

sPAT User Guide

This user guide will give you all the essential information needed for interacting with, and deploying a Wildlife Computers Survivorship PAT.

Table of Contents

| | |
|--|----|
| Almost Everything You Need to Know About the sPAT..... | 3 |
| About the Survivorship PAT (sPAT) | 3 |
| Before you Begin | 4 |
| Anatomy of a Tag | 4 |
| Types of Data Received from sPAT | 5 |
| Tag Release | 5 |
| Conditional Release | 6 |
| Pinger..... | 6 |
| Interacting with a Tag | 6 |
| Gathering Tag Information | 10 |
| Additional Information | 16 |
| Technical Specifications | 16 |
| Glossary of Terms | 17 |
| Contacting Wildlife Computers | 18 |

Almost Everything You Need to Know About the sPAT

The sPAT is ready to deploy when you take it out of the shipping box. Wildlife Computers preprograms your sPAT with the desired deployment duration (30, 45, or 60 days) and ships the tag in Auto Start mode so it begins its deployment as soon as the sensor hits sea water.

The rest of this user guide is helpful if you are curious about everything sPAT, if you need to change the deployment duration, or if you recover your tag and want to download the archive. If none of these situations apply to you, you can stop reading here.



In the guide, you will see the yellow icon highlighting information where special attention should be paid.

About the Survivorship PAT (sPAT)

The sPAT (also known as a PAT tag or PSAT) is a pop-up archival transmitting tag specifically optimized for short-term survivorship studies. The sPAT uses a suite of sensors and algorithms to monitor the status of the tagged animal for up to 60 days. Users can deploy the sPAT on by-catch, fish, shark, rays, skates, eels, and turtles. The sPAT is designed to be attached to an animal by a tether. The corrodible burn pin releases the tag from the tether on a pre-programmed interval (30, 45, or 60 days) or when the sPAT determines it is no longer attached to an animal. Data transmission occurs when the tag floats on the ocean surface after it releases from the tether.



Figure 1—sPAT tag rigged with a stainless-steel heat shrink-covered tether and a Wilton anchor

Tags are shipped pre-programmed and in auto-start mode—the sPAT automatically starts the deployment when submerged in saltwater. At any time, a single pass of a magnet near the communication's port will cause the LED to gradually transition from bright to dim as confirmation that the tag is in auto-start mode.

Transmitted data will allow you to infer the status of the animal at the time of release. Data generated during a deployment includes:

- Daily Data for the entire deployment
 - Minimum and maximum temperature and depth readings
 - Delta (difference between min and max) light-level for each UTC day
- 10-minute time-series depth data for the five days prior to release
- The Argos generated pop-up location

The sPAT will transmit for approximately three days and the data will show up in your Wildlife Computers Portal account as it is received.

Before you Begin

The list below shows what is required to communicate with the sPAT:

- A Wildlife Computers online portal account
- A Windows computer with Tag Agent Software and USB driver installed
- A Wildlife Computers USB communications cable
- A magnet

Visit wildlifecomputers.com to download the required software (Tag Agent and the USB Driver) and setup an account. At the end of this document, there is a list of key terms and concepts for reference. We recommend new users review this list.

Anatomy of a Tag

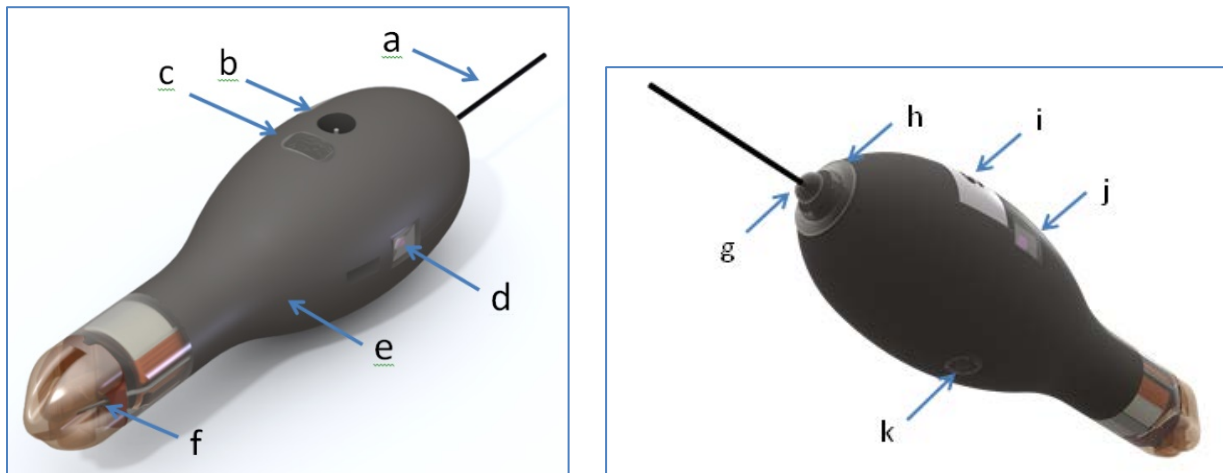


Figure 2 – sPAT tag showing: (a) Argos antenna, (b) temperature sensor, (c) communications port with plug, (d) light sensor (1 of 2), (e) float, (f) release pin, (g) LED light, (h) wet/dry sensor, (i) ground plate, (j) light sensor (2 of 2), and (k) pressure sensor

The communications port is where the USB communications cable plugs into the tag. The sPAT will be shipped with a greased communications port plug already inserted for your convenience. The plug protects the pins so data can be easily downloaded if the tag is recovered. The plug is not required for the tag to function normally.

The wet/dry sensor, ground plate, pressure sensor, thermistor, and electronic release pin should never be covered.



Covering these sensors interferes with the tags functionality. This includes anti-fouling coatings, brightly colored paints for recovery purposes, and attachment adhesives (e.g. epoxy).

Types of Data Received from sPAT

Daily Data

Daily data messages contain the minimum and maximum temperature and depth readings from the fast-sampled archive data set, as well as the change in light-level for each UTC day.

Time Series

The sPAT tag sends ten-minute time-series depth data for the **five days prior to release**.

Each time-series message contains:

- Time series depth data at a ten-minute interval
- The minimum/maximum values encountered during the time period covered by the time-series message period

Note: the absolute Min/Max values and point sample values may not match as the absolute values are determined from all archived data collected during the message period. This can give insight to the amount of aliasing that has occurred when generating the time-series message.

Time-Series Sensor Resolution

Time-series sensor resolution will vary for each measurement. All time-series sensor readings have an associated resolution which is reported in the decoded data. The resolution is dynamically adjusted to compress the data for transmission.

Tag Release

The sPAT will be pre-programmed for your desired deployment duration (30, 45, or 60 days). The tag will begin the release sequence when that specified interval is reached unless a conditional release occurs prior to reaching the intended duration.

Conditional Release

The sPAT uses sensor measurements to make reasonable assumptions about the state of the deployment. The sPAT will initiate release if it exceeds ten meters in depth and then meets any of the following criteria:

- Depth change over one day is less than four meters
- Goes deeper than 1400 m to avoid crushing the tag

Release reasons as reported in the tag's status messages:

1. **Interval**—the tag ran to the configured end of the deployment and the animal survived.
2. **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. Some external force pulled on the tether and broke the pin.
3. **Floater**—the tag stayed within four meters of a constant depth for more than one day *and* was dry for the majority of time. For some reason (mortality or attachment failure) the tag has come off the animal and is floating at the surface.
4. **Premature**—the tag stayed within 4m of a constant depth for more than one day. The tag could be sitting on the bottom, attached to a dead animal. This could also be a floater but the tag wasn't dry for the majority of the time. Examine the Depth Time Series data to make final determination.
5. **Too Deep**—the tag detected that it was getting dangerously close to its maximum structural depth. The animal was dead and sinking or diving to a depth that is too deep for tag. Examine the Depth Time Series data to analyze sink rate.

Pinger

The pinger is used for tag recovery. The sPAT sends out low power “pings” after release while at the surface. The tag can be located with an appropriate receiver and directional antenna. The sPAT will ping at a one second interval for the duration of the Argos transmission period (approximately three days after release).

Interacting with a Tag

The sPAT will be shipped pre-programmed by Wildlife Computers. In the case where you need to change the deployment duration or if the sPAT is recovered after a deployment, follow the instructions below to communicate with the tag.

Tag Agent Software is used to communicate with the sPAT. Tag Agent and the USB Driver can be downloaded from our website: wildlifecomputers.com .



Plug the USB communications cable into the computer and connect to a tag carefully observing the orientation of the connector pins. The home page will display with Tag Status as Interactive in the lower left with tag information and sensor readings visible. If tag status remains Disconnected, swipe the magnet supplied near the communication port on the tag to view the tag in interactive mode.

If the tag is new or has previously been programmed by another user, a pop-up box will appear asking if you wish to take ownership of the tag. Becoming a tag administrator gives you the authority to select and save new settings.

If tag settings have been updated through the portal using My Tags, a pop-up box will appear on opening Tag Agent advising that changes have been made and the tag's settings need to be updated.

The Administer Tag button allows you to modify the settings of the connected tag. Click the Send Changes button on the left of the screen to activate these changes.

The Download WCH tab shows a summary of data on the tag and gives you the option of downloading the archive and set-up info onto your local machine.



Figure 3—Tag Agent software connection screen



Figure 4—Tag Agent home screen

Configuring Deployment Duration

To change tag Deployment Duration within Tag Agent, select the Administer Tag button in the upper menu.

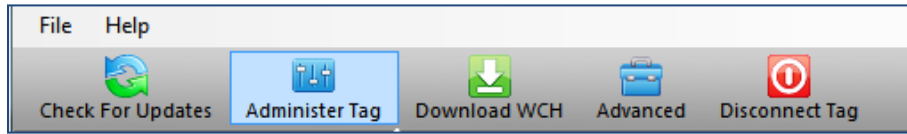


Figure 5—Tag Agent menu bar. Select Administer Tag to edit tag release settings

A new window will open up revealing three sections—Tag Information, Tag Release Sequence, and Transmission Settings.

Tag Details & Argos Settings

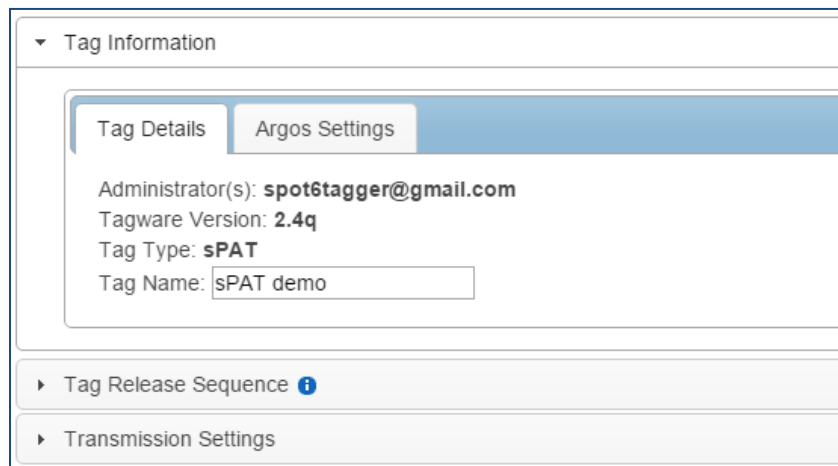
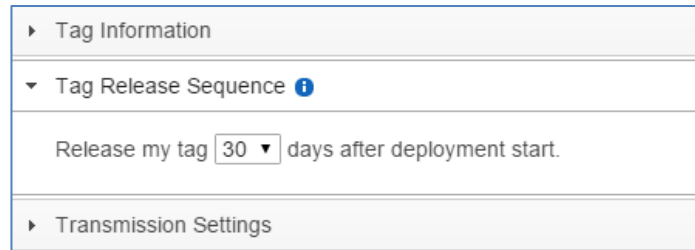


Figure 6—Expanded view of Tag Details tab

Tag administrators, tagware version, and tag type are displayed on the Tag Details tab. Tag Name is an optional field which makes a tag or tags easy to find in the Tag Portal using the filter. The Argos Settings tab displays the tag PTT ID details.

For more information on these terms, reference the Key Concepts section at the end of this document.

In the Tag Release Sequence section, you can choose to release the tag 30, 45, or 60 days after the deployment start.



| |
|---|
| ▸ Tag Information |
| ▾ Tag Release Sequence ⓘ |
| Release my tag <input type="text" value="30"/> days after deployment start. |
| ▸ Transmission Settings |

Figure 7—Tag Release Sequence section

Once settings have been chosen, use the blue Send Changes button (or Propose Changes button if working in Tag Portal) to load settings into tag. Tag Agent will confirm receipt of settings via dialog box. The Check for Updates tab on the top left navigation bar of Tag Agent home screen can be used at any time to see if settings updates are available.

Tag States: Start, Auto_Start, and Stop

The sPAT has three states: Auto Start, Start, and Stop.

1. A tag in auto start mode can be activated by sea water submersion. Wildlife Computers ships sPATs in Auto Start.
2. Start mode activates the tag. In Start, data collection is running and the tag begins monitoring for its set release condition.
3. Stop puts the tag into deep shutdown for storage. The tag will remain unresponsive unless connected to Tag Agent.

Disconnect from the sPAT

To disconnect from a tag, use the Disconnect Tag tab on the top right navigation bar. Do not simply unplug the USB communications cable.

Once disconnected a magnet swipe sequence can be used to change the state of the tag between Auto Start and Start modes. Tags in Stop mode need to be connected to Tag Agent through the USB cable to awaken the tag.

LED Blink Patterns

Within Tag Agent, the Disconnect Tag button on the top right navigation bar can be used to put a tag in any state. Wildlife Computers ships the sPAT in Auto-Start mode.

Once disconnected in Auto-Start:

- At any time, a single pass of a magnet near the communications port will cause the LED to gradually transition from bright to dim as confirmation that the tag is in Auto-Start mode.
- The LED turns on if the tag gets wet for a few seconds while in Auto-Start mode. After remaining wet for approximately ten seconds the LED blinks ten times, the archive is erased, and deployment begins.
 - The reset switch is disabled once the tag has been "mostly wet" for at least one hour—magnets no longer affect the tag unless the tag is returned to the manufacturer.
- If the tag gets wet while in Auto-Start mode, but not long enough to enter "deploy" mode as above, the LED gradually goes from bright to dim and remains in Auto-Start mode.
- You can put the tag back Auto-Start mode by swiping it with a magnet within the first hour of a deployment. You will see the LED come on and gradually transition from bright to dim.

Clearing the sPAT Archive

The archive is cleared automatically when a new deployment is started. The LED will indicate that the tag is clearing the archive with many rapid blinks. Leave the tag connected until Tag Agent indicates that the archive has been erased. This may take several minutes. Be mindful of this when selecting the tag state. If a tag is recovered, be sure to download the data prior to putting back in Auto-Start or Start mode.

Gathering Tag Information

Checking Sensor Readings & Transmission Test

The sensor values displayed on the Tag Agent home screen are continuously updated from the tag. Sensor functionality can be validated by manipulating the sensors as follows:

- Ambient Temperature—responds quickly to warm air blown onto the thermistor located immediately above the communications port
- Internal Temperature—this will change slowly as the entire tag changes temperature. Leaving a tag in a refrigerator for a while will change the value
- Wet/Dry—connecting a wire from the large rectangular ground plate strap above the communication port to the metal ring around the base of the antenna (letters i and h respectively in fig. 2) should change the value from over 200 to less than 20
- Light-Level—under typical office lighting, covering both light sensors (shiny squares on opposite sides of tag, letters d and j in fig. 2) with your fingers should drop the value by 20 to 40 counts

Test Transmission

Under the Advanced button on the top menu there's an option to Send Test Transmission. When selected, a pop-up box with transmission values will appear.

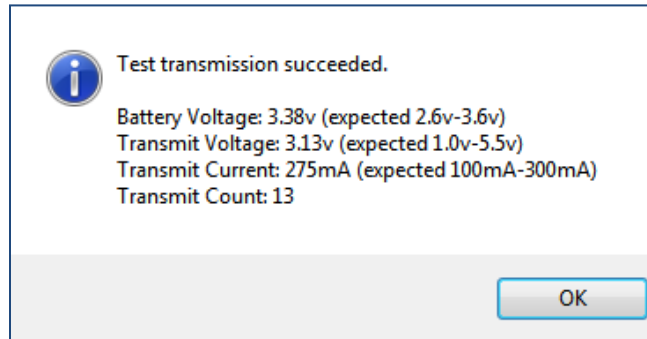


Figure 8—Test transmission results

The Battery Voltage value will be lower in the pop-up box than on the Tag Agent home screen because it is measured when the battery is driving a transmission.

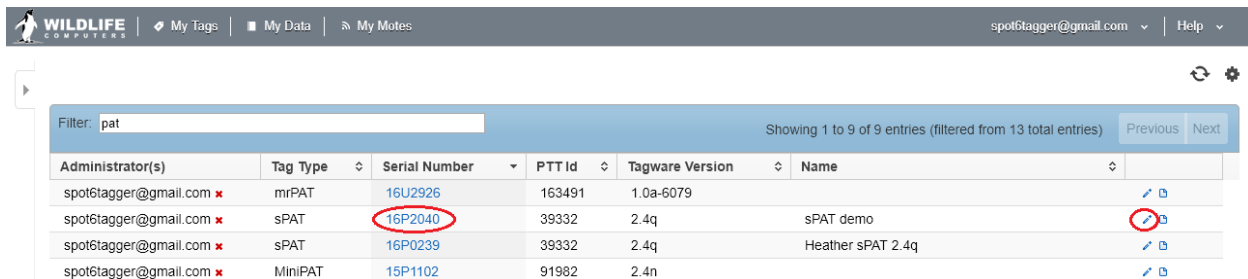
The Transmit Current will vary depending on the presence of conductive objects near the tag. It has been optimized for a tag that is floating in seawater.

Transmit Count is the number of transmissions the tag has made since it was manufactured.

Using Tag Portal to Select Settings Remotely

Tag Portal is the cloud-based service offered by Wildlife Computers for remotely selecting tag settings. Configuring can be done without connecting to your tag. This enables project coordinators to review and select settings for their associates and programming to be done while tags are in transit, before arrival.

When logged into your Portal account, a list of the tags which you have administrator power over can be viewed under the My Tags tab. To select settings, click on the serial number of the tag you wish to configure or use the pencil icon.



| Administrator(s) | Tag Type | Serial Number | PTT Id | Tagware Version | Name | |
|-----------------------|----------|---------------|--------|-----------------|-------------------|--|
| spot6tagger@gmail.com | mrPAT | 16U2926 | 163491 | 1.0a-6079 | | |
| spot6tagger@gmail.com | sPAT | 16P2040 | 39332 | 2.4q | sPAT demo | |
| spot6tagger@gmail.com | sPAT | 16P0239 | 39332 | 2.4q | Heather sPAT 2.4q | |
| spot6tagger@gmail.com | MiniPAT | 15P1102 | 91982 | 2.4n | | |

Figure 9—List of tags within Tag Portal. To program select the serial number or pencil icon.

This will open a new window with setting selections. The same programming options are available whether settings are configured via Tag Portal or from within Tag Agent.

Once settings have been selected in Tag Portal, click the blue Propose Changes. This will save the settings in the cloud. The next time that tag communicates with Tag Agent (no matter who plugs the tag in), a dialog box will appear notifying that new settings are awaiting upload.

Multiple set-ups can be published resulting in a queue of configurations awaiting upload. In this case, a dialog box will reveal a list of the configurations published, when they were selected, and which administrator chose the settings.

Tag Portal maintains a historic record of tag settings each time changes are uploaded into a tag. The record is instantly updated so long as an Internet connection is available.

If tags are programmed offline, using Tag Agent, the next time an Internet connection is established and Tag Agent software is open, the record automatically updates.

Offline Mode

Before you can program offline, you must download Tag Agent software and communicate with a tag while connected to the Internet. You can simulate offline mode by disabling your Internet connection.

What You Need Before You Begin

- A Windows-based computer with Tag Agent software and USB driver installed. Download both at WildlifeComputers.com
- A Wildlife Computers Portal account
- A USB communications cable
- A Magnet
- One of every tag type (i.e. SPOT, SPOT-F, MiniPAT) you are taking in the field

While Connected to the Internet

- Open Tag Agent and use the USB cable to connect a tag to your computer.
- Swipe a magnet near the communication port to establish connection. The tag LED will turn on and the Tag Agent home screen will appear.
- Use the Administer Tag tab to familiarize yourself with the tag setting options.
- Use the Disconnect Tag tab to select the tag state before unplugging.



If you are headed into the field with multiple tag types (i.e. SPOT, SPOT-F, MiniPAT, etc.) be sure to communicate with one of each model while you have an Internet connection.

Using Offline Mode

Working offline is nearly identical to working online. Internet status is displayed in the lower left corner.



Figure 10-Internet status



If the Internet connection is spotty, it is best to disable the connection entirely. A partial connection can prohibit settings from loading properly.

To Program Tags

- Open Tag Agent and use the USB communications cable to plug a tag into your computer.
- Swipe a magnet near the communication port to establish a connection.
- If the tag's internal clock needs adjusting, a pop-up box will appear along with a Date/Time Picker. Hint—sometimes the Picker hides in the upper left corner of the screen.

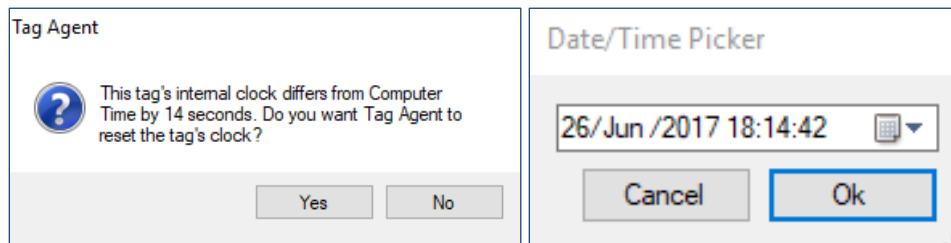


Figure 11-Pop-up boxes for date/time

- Click the Administer Tag tab and make the required changes to the tag settings.
- Click Send Changes to push settings into the tag. A pop-up box will confirm the new settings have been applied.

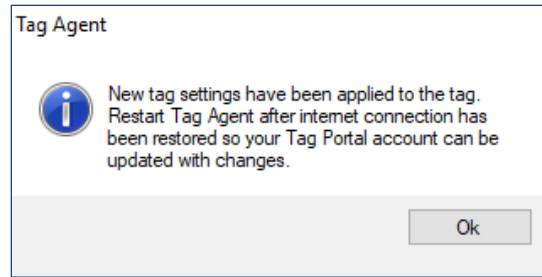


Figure 12-Pop-up confirming new settings

- Use the Disconnect Tag tab to select the tag state before unplugging.
- Restart Tag Agent when the Internet connection is restored so a record of the selected tag settings will be saved.

Creating Local Templates

You can program a group of tags with the same settings using a local template. Click the Administer Tag tab and use the Template Manager ☰ icon in the upper right corner of the screen to create and apply templates.



The Send Changes button must be selected after a template is applied to push settings into a tag.

sPAT Recovery Instructions

If the sPAT is recovered after deployment, it is possible that contamination of the communications port may cause some communication difficulties. The following instructions, in addition to describing how to recover the data, explain possible problems that might occur during the recovery and how to fix them. Even if all attempts to communicate with the sPAT fail, your deployment data are probably still in memory, and can be retrieved by Wildlife Computers.

Preparation for Post-Deployment Communication

When you recover your sPAT full of valuable deployment data, there are several steps to perform before attempting to connect it to the USB communications cable. As a precaution, it is advised to have the following on hand:

- Compressed air in a can
 - Electronic contact cleaner, if available
1. Thoroughly dry the sPAT with a paper towel.
 2. Remove the rubber communications port protection plug.
 3. Blow out any water in the communication port. Make sure the port is clean and dry.
Compressed air in a can works well for this. *Note: Communicating with a sPAT which has saltwater in the communications port will cause the pins to corrode very fast!*

4. Count the number of pins in the communications port. If there are not four pins, one or more have corroded or broken off. Stop there and send the sPAT to Wildlife Computers, and we will download your data.
5. Examine the pins in the communications port. If they are rusty or corroded, send the sPAT back to Wildlife Computers for downloading.
6. If all four pins look clean and golden in color, you can continue and attempt to establish communications.
7. You may wish to spray some contact cleaner into the communications port as a precaution.

If you are able to establish a communication connection with the tag, you are now ready to download your data with Tag Agent.

Download your Data

Use the Download WCH button on the Tag Agent top navigation bar to download SPAT archival data (Figure 11). You'll be prompted to save the .wch file to your computer. The file can then be uploaded into the Data Portal for decoding, analysis, and storage.

Put tag into Stop mode after downloading the data.



Figure 11 – Tag Agent menu bar. Select Download WCH to download archived data.

Additional Information

Tag Storage and Battery Maintenance

Store tags in a dry, cool environment (ideally around +5°C) to help minimize passivation and keep the batteries charged. When stored correctly, the amount of battery life lost per year is only 1%-2%. We recommend exercising the batteries every few months by sending a test transmission. This can be done in Tag Agent. Select Advanced and then Send Test Transmission. The transmission voltage should read approximately 3.2v and the battery voltage displayed on the main sensor screen should be around 3.5v. If you receive a low voltage reading, it may be due to passivation forming during storage.

Technical Specifications

| | |
|---------------------------------|---|
| Dimensions | 124 mm (length) X 38 mm (diameter) |
| Weight in Air | 60 g |
| Pressure Rating | 2000 m |
| Memory | 64 MB |
| Operating Frequency | 401.678 MHz |
| Operating Life | Up to two years |
| Sensors | Light, Pressure, Temperature, Wet/Dry |
| Light | $5 \times 10^{-12} \text{ W/cm}^2$ to $5 \times 10^{-2} \text{ W/cm}^2$ |
| Pressure | Range: 1700 m/Resolution: 0.5 m |
| Temperature | Range: -20°C to 50°C/Resolution: 0.05°C |
| Conductivity Operational Limits | 0.1 to 5 S/m |
| Storage Temperature | 5°C Optimal |
| Communication | Via USB port using Wildlife Computers USB communications cable |

Glossary of Terms

- Administrator—someone who has the authority to publish tag settings.
- Argos ID—uniquely identifies a transmitter for the Argos system. The ID consists of a decimal number and a hexadecimal (base 16) number.
- Argos location—a location generated by the Argos system from uplinks received during a satellite pass. Get more information about how the Argos system works here: www.argos-system.org
- Argos uplink—a radio transmission intended for the Argos satellite system.
- Daily Data—generated from sensors over a fixed 24-hour period.
- Data message—created by the tag to transmit data through the Argos system. Each data message is transmitted as payload in an Argos uplink. In order to increase the likelihood of its reception by the Argos system, each message is sent a fixed number of times.
- Data Products—the various types of data available from Wildlife Computer tags.
- Deployment—the period when a tag is associated with an animal and actively collecting and sending telemetry data.
- Location uplink—a transmission intended to generate an Argos location. These uplinks can also carry a data message payload. Multiple uplinks are required to generate an Argos location.
- Pinger—a UHF radio tracking beacon.
- Repetition Interval (repetition rate) —how often a tag will test for dry conditions and try to transmit. Set at 90 seconds for sPATs, this value is assigned by CLS (Argos) and set by Wildlife Computers.
- Start/Auto Start/Stop—the different tag states. When in Start mode, the tag will generate locations and/or collect sensor data. Auto_Start will allow the tag to Start using a magnet or when reading wet. Stop causes the tag to do nothing until reconnected to Tag Agent.
- Summary Period Data—generated from sensors during a defined number of hours.
- Tag Agent Software—the program used to change tag states and select tag settings and connect a tag to the Wildlife Computers Tag Portal.
- Tagware—the software version running on a tag.
- Tag Portal—the cloud-based service offered by Wildlife Computers for remote tag setup. A historic record of tag settings and templates are maintained within the Tag Portal.
- USB Communications Cable—the Wildlife Computers communication cable required by Tag Agent.
- Wet and Dry—the state of the tag as determined by the wet/dry sensor which measures conductivity.

Contacting Wildlife Computers

If you have any questions or concerns about using Tag Agent in offline mode, please contact us.

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.

Mailing and Shipping

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Technical Support: support@wctags.com

Phone

+1 (425) 881 3048

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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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