DAP and IGOR User Guide

This user guide will give you all the essential information needed for interacting with and deploying IGOR Pro and Wildlife Computers Data Analysis Program (DAP).

WILDLIFE COMPUTERS

v.202106

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Before You Begin

You will need to install two programs to your desktop before you begin: IGOR Pro 6.3 and Wildlife Computers Data Analysis Program 3. You must use IGOR Pro version 6.3 as this is the only version compatible with DAP.

IGOR must be installed before DAP. If DAP is installed first, you must delete it and reinstall it.

IGOR Installation

IGOR Pro is available from WaveMetrics. Click on the installation link: IGOR Pro 6.3 or http://www.wavemetrics.net/Downloads/Win/setupIgor6.exe. Earlier versions of IGOR must be uninstalled before downloading version 6.3.

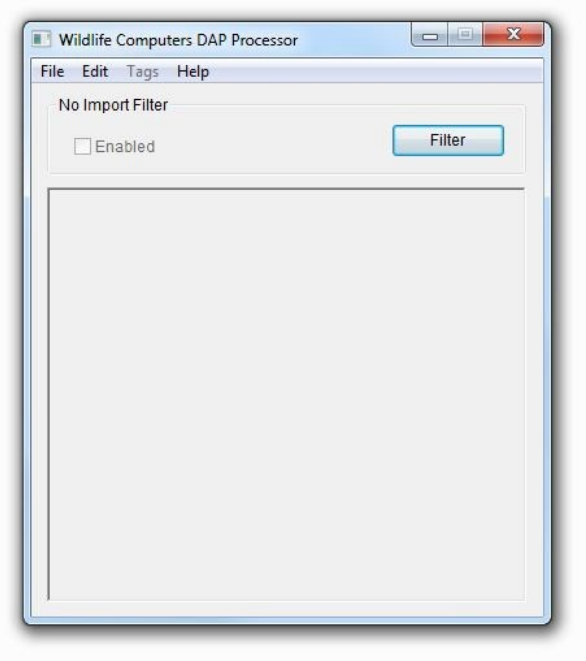
DAP Installation

DAP is available on the Wildlife Computers website https://wildlifecomputers.com/wp-content/uploads/software/WC-DAP.msi

Wildlife Computers Data Analysis Program (DAP) Processor

The DAP processor decodes and exports tag data that were transmitted through the Argos satellite system or downloaded directly from a tag. DAP can also read setup files created by Wildlife Computers Host programs. When files are created prior to deployment, exported files can be labeled with Histogram bin limits not normally included in Argos data files.

To start DAP Processor:
Start Menu > All Programs > Wildlife Computers> DAP> DAP Processor

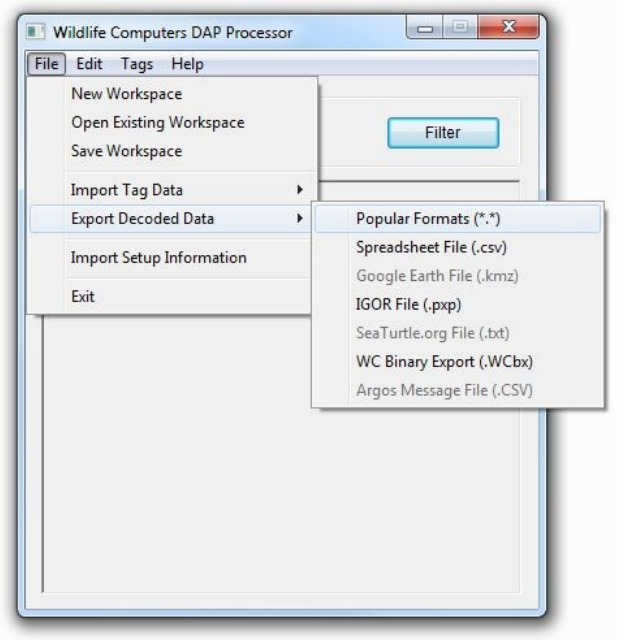


Drag and drop one or more Wildlife Computers Hexadecimal (WCH) files, Argos message data files (.prv, .ds, .txt), and/or data downloaded from ArgosWeb onto the DAP processor. You can also use the file menu to browse for your files. If your Argos data files have a .prv extension, you can simply double click on them to start DAP processor. DAP Processor automatically recognizes and decodes the data as required. If you have data from multiple tags and/or deployments and only want to process a subset of these data, see the Filters section.

Exporting Decoded Data

Decoded tag data can be saved from DAP in a variety of formats.

File > Export Decoded Data

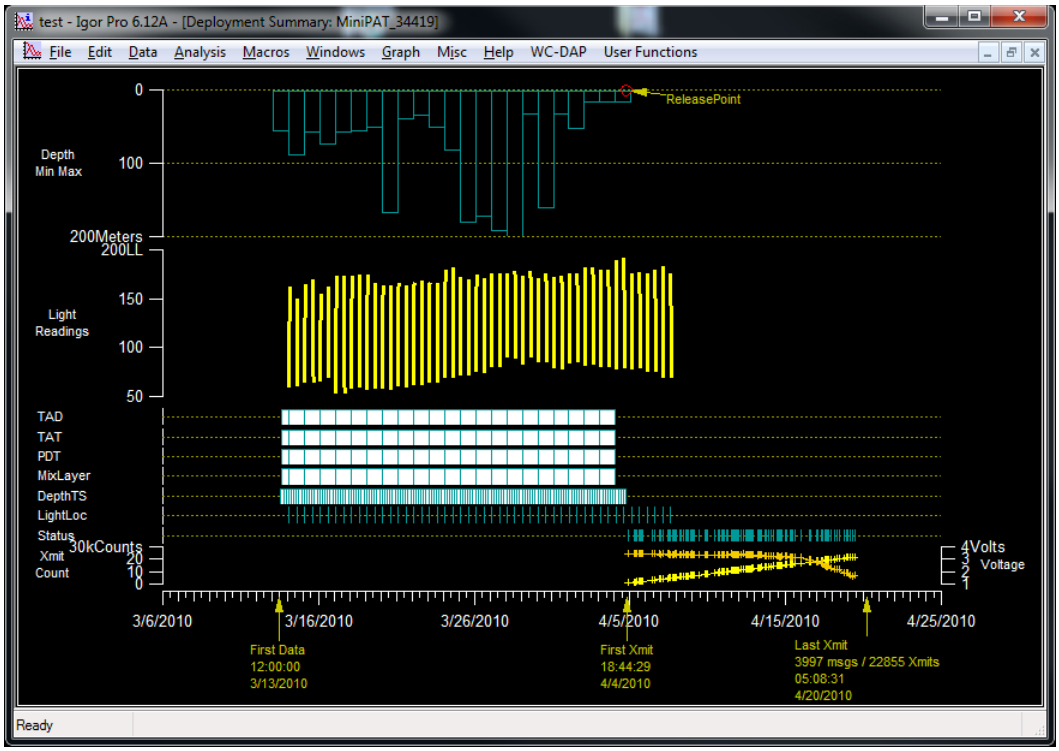


Spreadsheet File (.csv)—multiple files are created, each of which has multiple columns. Descriptions of these files and their columns are found in the Spreadsheet File Descriptions section.

Google Earth File (.kmz)—allows you to view the tag location(s). The Google Earth tracks include Argos locations, Wildlife Computers Global Position Estimator Version 3, and Fastloc® GPS locations.

IGOR File (.pxp)—IGOR allows you to quickly manipulate, process, and plot your data. IGOR provides a richer environment than DAP. The free version does not allow you to save your plotted data but he licensed version enables all the features. DAP is compatible with the 32-bit version of IGOR. DAP does not support 64-bit IGOR.

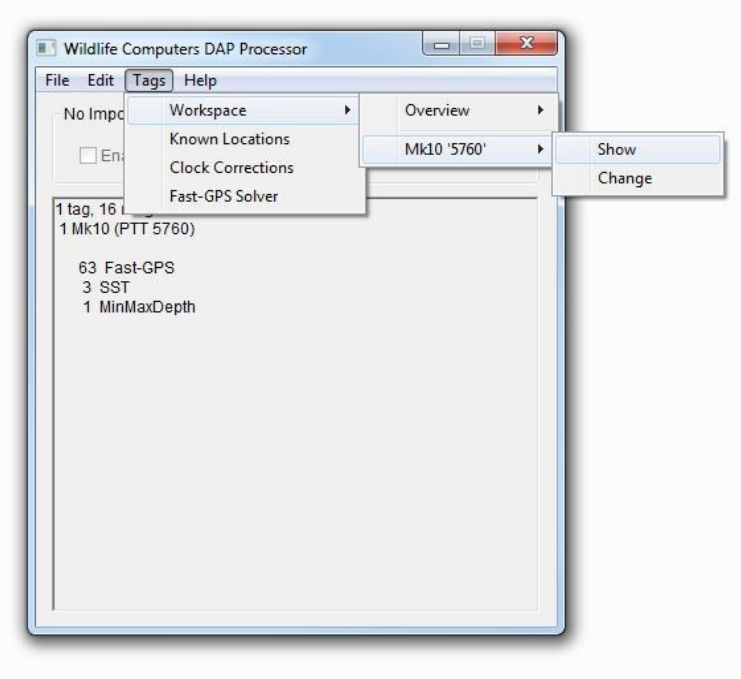
Here is an example of MiniPAT deployment summary in IGOR pro:



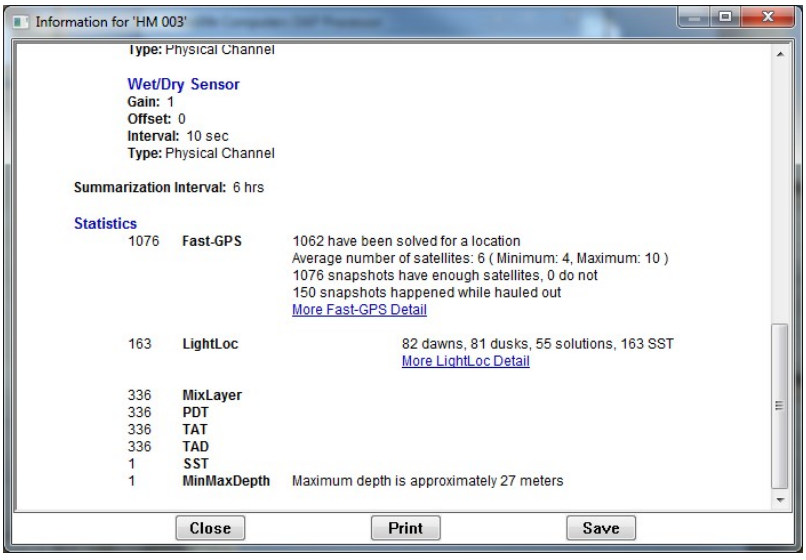
DAP Processor Workspace

DAP maintains a workspace containing the WCH archives, Argos message files, and any other information you have entered. To view the contents of the workspace:

Tags > Workspace

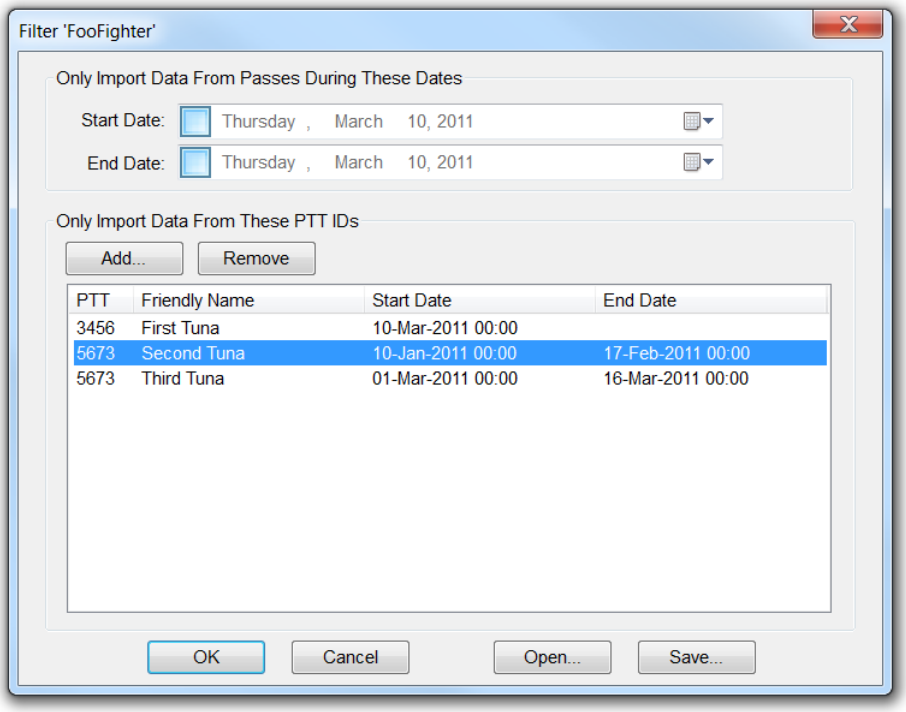


You can see details, Print, or Save:



Filters

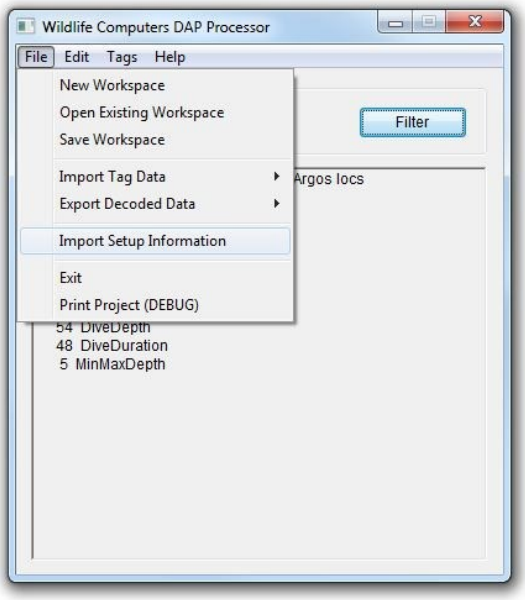
Filters are useful if you have Argos data containing multiple PTT IDs and/or multiple deployments. Filters allow you to choose specific PTT IDs and date ranges to be processed. They also let you assign a "Friendly Name" that appears in the tag's exported data. The "Friendly Name" appears as the tag's DeployID in exported .csv files. Filters are applied as data are imported into the DAP processor and have no effect on data already loaded. Pressing the Filter button in DAP lets you manage the current filter:



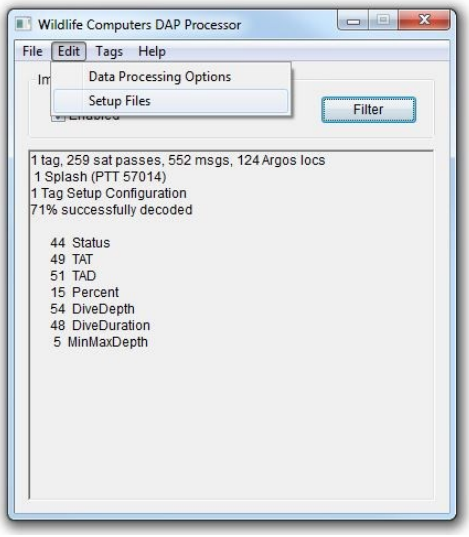
Check the Enabled box in the DAP interface to enable the filter.

Tag Setup Files

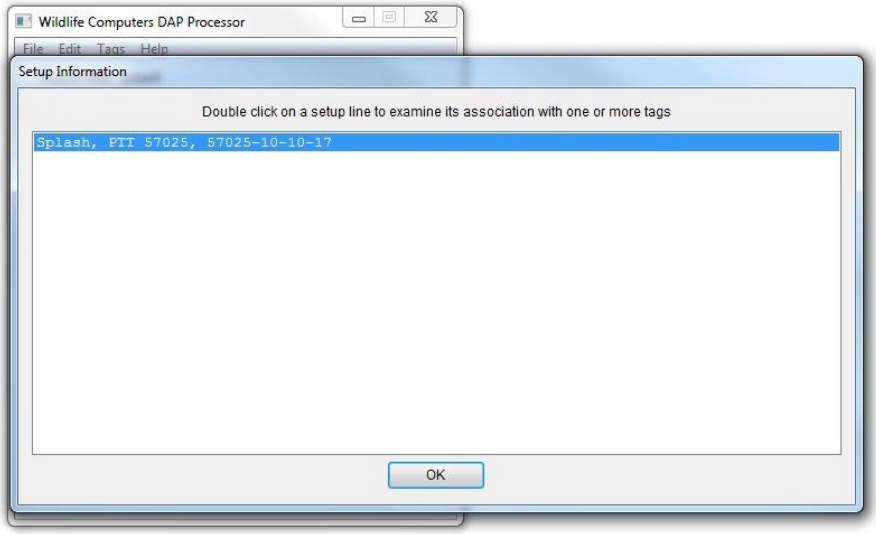
Tag setup files are created by the Wildlife Computers Host program for each tag when the tag is confirmed for deployment. A setup file can contain information that helps DAP decode the tag's data. Such information includes whether the tag is a 1,000- or 2,000-meter tag as well as limits for transmitted histogram data. DAP can include the information from the setup files when it exports data. Zero or more setup files can be imported into the workspace:

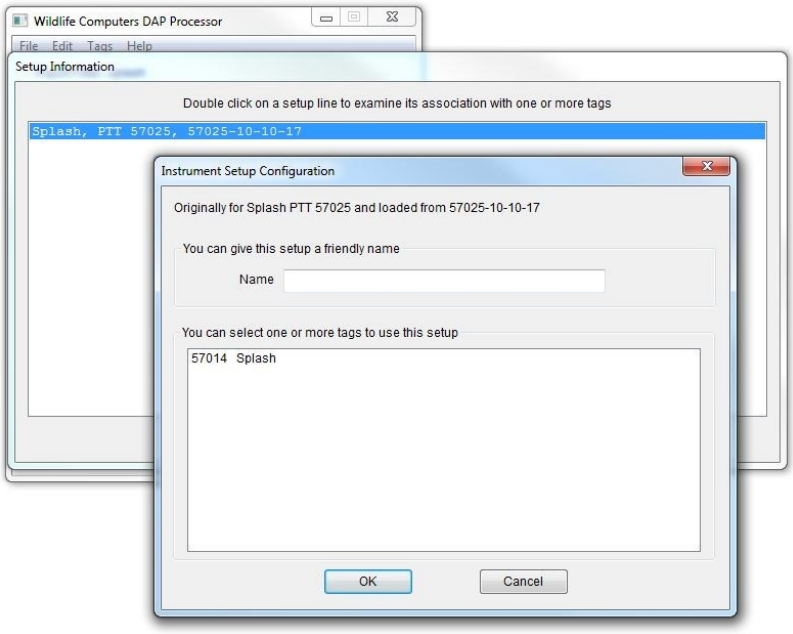


Once imported, setup information needs to be associated with one or more tags. This process starts with Edit > Setup Files:



This shows a list of all setup information which has been imported into the workspace:



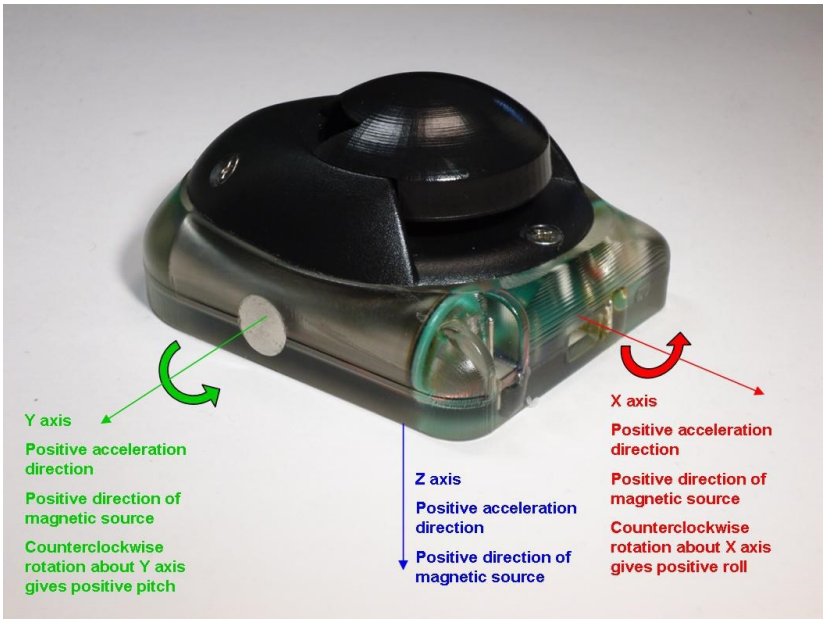


Setup information is associated with one or more tags by double-clicking on a setup entry in the list to reveal a list of tags in the workspace:

Selecting on or more tags and pressing OK associates the setup information with the tags. This setup information will be included where possible in DAPs exported data.

Accelerometry, Magnetometry, and Velocity

Some tags are equipped with sensors measuring 3-axes of acceleration, 3-axes of magnetic field strength, and velocity. These seven data channels are archived by the tag and later processed with DAP. Typical sense and assignment of the tag axes are illustrated below:



This tag senses acceleration and magnetic field strength in a right-handed coordinate frame. A motionless tag on a level surface produces the following static acceleration values:

- X=0
- Y=0
- Z=-9.8 m/s/s

DAP calculates several derived values from the archived acceleration and magnetic field strength data. These derived values are only available when the tilt (i.e., pitch and roll) of the tag can be reliably determined. Since the accelerometers are sensitive to both static and dynamic accelerations, DAP calculates the derived values only when the total acceleration measures 9.8 + 0.2 m/s/s. Under this condition DAP assumes that the acceleration reading is mostly static and therefore tilt can be determined. Once the tilt of the tag is known, pitch and roll can be reported along with various magnetic readings as follows. In special cases, the static acceleration can be isolated from the total acceleration readings using methods such as low pass filtering. This technique is not employed by DAP.

Wildlife Computers expresses thanks to the Swansea Moving Animal Team, Swansea University, and particularly to Dr. Ian Davies for his derivation of Heading.

Heading
This is the direction in which the nose of the tag is pointing and is expressed in degrees on a scale of 0 to 360. Magnetic North corresponds to a reading of 0 with a clockwise rotation increasing the value (consistent with navigational headings).

Magnetic Vertical
This is the value of the vertical component of earth's magnetic field strength, derived from the total magnetic field strength, and expressed in microteslas.

Magnetic Horizontal
This is the value of the horizontal component of earth's magnetic field strength, derived from the total magnetic field strength. The value is given in microteslas.

Magnetic Dip
This is the angle at which the earth's magnetic flux lines enter the earth's surface. This value is given in degrees, from -90 to +90 with 0 being completely horizontal to the earth's surface. +90 corresponds to the tag resting directly over the magnetic north pole while a -90 reading means the tag is over the magnetic south pole.

Pitch
This is the counterclockwise rotation of the tag about its Y axis as show above. This value is given in degrees from -90 to +90 (where a horizontal tag reads 0 degrees).

Roll
This is the counterclockwise rotation of the tag about its X axis as shown above. This value is given in degrees from -180 to +180 (where a tag flat on its base reads 0 degrees).

Magnetic Magnitude

This is the overall strength of the earth's magnetic field. It is the vector sum of the three magnetometer channels. The value is presented in microteslas.

Zero Offset Correction

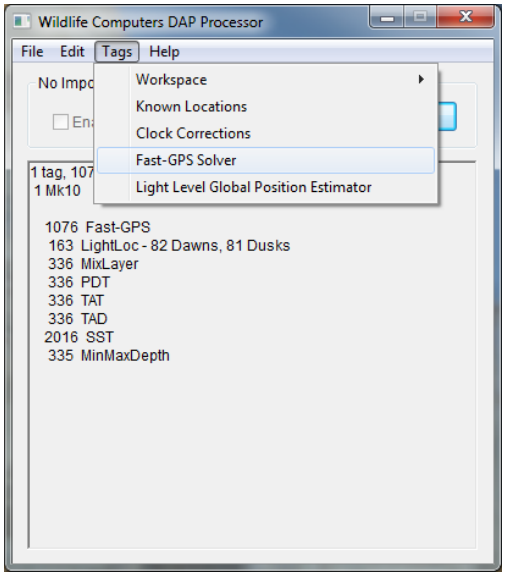
On some older model tags, the depth sensor reading measured at the ocean surface can drift away from 0 meters. This slow drift is considered to a Zero Offset Error. For some tagged animals, such as mammals that must come to the surface at some point in time, the wet/dry sensor can be used to independently observe a surfacing event. During the surfacing event, the depth sensor is read and the difference between the reading and 0 meters is noted. This value becomes the Zero Offset Correction. The correction value is then applied to subsequent depth readings to effectively "zero" the offset error. This is an optional feature on most tags that must be enabled prior to deployment.

In practice, the Zero Offset Error drifts slowly over time if at all. Therefore, the algorithm that tracks the error and produces the Zero Offset Correction value is constrained in time. The algorithm limits the change in correction value to 1 unit per hour. For a tag with 0.5-meter resolution, the limit is therefore 0.5 meters of change per hour. The limit is more than fast enough to track normal drifting of the sensor during a deployment. If, however, there is a large offset error at the beginning of the deployment, it could take several hours for the tag to reach the required correction value.

Fastloc®-GPS Solver

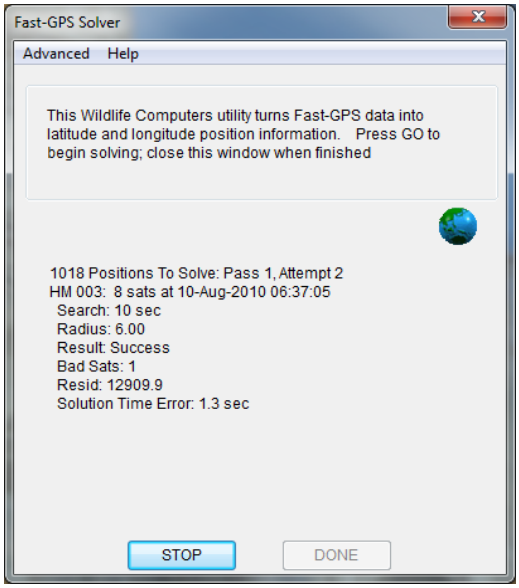
If the DAP workspace contains Fastloc-GPS snapshot information, it offers the option to convert the snapshot data into locations:

Tags > Fastloc-GPS Solver

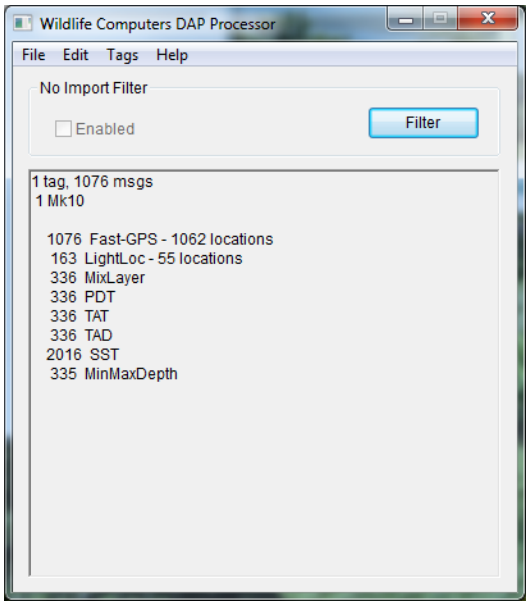


DAP uses daily RINEX files to convert snapshot data into locations. These files are automatically retrieved from the Internet as required. DAP saves these files on your computer so it doesn't need to

download it again. However, this means that an Internet connection is required the first time a snapshot for a particular day is solved.



When all positions have been solved, the globe will stop spinning and you can click Done which takes you back to DAP.



If you press Stop before all locations are solved (and this may take several passes through the complete data set), you can resume processing by going to Tags > Fastloc-GPS Solver > Resume.

Successful conversion of Fastloc-GPS data to locations requires a reasonably accurate estimate of the tag's location during some part of the deployment and an accurate clock on board the tag. The Tags menu has items for you to enter known clock error, estimated clock drift, and tag locations. This information is automatically retrieved from the Argos messages if the instrument has a transmitter. If

you have recovered a transmitting instrument, you should provide both the downloaded .wch file and the Argos message data to DAP.

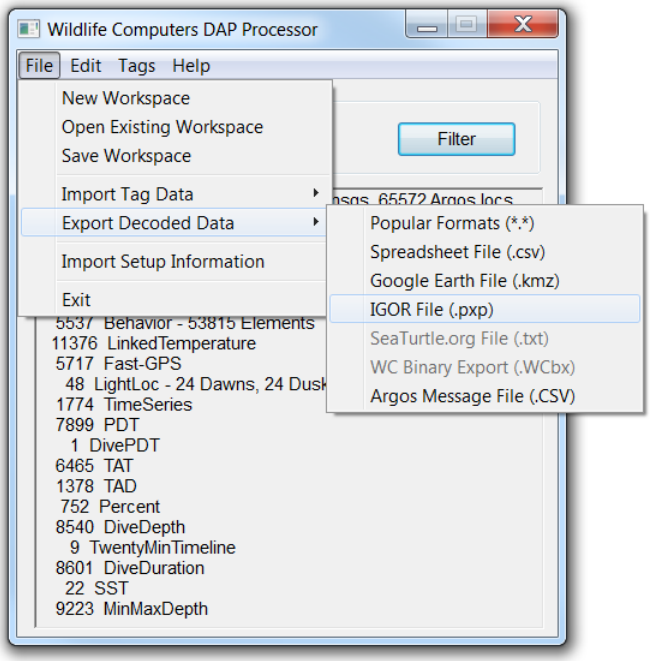
The difference between the tag's clock and the computer clock is noted and recorded in the .wch file when a tag is downloaded, and this can help determine clock drift if the computer's time is correct when the .wch file is created. You can examine the time differences from the Tags > Workspace menu and optionally enter the clock correction value.

Using IGOR to Analyze the Data

You can export tag data in a format readable by the IGOR software available from Wavemetrics (www.wavemetrics.com) and you can use IGOR to manipulate, process, and plot your tag data. The following sections describe how to easily create IGOR data files and illustrate the custom plotting functions included in DAP Processor.

If you choose to obtain a license for IGOR, you can save the plots to disk for inclusion in presentations and write your own data processing scripts. Otherwise, the freely available limited demo version of IGOR allows you to only view the plots on your screen.

IGOR files end with .pxp, and DAP generates them:

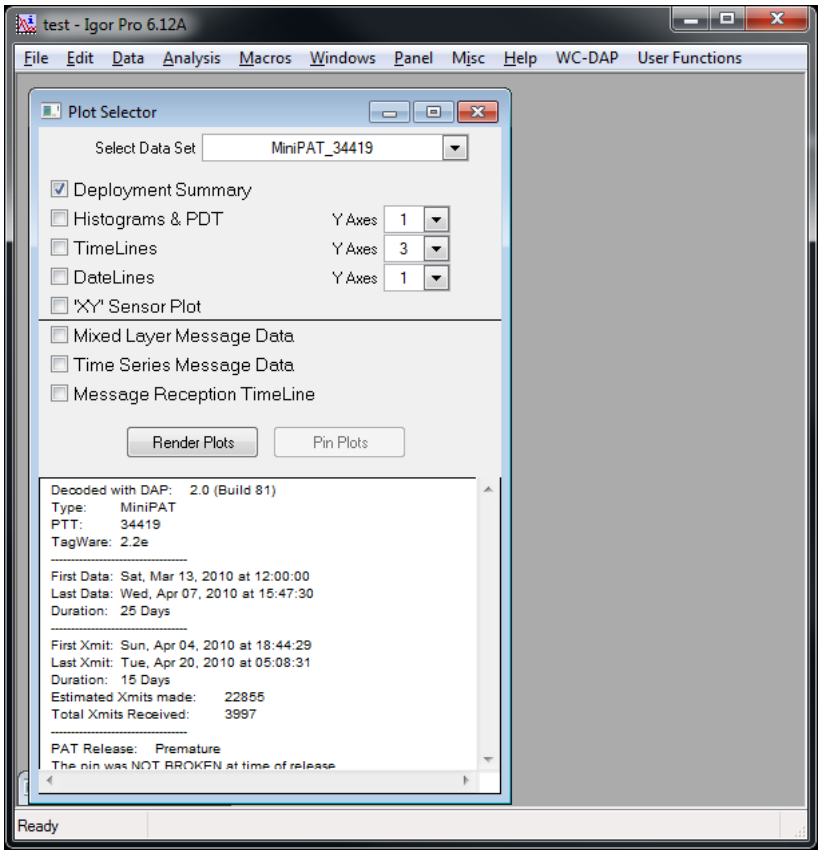


A single IGOR file is created containing all of the data for the tags in the workspace. The technical details are described in the IgorPXPDetails.pdf found in the WC-DAP installation folder.

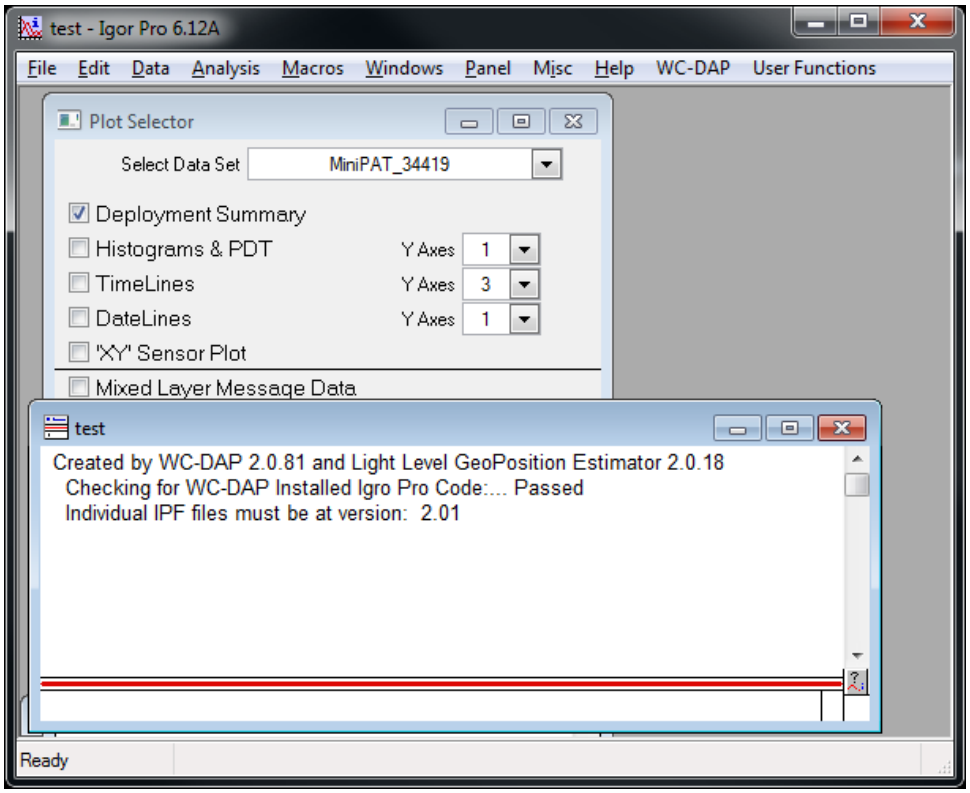
Verifying DAP and IGOR Installations

The *.pxp file generated by DAP can be directly read by IGOR which is a very powerful data plotting application. You can write custom scripts ranging from very simple to highly complex in the IGOR language to process and analyze your data. DAP includes plotting scripts to help you visualize the tag data and provide a summary overview of the tag deployment without having to learn the IGOR language.

By installing IGOR first, then installing (or reinstalling) DAP, DAP's plotting scripts become available to IGOR. Once installed correctly, double-clicking on an exported IGOR file will open IGOR, load the tag data, and display a Plot Selector window as illustrated here indicating that the installation was successful.



You should see the "WC-DAP" menu item in the menu bar at the top. If you do not see the Plot Selector or the WC-DAP menu item, then there is a problem with the installation of the scripts so please read the rest of this section for details on how to get set up. When loading a *.pxp file, diagnostic information is reported in the Command Window as illustrated below, which may be useful when trouble shooting an installation.



The DAP installer does two things when it is run. First, it places two shortcuts in special places in the IGOR installation folder. If IGOR is not installed before DAP, then the DAP installer cannot place the shortcuts in the correct IGOR folder. So, after installing IGOR, try reinstalling DAP.

The installer places one shortcut in "C:\Program Files (x86)\WaveMetrics\IGOR Pro Folder\User Procedures" named "WC-DAP User Procedures." The shortcut points to "C:\Program Files (x86)\Wildlife Computers\IGORProCode\UserProcedures."

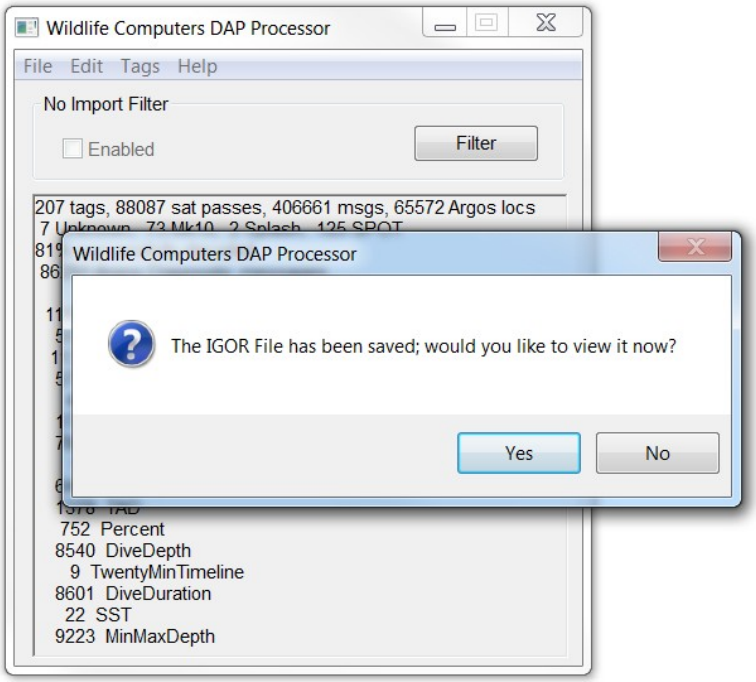
A second shortcut should be in "C:\Program Files (x86)\WaveMetrics\IGOR Pro Folder\IGOR Procedures" and is named "WC-DAP User Procedures". This shortcut points to "C:\Program Files (x86)\Wildlife Computers\IGORProCode\IgorProcedures."

The DAP installer places a file called WCDAPIgorProCodeLoader.IPF in the "C:\Program Files (x86)\Wildlife Computers\IGORProCode\IgorProcedures" folder and it places a file called WCDAP_Main.IPF in the "C:\Program Files (x86)\Wildlife Computers\IGORProCode\UserProcedures" folder. You can check to ensure ONLY these files are located in these folders.

On 64-bit Windows operating systems, all the software and shortcuts are located in the "Program Files (x86)" folder.

Generating Tag Plots

The following sections assume correct installations of DAP and IGOR. Assuming you have processed some data with DAP and exported the decoded data as an IGOR file, DAP gives you the opportunity to view the information in IGOR:



Choose Yes to launch IGOR.

Plot Control Window

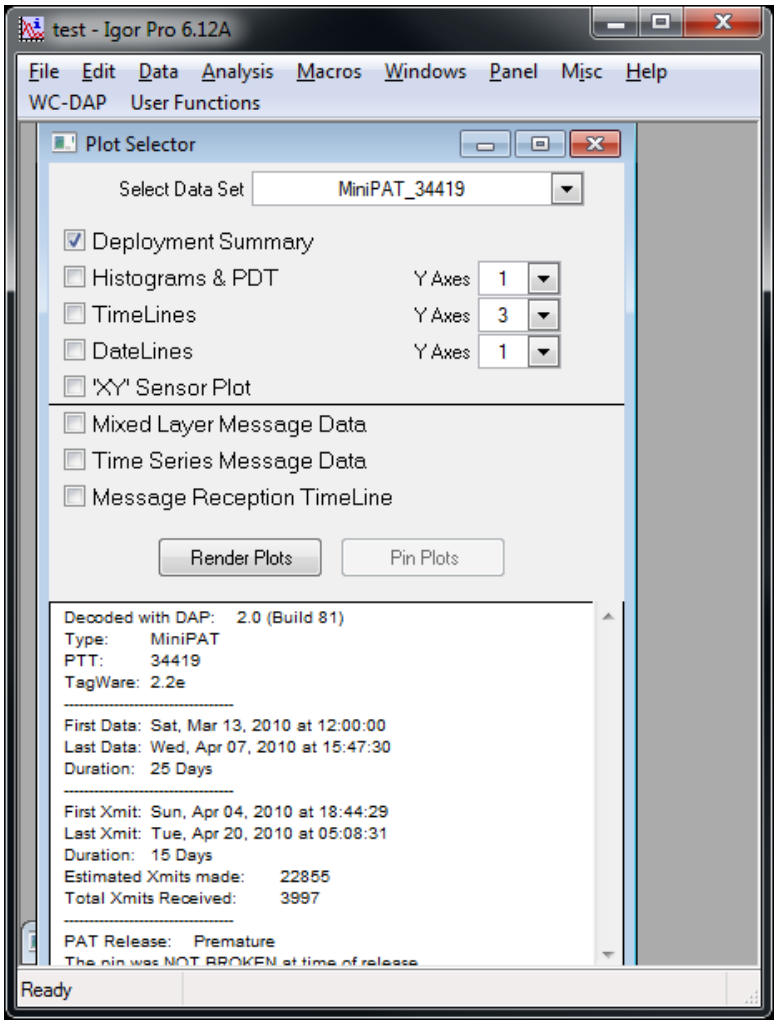
Your IGOR file may contain data from more than one tag, more than one type of tag, or data from both the Argos satellite system and from your tag's archive. The Plot Selector Panel provides an easy means of accessing your data from each tag. To access the Plot Selector panel within IGOR click the following menu item.

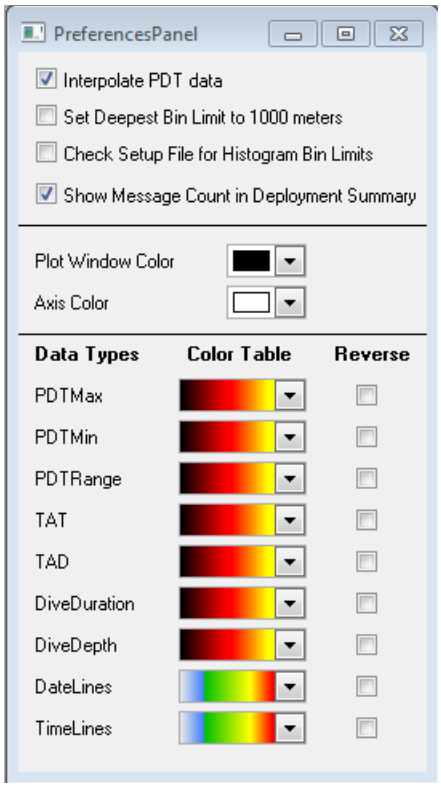
WC-DAP > Display Plot Selection Panel

Use the drop-down menu, Select Data Set to select the data set you want to plot. As you can see, a MiniPAT with PTT ID 34419 has been selected in the menu. Summary information concerning the length of deployment, number of transmission days, pop-off diagnostics, etc. are also displayed in the Plot Control Window for the currently selected tag.

There are many plot types, including special diagnostic plots, supported in the Wildlife Computers script. If your data set contains the required data to generate a specific plot, the corresponding plot check box will be enabled. This allows you to choose the plots you would like to generate for each tag if the data allow. Once you select the plots and the number of Y axes, click the Render Plots button to generate the plots. In addition to rendering the plots, this action will also enable the Pin Plots button in the Plot Selector Panel. Click the Pin Plots button if you want to preserve the currently rendered plots. Otherwise, if you choose a different tag and click the Render Plots button, the plot windows will

be reused to show the newly selected tag's data.





Preference Panel

You can modify some key plotting preferences by clicking on the following menu item:

WC-DAP->Display Preferences Panel

This brings up a panel with several configurable options. As you make changes, these settings are saved to your hard disk and will be applied to future sessions. The settings are saved on your computer and are used in future IGOR sessions.

Interpolate PDT Data: To improve the appearance of plots containing PDT data, you can choose to have IGOR interpolate the temperature colors between reported depth. The interpolation is linear. Set Deepest Bin Limit to 1000 Meters: In certain histograms such as TAD and Maximum Dive Depth, the deepest bin captures all of the data deeper than some value that you set. For plotting purposes, IGOR needs to know where to cut off the bottom of the graph. Checking this box sets the deepest depth in the histogram plot to 1000 meters unless some deeper data is reported.

Check Setup File for Histogram Bin Limits: The histogram bin limit data should be presented to IGOR from DAP. IGOR needs this data to properly display histogram data. If the bin limits are not provided by DAP when the .pxp file is generated, IGOR can prompt you for the tag's setup file when it attempts to render a plot that requires the limits. On the other hand, this may get annoying if the bin limits are simply not available. Therefore, you can use this setting to suppress the bin limit prompt. If no valid bin limits are provided, IGOR will plot the data against bin number.

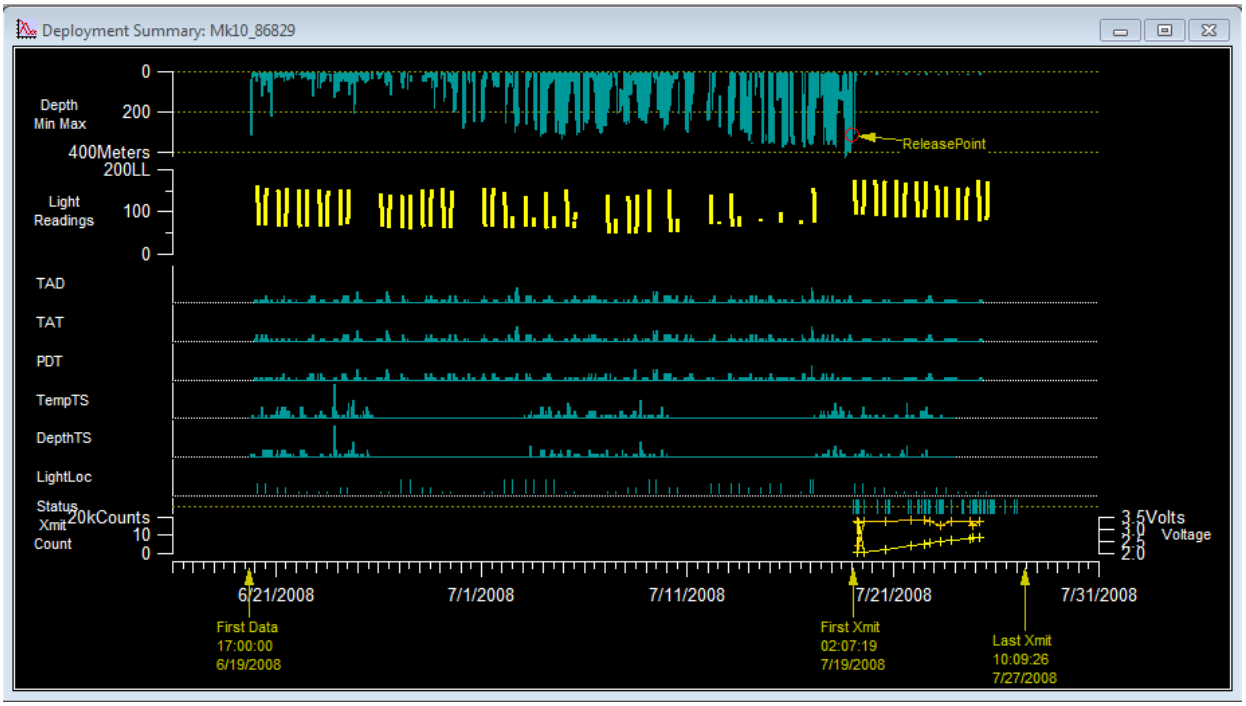
Show Message Count in Deployment Summary: The Deployment Summary plot has a number of axes that show whether or not a data type exists in the overall data set for a particular period of time. Normally, you only need to know whether you have received data or not. But you may want to know to know how many times a particular piece of data was received. This information is useful when trying to manage your Argos transmission count budget. The number of times a piece of data was received will be encoded as the height of the blue tick.

Plot Window and Axis Color: Use theses drop-down boxes to set the plot's background color and axis color. These settings do not apply to the diagnostic plots (Mixed Layer, Time Series, and Message Reception).

Color Tables: You can choose a color table for each data type as well as whether the table should be reversed. The chosen color table will be used to color encode data in the various plots. The Timelines plot will color its various traces by using sensible distinct colors from the chosen table.

Deployment Summary

The Deployment Summary plot gives you a concise overview of the entire tag deployment. The plot has date and time on the x axis and has several y axes depending on the type of tag and data content. For example, if your data set contains a complete deployment from a pop-off tag, it should look something like this:



The X axis is annotated to show the time of earliest data point (First Data), and the time of the first and last received Argos transmissions (First Xmit and Last Xmit). From the yellow and gold traces you can see the reported transmission counts are increasing steadily while the battery voltage is slowing tailing off to depletion indicating a typical deployment.

There is also an annotation at the top right of the plot which is important for pop-up tag users. This annotation is a circle and is placed on the plot at the time and depth the tag initiated the release procedure.

There are several Y axes included in this plot. Starting from the top there is a Depth Min- Max axis. The data plotted on this axis represent the minimum and maximum depths reported in the summary period. The channel is created by DAP from all available message types to build as complete a picture as possible. The summary period is the same summary period chosen for Mixed Layer, PDT, TAT/TAD histograms, etc., when the tag was initially set up.

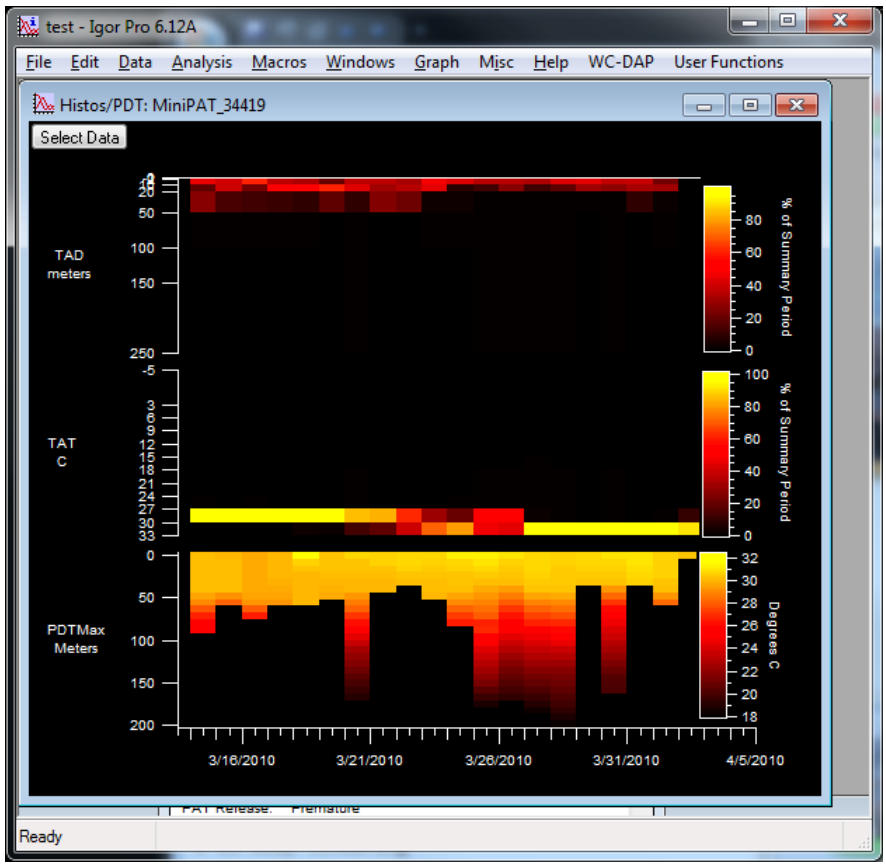
Plotted on the next Y axis are all of the light sensor data and these are the dawn and dusk curves used in the geolocation programs. The curves are included here as a diagnostic tool as some find the quality of these curves to be an indicator of how good the overall data set is.

Next are a number of axes grouped together. The blue tick marks on these axes represent the period of time during the deployment for which data was received. This is not the time of when the messages were received, but the time that the data were collected. The width of the tick marks in some cases can form boxes—these boxes are shaded white and represent period for which is data is summarized.

It is possible to show the number of times a particular piece of data was received through the satellite system. From the Preferences Panel, check "Show Message Count in Deployment Summary." The relative heights of the blue tick marks indicate the number of times a piece of data was received sets.

Histograms and PDT Plot

The plot window displays histogram and PDT data that was compiled from the sensor data collected by the tag. You can choose 1, 2, or 3 Y axes. The time and date are assigned to the X axis with data spaced along this axis according to the summarization period that was chosen when the tag was initially set up for deployment. For histograms, the percent time spent in each bin for a given summary period is encoded from the chosen color table and distributed over the "bins." If the bin limits are known to IGOR for a given data set, then the Y axis will be scaled appropriately. PDTs are a little different in that the temperature recorded at various depths is encoded (in degrees Celsius) as colors chosen from the color table.

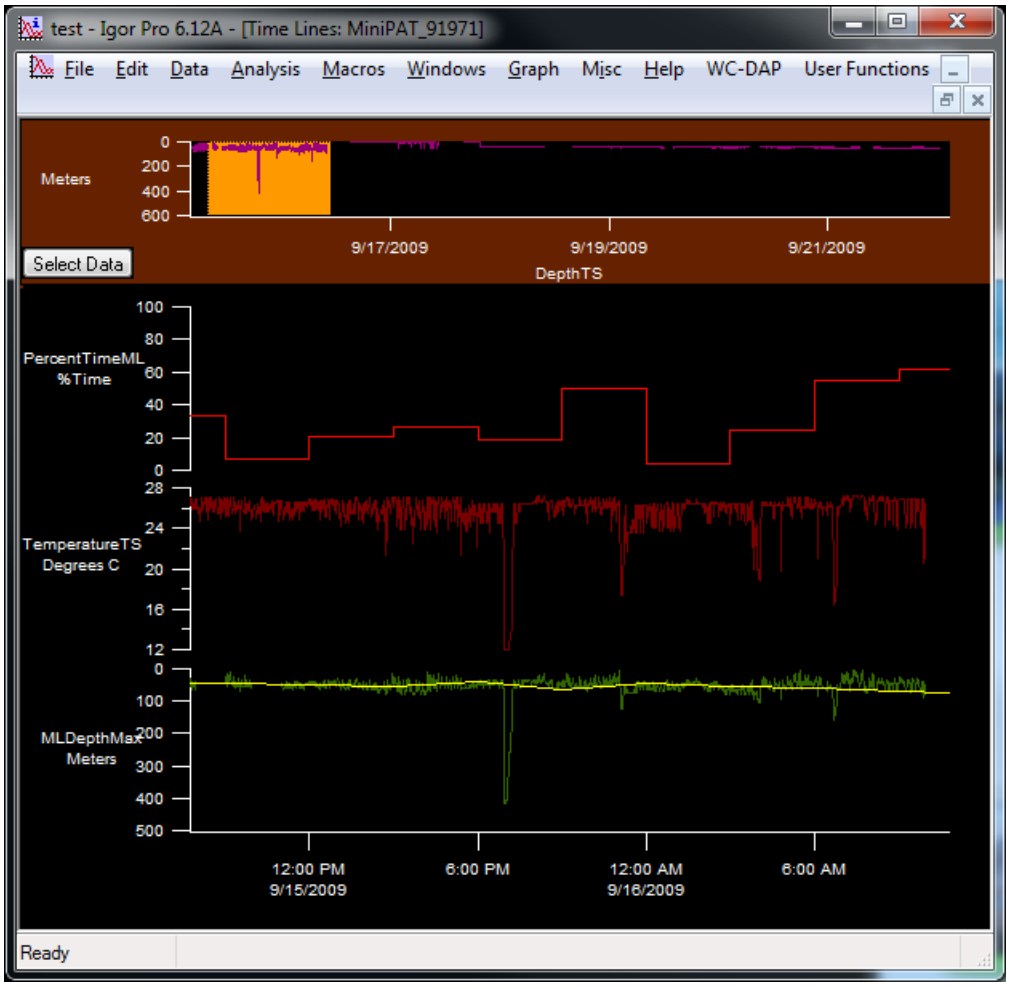


Plots are blank when first rendered from the Plot Selector panel. Clicking the "Select Data" button shows a list box from which you can choose the available data and axes to plot.

Time Lines Plot

Any data available in the data set that is evenly spaced in time with an appropriate x- scaling can be plotted in the Time Lines Plot. Select the data you want to plot by clicking on the Select Data button and checking the radio buttons as required. You should ensure the units of the traces are the same when combining traces on a single axis. You can see in the bottom axis (Left_0) that a Time Series Depth trace is overlaid with a trace representing the depth of the mixed layer.

The overview plot at the top of the plot window has a region shaded in orange. This represents the period of the overall data set that is currently zoomed in the main plot window. The overview plot is not intended for navigating or browsing the main plot: it is only an indication of the current zoom. To zoom in and out, or pan left and right, use the standard IGOR navigation keys and clicks on the main plot window.

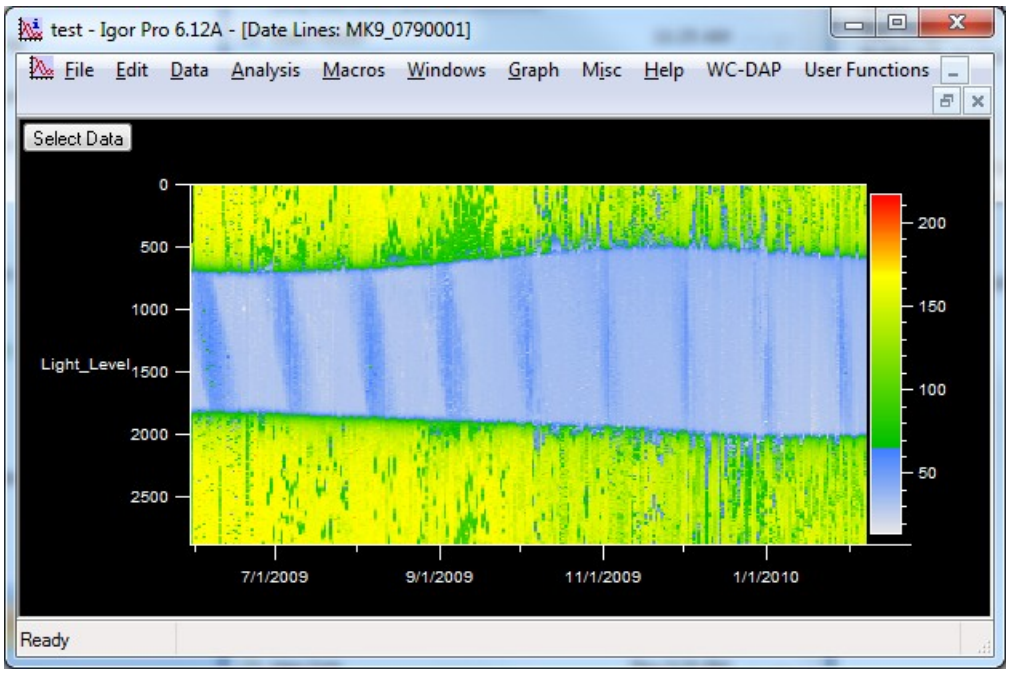


Date Line Plots

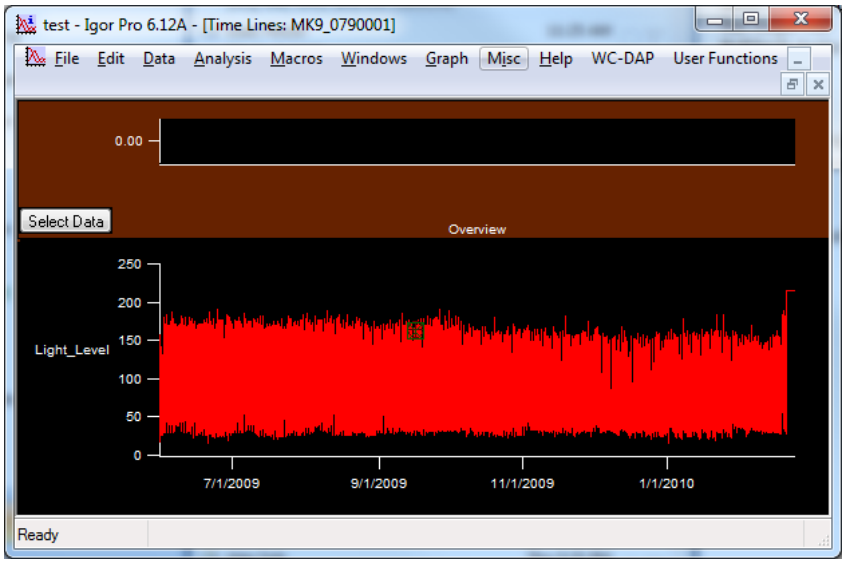
Any data that can be plotted in the Time Lines plot can be reformatted and plotted in the Date Lines Plot. A Date Line plot has date on the X axis and time of day on the Y axis.

The data are represented as colors chosen from the Preferences Panel. This type of plot is very useful for looking at trends in the data that may occur diurnally or over the course of several weeks or months.

Here is an example of light data collected on an Mk9 over 30 seconds for several months. The light readings, which range in values from 0 to 255, are mapped onto a color table such that light green and yellow represent larger (day time) readings and light and dark blue represent smaller readings (representing night time). The X axis represents UTC days. The Y axis ranges from 0 to 2880 which represents each 30 second sample with midnight starting at the top of the graph. You can see in the plot that the nights are getting longer and you can also see the periods of full moon represented by slightly darker blue bands. The entire set of light data is represented.

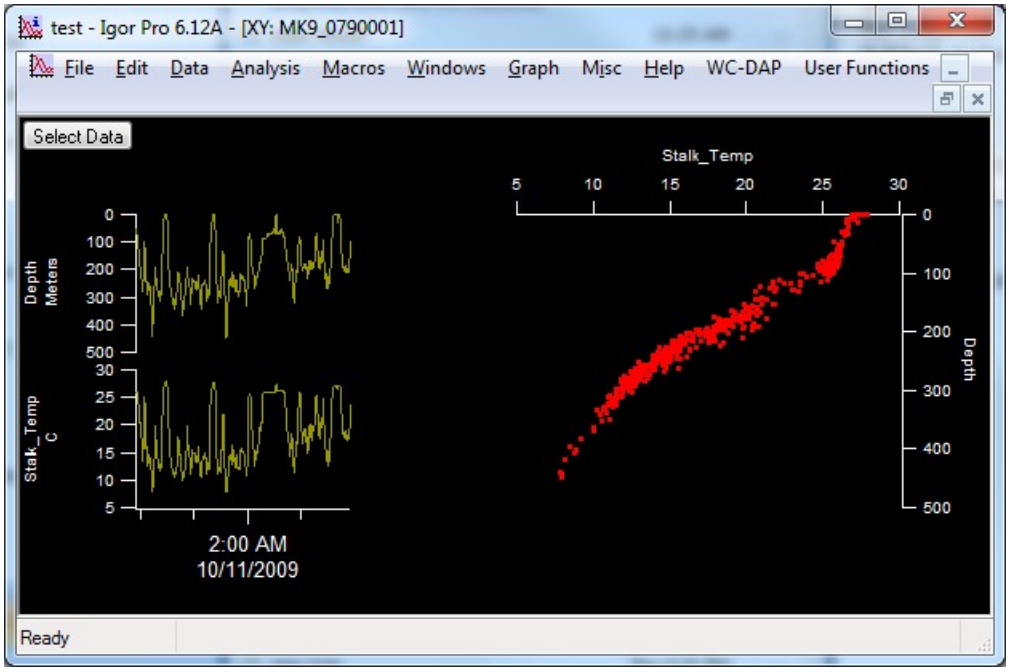


This exact same data can be plotted in the traditional manner as illustrated below. It is very difficult to tease out any information for this plot.



XY Sensor Plot

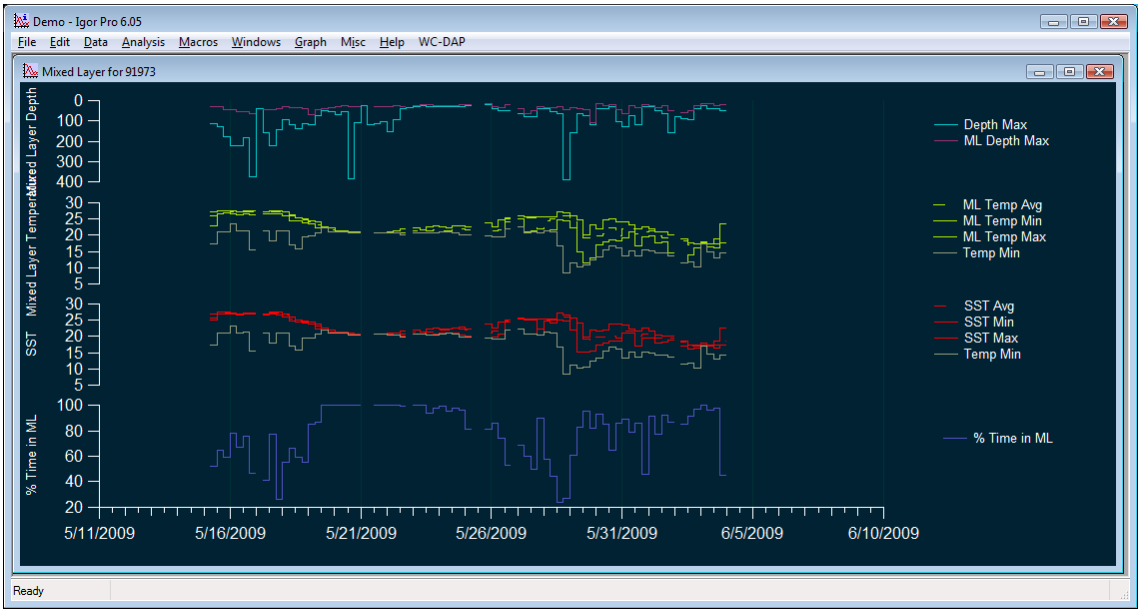
So far all of our data has been plotted against time. But you may want to plot temperature against depth. This is useful for visualizing the thermal profile of the water column. To do this, render an XY Sensor Plot and chose two channels by using the Select Data button. Keep in mind that the pair of data you chose must have the same sampling interval.



Diagnostic Plot (Mixed Layer Message)

This plot displays information about the mixed layer if your data set contains the appropriate information. The tag can detect when it is in the mixed layer if it detects a change in depth with very little change in temperature. The temperature recorded during the change in depth is considered to

be the mixed-layer temperature and is used as the reference point. Subsequent temperature readings that are within 0.5 degrees of this reference are considered to be in the mixed layer (even if there is no change in depth to confirm it). Mixed-layer reference temperatures are updated whenever there is a change in depth with no change in temperature, or when a sea surface temperature measurement is recorded. The mixed-layer temperatures and depths are summarized over the summary period in order to create a mixed-layer message.



Starting with the bottom Y axis, the mixed layer plot contains an estimate of the percent time spent in the mixed layer during the summary period.

The next Y axis displays the average, minimum, and maximum Sea Surface Temperature recorded in the summary period. The absolute minimum temperature recorded in the summary period is also displayed.

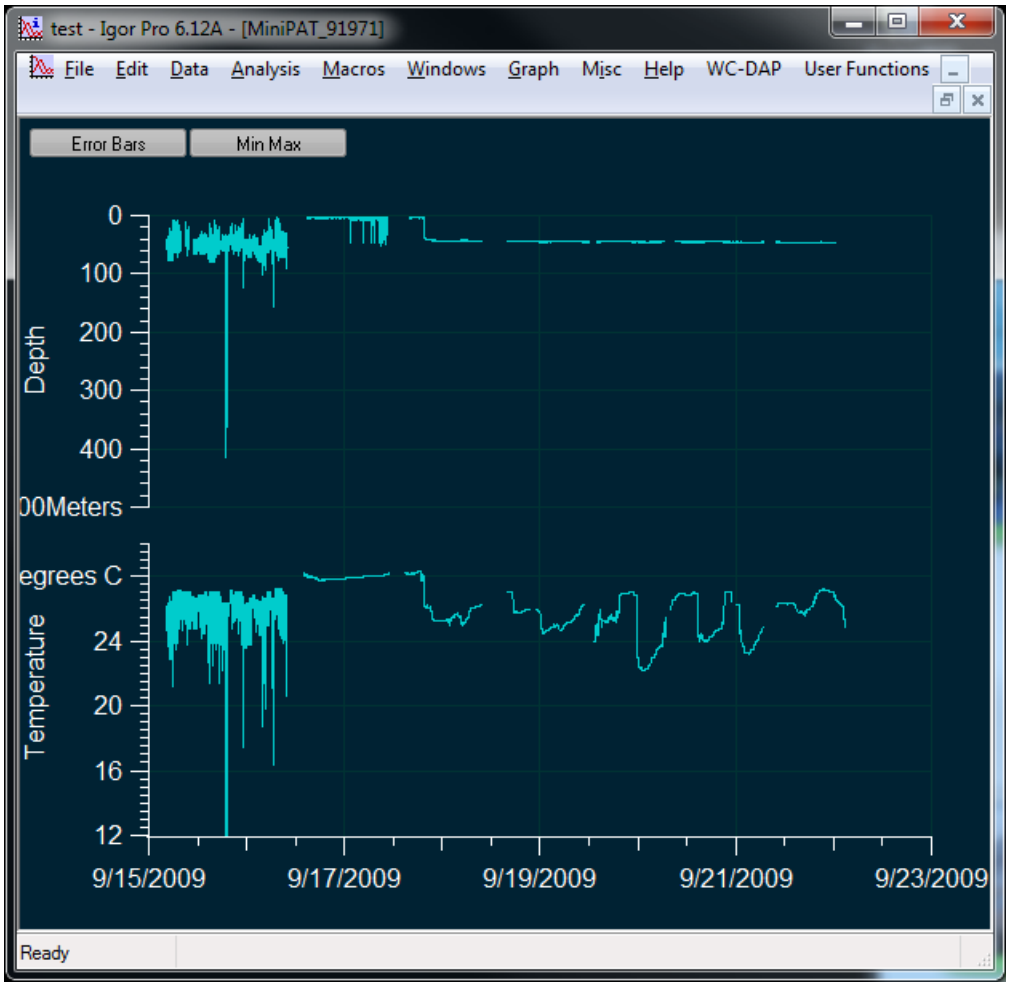
The third axis from the bottom shows the average, minimum, and maximum mixed-layer temperatures recorded along with the absolute minimum temperatures.

Finally, the uppermost Y axis shows the greatest depth recorded for the summary period as well as the greatest depth recorded that was believed to be within a mixed layer.

Diagnostic Plot (Time Series)

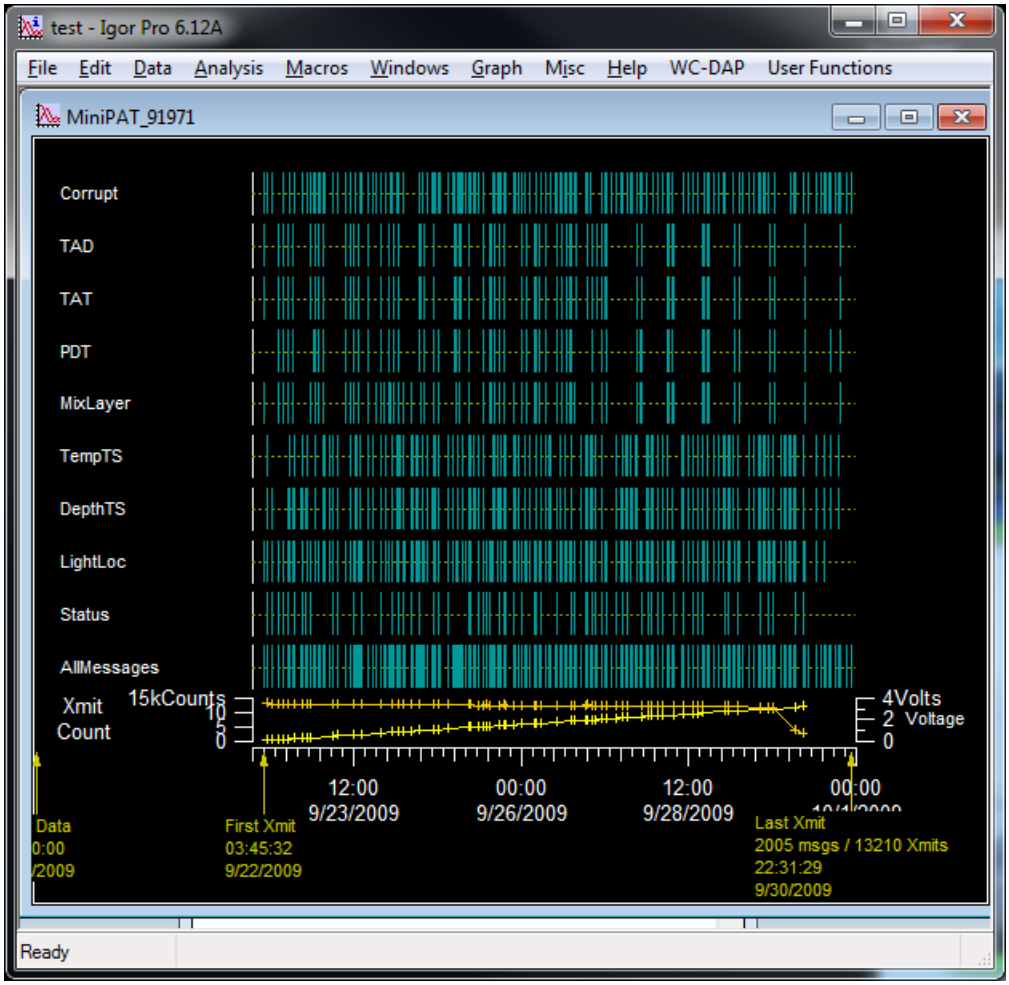
If your data set contains time series data transmitted through the Argos system, you can generate a plot as illustrated below. The plot shows a time series of Depth (if available) and Temperature (if available) drawn in a light blue color. Because of the reduced reporting resolution and under-sampling technique used when compiling the time series messages, the time series traces may not contain the actual minimum and maximum observations. Therefore, the actual minimums and maximums observed in each summary period are included in the time series messages. Click the “Min Max” button to overlay the min and max depth and temperature readings.

Another artifact of the way the time series processing is done is that the resolution of the depth readings decreases as the depth reading gets deeper. To see the resolution of each data point, click on "Error Bars."



Diagnostic Plot (Message Reception Timeline)

The plot below shows when messages were received through the Argos satellite system. All of the received messages are graphically represented by blue ticks on the axis labeled "All Messages." Individual messages containing specific data types are represented on their own respective axis. A special axis at the top of the graph is reserved to indicate when corrupt messages were received. The battery voltage and transmit count (this information is contained in the tag's status messages) is plotted at the bottom.



Saving Plots and Tables

If you have a licensed version of IGOR Pro, you can save plots and tables in several ways. If your copy of IGOR is unlicensed, you cannot save (you can "print screen" and possibly cut and paste). IGOR licenses are obtained from WaveMetrics at [www.wavemetrics.com.](http://www.wavemetrics.com)

You can save the plot AND the data used to generate the plot to a separate .pxp file. After clicking on the plot that you want saved, choose "Save Graph Copy" under the File menu. This creates a new PXP file containing both the rendered plot and the data used to generate it. This is handy as it allows you to continue to manipulate the plot within IGOR.

A second way to save the plot is to create a graphics file such as a bitmap (.bmp) or JPEG (.jpg) using the "Save Graphics" command under the File menu. Make sure the plot that you want saved is selected.

WC-DAP Menu

The WC-DAP menu is visible in the main IGOR menu bar when DAP's IGOR scripts have been successfully installed. From this menu you can:

- Display the Plot Selection Panel
- Display the Preferences Panel
- Rescan the .pxp
- Reinitialize the .pxp
- Display the versioning information
- Expose the Wildlife Computers IGOR script

When a .pxp file is first opened by IGOR, the DAP Processor scripts analyze the data to determine which tags are represented and the various data types available. This information is used during the course of your IGOR session. However, you may add some data or even a whole data set to the current .pxp file. If this happens you will want to rescan the data so the DAP scripts can pick up on these new additions and make them available to you for plotting.

Basic IGOR Commands

WaveMetrics' IGOR manual has a very helpful guided tour that helps familiarize you with the IGOR environment. However, to get you started, here are a few handy pointers:

Zooming—IGOR uses the concept of a marquee to manipulate plots. You draw a marquee on a plot by left-clicking and dragging open the marquee box. Where you initially click and how big you make the marquee will determine what happens next. Once you've drawn the marquee, right-clicking within it opens the menu. Here you are presented with choices to expand and shrink the X, the Y, or both axes. Ctrl-Z undoes your last zoom. Ctrl-A zooms all.

If your mouse is equipped with a scroll wheel, you can position the cursor on an axis and zoom in and out at that point of the axis by scrolling up and down.

The Hand—To move the plot contents from side to side or up and down, you initiate the "hand" by down the Alt key. Once you have the hand, simply left-click and drag with the mouse. You can "fling" the plot by flinging the mouse while releasing the left-click. To get finer control of the hand, holding Shift- Alt instead of Alt alone restricts the plot movement to just the y axis (if a movement up and down is your initial mouse movement) or just the x axis (if a movement left and right is your initial mouse movement). Like zooming, Ctrl-Z undoes your last move and Ctrl-A zooms all.

Point Data— You can get the actual X and Y data values of a point on any trace by positioning your mouse on the trace and hold down a left click. After 2 seconds the X and Y data values as well as the trace name appear in the bottom left of the plot.

Unfortunately, the Y data is represented in the number of seconds since 1/1/1904 so this is not very helpful. While you are holding down the left click, you can add an offset to the displayed trace in both the X and Y axes by simply moving the mouse. This can be helpful for exposing traces but can sometimes be done inadvertently. Ctrl-Z undoes your actions.

Information Markers— If you want to see the actual date and time of a point on the trace, or you would like to do some point comparison, turn on the graph information by first selecting the graph then under the Graph menu choose "Show Info." This creates a cursor menu extension to the current plot window attached to the bottom left. Markers A and B are available as a circle and a square which can be dragged out onto the plot and positioned on the trace where you would like. You can have up to five cursor pairs (enabled by right-clicking on the cursor menu). Information about the position and delta is displayed. Not that the date and time are now displayed for the X values.

Modifying or Creating Plots

You can generate your own plots in IGOR without learning how to program. All the generic plotting and table generation functions are available from the menu system supplied with IGOR. Please read the IgorMan.pdf available from the help menu to learn the plotting features of IGOR. If you do create your own plot, or manipulate the data in any way, you can save the .pxp file for later use. ***Saving the .pxp file requires a licensed copy of IGOR.***

You can add additional data to existing plots in much the same way as creating a new plot. This requires learning the IGOR menu system as well as the data structures created by DAP. Most tag data that you will likely plot is contained in the PlotData folder found in each tag folder. Please see the PXP2Details.pdf found in the WC-DAP installation folder for specific details on the data structures.

Writing Your Own IGOR Scripts

IGOR has a very powerful programming language that can be used to develop your own processing functions, manipulate data, and design custom graphs, tables, and publication quality page layouts. The IgorMan.pdf (created when you installed IGOR) has a complete guide to programming in IGOR and should be read and understood before writing your own code.

DAP Processor adds a small stub of code to each *.PXP file it generates. The code runs as a macro each time the .pxp file is opened by IGOR. You can reveal this code by pressing CRTL-M in the IGOR window. You can see that the macro attempts to locate the main body of WC-DAP IGOR code, dynamically includes the code, and executes a re-compile.

If you write code, we suggest creating and saving an *.IPF just for your functions. This file should be saved somewhere on your hard disk. By placing a shortcut to that place in the "C:\Program Files\WaveMetrics\IGOR Pro Folder\IGOR Procedures" folder, whenever you open ANY *.PXP file, the functions you stored in your *.IPF will be available to you. The WC-DAP scripts include a sample function which controls the "User Functions" menu item as a place for you to get started programming. This particular example is useful since it ties actions to the currently selected tag in the Plot Selection panel.

Do not modify any code in the main procedure window or the WCDAP_Main.IPF as future releases of WC-DAP will overwrite this file!

DAP code is placed in its own name space so it is compiled independently from your code and more importantly function names will not conflict with yours. You can make calls to functions by appending the "WCMsgPlot#" name space to the function name. Also, for reference purposes you can expose the

DAP IGOR code by clicking on WC-DAP > Expose WC-DAP code. The file is nominally write-protected to help prevent accidental changes.

Spreadsheet File Description

DAP creates spreadsheet files containing data and other information about your tags. Since there are many different categories of data reported by the tags, there are several distinct spreadsheet files created by DAP. Each row of each spreadsheet file is a related set of decoded data items recovered from your tag.

When you choose to save your data to spreadsheet files, the DAP programs add a suffix to the name you supply to help you identify the contents of the spreadsheets. For instance, if your tag sends status messages you will find a spreadsheet whose name ends with **-Status.csv** when you save your data.

This section describes the rows and columns of the spreadsheets created with the Wildlife Computers DAP programs. Wildlife Computers intends to preserve the column names, ordering, and meanings as product lines evolve, however some changes are probably inevitable. If you are writing software to interpret these files, Wildlife Computers strongly encourages you to minimize your dependence on column order and to localize your use of column names.

Common Elements

Many columns are common to several of the .csv files. This section describes those common elements. An empty cell in a spreadsheet generally means the data element is unavailable. A specific value in a cell means the item was decoded or otherwise deduced.

For 2000 m instruments, if the setup parameters were not provided when the data were decoded, depth values may need to be doubled. For tags that are programmed in the portal or archival .wch files uploaded to the portal, the setup parameters are automatically accessed, and there is no need to double depth readings for 2000 m tags.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT id.
DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1m, 0.5m, and 1.0m.
Source	Indicates where the data came from, or how it was generated. Possible values include: **Argos -** Information was generated on the tag and transmitted through Argos. **WCH -** Information was interpreted from the .WCH file. **DAP -** Information was generated by Wildlife Computers Data Analysis Program.

PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
Instr	Wildlife Computers instrument family. The list will grow over time. Presently the values include MiniPAT, Mk10, SPLASH, and SPOT6.
Count	Total number of times a particular data item was received, verified, and successfully decoded.
Date	The date and time associated with the row. In the case of histograms, this is the start of the histogram period. Alternatively, it is the time of reception for status messages. Unless otherwise stated, Date is the time as known on the tag and reported by the tag's real-time clock. It is not corrected for clock error or drift. NOTE: Experimentation reveals that opening a CSV file with Microsoft Excel and saving the file as a CSV will often truncate the seconds from a time field! This is a very important concern with some files such as LightLoc and Fastloc-GPS. Files such as these have Date separated into 'Day' and 'Time' fields which do not seem to suffer from the problem.
Day	The month, day, and year part of the time associated with a row.
Time	The hours, minutes, and seconds part of the time associated with a row.
Time Offset	The number of seconds of error in the Date field. Time Offset + Date = Real World Time
Satellite	The name of the Argos satellite that received the message.
Latitude	Latitude calculated by Argos for the satellite pass of interest.
Longitude	Longitude calculated by Argos for the satellite pass of interest.
LocationQuality	Class of location generated by Argos for the satellite pass containing this message (see below).

When Argos determines a location for which at least four messages are received during a satellite pass, an estimated error is calculated as described in the Argos User's Manual—http://www.argos-system.org

For convenience, here are the values delivered by Argos and appearing in the LocationQuality of several spreadsheet files:

Class	Estimated error	Number of messages received per satellite pass
3	<250m	4 messages or more
2	250m < < 500m	4 messages or more
1	500m < < 1500m	4 messages or more
0	>1500m	4 messages or more
A	No accuracy estimation	3 messages
B	No accuracy estimation	2 messages
Z	Invalid location (available only for Service Plus/Auxiliary Location Processing)	

Locations in the spreadsheet files have an associated timestamp indicating when the tag was at or near the position. For spreadsheets whose main purpose is to yield locations, the timestamp is the time of the location. For those spreadsheets whose main purpose is to yield other kinds of data (like PDTs, histograms, etc.), the location is the best position DAP could find within 24 hours of the data, and the timestamp on the spreadsheet line is the timestamp of the PDT, histogram, etc.

-Argos.csv

Each row in this spreadsheet represents an Argos satellite pass. Please visit the Argos system Internet web site (http://www.argos-system.org) for details. This spreadsheet does NOT contain data from individual received messages.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
Instr	Wildlife Computers instrument family.
RecordType	Type of Argos record, either DS or DI.

MsgCount	The number of messages received from the PTT for the satellite pass.
Duplicates	The number of identical messages received for the satellite pass. An empty cell means no duplicate messages were received for this pass. A value of '1' means the original plus one duplicate was received, '2' means the original plus two duplicates.
Corrupt	The number of corrupt messages in the given satellite pass.
AvgInterval	The average inter-message interval in seconds of all received messages for the given satellite pass.
MinInterval	The minimum inter-message interval in seconds of all received messages for the given satellite pass.
Date	The month, day, year, and time associated with a row.
Satellite	The name of the Argos satellite that received the message.
LocationQuality	Class of location generated by Argos for the satellite pass containing this message.
Latitude	Latitude calculated by Argos for the satellite pass of interest.
Longitude	Longitude calculated by Argos for the satellite pass of interest.
Latitude2	Argos DI messages contain a second latitude value, since their location algorithm can generate two possible positions. This is the second latitude value.
Longitude2	Argos DI messages contain a second longitude value, since their location algorithm can generate two possible positions. This is the second longitude value.
IQ	Argos-supplied value which gives transmitter frequency information.
Duration	Time elapsed between the first and last message received for the satellite pass.
Frequency	Calculated frequency of the transmitter.

Power	The best received signal strength (dB) during the satellite.

-Behavior.csv

Each row of this spreadsheet represents one type of behavior reported by the instrument.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1m, 0.5, and 1.0m. The value in this column is blank if the gain was unavailable - in this case a 0.5-meter resolution is assumed.
Source	Indicates where the data came from, or how it was generated.
Instr	Wildlife Computers instrument family.
Count	Total number of times this particular data item was received, verified, and successfully decoded.
Start	Timestamp when the particular behavior item began.
End	Timestamp when the particular behavior item ended.
What	Kind of element - Surface, Haulout, Dive, Message, or Unrecognized.
Number	The number of times the behavior element described by the following Shape, Depth, and Duration columns occurred back-to-back.
Shape	If the behavior is a dive, this is the shape of the dive determined by the tag (see below).
DepthMin	The dive Depth is between DepthMin and DepthMax meters.
DepthMax	The dive Depth is between DepthMin and DepthMax meters.
DurationMin	The duration of the element is between DurationMin and DurationMax seconds.

DurationMax	The duration of the element is between DurationMin and DurationMax seconds.
Shallow	In between dives, this is the time spent ABOVE the threshold to determine start and end of a dive.
Deep	In between dives, this is the time spent BELOW the threshold to determine start and end of a time and ABOVE the depth required to qualify a dive.

An element of kind "Message" means the following elements were collectively sent in a single Argos transmission. The start and end times are the nominal start and end times of the collection of elements in the Argos message. "Number" is the number of elements contained in the Argos message. DurationMin and DurationMax is the sum of the durations of the individual elements.
Tags that perform behavior processing classify dives into one of three simple shapes (square, V, and U) by assuming the bottom of the dive is any depth reading >=80% of the maximum reading observed for the dive. If the total duration of the dive is T and the total time between the first bottom reading and the last bottom reading is B:

Shape	Bottom Time
Square	**B** > 50% **T**
V	**B** <= 20% **T**
U	20% **T** < **B** <= 50% **T**

-Corrupt.csv

Each row is a message whose contents was rejected by DAP. Most messages transmitted by Wildlife Computers' tags incorporate features allowing detection of data corruption. There are many ways perfectly formed messages can be corrupted on their journey to and from an Argos satellite, including:

- Salt water may have splashed over the tag's antenna during the transmission.
- Another message may have been simultaneously transmitted by a different platform, and the two messages may have corrupted each other.
- Atmospheric conditions may have led to the corruption of the message.

An abnormally high number of corrupt messages could indicate the type of tag was misidentified by DAP. For instance, if DAP believes a tag is a MK10 but it is actually a MiniPAT all the tag's status messages will be reported corrupt because MiniPAT and Mk10 encode status messages differently. Such situations will normally reconcile themselves if enough messages are received.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.

Instr	Wildlife Computers instrument family.
Date	The time and date when the message was received by Argos.
Duplicates	The number of identical messages received for the satellite pass. An empty cell means no duplicate messages were received for this pass. A value of '1' means the original plus one duplicate was received, '2' means the original plus two duplicates.
Satellite	The name of the Argos satellite that received the message.
LocationQuality	Class of location generated by Argos for the satellite pass containing this message.
Latitude	Latitude portion of the location generated by Argos.
Longitude	Longitude portion of the location generated by Argos.
Reason	A terse explanation of why the message was rejected. A reason such as "CRC" or "Checksum" means mathematical integrity checks indicate a corrupt message.
Possible Timestamp	If the message at all resembled a valid WC messages, this is the timestamp the data could have had. It is important to realize we are dealing with a corrupt message, so this value may be nonsense.
Possible Type	If the message at all resembled a valid WC messages, this is the kind of data the message might have had. It is important to realize we are dealing with a corrupt message, so this value is nonsense.
Byte 0, Byte 1,....	These columns contain the data bytes, in decimal, as received from Argos. Presumably one or more of these data bytes are corrupted.

-DailyData.csv

This spreadsheet is generated if the decoded data contain information regarding the broad daily readings of the tag.

Column	Description
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
Instr	Wildlife Computers instrument family.
Date	The date of the daily data.

MinTemp	The minimum temperature observed during the period.
MaxTemp	The maximum temperature observed during the period.
MinDepth	The minimum depth observed during the period.
MaxDepth	The maximum depth observed during the period.
MaxDeltaTilt	Historical. Replaced by AvgMinMaxTilt.
AvgMinMaxTilt	The average of the minimum observed tilt for the day and the maximum observed tilt for the day.
DeltaLight	The difference between the minimum and maximum light level observed during the previous day.

-DDN.csv

Each line in this spreadsheet classifies one hour of behavior as dry, deep, or neither dry nor deep. The definitions of dry and deep are specified when the tag is configured.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
Instr	Wildlife Computers instrument family.
Count	Total number of times this particular data item was received, verified, and successfully decoded.
Date	The date and time of the start of the DDN timeline.
Disposition	Dry, deep or neither.
Code	Number indicating whether it is Dry (0), deep (1), or neither (2).

-DivePDT.csv

This spreadsheet is generated if the decoded data contain Deepest-Dive Temperature Depth profiles. These temperature profiles are created from data collected during the deepest dive within the histogram summary period.

Column	Description
BadTherm	1 if the tag reported a broken external thermistor during the summary period, 0 if the tag did not report a broken thermistor, and blank if the tag does not report the thermistor condition.
Depth	The depth at which the associated temperature reading was measured. Associated with the maximum number of non-zero bins received in any of the current HistType kind of messages.
TemperatureDelta	The temperature measured at Depth and encoded as a delta from the base temperature. The actual temperature is this value added to the base temperature.
Temperature	The temperature measured at Depth. It is the base temperature plus the Temperature Delta. The tag does not transmit the base temperature and therefore must be obtained from the tag report file. If the setting is not known, this column will be blank.

-FastlocGPS.csv

This spreadsheet is generated if the decoded data contain Fastloc-GPS snapshot information. Each row in the spreadsheet is an individual snapshot. **Data needs to be processed using Wildlife Computers GPS Solver on the Portal before locations will be shown in this spreadsheet.**

Column	Description
Name	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
Day	The date of the GPS snapshot.
Time	The time of the GPS snapshot.
Count	Total number of times this particular data item was received, verified, and successfully decoded.
Time Offset	Calculated difference between the tag's clock and the time reported by Argos. Adding this value to the value in the 'RTC' column should yield the value in the 'Received' column.
LocNumber	The tag increments a counter each time it successfully gathers satellite data. This is the value of that counter when this row's snapshot was taken.
Failures	The tag increments a counter each time it attempts to gather satellite data but fails to see enough satellites. This is the current value of that counter when the current snapshot was taken.

Hauled Out	Contains '1' if the tag was hauled-out at the time of the snapshot, '0' if not hauled out, and is blank if the tag does not support haul-out or if the original message did not contain haulout information.
Satellites	The number of GPS satellites contained in a snapshot. A minimum of 4 satellites is required to successfully generate a location solution. More satellites tend to have less uncertainty.
InitLat	Latitude used as the seed to solve the location in this record.
InitLon	Longitude used as the seed to solve the location in this record.
InitTime	Time used as the seed time to solve the location in this record.
InitType	Source of the seed (Init) location.
Latitude	The latitude component of the position of this snapshot. This field is empty when the data is decoded from an instrument; it is filled in when a location solution is generated.
Longitude	The longitude component of the position of this snapshot. This field is empty when the data is decoded from an instrument; it is filled in when a location solution is generated.
Height	The altitude of the position in meters above the WCS84 Geoid model (not sea level). This value has a large margin of error and should probably be ignored.
Bad Sats	The number of bad satellites which were discarded when arriving at the solution. Satellites may be discarded because the combination of the observation time and the physical position of the satellite are incompatible (i.e. the satellite should have been on the other side of the earth). Or the satellite could have been out of service. If many rows of the spreadsheet have non-zero 'Bad Sats' values, the timestamp of the observation or the starting location of the snapshot may be in error.
Residual	A quality indicator for a GPS position. Large residuals or large time errors relative to other locations can indicate a high degree of uncertainty in the location.
Time Error	An estimate of the error of the clock on board the instrument after the value in the Time Offset column has been applied. Solver uses the snapshot time and downloaded RINEX files to determine the satellite geometry when the snapshot was taken. Presuming the Date and Time Offset inputs are correct, this value should remain reasonably small and smoothly change over time.
TWIC Power	An optional value indicating how many mAH have been consumed by the instrument's Argos transmitter since the unit had a battery replacement.
Fastloc Power	An optional value indicating how many mAH have been consumed by the instrument's Fastloc-GPS circuitry since the unit had a battery replacement.
Noise	Snapshot data used by Solver.

Range Bits	Snapshot data used by Solver.
ID	Snapshot data used by Solver.
Range	Snapshot data used by Solver.
Signal	Snapshot data used by Solver.
Doppler	Snapshot data used by Solver.
CNR	Snapshot data used by Solver.

-HaulOut.csv

Some tags allow the transmission of haul out information through Argos. Each line in this spreadsheet describes one haulout.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
Instr	Wildlife Computers instrument family.
ID	Every haul out is assigned a numeric identifier by the tag. SPLASH10 tags send the least significant bits of this identifier through Argos to help you detect missing haulout information; this number should cycle from 0-15 and repeat.
Start	The tag's real-time clock value after the first dry minute of the start of the haulout was detected.
End	The tag's real-time clock value after the first wet minute ending the haulout was detected.
Duration	The length in minutes of the haulout, to a maximum of approximately 2 days and 18 hours.
LocationQuality	Historical. No longer applicable.

Latitude	Historical. No longer applicable.
Longitude	Historical. No longer applicable.

-Histos.csv

This spreadsheet accumulates histogram data including Time at Depth (TAD), Time at Temperature (TAT), Dive Durations, Dive Depths, Percent Timelines, and Twenty Minute Timelines.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1m, 0.5, and 1.0m. The value in this column is blank if the gain was unavailable - in this case a 0.5-meter resolution is assumed.
Source	Indicates where the data came from, or how it was generated.
Instr	Wildlife Computers instrument family.
HistType	The type of histogram data in the current row with values such as TAT, TAD, Percent, TwentyMinTimeline, DiveDuration, DiveMaxDepth.
Date	The date and time the histogram period started.
Time Offset	Calculated difference between the tag's clock and the time reported by Argos.
Count	Total number of times this particular data item was received, verified, and successfully decoded.
BadTherm	1 if the tag reported a broken external thermistor during the summary period, 0 if the tag did not report a broken thermistor, and blank if the tag does not report the thermistor condition.
LocationQuality	Historical. No longer applicable.
Latitude	Historical. No longer applicable.
Longitude	Historical. No longer applicable.

NumBins	The number of non-zero bins received in any of the current HistType messages.
Sum	The sum total of the data in each bin on the current row.
Bin1…	Tag data for the corresponding histogram bin.

-Lightloc.csv

This spreadsheet consolidates the data used by Wildlife Computers GPE software.

Column	Description
Index	Counter that increments each time a light curve is identified.
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1, 0.5, and 1.0 m. The value in this column is blank if the gain was unavailable - in this case a 0.5-meter resolution is assumed.
Source	Indicates where the data came from, or how it was generated.
Instr	Wildlife Computers instrument family.
Day	The day the first reading of the light curve took place.
Time	The time the first reading of the light curve took place.
Time Offset	Calculated difference between the tag's clock and the time reported by Argos.
Count	Total number of times this particular data item was received, verified, and successfully decoded.
InitLocQ	The location quality of InitLat and InitLon.
InitTime	The time when InitLat and InitLon were experienced by the tag.

InitLat	Most appropriate available latitude within 24 hours of 'Day' and 'Time.'
InitLon	Most appropriate available longitude within 24 hours of 'Day' and 'Time.'
Deepest	The deepest depth the tag was at during the light curve.
SSTTime	Time of day when the sea surface temperature was sampled.
SSTDepth	Depth, in meters, when the temperature was sampled. If greater than 10 m, the value is not considered a reliable surface measurement and is not used in GPE3.
SSTTemp	Temperature in degrees C of the sea surface.
Type	The type of information contained in this row (Dawn curve, Dusk Curve, Begin = deployment start date, End = Deployment end date).
Delta	The number of seconds between individual light level samples in the following list.
MinDepth	The minimum depth in meters for any of the light level samples. The resolution is 32 meters. The midpoint of the range is reported.
MaxDepth	The maximum depth in meters for any of the light level samples. The resolution is 32 meters. The midpoint of the range is reported.
AttenShallow	The shallow light attenuation constant calculated by the tag and used for this dawn or dusk.
AttenDeep	The deep light attenuation constant calculated by the tag and used for this dawn or dusk.
TravelMetric	A measure of the vertical distance traveled since previous dawn or dusk. The value is log2 of the sum of absolute values of all depth deltas.
FoundPrevious	If the tagware detected the previous dawn or dusk, this value is set to 1. If the previous dawn or dusk could not be detected, this value is set to 0.
K	A value that helps insure the integrity of the light level values.
LL0….	The light level samples.
Depth0….	The depth reading for each corresponding light reading.

-Locations.csv

This spreadsheet consolidates all the Argos locations.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
Instr	Wildlife Computers instrument family.
Date	The date and time of the location.
Type	Type of location: Argos.
Quality	Class of location generated by Argos for the satellite pass containing this message.
Latitude	Latitude portion of the location.
Longitude	Longitude portion of the location.
Error radius	If the position is best represented as a circle, this field gives the radius of that circle in meters.
Error Semi-major axis	If the estimated position error is best expressed as an ellipse, this field gives the length in meters of the semi-major elliptical axis (one half of the major axis).
Error Semi-minor axis	If the estimated position error is best expressed as an ellipse, this field gives the length in meters of the semi-minor elliptical axis (one half of the minor axis).
Error Ellipse orientation	The angle in degrees of the ellipse from true north, proceeding clockwise (0 to 360). A blank field represents 0 degrees.
Offset	This field is non-zero if the circle or ellipse are not centered on the (Latitude, Longitude) values on this row. "Offset" gives the distance in meters from (Latitude, Longitude) to the center of the ellipse.
Offset orientation	If the "Offset" field is non-zero, this field is the angle in degrees from (Latitude, Longitude) to the center of the ellipse. Zero degrees is true north; a blank field represents 0 degrees.
GPE MSD	Historical. No longer applicable.
GPE U	Historical. No longer applicable.
Comment	Optional text field.

-MinMaxDepth.csv

This file is produced as a result of examining all sources of data received from the tag, and contains min and max depths experienced by the tag. To avoid having this file grow to a huge size, readings are approximately 6 hours apart or at the interval of the data summary bins, whichever is longer.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1m, 0.5, and 1.0m. The value in this column is blank if the gain was unavailable - in this case a 0.5-meter resolution is assumed.
Instr	Wildlife Computers instrument family.
Date	The date that the data pertains to.
LocationQuality	Historical. No longer applicable.
Latitude	Historical. No longer applicable.
Longitude	Historical. No longer applicable.
MinDepth	The minimum depth during the period.
MinAccuracy	The accuracy of the MinDepth. For example, "4" means the depth is accurate to within +/- 4 meters.
MinSource	The data product that the depth was pulled from.
MaxDepth	The maximum depth during the period.
MaxAccuracy	The accuracy of the MaxDepth. For example, "4" means the depth is accurate to within +/- 4 meters.
MaxSource	The data product that the depth was pulled from.

-MixLayer.csv

The –MixLayer.csv file is created if Mixed Layer messages (MLT) are enabled on the tag. It contains information about the mixed layer including the percent time spent in and out of the layer.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1m, 0.5, and 1.0m. The value in this column is blank if the gain was unavailable - in this case a 0.5-meter resolution is assumed.
Source	Indicates where the data came from, or how it was generated.
Instr	Wildlife Computers instrument family.
Date	The time and date of the beginning of the mixing layer summary period.
Hours	The length in hours of the summary period.
LocationQuality	Historical. No longer applicable.
Latitude	Historical. No longer applicable.
Longitude	Historical. No longer applicable.
PerCentMLTime	The amount of time the tag spends in the mixed layer as a percentage of the summary period.
MLTave	The average of all temperature readings considered to be in the mixed layer for the summary period.
MLTmin	The minimum of all temperature readings considered to be in the mixed layer for the summary period.
MLTmax	The maximum of all temperature readings considered to be in the mixed layer for the summary period.
MLDExtreme	The deepest observed depth reading that was considered to be in the mixed layer for the summary period.

SSTAve	The average of all surface temperature readings in the summary period. A temperature is considered a surface temperature if the depth is no more than 5 meters.
SSTmin	The minimum surface temperature reading in the summary period.
SSTmax	The maximum surface temperature reading in the summary period.
TempMin	The minimum observed temperature in the summary period.
DepthMin	The minimum observed depth reading in the summary period.
DepthMax	The maximum observed depth reading in the summary period.

-Orientation.csv

Each row in this spreadsheet represents one summary period of orientation data. This data product characterizes the vertical orientation over time of a single-point mount MiniPAT. Orientation data uses the onboard accelerometer and is designed to detect activity. It is only available on shorter deployments with an archive sample interval of 1 second.

Column	Description
Upright	The percentage of time that the tag was upright.
Knockdown	Number of times the tag was knocked down.
MinDry	Minimum dry reading.
MaxDry	Maximum dry reading.

-PDTs.csv

A PDT is a **P**rofile of **D**epth and **T**emperature. If suitably configured, several Wildlife Computers tags measure external temperature as a function of depth. At the end of each summarization period, the tag examines the collected temperature and depth readings and constructs a message containing a subset of the sampled values. This spreadsheet contains those readings.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1m, 0.5, and 1.0m. The value in this column is blank if the gain was unavailable - in this case a 0.5-meter resolution is assumed.
Source	Indicates where the data came from, or how it was generated.
Instr	Wildlife Computers instrument family.
Date	The time and date of the beginning of the PDT summary period.
Time Offset	Calculated difference between the tag's clock and the time reported by Argos.
Count	Total number of times this particular data item was received, verified, and successfully decoded.
LocationQuality	Historical. No longer applicable.
Latitude	Historical. No longer applicable.
Longitude	Historical. No longer applicable.
BadTherm	1 if the tag reported a broken external thermistor during the summary period, 0 if the tag did not report a broken thermistor, and blank if the tag does not report the thermistor condition.
NumBins	Number of tuples of PDT available.

Partial	This value indicates whether this PDT contains the full set of data for the summary period. Blank = the entire data set was received and decoded. 1 = Only the shallow part was received and decoded. 2 = Only the deep part was received and decoded.
Depth1	The depth at which a series of readings were taken.
MinTemp1	Minimum temp observed at corresponding depth.
MaxTemp1	Maximum temp observed at corresponding depth.
%Ox1	Percent Oxygen at the corresponding depth.
Discont1	This represents whether or not there was a discontinuity at this depth. 1 = discontinuity. 0 = no discontinuity.

-RTC.csv

Many tags incorporate an on-board clock to keep track of the current date and time. All clocks have some amount of drift depending on many factors such as initial calibration, reference frequency technology, ambient temperature, etc. The Data Portal maintains an internal database of tag time vs. real-world time and makes timestamp corrections when necessary. This spreadsheet details the Data Portal's internal correction database.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
Instr	Wildlife Computers instrument family.
CorrectionType	The kind of clock correction represented by this entry. **Weak** -This timestamp is not completely trusted. It was assumed or inferred. For instance, the clock is assumed correct at the beginning of a deployment, so that entry would be marked as "Weak." Another kind of "Weak" correction might be a clock value transmitted by the tag, but without a corresponding CRC or checksum. **Strong** – The clock correction came from a trustworthy source. The tag's transmitted time was accompanied in the transmission by a CRC or other means of validating the transmitted time value. **UserSupplied** – The times were entered by the user (in the Portal) and are assumed correct.

TagDate	Date on the tag.
TagTime	Time on the tag.
RealDate	Actual real-world date.
RealTime	Actual real-world time.

-Series.csv

Subsampled archive data that is sent through Argos. While potentially consuming significant bandwidth, detailed readings are sometimes critical. If the tag sends such time series data, the resulting decoded values appear in this spreadsheet.

To reduce the bandwidth required to transmit these messages, special message encoding techniques are employed by the tag to pack more information into each Argos message. While this reduces the number of transmitted messages, the tradeoff is a reduction in the accuracy of the decoded values. The 'DRange', 'TRange' and 'ARange' columns characterize the potential error contained in the 'Depth', 'Temperature' and 'Activity' columns respectively.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1m, 0.5, and 1.0m. The value in this column is blank if the gain was unavailable - in this case a 0.5-meter resolution is assumed.
Source	Indicates where the data came from, or how it was generated.
Instr	Wildlife Computers instrument family.
Day	The day the time series data pertains to.
Time	The time the time series data pertains to.
LocationQuality	Historical. No longer applicable.
Latitude	Historical. No longer applicable.
Longitude	Historical. No longer applicable.
Depth	Sample depth in meters.
DRange	± error band in meters for 'Depth.'
Temperature	Sample temperature in meters.

TRange	± error band in degrees C for 'Temperature.'
Activity	Count of the number of high activity outliers.
ARange	± error band in number for 'Activity'.

-SeriesRange.csv

This file is a companion file to the Series.csv spreadsheet. It consolidates the minimum and maximum values observed for depth and temperature and provides summarized activity data. The tag is most likely sampling its sensors at a higher rate than what is transmitted in the Time Series messages; the values found in this file may have been observed during one of those higher rate samples. Therefore, it is possible that any min or max value found in this file *might not be present* in the Series.csv file.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1m, 0.5, and 1.0m. The value in this column is blank if the gain was unavailable - in this case a 0.5-meter resolution is assumed.
Source	Indicates where the data came from, or how it was generated.
Instr	Wildlife Computers instrument family.
Count	Total number of times this particular data item was received, verified, and successfully decoded.
Start	Start of the time period for which these ranges are valid.
End	End of the time period for which these ranges are valid.
LocationQuality	Historical. No longer applicable.
Latitude	Historical. No longer applicable.
Longitude	Historical. No longer applicable.

MinDepth	The minimum depth observed during the period.
MinDepthAccuracy	The accuracy of 'MinDepth.'
MaxDepth	The maximum depth observed during the period.
MaxDepthAccuracy	The accuracy of 'MaxDepth.'
MinTemp	The minimum temperature observed during the period.
MinTempAccuracy	The accuracy of 'MinTemp.'
MaxTemp	The maximum temperature observed during the period.
MaxTempAccuracy	The accuracy of 'MaxTemp.'
MobMean	Mean of the mobility metric observed during the period.
MobSD	The standard deviation associated with the mobility metric mean during the period.
ActivitySum	Count of the number of high activity outliers during the period.

-SST.csv

This spreadsheet is produced as a result of examining all sources of data received from the tag and contains a set of readings qualifying as possible Sea Surface Temperatures. A temperature reading within 5 meters of the surface is considered a valid SST. To avoid having this file grow to a huge size, readings are spaced out approximately 90 minutes apart.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.

DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1m, 0.5, and 1.0m. The value in this column is blank if the gain was unavailable - in this case a 0.5-meter resolution is assumed.
Instr	Wildlife Computers instrument family.
Date	The date and time of the start of the summary period.
LocationQuality	Historical. No longer applicable.
Latitude	Historical. No longer applicable.
Longitude	Historical. No longer applicable.
Depth	The depth at which the temperature was measured.
Temperature	The measured temperature.
Source	Where the Depth and Temperature measurements came from. Knowing the source of the SST data is very important in understanding the meaning of the associated timestamp and the depth. 1) The MixLayer SST data is an estimate of SST integrated over the histogram summary period. So, if you are getting only one MixLayer message per day then the data is a daily summary and the timestamp marks the beginning of that summary period. 2) The TimeSeries SST data are very useful because they are individual discrete samples of temperature each marked with an absolute timestamp. The trouble with TS SST data is that the corresponding depth value can have a varying resolution depending on how the associated Depth was encoded. 3) The SST data contained in LightLoc messages are also discrete temperature readings, preferentially sampled during the night if the animal comes to the surface at night, and the associated depths are reported at full resolution.

-Status.csv

Every Wildlife Computers tag sends regular status messages in addition to transmitting its experimental information. Status messages contain information which indicate the health and overall state of the tag. Not all tags send the same information, so some columns will be blank for specific tags. For instance, the MiniPAT does not support haul out so the 'HaulOut' column will always be empty for a MiniPAT.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.

DepthSensor	Indicates the resolution of the depth sensor. Typical values are 0.1m, 0.5, and 1.0m. The value in this column is blank if the gain was unavailable - in this case a 0.5-meter resolution is assumed.
Instr	Wildlife Computers instrument family.
SW	The version of software on the tag.
RTC	Value of the tag's onboard clock.
Received	Time and date of message reception as reported by Argos.
Time Offset	Calculated difference between the tag's clock and the time reported by Argos. Adding this value to the value in the 'RTC' column should yield the value in the 'Received' column.
LocationQuality	Location class assigned by Argos for the computed position of the tag when this status message was received by Argos.
Latitude	Latitude of the position of the tag generated by Argos when this status message was received by Argos.
Longitude	Longitude of the position of the tag generated by Argos when this status message was received by Argos.
Type	Some tags send strongly validated status messages, others do not. If this message was strongly validated, the field contains a value such as 'CRC' or 'CKSUM'. If blank, you may want to look for repeated messages to confirm the data are accurate.
HauledOut	Contains '1' if the tag was hauled out at the time of the transmission, '0' if not hauled out, and is blank if the tag does not support haulout or if the original message did not contain haulout information.
BrokenThermistor	Some tags have an external thermistor which may be subject to damage. This field is '1' if the tag has detected a broken thermistor, '0' if the thermistor is not broken, and blank if the tag does not transmit this information.
BrokenLink	If the tag supports automatic release from the animal, and if the tag has the capability to determine if the release mechanism is currently intact, this field will contain a '0' if the mechanism is intact and a '1' if the mechanism is broken or released.
Transmits	The number of Argos transmissions generated by the tag. NOT the number of messages received by Argos.
BattVoltage	Battery voltage measured by the tag during the transmission of this status message.
TransmitVoltage	Transmitter's Power Amp supply voltage. Used for diagnostics by Wildlife Computers.
TransmitCurrent	Transmitter's Power Amp supply current. Used for diagnostics by Wildlife Computers.

Temperature	Temperature measured by the tag just prior to this transmission.
Depth	Depth sensor reading made just prior to transmission. Since the tag must be at the surface to transmit, this value should be close to zero and therefore indicates any drift in the sensor. The ZeroDepthOffset has not been applied to this value.
MaxDepth	Maximum depth measured by the tag during some previous period (usually the previous day, but can vary depending on tag type).
ZeroDepthOffset	The amount of offset that the tag is currently applying to the Depth sensor readings if the Zero Offset Correction feature is enabled on the tag. The feature is working correctly if 0 meters = Depth + ZeroDepthOffset*Resolution where Depth is the uncorrected value reported in this status message.
LightLevel	Light level measured by the tag just prior to this transmission.
NoDawnDusk	The number of days during the deployment for which no dawn or dusk curve was found. If present, the count includes only days prior to pop-off.
ReleaseType	For pop-up tags, this is the most likely reason the tag released from the animal. Not all reasons are possible for all tags; other than blank, the possible values are: **Pin Broke** - the tag sensed the release pin was broken and the tag found itself floating on the surface for an extended period of time. **Floater** - the tag's configured conditional release parameters were satisfied. Furthermore, the tag was configured to release only at the surface, or the tag was dry for the majority of the time during which the conditional release criteria was satisfied. **Battery Low** - the tag's battery voltage dropped to a level that could not sustain continued deployment. **Scheduled** - the tag released on the scheduled date. **Interval** - the tag released after the programmed number of days. **Too Deep** - the tag detected it was getting dangerously close to its maximum structural depth. **Premature** - the tag's configurable conditional release parameters were satisfied.
ReleaseTime	Time recorded by the tag's on-board clock when the tag initiated the release mechanism.
InitiallyBroken	'1' if the release link was unexpectedly broken when release was initiated; '0' if not broken, and blank if unknown.
BurnMinutes	Number of minutes the release link was energized before the tag detected the link had burned through.

ReleaseDepth	Depth sensor reading when release was initiated.
FastGPSPower	Number of mAH consumed to date by the Fastloc GPS board.
TWICPower	Number of mAH consumed to date by the Argos transmitter.
PowerLimit	Deployment may stop if consumed mAHrs exceeds this value.
WetDry	The wet/dry sensor reading at the time of this status message.
MinWetDry	The minimum wet/dry sensor value observed during the previous day.
MaxWetDry	The maximum wet/dry sensor value observed during the previous day.
WetDryThreshold	The current wet/dry sensor threshold value. Wet/dry sensor values above this value indicate the tag is dry. Sensor values less than this value indicate the tag is wet.
StatusWord	This low-level diagnostic work Is sent to illuminate the tag's internal state. This is used for diagnostics at Wildlife Computers.
TransmitPower	Some tags have variable power transmitters. This field indicates the tag's current transmitter power setting.
Resets	The number of resets the tag has experienced during deployment. It should be blank or zero.
PreReleaseTilt	The measured tilt in degrees for one hour prior to release.
PreReleaseTiltSd	The standard deviation of the PreReleaseTilt measurements.
PreReleaseTiltCount	The number of samples used to calculate pre-release tilt.
XmitQueue	How many data messages are waiting to be sent.
FastGPSLocNumber	The tag increments a counter every time a FastLoc snapshot is attempted. Success and failures are included in this count. This is the value of that counter at the time of transmission.
FastGPSFailures	The tag increments a counter each time it attempts to gather satellite data but fails to see enough satellites. This is the value of that counter at the time of transmission.

BattDiscon	If a tag has a dangerous goods switch, this field indicates whether the screw has been inserted. '1' if disconnected (screw not inserted), '0' if connected (screw inserted), and blank if the tag does not send this info.
ReleaseTemperature	Temperature at the time release was initiated.

-STP.csv

This spreadsheet contains stomach temperature data.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
Source	Indicates where the data came from, or how it was generated.
Instr	Wildlife Computers instrument family.
Day	The date of the STP data.
Time	The time of the STP data.
Count	Total number of times this particular data item was received, verified, and successfully decoded.
Type	The kind of STP data. Values include: NoPill, High Resolution, Low Resolution, Feeding starts, Feeding Initial STP, Feeding Second STP, Feeding Minimum STP, Feeding Deepest Depth, and Feeding Ends.
STP	Stomach Temperature as reported by the stomach temperature pill.
Depth	The depth at which the element occurred.
Ext Temp	The external temperature at which 'Type' occurred.
Descending	A very crude and probably unreliable indicator which is '1' if the animal was descending and '0' if the animal was not descending.

-Summary.csv

Each line in this spreadsheet contains information about one tag and gives general, high-level information about the tag's deployment.

Column	Description
DeployID	Friendly name given to the tag by the user. If no specific friendly name is given, this is the PTT ID.
PTT	Argos Platform Transmitter Terminal identifier, which is a unique number identifying your instrument.
Instr	Wildlife Computers instrument family.
SW	The tagware version on the tag, if available.
PercentDecoded	The percentage of successfully decoded messages.
Passes	The number of Argos satellite passes that detected the tag's transmissions during the deployment.
PercentArgosLoc	The percentage of Argos satellite passes that resulted in a calculated Argos location. Multiple messages must be received on a pass for Argos to calculate a location.
MsgPerPass	The average number of received messages per satellite pass.
DS	The number of messages received from the tag including corrupt and duplicate messages.
DI	The number of diagnostic reports generated by Argos on a per satellite pass basis.
MinPower	The minimum received signal strength (dB) for all received transmissions as reported in the Diagnostic reports.
AvgPower	The average of the reported received signal strength (dB) for all transmissions as reported in the Diagnostic reports.
MaxPower	The maximum received signal strength (dB) for all received transmissions as reported in the Diagnostic reports.
MinInterval	The shortest interval between received Argos transmissions for the tag.
EarliestXmitTime	The time of the first received Argos transmission.

LatestXmitTime	The time of the last received Argos transmission.
XmitDays	The difference in days between LatestXmitTime and EarliestXmitTime. The number of complete days the tag has been transmitting.
EarliestDataTime	The time stamp of the first data point, including status messages. This should be close to the deployment date.
LatestDataTime	The time stamp of the last data point, excluding status messages.
DataDays	The difference in days between LatestDataTime and EarliestDataTime. The number of days for which data was received through Argos.
ReleaseDate	The date on which a pop-up tag released.
ReleaseType	The reason a pop-up tag released, if it is known.
DeployDate	The date the tag was deployed, if it is known.

Contacting Wildlife Computers

U.S. and International

Members of the Wildlife Computers technical sales and support team are located in Redmond, WA, USA, and Havelock North, New Zealand, allowing us to cover promptly a wide range of time zones.

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For Asian Clients

While we welcome your direct correspondence, we recommend that you contact our colleague, Yong Huang, for assistance. Mr. Huang understands the special purchase processes for your countries and will provide you with the best service for the best price. He also is fluent in Japanese, Chinese, and English.

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