pix:point™

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PixPoint™ for ArcGIS™

User's Guide

RED HEN
SYSTEMS, INC.

pix:point™

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Red Hen Systems, Inc.

2310 E. Prospect Road, Suite A

Fort Collins, CO 80525

800-237-4182

www.redhensystems.com/pixpoint

Contents

1. Introduction to PixPoint™ for ArcGIS™

What You Can Do With PixPoint

- You can associate digital pictures with locations, and then view the pictures as feature attributes in ArcGIS.

- PixPoint associates GPS data with digital pictures by matching times in picture file metadata and GPS track logs. It creates a companion .gps file containing the GPS data for each picture, and it also saves the GPS data within the picture file as EXIF data.

  - ƒ PixPoint adds georeferenced pictures to ArcGIS feature layers and geodatabases.

  - ƒ PixPoint adds a toolbar to ArcMap, which enables you to open georeferenced pictures and inspect information about them, simply by clicking on map features with georeferenced picture attributes.

- You can distribute digital pictures with associated GPS metadata (.gps files or EXIF) to another PixPoint user who can view the resulting map layers in ArcGIS.

- You can populate databases with georeferenced imagery.

> **Exchangeable Image File (EXIF)** data is additional information that can be stored along with the picture, for example, digital cameras typically store information about the file name, date created, and image size. PixPoint adds GPS information to the EXIF data stored within each image file.

How To Use PixPoint

1   Take pictures while saving a track log on your GPS unit.

2   Take a calibration picture of a UTC time display on the GPS unit or on the Internet. This is for PixPoint's required calibration step.

3   Run PixPoint to associate GPS data with pictures.

4   View, save, and distribute the output in ArcGIS.

> **CAUTION:** PixPoint modifies digital image files and database files. It is strongly recommended that you always backup your picture and database files before processing with PixPoint.

General Requirements

- ArcGIS 8.x. PixPoint is not a standalone program. After installation, PixPoint is launched from within ArcMap.
- To use PixPoint for matching digital pictures with GPS data, you will need:
  - ƒ A GPS track log.
  - ƒ Digital pictures that were taken while the track log was recorded.
  - ƒ Among the digital pictures, you need a calibration picture of a clock showing GPS system (UTC) time.
- To use PixPoint for populating an ArcGIS Geodatabase with georeferenced pictures, you need digital picture files that have been processed by PixPoint (these pictures contain the GPS information in EXIF data.

2. Taking Pictures

Requirements

1 **Camera.** The Design Rule for Camera File (DCF) standard is required, and the camera needs to record the picture acquisition time with the picture. This applies to virtually all digital cameras available today.

2 **GPS.** The GPS receiver must be logging points when you take each picture. (If you use the Garmin GPS V, you can store a waypoint when you take each picture; see **Appendix A. Notes for Specific GPS** Receivers).

3 **Calibration.** Take a calibration picture for each batch of pictures to be processed.

> A **calibration picture** shows GPS system (UTC) time. For example, a picture of a GPS time display set for UTC with no offset, or a picture of the 'live' UTC clock found at www.time.gov.

Those are all the instructions needed for taking pictures. Other than ensuring that you take a calibration picture, you simply take pictures as you normally would.

Taking a Calibration Picture

PixPoint will calibrate your camera's clock against the GPS system time in order to accurately georeference your pictures. For the calibration, you need to take a picture that shows the UTC time reported by the GPS system.

There are two easy ways to do this:

1 Take a calibration picture of your GPS time display screen while you are taking pictures in the field.

2 Take a picture of your computer screen with the GPS system time displayed 'live' on the Internet.

Method 1-GPS Time Display

Take a picture of your GPS time display screen. Ensure the following:

- The GPS receiver is navigating (the receiver has a GPS location fix).
- The time display is set for UTC with no offsets.
- Take the picture with the same camera you use for taking the pictures to be processed with PixPoint.

Method 2-Internet

Take a picture of your computer screen with the GPS system time displayed on the Internet at www.time.gov. Ensure the following:

- Select the time display option for UTC with no offsets (the screen displays world standard time).
- Take the picture with the same camera you use for taking the pictures to be processed with PixPoint.
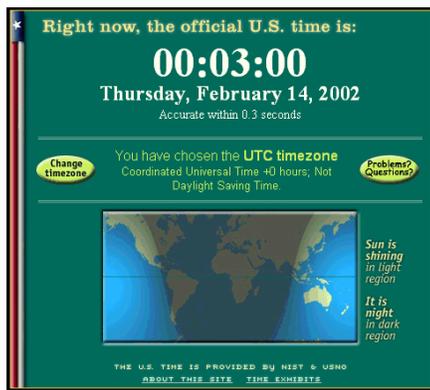
> Whichever method you choose, **take more than one calibration picture** because close-range pictures can sometimes be out of focus. You may need to use your camera's "macro" focus setting. Avoid flash glare on the calibration picture.

3. Collecting GPS Data

CAUTIONS:

It is important for you to become familiar with the options of your GPS receiver. Various settings may affect the GPS track log, depending on the receiver you use. Read your owner's manual, test the receiver's functions, and familiarize yourself thoroughly with the process before beginning any serious data collection task.

Be aware that GPS track logs may fill up or wrap. See the instructions for your receiver, and take steps to prevent losing or overwriting data.

Take care not to clear the track log before downloading it to the computer.

When preparing to obtain a new set of pictures, first clear the active GPS track log to make sure you have enough space for a new log. While taking pictures, periodically ensure the GPS log is not full. To save log space you can turn the GPS receiver off between shots.

Ensure that you log at least one GPS point before and after taking each picture if standing still. If moving, set the track log to collect data at a suitably short interval to collect points close to the location. The logging interval and the time match error you set in PixPoint will determine the mapping accuracy of your pictures.

GPS Track Log Setup

The GPS receiver memory size limits the length and resolution of the GPS log. For example, if your GPS receiver can store maximum 5000 points in a log file and you choose a 5-second interval, you can save a continuous GPS track log for up to 25,000 seconds (or 6.9 hours).

Calculating a Time-Based Logging Interval

A simple calculation can help you choose a logging interval based on how long you plan to be in the field:

total time = total log points x logging interval

where logging interval is the time between GPS points in the log file, and total log points is the maximum capacity of the GPS track log file.

You should check the capacity of your GPS receiver and calculate a logging interval according to your needs. If you need to take a large number of pictures with one GPS track log, you can turn on GPS logging only when you take a picture.

> **IMPORTANT:** The GPS track log must be obtained while the pictures are being taken. You can turn logging off between pictures to maximize the useful data storage in your log file. If you do this, start logging a few seconds before taking a picture, ensure the receiver has a fix on your location, then take the picture. Continue logging GPS data for at least two times the logging interval after taking a picture.

GPS Receiver Setup

- Set the receiver to create a track log (optional if marking waypoints with Garmin GPS V).
- Ensure the receiver is navigating (has a satellite fix) when you take pictures.
- Place the receiver where it can get a clear view of the sky to obtain an accurate position fix.
- Ensure the receiver has sufficient battery power. To save power you can turn the GPS receiver off between pictures, but be certain the receiver is on, navigating, and logging points when you take pictures.

Logging Points While Moving

If you are moving slowly a 5 second log interval may be adequate. For the best positioning precision you must occupy the location where you take the picture for a time that is at least twice the log interval, or 4 seconds, whichever is longer.

GPS Models and Data Sources for PixPoint

PIXPOINT DOWNLOADS LOG FILES DIRECTLY FROM THE FOLLOWING:	
Garmin (www.garmin.com)	**Magellan (www.magellangps.com)**
All models are supported except the aviation type receivers. Suitablility varies, look for larger track log storage and time periodic track logging. **Recommended:** • GPS V (Supports interactive mode) (3000 track points, 500 waypoints) • GPSMAP 76S (5000 track points) • eTrex Vista (3000 track points) • eTrex Legend (2048 track points) • eTrex Venture (2048 track points) **Supported but NOT recommended:** • eTrex • eTrex Camo • eTrex Summit • eMap	Magellan receivers do not support time periodic data logging. They should be used in spatial periodic mode. • Map 330 (requres software version 2.08 or higher, update is free) • Meridian GPS • Meridian Gold • Meridian Platinum **Brunton (www.brunton.com)** Multi-Navigation System (MNS) (5000 track points, 1000 waypoints). The Brunton MNS can be used in interactive mode but does not support WAAS. **Silva (www.silva.com)** Multi-Navigator (MN) (5000 track points, 1000 waypoints). The Silva MN can be used in interactive mode but does not support WAAS.

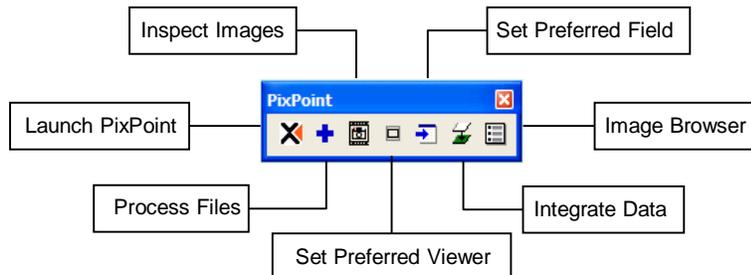| **PIXPOINT CAN USE LOG FILES EXPORTED FROM THE FOLLOWING:**	
ESRI (www.esri.com)	**Casio (www.casio.com)**
ArcPad running on a PocketPC (supports many types of GPS receivers) **Trimble (www.trimble.com)** Pathfinder Office Software enables the use of any GPS receivers supported by Pathfinder Office including: • GeoExplorer 3 • ProXR/ProXRS • TeraSync software used on a PocketPC (usually with a Pathfinder Pocket GPS) • EZMap software on a PocketPC (www.trimble.com/aggps_ezmap.html)	Pathfinder GPS Watch (PAT2GP-1V GPS Satellite NAVI) (400 waypoints). This is a wristwatch GPS, which can be used only in interactive mode. **Red Hen Systems (www.redhensystems.com)** • MediaMapper video index files (.dbf) • GPS Server log files **Other** NMEA log files (.txt) containing RMC, or GGA and ZDA strings

4. The PixPoint Toolbar

Inspect Images   Set Preferred Field

Launch PixPoint   **PixPoint** ✕   Image Browser

Process Files   Integrate Data

Set Preferred Viewer

✕   The **Launch** button starts PixPoint. Click this button when you want to associate GPS data with digital pictures.

➕   The **Process Images** button starts PixPoint at the Media Processing screen. Click this button when you have digital pictures that are already associated with GPS data, for instance, when you receive pictures from another PixPoint user, and the georeferencing information is already stored in the EXIF data (or companion .gps files). This button takes you directly to the step for adding the georeferenced pictures to the geodatabase.

🎞   The **Inspect Images** button enables you to view georeferenced pictures in ArcMap. Click this button after you have used PixPoint to georeference the pictures and add them to a geodatabase or feature layer. With this tool selected, you can click on map features to open the digital pictures.

▢   The **Set Preferred Viewer** button enables you to select a default image viewer. Click this button if you wish to open georeferenced digital pictures in a viewer other than the PixPoint viewer. The PixPoint viewer displays GPS information for the selected image in a caption, and offers several other useful features.

➡   The **Set Image Field** button enables you to select the default field to inspect when you click on a feature with the Open Image tool in ArcMap. Click this button when you want to set the Open Image tool to open a data inspection window rather than an image when you click on a map feature.

🖌   The **Integrate PixPoint Data** button allows you to join PixPoint data to another layer or geodatabase. Click this button when you want to merge or add the data in a PixPoint layer to another ArcGIS data file.

▤   The **Image Browser** button turns the Image Browser on and off. Click this button when you want to view or close the Image Browser tab in the ArcMap Table of Contents.

5. PixPoint Quick Start

To get started, check the sections indicated for the following PixPoint applications:

1 *I've taken digital pictures while collecting GPS data. I want to match the pictures with the GPS data.*

Go to Section 6. Matching Pictures with GPS Data. This will start from the beginning. Typically, when you start from the beginning you have the following connected and accessible to the computer:

- Your camera or image storage media (i.e., Memory Stick or Compact Flash storage media).
- Your GPS receiver with track log in memory, or a GPS track log exported to a PixPoint-compatible format.

2 *I have digital pictures that have already been matched with GPS data in PixPoint. I want to add the pictures to a layer or table and view them in ArcMap.*

Go to Section 7. Processing Georeferenced Pictures. After pictures have been georeferenced using PixPoint, they can be added to a layer or table later. This is convenient if you want to georeference your pictures and then send them to another PixPoint user. Typically, when you want to add georeferenced pictures to ArcMap, you will have the following:

- A folder containing digital image files. If the image files do not contain the georeferencing information as EXIF data, then each image must also have a companion .gps file in the folder.

3 *My georeferenced pictures have been added to a layer or geodatabase. I want to add or link the data to another layer or geodatabase.*

Go to Section 9. Integrating Data in ArcGIS.

6. Matching Pictures with GPS Data

To use PixPoint for matching digital pictures with GPS data, you should have digital pictures that were taken while saving a GPS track log or waypoints.

The pictures may be on the camera if you can connect the camera to the computer, or on removeable storage media, or already copied to your computer hard disk.

The GPS track log or waypoints may be on the GPS, or exported to your computer hard disk in a PixPoint-compatible format.

Among the digital pictures you should have a calibration picture of a GPS system time display. PixPoint calibrates your camera clock against the GPS system time to accurately georeference your pictures.

Starting PixPoint

Run ArcMap to access the PixPoint toolbar.

- Click [X] to launch PixPoint at the Acquire Data screen.

The Acquire Data Screen

CAUTION: PixPoint modifies digital image files and database files. It is strongly recommended that you always backup your picture and database files before processing with PixPoint.

NOTE: If your pictures and GPS data have already been copied to the hard disk, and you have already taken a calibration picture, you can click **Skip** to proceed to the next screen.
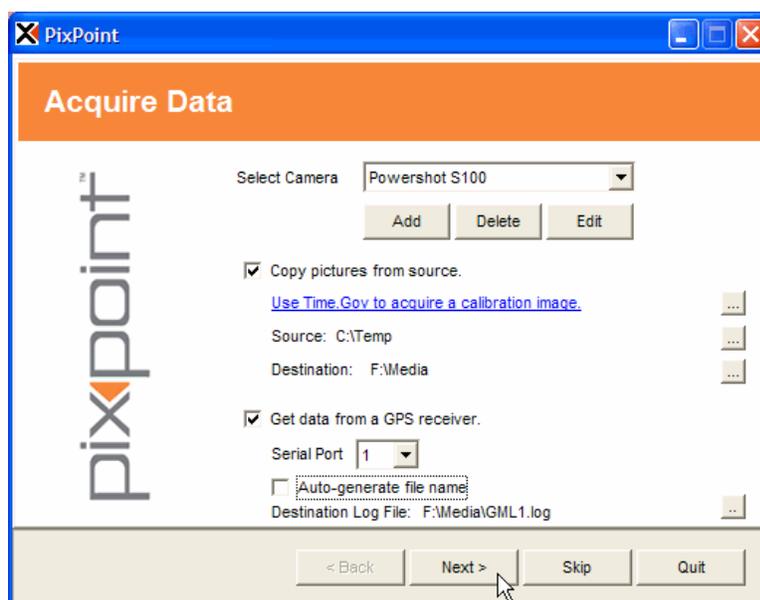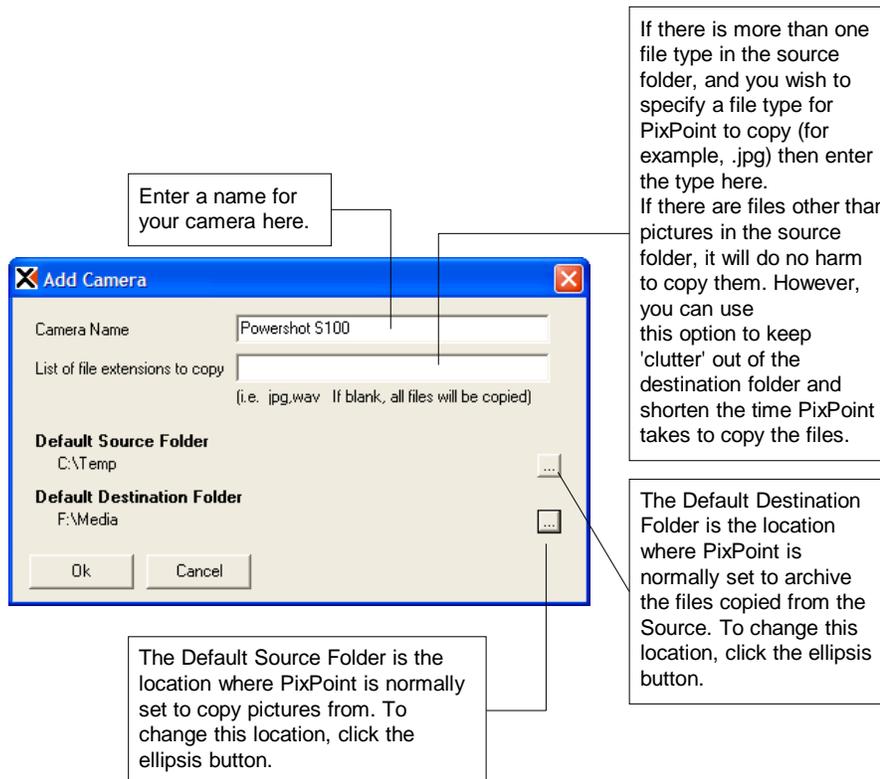

The Acquire Data screen enables you to access and archive your digital pictures and GPS log files. This screen will assist you in copying the files directly from your camera (or storage media) and GPS receiver.

1   Select your camera from the list. Click **Add** if your camera is not in the list. If you use more than one camera with PixPoint, you should add each camera to the list (don't select 'Default' for all cameras). This is important because PixPoint performs a camera clock drift calibration that is specific to each camera.

> **Drift:** PixPoint also calculates camera clock drift. The program uses this to compensate for errors resulting from camera clocks that gain or lose time. Clock drift is automatically calculated for any camera that has previously had a clock offset calibration. The most accurate method to do this is to take a calibration picture at the beginning and again at the end of your field session. Enter the calibration information twice (first enter the time from one picture, then repeat by entering the time from the other picture). PixPoint will then account for clock drift in the file matching process.

  a   The **Add Camera** dialog box enables you to enter a name, default source, and default destination for the pictures taken with a particular camera.

Enter a name for your camera here.

If there is more than one file type in the source folder, and you wish to specify a file type for PixPoint to copy (for example, .jpg) then enter the type here.
If there are files other than pictures in the source folder, it will do no harm to copy them. However, you can use this option to keep 'clutter' out of the destination folder and shorten the time PixPoint takes to copy the files.

The Default Destination Folder is the location where PixPoint is normally set to archive the files copied from the Source. To change this location, click the ellipsis button.

The Default Source Folder is the location where PixPoint is normally set to copy pictures from. To change this location, click the ellipsis button.

2   If you want to archive a copy of your pictures, check the box to **Copy pictures from source**. For instance, you would do this if your pictures are on the camera or a memory card, and you want to copy them to the hard disk. This is recommended.

> **NOTE:** PixPoint creates a companion .gps file for each picture (this file contains the GPS data for the picture). The .gps file is saved to the location where the picture is saved. If you do not copy the pictures from the source to another destination, the companion .gps files will be saved to the source folder (such as the Compact Flash card).

3   If you do not already have a calibration picture, you can click the link to **Use Time.gov** to acquire a calibration picture. An Internet connection is necessary to use this method of taking a calibration picture.

    a   Click the link and wait a moment for the www.time.gov web site to load in your Internet browser.

    b   When the UTC time is displayed, take a picture of the screen.

    c   If an Internet connection is not available or if your browser is unable to display the Java time display on the web site, take a calibration picture of your GPS time screen before proceeding.

4   Accessing pictures: How you access the digital pictures depends on the type of camera you have. Either place the camera memory card into a card reader, or connect the camera to the computer using the appropriate cable.

    a   Click ⊡ if necessary to select the **Source** where the pictures are located.

    b   Click ⊡ if necessary to select the **Destination** where the pictures and .gps files will be saved.

> **NOTE:** If your GPS track log is already saved on the hard disk, you may **Skip** the following step. You will be able to select the GPS data file on the GPS Matching screen.

5   Accessing GPS data: Connect the GPS receiver to one of the COM ports on your computer in accordance with manufacturer's instructions, then turn the GPS receiver on.

    a   Check the box to **Get data from a GPS receiver**, and then choose the Serial Port to which the receiver is connected. (COM port).

    b   If you do not have a file name preference, select **Auto-generate file name** for the GPS track log.

    c   Click ⊡ to choose or create a destination folder for the GPS track log.

6   Click **Next** to continue, and PixPoint will download the files.

The Acquisition Results Screen

The Acquisition Results screen indicates whether PixPoint located the digital pictures and GPS data at the specified source locations.

If you receive an error message, click **Back**. Check any cable connections and source locations, and try again.

The Camera Calibration Screen

Calibration is necessary so that PixPoint can correct for the difference between the camera clock time and the GPS system time.

> PixPoint calculates the camera clock offset from world standard UTC using manually entered UTC data. The data comes from a picture of a live UTC clock, taken by the same camera you use in the field. The calibration picture can be a picture of the GPS receiver time display, or a display of a live UTC clock (such as the U.S. time clock that can be accessed on the Internet at www.time.gov). PixPoint uses this UTC data to correct for time zone offsets and error in the set time and absolute accuracy of the camera's real time clock.

The Camera Calibration screen displays a list of picture files in the selected folder, and a thumbnail picture of the selected picture file.
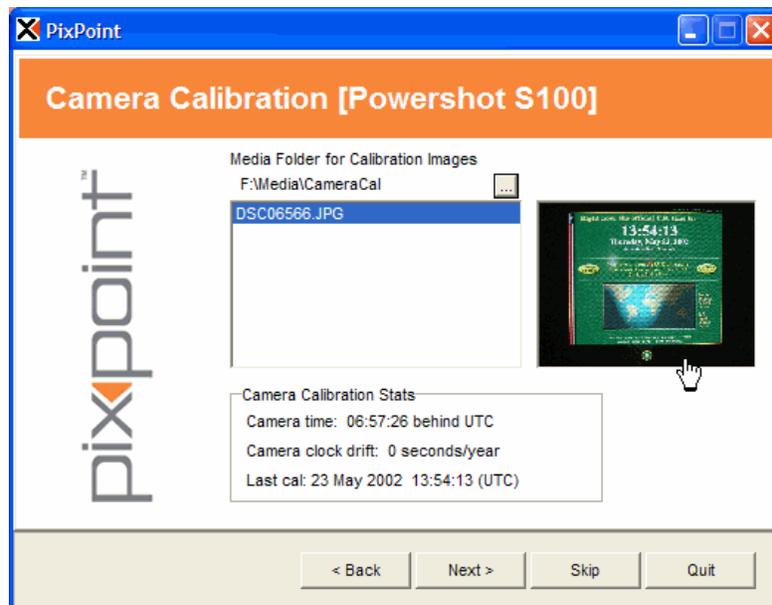

1   Click [...] to locate the folder where your calibration picture is saved.

2   Locate and select the calibration picture in the list, and then click on the thumbnail image. The calibration picture opens in the calibration window.

3   At the bottom of the calibration window, enter the exact time and date as it is displayed in your calibration picture. When ready, click **OK**. The calibration window closes and PixPoint displays the GPS Matching screen.
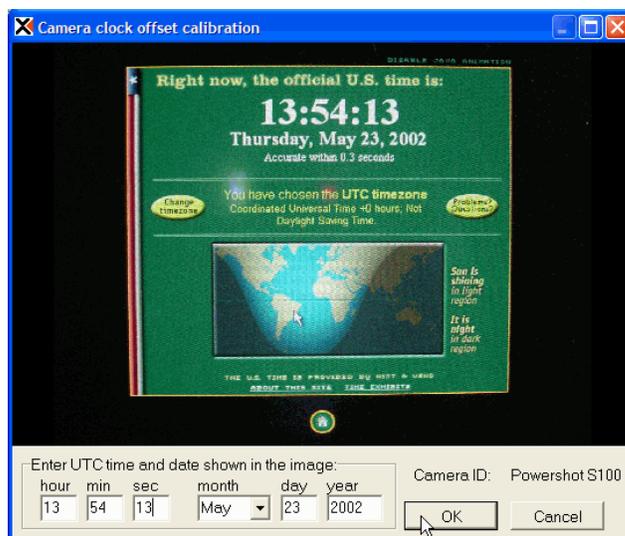
The GPS Matching Screen
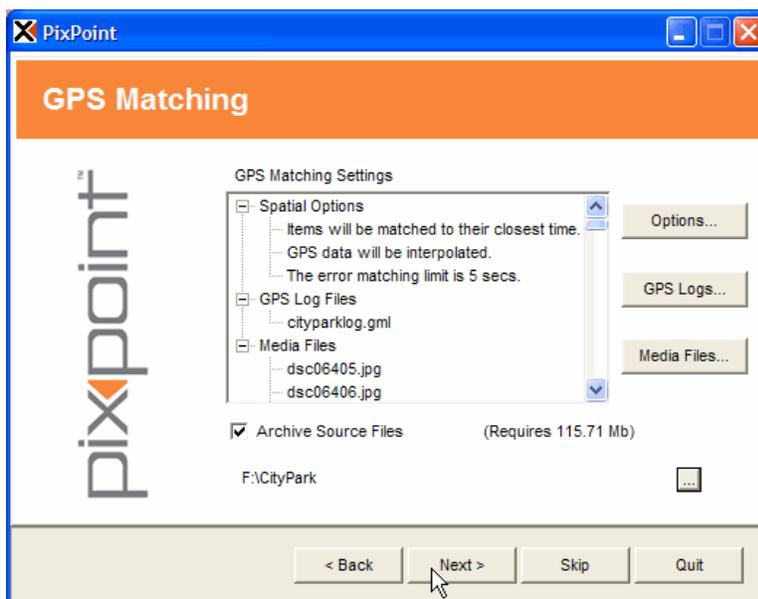
The GPS Matching screen enables you to set options for how to match GPS data to digital pictures, and specify the GPS logs and pictures to process.

1   Click **Options...** to set GPS matching options (*see below for further instructions*).

2   Click **GPS Logs...** if you need to select a GPS log file (*see below for further instructions*).

> **NOTE:** If you downloaded a log file during a previous step, you do not need to select this option. The log file should already be listed on this screen.

3   Click **Media Files...** if you wish to preview and select pictures for processing (*see below for further instructions*).

> **NOTE:** If you copied pictures from the camera during a previous step, and you wish to process all pictures, you do not need to select this option. The pictures should already be listed on this screen.

4   Check the box to Archive source files if you want PixPoint to make backup copies of the digital pictures during processing. This step is recommended. Click ⊡ to specify where the files will be copied.

5   Click **Next** to continue. The GPS matching process will complete in a few moments.
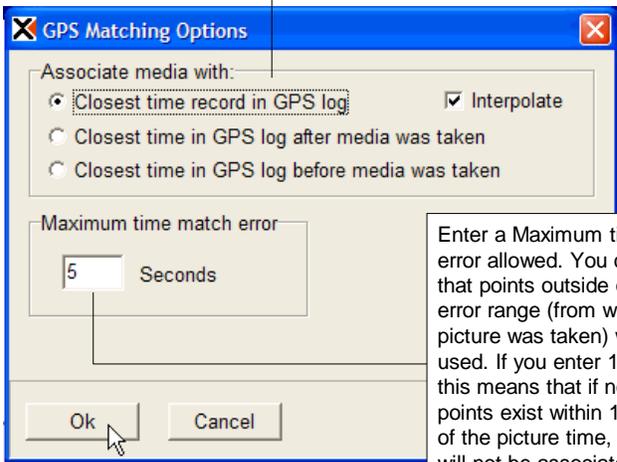
GPS Matching Options

> **IMPORTANT:** The time match error should not be smaller than your GPS track logging interval.

If you have a continuous log (you did not turn off the GPS between pictures) you can select Closest time record in GPS log and check the box to Interpolate.

If you turned off the GPS between pictures and only logged points before or after taking pictures, select to use Closest time in GPS log after (or before) media was taken as appropriate.

Enter a Maximum time match error allowed. You can specify that points outside of a time error range (from when a picture was taken) will not be used. If you enter 10 seconds, this means that if no GPS points exist within 10 seconds of the picture time, the picture will not be associated with a location.

Selecting Media and GPS Files

These dialog boxes are accessed from the GPS Matching screen when you click **Media Files...** or **GPS Logs...**

Their function is to enable you to select or make changes to the list of pictures and GPS files PixPoint will process. If you have just downloaded these files from your digital camera and GPS receiver, then all of the downloaded files will already be listed.
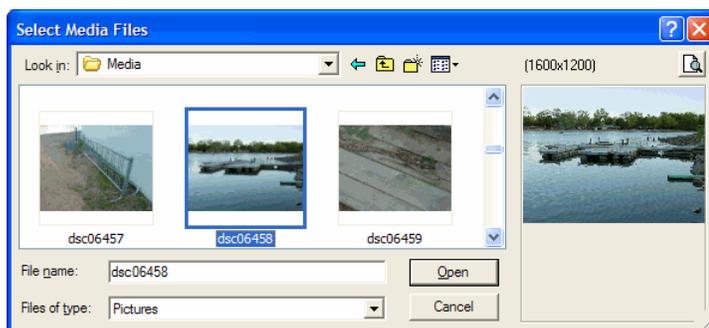
The toolbar includes:

Add Files   Remove Selected Files

Save and Close   Cancel
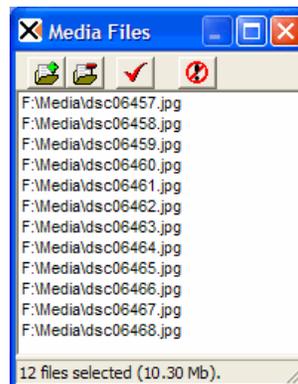
When there are no media files queued for processing, or when you click [icon], the **Select Media Files** dialog opens. This dialog box displays thumbnail images to help you locate the files you wish to add to the Media Files list.
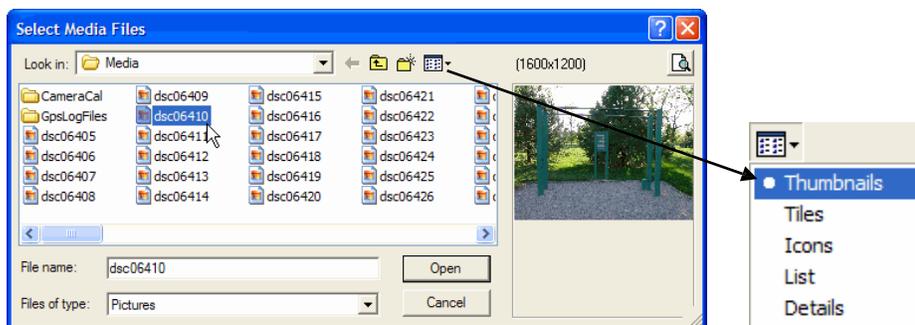
Switch to Thumbnail view for easier selection.

- To select multiple images in a row, click the first image and then scroll to the last image, hold the Shift key and click on the last image.
- To select multiple images that are not listed together, hold the Ctrl key while clicking on each image.

- To preview a single image at full size, select it and then double-click on the thumbnail image at the right side of the dialog box.

Click **Open** when the desired files are selected.

The GPS Matching Results Screen

The GPS Matching Results screen displays a report of how many digital pictures were matched with GPS data.

Common reasons why some files may not be matched with GPS data:

- You may have selected some files that do not have associated GPS data, for instance, pictures taken inside buildings or pictures taken when the GPS receiver was not logging.

- The Maximum time match error setting may be too small. If you think this is the problem, click **Back** and then select **Options**. Increase the time match error, and then reprocess the files.

When ready, click **Next** to continue adding the georeferenced pictures to ArcGIS.

The Media Processing Screen

CAUTION: PixPoint modifies digital image files and database files. It is strongly recommended that you always backup your picture and database files before processing with PixPoint.

The Media Processing screen contains settings and options for:

- Selecting or creating a feature layer for the georeferenced images

- Choosing which data fields will be sent to ArcGIS

- Choosing how the pictures will be referenced in the database (that is, how ArcGIS will locate the pictures when you want to open them)

- Resizing pictures
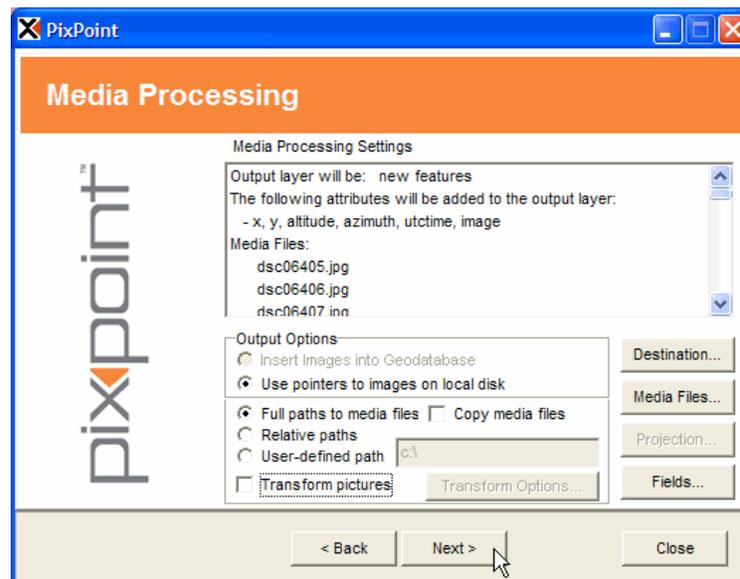
1   Click **Destination**. In the **Select destination layer or table** dialog, you can select a layer or table from the list, create a new file, or select an existing layer or table that is not loaded in the current map.
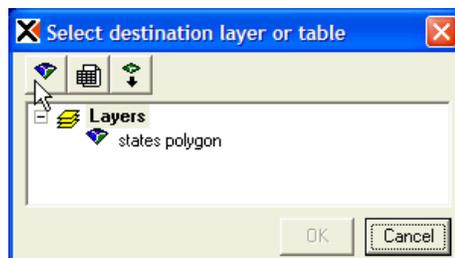
a   To use the toolbar buttons, first highlight **Layers** at the top of the list.

b   To create a new layer, click . The new layer type may be a Shapefile, Feature classes layer, or a Personal Geodatabase (into which you will be prompted to create a layer).

c   To create a new table, click .

d   To select an existing layer or table, click .

e   When finished, click **OK** to return to the Media Processing screen.

2   If you wish to make changes to the list of pictures to be added to the map, click **Media Files...** (see Page 16, **Selecting Media and GPS Files** for more information).

3   If you need to change the map projection, click **Projection...** and select the map projection for the location where you took pictures. The PixPoint default is lat/lon, WGS84 datum.

4   If you wish to view or edit the data fields PixPoint will add to the destination file, click **Fields...** By default, all of the available GPS data fields are included.

a   The **Attribute Selection** dialog (below, left) opens if you have created a new destination layer. The **Attribute Selection and Mapping** dialog (below, right) opens if you have selected an existing destination layer.
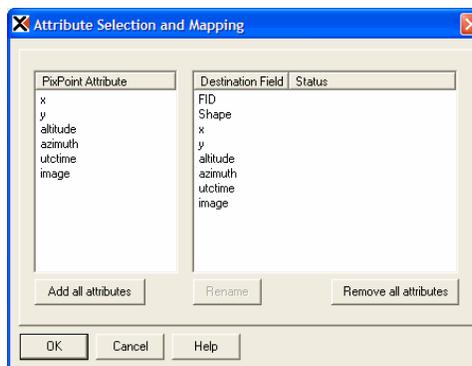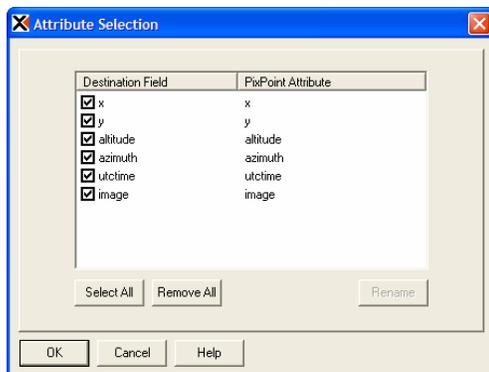
b   If you have created a new layer, the Destination Field list contains the available PixPoint feature attributes. To make changes to the data that will be output to the database, clear the checkboxes for Destination fields you wish to remove.

c   If you have selected an existing layer, the Destination Field list contains the existing fields and the PixPoint feature attributes. To make changes to the data that will be output to the database, click **Remove All** to clear the list, and then use the mouse to drag the desired PixPoint attributes to the Destination list.

d   To edit the name of a selected field, click **Rename**.

e   To map a PixPoint attribute to an existing database field, use the mouse to drag the attribute to the destination field. When the destination field is highlighted, release the mouse button.

f   Click **OK** to return to the Media Processing screen.

5   Select whether to **Insert images into Geodatabase** (enabled if this is the destination type) or **Use pointers to images on local disk**.

a   Select to **Use full paths to media files** when you want the data file to reference the complete path to the digital pictures.

b   Check the box to **Copy media files** if you wish to save a copy of each picture in a companion folder with the ArcGIS data file (Shapefile or Geodatabase). If you only want to create a data file, clear this check box.

> **NOTE:** Copy media files is recommended if you transform pictures, because the changes will be made to a copy of each file and you will retain the original.

c   You can select **Relative paths** if the digital pictures will be copied to a companion folder in the data file directory. This makes it possible for you to copy or move the data file and the media folder together, without affecting the validity of a referenced path.

d   Select **User-defined path** if you need to specify a different path, for instance, if the pictures will reside on a server.

6   Select **Transform pictures** when you want to resize the digital pictures as a part of the final processing step (see Page 20, Error! Reference source not found., for more information).

7   Click **Next** to continue.

The Processing Results Screen

After your pictures have been added to the feature layer, the Processing Results screen opens to report the steps PixPoint has completed.

•   Click **Back** to reprocess with different settings, or click **Finish** to close PixPoint.

Transforming Digital Pictures

Transforming, or resizing pictures is an option you can use to ensure a consistent picture size and resolution for all pictures after the final processing step in PixPoint.

From the Media Processing screen, click **Transform Options...** to open the **Media Processing Options** dialog box.

CAUTION: PixPoint modifies digital image files and database files. It is strongly recommended that you always backup your picture and database files before processing with PixPoint. If you choose to transform pictures, you should not transform the original files. To use PixPoint to backup your files, select Copy media files on the Media Processing screen. This ensures that resizing will be applied only to a new set of files that will be saved in a companion folder with the destination layer or Geodatabase.
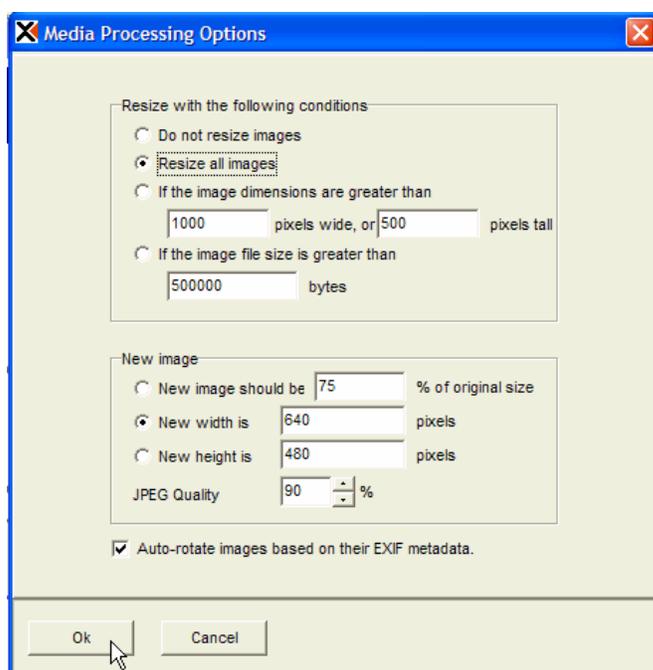
Resize with the following conditions

- **Do not resize images:** select if you want any linked pictures to be exported without changes.

- **Resize all pictures:** select if you want all pictures to be resized by the instructions entered in the bottom of the dialog box.

- **If the picture dimensions are greater than:** select if you want pictures resized when width or height criteria are met, measured in pixels. Enter either a width or a height.

- **If the picture file size is greater than:** select if you want pictures resized when a file size criterion is met, measured in bytes (1000 bytes = 1 kilobyte = 1 KB).

New image

> **NOTE:** This section is not enabled if you select 'Do not resize images' in the upper section.

- **New picture should be [x] % of original size:** enter a percentage value if you want PixPoint to apply a proportional resizing of the pictures.
- **New width is:** enter a pixel value here if you choose to specify the exact dimensions.
- **New height is:** enter a pixel value here if you choose to specify the exact dimensions.
- **JPEG Quality:** the file size and the picture quality will be affected by this entry. A lower value will result in a smaller file, and an picture of lower quality.

Auto-rotate

If pictures were taken with the camera rotated from the horizontal or normal orientation, some digital cameras will store the offset data in the image file. Select to Auto-rotate images based on their EXIF metadata to correct for this and save pictures with the proper viewing orientation.

If your camera does not store offset data, you can use the Rotate option in the Image Browser shortcut menu to correct the picture orientation.

7. **Processing Georeferenced Pictures**

To use PixPoint for processing georeferenced pictures and adding them to ArcGIS, you should have one of the following:

• Digital pictures that contain GPS information as EXIF data, or

• Digital pictures with companion .gps files.

Starting PixPoint

1   Run ArcMap to access the PixPoint toolbar.

2   Click [+] to launch PixPoint at the Media Processing screen.

3   Follow the instructions in the previous section, starting at Page 17, **The Media Processing Screen.**

8. Viewing Georeferenced Pictures and Data in ArcMap

After you have completed processing georeferenced pictures with PixPoint, they are available for inspection in ArcMap.

PixPoint adds two new parts to the ArcMap interface:

1   The PixPoint Toolbar (see Page 8)

2   The Image Browser (see Page 24)

Viewing Pictures

To view georeferenced pictures, click [image] on the PixPoint toolbar, and then select a feature in the new layer.

If you click on a location where features are close or overlapping, a **Multiple points found** dialog box will prompt you to select which picture to inspect.
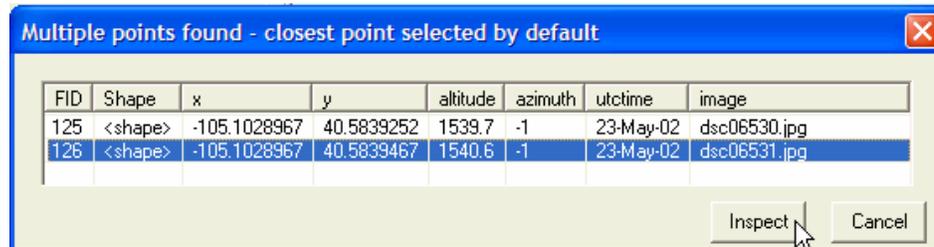
There are two optional settings that control how PixPoint locates and opens the pictures:

Set Preferred Viewer

The image opens in the PixPoint viewer, a utility that is installed with PixPoint. This viewer displays the picture metadata in the caption area. If you prefer to open georeferenced pictures in another image viewer, click [image] to choose a different program.

Set Preferred Field

If you change the name of the database field into which images were processed, you will need to set the preferred field to update the Image Browser and enable PixPoint to locate the pictures. To do this, click [image] and select the field that corresponds to the pictures.

The Image Browser

PixPoint adds the Image Browser as a new tab in the ArcMap Table of Contents. The Image Browser functions as an 'image-centric' method of accessing your georeferenced pictures.

Click [icon] on the PixPoint toolbar to toggle the Image Browser on or off.

Image Browser functionality enables you to:

- Select a layer containing georeferenced pictures in the Image Browser list. Thumbnail views of the images will be displayed.
- Right-click on a thumbnail to view a shortcut menu (see below).
- Filter how thumbnails are displayed, and locate pictures. Click the hotspots on the image below for descriptions of these tools.

Displays the associated data and path to the pictures in the current layer.

Displays the EXIF metadata stored in the selected image file.

Displays the path to the selected image file.

If you did not select to Auto-rotate images while processing in PixPoint, or if rotation information is not stored in the image file, you can use this option to correct any pictures taken at an offset from the normal camera orientation.

Send the selected picture to the default image editor, the default image viewer, or the media processor utility.

Set a larger or smaller thumbnail view in the Image Browser, or reset the thumbnail view to the default size.

Close the shortcut menu.

Show thumbnails for visible features in the current map view.

Show thumbnails for selected features.

Limit the number of thumbnails displayed. If you have a layer containing a large number of pictures, you might want to use this option for better performance.

Show thumbnails for all features with georeferenced picture attributes.

Move the map to center on the location/ extents of selected thumbnails.

9. Integrating Data in ArcGIS

The Integrate Data tool enables you to integrate PixPoint image data with an existing ArcMap layer, either by adding columns and data from the source (images and metadata) to their destination layer. Alternatively, the PixPoint data can remain in a separate table or layer and be joined as a 'relationship' to the records in the destination layer.

Click ![icon] to integrate pictures and data with an existing ArcMap layer. Layers and tables that are currently loaded are available to the Data Integration tool.
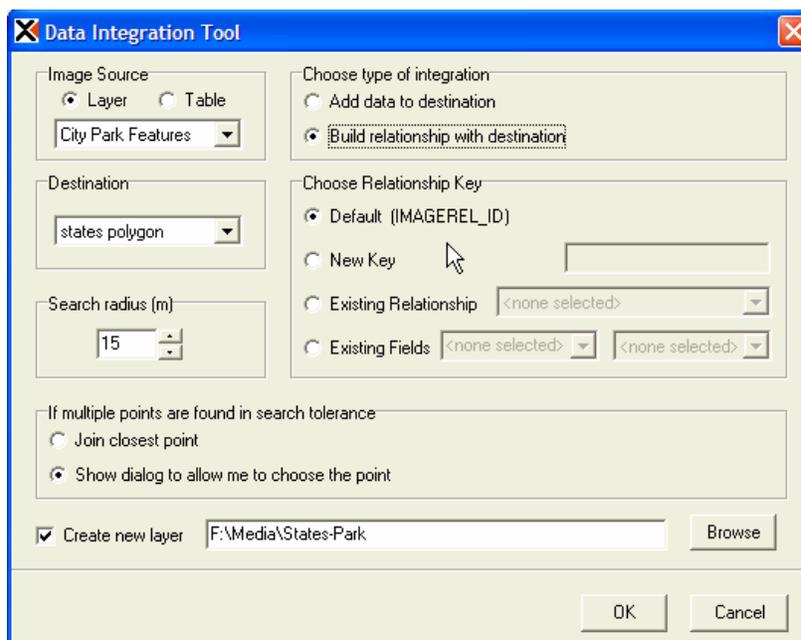
Options in the Data Integration Tool dialog box are:

Image Source

The image source can be a table (exported from PixPoint with X and Y columns) or a point layer.

Destination

The destination can be any point, line, or polygon layer.

Search Radius

The search radius determines the width of a buffer temporarily generated around each feature in the destination layer to test to see which point(s) in the source are related and should be joined.

Choose type of integration

Select **Add data to destination** if you wish to add fields from the Image Source. Existing fields with the same names and compatible types will be used, and current data in the Destination will be overwritten.

> **NOTE:** If PixPoint identifies an existing Destination field with the same name as a Source field, but containing an incompatible data type, the Source data is not added to the Destination field.

Select **Build relationship** to create a relationship object rather than adding fields from the Source. This is persisted in the document (.mxd file) for Shapefiles and the Geodatabase for MS Access layers. This is useful if you want to create a one-to-many relationship between features and the images that relate to them. Whenever you add new data to the Source, simply run the Data Integration tool again to rebuild the relationship with the Destination.

Choose relationship key

To build a relationship, choose one of the following key field options:

- **Default**—the IMAGEREL_ID field is the key
- **New Key**—a new field will be added to both the destination and source
- **Existing Relationship**—if adding to a one-to-many relationship that has already been created
- **Existing Field**—select an existing integer field in either the Destination or Source layer. A key field of the same name will be added to the other layer.

If multiple points are found in the search tolerance

If there are multiple points within the search radius, the option you select will determine whether PixPoint will:

- **Join the closest point** (or closest point to the centroid in the case of line or polygon destination features).
- **Show a dialog** with thumbnail images and database information to help you determine which point to match.

Create new layer

You can save the joined or related destination as a new layer based on a Shapefile or MS Access database, leaving the original destination layer unaltered. You can **Browse** to a new destination workspace (a directory or MS Access database), or enter a layer name.

If you enter a layer name, then the new featureclass will be created in the same workspace as the destination layer.

10. Frequently Asked Questions

Find the latest information, updates, and user support forum on the web at www.redhensystems.com/pixpoint.

Q: Should I reset my camera clock before each session?

A: Just make sure your camera clock is set once, then (unless there is a camera malfunction) you need not set it again. Never reset the camera clock during a field session. Resetting the camera clock at any time will affect PixPoint's camera clock drift calibration.

Q: I'm a Trimble user and I don't see a PixPoint format in the export options in GPS Pathfinder Office.

A: The PixPoint installation automatically locates GPS Pathfinder Office and installs an export file template, which enables GPS Pathfinder Office to save your GPS track log in a .gml format that is compatible with PixPoint.

         If you install GPS Pathfinder Office after PixPoint, then reinstall PixPoint. This will add the template to GPS Pathfinder Office.

Q: Can my camera be set to local time?

A: Yes, but the clock you take a picture of for calibration purposes must display UTC time with no offsets.

Q: Can I send log files and pictures using email, then process them with PixPoint later?

A: Yes. You should know that when you send a file in email, a new file creation time is generated. You would see this when browsing detailed file properties in Windows. This normally does not affect PixPoint, since digital cameras typically store the time the picture was taken in the picture metadata, and this metadata is used by PixPoint to correctly georeference the pictures. However, if you want the files to display their original creation time when you browse file properties in Windows, then place the files in a .zip archive before emailing. The recipient can "unzip" the files and process them, and the files will maintain their original creation time.

Q: Are there special settings I need to make on my digital still camera?

A: Some Kodak cameras (for example DSC 520) save pictures in a proprietary version of TIFF format. Set the camera to JPEG format to ensure best results. You should test your digital still camera and GPS unit with PixPoint and verify there are no problems before you collect important data.

Q: Where can I send other questions?

A: Visit the support page at www.redhensystems.com/pixpoint/ or send email to support@redhensystems.com).

Appendix A.   Notes for Specific GPS Receivers

Garmin eTrex Models and eMap

These GPS receivers create a track log when they are turned on, so there is no setup required to begin a GPS track log.

> **CAUTION:** The log file is always set to wrap on these GPS receivers. Ensure the receiver is not left on by mistake, since this may result in part or all of your track log being overwritten. Further steps to take include clearing the log before you start, and saving the log as soon as you finish. Check the log size periodically, and do not allow it to reach 99% full before you save the file.

After you use PixPoint to upload the track log to the computer, you can clear the log.

Potential Problems with "e" Series Receivers

These receivers log points based on course and speed criteria. They do not log points by time period (i.e., one per second). Therefore, whether the receiver is logging points depends on the movement of the user. Originally, these receivers were set to log points when the user is moving at 2 mph or higher. An upgrade, which changes this to a minimum of 1 mph, is available at www.garmin.com/support/download.html. Another aspect of these track logs is that points are logged on course changes. This means that if the receiver logs an initial point and then you move some distance in a straight line, when you change course it will log another point and discard all the intervening data along the straight line. PixPoint offers an **Interpolate** option to compensate for this, however, greater inaccuracy may result.

A Solution

These receivers can be forced to log a point whenever you need to record one. To do this, turn the GPS receiver off and then on. When you cycle the power, a point is logged as soon as a satellite fix is obtained. As an example, if you are standing still getting ready to take a picture, cycle the GPS power, then take the picture, then cycle the GPS power again to log another point before moving on.

How to Make a Garmin Track Log Accessible to PixPoint:

1   Connect the GPS receiver to one of the COM ports on your computer in accordance with manufacturer's instructions, then turn the GPS receiver on.

2   Locate the Interface settings in the GPS receiver's Setup menu. Set the format to Garmin.

3   On the PixPoint Acquire Data screen, select to Get data from a GPS receiver.

Garmin GPS III and GPS III Plus

Recording mode options

- **Fill.** This is the recommended mode. Fill mode records the track log until it is full (up to 1900 points). The track log will not be overwritten after it is full, however, you should periodically check that the log has not exceeded 99% capacity.

- **Wrap.** This mode records the track log continuously, overwriting collected points if the track fills. This mode is generally not recommended.

Logging interval options

The choice of logging interval determines how quickly the log fills, and how accurate the results will be.

- **Time interval.** This is the recommended option. The GPS position is recorded at the time interval value you specify. For example, a 5-second time interval used for 1900 points allows you to record a track log for about 2.6 hours. A 10-second time interval allows you to record a GPS track log for about 5.2 hours, however, the accuracy of placement on the map may suffer if you take pictures while moving. For higher accuracy, use shorter logging intervals.

- **Distance interval.** A point is recorded when the GPS receiver has moved beyond the specified distance interval from the last point. Because PixPoint matches by time it is better to log by time interval. If you use the distance interval option, you may need to increase the acceptable time match error when processing the files with PixPoint. This option is generally not recommended.

Garmin GPS V

The Garmin GPS V can be used to store waypoints instead of a track log to mark the locations of your images. This is referred to as *interactive mode*. In this mode you must interact with the receiver (store a waypoint) each time you want to record a location, however, the advantages of using interactive mode include:

- Better control over memory usage, since each picture uses only one waypoint in memory.

- The GPS V can store 500 waypoints so you can take up to 500 georeferenced pictures before you have to unload the receiver.

Interactive Mode Setup

To use the GPS V in interactive mode, set the GPS time parameters to:

- **Time Format:** 24 Hour

- **Time Zone:** Other

- **Daylight Savings:** (Blank)

- **UTC Offset:** +00:00

> **IMPORTANT:** Do NOT rename the waypoints. Leave the name set to the system default.

To Store A Waypoint

1   Press and hold **ENTER** until the **Mark Waypoint** dialog appears.

2   Release, and then again press **ENTER**.

How to Make Garmin V Waypoints Accessible to PixPoint

1   Connect the GPS receiver to one of the COM ports on your computer in accordance with manufacturer's instructions, then turn the GPS receiver on.

2   Locate the **Interface** settings in the GPS receiver's Setup menu. Set the format to **Garmin**.

3   On the PixPoint Acquire Data screen, select to **Get data from a GPS receiver**.

> **NOTE:** PixPoint will match pictures to both a tracklog and waypoints. In this case, pictures are matched to the GPS location recorded closest in time to when the picture was taken, regardless of whether the GPS data point is a waypoint or is recorded in the track log.

Clearing the Waypoint Memory

When you are finished uploading data from the GPS receiver, you should clear the waypoint memory to make room for storing more image locations.

To clear the waypoint memory in the Garmin GPS V:

1   Press **MENU->MENU.**

2   Select **Find** and then press **ENTER.**

3   Select **Waypoints** and then press **ENTER.**

4   Select **By Name** and then press **ENTER.**

5   Press **MENU** and then select **Delete All**.

6   Press **ENTER** and then select **YES**.

7   Press **ENTER**.

Casio Pathfinder GPS Watch

Limitations of the Pathfinder

- The time data reported in the GPS log does not include seconds. Time data is truncated to the minute.

- The GPS log file is not strictly time periodic. The interval you set is actually the maximum rate at which data will be recorded. The GPS receiver must be activated either manually or by time periodicity each time GPS data is recorded. The first GPS data point measured after the log "opens" for a period is recorded in the log. The time at which the log opens to accept a GPS measurement is synchronized with the "top" of a minute (UTC seconds = 0) and the log closes when a GPS data point is recorded. The fastest rate at which GPS data can be recorded is once per minute.

- Because the GPS time resolution is only one minute, pictures may not be placed accurately if you are move around the time a picture is taken.

Logging Mode

The recommended mode of operation is manual GPS point logging. The advantages of this mode are:

*   The actual location of the picture is recorded
*   The number of pictures mapped per session is maximized
*   Power consumption is minimized (longest battery life)

Procedure

1   Ensure the **GPS TRK INTERVAL** is set to **1 min**.

2   Ensure the **MSR. MODE** is set to **ONE SHOT**.

3   When you are ready to take a picture:

> **a**   Press the **START** button.
>
> **b**   Wait for the GPS to complete a measurement.
>
> **c**   Take the picture.

You can take the picture before the GPS measurement, but the time the picture was taken will not match as closely because it takes the watch about 30 seconds to measure a GPS location. It is best to wait for the measurement and then take the picture as close to that time as possible.

How to Make a Casio Pathfinder GPS Track Log Accessible to PixPoint

*   Connect the watch through the docking station to the computer.
*   Upload the log file into the Casio Satellite Navi Software as described in the Casio Module No. 2240 User's guide.
*   Select **File>Export>Export TrackPoint Set**.
*   Set the options in the **Export Data Settings** dialog as shown below
*   Click **OK** and enter a file name for the log. This is the file you will use with PixPoint.
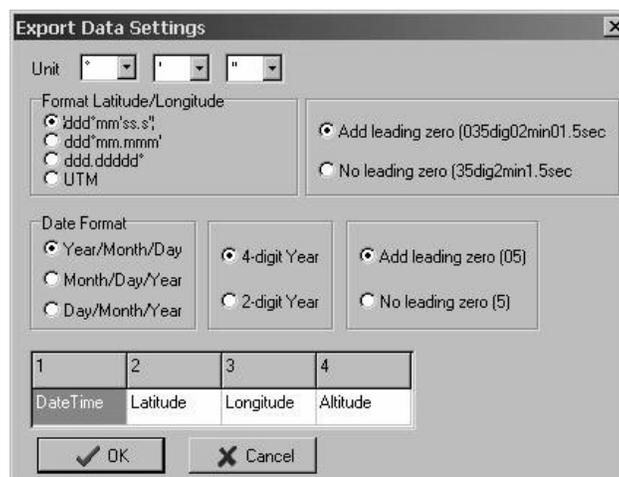
Trimble GeoExplorer 3 and GeoExplorer 2

You can adapt and apply these general instructions for use with other Trimble GPS receivers that are compatible with GPS Pathfinder Office. In addition to the following, you should check the general GPS receiver requirements.

> **NOTE:** When choosing a logging interval, it is helpful to know whether you will be moving or standing still when taking pictures. In any case, you need to collect at least one GPS log point before and after taking each picture. If moving, set the track log to collect data at a suitably short interval to collect points close to the location. The logging interval and the time match error you set in PixPoint will determine the mapping accuracy of your pictures.

GeoExplorer 3

Choosing a logging interval

1 To set the track log interval, enter the **SYS** menu and select:
Feature Settings>Generic>Point.

2 Choose an Accuracy setting. The Accuracy setting in this menu sets Carrier or Code accuracy. You can select Carrier for high accuracy, which enables logging of about 4000 points in the file. This means that with a 5-second interval, the total log time is about 5 hours. You can otherwise select Code for lower accuracy, which enables logging of about 10000 points in the file. This means that with a 5-second interval, the total log time is about 14 hours. Either accuracy can be differentially post-processed in Trimble GPS Pathfinder Office.

Starting a GPS log

1 Enter the **DATA** menu.

2 Choose a new or existing log file.

3 Select to begin logging **NOW**.

> **NOTE:** You can pause and restart logging when desired by pressing the LOG II button.

GeoExplorer 2

Choosing a logging interval

There are several logging frequency selections to choose from. The time available for each is:

Mode	Frequency	Log Time
Rover	1sec / velocity logging off	3 hours
Rover	5sec / velocity logging off	15 hours
Rover	1sec / velocity logging on	1.5 hours
High Accuracy Rover	15sec / minimum time 10 min.	4 hours

Either accuracy mode can be differentially post-processed in Trimble GPS Pathfinder Office.

Starting a GPS Track Log

The track log is called a rover file in the GeoExplorer 2 menu. To start the log, select:

Main Menu>1.Data Capture>1.Open Rov. File

How to Make a Trimble Track Log Accessible to PixPoint Using Trimble GPS Pathfinder Office

The PixPoint installation automatically locates GPS Pathfinder Office and installs an export file template, which enables GPS Pathfinder Office to save your GPS track log in a .gml format that is compatible with PixPoint.

If you install GPS Pathfinder Office after PixPoint, you can select the Install Template utility in the Start Menu before you use GPS Pathfinder Office.

> **NOTE:** The file export procedures described below can be automated using the GPS Pathfinder Office batch processor.

1   Connect the GPS receiver to one of the COM ports on your computer in accordance with manufacturer's instructions, then turn the GPS receiver on.

2   In GPS Pathfinder Office, select **Utilities>Data Transfer**.

3   When GPS Pathfinder Office locates the GPS receiver, click **Add**.

4   Select the appropriate data file (the GPS track log), then click **Open**.

5   Click **Transfer All**. GPS Pathfinder Office creates a .ssf file from the track log.

6   *Optional at this step:* Use GPS Pathfinder Office to differentially post-process the .ssf file if desired. If you do this, GPS Pathfinder Office creates a .cor file.

7   Export the .ssf or .cor file by selecting **Utilities>Export**.

8   Choose the PixPoint export setup, and select a folder for the exported file. Click Ok to complete the export.

Other GPS Data Sources

How to Make a .txt (NMEA data file) or .dbf (MediaMapper GPS index) Accessible to PixPoint

PixPoint can use GPS information from any NMEA .txt file that contains the RMC string or the GGA and ZDA strings.

PixPoint can also use MediaMapper GPS index files, for example, if you use Red Hen Systems' VMS 200 GPS hardware to record GPS-indexed video and simultaneously take digital pictures at sites of interest.

1   On the PixPoint Acquire Data screen, do not select to Get data from a GPS receiver.

2   Continue to the Camera Calibration screen and complete the calibration step.

3   On the GPS Matching screen, click **GPS Logs...** to locate the .txt file or.dbf file.

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