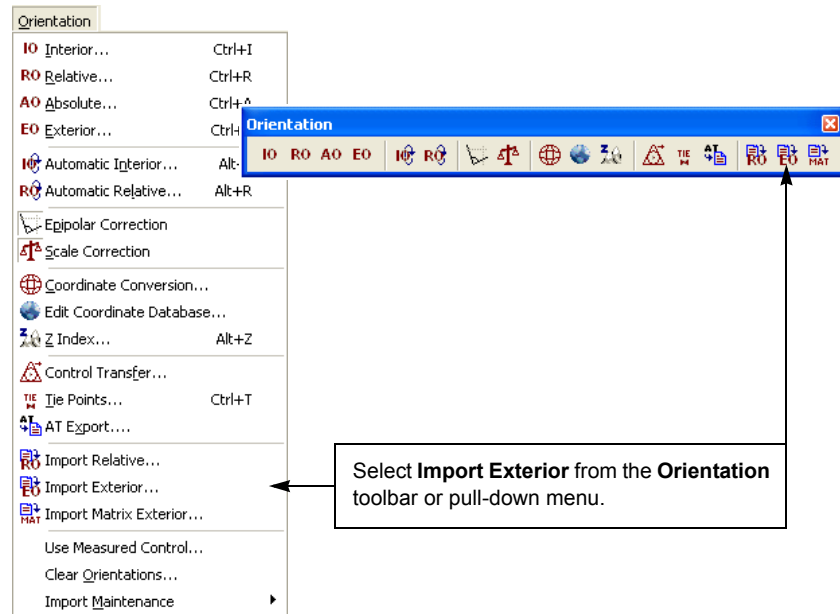
- Step 8)** When all the images have a match, select **Finish**.



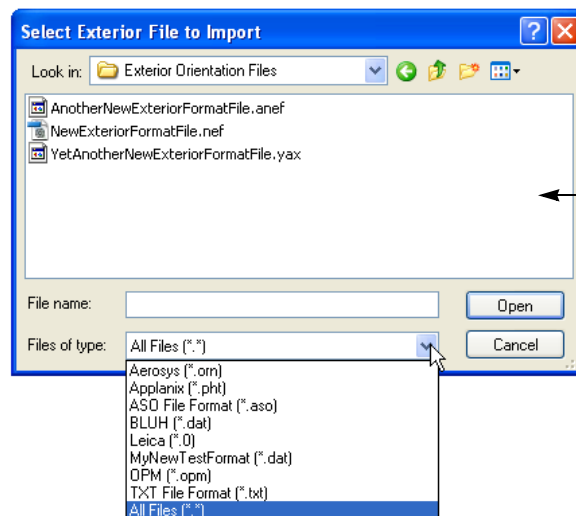
## Import an Unknown-Format AT File

To import exterior orientation file of a format that SUMMIT EVOLUTION doesn't recognize, perform the following:

**Step 1)** Select **Import Exterior** from the **Orientation** toolbar or pull-down menu.



**Step 2)** Set the **Files of type** filter to **All Files (\*.\*)** so that it will display files with any file extension. Choose the exterior orientation file.

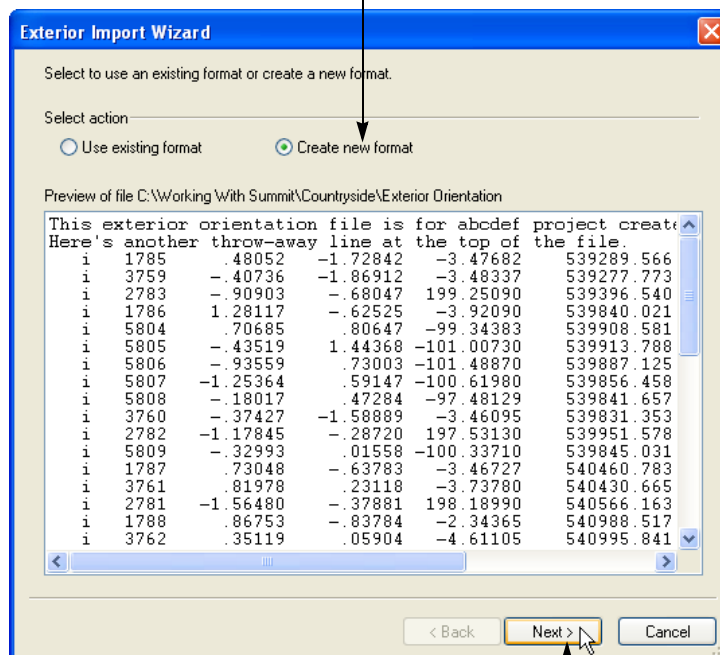


**Step 3)** The Exterior Import Wizard checks the file extension, such as **.txt** or **.dat**, against the list of formats that are already known. If it does not match a known format extension, the **Create new format** option is automatically selected.

| Question about known formats                                                                                    | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Use existing format</b> is selected, but I know this file is not known and hasn't been previously specified. | The extension of your file happens to match a definition that already exists, but you do not need to use that format. Select <b>Create new format</b> . You can specify multiple formats that use the same file extension. Later, when you use your new format from the <b>Use existing format</b> option, be sure to set the correct format name (it will be automatically set to the first definition it finds that has that file extension). |

**Step 4)** Select the **Next** button.

- If the exterior file is an unknown format, select **Create new format**.
- To import a known format, see page F-1.



Select Next.



**Step 5)** Specify the file's format:

- Enter the **Lines per record**. Most files have one line per record, but some file formats may have two or more lines for each image. For example, if the image name and coordinate are on one line and the angle values are on the next line, then there are two lines per record.
- Select a comment indicator. For example, if comments in the file are always started with a semi-colon, then enter ; in the **Comment indicators** box.
- Select one or more field delimiters. For example, if each field is separated by a comma and a space, check on both **Comma** and **Space**. If the delimiter is not listed, check on **Other** and enter the character.
- If more than one field delimiter appears between data elements, then check on **Treat consecutive delimiters as one**. For example, if there are two spaces separating X and Y and six spaces separating Y and Z, then there are consecutive delimiters.
- If there are leading delimiters at the beginning of the line, then check on **Skip over initial delimiters**. For example, if five spaces appear at the beginning of each line, then there are initial delimiters.
- Select an angle type.
- Set **Start import at record** to the first line that contains exterior orientation data.

The screenshot shows the 'Exterior Import Wizard - New Format Step 1' dialog box. The 'Lines per record' is set to 1. The 'Field delimiter' section has 'Space' checked. The 'Comment indicators' field contains '#'. The 'Angle Type' is set to 'Gradians'. The 'Start import at' is set to 3. The 'Data preview' shows a list of data points with blue field lines separating the fields. The 'Left Handed' checkbox is checked. The 'Next >' button is highlighted.

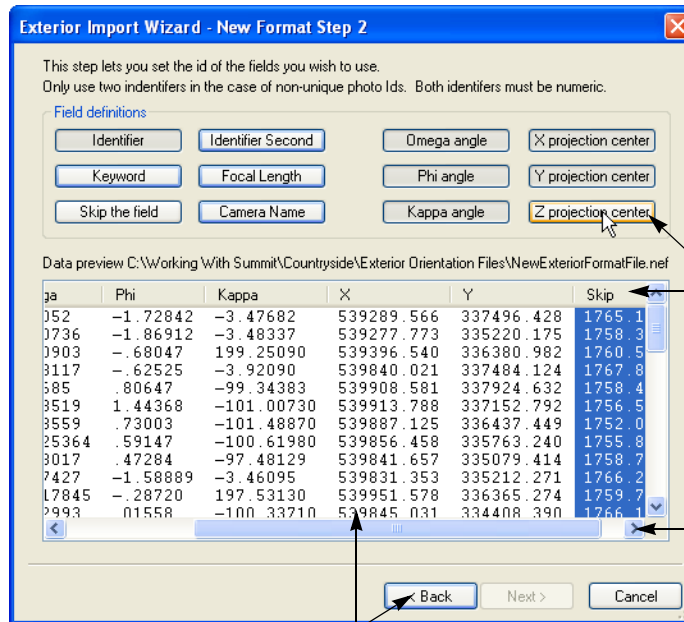
In this example, set **Start import at** to 3 to ignore the first two lines of text.

As the format components are selected, the selections will be reflected in the preview list. The line indicated by the **Start import at** setting appears first and fields appear separated by blue field lines.

**Left Handed** was added by request of a customer who wanted to import a third-party KLT Atlas EO .dat file format, which used a left-handed method for the omega, phi, and kappa values. All other formats that DAT/EM is aware of are right handed and will need this setting OFF.

When the settings are correct, select **Next**.

- Step 6)** Now identify each field component. Click the mouse pointer on a column header (such as **Skip**, **Id** or **Y**), then select a definition from the **Field definitions** list. The header will update to show the definition name. Continue selecting headers and matching them to definitions. Be sure to scroll all the way to the right if some of the columns are off the edge of the view.



Click a column header to highlight the column. Choose a matching definition button for the column. Repeat for each column until all columns have been identified.

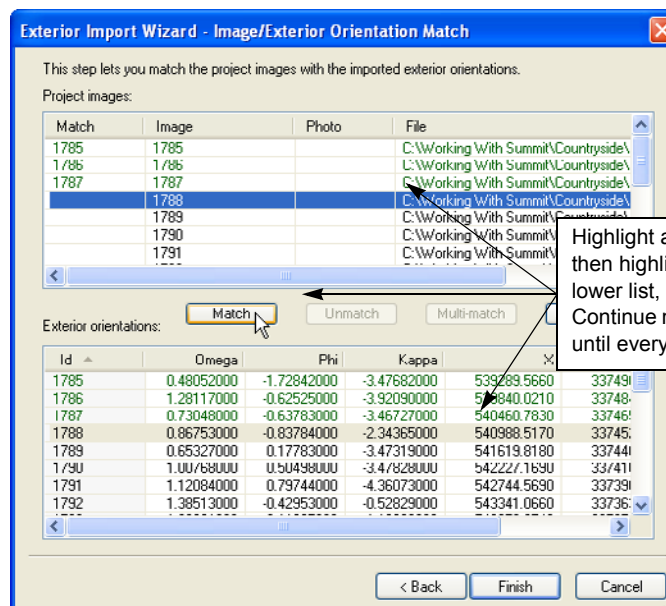
- The definitions that have been used will turn a light gray color.
- Choose **Skip the field** for any field that should be ignored.
- The **Next** button will not be available until the six required definitions have been used. These are omega, phi, kappa, and the X, Y, and Z projection centers.

Be sure to scroll to the right to view and identify all the fields.

If the fields do not appear correctly separated into columns, select **Back** and fix the field delimiters.

- Step 7)** When all the columns have been identified, select **Next**.

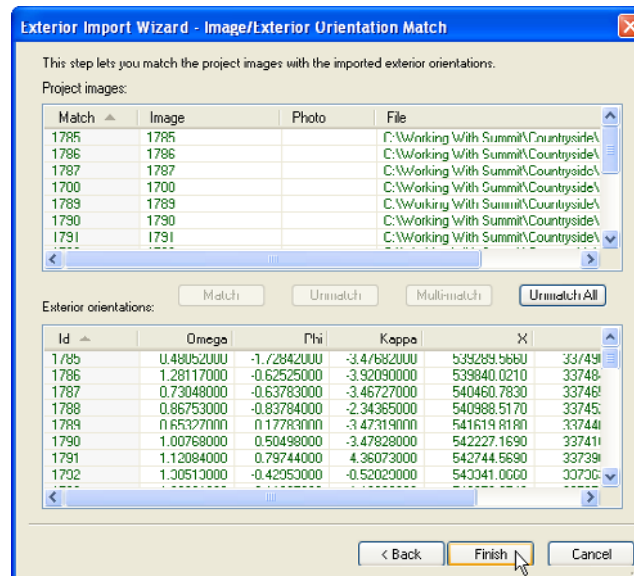
- Step 8)** A box appears showing a list of exterior orientations available and a list of the images. If the AT file contained image names associated with the exterior orientations, then the orientations and images will be matched. Otherwise, the user must match them. To match images and orientations, highlight an image name from the top list, then highlight its image center from the lower list, then select the **Match** button. Continue matching images and orientations until every image has a match.



Highlight an image name from the top list, then highlight its image center from the lower list, then select the **Match** button. Continue matching images and orientations until every image has a match.

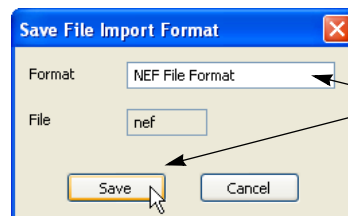
**Step 9)** If an image and orientation are mistakenly matched, simply select them again and select **Unmatch**.

**Step 10)** When all the images have a match, select **Finish**.



When each image has a match, select **Finish**.

**Step 11)** Enter a name for the newly defined format, then select **Save**:



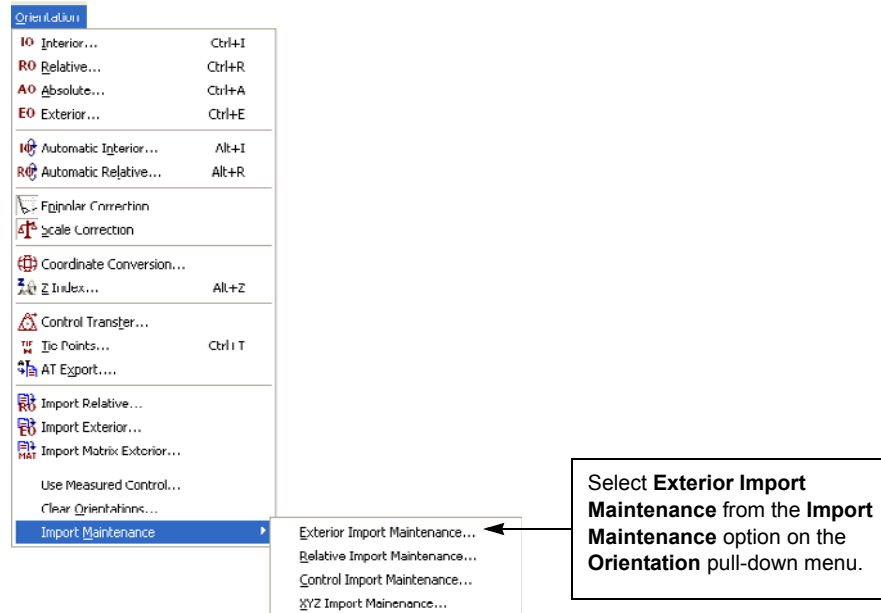
Enter a name for the newly defined format, then select **Save**.

**Step 12)** To rename the format or to delete it later, see “Exterior Import Maintenance” below.

## Exterior Import Maintenance

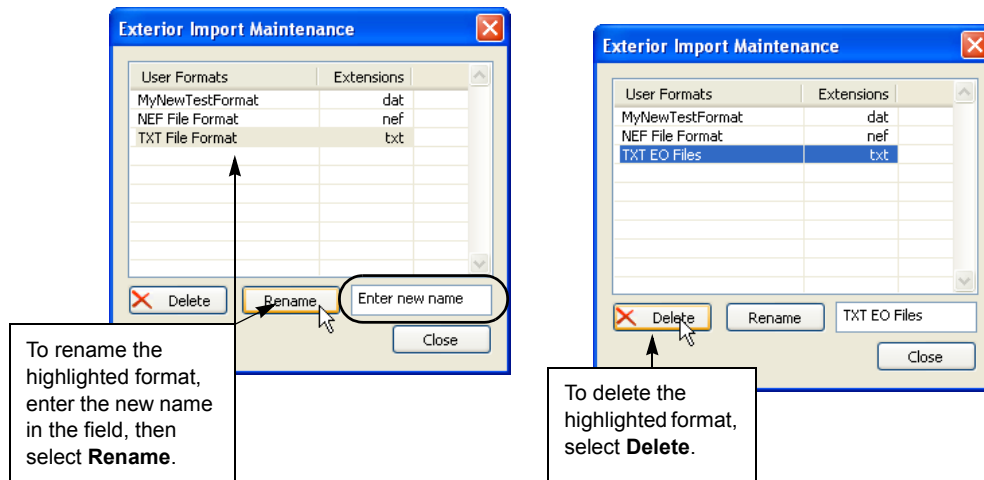
To delete or rename formats that have been created previously with the Exterior Import Wizard, perform the following steps:

- Step 1)** Select **Exterior Import Maintenance** from the **Import Maintenance** option on the **Orientation** pull-down menu. Formats that were saved previously with the Exterior Import Wizard are listed.



- Step 2)** To rename any of the listed formats, click on the line, enter the new name, and select **Rename**.

- Step 3)** To delete a format, click on the line to highlight it, then select the **Delete** button:



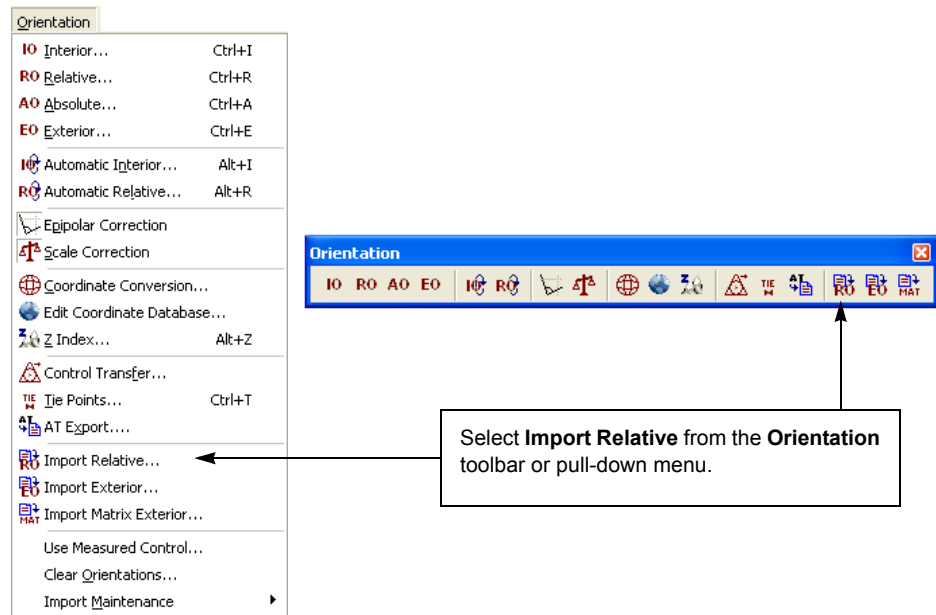
- Step 4)** When finished, select the **Close** button. The next time the Exterior Import Wizard is started, the list of formats will reflect the changes made in the Exterior Import Maintenance dialog box.

## Appendix G. Relative Import Wizard

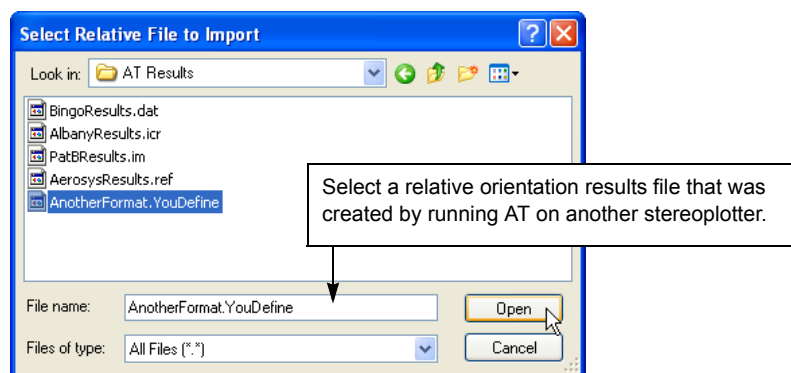
The Relative Import Wizard is activated when importing the relative orientation results of a third-party aerotriangulation (AT) software that was run on another workstation. Do not import relative orientation if AT was run on SUMMIT EVOLUTION's local computer; instead, go on to import exterior orientation (page 21-4).

The relative orientation file must be available for SUMMIT EVOLUTION to read.

- Step 1)** For steps leading up to the activation of the Relative Import Wizard, see "Relative Orientation: Import Relative Method" on page 19-34. The Relative Import Wizard is activated by selecting **Import Relative** from the **Orientation** toolbar or pull-down menu.



- Step 2)** Select the relative orientation results file that was created by a third-party aerotriangulation (AT) software on another workstation.



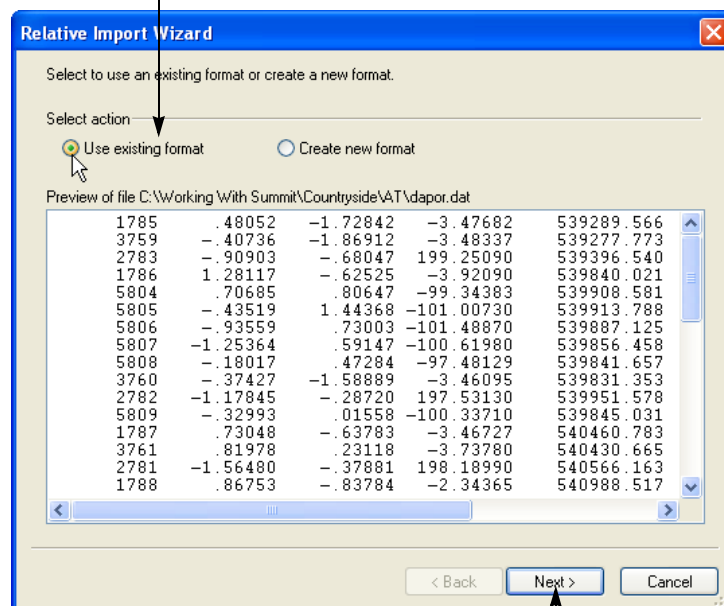
- Step 3)** The Relative Import Wizard appears. This utility helps import both known- and unknown-format AT results. To import a known or previously specified format file, see page G-2 below. To import an unknown format file, see page G-4 below.

| Question about known formats                                                                                                                                                                                                      | Answer                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| What if the file extension is different than most files of this type, but I know the file format is a commonly known format?<br><br>In other words, <b>Create new format</b> is selected, but I know this file is a known format. | Select <b>Use existing format</b> . You will be able to choose the format you want even if the file extensions don't match.                                                                                                                         |
| <b>Create new format</b> is selected, but I'm sure I specified this format while using a previous version of SUMMIT EVOLUTION.                                                                                                    | The first few versions of the Relative Import Wizard stored the user-specified settings in the registry where they would be overwritten by software updates. From now on, they will not be overwritten. Go to page G-4 to specify the format again. |
| <b>Use existing format</b> is selected because someone already saved a format definition for this file type. However, I know from previous experience that the definition is incorrect.                                           | Cancel the Relative Import Wizard. Delete the incorrect file definition using <b>Relative Import Maintenance</b> shown on page G-7. Then go to page G-4 to specify a new, correct format for this file type.                                        |

## Import a Known-Format Relative Orientation File

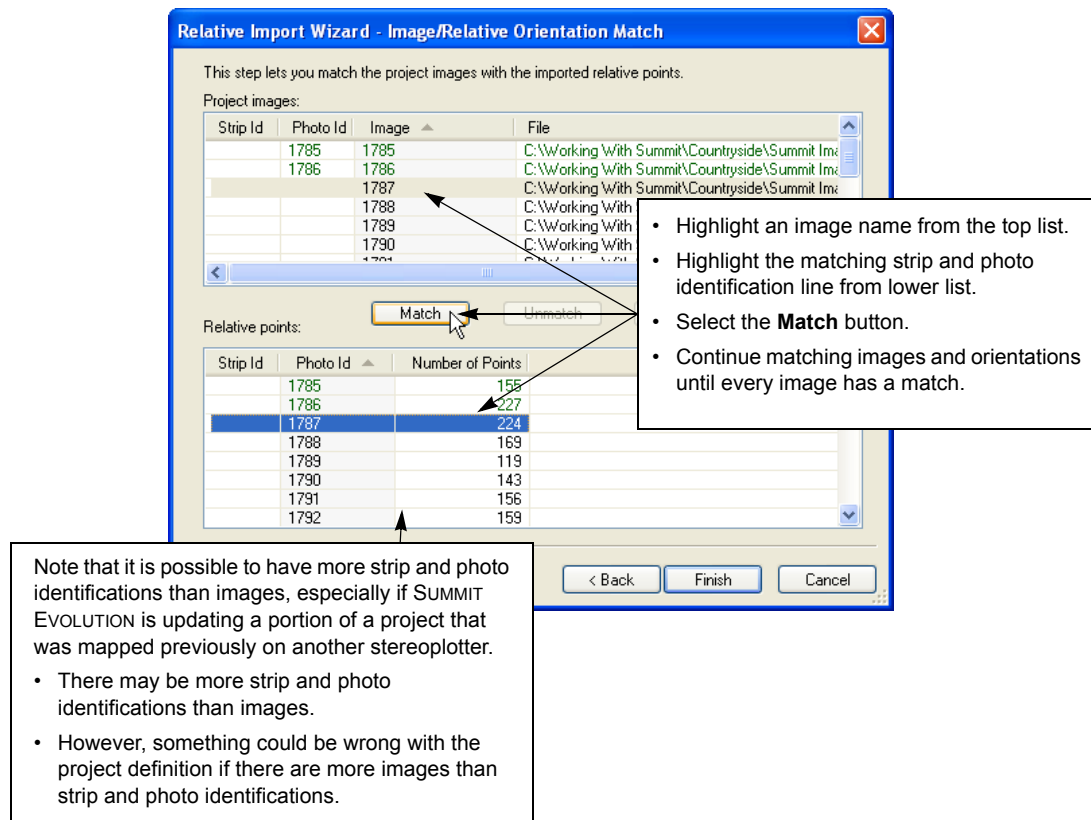
**Step 1)** If the file extension (such as “.icr” or “.im”) indicates a known format, the Relative Import Wizard automatically selects **Use existing format**.

- If the file extension indicates a known format, **Use existing format** is automatically selected.
- To specify a new format instead, see page G-4.



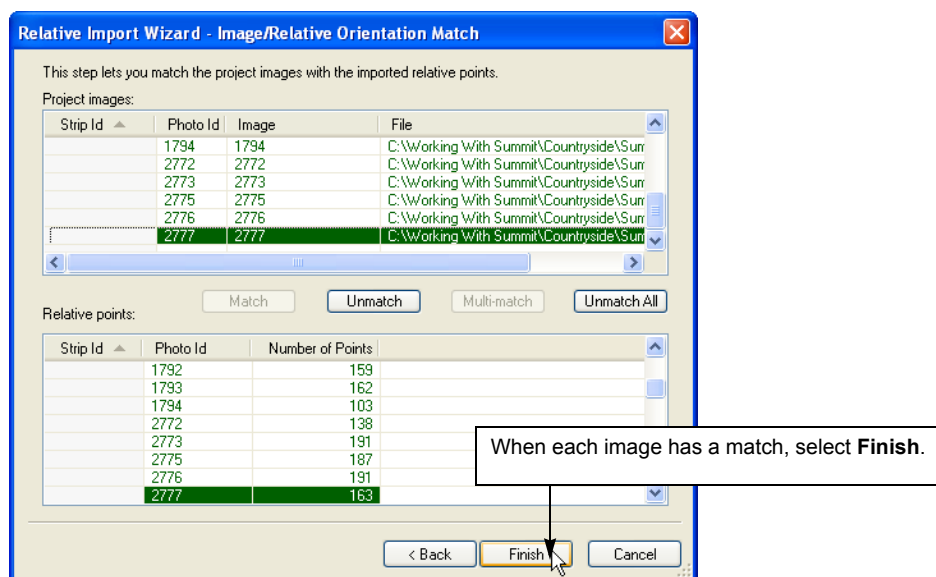
Select Next.

**Step 2)** A box appears showing a list of relative orientations available and a list of the images. Match image names to the relative orientation's strip and photo identifications. Highlight an image name from the top list, then highlight its matching strip and photo identification from the lower list, then select the **Match** button. Continue matching images and orientations until every image has a match.



**Step 3)** If an image and photo identification are mistakenly matched, reselect them and select **Unmatch**.

**Step 4)** When all the images have a match, select **Finish**.



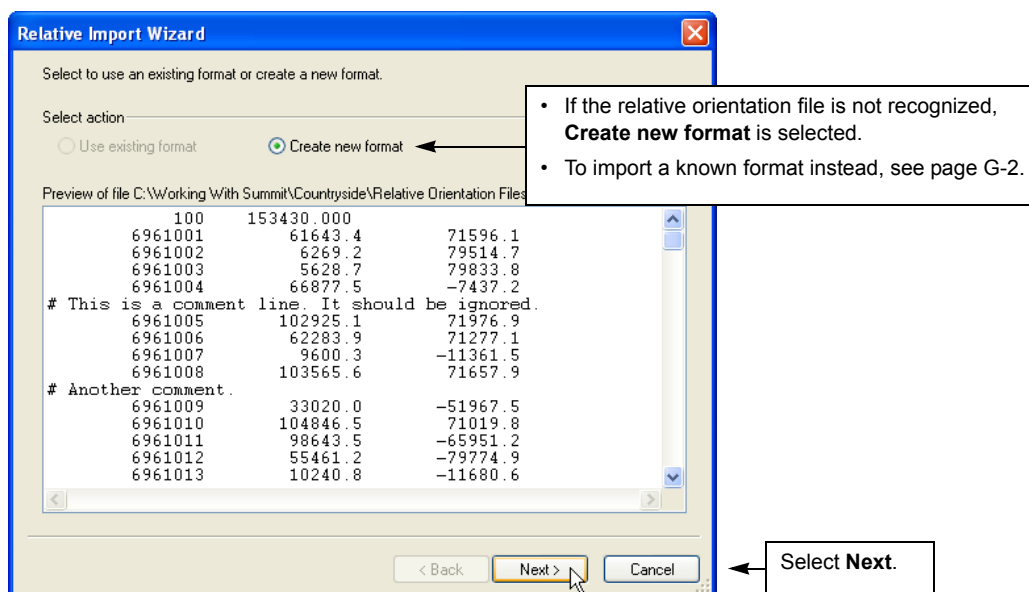
**Step 5)** Go on to import exterior orientation (*Chapter 21*).

## Import an Unknown-Format AT File

- Step 1)** If the file extension is not a known format, the Relative Import Wizard automatically selects **Create new format**.

| Question about formats                                                                                          | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Use existing format</b> is selected, but I know this file is not known and hasn't been previously specified. | The extension of your file happens to match a definition that already exists, but you do not need to use that format. Select <b>Create new format</b> . You can specify multiple formats that use the same file extension. Later, when you use your new format from the <b>Use existing format</b> option, be sure to set the correct format name (it will be automatically set to the first definition it finds that has that file extension). |

- Step 2)** Select the **Next** button.





**Step 3)** Specify the file's format. The goal is to ignore non-data lines and to have vertical blue lines separate the major data fields.

- Select a field delimiter. For example, if the fields in the file are separated by a combination of spaces and commas, check on **Space** and **Comma**. If the delimiter is not listed, check on **Other** and enter the field separator character.
- If more than one field delimiter appears between data elements, then check on **Treat consecutive delimiters as one**. For example, if there are two spaces separating the strip number and the photo number and six spaces separating X and Y, then there are consecutive delimiters.
- If there are leading delimiters at the start of the line, then check on **Skip over initial delimiters**. For example, if five spaces appear at the start of each line, then there are initial delimiters.
- Select a comment indicator. For example, if comments in the file are always started with a semi-colon, then enter ; in the **Comment indicators** box.
- Set **Units** to the image measurement units, either millimeters or micrometers.
- Set **Start import at record** to the first line that contains relative orientation data.
- Set **End Photo Record** to the character flag that marks the end of a photo's relative points list. In the same file below, "-1" appeared between photos.

**Relative Import Wizard - New Format Step 1**

This step lets you set the delimiters, comment indicators and units your data contains. You can see how your data is affected in the preview below.

**Field delimiter**

☒ Space ☐ Tab ☐ Comma ☒ Treat consecutive delimiters as one  
☐ Semicolon ☐ Colon ☐ Other:  ☒ Skip over initial delimiters

Comment indicators: # Units: Millimeters Start import at record: 1  
 End Photo Record: -99

Data preview C:\Working With Summit\Countryside\Relative Orientation Files\NewROFormat.nrf

|                                                 |          |          |
|-------------------------------------------------|----------|----------|
| 6961001                                         | 61643.4  | 71596.1  |
| 6961002                                         | 6269.2   | 79514.7  |
| 6961003                                         | 5628.7   | 79833.8  |
| 6961004                                         | 66877.5  | -7437.2  |
| # This is a comment line. It should be ignored. |          |          |
| 6961005                                         | 102925.1 | 71976.9  |
| 6961006                                         | 62283.9  | 71277.1  |
| 6961007                                         | 9600.3   | -11361.5 |
| 6961008                                         | 103565.6 | 71657.9  |

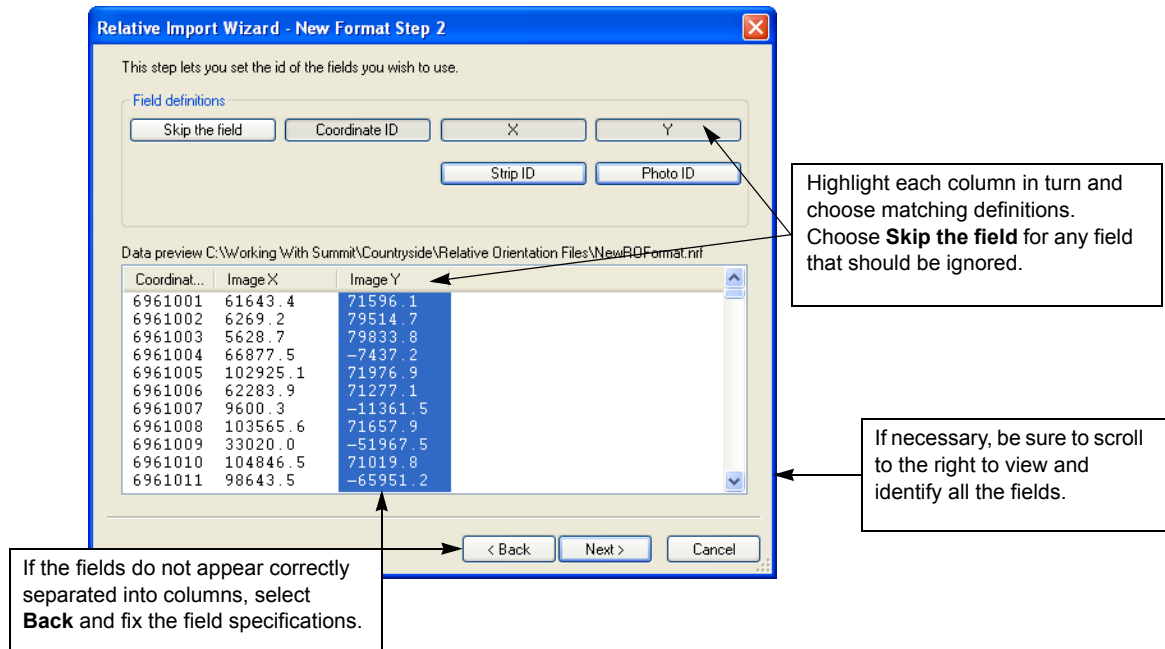
< Back Next > Cancel

As the format components are selected, the selections will be reflected in the preview list. The starting import record appears first, fields appear separated by blue field lines, and comments appear to straddle the field lines.

Note that once field delimiters are checked on, this preview window displays only the first 100 lines of text found in the file. This simply saves display time; it does not affect the file.

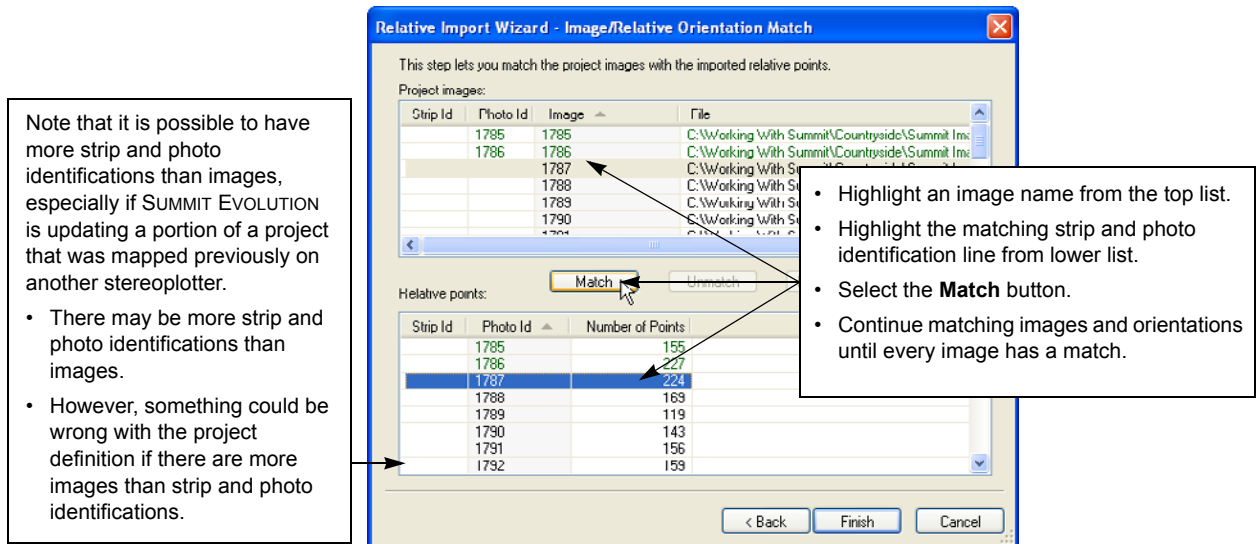
When the settings are correct, select **Next**.

**Step 4)** Now identify each field component. Click the mouse pointer on a column header (they all say **Skip** at first), then select a definition from the **Field definitions** list. The header will update to show the definition name. Continue selecting headers and matching them to definitions. Be sure to scroll all the way to the right if some of the columns are off the edge of the view.



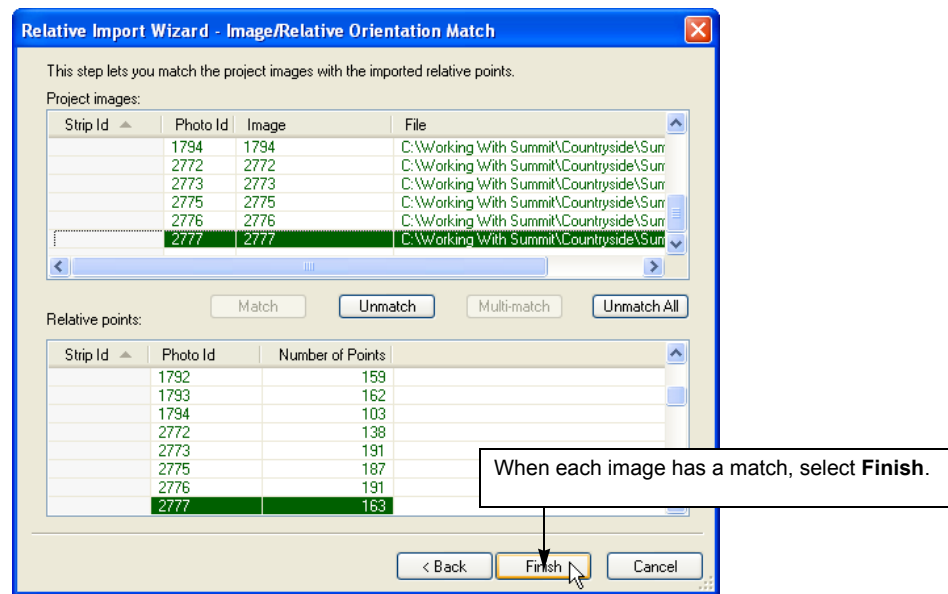
**Step 5)** When all the columns have been identified, select **Next**.

**Step 6)** A box appears showing a list of relative orientations available and a list of the images. The user must match image names to the relative orientation's strip and photo identifications. Highlight an image name from the top list, then highlight its matching strip and photo identification from the lower list, then select the **Match** button. Continue matching images and orientations until every image has a match.



**Step 7)** If an image and photo identification are mistakenly matched, select them again and click **Unmatch**.

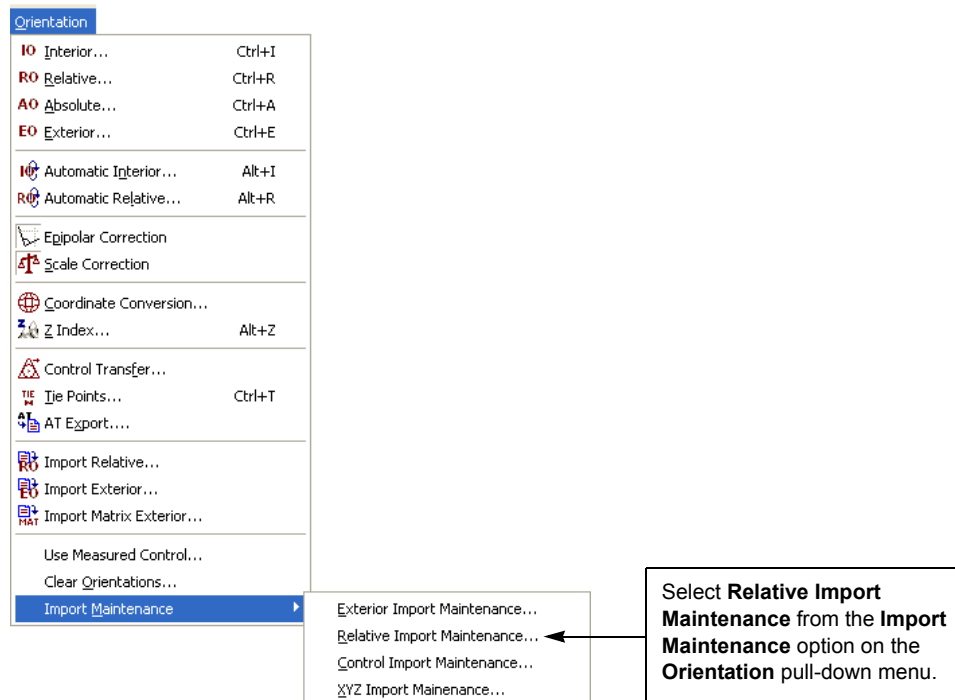
**Step 8)** When all the images have a match, select **Finish**.



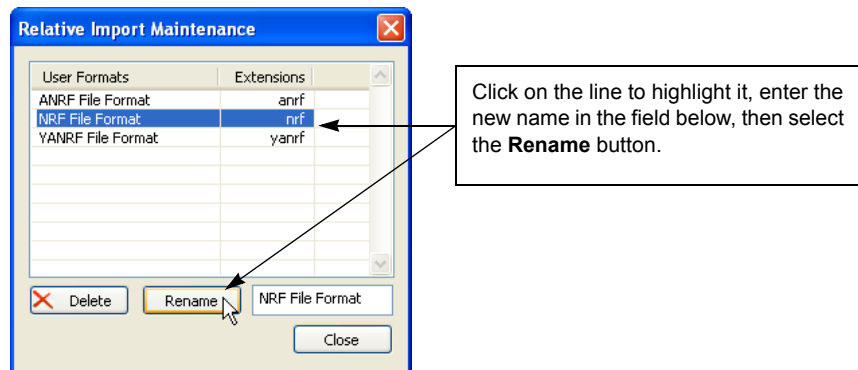
## Relative Import Maintenance

To delete or rename formats that have been created previously with the Relative Import Wizard, perform the following steps:

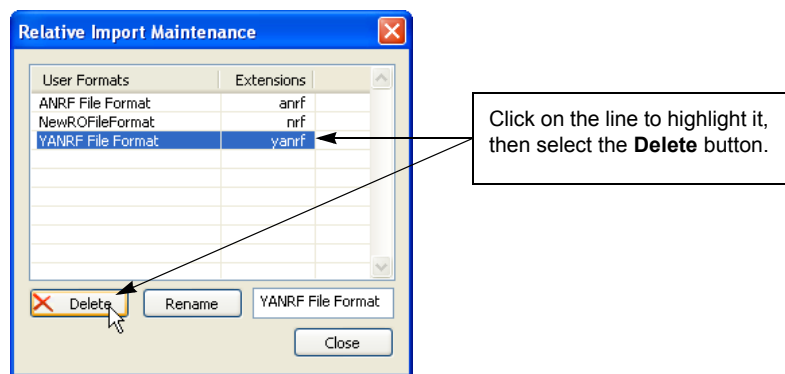
**Step 1)** Select **Relative Import Maintenance** from the **Import Maintenance** option on the **Orientation** pull-down menu. Formats that were saved previously with the Relative Import Wizard are listed.



**Step 2)** To rename any of the listed formats, click on the line, enter the new name, and select **Rename**:



**Step 3)** To delete a format, click on the line to highlight it, then select the **Delete** button:



**Step 4)** When finished, select the **Close** button. The next time the Relative Import Wizard is started, the list of formats will reflect the changes made in the Relative Import Maintenance dialog box.

## Appendix H. Scanning Conversion Charts

The following charts show some common scanning conversions.

### Digital Scanning Conversion Chart in Meters

| Digital Scanning Conversion Chart -- Meters |                             |        |        |        |        |        |        |        |        |        |        |        |
|---------------------------------------------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Microns <sup>a</sup>                        | 7                           | 8      | 9      | 10     | 12     | 14     | 16     | 20     | 21     | 24     | 28     | 32     |
| DPI <sup>b</sup>                            | 3629                        | 3175   | 2822   | 2540   | 2117   | 1814   | 1588   | 1270   | 1210   | 1058   | 907    | 794    |
| Grayscale<br>File Size Mb <sup>c</sup>      | 1126                        | 862    | 681    | 552    | 383    | 281    | 215    | 138    | 125    | 96     | 70     | 54     |
| Color<br>File Size Mb                       | 3377                        | 2586   | 2043   | 1655   | 1149   | 844    | 646    | 414    | 375    | 287    | 211    | 162    |
| Photo Scale                                 | Ground Resolution In Meters |        |        |        |        |        |        |        |        |        |        |        |
| 1:1200                                      | 0.0084                      | 0.0096 | 0.0108 | 0.0120 | 0.0144 | 0.0168 | 0.0192 | 0.0240 | 0.0252 | 0.0288 | 0.0336 | 0.0384 |
| 1:2400                                      | 0.0168                      | 0.0192 | 0.0216 | 0.0240 | 0.0288 | 0.0336 | 0.0384 | 0.0480 | 0.0504 | 0.0576 | 0.0672 | 0.0768 |
| 1:3600                                      | 0.0252                      | 0.0288 | 0.0324 | 0.0360 | 0.0432 | 0.0504 | 0.0576 | 0.0720 | 0.0756 | 0.0864 | 0.1008 | 0.1152 |
| 1:4800                                      | 0.0336                      | 0.0384 | 0.0432 | 0.0480 | 0.0576 | 0.0672 | 0.0768 | 0.0960 | 0.1008 | 0.1152 | 0.1344 | 0.1536 |
| 1:5000                                      | 0.0350                      | 0.0400 | 0.0450 | 0.0500 | 0.0600 | 0.0700 | 0.0800 | 0.1000 | 0.1050 | 0.1200 | 0.1400 | 0.1600 |
| 1:6000                                      | 0.0420                      | 0.0480 | 0.0540 | 0.0600 | 0.0720 | 0.0840 | 0.0960 | 0.1200 | 0.1260 | 0.1440 | 0.1680 | 0.1920 |
| 1:7200                                      | 0.0504                      | 0.0576 | 0.0648 | 0.0720 | 0.0864 | 0.1008 | 0.1152 | 0.1440 | 0.1512 | 0.1728 | 0.2016 | 0.2304 |
| 1:8400                                      | 0.0588                      | 0.0672 | 0.0756 | 0.0840 | 0.1008 | 0.1176 | 0.1344 | 0.1680 | 0.1764 | 0.2016 | 0.2352 | 0.2688 |
| 1:9600                                      | 0.0672                      | 0.0768 | 0.0864 | 0.0960 | 0.1152 | 0.1344 | 0.1536 | 0.1920 | 0.2016 | 0.2304 | 0.2688 | 0.3072 |
| 1:10000                                     | 0.0700                      | 0.0800 | 0.0900 | 0.1000 | 0.1200 | 0.1400 | 0.1600 | 0.2000 | 0.2100 | 0.2400 | 0.2800 | 0.3200 |
| 1:12000                                     | 0.0840                      | 0.0960 | 0.1080 | 0.1200 | 0.1440 | 0.1680 | 0.1920 | 0.2400 | 0.2520 | 0.2880 | 0.3360 | 0.3840 |
| 1:14400                                     | 0.1008                      | 0.1152 | 0.1296 | 0.1440 | 0.1728 | 0.2016 | 0.2304 | 0.2880 | 0.3024 | 0.3456 | 0.4032 | 0.4608 |
| 1:18000                                     | 0.1260                      | 0.1440 | 0.1620 | 0.1800 | 0.2160 | 0.2520 | 0.2880 | 0.3600 | 0.3780 | 0.4320 | 0.5040 | 0.5760 |
| 1:20000                                     | 0.1400                      | 0.1600 | 0.1800 | 0.2000 | 0.2400 | 0.2800 | 0.3200 | 0.4000 | 0.4200 | 0.4800 | 0.5600 | 0.6400 |
| 1:24000                                     | 0.1680                      | 0.1920 | 0.2160 | 0.2400 | 0.2880 | 0.3360 | 0.3840 | 0.4800 | 0.5040 | 0.5760 | 0.6720 | 0.7680 |
| 1:30000                                     | 0.2100                      | 0.2400 | 0.2700 | 0.3000 | 0.3600 | 0.4200 | 0.4800 | 0.6000 | 0.6300 | 0.7200 | 0.8400 | 0.9600 |
| 1:36000                                     | 0.2520                      | 0.2880 | 0.3240 | 0.3600 | 0.4320 | 0.5040 | 0.5760 | 0.7200 | 0.7560 | 0.8640 | 1.0080 | 1.1520 |

a. 1 micron = 0.000001 meter

b. DPI = Dots Per Inch

c. Mb = Megabytes

## Digital Scanning Conversion Chart in Feet

| Digital Scanning Conversion Chart -- Feet |                           |        |        |        |        |        |        |        |        |        |        |        |
|-------------------------------------------|---------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Microns <sup>a</sup>                      | 7                         | 8      | 9      | 10     | 12     | 14     | 16     | 20     | 21     | 24     | 28     | 32     |
| DPI <sup>b</sup>                          | 3629                      | 3175   | 2822   | 2540   | 2117   | 1814   | 1588   | 1270   | 1210   | 1058   | 907    | 794    |
| Grayscale<br>File Size Mb <sup>c</sup>    | 1126                      | 862    | 681    | 552    | 383    | 281    | 215    | 138    | 125    | 96     | 70     | 54     |
| Color<br>File Size Mb                     | 3377                      | 2586   | 2043   | 1655   | 1149   | 844    | 646    | 414    | 375    | 287    | 211    | 162    |
| Photo Scale                               | Ground Resolution In Feet |        |        |        |        |        |        |        |        |        |        |        |
| 1"=100'                                   | 0.0276                    | 0.0315 | 0.0354 | 0.0394 | 0.0472 | 0.0551 | 0.0630 | 0.0787 | 0.0827 | 0.0945 | 0.1102 | 0.1260 |
| 1"=200'                                   | 0.0551                    | 0.0630 | 0.0709 | 0.0787 | 0.0945 | 0.1102 | 0.1260 | 0.1575 | 0.1654 | 0.1890 | 0.2205 | 0.2520 |
| 1"=300'                                   | 0.0827                    | 0.0945 | 0.1063 | 0.1181 | 0.1417 | 0.1654 | 0.1890 | 0.2362 | 0.2480 | 0.2835 | 0.3307 | 0.3780 |
| 1"=400'                                   | 0.1102                    | 0.1260 | 0.1417 | 0.1575 | 0.1890 | 0.2205 | 0.2520 | 0.3150 | 0.3307 | 0.3780 | 0.4409 | 0.5039 |
| 1"=500'                                   | 0.1378                    | 0.1575 | 0.1772 | 0.1969 | 0.2362 | 0.2756 | 0.3150 | 0.3937 | 0.4134 | 0.4724 | 0.5512 | 0.6299 |
| 1"=600'                                   | 0.1654                    | 0.1890 | 0.2126 | 0.2362 | 0.2835 | 0.3307 | 0.3780 | 0.4724 | 0.4961 | 0.5669 | 0.6614 | 0.7559 |
| 1"=700'                                   | 0.1929                    | 0.2205 | 0.2480 | 0.2756 | 0.3307 | 0.3858 | 0.4409 | 0.5512 | 0.5787 | 0.6614 | 0.7717 | 0.8819 |
| 1"=800"                                   | 0.2205                    | 0.2520 | 0.2835 | 0.3150 | 0.3780 | 0.4409 | 0.5039 | 0.6299 | 0.6614 | 0.7559 | 0.8819 | 1.0079 |
| 1"=1000'                                  | 0.2756                    | 0.3150 | 0.3543 | 0.3937 | 0.4724 | 0.5512 | 0.6299 | 0.7874 | 0.8268 | 0.9449 | 1.1024 | 1.2598 |
| 1"=1200'                                  | 0.3307                    | 0.3780 | 0.4252 | 0.4724 | 0.5669 | 0.6614 | 0.7559 | 0.9449 | 0.9921 | 1.1339 | 1.3228 | 1.5118 |
| 1"=1500'                                  | 0.4134                    | 0.4724 | 0.5315 | 0.5906 | 0.7087 | 0.8268 | 0.9449 | 1.1811 | 1.2402 | 1.4173 | 1.6535 | 1.8898 |
| 1"=2000'                                  | 0.5512                    | 0.6299 | 0.7087 | 0.7874 | 0.9449 | 1.1024 | 1.2598 | 1.5748 | 1.6535 | 1.8898 | 2.2047 | 2.5197 |
| 1"=2500'                                  | 0.6890                    | 0.7874 | 0.8858 | 0.9843 | 1.1811 | 1.3780 | 1.5748 | 1.9685 | 2.0669 | 2.3622 | 2.7559 | 3.1496 |
| 1"=3000'                                  | 0.8268                    | 0.9449 | 1.0630 | 1.1811 | 1.4173 | 1.6535 | 1.8898 | 2.3622 | 2.4803 | 2.8346 | 3.3071 | 3.7795 |
| 1"=100'                                   | 0.0276                    | 0.0315 | 0.0354 | 0.0394 | 0.0472 | 0.0551 | 0.0630 | 0.0787 | 0.0827 | 0.0945 | 0.1102 | 0.1260 |
| 1"=200'                                   | 0.0551                    | 0.0630 | 0.0709 | 0.0787 | 0.0945 | 0.1102 | 0.1260 | 0.1575 | 0.1654 | 0.1890 | 0.2205 | 0.2520 |
| 1"=300'                                   | 0.0827                    | 0.0945 | 0.1063 | 0.1181 | 0.1417 | 0.1654 | 0.1890 | 0.2362 | 0.2480 | 0.2835 | 0.3307 | 0.3780 |

a. 1 micron = 0.000001 meter

b. DPI = Dots Per Inch

c. Mb = Megabytes

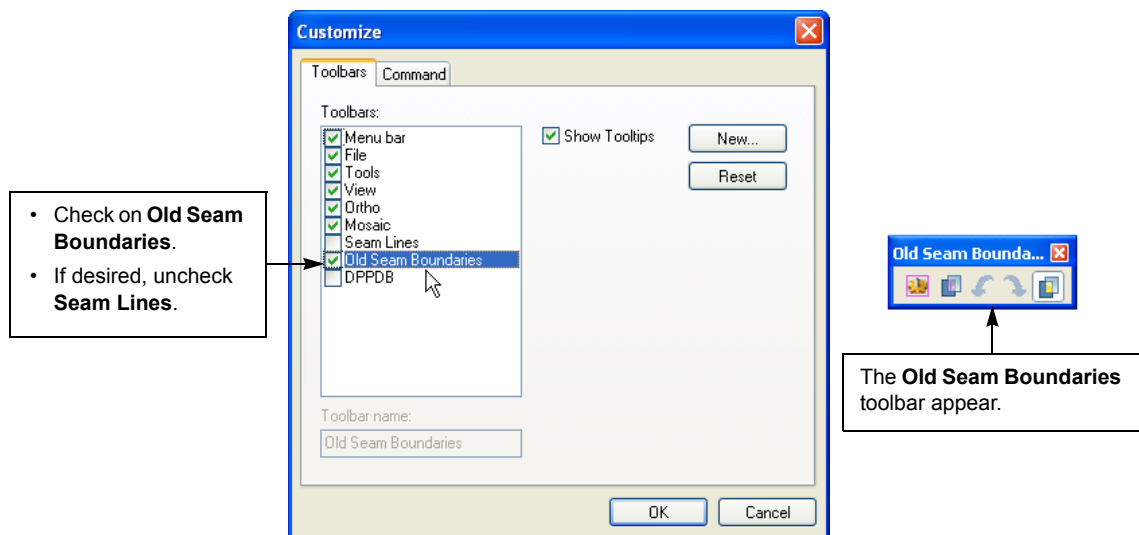
## Appendix I. Old Seam Boundaries Toolbar and Method

In the DAT/EM software version 4.4, a new mosaic seam method was added to the PROJECT VIEWER/ORTHO+MOSAIC, along with a new **Seam Lines** toolbar. It is recommended to use the new method, which is shown in the “Generate and Edit Mosaic Seams” sections starting on page 28-28. The old method was not removed, however, and it may be used if you prefer it.

The extended PROJECT VIEWER/ORTHO+MOSAIC for orthophoto and mosaic generation is provided with SUMMIT EVOLUTION PROFESSIONAL EDITION in some geographic regions. If your PROJECT VIEWER provides the extended version, the dialog will be labeled “Orthophoto and Mosaic” or “Ortho+Mosaic” and will contain additional **Ortho**, **Mosaic**, and **Seam Lines** toolbars. It will also have a toolbar called **Old Seam Boundaries**, which is off by default. The extended version will be called “PROJECT VIEWER/ORTHO+MOSAIC” in the instructions below.

The old seam line method is located on a PROJECT VIEWER/ORTHO+MOSAIC toolbar called **Old Seam Boundaries**, which is off by default. If you would like to use the older method, perform the following steps:

- Step 1)** Select **Customize** from the **Tools** pull-down menu in the PROJECT VIEWER/ORTHO+MOSAIC. Check on **Old Seam Boundaries**. If desired, uncheck **Seam Lines**, which is the toolbar for the newer seam line method.

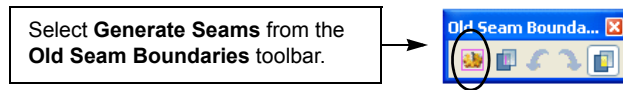


Mosaic seams define the line of transition between adjoining input orthophotos. If feathering is used during mosaic generation, the center of the feathering is along the seams. There are two choices for creating seams:

- **Choice 1:** Generate seams and edit them. Seams may be edited to follow image features such as curved roads or water that are nearby or cut by the generated seams. Editing the seam to run along the image feature repositions the center of feathering, so that pixel blending appears more even along the feature. Use the instructions in this section (below).
- **Choice 2:** Generate seams, but don't view or edit them. This is done later by checking on **Automatically Generate Seams** on the **Auto Adjust** tab on the Generate Mosaic dialog. If you would like to use this option, skip this section and go on to “Remove Hot Spots” on page 28-40.

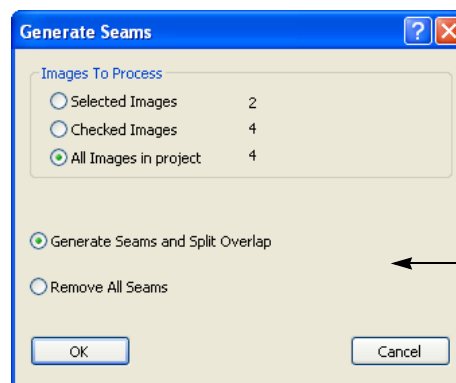
To generate, view, and edit seams, perform the following steps:

**Step 1)** Select **Generate Seams** from the **Old Seam Boundaries** toolbar:



**Step 2)** Choose the images to process, then choose whether to remove existing seams or generate new seams:

- Select **Generate Seams and Split Overlap** to draw the seams through the middle of the overlap between adjoining orthophoto images.
- Select **Remove All Seams** to remove existing seams. This is usually done just before regenerating new seams.

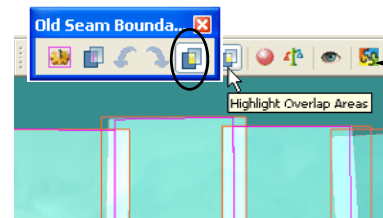


Choose what to do:

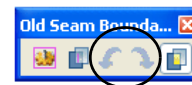
- Select **Generate Seams and Split Overlap** to draw the seams through the middle of the image overlap area.
- Select **Remove All Seams** to delete existing seams.

**Step 3)** Review the automatically generated seams. If desired, edit the seams so that they run along nearby image features such as roads. To edit a seam, perform the following ordered steps:

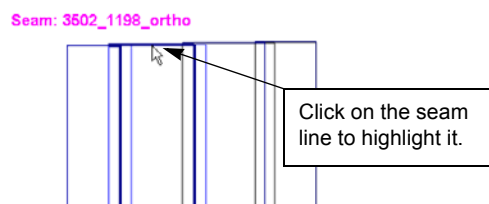
- a.) If desired, toggle **Highlight Overlap Areas** on the **Old Seam Boundaries** toolbar. The orthophotos' overlap areas will be shown in a bright color. This may help to place seam vertices correctly during editing:



- b.) At any time, use the **Undo** and **Redo** icons on the **Old Seam Boundaries** toolbar to undo/redo seam edits:

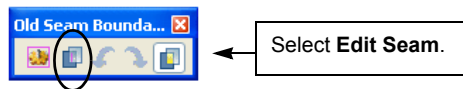


- c.) Click on the seam line to highlight it. Keep in mind that one seam is highlighted, but editing it affects the adjoining seam(s) as well.

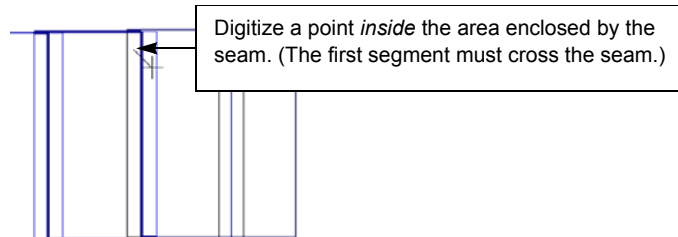




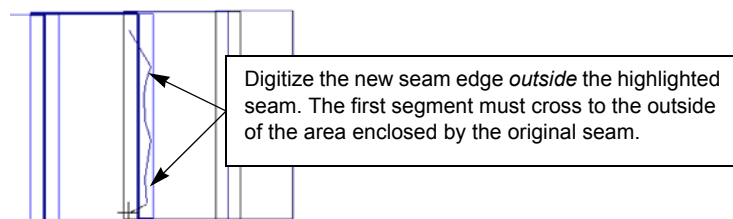
- d.) Select **Edit Seam** from the **Old Seam Boundaries** toolbar.



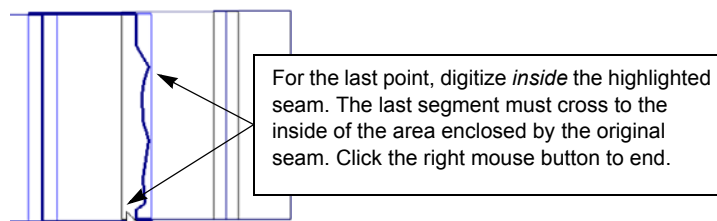
- e.) Digitize a point *inside* the area enclosed by the highlighted seam. This first digitized point will not be part of the seam; its purpose is to start a line segment that can intersect the original seam.



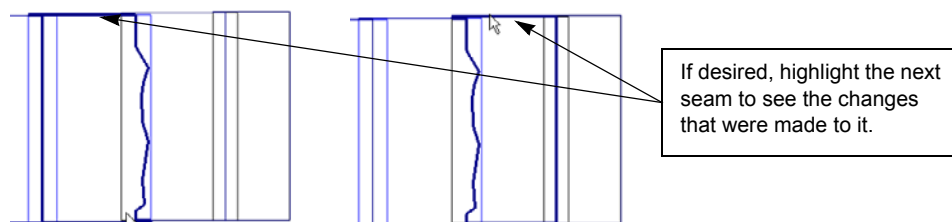
- f.) Position the cursor *outside* the highlighted seam and digitize the new seam edge, which may follow an image feature such as a road. The first segment must cross to the outside of the area enclosed by the original seam.



- g.) For the last point, digitize *inside* the highlighted seam, then click the right mouse button to end. The last segment must cross to the inside of the area enclosed by the original seam. This last digitized point will not be part of the seam; its purpose is to define a line segment that intersects the original seam.



- h.) Note that the new seam edge also becomes part of the adjoining seam edge(s). If desired, highlight the next seam to see the changes that were made to it:



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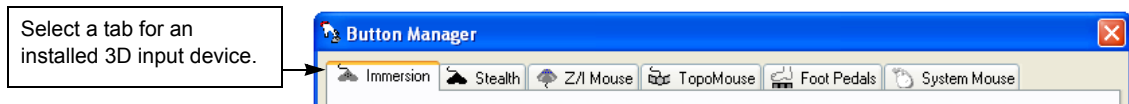
## Appendix J. Button Manager Settings

This Button Manager discussion applies to several DAT/EM products and interface options: SUMMIT EVOLUTION, LANDSCAPE, and DAT/EM CAPTURE for AutoCAD, MicroStation, and ArcGIS.

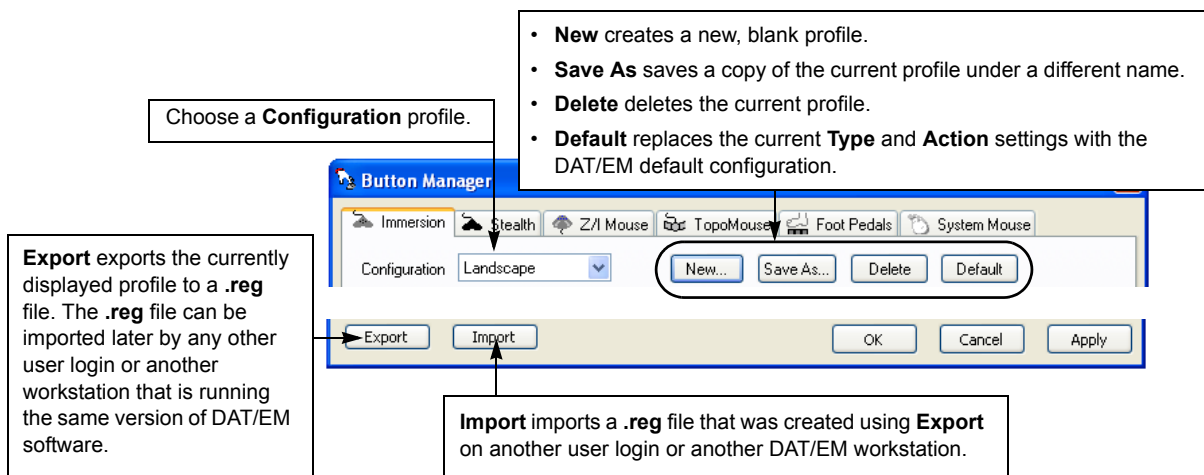
The 3D input device for SUMMIT EVOLUTION and/or LANDSCAPE may be a system mouse or one of several compatible purpose-designed 3D input devices. Multiple input devices of difference types are allowed.

Perform the following steps to start the Button Manager and make settings:

- Step 1)** To set the functions of the buttons and switches on the input device(s), start the Button Manager. Choose a method to start the application:
- From SUMMIT EVOLUTION or LANDSCAPE, select **Button Manager** from the **Tools** toolbar or pull-down menu. Or key in the shortcut, which is <Ctrl>B (unless you have changed it by customizing shortcuts).
  - If DAT/EM CAPTURE for AutoCAD is running, key in the **buttons** command at the AutoCAD command window.
  - If DAT/EM CAPTURE for MicroStation is running, key in the **button edit** command in the MicroStation command window.
- Step 2)** Select a tab for an installed 3D input device.



- Step 3)** Choose, create, or import a **Configuration** profile. Custom profiles may be made to fit the situation: For LANDSCAPE, SUMMIT EVOLUTION, the DAT/EM CAPTURE interface type (AutoCAD, MicroStation, or ArcMap), the individual person, and the individual project. If desired, use the **Import** button to import a **.reg** file that was created using **Export** from another user login or another workstation using the same version of DAT/EM software.



**Step 4)** For each button number for the particular device, select a function **Type** and an **Action**.

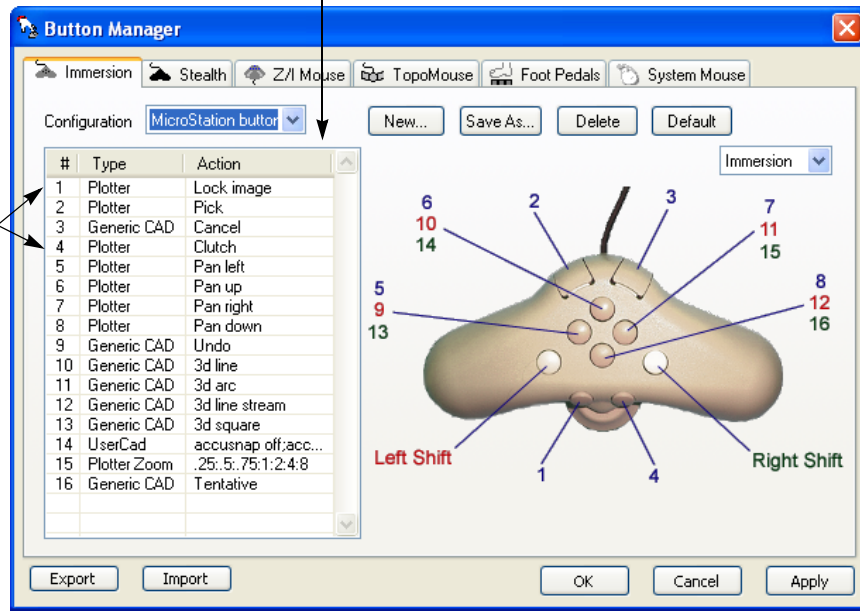
For each button number, select a function **Type** and an **Action**.

- For the **User CAD** type, enter a text string that will be sent as a command to the CAD application.
- For ArcGIS, the same keywords that are used for the DAT/EM KEYPAD may be used for **User CAD** button settings.



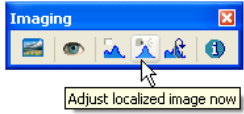

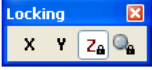
Note that the two footpedals that are installed with the SoftMouse use the settings for Button 1 and Button 4.



Same as Button 1 and Button 4



The **Type** and **Action** settings can be different depending on whether they will be used for SUMMIT EVOLUTION, LANDSCAPE, AutoCAD®, MicroStation®, or ArcGIS®. The following tables show the **Type** and **Action** settings and their functions for each application:

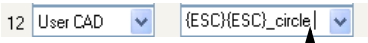


| Type                              | Interface                                                                                               | Button Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>None</b><br>Type<br>None       | AutoCAD, MicroStation, and ArcGIS                                                                       | Deactivates the button.<br><br>Button 2 should be set to <b>Type=None</b> when using the system mouse as the 3D digitizing device, usually with SUMMIT EVOLUTION LITE EDITION.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Plotter</b><br>Type<br>Plotter | All options in this list work with SUMMIT EVOLUTION<br><br>Those marked with * also work with LANDSCAPE | All of the following actions may be sent to SUMMIT EVOLUTION; those marked with * may be sent to LANDSCAPE: <ul style="list-style-type: none"> <li>• <b>Pick*</b> – Digitizer select button.</li> <li>• <b>Clutch*</b> – Deactivates cursor movement while held down. Release the button to resume cursor movement.</li> <li>• <b>Pan left*</b> – pan the cursor to the left. To set the pan speed, see page 3-1.</li> <li>• <b>Pan up*</b> – Pan the cursor up. To set the pan speed, see page 3-1.</li> <li>• <b>Pan right*</b> – Pan the cursor to the right. To set the pan speed, see page 3-1.</li> <li>• <b>Pan down*</b> – Pan the cursor down. To set the pan speed, see page 3-1.</li> <li>• <b>Lock image</b> – Used during relative orientation to lock one image and allow the other to move with the cursor.</li> <li>• <b>Zoom CAD*</b> – Used to force the AutoCAD, MicroStation, or ArcMap view to match the current Main View. For more information, see page 23-5.</li> <li>• <b>Skip</b> – Used during AutoCAD Cross section and DTM digitizing to skip the current point. (For MicroStation, enter a reset).</li> <li>• <b>Align</b> – Used to activate an image Z alignment if an image match can be found near the cursor. May be used during relative orientation and during the digitizing process. Same as <b>Aligns images</b> on the <b>Align</b> toolbar. See page 24-3.  </li> <li>• <b>Snap toggle</b> – Toggle the snap mode, which automatically and continuously aligns Z if an elevation match can be found. Same as <b>Snap toggle</b> on the <b>Align</b> toolbar. See page 24-4.  </li> <li>• <b>Pan Z up*</b> – Increase the Z coordinate. Most useful for close range projects. To control the speed and magnitude of this pan, see page 3-1.</li> <li>• <b>Pan Z down*</b> – Decrease the Z coordinate. Most useful for close range projects. To control the speed and magnitude of this pan, see page 3-1.</li> <li>• <b>Image adjustment</b> – Activate a histogram equalization based on the current Image View. Same as <b>Adjust localized image now</b> on the <b>Imaging</b> toolbar. See “Imagery Menu &gt; Image Adjustment Settings” starting on page 25-67.  </li> <li>• <b>Terrain follow toggle</b> – Toggle terrain following. See page 24-9.</li> <li>• <b>Lock XY toggle</b> – Toggle XY movement. Same as toggling the X and Y icons on the <b>Locking</b> toolbar.  </li> <li>• <b>Lock Z toggle</b> – Toggle Z movement. Same as toggling Z on the <b>XYZ Movement</b> toolbar.  </li> </ul> <p>(Continued on next page)</p> |

| Type                                        | Interface                                                                                               | Button Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Plotter</b><br>Type<br>Plotter ▼         | All options in this list work with SUMMIT EVOLUTION<br><br>Those marked with * also work with LANDSCAPE | (Continued.)<br>All of the following actions may be sent to SUMMIT EVOLUTION; those marked with * also work with LANDSCAPE: <ul style="list-style-type: none"> <li>• <b>System mouse toggle</b> – Toggle the 3D device (if any) to system mouse mode. Button 2 is the left mouse button; button 3 is the right mouse button; the Z wheel is the mouse wheel. Select again to resume image pointer mode.</li> <li>• <b>Pan Speed Up</b> – increase the pan speed of the <b>Pan left</b>, <b>Pan right</b>, <b>Pan up</b>, and <b>Pan down</b> buttons; does not affect <b>Pan Z up</b> and <b>Pan Z down</b>.</li> <li>• <b>Pan Speed Down</b> – decrease the pan speed of the <b>Pan left</b>, <b>Pan right</b>, <b>Pan up</b>, and <b>Pan down</b> buttons; does not affect <b>Pan Z up</b> and <b>Pan Z down</b>.</li> <li>• <b>Z Index from TIN</b> – Toggles a Z index with respect to a TIN generated for SUMMIT EVOLUTION Terrain Following's loaded DTM.</li> <li>• <b>Zoom In*</b> – zoom in in the Main View.</li> <li>• <b>Zoom Out*</b> – zoom out in the Main View.</li> <li>• <b>Min/Restore keypad*</b> – Alternates between displaying and minimizing the DAT/EM KEYPAD CONTROLLER window.</li> <li>• <b>Corner Detection Snap</b> – activates SUMMIT EVOLUTION's Corner Detection tool (page 25-54).</li> <li>• <b>Give up 3D device*</b> – releases SUMMIT EVOLUTION or LANDSCAPE's 3D input device and sets the system mouse digitizer instead. This allows another DAT/EM application to set the 3D input device.</li> <li>• <b>Ext movement toggle</b> – toggles the SUMMIT EVOLUTION Relative Orientation Tie Points dialog's <b>Exterior Orientation Angles</b> button.</li> </ul> |
| <b>Generic CAD</b><br>Type<br>Generic CAD ▼ | ArcGIS                                                                                                  | The following <b>Generic CAD</b> actions are active for ArcMap: <ul style="list-style-type: none"> <li>• <b>Cancel</b> = Finish the active sketch.</li> <li>• <b>Undo</b> = Either undo the last complete object or remove the most recently digitized vertex in an active sketch. May be repeated.</li> <li>• <b>Delete object</b> = Deletes the selected object.</li> <li>• <b>Zoom Plotter</b> = zooms the stereoplotter view to match ArcMap's view.</li> <li>• <b>3d line</b> = sets point-to-point ground coordinate collection mode.</li> <li>• <b>3d line stream</b> = sets streaming ground coordinate collection mode.</li> <li>• <b>3d arc</b> = sets arc ground coordinate collection mode.</li> <li>• <b>3d square</b> = sets squared ground coordinate collection mode.</li> <li>• <b>Tentative</b> = Move the SUMMIT EVOLUTION cursor to the snapped-to location. The move is in XYZ with 3D snap on and XY with 2D snap on. When snap is off, the <b>Tentative</b> button does nothing.</li> </ul> Do not use any other <b>Generic CAD</b> actions besides those listed here. The other actions are intended for AutoCAD and MicroStation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

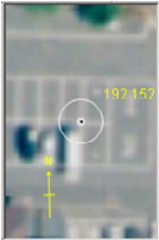
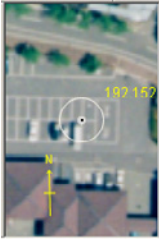



| Type                                                          | Interface | Button Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div><b>User CAD</b></div> <div>Type</div> <div>UserCad</div> | ArcGIS    | <p>The same keywords used on the DAT/EM KEYPAD for ArcGIS may be set on a <b>Type=User CAD</b> button. For a list of keywords, see the <i>DAT/EM Stereo Capture Operation Manual</i>, the <i>DAT/EM Keypad Operation Manual</i>, or <b>Contents</b> from the <b>Help</b> menu in the DAT/EM Keypad Controller window.</p> <p>The BUTTON MANAGER can support a series of keyword sets on a single <b>Type=User CAD</b> button. Separate each keyword set with a semi-colon (;). Do not add a space before or after the semi-colon (;). Each time the button is pressed, the next keyword set is activated, cycling back to the first set after the last set is used. Examples:</p> <div><div>UserCad</div><div>draw Stream;draw PointToPoint;draw arc;draw Square;draw trace;</div></div> <div><div>Do not include a space before or after the ; character.</div></div> <div><div>16 UserCad</div><div>Snap2d;Snap3d;snapoff;</div></div> <div><div>Scroll through the DAT/EM snap modes.</div></div> |


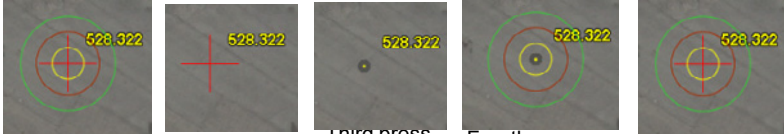

| Type                                        | Interface | Button Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Generic CAD</b><br>Type<br>Generic CAD ▼ | AutoCAD   | <p>The button actions send the following commands to AutoCAD. Note that the underscore character, _, forces the English AutoCAD command to work in any language version of AutoCAD.</p> <ul style="list-style-type: none"> <li>• <b>Cancel</b> = &lt;Esc&gt;</li> <li>• <b>3d line</b> = &lt;Esc&gt;&lt;Esc&gt;_3dpoly&lt;Enter&gt;</li> <li>• <b>2d line</b> = &lt;Esc&gt;&lt;Esc&gt;_pline&lt;Enter&gt;</li> <li>• <b>3d line stream</b> = &lt;Esc&gt;&lt;Esc&gt;capt3d&lt;Enter&gt;</li> <li>• <b>2d line stream</b> = &lt;Esc&gt;&lt;Esc&gt;capt2d&lt;Enter&gt;</li> <li>• <b>3d arc</b> = &lt;Esc&gt;&lt;Esc&gt;autoarc3d&lt;Enter&gt;</li> <li>• <b>2d arc</b> = &lt;Esc&gt;&lt;Esc&gt;autoarc2d&lt;Enter&gt;</li> <li>• <b>3d square</b> = &lt;Esc&gt;&lt;Esc&gt;psqr3d&lt;Enter&gt;</li> <li>• <b>2d square</b> = &lt;Esc&gt;&lt;Esc&gt;psqr2d&lt;Enter&gt;</li> <li>• <b>Datpan toggle</b> = &lt;Esc&gt;&lt;Esc&gt;datpan&lt;Enter&gt;&lt;Enter&gt;</li> <li>• <b>Contour up</b> = &lt;Esc&gt;&lt;Esc&gt;contourup&lt;Enter&gt;</li> <li>• <b>Contour down</b> = &lt;Esc&gt;&lt;Esc&gt;contourdown&lt;Enter&gt;</li> <li>• <b>Spot elevation</b> = &lt;Esc&gt;&lt;Esc&gt;spotx&lt;Enter&gt;</li> <li>• <b>Fit to view</b> = &lt;Esc&gt;&lt;Esc&gt;_zoom&lt;Enter&gt;_extents&lt;Enter&gt;</li> <li>• <b>Offset line in 3d</b> = &lt;Esc&gt;&lt;Esc&gt;3doffsetmeasure&lt;Enter&gt;</li> <li>• <b>Draw culvert</b> = &lt;Esc&gt;&lt;Esc&gt;culvert&lt;Enter&gt;</li> <li>• <b>Delete object</b> = &lt;Esc&gt;&lt;Esc&gt;_erase&lt;Enter&gt;</li> <li>• <b>Tentative</b> = Do not use for AutoCAD; used for MicroStation/ArcGIS only.</li> <li>• <b>Close line</b> = _close&lt;Enter&gt;</li> <li>• <b>Undo</b> = _undo&lt;Enter&gt;</li> <li>• <b>Zoom plotter</b> = &lt;Esc&gt;&lt;Esc&gt;zoomplot&lt;Enter&gt;</li> <li>• <b>Arc 3d</b> = &lt;Esc&gt;&lt;Esc&gt;arc3d&lt;Enter&gt;</li> </ul> |

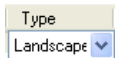


| Type                                 | Interface | Button Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>User CAD</b><br>Type<br>UserCad ▼ | AutoCAD   | <p>Enter any string or strings to send to AutoCAD. Enter either a single command or a list of commands separated by a semi-colon (;).</p> <ul style="list-style-type: none"> <li>• Add a space for the &lt;Enter&gt; or the spacebar key that would normally be used in the AutoCAD command sequence. A space after a command name is necessary to activate the command in AutoCAD.</li> <li>• Use “{ESC}” or “{esc}” to send a cancel to AutoCAD.</li> </ul> <p>For example, to cancel any active command and start the AutoCAD <b>circle</b> command from any language version of AutoCAD:</p> <div style="text-align: center;">  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> The space character here is necessary to activate the command in AutoCAD. </div> </div> <p>The underscore character in this example makes the English AutoCAD command work in any language version, and may be left out if the command is spelled correctly for the version in use.</p> <p>A more complex command string may be entered, as long as space characters are entered where a space or enter key would be used in AutoCAD. For example, to activate <b>pedit</b> for the last-drawn entity and get ready to insert a point between the first and second vertices:</p> <div style="text-align: center;">  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> Space at the end! </div> </div> <p>A list of command strings may be set so that each time the button is pressed, the next string in the list is sent. The list cycles back to the first string after the last string is used. The strings are separated by a semi-colon (;) character. For example, this setting activates a different object drawing command each time the button is pressed:</p> <div style="text-align: center;">  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <ul style="list-style-type: none"> <li>• Include a space at the end of the command.</li> <li>• <u>Do not</u> include a space after the ; character.</li> </ul> </div> </div> |

| Type                                        | Interface    | Button Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Generic CAD</b><br>Type<br>Generic CAD ▼ | MicroStation | <p>The button actions send the following commands to MicroStation:</p> <ul style="list-style-type: none"> <li>• <b>Cancel</b> = MicroStation reset</li> <li>• <b>3d line</b> = place lstring space</li> <li>• <b>2d line</b> = autoarc2d</li> <li>• <b>3d line stream</b> = place lstring stream</li> <li>• <b>2d line stream</b> = snapz on + bktrack (Used for elevation contours)</li> <li>• <b>3d arc</b> = datdraw autoarc</li> <li>• <b>2d arc</b> = datdraw 2dautoarc</li> <li>• <b>3d square</b> = psqr 3d + psqr</li> <li>• <b>2d square</b> = psqr 2d + psqr</li> <li>• <b>Datpan toggle</b> = datpan toggle</li> <li>• <b>Contour up</b> = mv ci up</li> <li>• <b>Contour down</b> = mv ci dn</li> <li>• <b>Spot elevation</b> = spotx</li> <li>• <b>Fit to view</b> = fit</li> <li>• <b>Offset line in 3d</b> = 3doffset measure</li> <li>• <b>Draw culvert</b> = culvert</li> <li>• <b>Delete object</b> = delete element</li> <li>• <b>Tentative</b> = tentative point selection</li> <li>• <b>Close line</b> = lclose</li> <li>• <b>Undo</b> = undo</li> <li>• <b>Zoom plotter</b> = plotterzoom</li> <li>• <b>Arc 3d</b> = Do not use for MicroStation. This setting is for AutoCAD only.</li> </ul> |
| <b>User CAD</b><br>Type<br>UserCad ▼        | MicroStation | <p>Enter any key-in-type command string or strings to send to MicroStation. Enter either a single command or a list of commands separated by a semi-colon (;).</p> <p>For example, set a button to start the MicroStation <b>place circle</b> command:</p> <p>10 UserCad ▼ place circle ▼</p> <p>It is not necessary to add a return or enter character at the end of the command string.</p> <p>A list of commands may be set so that each time the button is pressed, the next command in the list is sent. The list cycles back to the first command after the last command is used. The commands are separated by a semi-colon (;) character. For example, this setting changes the <b>datdraw</b> drawing mode each time the button is pressed. It works before and during digitizing:</p> <p>12 User CAD ▼ datdraw autoarc; datdraw psqr; datdraw stream; ▼</p> <p>Note that only one command may be entered by itself or between semi-colon (;) characters. A string such as “lv=3 co=2 wt=1 place circle” would <u>not</u> work. The string, “lv=3;co=2;wt=1; place circle;” would work, but would require four button presses to activate the entire list.</p>                                              |

| Type                                                     | Interface                    | Button Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div><b>Plotter Zoom</b><br/>Type<br/>Plotter Zoom</div> | Specific to SUMMIT EVOLUTION | <p>Enter each zoom level separated by a colon (:) character. Enter the zoom levels as decimal numbers. For example, the 1:4 and 8:1 zooms found on the SUMMIT EVOLUTION <b>Zoom</b> toolbar would be listed as 0.25 and 8 on a <b>Plotter Zoom</b> button.</p> <p>Each time the button is pressed, the Image View zooms to the next zoom level in the list or cycles back to the first zoom level.</p> <div><div>12 Plotter Zoom 0.25:0.5:2</div><div>In this example, pressing the button five times gives the Image View zooms below:</div><div><div><br/>First press, 0.25 (1:4)</div><div><br/>Second press, 0.5 (1:2)</div><div><br/>Third press, 2 (2:1)</div><div><br/>Fourth press, 0.25 again</div><div><br/>Fifth press, 0.5 again</div></div><div><div>12 Plotter Zoom .25:5:1:4:8:16:32</div><div>In this example, pressing the button eight times has the same effect as clicking each of the <b>Zoom</b> toolbar's zoom icons in order.</div><div></div></div></div> |

| Type                                                  | Interface                    | Button Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Plotter Cursor Set</b><br>Type<br>Plotter Cursor ▼ | Specific to SUMMIT EVOLUTION | <p>Enter each cursor name separated by a colon (:) character. Each time the button is pressed, the cursor design changes to the next cursor name in the list or cycles back to the first cursor name. (The available cursor names may be viewed in the Cursor Selection dialog, which is activated by <b>Cursor Select</b> on the <b>Tools</b> toolbar.) If a cursor name is misspelled or the file is not found, a default cursor will appear. <b>Example A:</b></p> <p>10 Plotter Cursor ▼ YellowDot:BlackDot:Diamond ▼</p>  <p>First press, YellowDot      Second press, BlackDot      Third press, Diamond      Fourth press, YellowDot again      Fifth press, BlackDot again</p> <p>Cursor ground rings may be toggled with <b>Plotter Cursor Set. (RingsOn)</b> and <b>(RingsOff)</b> may be added before or after the cursor design name, or they may appear alone to toggle the rings without changing the cursor design. <b>(RingsOn)</b> and <b>(RingsOff)</b> are not case sensitive, for example, <b>(RINGSON)</b> and <b>(ringsoff)</b> work equally. Rings settings initially must be on in the <b>Tools &gt; Cursor &gt; Ground Rings</b> tab (page 25-42); check <b>Enable Ground Rings</b>, and leave at least one <b>Show</b> checkbox on.</p> <p><b>Example B:</b> Toggle ground rings on and off with two different cursor designs called SimpleCross and YB1.</p> <p><b>SimpleCross(RingsOn);SimpleCross(RingsOff);YB1(RingsOff);YB1(RingsOn);</b><br/> Or,<br/> <b>(RingsOn)SimpleCross;(RingsOff)SimpleCross;(RingsOff)YB1;(RingsOn)YB1;</b></p>  <p>First press, SimpleCross with rings      Second press, SimpleCross without rings      Third press, YB1 without rings      Fourth press, YB1 with rings      Fifth press, start the cycle over.</p> <p><b>Example C:</b> Don't change the cursor design, but do toggle the ground rings. Use <b>(RingsOn)</b> and <b>(RingsOff)</b> alone between the semi-colon character:</p> <p><b>(RingsOn);(RingsOff);</b></p>  <p>First press, rings are off      Second press, rings are on      Third press, rings off</p> |


| Type                                                                                                  | Interface                      | Button Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Landscape</b><br> | Specific to LANDSCAPE          | <p>The following actions may be sent to LANDSCAPE:</p> <ul style="list-style-type: none"> <li>• <b>Rotation Clutch</b> – While this button is held down, the cursor’s physical left-right movement changes the viewpoint in the Main View. When the button is released, the left-right movement returns to regular pan mode.</li> <li>• <b>Reset Rotations</b> – Removes the Main View rotation; resets a top-down, zero-degrees-up viewpoint (as if looking straight down on the XY plane).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Shortcut Key</b>                                                                                   | SUMMIT EVOLUTION and LANDSCAPE | <p>Any shortcut key that is set in SUMMIT EVOLUTION or LANDSCAPE may be set to a button. First, verify the current setting or make a new setting for the shortcut key using the instructions in “Tools Menu &gt; Shortcuts” on page 25-65.</p> <p>To set the shortcut on the button:</p> <ol style="list-style-type: none"> <li>1. Set the <b>Type</b> to <b>Shortcut Key</b>.</li> <li>2. Click the system mouse in the <b>Action</b> column.</li> <li>3. Press the shortcut key or key sequence. For example, press the &lt;F4&gt; key (F4 is usually set to toggle Full Screen mode). The shortcut will appear in the <b>Action</b> field.</li> <li>4. <i>To exit the field properly, click the system mouse in another field.</i><br/>Exiting the field is necessary to activate the <b>Apply</b> button. Because this field is waiting for key-ins as actual settings, it cannot be exited properly using the usual dialog-controlling keys such as Enter or Tab.</li> <li>5. Select <b>Apply</b> to activate the setting on the 3D device. (If <b>Apply</b> is not yet active, click the system mouse in a different field first.)</li> </ol> |

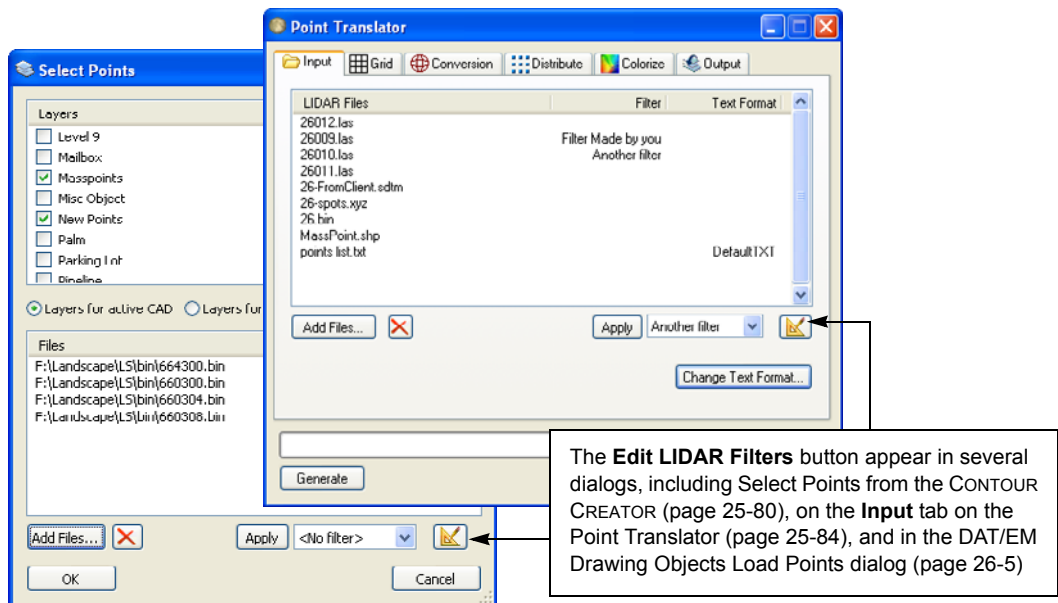
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## Appendix K. LIDAR Filter Editor

The LIDAR Filter Editor is offered from several SUMMIT EVOLUTION dialogs as well as from other DAT/EM applications. It helps filter out certain kinds of points from a LIDAR file.

To use the LIDAR Filter Editor, perform the following steps:

- Step 1)** Select the **Edit LIDAR Filters** button, , from any dialog that offers it in any DAT/EM software. For example:





- Step 2)** (Optional) To import LIDAR filters from another SUMMIT EVOLUTION or LANDSCAPE workstation, select the **Import** button at the lower left of the dialog. Browse for a **.reg** file that was created earlier using the LIDAR Filter Editor's **Export** button.


- Step 3)** Choose a method to create or select a filter:


Choose a method to create or select a filter:

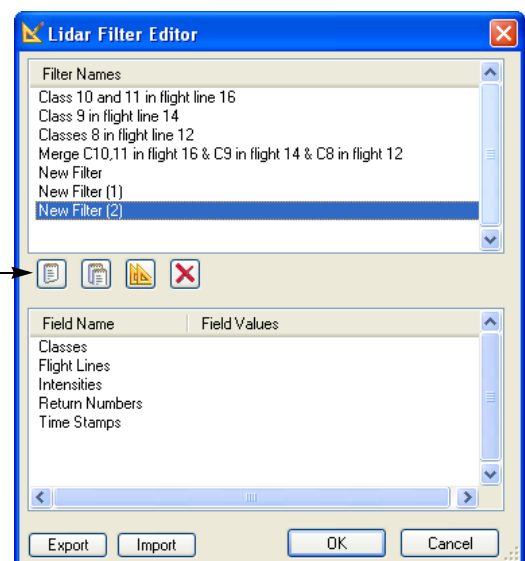
- To select an existing filter, click on the filter name to highlight it.

-  To create a new, empty filter, select the **Create a new, empty filter** button.

-  To make a copy of an existing filter, select the **Duplicate the selected filter** button.

-  To add multiple existing filters together, first select the filter names from the list to highlight them, then select the **Merge selected filters to create a new one** button.

-  To delete one or more filters, first highlight the filter(s) in the list, then select the **Delete the selected filters** button.



- Step 4)** If creating or editing a filter, continue. Highlight the filter name in the **Filter Names** list.

- Step 5)** Rename the filter if necessary. Click again on the highlighted filter name or press the F2 key. Enter the new name.
- Step 6)** In the **Field Name** list, click in the **Field Values** column directly to the right of the **Field Name** to use as a filter. Use the following definition options:

- Leave a field blank if it will not be used as a filter.
- Use integers for all entries (except possibly the **Time Stamp**).
- Separate individual integers or lists with a semi-colon (;).
- To make a list of consecutive integers, use two periods (..) between the start and end of the list.
- The format of the **Time Stamp** depends on the input files. Some files do not include a time stamp; **.las** and **.bin** files may contain it, but often they do not. In **.las** files, it is documented as “the GPS time” and is a double. In TerraScan **.bin** files, it is documented as a “32 bit integer time stamp appended to points” and is an integer. It is defaulted to 0. Determine the format used in the file(s) and enter it in the field.

Examples:

To include flight lines 1, 7, and 15: →

| Field Name   | Field Values |
|--------------|--------------|
| Flight Lines | 1; 7; 15     |

To include every flight line from 1 to 10 and 12 to 28: →

| Field Name   | Field Values  |
|--------------|---------------|
| Flight Lines | 1..10; 12..28 |

To filter by classes and return numbers only: →

| Field Name     | Field Values |
|----------------|--------------|
| Classes        | 9; 10        |
| Flight Lines   |              |
| Intensities    |              |
| Return Numbers | 3; 4         |
| Time Stamps    |              |

To filter by classes 3 through 9, flight lines 1 through 10 and 12 through 28, intensity of 12, return number of 2, and ignore the time stamp: →

| Field Name     | Field Values  |
|----------------|---------------|
| Classes        | 3..9          |
| Flight Lines   | 1..10; 12..28 |
| Intensities    | 12            |
| Return Numbers | 2             |
| Time Stamps    |               |

- Step 7)** If desired, export LIDAR filters that may be imported later on another SUMMIT EVOLUTION or LANDSCAPE workstation. Select the **Export** button at the lower left of the dialog. Create a **.reg** file.



### Appendix L. DAT/EM Technical Support

For questions concerning this product, contact DAT/EM's Support Department. You may be asked to purchase a software support agreement before support services are received.

DAT/EM Systems International  
8240 Sandlewood Place, Suite 101  
Anchorage, Alaska 99507  
USA  
Phone: (907) 522-3681  
Fax: (907) 522-3688  
E-mail: [support@datem.com](mailto:support@datem.com)

General information is available on DAT/EM's website at [www.datem.com](http://www.datem.com).

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