

Mk10

User Guide

Supporting the following add-ons:

- A Argos transmitter
- F Fastloc GPS
- L Linked sensor
- PAT Pop-up archival tag
- V Velocity meter

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Introduction

The Mk10 is Wildlife Computers basic hardware and corresponding software platform which provides common data collection, data archival and control functions. It functions as a stand-alone archival tag.

Additional hardware modules can be added to the Mk10 to increase functionality. They can be added singly or in combination. These modules currently offered are:

-A	Argos transmitter (using Wildlife Computers Cricket transmitter)
-Fastloc	Wildtrack Telemetry System's fast GPS satellite location acquisition
-L	Remotely-linked sensors such as stomach temperature pills
-V	Velocity meter
-PAT	Popup Archival Tag functionality

Having a single hardware and software platform allows Wildlife Computers to offer a uniform set of instrument capabilities over a broad range of instrument physical configurations and attachments.

A single Windows-based program, Mk10Host, is used to communicate with the Mk10. Mk10Host is used to set parameters, test sensors and other hardware components, and download data archived on the Mk10 to your PC.

The Mk10Host program will display the parameters appropriate to the hardware configuration of the connected tag. Please note that the Mk10Host screens shown in this manual are representative of various tag configurations. The screens that you see when connected to your tag will present only those parameters applicable to the connected tag's configuration.

This manual documents the common features of all Mk10 tags, as well as the specific features associated with the various hardware modules. The Mk10 is a complex tag. We strongly suggest reading through the manual to gain an understanding of its features and operation. Please refer to the Table of Contents as an outline to help you navigate through the manual and find information regarding specific functions.

Overview of Mk10 functionality

Operational modes

Mk10 has four main operational modes:

Communicating	Mk10 has a communications interface connected between it and the PC and is communicating with a host program on the PC. This mode is used for interrogating and configuring Mk10. If connected to a Wildlife Computers Blue Box or Cable Comm communications interface, Mk10 is drawing power from the Blue Box or through the Cable Comm from the PC. It is also using a small amount of internal battery power.
Standby / Monitoring	Mk10 is in a very low power mode. It is not archiving samples nor will it transmit, if configured to do so. It can stay in this mode for a very long time without consuming much battery power. It is monitoring its environment, and if it believes it has “gone deep” or “gotten wet” Mk10 will automatically enter the Deploy/Running state.
Deploy / Running	Mk10 has been configured and is now actively collecting data and potentially transmitting information to Argos, if configured to do so. Mk10 should be in this mode when attached to a study animal or other platform for an experiment.
Shut Down / Killed	Mk10 is in a very low power state and is not monitoring the environment. It can only come out of this state if it is connected to a Blue Box or Cable Comm and swiped with a magnet.

Table 1

Sensors.

The Mk10 is 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
 - No need to be set to sample for field deployments
- Light level
 - Must be set to sample for geolocation by light-level, along with Internal temperature
- Battery voltage
 - To internally monitor performance of the battery
 - No need to be set to be sample for field deployments
- Wet/dry
 - Used by the tag to correct drift in depth zero offset
 - Used by -A, -F, and -V add-on modules to determine when the tag is out of water
 - No need to be set to sample for field deployments

Memory.

The Mk10 is configured with 16 Mbytes of memory available for the storage of sampled data. The Mk10 uses two bytes of memory to store the full resolution of all sensors.

Data collection intervals.

Data can be sampled every 1 to 255 seconds as standard. Each sensor can be sampled at an independent rate.

Decoding the data.

Wildlife Computers provides two analysis programs, Instrument Helper and HexDecode, to decode and display the data downloaded from a recovered tag.

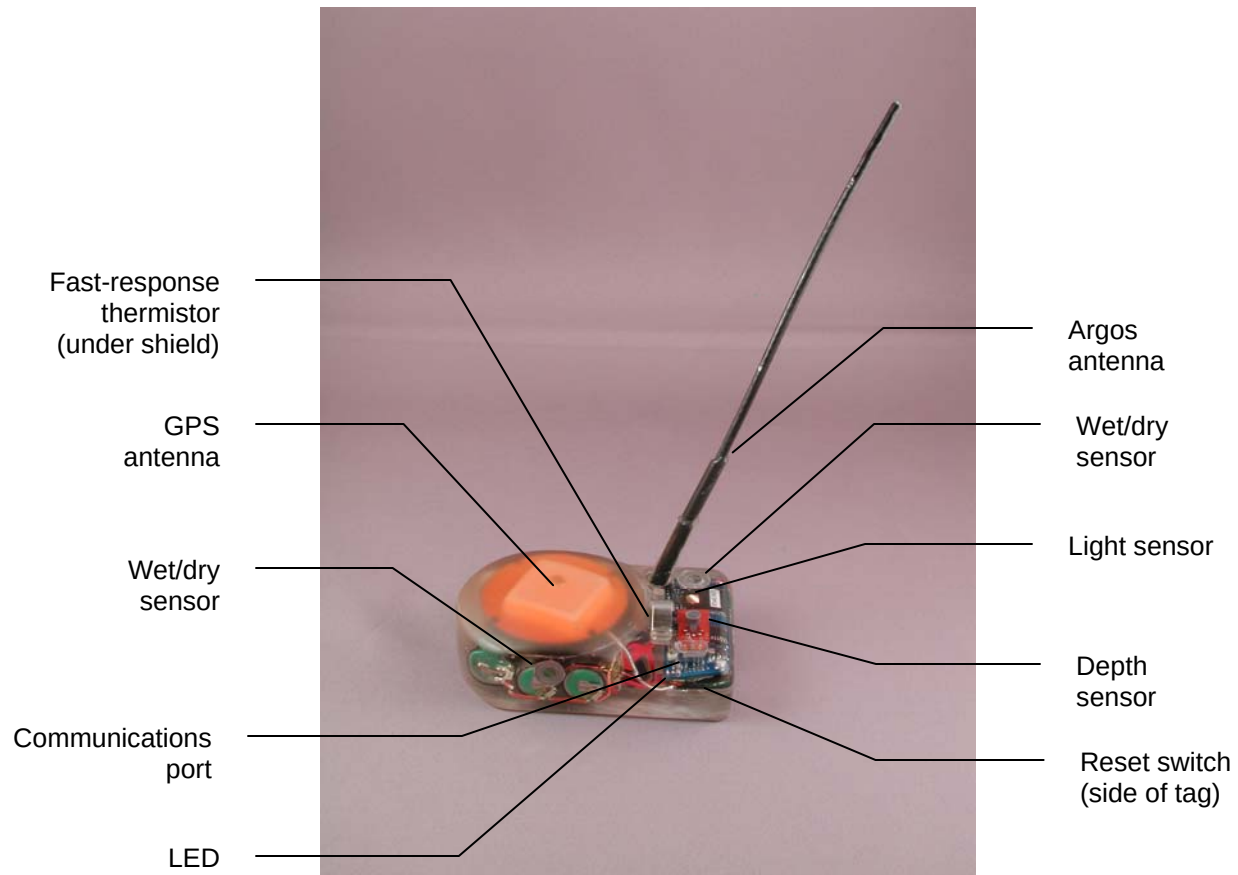
A word on version numbers.

The Mk10's on-board software (Mk10Ware) can be upgraded in our lab. Mk10Host code is upgraded in parallel, and is generally distributed via email or our website. In order 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 Mk10 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 www.wildlifecomputers.com for the most up-to-date Mk10Host

Add-on modules –AF: Argos transmitter + Fast GPS

The Mk10-AF includes the Wildlife Computers Cricket Argos transmitter plus the Fastloc fast acquisition GPS module. In addition to the standard archival functions, the Mk10-AF takes snapshots of the GPS constellation. These GPS snapshots, along with summarized depth and temperature data, can be transmitted to the Argos satellite system.



Notes:

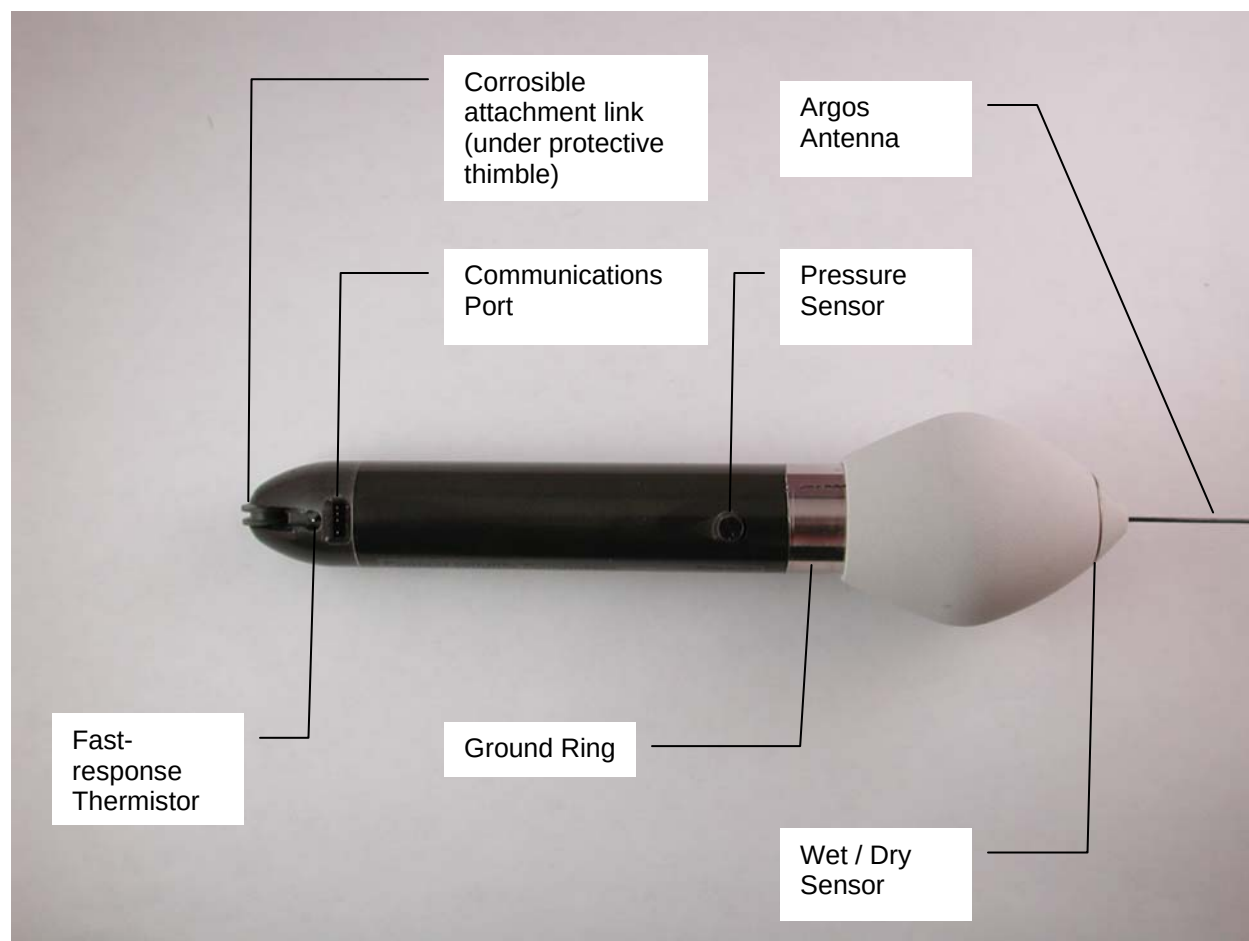
- Do not put anything over any of the sensors or the GPS antenna
- Ensure the wet/dry sensors are free of oils and epoxy
- Place magnet on the side of the tag by the communications port to trigger the reset switch
- LED is best visible from the side of the tag

Add-on module –PAT: Popup Archival Tag

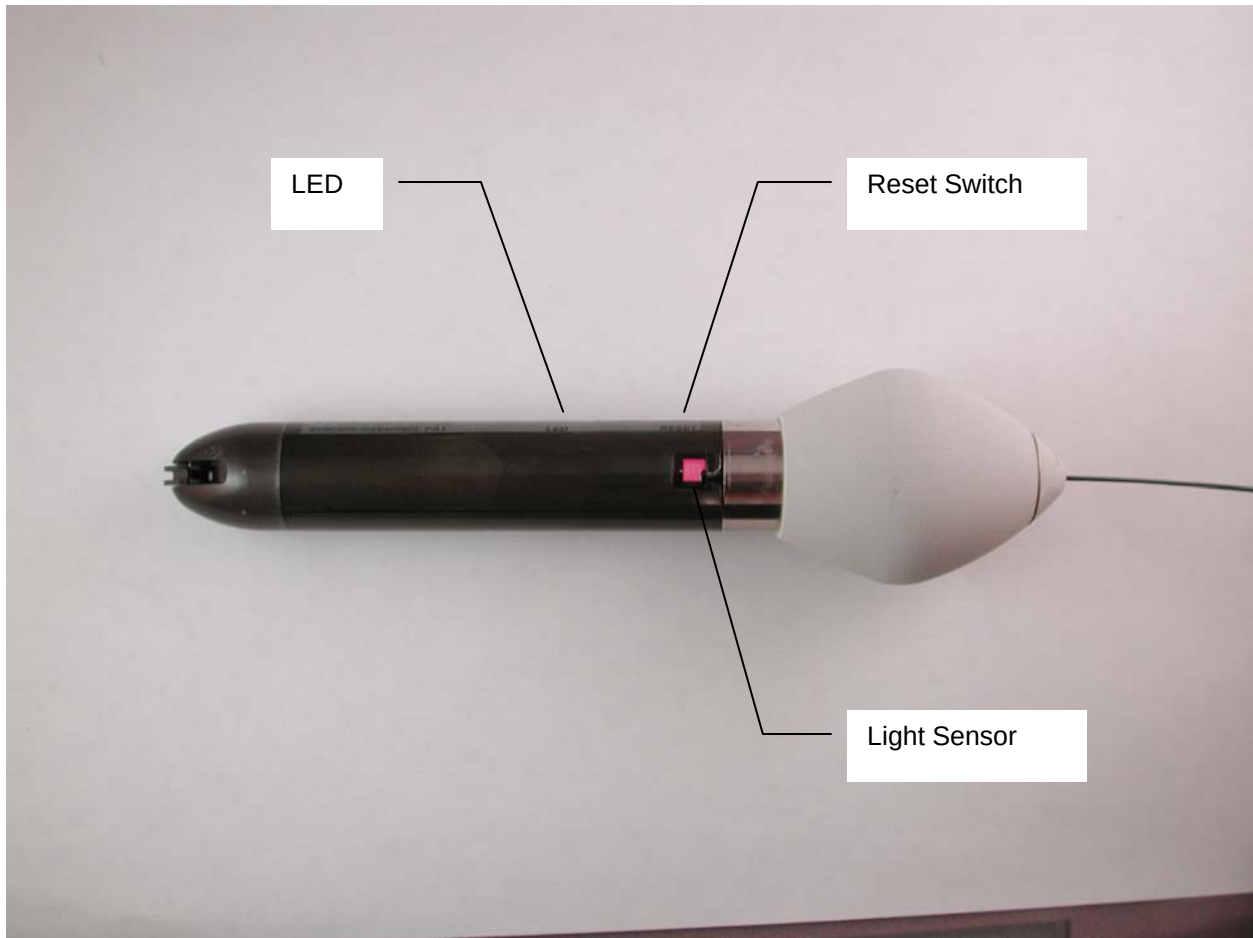
The Mk10-PAT is designed for deployments where the animal does not regularly come to the surface. This configuration includes the Mk10 controller, the Cricket Argos transmitter, and a corrosible attachment link. The Mk10-PAT is attached to the animal by a tether through the attachment link. The corrosible attachment link that will release the tag from the tether on a pre-programmed release date, or optionally when the Mk10-PAT determines it is no longer attached to an animal.

In addition to the standard archival functions, depth, temperature and light-level data are collected and summarized for later transmission through the Argos system during the deployment. Actual transmission to the Argos satellites occur after the release of the tag from the tether.

Mk10-PAT Diagram 1: Communications Port Side View

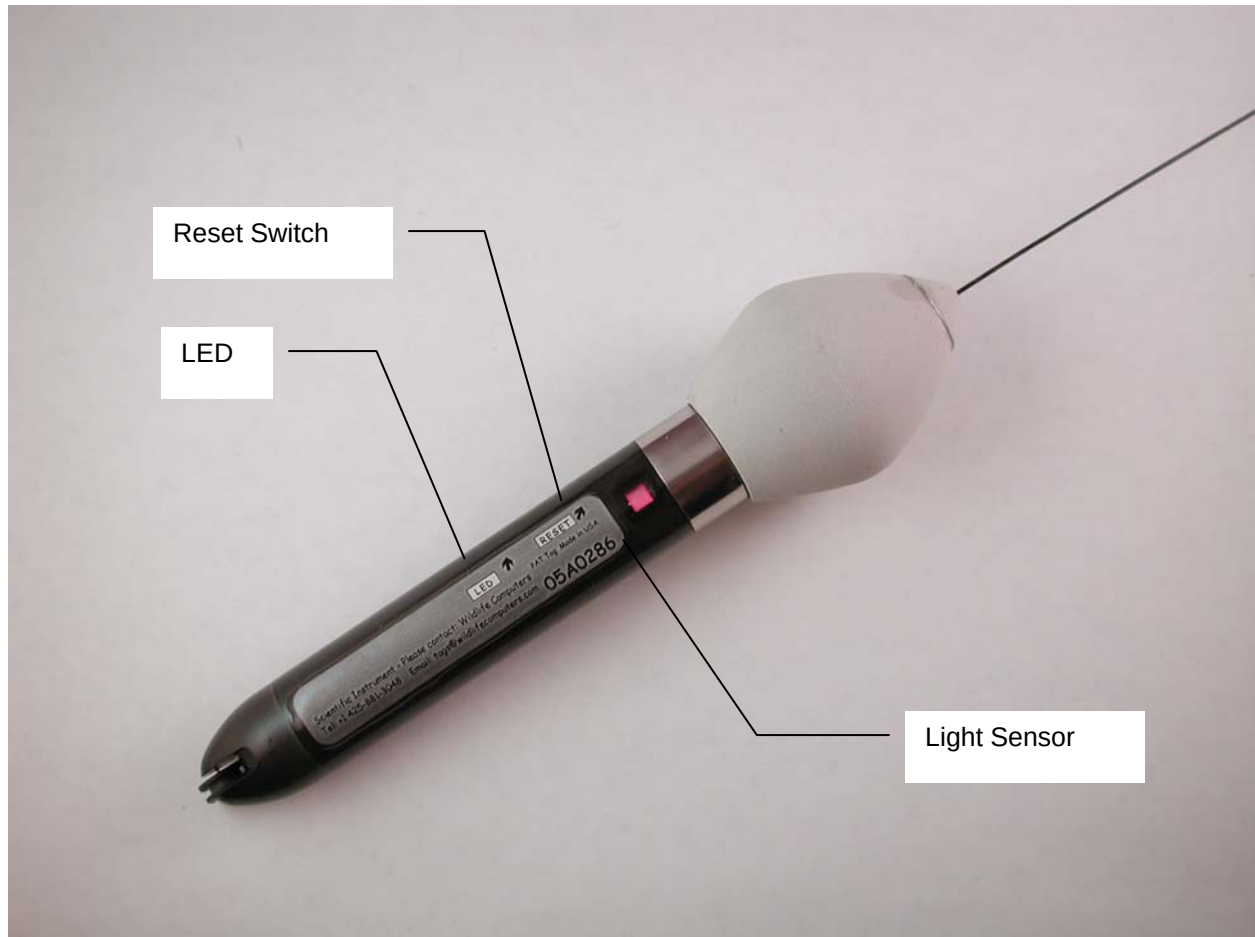


Mk10-PAT Diagram 2: Light Sensor Side View (Internal Label)



Some Mk10-PATs have the labels positioned between the Light Sensor and Communications Port sides.

Mk10-PAT Diagram 3: LED Side View (External Label)



Add-on module –V: Velocity

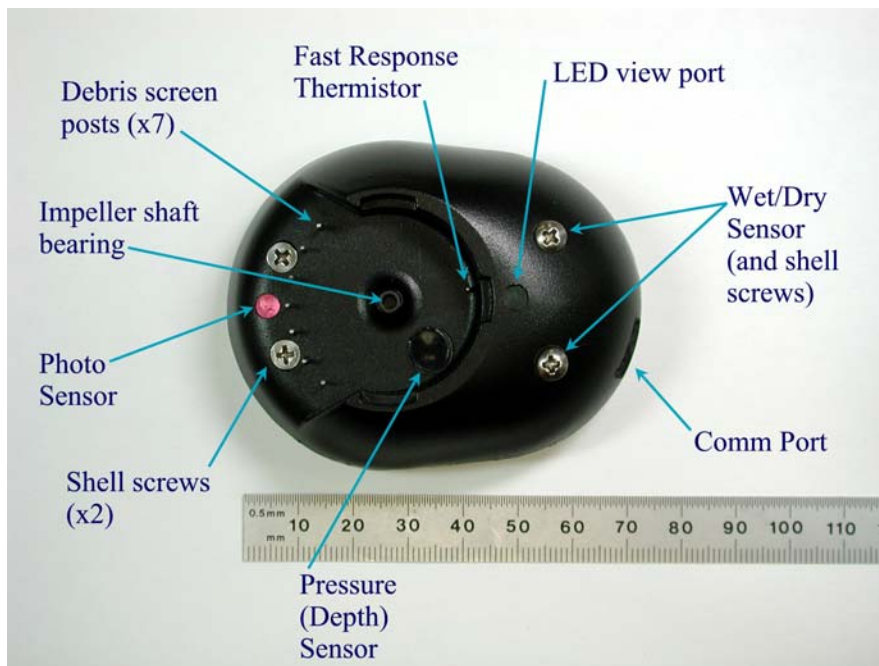
A velocity sensor can be added to the Mk10. Velocity is measured by reading the revolutions of a impeller (paddle-wheel) as it spins while moving through the water. Velocity is reported in meters/second, but be aware that this is the speed of the water through the impeller, not necessarily of the animal through the water. Factors such as laminar flow can influence the speed of the impeller.

Mk10-V Diagrams 1: Velocity Impeller



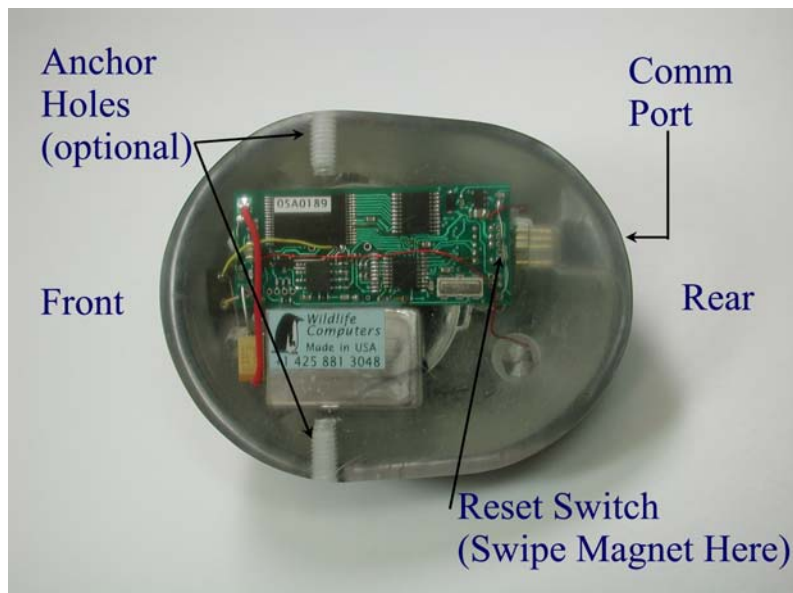
NOTE: The impeller cap is permanently attached to the rest of the housing. It is shown removed to illustrate the sensor locations only. The entire housing and cap is removable for replacement if it becomes damaged.

Mk10-V Diagram: Sensors

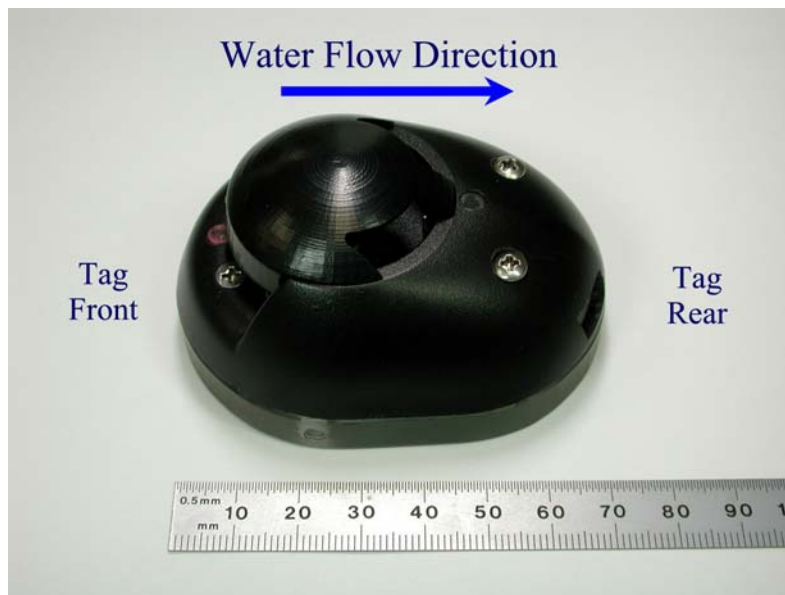


NOTE: The impeller cap is permanently attached to the rest of the housing. It is shown removed to illustrate the sensor locations only. The entire housing and cap is removable for replacement if it becomes damaged.

Mk10-V Diagram 3: Bottom view



Mk10-V Diagram 4: Direction of water flow



Communication with the Mk10

User parameters are programmed into the Mk10 via a Windows-based program provided by Wildlife Computers called Mk10Host. Mk10Host must be installed on your PC. Mk10Host has been tested on Windows 2000 and Windows XP. 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.

Install Mk10Host on your PC from the distribution disk

Installation of the Mk10Host can be done following the prompts. Mk10Host synchronizes communications with the Mk10's on-board software. It sends and receives commands to and from the Mk10. Parameters are downloaded from the Mk10 to your PC. Mk10Host allows you to modify those parameters. Once the parameters are set, they can be uploaded to the Mk10.

The Mk10 is connected to your PC via either a **Blue Box** or **Cable Comm**, available from Wildlife Computers only. Both the Blue Box and Cable Comm connect to a serial port on your PC.

If your PC does not have a serial port, you will need to purchase a USB-to-Serial Port adaptor. Please note that these adaptors are not standardized, and some do not work with the Blue Box/Cable Comm. We have had problems with those made by Belkin. We recommend the Keyspan USA-19QW High Speed USB serial adapter. If you cannot get the Keyspan USA-19QW, the USA-19Q or USA-19HS should also work. Install the USB-to-Serial Port adaptor *before* connecting the Blue Box/Cable Comm.

Regardless of which Keyspan unit you use, if you follow the manufacturer instructions for installation, the adapter should function properly and communication with the Mk10 tag will be possible.

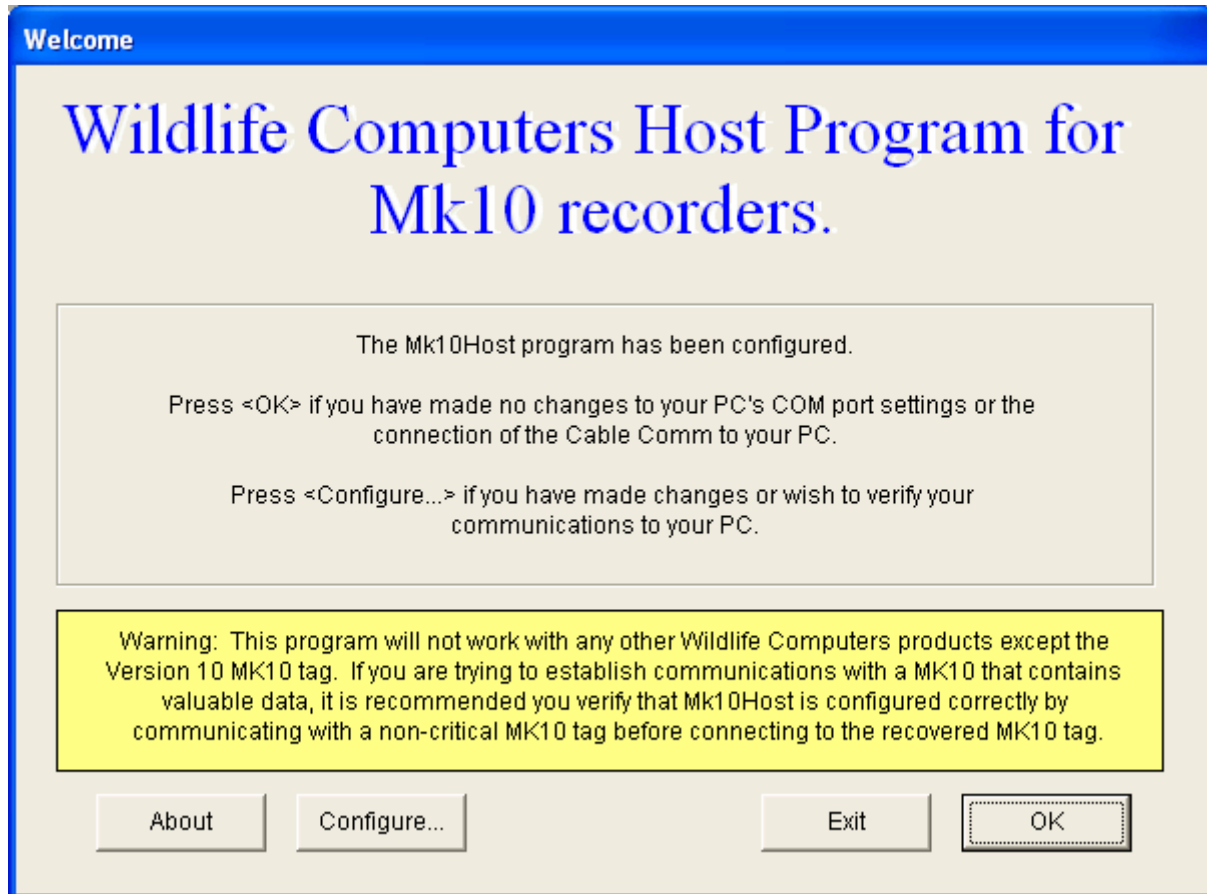
Word of note: for the Keyspan models, make sure you install the driver before plugging in the adaptor. Otherwise you may experience installation issues.

For laptop users, we suggest you set up everything on your new laptop before heading out to the field. The configurations of the new laptops are more complex, and one thing we have found is that sometimes the USB-to-Serial gets assigned to a COM port greater than 4. The new host program now supports these higher COM port numbers, but it is always advisable to make sure that your PC and all connections function properly before you leave the lab.

In addition, some laptop users have experienced problems using the USB adapter for the communications interface if they have previously installed other USB device drivers on their system (e.g., PDA's, serial mice). If this is the case for you, the drivers for the other USB devices will need to be removed before proceeding.

Configuring Mk10Host to Your PC

Each time you start Mk10Host, you will be greeted with a Welcome screen.



Define which COM port to use

The first time you run Mk10Host, you will need to configure the program by telling it which COM port to use to communicate with the Blue Box/Cable Comm. The OK Button will be grayed-out until you complete this step. Click the Configure button to start the Connection Wizard.

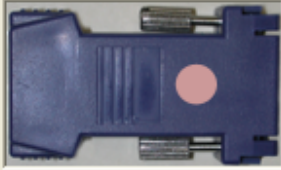
If you are using a Blue Box, follow the prompts on the Blue Box tab. If you are using a Cable Comm, follow the prompts on the Cable Comm tab.

Once Mk10Host is properly configured, you will be returned to Welcome Screen. Mk10Host will remember the COM port, so you do not need to repeat these steps unless you want to change the communications port to which your interface is configured.

When using a Cable Comm, follow the prompts on this tab.

Connection Wizard - Setup

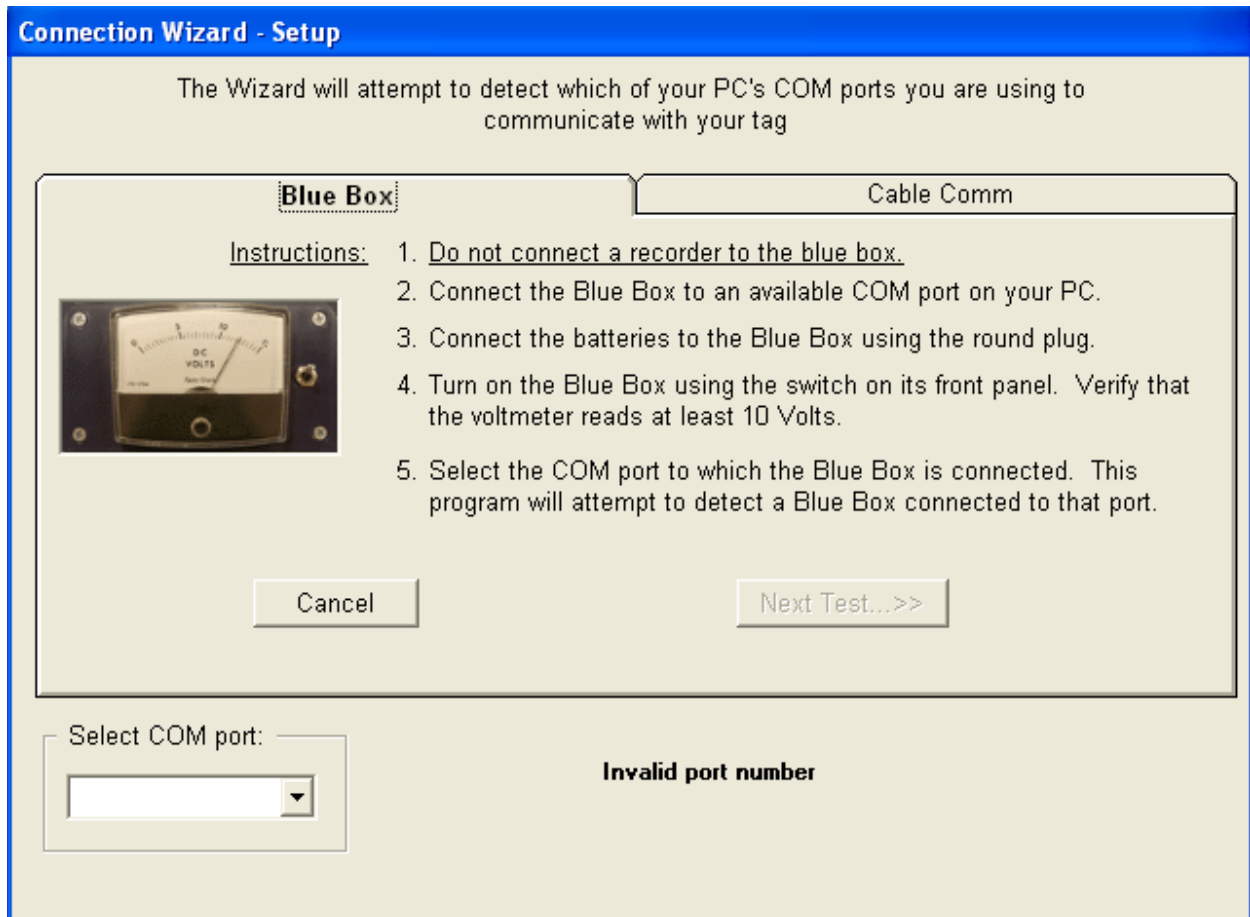
The Wizard will attempt to detect which of your PC's COM ports you are using to communicate with your tag

Blue Box	Cable Comm
<u>Instructions:</u>  1. <u>Do not connect a recorder to the Cable Comm.</u> 2. Connect the Cable Comm to an available COM port on your PC. 3. Select the COM port to which the Cable Comm is connected. This program will attempt to detect a Cable Comm connected to that port.	
Cancel Done	

Select COM port:

COM 1
COM 4

When using a Blue Box, follow the prompts on this tab.



When attempting to configure your COM port, you will be notified (as shown above) if you have chosen an invalid port number. Simply select a different port to try again.

Connecting the Mk10 to your PC

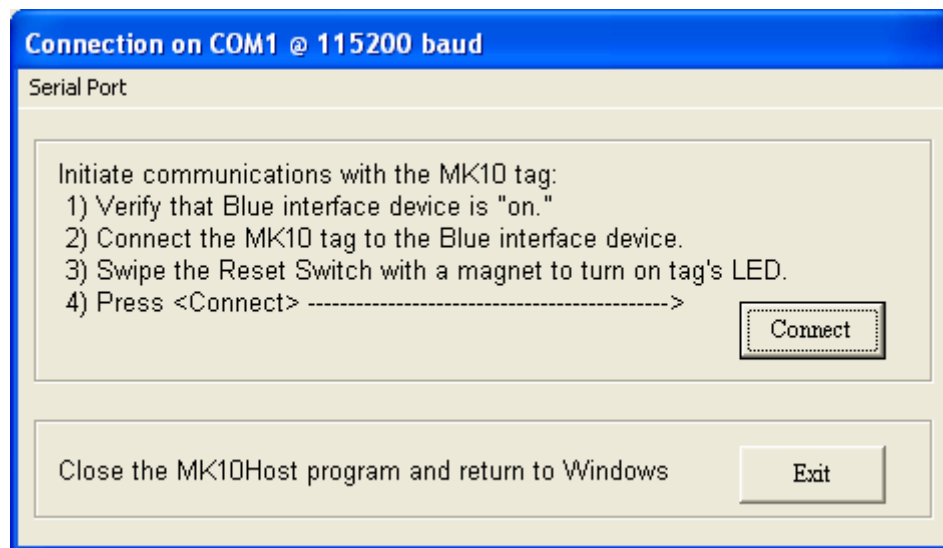
See the Mk10 diagram appropriate for your configuration to identify the location of the tag's communications port.

Carefully insert the flat plug from the Blue Box or Cable Comm into the Mk10's communications port. 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 critically important to ensure the flat plug is correctly oriented to the pins in the communications port before inserting the plug.*

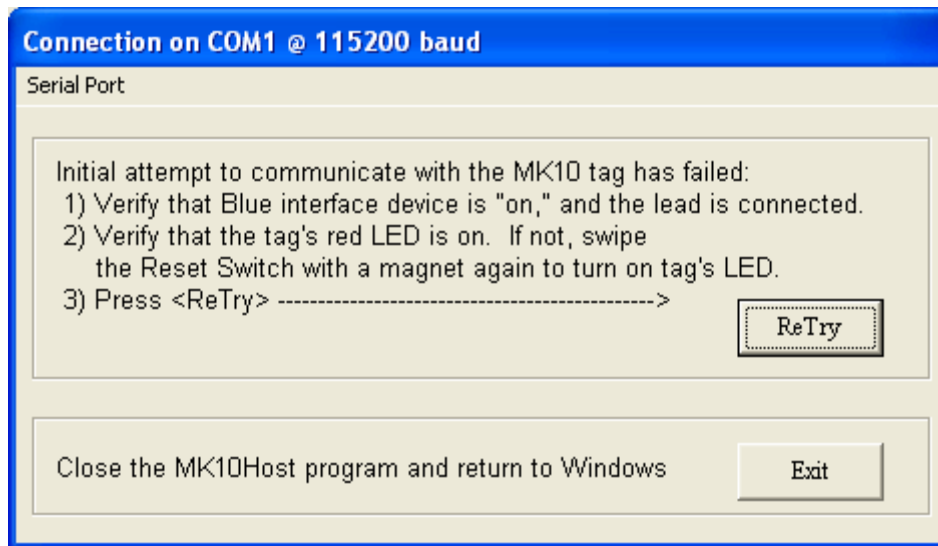
Initiate Communications with the Mk10

Follow the instructions displayed on the Connection screen. Once the magnet has been swiped over the communications port, if the cables between the PC, Blue Box/Cable Comm and Mk10 are connected correctly, a LED on the Mk10 will glow. The LED must be glowing before clicking the Connect button.

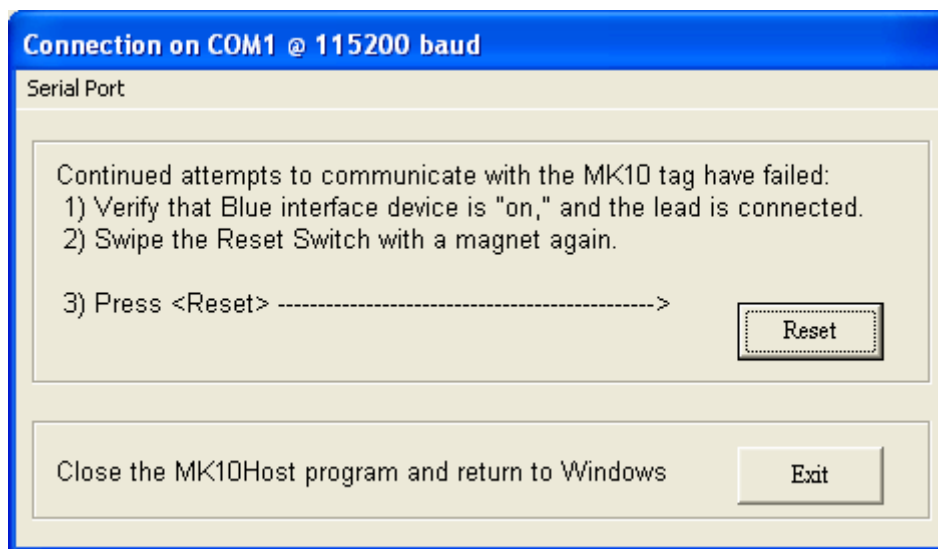
CAUTION: Do not leave the Mk10 tag hooked up to the communications hardware any longer than necessary to set up or download the tag. Leaving the tag hooked up to the communications hardware for extended periods of time will cause a more rapid drain on the battery.



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



If your initial attempt to connect does not work, the Mk10Host displays the above screen. If you try to connect more than twice, the Mk10Host will display the following screen.



If you continue to have difficulty, check your communications interface set-up again, or contact Wildlife Computers for technical support. Contact information is provided on the last page of this manual.

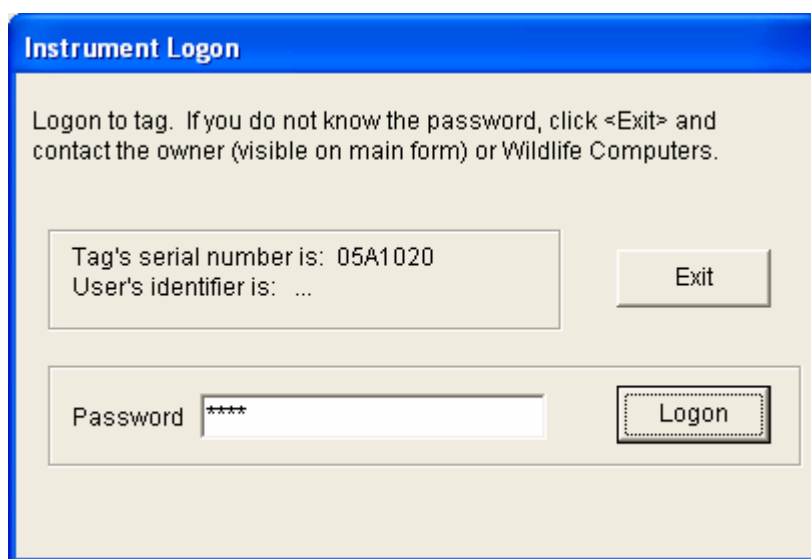
Log on to the Mk10

After initial communications are established, you need to log on to your Mk10 tag. You must correctly enter your password and log on as Owner in order to read and update information from the Mk10. ***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 7 characters. If you forget your password, you will have to return the tag to Wildlife Computers so we can reset it.

Note: The password for an individual tag will be remembered for each subsequent log on 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 *Standby*.



The image shows a software dialog box titled "Instrument Logon" with a blue header bar. The main area has a light beige background. At the top, it contains the text: "Logon to tag. If you do not know the password, click <Exit> and contact the owner (visible on main form) or Wildlife Computers." Below this text is a rectangular box containing two lines of information: "Tag's serial number is: 05A1020" and "User's identifier is: ...". To the right of this box is a button labeled "Exit". Below the information box is a password entry section consisting of the label "Password" followed by a text input field containing five asterisks "*****". To the right of the password field is a button labeled "Logon".

Programming and testing the Mk10

The Mk10 will display several sub-screens, identified by “tabs”. These tabs appear along the top and right-hand side of the screen, and different tabs will be displayed depending upon the add-ons installed on the Mk10.

General Tab

Identification Information

Tag's serial number	05A0364
User's identifier	...
Argos PTT	62946 (3222126 Hex) Uplink / LUT id: 3208.38
Repetition intervals	46s (at-sea); 91s (haulout)
Versions	Tagware: 1.20; Hardware: 10.1
Owner	Wildlife Computers 16150 NE 85th St #226 Redmond, WA 98052 USA +1-425-881-3048

Tag's Date and Time

GMT Date: 27 Dec 2005
GMT Time: 19:45:30

Buttons: Re-Read, Change...

Last Deployment Information

Bytes of Archived data: 65832
Bytes of Histogram and Profile messages: 0
Bytes of Location messages: 0
Number of messages transmitted: 3413

Buttons: Read Setup, Save Setup, Create Report

This screen provides the main interface with the Mk10. It is divided into 4 areas:

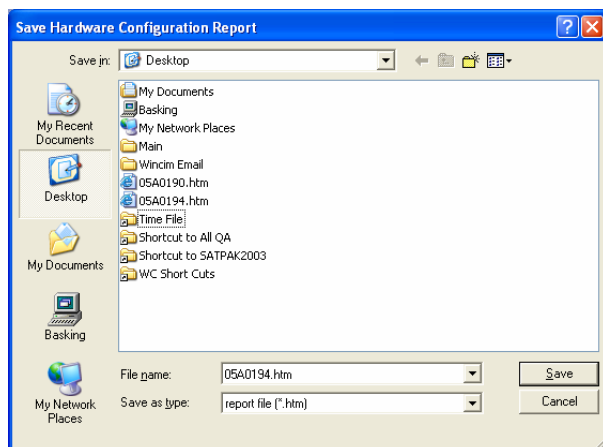
Identification Information	Configuration of the Mk10, including the user's tag identifier, which can be unique to each tag.
Tag's Date and Time	To view and set the tag's clock.
Last Deployment Info	Bytes of collected data.
Setup and Report buttons	Explained below.

Copying Data Collection Intervals from One Mk10 to Another - SAVE SETUP, READ SETUP

The **SAVE SETUP** button is useful if you are setting up a series of Mk10 tags and wish them all to have the same (or very similar) setup. Set up the first Mk10 tag and then click the **SAVE SETUP** button. As long as you do not leave Mk10Host (continue the session from one tag to another), you can use the **READ SETUP** button on subsequent Mk10 tags to set all of the data collection intervals to be the same as the first tag.

Create Hardware Configuration Report

It is important to archive the configuration of the Mk10 (versions, parameters) prior to deployment so that they can be used to correctly analyze the data. Click the **CREATE REPORT** button. 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.



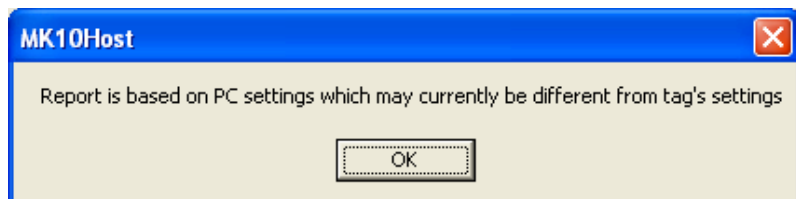
Once you either **SAVE** or **CANCEL** out of this screen, the Hardware Configuration Report screen will appear and display the configuration report of the Mk10 that is held by Mk10Host on your PC.

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 Save Hardware 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.

You should always save a final copy of the report and review all parameters before deployment. The success of your experiment depends upon the correct set-up of all parameters.

Note that selecting this configuration report function only displays the Mk10 parameters stored by the Mk10Host on the PC, not necessarily those on the Mk10 tag. It does not perform any upload function. *When running the report, the Mk10Host will indicate (as shown below) if the report shows a change from what is on the Mk10. If so, be sure to save the changes when you exit or deploy.*



Hardware Configuration Report

File

[PRINT](#)

Host Settings	
MK10Host version	1.20.0002
User Name	(User Logon Name)

Time And Date Settings	
PC Date	18 Oct 2005 at 14:47:11
Tag Date	18 Oct 2005 at 21:47:23

General Settings	
Tag's Serial Number	05A0194
Password	MK10
User's Identifier	...
Argos Ptt number	Not installed
Repetition Intervals	Not installed
Tagware version	1.20d
Hardware version	10.1
Owner	Wildlife Computers 8345 154th Ave NE Redmond, WA 98052 USA +1-425-881-3048
Bytes of archive data collected	5853

Data to Archive Settings	
Depth	1 second
Internal Temperature	1 second
External Temperature	1 second
Depth Sensor Temperature	1 second
Light Level	1 second
Velocity	1 second
Battery Voltage	1 second
Wet/Dry Sensor	1 second
Wet/Dry Threshold	Dynamic (initial value = 200)
Sampling Mode	Wet or Dry
Automatic Correction of Depth Transducer Drift	Using first dry reading

Channel Settings	
Depth	Channel: 0; Range: -40m to 1000m; Resolution: 0.5m
Internal Temperature	Channel: 1; Range: -40C to 60C; Resolution: 0.05C
External Temperature	Channel: 2; Range: -40C to 60C; Resolution: 0.05C
Depth Sensor Temperature	Channel: 3; Range: -40C to 60C; Resolution: 0.05C
Light Level	Channel: 4; Range: 0 to 0; Resolution: 0.25
Velocity	Channel: 5; Range: 0 to 1023; Resolution: 1
Battery Voltage	Channel: 14; Range: 0V to 5V; Resolution: 0.0048V
Wet/Dry Sensor	Channel: 15; Range: 0 to 255; Resolution: 1

Messages:

Set Tag's Time and Date.

It is important to accurately set the tag's time to GMT. The date and time are used to label when the data were collected. The time displayed on the General Tab screen is from the tag's clock at the time communication was established and is a static value. The ***Re-Read*** button will update the time displayed each time it is clicked.

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.

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

Automatic Settings from PC's Clock.

If your PC clock is not set to GMT, 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 the ***Update*** button.

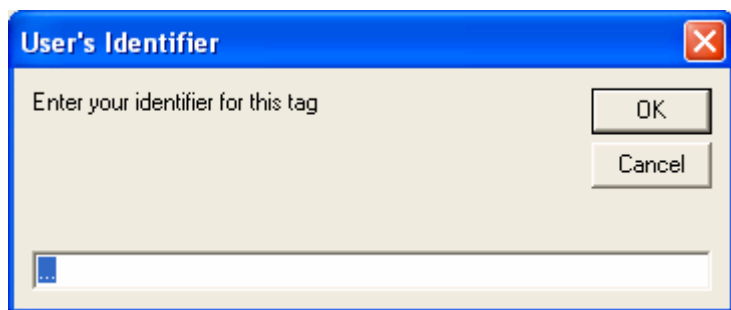
Manual Setting.

Alternately, enter the appropriate GMT date and time using an accurate time source, clicking the ***Update*** button to send the values to the tag.

Identify Instrument.

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 Mk10 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.



Testing tab: Click the Test button to test the sensors.

MK10Host - Owner - 05A0364

Password Resync Options Maintenance Help

General Testing Data to Archive Fast-GPS Data To Transmit When to Transmit Haulout Control Exit Data Retrieval Audit File Locations

Test Sensors

Depth	0.0
Internal Temperature	21.05
External Temperature	21.00
Depth Sensor Temperature	21.10
Light Level	185.0
Battery Voltage	3.61
Wet/Dry Sensor	255

Test

Immediate Test of Argos Transmitter Unattended test of Argos Transmitter

Bytes in test message: 3

Transmit

Wet/Dry Sensor Threshold

Consider tag to be dry if Wet/Dry sensor reading exceeds this value

Dynamic

Argos Fast-GPS

Test Sensors frame

Click the *Test* button. The current values of each installed channel will be displayed and will continue to display updated values until stopped. None of these values are archived.

MK10Host - Owner - 05A0364

Password Resync Options Maintenance Help

Test Sensors

Depth	0.0
Internal Temperature	21.35
External Temperature	21.20
Depth Sensor Temperature	21.45
Light Level	187.8
Battery Voltage	3.61
Wet/Dry Sensor	255

Stop

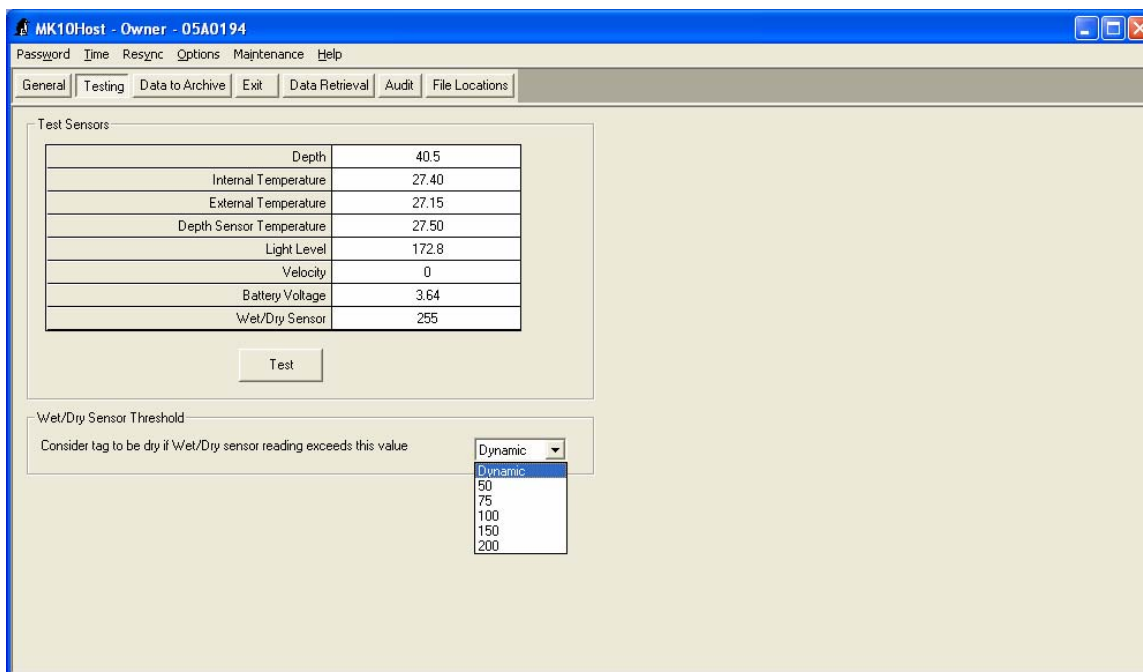
ReZero Depth Sensor

If you attempt to Re-Zero the Depth Sensor when it is not needed, you will see the following box.

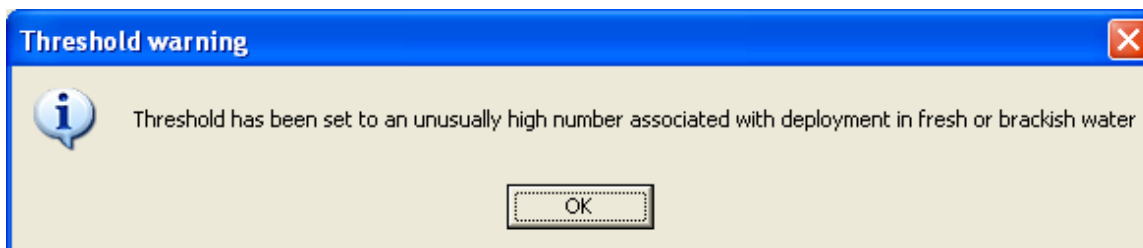


Wet/Dry Sensor Threshold frame

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.



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.



Argos Side-tab

This side-tab is visible from the testing tab for tag configured with the Cricket Argos transmitter.

Immediate Test of Argos Transmitter

MK10Host - Owner - 05A0364

Password Resync Options Maintenance Help

General Testing Data to Archive Fast-GPS Data To Transmit When to Transmit Haulout Control Exit Data Retrieval Audit File Locations

Test Sensors

Depth	
Internal Temperature	
External Temperature	
Depth Sensor Temperature	
Light Level	
Battery Voltage	
Wet/Dry Sensor	

Test

Immediate Test of Argos Transmitter | Unattended test of Argos Transmitter

Bytes in test message: 3

Transmit

Wet/Dry Sensor Threshold

Consider tag to be dry if Wet/Dry sensor reading exceeds this value

Dynamic

Argos Fast-GPS

This function allows you to quickly verify the Argos transmitter is functioning and the battery voltage is at least 3.0 V.

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General Testing Data to Archive Fast-GPS Data To Transmit When to Transmit Haulout Control Exit Data Retrieval Audit File Locations

Test Sensors

Depth	0.0
Internal Temperature	21.35
External Temperature	21.20
Depth Sensor Temperature	21.45
Light Level	184.8
Battery Voltage	3.61
Wet/Dry Sensor	255

Test

Immediate Test of Argos Transmitter | Unattended test of Argos Transmitter

Bytes in test message: 3

Transmit

Transmission Results:
Battery voltage = 3.74 Volts
Battery current = 0.208 Amps

Wet/Dry Sensor Threshold

Consider tag to be dry if Wet/Dry sensor reading exceeds this value

Dynamic

Argos Fast-GPS

Unattended Test of Argos Transmitter

The screenshot shows the 'MK10Host - Owner - 05A0364' window. The 'Testing' tab is active, displaying the 'Unattended test of Argos Transmitter' configuration. On the left, the 'Test Sensors' table lists various sensor readings. On the right, the 'Unattended test of Argos Transmitter' section allows setting transmission parameters. A 'Start Test' button is present. At the bottom, a 'Wet/Dry Sensor Threshold' section is visible.

Test Sensors	
Depth	0.0
Internal Temperature	21.35
External Temperature	21.20
Depth Sensor Temperature	21.45
Light Level	184.8
Battery Voltage	3.61
Wet/Dry Sensor	255

Test

Immediate Test of Argos Transmitter **Unattended test of Argos Transmitter**

First transmission at 0 sec after the next minute

Interval between transmissions is 60 sec

Total transmissions in test 800

Auto-increment First transmission by 2 sec

Start Test

Wet/Dry Sensor Threshold

Consider tag to be dry if Wet/Dry sensor reading exceeds this value

Dynamic

All tags are tested prior to leaving Wildlife Computers. You may, however, wish 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).

Fast-GPS Side-tab

This function is for diagnostic purposes by Wildlife Computers. Do NOT change any of the settings on this tab.

The screenshot shows the MK10Host software interface. The title bar reads "MK10Host - Owner - 05A0364". The menu bar includes "Password", "Resync", "Options", "Maintenance", and "Help". The tab bar at the top contains "General", "Testing", "Data to Archive", "Fast-GPS", "Data To Transmit", "When to Transmit", "Haulout Control", "Exit", "Data Retrieval", "Audit", and "File Locations". The "Fast-GPS" tab is selected.

On the left, under "Test Sensors", there is a table with the following data:

Depth	0.0
Internal Temperature	22.10
External Temperature	22.00
Depth Sensor Temperature	22.05
Light Level	170.5
Battery Voltage	3.60
Wet/Dry Sensor	255

Below this table is a "Test" button.

At the bottom left, there is a section for "Wet/Dry Sensor Threshold" with the text "Consider tag to be dry if Wet/Dry sensor reading exceeds this value" and a dropdown menu set to "Dynamic".

On the right, there is a "Test Fast-GPS" button above a table showing register values:

Register	Value
Status	Idle
Mode	3
Offset	37
Span	11
Threshold	20
Hardware	0.0
Software	1.1c
Serial Number	05F0015
Data	no data

Below this table is a "Refresh" button.

On the far right, there is a vertical sidebar with tabs for "Angus", "Fast-GPS", and "Fast-GPS". The "Fast-GPS" tab is selected.

Data to Archive tab: set sampling intervals

Archival Sampling Intervals

Set shortest interval first

Depth	60	Sec
Internal Temperature	60	
External Temperature	60	
Depth Sensor Temperature	60	
Light Level	60	
Battery Voltage	60	
Wet/Dry Sensor	never	

Sampling Mode

☒ Archive samples when tag is wet or dry

☐ Archive samples only when tag is wet

Sampling Duration

Time till 15 MByte memory is filled is 910 days

Tag will "wake-up" to check if it is time to take an archival sample every 60 Sec

Automatic Correction of Depth Transducer Drift

☐ by most common shallow depth

☐ by first dry depth reading

CAUTION: If the Mk10 has important data from a deployment that has not been downloaded, follow instructions in the section on *Recovering Collected Data* **before** changing any parameters.

Determine the Data Collection Intervals (Sampling Protocol)

Determine how you want the Mk10 to sample.

- Decide sampling rate. Establish the rate each sensor needs to be sampled in order to meet your experiment's criteria, and how long you expect the deployment to last.
- Determine amount of memory that will be used during the deployment. You need to do some arithmetic.
 - Multiply the sampling rate of each sensor by the length of the deployment, and then sum that value for all sensors. That gives you the total number of readings for the deployment. Multiply that number by two to get the total number of bytes required.
 - If there is not enough memory to store the readings at the rate you want, you will need to sample the sensors less frequently.
 - If there is more than enough memory to store the readings at the rate you want, you can increase the sampling rate and get more detail.

Archive Sampling Intervals frame

Set the sampling for each sensor by clicking next to the sensor name:

- Chose from the drop-down list of available intervals. Note that all intervals are in seconds.
- Set the *shortest* interval first.

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 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 Mk10 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, there may not be as many data archived as expected.

Sampling Duration frame

The Mk10 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

Select how the Mk10 should determine when the tag is “at the surface,” thus at zero meters depth

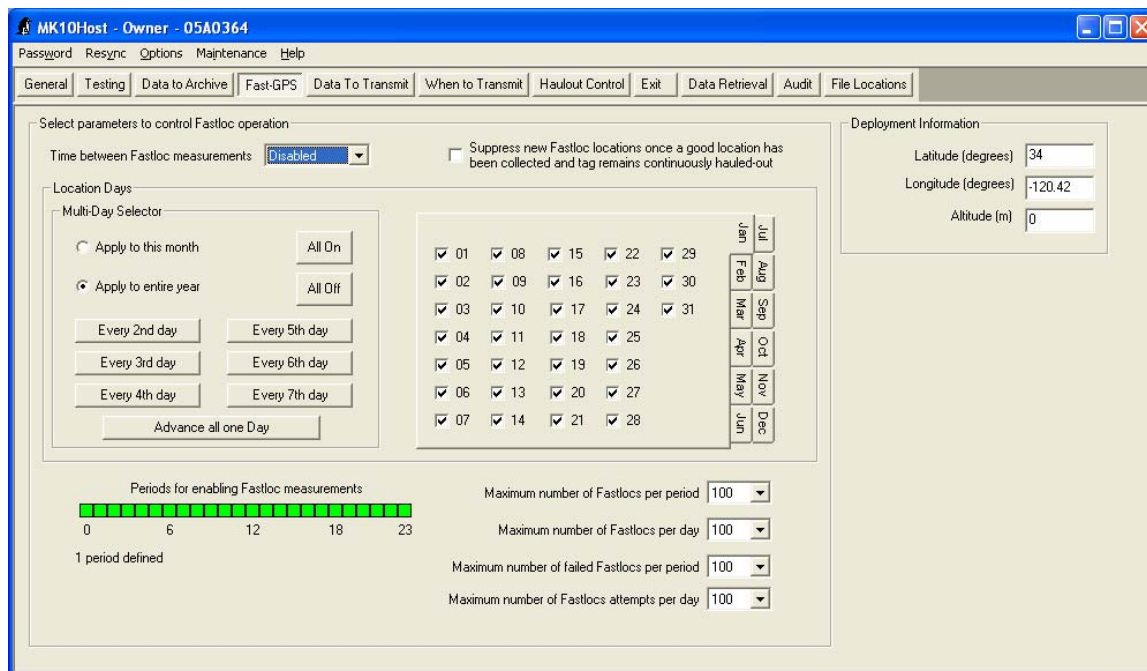
- *By most common shallow depth* is appropriate if tag may not break the surface of the water, e.g. on a non-air-breathing animal
- *By first dry depth reading* when the tag is deployed on an air-breathing animal and the tag is positioned such that the tag will be above the surface of the water when the animal breathes

Fast-GPS Tab: Set when to acquire GPS snapshots (-F add-on only)

The Fast-GPS module incorporates the Fastloc™ technology developed by Wildtrack Telemetry Systems, Ltd. A “snapshot” of the GPS constellation signals is taken. This snapshot takes less than one second and limited battery power. After the snapshot, the Fast-GPS module performs significant on-board processing to determine the identity and ranges of signal. This processing takes 20-30 seconds and represents a significant amount of power consumption (equivalent of 6-8 Argos transmissions). A location can be calculated if good signals are received from five satellites. The Mk10 considers an Fast-GPS acquisition “successful” if 5 or more satellites are identified for the snapshot.

The Mk10 allows for significant control regarding when a Fast-GPS acquisition is attempted, how many acquisitions should be attempted, and how many successful acquisitions are targeted.

The Mk10 controls the Fast-GPS acquisitions by day (0 – 2300 GMT) and by “periods”. A period is defined as a number of contiguous hours within a day.



Time between Fastloc measurements: This parameter controls when the Mk10-AF takes attempts an acquisition. Approximately 10,000 Fast-GPS acquisitions (exclusive of Argos transmissions) can be made by the Mk10-AF with new batteries. Selecting “Disabled” means do not attempt any Fast-GPS acquisitions.

Suppress new Fastloc locations...: This functionality has not been tested in the prototype units, and should NOT be selected

Location Days Frame: Select which days of the month Fast-GPS acquisitions should be enabled.

Periods for enabling Fastloc measurements: A “period” is defined as a number of contiguous hours within a 24-hour period (hours 0 through 23). Hours displayed in green are enabled for Fast-GPS acquisition. Clicking on an hour switches the hour from enabled to disabled. Note that each period does not need to be of the same duration.

Maximum number of Fastlocs per period: The Mk10 will target this number of *successful* Fast-GPS acquisitions per period.

Maximum number of Fastlocs per day: The Mk10 will target this number of *successful* Fast-GPS acquisitions within a GMT day.

Maximum number of failed Fastlocs per period: The Mk10 will *stop attempting* Fast-GPS acquisitions for a period once this limit is reached.

Maximum number of Fastloc attempts per day: The Mk10 will *attempt* this number of Fast-GPS acquisitions within a GMT day.

Data to Transmit tab: Selecting the types of messages to transmit through Argos (-A and -PAT add-on only)

Mk10s configured with the “-A” module include the Cricket Argos transmitter. The tab below appears only on tags with the -A module.

Data are summarized into histograms, timelines, light-based location curves, and/or Fast-GPS acquisitions. 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.

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General Testing Data to Archive Fast-GPS Data To Transmit When to Transmit Haulout Control Exit Data Retrieval Audit File Locations

Histogram Data Sampling Interval 30 sec

Message Type	# Bins	Upper limits of Bins													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Dive Maximum Depth (m)	14	25	50	75	100	150	200	250	300	350	400	450	500	550	>550
Dive Duration (sec)	14	1	2	3	4	5	6	7	8	9	10	12	14	16	>16
Time-at-Temperature (C)	off														
Time-at-Depth (m)	off														

Other Messages generated at Histogram Collection Interval

☐ PAT-style Depth-Temperature Profiles

Collection Control

☒ Do not create new Histogram-style messages if a tag is continuously dry throughout a Histogram collection period

Other Messages generated every 24 Hours

☐ Hourly % Time-Lines

☒ 20-minute Time-Lines

☐ Light-Level Locations

Histogram Collection

Hours of data summarized in each histogram 6

Histograms start at GMT 5

Dive & Timeline Definition

Depth reading to determine start and end of dive 1 m

Ignore dives shallower than 10 m

Depth threshold for timelines Wet/Dry

Transmission Control

Transmit data collected from these last days 7

Relative priority of transmitting Location relative to all other messages:

Low location priority High location priority

Actual transmissions will follow this sequence:
10 location message(s), then 1 other message(s)

When to Transmit tab: Control how often to make an Argos transmission (-A add-on only)

The tab below only appears on Mk10s configured with the -A module (Cricket Argos transmitter).

The Mk10 allows you to control which day of each month and which hours of the day to enable Argos transmissions. It also allows you to limit the total number of transmissions per day by month.

Note: set the Daily Allowance for each month to 0 to disable all Argos transmissions.

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General Testing Data to Archive Fast-GPS Data To Transmit When to Transmit Haulout Control Exit Data Retrieval Audit File Locations

Select the hours and days during which the tag should transmit.

Transmit Days

Multi-Day Selector

☐ Apply to this month

☒ Apply to entire year

☒ 01	☒ 08	☒ 15	☒ 22	☒ 29
☒ 02	☒ 09	☒ 16	☒ 23	☒ 30
☒ 03	☒ 10	☒ 17	☒ 24	☒ 31
☒ 04	☒ 11	☒ 18	☒ 25	
☒ 05	☒ 12	☒ 19	☒ 26	
☒ 06	☒ 13	☒ 20	☒ 27	
☒ 07	☒ 14	☒ 21	☒ 28	

Transmit for the first days regardless of these settings

Transmit Hours

☒ 00	☒ 06	☒ 12	☒ 18
☒ 01	☐ 07	☒ 13	☐ 19
☒ 02	☐ 08	☒ 14	☐ 20
☐ 03	☐ 09	☐ 15	☒ 21
☐ 04	☒ 10	☐ 16	☒ 22
☒ 05	☒ 11	☒ 17	☒ 23

Transmit Control

	Daily Allowance	Accumulate	Optimize for Battery Life
Jan	0	☒	☐
Feb	0	☒	☐
Mar	0	☒	☐
Apr	0	☒	☐
May	0	☒	☐
Jun	0	☒	☐
Jul	0	☒	☐
Aug	0	☒	☐
Sep	0	☒	☐
Oct	0	☒	☐
Nov	0	☒	☐
Dec	0	☒	☐

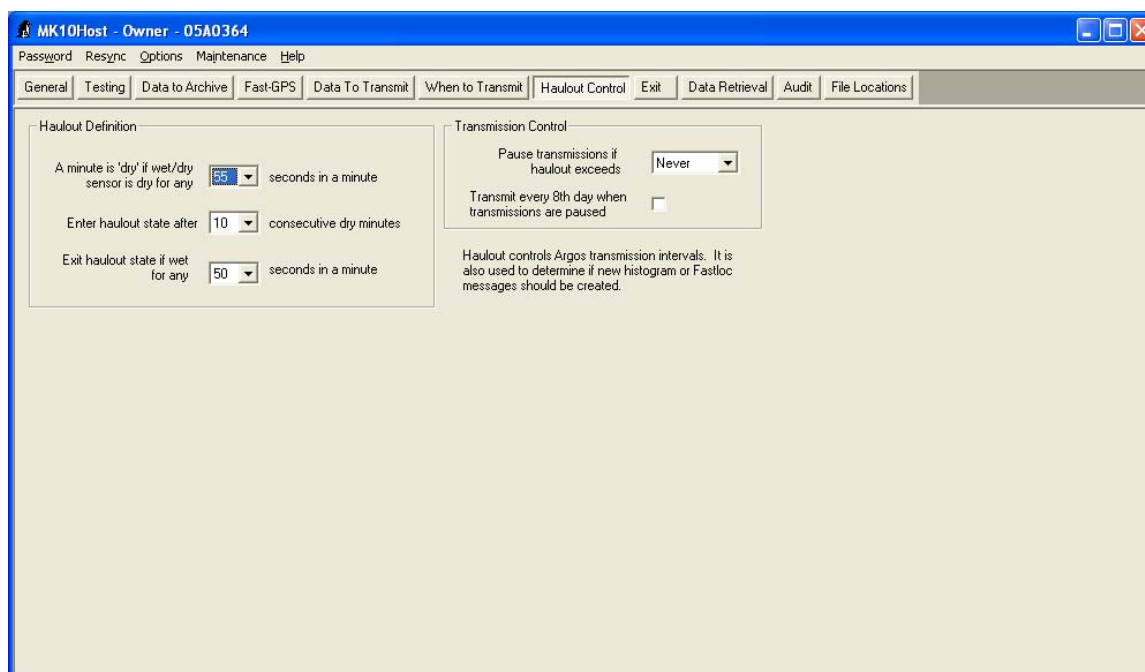
☐ Make all months the same

Haulout Control tab: Define when the Mk10 is in “haulout” mode (-A add-on only)

The tab below only appears on Mk10s configured with the -A module (Cricket Argos transmitter).

The Mk10 can have a different regimes when the animal is “hauled 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 Mk10 switches to haulout mode, whether Argos transmissions should be paused after a certain number of hours in haulout mode, and whether informative Argos transmissions should be made on every 8th day of haulout (to indicate the tag is still functioning).



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General Testing Data to Archive Fast-GPS Data To Transmit When to Transmit **Haulout Control** Exit Data Retrieval Audit File Locations

Haulout Definition

A minute is 'dry' if wet/dry sensor is dry for any seconds in a minute

Enter haulout state after consecutive dry minutes

Exit haulout state if wet for any seconds in a minute

Transmission Control

Pause transmissions if haulout exceeds

Transmit every 8th day when transmissions are paused ☐

Haulout controls Argos transmission intervals. It is also used to determine if new histogram or Fastloc messages should be created.

Pop-Up Date Tab: Set parameters for release of Popup Tag (-PAT add-on only)

MK10Host - Owner - 05A0176
 Password Resync Options Maintenance Help
 General Testing Data to Archive Data To Transmit **Pop-up Date** Exit Data Retrieval Audit File Locations

Scheduled Release Setup

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

Release Days

Tag will release this many days after it is deployed or activated (by going wet or deep, or with a magnet)

100

Hour: 00

Release 100 days after deployment at 00:00

Premature Release Setup

The 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.

Minimum depth to start premature release detection: 20m

Hours permissible at a constant depth before MK10-PAT starts to corrode off its tether: 24

PAT thinks it is at a constant depth even if depth varies within this range: 10m

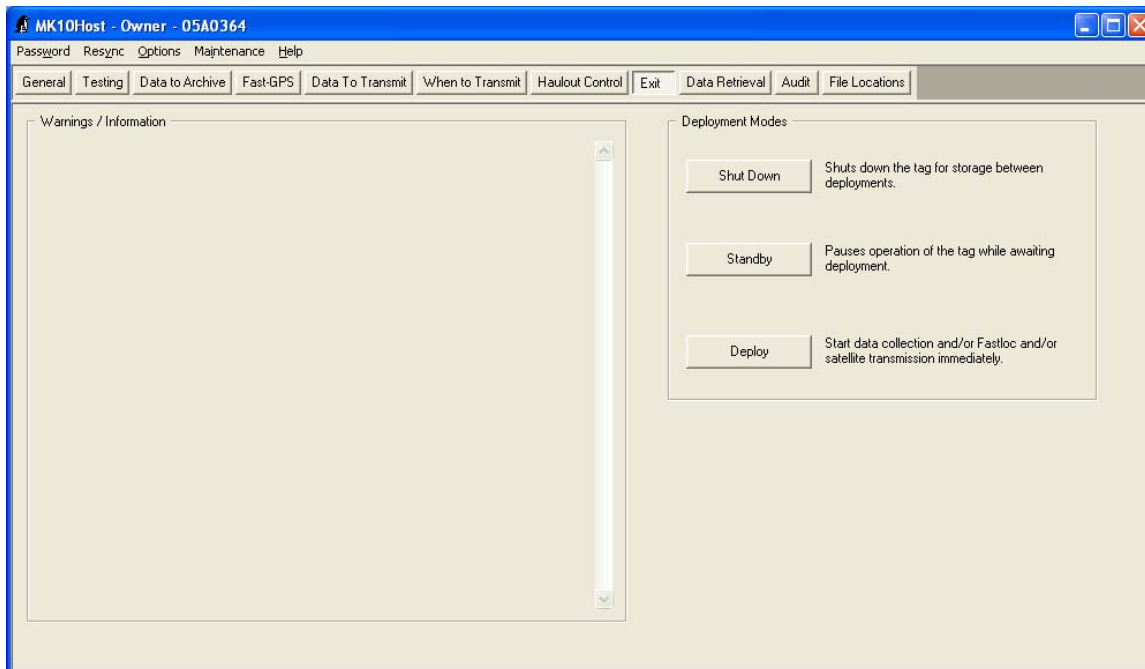
Release even if there are a few outliers (3 for PRHours = 24): ☒

Must be at surface to be a premature release: ☐

If 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: 4 days

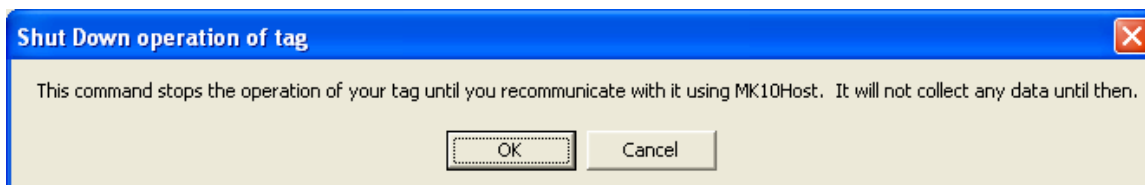
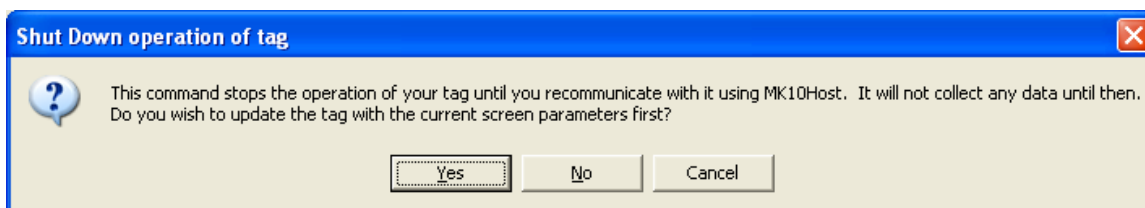
Exit tab: Deploying the Mk10



Mk10 modes.

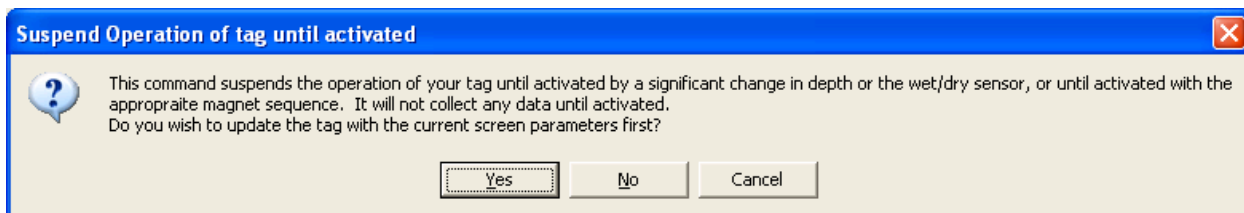
Shutdown mode.

Use this mode for storage between deployments. You must reestablish communications to deploy the tag or put it into Standby mode. The clock is maintained. The data in memory are maintained. Depending on whether or not you have changed any parameters during your Host session with the tag, you will see one or the other of these messages.



Standby mode.

When you exit communications by clicking the **Standby** button in Host, the tag goes into Standby mode. In this mode the Mk10 is not entirely “turned off,” but monitoring for a signal to go into Deployed mode. You will be prompted whether or not you want to clear the tag’s memory, or have the tag append to the data already in memory. If appending, the new data will be marked as a new deployment.



Deployed mode.

The tag initializes and immediately begins to sample. *Exiting using the **Deployed** button, unlike the **Standby** button, will also clear any archived data from the tag’s memory.*



NOTE: When initially deployed, after 10 flashes the LED will give one long flash. It will then glow dimly until the next full minute, indicating it is deployed. If you pass a magnet over the reset switch during the long LED flash, this will change the mode to Standby, as described in *Activating the Mk10 (start sampling)* section of the manual.

Note: If you click on CANCEL button after selecting the DEPLOY button, it will abort the reading of the blocks of memory on the tag, but will NOT prevent deployment. Canceling stops the generation of the automatic systems settings report that Wildlife Computers can use to troubleshoot problems with the tag.

WARNING: You should never turn off the blue box or disconnect a Mk10 from a Cable Comm or Blue Box without clicking on either the **Shutdown** or **Standby** or **Deploy** buttons. Doing so could leave your Mk10 in a mode that will use up its internal battery within a few hours.

Activating the Mk10 (start sampling)

When you exit communications from the Mk10 using the ***Standby*** button, it can be activated (start sampling) without establishing communications in one of three ways:

- Applying a magnet in a special pattern
 - Pass a magnet over the reed switch. The LED will quickly double-flash three times, followed by one long flash, indicating it is in standby mode.
 - If you pass a magnet over the reset switch during the long LED flash, the Mk10 will go into Deploy mode. The LED will flash quickly 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 pass a magnet during this long LED flash, the Mk10 remains in standby mode.
- Depth sensor reads a 20m change in depth.
- Wet/dry sensor senses a pre-set minimum change in conductivity.

Verifying function prior to deployment

You should always confirm the Mk10 is sampling before deployment.

Pass a magnet over the reed switch. The LED will flash quickly 10 times, followed by one long flash. It will then glow dimly until the next full minute indicating it is sampling.

If you want the flashing to stop right away, you can press on the pressure sensor to simulate a deep dive (the 20m change in depth mentioned above). The LED will also stop flashing 31 hours into the deployment.

Sealing the communications port

Apply a very small amount of silicone grease (e.g., vacuum grease) to the small white Teflon communication port plug. Press the plug into the Mk10's communication port until it is firmly seated.

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 suspended until ready to use. Just prior to deployment, the user can deploy them using a magnet. *NOTE: Be sure that all previous data are erased prior to redeploying if you want the entire Mk10 memory available for data collection.*

Alternatively, since Mk10 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 Mk10 is sampling before deploying it on the study animal or gear.

Changing mode with a magnets

You can display and change the mode of the Mk10 after exiting communications by using a magnet.

Swipe a magnet once across the center of the Mk10's controller board. The LED will flash in a sequence that displays the mode of the Mk10 tag.

- Standby mode LED pattern: ***2 blinks, a 3 second pause, 2 blinks, a 3 second pause, and 2 more blinks*** (You may not see all three sets, as this occurs very rapidly.)
- Deployed mode LED pattern: ***10 blinks***

Once the mode is displayed, the ***LED will stay on for 2 seconds.***

- If you keep the magnet away from the Mk10 while the LED is on, the Mk10 will stay in its current mode.
- *If you swipe a magnet across the board while the LED is on, you will toggle the mode.* If the Mk10 was toggled to the Standby mode, the LED will blink as described in “Standby mode” above. If the Mk10 was toggled to the Deployed mode, the LED will blink as described in “Deployed mode” above.

In summary, a single swipe of the magnet displays the mode of the Mk10. It takes two specifically timed swipes of the magnet to change the mode.

Data Retrieval tab: Download collected data from the Mk10 to your PC

Basic Recovery Information

If the Mk10 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 Mk10 fail, your deployment data are probably still in memory, and can be retrieved by Wildlife Computers.

Preparation for Post-Deployment Communication

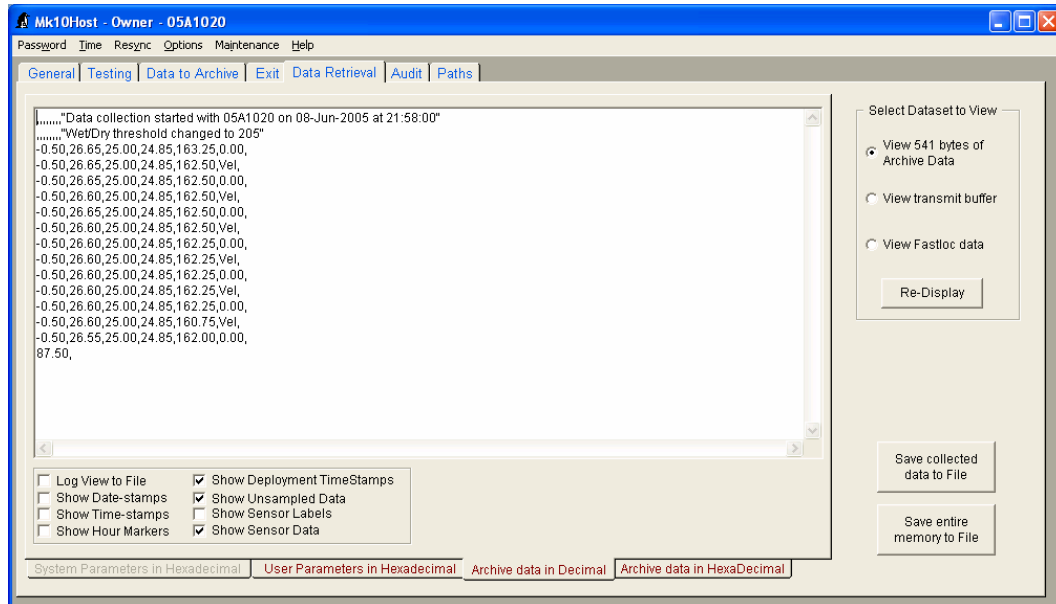
When you recover your Mk10 full of valuable deployment data, there are several steps to perform before attempting to connect it to the blue box.

As a precaution, it is advised to have the following on hand:

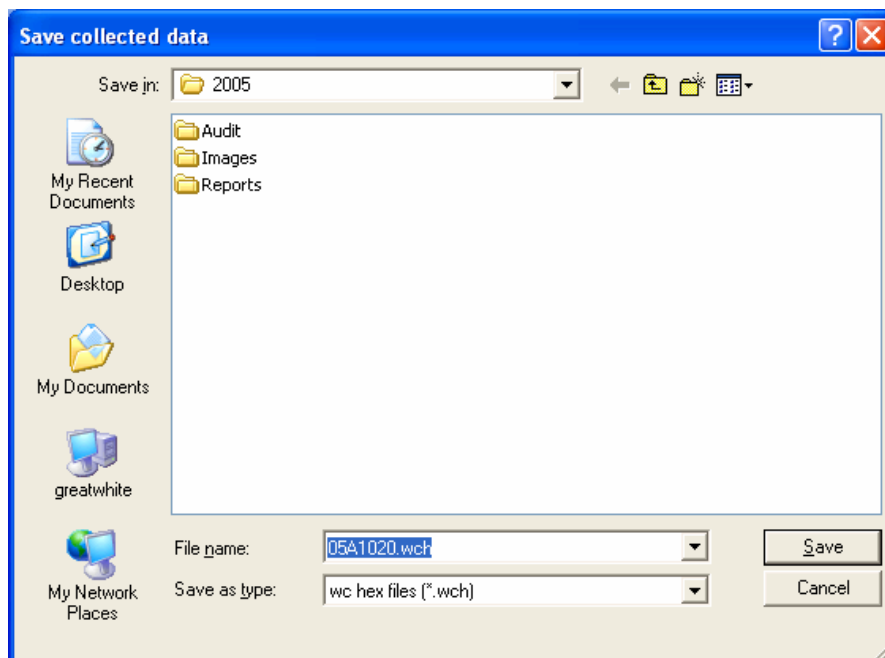
- Compressed air in a can
 - Electronic contact cleaner, if available
- 1) Thoroughly dry the Mk10 with a paper towel.
 - 2) Remove the Teflon communications port protection plug.
 - 3) Blow any water out of the communication port. Make sure the port is clean and dry. Compressed air in a can works well for this. Note that communication with the Mk10 with saltwater in the communications port will cause the pins to corrode very fast!
 - 4) Count the number of pins in the communications port. If there are not four pins, one or more have corroded or broken off. Send the Mk10 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 Mk10 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 the Data

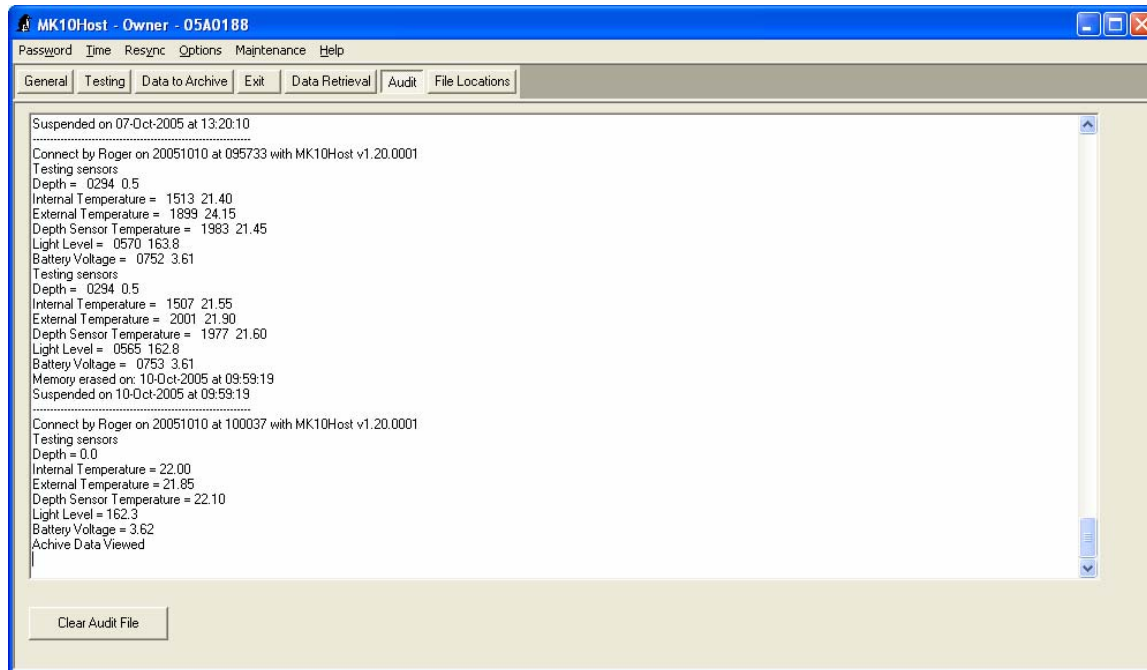
You can view a snapshot of your data, which is useful if you are simply checking test data.



However, *it is very import to save the collected deployment data in the .wch format. This is the only format that can be processed by Wildlife Computers analysis programs.*

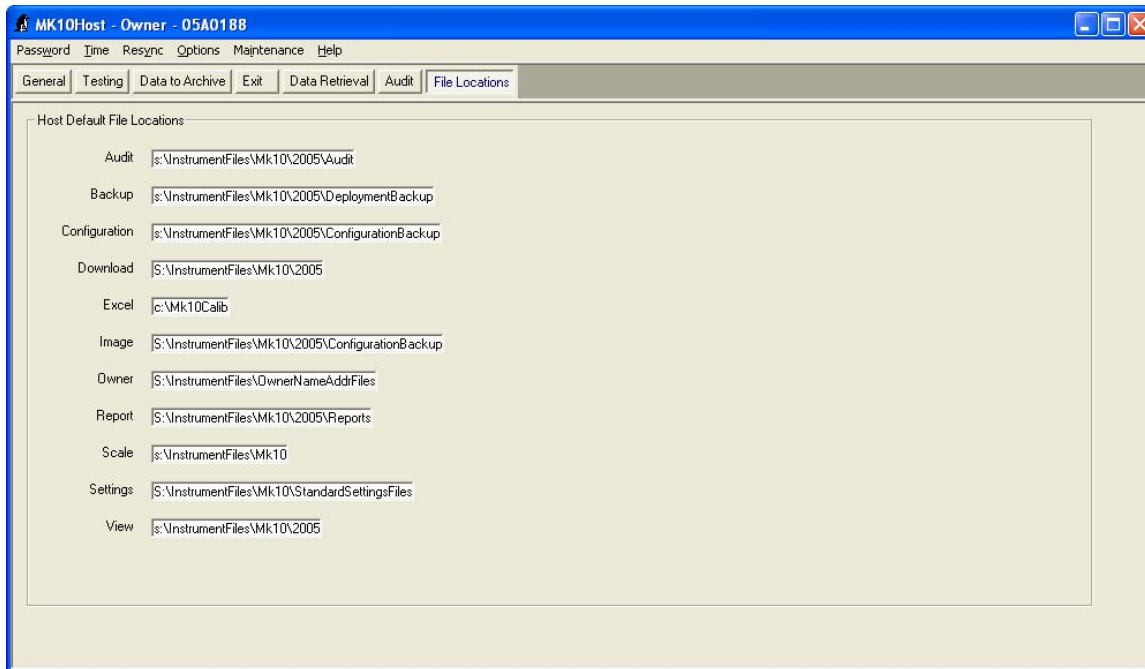


Audit tab



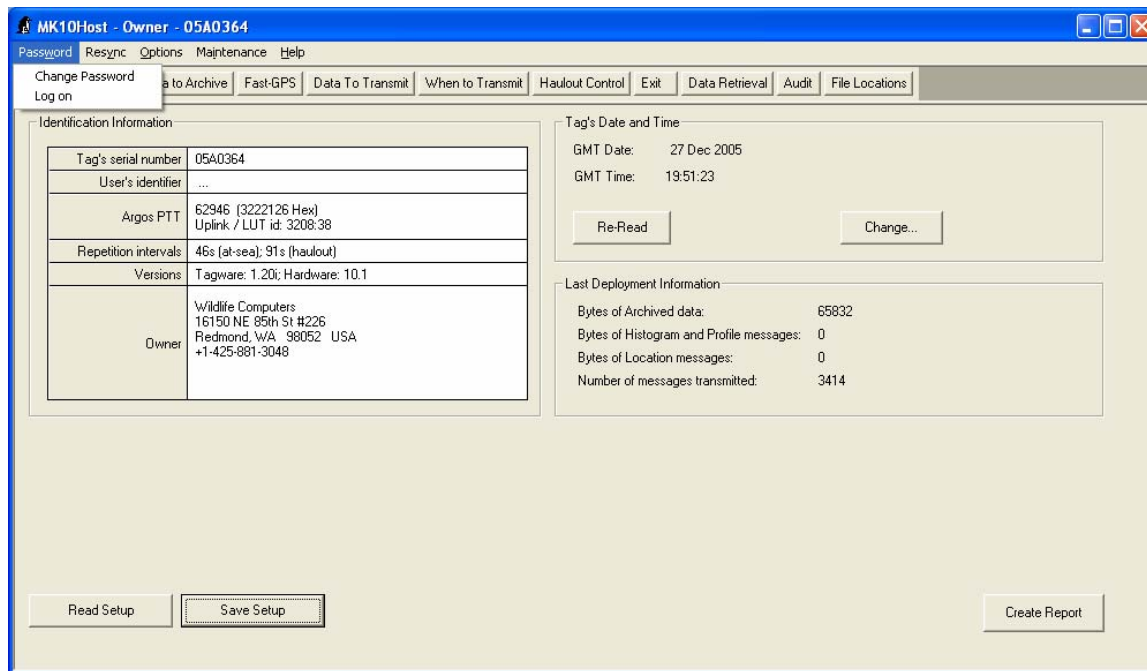
This shows you the history of commands and Mk10 responses that occurred during communications. New information is appended.

File Locations tab: Where on your PC the Mk10Host stores its files



Menu items

Password



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 7 characters. If you forget your password, you will have to return the tag to Wildlife Computers so we can reset it.

Resync

MK10Host - Owner - 05A0364

Menu: Password, Resync, Options, Maintenance, Help

Tabs: General, Testing, Data to Archive, Fast-GPS, Data To Transmit, When to Transmit, Haulout Control, Exit, Data Retrieval, Audit, File Locations

Identification Information

Tag's serial number	05A0364
User's identifier	...
Argos PTT	62946 (3222126 Hex) Uplink / LUT id: 3208.38
Repetition intervals	46s (at-sea); 91s (haulout)
Versions	Tagware: 1.20i; Hardware: 10.1
Owner	Wildlife Computers 16150 NE 85th St #226 Redmond, WA 98052 USA +1-425-881-3048

Tag's Date and Time

GMT Date: 27 Dec 2005
GMT Time: 19:51:23

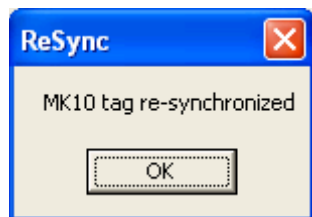
Buttons: Re-Read, Change...

Last Deployment Information

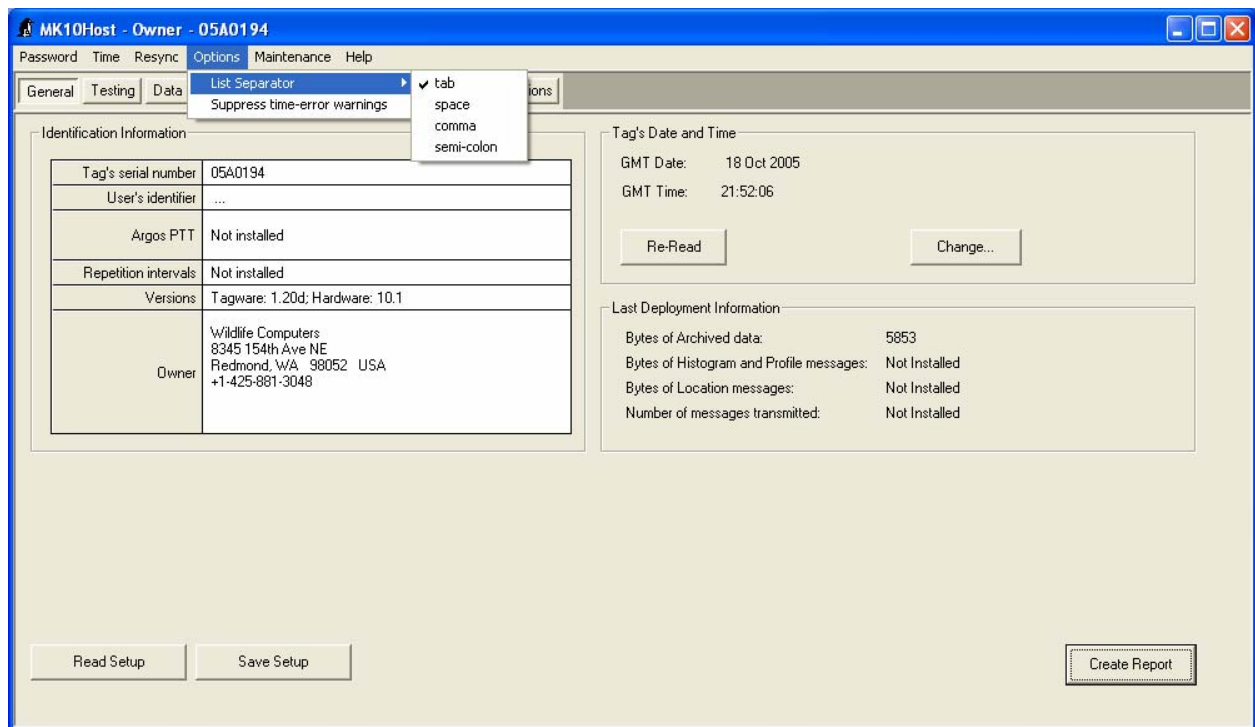
Bytes of Archived data: 65832
Bytes of Histogram and Profile messages: 0
Bytes of Location messages: 0
Number of messages transmitted: 3414

Buttons: Read Setup, Save Setup, Create Report

On occasion, your tag may get out of sync with the Host program. When you have successfully re-synchronized your tag, you will get the following notice.

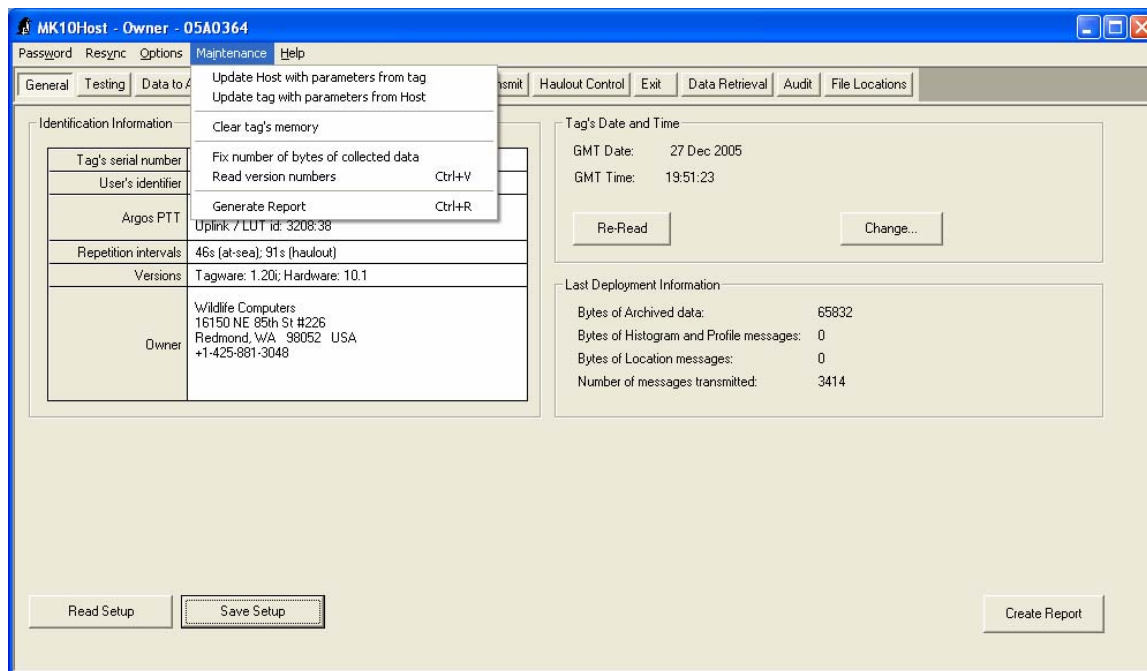


Options

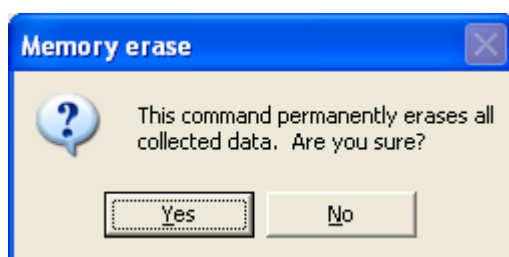
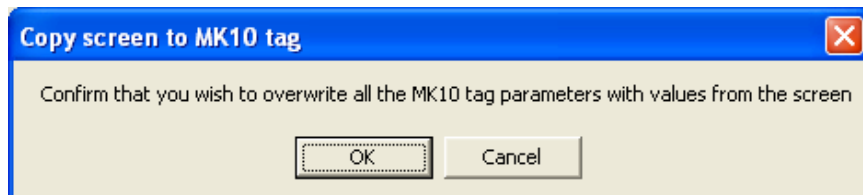
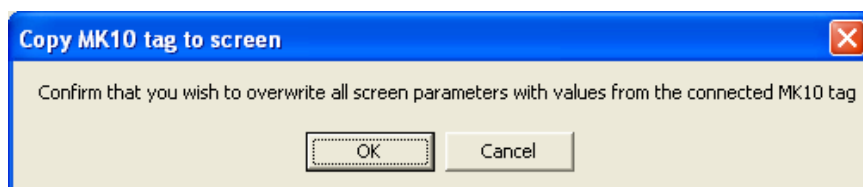


You may choose your preferred separator for displaying listed data under this menu item.

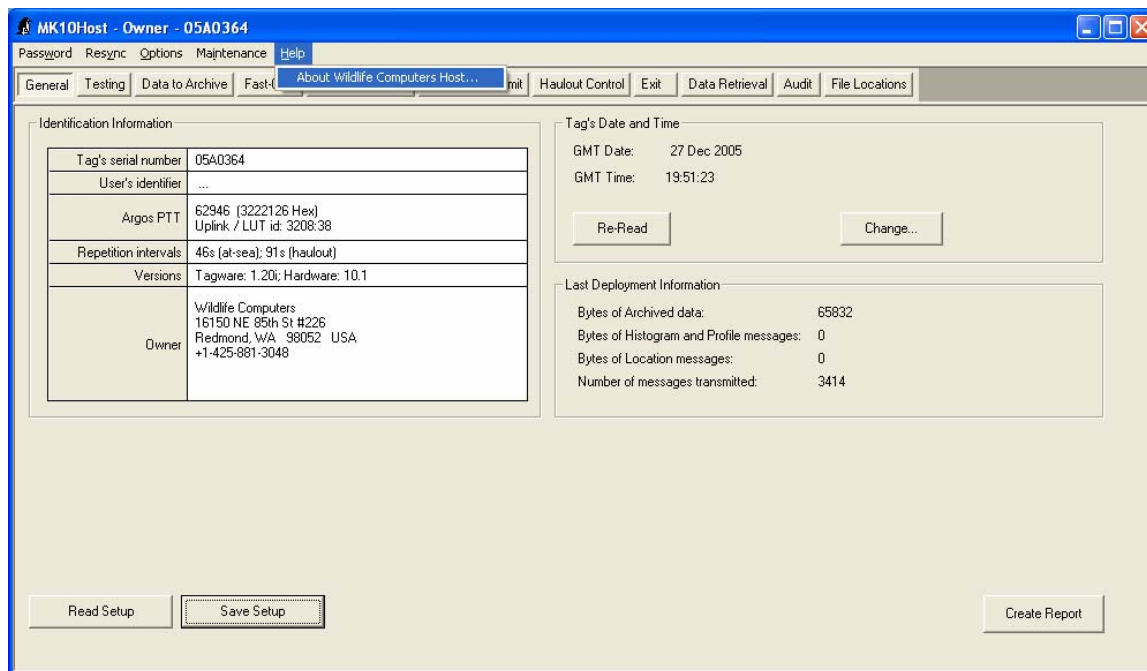
Maintenance



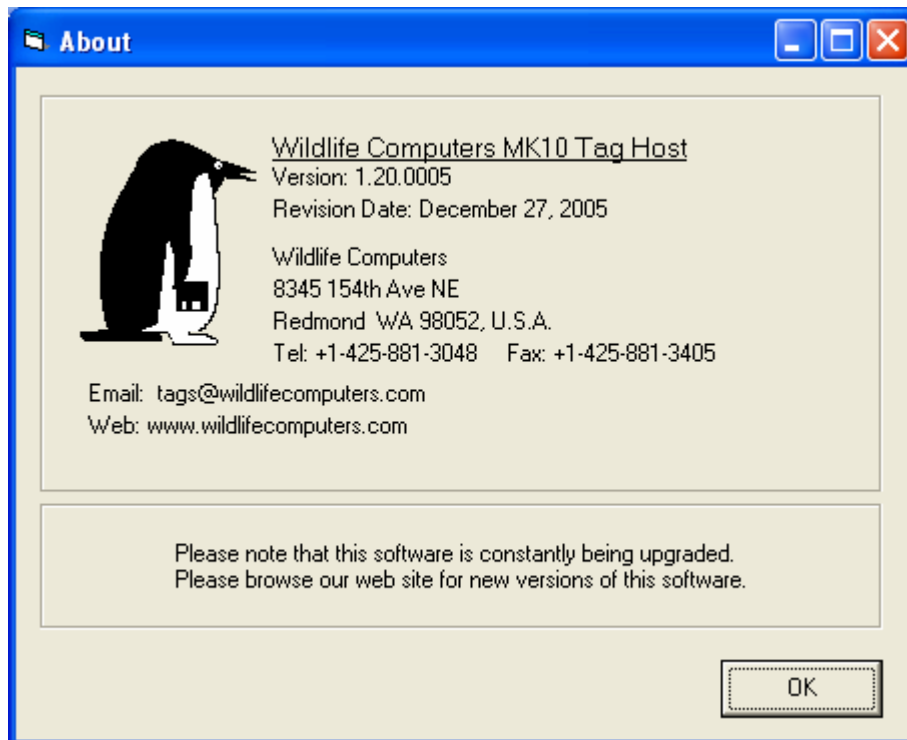
Following are the dialog boxes you will see upon selecting the first two items under Maintenance, as well as the **Clear Tag's memory** and **Read version numbers** options.



Help



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



Storing Mk10 Tags

Lithium batteries develop an oxide layer over their anodes to minimize self-discharging. This is called passivation. This process is exacerbated by high (30C+) temperatures. The passivation layer is “burned off” when current is drawn from the battery. Very little current is drawn from the Mk10 when it is suspended, so a passivation layer can form.

If the passivation layer is too thick, the battery voltage drops so low that the Mk10 cannot function.

Mk10s that will not be deployed for an extended period of time (more than one month) should be stored in a refrigerator or freezer (5 to -20C). This minimizes the battery passivation.

Testing after Storage

The Mk10 should be tested after storage, prior to deployment. It is not necessary to warm up the tag prior to proceeding with the test.

Establish communications with the tag. Test the sensors and check the battery voltage. It should read 3.0V or greater. The battery voltage may be a little low initially, but should increase after testing the sensors for a few minutes.

If the voltage continues to appear lower than expected, set the Mk10 to sample overnight at a one-minute data collection interval, deploy and activate. Leave the Mk10 in a freezer (-10C) overnight. Download the data and verify the Mk10 collected data throughout the test.

Contact Information

If you have been unable to find the answer to your question in this manual, our user support staff is available by email, phone or fax. Detailed questions which are not time-critical are best addressed by sending an email or fax with the details for staff review. Response will be by email or telephone.

Email Address: tags@wildlifecomputers.com

Fax Number: +1 425-881-3405

Telephone Number: +1 425-881-3048

Address: 8345 154th Ave NE
Redmond, WA 98052 USA