

SPLASH10 (-F, -BF, -FL, -X, -L, -FX) TDR10 (-F, -BF, -X, -L, FL, -FX, -BX) with host version 1.26.3002 User Guide

This user guide will give you all the essential information needed for interacting with, configuring, and deploying a Wildlife Computers SPLASH10 or TDR10.

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Before you Begin



The information contained in this guide is designed to help you get the most from your deployment. In the guide, you will see the yellow icon highlighting information where special attention should be paid.

The list below shows what is required to interact with a SPLASH10 tag:

- A Windows® computer with [Mk10Host](#) and our USB driver ([32-bit](#) or [64-bit](#)) installed
- A Wildlife Computers Portal Account
- A Wildlife Computers Communications Cable
- A magnet

Mk10Host is used to communicate with a variety of Wildlife Computers tags, including all versions of SPLASH10s and TDR10s. Mk10Host is used to set parameters, test sensors and other hardware components, and download data archived on the tag to your PC.

As you might expect, Mk10Host is quite complex to support all the possible permutations of modules. To simplify the user-interface, Mk10Host will only display the parameters appropriate to the modules present on the connected tag. Therefore, there may be many places where you cannot access features described in this manual because the necessary module is not present.

How do I know I have a “SPLASH10” tag versus a “SPLASH” tag model?

Serial number

- SPLASH10 tags have the letter “A” in their serial number. E.g., 18A0635
- SPLASH tags usually have the letter “U” in their serial number. E.g., 18U0635

Tag Agent Host view

- Although SPLASH10 tags can interact with Tag Agent, the main screen will not display any Tag Sensor data, and the Tag Type is designated as “Mk10.” If the image shown is what you see, close Tag Agent by clicking the [x], as the Disconnect tab is non-functional, and open Mk10Host instead.
- When SPLASH tags interact with Tag Agent, the main screen will display Tag Sensor data.

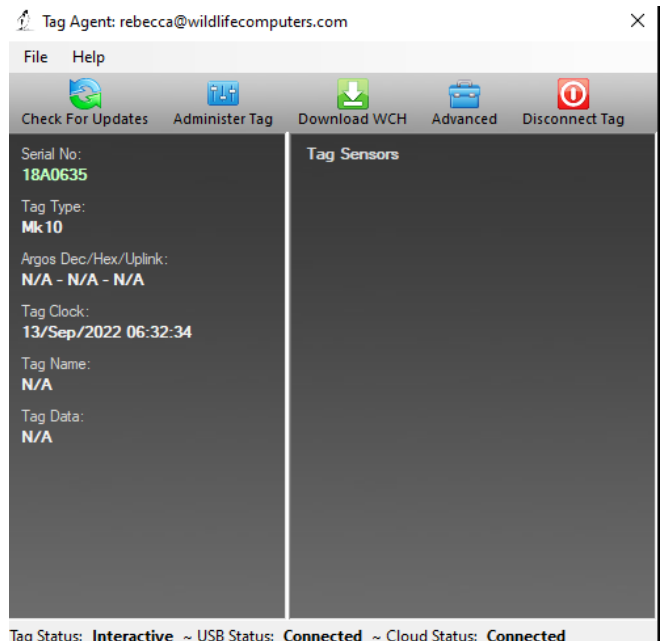


Figure 1—Mk10 tags connected to Tag Agent.



If the image shown is what you see, close Tag Agent by clicking the [x], as the Disconnect tab is non-functional, and open Mk10Host instead.

Visit wildlifecomputers.com to create a Wildlife Computers Data Portal account. A Portal account is required to decode, run location processing (when applicable), and download your data post-deployment. See the [Wildlife Computers Portal and Tag Agent User Guide](#) to learn more about how to navigate the Data Portal, post-deployment.

At the end of this User Guide is a [Glossary of Terms](#) with key concepts to reference. *We recommend new users review this list.*

About SPLASH10 and TDR10 Tags

SPLASH10 tags from Wildlife Computers come in different configurations (-F, -BF, -FL, -X, -L, -FX), each including an array of features. These features consist of an Argos transmitter, pressure sensor, temperature sensor, wet/dry sensors, Fastloc-GPS receiver (for -F, -BF, -FL versions), stomach temperature link (for -FL, -L, versions), and accelerometer sensor (for -X, -FX versions). Sensor data collected by these tags are stored permanently and can be retrieved after deployment.

The Argos transmitter serves the purpose of communicating with the Argos satellite system. These transmissions help determine the tag's position and transmit data. The location of the tag and the host animal can be calculated using consecutive transmissions received during a single satellite pass. More information on Doppler locations can be found at <http://www.argos-system.org>.

SPLASH10 tags feature an onboard clock that keeps track of transmission timing. When it is time for a transmission, the tag monitors its wet/dry sensors. As soon as these sensors indicate a dry condition, the transmission process is initiated.

For SPLASH10 tags with Fastloc capabilities, they can rapidly capture information about the GPS satellites in the sky above. This satellite data is stored on the tag and later transmitted back to the researcher via Argos during a subsequent surfacing event. The Wildlife Computers Data Portal can process these captured snapshots to determine a location, with achievable accuracies ranging from 20 to 75 meters. The accuracy may vary depending on the number of GPS satellites used in the location calculation.

On the other hand, Wildlife Computers TDR10 tags (-F, -BF, -X, -L, -FL, -FX, -BX) are solely archival and do not transmit data messages to Argos. These tags share similar features, including a pressure sensor, temperature sensor, wet/dry sensors, Fastloc-GPS receiver (for -F, -BF, -FL versions), stomach temperature link (for -FL, -L, versions), and accelerometer sensor (for -X, -FX versions). Sensor data collected by these tags are stored permanently and can be retrieved after deployment.

Operational Modes

Four main operational modes:

Communicating	For configuring tags. The tag is connected via a Wildlife Computers USB communications cable interface to a PC which is running Mk10Host. In this mode the tag draws power from the PC through the USB communications cable.
Standby	For temporary suspension of tag activities. The tag runs in a very low power mode and does not archive samples or transmit. It can stay in this mode for a very long time without consuming significant battery power. While in this mode the tag will automatically deploy if it detects a high pressure reading* or a wet sensor reading. It can also be manually deployed by appropriate application of a magnet.
Deploy	In this mode, the tag actively collects data and transmits information to Argos, if configured to do so. The tag should be in this mode when attached to a study animal or other platform for an experiment. The tag can be returned to Standby mode by appropriate application of a magnet.
Shut Down	This mode is used for long-term storage of a tag. The tag runs at the lowest-possible power and does not monitor the environment. It can only come out of this state if it is connected to a USB communications cable and a magnet is passed over the reset location on the tag while Mk10Host is running.



If you use high-power VHF radios near a tag with a depth sensor, it can generate depth spikes which may cause the tag to deploy. You can choose the "Don't Deploy from Standby on Depth Change" option to avoid this situation.

Sensors

Tags are configured with the following sensors as standard:

- Depth
- Internal (tag body) temperature
- External (environmental) temperature
- Depth sensor temperature
 - To internally correct drifts in the depth sensor due to temperature changes
 - No need to be set to sample for field deployments
- Light level
- Battery voltage
 - To internally monitor performance of the battery
 - No need to be set to sample for field deployments
- Wet/dry
 - Used by the tag to correct drift in depth zero offset
 - Determines when the tag is out of water
 - No need to be set to sample for field deployments

Memory

Tags store data in flash memory. This data includes sensor readings, processed data, and satellite messages. Contents of this memory are maintained even if the battery becomes discharged.

Data Collection Intervals

Data collection intervals can be set independently for each sensor. Intervals can range from 1/128th second to 18 hours. Available range may vary between different tag types.

Decoding the Data

Wildlife Computers has developed a specialized website and online repository for the purpose of storing and managing scientific data from Wildlife Computers tags in the cloud. The storage of data is free of charge. This online platform, known as the Data Portal, provides a means to decode and download data from a retrieved tag. Once you have saved your retrieved archive, you can import it into the WC Data Portal to begin the decoding process. Subsequently, the WC Data Portal allows you to export the decoded data in various formats, including .csv, Excel spreadsheet, and Google Earth.

A Word on Version Numbers

The on-board software can be upgraded in our lab. Mk10Host code is upgraded in parallel and is distributed via email or our website. To keep the version of on-board software and Mk10Host working seamlessly together, please note the following:

- The Mk10Ware version numbers are in this format: x.yy
- Mk10Host has version numbers in this format *a.bb.cccc*
- When attempting to communicate with a tag use the following rules:
 - *a* must be the same as *x*
 - *bb* must be greater than or equal to *yy*
- It is best to use highest *cccc* available – see our website wildlifecomputers.com for the most up-to-date Mk10Host

Communication

User parameters are programmed into the tag via a Windows-based program provided by Wildlife Computers called Mk10Host. Mk10Host must be installed on your PC. Mk10Host has been tested under Windows 2000 or later versions. Earlier versions of Windows may or may not work, depending on the configuration of your PC. We do not support other operating systems (e.g., UNIX) or Windows emulators.

Mk10Host works by:

- downloading a copy of the set-up parameters from the tag to the PC
- allowing you to edit these parameters in a standard Windows environment
- uploading the changed parameters back to the tag

Mk10Host can be installed from our website wildlifecomputers.com. Follow the prompts provided.

Next install the USB Driver from our website. This allows you to use the USB communications cable available only from Wildlife Computers. Install the driver before connecting the USB cable to the PC.

You should verify your communications with your tag before heading out to the field. Trying to debug communications issues remotely with users who are “in the field” can be difficult.

Communications Connections Between the Tag and your PC

The communications port is a rectangular hole with chamfered edges in the epoxy casting of your tag. It contains 4 gold-plated pins. Note the orientation of the pins in the communications port. There are three pins in sequence, a “missing pin,” and a single pin. Note the orientation of the sockets in the flat plug. One of the sockets is blocked. It is important that the flat plug is correctly oriented to the pins in the communications port before inserting the plug. At the appropriate time, carefully insert the flat plug from the USB communications cable into the communications port. **IMPORTANT: Do not force the plug.**

Configuration with USB Communications Cable

Each time you start Mk10Host, you will be greeted with a Welcome screen. The first time you use the Host, you will use this screen to configure your computer for communication with the tag.

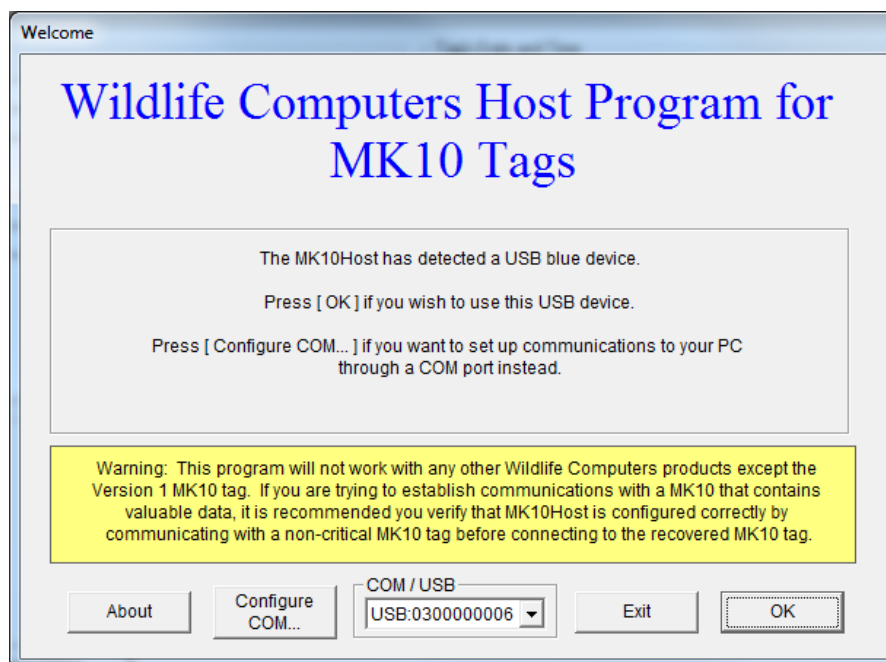


Figure 2—Mk10 Host Welcome Screen.

When you see the USB communications cable dropdown is pre-populated, click on OK. You will see the Connection on the USB screen. Follow the instructions displayed.

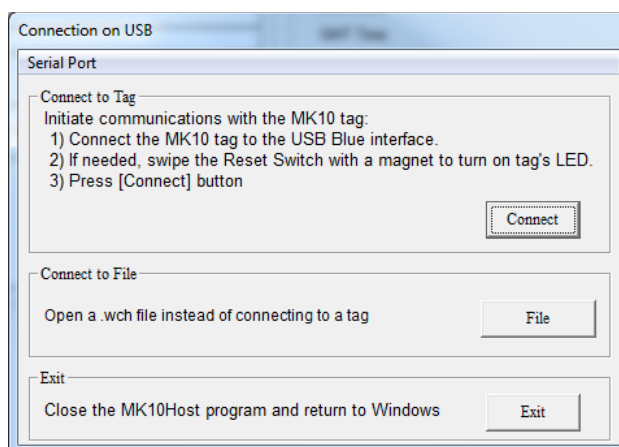


Figure 3—connecting to a tag.



The Reset Switch is located near the communications port, so passing a magnet in the vicinity of the communications port should activate the tag causing the LED to glow.

If the connections between the PC, USB communications cable and the tag are seated correctly, an LED on the Mk10 will glow once the tag is ready for communication. *The LED must be glowing before clicking the Connect button.*

Support for the USB Communications Cable

If you have previously installed the driver for another tag, and that device is connected, the connection will default to that device. Optionally, the drop-down box in the COM /USB frame lets you select the USB device you wish to use (if you have more than one connected) or to revert to a previously defined COM port.

Communications Troubleshooting

Mk10Host may display additional prompts, such as the next screens illustrate, if there are difficulties in establishing communications.

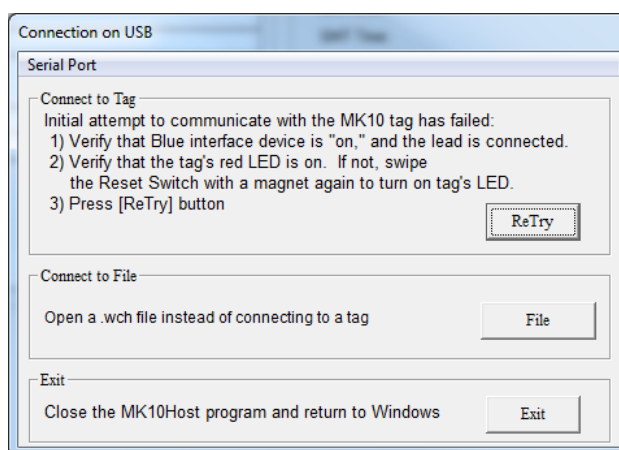


Figure 4—communications troubleshooting screen.

The reset switch location is at the opposite end of the main tag board from the communications connector. Refer to the appendices for more information on locating the reset location.

If you continue to have difficulty, you will eventually reach the following screen. At this point you need to [contact Wildlife Computers](#) for technical support.

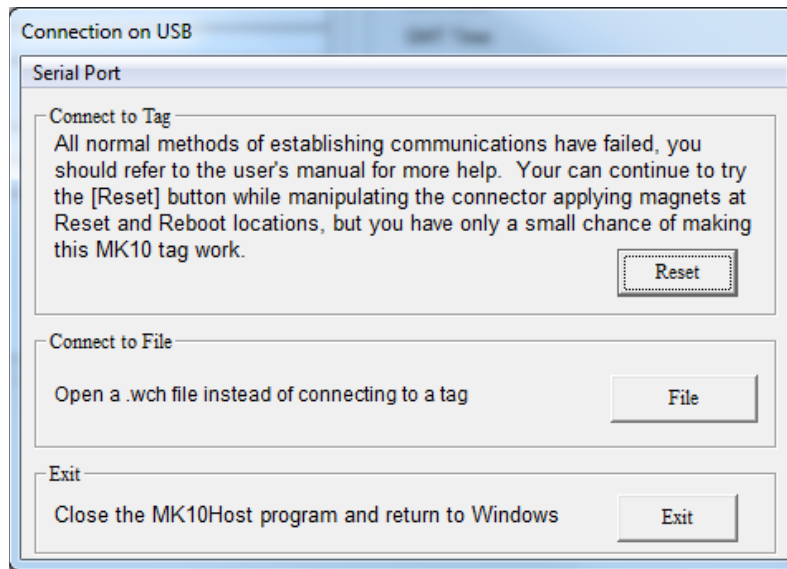


Figure 5—communication failure screen.

Connecting to a File

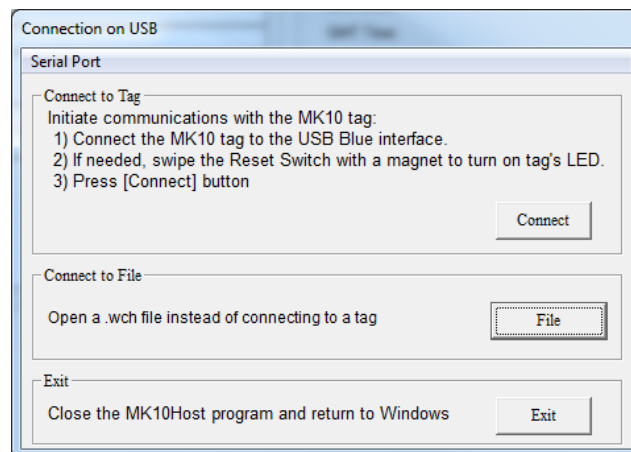


Figure 6—connecting to a file.

If you click on the **File** button in any of the above dialogs, you can connect to a .wch file instead of a tag. This feature provides you with a simple way to examine the set-up of a previous deployment, or to try out the Mk10Host program.

Log On

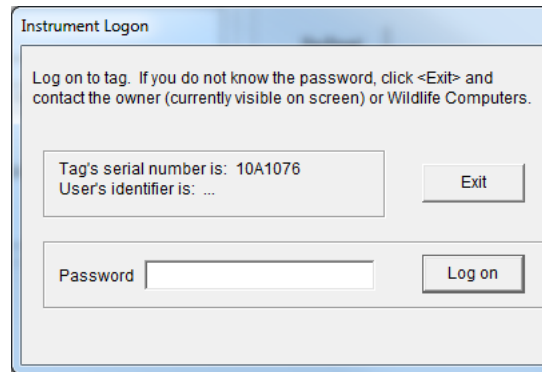


Figure 7—logging onto the tag.

After initial communications are established, you need to log on to your tag. You must correctly enter your password and log on as Owner to read and update information from the tag.



The default password for all Mk10 tags is: mk10. The password is not case-sensitive.

You can change your password any time after you have logged on as a user, by selecting the **Password** menu item at top left of the Host screen. Acceptable passwords include entries up to seven characters. If you forget your password, you will have to return the tag to Wildlife Computers so we can reset it.



The password entered will be remembered for each subsequent logon to successive tags for the duration of the same session with Mk10Host.

If you do not know the password, you will only be able to see general information. You cannot change any data or access any of the tag's functions. Your only option after viewing the general information is to click on **Exit**.

Disconnected Batteries and Dangerous Goods

Once you have successfully logged on to the tag, you may receive a warning about disconnected batteries. This occurs when your tag is considered "Dangerous Goods" for shipping purposes due to the number of lithium batteries used in the tag. See the Dangerous Goods section for more information.

Programming and Testing

Mk10Host will display several sub-screens, identified by "tabs." These tabs appear along the top of the screen. Some of these tabs may be blank (and their captions enclosed in square braces), depending upon the modules installed on the tag.

General Tab

MK10Host - Owner - 10A1076

Password Resync Options Maintenance Help

General Test Archive [GPS] Data to Transmit When to Collect When to Transmit [Pop-up] Haulout Battery Exit Download Audit Files

Identification Information

Tag's serial number	10A1076
User's identifier	...
Argos PTT	5760 (5A03F Hex)
Repetition intervals	60s (at-sea); 60s (haulout)
Versions	Tagware: 1.24; Hardware: 10.2
Owner	Wildlife Computers 8345 154th Ave NE Redmond, WA 98052 USA +1-425-881-3048

Tag's Date and Time

GMT Date: 7 Jan 2011
GMT Time: 18:01:53

Re-Read Change...

Last Deployment Information

Bytes of Archived data:	0
Bytes of Histogram and Profile messages:	0
Bytes of Location messages:	0
Number of messages transmitted:	24
Total Memory Available	67,108,864

Read Setup Save Setup Create Report

Figure 8—general tab in Mk10 Host.

This screen provides the main interface with the Tag. It is divided into several areas:

1. *Identification Information*: Configuration of the Tag, including the user's identifier, which you can change to identify each tag.
2. *Tag's Date and Time*: Current state of the tag's clock.
3. *Last Deployment Info*: Bytes of collected data.
4. *Dangerous Goods information*: Explained below.
5. *Set-up and Report buttons*: Explained below.

Identification Information

The Tag Serial Number, Argos ID (PTT decimal and hexadecimal numbers), Repetition Interval, and Version are fixed manufacturers settings. [Contact Wildlife Computers](#) if a PTT ID or repetition interval change is needed. The User Identifier and Owner selections are editable.

The User-Defined Identifier is an optional parameter. It can be used to identify the deployment. This identifier will be displayed along with the data downloaded from the tag upon recovery.

Click the box next to the User Identifier label to enter a new identifier. The default value is as shown, "...". The maximum number of characters allowed is 15. Any additional characters will be truncated.

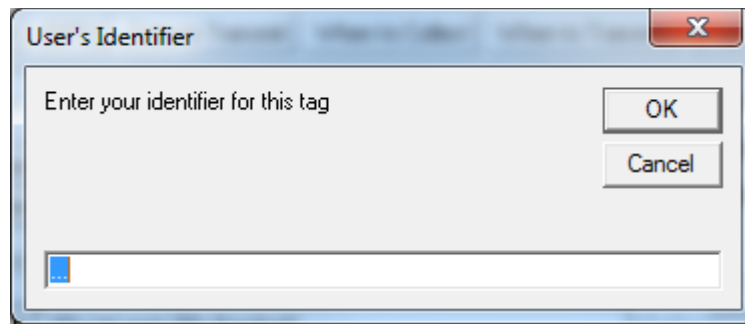


Figure 13—entering a user-defined identifier.

Copying Set-Up Information from One Tag to Another

The **Save Setup** button is useful if you are setting up a series of tags and wish them all to have the same (or very similar) set-up. Set up the first tag, update, and then click **Save Setup**. You will be prompted for a filename to save this set-up. You can use **Read Setup** on subsequent tags to load previously saved set-up files. The format of these set-up files is compatible with the format used when saving data. Thus you can restore a tag to the configuration used to gather a dataset by reading the set-up from that archive record. These files use a .wch extension.

Create Report (.htm file)

It is important to archive the configuration of the tag (versions, parameters) prior to deployment so that they can be used to correctly analyze the data. An abbreviated report is automatically generated whenever deploying from Mk10Host. However, this full report also tests the integrity of the tag's internal table structure. Click Create Report and the following screen will appear, offering you a choice on where to save the report prior to displaying it on the monitor or printing it out.

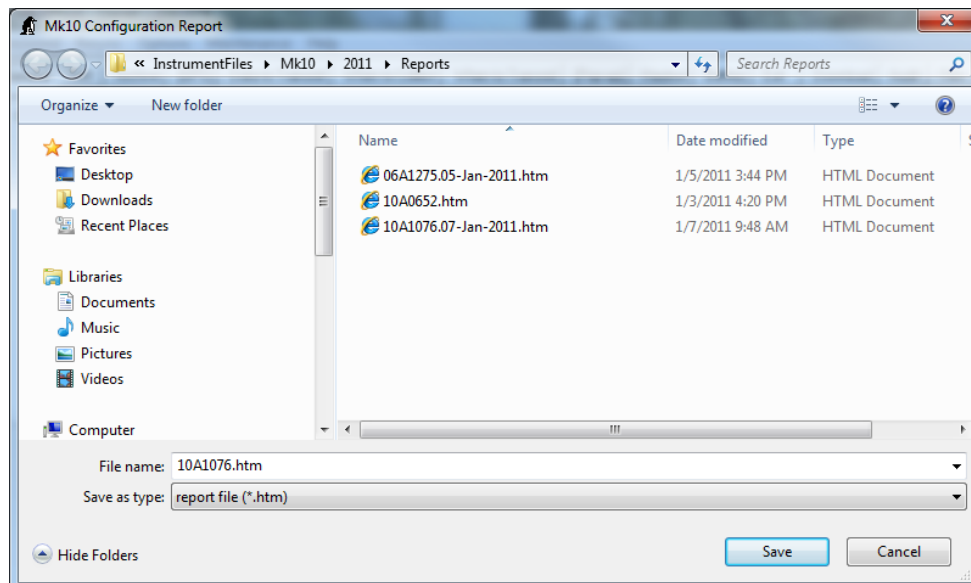


Figure 9—creating a configuration report.

If you want to save the configuration to disk (as a .htm file which can be viewed with any web browser) click **Save**, otherwise click **Cancel**.



This configuration report only displays the tag parameters as stored by the Mk10Host on the PC, not necessarily those on the tag. It does not perform any upload function to Mk10Host. Mk10Host will indicate (as shown below) if the report shows a change from what is on the tag. If so, be sure to save the changes when you exit or deploy.

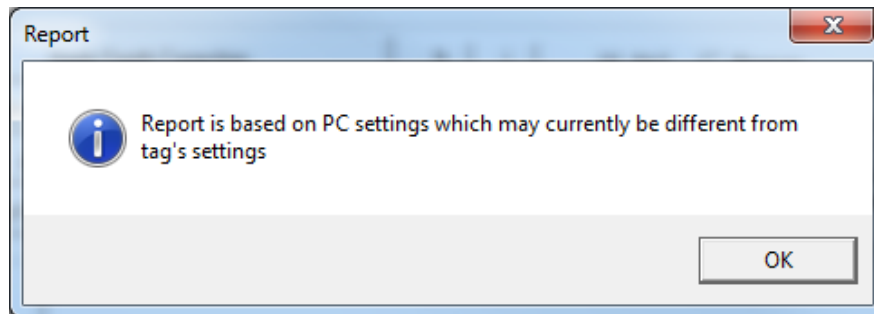


Figure 10—Mk10Host indicating if the report shows a change from what is on the tag.

Host Settings	
MK10Host version	1.24.2000
User Name	Heather

Time And Date Settings	
PC Date (UTC)	07 Jan 2011 at 18:02:10
Tag Date	07 Jan 2011 at 18:02:15
PC UTC offset	8 hours
Last deployment date	29 Nov 2010 at 19:01:00

General Settings	
Tag's Serial Number	10A1076
Password	MK10
User's Identifier	...
Argos Ptt number	5760 (5A03F Hex)
Repetition Intervals	60s (at-sea); 60s (haulout)
Tagware version	1.24t
Hardware version	10.2
Battery Configuration	1 x 2/3AA
Battery Capacity (from manufacturer's datasheet)	1300mAh
Owner	Wildlife Computers 8345 154th Ave NE Redmond, WA 98052 USA +1-425-881-3048

Figure 11—example of configuration report.

The File menu item at the top of the Hardware Configuration Report screen allows you to save or exit this report. If you choose to save the report, the same Mk10 Configuration Report dialog box you saw earlier will appear.

You must select **PRINT** at the top of the Hardware Configuration Report to get a hardcopy of your report.

Change Tag's Date and Time



SPLASH10 tags contain very accurate Super-Real-Time Clocks. DO NOT adjust unless the tag's time is more than one minute from GMT/UTC time. Current GMT/UTC time can be found online and is displayed in the bottom corner of the Wildlife Computers Data Portal.

It is important the tag's time be accurately set to GMT. The date and time are used to label when the data are collected.

There are two ways to set the tag's clock. The best and most accurate way is to use the clock on your PC. First ensure the clock on your PC is accurate. There are several websites that allow you to do this. Alternatively, in Windows, select "Date and Time" in Control Panel, then select the "Internet Time" tab, and follow the instructions.

Click the **Change** button on the Tag's Date and Time to bring up the window to set the tag's clock:

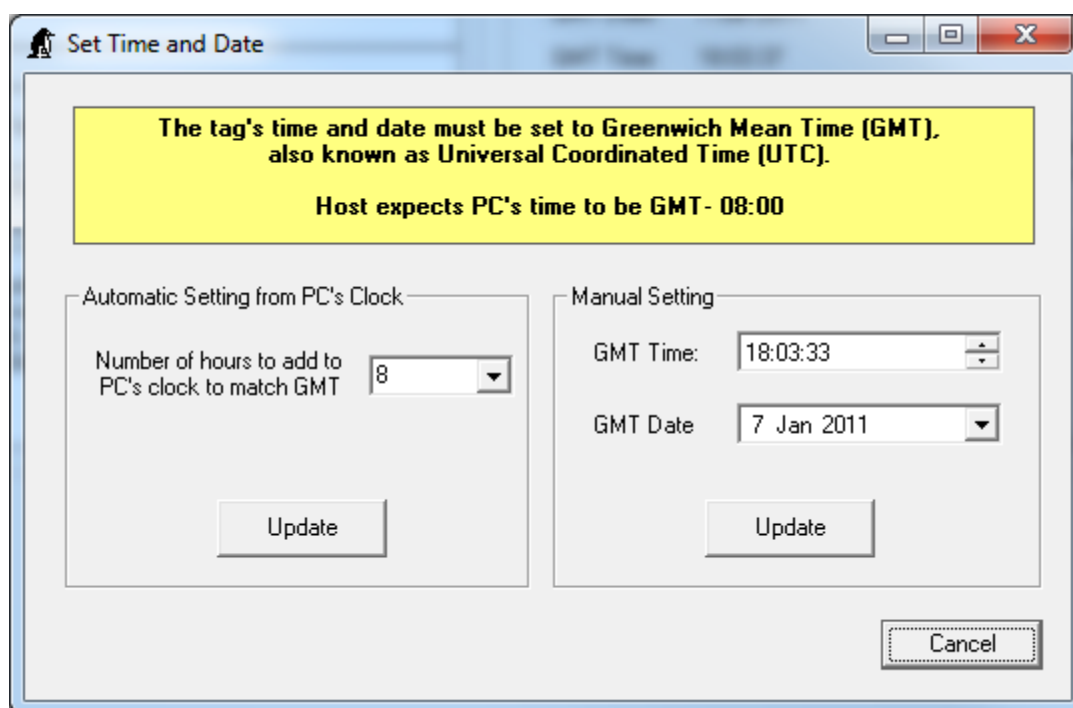


Figure 12—changing the tag's date and time.

Automatic Settings from PC's Clock

Mk10Host will read the local settings of your computer and fill in the GMT offset. If you need to override this, select the number of hours that need to be **added** to the time on your PC's clock to match GMT. For example, if your PC is set to GMT -7, select "7" in the drop-down box.

Click **Update** in the Automatic setting frame.

Manual Setting of Time and Date

Alternately, enter the appropriate GMT date and time using an accurate time source, clicking **Update** (in the Manual setting frame) to set the tag's time and date to these values.

Test Tab

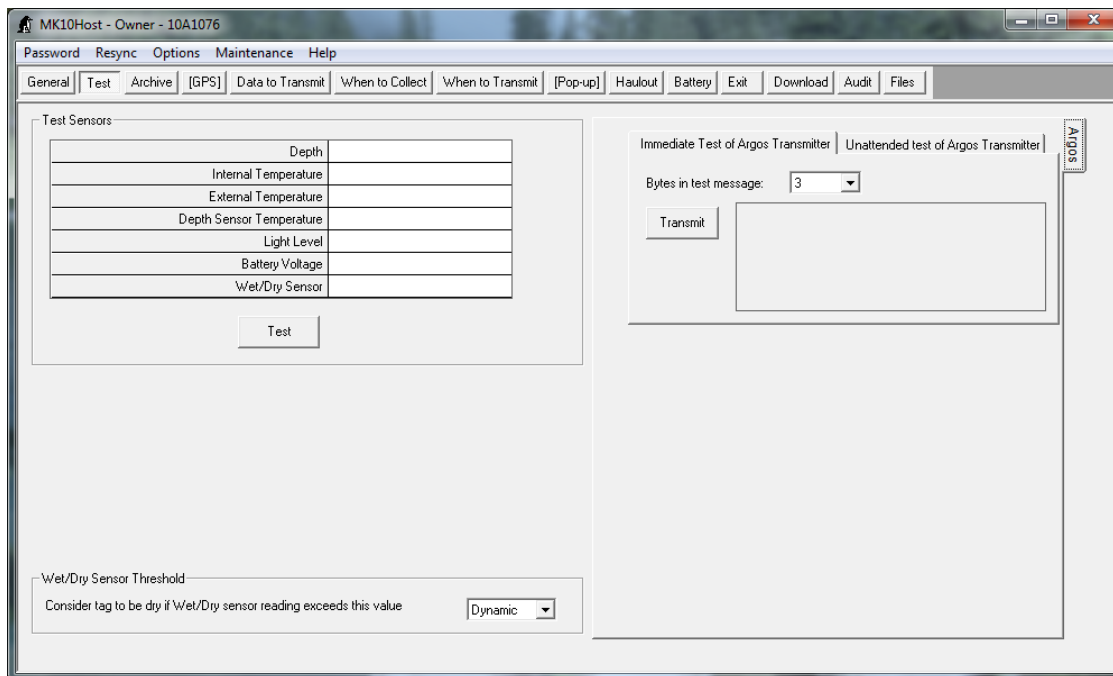


Figure 14—test tab in Mk10Host.

Test Sensors Frame

Click the **Test** button. The current values of each installed channel will be displayed:

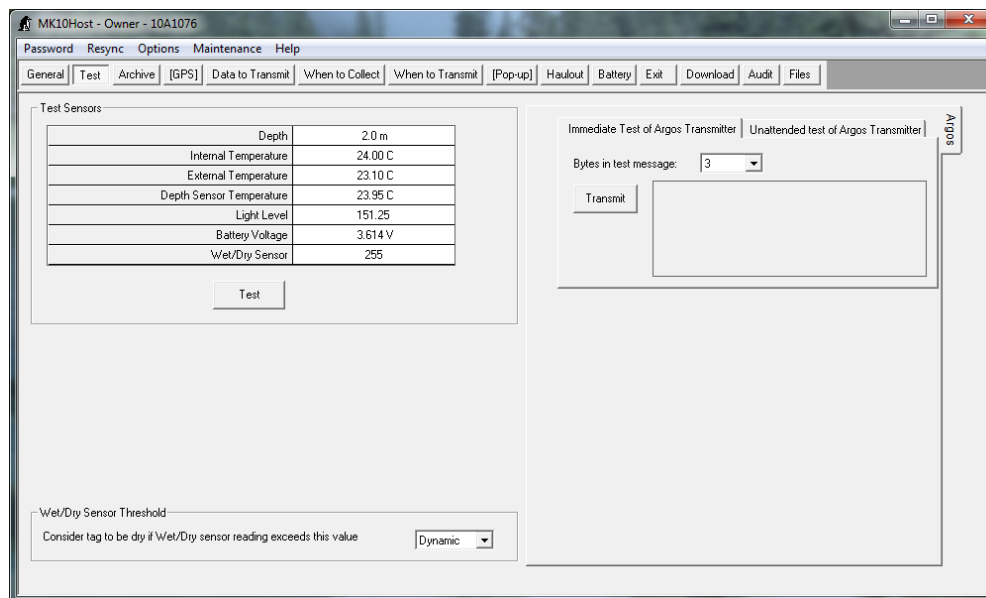


Figure 15—testing the sensors in Mk10Host.

Wet/Dry Sensor Threshold Frame

The tag can dynamically determine the appropriate threshold value for wet/dry determinations in sea and brackish water. Leave this setting to Dynamic unless you are attempting deployment in unusual water conditions. In such instances, [contact Wildlife Computers](#) for advice regarding this setting.

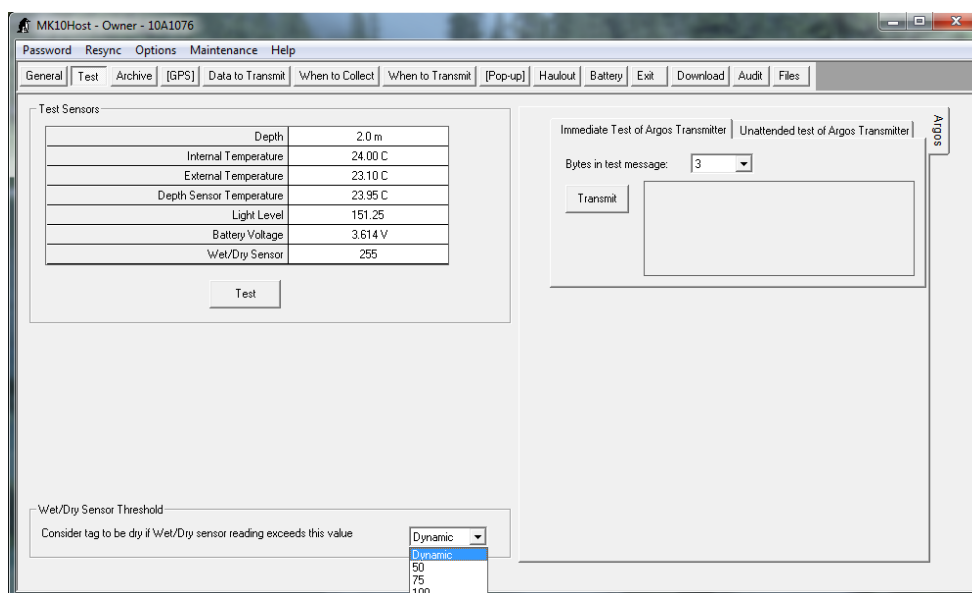


Figure 16—setting the wet/dry sensor threshold in Mk10Host.

If you change the Wet/Dry Sensor Threshold to either 150 or 200, you will get a warning message. Be sure you have this value set to what you need for the type of water in which the tag will be deployed.

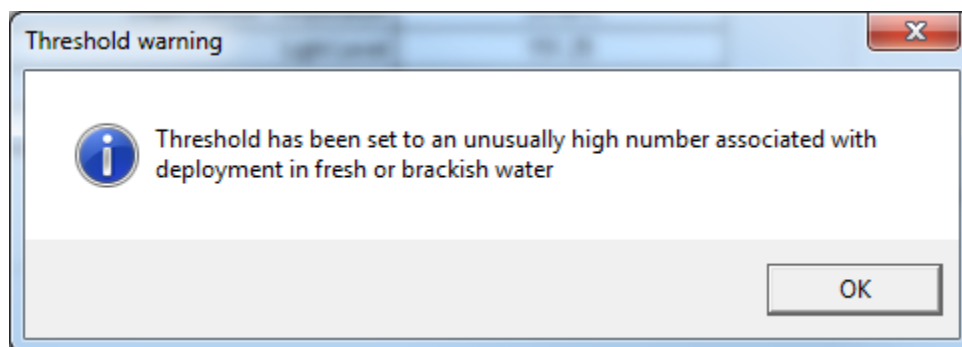


Figure 17—warning message for wet/dry sensor threshold setting.

Argos Side-Tab

This side-tab is visible from the testing tab for tags configured with an Argos transmitter.

Immediate Test of Argos Transmitter

This function allows you to quickly verify the Argos transmitter is functioning and the battery voltage is at least 3.3-3.7V.

Click **Transmit** and the battery voltage and current drawn from the battery are reported.

Unattended Test of Argos Transmitter

This function allows you to retest the tags through the Argos system. This would be most applicable for tags that have been stored for a long period of time (several months).

When testing multiple tags concurrently, it is important that tags do not transmit simultaneously. The “Auto-increment first transmission by” field causes subsequent tags within the Mk10Host session to have their “First transmission at” field automatically incremented to stop the tag’s transmissions from being simultaneous.

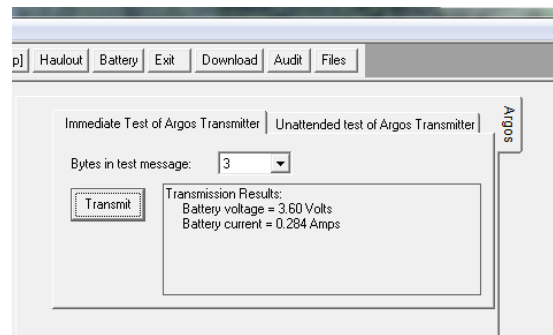


Figure 18—side tab for Argos transmitter.

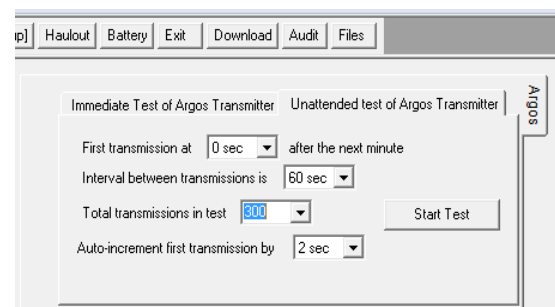


Figure 19—unattended Argos transmission test.

Fast-GPS Side-Tab

This function allows you to test the functionality of the Fast-GPS module. Click on **Test Fast-GPS** and wait about 40 seconds, then click **Refresh**. If results are ready, the table will be updated and Fast-GPS data displayed. If Status is still processing, wait a few seconds and click **Refresh** again. You will not receive satellite signals if you are running this test inside a building.

The screenshot shows the 'Fast-GPS' side-tab in a software window. At the top, there are menu items: Haulout, Battery, Exit, Download, Audit, and Files. Below these is a 'Test Fast-GPS' button. A table displays the following data:

Register	Value
Status	Idle
Mode	7
Offset	176
Span	104
Autotune	0 (off), Target = 6
Threshold	20
Hardware	3.3
Software	2.0d
Serial Number	10F0206
Data	no data
Locations Processed	208 (197 successful)
Energy used	none

Below the table is a 'Refresh' button. On the right side of the window, there are tabs for 'Argos' and 'Fast-GPS', with 'Fast-GPS' currently selected.

Figure 20—testing Fast-GPS.

Stomach Temperature Side-Tab

This function allows you to test the functionality of the Stomach Temperature pill. When you start up a pill, it may take an extended time before the tag recognizes it. Or, as shown in the first pane, the receiver may be disabled. In either case, clicking **Search for pill** will force the tag to restart the search, as shown in the second pane. After the pill has transmitted, clicking **Refresh** will display the new reading from the pill. This is a more reliable method of interrogating the pill than using the Test button (not shown here). Once a pill has been acquired by the tag (it knows the pill's repetition rate), then status will show "Acquired" and the Test button will work more reliably.

The figure shows three sequential screenshots of the 'Stomach Temperature' side-tab interface, illustrating the process of acquiring a pill. Each screenshot has a 'Search for pill' button at the top and a 'Refresh' button at the bottom. The table data changes across the three states:

State 1 (Left): The Status is 'Disabled'. The Data field shows 'No pill detected'.

State 2 (Middle): After clicking 'Search for pill', the Status changes to 'Actively Listening'. The Data field still shows 'No pill detected'.

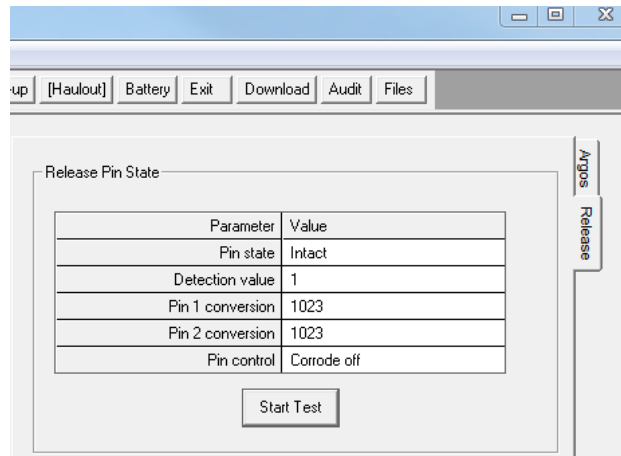
State 3 (Right): After clicking 'Refresh', the Status changes to 'Acquired'. The Data field now shows '2345 = 14.8C, Thermistor 2'.

Figure 21—Stomach Temperature Pill side tab.

Corrosion Release Side-Tab

This function allows you to test the corrosion release on towed SPLASH10 tags. To start the test, connect a multi-meter between the release wire and the ground ring (next to the float), and click **Start Test**. The corrosion release wire is now activated. The multi-meter should be set to measure current, and about 50mA of current should be flowing. Click on **Stop Test** and the current should drop to zero. The Pin state field should always read "Intact" but Pin 1 conversion and Pin 2 conversion values may vary from the examples below.

With nothing between pin and ground ring:



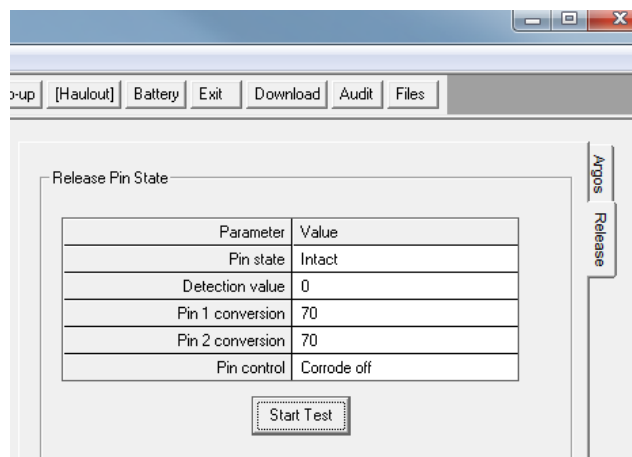
The screenshot shows a software window titled "Release Pin State" with a menu bar containing "up", "[Haulout]", "Battery", "Exit", "Download", "Audit", and "Files". On the right side, there are tabs labeled "Argos" and "Release". The main area contains a table with the following data:

Parameter	Value
Pin state	Intact
Detection value	1
Pin 1 conversion	1023
Pin 2 conversion	1023
Pin control	Corrode off

Below the table is a button labeled "Start Test".

Figure 22—corrosion release side tab.

With a 60-ohm resistor between pin and ground ring:



The screenshot shows the same software window as Figure 22, but with different values in the "Release Pin State" table:

Parameter	Value
Pin state	Intact
Detection value	0
Pin 1 conversion	70
Pin 2 conversion	70
Pin control	Corrode off

The "Start Test" button is still present below the table.

Figure 23—release pin state.

Archive Tab

Set shortest interval first	
Depth	5
Internal Temperature	5
External Temperature	5
Depth Sensor Temperature	5
Light Level	5
Battery Voltage	5
Wet/Dry Sensor	never

Sec

Sampling Mode

☒ Archive samples when tag is wet or dry

☐ Archive samples only when tag is wet

Sampling Duration

Time till 63.921875 MByte memory is filled is 430 days

Tag will "wake-up" to check if it is time to take an archival sample every 5 seconds

Automatic Correction of Depth Transducer Drift

☐ by most common shallow depth

☐ by first dry depth reading

Figure 24—archive tab.



Warning: If the tag has important data from a deployment that have not been downloaded, follow instructions in the section: [Download the Data](#) before changing any parameters.

Setting the Data Collection Intervals

The tag processes sampling intervals as a 2-fold process:

- Set the granularity of the sensor sampling to 1/128th (ultrafine), 1/64th (fine), or one second (normal). 1/128th and 1/64th should only be used with TDR10-X tags. Click on the right column to change the granularity of the sensor sampling.
- Set the sensor with shortest sampling interval first, then the second shortest, etc. This way the available options will be the most obvious.

Having set the sampling intervals as desired, check the Sampling Duration frame to see how long it will take to fill memory. If this value is longer than your anticipated deployment, you could sample data faster. If this value is shorter than your anticipated deployment, you should sample data slower or check the "Archive samples only when tag is wet" checkbox (see below).

Sampling Mode Frame

Use of memory can be optimized by programming the tag to **Archive samples only when tag is wet**. This option should only be used if:

- There is not enough memory to store the samplings at the desired sampling rate and anticipated deployment duration
- You are not interested in samples while the tag is dry
- The tag has wet/dry sensors (this option will not be available if the tag does not have wet/dry sensors)
- Use caution when choosing to **Archive samples only when tag is wet**. If the wet/dry sensor is damaged or obstructed, or the water conductivity is not as expected, you may not gather any useful data.

Sampling Duration Frame

Mk10Host will calculate and display:

- How long data can be stored at the programmed sampling rate
- How often the tag will “wake up” to take a sample

Automatic Correction of Depth Transducer Frame

Pressure transducers tend to drift over a deployment. The tag offers two strategies to monitor this drift so that it can automatically correct for it:

- **By most common shallow depth.** This is appropriate if the tag may not break the surface of the water, (e.g. on a non-air-breathing animal) but you know that it will occasionally come to the surface. This is your only choice if there is not a wet/dry sensor on your tag.
- **By first dry depth reading.** This is appropriate when the tag is deployed on an air-breathing animal and the tag is positioned such that the tag will be above the surface of the water when the animal breathes.

The automatic correction of the depth transducer only affects data that will be processed into Argos messages; corrections are *not* applied to the archive. Entries are made in the archive to indicate when an automatic correction was made, and its value. These values are only used by analysis programs.

Fast-GPS Tab

The Fast-GPS module incorporates Fastloc® technology. When appropriate conditions are met, a sub-second “snapshot” of the GPS constellation is taken. Following the snapshot, the Fast-GPS module processes the snapshot to determine the identity and range of the GPS satellites that were present. Processing takes 12 seconds and continues after the animal has submerged.

A Fast-GPS acquisition is considered “successful” if four or more satellites are identified in the Fast-GPS snapshot. If four or more satellites are identified, these data will still be saved to the archive and an Argos message will be created. When three or fewer satellites are identified, no data is stored in the archive.

There is a lot of control regarding when a Fast-GPS acquisition is attempted, how many acquisitions should be attempted, and how many successful acquisitions are targeted:

The screenshot shows the 'Mk10Host - Owner - 12A1695' window with a menu bar (Password, Resync, Options, Maintenance, Help) and a toolbar (General, Test, Archive, GPS, Data to Transmit, When to Collect, When to Transmit, [Pop-up], Haulout, Battery, Exit, Download, Audit, Files). The main panel is titled 'Select parameters to control Fast-GPS operation'.

Time between Fast-GPS measurements: 30 minutes (dropdown)

Fast-GPS Days:

- Multi-Day Selector:
 - ☐ Apply to this month (All On)
 - ☒ Apply to entire year (All Off)
 - Every 2nd day, Every 5th day, Every 3rd day, Every 6th day, Every 4th day, Every 7th day
 - Advance all one Day
- Calendar grid (Jan-Dec) with checkboxes for each day (01-31). All days are checked.

Fast-GPS Hours:

- Grid of checkboxes for hours 00-23. All hours are checked.
- All On, All Off buttons.

Maximum number of Fast-GPSs per hour: 2 (dropdown)

Maximum number of Fast-GPSs per day: 48 (dropdown)

Maximum number of failed Fast-GPSs per hour: 10 (dropdown)

Maximum number of Fast-GPS attempts per day: 100 (dropdown)

☐ Suppress Fast-GPS measurements once a good location has been collected and tag remains continuously hauled-out

Deployment Information:

- Latitude (degrees): 47.7
- Longitude (degrees): -122.2
- Altitude (m): 0

Advanced Features:

- Take extra Fast-GPS measurements after surfacing from qualifying dive:
 - Number of additional Fast-GPS measurements: None (dropdown)
 - Time between Fast-GPS measurements: Disable (dropdown)
 - Change Qualifying Dive Definition
- Take extra Fast-GPS measurements after finishing a haulout:
 - Number of additional Fast-GPS measurements: None (dropdown)
 - Time between Fast-GPS measurements: Fast (dropdown)
- ☐ Retry a failed Fast-GPS immediately
- ☐ Only transmit latest location

Figure 25—Fast-GPS information.

Parameters

Time between Fast-GPS measurements

This parameter controls how frequently the tag should attempt a Fast-GPS measurement. Selecting “Disabled” means do not attempt any Fast-GPS measurements. When a snapshot fails because three or fewer satellites are identified, a new snapshot will be attempted after 15 minutes or *the Time Between Fast-GPS measurements*, whichever is shorter, and when the tag is next dry.

Time Between Fast-GPS Measurements After Release

This parameter controls how frequently the tag should attempt a Fast-GPS measurement after releasing from an animal. This option only appears for a tag fitted with a release.

Fast-GPS Days Frame

Select the days of the month for which Fast-GPS measurements should be attempted.

Fast-GPS Hours Frame

Select the hours of the day for which Fast-GPS measurements should be attempted.

Maximum Number of Fast-GPSs per Hour

The tag will target this number of *successful* Fast-GPS measurements per hour.

Maximum Number of Fast-GPSs per Day

The tag will target this number of *successful* Fast-GPS measurements within a GMT day.

Maximum Number of Failed Fast-GPSs per Hour

The tag will *stop attempting* Fast-GPS measurements for an hour once this limit is reached. Remember that a failed Fast-GPS measurement causes a new measurement to be made after 15 minutes have elapsed or the *Time between Fast-GPS measurements*, whichever is smaller. This value includes additional Fast-GPS attempts such as the default 15 minute retry or if “Retry a failed Fast-GPS immediately” is enabled.

Maximum Number of Fast-GPS Attempts per Day

The tag will *attempt* this number of Fast-GPS measurements within a GMT day. This value includes failed attempts and must also include all the retry settings outlined above.

Suppress Fast-GPS Measurements Once a Good Location has been Collected ...

Check this box to avoid wasting power by attempting Fast-GPS measurements when they are not going to be useful because you are not interested in on-land locations after the initial haul out.

Deployment Information Frame

Fill in the starting location so that the Fast-GPS solver can generate good locations from the archive seamlessly. Use decimal latitude and longitude with up to two decimal places and negative values for South and West start locations, for example -39.66 ° is 39.66 ° south.

Advanced Features Frame

Take Extra Fast-GPS Measurements After Surfacing from a Qualifying Dive

The first parameters are used when a researcher is primarily interested in the heading and speed of the study animal following a “qualifying” dive. Qualifying dives must have a minimum dive depth and dive duration, and are set on the Data to Transmit tab. These snapshots count against the daily and hourly GPS snapshot limits.



This parameter will cause many Fast-GPS measurements to be attempted and will exhaust your battery quite quickly. Do not enable this feature unless you really need these extra measurements.

Haul-out Location and Duration, and Post Haul-out Movement

This feature is used when the researcher is interested in haul-out behavior and is especially relevant for disturbance studies. When this feature is enabled, GPS messages will contain the location and duration of haul outs and one or more post haul-out locations. The haul out is specified by the haul-out definition (see [Haulout Tab](#)) and the duration is reported from the first dry minute.

By setting *Number of additional Fast-GPS measurements* to one or more, the feature is enabled. At least one post haul-out location must be taken to enable this tool. A GPS snapshot is taken as soon as the criteria for the haul out are met. When the haul out ends, GPS snapshots are attempted with the settings specified here. They override the normal GPS settings.

By setting the *Time between Fast-GPS measurements* to *Fast*, the tag will take snapshots as fast as possible at a minimum interval of approximately 30 seconds. Haul-out snapshots count against the Fast-GPS budgets for hourly and daily limits. If this feature is enabled, Wildlife Computers Data Portal

(or legacy WC-DAP) will generate a Haulout.csv file that lists the haul-out start time, end time, and location. Post haul-out locations will be included in the FastGPS.csv file.

Retry a Failed Fast-GPS Immediately

By default, a failed Fast-GPS fix will instigate a new snapshot attempt after 15 minutes or the *Time Between Fast-GPS Measurements*, whichever is shorter. If this box is ticked, the tag will attempt a GPS fix immediately when the animal surfaces. It will continue to attempt fixes until a successful fix is obtained or the maximum number of failed Fast-GPS fixes per hour or day is reached.

Only Transmit Latest Location

When this feature is selected the tag will only transmit the last location. This is useful when decoding Argos messages in real-time to track a deployed tag; however, this will reduce the total number of locations because the tag will not buffer transmissions. For tags with both a release pin and a GPS, this setting applies to locations that occur before *and* after release.

Data to Transmit Tab

Data are summarized into histograms, timelines, light-based location curves, and/or Fast-GPS acquisitions. Newer tags also include behavior messages. This tab allows you to select the types of messages to transmit, the sampling interval for histograms and timelines (which is independent of the data archiving sampling interval), dive definitions, number of days of data to keep in the buffer for transmission, and the relative priority of location messages over other types of messages.

Mk10Host - Owner -12A1695

Password Resync Options Maintenance Help

General Test Archive GPS **Data to Transmit** When to Collect When to Transmit [Pop-up] Haulout Battery Exit Download Audit Files

Histogram and Behavior Data Sampling Interval: 1 sec

Message Type	# Bins	Upper (deeper/longer/hotter) Limits of Bins													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Dive Maximum Depth (m)	14	5	10	15	20	25	30	35	40	45	50	55	60	65	>65
Dive Duration (min sec)	14	15s	30s	1m	2m	3m	4m	8m	16m	24m	32m	64m	128m	256m	>256m
Time-at-Temperature (C)	14	10	12	14	16	18	20	22	24	26	28	30	32	34	>34
Time-at-Depth (m)	14	0	5	10	15	20	25	30	35	40	45	50	55	60	>60

Histogram Collection

Hours of data summarized in each histogram: 6

Histograms start at GMT: 0

☐ Suspend generating new Histogram-style messages while a tag is continuously dry

Dive Definition

Ignore Dives shallower than 2m

Ignore Dives shorter than 5s

Dive's duration is determined from the first wet reading to the last wet reading

Change Dive Definition

Standard | Time-Series | DDN Timeline

Additional Messages Generated at Histogram Sampling Interval

☒ PAT-style Depth-Temperature Profiles (PDT) ☐ Lo-Res ☐ Hi-Res

☐ Deepest Dive Depth-Temperature Profiles with temperature range: -4C to 8.75C

Other Messages

☒ Hourly % Timelines (1 per 24 hours) ☐ Lo-Res ☐ Hi-Res

☐ 20-minute Timelines (1 per 24 hours)

Depth threshold for timelines: Wet/Dry

☐ Light-Level Locations (1 per 24 hours)

Behavior Collection

☐ Enable Behavior message generation

Transmission Control

Transmit data collected from these last: 2 days

Histogram & ST transmission priority: ☐ low ☒ med ☐ high

Location transmission priority: ☐ low ☐ med ☒ high

Behavior & TS transmission priority: ☐ low ☒ med ☐ high

Figure 26—data to transmit tab.

Histogram Data Sampling Interval

This is the main on/off switch for generating messages. 1-sec intervals are recommended to generate the most accurate histograms, but 10-sec intervals may be needed to maintain compatibility with data collected from our previous satellite tags (SDR-T16, etc.).

Histogram Table

This table contains and controls many parameters. First set the number of bins required for each histogram message type that you want to be generated by clicking on a cell in the # *Bins* column. This will define the number of editable squares in the table. Next fill in the upper (deeper/longer/hotter) limits for the bins by clicking on non-grey bin-limit cells. When focus leaves a row, the bins will automatically sort into ascending order. The last bin is never editable and consists of the counts not contained in any other bin. If histograms are not required, set # *Bins* to *Off*.

Dive Maximum Depth and *Dive Duration* bins hold the count of dives at that duration or depth. The maximum valid value in any bin is 254. A bin reading of 255 indicates a count of 255 or more dives. In other words, all bins get capped at 255 dives.

Time-at-Temperature (TAT) and *Time-at-Depth (TAD)* histograms are the % of time spent at the specified temperature and depth (in Celsius and meters). Note that each bin value is the upper limit of the bin. E.g., With bin settings of 0, 5, 10 & 20 meters, a reading of 5.1 would appear in the 10-meter bin.

- Note that if any data occurs in a bin, that bin will indicate a "1" even though scaling would have rounded the bin down to "0". This applies to Dive Maximum Depth, Dive Duration, TAT, and TAD histograms.

Tip: It is easiest to enter values starting at Bin #1, and then press Enter to move to the next field. When you reach the last bin, the row will then sort into ascending order.



The inherent units of Dive Duration are seconds. Minutes can be entered by following the number with either m or ' (e.g. 2m30 or 2'30 is 2 minutes 30 seconds).

Histogram Collection

You can collect between 1 and 24 of each kind of histogram (and "Additional Messages Generated at Histogram Sampling Interval") per day. This frame allows you to select this number, and at what time (GMT) they should start. You can also restrict the generation of new histograms when the tag is continuously dry throughout the collection period.

Histogram & Timeline & Behavior Definition

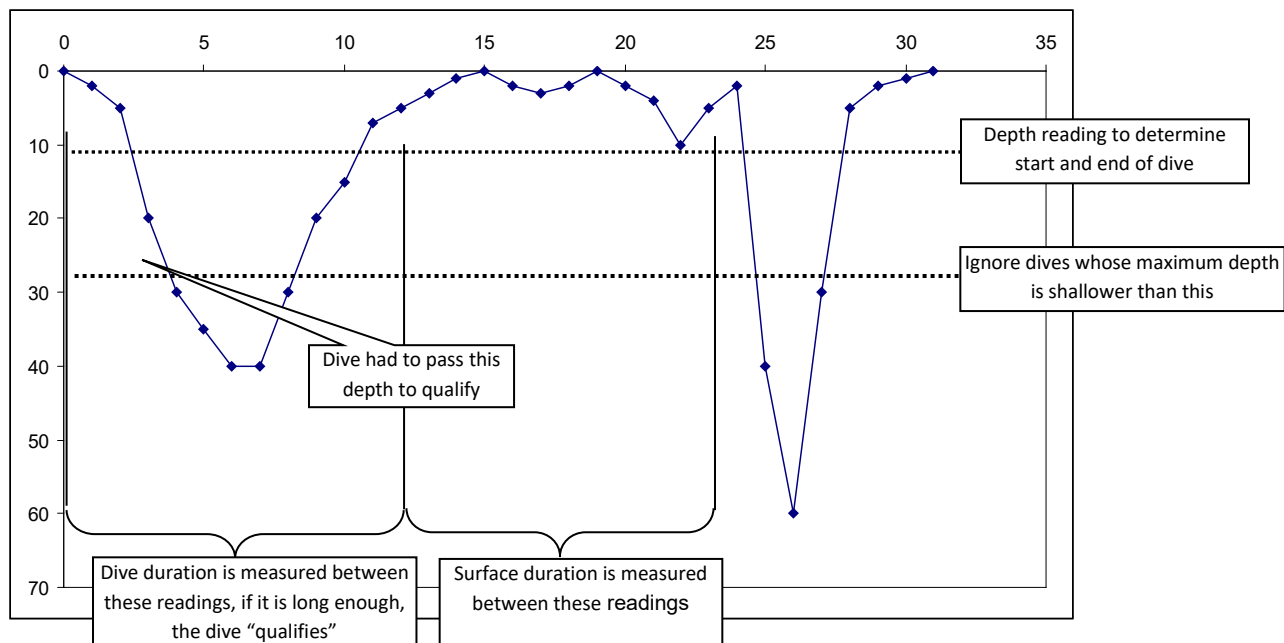


Figure 27—histogram, timeline, and behavior definition.

Start/end depth and shallowest maximum dive depth are shown above. They, in combination with the "Ignore dives whose overall duration is shorter than" drop-down list, define "Qualifying Dives."

Qualifying dives are used in processing:

- Maximum dive depth histograms
- Dive duration Histograms
- Behavior messages
- Advanced features of Fastloc® control

Timeline messages (messages that record time spent shallower and deeper than a specified depth) use their own depth threshold.

Depth-Temperature Profiles

These messages are generated from data sampled at the Histogram Data Sampling Interval:

- *PAT-style Depth-Temperature Profiles (PDTs)*
 - Low Resolution: The minimum and maximum temperatures observed at 8 depths are recorded and transmitted in one message. The depths are chosen dynamically to include the minimum and maximum depths detected, and 6 other depths arranged equally between them.
 - High Resolution: The minimum and maximum temperatures observed at 16 depths are recorded and transmitted in two separate messages. Every other depth (with corresponding temperatures) is in the first message, and the remaining depths are in the second message. This allows you to see the entire range even if you only receive one of the two messages.

- PAT-style PDTs are oceanographic profiles. As the time and order of the values are not transmitted it is not possible to determine animal behavior using PDT data.
- *Deepest Dive Depth-Temperature Profiles*
 - Deepest Dive Depth-Temperature Profiles create many messages containing paired depth and temperature readings. The number of messages created will depend on the Histogram Data Sampling Interval and the duration of the deepest dive recorded in the Histogram period. You also need to define the temperature range for the profiles from the drop-down list. The tag does not transmit the base temperature (lower value of the temperature range) and therefore must be obtained from the report file for decoding purposes.
 - Since the tag is working to capture the deepest dive and since the tag does real-time processing, it only knows a dive's maximum depth AFTER the animal starts its ascent. For each histogram summary period the tag will select the single deepest dive. So, if the current dive is deeper than the previous deepest dive, data collected from the current dive overwrites the data in the DivePDT buffer. At the end of the histogram summary period, the data in the DivePDT buffer will be from the deepest dive. The buffer reserved for the DivePDT contains 2000 bins. Each bin can only hold the LATEST temperature reading at each depth during an ascent. Data are continuously sampled at the histogram sample interval but only added to the buffer during the ascent of the deepest dive.
 - At the end of the histogram summary period the buffer is processed into Argos messages.
 - ***The number of messages created is a function of the depth-temp pairs and which can range from a couple of pairs to 2000! In other words, selecting this option may create hundreds of messages which may swamp other collected data. It is not recommended to use this option.***



Percentage Dry Timelines

- Hourly % Timelines record the percentage of time spent above a threshold depth within 24 1-hour blocks per day. These percentages are rounded to the nearest 10% (low resolution) or 1% (high resolution), but all-deep and all-shallow are identified independently.

% reported in DAP spreadsheet	Amount of time during hour
0	0% (no readings were dry)
3	0% < dry < 5%
10	5% <= dry < 15%
20	15% <= dry < 25%
30	25% <= dry < 35%
40	35% <= dry < 45%
50	45% <= dry < 55%
60	55% <= dry < 65%
70	65% <= dry < 75%
80	75% <= dry < 85%
90	85% <= dry < 95%
98	95% <= dry < 100%
100	100% (every sample was dry)

Figure 28—percentage dry timelines.

Other Messages

- 20-minute timelines record whether the tag was on average deeper or shallower than a threshold depth within 72 20-minute blocks per day. Alternately wet/dry can be used as the threshold instead of a specific depth. In the transmitted data, deeper/wet is indicated with a "1" and shallower/dry with a "0."
- Light-Level Locations create messages that can be used to locate your study animal using the times of dawn and dusk.

Except for haul-out data in status messages, wet/dry sensor values are not transmitted and are only available if the tag is recovered.

Behavior Collection

If behavior collection is enabled, then messages will be created describing the diving behavior of the study animal. Diving behavior is subdivided into 2 modes:

- In a qualified **dive** as defined above in the *"Histogram & Timeline & Behavior Definition"* section, the following are reported:
 - Dive Duration
 - Maximum dive depth
 - The shape of the dive (see Dive Shape Classification below)
 - Square
 - "V"
 - "U"
 - Unclassified
- At the *surface*, the following are reported:
 - Time spent at the surface. Surface is defined as the time between qualifying dives as described above in the *"Histogram & Timeline & Behavior Definition"* section.
 - Time spent shallow. This is the time spent at or above the defined start/end depth of a dive, or time dry if using the wet/dry sensor to start/end dives, while in a surface interval.
 - Time spent deep. This is the time spent below the defined start/end depth of a dive, or time wet, while in a surface interval.

You can expect about 5 dives with associated surface periods to be encoded into a single Argos message. If your dive definition is inaccurate, you could end up with no messages (qualifying dive definition is too broad, so no dives qualify), or too many messages (qualifying dive definition is too narrow, so every vertical movement the animal makes is a "dive"). This could result in a holey dataset.

Dive Shape Classification

Dives are classified into one of three simple dive shapes (square, V, U) by assuming the bottom of a dive is any depth reading $\geq 80\%$ of the maximum reading observed for the dive. If the total duration for the dive is T , the total time between the first bottom reading and the last bottom reading is B :

Classification	Bottom Time
Square	$B > 50\% T$
U	$20\% T < B \leq 50\% T$
V	$B \leq 20\% T$

Stomach Temperature

This section will be disabled unless you have the -L module installed to link data from a stomach temperature pill. There are three types of messages that can be generated; they can be selected in any combination. The processing will recognize "ingestion events" from a rapid drop in stomach temperature (ST). You set this threshold. An ingestion event ends when the ST returns to within 0.5°C

of pre-ingestion temperatures or when the event exceeds a maximum duration (that you also set). The message types are:

- **Ingestion event records.** These records are created as an ingestion event finishes. It contains the following parameters:
 - The time and date of the ingestion event
 - The ST immediately before the ingestion event started
 - The first ST of the ingestion event
 - The depth immediately before the ingestion event started
 - Whether the tag was ascending or descending when the ingestion event started
 - The deepest depth measured during the ingestion event
 - The seawater temperature at this deepest depth
 - The time of this deepest depth
 - The overall duration of the feeding event
 - The last ST of the feeding event
 - The lowest ST recorded
 - The time of the lowest ST recorded
- **Fine-scale ST samples during an ingestion event.** During a recognized ingestion event, the ST readings will be saved as a Time Series at 1-min intervals. The temperature resolution is 0.1°C.
- **Course-scale ST messages when not fine-scale.** This is the default method of encoding ST readings as a Time Series. Data are stored at 2-min intervals, but small changes in temperature ($< \pm 0.5^{\circ}\text{C}$) will be reported as “no change.” This allows much greater compression of data.

The message types can be selected independently. Selecting or deselecting the “Ingestion events records” just affects the generation of such messages, not the recognition of ingestion events. You can deselect “Ingestion events records” and select “fine-scale ST...” The fine-scale messages will still be generated during an ingestion event. The table below shows how the fine- and coarse-scale messages interact.

	Fine-scale disabled	Fine-scale enabled
Coarse-scale disabled	No Time Series data are generated. Ingestion events can still be generated if enabled.	No Time Series data will be generated unless an ingestion event is underway.
Coarse-scale enabled	Coarse-scale data will be generated throughout the deployment. No special action will take place during an ingestion event.	Coarse-scale data will be generated between ingestion events, and fine-scale data will be generated during ingestion events.

Time Series Data

Time Series data is available on some tags. If this option is available to you, you will see the following Data to Transmit screen, with a Time-Series tab.

MK10Host - Manufacturer - 12A0122

Password Resync Options File Maintenance Help Suspend Deploy Update tag

General Test Archive [GPS] Data to Transmit When to Collect When to Transmit [Pop-up] Haulout Battery Exit Download Audit Files

Histogram and Behavior Data Sampling Interval 10 sec

Message Type	# Bins	Upper (deeper/longer/hotter) Limits of Bins													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Dive Maximum Depth (m)	12	10	20	50	100	150	200	300	400	500	600	700	>700		
Dive Duration (min sec)	14	3m	6m	9m	12m	15m	30m	45m	60m	75m	90m	120m	150m	180m	>180m
Time-at-Temperature (C)	14	-2	0	3	6	9	12	15	18	21	24	27	30	33	>33
Time-at-Depth (m)	14	0	2	10	20	50	100	150	200	300	400	500	600	700	>700

Histogram Collection

Hours of data summarized in each histogram 6

Histograms start at GMT 0

☐ Suspend generating new Histogram-style messages while a tag is continuously dry

Dive Definition

Ignore Dives shallower than 2m

Ignore Dives shorter than 2min

Dive's duration is determined from the first wet reading to the last wet reading

Change Dive Definition

Standard messages Time-Series (TS) Stomach Temperature (ST)

☒ Enable Time-Series message generation

Channels to report

Depth ☒

External Temperature ☒

Duty-Cycling

Initially on for 90 days

Then start duty cycling:

off for 255 days

and on for 255 days

Time series data interval 10 min

These settings will generate:

6 Argos messages per day for the first 90 days

and an average of 3 Argos messages per day thereafter

Transmission Control

Transmit data collected from these last 7 days

Histogram & ST transmission priority

☐ low ☒ med ☐ high

Location transmission priority

☒ low ☐ med ☐ high

Behavior & TS transmission priority

☐ low ☒ med ☐ high

Figure 29—Time-Series tab.

On the Time-Series tab, you will choose

- whether or not to enable Time Series message generation
- what duty-cycling settings to use
- the Time Series sampling interval

Time Series Data are not recommended on Fastloc tags as the volume of both Time Series Data and Fastloc data is too high for the limited Argos bandwidth.

Detailed information on Time Series data options and what the parameters mean are available in the [Data in Detail](#) section.

Dry-Deep-Neither Timeline

The Dry-Deep-Neither Timeline (or DDN Timeline) categorizes each hour of the day as Dry, Deep, or Neither. The statistics are based on data collected at the histogram sampling interval.

On the DDN Timeline tab you will define:

- Dry hour – the percentage of the hour that must be dry for the hour to be considered “Dry.”
- Depth threshold– the depth used to determine “Deep.”

- Deep hour – the percentage of the hour that must be below the depth threshold for the hour to be considered “Deep.”

Any hours that do not qualify as Dry or Deep will be considered Neither.

At the end of each day, each hour is marked as Dry, Deep, or Neither. This message is generated once per day and contains data from the previous 5 days.

In the example below, the tag will tally each 10 second sample in an hour. If more than 90% of those 600 samples are “dry” the hour will be marked as “Dry.” Or if more than 50% of those 600 samples are deeper than 10 meters, the hour will be marked as “Deep.”

Transmission Control

Mk10Host - Manufacturer - 12A1805

Password Resync Options File Maintenance Help Suspend Deploy

General Test Archive GPS Data to Transmit When to Collect When to Transmit [Pop-up] Haulout Battery Exit Download Audit Files

Histogram Data Sampling Interval 10 sec

Message Type	# Bins	Upper (deeper/longer/hotter) Limits of Bins													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Dive Maximum Depth (m)	off														
Dive Duration (min sec)	off														
Time-at-Temperature (C)	off														
Time-at-Depth (m)	off														

Histogram Collection

Hours of data summarized in each histogram 1

Histograms start at GMT 00h

☐ Suspend generating new Histogram-style messages while a tag is continuously dry

Dive Definition

Ignore Dives shallower than 84m

Ignore Dives shorter than 2min

Dive's duration is determined from the first wet reading to the last wet reading

Change Dive Definition

Standard Time-Series DDN Timeline

DDN Timelines are messages that categorize each hour as: "Dry" "Deep" or "Neither"

☒ Enable DryDeepNeither (DDN) Timeline message generation (1 per day, which covers previous 5 days)

Hour is "Dry" if it is dry at least 90% of the time

Hour is "Deep" if it is deeper than 10m at least 50% of the time

Otherwise hour is classified as "Neither"

Transmission Control

Transmit data collected from these last 7 days

Histogram & ST transmission priority low med high

Location transmission priority low med high

Behavior & TS transmission priority low med high

Figure 30—Dry, Deep, Neither information.

- Sets the number of days of data to hold in the transmission buffer
- Sets the priorities for the different kinds of messages

Together, these parameters determine the likelihood that a given message type will be sent from a given period of the deployment.

The current version of the control uses relative priorities where high = 3x, medium = 2x, and low = 1x. Thus if the behavior priority is set to high, and location priority is set to low, the transmission of data will be adjusted so that all the behavior messages (in the transmit buffer) will be transmitted three times for every time the entire set of location messages (in the transmit buffer) are transmitted. Note that setting all priorities too high will have no impact. Priorities must be set to different values to

create a difference in the likelihood that a message type will be received by an Argos satellite. You can also specify the number of days of Argos data you want to hold in the transmit buffer.

When to Collect Tab

Mk10Host allows you to control which day of each month to collect and process Argos messages for later transmission.

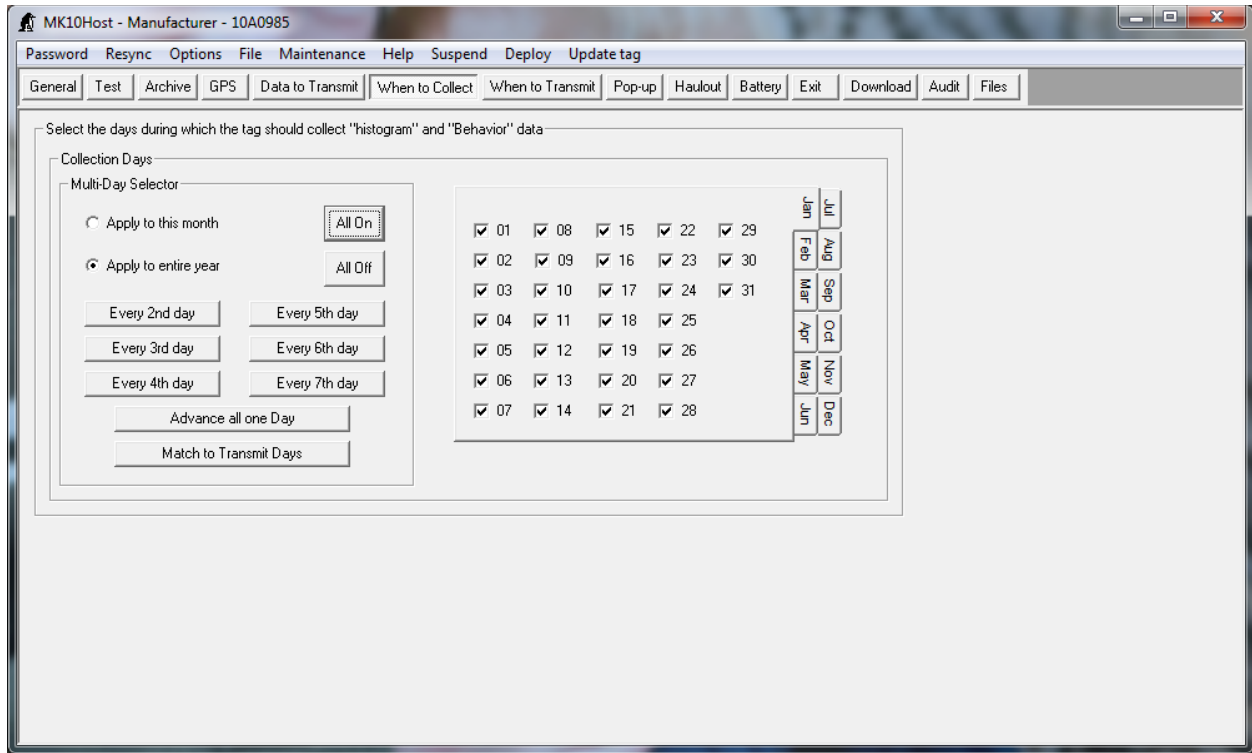


Figure 31—When to Collect tab.

The default setting for *Collection Days* is to collect on all days. Only use other set-ups if you are sure that you only want to sub-sample the overall Argos message creation (to extend battery life, for instance).

When to Transmit Tab

This tab controls when Argos messages should be transmitted, how many should be transmitted, and how they should be constructed.

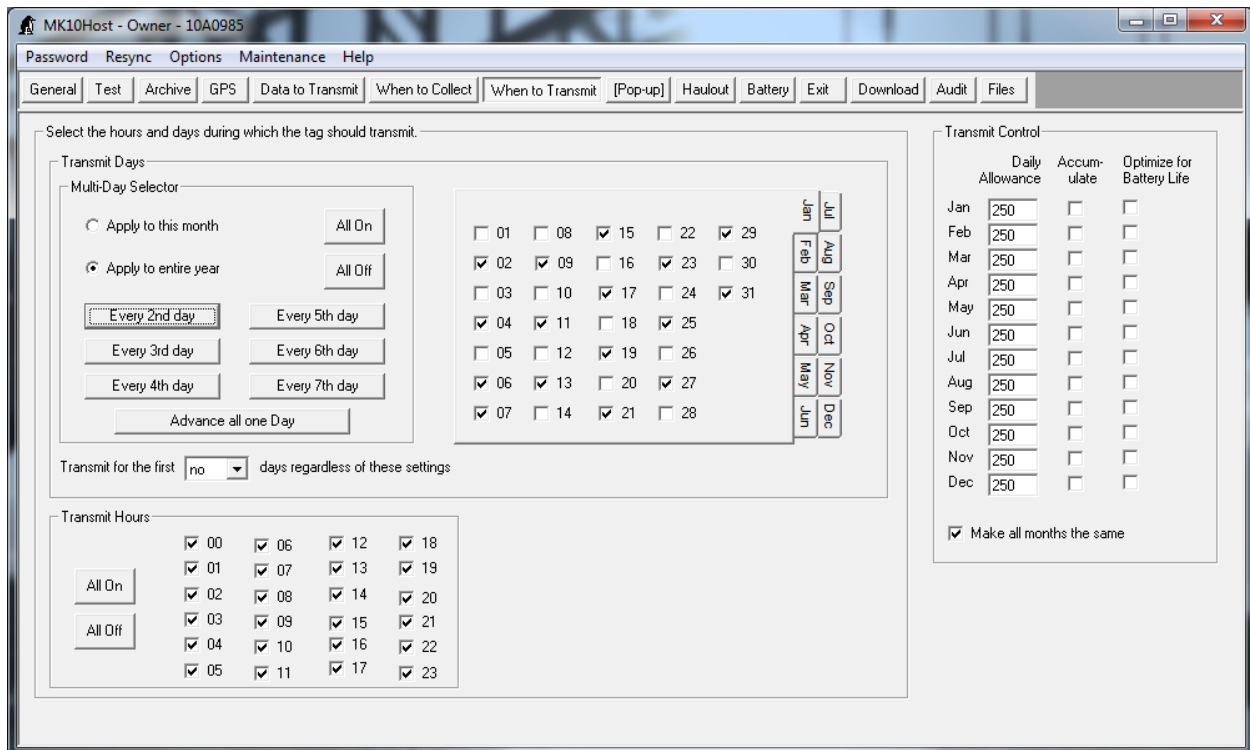


Figure 32—When to Transmit tab.

Use the controls in the *Transmit Days* and *Transmit Hours* to control the dates and times of transmissions.

You can ignore the specified transmit days and hours at the beginning of the deployment. This allows for intense telemetry effort to track an animal immediately following tag deployment. Adjust “*Transmit for the first...*” drop down to do this.

Use the *Transmit Control* to adjust the transmission schedule. The “*Daily Allowance*” field allows you to limit the number of transmissions per day on a month-by-month basis.



Only set the Daily Allowance for each month to “0” if you want to disable all Argos transmissions.

The “*Accumulate*” check boxes determine whether unused daily allowances of transmissions should roll-over to the next transmission day (checked), or whether just the specified allowance should be used each day (unchecked). Regardless of this state, the daily transmission allowance is accumulated at 00h (tag time) only on days that are checked in the *Transmit Days* frame. Additionally one day’s transmission allowance is allocated when the tag is deployed (assuming the deployment day is enabled, or the number of days to transmit regardless of other settings is not set to “no”).

The “*Optimize for Battery Life*” check boxes determine how the tag builds Argos Messages.

- If unchecked, the tag will attempt to pack as many different message types into a single Argos message as it can, using a complex packing scheme. This will result in Argos messages close to the maximum of 31 bytes long.

- If the “Optimize for Battery Life” boxes are checked, the tag will stop packing in additional message types once the Argos message is 15 bytes long. Longer messages are more efficient for retrieving data through the Argos system but discharge the battery faster.
 - These boxes should *only* be checked when your deployment is only going to generate comparatively little data, and you need the tag to continue to provide locations for as long as possible.

The control for the towed SPLASH10 tags is a little different:

The screenshot shows the 'When to Transmit' settings for a towed SPLASH10 tag. The 'Pre-Release Transmit Days' section includes a 'Multi-Day Selector' with options to 'Apply to this month' or 'Apply to entire year', and buttons for 'All On' and 'All Off'. Below these are buttons for 'Every 2nd day' through 'Every 7th day', and an 'Advance all one Day' button. A dropdown menu shows 'no' days regardless of these settings. The 'Pre- and Post-Release Transmit Hours' section has a grid of checkboxes for hours 00 through 23, with 'All On' and 'All Off' buttons. The 'Pre-Release Transmit Control' section on the right has a table for 'Daily Allowance', 'Accumulate', and 'Optimize for Battery Life' for each month from Jan to Dec. The 'Make all months the same' checkbox is unchecked.

	Daily Allowance	Accumulate	Optimize for Battery Life
Jan	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Feb	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Mar	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Apr	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
May	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Jun	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Jul	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Aug	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Sep	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Oct	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Nov	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dec	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Figure 33—When to Transmit towed SPLASH10 tags.

The *Pre-Release Transmit Days* setting and the *Pre-Release Transmit Control* are for *pre-release* only, only the *Transmit Hours* affect both the *pre- and post-release* phases. In *post-release* mode the tag will transmit every day as often as possible until the battery is expired, regardless of these settings.

This allows the towed SPLASH10 tag to be set up for “opportunistic transmissions” by setting the Daily Allowance to a small (non-zero) number, like 10 or 20, for the months you are interested in getting occasional messages through the Argos system.



Because the Transmit Hours controls both post-and pre-release, we recommend that these are set to All On.

Pop-Up Tab

Scheduled Release Setup

The towed SPLASH10 tag can be instructed to pop-up (or release from the study animal) either on a specific date:

MK10Host - Owner - 10A0985

Password Resync Options Maintenance Help

General Test Archive GPS Data to Transmit When to Collect When to Transmit Pop-up Haulout Battery Exit Download Audit Files

Scheduled Release Setup

☒ Release on specified date ☐ Release Specified days after tag is deployed or activated

April 2011

Sun	Mon	Tue	Wed	Thu	Fri	Sat
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
1	2	3	4	5	6	7

Hour: 12

Release on: 17-Apr-2011 at 12:00

Premature Release Setup

The Mk10-PAT tag thinks it has released prematurely or the fish has died if it stays at a constant depth (either the surface or the seafloor) for a long time. It will then corrode off its tether and start transmitting.

Hours permissible at a constant depth before MK10-PAT starts to corrode off its tether: 48

Minimum depth to start premature release detection: immediate

Mk10-PAT thinks it is at a constant depth even if depth varies within this range: 5m (+/- 2.5m)

Release even if there are a few outliers (4 for PRHours = 48): ☒

Must be at surface to be a premature release: ☐

When released and trying to transmit, ignore wet/dry sensor after 45 days: ☐

Start release when this percentage of the battery capacity has been used: Disabled

If Mk10-PAT releases prematurely: Initially transmit the Histogram and PDT messages collected immediately preceding the premature release event with doubled priority.

Number of days of messages to transmit with doubled priority: none

Figure 34—towed SPLASH10 tag pop-up menu.

Or after a specified number of days following deployment:

The screenshot shows the MK10Host software interface with the 'Pop-up' tab selected. The 'Scheduled Release Setup' section on the left has two radio buttons: 'Release on specified date' (selected) and 'Release Specified days after tag is deployed or activated'. Below these, a text box explains: 'Tag will release this many days after it is deployed or activated (by going wet or deep, or with a magnet)'. A dropdown menu shows '100'. Below that, an 'Hour' dropdown shows '12'. A summary box at the bottom says 'Release 100 days after deployment at 12:00'. The 'Premature Release Setup' section on the right contains several settings: 'Hours permissible at a constant depth before MK10-PAT starts to corrode off its tether' is set to '48'; 'Minimum depth to start premature release detection' is set to 'immediate'; 'MK10-PAT thinks it is at a constant depth even if depth varies within this range' is set to '5m (+/- 2.5m)'; 'Release even if there are a few outliers (4 for PRHours = 48)' is checked; 'Must be at surface to be a premature release' is unchecked; 'When released and trying to transmit, ignore wet/dry sensor after 45 days' is unchecked; 'Start release when this percentage of the battery capacity has been used' is set to 'Disabled'; and 'Number of days of messages to transmit with doubled priority' is set to 'none'. A note at the bottom states: 'If Mk10-PAT releases prematurely: Initially transmit the Histogram and PDT messages collected immediately preceding the premature release event with doubled priority.'

Figure 35—towed SPLASH10 tag pop-up information.

Premature Release Setup

If your SPLASH10 has a depth sensor, the tag can detect when it comes off the animal before the scheduled release. Tags without a depth sensor will not have premature release detection.

Having premature release set up appropriately is important for a successful deployment. A premature release is determined to have happened when the depth reading has not been variable enough. This indicates that the tagged animal is not moving in the water column (dead) or that the towed SPLASH10 has become detached from the animal. After premature release is detected, the towed SPLASH10 corrodes off its tether and starts to transmit immediately. The depth measurement for premature release detection is taken every minute (for detection periods up to, and including, 96 hours) and every two minutes (for detection periods over 96 hours). This happens regardless of the other settings on the tag.

The *hours permissible at a constant depth before towed SPLASH10 starts to corrode off its tether* field sets the sensitivity of the premature release. A short number of hours will cause a premature release to be detected sooner but may be subject to false detection.



If you do not wish to enable premature release detection, set the Hours permissible at a constant depth before towed SPLASH10 starts to corrode off its tether to forever

Use the *minimum depth to start premature release* detection control to disable premature release detection before the tag is deployed on a study animal. Be careful if you have a very shallow diving animal to make sure this threshold will be passed.



DO NOT press on the pressure sensors to test the release.

If the animal is dead and resting on the seafloor, then depth will continue to change due to tidal variation. Use the towed *SPLASH10* thinks it is at a constant depth even if depth varies within this range control to allow for this tidal variation and set it to a number larger than expected tides.

We recommend enabling the *release even if there are a few outliers*. This allows a few readings to be outside the prescribed range without stopping the premature release. This can be useful where a tag is washed up on a beach and is tumbling among rocks, and occasional waves cause high pressure readings. Do not enable this if you have an animal that stays at the surface constantly, with rare dives.

Depths deeper than a specified value can be treated as if the tag remained at this value using the *treat all depths deeper than this value as if they are this value* field. This can be useful where a study animal is known never to go deeper than some value, and that premature release detection should start detection immediately this threshold is passed. This will not cause an immediate release. It will still have to stay the specified hours, above, deeper than this value. However, variations in depth that might have postponed a premature release detection are effectively masked out.

Newer versions of Mk10Ware (v1.22 on) allow the user to initiate a premature release based on an internal calculation of the amount of battery power consumed. This is only relevant for experiments which include opportunistic transmissions, as otherwise no appreciable current is consumed by the tag during data sampling.

You may be interested in what took place immediately preceding a premature release detection, e.g., in a mortality study. The *number of days to transmit with doubled priority* allows you to specify this history window.

Haulout Tab

The tag can have different regimes when the animal is “hailed out.” This includes the transmission repetition rate and the creation of new histograms and Fast-GPS messages.

The parameters on this tab define when the tag switches to haul-out mode, whether Argos transmissions should be paused after a certain number of hours in haul-out mode, and whether informative Argos transmissions should be made on every 8th day of haul out (to indicate the tag is still functioning). Set the “Pause transmissions” parameter to “Never” to transmit for entire haul out.

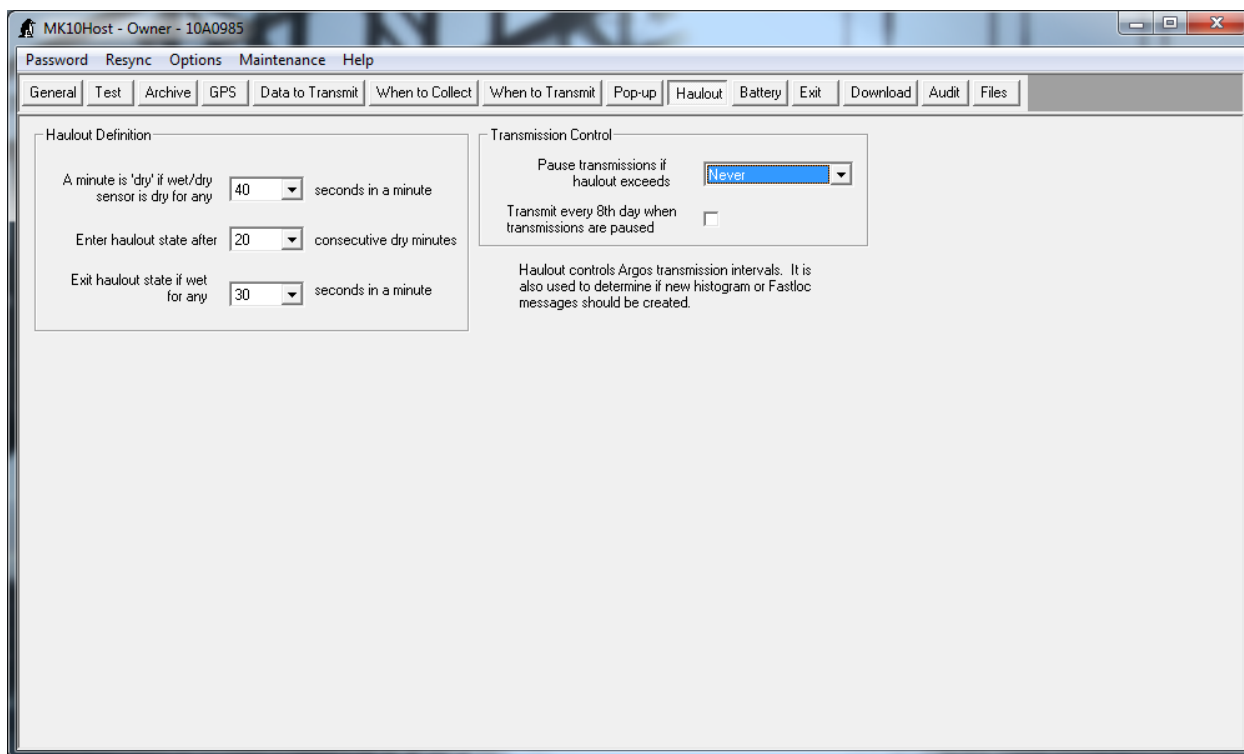


Figure 36—Haulout control tab.

Haul out will start when a predefined number of consecutive minutes pass in which the tag is sufficiently dry. “Sufficiently dry” is in turn defined as having enough dry readings, measured once per second, in a minute. These dry readings do not have to be consecutive. Haul out ends in a similar manner, when enough wet readings occur in a minute.

Battery Tab

The battery tab information is no longer current. Please contact [Wildlife Computers](#) for assistance in determining tag life for the various tag configurations and research conditions.

Exit Tab

You will always use this tab when disconnecting the tag. Future versions of the software may include warnings about parameters that are poorly set. *Absence of a warning does not necessarily indicate that the tag has been set up optimally!*

There are three options for Deployment Modes: Shut Down, Standby, and Deploy.

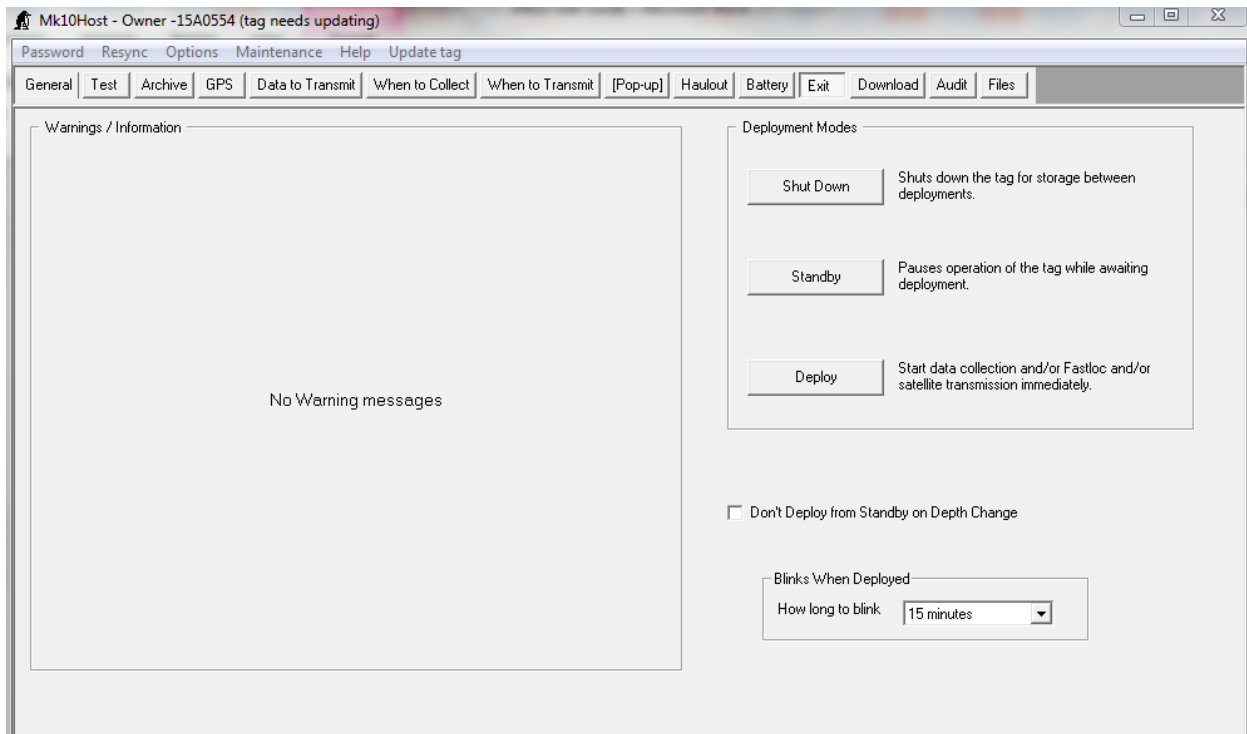


Figure 37—Exit tab.

Shut Down Mode

Use this mode for storage between deployments. You must re-establish communications to deploy the tag or put it into Standby mode. The clock is maintained. The data in memory are maintained. Depending on whether you have changed any parameters during your Host session with the tag, you will see one or the other of these messages.

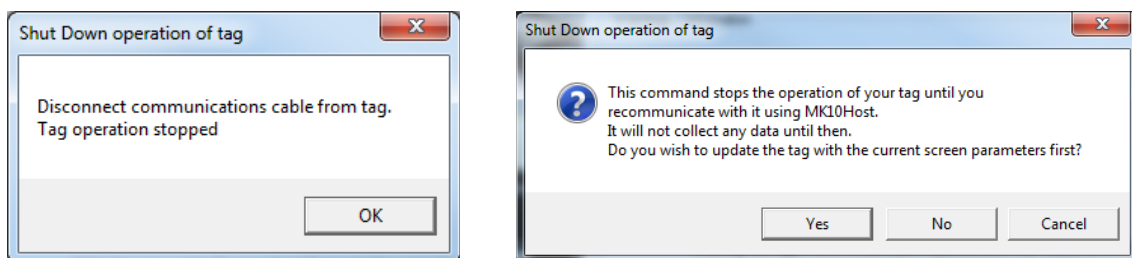


Figure 38—Shutdown Mode warning screen.

Standby Mode

In this mode the tag is not entirely “turned off,” but monitors for a signal to activate it into Deployed mode. The signals are described below. Depending on whether you have changed any parameters during your Host session with the tag, you will see one or the other of these messages.

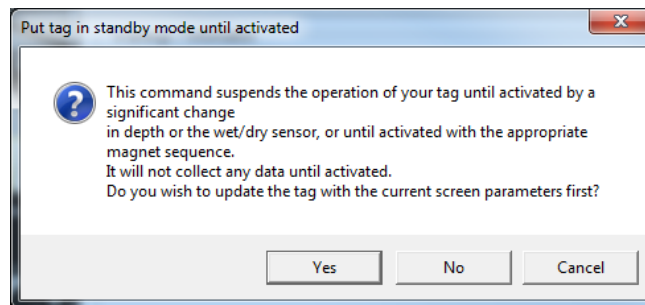


Figure 39—Standby Mode information screen.

If you have any previously collected data in memory, you will receive the following prompt:

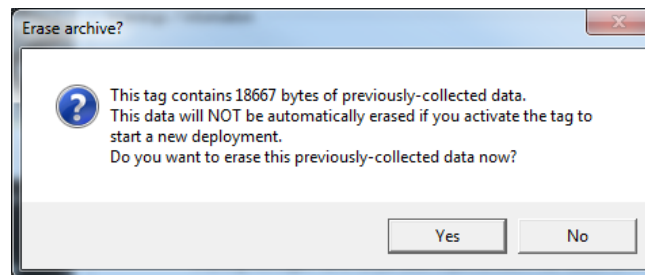


Figure 40—prompt to overwrite previous data.

If you do not erase previously-collected data, the new data will be appended. The new data will be marked as a new deployment.

Finally, you will receive this confirmation:

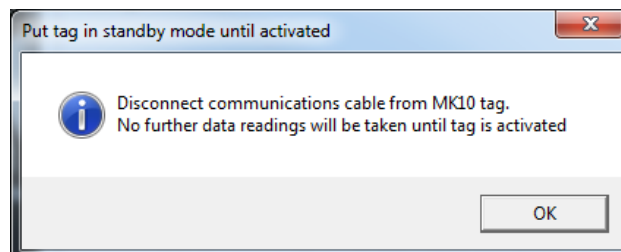


Figure 41—confirmation of disconnecting tag.

An abbreviated report file and a set-up file will be automatically created. They have file names of serialnumber.date.htm and serialnumber.date.wch respectively. These files can be found in the default location of My Documents\My Tags directory. The file locations can be changed on the [Files tab](#).

Activating the Tag from Standby Mode

From Standby Mode, the tag can be activated into deploy mode without re-establishing communications. There are three ways to do this:

- Applying a magnet in a specific way:
 - Pass a magnet near the communications port. Two blinks and a pause repeated three times means the tag is in Standby mode.
 - If you pass a magnet over the same location during the long LED flash, the tag will go into Deploy mode. The LED will rapidly blink 10 times, followed by one long flash. It will then glow dimly until the next full minute, indicating it is deployed.
 - If you do not time the magnet passes correctly, the tag remains in Standby mode.
- Depth sensor reads a 20m change in depth:
 - If you use high-power VHF radios near a tag with a depth sensor, it can generate depth spikes which may cause the tag to deploy. You can choose the "Don't Deploy from Standby on Depth Change" option to avoid this situation.
- Wet/dry sensor senses a pre-set minimum change in conductivity.

Deployed Mode

The tag initializes and immediately begins to sample. *This mode automatically updates the tag (if parameters have changed) and erases memory.* A report file and a set-up file will also be automatically created. They have file names of serialnumber.date.htm and serialnumber.date.wch respectively. These files can be found in the default location of My Documents\My Tags directory. The file locations can be changed on the [Files tab](#).



Figure 42—deployment confirmation.



WARNING: You should never disconnect a tag from a USB communications cable, Cable Comm, or Blue Box without clicking on either the Deploy, Standby or Shut Down buttons. Doing so may leave your tag in a mode that will rapidly deplete its internal battery.

Do not Deploy from Standby on Depth Change

Checking this box prevents a depth change from triggering deployment. A change in the wet/dry sensor readings or magnet swipe will still activate the tag.

Blinks When Deployed

Once deployed, the tag begins data collection and flashes whenever it wakes up to take a sample. How long the blinks run for is customizable. Selections are in increments of 10 minutes, from never up to 3 days. Once the tag reaches depth, the LED will stop flashing after 31 hours regardless of the set blink duration.

Download Tab

There are two ways you can examine your collected data.

1. Use the built-in data viewer (only recommended for small data sets, such as for verification of the sensors).
2. Download the collected data to a file and use other utilities (such as Wildlife Computers Data Portal or legacy WC-DAP) to decode/view the data for analysis.

Viewing the Data

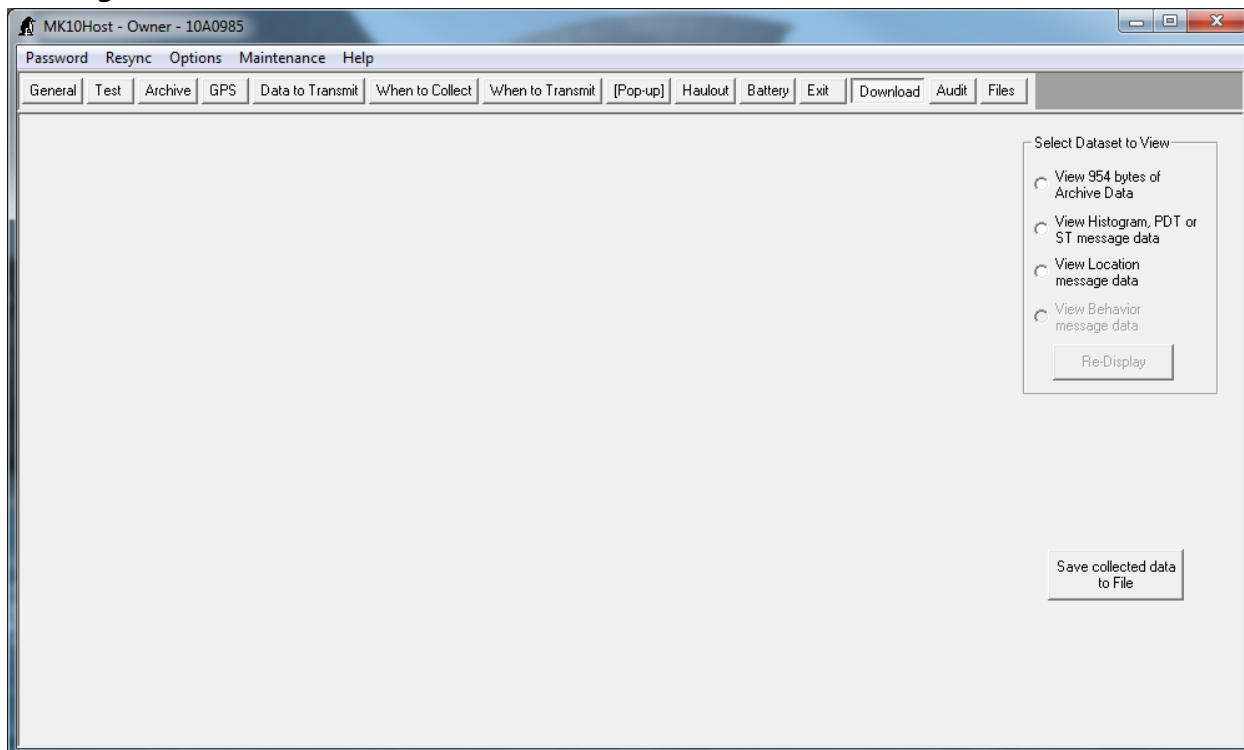


Figure 43—viewing your data.

To view at least some of your data, click on the radio button in the *Select Dataset to View* frame. If you have more than 50,000 bytes of data in your archive, you will be limited to viewing only those initial data.

Viewing Archive data will generate a view that looks like this:

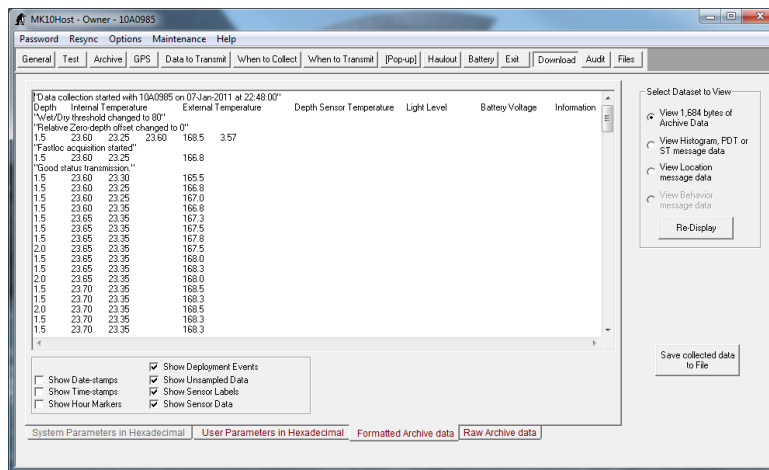


Figure 44—viewing archive data.

You can change the fields displayed using the checkboxes. The column separator can be changed in the Options menu. You can cut-and-paste data from the data display textbox into Excel, or other programs. If you press Ctrl-A after clicking somewhere inside the data display textbox, all data are copied to the clipboard (even data that were not displayed due to constraints of the textbox control).

You may also view Histogram, PDT, Location or Behavior records in a similar manner.

Download the Data

Use the **Save collected data to File** button to Download your data. This will save the data in our standard .wch format. The data can then be imported into Wildlife Computers Data Portal to be viewed graphically in (or alternatively viewable in legacy WC-DAP).

Audit Tab

This shows the history of commands and responses that occurred during communications.

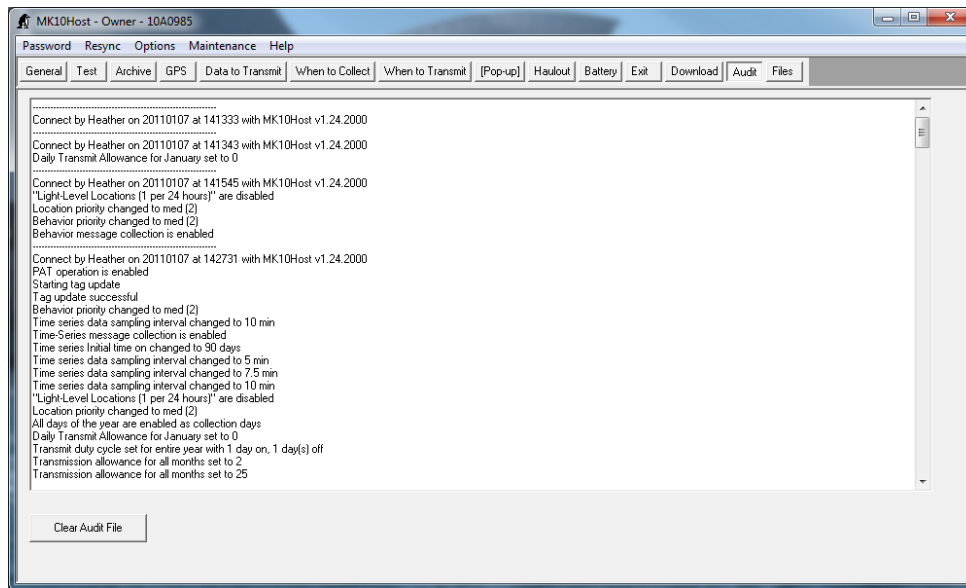


Figure 45—Audit tab.

New information is appended. This can be a useful diagnostic tool when trying to figure out how or when a parameter was changed.

Files Tab

This tab allows you to see (and change) the default location to which Mk10Host saves data. **Half of the options shown will not affect the tag** and are only used during initial testing by Wildlife Computers.

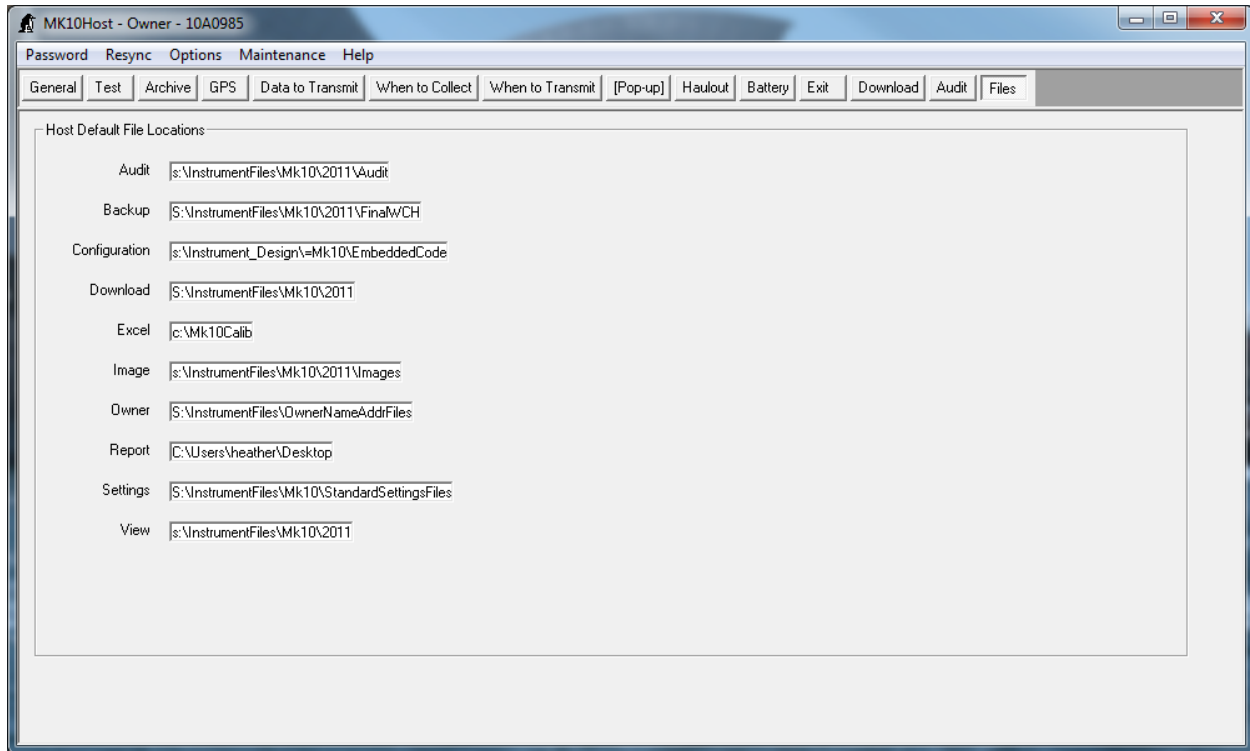


Figure 46—File tab.

The files affected by these settings that are pertinent to your use of Mk10Host are:

Audit	Audit files. Naming convention is <i>AuditOfxxAxxxx.tag</i>
Backup	Automatically generated set-up files when you Standby or Deploy a tag. Naming convention is <i>xxAxxxx.dd-mmm-yyyy.wch</i>
Configuration	Manually generated set-up files from the <i>General</i> tab. Naming convention is <i>xxAxxxxconfig.wch</i>
Download	Downloaded data files. Naming convention is <i>xxAxxxx.wch</i>
Report	Manually and automatically created report files. The name convention is <i>xxAxxxx.htm</i> for manually created reports, <i>xxAxxxx.dd-mmm-yyyy.htm</i> for automatic (where <i>xxAxxxx</i> is serial number, and <i>dd-mmm-yyyy</i> is today's date).

To change the default folder, click on its name and the following dialog will appear. Browse to choose the desired location.

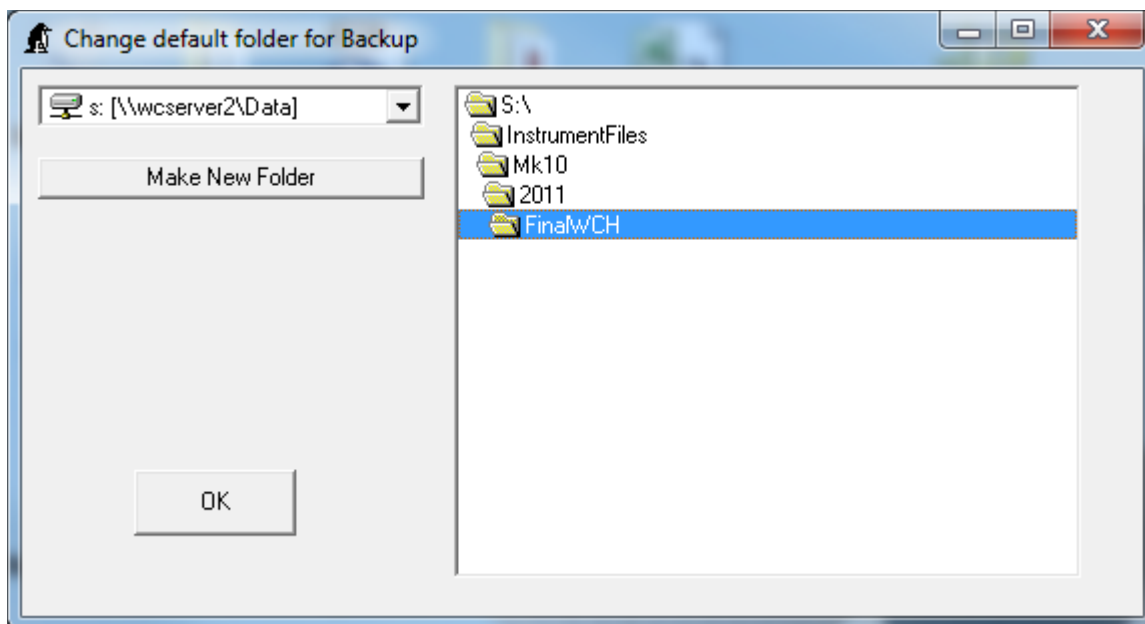


Figure 47—changing the default folder.

Menu Items

Password

You may change your password anytime you are logged on as a user, by selecting the *Password* menu item at top left of the Host screen. Acceptable passwords include entries up to 7 characters. If you forget your password, you will have to return the tag to Wildlife Computers so we can reset it. Passwords are not case sensitive. The default password is *mk10*.

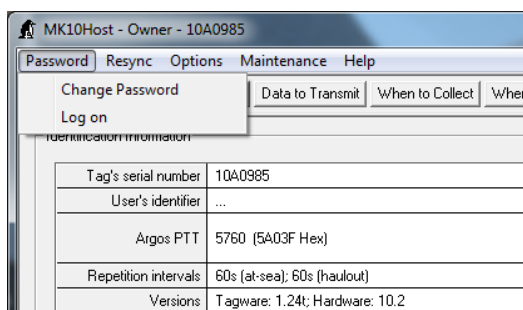


Figure 47—changing a password.

Resync

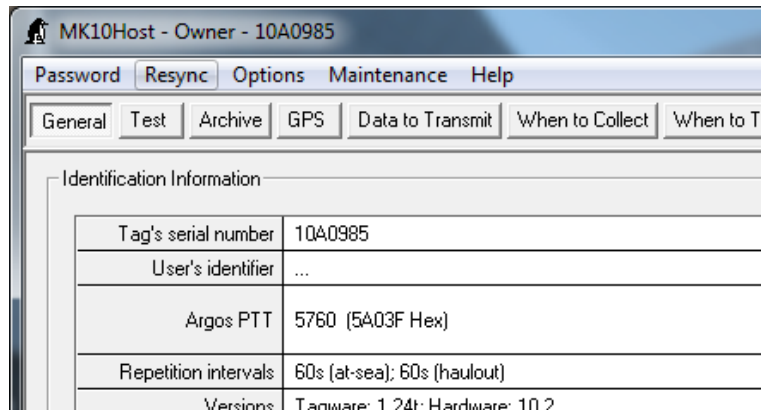


Figure 48—resyncing with the Host program.

On occasion, your tag may get out of sync with the Host program. You will get a message warning you about this. Clicking on the *ReSync* menu item should resynchronize communications. When you have successfully re-synchronized your tag, you will get the following notice.

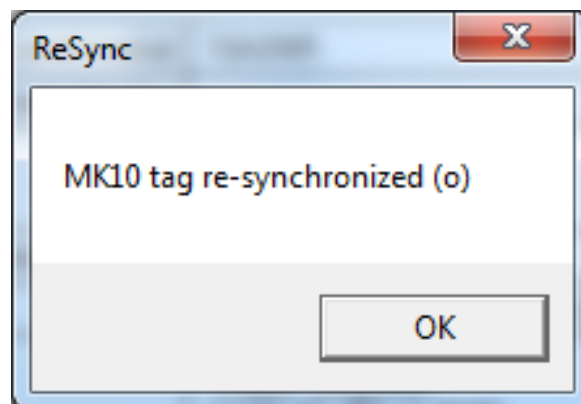


Figure 49—resyncing confirmation screen.

Options—List Separator

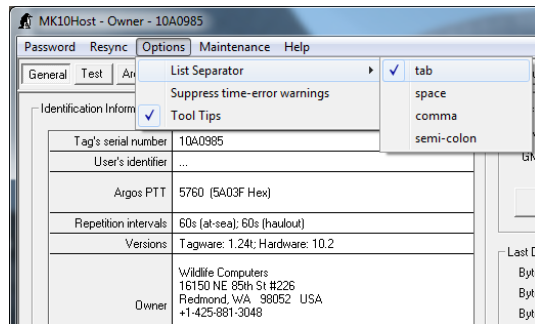


Figure 50—choosing the preferred separator.

You may choose your preferred separator for displaying viewed data on the Download tab.

Options—Suppress Time-Error Warnings

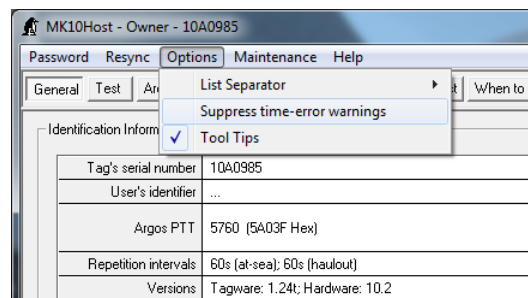


Figure 51—suppressing clock failure message.

If you have a tag whose clock has failed, you may be plagued with error messages warning you that the clock is not advancing correctly. Clicking this menu item will suppress these messages so you can continue to work with the tag.

Options—Allow Updates to Modify Source .wch File

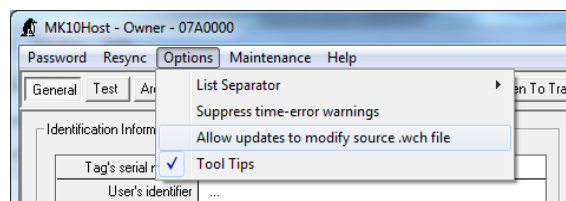


Figure 52—suppressing clock failure message.

This menu item only appears if you are connected to a file rather than a real tag. Normally you are prevented from modifying the .wch file to which you are connected to protect the integrity of the data in that file. Checking this menu item overrides this restriction. **Use it with extreme caution.**

Maintenance—Update Host

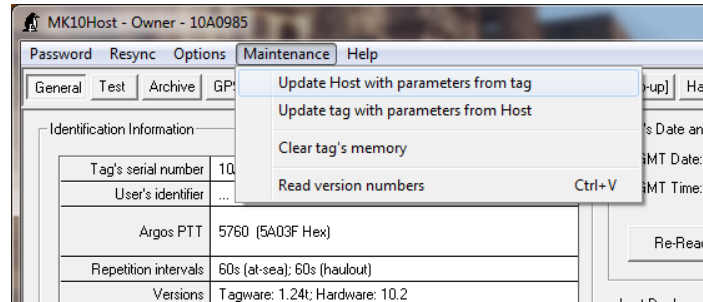


Figure 53—re-downloading tag parameters.

This provides a route for re-downloading parameters from the tag to the PC. Use this if you make mistakes while setting your parameters and want to start over.

Maintenance—Update Tag

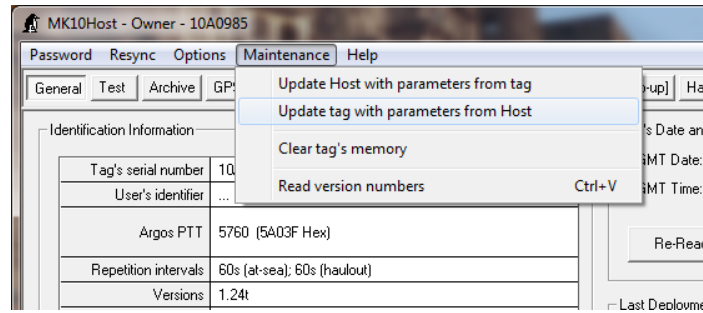


Figure 54—forcing tag updates.

This provides a manual route for forcing an immediate update of the tag with any changed parameters on your PC.

Maintenance—Clear Tag's Memory

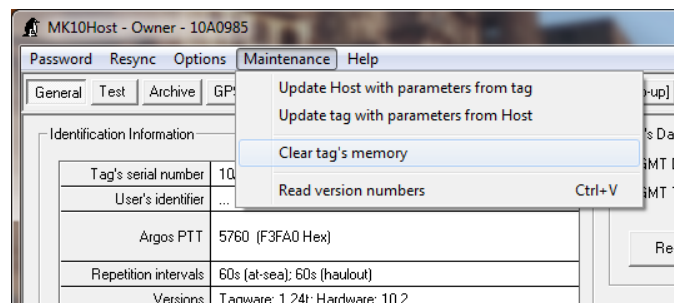


Figure 55—clearing the memory.

This menu item may be used to clear collected data from a tag. It is not necessary to do this, as data is automatically erased when a tag is re-deployed and you are prompted to erase when putting a tag into Standby mode.

Maintenance—Read Version Numbers

This allows you to view all the version number information for the tag and Mk10H.

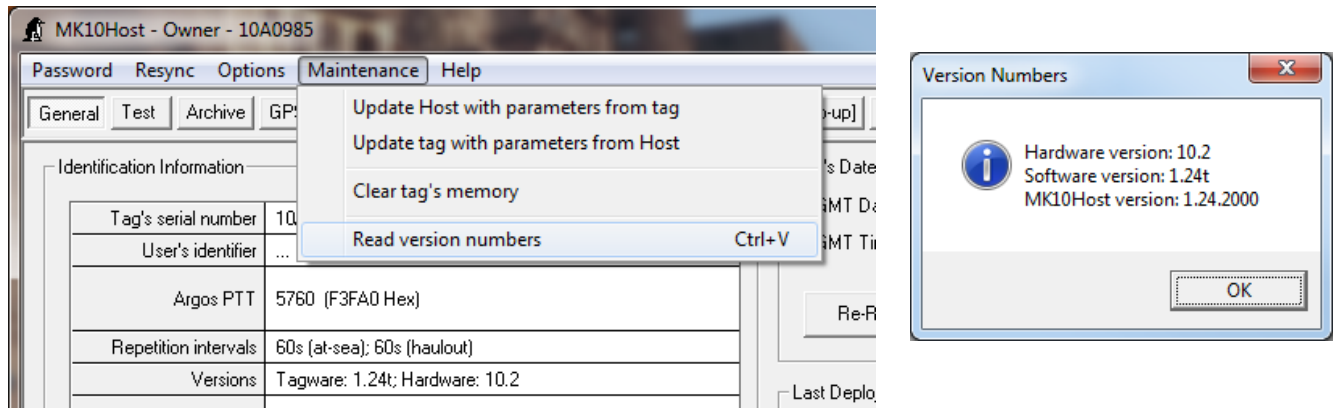


Figure 56—viewing the hardware and software version numbers.

Help

The Help item will display the following Host version and contact information:

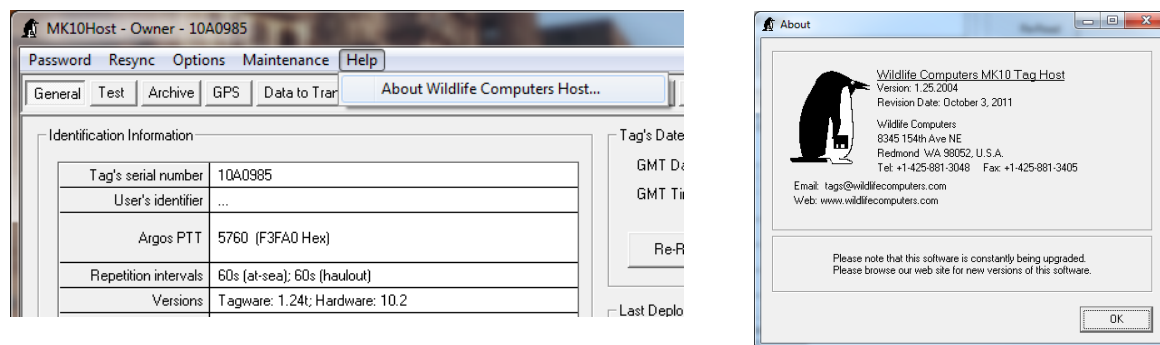


Figure 57—viewing the Host version and contact information.

Deployment

Setting up Communications

Follow the instructions in the detailed description of the Mk10Host program.

Setting Up the Tag

Follow the instructions in the detailed description of the Mk10Host program.

Changing Modes with a Magnet

Pass a magnet once across the tag near the communications port. The LED will flash in a sequence that displays the mode of the tag:

- Shut Down mode LED pattern: The LED will remain off. The tag will not respond to a magnet.
- Standby mode LED pattern: *2 blinks, a 1 second pause, 2 blinks, a 1 second pause, and 2 more blinks* (You may not see all three sets, as this occurs quite rapidly.)
- Deployed mode LED pattern: *10 blinks*

Once the Standby or Deployed mode has been displayed, the LED will pause for another second and then stay on for 2 seconds.

- If you keep the magnet away from the tag during the 2 seconds that the LED is on, the tag will stay in its current mode.
- If you pass a magnet across the board during the 2 seconds that the LED is on, you will toggle the mode between Standby and Deploy. The mode identification blink sequence of the new mode will be displayed.

In summary, a single pass of the magnet over the tag displays the mode of the tag. It takes two specifically timed passes of the magnet to change the mode.

Verifying Function Prior to Deployment

You should always confirm the tag is sampling before deployment. Pass a magnet once across the tag near the communications port. The LED will flash, showing its current state, as described above. After the next minute has rolled-over, the tag begins data collection and flashes whenever it wakes up to take a sample. How long the LED flashes is user customizable. Selections are in increments of 10 minutes, from never up to 3 days. Once the tag reaches depth, the LED will stop flashing after 31 hours regardless of the set blink duration.



DO NOT press on the pressure sensors to test.

Sealing the 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.

Additional Deployment Information

Wildlife Computers recommends that all tags initially be set up in the lab when there is plenty of time and conditions are at their best. Once the tags are set up, they can be placed in Standby until ready to use. Just prior to deployment, the user can deploy them using a magnet.



Be sure that all previous data are erased prior to redeploying if you want the entire memory available for data collection.

Alternatively, since tag batteries have plenty of capacity, if the tags will be deployed within a month, they can be set up and deployed at the same time. The user should then use a magnet to verify the tag is sampling before deploying it on the study animal or gear.



WARNING: If you are programming towed SPLASH10 tags, and have set the tags with premature release parameters, it is STRONGLY recommended to leave the tags in Standby mode and not in Deploy mode to prevent accidental premature release detection, which may burn the corrodible pin and/or start transmissions, which will drain the battery.

Data Recovery

Basic Recovery Information

If the tag has been out for a long deployment (months to years), 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 tag fail, your deployment data are still in memory, and can be retrieved by Wildlife Computers.

Preparation for Post-Deployment Communication

When you recover your tag 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 tag with a paper towel.
 2. Remove the 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 that communicating with a tag which has saltwater in the communications port will cause the pins to corrode extremely 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. Send the tag 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 tag back to Wildlife Computers for downloading.

6. If all four pins look clean and golden, you can continue and attempt to establish communications.
7. You may wish to spray some contact cleaner into the communications port as a precaution.

Download Your Data

Follow the instructions in the detailed description of the Mk10Host program.



It is important to save the collected deployment data in the .wch format. This is the only format that can be processed by Wildlife Computers analysis programs.

Put your tag into Shut Down or Standby mode after downloading the data.

Tag Storage and Battery Maintenance

Proper tag storage is important to minimize passivation and keep the batteries charged. When stored correctly, the amount of battery life lost per year is only 1-2 percent. Battery passivation may cause low voltage readings, and in extreme cases, may compromise the battery. For this reason, batteries must be properly stored and then exercised monthly.

As a standard, SPLASH10 tags ship in “Standby” mode for immediate deployment, unless otherwise specified.

If your tag has a [battery isolator screw](#), place the screw before storing your tags.



****Care must be taken with tags containing 1 AA battery only to avoid battery passivation. [Read the Addendum page of this User Guide for Special Storage and Testing Guidelines.](#)***

SPLASH10 Storage—Less Than One Month

If your deployment date will be less than one month, simply store the tags in “Standby” 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.

SPLASH10 Storage—Longer Than One Month

If you are storing SPLASH10 tags longer than one-month, place your tag in “Shut Down” mode using Mk10Host. Then exercise the batteries at least 3 months* prior to deployment by sending Test Transmissions (via Test Tab in Mk10 Host) to confirm the Battery Voltage is 3.3-3.7V. 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.

Testing After Storage

Tags should be tested after storage, prior to deployment. It is not necessary to warm up the tag prior to proceeding with the test.

- Tags with one AA battery should undergo the Argos Transmitter Test **every month**. [Read the Addendum page of this User Guide for Special Storage and Testing Guidelines.](#)
- Tags with all other battery configurations should undergo the Argos Transmitter Test at least 3 months prior to deployment.

Establish communications with the tag. If the tag has an Argos transmitter, test the Argos transmitter, and check the battery voltage reported. It should read 3.3V or greater. The battery voltage may be a little low initially but should increase after testing the transmitter several times. If the tag has a Fast-GPS module, initiate a [Fast-GPS test](#). Then test the sensors to read the battery voltage while the Fast-GPS processing is taking place. Again, the battery voltage should stay above 3.3V throughout the test. Repeat, as necessary.

The SPLASH10-F includes the Wildlife Computers Cricket Argos transmitter plus the Fastloc® fast-acquisition GPS module. In addition to the standard archival functions, the SPLASH10-F takes snapshots of the GPS constellation. These GPS snapshots, along with summarized depth and temperature data, can be transmitted to the Argos satellite system.

Sending Test Transmissions

Tips to Optimize Transmitting Tests

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 touch the antenna to anything.
- **SPLASH10-312 tags should be held ~15cm above the desk for this test.** Think of the desk as the surface of the water. You should hold the tag in a way that imitates the height of the instrument when the animal comes out of the water. For [finmount](#) applications, tags should be held higher (~15-30cm above the desk).

It is not necessary to warm up the tag prior to proceeding with the test.

Establish communications with the tag. Click the button. Click on the left side of the screen to view the sensor channel readings are within normal range.

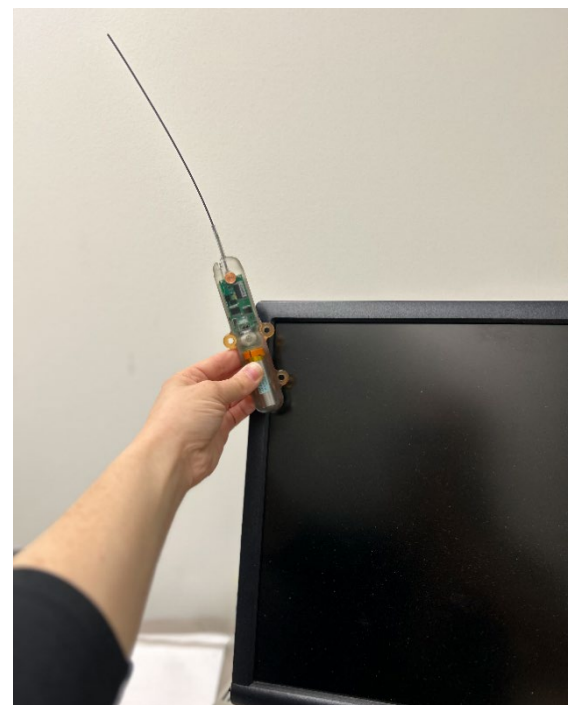


Figure 58—example of SPLASH10-312 finmount orientation for Test Transmission test.

Argos Transmitter Test

Immediate Test of Argos Transmitter

Click **Transmit** and the battery voltage and current drawn from the battery are reported. It should read 3.3V or greater. Repeat two more times (three times total).

If the output values of three consecutive test transmissions are all within the expected range, and all sensors on the main sensor screen are within the normal range, the tag is ready to continue storing or it is ready to deploy.

- To continue storing; Disconnect the tag in "Shut Down" mode.
- To prepare for deployment (<1 month); Disconnect the tag in "Standby" mode.

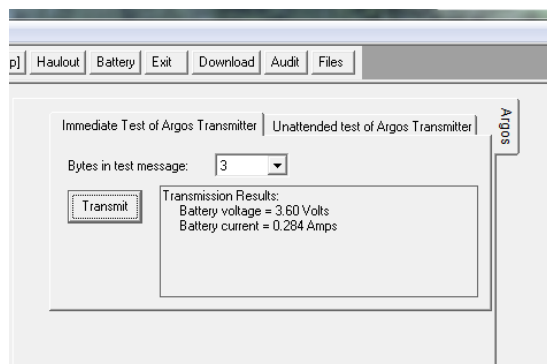


Figure 59-Argos test transmitter.

If the battery voltage is under 3.3V, you will need to perform an [Unattended Test](#).

Unattended Test of Argos Transmitter

If a tag shows a low voltage reading after sending a Test Transmission, run the Unattended Test in Mk10 Host. [Refer to the Tips to Optimize Transmitting Tests](#).

In the main **Test** section, on the far right select the "Unattended Test of Argos Transmitter" tab.

- Set First Transmission at "0 sec"
- Set interval between transmissions to "60 sec"
- Set Total transmissions in test to "250"
- Set Auto-increment first transmission by "2 sec"

When testing multiple tags concurrently, **it is important that tags do not transmit simultaneously**.

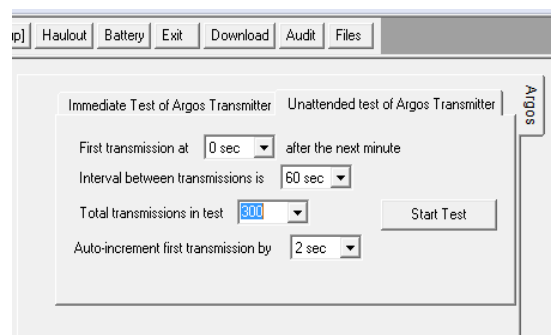


Figure 60-Unattended Argos test.

Offset the First Transmission at" for every tag by 2 seconds to prevent tags from transmitting simultaneously. Simultaneous or competing transmissions could result in corrupt transmissions or failed transmissions. The "Auto-increment first transmission by" field causes subsequent tags within the Mk10Host session to have their "First transmission at" field automatically incremented to stop the tag"s transmissions from being simultaneous.

After performing the unattended test, check the tag"s battery voltage.

If the voltage remains below 3.3V, perform a **second** Unattended Test of Argos Transmitter for an additional 250 transmissions. After the conclusion of the second test, check the tag"s battery voltage.

If the voltage remains below 3.3V after you've put a total of 500 transmissions on the tag, contact Wildlife Computers at tags@wildlifecomputers.com

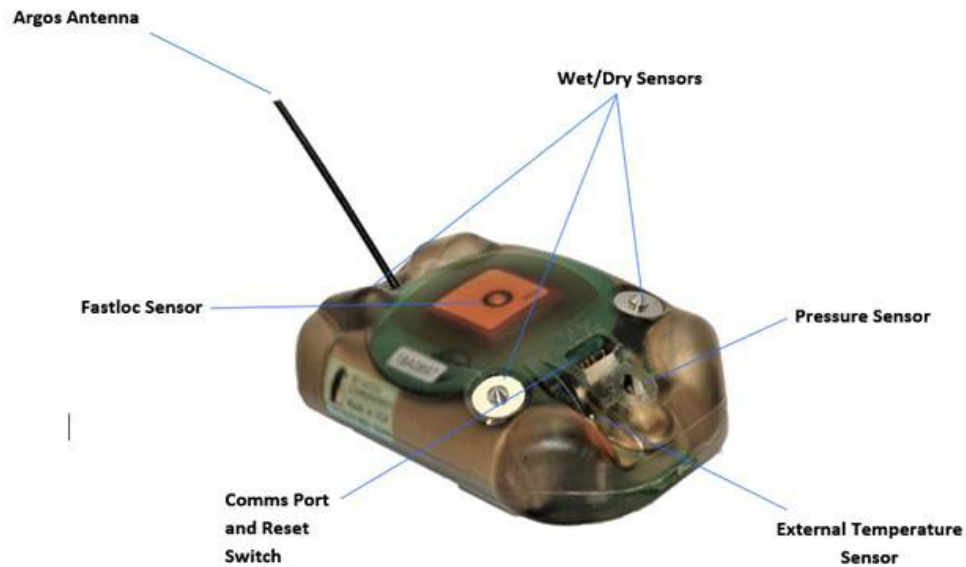


Figure 61—SPLASH10 sensors.

Notes:

- Do not put anything over any of the sensors or the GPS antenna
- Ensure the wet/dry sensors are free of oils and epoxy
- Place magnet on the side of the tag by the communications port to trigger the reset switch
- LED is best visible from the side of the tag

RD1800 Release Device for towed SPLASH10

Wildlife Computers has developed a mechanical release device, called the RD1800, which prevents the towed SPLASH10 from being towed to depths that could crush it. The RD1800 acts as a guillotine, severing an internal shear pin when it is exposed to a depth of 1800-2000 meters. At these depths, water pressure overcomes an internal support within the RD1800, the center section of the RD1800 snaps down and cuts the pin, separating the RD1800. This releases the towed SPLASH10 so that it can float to the surface. The Premature Release feature eventually recognizes a “constant depth” situation and initiates transmission.

RD1800 Installation Instructions

The RD1800 release devices are supplied pre-assembled, but not connected to the SPLASH10 tags.

This device has been designed to work with both monofilament and stainless-steel leadering materials. We recommend:

- .046-inch stainless steel cable so that it can be pulled tightly around the RD1800 thimbles.
- Monofilament should be no greater than .070 inches in diameter so that it will fit through the holes in the RD1800. This includes some 300 lb. test monofilament, depending on the manufacturer.

When adding a leader to your tags, it is important to be sure to pull whichever leader material you use tight around all three thimbles, one on the tag and two on the RD1800, prior to crimping the crimps.

Figure 61—stainless steel cable.



Figure 62—monofilament leader.



TDR10-X Tags

TDR10-X tags are Wildlife Computers accelerometer datalogging tags. In addition to the 3-axis accelerometer, these tags may contain 3-axis magnetometers, depth, temperature, velocity, wet/dry, battery voltage and light-level sensors.

TDR10-X tags consist of a 3-axis accelerometer with optional depth sensing and temperature and light-level sensors. As these tags do not contain a magnetometer they are activated via a magnet.

Battery/Memory Capacity

TDR10-X configuration tags are based on the Mk10 platform employing a 1 gigabyte memory chip used to store the sensor values. These tags are typically powered by a single 2.1Ah AA battery. The following details typical battery life and memory fill times which vary with sample rate.

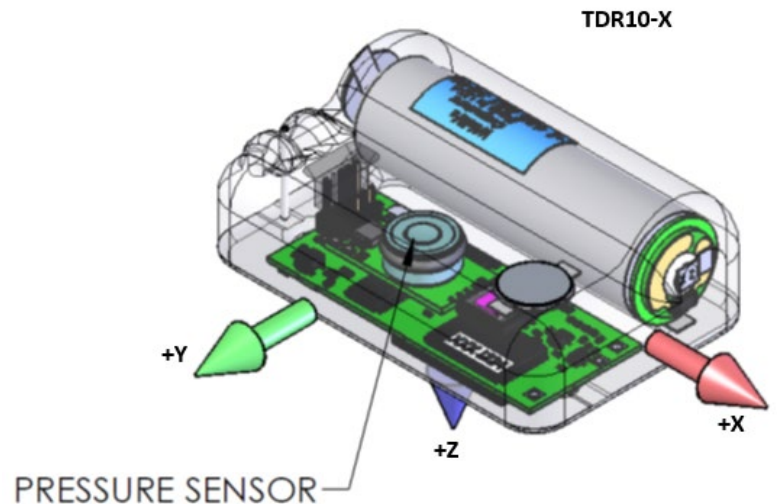


Figure 63—TDR10-X 3-axis configuration.

Case 1

Accelerometer @ 32 Hz
Depth, Temperature, light-level @ 1 Hz
Memory Fill = 79 days
Battery Life = 9 days.

Case 2

Accelerometer @ 16 Hz
Depth, Temperature, light-level @ 1 Hz
Memory Fill = 154 days
Battery Life = 17 days.

Case 3

Accelerometer @ 8 Hz
Depth, Temperature, light-level @ 1 Hz
Memory Fill = 297 days
Battery Life = 32 days

Data in Detail

Some versions of transmitting tags can send Time Series depth and/or temperature data through Argos. This feature is designed to provide low-frequency reporting of sensor data for instruments which may never be recovered.

MK10Host - Owner - 10A1076

Password Resync Options Maintenance Help

General Test Archive [GPS] Data to Transmit [When to Collect] [When To Transmit] Pop-up [Haulout] Battery Exit Download Audit Files

Histogram and Behavior Data Sampling Interval 30 sec

Greyed-out parameters are not available for MK10-PAT tags

Message Type	# Bins	Upper (deeper/longer/hotter) Limits of Bins													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Dive Maximum Depth (m)	off														
Dive Duration (min sec)	off														
Time-at-Temperature (C)	14	-2	0	3	6	9	12	15	18	21	24	27	30	33	>33
Time-at-Depth (m)	14	0	2	10	20	50	100	150	200	300	400	500	600	700	>700

Histogram Collection

Hours of data summarized in each histogram 6

Histograms start at GMT 0

☐ Suspend generating new Histogram-style messages while a tag is continuously dry

Dive Definition

Ignore Dives shallower than 2m

Ignore Dives shorter than 14368min

Dive's duration is determined from the first wet reading to the last wet reading

Change Dive Definition

Standard messages Time-Series (TS) Stomach Temperature (ST)

☒ Enable Time-Series message generation

Channels to report

Depth ☒

External Temperature ☒

Duty-Cycling

Initially on for 90 days

Then start duty cycling:

off for 1 day

and on for 1 day

Time series data interval 10 min

These settings will generate:

12 Argos messages per day for the first 90

and an average of 6.0 Argos messages per day thereafter

Transmission Control

In pre-release, transmit data from these last days

Histogram & ST transmission priority

☐ low ☐ med ☐ high

Location transmission priority

☐ low ☐ med ☐ high

Behavior & TS transmission priority

☐ low ☒ med ☐ high

Total transmits until popoff = 1260

If you collect more than 1250 messages, you are unlikely to receive them all through Argos

Figure 64—TDR10-X 3-axis configuration.

You can choose from one of five Time Series sample rates. A single point sample is taken at the chosen sample rate, for example every 5 minutes. The sample rate determines the number of messages generated per day. The Min/Max values for the message period are determined and used to set the range of values. This range is divided into 16 bins to which each sample point is fitted.

48 summarized samples will fit into 1 Argos message. *This Time Series sample rate is completely independent of and unrelated to the archive sample rate.*

Sample Rate (minutes)	Argos Messages Per Day		Message Period (hours)
	Depth or Temp (1 channel)	Depth & Temp (2 channels)	
1 ¼	24	48	1
2 ½	12	24	2
5	6	12	4
7 ½	4	8	6
10	3	6	8

Figure 65—Time Series sample rates.

For example, 12 Time Series messages per day are created if both depth and temperature data are sampled every 5 minutes; six messages per day would be transmitted if temperature were omitted. Messages are transmitted in sequential order to maximize the probability of receiving continuous runs of data.

Selecting a short (75-second) Time Series Sampling Interval rapidly generates a need for lots of messages. This might be acceptable for a short deployment. However if too many messages are generated too quickly, the tag will be unable to transmit all of them. The result will be random gaps of time during the deployment for which there is no Time Series data. Selecting a longer Sampling Interval so that fewer than 1250 messages are needed to transmit the Time Series will improve the odds that there will be no gaps in your Time Series data set. However, the temporal resolution of each datum will be reduced. Different study objectives will warrant different trade-offs between coverage and temporal resolution.

Each Time Series message contains:

- 48 instantaneous points sampled at the specified sample rate for that message period.
- The minimum and maximum values encountered during the message period for the channel are determined from all archived values in that message period.



The absolute Min/Max values and point sample values may not match as the Min/Max value is determined from all archived data during the message period.

Three duty cycling parameters are available to control the Time Series data generation as shown below:

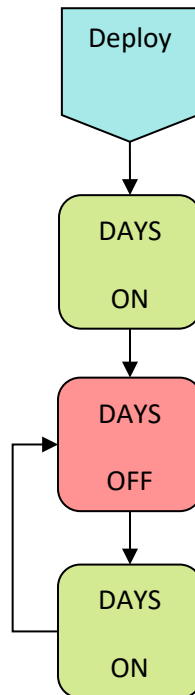


Figure 66—duty-cycling parameters.

Duty cycling is by days, each day is defined as the passage of 00:00 on the instrument clock. The instrument supports Time Series generation being turned **ON** for zero or more days immediately after deploying, **OFF** for zero or more days, followed by **ON** for zero or more days. The instrument can be set to sample for only a predetermined time after deploying (and never again) by setting the topmost **ON** block to the desired value and setting the two lower blocks to zero. Alternatively, the instrument can be set to sample during the entire deployment by setting the topmost **ON** block to any value, the **OFF** block to NEVER, and the bottom **ON** block to a value such as 10.



The duty-cycle settings are for Time Series Data message creation only and do not affect the tags archive sample rates or Argos transmission settings.

Tag Modes

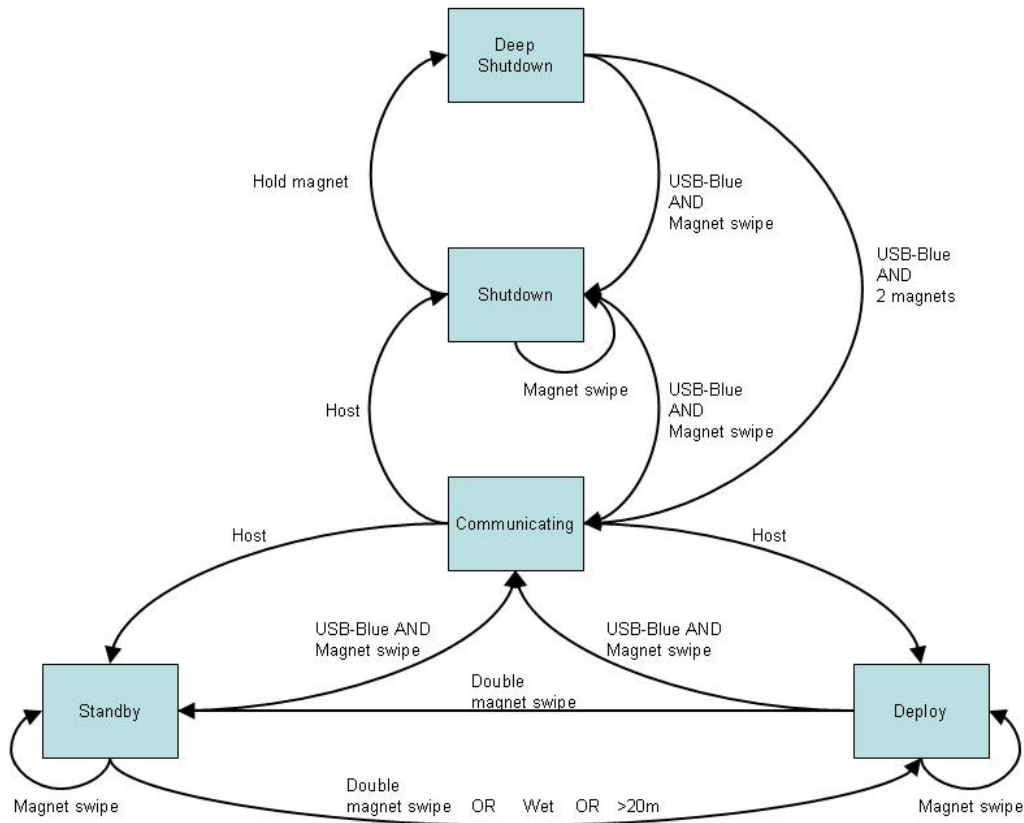


Figure 67—SPLASH10 tag modes.

Disconnected Batteries and Dangerous Goods

Summary

To comply with lithium battery shipping regulations, certain Wildlife Computers tags include a battery isolator screw. Tags with the isolator can be transported with their power cells disconnected. It is critical that you communicate with these tags and connect the batteries before deployment.

A tag with disconnected batteries can only be put into Shut Down mode. This prevents accidental deployment of the tag without first connecting the batteries.

Connecting to a Tag for the First Time

When you connect to a tag that has disconnected batteries, host will prompt you to place the screw that connects the batteries. By clicking “OK” you acknowledge that the screw is placed. The tag can now be placed in Standby or Deploy mode.

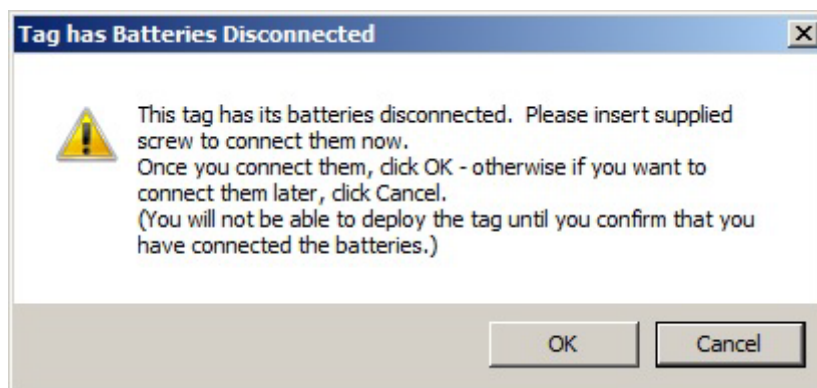


Figure 68—connecting to tags for the first time.

You may also choose to cancel at this point and leave the batteries disconnected (with the screw unplaced). This allows you to change the tag settings but you will only be able to put the tag into deep kill. You might want to do this if you were setting up tags and then shipping them to your field site.

The next time you connect to the tag to the host program, you will be prompted with this message again.

General Tab

The general tab will display the status of the batteries. A red warning will indicate the batteries are not connected.

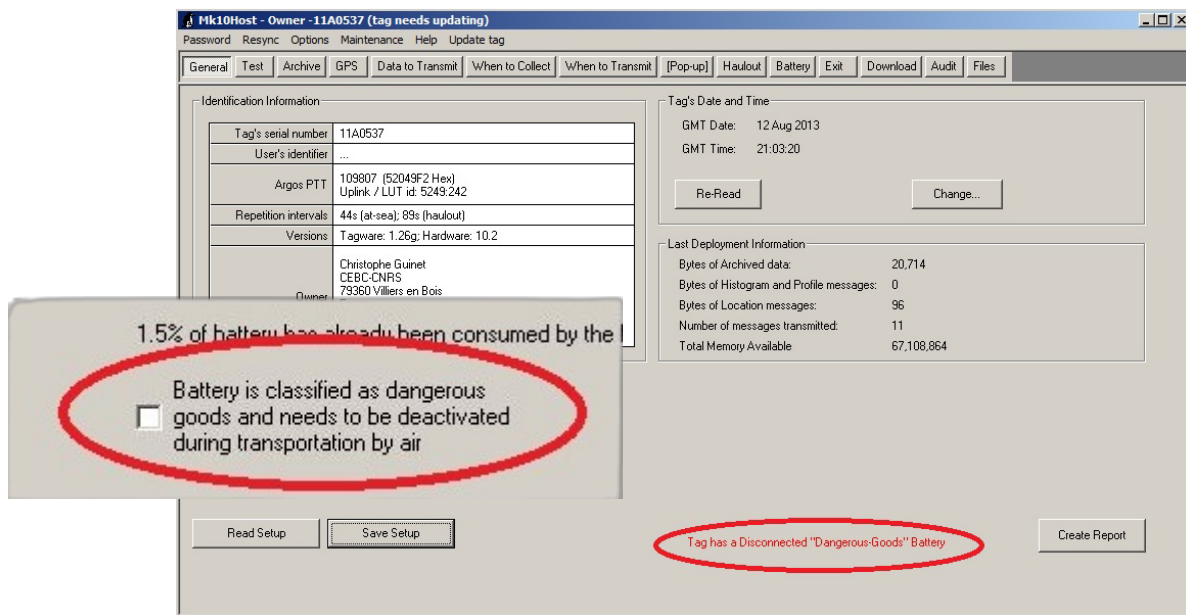


Figure 69—disconnected Dangerous Goods battery.

Exit Tab

If you have not acknowledged placement of screw connecting, only Shut Down mode will be available. We do not recommend storing the tags without first connecting the batteries; however, you are able to put the tag into Shut Down. If you attempt to place the tags into Standby or Deploy mode, you will have the opportunity to place the screw.

Instructions for Connecting the Batteries

1. You will need the titanium battery isolator screw, titanium lock washer, and 3/32" Allen key, all of which are included in your shipment. **DO NOT USE A POWERED SCREWDRIVER.** This will damage the socket and the screw.



Figure 70—Battery Isolator Screw.

2. For each tag, you will insert a screw and lock washer into the cylindrical metal socket.



Figure 71—cylindrical metal socket.

3. Hand-tighten the screw until the lock washer compresses and the screw is firmly seated. The screw will be flush or slightly recessed.



Figure 72—screw position in the tag.

4. The battery isolator bolt is intended to be inserted up to 10 times. Once inserted, take care not to unnecessarily remove and reinsert the screw.
5. Before deployment, communicate with the tag to confirm that the batteries are connected.

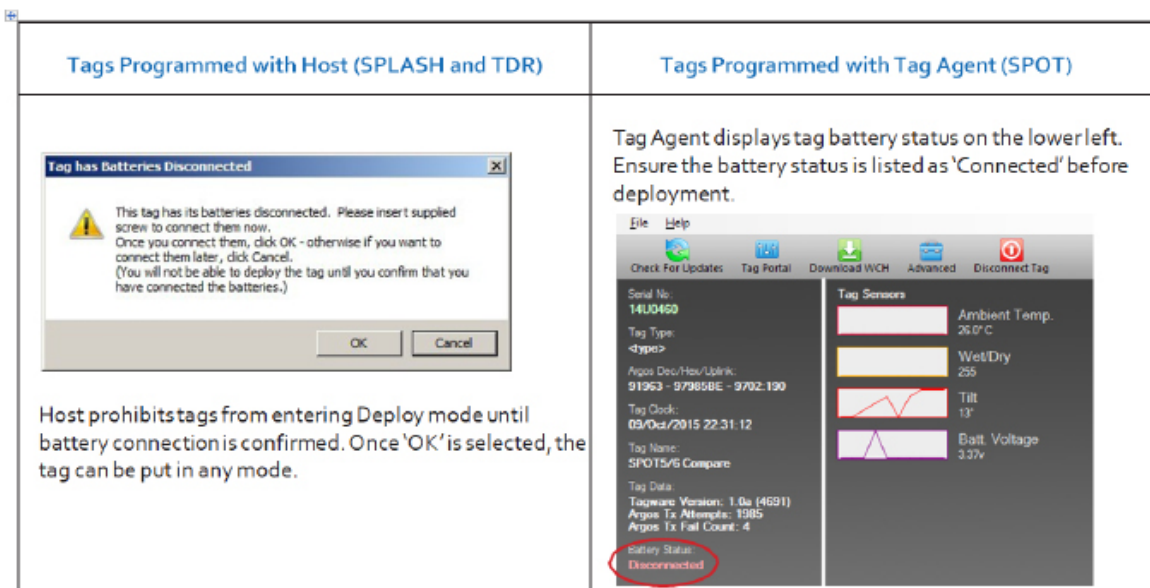


Figure 73—communicating with tags prior to deployment.

For more information on the battery isolator screw and Dangerous Goods shipping regulations, visit our website: <https://wildlifecomputers.com/wp-content/uploads/misc/IATA-Battery-Shipping-Compliance.pdf>.

Technical Specifications

The SPLASH10/TDR10 tags are configurable with a wide variety of sensors. Fastloc® GPS is available in several configurations. Below are the general physical specifications. **** indicates the specification is dependent upon the configuration model.*

Attachment Type	Externally mounted***
Sensors	Depth, Temperature, Light-level, Wet/Dry, 3D Accelerometer, Stomach Temperature, Fastloc GPS***
Depth Sensor Range	0-1700 m, 0-2000 m***
Depth Sensor Resolution	0.5 m, 1 m***
Depth Sensor Accuracy	±1% of reading
Temperature Sensor Range	-40 °C to 60 °C
Temperature Sensor Resolution	0.05 °C
Temperature Sensor Accuracy	± 0.1 °C
Light Sensor (When installed)	5 x 10 ⁻¹² W cm ⁻² to 5 x 10 ⁻² W cm ⁻²

3D Accelerometer Range	$\pm 2g$
3D Accelerometer Resolution	0.05 m^{-2}
Stomach Temperature Resolution	$\pm 0.1^{\circ} \text{ C}$
Stomach Temperature Accuracy	$\pm 0.3^{\circ} \text{ C}$
Maximum Sampling Rate	32 Hz
Pressure Rating (m)	Up to 2000 m
Operating Temperature Rating ($^{\circ}\text{C}$)	-20° C to 50° C
Optimal Storage Temperature Range ($^{\circ}\text{C}$)	0° C to 5° C
Conductivity Operational Limits	0.1 S m^{-1} to 5 S m^{-1}
Memory	1 GB
Length, Width, Height, Weight, Wet/Dry Sensor, Maximum Deployment Length	***

Additional Information

Glossary of Terms

- Argos—a satellite-based tracking and data collection system (www.argos-system.org).
- 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>
- Data Portal—the cloud-based data management service offered by Wildlife Computers.
- Depth—distance below the surface.
- Duty-cycle—enabling and disabling functionality of the tag during a deployment. This is typically done to save power or conserve data memory, and thus extend the total duration of a deployment.
- GMT—Greenwich Mean Time. Global time standard that is based on the mean position of the sun at noon at 0 degrees longitude. On Wildlife Computers tags, this is functionally equivalent to UTC and UT1.
- Host—the software running on a PC which displays information from the tag, downloads data from the tag, and programs the tag.
- Mk10Host—the name of the host for communicating with the tags covered in this user guide.
- Pressure—the unit force per square inch. Can be converted to a depth in sea water.
- Sample—a single reading from a sensor.
- Sample rate—samples measured per unit time. For example, 0.5 samples per second.
- Sample interval—the time between samples, also the inverse of sample rate. For example, a 2 second sample interval is equivalent to sample rate 0.5 samples per second.
- Tagware—the firmware, or software, running on a tag.

- .wch—file extension for data and setup files used by Wildlife Computers software.
- Wet/Dry sensor—sensor on a tag which can determine if the tag is in or out of sea water. Unique settings are required for brackish or freshwater.
- Wildlife Computers USB Communications Cable—the Wildlife Computers cable for communicating with a tag. It provides power and communications.

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. SPLASH tags on species such as sea turtles should be painted with one coat of primer and three coats of any Micron paint. When using the SPLASH versions of the [Wildlife Computers towed tags](#), Wildlife Computers recommends performing a float test once antifouling paint and tethers are applied.*



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/>



SPLASH tag wet/dry sensors should never be covered or coated with antifouling paint. Seawater contact is essential to these sensors for correct operation. Use masking tape to protect the wet/dry sensors when painting.

Antifouling Tests

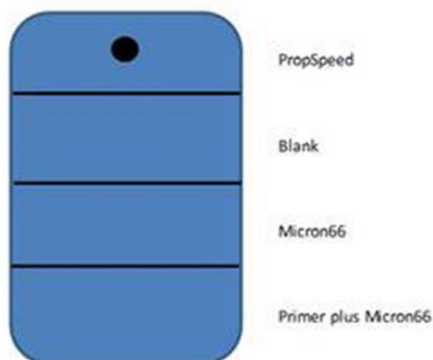
Wildlife Computers have been undertaking tests on antifouling paint in various parts of the world.

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:



Contacting Wildlife Computers

U.S. and International

Members of the Wildlife Computers technical sales and support team are 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.

Mailing Address—Please ship tags to our main office in Redmond, WA.

Yong Huang
Enfotran Corporation
816 Evergreen Point Road, #217
Medina, WA 98039 USA

Email

yong.huang@enfo.us

Phone

+1 (425) 456 0101

Fax

+1 (425) 456 0303

Addendum

Battery Storage and Testing Guidelines for AA-Battery Tags

The following SPLASH10 tag models contain one AA battery. This battery configuration is susceptible to passivation *if the batteries are not properly exercised every month*.

SPLASH10-312

- AM-A312B-A-00
- AM-A312C-A-00

To minimize passivation, follow the special storage and battery maintenance guidelines below.

Special Storage and Battery Maintenance for Single Battery Tags

Proper tag storage and battery maintenance are important to minimize passivation, maintain optimal battery voltage, and prepare the tags for deployment. When stored correctly, tags may experience battery life loss of one to two percent for every year of non-use.

As a standard, SPLASH10 tags ship in “Standby” mode for immediate deployment, unless otherwise specified.

If your tag has a battery isolator screw, be sure to place the screw before storing your tags. See the [Instructions for Connecting the Batteries](#).

SPLASH10-312 Storage—Less Than One Month

If your deployment date is less than one month from receipt, simply store the tags in “Standby” mode in a cool, dry environment—optimally between 0° C and 5° C. Tags must not be stored at temperatures warmer than 5° C or colder than -20° C.

SPLASH10-312 Storage—Longer Than One Month

If your deployment date is greater than one month from receipt, place the tags in “Shut Down” mode before storing in a cool, dry environment—optimally between 0° C and 5° C. Tags must not be stored at temperatures warmer than 5° C or colder than -20° C. Refer to the Tag Storage and Battery Maintenance section of this User Guide.

SPLASH10 tags can be stored longer than a month, but care must be taken for tags with one AA battery to avoid battery passivation. After storing your tags, you must **CONNECT TO EACH TAG MONTHLY** and exercise the batteries. Perform the Argos Transmitter Test in Mk10 Host to confirm the battery voltage is within the acceptable range (3.3V-3.7V). See the [Testing After Storage](#) section of this user guide.