mrPAT User Guide

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

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About the Mark Report PAT (mrPAT)

The mrPAT is a small, fisheries-independent Argos location reporter. An animal is tagged at a known time and location. At some user-defined time interval, or absolute date, the release pin is activated causing the tag to separate from its tether. Being positively buoyant, the tag floats to the surface and Argos transmissions are initiated once a dry environment is recognized. The first Argos location marks the last known location of the tagged animal.

Before you Begin

The list below shows what is required to configure and deploy the mrPAT:

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

Visit wildlifecomputers.com to download the required software (Tag Agent and the USB-Blue 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.
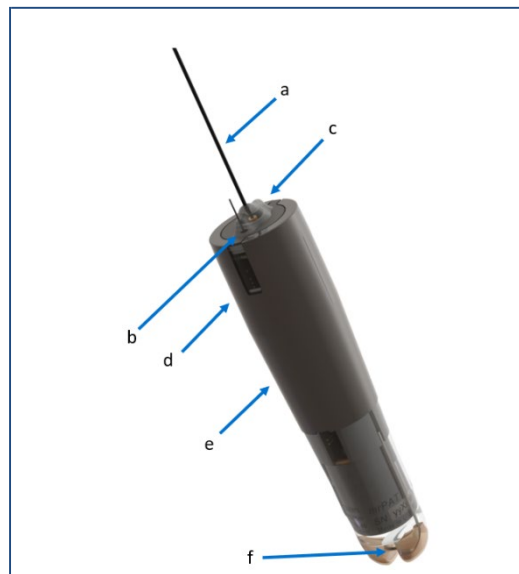
Anatomy of a Tag

Figure 1—mrPAT tag showing: (a) Argos antenna, (b) wet/dry sensor, (c) LED indicator light, (d) communications port, (e) float, and (f) release pin.

Wet/Dry Sensor

The wet/dry sensor is composed of two elements: a small metal post at the top of tag and metal strap on the side of tag.

The wet/dry sensors should never be covered in any way. This includes anti-fouling substances and attachment adhesives (e.g., epoxy). Covering can interfere with the tag's ability to differentiate between wet and dry conditions.

Contact Wildlife Computers if tags are to be used in brackish or freshwater. Special wet/dry sensor hardware may be necessary depending on water conductivity.

Communications Port

The communications port is where the Wildlife Computers Communications Cable connects to the tag. Prior to a deployment, this port should be sealed with the plug provided. Smear a small amount of the silicone grease supplied onto the sides and bottom of the plug, align the plug and pins, and carefully push the plug into the port. If it does not align easily with the pins, rotate it 180° and try again. The plug prevents corrosion of the pins during the deployment; however, the plug is not required for the tag to function normally.

LED Indicator Light

The LED indicator light displays what mode the tag is in.

Release Pin

The tag begins its release sequence by energizing the release pin causing an electrolytic reaction. In sea water, it takes about 4 hours for the pin to erode to a point where the tag separates from the tether.

Antenna and Float

The mrPAT is designed to float with the antenna and wet/dry sensor above the water surface. It is of great importance that the full package (with tether and anchor attached) is positively buoyant. If attachment fails and the anchor pulls out of the animal, the tag will only report if a dry environment is detected. If the tag sinks, it may be crushed or sit on the bottom until the release date/mission duration is achieved.

Interacting with a Tag

Tag Agent Software is used to communicate with the mrPAT. Tag Agent and the USB-Blue Driver can be downloaded from our website: wildlifecomputers.com . Once installed, Tag Agent can be used to:

- Configure the tag deployment duration or release date
- Change tag states
- Upload remotely-selected settings into a tag
- Check sensor readings and conduct test transmissions

To communicate with a tag, open Tag Agent Software (Figure 2).

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Figure 2—Tag Agent Software home screen.

Use the USB communications cable to plug the tag into your PC. Take care to ensure that the pins are aligned. Once plugged in, swipe a magnet near the tag communication port to establish connection. The tag LED at the base of the antenna will turn orange, and the Tag Agent home screen will appear with tag information on the left and sensor readings on the right (Figure 3).
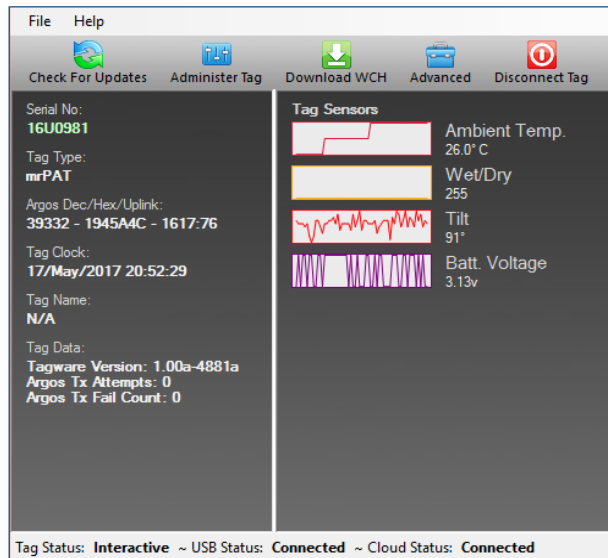

Figure 3—Tag Agent home screen.

If the tag is new or was previously 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.

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Configuring Deployment Duration

To set the tag deployment duration or release date within Tag Agent, select the Administer Tag button in the upper menu.

Figure 4—Tag Agent menu bar. Select Administer Tag to edit tag release settings.

A new window will open up revealing two sections: Tag Information and Tag Release Sequence.

Tag Information

All information about the tag type, serial number, tagware version, and Argos settings can be found under the Tag Information tab. The Tag Name field is an optional user-definable label.
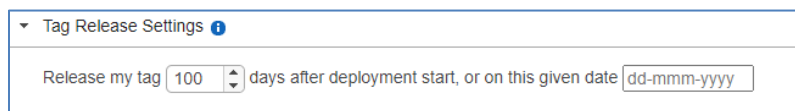
Tag Release Settings

Figure 5—Tag Release Settings Tab within Tag Agent.

The mrPAT can be programmed to begin its release sequence either after a specified deployment duration (interval), or on a specific calendar date.

- **When an interval duration (day) is selected**: release is initiated at the same time of day when deployment was detected. For example, a deployment scheduled for five days starting on 1 May 2017 at 18:00 UTC will initiate its release sequence on 6 May 2017 at 17:59 UTC, five days from deployment.
- **When a specific calendar date is selected**: release is initiated at midnight UTC rollover into the release date, regardless of the time of day the deployment was detected. For example, a deployment on 1 May 2017 at 18:00 UTC with a release date of 6 May 2017, will initiate its release sequence on 6 May 2017 at 00:00 UTC, four days and six hours from deployment.

Once release is initiated, the release link begins to degrade. After approximately 4 hours, the nose cone will separate from the body of the tag. The tag will ascend to the surface and Argos uplinks will begin.

Conditional Release

The mrPAT monitors for premature tag detachment. The default settings will trigger release if the tag is more than five percent dry for two consecutive hours with the wet/dry sensor sampled every three seconds. The standard release settings are appropriate for pelagic fish that don't often surface. You can choose to create custom settings and adjust the conditions that will trigger release.
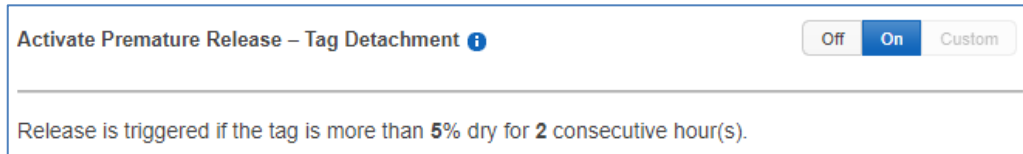
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Figure 6—Example of the default settings to trigger release.

Premature release detection is a critical feature of the mrPAT. Prompt reporting on release ensures you get the last known location of your animal, even if the tag is shed before the scheduled release date. Disabling conditional release is not recommended unless animals are expected to venture into fresh water.

Send Changes Button

Once release settings have been chosen, use the blue Send Changes button 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 setting updates are available.

Tag States: Auto-Start, Start, and Stop Modes

The mrPAT has 3 states: Auto-Start, Start, and Stop (Figure 5).

- Auto-Start puts the tag in standby. A tag in Auto-Start mode can be activated by sea water submersion or by magnet swipe protocol.
- Start mode activates the tag. In Start, data collection is running and the tag begins monitoring for its set release condition. The mrPAT can only be started by submersion in salt water or by magnet protocol. Tag Agent cannot be used to activate the mrPAT.
- Stop puts the tag into deep shutdown for storage. The tag will remain unresponsive unless connected to Tag Agent.
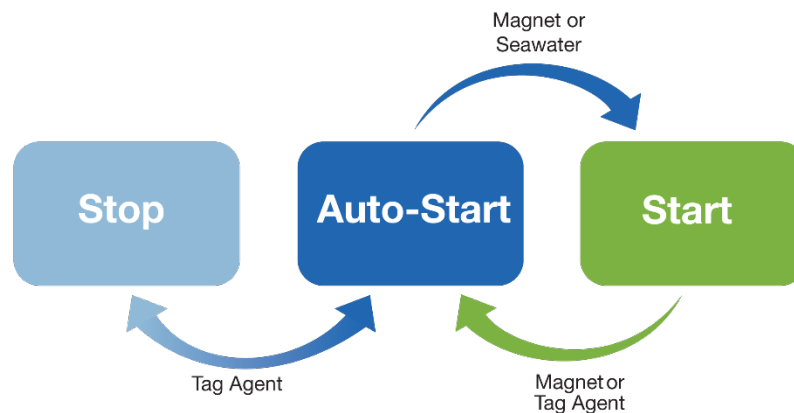

Figure 7—Methods for changing an mrPAT's state. Note that Tag Agent cannot be used to Start a tag.

LED Blink Patterns

Passing a magnet near the communications port will cause the tag to blink the indicator light. The blink pattern reveals the tag state:

- Auto-Start: Two blinks and a pause repeated 3 times
- Start: Ten rapid blinks
- Stop: No blinks

Changing Tag States with a Magnet

Passing a magnet near the communications port can toggle the tag between Auto-Start and Start mode. After a magnet is swiped and the blink pattern is displayed, the indicator light remains on for two full seconds. If the magnet is swiped again during the window that the light is on, the mode will change and the blink pattern of the new mode will display. Once the tag begins release, you can no longer change modes with a magnet. You must change modes by connecting to Tag Agent.

⚠️ *If you start a tag, and are using the default premature release settings, the tag must be deployed in water within two hours or premature release will begin.*

Auto-Start Light Pattern

Start Light Pattern

Figure 8—Magnet and indicator light sequence to switch from Auto-Start to Start. A magnet swipe near the communications port will double-blink three times. Then the indicator light will remain on for two seconds. Swiping the magnet again in the window while the light is on will put the tag in Start mode. The tag will blink 10 times rapidly and then remain lit for two seconds to show it is activated.

⚠️ *If a tag is deployed by mistake, either the magnet swipe protocol or Tag Agent can be used to set the active tag back to Auto-Start.*

Disconnect from the mrPAT

Use the Disconnect Tag tab on the upper left of the Tag Agent Menu to select the tag state before unplugging. If you are planning to deploy in the near future, select Auto-Start mode. The tag will then auto deploy on saltwater submersion.

Always disconnect the tag using the Disconnect Tag button. Unplugging without setting the tag state could leave the tag in a mode that will rapidly deplete the battery.
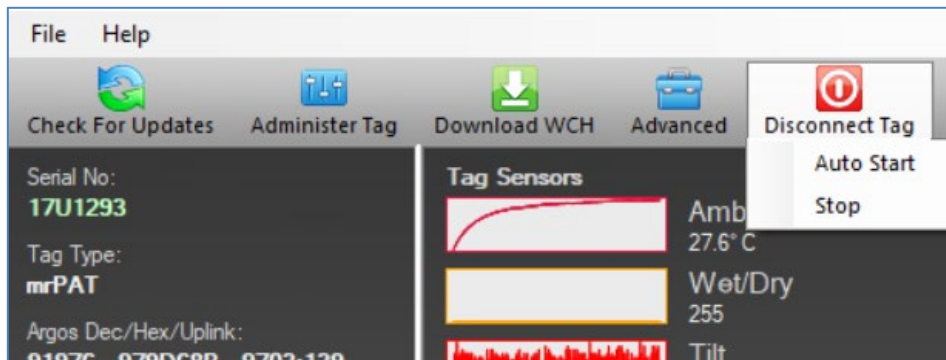

Figure 9—Example of how to disconnect a tag.

Checking Sensor Readings and 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:

Temperature—when you first plug into the tag, the temperature will read approximately room temperature. You can expect the value to increase over time as the LED heats the sensor.

Wet/Dry—connecting a wire from the large rectangular ground plate strap to the small metal post at the top of tag will change the value from over 200 to less than 20.

Tilt—changes with tag orientation.

Test Transmission

Under the Advanced button on the top menu, there is an option to Send Test Transmission. When selected, a pop-up box will appear displaying the transmit voltage. The transmission voltage should read approximately 2.5-3.0v.
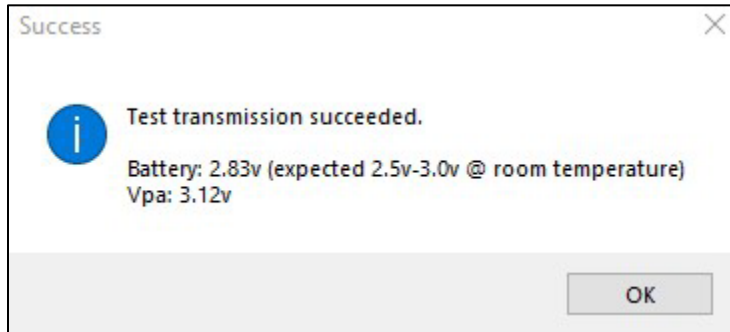

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Figure 10—Example of successful test transmission.

Argos Transmitter Test

The Argos Transmitter test allows for a full system test to confirm that the tag is successfully sending messages to the Argos satellites. Click on the Advanced Tab then Argos Transmitter Test.
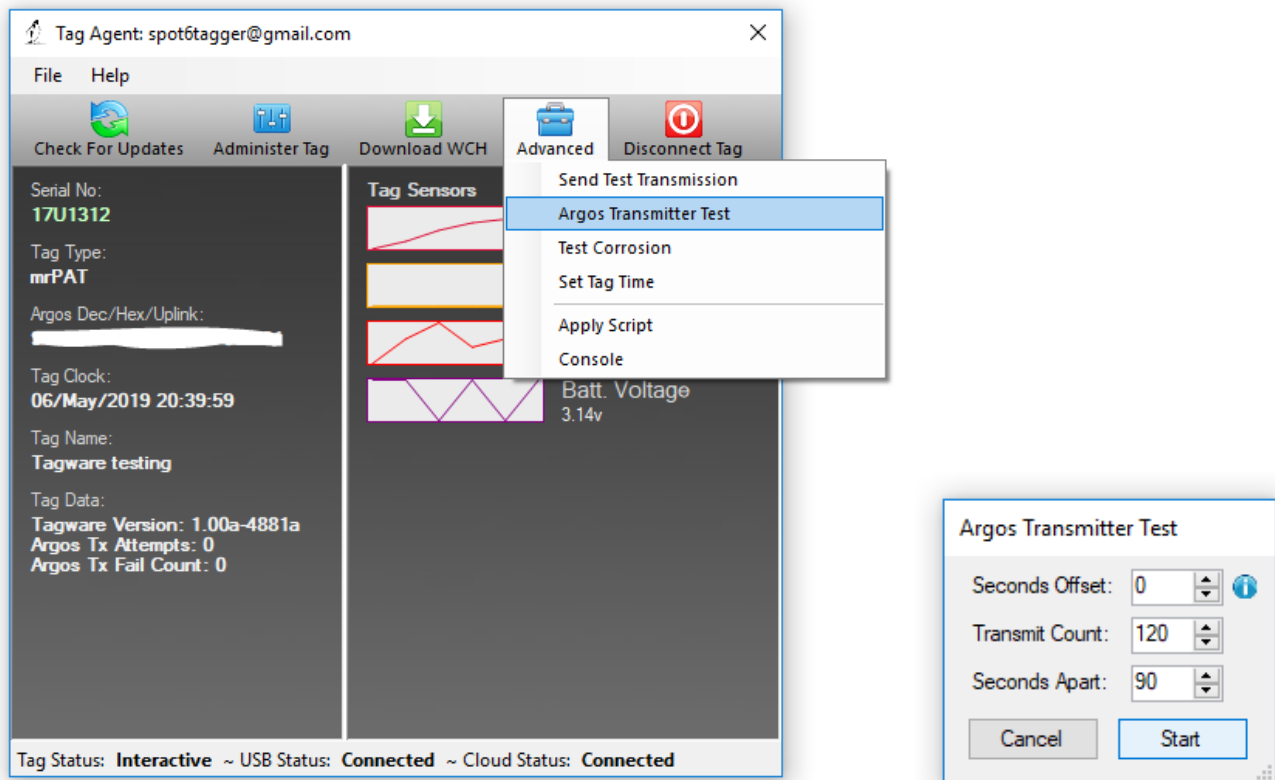

Figure 11—Argos transmitter test.

- Seconds Offset: If you will be testing multiple tags at one time, you can use this parameter to offset transmissions so the tags will not transmit at the same time.
- Transmit Count: How many times you want the tag to transmit. 120 transmissions at a 90 second interval will provide a 3-hour test, which is usually enough to coincide with a couple of satellite passes. Check the satellite passes in your area prior to beginning the test.

- Seconds Apart: The time between each transmission. The usual repetition rate for a mrPAT is 90 seconds.

When all of the tags are set up and deployed, take them outside where they have a full view of the sky. For best results, float the mrPATs in a bucket of saltwater.

When the test ends, the tag will automatically go into Stop Mode. You will need to connect to the tag again with Tag Agent to put it into Standby Mode prior to deployment.

⚠️ ***Upon completion of the Argos Transmitter Test, the tag will be in STOP mode, and you will need to communicate with it again prior to deploying it.***

⚠️ ***When the test is complete, verify that the LED light is not on. If the LED light is on, you MUST communicate with the tag using Tag Agent and manually place the tag in Auto-Start or Stop mode.***

Set Tag Time

Under the Advanced button on the top menu, there is an option to Set Tag Time. If the tag clock is not set when you first communicate with a tag, Tag Agent will ask if you want to set the clock. If there is any other time that you wish to confirm that the clock is set, you can choose this Set Tag Time option.

Apply Script and Console

These two options under the Advanced Menu in Tag Agent are for troubleshooting with Wildlife Computers Support. You will not need to use these options under normal circumstances.

Using Tag Portal to Select Settings Remotely

Tag Portal is the cloud-based service offered by Wildlife Computers for remotely selecting tag settings.

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.

Figure 12—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 you 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.

Offline Mode

Before programming can be done offline, Tag Agent must be downloaded and opened with valid credentials entered while connected to the Internet.

So long as the software has been opened once and credentials have been entered, programming offline is feasible. To program the release date or mission duration, select Administer Tag from Tag Agent's top navigation bar, choose Settings, and click Send Changes. A dialog box will confirm settings have been loaded into tag.

The next time Internet connection is established, and Tag Agent software is open, the historical record will be updated in Tag Portal.

Online templates are not accessible when working offline. To program a group of tags with the same settings when working without an Internet connection create a local template. A file of the selected tag settings will be saved onto your local machine. Local templates can be created and applied in the Template Manager. Expose the Template Manager with the ≡ icon in the upper right corner of the screen.

The Internet connection status is displayed at the bottom of the Tag Agent home screen.

Sync Argos PTT Numbers to your Portal Account

Wildlife Computers supplies the Argos PTT numbers for all mrPAT tags. These PTT numbers must be synced to your portal account to view data.

Before tags are shipped, Wildlife Computers will contact you with Argos sub-program login credentials. To link these credentials to your Portal account:

1. Log in to your Portal account.
2. Click on the account holder's name in the top-right menu bar.
3. Select Account Settings.

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4. Select the Add Account tab and enter the provided username and password. Once your Argos sub-program is synced, all incoming data will be automatically ingested into the portal.

Transmitted Data

Transmitted data helps infer if the tag was still attached to a swimming fish at the time of release.

- Daily Temperature Range: Min and Max values for each GMT day for the last 100 days of deployment.
- Status Message: Current temperature at the time of transmission.

Email Alerts

Within the Data Portal, alerts can be set to email you when tags begin transmitting. On the Data Portal home page, select Data Alerts from the left sidebar menu.

Click New Alert. Select the PTT ID numbers and specify the destination email address and alert start/stop times. When complete, click Save.

Tag Storage and Battery Maintenance

Proper tag storage and battery maintenance are important to minimize passivation, maintain optimal battery voltage, and prepare the tags for deployment.

As a standard, mrPAT tags ship in "Auto-Start" mode for immediate deployment, unless otherwise specified. When stored correctly, tags may experience battery life loss of one to two percent for every year of non-use.

mrPAT Storage—Less Than One Month
If your deployment date will be less than one month, simply store the tags in "Auto-Start" mode. The optimal storage temperature range is 0° to 5° C. Tags must not be stored at temperatures warmer than 5° C or colder than -20° C. Remember to read the pre- and post-deployment checklists to optimize your deployment.

mrPAT Storage—Longer Than One Month
If your deployment date is more than one month away, place the tags in "Stop" mode before storing. Refer to the Special Considerations for Longer-term Storage section of this User Guide for battery maintenance while in storage.

To put tags in "Stop" mode, open Tag Agent. In the top menu, click the "Disconnect Tag" tab. Scroll down to "Stop" and follow the prompts. The optimal storage temperature range is 0° to 5° C. For long-term storage, tags must not be stored at temperatures warmer than 5° C or colder than -20° C. Remember to read the pre- and post-deployment checklists to optimize your deployment.
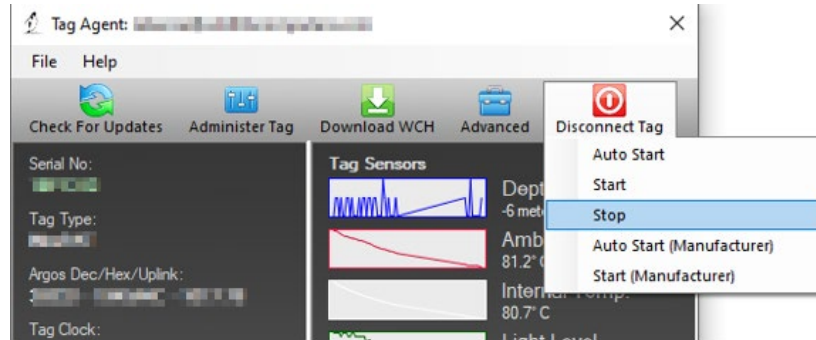
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Figure 13—Example of disconnecting a tag in Tag Agent.

Special Considerations for Longer-term Storage

Connect to each tag at least three months prior to deployment and send Test Transmissions in Tag Agent to confirm the Transmit Voltage is 2.5V or higher.

Sending Test Transmissions

Once tags are stored, they must be "exercised" by sending test transmissions in Tag Agent. Connect to each mrPAT and log in to Tag Agent. In the menu at the top, you will see the "Advanced" tab. Scroll to select, "Send Test Transmission."

Tips to Optimize Sending Test Transmissions

To optimize this test, consider the following:
- **Antenna angle should point UP.** The angle of the antenna should mimic how the tag will orient while transmitting in the field.
- **Never lay the tag flat or have the tag antenna touch anything.**

Pop-up tags transmit when they reach the water's surface. While floating, the ground ribbon remains under water. For this reason, a good angle and height orientation for the Sending Test Transmissions is shown below.
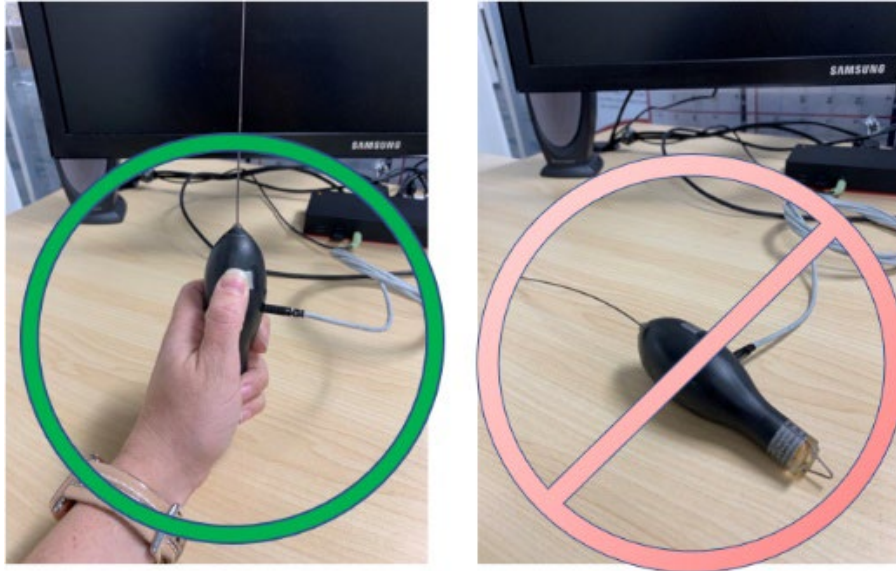
Figure 14— Optimal orientation of pop-up tag for Test Transmission. MiniPAT pictured, not mrPAT.

Connect to each mrPAT and log into Tag Agent. In the menu at the top, click the "Advanced" tab. Scroll down to "Send Test Transmission" and follow the prompts.

The test transmission voltage should read approximately 2.5-3.0 V and the battery voltage displayed on the main sensor screen should be around 3.2V. If the output values of three consecutive test transmissions are all within the expected range(s), and all sensors on the main sensor screen are exhibiting normal readings, the tag is ready to store or deploy.
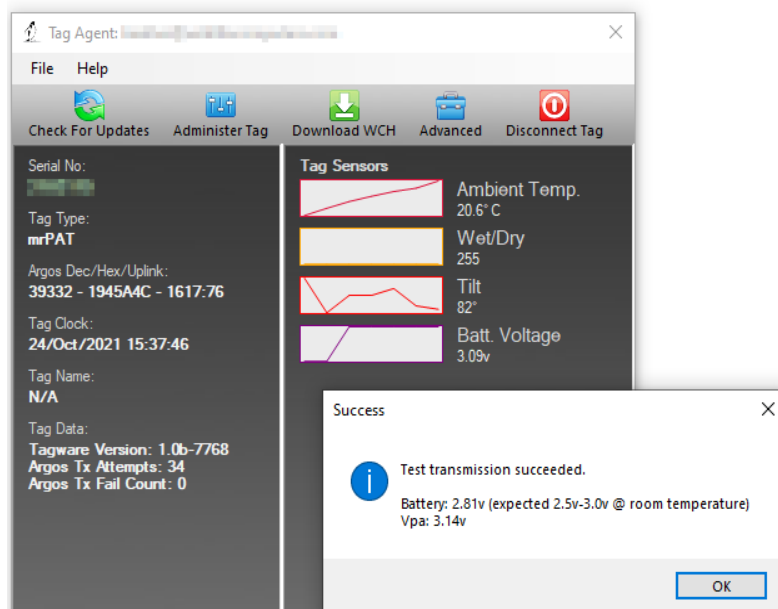

Figure 15—Example of a successful test transmission with acceptable battery threshold.

If you see a lower than acceptable voltage, it may be due to passivation forming during storage. We recommend repeating this test at least 5-10 times to dislodge this possible passivation layer. If you continue to receive a low voltage reading—anything less than or equal to 2.5V—contact your technical sales consultant at tags@wildlifecomputers.com.

Technical Specifications

Dimensions	118 mm (length) X 28 mm (diameter)
Weight in Air	44 g
Pressure Rating	2000 m
Operating Frequency	401.678 MHz
Operating Life	Up to two years
Sensors	Temperature, Tilt, Wet/Dry
Temperature	Range: -20°C to 50°C/Resolution: 0.05°C
Conductivity Operational Limits	0.1 to 5 S/m
Optimal Storage Temperature Range (°C)	0° C to 5° C
Communication	Via USB port using Wildlife Computers communications cable

Additional Information

Glossary of Terms

- Administrator—someone who has authority to publish and change tag settings.
- Argos PTT—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 Argos from uplinks received during a satellite pass. Multiple uplinks are required to generate a single location. Get more information about how the Argos system works here:http://www.argos-system.org/web/en/391-faq-general-questions.php.
- Transmission Interval (repetition rate)—how often a tag will test for dry conditions and try to transmit. mrPAT tags are set to transmit every 90 seconds. This value is programmed by Wildlife Computers.
- Start/Auto-Start/Stop—tag states. When started, will initiate a scheduled release. 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.
- Tag Agent Software—the program used to program Wildlife Computers tags.
- Tagware— software running on a tag.
- Wildlife Computers communications cable—the cable required by Tag Agent.
- Tag Portal—a cloud-based service for data viewing and remote tag setup.
- Wet and Dry—the state of the tag as determined by the wet/dry sensor which measures conductivity.

What is Antifouling Paint and Why You Should Apply It

Heavily fouled tags can be hugely detrimental to tagging studies as fouling growth over critical sensors impedes the tag's transmitting performance. Especially for deployments in tropical waters, it is imperative that tags be protected against marine growth.

Wildlife Computers leaves the decision to apply antifoul coating after manufacturing and before deployment entirely to the researcher's discretion. Excluding animals that regularly haul-out, **we strongly recommend that tags be treated with some antifouling coating to ensure the best possible chance of a successful deployment as Wildlife Computers does not provide warranty against biofouling.**

Wildlife Computers endorses two antifouling coatings: Micron and Propspeed.

Micron is a range of copper-based antifouling paints, many with a biocide that repels barnacles. For optimal protection, it is critical to use [International Paints' Interprotect primer](#) in addition to the paint. Micron66* is a great choice for slow movers like sea turtles and whale sharks. Other Micron saltwater paint options are available and should work well. Proven choices are Micron 66, 77, 99, CSC, and Extra SPC. If Micron paint is unavailable in your area, find an alternative copper-based ablative antifouling paint with a suitable primer. Wildlife Computers does not currently apply Micron antifouling paint.

Micron66 has been discontinued but can still be found in some stores. Wildlife Computers has been testing Micron CSC and Micron Extra SPC as a replacement. mrPAT pop-up tags should float with one coat of primer and one coat of Micron CSC. Micron Extra SPC is heavier, restricting its application until further testing can be done on mrPAT tags. Once antifouling paints and tethers are applied, Wildlife Computers recommends performing a float test.

Tags painted with Micron must only be handled with gloves as Micron contains copper and biocides. Store the tags in a Ziploc® bag as Micron gives off a strong odor. Store the tags in a cool place optimally between 0° C and 5° C.

Propspeed is a foul release silicon coating, not an antifoul, that impedes biofouling adhesion. Propspeed is non-toxic and widely available. Propspeed relies on movement for its effectiveness—the more water moves over its surface, the better it performs, as marine growth cannot get a grip to grow. Propspeed can last up to a year and is relatively non-toxic according to the manufacturer.

Wildlife Computers offers an optional service to sand, mask, and paint tags with Propspeed antifouling and coat the wet/dry sensors with conductive polymer. Wildlife Computers offers Propspeed antifouling painting at a charge of $100 per tag prior to shipping.

For instructions on how to apply antifouling coatings, videos, and more:
https://wildlifecomputers.com/our-tags/extras/anti-fouling/

Antifouling Tests

Wildlife Computers have been undertaking tests on antifouling paint in various parts of the world.

Below is an image of submerged polyurethane and epoxy test plates after two months on a wharf pile in New Zealand.

Propspeed is at the top and has done a reasonable job but has started to fail. Next is a placebo blank area with no protection that has fouled badly. The next strip down had Micron without a primer and the Micron has nearly worn away completely.

The Micron at the bottom has one coat of Interprotect primer and three coats of Micron—it is pristine. We recommend this set up for a successful project.

The plates are as follows:

PropSpeed

Blank

Micron66

Primer plus Micron66
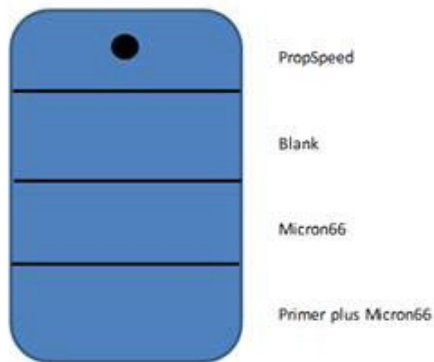
Contacting Wildlife Computers

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.

Mailing and Shipping

Wildlife Computers
8310 154th Avenue NE, Suite 150
Redmond, WA 98052 USA

Email

Sales, Quotes, and Inquiries: tags@wildlifecomputers.com
Technical Support: support@wildlifecomputers.com

Phone

+1 (425) 881 3048

Website

WildlifeComputers.com

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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